Marine Research and Eco-Tourism Centre.

Exploring notions of marine conservation, eco-tourism, a social and educational intersect within the current temporal context.

Ebrahim Dien M Arch 2022

Abstract

Small rural coastal towns have unique shared experiences between humans and marine life. The research question is: How can a traditional Regional Coastal Vernacular form the social and educational Intersect, between industry (local fisherman and community) and oceanic life forms (research) to support eco-tourism in Struisbaai in the Overberg District. Active research in coastal Marine Protected Areas (MPA) in the district is challenged with a lack of facilities to support the daily operations required for marine research, rehabilitation, and data collection.

Traditional regional coastal (fig 01), industrial vernacular, study buildings and site context were investigated and synthesized to develop a symbiotic relationship into an architectural form to accommodate a Marine Research and Eco-tourism Centre. Feedback from Marine Research experts and the fisherman community together with precedent study buildings established an interactive relevant symbiotic design. This dissertation provides solutions to address the marine conservation and eco-tourism into a social and educational intersect to promote social cohesion and conservation in similar rural coastal communities.

Fig 01 Hotagterklip (Dien, 2002)

Preamble

Growing up in the coastal regions we spent countless weekends exploring coastal towns and engaging recreational activities. In later years there was a realization of the lack of regulation implementation and the importance of marine conservation. This highlights the importance of public marine life education. Environmental degeneration is prevalent in the Overberg district with large sections being plundered and stripped of its natural resources leading to unbalanced decay of natural ecosystems.

This dissertation proposal a Marine Research and Eco-tourism Centre in an existing rural small town nestled on the shoreline of an existing commercial and recreational harbor. The proposed social and educational intersect will link Research and Learning Centre with rehabilitation tanks and quarantine pens for rehabilitation, with an eco-tourism center which includes a boat club, mobile shops, a fish market and restaurants. The research and conservation of marine life will be dedicated to sharks and well the well-known Struisbaai rays.

Funded by Provincial Government Department of Environmental Affairs and District Planning together with international donors, the proposed design will provide more tangible connections within the Struisbaai community. With education and the application of research data, the proposal can change of mindsets to turn around the negative impact into positive outcomes.

Fig 02 Harbour slipway (Dien, 2022)

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Introduction: Research Focus, challenges and question

How can a traditional Regional Coastal Vernacular form the social and educational Intersect between industry (local fisherman and community) and oceanic life forms (research) to support eco-tourism in Struisbaai in the Overberg District, see fig 03.
This design dissertation centres on a single notion: **SYMBIOSIS**, through a proposed Marine Research and Eco-tourism Centre with aim to integrate the community by creating awareness and mutual participation in the proposed development.

Research focus.

Throughout time, mankind has looked nature for inspiration. Cooperation with the natural environment has become an absolute requirement if we are to survive. The design dissertation focuses on a single notion: SYMBIOSIS. Through a proposed a Marine Research and Eco-tourism Centre on the Struisbaai harbor the symbiotic relationship is explored and reinforced with an eco friendly mutually beneficial intervention which seeks to educate the general public and tourists alike. The purpose of this dissertation is to understand symbiotic relationships and establish a design ethic or thinking that will synchronize with nature and the environment. Portions of the site has been identified for parking upgrades (Press Release) as well as Tourism facilities, (Cape Agulhas Municipality, 2017: 78).

Largely due to the lack of infrastructure development as a result of a lack of funding, the local Aghulhas Municipality has identified the precinct for future upgrades earmarked funds for this venture.

Brief

This dissertation aims to explore the opportunities of how a culture and natural life form can intersect and form a symbiotic relationship. The intersect must be researched as it partially exists as an informal eco-tourist attraction.

Symbioses

On the return of fishing vessels, the boat crew clean their vessels and discard the fish leftovers just outside the harbour, this attracts the local town mascot known as Parrie. Parrie has become the local legend (a general name for the short tail black stingrays) In a conversations with the local fisherman it was said that these stingrays have over the years become semi tame and the local fisherman started feeding them, the local people of Struisbaai also became part of the interaction and a strong symbiotic bond exists between man and wild animals, they are usually hand fed and this intersect forms a main attraction for locals and tourists.

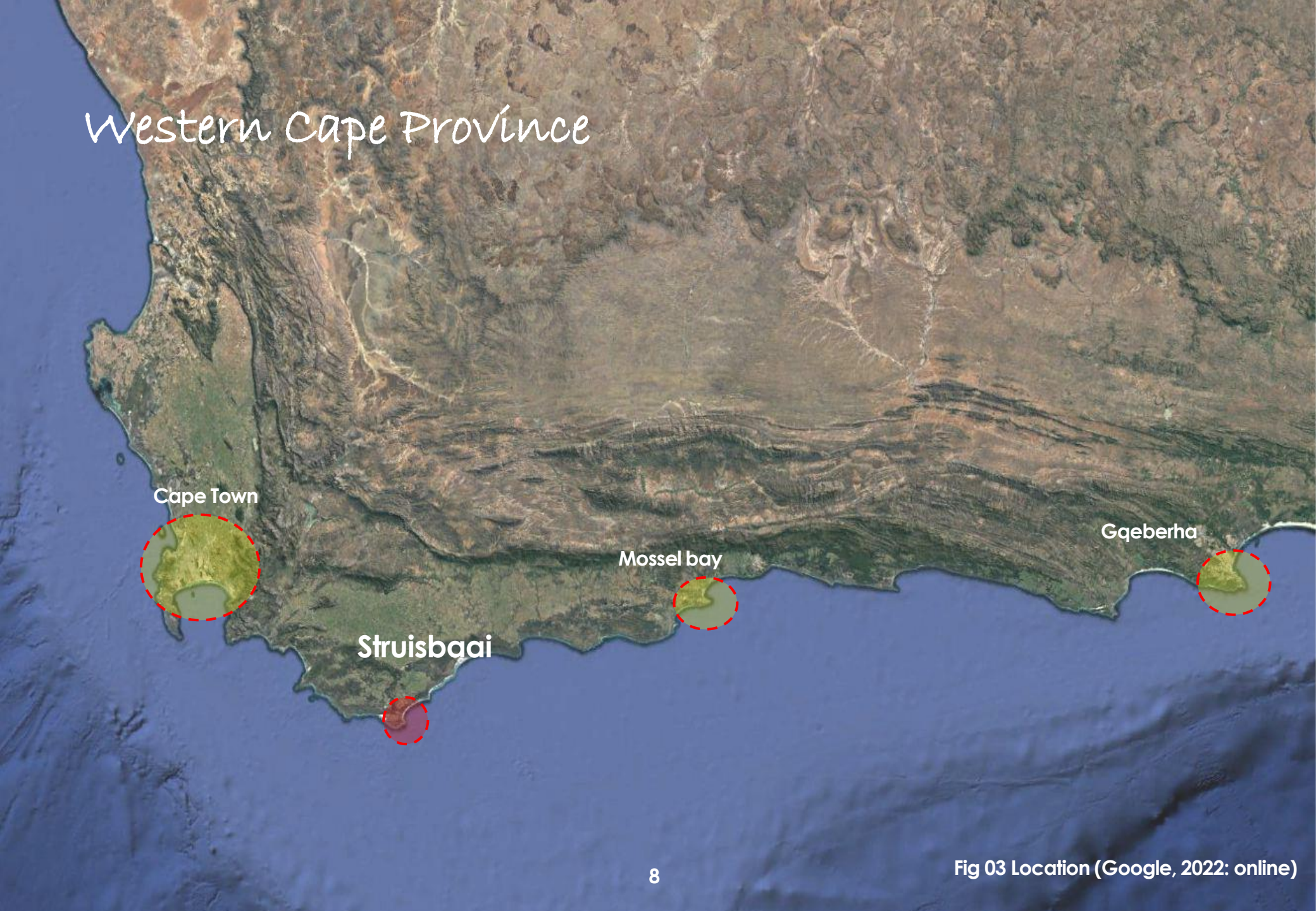


Fig 03 Location (Google, 2022: online)

Magical Struisbaai and its harbour

Fig 04 (Tresfon, 2022: online)

Research Question.

How can a traditional Regional Coastal Vernacular form the Intersect between human civilization (mankind) and oceanic life forms. This dissertation aims to explore the opportunities of how a culture and natural life form can intersect and form a symbiotic relationship. The intersect must be researched as it partially exists as an informal eco tourist attraction.

Leading theme.

An exploration and interpretation of symbiosis that exists within a community, how it can influence the making of a contemporary architectural response.

Magical moment: a local hand feeding a stingray

Fig 05 Tourist handfeeding a stingray (Dien, 2022)

The Department of Environmental Affairs and District Planning (DEADP) and the Department of Public Works of the Western Cape Government seeks to formerly revitalize the harbour precinct by creating a marine park that will tie-in with other coastal activities such as the whale route, Walker Bay nature reserve and De Hoop nature reserve, see fig 07. Create a marine park with a rehabilitation facility for the release of previously captured elasmobranchs, with a research lab that with support the De Hoop project and other research based marine protected areas (MPA'S) with amenities such restaurant, curios, fish market and other general facilities. The current harbour does not have proper amenities and together with the governmental departments will become a multi-functional collaborative.

It will include the existing FISHERIES INSPECTORATE, the functions can serve each other, amenities must be shared. Parking and management of the facility must be addressed as it becomes congested during peak season, additional thought is to be given to how the site is accessed and how traffic issues can be alleviated. Dunes and natural fauna and fauna to be respected and any intervention should include either the reinstatement or the relocation of the nett values of disturbed land.

The site roughly forms an arc with the northwest and southeast portions split by the access point to the slipways. The flat ground is roughly 2.0m above the mean sea level, the Northwest and Southeast portions have minor coastal dunes which reach up to 4.5-5.5 m above mean sea level and is made up of silica-based sea sand, limestone and cape fynbos, both also boast to boardwalks which form a much-loved part of the community. The harbour itself has two main launch slipways and one minor and one unused unit. A fish market, restaurant and many shops have come and gone over the years. Amenities such public ablutions sit outside of the harbour, informal parking is in front of the restaurant and needs to ideally be situated where there are better traffic flow options.

Fig 06 Struisbaai winter days (Dien, 2022)

Links to Coastal and Eco- Tourism Activities

Hermanus -Whale watching, surfing and tourist holiday destination

Walker Bay- Whale Watching

Gaansbaai –Fishing and Shark Cage Diving

L'Aghulus – Southernmost tip of Africa

Struisbaai- Charter Fishing, Sport fishing, Surfing and tourist holiday destination

Arniston- Sport Fishing, surfing and tourist holiday destination

De Hoop- MPA, Nature, fish tagging program

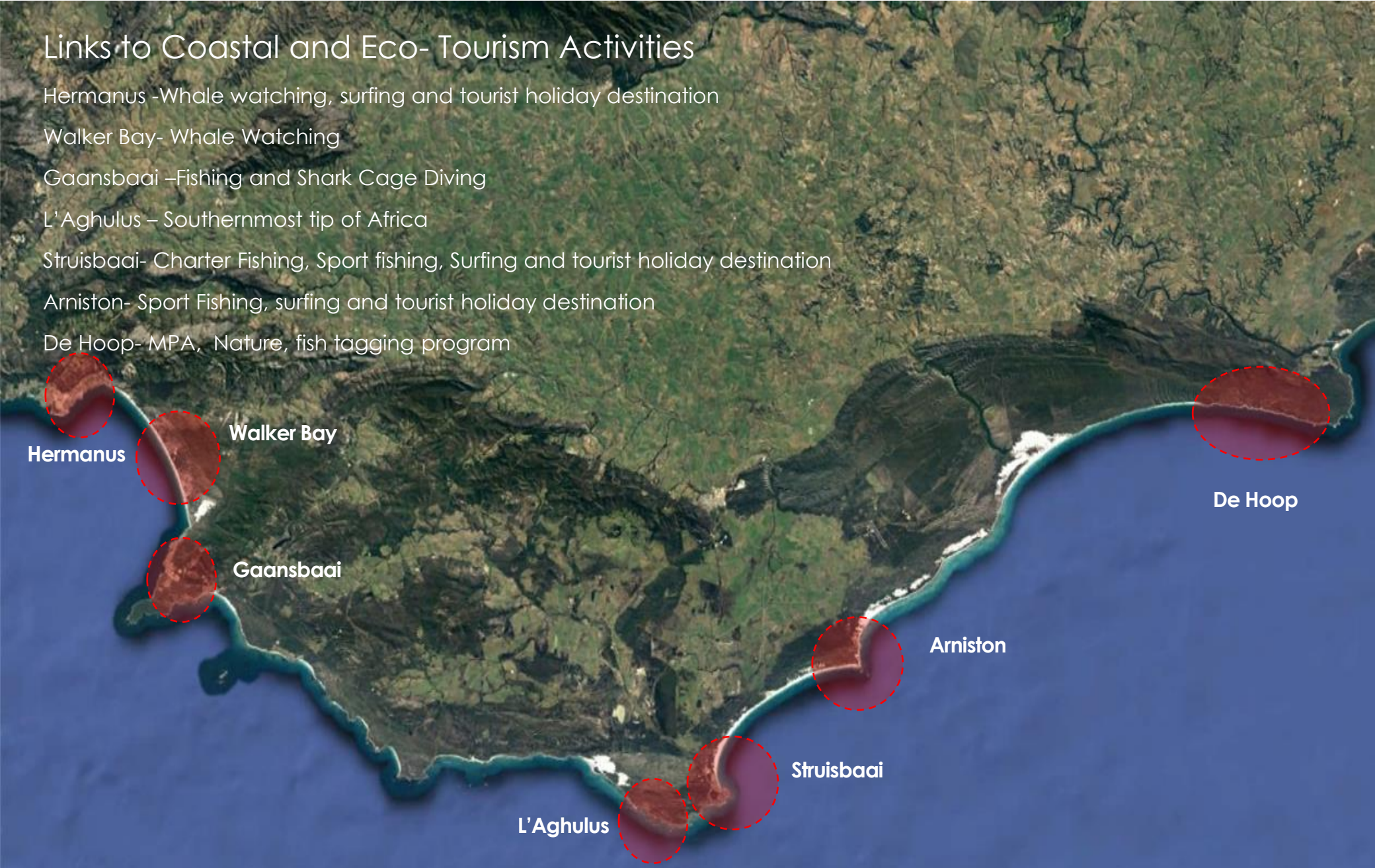


Fig 07 Links to Coastal and Eco- Tourism Activities (Google, 2022: online)

Struisbaai Harbour

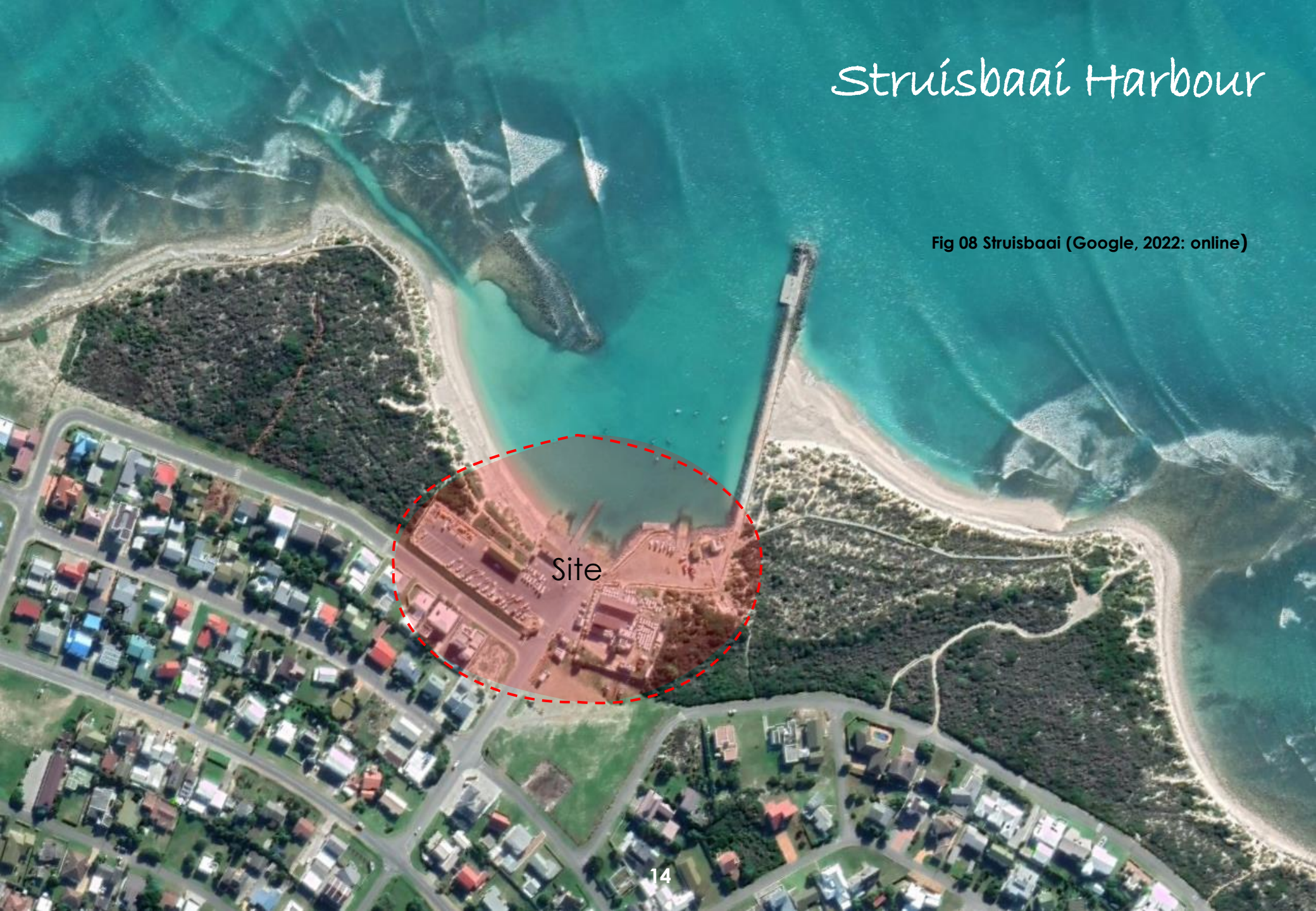


Fig 08 Struisbaai (Google, 2022: online)

Part 1 | Project Rational

Fig 09 Harbour (Dien, 2022)

1. PROJECT RATIONALE

Scientific research in collaboration with communities have worked well within the modern era, whereby more communities are starting to understand the impact of their activities and how research suggests solutions, this process is dynamic and active participants benefit in many ways by engaging in a "symbiotic" manner. More citizens need to become active in these initiatives and the main aim of this project is to bring together active participants as well as inactive and create a more sustainable approach. Coastal communities have long survived creating a living by working in the sea environment and must be acknowledged for their participation as role players.

The aim is as follows:

- Promote a more inclusive communal participation
- Promote conservation
- Reconnect the previously disconnected communities
- Synthesize and connect communities to reach a result of symbiosis with nature

Education and Rehabilitation

It is quite evident in the coastal communities that there is a lack of understanding of marine eco systems, for example, an angler would not handle sharks correctly, this happens due to a lack of understanding of how these animals' biology works. An educational component in the facility will run workshops on shark handing and education.

We can then extract an idea of a brief which needs to address the following

- A research lab with education component and rehabilitation facility
- Eco-tourism harbour with a fish market and other recreational activities with end user facilities

See flowchart fig 10.

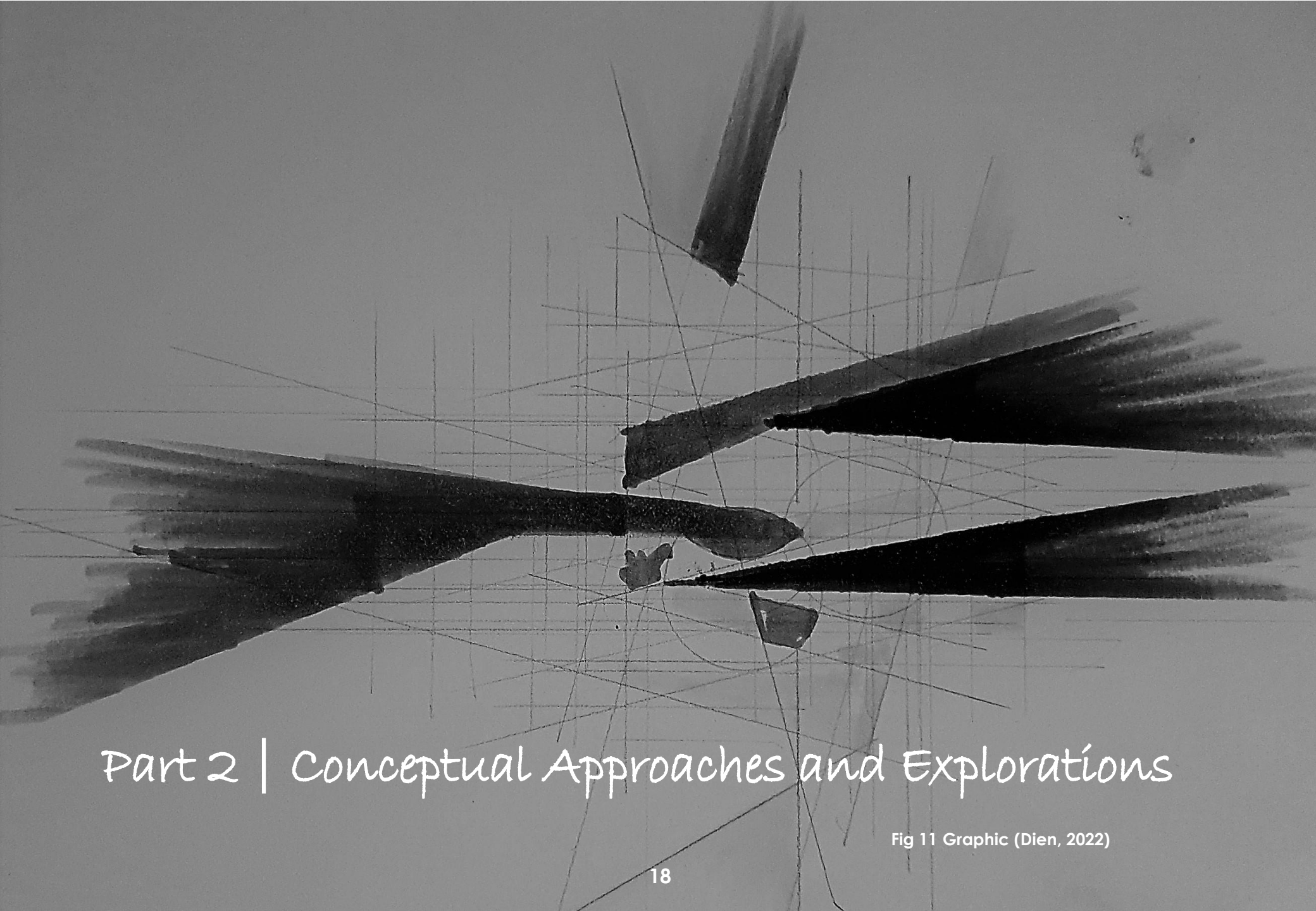
Learning processes adults and kids ages 6-80
- Interactive learning
- A selection of desired objectives such as ecological sustainable teaching.

Gain knowledge.
Boost confidence

Process knowledge and apply and educate.

Outcomes achievable.
- Personal improvement regarding eco systems
- Primer for learning and growth
- Hands on learning and conservation knowledge.
- Practical experience.

Fig 10 Flow chart (Dien, 2022)



Part 2 | Conceptual Approaches and Explorations

Fig 11 Graphic (Dien, 2022)

2.0 Research on Struisbaai Town, History and Values

History of L'Agulhas and Struisbaai

Approximately **150 shipwrecks** dots the South African coastline can be found predominantly around the most southern tip of Africa at L'Agulhas. It's fierce and treacherous history is like its reef which would eventually give birth to its name.

Tools found in the area date back to over a million years ago, having been made in the Early Stone Age. Fish traps and middens in the area leads us to believe that San and Khoekhoen people used to inhabit this region due to the abundant waters. From the reference above we learn that communities of prehistoric inhabitants lived in harmony with land and reinforces a symbiotic approach.

The exact discovery of Struisbaai and L'Agulhas is still a subject of debate on the origins of the names. The name supposedly has three origins, the first of which is accredited to the straw ("strooi" in Afrikaans) roofs of the fishermen cottages. Another possibility is the ostriches ("struisvogel" in Dutch) that used to roam here, while others believe the name was derived from an old Dutch word meaning "huge" due to the long stretches of beach. For L'Agulhas however, it was the establishment of the town that draws heavy debates. It is believed that L'Agulhas was discovered in the early 1400's by the Portuguese and finally on 16 May 1488 Bartholomew Dias named the most southern point of Africa after St Agulhas. The southernmost tip was christened Cabo dos Agulhas (Cape of Needles) by the Portuguese. The French influence of later turned it to L'Agulhas. As time went by, this version of the name was forgotten, but during the restoration of the Lighthouse the old name was once again reinstated and accepted by the National Names Commission, (Explorio, 2022; online) .

Fig 12 Harbour (Dien, 2022)

Struisbaai Harbour

The quaint little harbour, built in 1959, was deepened and enlarged in 1990 and is today used by both fishing and ski boats. Originally built to service the commercial fishing industry, it has now become a recreational and commercial shared harbour, (Explorio, 2022; online).

Fig 13 Harbour (Dien, 2022)

Struisbaai Population Data

Cape L'Aghulus population growth 2020-2024 =0.9%- informs a slow growth pattern. A gradual decline is evident, (Cape Agulhas Municipality, 2017: online).

Western Cape Government -5 priorities

- Safe and cohesive communities
- Growth and jobs
- Empowering people
- Mobility and spatial transformation
- Innovation and culture.

Demographics @2021,(Cape Agulhas Municipality, 2017: online).

Female 50.4% : Male 49.6%

Population 10 per sqm

Current population 35 427 10802 households

Eco-tourism

Tourism directed towards exotic, often threatened, natural environments, intended to support conservation efforts and observe wildlife. Shipwrecks already form a part of the local tourists' attractions and could be incorporated into the eco tourism theme, *(*WCG, 2020: online).

2.1 Vernacular Architectural Influences

2.1.1 Traditional Coastal Vernacular

The Cape vernacular, as an inherited tradition, has endured for over three hundred years through its close response to place, technology and culture. It has been revered by architects such as Baker (1862-1946), (Barker, 2012: 3).

The fourth Cape vernacular interpretation Houses designed by Pius Pahl, Revel Fox and Gawie Fagan during the 1950s and 1960s built on and developed the formal, spatial and technological legacy of the preceding Cape vernaculars. **Simple white box forms**, often with fireplaces as focal elements provided aesthetic continuity while haptic qualities, we re extended using white painted bagged brickwork, clay tiles floors and simple pitched roofs. Functional organizations, influenced by Modern Movement tendencies, ordered space efficiently while resolving the conflict of external contact and the introverted nature of the vernacular model. A simple approach to technology emulated that of old and fostered an economy of means. The attenuative design approaches recognized the restraints of the vernacular while contextualizing Modern Movement attitudes to space making, technology and climatic response. This approach layered a functional determinism on an established formal and technological tradition, (Barker, 2012: 3).

Vernacular building is an authentic architectural response to physical and socio-cultural context. It constantly evolves through influences such as the arrival of a new group of people with different cultural practices, new functional requirements or changes in technology. These shifts are concretized in the hands of craftsmen or designers who reconcile modern dictates with the necessity for historical continuity and cultural meaning.

The focus is on the traditional coastal fisherman's cottage as well as the industrial vernacular. These two forms of architecture were investigated to propose a vernacular symbiotic intersect.

Fig 14 Hotagterklip (Dien, 2022)

Introduction

Vernacular Architecture forms part of a region's culture and living heritage. It is an architecture that reflects local needs and uses local materials. Buildings are primarily constructed by community tradesmen, whose methods are well attuned to the locally sourced materials and have been passed down from generation to generation. As a result, vernacular architecture can be considered highly relevant to today's concerns regarding sustainable and green materials for the architectural response.

I will be exploring these characteristics within the vernacular architecture of the Western Cape and will look at how the structures developed, its materiality and place special emphasis on their use of green building techniques (locally sourced labour and materials). I will also explore how and why this architecture has adapted to modern applications.

Typical cottages

Structures are mainly arranged within a homestead format in which one family has more than one building. These spaces vary in shape and (as of recently) in construction materials. Functions include but not limited to:

- Gathering
- Sleeping
- Cooking
- Animal shelters

Construction

Foundations are generally constructed from stone which is locally sourced. Walls are comprised either of limestone or mud bricks. These are then plastered with Daga and painted with either limewash, or white paint or PVA paint. Floors are traditionally Daga. This is trowelled to create a smooth surface.

The Roof Structure is a timber frame, it is constructed in order to create the framework for the thatch. This framework is constructed from gum poles which rest on the walls and meet at the centre. Saplings (smaller branches) are then tied to these poles. Thatch: Bundles of thatch are placed onto the roof structure and are tied down with twine or rope.

Building Form

A basic rectangular form developed over time and traditionally was a product of the available technology and limitations of local materials.

Spaces are usually open plan and accommodated all functions in one space with sleeping quarters at the one end and the functional cooking zone at the other, see fig 15.

Threshold spaces form the spaces between units and werf walls and later received further modifications such as verandas or "afdak".

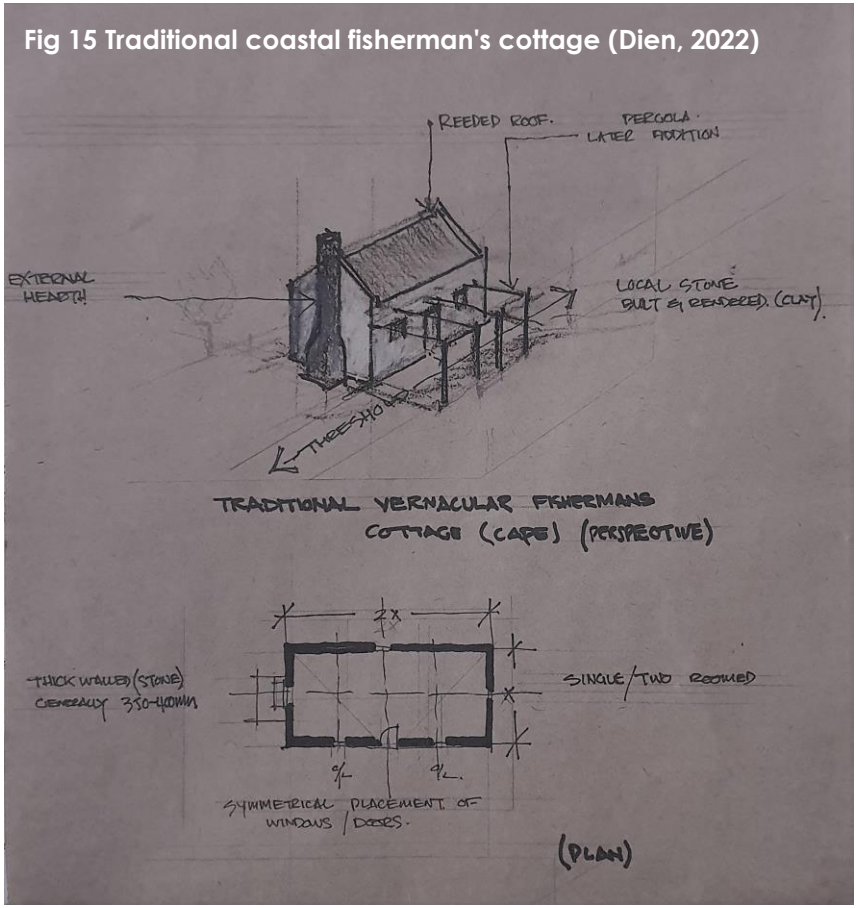


Fig 15 Traditional coastal fisherman's cottage (Dien, 2022)

Fig 16 Hotagterklip (Dien, 2022)

Grouping

Grouping of units is evident and formed part of the close-knit traditional communities, see fig 17. The units in places have a random orientation but generally it faces Easterly direction.

Werf wall

Traditional werf wall creates the edge of the precinct and can be seen as an element holding spaces together creating threshold spaces as well boundary and planter elements and is traditionally constructed with locally available limestone and it is either plastered or limewashed, see fig 17.

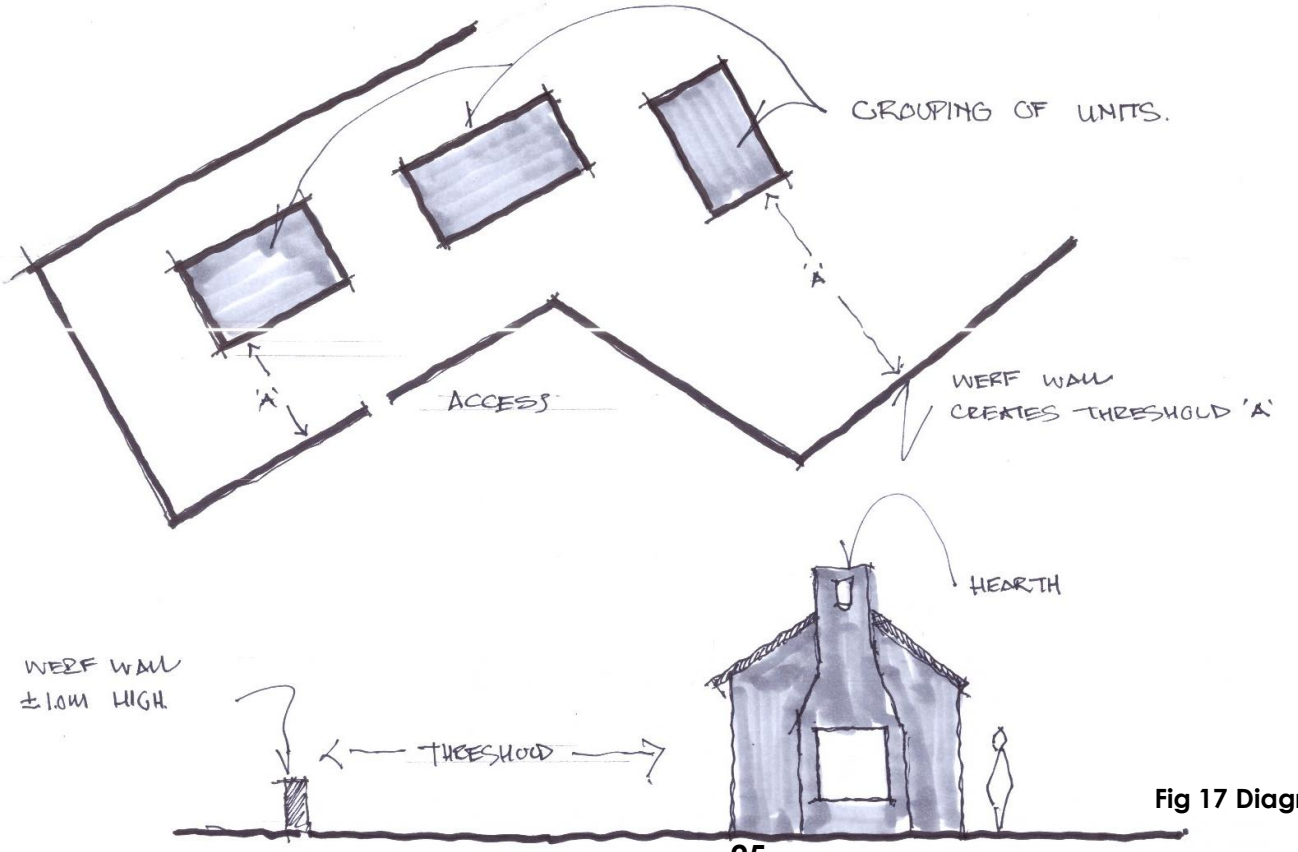


Fig 17 Diagram (Dien, 2022)

Hearth as the heart of the dwelling

The External hearth grounds the building both visually as well functionally as this was considered the heart of the dwelling, these elements can be introduced to propose and perform similar functions, see fig 18.

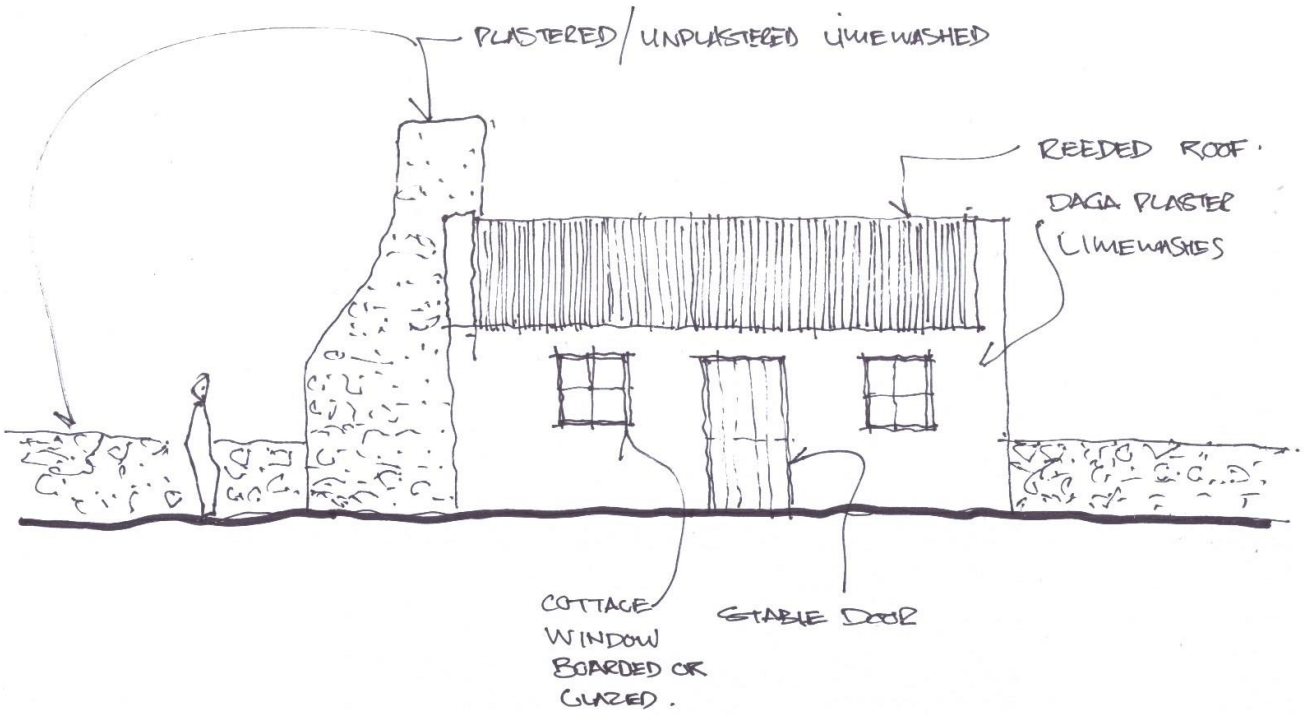


Fig 18 Diagram (Dien, 2022)

Industrial Vernacular

As rural towns grew as a result of industrialization of farming, so did the need for infrastructure, dotted on the main routes and towns in the Overberg landscape we find a regional industrial vernacular that is dominant in its setting and can suggest an influence in typology, element design and finishing interpreted in a contemporary manor. Concrete silos or containers are seen as an important element and can form a recognizable echo.

Traditional elements identified, see fig 19&20.

Linear augmentation

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Industrial type concrete and steel in a rural setting

Grain silo soft cylindrical form

FIG 19 Caledon Silos (Dien, 2022)

FIG 20 Caledon Silos (Dien, 2022)

The containment of produce, grain is the livelihood of the regional farms and forms the main source of income for the farming community, these elements are seen in the landscape and rarely acknowledged, the farming community and residents easily identify with the grain silos. Functional containment of water for the aquarium component will be explored as the language of the concrete structure can suggest an industrial vernacular feel, see fig 21.

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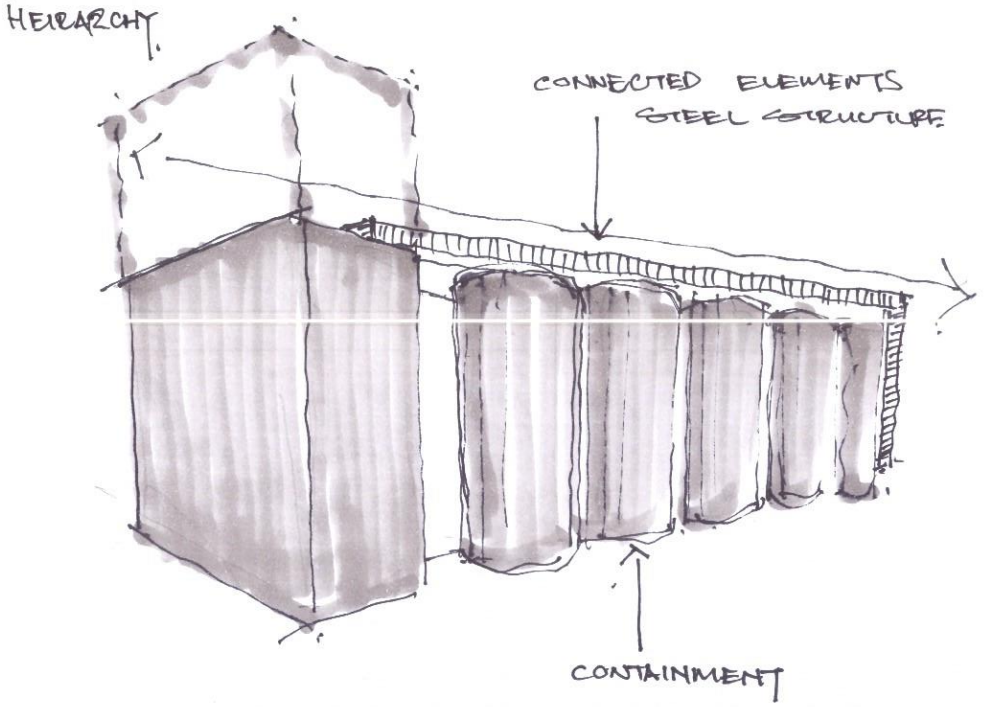


FIG 21 Silos Diagram (Dien, 2022)

Lessons learnt.

Traditional Coastal Vernacular

From the explorations of vernacular architecture, we can see the importance and relevance of the architectural influences.

The werf wall sets out boundary and threshold spaces and creates a sense of connection to the Cape Vernacular form; the components of the walls is layers of limestone and could also create the feel of traditional vernacular as an element in the design.

The HEARTH which is seen as the heart of the vernacular cottage is important as it will also form the connection to traditional cottage vernacular architecture.

Industrial Vernacular

Industrial Vernacular supports the machine idea, and it creates a machine within which the functions of a research centre lives.

The container as noted is an important element as it can contain elements of the design, constructed from reinforced concrete it can lend the industrial feel as required to create the machine- industrial type design.

Structural Steel connects spaces and creates further components of the machine which also relevant to creating the machine. Steel and timber can form a softer approach to connect to the vernacular feel.

2.2 Shark Research and Conservation- Connected Infrastructure

2.2.1 Reel Science CONVERSATION on research processes.

In my processes of gathering data and researching marine systems relevant to this thesis, I struggled to get information from key role players in the industry. I know Dr Michelle Soekoe (an angling friend whom I met years back whilst coaching the Western Province ladies Team) had recently started consulting as Marine researcher, I was not sure if it was going to be applicable but turns out to be an important part of the research process.

Dr Soekoe runs Reel Science, a research laboratory and consults for various international and local organizations with interests in the marine environment.

We met informally on 01 June 2022 in Gordons Bay and had a conversation on marine research.

After the conversation, the information was captured and communicated via email, (see annexure b).

Question: What are the current Western Cape projects you are working on and how can this proposal be integrated and form the base station for your possible research?

Project: Genotype-environment associations in Southern African elasmobranches: a first step towards the identification of climate-sensitive populations

Client: Stellenbosch University, Department of Genetics, Molecular Breeding and Biodiversity Group

Details: Rock and surf angling for genetic sample collection from *Mustelus mustelus*, *Triakis megalopterus, Sphyrna zygaena, and S. lewini*

Base Station Integration: Reel Science Co. distributes sample collection kits to experienced anglers to aid in greater temporal and spatial sample collection. The base station can be used as a sample kit collection and drop-off point This will drastically reduce courier costs of the kits which will aid in more kits going out, more anglers taking part and more samples being collected.

From the above we find that local researchers support the idea to have a base research station in the Overberg region and more particularly the selected site as identified at Struisbaai Harbour, see fig 22.

Links to other facilities

The project will form part of A network of facilities on the Overberg coastline such as the De Hoop nature conservation tagging project as well as South African Shark Conservancy (SASC) in Hermanus.

Fig 22 Connecting places Overberg district (Google, 2022: online)

Question: What is it that you do in the field and then in the laboratory?

This greatly depends on the projects being worked on, no two days are the same. Currently, most of my time is spent travelling to various locations across the Western Cape where we undertake Roving Creel Surveys of recreational anglers. These surveys take place from sunrise to sunset, four days a week. On our off days, we collect sea bird feathers and scat from the beaches and rocks and fish for specimens using standard rock and surf angling techniques. For eDNA sampling, targeted sampling trips are undertaken by boat where water samples are collected from various points.

All samples land up in our genetics laboratory at Stellenbosch University where DNA is extracted and PCR's are run.

Question: After the laboratory work, what happens to this data?

General information is published on the Reel Science Co. website and social media platforms. To keep the public engaged and informed, articles are published in local newspapers and appropriate online newsletters. Significant research findings are presented at scientific conferences both locally and internationally and published in relevant peer-reviewed scientific journals.

Question: Who typically funds your research?

Reel Science Co. is a registered supplier for Rhodes University, Stellenbosch University, and the City of Cape Town. Much of our time is spent writing project proposals and applying for grants/funding from various funding bodies. For instance, our eDNA project is funded by Idea Wild which supplied us with all of the equipment we required and a financial grant from The Rufford Foundation which covers all the running costs for the project.

Question: How does this research then feed back into the communities if a change is required?

Community engagement takes place in many ways. Reel Science Co. is involved with various home-schooling groups where rock pool educational sessions and beach clean-ups are organized to educate and engage school children of all ages. We are often invited to give talks at various conservation evenings organized by groups such as Oceaneers, The Helderberg Ocean Awareness Movement and the Sunrise Rotary Club. Popular articles are written for online magazines to educate recreational anglers on the importance of practicing catch and release and sustainable fishing practices, see fig 23.

Fig 23 Active tagging (Dien, 2022)

Question: Can you give a brief scenario of a typical "live research" project for example the populations of the Bettys bay spotted gully sharks, what you have discovered and how this relates to symbiotic ecosystems?

In a feeding study of the spotted gully shark, Triakis megalopterus, sharks from Angola and the Eastern Cape feed predominantly on teleosts, crustaceans and molluscs. In the Western Cape, however, these sharks prey almost exclusively on the Cape rock lobster (Jasus lalandii). This is not surprising as this rock lobster is also nocturnal and occupies the same reef habitat. The Cape rock lobster is also abundant in Betty's Bay where the Western Cape sampling site was located. This is a consequence of the increased population sizes of J. lalandii along the southern and eastern coasts since the early 1990s, which saw this species shift its distribution range eastwards to the east of Cape Hangklip. The incursion of lobster into the Cape Hangklip area initiated a regime shift whereby the ecosystem, previously dominated by coralline algae and herbivores, is now dominated by lobster and macroalgae. The increase in numbers of J. lalandii is thought to be a consequence of the overexploitation of its main predators, reef fish and the Cape fur seal (Arctocephalus pusillus).

Although the seal population has recovered, it does not appear that they have managed to control the lobster population. This is perhaps due to the eastward shift of the lobsters, while the bulk of the seal population remains on the west coast. The size of the lobster population has also had a profound effect on the sea urchin and juvenile abalone populations. Due to predation by the Cape rock lobster, the sea urchin populace collapsed in Betty's Bay and Mudge Point, South Africa in 1994. As juvenile abalone shelter under sea urchins, the collapse of the sea urchin populations thus resulted in a high mortality rate of juvenile abalone. Thus, even though abalone do occur in the Western Cape, none were found in the stomach contents of T. megalopterus in this area, unlike the Eastern Cape individuals. Due to the collapse of prey for J. Lalandii, it is not clear what will happen to these populations in the future. They will either have to adapt their feeding to a more readily available prey species or migrate to a more suitable environment. If migration occurs, T. megalopterus will lose their primary prey item which will require these sharks to adapt their feeding, again, or also migrate. This pattern of reduction of predators (A. pusillus and reef fish), the abundance of J. lalandii and consequent depletion of prey populations (sea urchins and abalone), is a prime example of the top-down effect predators have on their ecosystems.

Active research as noted by Dr Soekoe will form an integral part of the proposed Marine Research and Eco-tourism Centre.

Lessons learnt from research above

Equipment needed, Processes Educations systems, Drop off point for samples.

Storage room for samples whether it be tissue samples, feathers, mucus, scat or whole specimens for dissection. This should include:

- Fridges and chest freezers
- A walk-in freezer
- An incinerator
- Shelf/cupboard storage
- A dissection room which should include:
- An autopsy table
- Washbasins
- Autoclave
- Secure storage for preservation chemicals (e.g., formalin and ethanol)
- A sterile genetics laboratory, divided up into five different sections:
    - Storage room for DNA
    - Extraction kits and reagents
    - Sample preparation room
    - DNA extraction room
    - PCR preparation room

2.2.2 De Hoop Tagging Project

De Hoop- Marine Protected Area, World heritage site.

About 3 hours from Cape Town, we find the De Hoop Nature Reserve is situated in the Overberg region close to the southern tip of Africa.

CapeNature manages its largest reserve which is approximately36 000ha in size. It is a favourite destination for hikers, cyclists, bird watchers and, during the winter and early summer months, whale watchers flock to the area.

The Marine Protected Area (MPA), extends three nautical miles (5.5km) out to sea, is one of the largest MPA's in Africa, it provides a sanctuary for marine species.

It is believed that many thousands of years ago, Stone Age people hunted game in the De Hoop area, followed by Late Stone Age hunter-gatherers who lived off the veld and coastal resources.

Prior to the arrival of Europeans, the nomadic Khoi or Khoekhoen inhabited most of the southern Cape and their middens can be found dotted along the op coast, (DeHoop, 2022: online).

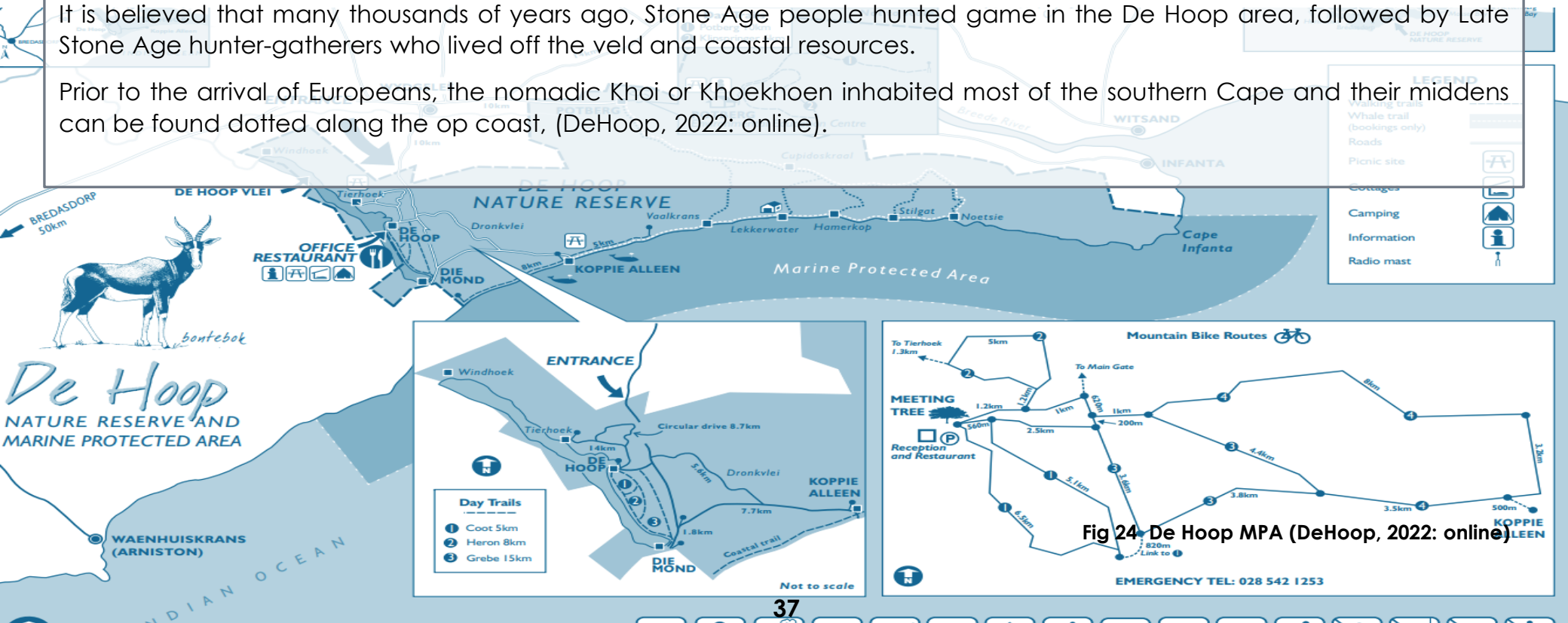


Fig 24 De Hoop MPA (DeHoop, 2022: online)

The Overberg region was colonised in the early eighteenth century and over the next 100 years it become well known for merino sheep farming, horse and cattle breeding, and grain farming. The earliest registered owner in the De Hoop area was Pieter Lourens Cloete who established a successful Spanish horse stud operation on what was known as Hope Farm. The Cape Provincial Administration bought the farms De Hoop in 1956 and Windhoek in 1957. De Hoop Nature Reserve was proclaimed in 1957 and subsequently enlarged by further acquisition of land. The reserve was initially utilized as an experimental wildlife farm where rare and endangered species, such as bontebok and Cape mountain zebra, were bred for restocking reserves and sale to private landowners. Since the early 1970s, however, the primary objective of De Hoop has been to conserve natural ecosystems typical of the Western Cape coastal region. **The Marine Protected Area was proclaimed in March 1986, contributing significantly to the conservation of this region's coastal marine resources**.

Tagging project

Science communication is challenging. Scientific jargon, restricted access journals and a tendency for scientists to get 'lost in the detail' inhibit the flow of information to those genuinely interested. Here, we aim to provide the general public an overview of the data collected by the De Hoop monitoring programme on a platform that is easy to use, understandable and accessible to all to browse in their own time. The website contains the results of 30 years of fishery-independent monitoring of surf-zone fish abundance in the De Hoop Marine Protected Area. It is not exhaustive, but rather illustrates the basic provisions of fish monitoring programmes: total catch, catch-per-unit-effort and size-structure data. These can be used as indicators of fish abundance and a benchmark for assessments in exploited areas. Moreover, the data are used to measure natural variation in these parameters over time and between sites. Natural trends in abundance and the scale of such variation are important for assessing the impact of fishing and for determining catch regulation, (DeHoop, 2022: online).

Individual sports angling members are regularly invited on a few occasions annually to participate in active research.

The project involves active education of anglers who will then transfer their skills sets and knowledge to their peers and general public thus creating and promoting conservation ethics.

Fish are caught in a limited zone, tagged, measured and released. The data is captured and kept on file.

The tag project operates with no proper facility and will utilize the Marine Research and Eco-tourism Centre and collaborate on projects, see fig 25.

The De Hoop Project has little to no resources and or facilities and will collaborate with the Marine Research Centre

Infrastructure connection- forms part of a network of connections to the Overberg, see fig 26. DeHoop tagging project will collaborate with the research centre with regards to research and education. The labs will be used to study samples and education facilities will be used to educate the general public on marine conservation.

Fig 25 Tagging (Dien: 2022)

Fig 26 De Hoop (Dien, 2022)

2.2.3 Two Oceans Aquarium

Rethink the Shark

We fear sharks as we do not know much about these prehistoric predators, this is exacerbated by shark attacks on bathers, surfers, divers and people stranded at sea, our instincts is to react and kill in order to be safe and many believe a "good shark" is a "dead shark". Sharks are seen as man eaters and these perceptions are difficult to overcome, at the same time we have come to the realization that we have to conserve these animals for micro and macro ecosystems to flourish, thus ensuring the well being of our oceans.

Shark populations are in decline worldwide leading to a vastly imbalanced natural environment. The task of Two Oceans Aquarium is to promote education of the visitors and inform them of the role of large sharks as apex predators. It is a daunting task to convince visitors that the perceived man-eaters are an integral part of the environment whilst they continue to attack humans.

The focus is keeping things in perspective and reduce hysteria and the outcries for revenge each time an attack occurs, As Shark attacks are horrific as they appear to be savage and malicious. We must accept that these animals must attack their prey as it is their means of obtaining nutrition in order to survive.

The message is clear to anyone entering the ocean, these are wild animals, and their feeding habits must be accepted and respected as they form part of an ecosystem where they reign supreme at the top of the food chain

Historically on average, only one serious injury every year and only one fatality every 2.3 years, thus we cannot consider ourselves prime targets. Relative to the recent Cape Town False Bay shark attacks, there has been none in the surf zone, with all attacks in the backline or Deepwater. Surf users will have to accept that when venturing into deep water the chances are real that there may be an encounter with these apex predators.

The Advertising agency Saatchi & Saatchi, in partnership with the production company Groundglass, have recently produced the advertisements, comparing shark attacks to deaths caused by the use of everyday appliances and toys and cleverly interweaving the hysteria portrayed in films such as "Jaws", they show that the chance of falling prey to a shark attack is miniscule in comparison to deaths caused by defective toasters, people falling off chairs The message is neither frivolous nor disrespectful, It is simply that we need to 'Rethink The Shark', (Two Oceans Aquarium, 2022: online).

The Two Oceans Aquarium does not do any physical research on their animals; however, they do provide an educational function and further assist research candidates and professionals with data and specimen samples. All the display animals except for baitfish and predator fish which end up as part of the sharks and rays' diet are released back into the wild. These animals are tagged along with local animals' resident in the release area and monitored for further growth and development and reintroduction. The data is captured and documented for further research and may make its ways into Marine Science published articles and or workshops. This research may influence policy makers in creating new laws for the preservation of marine life, (Conversation with Curator and manager of Two Oceans Aquarium, 2022: online).

As stated above the rehabilitation and release of the animals will occur at the Struisbaai Facility, which will form the necessary base station from which this release function is facilitated.

2.3 Symbiotic Relationships

2.3.1 Symbiosis

Functional symbiosis

The intention is to functionally express symbiosis by creating a symbiotic structure that not only reinforces architectural symbiosis, but also function in a symbiotic manner, see fig 27.

In a symbiotic architectural response, the built environment relationship with non-man-made world exists in harmony within an architectural design.

In the field of architecture, the symbiotic association is translated to the relationship between an existing building and new intervention. The sole purpose of the symbiotic associations is to allow at least one symbiont to draw benefits, nutrition or protection from this relationship.

Biophilic architecture

Biophilic design is an approach to architecture that seeks to connect building occupants more closely to nature. Biophilic designed buildings incorporate things like natural lighting and ventilation, natural landscape features and other elements for creating a more productive healthy built environment for people.

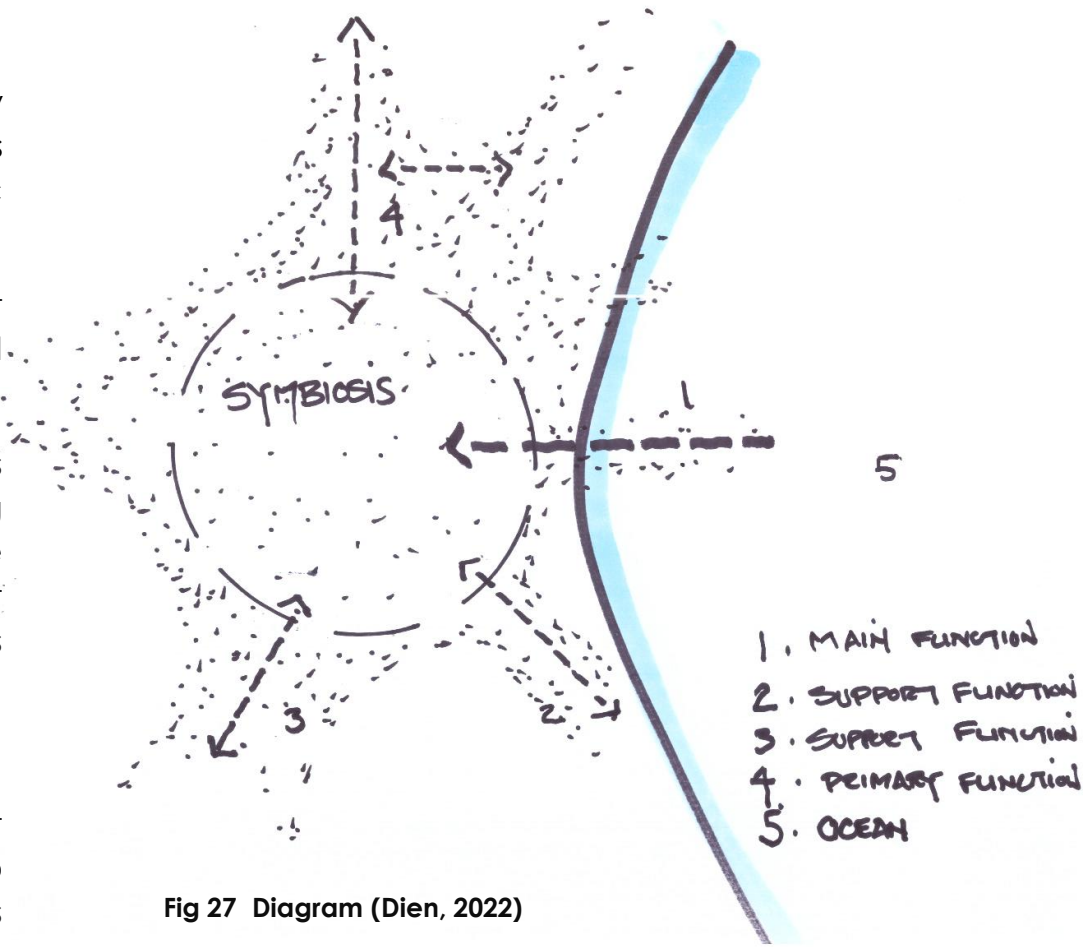


Fig 27 Diagram (Dien, 2022)

2.3.2 Philosophical approach.

Deciphering the Signals.

To the average person, canned tuna is readily available at the store, very little thought is given to where the product comes from, the product is a result of harvesting, which is to a large extent some form of commercial process. The harvesting process in turn kills off natural predators, in turn causes imbalance in the natural environment and will have knock on effects not only on the natural eco systems but on local communities and on a global scale as well, (WWF document 2022: online).

Current concerns in the natural environment

- Overfishing
- Destruction of the environment
- Imbalances in eco systems
- Wildlife Population declines
- Migration of species
- Die out of species

2.3.2.1 Symbiosis

Symbiotic relationships can form spaces of interaction and connect activities that will inspire thought.

As stated by Heidegger "Every human activity from the intellectual to the mundane, considered properly as he perceived it, derived authority from, and offered opportunities to explore philosophically, the ever-central question of being", (Sharr 2007: 8).

From this we can devise our need to become of our surroundings and it suggests an aspect of being part and not only a traveller or tourist passing through.

The interaction of the parties will form spaces for symbiotic relations and functions; thus, the traveller becomes part of the activities and reinforces both the eco tourism and research functions, see fig 28.

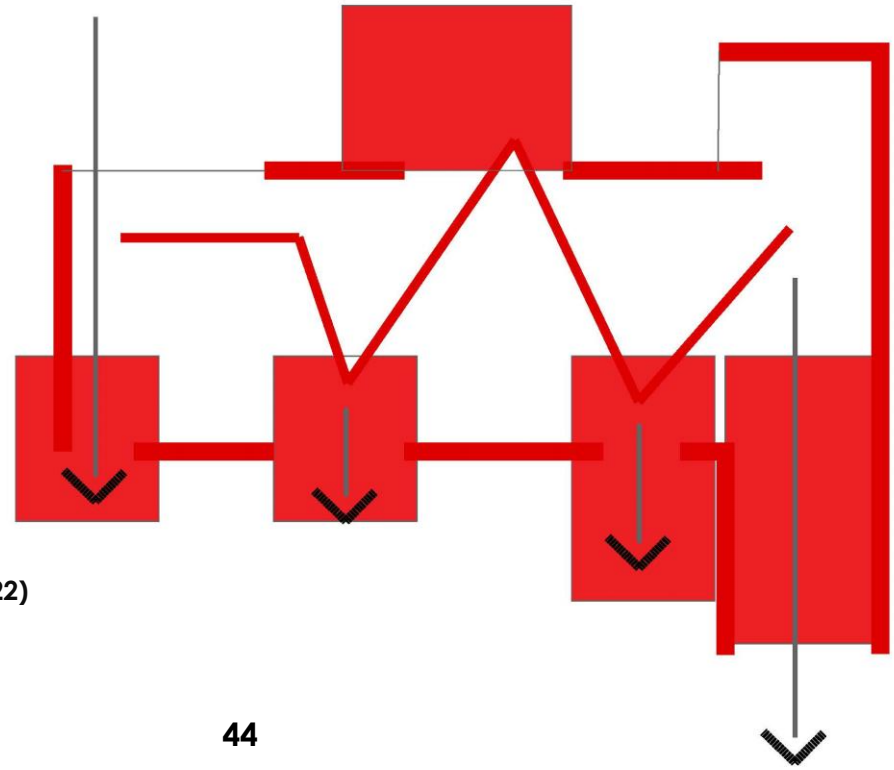


Fig 28 Becoming Part of Surroundings (Dien, 2022)

All functions placed close to the building envelope will allow for a symbiotic connection by connecting spaces from the inside to the outside thus allowing the visitor to engage with his surroundings symbiotically.

The traveler interacts within a multiplicity on environments between the inside and outsides, see fig 29. Extracted from this we can achieve a permeable building that connects to the outside.

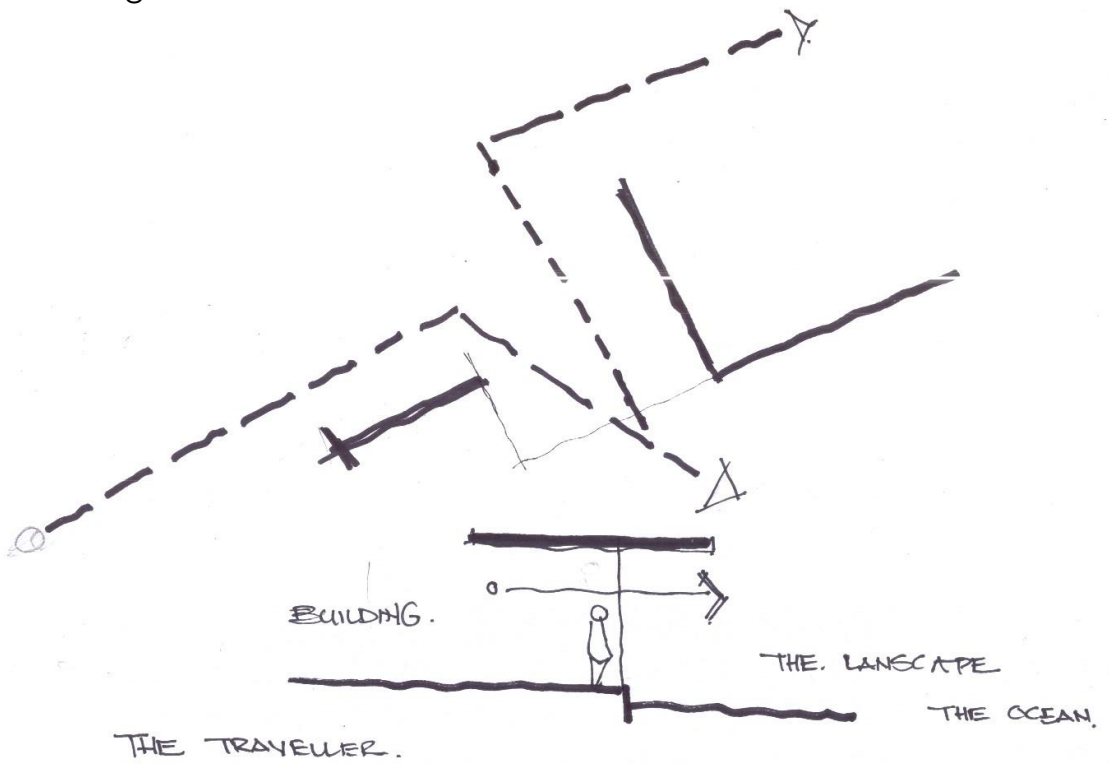


Fig 29 The traveler (Dien, 2022)

The symbiotic functions, Parrie and tourists, the fisherman and the marine life, fish market and existing functions together sets up a symbiotic diagram, see fig 30 and 31.

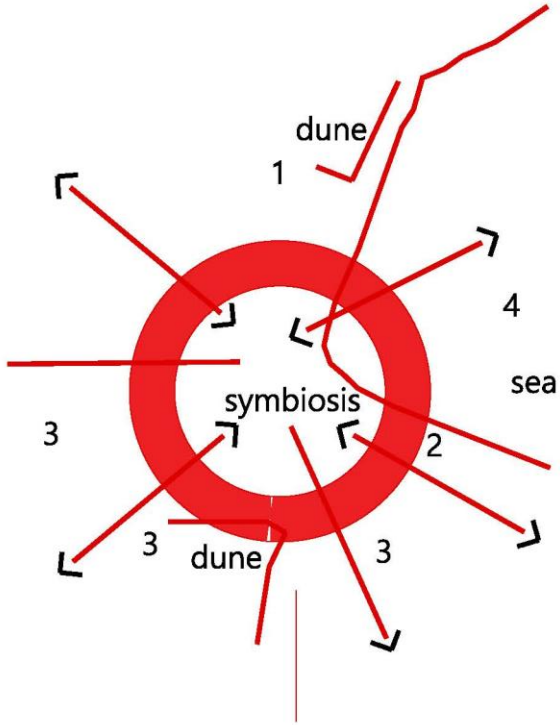


Fig 30 Site Symbiosis (Dien, 2022)

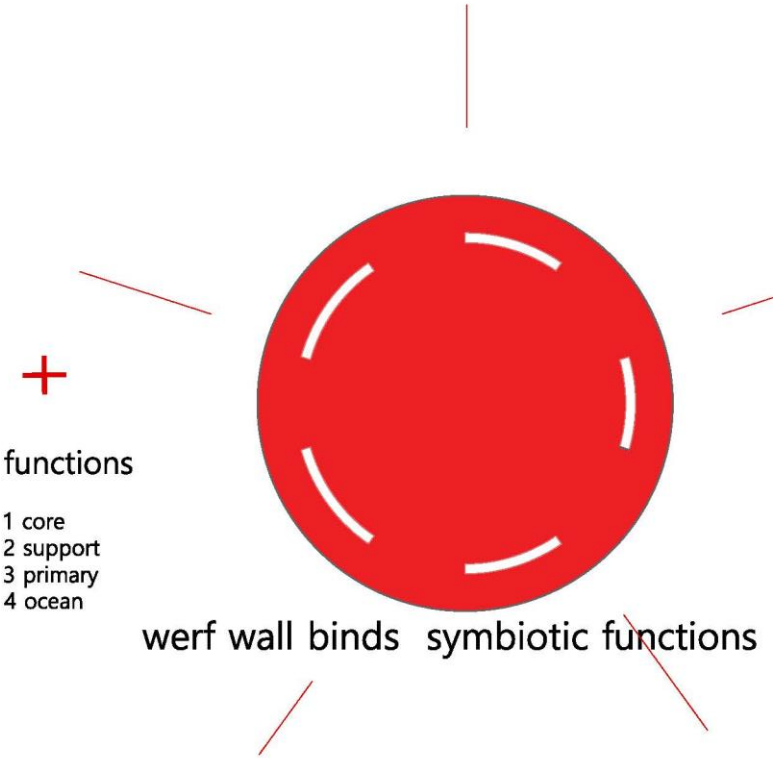


Fig 31 Site Symbiosis (Dien, 2022)

2.3.2.2 The Rhizome

"The plane of consistency of Nature is like an immense Abstract Machine, ...This plane has nothing to do with a form or a figure, nor with a design or a function", (Coyne 2007: 254). Its unity has nothing to do with a ground buried deep within things, nor with an end or a project in the mind of God. Instead, it is a plane upon which everything is laid out, and which is like the intersection of all forms, the machine of all functions; its dimensions, however, increase with those of the multiplicities of individualities it cuts across, (Coyne 2007:254).

See fig 32 for diagrammatic interpretation

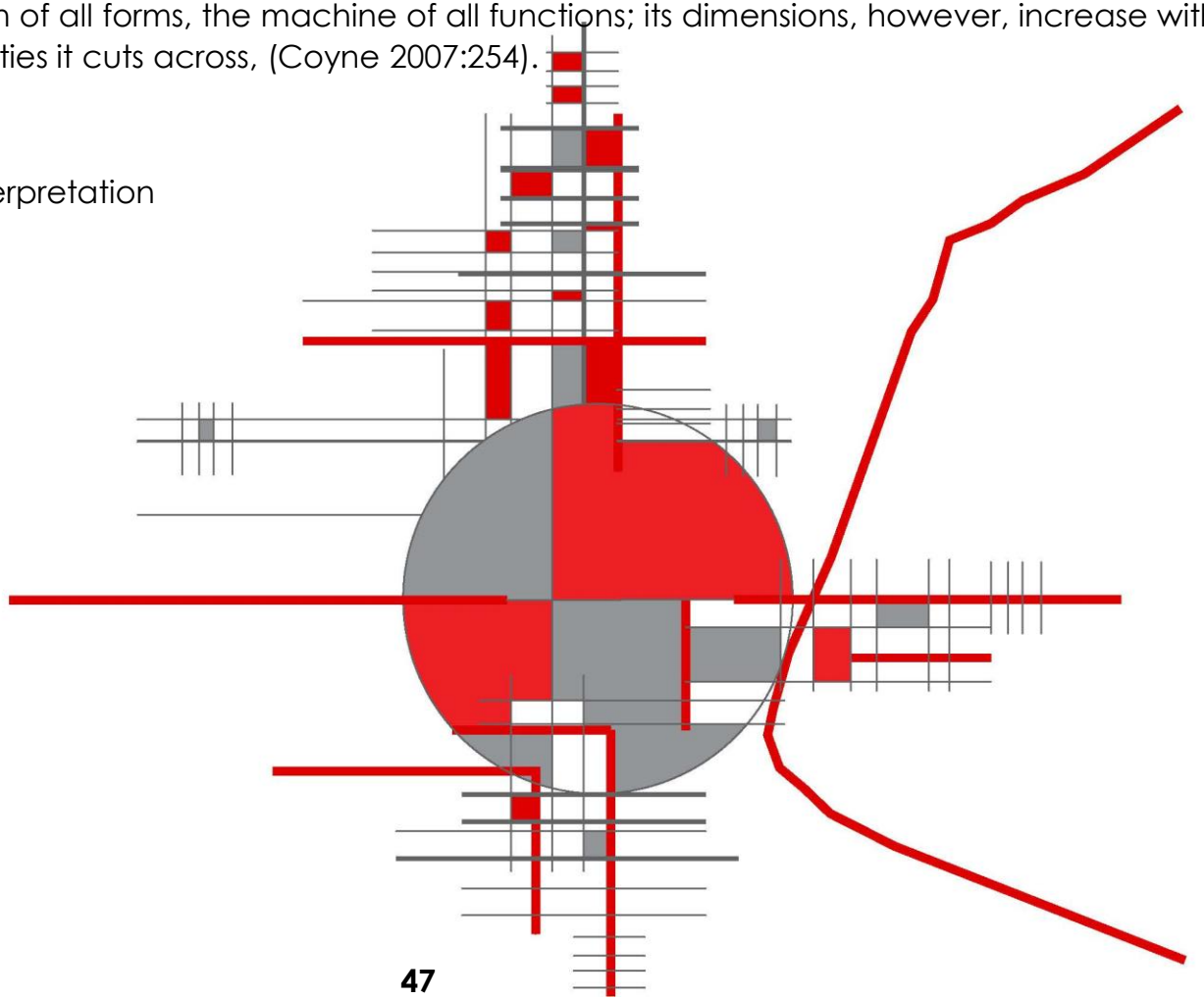


Fig 32 Diagram (Dien, 2022)

"The particular network structure that Deleuze and Guattari promote is the rhizome – a plant structure that can bifurcate and send out a new shoot at any point. They use it as a contrast with the tree structure, where everything branches out from a central trunk – the little twigs branch out from larger ones, and so on, back to the sturdy core. This is treated as an image of centralized power, or as something more than an image: it is a model of centralization, a real acting-out of it. Trees are normally given a good press by the environmentally concerned, and it is surprising to find them so roundly condemned", (Ballantyne, 2007: 25).

The research centre seen as a 'machine' together with its components of a functional laboratory and research becomes and takes the form of industrial vernacular, growing from an already existing symbiotic platform (core) of functions, combined with the traditional 'werf wall' it grows as a rhizome, with the symbiotic relationships on site, it forms the centre from which all activities are founded, see fig 33.

Rhizomes self-organise in a challenge to the state's top-down projection of power and according to Coyne," The plane of consistency of Nature is like an immense Abstract Machine", (Coyne 2007: 558). A self organized symbiotic core exists around the harbour slipway and has already taken on the characteristics of a rhizome and is further strengthened by existing functions around this core.

Fig 33 Diagram (Dien, 2022)

2.3.2.3 Space and place- thoughts One becomes Two

Deleuze and Guattari equate the dialectic with the beginnings of all manner of political excess, or ultimately oppression, and boredom: "One becomes two: whenever we encounter this formula y what we have before us is the most classical and well reflected, oldest and weariest kind of thought", (Coyne 2007: 5). Their parody of the dialectic is of a bifurcation (rather than the synthesis or convergence of two positions). One thought becomes two, which commences a lineage of further subdivisions. For Deleuze and Guattari, dialectical thinking contains the seeds of a process they regard as tree-like, or arboreal. Everything derives from the main trunk, and there is a hierarchy of dependence. Though concealed beneath the veneer of liberalism, it is a vertical process, overloaded with the trappings of authority, order, and hierarchy,(Coyne 2007: 5), see fig 34.

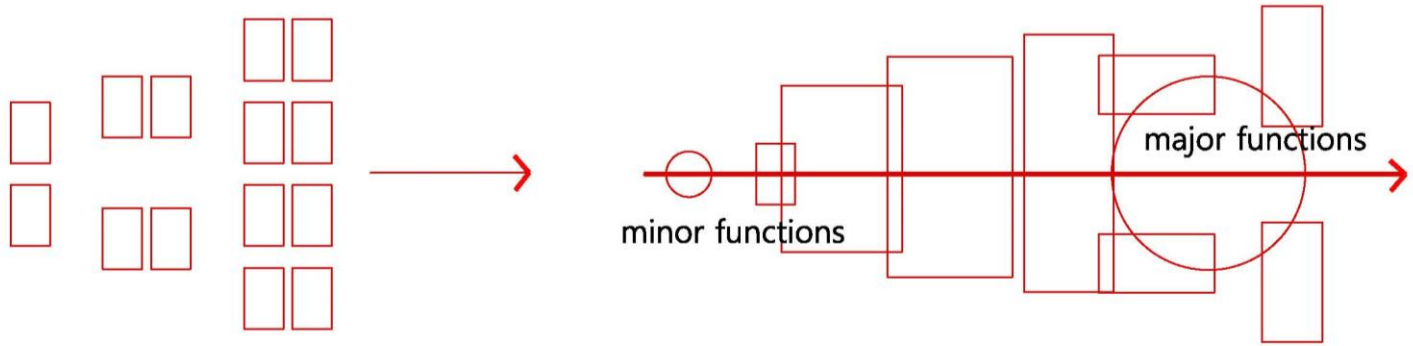


Fig 34 Diagram (Dien, 2022)

The building functions and hierarchy increases thus one becomes two.

Entrance spaces and reception spaces becomes the next space, From here on the hierarchy of spaces increase as you move through, see fig 35.

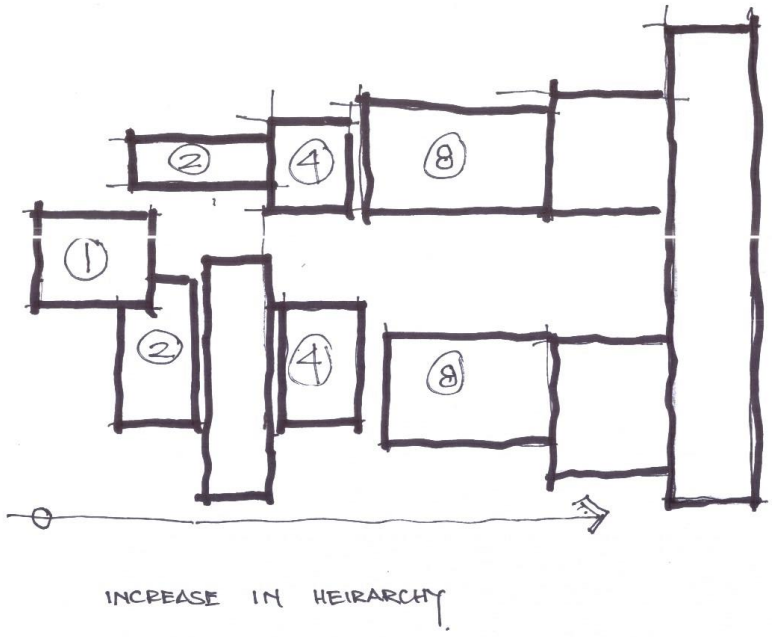


Fig 35 Diagram (Dien, 2022)

2.3.2.4 Vernacular

Regional vernacular seeks to form a intersect of activity, to promote social bonds and education, this can be seen in Adam Sharr's interpretation: For Heidegger, a building was built according to the specifics of place and inhabitants, shaped by its physical and human topography. Considered according to Heidegger's way of thinking, Skiddaw House Hostel located human life in the valley, standing for human presence there. It was built according to the needs of its first inhabitants. The building then shaped their lives, and they continued to shape the building through their daily occupation of it. Its materials were largely quarried and harvested in the vicinity, probably within sight of the building, (Sharr 2007: 10).

Here we see how regional buildings have developed within the context of the natural surrounds utilizing locally sourced materials. Furthermore, the physical topography shapes the forms, see fig 36 for graphic of representation.

It is be noted that the existing footpaths on site are to be RESPECTED and incorporated into the design as they are part of the topography and cultural values of the community.

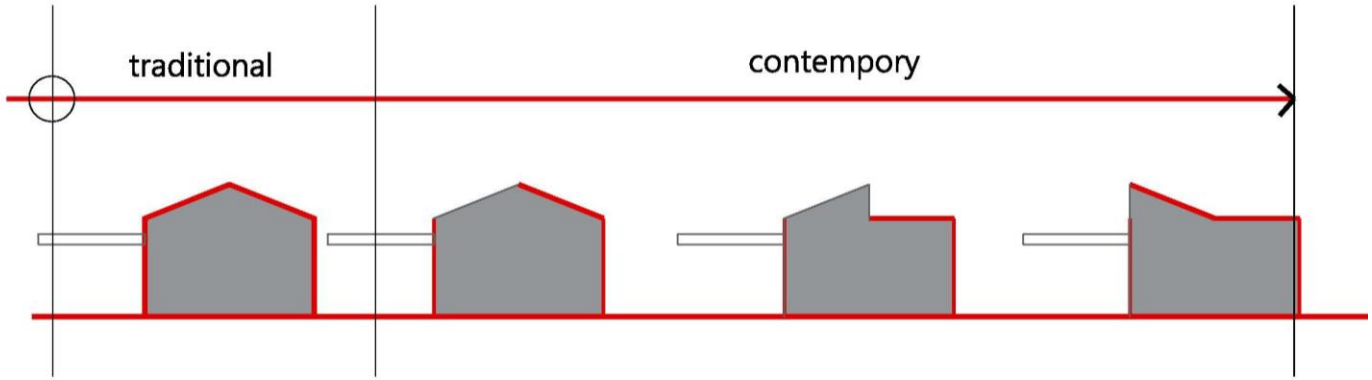


Fig 36 Vernacular Interpretations (Dien, 2022)

2.3.2.5 Romanticism. Vernacular form

A clear form of expression can be derived by primarily imitating older regional architectural form such as the regional coastal and industrial vernacular as suggested by Heidegger: of the mountain life from which he drew philosophical influence as 'up there', referring to moral authority as well as to altitude. In attributing such authority to the raw presences and natural rhythms of the mountains, to what he perceived as their privileged access to being, the philosopher emphasised the increasing absence of the lessons he found in such landscapes from many lives in the Western world. Moments of awareness of our own presence, often brought home to us by our senses, emotions and the phenomena of nature, had become rare opportunities to him. He felt that we were "losing the ability to appreciate our existence in the context of a sweep far longer and broader than our own lives. Heidegger's attribution of special authority to these landscapes of being, as he perceived them, is marked by his tendency to romanticism", (Sharr 2007: 12).

To nestle into a small-town coastal architecture regional vernacular, the proposal mimics and takes on the forms of vernacular in a modern interpretation.

2.3.3.6 Site specific symbiotic relationships

The diagram depicts how the existing activities on site already forms a symbiotic relationship which is further strengthened and promoted in this intervention, see fig 37.

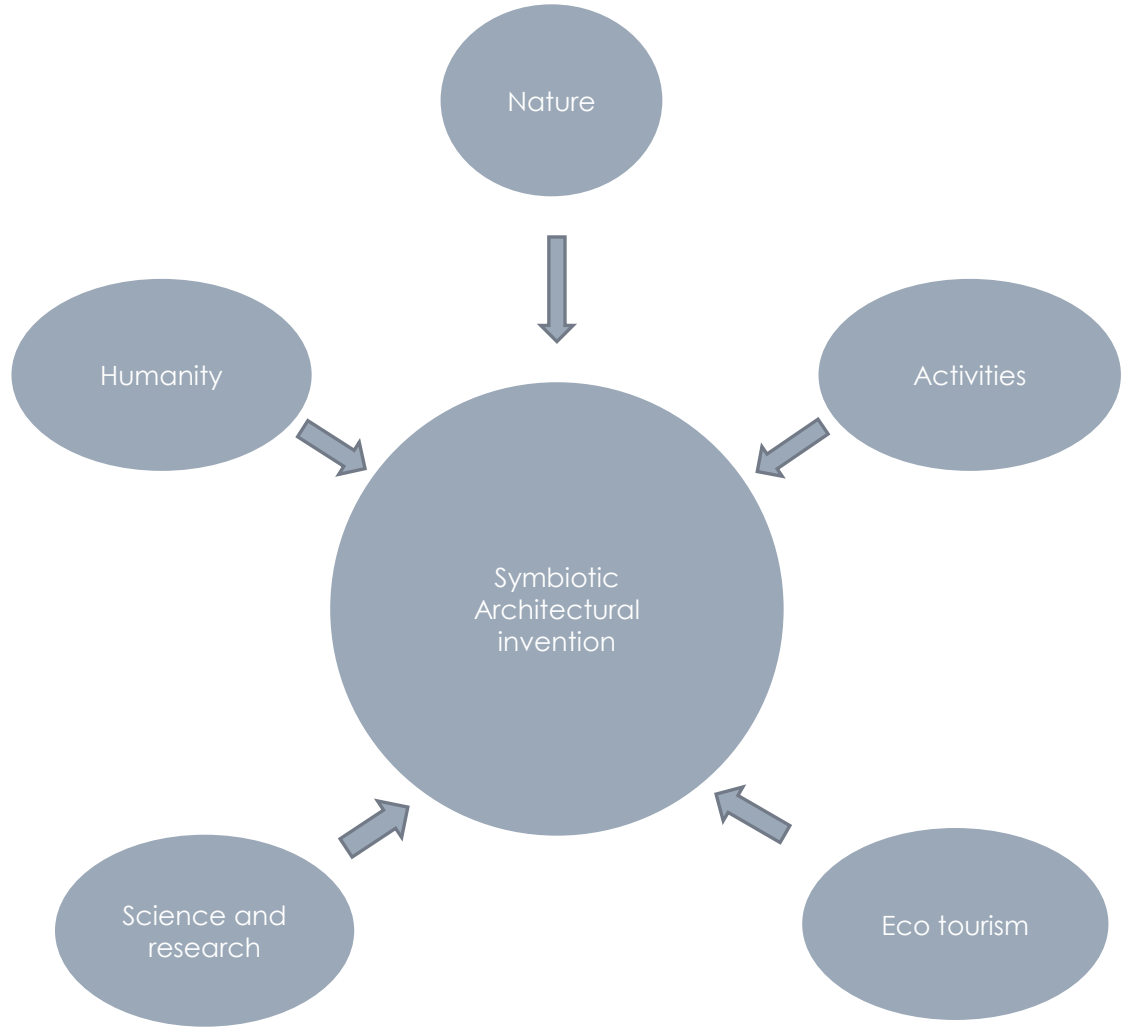


Fig 37 Symbiotic Graphic (Dien, 2022)

2.4 Eco tourism

2.4.1 Parrie the mascot

Parrie is the local mascot and became famous after a stay at the Two Oceans Aquarium for some time, it is a well known that black stingrays hang around the harbour and slipway when fisherman return, you will hear the locals proclaim," look its Parrie the large one". Parrie has become a tourist attraction and is the only known place in South Africa where you can hand feed them, see Fig 38.

Parrie was once "held" by the Two Oceans Aquarium, but the locals demonstrated a fierce loyalty to Parrie and got him returned to his home. Now there are a few more stingrays that have joined their famous friend, but they are still shy. Parrie on the other hand is happy to greet anyone (especially if they come with food in hand!) and you can generally spot him as he is the largest of the group.

Fig 38 Parrie (Dien, 2022)

2.4.2 Guided fishing and charter

Tour guides operate both on land and ocean via a charter operation.

Clients come from all over the world to experience this once in a life catch opportunity, the guides are professionals and registered with relevant tourist and Angling associations. Fishing Charters operate form Struisbaai a and offer various packages to experience Sport angling. When these boats return from the deep a symbiotic relationship unfolds, black rays (Parrie and team) hang around the slipway for leftover fish and this is where the magic occurs.

Tourists experience this moment between man and animals.

Off The Charter Boats ,Common caught species include the following:

Yellow tail- *Seriola dumerili,* see fig 39.

Katonkel aka Atlantic Bonito- *Sarda sarda*

Kabeljou- *Argyrosomus japonicus*

Yellow Fin Tuna- *Thunnus albacares*

Blue Marlin- *Makaira nigricans*

(Heemstra & Heemstra 2004)

Fig 39 Yellow tail (Dien, 2022)

Land based fishing charters often known as guides, will take you on a fishing trip provide all the necessary gear and put you onto your dream fish, this form of eco tourism is an import part of the Struisbaai fishing industry.

Data from the catch, tag and release is then sent to the Oceanographic Research Institute (ORI) for processing, a recaptured (tagged) fish will then provide information on growth, health and habitat migration.

Popular In edible species "Struisbaai big 5"

- Bronze whalers *Carcharhinus Brachyurus*
- Ragged tooth shark- *Carcharias Taurus*
- Short Tail Black Stingray (Parrie) *Dasyatis brevicaudata*
- Diamond *RayDasyatis Dipterura*

Popular Edible species

- Galjoen- *Dichistius Capensis*
- Hottentot- *Pachymetopon Blochii*
- Shad- *Pomatomus saltatrix*
- White Steenbras- *Lithognathus Lithognathus*
- Kabeljou- *Argyrosomus Japonicus*

(Heemstra & Heemstra 2004)

Fig 40 Guided Angling (Dien, 2022)

2.4.3 Economic opportunities

Fish market

A fish market exists and is in need of an urgent upgrade in order to provide decent facilities for the local fisherman from where they can sell their catch, small scale fisheries operate in a sustainable manner by using traditional hand line methods to obtain their catch.

They also practice within a strict code of releasing undersized fish. The installation of an upgraded fish market further reinforces the idea of symbiosis, the process of limited catch allows the specie to survive and replenish itself naturally.

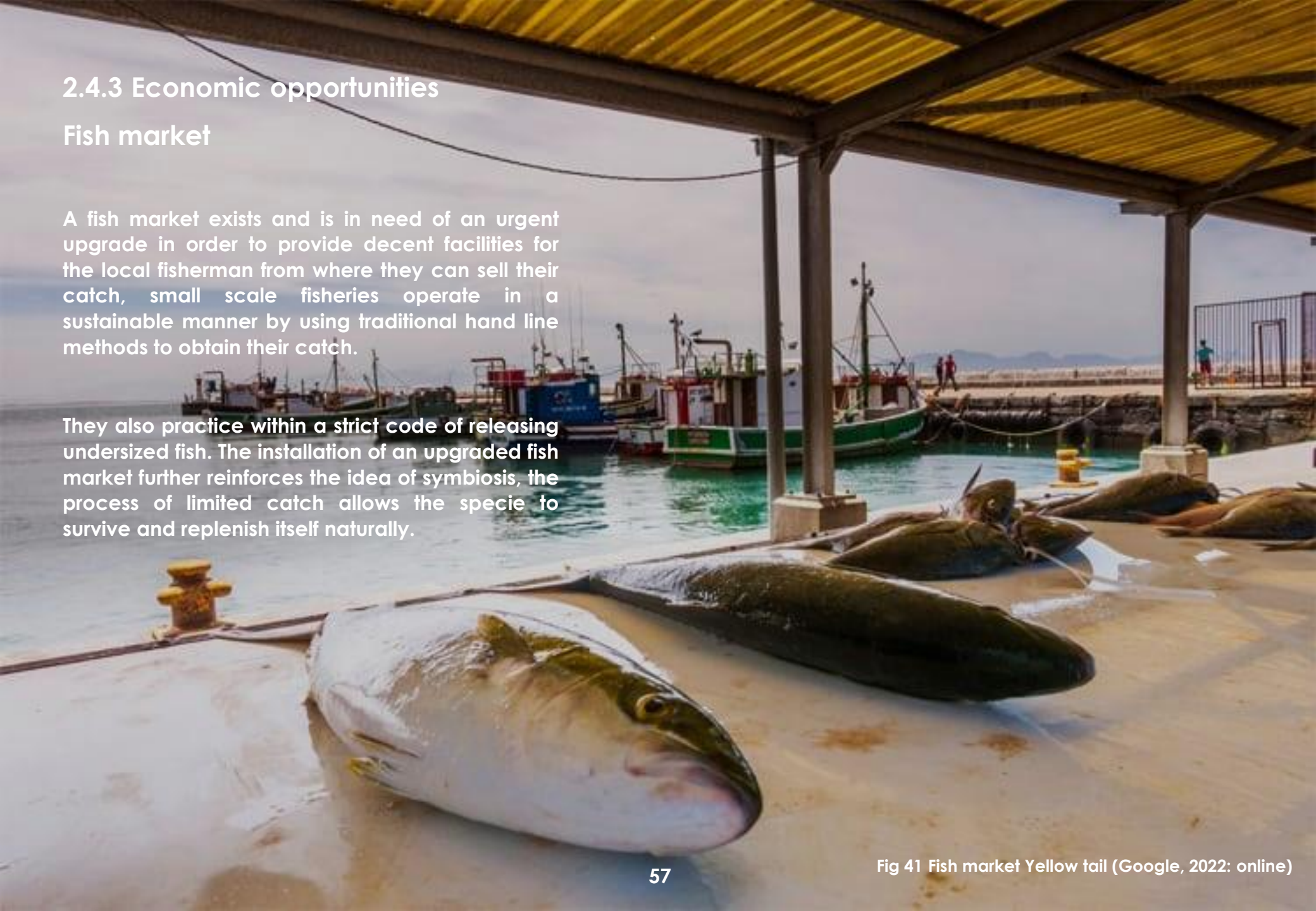


Fig 41 Fish market Yellow tail (Google, 2022: online)

Market

In my visits to Struisbaai, I met George the sculptor and his kids (fig 42), a local entrepreneur who hand fabricates scaled models of the local Hotagterklip vernacular architecture. A market was not initially part my project but decided that it needs to be included as it further reinforces the idea of community participation.

Fig 42 George the Sculptor (Dien, 2022)

2.5 Site analysis

2.5.1 Figure Ground context

Soft grained wide-open spaces single and double story residential buildings

Fig 43 Fig Ground (Dien, 2022)

2.5.1 Context

CONTEXT - PLAN

Fig 44 Context (Dien, 2022)

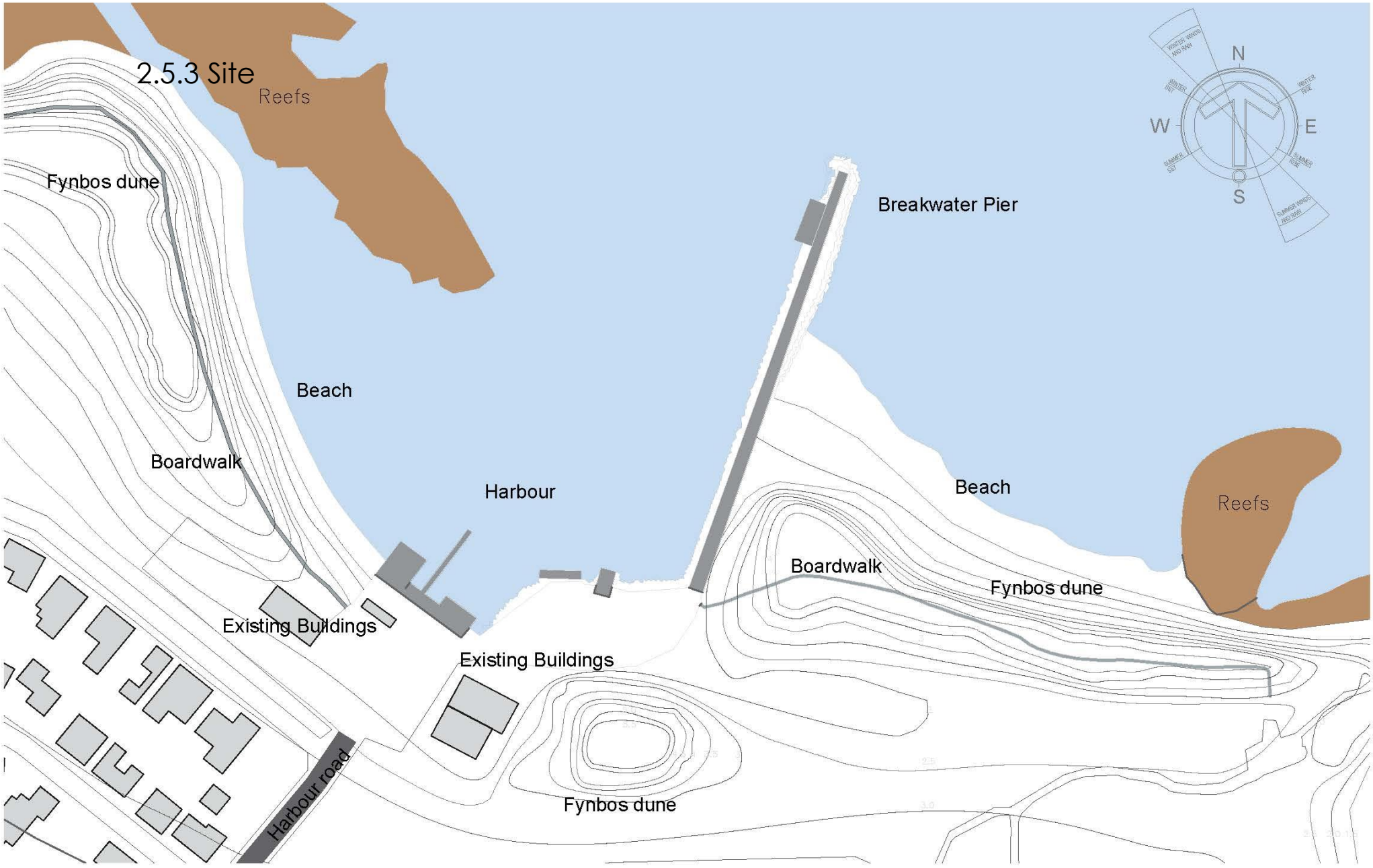


Fig 45 Site plan (Dien, 2022)

Site Geology

Cenozoic Bredasdorp Group, (fig 47).

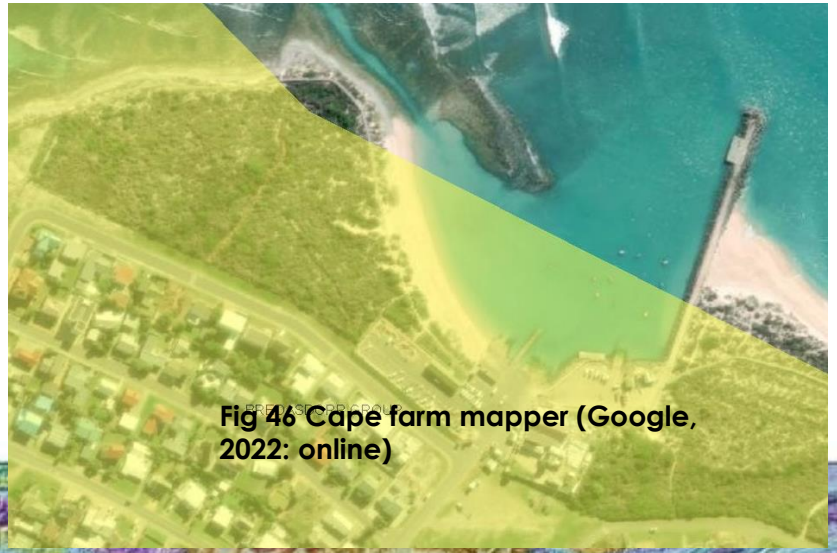


Fig 46 Cape farm mapper (Google, 2022: online)

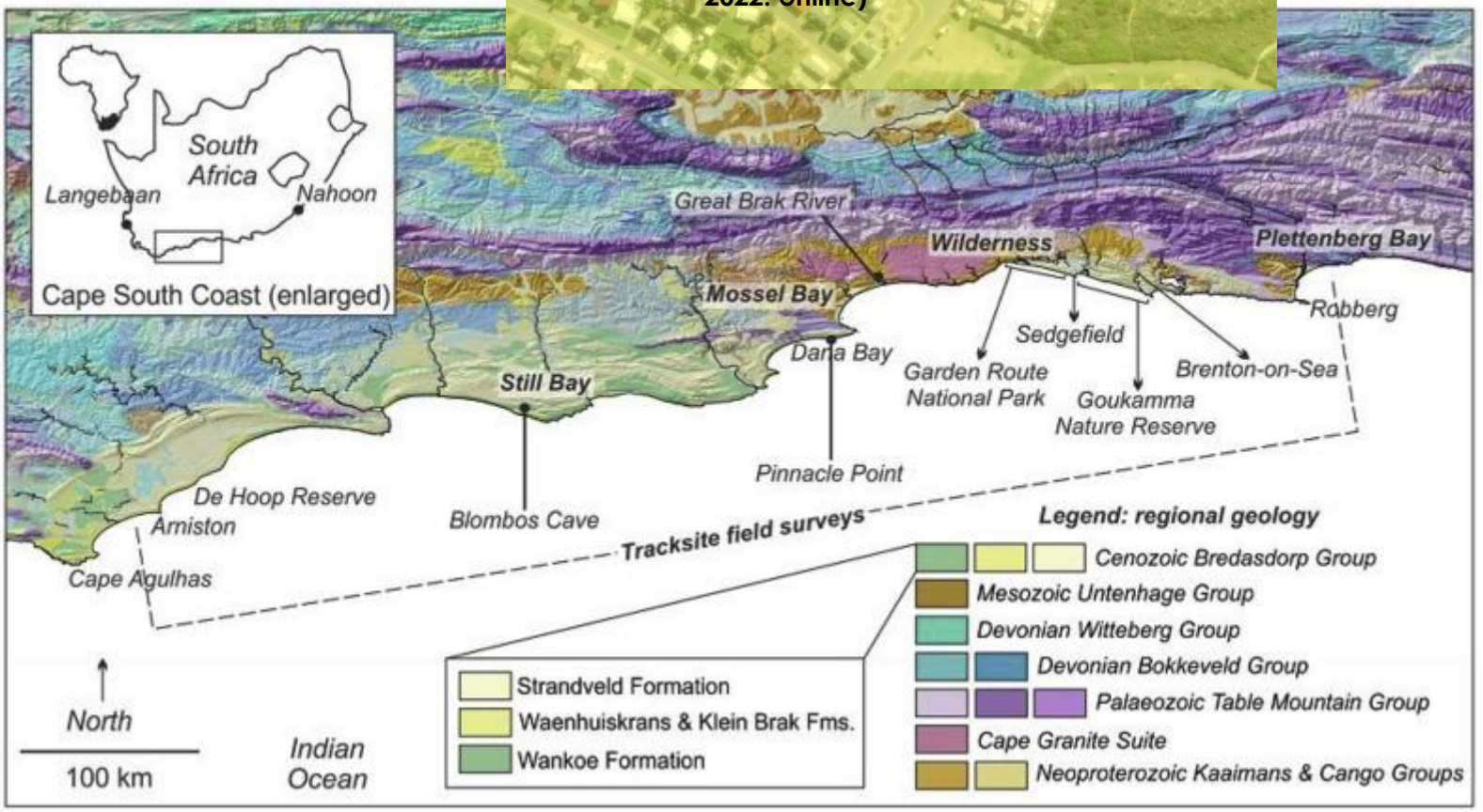


Fig 47 Geological formation (Google, 2022: online)

2.5.4 Climatic Conditions

Temperature and Wind

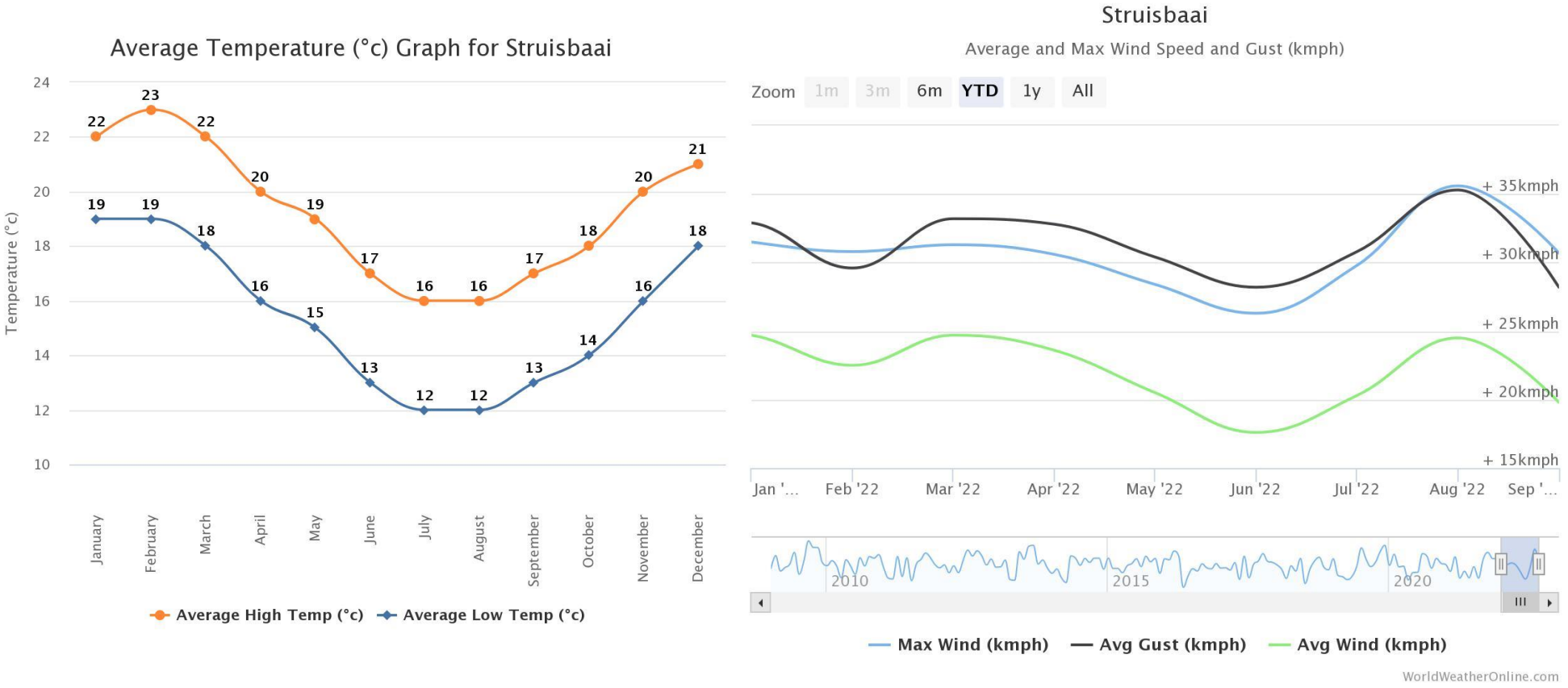


Fig 48 Average Temperature and Wind Speed (worldweatheronline, 2022: online)

2.5.4 Climatic Conditions

Precipitation

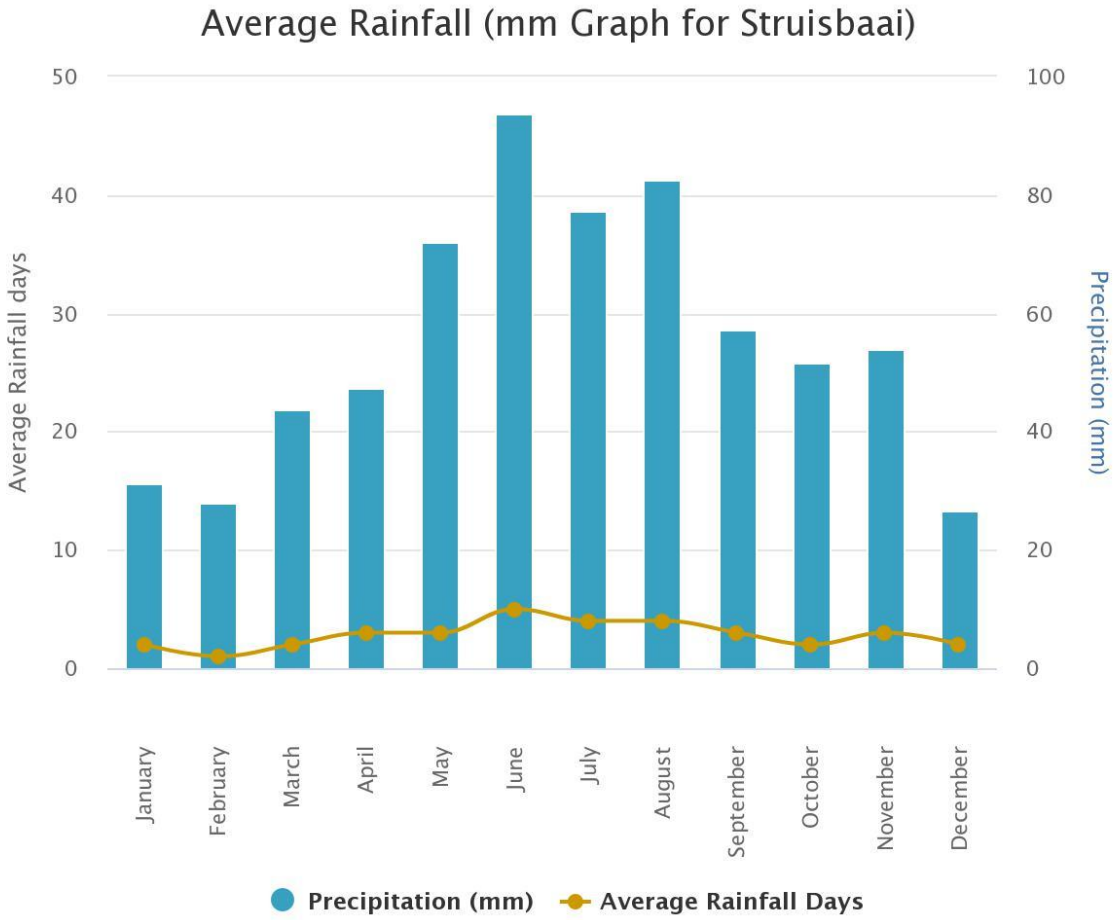
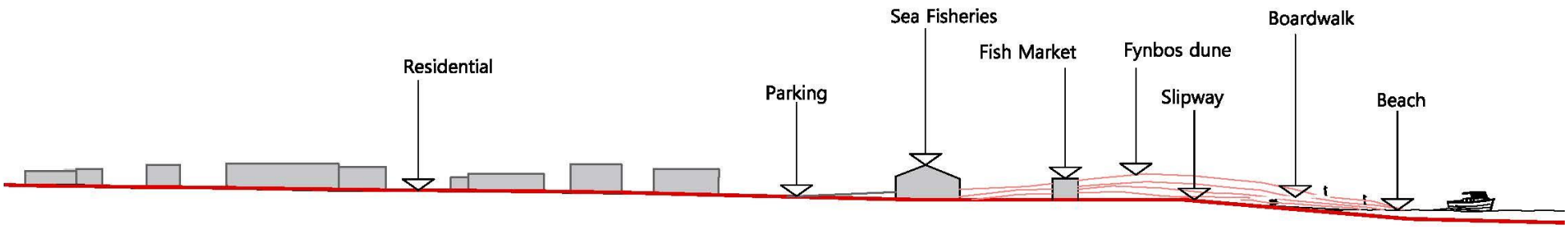
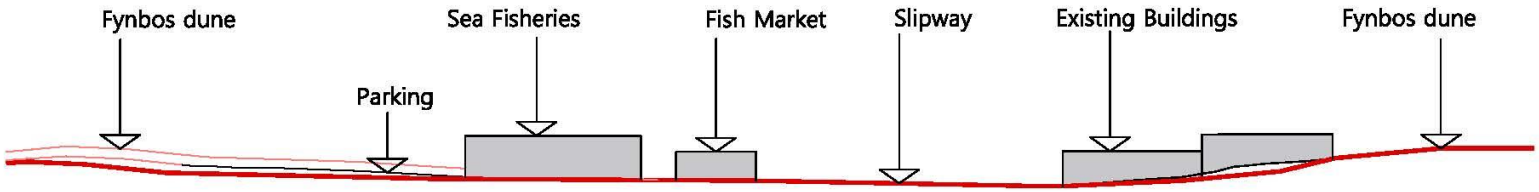


Fig 49 Average rainfall (worldweatheronline, 2022: online)

2.5.5 Site Sections



longitudinal section



cross section

Fig 50 Site Sections (Dien, 2022)

Tide Section

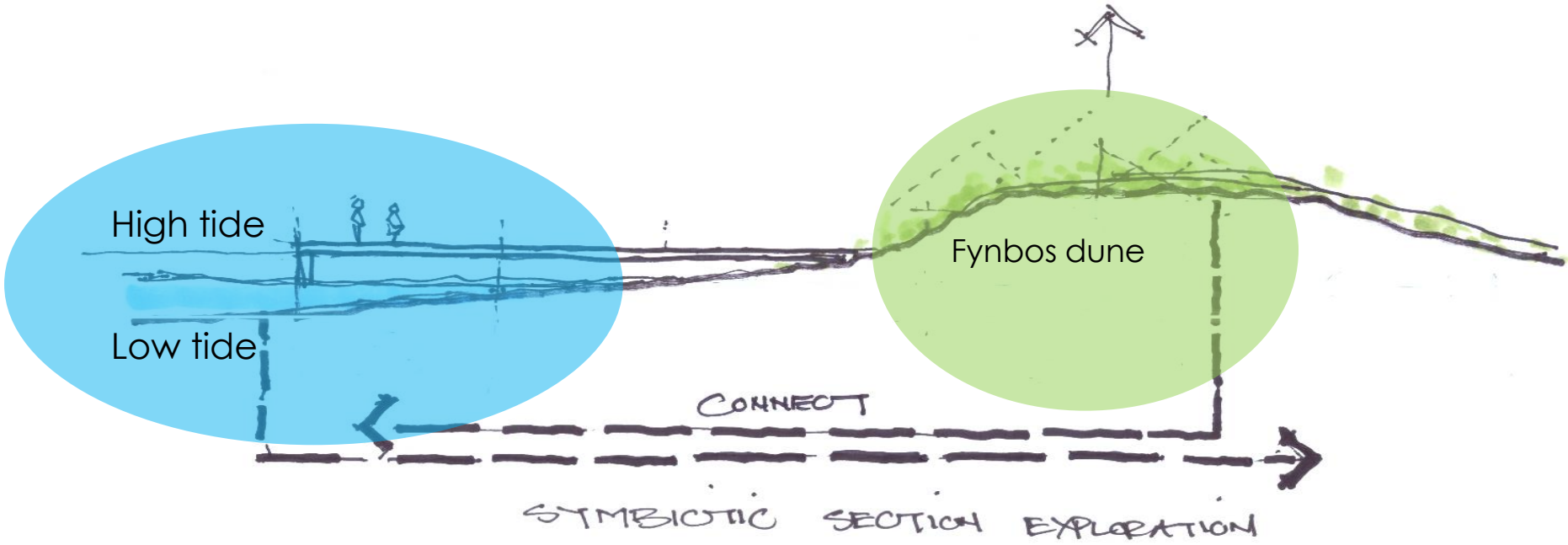


Fig 51 Section (Dien, 2022)

limestone is prevalent and cape fynbos grows in this coastal belt, there is many reef stones and rocks that may become part of the development

the slipways are congested and needs to be orientated to work off a central axis

the popular pier is used daily by local and tourist fisherman to obtain the "daily catch"

2.5.6 Visual Analysis

the much loved boardwalk will form part of the dresign

the south- south east wind action in summer creates a sanded up pier

fishmarket

traditional "chukkie" vessels anchored in harbour

existing sea fisheries will accommodated as part of the design

low scale single and double story residential surrounding the harbour

the harbour

the working harbour has various functions, which include:

- a swimming beach
- repair areas for commercial boats
- 3 slipways
- restaurant and shops
- a fishing pier
- surfable reefs

the "chukkies" used by the commercial fisherman needs storage as their exiting facility was derelict and demolished, locals suggested container storage facilities for the timber and equipment.

Fig 52 Visual Analysis (Dien, 2022)

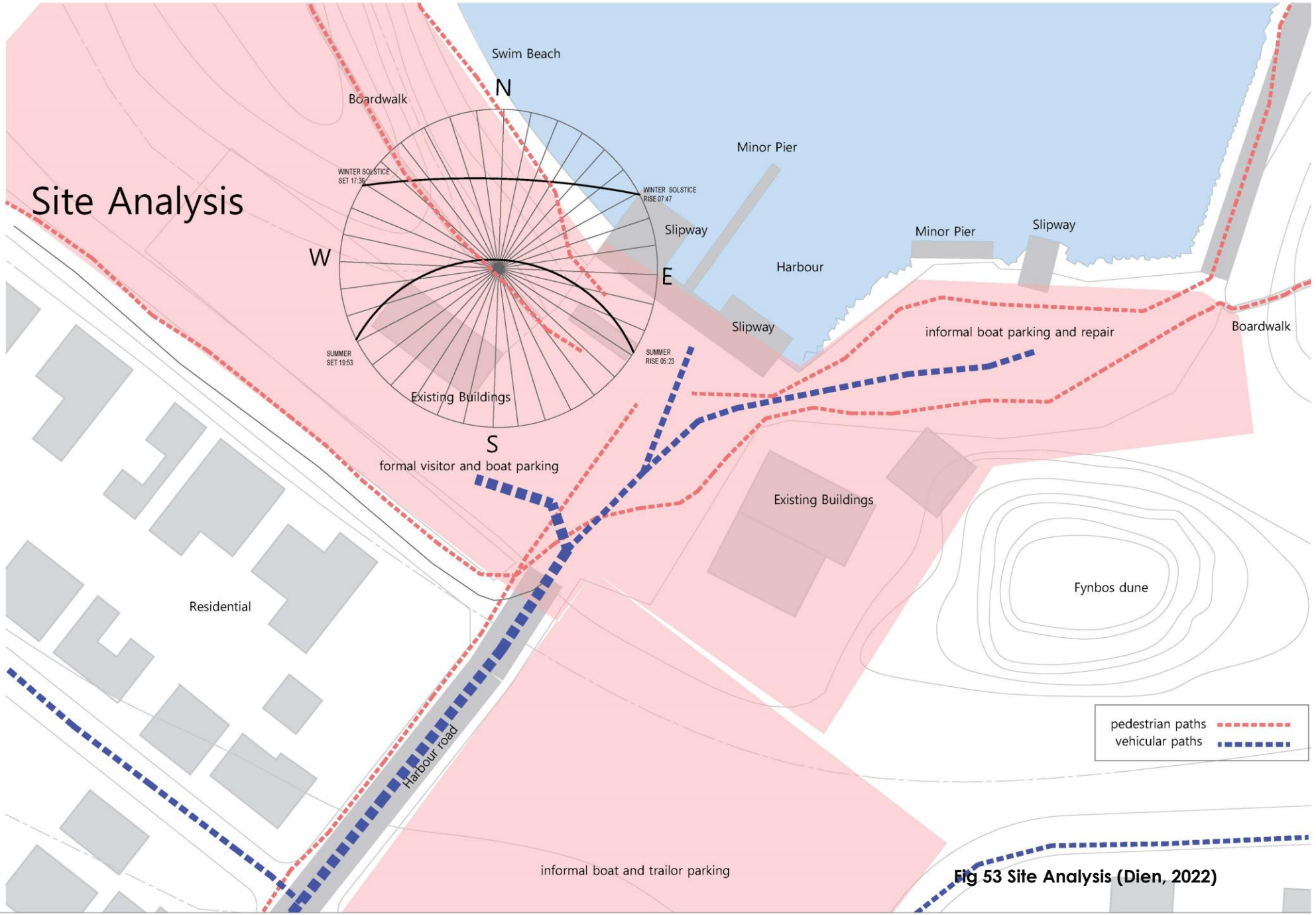


Fig 53 Site Analysis (Dien, 2022)

2.6 From touchstone, to concept, to possible approaches Touchstone

Touch stone- Symbiotic relationships

- **Site influences**
- **Natural curves**
- **Raised natural embankments-dunes**
- **Low rise Small volumes natural shapes**

Key words

- **Rhythm**
- **Ocean**
- **Breeze**
- **Water nature**
- **Fauna and Flora**
- **Commercial**
- **Tourists**
- **Interaction**

From the touchstone a need to connect and integrate with the surrounds, landscape and ocean

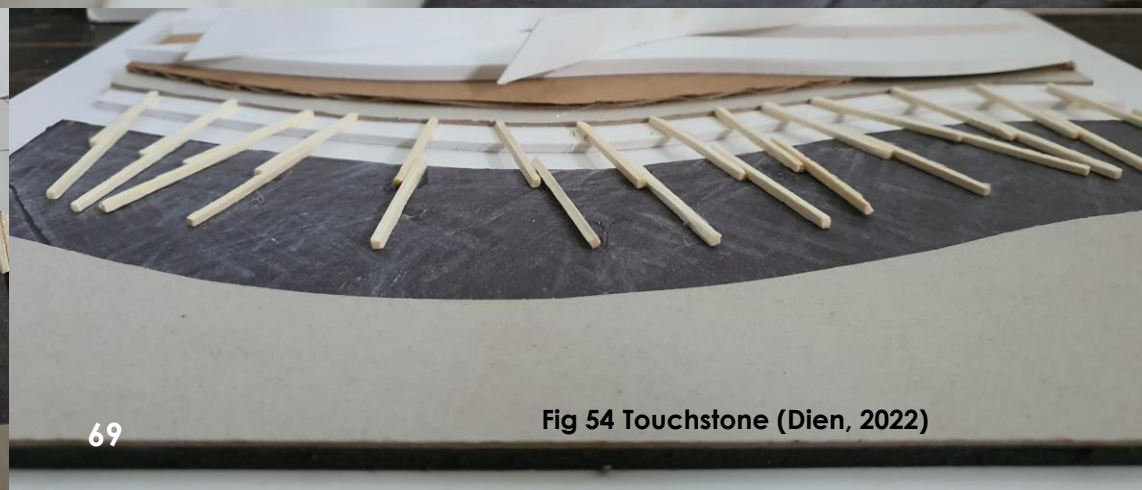


Fig 54 Touchstone (Dien, 2022)

2.6.1 Concept 01 Earth SKIN unfolding

Keywords: INTERGRATION | TRANSPARENT | LAYERS | CORE | BOND

Fig 55 Concept (Dien, 2022)

Osmosis is a process that happens among the inside and the outside space and causes the facade to reveal the interiors in the exteriors or to close completely the architecture. The facade becomes a fictious, fallacious and ephemeral face of the architecture that blends and balances and creates a state of equilibrium.

In the design process a decision was made to move away from this concept and keep elements that are explored in Concept 3.

Fig 56 Concept (Dien, 2022)

2.6.2 Concept 02 Cultural Immersion A Symbiotic INTERSECT

Keywords: JOURNEY |PATH | SPACE | TIME | INTERACTION | SYMBIOSIS

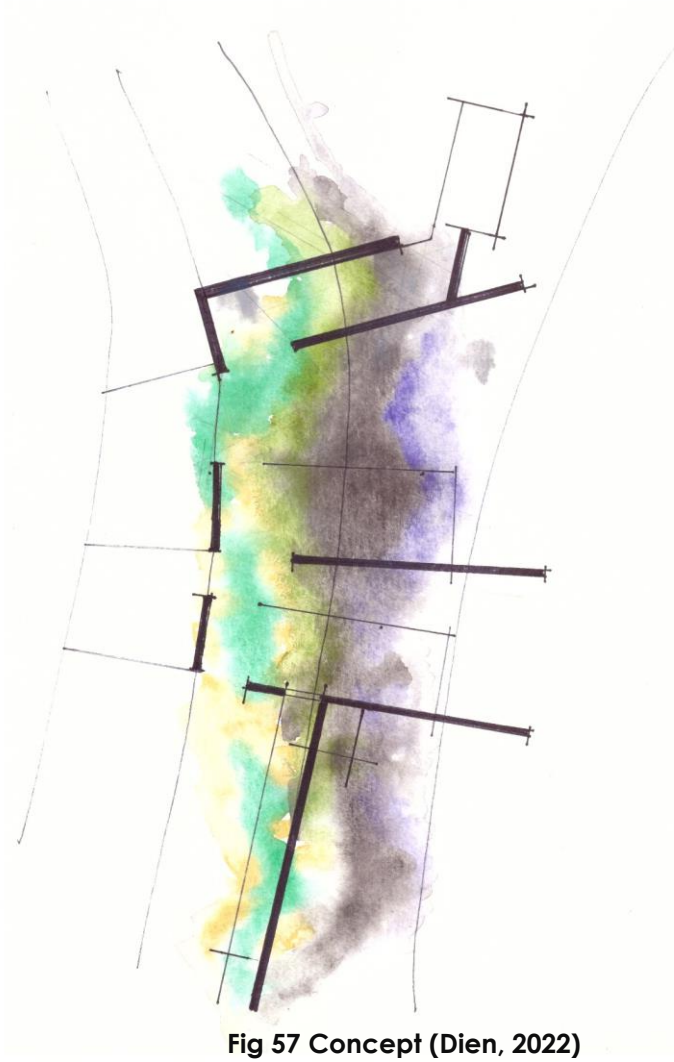


Fig 57 Concept (Dien, 2022)

Culture is defined as the ideas, customs and social behaviour of particular people or society. The behaviours we are accustomed to and have been taught are the factors determining the kind of spaces we need to live in. "Architecture becomes a frame for constructed situations" – Bernard Tschumi, (re-thinkingthefuture, 2022: online). In its basic form architecture fulfils the needs of its users. This concept combines with Concept 03 to form a single concept.

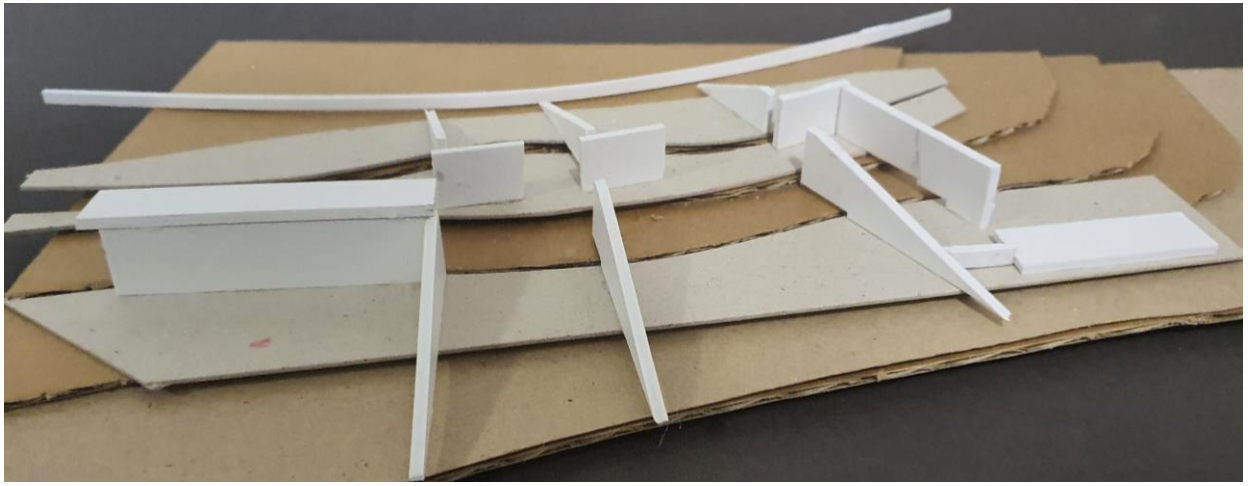


Fig 58 Concept (Dien, 2022)

2.6.3 Concept 03 Reinforcing Symbiotic RELATIONSHIPS

Keywords: EXIST | PATH |OSMOSIS |BALANCE | RHYTHM

Fig 59 Concept (Dien, 2022)

Symbiosis refers to all types of close relationships between two symbionts, a new intervention and the original building. These relations can be commensal, mutualistic, or parasitic, depending on the influence symbionts have on each other's structure, material, form, and spatial organization

What is symbiotic evolution?

One theory of evolution is that selection occurs through genetic variation within collective groups of organisms (e.g., an animal and its microbes) Symbioses are the ultimate examples of success through collaboration and the powerful benefits of intimate relationships.

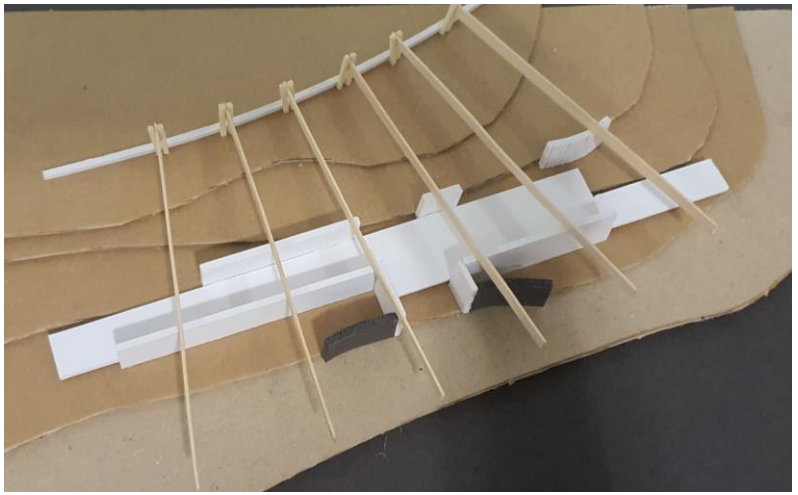
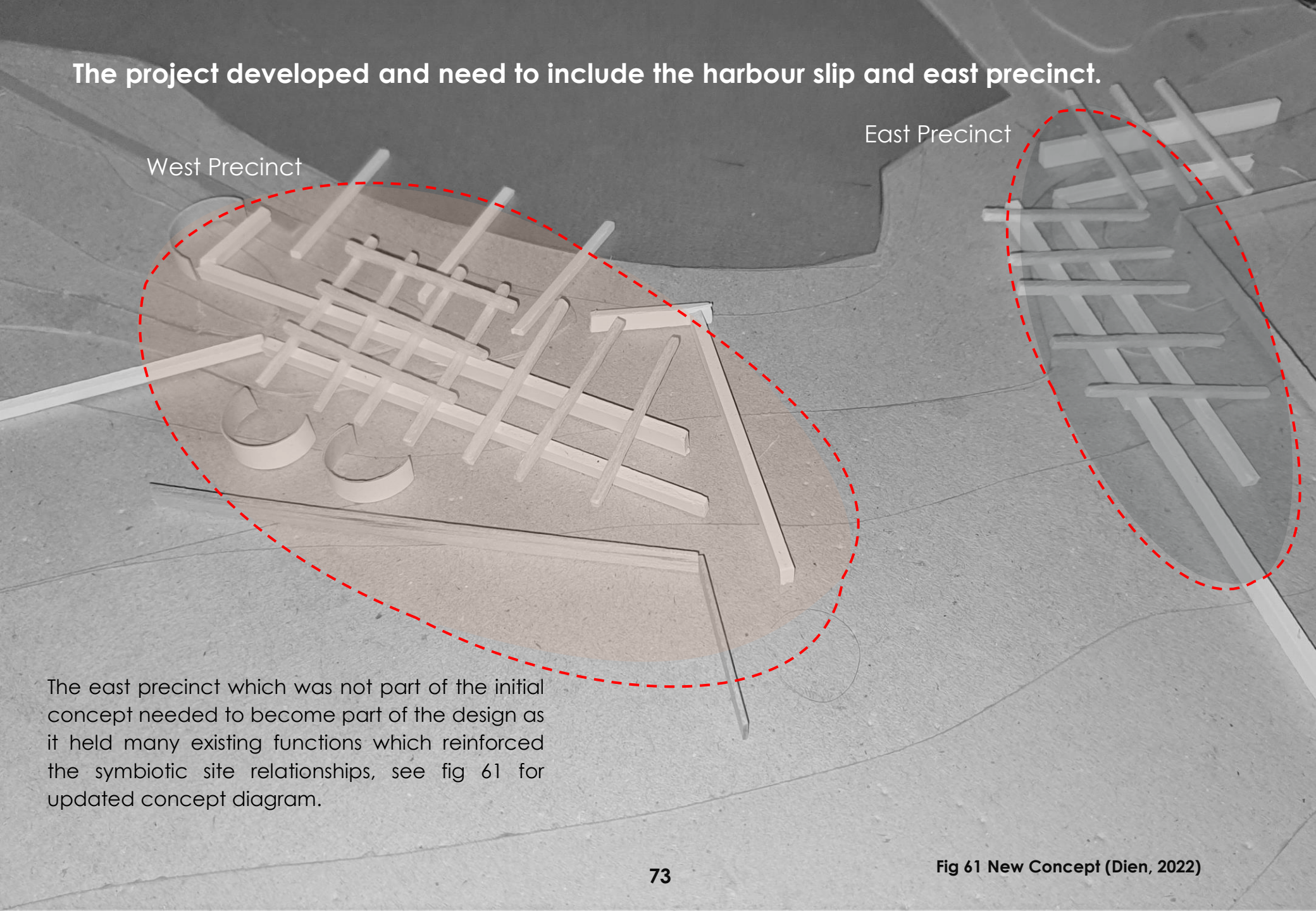


Fig60 Concept (Dien, 2022)

The project developed and need to include the harbour slip and east precinct.



The east precinct which was not part of the initial concept needed to become part of the design as it held many existing functions which reinforced the symbiotic site relationships, see fig 61 for updated concept diagram.

Fig 61 New Concept (Dien, 2022)

2.6.3.1 Acknowledging the harbour Symbiosis

We find an existing harbour symbiosis prevalent in the small quaint coastal town:

The fish market

Serves the broader struisbaai community and tourists who want to get a fresh fish for the braai.

Parrie the mascot

Parrie the short tailed black stingray keeps the locals and tourists entertained when fishing vessels return to the harbour after a day's fishing. Local tour guides offer a hand feeding program, whereby visitors can purchase fresh sardines and feed the animals.

The intersect of communal activities

Shore Anglers and boat fisherman use the harbor daily and this creates a nostalgic atmosphere for anyone visiting the harbour.

The need for a Sustainable Symbiotic response- Paris Accord

The Minister of Environmental Affairs, Edna Molewa has signed the Paris Agreement on climate change at the United Nations in New York.

The Paris Agreement was adopted on 12 December 2015 at the 21st session of the Conference of the Parties to the UNFCCC CoP21, held in Paris from 30 November to 13 December 2015. The Agreement was adopted after four years of intense negotiations mandated by the 17th UNFCCC CoP held in Durban in 2011.

The main objective of the Agreement is to limit the global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees. The recognition of the 1.5-degree target is of central importance to South Africa as an African and developing country that is highly vulnerable to climate change.

South Africa is already acting on climate change and has invested renewable energy, public transport, energy efficiency, waste management and land restoration initiatives, (Paris agreement, 2022: online).

2.6.3.2 Precedent Studies

VENACULAR architecture, because of its regional context it relies on locally sourced materials and is seen as a form of a symbiotic approach. Heidegger notes "Every human activity from the intellectual to the mundane, considered properly as he perceived it, derived authority from, and offered opportunities to explore philosophically, the ever-central question of being", (Sharr 2007: 8). Cape Vernacular with its threshold spaces, openings from inside to outside, allows for exploration of being.

Paradys, Langebaan, West Coast by Gawie Fagan Architects, Completed 2005.

Gawie wanted a simple, easily maintained weekend retreat able to accommodate three couples with their children, as well as a dingy and surfboard lock-up storage, readily accessible to the beach. The house is sunken below road level, exposing only the vaulted roof and prominent chimney. Thus, secluded from the street, the front door is reached by a descending ramp between two high walls.

The six vaulted modules successively contain boat storage, with living and kitchen/dining area opening onto a sunken courtyard that lets in the morning sun. Each of the three bedrooms has a sleeping loft and shower and toilet cubicle. A single brick type was used for the paving, floors, walls and vaulted roof which provides for high thermal mass, (Fagan, 2022: online). To maintain a vernacular, intersect response, forms of the design will take on these vernacular elements. An important lesson learnt is that local materials are of great importance as this synthesizes vernacular architecture.

Fig 62 Fagan Architects,(Fagan, 2022: online)

Symbiotic Architecture

In our current Anthropocene conditions, inventing new modes of co-existence and more sustainable ways of living has become a fundamental task for architects and develops, with pressures mounting from international bodies to go "green". Through the establishment of a Learning Centre for Biodiversity, this project explores how architecture can have a positive impact in a vulnerable habitat and how it can be an asset not only for the people but also for the environment the project is implemented within.

By using the invasive species of the site - reed - as main building material and by considering the façade as a permeable membrane that can serve as habitat and food source for the local birdlife, an interactive form of architecture is proposed that redefines the relationship between people and the environment, (Symbiotic architecture, 2022: online).

Fig 63 Symbiotic integration (Royal Danish academy, 2022: online)

Symbiosis in an Architectural response is simply connecting with the environment to such a degree that the impact is low and looking at how buildings can respond to site within a symbiotic manner, good examples of these are buildings that not only function in a symbiotic manner with its communities and environment but also utilizing traditional material available on site or in the immediate surrounds, see fig 63.

Traditionally vernacular structures in the Overberg region were constructed of limestone and in some instances no rendering or finish was ever applied.

2.6.3.3 Response

Vernacular

Elements of vernacular architecture such as threshold space, werf walls, chimneys, wall planes, roof planes and materiality will bind the design and create synthesis of spaces connected by a SYMBIOTIC Intersect.

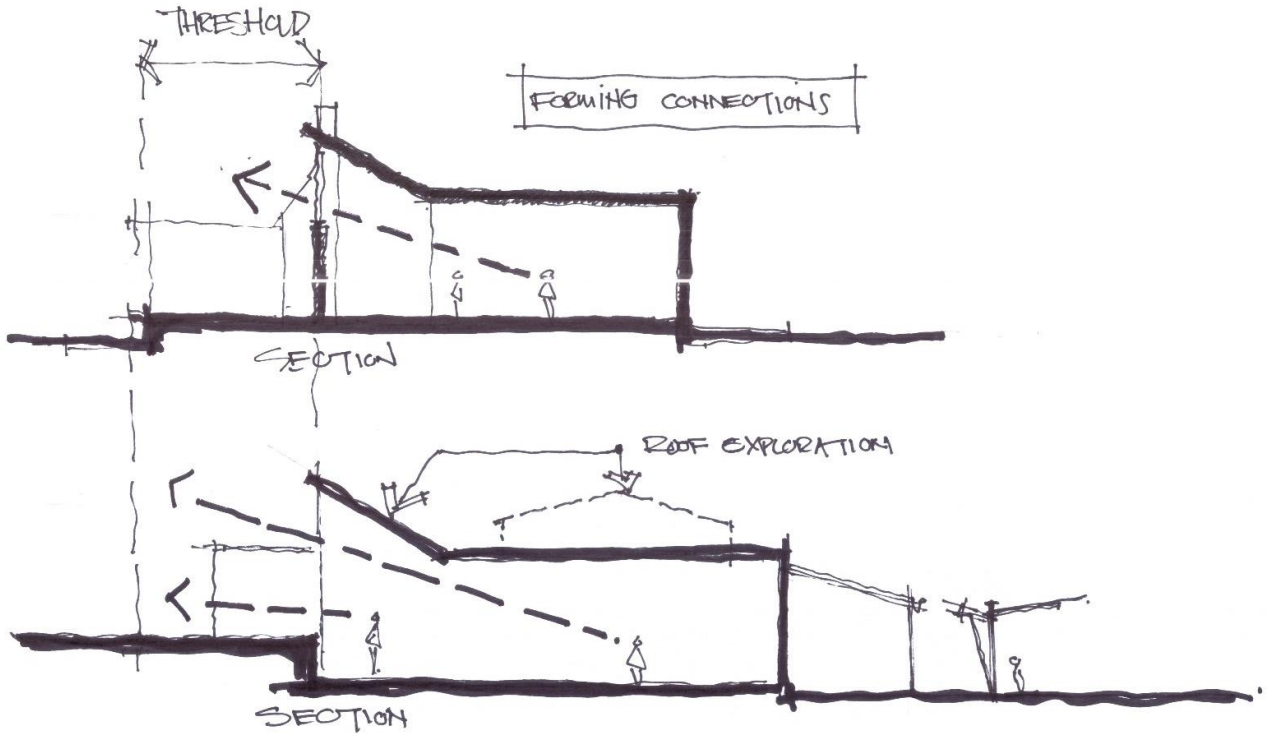


Fig 64 Vernacular roof interpretations (Dien, 2022)

Symbiotic

Symbiotic architecture asks that an interaction with nature and the natural surrounds manifests, to achieve this I will look at connecting the internal to external in all planes, such as roof, section, and floor planes.

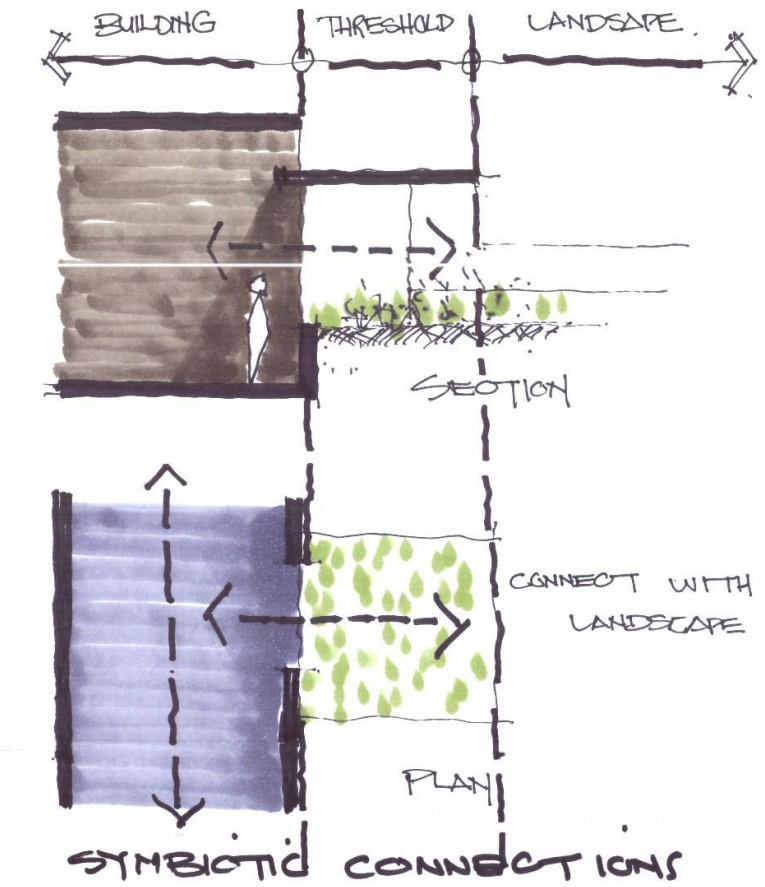


Fig 65 Symbiotic connections Diagram (Dien, 2022)

2.7 Conceptualizing and reinforcing symbiotic intervention

2.7.1 Conceptual Development Symbiotic vernacular synthesis

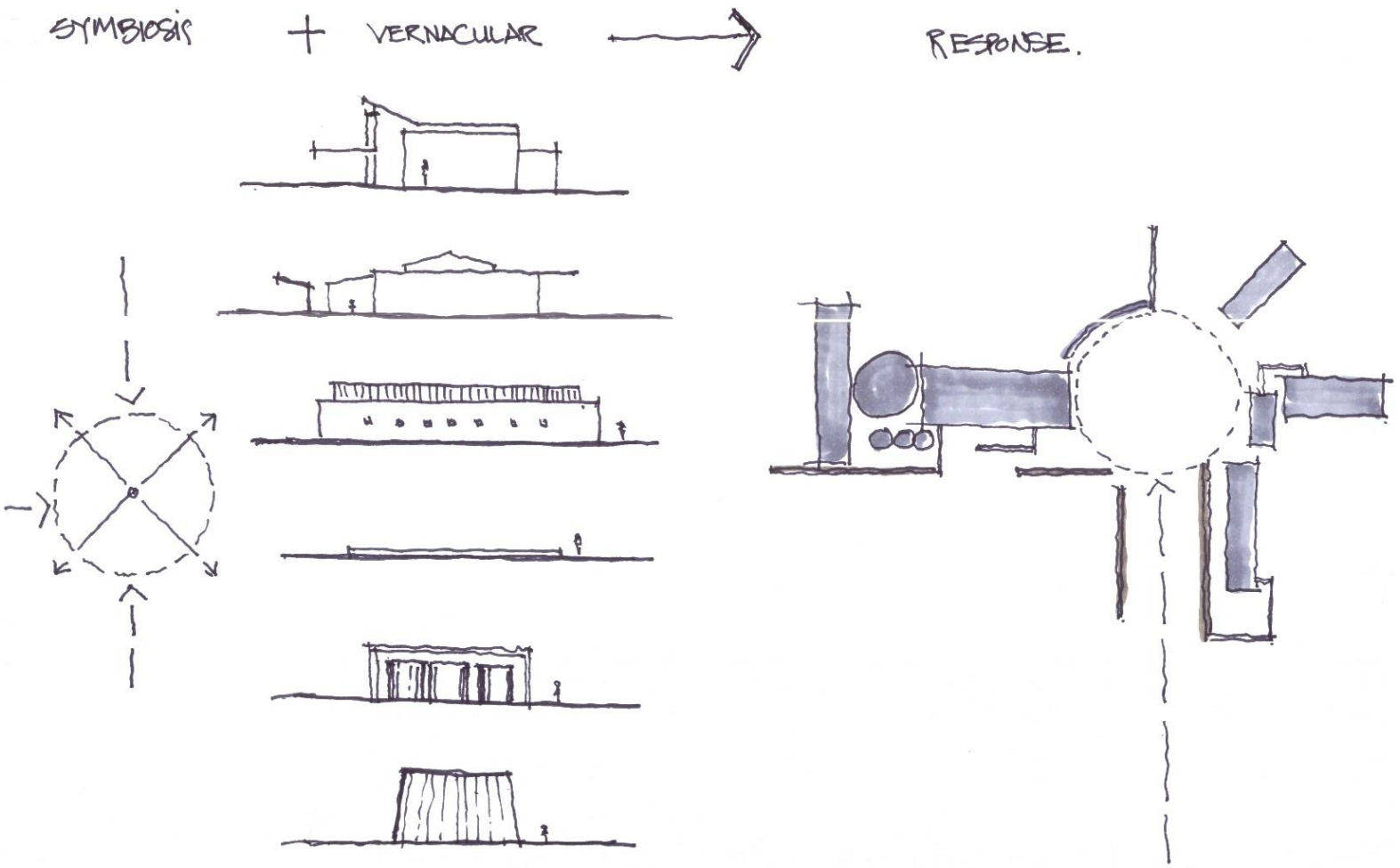


Fig 66 Response Diagram (Dien, 2022)

2.7.1 Conceptual Form Development

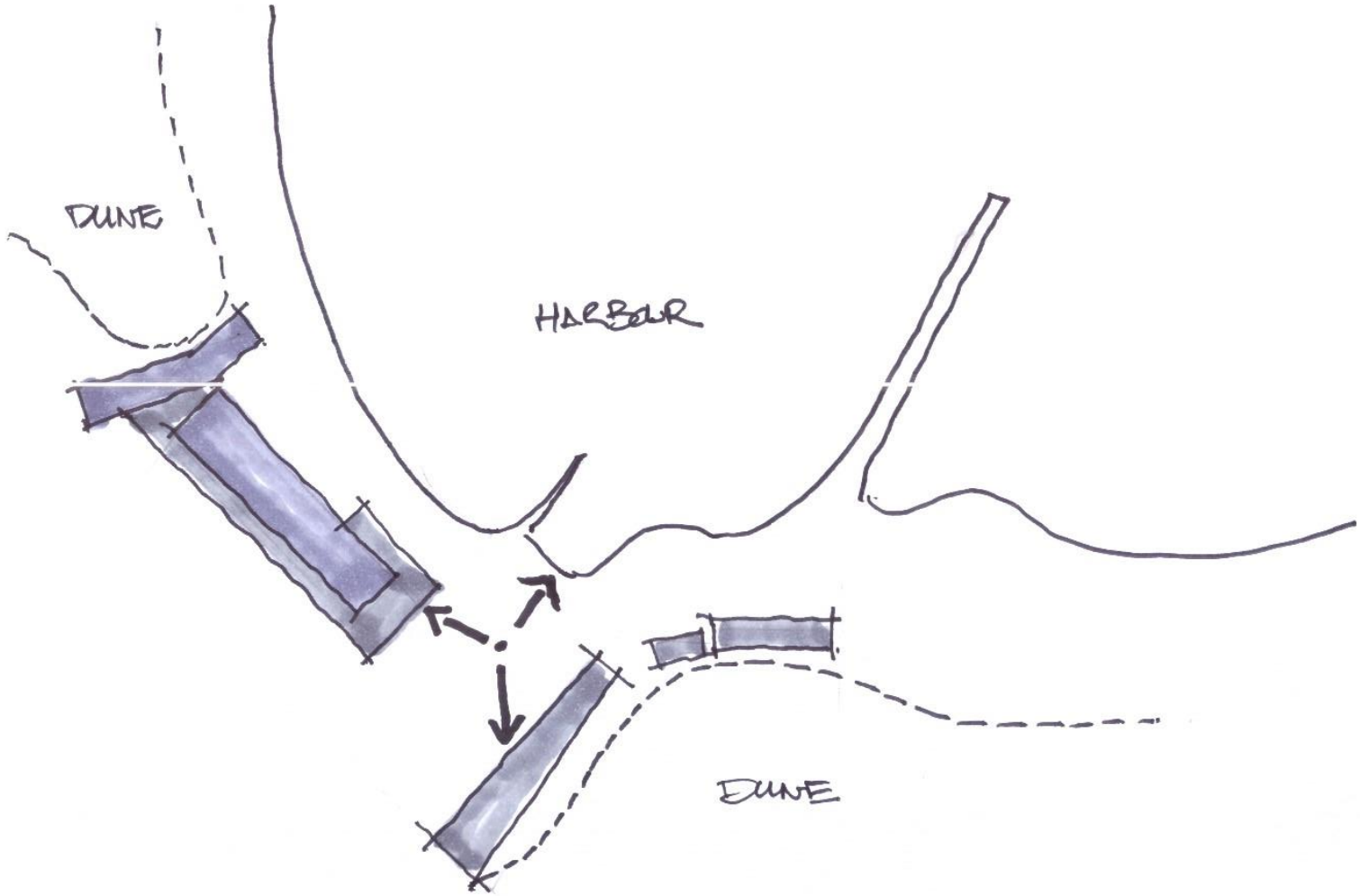


Fig 67 Form Development (Dien, 2022)

2.7.2 Eco tourism and marine research residing in the intersect

Analysis of existing harbour reveals an **intersect** of communities, local commercial fisherman, recreational fisherman and tourists. This intersect of activity explored generates a diagram that can be used to suggest formal placement of spaces, see fig 68.

Ecotourism is defined by The International Ecotourism Society as:

"Responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education", (IETS, 2022: online).

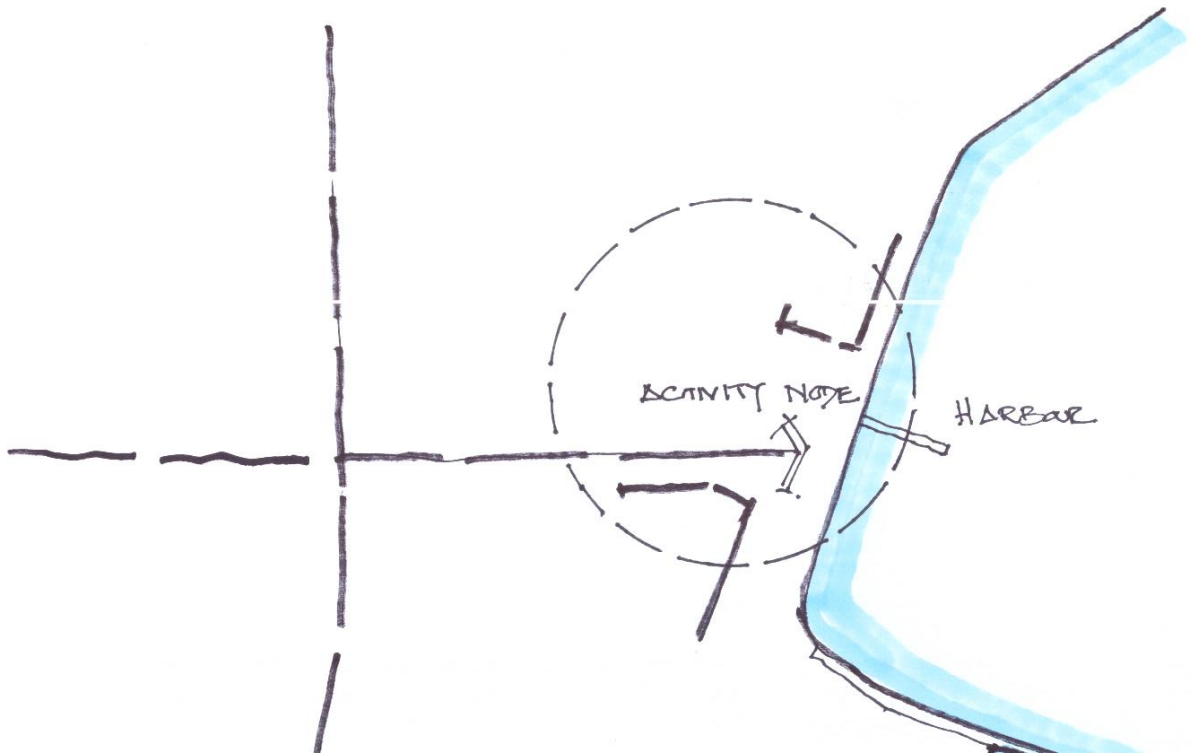


Fig 68 Intersect Diagram (Dien, 2022)

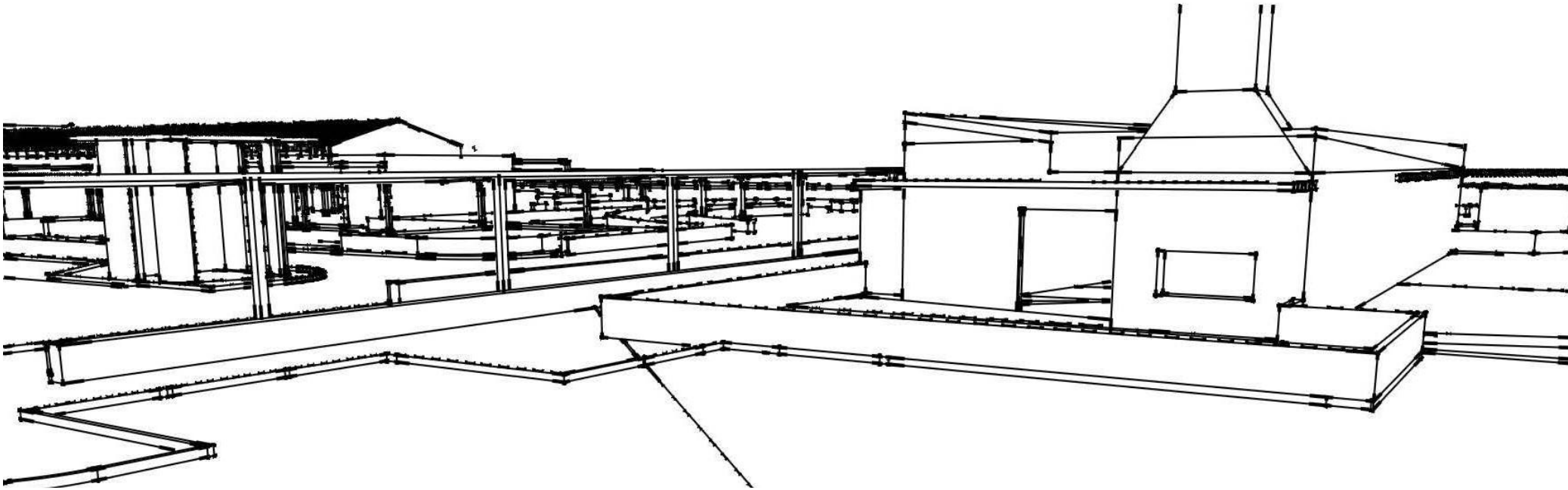


Fig 69 Sketch Diagram (Dien, 2022)

3.1 Design Development

Challenges identified

Constrained by dunes, Many options explored favoured a linear layout with vertical expansion being the logical format. Early stages explored multiple levels connecting planes and spaces, the challenge was getting the levels to work and there was simply not enough space to accommodate the design idea.

Many iterations later the design settled as a synthesized combination of the three concepts.

The core functions are all placed off the symbiotic intersect and binds the spaces together to form the intersect, see fig 70.

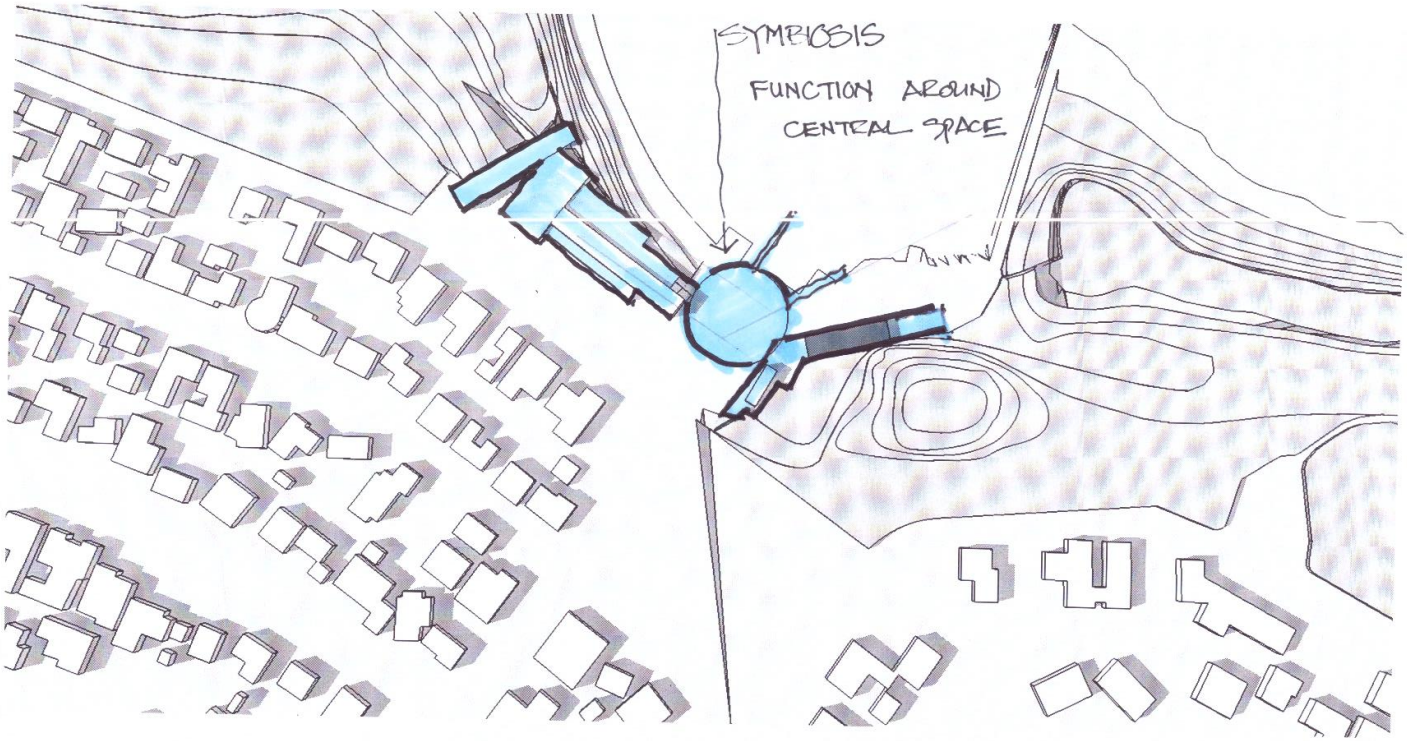


Fig 70 Symbiosis Grouping (Dien, 2022)

3.1 Design Development

The landscape edge element is used to set out the edge of the buildings on the east precinct.

Existing old buildings will fall away, and the landscape will form the edges, see fig 71.

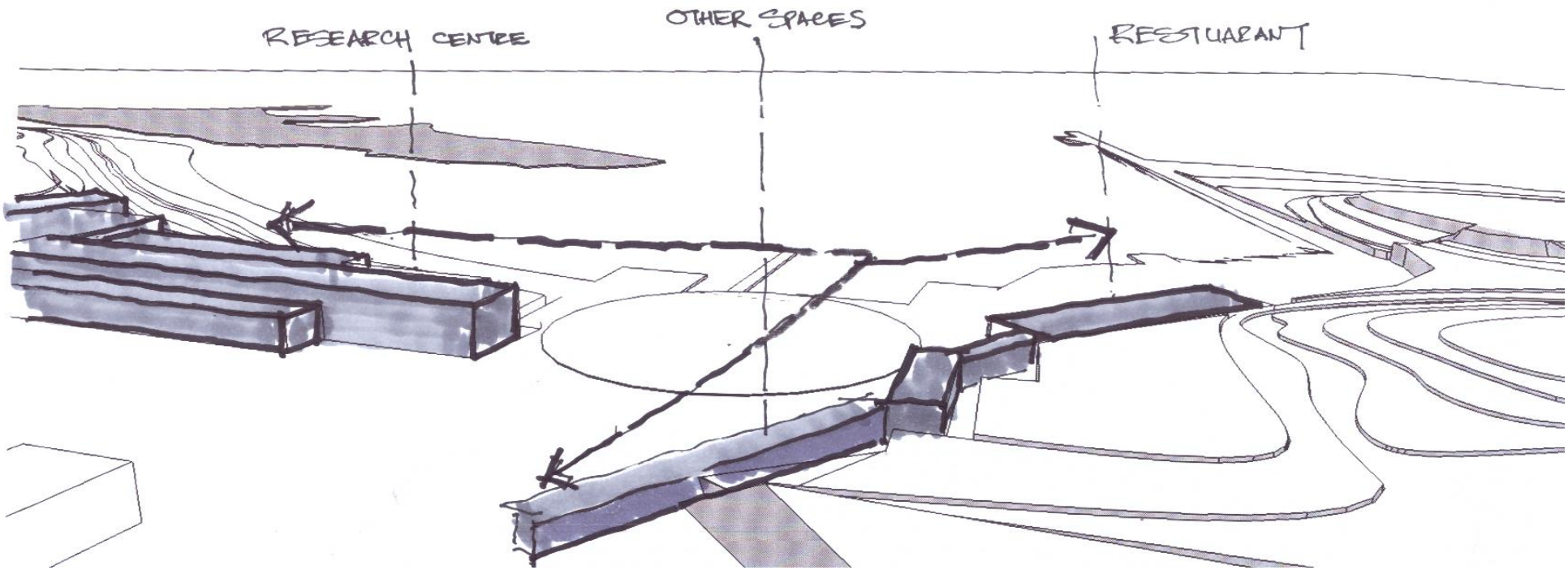


Fig 71 Binding Spaces (Dien, 2022)

3.1 Design Development

Elements of vernacular accentuating entrances and social spaces, and spaces are connected using covered walkways.

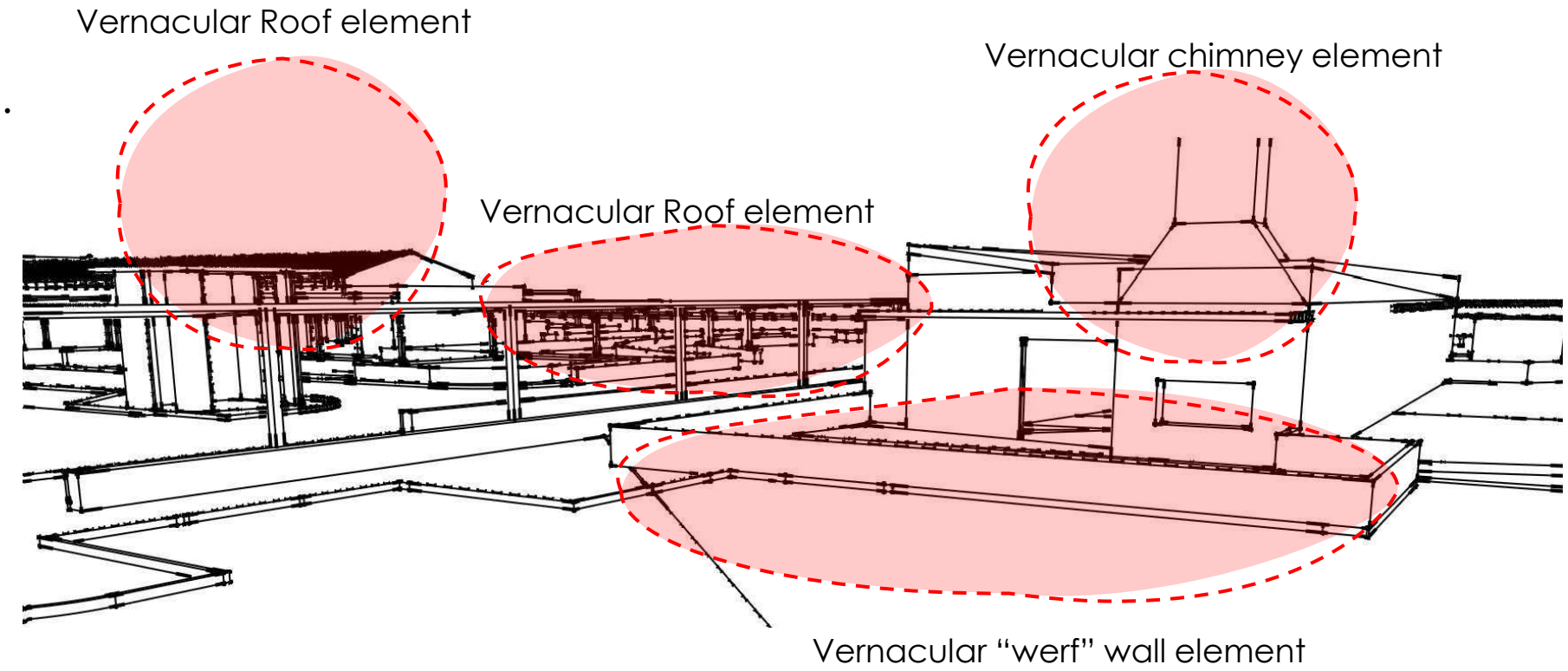


Fig 72 Design Diagram (Dien, 2022)

3.1 Design Development

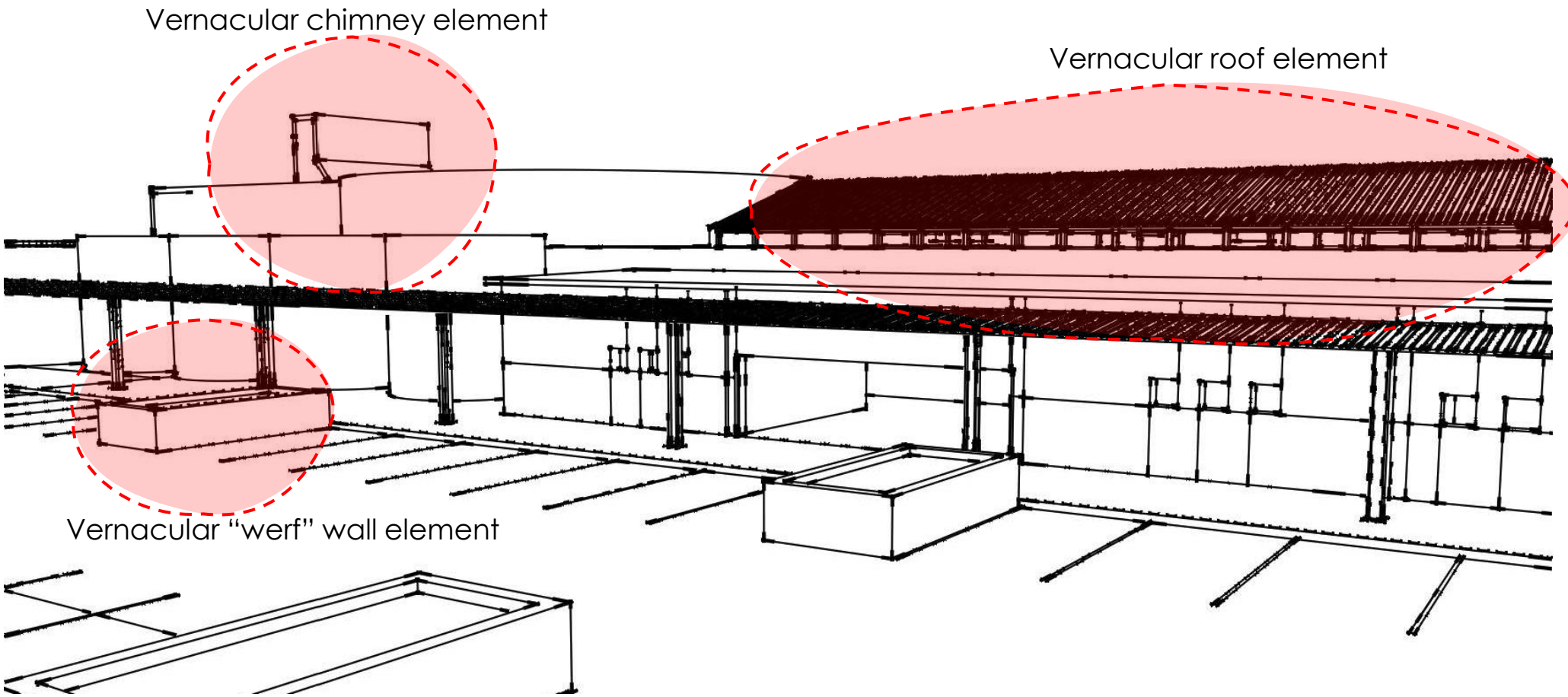


Fig 73 Design Diagram (Dien, 2022)

3.1 Design Development

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Fig 74 Design Diagram (Dien, 2022)

3.1 Design Development

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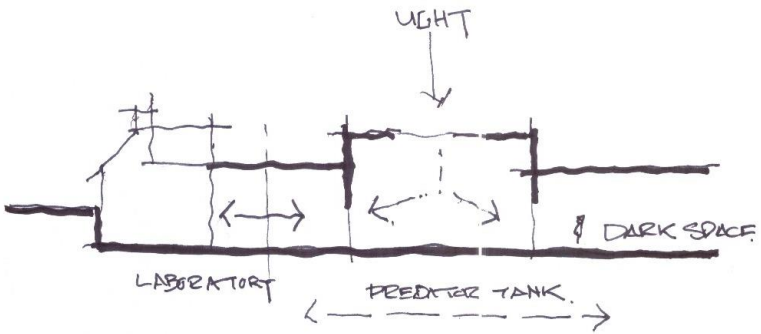


Fig 75 Design diagram (Dien, 2022)

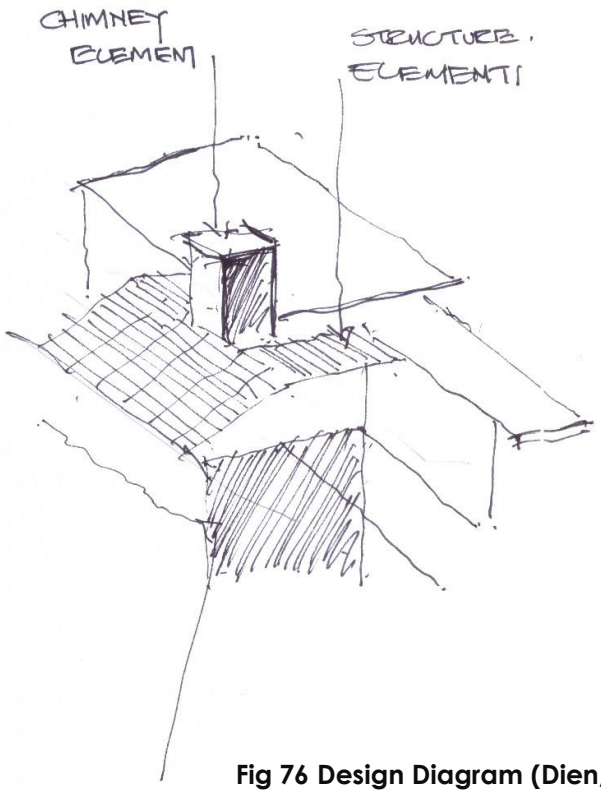


Fig 76 Design Diagram (Dien, 2022)

3.1.1 Case studies

3.1.1.1 Two Oceans Aquarium

See Fig 77-79 filtration facility

Tank requirements:

- large predator tank
  2 million liters display tank. Min 6.0m deep to accommodate large sharks and rays a typical diameter would be roughly 22m (2.28million liters)
- Small – medium predator tank
  1 million liters display tank.
  Min 4.0m deep to accommodate small and medium sharks and rays a typical diameter would be roughly 15m(2.28million liters

- Temperature zone 13-21 degrees
- Sub gravel filters
- Under gravel filters
- Activated glass media – Mechanical filtration process
- Protein skimmer to remove hydrophobias particles

Fig 77 Services and Filtration (Dien, 2022)

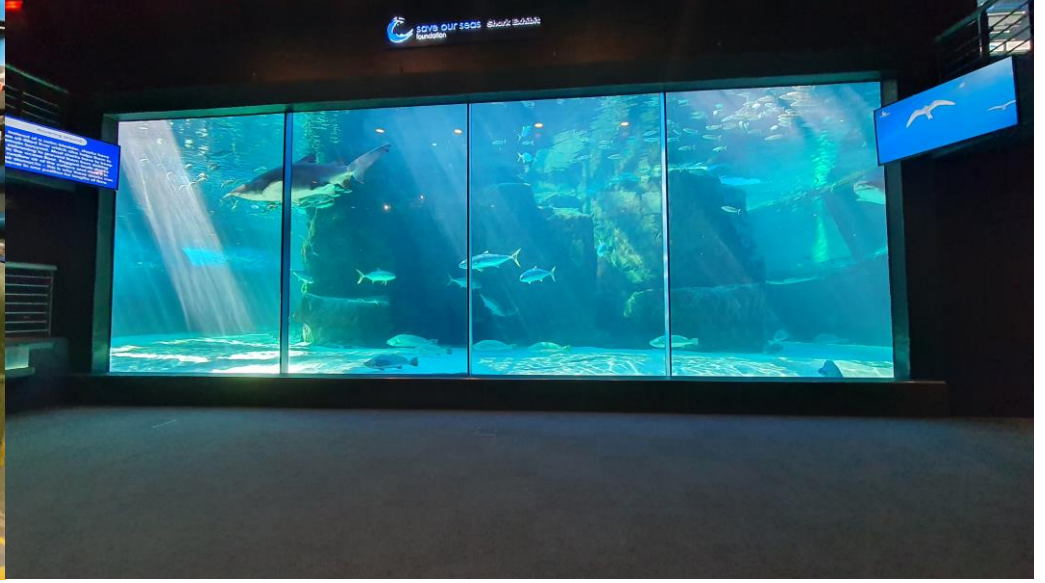


Fig 78 Predator Tank (Dien, 2022)

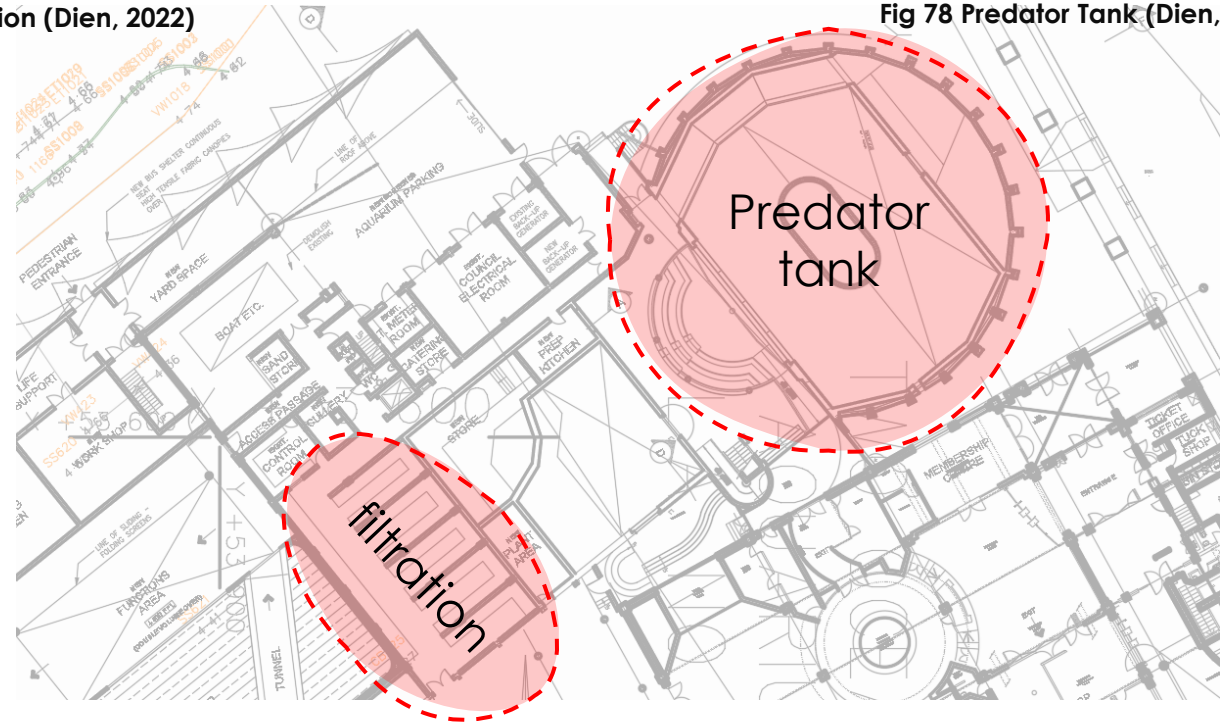


Fig 79 Proximity Diagram (Dien, 2022)

3.1.1.2 Reel Science Conversation

Question - As a researcher in the field of marine science what are your spatial requirements such as labs, rooms, stores, tank, and lab equipment etc.

Storage room for samples whether it be tissue samples, feathers, mucus, scat or whole specimens for dissection. This should include:

- Fridges and chest freezers
- A walk-in freezer
- An incinerator
- Shelf/cupboard storage

A dissection room which should include:

- An autopsy table
- Washbasins
- Autoclave
- Secure storage for preservation chemicals (e.g., formalin and ethanol)

A sterile genetics laboratory, divided up into five different sections:

- Storage room for DNA, extraction kits and reagents
- Sample preparation room,
- DNA extraction room,
- PCR preparation room,
- PCR room

Sample drop-offs point for Citizen Science projects.

See fig 80 for bubble diagram.

laboratory

1. Fridges and chest freezers
2. A walk-in freezer
3. An incinerator
4. Shelf/cupboard storage
5. A dissection room which should include:
6. An autopsy table
7. Washbasins
8. Autoclave
9. Secure storage for preservation chemicals (e.g., formalin and ethanol)
10. A sterile genetics laboratory, divided up into five different sections:
11. Storage room for DNA, extraction kits and reagents,
12. Sample preparation room,
13. DNA extraction room,
14. PCR preparation room,

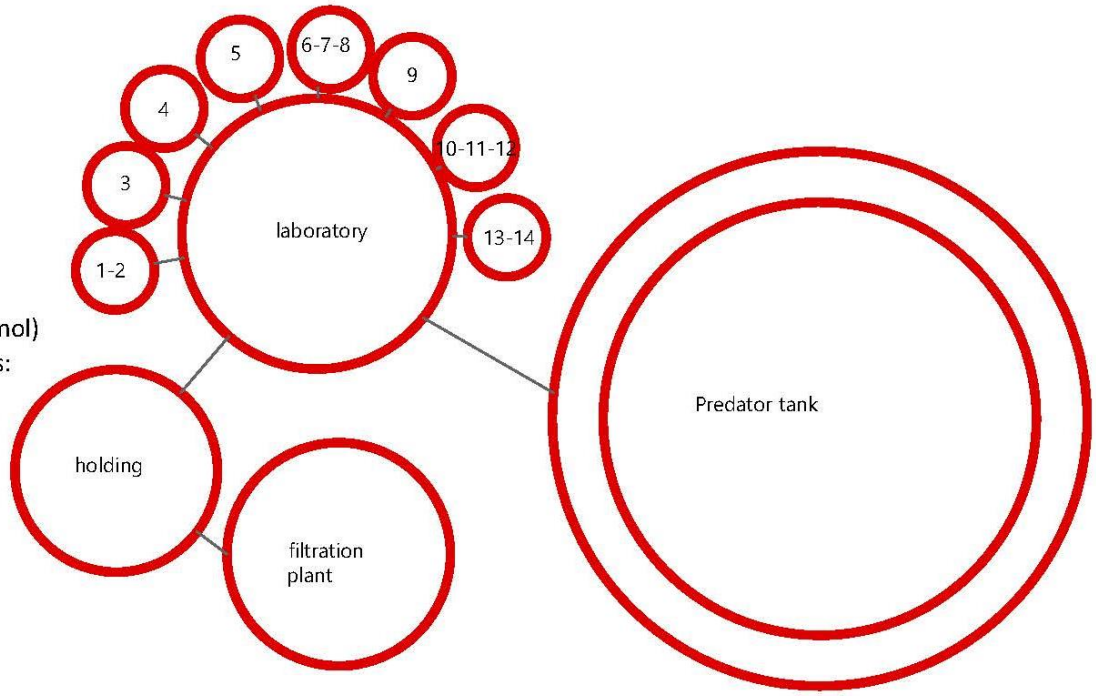


Fig 80 diagram (Dien, 2022)

3.2 Accommodation

Marine Research and Eco-tourism Centre	Comments	gf	ff	further notes and assumptions
West Wing				
Arrival space reception core	Open plan			open flow setting with ticket offices
Curio shop	Open plan	40		accommodate local curio crafts, cubicles?
Book Store	Open plan	20		marine rlated book store
Security	Open desk	20		security station with cctv monitors
Cafeteria	service space	100		link to outside
Exhibition	main space			exhibition of marine species, particulary Elasmobranchii
Learning experience spaces	open plan			with 1.5million l water tank
kids	Open plan	2000		based on similar function facicilities
research lab	Open plan	200	#	
lab plant	Open plan	100		research lab with clinical equipment
water tanks	Open plan	tbc		filtration plant intergrated into design
Management				
Director - Curator	Open View Office	20		
Meeting facilities	Open plan	20		main space
Work Shop	Open plan	40		
Reception	waiting area and pre wait	20		
Server room	euipment management	20		
Staff Room	12 Persons	40		
Staff ablutions	male and female	tbc		as per sans regulations

Other		gf	ff	
parking				TBC Allow Service and Energency vehicles
Holding area		150		
Staff cleaning		tbc		
Services core tbc	Elecrical Electronics Automation	tbc		
Air handling plant – eco friendly	tbc	tbc		
Water handling plant	tbc	tbc		
South Wing				
Fish Market		250		water , cleaning tables, wash down and drains
Ski Boat Club		250		relocate boat club from old location with trailor parking
Sea Fisheries		80		launch unit and office
Market Space		60		general surf shop, tackle shop, ice cream shop etc
Restuarant		300		needs private parking
public ablution		50		allow uni access
		3780		

ACCOMMODATION LIST

west wing

- arrival space reception core
  - curio shop
  - book store
- security
- cafeteria
- exhibition
- learning experience spaces
- research lab
- lab plant
- predator tank
- release pen
- management
  - director - curator
  - boardroom
  - reception
  - server room
  - staff room
  - staff ablutions

other

- parking
- holding area
- staff cleaning
- services core
- air handling plant
- water handling plant

notes

open flow setting with ticket offices
accommodate local curio crafts
marine related book store
security station with cctv monitors
link to outside
exhibition of marine species, particularly elasmobranchii

research lab with clinical equipment

with 1.5million l water tank filtration plant integrated into design

south wing

- south wing
- fish market
- ski boat club
- sea fisheries
- market space
- restaurant
- public ablution

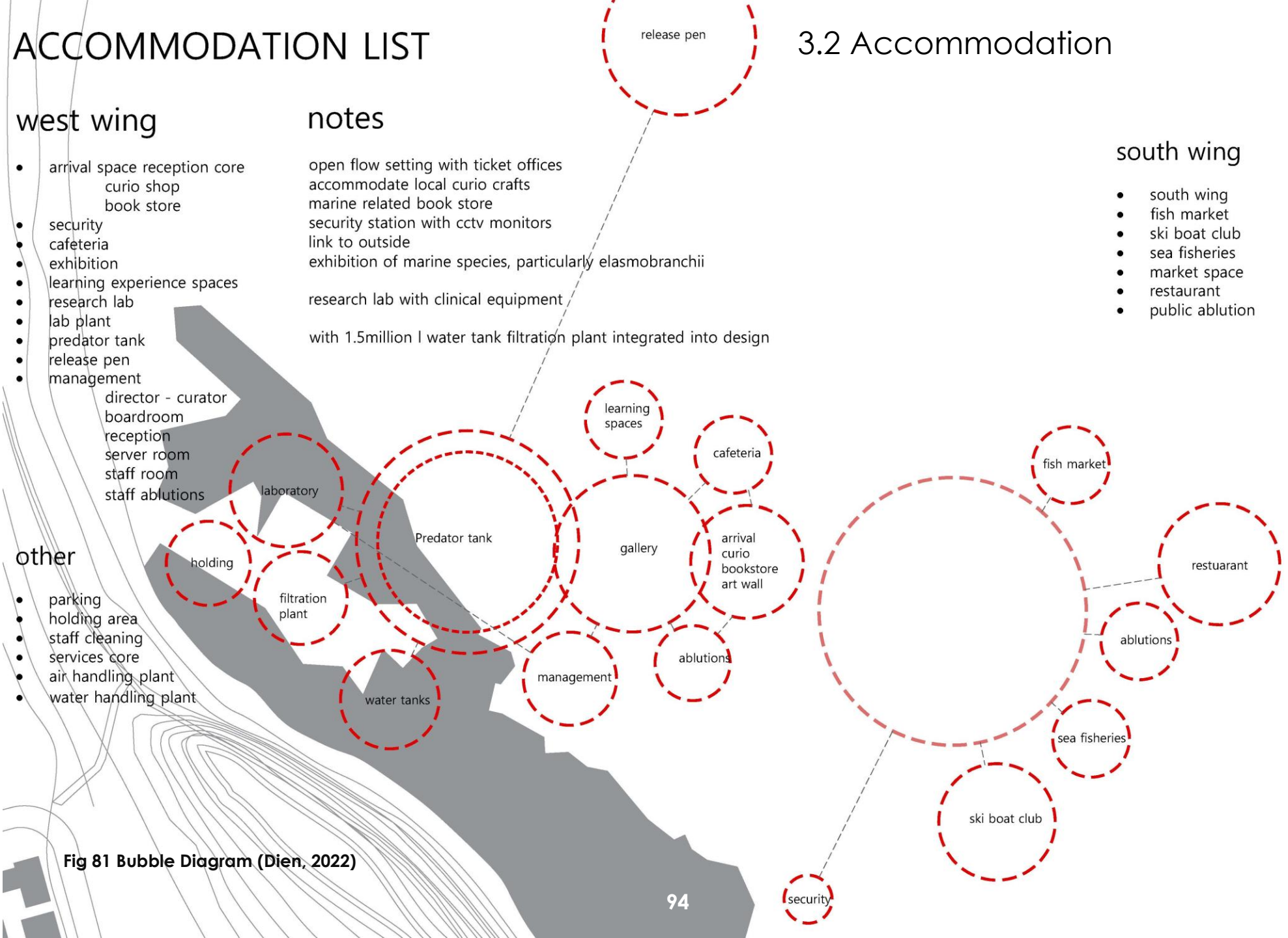
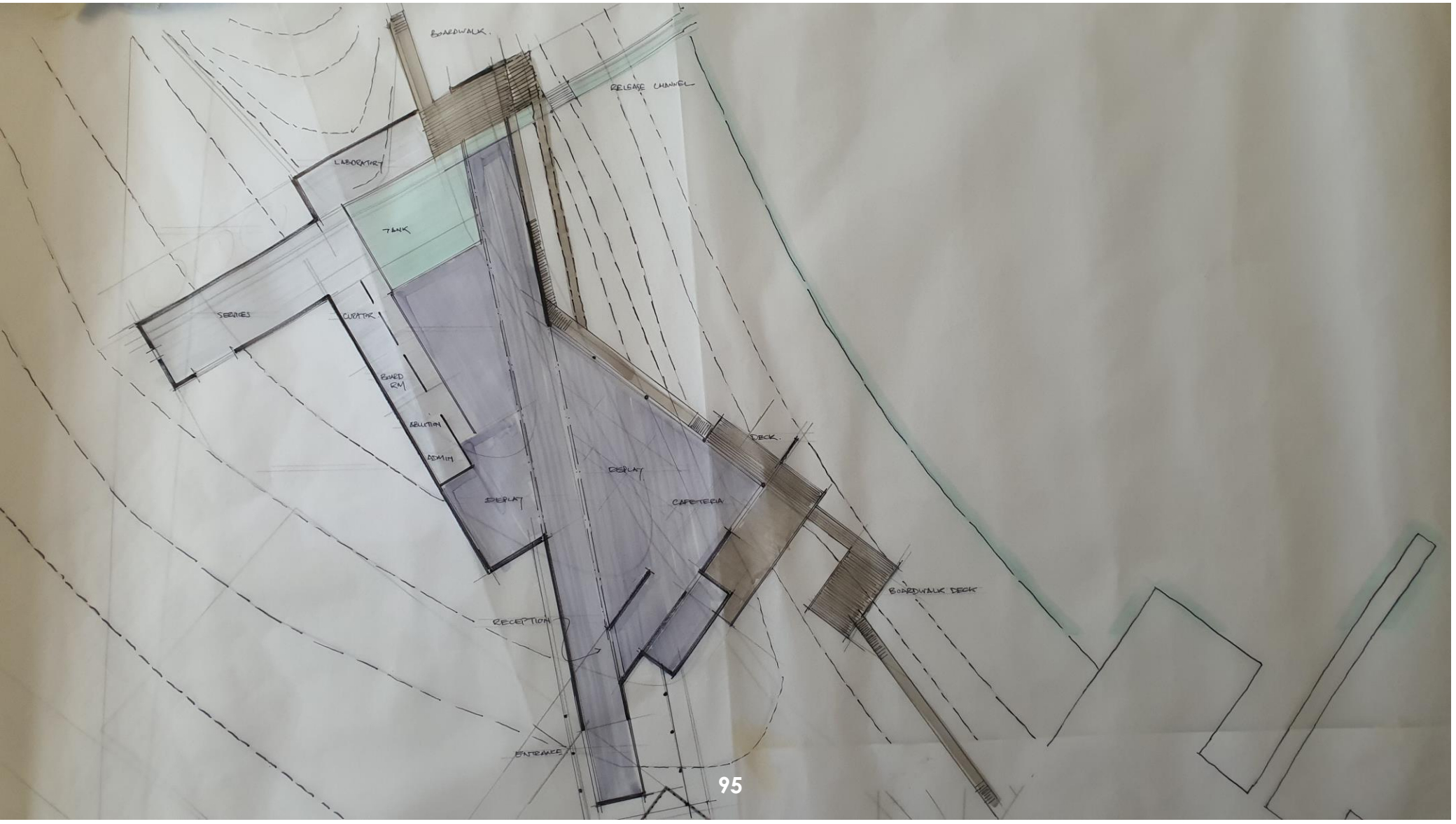
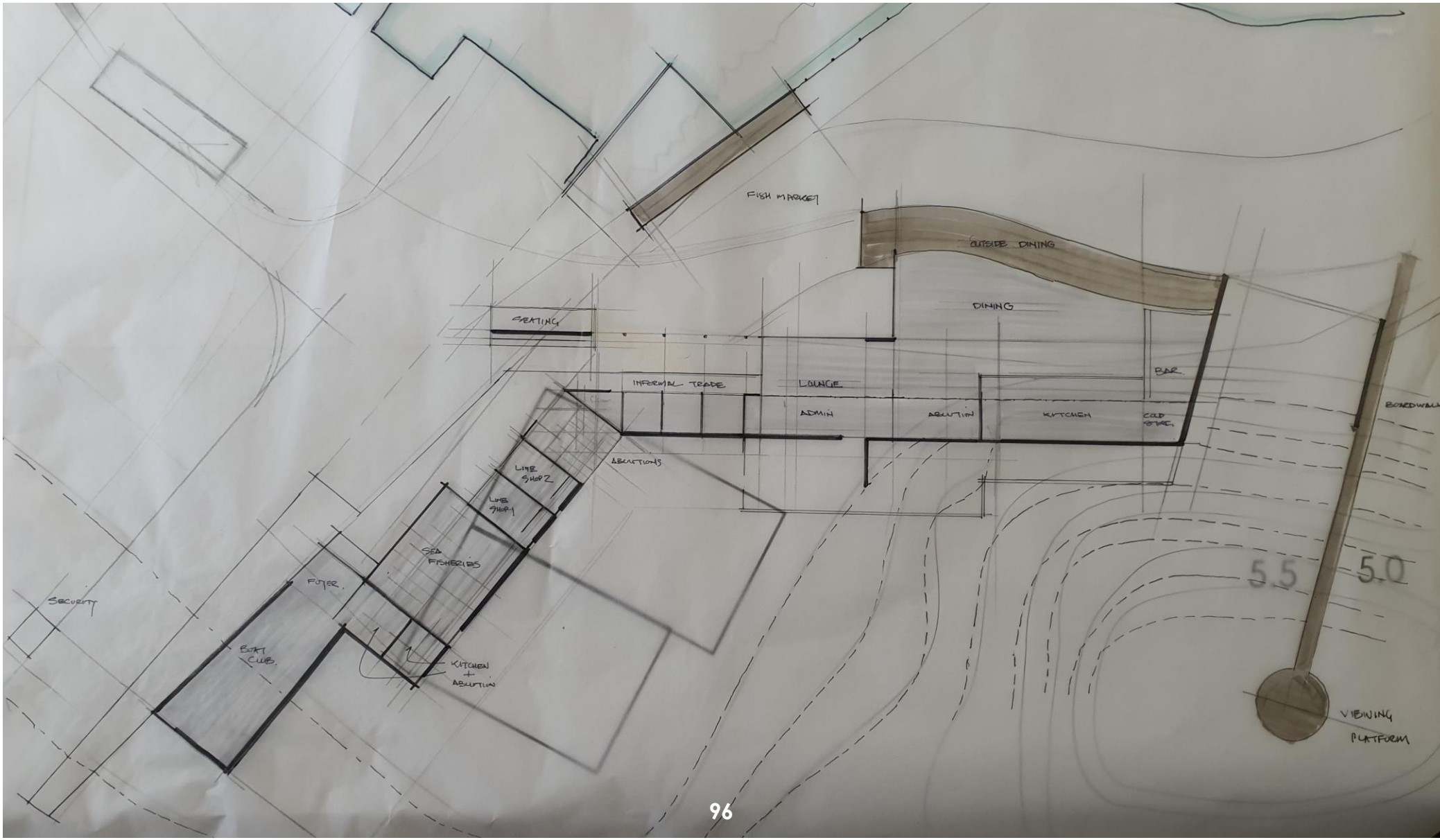


Fig 81 Bubble Diagram (Dien, 2022)

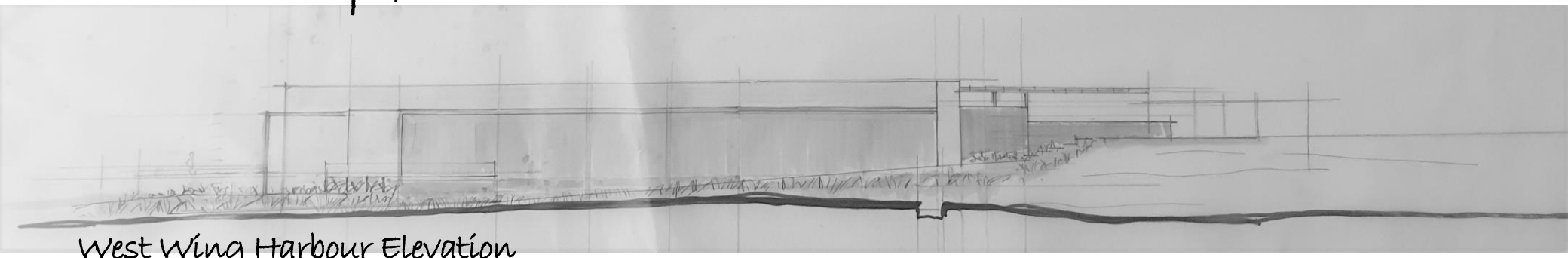
West Wing plan



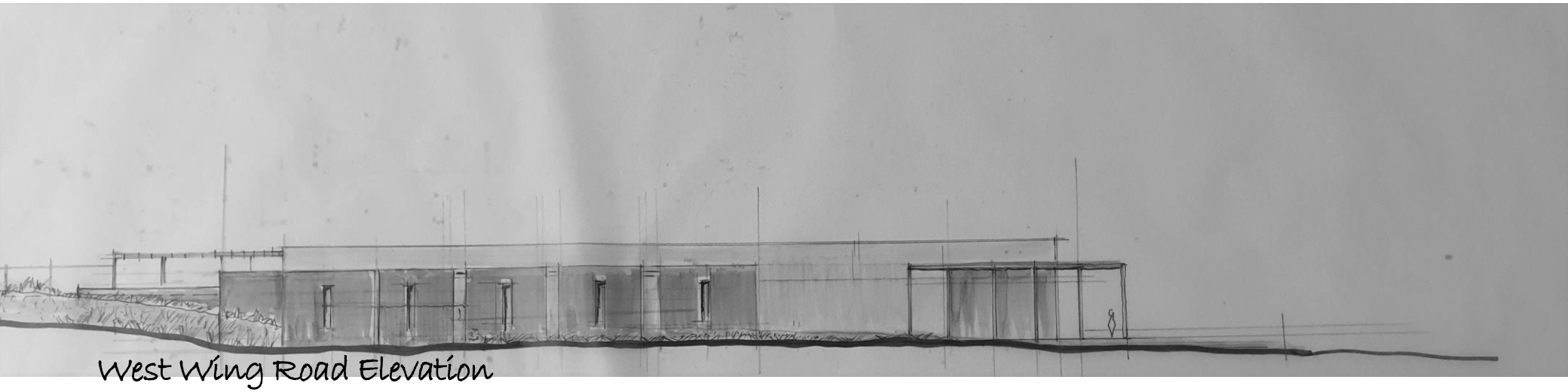
South Wing plan



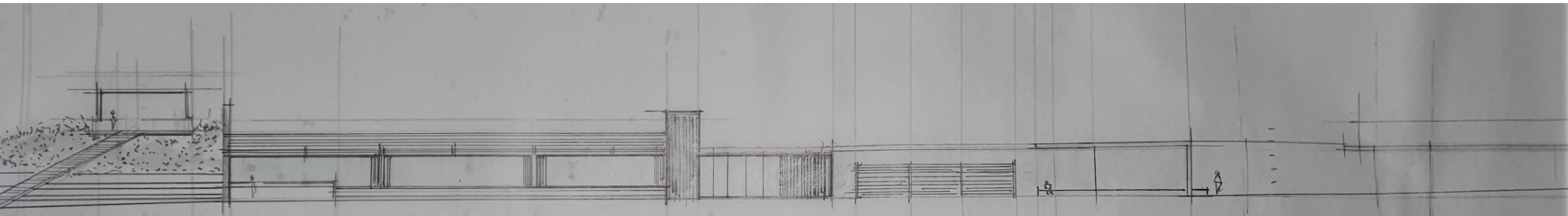
First attempt, elevations



West Wing Harbour Elevation

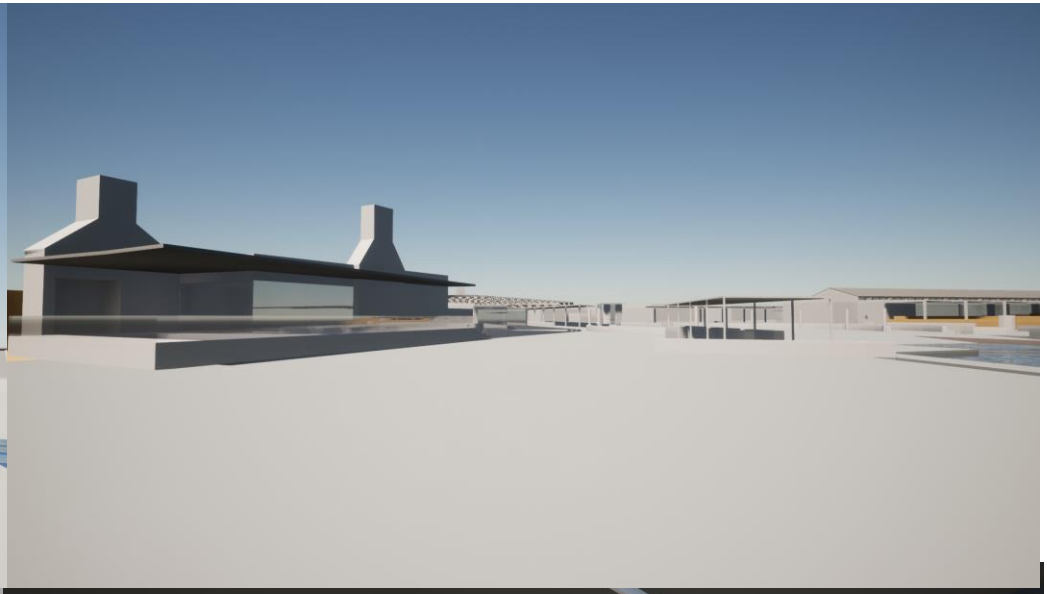


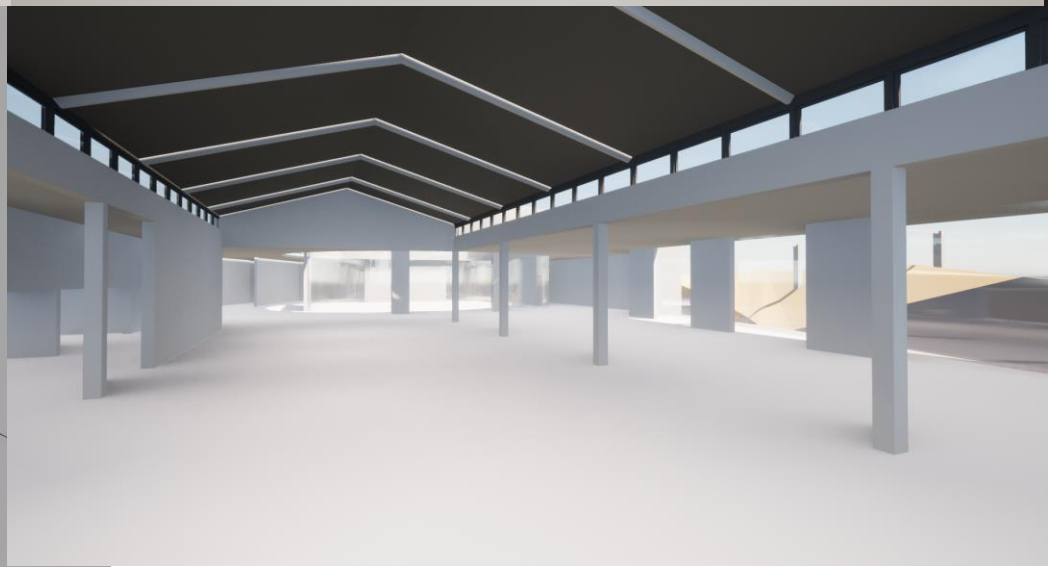
West Wing Road Elevation



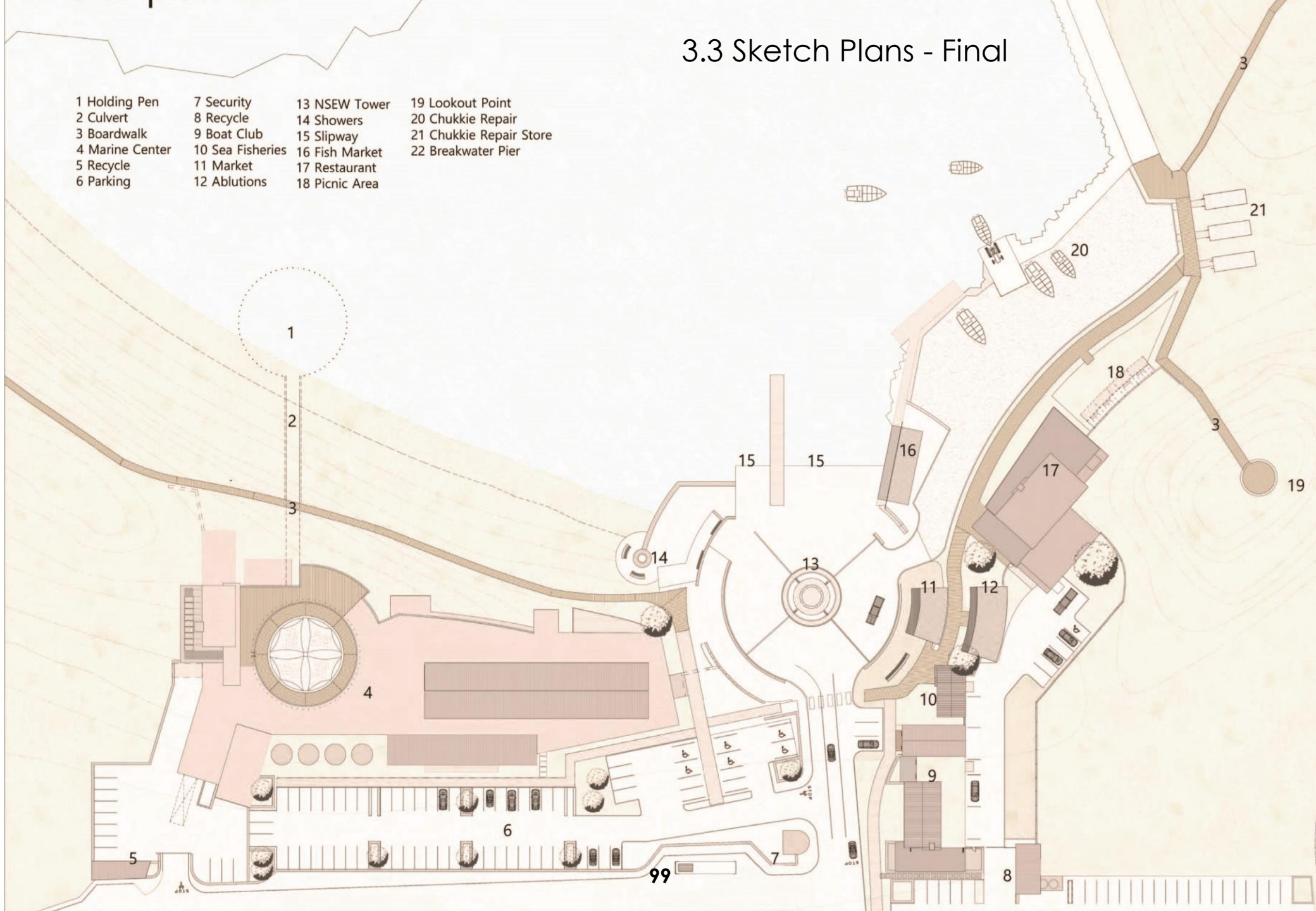
East Wing Harbour Elevation

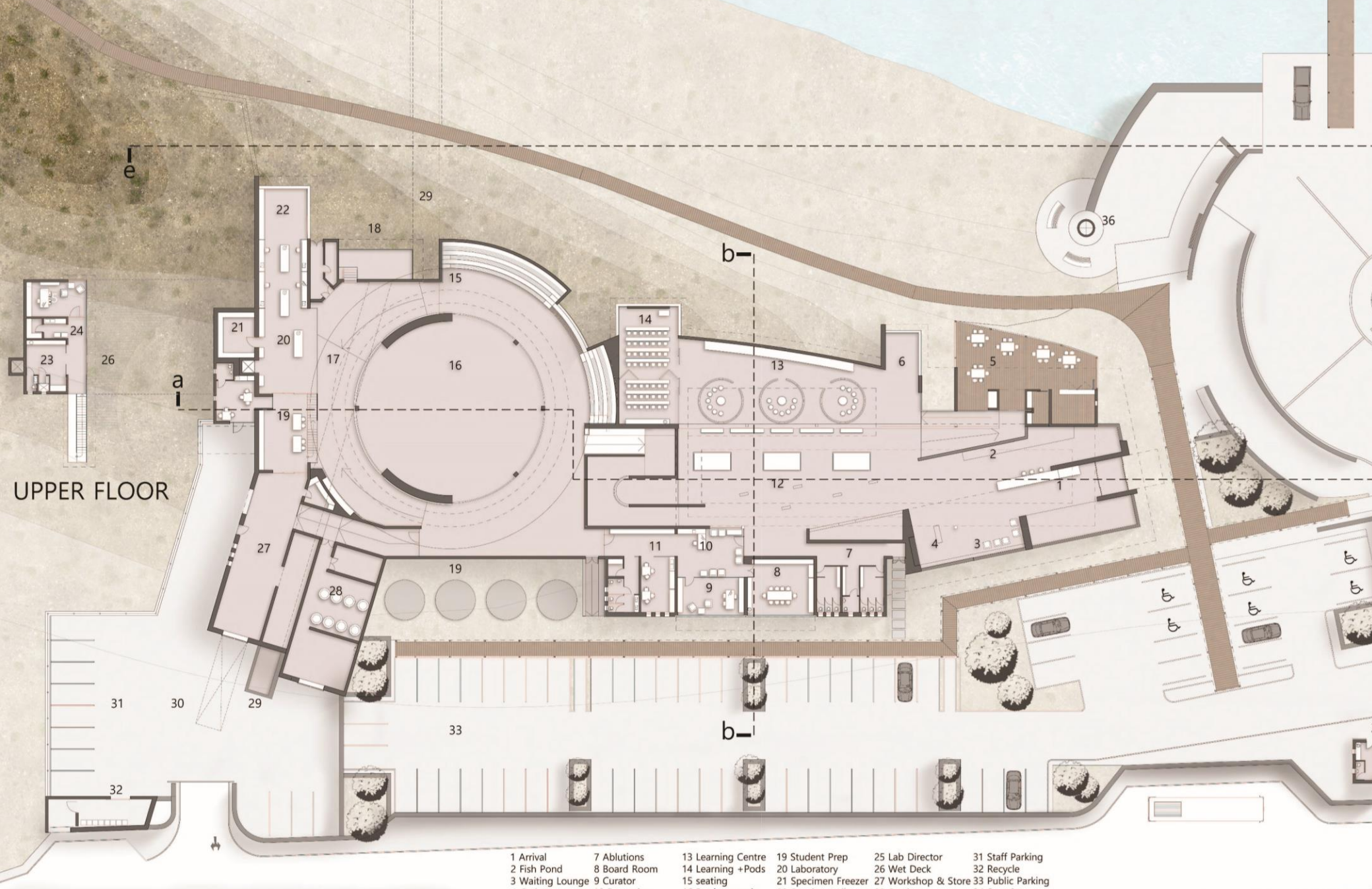
3d process work





3.3 Sketch Plans - Final



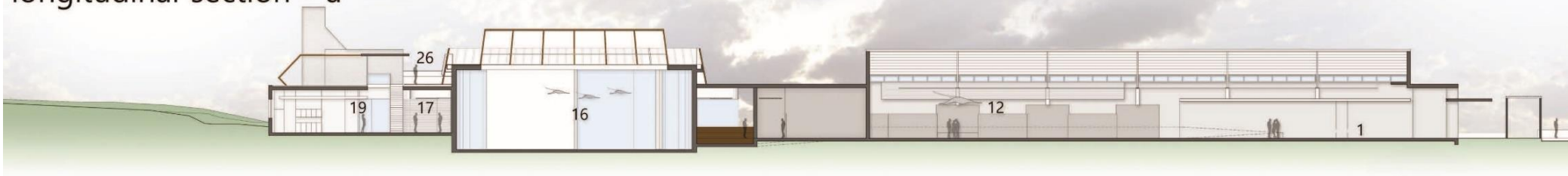


1 Arrival
2 Fish Pond
3 Waiting Lounge
4 Curios
5 Cafeteria
6 View Niche
7 Ablutions
8 Board Room
9 Curator
10 Reception
11 Staff Room
12
13 Learning Centre
14 Learning +Pods
15 seating
16 Predator tank
17 Interactive Lab
18 Base View
19 Student Prep
20 Laboratory
21 Specimen Freezer
22 Specimen Library
23 Dive prep
24 Feed Prep
25 Lab Director
26 Wet Deck
27 Workshop & Store
28 Services
29 Culvert
30 Loading
31 Staff Parking
32 Recycle
33 Public Parking
34 Security
35 Showers
36 NSEW Tower

ground floor plan west wing 1:200

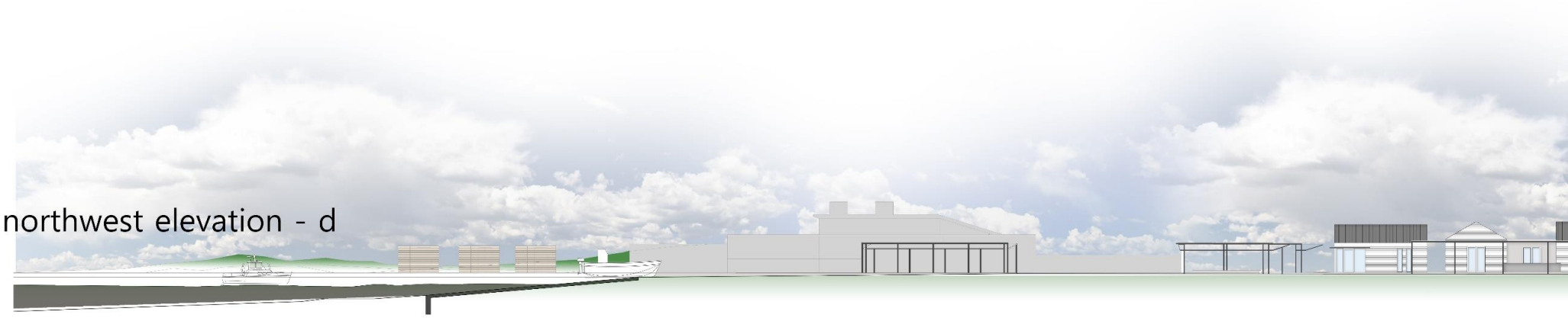
ground floor plan south wing 1:200

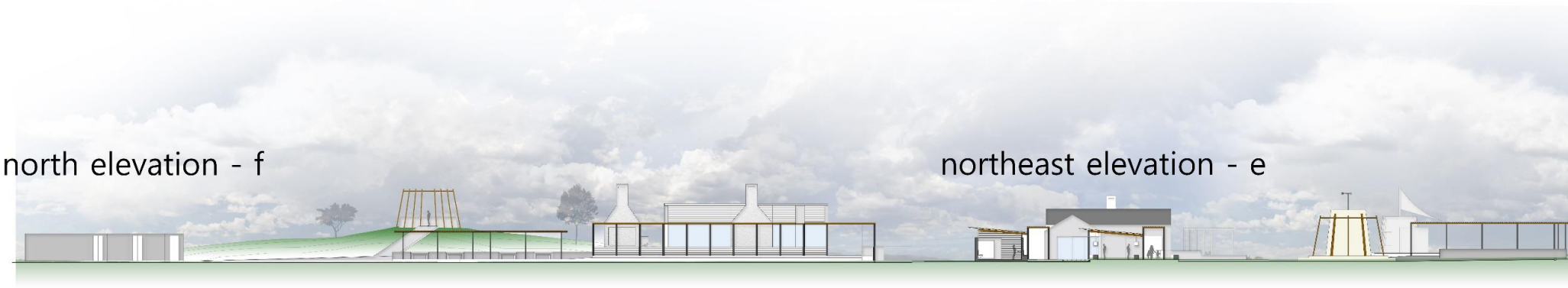
longitudinal section - a

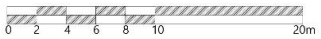


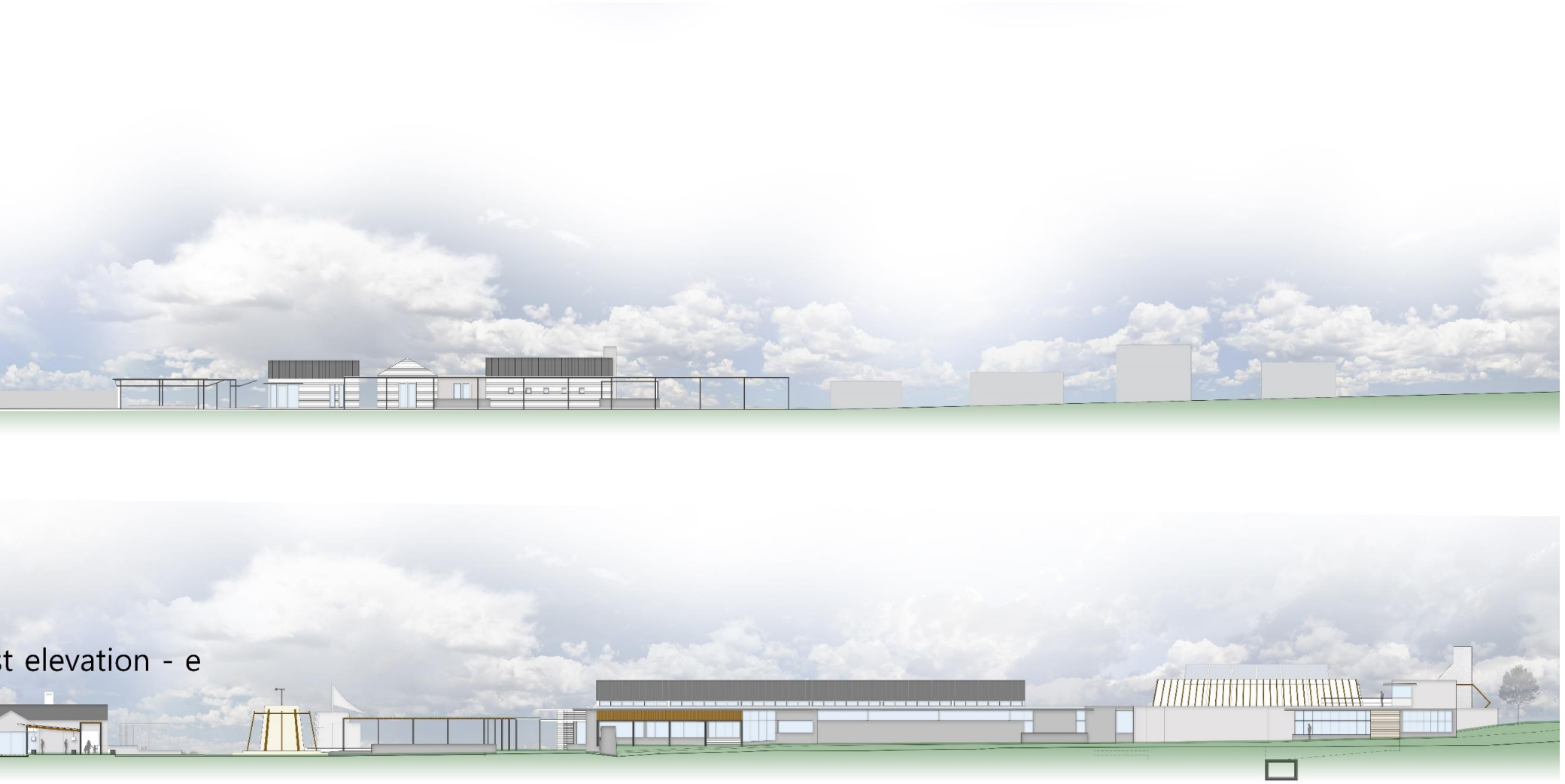
southwest road elevation


12

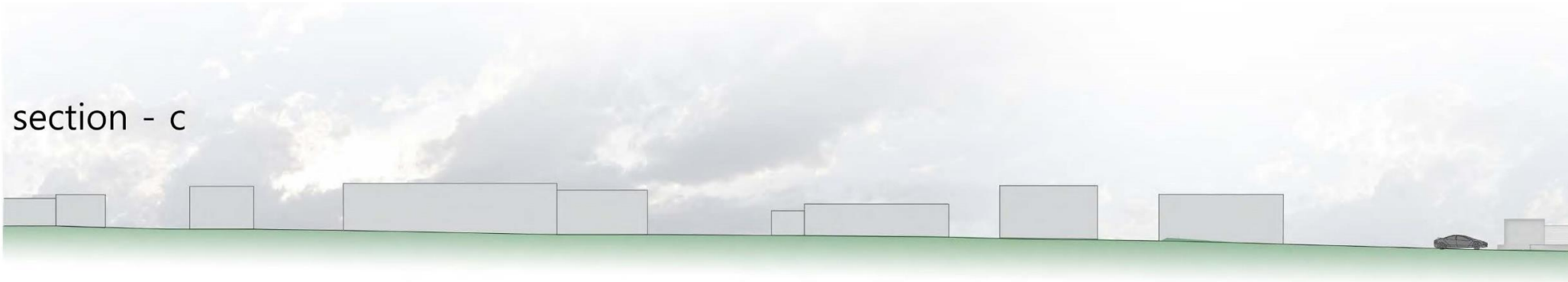

northwest elevation - d


north elevation - f
northeast elevation - e

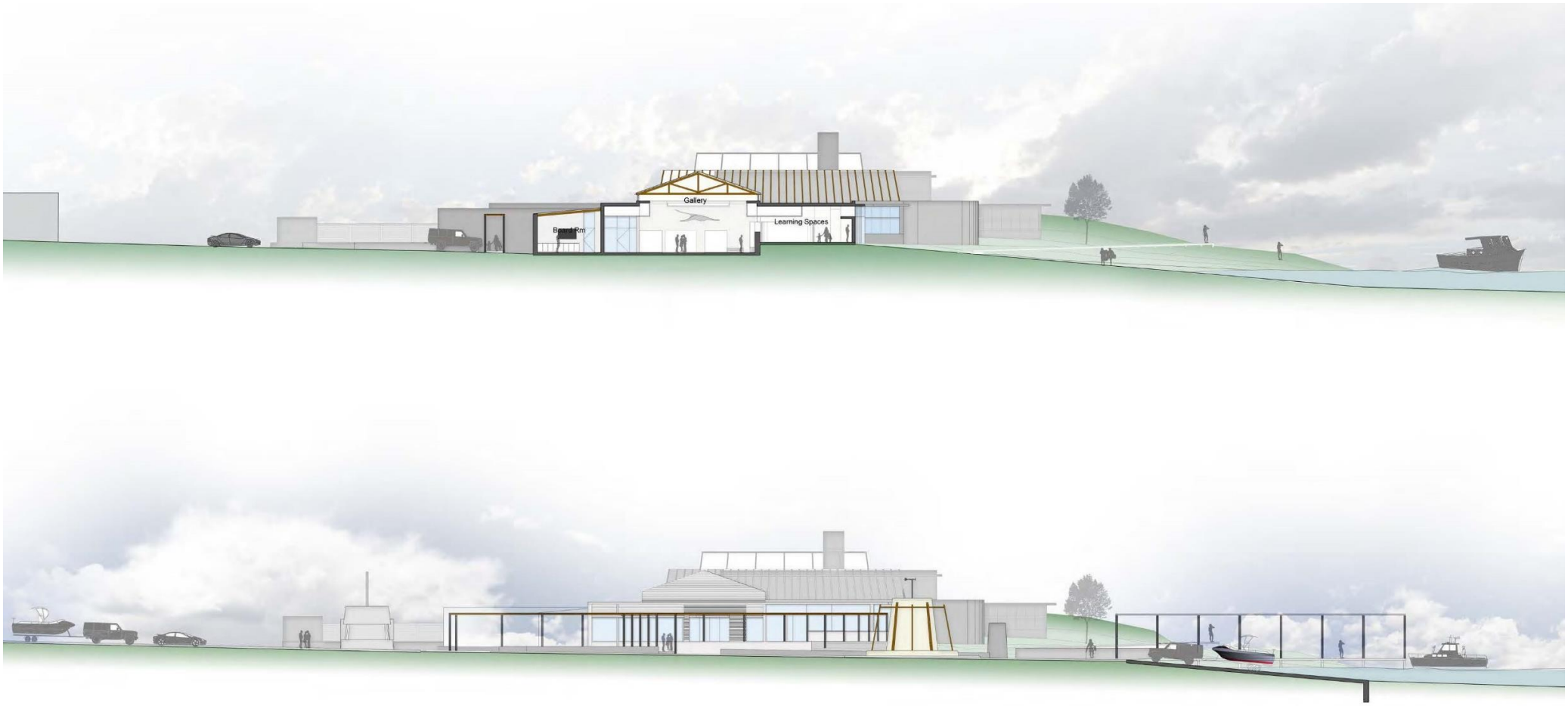

0 2 4 6 8 10 20m


t elevation - e

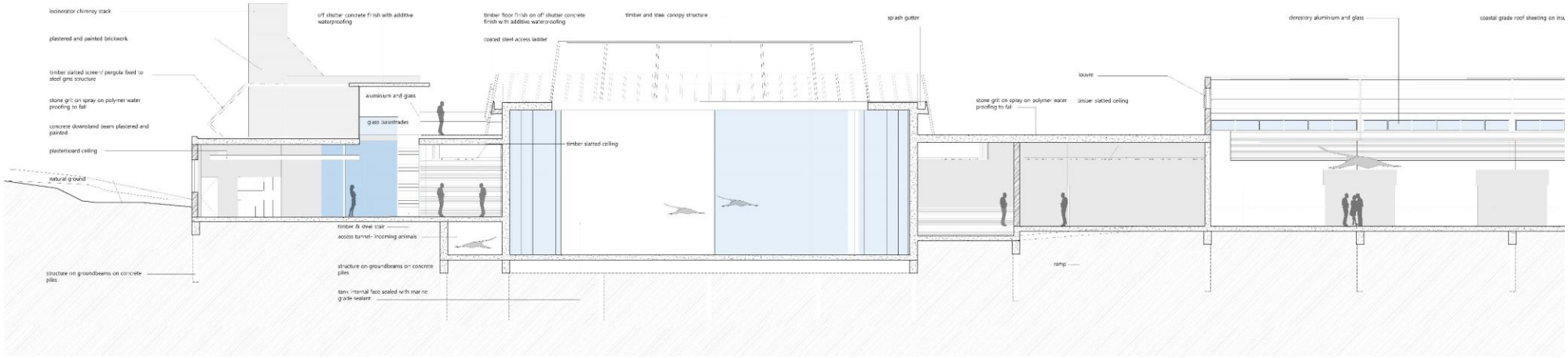
section - c



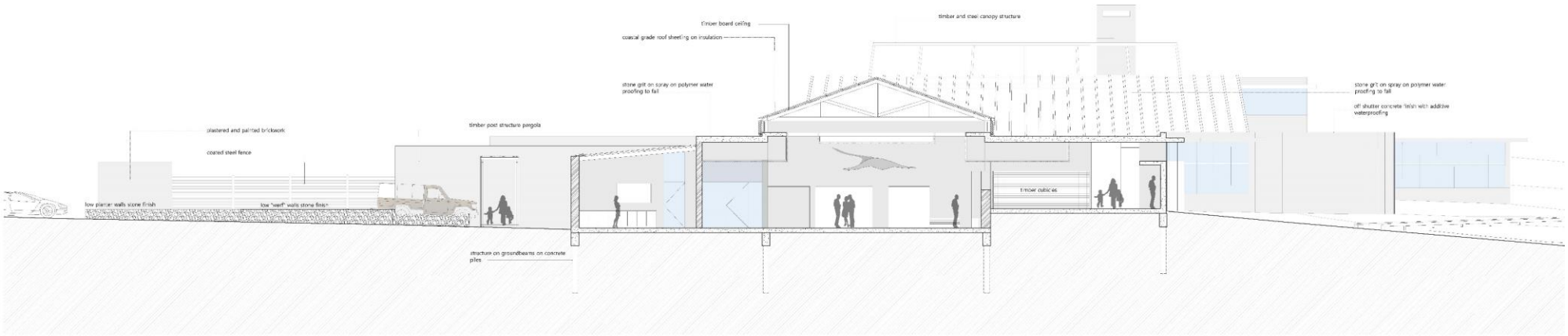
southwest road elevation


Gallery
Learning Spaces

longitudinal section - a part 1

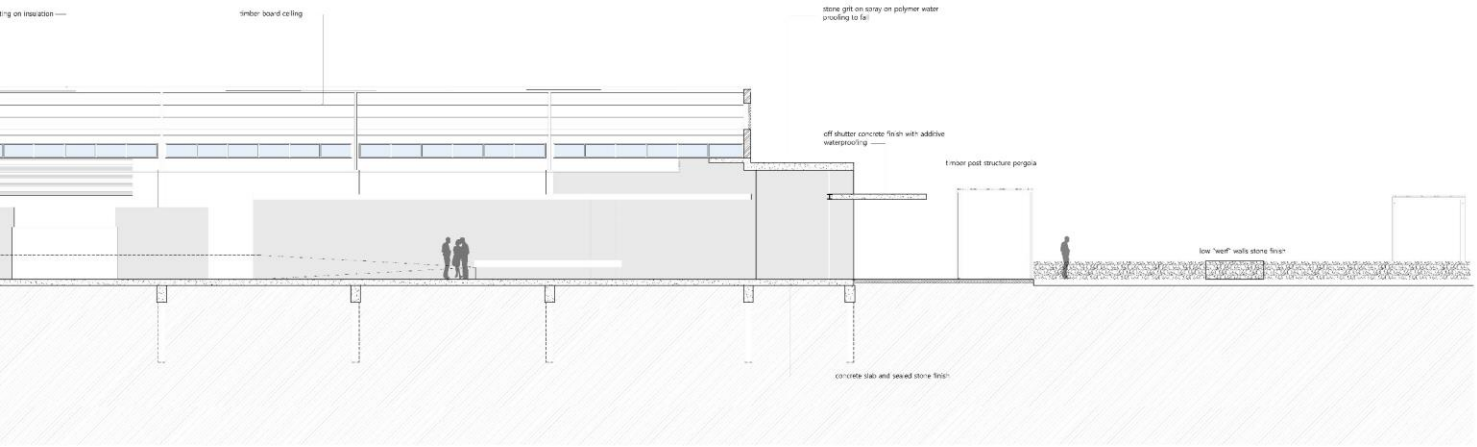


section - c

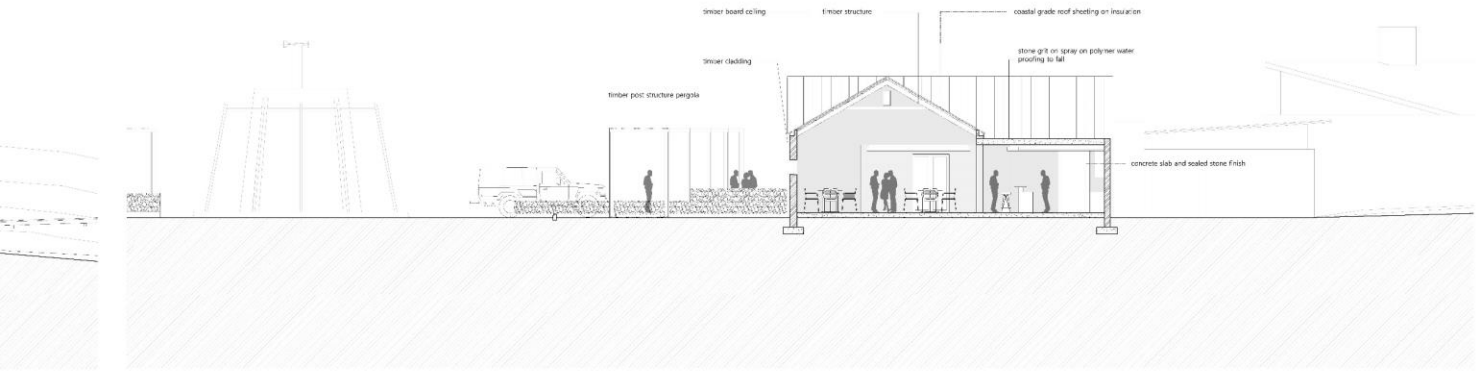


construction sections 1-100

0 1 2 5m



longitudinal section - a part 2



Pedestrian Access to Marine Centre

Access and view to slipway

Bus Parking

View to Lab

Entrance to Research Aquarium

Restaurant and Orientation tower


View to slipway


Reception

Educational component

Learning pods, Educational component

Learning pods, Educational component

Interactive lab and Predator tank

Laboratory

Laboratory upper level


Walkway to entrance.

Fish Market

Boat club outside space.

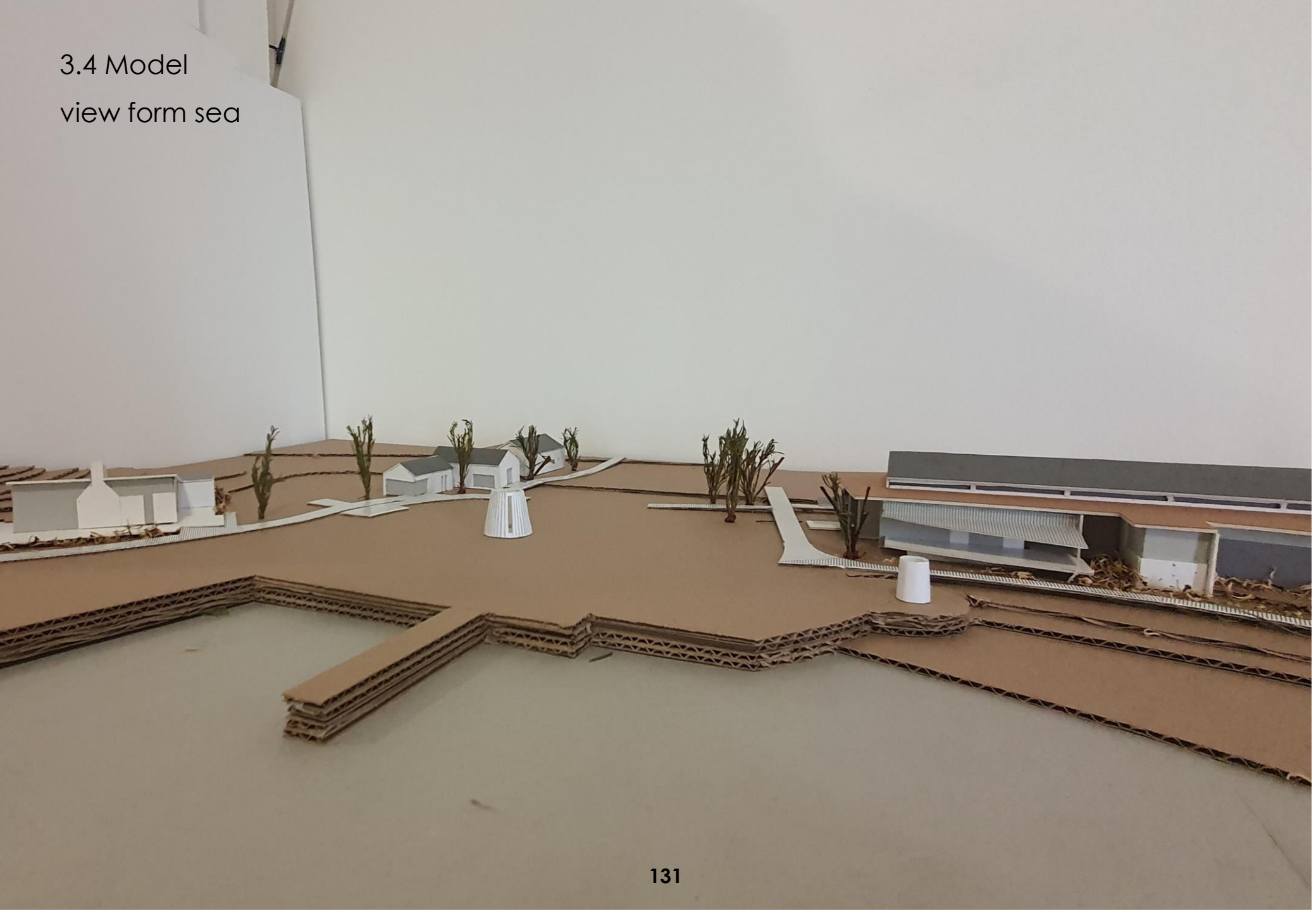
Showers

Restaurant entrance

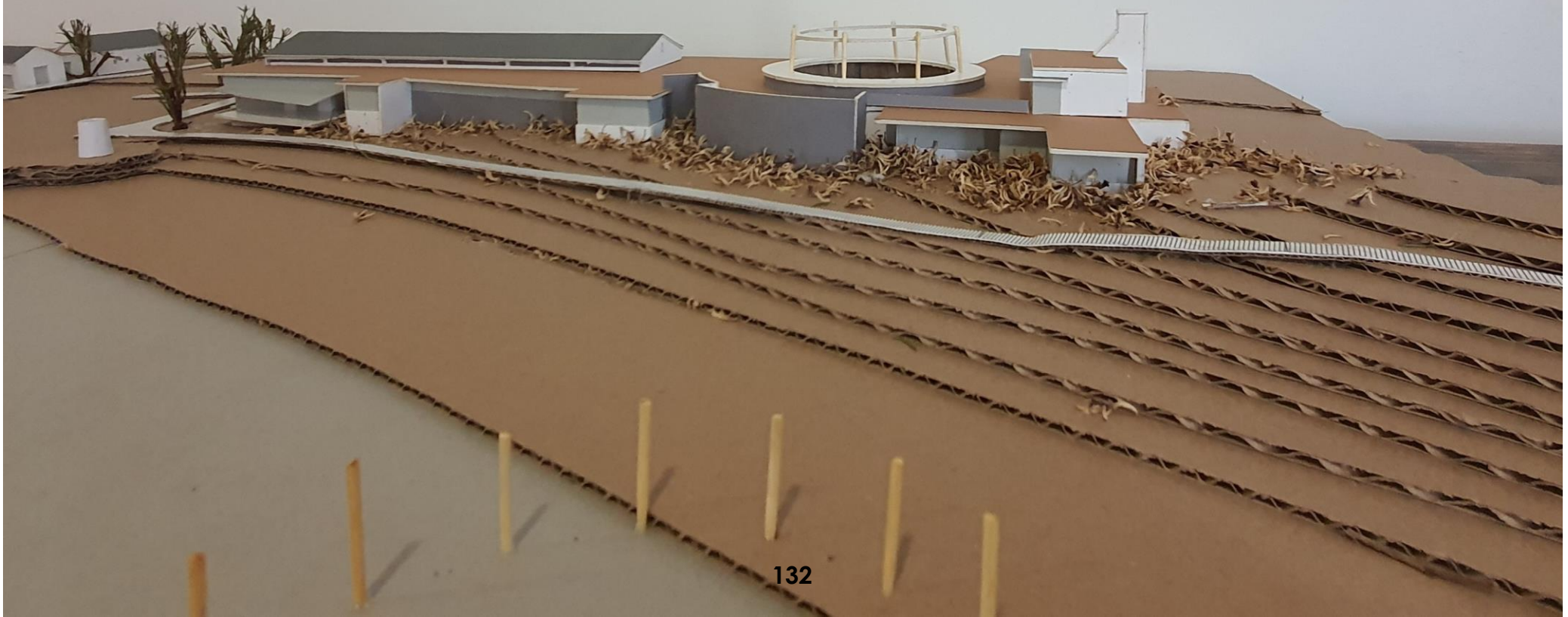
Ablutions

Restaurant

3.4 Model
view form sea



view from release pen



Predator tank and Laboratory

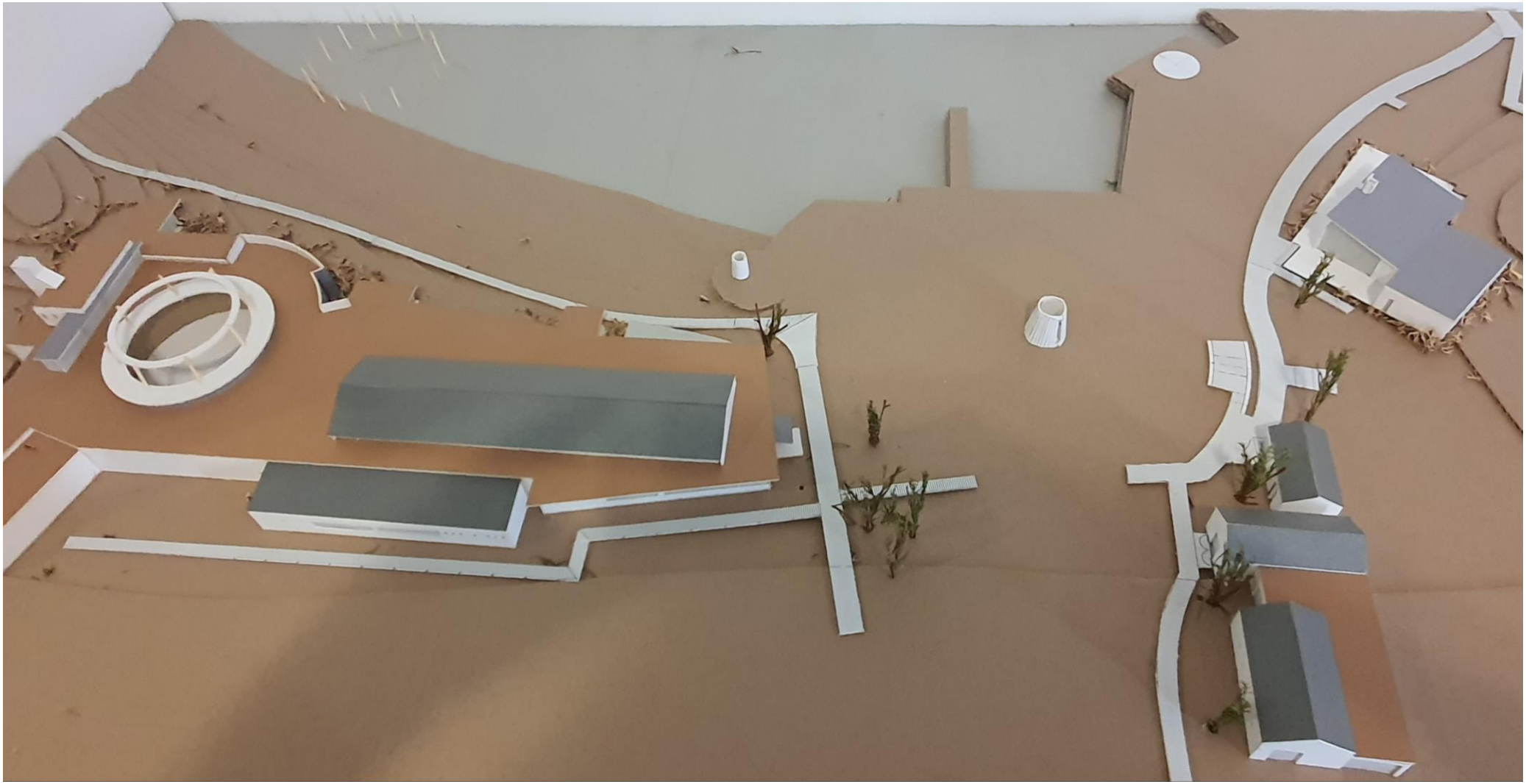
Predator tank and laboratory and services access

Boat club , Sea fisheries and Restaurant

Main building and Administration


entrance to aquarium

aerial view



3.5 Sustainable considerations

- Naturally, available limestone
- Timber construction clip on structures
- Emission free natural ventilation passive design where applicable
- Recyclable materials plastic free
- Locally sourced low carbon embodied materials

3.6 Materials

Sandstone- readily available from surrounding areas

Rammed Earth - investigate

Galvanised mild steel (coastal impact)

Timber rough and planned

Timber gum poles

Off shutter concrete

Low e glass

Stone cobbles

Aluminium

Gabion walls local stone filled

Crusher dust (Sand grit) cement sand render

Fig 82 Collage (Dien, 2022)

3.7 References:

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PART 4 | Reflection

Reflection

The development of this dissertation satisfied a personal curiosity to understand the effect that architecture can have as a symbiotic role in of a society, environmental setbacks and form suggested solution to reconnect small town coastal communities.

At times it proved difficult to secure information from relevant people in marine research fraternity even though I am an active participant in fishing conservation endeavors. Many promises were made and never came to fruition, and I therefore make special mention to the persons who made it their priority to assist.

Designing Marine Research and eco-tourism Centre not only developed my understanding of coastal towns but also developed a deep-thinking process to resolve the issues of the site, which at time were extremely challenging. Some of the major issues was that I chose an underdeveloped site with the usual coastal constraints that surfaces and makes the process n intense communal engagement which at time proved challenging, it was not easy at all to meet with key role player for this theoretical exercise.

In exploring the possibilities and engaging with role players I have learnt that a difference can be made in societies by architectural interventions.

I can only learn from the experience. I can confidently say that I have a deeper appreciation for the theoretical process in unpacking architecture.

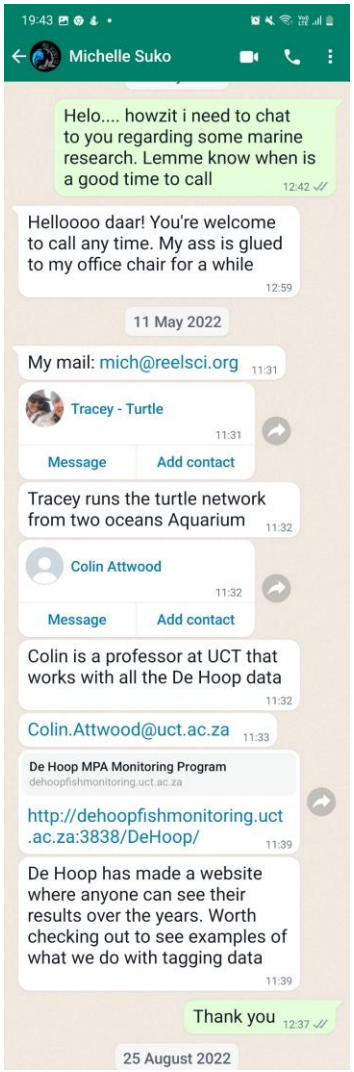
Conclusion

I have thoroughly enjoyed this project as it I have a personal interest in fishing and conservation, as architectural professionals in the industry we must consciously strive to improve our environment. There is huge drive to create more sustainable structure and this project has allowed me to share my knowledge and at the same learn new methodologies and systems.

Acknowledgements

- Mike White for all the printing of my documents.
- Michelle Soekoe of Reel Science for the valuable insights on marine science and Eco Systems.
- Natalie Vijoen and Kevin Spiby for meeting up and tour of the Two Oceans Aquarium.
- Matthew Bosch, Ashley Campher for all your time advising on catch and release programs and advising on how the tagging projects function at De Hoop MPA.
- Dennis Fabian of Fabian Architects for the speedy response in supplying drawings of the Two Oceans Aquarium.

Appendix A



Gmail

ebrahim dien <ebrahimdien@gmail.com>

Rehab and Research lab Struis baai

ebrahim dien <ebrahimdien@gmail.com> Wed, May 11, 2022 at 3:38 PM
To: mich@reelsci.org

Hi Michelle.

Thank you for your time earlier today.

My proposal is a research lab / rehabilitation marine park at the Struisbaai Harbour, the concept is symbiosis and will speak about the symbiotic relationships of man and the environment, particularly sharks and rays.

The site selected is Struisbaai as it is strategically located close to the intersection between the warm Indian and cold Atlantic oceans at the southernmost tip of Africa as this intersection holds an abundance of wildlife.

Struisbaai is geographically the midpoint between Hermanus and De Hoop nature conservation tagging project and the proposal aims to connect these three locations via a research hub.

As mentioned earlier,please advise on the current Western Cape Project you are working on and how this proposal could be integrated (hypothetically speaking) and form the base station for your possible research.

As a researcher in the field of marine science what are your spatial requirements such as labs, rooms, stores, tank and lab equipment etc.

What is it that you do in the field and then in the laboratory?
After the laboratory work, what happens to this data?
Who typically funds your research.?
How does this research then feed back into the communities if change is required?

Can you please give a brief scenario of a typical "live research" project for example the populations of the bettys bay spotted gully sharks, what you have discovered and how this relates to symbiotic ecosystems.

Anything else that you may add will also be appreciated.

Regards

Ebrahim Dien

082 8234 237

Appendix A

Dear Ebrahim,

Thank you for choosing Reel Science Co. to help you with your research project for a lab/rehabilitation marine park at the Struisbaai Harbour project. Please see below, the answers to your questions:

1. **What are the current Western Cape projects you are working on and how can this proposal be integrated (hypothetically speaking) and form the base station for your possible research?**

Project: A survey of the South African recreational fishery: Investigating catch, effort, and angler specialization

Client: Rhodes University, Department of Ichthyology and Fisheries Science

Details: Aerial (drone) and roving creel surveys of the Western Cape coastline, to improve our understanding of the exploitation of nearshore fish stocks by recreational anglers

Base Station Integration: A base station is not required for this type of research as it involves surveying recreational anglers across South African beaches. However, a great addition to any base station is an information centre where the public can view information about various research projects. This includes a conference room where researchers can be invited to give scheduled talks.

Project: Biomonitoring and bioassessment of fish community structure in a Marine Protected Area with environmental DNA metabarcoding: a pilot EDNAM project

Funding: The Rufford Foundation and Idea Wild

mich@reelsci.org 065 917 6673 Cape Town, South Africa www.reelsci.org

Details: Apply marine environmental DNA metabarcoding as an alternative, non-invasive sampling method, to get a near-comprehensive snapshot of fish species composition and community structure, and site occupancy rates in the Helderberg MPA, and illuminate the strengths and limitations of each sampling approach.

Base Station Integration: Environmental DNA degrades readily in the environment, and the rate of eDNA degradation increases with higher temperatures and exposure to UV light. Therefore, it is important to reduce the time between sampling and filtering to retrieve as much eDNA as possible from the sample. To filter eDNA from water samples, an electrical vacuum pump is connected to a filter holder manifold. The vacuum removes the water and traps the DNA in a filter. Being able to filter the samples at the base station will ensure optimally fast and sterile filtering conditions leading to more accurate results by eradicating cross-contamination.

Project: Genotype-environment associations in Southern African elasmobranchs: a first step towards the identification of climate-sensitive populations

Client: Stellenbosch University, Department of Genetics, Molecular Breeding and Biodiversity Group

Details: Rock and surf angling for genetic sample collection from *Mustelus mustelus, Triakis megalopterus, Sphyrna zygaena, and S. lewini*

Base Station Integration: Reel Science Co. distributes sample collection kits to experienced anglers to aid in greater temporal and spatial sample collection. The base station can be used as a sample kit collection and drop-off point This will drastically reduce courier costs of the kits which will aid in more kits going out, more anglers taking part and more samples being collected.

Project: The Cormorant Ark (CormArk)

Client: Reel Science Co. Research

mich@reelsci.org 065 917 6673 Cape Town, South Africa www.reelsci.org

Appendix A

- Shelf/cupboard storage
- A dissection room which should include:
  - An autopsy table
  - Washbasins
  - Autoclave
  - Secure storage for preservation chemicals (e.g., formalin and ethanol)
- A sterile genetics laboratory, divided up into five different sections:
  - Storage room for DNA, extraction kits and reagents,
  - Sample preparation room,
  - DNA extraction room,
  - PCR preparation room,
  - PCR room
- Sample drop-offs point for Citizen Science projects

3. What is it that you do in the field and then in the laboratory?

This greatly depends on the projects being worked on, no two days are the same. Currently, most of my time is spent travelling to various locations across the Western Cape where we undertake Roving Creel Surveys of recreational anglers. These surveys take place from sunrise to sunset, four days a week. On our off days, we collect sea bird feathers and scat from the beaches and rocks and fish for specimens using standard rock and surf angling techniques. For eDNA sampling, targeted sampling trips are undertaken by boat where water samples are collected from various points.

All samples land up in our genetics laboratory at Stellenbosch University where DNA is extracted and PCR's are run.

4. After the laboratory work, what happens to this data?

General information is published on the Reel Science Co. website and social media platforms. To keep the public engaged and informed, articles are published in local newspapers and appropriate online newsletters. Significant research findings are presented at scientific conferences both locally and internationally and published in relevant peer-reviewed scientific journals.

mich@reelsci.org 065 917 6673 Cape Town, South Africa www.reelsci.org

Details: Development of a curated and standardized genetic sample-metadata biorepository for two endangered, sympatric cormorants (Aves: Phalacrocoracidae) to enable conservation genomics research

Base Station Integration: Citizen Scientists are used to collect marine bird feathers for this type of research. The base station can be used as a sample drop off point, as per above. Also, if a genetics lab is available, DNA can be extracted, stored, and analysed on-site.

Project: Epigenetic clocks of bio-economically important teleosts and elasmobranchs

Client: Reel Science Co. Research

Details: To identify epigenetic markers within and between species using an epigenome sequencing approach, develop an epigenome array/chip for large-scale genotyping, and commercialize the epigenome chip (EPICBITE® Array) for application in fisheries management.

Base Station Integration: As anglers are permitted to keep their catch for the braai, the base station can be used as a sample drop-off point for the skeletons. Anglers will be encouraged to fillet their fish and freeze the skeletons for science. The base station can be used as a drop-off point for these skeletons where they can be catalogued and frozen. The skeletons can be used for ageing and genetic purposes, fundamental in the long-term monitoring of fish stocks. Again, if there were to be a genetics lab available, genetic analyses could be done on-site. Also, if the base station had a laboratory for ageing studies, which would only need a special saw and a microscope, ageing studies could also be done on-site.

2. As a researcher in the field of marine science what are your spatial requirements such as labs, rooms, stores, tank, and lab equipment etc.

- Storage room for samples whether it be tissue samples, feathers, mucus, scat or whole specimens for dissection. This should include:
  - Fridges and chest freezers
  - A walk-in freezer

mich@reelsci.org 065 917 6673 Cape Town, South Africa www.reelsci.org

Appendix A

5. Who typically funds your research?

Reel Science Co. is a registered supplier for Rhodes University, Stellenbosch University, and the City of Cape Town. Much of our time is spent writing project proposals and applying for grants/funding from various funding bodies. For instance, our eDNA project is funded by Idea Wild which supplied us with all of the equipment we required and a financial grant from The Rufford Foundation which covers all of the running costs for the project.

6. How does this research then feed back into the communities if a change is required?

Community engagement takes place in many ways. Reel Science Co. is involved with various home schooling groups where rock pool educational sessions and beach clean-ups are organised to educate and engage school children of all ages. We are often invited to give talks at various conservation evenings organised by groups such as Oceaneers, The Helderberg Ocean Awareness Movement and the Sunrise Rotary Club. Popular articles are written for online magazines to educate recreational anglers on the importance of practising catch and release and sustainable fishing practices.

7. Can you please give a brief scenario of a typical "live research" project for example the populations of the Bettys bay spotted gully sharks, what you have discovered and how this relates to symbiotic ecosystems.

In a feeding study of the spotted gully shark, *Triakis megalopterus*, sharks from Angola and the Eastern Cape feed predominantly on teleosts, crustaceans and molluscs. In the Western Cape, however, these sharks prey almost exclusively on the Cape rock lobster (*Jasus lalandii*). This is not surprising as this rock lobster is also nocturnal and occupies the same reef habitat. The Cape rock lobster is also abundant in Betty's Bay where the Western Cape sampling site was located. This is a consequence of the increased population sizes of *J. lalandii* along the southern and eastern coasts since the early 1990s, which saw this species shift its distribution range eastwards to the east of Cape Hangklip. The incursion of lobster into the Cape Hangklip area initiated a regime shift whereby the ecosystem, previously dominated by coralline algae and herbivores, is now dominated by lobster and macroalgae. The increase in numbers of *J. lalandii* is thought to be a consequence of the overexploitation of its main predators, reef fish and the Cape fur seal (*Arctocephalus pusillus*). Although the seal population has recovered, it does not

mich@reelsci.org 065 917 6673 Cape Town, South Africa www.reelsci.org

appear that they have managed to control the lobster population. This is perhaps due to the eastward shift of the lobsters, while the bulk of the seal population remains on the west coast. The size of the lobster population has also had a profound effect on the sea urchin and juvenile abalone populations. Due to predation by the Cape rock lobster, the sea urchin populace collapsed in Betty's Bay and Mudge Point, South Africa in 1994. As juvenile abalone shelter under sea urchins, the collapse of the sea urchin populations thus resulted in a high mortality rate of juvenile abalone. Thus, even though abalone do occur in the Western Cape, none were found in the stomach contents of *T. megalopterus* in this area, unlike the Eastern Cape individuals. Due to the collapse of prey for J. Lalandii, it is not clear what will happen to these populations in the future. They will either have to adapt their feeding to a more readily available prey species or migrate to a more suitable environment. If migration occurs, *T. megalopterus* will lose their primary prey item which will require these sharks to adapt their feeding, again, or also migrate. This pattern of reduction of predators (*A. pusillus* and reef fish), the abundance of *J. lalandii* and consequent depletion of prey populations (sea urchins and abalone), is a prime example of the top-down effect predators have on their ecosystems.

Best wishes with your project, looking forward to seeing the result!

Kind regards,

Dr Michelle Soekoe

Founding Director: Reel Science Co.

mich@reelsci.org 065 917 6673 Cape Town, South Africa www.reelsci.org

Appendix B

Gmail ebrahim dien <ebrahimdien@gmail.com>

Studies research

Kevin Spiby <Kevin.Spiby@aquarium.co.za> Tue, Sep 13, 2022 at 12:46 PM
To: ebrahim dien <ebrahimdien@gmail.com>
Cc: "Nathalie (TOAEF)" <nathalie@aquariumfoundation.org.za>

Hi Ebrahim,

Please see answers to your 2 questions below:

1. Are the tops of the main tanks open to the air? Yes, they are open but do have a shade cloth covering to slow down algae growth in the exhibits and reduce direct sunlight.

2. How do animals arrive and get placed into the tanks and then removed for repatriation? The animals are transported to the aquarium in specialized transport tanks on the back of a truck/bakkie depending on the size & number of animals. They are then either carried up to quarantine by hand in bags/buckets/stretchers if they are small or hoisted up to our quarantine facility by a crane if it is a large animal (large sharks). When it is time to release the animals, the reverse procedure applies.

Regards,

Kevin Spiby
Curator: Operations & Animal Husbandry

Two Oceans Aquarium, Dock Road, V&A Waterfront
Tel: +27 (0)21 418 3823 | **Direct line:** +27 (0)21 814 4570
Website: www.aquarium.co.za

Appendix B

TOA-RES reference no.

TWO OCEAN AQUARIUM TRUST (AQUARIUM)
Reg. No. T2601/94 Vat. No. 4220145744
Dock Road, V&A Waterfront 8002
P. O. Box 50603 V&A Waterfront 8001
Tel: +27 21 418 3823. Fax: +27 21 418 3952
TOAT is a member of WAZA (World Association of Zoos and Aquaria)
Accredited member of PAAZA (Pan-African Association of Zoos and Aquaria).

Two Oceans Aquarium Trust and the Two Oceans Aquarium Foundation

Research Collaboration Request Form

Purpose

This form serves to record requests to the Two Oceans Aquarium Trust (AQUARIUM) and Two Oceans Aquarium Foundation (FOUNDATION) for provision of specimens and/or samples, and information/data in certain cases, from captive or wild organisms, or for social research, for *bona fide* non-commercial research purposes.

To be completed by the applicant:

RESEARCH PROJECT TITLE	Cultural Immersion A Symbiotic INTERSECT
BRIEF DESCRIPTION OF PROJECT	This dissertation aims to explore the opportunities of how a culture and natural life form can intersect and form a symbiotic relationship. The intersect must be researched as it partially exists as an informal eco-tourist attraction.
KEY QUESTIONS	Functional and sizing requirements Operational narratives Species research Other
FOCAL SPECIES	Elasmobranches sharks and rays
DETAILS OF SAMPLES / INFORMATION / INPUT REQUESTED FROM THE AQUARIUM / FOUNDATION	n/a
PROJECT LEADER / SUPERVISOR	Prof J.D. Smit, Mrs P. Smit and Dr G Bosman
PRINCIPLE RESEARCHER	Masters Of Architecture Program Student - Ebrahim Dien
ORGANISATION	University of The Free State
CONTRACT/MOU/AGREEMENT	n/a
ETHICS CLEARANCE NUMBER	n/a
FUNDING	n/a

START DATE	2022-02-01
WORKPLAN	n/a
HOW WILL THE RESULTS OF THE PROJECT BE PRESENTED (THESIS, REPORT, PUBLICATION)?	Thesis
How will the contribution from THE AQUARIUM / FOUNDATION be acknowledged?	n/a
NOTES	

Please note that:

1. By signature the requesting person(s) acknowledge that they have the necessary permissions and permits from all authorities to undertake the proposed research and to collect or transport the specimens/samples.
2. The requesting person(s) take full responsibility for the specimens/samples or data in their possession, including managing appropriate use and storage.
3. No specimens/samples or data provided by the AQUARIUM / FOUNDATION for the specified project(s) may be given to other researchers or institutions without the prior written consent of the AQUARIUM / FOUNDATION.
4. The AQUARIUM and the FOUNDATION must be acknowledged appropriately in all written reports and publications. AQUARIUM / FOUNDATION staff members must be included as co-authors of publications should they contribute to the design of the project or are involved in data processing or analysis. Co-authorship will be discussed early in the process.
5. A draft copy of the final report / paper / popular article must be given to the FOUNDATION Head of Research, prior to it being published in any manner.
6. A copy of the final report / paper or any other publication emanating from the work must be lodged in the FOUNDATION library.
7. If required, all data must be made accessible to the FOUNDATION, either during or on completion of the project. Should no publication be forthcoming within three years of completion of the project (as indicated in your time frame), we reserve the right to use these data for publication purposes. The principal researcher will be included as a co-author.

Appendix B

8. No progress reports are necessary for projects of less than a year. For projects of duration greater than one year, an annual report must be submitted to AQUARIUM / FOUNDATION. If project reports are not submitted, AQUARIUM / FOUNDATION has the right to terminate the project and retrieve all specimens/samples or data provided.
9. If not employed by the AQUARIUM or the FOUNDATION researchers must sign an indemnity form and a confidentiality agreement prior to the initiation of the project.
10. AQUARIUM / FOUNDATION will not carry any of the direct costs of external research projects; however, logistical assistance may be provided. If initiated by staff and if the research is directly applicable to AQUARIUM / FOUNDATION financial assistance can be considered.

I herewith acknowledge the conditions listed above.

Date: 30-08-2022

ebrahim dien

Print name: Principal investigator

Signature: Principal investigator

Affiliation and contact details:

To be completed by the AQUARIUM / FOUNDATION:

INTERNAL PROJECT CONTACT NAME	
STAFF INVOLVED IN PROJECT (Estimated time allocation per staff member)	
BUDGET ALLOCATION	
APPROVAL BY RESEARCH STEERING COMMITTEE	
INTERNAL ETHICAL CLEARANCE NUMBER	

RESEARCH PERMIT NUMBER	
COMMENTS	

_____

Date Project Approved by Research Steering Committee:

_____

Signed (FOUNDATION Head of Research)