Bridging to The Deep Blue

rebalancing surfing culture

Bridging to The Deep Blue - rebalancing surfing culture

Neill McCulloch
1139453

Explanatory Document
Principal Supervisor: Graeme McConchie
Associate Supervisor: Kerry Francis

A Research Project submitted in partial fulfilment of the requirements for the degree
of Master of Architecture (Professional). Unitec Institute of Technology 2020

total word count 14890

Personal Statement

Surfing has been a source of sanity throughout some tumultuous periods of my life, as a form of escapism which enables you to step out any 'normal world' situation for a fresh change in perspective. Throughout my years as a surfer, I have seen many locations and behaviours, have been met with both acceptance and distain because of being a surfer, and have contemplated some of the negative environmental impacts surfing causes. The surfing population is growing, and with that growth is the exponential potential for environmental damage, and a dangerous behaviour (in the water) due to an ineducation of the 'silent' etiquettes surfing has. This project is as much a personal hope, as it is an academic research assignment, into possible 'undoings' of some of the negatives that have crept into surfing culture.

Acknowledgements

There are a great number of people I wish to thank for their encouragement and contribution to the completion of this document. They are in no specific order...

My principal and associate supervisors Graeme McConchie, and Kerry Francis for their guidance, and wisdom.

The Unitec staff for tolerating me for the past five years.

Jack Candlish from Organic Dynamic Surfboards for your ethic, your input, and the sick stick! Chur bro

The McCulloch and Hale families, for all of the love and support.

My biggest thanks go to my wife Jo, and my daughter Ava, for putting up with my surf trips, late night absences, cofee addictions, and my cooking. You are the lights of my life!

Through surfing, the ancient Hawaiian natives formed a bond with their surrounding environment – with surfing being a physical manifestation of the delicate balance between the ocean, land, and sky. To them, surfing is a high art form centred around etiquettes of respect and custodianship, and the crafting of a surfboard considered a spiritual experience. Modern surfing however, echoes only some of these sentiments. Above the surface, surfing appears as an activity holistically involved with the ocean. It has been proven as effective for physical and mental wellbeing, and through its international sporting exposure, is a powerful door for charitable and environmental organisations to operate through. Yet, underneath the surface is an industry reliant on pollutive products, and an ever-increasing ethic that forgets, or ignores the respectful etiquettes of old, instead favouring fervent localism, and selfish competitiveness.

Bridging to The Deep Blue purposes to use architectural interventions to aid the surfing community in replenishing its custodial role, at a surfing site that has suffered at the hands of man. Te Arai Point in Northland, New Zealand, is a protected conservation reserve, a popular surfing and tourist location, and plays host to endangered sea-birds. This site has been subjected to deforestation and quarrying, and now is surrounded by cattle farms whose effluents are leaching into waterways. These polluted waterways further risk the already endangered local bird species, as well as spreading into the sea.

The programme for this project will comprise of three structures working in a sustainable cooperation which 'rebalances' surfing's identity, by simultaneously addressing the mentioned issues involved with the Te Arai site, and providing a non-toxic alternative to modern petro-chemically based surfboards. By having the surfing community involved in these activities, educates them to their wider environment, and the responsibility and ownership they can have in environmental restoration.

CONTENTS

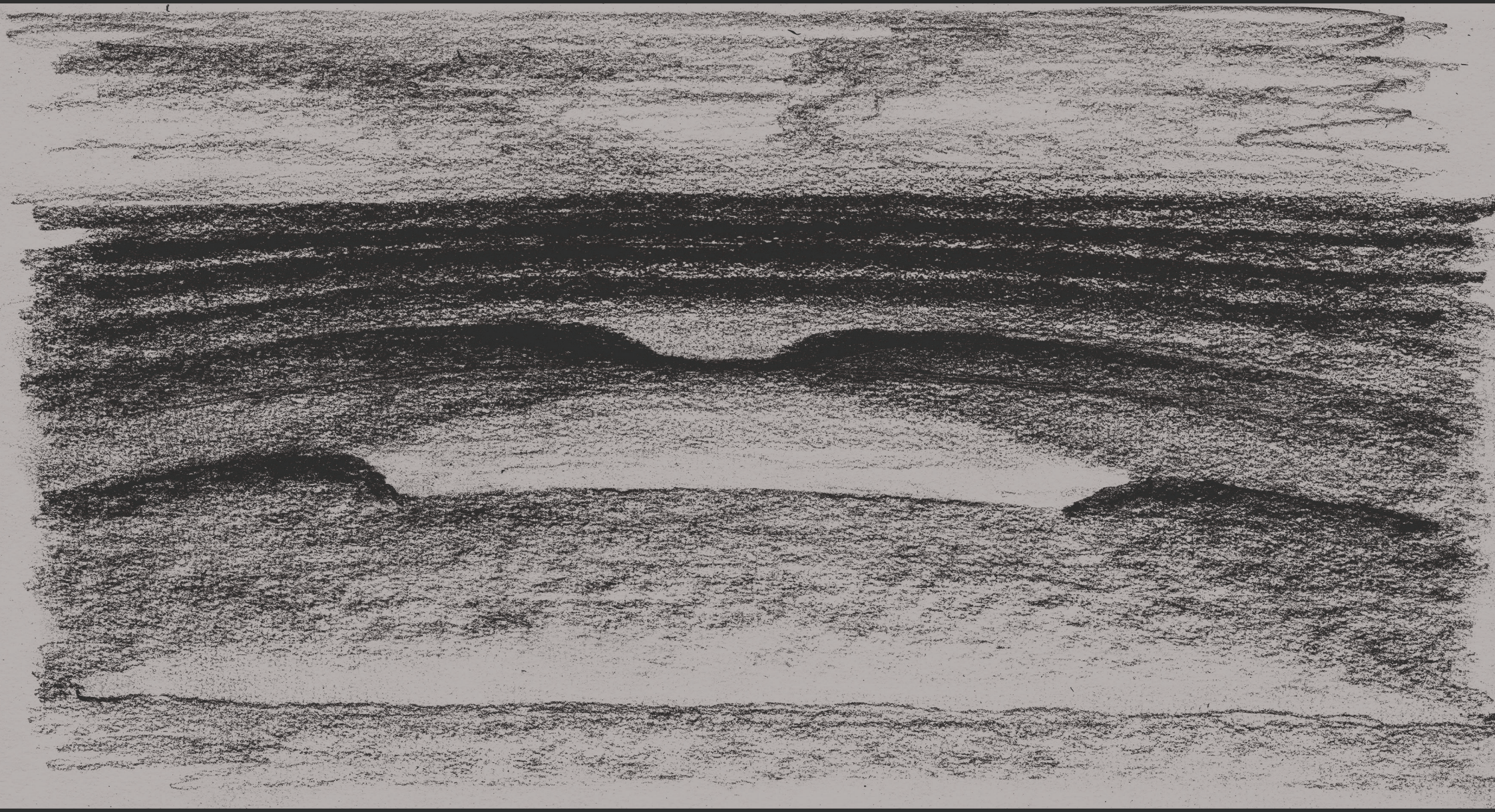


figure 1.1 ‘A’ frame

1.0 INTRODUCTION

1.1 Background

Surfing is an action that requires the coordination between a human body, a surfboard, and an ocean wave to be well balanced, yet modern surfing culture is anything but. Through its Polynesian ancestry, it became to be an action that earned social status, and had strict laws entwined with deep custodial roles of the surrounding human and natural environments - a sense of which has currently been greatly lost. Modern surfboards are made of a concoction of toxic substances, detrimental to the environment and the artists who manufacture them, and, the effects of commercialisation and professional sporting competition have bred a “winner take all” type attitude which is repeated in the aquatic behaviours of surfers, ignoring the fundamental etiquettes focussed on mutual respect.
This project is born out of thirty years of being personally planted in what mainstream society would consider surfing culture, and realising that surfers as a people experience a unique perspective of the world which is mostly ignored and unappreciated – by the very people who take part in it. As a surfer, it should be a personal responsibility to take care of the oceanic playground, lest it become somehow ruined and unusable. Bridging to the Deep Blue is one option for surfing culture to be re-balanced, by creating an architectural intervention that involves surfers in a system that can have positive repercussions in a needy natural environment, and a sense of belonging to surfing culture’s identity. The chosen site for this project is Te Arai Point in Northland New Zealand, a popular surfing destination with no permanent human habitation, an ecosystem that holds critically endangered bird species, and a landscape scarred from forestry and quarrying.

This research project leans on the principles of surfing and balance to advise its architectural design. As surfing is an activity that relies on the manipulation of balance, on one side of the scale is the representation of surfing culture's history, knowledge, and etiquettes, and an ability to find a uniformity in design that can be recognised as iconically surfing based. This is driven by the fact that surfing actions are reasonably uniform, but sites are unique. On the other side is how surfing culture can meet the practical needs of the site's natural environment, as an expansion of surfing's etiquettes of respect, and its history of custodianship. There is an opportunity to repair damaged land through replanting of native flora, provide a solution to cattle effluents in local waterways, and in doing so protect estuaries holding endangered birdlife, and supply raw materials for the construction of environmentally–friendly surfboards. Also, there is an opportunity to use waste products from the surfing industry to be incorporated into the final design's construction.

1.3 Aims & Objectives

The aim of A Bridge to The Deep Blue is to provide architectural solutions that

- embrace aspects of surfing culture that represent surfing in a way that surfers would identify as 'theirs', and interact with it in a way that encourages surfing knowledge and ability.

- enquire into solutions that reconcile surfing's use of toxic materials, by investigating alternative programmes that can offer a sustainable model.

- embrace the wider site environment by providing restoration of deforested areas, solutions to cattle farm pollutants, support of existing conservation activities, and protection of endangered bird species.

The architectural requirements to achieve this will be…

- a place of learning – a surf school which not only teaches about the action of surfing, but also the importance of reading weather and oceanic conditions, fitness, etiquette, water safety, and the science behind surfboard design through its developments. This area could also be a communal space for locals and visitors to gather for club and competitive functions. Through the place of learning is also an opportunity to support current work undertaken by DOC in the preservation of the local environment.

- a place of building – a workshop where surfboard manufacture can be undertaken, as part of the surf school. The incorporation of a hands-on approach encourages a more holistic experience of surfing education. In conjunction with the workshop would be a nursery to sustain the supply of appropriate timber for crafting surfboards, and for supplying the needs of native timber repopulation in the area surrounding the chosen site.

- a place of growing – a nursery with the motivation of growing native plant species for repopulation of deforested areas of the site, and the growth of Paulownia timbers which both dilute the effects of cattle effluents surrounding waterways, and provide raw materials for the construction of environmentally friendly surfboards.

How can aspects of surfing inform an architectural design, that balances surfing culture, with the environmental needs of a surfing location.

1.4 Research Question

1.5 Scope & Limitations

The scope of this project is not about creating a museum that recalls surfing's history, or any architecture that may seem 'beachie' or other such gimmick inspired response. Nor is it a derivative of Hawaiian, or other Polynesian works, although there may be homage to these locations with certain structural alignments. What this project is hoping to be, is a response to surfing's actions and mindsets, coupled with a realistic programme that can benefit a region's environmental wellbeing, and involve surfer's within that programme. This project is not about staking a claim that says "this is surfing culture," but merely something that may act as an accelerant towards it. There are ideas that this project would like to consider, regarding re-use of surfboard waste, but due to limited workshop time (something to do with a pandemic), this aspect will be ranked low on a goal list.

To obtain an insight into surfing culture, and the broader context of this project, a holistic approach of research must be done. These are the methods…

Experiencing

Surfing is a strongly physical action, with a particular interaction between natural environmental processes, and body mechanics. An understanding of the exertions involved must be experienced to gain insight for its relation to, and representation in architectural design. This experience is achieved by 'performing' surfing, or monitoring surfers in action, and recording video footage of these actions for repeatable observation. From pre-surf assessment and planning, to navigating a position in the breaking wave zone, to improvising a path of manoeuvres on a wave, it is apparent that surfing is also a strongly visual action, giving further support for the need of video and photographic recollection.

Site Investigation

The surfing site of Te Arai Point has many discernible and unique features that are relative to both the surfing, and the wider environmental categories of this research. Given the site's proximity to Auckland city, and its accessibility, regular visits to site are possible and imperative, although ideal surf conditions are a preferred requirement, which lessens the percentage of opportune timeframes. The site also has a rich history that has had visible and environmental consequences, which can be incorporated into the design programme. Evidence of this history is well documented through District Council, Local History, and environmental lobby group's literatures.

Literature, Arts, and Articles.

With regards to architecture for surfing culture, there are no literary references that can relate to this project, so research will be directed into arts that are surfing inspired. These may be visual, musical, or literary examples that describe the sensory interactions or emotions that a felt by surfers, that are described in an abstract way that can inspire architectural design. There are also article examples of existing sustainable practices of surfboard production, that use materials recycled from the construction industry, or from timbers grown for dairy farm waterway purification purposes.

Architectural Informers

Again, surfing as a culture does not have an architectural stereotype, so existing architectural projects will have to be examined for principles relative to surfing, and the broader scope of this project of which architecture can serve their strategies. These would fall under categories such as, resilience near an ocean environment, representation of balance and movement, sustainability and using locally sourced or recycled materials, sapling nursery design, and adhesion to cultural requirements.

figure 2.1 Native Hawaiian Surfer

2.0 EXISTING KNOWLEDGE

2.1 What is Surfing?

What is surfing? The answer to that question reaps mixed responses. To some, it is a fun thing you do when you go to a beach in summer, you buy a boogie board, or a surfboard, and you try and catch a wave, get sunburnt, and go home with sand through your hair and your under-pants. To others it is a wasteful way to spend your time, and surfers are just drunken 'bums' who litter the beach with beer cans or other intoxicative paraphernalia. For much of the world it is an enviable sport, with glamorous images of wealthy and lean athletes in beautiful exotic locations.

In reality, it is an action that is entirely connected to – and at the mercy of - a natural environmental process, an action that is fleeting and short lived, and yet holds millions of people the world over in a state of heightened addiction - an adrenaline fuelled addiction that people centre their lives on, with surfing dictating where and how to live, their types of jobs, what social circles to inhabit, what music to listen to …it is an axle to which the wheel of a surfers world spins around. Surfing is so entangled in a complex network of factors reliantly collaborating together, that the intuition learned to gain even the most basic grasp of surfing takes a lot of knowledge, skill, patience, luck, perseverance, and time. Wind, tide, ocean swell, gravity, and seafloor topography must unite in a precise way and within the right parameters, to form the idyllic surfing conditions. This in itself is such a rarity, that to those entwined in surfing culture, these moments take precedence over all of life's daily activities – often to the disrespect and ill-favour of the communities around surfers. Surfing is such a powerfully addictive action, that depending on a surfer's mind-set, it can either be a medicine, or a drug.

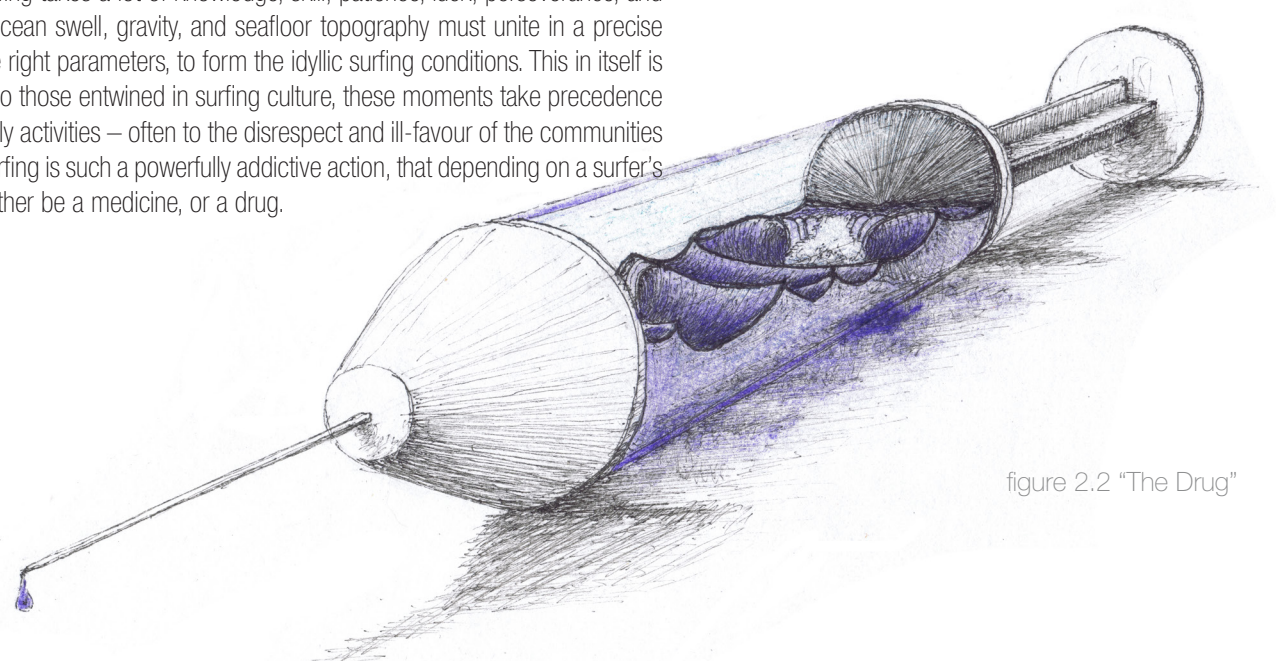


figure 2.2 "The Drug"

Surfing's first documented recording was made by European explorers visiting the island of Tahiti in 1767, although it is also noted as occurring in Samoa, Tonga, Hawaii, Papua New Guinea, West Africa, and South America – all regions which are far apart, but notably within tropical boundaries. Although the fundamental action of catching an ocean wave at the point of breaking is surfing's international motif, the methods and reasoning behind it deviate from the modern definition of surfing - as per each region's example. The current version of surfing is founded in Polynesian tradition, with Hawaii being its iconic capital. The recognisable method is where a surfer lies atop a purpose-built board, using their arms to paddle into a breaking wave, and then ride the kinetic energy of the wave, in a standing position.

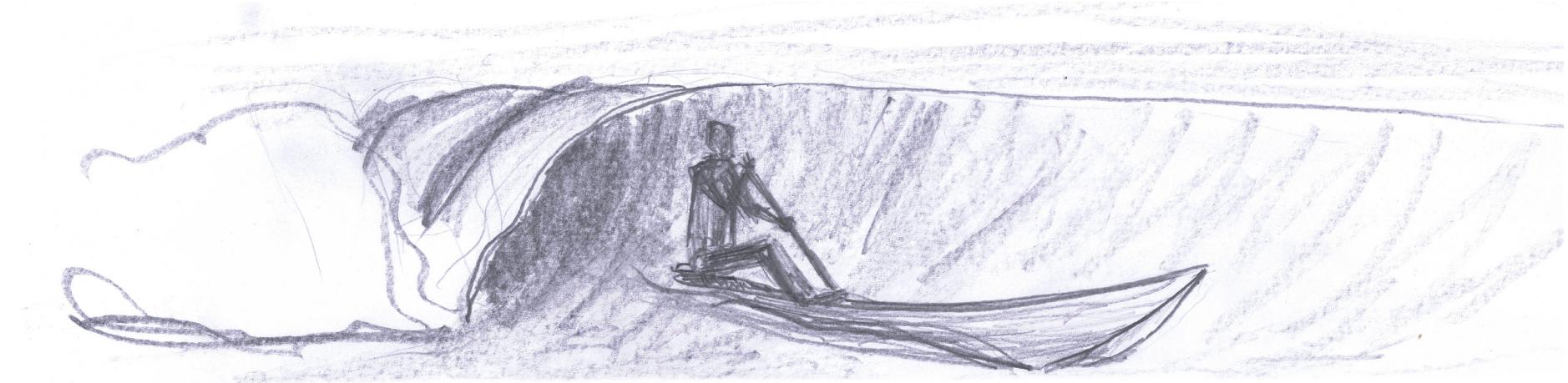


figure 2.3 Canoe surfer, West Africa

From the documentation of Thomas J Hutchinson, in his early explorations of the Ghana region of West Africa around 1861, he describes native people grouping in their light-weight one-person canoes at a part of the reef where waves were breaking, and then in a sitting position (as per sketch above), paddling into, and riding the waves, trailing their paddles behind them in order to steer. This was done at times when conditions were unfavourable for fishing, and had the pure objective of joyous entertainment. This was also done as a means of transporting goods to shore from ships, or loads of caught fish. Children were also documented using broken shards of canoe to ride the smaller shore waves. The canoes used were made of a single piece of timber, carved out to form a buoyant cavity – much like modern wave–skis.[1]

1 Thomas J Hutchinson, *Ten Years' wanderings among the Ethiopians – with sketches of the manners and customs of the civilized and uncivilized tribes, from Senegal to Gaboon*, (London: Hurst and Blackett, 1861), https://openlibrary.org/books/0L7203893M/Ten_years'_wanderings_among_the_Ethiopians

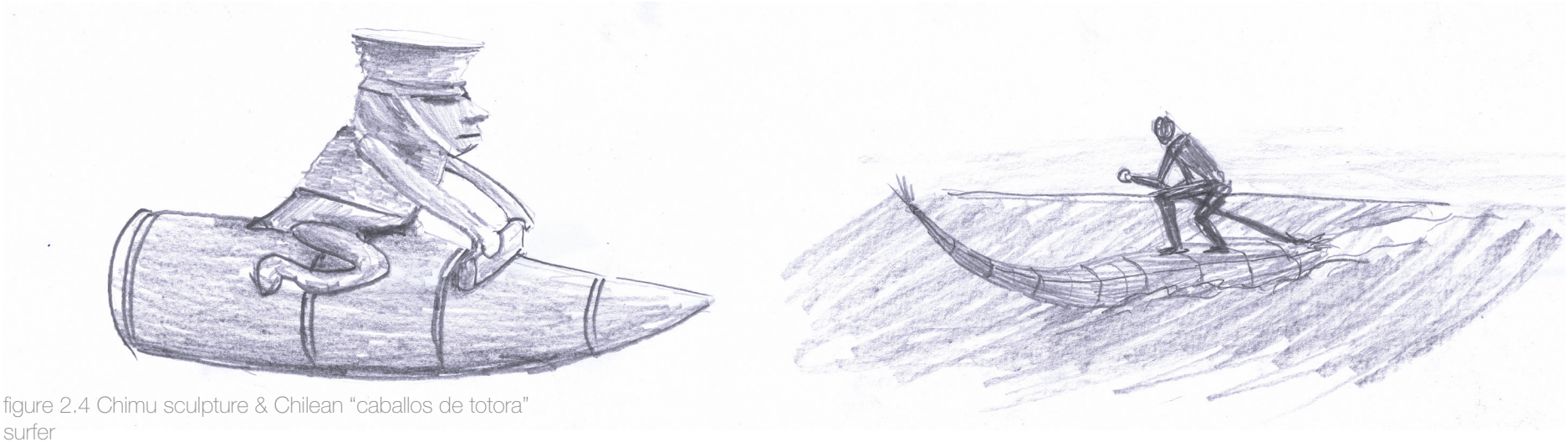


figure 2.4 Chimu sculpture & Chilean “caballos de totora” surfer

South American surfing has been recorded in sculptural art of the pre-Columbian Chimu and Mochica people of northern Peru (left hand sketch), depicting wave riding that has potentially been done for thousands of years. Traditionally for the Chimu, wave riding was done in a sitting position on return from fishing, lending to the Spanish name for the Chimu surfboards as Caballos de totora – meaning “little reed horses”. Other artifacts and art imply that surfing was also done in standing position, and for fun, not just as a necessity (right hand sketch). The method was achieved similarly to the African canoes, with a trailing paddle to aid stability and direction. Due to the age of artifacts found, it is possible that the South Americans may technically be the first people to have surfed.[2]

2 Matias Lopez, “South American Surf History – On Top of the Wave,” legendarysurfers.com, January 2011, accessed April 13, 2020, http://www.legendarysurfers.com/2011/01/south-american-surf-history.html

figure 2.5 Body surfer, Papua New Guinea

The Papua New Guinean native's approach to wave-riding was extremely basic – or perhaps purer - in form. The Papuans use a range of solid timber boards, made from their local Balsa trees, ranging in size from forearm length, to body length, and used in a way where the surfer rides in a 'prone' or lying down position similar to modern body boards (or "boogie" boards). With the forearm length board, the board becomes more of a guide, as the surfer's body becomes the board. Surfing, to the Papuans, is something that their people have been enjoying for thousands of years, again as a pure and innocent form of entertainment.[3]

3 *Splinters*, directed by Adam Pesce (Los Angeles: Adam Pesce 2011), Amazon Video, http://primevide.com

Hawaii

The modern form of stand-up surfing evolved in the islands of Hawaii. Under the influence of peoples from Tahiti and the Marquesas, Hawaiians adopted 'belly boarding' -itself derived from their Papuan ancestors. This was accomplished with short, carved solid timber boards. The islands supply of large and challenging waves, and the Hawaiians skilful inclinations to the sea, rose surfing from a prone position, to a proud one. The change to stand-up surfing required a change in board technology, resulting in three types of boards - The 'Olo', a long-board ridden by nobles, the 'Alaia', a short-board ridden by commoners, and 'Paipo', a small board used by children. Surfing method had to also change, so to steer the heavy boards, legs and arms were dragged in the wave face. Surfing became not only a recreational activity, but also a means of resolving conflicts, and a test of bravery - earning status for the most adept. The "Ali'i", or ruling class, set rules around their surfing, reserving the best beaches, and longest surfboards – some as long as eight metres – for elitist use only. Rulings were so strict that the penalty for breaking them was death. In the last three hundred years, Hawaii has suffered from multiple invasions. Colonising, Christianising, Americanising, and militarising have stripped the Hawaiians of much of their culture, with surfing being a fragment of their former selves which they have retained. Surfing had been banned by the colonisers, who saw it as a time waster, and tried to encourage the ethic of hard work and capitalism instead. What had nearly disappeared completely, found a resurgence in the early nineteen-hundreds, through international promotion by native Hawaiian Duke Kahanomoku, to garner tourist income to Hawaii.[4]

4 Patrick Moser. "The Endurance of Surfing in 19th Century Hawai'i." The Journal of the Polynesian Society 125, no.4 (2016). Accessed April 13, 2020. https://www.jstor.org/stable/26451595

New Zealand.

Aotearoa – New Zealand, is a place founded by Hawaiian explorers, who are now known as the Maori people. With these Hawaiian explorers, was bought the art of surfing, but exclusive of the serious social implications. Known as Whakahekeheke, or Whakahekengaru, this surfing was encouraged as a means to establish confidence, strength and resilience in strong ocean conditions – as many of the Maori settlements were situated coastally to take advantage of the sea's abundance. The Maori not only had carved timber surfboards, but also used woven kelp 'rafts' as surf-craft.[5]

5 Elsdon Best, *Games and Pastimes of the Maori* (Wellington, A.R. Shearer, 1976), 40

1950's - 70's

Surfing's popularity had prospered internationally, particularly on the densely populated coasts of America's California and Florida, and in the countries of Australia, and South Africa. Advancements in technology had changed surfboard design from large and heavy slabs of timber, to lighter and more manoeuvrable boards of fibreglass and resin covered polyurethane foams. Many surfers from these locations, full of competitive bravado and the desire for fame, flocked to the warm waters and challenging waves of Hawaii, living a hermit lifestyle in whatever accommodation they could find, during the most opportune seasons, only returning to their home countries when funds needed replenishing. The lifestyle also attracted many free spirits – remnants of 'hippy' culture, and people evading being drafted into the Vietnam War. This lifestyle had earned surfers a negative reputation as being counter-culture to society, and surfing as a source of disreputable characters. At this time, surfing had started to attract media attention, and it became aware that surfing had the potential to be a marketable sport.

The hype and publicity that the media provided, attracted and encouraged ego driven competitors fuelled with a desire to dominate – contradictory to the Hawaiian's respectful nature of competitive comradery. Professional competitions were organised on the north shore of the island of Oahu, with media coverage and corporate sponsorship, yet were done so without the inclusion of, or approval of, the Hawaiian locals. These actions were met with disapproval, an insulting breach of the Hawaiian customs and 'Aloha' spirit. Much had to be done to dissuade the extreme retaliatory actions planned by many Hawaiians, but peaceful reconciliations succeeded. From the drama caused during this time, surfing's potential as a powerful emotive action was realised, either as a source of conflict, or as a force of healing.[6]

[6] *Bustin' Down the Door*, Directed by Jeremy Gosch(Los Angeles: Screen Media Films, 2008) DVD

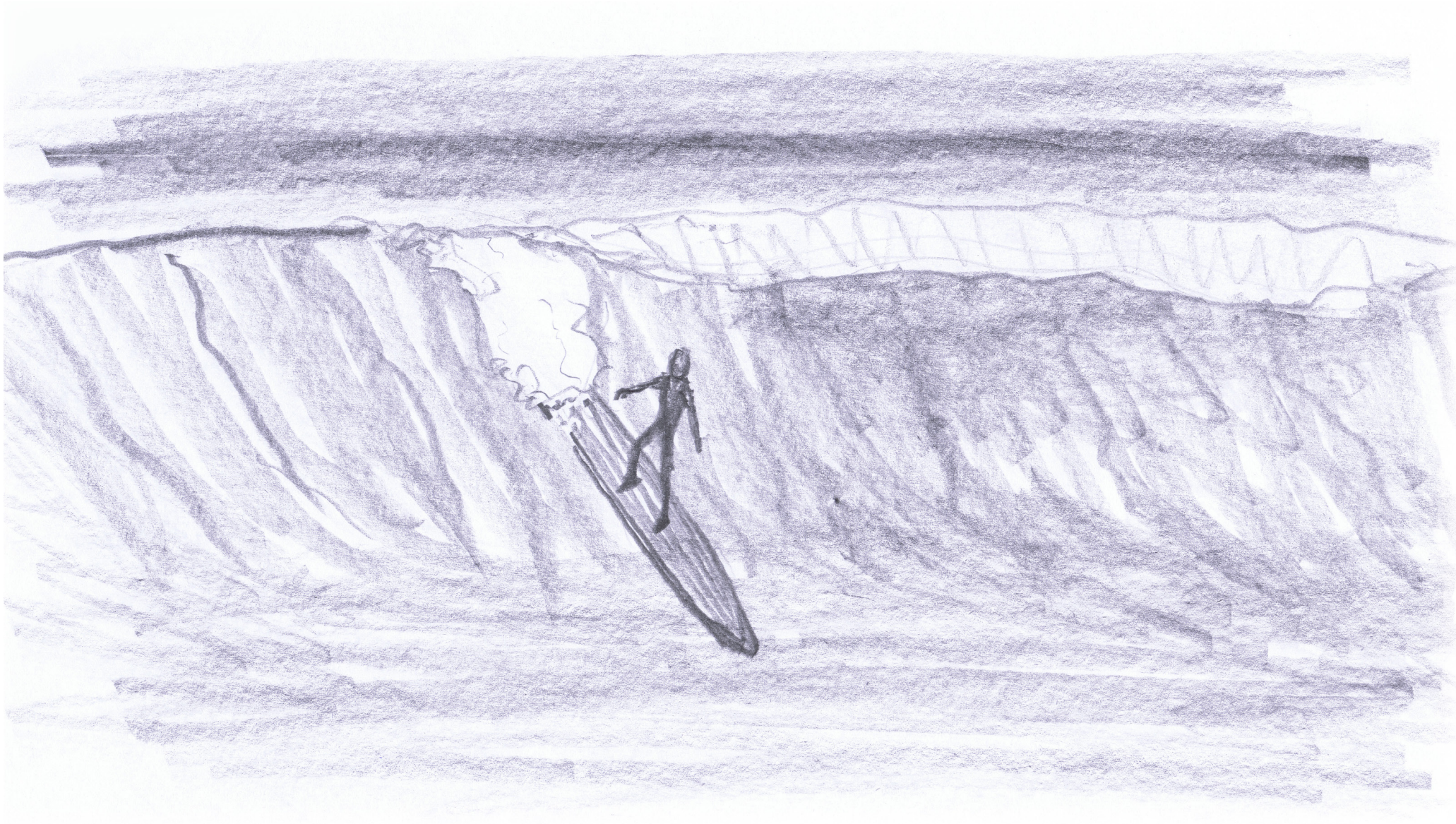


figure 2.6 Hawaiian surfer

At face level, modern media portrays surfing as an adventure sport, with a clean and "green" image. Underneath the surface, surfing is a multi-billion-dollar industry which branches not just into surfing equipment, but also fashion, the arts, and tourism. According to SIMA (the Surf Industry Manufacturer's Association), the worldwide surfing population is estimated between 17 and 35 million partakers , yet is considered a 'niche' sport due to its limiting requirements of being located coastally, or having access to a wave-generating pool. With those numbers though, comes a demand for equipment and services, which enables both the potentials of earning a living, and of creating excessive waste.

Surfing has followed similar models of marketing as other sports, with levels of professional leagues which offer ascendingly greater financial reward through prize-winnings and sponsorship.[7] Competitions are held at locations considered to be 'world class', and are broadcast internationally. Professional surfers earn a fame status, and fans follow their idols often by a loyalty to their attributed brands of equipment sponsors. The surfing culture's exposure to the world, combined with the modern ability to access nearly any location on the planet, give surfers an opportunity to have an impact on the communities with which they encounter.

The invention of the wetsuit has also allowed surfers to inhabit much colder climates with decreased risk of hypothermia, further spreading surfer's reach internationally. Surf tourism allows surfers who frequent surf breaks that may not have a desirable climate, or may suffer from overcrowding, find solace in a place to imbibe on their surfing addiction without having to worry about the potential for altercations.

Many of these desired locations are outside of 'first world' technologies and ideology, so are encouraged to comply to the demands of their much wealthier visitors. The effects on these tourist communities is mixed.

[7] "How Many Surfers Are There in the World?" surfertoday.com, accessed May 5, 2020, http://www.surfertoday.comhow-many-surfers-are-there-in-the-world#

On a positive side, openings are made for charity organisations to reach these remote areas, delivering access to medicines, or even technologies such as the extraction of clean drinking water. On a negative side, the visiting surfers are creating a demand within the local populations who wish to become surfers, inviting the potential aftermath of toxic waste (old surfboards), and a distraction from traditional cultural customs.

Of all of the goodwill organisations based in the surfing community, none have yet to deal with the issue of waste surfboards.[8] Regardless, surfing has been established as a powerful vehicle for either health and healing, or anger and pollution.

figure 2.7 surf charities

[8] Philip Sebastian Schilling, "History of Surfing/Sports and Recreation", centralhome.com, accessed March 19, 2020, https://www.centralhome.com/Surfing-History.htm

figure 2.8 surfing at face level

figure 2.9 the aftermath

figure 2.10 the ideal, harmony and respect

figure 2.11altercations

figure 2.12 overcrowded conditions

Culture, in one definition, is *"The behaviours and beliefs characteristic of a particular group of people, as a social, ethnic, professional, or age group."*[9] Surfing culture may not be based on blood, language, or borders, but its international population has a significant impact on the world.

Overall, surfing is an individual action, best experienced as one 'rider' per wave ridden. Unfortunately, the ocean only provides a limited supply of waves, so when the overcrowding of a surf break occurs, the mathematical chances of riding a wave in solitude become proportionately less. Relatively, the chances of negative behavioural responses increase.

Surfers see a good surfing location as a valuable commodity, as something worth fighting for and protecting, and more often than not, a surfing community will rally against anything that is detrimental to their location. Localism can provide a fervent type of tribalism that commands a respect which, if side-tracked, may end in stern words, violent actions, or vandalism to the intruder's property.

Examples of this behaviour are shown at Hollister Ranch, and Palos Verdes, in California USA. In Hollister Ranch's case, overcrowding caused fighting in and out of the water, and degradation to the native flora and fauna. Surfing clubs and landowners restricted beach access to allow permission to residents only, which stabilised the environmental and emotional issues, although was met with much begrudgery from external personalities. With Palos Verdes, blockading is done outside of legal influence, using violent intimidation to enforce the local surfer's positions, and in some instances, has resulted with felony charges.[10] This overindulgent sense of tribalism evolves into surf 'gangs', and it is this side of surfing those outside of the culture most frequently see.

[9] "culture." Dictionary.com. Accessed April 13, 2020. https://www.dictionary.com/browse/culture?s=t

[10] Michael De Alessi, "The Customs and Culture of Surfing, and an Opportunity for a New Territorialism?" last modified January 2009, https://s3.amazonaws.com/academia.edu.documents/46454436/The_Customs_and_Culture_of_Surfing

Despite having an intimidating persona, localism of surf breaks does work – but is best if represented with respect. "Respect," is the keyword of Hawaiian surfer Brad Melekian, when he describes the situation how it mostly is – or how it should be – *"I wouldn't just paddle out at Huntington Beach (California) and take all the waves from the guys who live there… there's localism everywhere – Australia, Brazil… if you f**k with the Balinese, they'll chase you with machetes. Our goal (in Hawaii) was simply for the place to be safe, and for us to get some respect."* [11] The nature of territorial dominance is within all living creatures on Earth, yet humanity's intelligence can exemplify territorialism in a more political and non-violent manner.[12] This intelligence is not guaranteed, so it is up to a visitor to assess the level of hostility they can expect, and whether it is worth suffering, or avoiding.

[11] Brad Melekian, "Rough Justice," Outsider Magazine, November, 2008, accessed April 14, 2020, http://outsideoline.com/outside/culture/200811/surfing-hawaii-1.html

[12] Robert Ardrey, The Territorial Imperative: A Personal Inquiry into the Animal Origins of Property and Nations." (New York, Atheneum, 1966) p38

Surfing communities – no matter where they are in the world – show a consistent form of structures with definitive roles, seemingly echoing the social structures implemented by its Hawaiian forebears. Such heirarchies include…

- The Shaper. This is someone who crafts surfboards and is also affectionately known as a 'guru', as they are usually a source of wisdom, art, and providers of surfboards that may hold seemingly magical properties that may excel any surfer to legendary status. Their magical persona may also be a result of years of inhalation of petro-chemically derived products.

- The Pro. Here is a character who seems to magnetically attract all of the good waves when out surfing, and be able to accomplish impressive surfing feats with seemingly no physical exertion, or fear. Their mere presence commands respect, and sets a precedent of standard which must be either obtained, or surpassed.

- The Grom (or Grommet). Usually this is a young surfer, although a beginner may also fall under this term. This is a derivative from an American term "Gremmie" – an abbreviation of the word "Gremlin". Groms are typically school age, and are a source of mischief and annoyance.

- The Kook. The Kook is someone who despite their best efforts, cannot achieve any accomplishment of surfing practices. They usually have the latest and best equipment in order to try to overcome their obvious lack of ability, and may also suffer from an oblivious unawareness of surfing's etiquettes.

Surfing communities also hold characters whose social standing may be determined by the type of surf-craft they ride, and the manner with which they ride it. Such characters are…

- The Shortboarder. Probably the most common type of surfer, and probably the most self-proclaimed authority in a surfing community. This may be that short-boarders see themselves as the worthiest and skilful surfers – by having to negotiate critical manoeuvres on a surfboard that is made for performance and speed, which requires more effort, dexterity, and concentration.

- The Long-boarder. Another common type of surfer, although slightly hated, or envied amongst short-boarders. The long-boards buoyancy and large dimensions enable these surfers to catch waves easier and much further out than short-boarders – an advantage which riles other surfers because long-boarders tend to easily procure all of the waves.

- The SUP rider. SUP is an acronym for 'Stand-up-paddle-boarder, and has become a mode of surfing as popular as long-boarding. The SUP rider uses a single paddle as a method of propulsion, and again has advantages over other surfers due to their ease in catching waves, and their elevated standing position being able to observe approaching waves earlier. Like the long-boarder, the SUP rider is also the target of unspoken animosity.

- The Body-boarder. The body-boarder (or boogie boarder), rides a waist to chest length board in a prone position, with the use of flippers to aid their propulsion. When a body-boarder is riding a wave, a surfer will disregard all etiquette and ignore the body-boarder's entitlements completely. Body-boarding is seen by many surfers as an unskilled practice, although body-boarders do have an advantage in certain surf conditions.

Surfing culture follows a set of etiquettes that encourage safety and peace in the water, and respect for its environment. These are…

- Observe Right of Way. Wave priority lies with – those who have waited longest, or the closest surfer to the peak of the breaking wave. When catching a wave, it helps to call out which direction you are going.

- Don't Drop In. This means catching a wave in front of someone actively riding, which is not only disrespectful, but dangerous.

- Don't Snake. A term used when someone repeatedly paddles around others to gain an inside position. You should wait your turn.

- Apologise if you need to. If you breach an etiquette, run someone over, or get in someone's way, apologise. A "sorry" can smooth the harshest incidents.

- Respect the Locals. Some people surf the same location nearly every day, and the attitude of "show respect – get respect" goes a long way to keeping a friendly atmosphere. If you are visiting, don't rush a surf spot in large numbers, and don't position yourself immediately – take your time. Disrespecting locals may end up in violence or vandalism directed at you. When in doubt, ask, or leave a gift offering by your car (usually some beers help).

- Learn the correct way to paddle out. Take five minutes before paddling out to observe the ocean conditions. Find a path that will not put yourself in danger from powerful waves, or put you in the way of riding surfers, causing irritation and aggression. Observation may show who the local surfers are, who are the most talented, and whether or not a location is too crowded.

- Only surf somewhere within your ability. Otherwise, you may get in the way, or find yourself at a risk of drowning, becoming a potential hazard to yourself, or other surfers.

- Help Others. Offer aid to any surfer – or anyone in the water – that may be in trouble or injured.

- Respect the Environment. There is a saying which implies this – "leave only your footprints in the sand".

- The most important rule – Have Fun.

There always are though, characters who choose to ignore these rules, and act as a law to themselves - often resulting in injury to fellow surfers, and / or damage to expensive surfing equipment.[13]

[13] "Surfing Etiquettes," surfing-waves.com, accessed May 2, 2020, http://www.surfing-waves.com/surfing-etiquette.htm

A branch of oceanography follows the physical processes within the ocean, and in particular, the movements of ocean waters. Surfing waves are generated by oceanic winds, which over distance and time, accumulate from sporadic surface ripples, developing into even pulses of powerful kinetic energy. Each location has optimal times when wind and ocean swell generation coincide to make rideable waves. These times may be during particular cyclone seasons, or when trade winds seasonally move between particular latitudes. Wave-generating storms don't necessarily have to be in a localised area.

The California coast is renowned for excellent surf conditions, because many of the ocean swells reaching there are generated in the South-west Pacific, and due to the Pacific's great openness and depth, these swells journey this great distance unchallenged. The greater the distance that the swell has travelled – or "fetch" – gives the swell energy more time to become orderly and predictable. This energy ends its 'life' as a collapsing vortex of chaos, after being squeezed between Earth's gravity from above, and the unmoving land below. It is at this exact moment where surfing is achieved, and is only done so successfully if there is some knowledge of a wave's whys, hows, and whens. Successful surfing requires timing and positioning to be able to 'catch' a wave at this exact point, and the ideal wave is one which can maintain this zone of collapse for the longest amount of time, and at a pace with which the surfer can maintain.

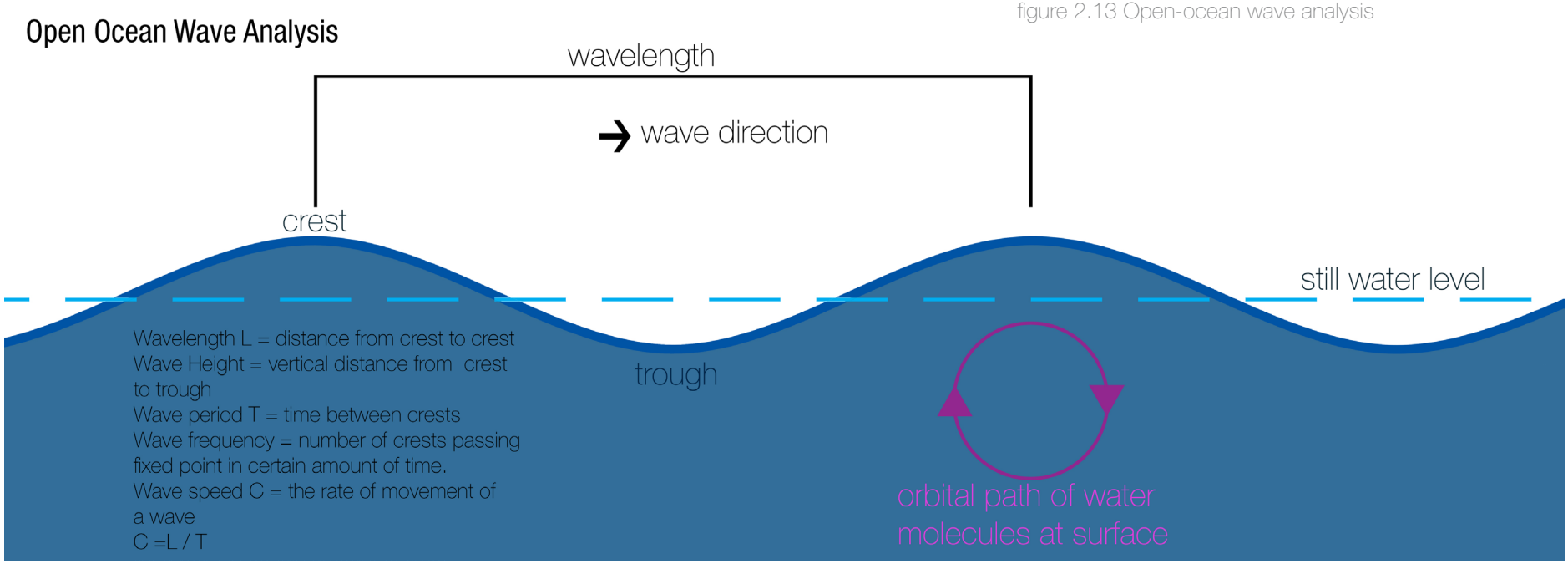
Bathymetry is the study of ocean-floor topography, and there are factors in this science which deem a breaking wave worthy of a surfer's attention. The gradient of the ocean floor determines the intensity of a breaking wave – a gentle slope produces a slowly crumbling wave, whereas an instant change from deep to shallow water results in a wave which violently plunges, or 'dumps'. This variance in intensity also attracts the skill level of the surfer, as crumbling waves are slower, and more suited to beginners, where plunging waves are fast, and better for professionals. Also, certain types of surfboards have performance characteristics designed for the specifics of the types of wave ridden. Waves that break on sand are susceptible to change, as currents, tides, and rips alter sand-bar topography, giving sand beaches a level of unreliability. Reef breaks are more dangerous to surf on, but hold a greater consistency and predictability for surfers to assess. Wave generation, and bathymetry have been replicated through man-made means, with projects constructing artificial reefs at populated beaches, or physically generated waves in small man-made lakes.

Professional surfer Kelly Slater (USA), instigated the design and construction of the first surfing-prioritised 'wavepool', located at Leemore, California. The two-thousand by five-hundred-foot man-made lake uses a system of hydrofoils to generate a continual wave, and a computer designed and controlled contouring system on the lake bottom, mitigates a wave that can be surfed for forty-five seconds. So far this is the most successful example, but there are other experimental models using hydraulic rams being tested in Australia. This 'mechanising' of wave generation has allowed surfing to be available to land-locked nations, and to sporting events such as the Olympic Games, without having reliance on seasons or weather conditions.

There is a myriad of information from metering sources which a surfer can use to predict a successful surf forecast. The science of bathymetry has devised formulas and calculations to apply to this information, and generate graphic representation to streamline translation for any interested parties. These are as follows…[14]

[14] Shaw Mead, Kerry Black, "Predicting the Breaking Intensity of Surfing Waves," *Journal of Coastal Research*, no 29 (2001): 51-56, accessed April 13, 2020, https://www.jstor.org/stable/25736205

figure 2.13 Open-ocean wave analysis



The open ocean wave analysis gives a representation of unhindered ocean swells. The depth of the water lends no resistance to the motion of the swell, allowing for more accurate readings. Motions of movement follow a sine pattern with positive and negative values averaging around the evident still sea level. Depending on the depth of the water, obstacles may become apparent with lower tides, in which case, interruptions may occur to the regular swell patterns, creating irregularities which may affect shipping.

Wave Compression Analysis

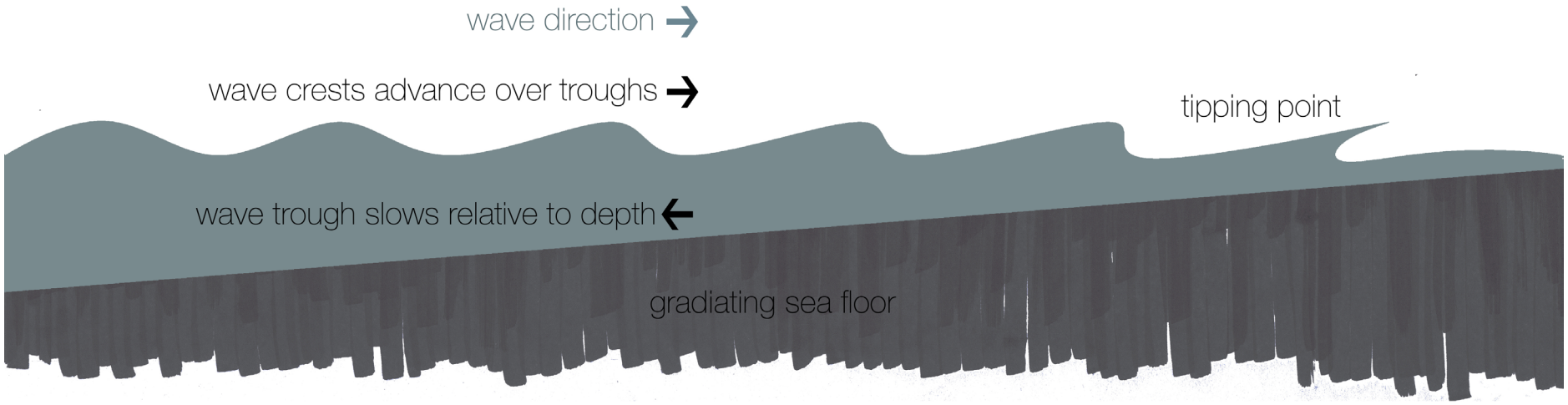


figure 2.14 Wave compression analysis

As ocean waves approach shallower depths, their velocity decreases. When the wave reaches a critical depth, the wave trough drastically slows compared to its crest, resulting in the crest tipping over the trough – what is known as a breaking wave. The kinetic energy after this point is dissipated as decreasing turbulence (known as white-water) to the shoreline. Any remaining energy retracts back to the sea as undertows and rips, which on some beaches where these returning currents are confined, create dangers for swimmers.

figure 2.15 Wave typology

Breaking waves are typified by their 'intensity'. The contours of the ocean floor as an ocean swell approaches a coastline effect the wavelength, wave height, speed, and direction of the wave, which gives every surfing beach their unique qualities. The gradient and material type of the ocean floor display these effects in different ways. One way of understanding the difference between these waves, is the way they deplete their kinetic energy – a swell interacting with a low gradient slope slows in speed, and releases their energy slowly, making them less exciting, but more manageable. The same ocean swell reacting with an abrupt slope releases its energy violently and in a short period of time, resulting in a frighteningly exciting ride, and difficult to maintain.

The above diagrams show how wave shape and intensity changes between gentle and abrupt gradients, which relatively relate to the danger involved, and the skill required of the surfer to be able to ride successfully. Crumbling waves break slowly,and require little skill to ride. This type of wave is most favoured by long-boarders and craft of similar volume. Peeling waves are the most popular among surfers, as all types of boards can ride them, and they offer a greater potential for range of manoeuvres. The dumping waves that are the result of deep-water swells encountering sudden shallow land masses, require a high amount of skill to conquer, and more often than not, need motorised assistance to attain the wave's speed. This mode of assistance is typically achieved via jet-ski.[15]

[15] Shaw Mead and Kerry Black, "Predicting the Breaking Intensity of Surfing Waves," *Journal of Coastal Research* 29, 2001, accessed April 13, 2020, https://www.jstor.org/stable/25736205

figure 2.16 crumbling wave

Crumbling - Waikiki Hawaii

figure 2.17 peeling wave

Peeling - Te Arai Beach

figure 2.18 dumping wave

Dumping - Teahupoo Tahiti

There are also types of waves which have a combination of these seafloor conditions, typically where there are sand and rock/reef combinations. These examples display different intensities known as “sections”, which can have characteristics repeatable from wave to wave. These characteristics are something a surfer can familiarise themselves with, and if negotiated well, provide an advantage for particular manoeuvres. Surfing locations are also recalled to familiarity by their names. Usually, it is something relative to a place or street name – for example Te Arai Point, or Tay Street, but if it is a wave of notoriety, may earn a more creative monicker. These names may be from a geographical feature – (The Spit), an object of visual relevance to the wave’s nature – (Macaroni’s), an element of local history (Lance’s Right), or an emotion conveyed by that particular break (Cloud 9). Some waves, a surfer may ride or even get to see, but understand that wave’s reputation by their name that has made them famous. For instance, if a surfer were going to surf “Cyclops”, “Jaws”, or “Dungeons”, there is a good chance that surfer may never be seen alive again.

It is not necessary to use a surfboard to catch a breaking wave. This can be accomplished by swimming into the waves energy, however, the human body is not designed with hydrodynamics in mind, and body surfing is a taxing endeavour, so an intermediary device is needed to conserve energy, and make surfing more enjoyable. The relationship between a surfer and their board(s), is much like a marriage, where the board is made or bought with relevance to a surfers style of surfing, and their physicality, and the surfer adusts themselves to the performance 'personality' ot the surfboard. This is perhaps why the ancient Hawaiians saw the crafting of a surfboard as a spiritual experience.

Traditionally, surfboards were various sizes of craft ranging from arm length to several metres, and made of solid floatable materials such as timber or bound reeds. They were built around the rider's method of operation – either prone (lying down), seated, kneeling, or standing. These craft are propelled atop the water's surface by hand paddling (like swimming), using a paddle (like a canoe), or until recently, by using kicking propulsion through flippers (for lie-down riders like body boards). The resulting action of these designs allowed a rider to catch a wave, then move roughly in a straight line towards shore, being held at speed by the residual dissipating turbulence after the wave had broken (white-water), with control and stabilising of the craft achieved through the dragging of body parts or a paddle through the water.

These original boards could be heavy and cumbersome, and much of the effort required for surfing was used just by carrying the board to the water. With advancements in technology – in particular the marine and aviation industries – came the adoption of using petroleum –based products to build stronger and lighter boards, which could be transported much easier than their timber relatives.

The first variant – invented by Tom Blake in 1926 - was still made of timber and followed the traditional lengths greater than 10 feet, but consisted of a hollow frame surrounded by a plywood surface, then coated with a layer of varnish to make the formation water – tight. Blake had also incorporated the use of a stabilising "fin" – like the rudder of a boat, which gave the boards greater stability and a degree of manoeuvrability.

Another personality attributed to modern surfboard design is Bob Simmons, who experimented with various shapes which controlled the flow of water around the board. In particular, is a lengthwise upward curvature known as "rocker", which greatly enhanced performance capabilities, and combined with a fin, allowed a surfer to turn, and move 'along' a wave instead of going straight.

figure 2.19 rack of surfboards

The 1940's bought experimentation with combinations of timbers such as Redwood for strength, and Balsa for lightness, making surfing's first composite boards. The 1950's found the invention of the 'sandwich' style surfboard which is still present today. This uses a foam core with a timber stabiliser (or stringer) running centrally through the length of the board, which is then encased in a fibreglass and resin shell. The resulting combination allows for ease of construction, diversity in shaping options, and a lighter, buoyant, and more manoeuvrable surfboard. This allowed the surfboard to be built using templates, and mass produced for an ever – increasing surfing population.

This format of construction is still presently utilised, albeit with inputs from computer simulation and feedback from professional surfers to fine-tune the shape, length, thickness, edges, fins, and composites – making boards that are 'tuned' to a style of surfing, and a wave size and type.[16]

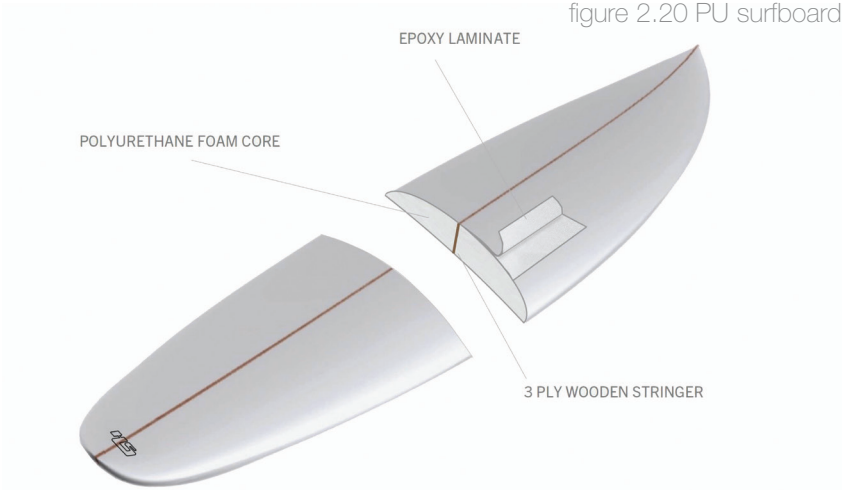
Surfboards can now have preferences recorded by a surfing professional, then replicated through a digitally controlled shaping machine, for a consumer who desires to perform similarly to that professional. For the more educated surfer, preferences can be ordered to their request, and artwork can be applied under the layers of fibreglass to make a visual statement.

The materials used however, are still – by preference – based in the petro-chemical industry, and are a major contributor to global pollution. With the current awareness of this pollution, some surfboard manufacturers are seeking the use of alternatives, or of 'green' materials and methods to diminish surfing's detrimental environmental actions. Used surfboards can be granulated, and reincorporated into foam blanks again, but the process – and therefore the final outcome – are costly. Also costly are the use of materials such as hemp fibres, recycled timbers, corn-starch based foams, and bio-resins, all of which are compostable.

The expense of such products are likely to reduce if their popularity is increased, unfortunately, without endorsement from professional surfers and mainstream manufacturers, environmentally friendly products will most likely be classed as gimmick. The general consensus within the professional surfing community positions eco – surfboards as not having flexibility characteristic like a PV/fibreglass surfboard has, a performance feature that professionals are not willing to risk their careers on.

[16] Andrew Couldwell, "History of the surfboard," COTW, April 11, 2006, accessed 18 June, 2020, https://clubofthewaves.com/feature/history-of-the-surfboard/

figure 2.20 PU surfboard



Polyurethane (PU) and Epoxy (PE) surfboards (above) have a foam core with a fibreglass and polyester/epoxy resin coating to solidify and seal the surfboard into its final shape. This format has a limited life before water eventally ingresses the foam core, degrading it until it is unusable waste. EPS (Expanded Polystyrene) surfboards (below), have similar construction with a fibreglass/resin outer layer, but the core can be recycled - although at a cost.

figure 2.21 EPS surfboard

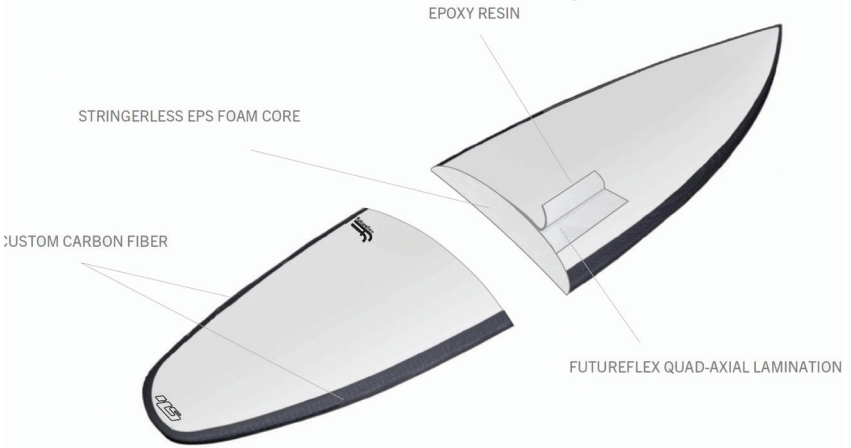


figure 2.22 surfboard control principles

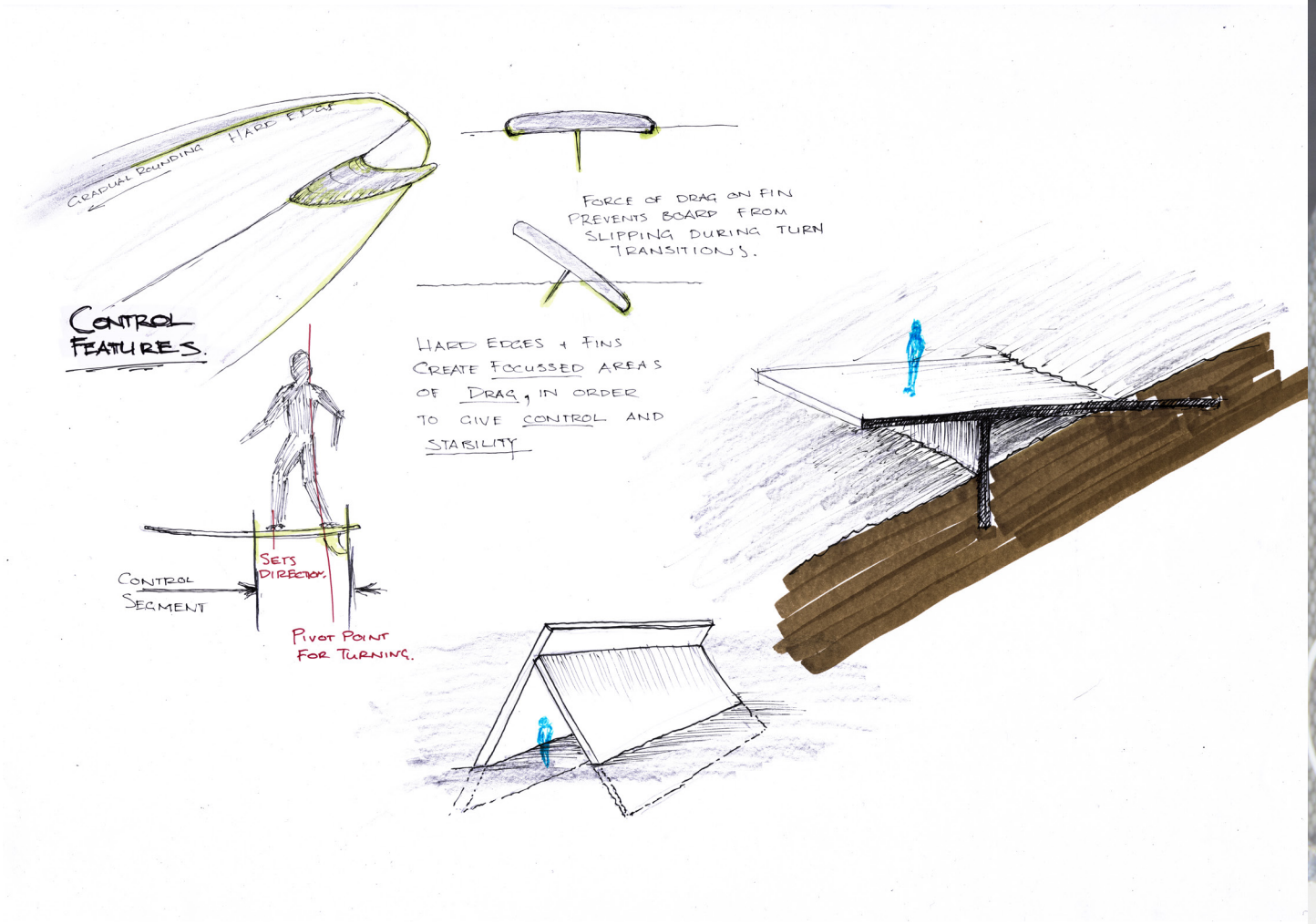


figure 2.23 fins

2.6 The Surfing Process

There is much preparation that can be done before the actual act of surfing. These may not be necessary, but are dependent on the personality of the surfer, and whether they prioritise being organised, or sporadic. A knowledge – and constant monitoring – of weather systems is essential to a surfer's knowledge.

To be able to predict surf conditions up to a week in advance benefits a surfer's ability to plan their day to day life actions tin order to suit their habit. Modern technology has streamlined weather prediction, through use of satellite imagery and ocean based swell buoys, and for more short term predictions, many popular surf breaks have live-streamed cameras operating for real-time assessment.

Preparations to suit proposed conditions may include the selection of appropriate surf-board wetsuit, travel method, and essential necessities such as surfboard wax and food. A more serious surfer may take physical preparations as well – such as a calisthen-ic-based exercise regime to garner strength and stamina – and yoga type stretches to avoid potential injuries.

Before entering the water, it is recommended to observe the water conditions for 5 – 10 minutes to assess the timing of larger waves, crowd conditions, where wave – catching positions are, and a line in which to paddle out with the least danger to yourself and other surfers. When paddling out an awareness must be kept of a riding surfer's travel paths, as well as approaching waves. Currents and turbulence may take you from your desired position also. Once beyond the zone of breaking waves, a surfer can use fixed objects to triangulate their position. These may be visible rocks beneath the water, trees, buildings, parked cars etc…Positioning may change due to tides and currents, so assessment is a continual process.

When surfing is taking place, it is a constant contemplation of negotiating a response to how the wave is forming ahead, and negating any obvious obstacles that present themselves along the path of the ride.
From beginning to end, the entire processes described becomes instinctual – after time and experience – and the act of surfing advances to forms of abstract representations of the surfer's style.

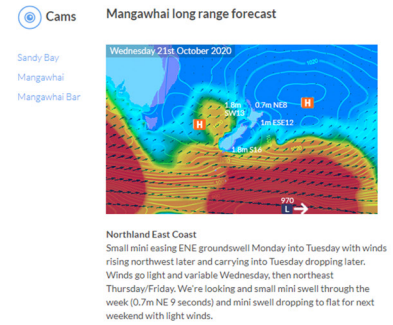


figure 2.24 surf forecast

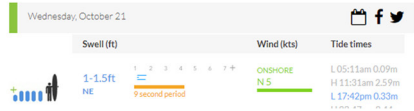


figure 2.25 surfboards on roof

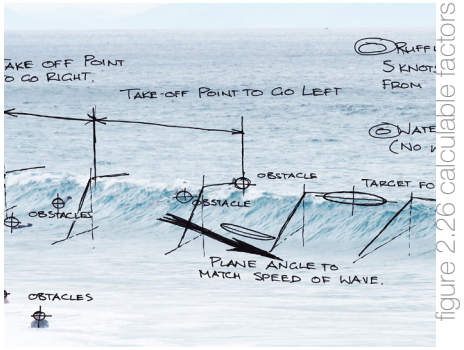


figure 2.26 calculable factors

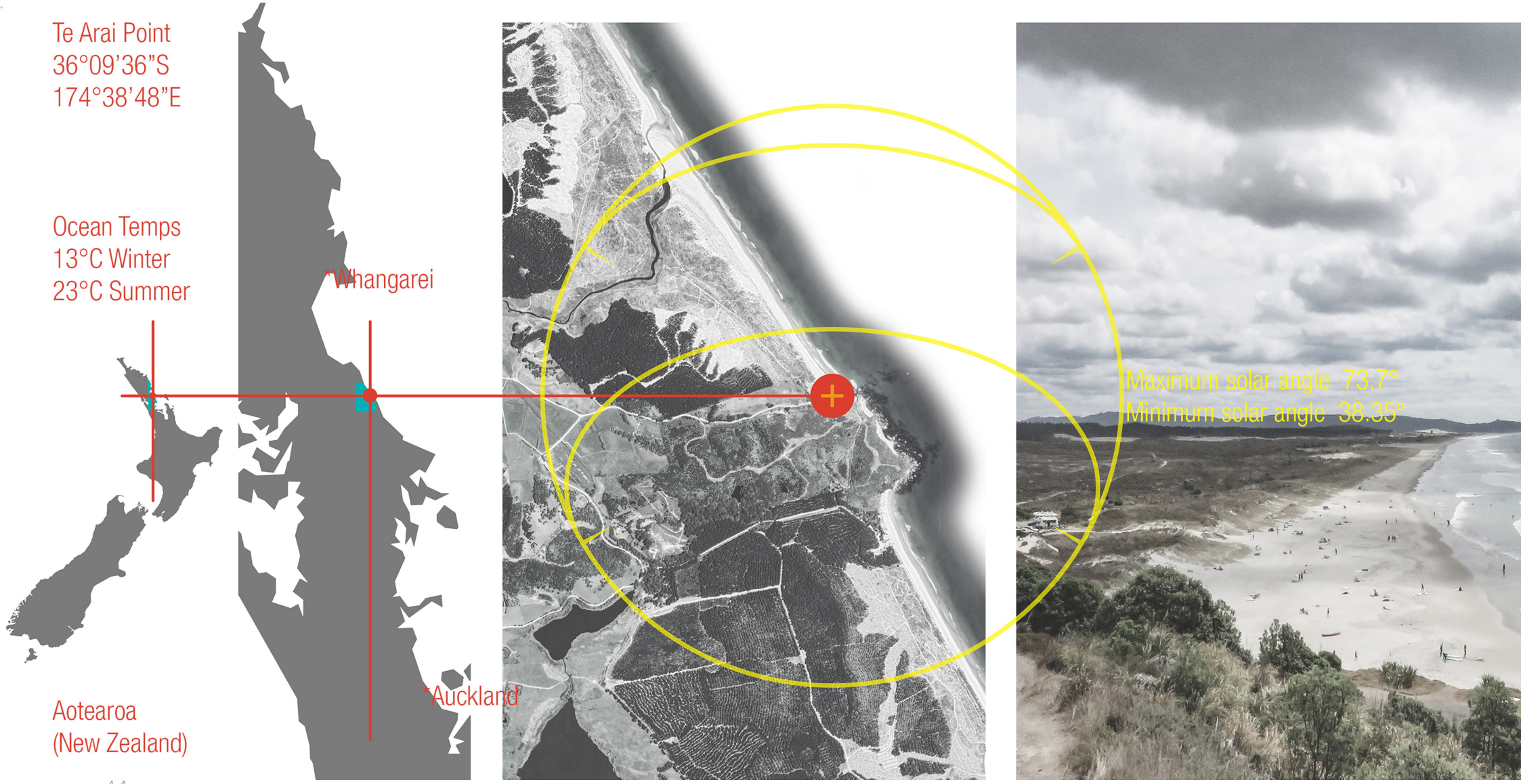
figure 2.27 alignment

Aligning rock feature with shrub on far ridge, in order to triangulate position within water.

figure 3.1 Te Arai Point from the ocean

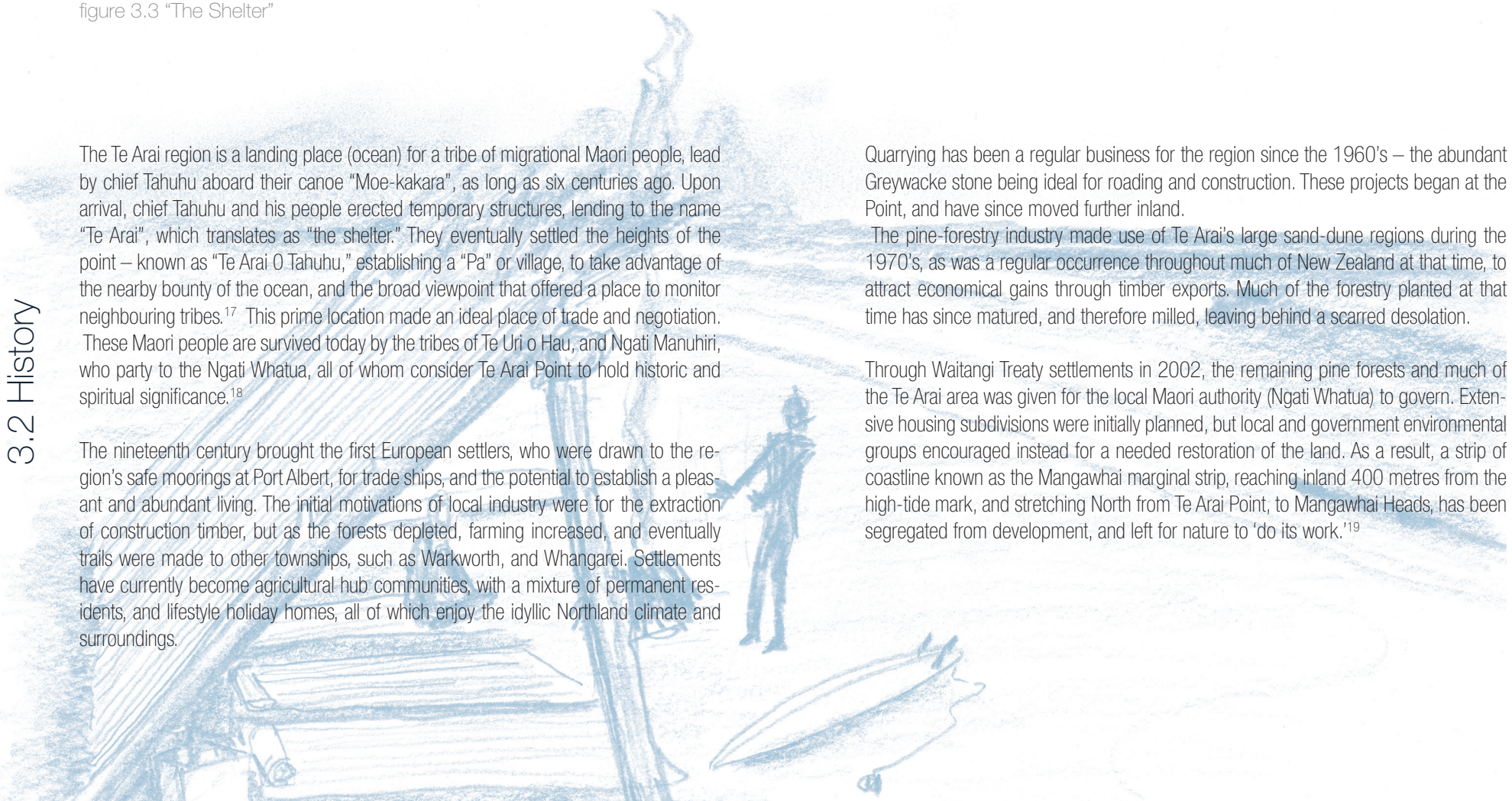
3.0 SITE ANALYSIS

figure 3.2 Te Arai Point details



If any location could capture the essence of a New Zealand summer, it is Te Arai Point. The white sand beaches and empty surroundings, combined with the (usually) gentle waves, provide an opportune playground for surfing, and other outdoor activities. For surfers, the combination of sand, and rock reefs make for wave intensities that range mostly between fun, and lightly dangerous. For three quarters of a year, the waters of Northlands East Coast have swell sizes less than waist high, making it ideal for children and beginner surfers. But during due season, tropical cyclones may venture south past the East coast of New Zealand, generating waves sometimes as high as twenty feet on their faces – a size surfable only by a select few.

figure 3.3 “The Shelter”



3.2 History

The Te Arai region is a landing place (ocean) for a tribe of migrational Maori people, lead by chief Tahuhu aboard their canoe “Moe-kakara”, as long as six centuries ago. Upon arrival, chief Tahuhu and his people erected temporary structures, lending to the name “Te Arai”, which translates as “the shelter.” They eventually settled the heights of the point – known as “Te Arai O Tahuhu,” establishing a “Pa” or village, to take advantage of the nearby bounty of the ocean, and the broad viewpoint that offered a place to monitor neighbouring tribes.[17] This prime location made an ideal place of trade and negotiation. These Maori people are survived today by the tribes of Te Uri o Hau, and Ngati Manuhiri, who party to the Ngati Whatua, all of whom consider Te Arai Point to hold historic and spiritual significance.[18]

The nineteenth century brought the first European settlers, who were drawn to the region’s safe moorings at Port Albert, for trade ships, and the potential to establish a pleasant and abundant living. The initial motivations of local industry were for the extraction of construction timber, but as the forests depleted, farming increased, and eventually trails were made to other townships, such as Warkworth, and Whangarei. Settlements have currently become agricultural hub communities, with a mixture of permanent residents, and lifestyle holiday homes, all of which enjoy the idyllic Northland climate and surroundings.

Quarrying has been a regular business for the region since the 1960’s – the abundant Greywacke stone being ideal for roading and construction. These projects began at the Point, and have since moved further inland.

The pine-forestry industry made use of Te Arai’s large sand-dune regions during the 1970’s, as was a regular occurrence throughout much of New Zealand at that time, to attract economical gains through timber exports. Much of the forestry planted at that time has since matured, and therefore milled, leaving behind a scarred desolation.

Through Waitangi Treaty settlements in 2002, the remaining pine forests and much of the Te Arai area was given for the local Maori authority (Ngati Whatua) to govern. Extensive housing subdivisions were initially planned, but local and government environmental groups encouraged instead for a needed restoration of the land. As a result, a strip of coastline known as the Mangawhai marginal strip, reaching inland 400 metres from the high-tide mark, and stretching North from Te Arai Point, to Mangawhai Heads, has been segregated from development, and left for nature to ‘do its work.’[19]

[17] George Graham, “Te Toka Tu Whenua. A Relic of the Ancient Waiohua of Tamaki,” *Journal of The Polynesian Society* 34, no. 134 (1925): 3. http://tearai.kete.nz/site/documents/show/22-te-toka-tu-whenua

[18] Vanessa Tanner, “Statement of Evidence of Vanessa Tanner on Behalf of Auckland Regional Council,” Te Arai Kete, (2009), accessed February 26, 2020, http://tearai.kete.net.nz/documents/0000/0000/0041/V.Tanner_Archeologist.pdf

[19] “Explore Te Arai”, visitwellsford.com, accessed June 12, 2020, https://wwwvisitwellsford.co.nz/explore/te-arai

figure 3.4 the wasteland

figure 3.5 the poison

figure 3.6 a local inhabitant

figure 3.7 silica sand

figure 3.8 greywacke

Te Arai Point is an eighty-metre high elevation of Greywacke and Waitemata Flysh rocks, bisecting a twenty-four kilometre stretch of white silica sandy beach, which reaches from Pakiri to the South, to Mangawhai in the North. Much of the surrounding Te Arai area is comprised of this sand, mixed with peat and clay, as the land stretches Eastward towards Wellsford, formed as lowland flats that attract swamps and freshwater lakes.[20]

The extent of Te Arai's stone supply has been the subject of quarrying at various locations in the area, particularly at the northern sea-edge, between 1950 and 1980, with the rock being used as aggregates for road-works, and compact fill for concrete foundations.

Te Arai's sands have been the subject of debate, due to its high silica content making it ideal for glass manufacturing. Local environmental groups have continually protested the sand's potential excavation, viewing it as contradictory to a national treasure.[21]

Winds in Te Arai for the majority are South West Trade-winds, but occasionally reverse and come from the North-East. Between the months of November and April are the most likely moments for tropical cyclones to venture South over or past New Zealand, delivering strong winds and large ocean swells.

Rainfall varies from 10mm – 200mm per month, with the lesser being around February, and the greater being around July. Air temperatures range from around 30 degC max in summer, to 5 degC in winter[22] , and water temperatures between 23 degC in late February, and as low as 13 degC in late August.[23]

[20] Jocelyn Thornton, *The Reed Field Guide to New Zealand Geology* (Auckland, New Zealand: Reed Publishing, 2000), 145-150.
[21] "Mining the Sea Sand," seafriends.org, accessed February 26, 2020, http://www.seafriends.org.nz/oceano/seasand.htm
[22] Te Arai Monthly Climate Averages," World Weather Online, accessed August 12, 2020, https://www.worldweatheronline.com/te-arai-weather-averages/nz.aspx
[23] "Te Arai Point Water Temperature and Wetsuit Guide," Surf-Forecast.com, accessed August 12, 2020, https://www.surf-forecast.com/breaks/Te-Arai-Point/seatemp#

Archeological evidence has suggested that Kauri forest once dominated the Te Arai flats, but sadly around 800 years ago this was destroyed by fire. It cannot be proved whether this destruction was naturally, accidentally, or creatively induced, but as a result, local farmers have reaped from supplies of fossilized Kauri remains. In the wake of the Kauri reduction, sand dunes advanced far inland and remain to this day.[24] Forestry companies planted staggered lots of Pine around the early 1970's – a common venture in much of New Zealand at that time – but most of Te Arai's Pine has reached maturity and therefore taken for construction and exports. What remains are the flotsam and jetsam of Pine waste, and opportunity for invasive Gorse bushes to flourish. The Point itself has some remaining pine, as well as pockets of native species such as Pohutukawa, Toetoe, Harakeke flax, and Raupo reeds, particularly where there are hidden swamps. Sand dunes areas are predominantly matted with Spinifex and Pingao grasses, and Pohuehue vine. Unseen, but prevalent are green and brown Rimurapa (Bull Kelp), Neptune's Necklace, and other seaweeds which usually only become prevalent after large swells, where they are detached and washed up on the shore, or floating in bunches amongst the waves.[25]

[24] Vanessa Tanner, "Statement of Evidence of Vanessa Tanner on Behalf of Auckland Regional Council," Te Arai Kete, (2009), accessed February 26, 2020,

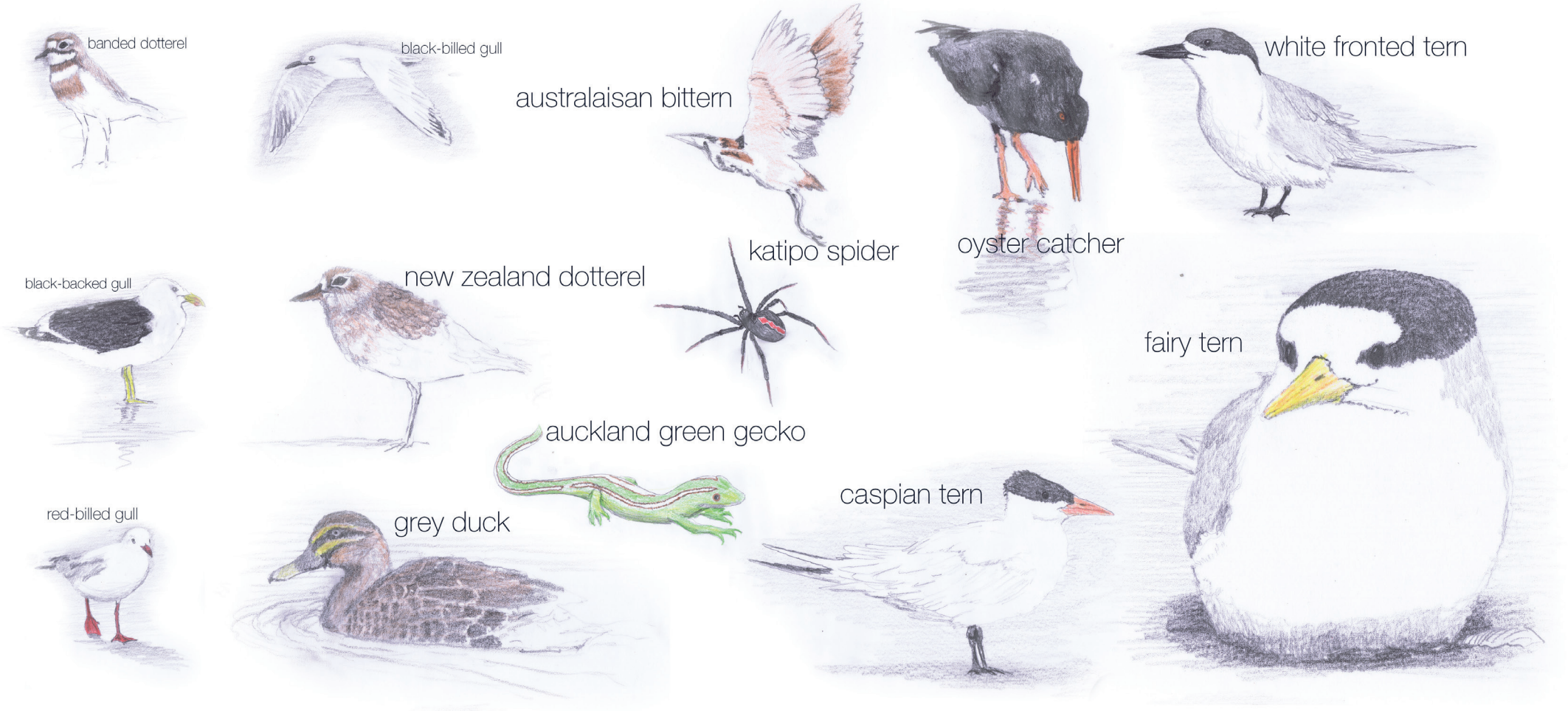
[25] Kate Neill, Wendy Nelson, "Beautiful Browns – a guide to the large brown seaweeds of New Zealand," Stunning seaweeds, version 1 (2016). https://niwa.co.nz/static/web/MarineidentificationGuidesandFactsheets/Beautiful_Browns_Ver1-2016-NIWA.pdf (accessed October 1, 2020).

figure 3.9 flax and sea

figure 3.10 swamp and forest

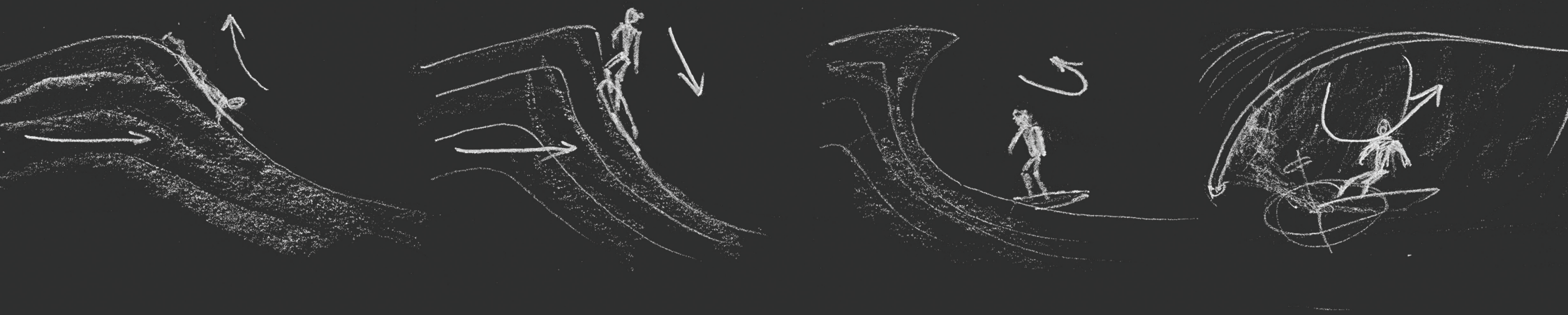
figure 3.11 dune grass

figure 3.12 faces of Te Arai



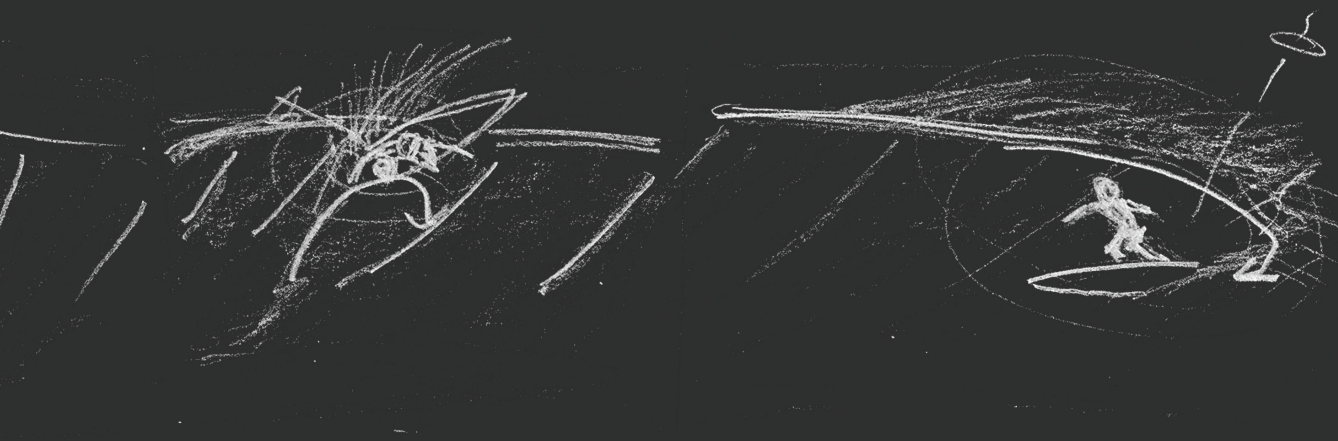
Being a coastal location, Te Arai hosts creatures of the land, the sea, and those in between. The predominant native land animals here are its birdlife, which consist of permanent, and migrational species, some of which are endangered – the most so being the Fairy Tern. These birds mostly nest within a small wetland estuary one kilometre north of Te Arai Point, which is also the primary drainage outlet for the Te Arai region's landscape. To sustain the avian population are - from the tidal areas are scores of shellfish such as Pipi, Tuatua, Paua, and Scallop, and from the sea are mainly Kahawai, Snapper, and Kingfish. Sharing the supply of fish are regular occurences of Bottlenose Dolphin, Orca, Stingray, and several types of shark. To unbalance the natural pattern of life are introduced species, and are the source of the endangered bird's – and landscape's - predicament. Rats raid ground based nests to feed on eggs, and the waste of Bovine Cattle corrupt fresh water streams, which lead to nesting areas, and onwards into the ocean. At the crux of these disruptive animals are of course, human beings, who not only introduced the corruptions to the ecosystem, but continue with their actions, mostly indifferent to the affects they are having by their increasing presence.[26]

[26] Christine Wild, "Te Arai Dune Lands," *New Zealand Herald*, 2013, accessed February 26, 2020, http://media.nzherald.co.nz/webcontent/document/pdf/201343/Te_Arai_Chris_Wild.pdf



Surfing is a rich source of visual, environmental, cultural, and physical themes that can inspire an architectural language. In this project is an opportunity to not just represent surfing itself, but a wider scope of variables which the surfing community can have influence upon. The following subjects evaluate principles which are a response to fundamental elements of surfing's actions, behaviours, and necessities.

figure 4.1 motion and balance analysis



4.0 DESIGN CONSIDERATIONS

figure 4.2 ‘bottom turn’ dynamics

the bottom turn is a manoeuvre that relies on a pendulum action, using gravity to assist in developing speed

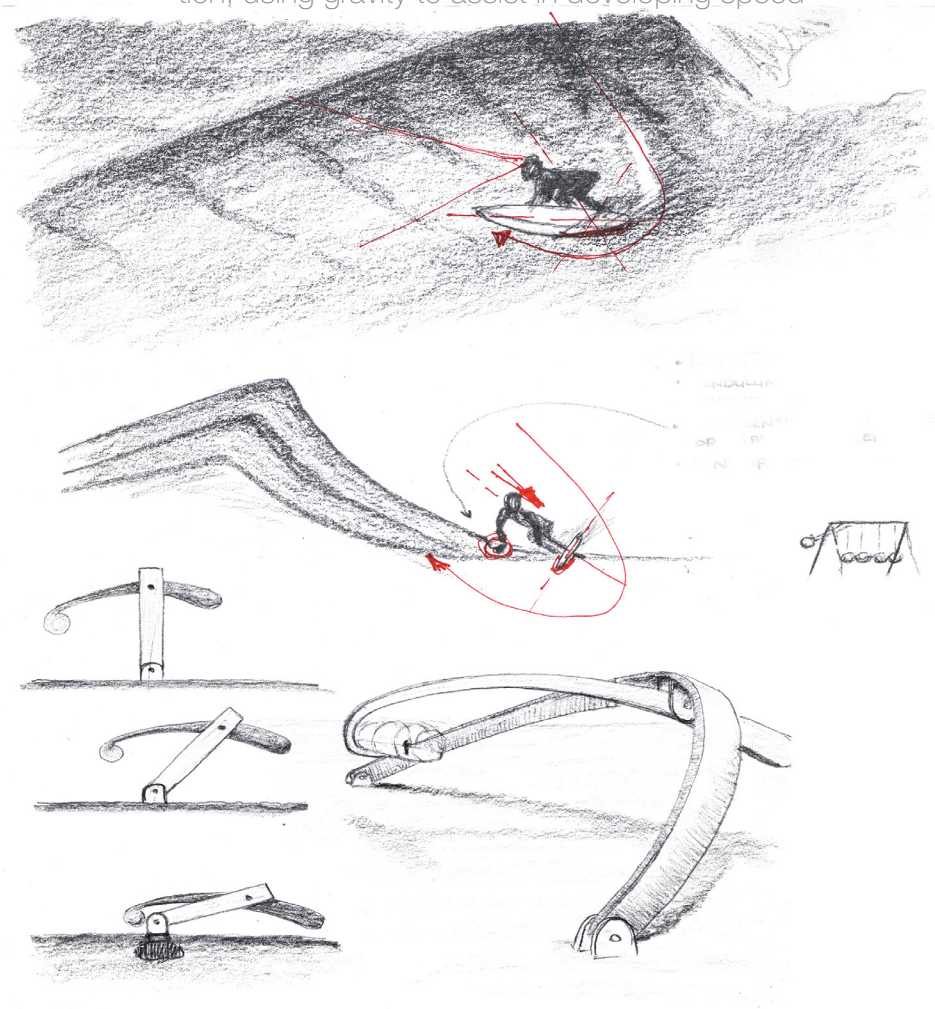
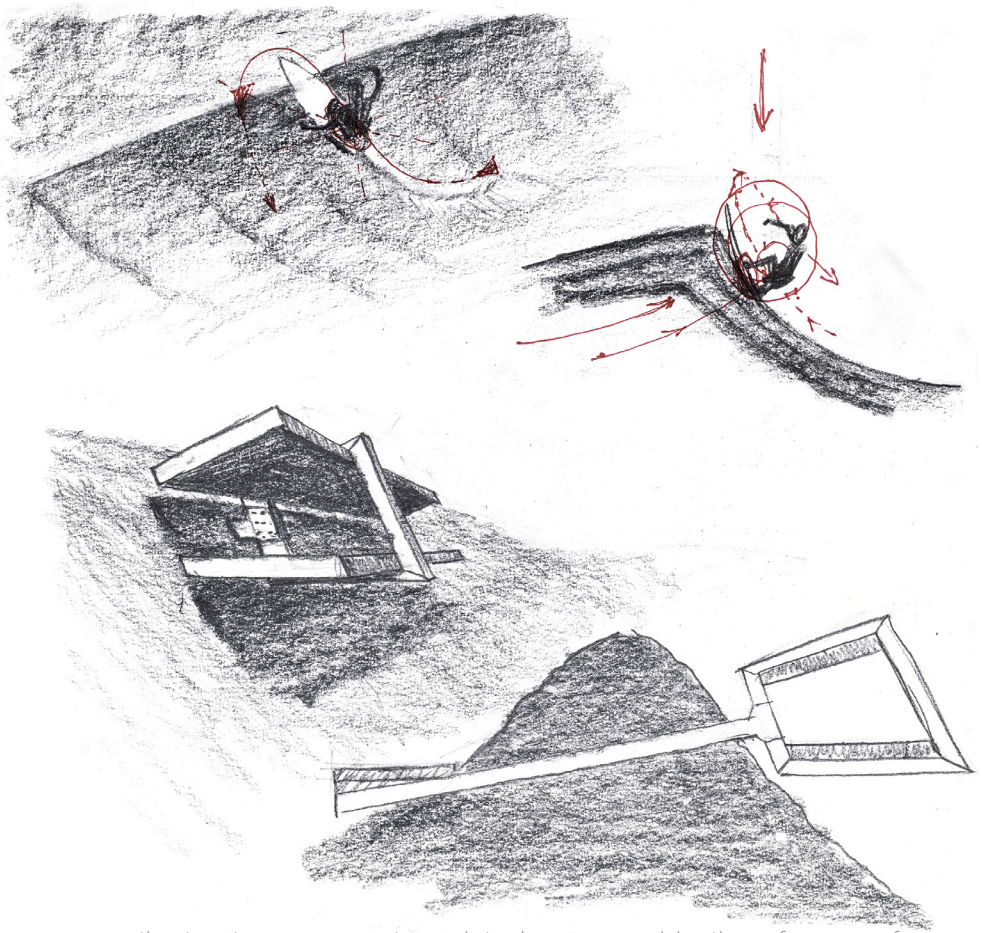


figure 4.3 ‘top turn’ dynamices



the top turn occurs at a point where a combination of unseen forces cancel each other out, and pivot on a point of weightlessness

The motions in surfing are complex co-ordinations of relating bodily mass and strength, to gravitational, centripetal, and inertial forces, linking together through a dancelike transitioning of balance. Sir Isaac Newton referred in his studies to these forces as "Rational Mechanics"[27] , and through his (co)development of the mathematics of calculus, proved foundational laws which governed these forces, and how to both explain and predict them. What though, are these forces, and how are they represented in surfing? The bottom turn (above left) is a manoeuvre that relies on a pendulum action, using gravity to assist in developing speed. The top turn (above right), occurs at a point where a combination of unseen forces cancel each other out, and pivot on a point of weightlessness.

Gravity – "the force of attraction by which terrestrial bodies tend to fall toward the centre of the Earth."[28]

Gravity is evident through surfing on many levels. It is gravity that divides the sky, the sea, and the land, gravity that moves the moon which creates the changing tides, and gravity that a surfer utilises to both assistive and resistive effects, in order to control their speed and direction.

Centripetal force – "the force, acting upon a body moving along a curved path, that is directed toward the centre of curvature of the path and constrains the body to the path."[29]

"Curved path" resonates with the lines taken by a surfer when negotiating a breaking wave's metamorphic features. This path is a response to the curves of the changing topography of the wave, which drives a surfer to improvise their directions of travel.

Inertia – "the property of matter by which it retains its state of rest or its velocity along a straight line, so long as it is not acted upon by an external force."[30]

An ocean swell holds a constant inertia until it breaks, in which case it dissipates. A surfer uses gravity, and centripetal force to match or exceed the breaking waves inertia, leading to a successful ride.

[27] Isaac Newton, *Principia Mathematica* : 2nd Edition (London, Oxford University Press, 1965) 3

[28] "Gravity," dictionary.com, accessed September 10, 2020, https://www.dictionary.com/browse/gravity?s=t

[29] "Centripetal Force," dictionary.com, accessed September 10, 2020, https://www.dictionary.com/browse/centripetal-force

[30] "Inertia", dictionary.com. accessed September 10, 2020, https://www.dictionary.com/browse/inertia?s=t

The aforementioned Isaac Newton also proposed “every action has an equal and opposite reaction.”[31] In surfing, this has a visual representation. When a surfer turns their board, the interaction of the previously mentioned forces takes place, resulting in a displacement of water which forms a pattern, cast from the edge of the surfboard.

[31] Isaac Newton, *Principia Mathematica* : 2nd Edition (London, Oxford University Press, 1965) 3

figure 4.4 displacement sequence

Often referred to as a ‘rooster tail’, or a ‘spray’, this pattern is an indicator of the strength of the surfer, the criticality of the turn, and the control with which the turn has been executed. In contest situations, the assessment of the surfer’s performance is assumed from this ‘spray’ patterns size, volume, and shape, and rating is prescribed accordingly.

4.3 Mind-surfing

Mind - surfing is - “a mental experience that allows surfers to rehearse actions and movements that they want to complete and achieve shortly.” These mental experiences may be ‘triggered’ by an object that has a visual resemblance to a breaking wave, such as a hedge, a slope, or, an architectural feature. This behaviour has the potential for interactive relationship to the final architectural design.[32]

[32] Surfertoday.com, “How to Mind Surf,” accessed May 15, 2020, https://www.surfertoday.com/surfing/how-to-mind-surf

what a pedestrian sees...

what a surfer sees...

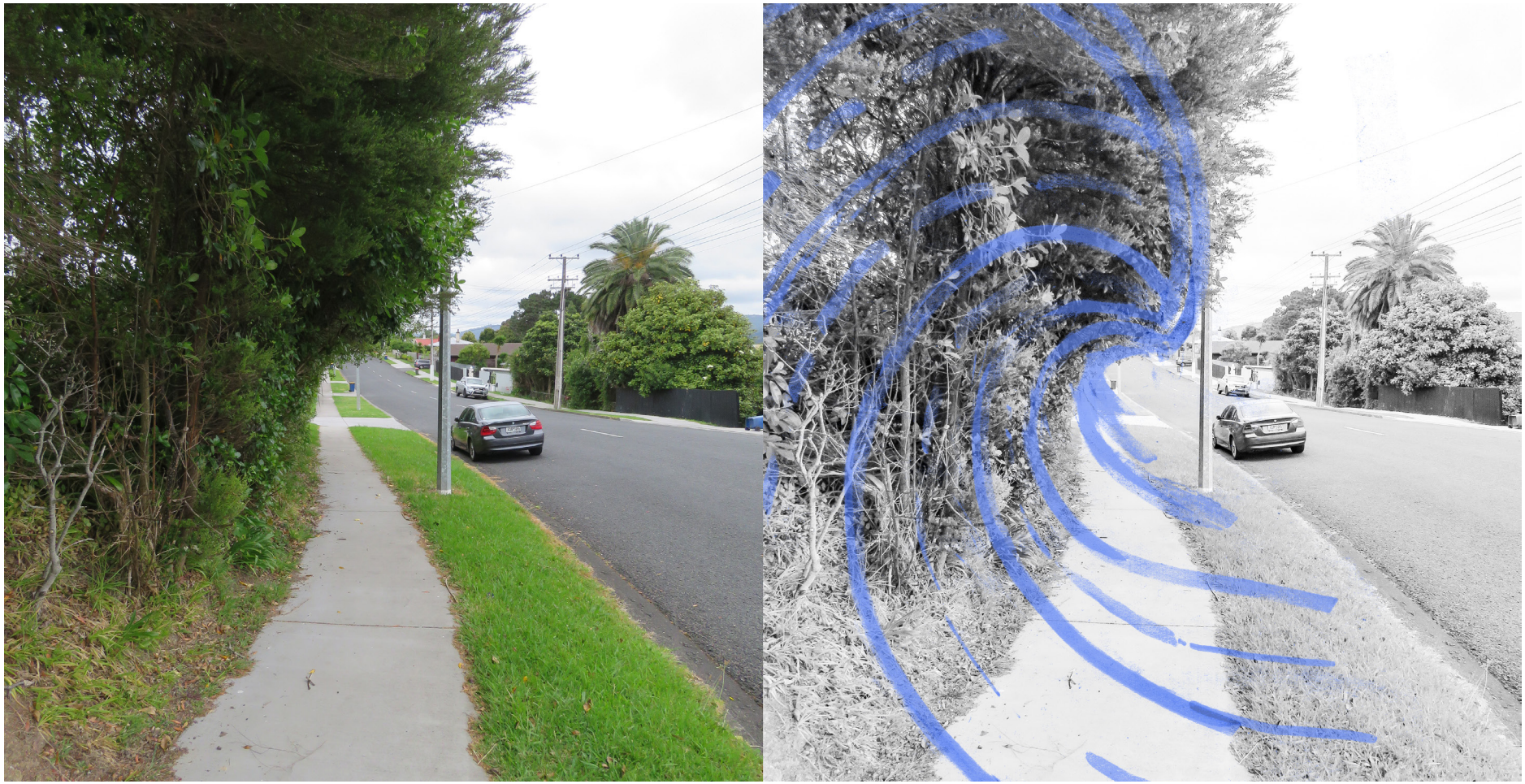


figure 4.5 mind surfing

1. assess the options

2. aim for manoeuvre point

Surfing is a constant process of assessing situations, and when planning manoeuvres, key parts of a wave offer different options for the type of manoeuvres that can be accomplished - a skill which becomes instinctive after experience and practice. This process can be applied to architecture in ways where a site may be assessed for foundation options, structural orientations, or if a structure needs a particular response for an environmental occurrence. It implies that the design should be adaptive to its environment, instead of adapting the environment to it.

3. carry out manoeuvre

4. success

figure 4.6 planning a path sequence

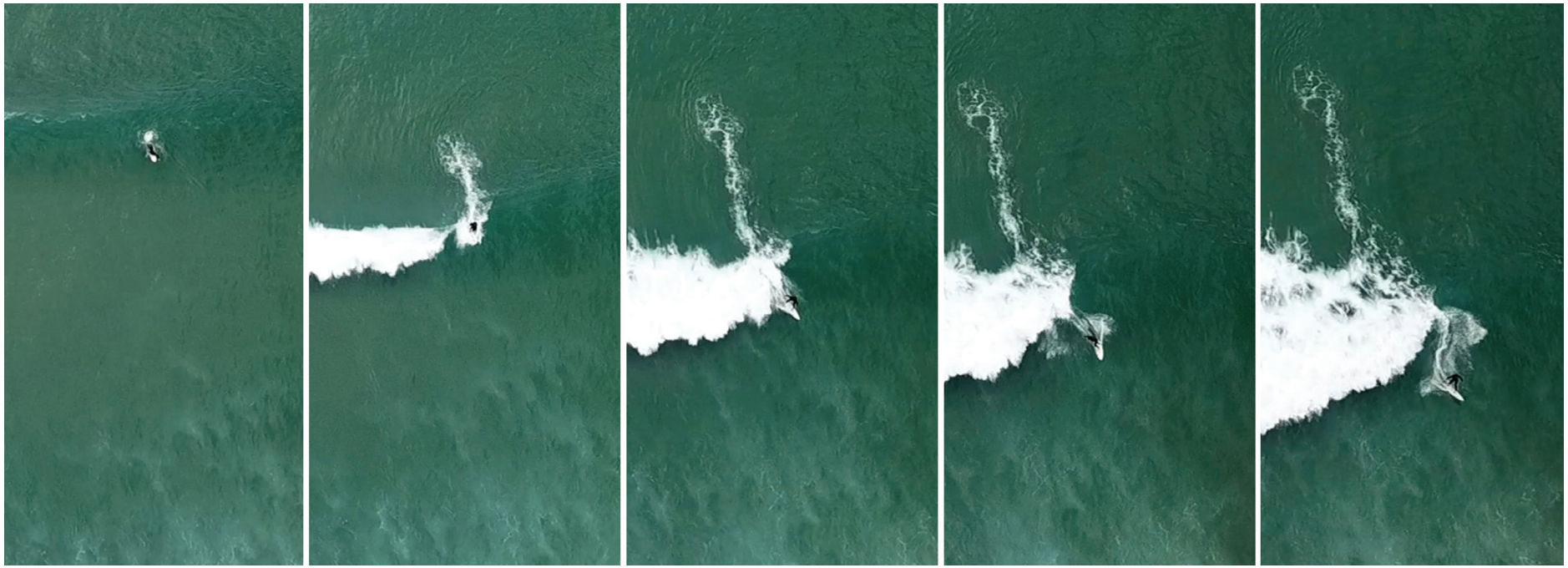


figure 4.7 surfer's trail sequence

Whatever path the surfer chooses to ride, a visual reminder is left behind as a history of their travel. This indication quickly dissipates leaving no trace of the occurrence. A reminder that surfing is short lived, but a memorable ride stays in the mind of a surfer forever. There is perhaps an architectural precedent here, that would imply that the designed structure(s) should have minimal connection to the Earth, and if ever removed, would leave little to no impression other than a place in memory - or history.The concept on the right experiments with the idea of taken a path that a surfer as ridden, and representing it as a solid form. This method has the potential to form structural shapes.

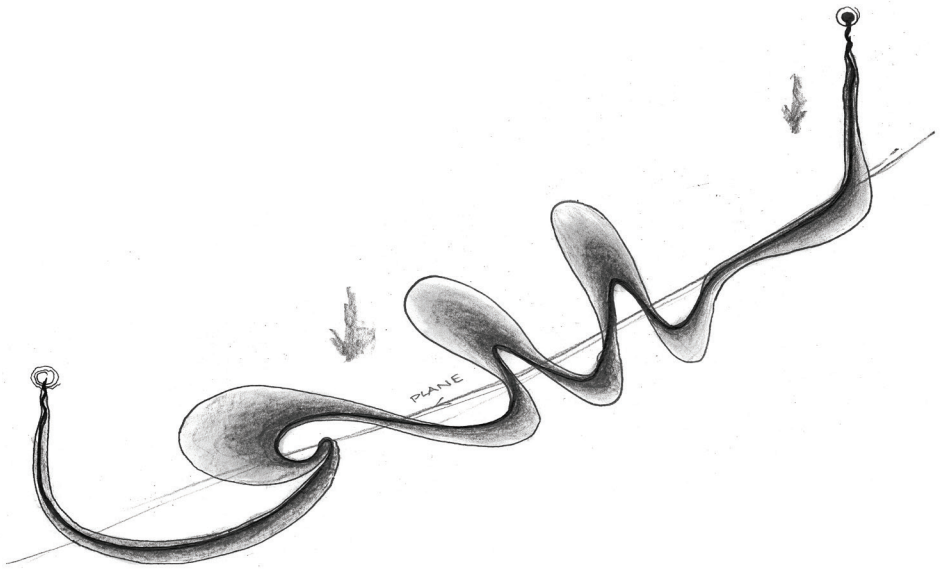


figure 4.8 surfing trail analysis

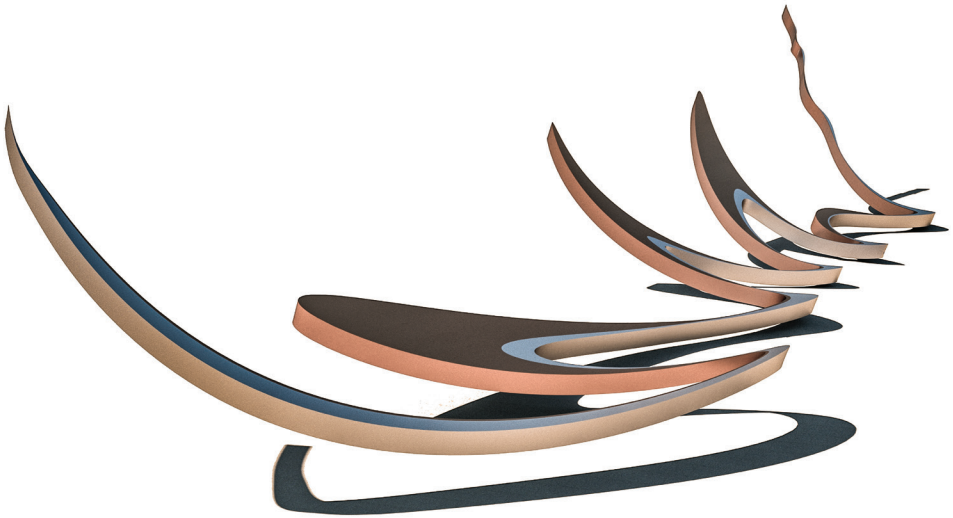


figure 4.9 surfing trail digital model

figure 4.10 Te Arai underwater

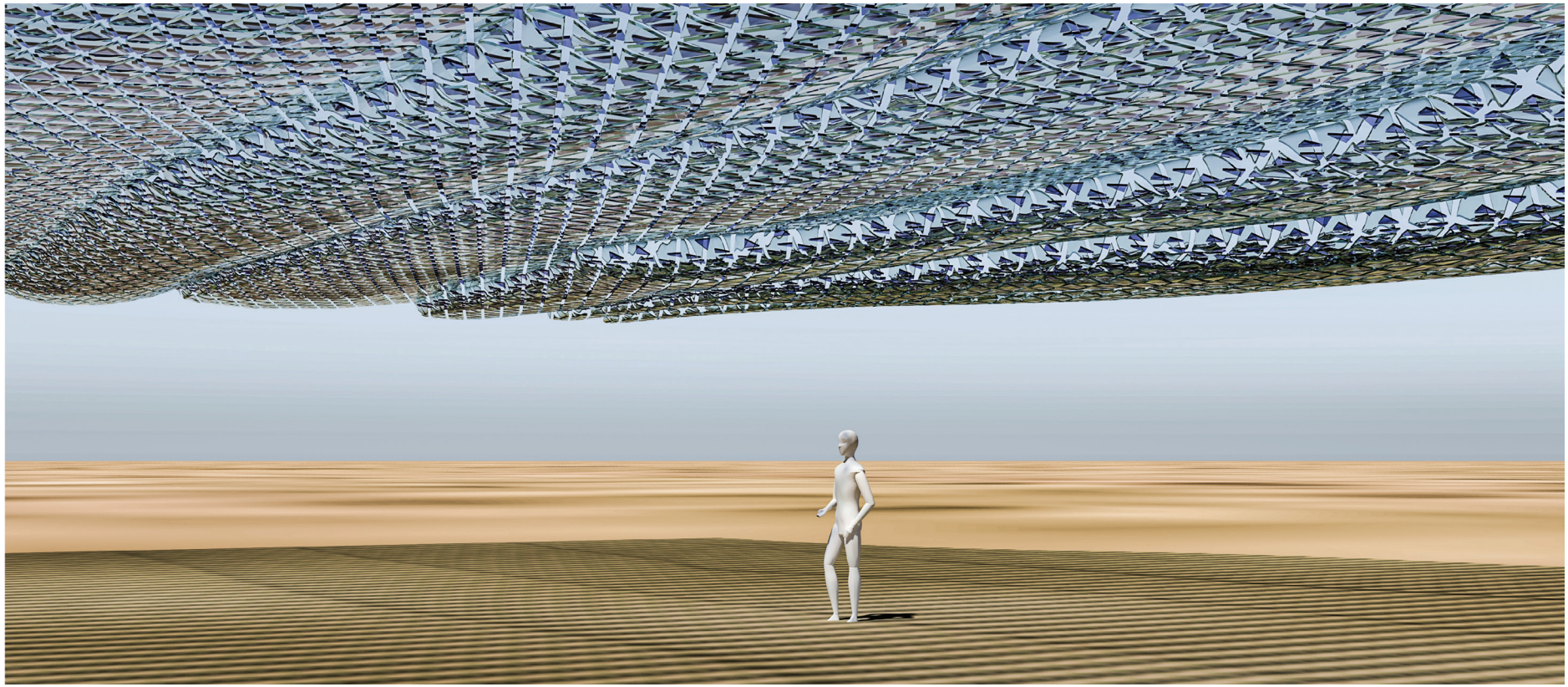


figure 4.11"the world below"

From the bathymetric studies researched in previous ocean waves research, it was determined that the ocean floor's topography affects the manner in which the wave breaks - in simpler terms and as a twist to esoteric sayings - as below, so above... From below the surface, the perspective of the wave changes, the scattering of the light, the preciseness and volume of the sound, and the sway of currents moving back and forth. For a surfer to have an understanding of this realm can alter their surfing technique. The attached concepts experiment with light displacement - an important feature for a design that desires to utilise daylight for function - but controlled in a passive way. Also moving through underwater conditions as a negative space (the space that a breaking wave takes underwater - following page).

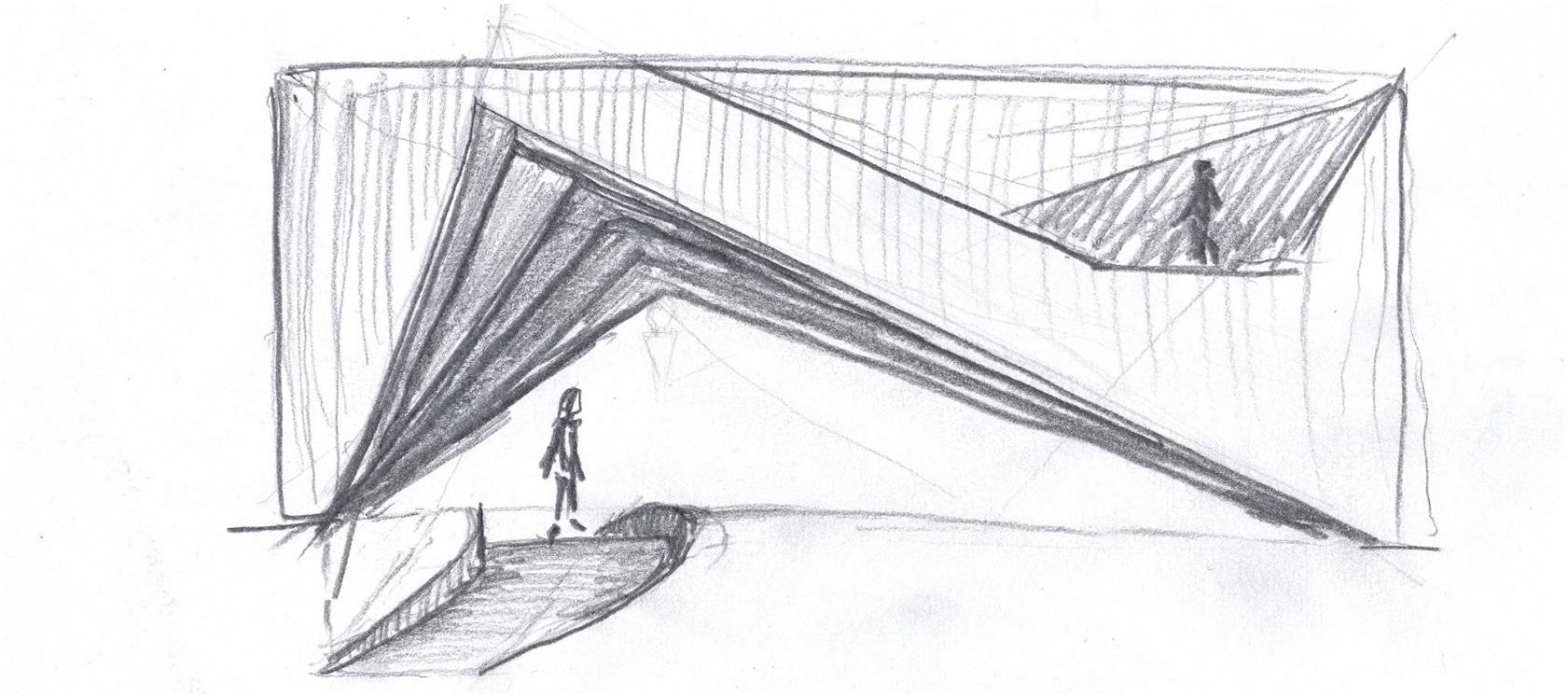


figure 4.12 negative space sketch concept

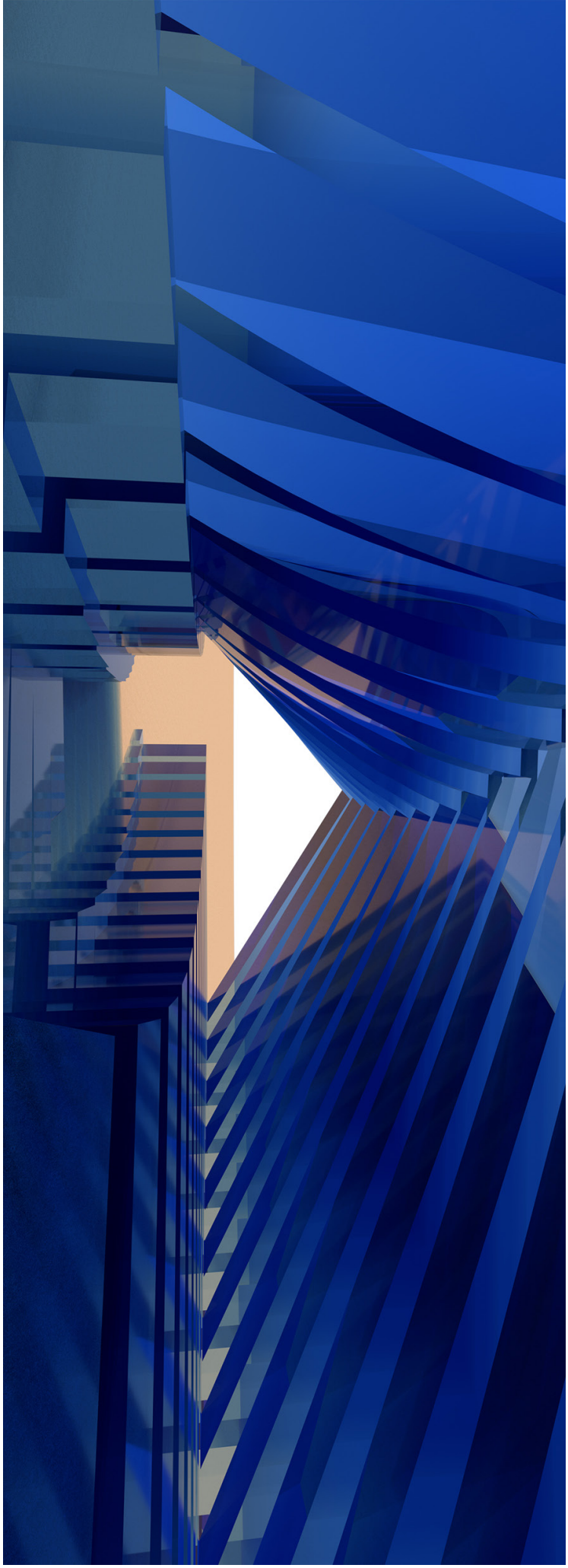


figure 4.13 negative space concept digital model

"I will always remember my first wave that morning. The smells of paraffin wax and brine. The way the swell rose beneath me like a body drawing in air. How the wave drew me forward and I sprang to my feet, skating with the wind of momentum in my ears. I leant across the wall of upstanding water and the board came with me as though it was part of my body and mind. The blur of spray. The billion shards of light. I was intoxicated. And though I've lived to be an old man with my own share of happiness for all the mess I've made, I still judge every joyous moment, every victory and revelation against those few seconds of living." [33]

This excerpt from author Tim Winton in his book "Breath", gives an account of the emotional connection that a surfer can feel towards their aquatic actions. His description is a masterful reiteration of the sensual experiences that pass by in the brief time it takes to ride a wave, and his allusion to the intoxication that a surfer can feel after surfing gives reason why it is such an addictive action. This raises the question that can an architectural representation be withdrawn, which can recall the experiences described in this text, and can simultaneously satisfy, and encourage the surfing addiction.

[33] Tim Winton, *Breath* (Australia, Penguin Group, 2008), 40.

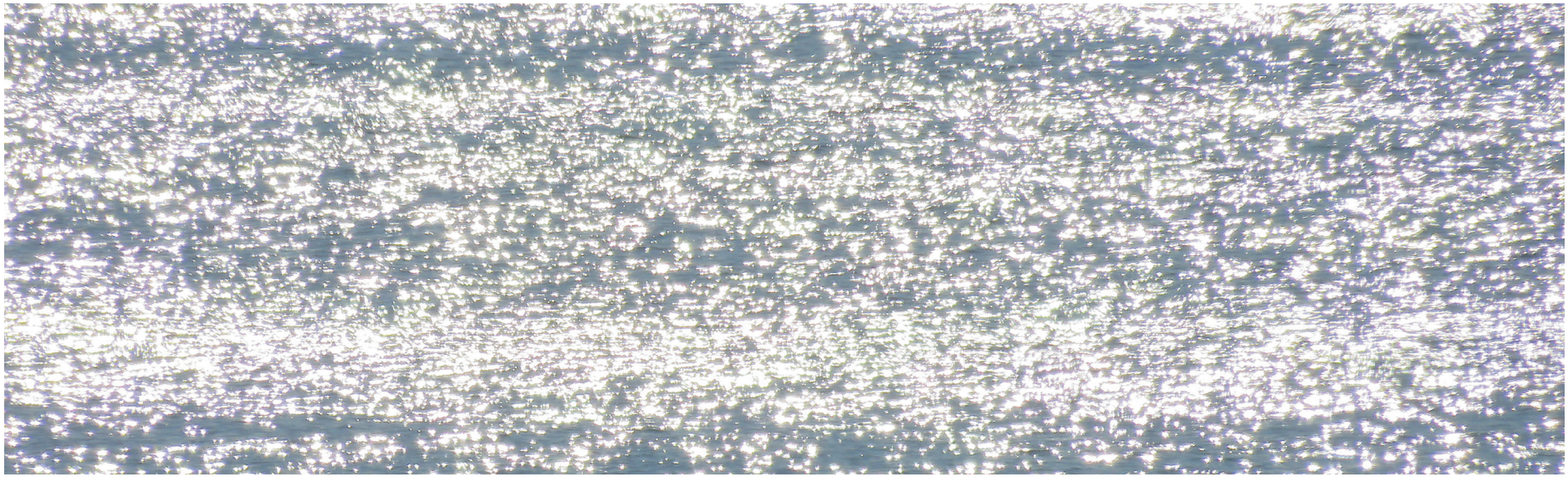


figure 4.14 “a billion shards of light”

figure 5.1 the solution

5.0 PROBLEMS AND SOLUTIONS

5.1 Identifying the problems

This project aims to address the two main problems established within surfing culture, those being deviation away from traditional surfing etiquettes, and the pollutive effects by modern surfboards, and through architectural interventions, address these problems collectively.

Surfing etiquettes are based around one gesture – respect. It is understandable that an action that is best performed individually can take on a selfish demeanour – especially one so addictive as surfing, but to ignore the ethic of respect, renders a surfer as incomplete. It is perhaps this unique selfish desire that has – coupled with a competitive mindset – formed the basis of the issues that surfing presently suffers from, and creates. In a society that is driven by time, money, and competitive success, it is little surprise that the values of that particular society corrupt a culture that already has a fragile and fluid identity.

Many surfers may be unaware of their etiquettes - they are after all mostly learned 'the hard way', through experience. This gives an opportunity for architecture to intervene in a process that potentially avoids conflict, injury, and material damage. By having a place where these etiquettes, and other knowledge relevant to surfing performance can be taught and learned, these goals may be achieved.

To address surfing's environmental crimes, investigation must be done into actual schemes which provide realistic alternatives to petro-chemical based surfboards, instead using materials that are either organically sourced and compostable, reusable, or recyclable. What would also benefit this project, is the inclusion of sustainability principles that can influence surfing directly, and its wider surroundings. The scheme for this project follows that of surfboard manufacturers, Organic Dynamnic…

figure 5.2 timber surfboard shaping

Organic Dynamic is a humble surfboard manufacturer in Lyall Bay, Wellington, which has a modus operandi that offers resolution to the problem of surfboard pollution, and has an operational pattern that can assist with the plights that the Te Arai region is debating. The owner of Organic Dynamic, Jack Candlish, was plagued by the irresponsible ethic of the surfboard industry, and as an avid surfer, sought a solution. With his trade background, he developed a method of constructing surfboards using compostable and/or recycled materials. His current examples use a core of polystyrene which has been recycled from the construction industry, and encased in a shell of Paulownia wood - a lightweight hardwood famous for its resistance to saltwater, and popularity in the marine industry. All of the glues and resins used are also organically sourced. One variation can be used for a completely compostable surfboard, by using a polystyrene core that is sourced from corn-starch, instead of petrochemicals. The choice of using a recycled polystyrene core means that instead of this material being confined as polluting waste for the rest of its existence, it is given a much nobler cause. At the end of the surfboard's life, the polystyrene can be extracted, and used again. By taking this ethos, Organic Dynamic prevents a substantial amount of waste from reaching refuse sites, and supports a local business that has devised a way of taking this building waste, and recycling it to be used again. The Paulownia timber is sourced from a dairy farmer in the Waikato region, who grows it as a method of preventing effluents from his cattle reaching surrounding waterways, which are popular for trout fishermen. This also gives the farmer an additional income, as Paulownia has a demand within the furniture and marine industries.[34]

[34] "Surfing the Eco-design Wave – Jack Candlish-TEDxWellington," filmed June 27, 2017, YouTube Video,

5.3 A solution

With relevance to the project site, there are significant amounts of effluents leaching into estuary waterways from surrounding cattle farms, endangering native bird species, and eventuating in the ocean.

There is opportunity for the use of Paulownia timber to be used in multiple manners of effectiveness in the Te Arai area. Primarily it is used to reduce the effects of the effluents – as Paulownia uses the nutrients in the effluents for its own growth – but it is also effective as shelter belts from winds, and when leaves are dropped, are a nutritious additional food source for cattle. If these trees are used extensively, its availability can encourage the use of its timbers in the use for the making of aquatic craft – especially surfboards.

Architectural solutions can provide two ways to support these schemes for Te Arai Point.

The first structure proposed by this project is a multi-use space that is primarily a surfing school, but can also be used for 'club' activities such as social functions, competitions, and support for existing conservation measures.

Secondly, is a nursery which caters for the cultivating of Paulownia saplings for the use on the local cattle farms, and native plant species for the reforestation of the Mangawhai marginal strip.

Thirdly, is a surfboard factory under a similar motive as the Organic Dynamic operation, to supply the surfing industry with an environmentally conscious product, create an additional income stream for the farmers who provide Paulownia supplies, and as a source of surfboard design education for the surf school.

figure 5.3 Te Arai deforested wasteland in foregreound, and estuary outlet to ocean

9:41, posted by "TEDx Talks," June 2017, https://www.youtube.com/watch?v=DAAfxp2NXMM.

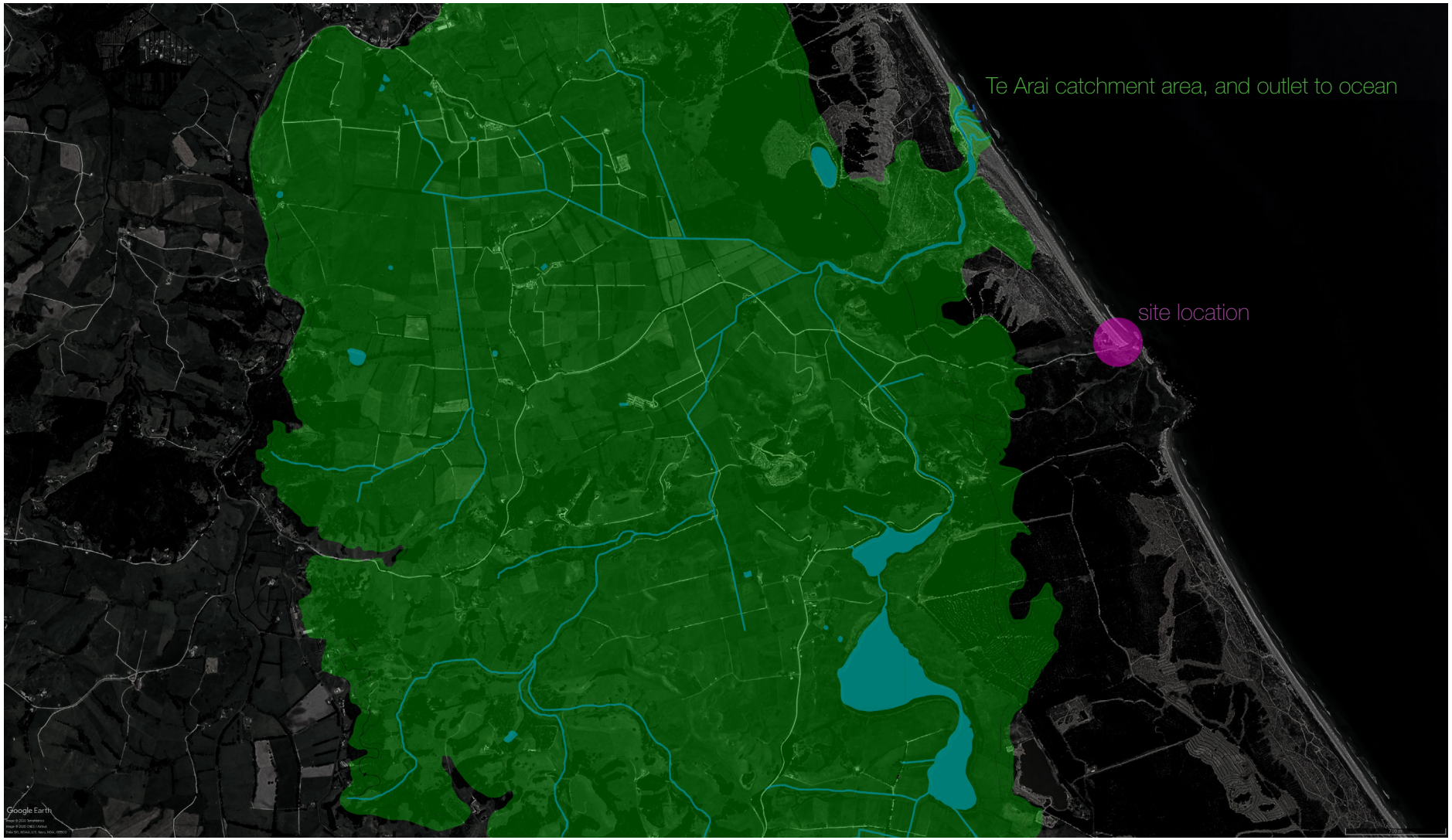


figure 5.4 Te Arai catchment area

figure 5.5 Paulownia plantation

With Paulownia being tauted with a definitive purpose in this project, some background information is needed on this unique material...

Paulownia is a timber which originates in Southern China, and is a lightweight hardwood that has a natural resistance to saltwater. For these reasons, it is popular in the construction of marine vessels, and its pale colouring makes it popular as a veneer for furniture and cabinetry. The timber's properties also make it useful as thermal, and sonic insulators. Visually, as a mature tree, it reaches eight to twelve metres in height, with a broad leaf, and purple flowers. A sapling can be grown in a transportable pot for a year, reaching five to six metres in height, and when planted, can reach a useable maturity within five to eight years. Once harvested, the tree can be regrown from its cut stump.[35]

[35] "Paulownia," NZ Wood, accessed August 4, 2020, www.nzwood.co.nz/forestry-2/paulownia/

5.5 Function and Purpose

Function.

The three proposed structures of Surf-school, Nursery, and Surfboard Workshop function cohesively – perhaps even symbiotically - to serve the brief of this project. Between the school and the workshop is a relationship which is mutually enriching – for a surfer to understand and improve their surfing, they must have an intimate knowledge of the craft that they ride on. For a surfboard manufacturer to develop, they need a surfer's insights on the performance characteristics of their surfboards, and what changes can be made to improve designs. Between the school and the nursery is responsibility to the privilege of membership. As a clause of membership, 'voluntary' work must be undertaken at the nursery as part of etiquette education. Duties would include planting and maintenance of native and Paulownia saplings, the reintroduction of native saplings to the immediate deforested areas, and the supply of Paulownia saplings to pastoral zones surrounding Te Arai (and beyond). The benefits of these duties for the environment, is its vegetative restoration, and protection of native species residing within it. The benefits to the members of the school are - a broader understanding of how their terrestrial and aquatic environments affect each other, and how a local 'status' or 'presence' can be achieved connectively, rather than financially or territorially. Through these interactions, the 'local' surfers can portray a positive persona to their broader district, improving surfing's social reputation.

Purpose.

With the functions of the chosen structures identified, and a culture established through an ethic, questions arise which ask, what purpose does the architecture of these structures serve? What are they doing to represent and reinforce surfing culture? In the book "The Cultural Role of Architecture," the influence of globalization on modern architecture is contemplated, and how it "subsumes the particular conditions or characteristics of a locale into generalized stereotypes," and how architecture is marketed more as an economic generator. Globalizations effects on surfing are similar, with the manipulation by business brands, that use the influence of their endorsed athletes to produce revenue – may possibly be why surfing has become distracted from its cultural roots, and its environmental responsibility. "The Cultural Role of Architecture," also theorizes that an individual's relationship with their culture's architecture occurs at historical, and theoretical levels, and when an individual recognises these aspects within their architecture, it reinforces a greater sense of identity.[36] Therefore, an objective of identifying key features of surfing culture that can be distinctly represented by architectural language is imperative, so that a surfer can correlate to the architecture, and identify it as 'theirs.'

[36] Paul Emmons, Jane Lomholt and John Shannon Hendrix, "The Cultural Role of Architecture : Contemporary and Historical Perspectives, (London: Taylor & Francis Group, 2012), 20

figure 5.6 surf school

figure 5.7 nursery

figure 5.8 surfboard workshop

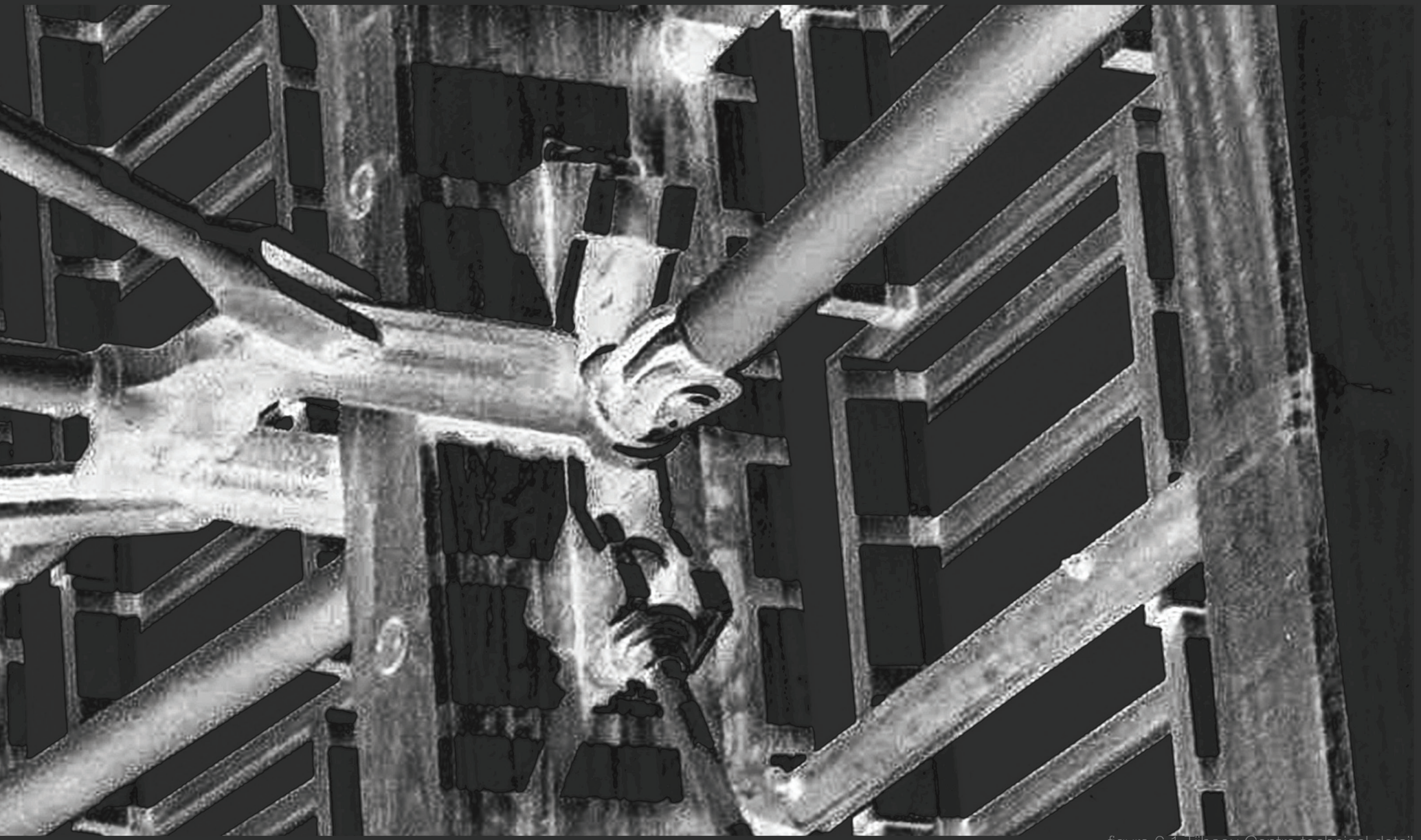
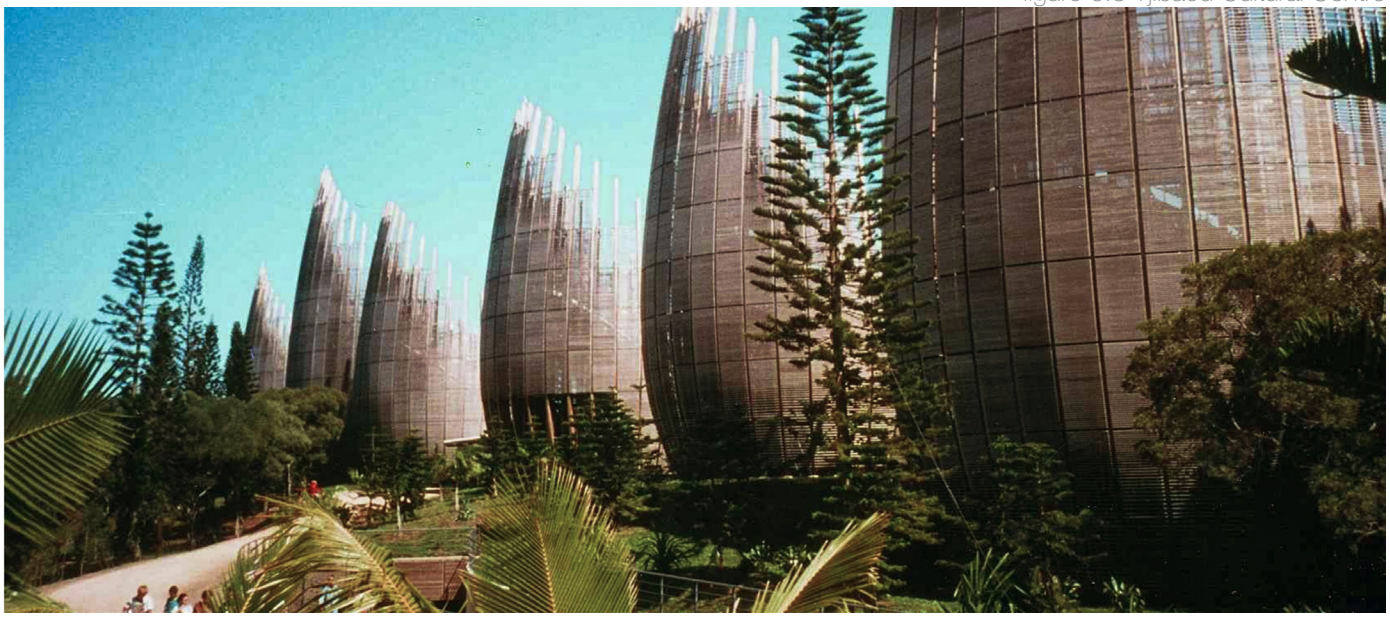


figure 6.1 Tjibaou Centre technical detail

6.0 ARCHITECTURAL PRECEDENTS

figure 6.2 Tjibaou Centre with Kanak huts I

figure 6.3 Tjibaou Cultural Centre



Architect - Renzo Piano Building Workshop
Client - Agence pour le Developement de la Culture Kanak
Place - Noumea, New Caledonia
Year - 1998

The Jean-Marie Tjibaou Cultural Centre is an architectural design which honours the New Caledonian native Kanak culture, by mixing traditional building traditions with modern techniques and materials. The designers have taken care to detail the Kanak method of 'weaving' their structures together, but using structural elements of steel and aluminium, and finishing treatments of glass and timber, to create a representation that has a longevity more suited for its frequent use, and ocean-side environment.

Incorporated into the design is an efficient passive ventilation system which uses a double façade of adjustable louvres to regulate prevailing wind strength, and supply fresh air for their occupants.

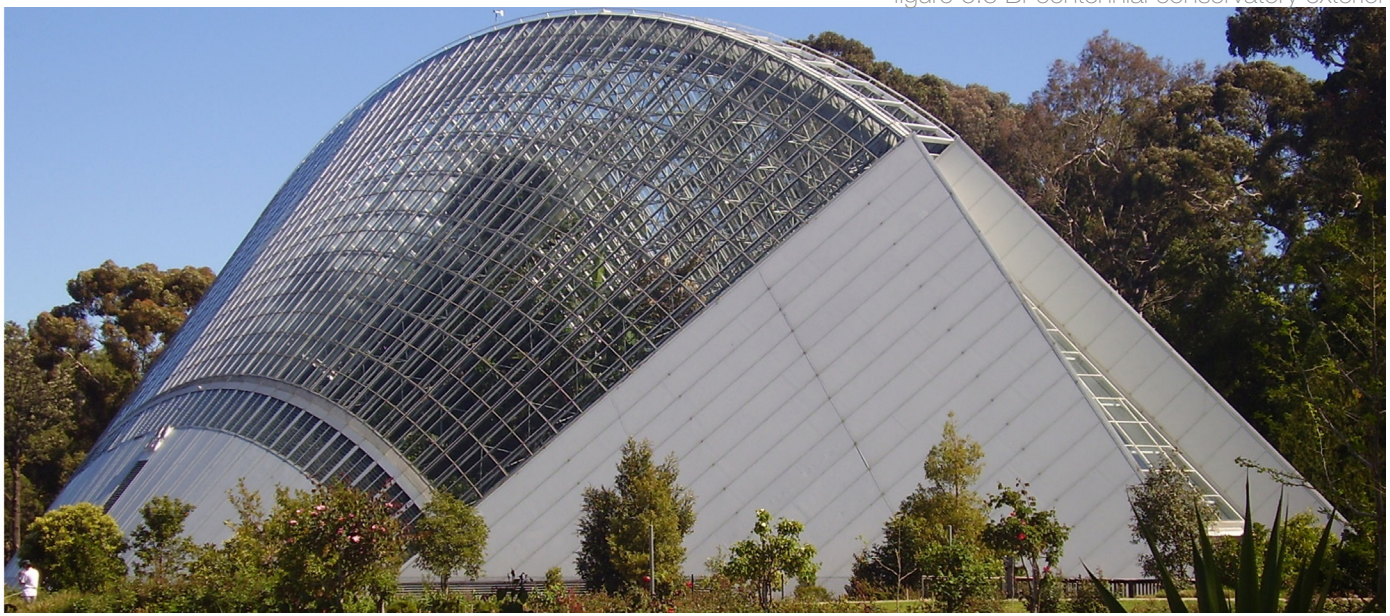
Together, the ten structures that comprise the cultural centre have been interlinked with pathways, connecting them socially and functionally, much like a Kanak village. Some of the buildings have fixed uses as exhibition spaces, research rooms, conference rooms, and a library, and the remaining have mixed use spaces for dance, sculpture, and musical performances.

The success of this precedent is that when the traditional, and modern structures are viewed side by side, it is easily apparent that they are 'familial,' and that the modern version takes nothing away from the traditional.[37]

[37] "Jean-Marie Tjibaou Cultural Center," rpbw.com, accessed September 14, 2020, www.rpbw.com/pro-

figure 6.4 Bi-centennial conservatory interior

figure 6.5 Bi-centennial conservatory exterior



Architect - Guy Maron, Raffen Maron Architects.
Client - Adelaide Botanic Garden.
Place - Adelaide, South Australia.
Year - 1988.

The Bicentennial Conservatory is a 100 - metre long curved steel truss that supports almost 2500sq metres of toughened glass, which as a structure houses an isolated and controlled environment that is 'tuned' to maintain endangered Australasian tropical fauna.

Its height, which reaches to 27 metres at its apex, enables a microcosm of canopy trees, and forest floor foliage to flourish, and be enjoyed by the public, who can walk through the structure on a meandering pathway.

The extensive glazing used is primarily for the function of creating an isolated environment, but its transparency ties the structures internal and external contexts together, under the theme of botanical celebration.[38]

With regard to this research project, the planned saplings to be grown within the proposed nursery, do not need to be environmentally controlled – apart from wind shelter to prevent stem snapping, and a reserve supply of water. What is relevant, is the truss system that the Bicentennial Conservatory uses to provide and uninhibited growth space below, and structural means for services such as irrigation sprinklers and wind breaks.

ject/jean-marie-tjibao-cultural-center

[38] Tone Wheeler, "AAA looks at the Bicentennial Conservatory," Architecture and Design, October 10, 2019, accessed September 30, 2020, https://www.architectureanddesign.com.au/features/features-articles/bi-centennial-conservatory-adelaide

figure 6.6 Organic Dynamic workshop sign

figure 6.7 Organic Dynamic workshop machines

Owner – Organic Dynamic Surfboards
Location – Wellington, New Zealand
Year – 2020

Although this example is not a 'profile' architectural example, its functional model is an imperative, on the design of the surfboard workshop part of this project. The owner/operators of this workshop have devised a strategic fabrication process for their surfboard construction – that works with the limited space they have.

Information such as their equipment dimensions, and the ability to move between machinery with product is vital information when attempting to devise a floorplan that functions optimally, and safely. The workshop also has segregated areas specifically for CNC routing (Computerised Numerical Control), sanding, painting, and resin coating, so that dust and other debris are isolated from interfering with other works.

figure 6.8 Lyall Bay renovation

figure 6.9 Rodeca polycarbonate cladding

Project - Lyall Bay Renovation
Architect - Solari Architects
Client - Loria Atkinson and Midge Marsden
Place - Wellington, New Zealand
Year - 2017

This Wellington based renovation is a former cinema, converted into a 5 x bedroom home, that is exampled here for its most identifiable feature – an entire wall composed of a translucent insulative polycarbonate cladding known as Rodeca.

The side of the house with this cladding, faces directly to the South, and an exposed Lyall Bay beach – which means that it is exposed regularly to Southerly winds coming off of Cook Strait, and the salt-water and sand 'blasting' that comes with it. With this entire wall having a translucent theme, comes a supply of ambient light during the day.

The polycarbonate cladding is of interest to this research project, as it offers a translucency which was explored in previous concepts (p66 - 69), and the durability to withstand punishing beach conditions.[39]

[39] Sharon Stephenson, "House of the week: Converted Wellington Cinema," Stuff.co.nz (Blog), February 1, 2017, https://wwwlstuff.co.nz/life-style/home-property/house-of-the-week/88940333/house-of-the-week-converted-wellington-cinema

figure 7.1 canopy render and surfboard hut

7.0 DESIGN DEVELOPMENT

7.1 The Brief

From the prior section 'Problems and Solutions,' it has been determined that this project involves three components that function cohesively to an environmentally sustainable programme, that is focussed on

- Education of surfers (a Surf-School).

- Construction of Environmentally-friendly surfboards made from Paulownia timbers (a Surfboard Workshop).

- Supply of native and Paulownia saplings to minimise deforestation and leaching effects of cattle farms (a Nursery).

The nature of these three structures require interaction to each other, and to the surrounding habitat, so therefore, based on their occupiers and their thematic cohesiveness, should have an aesthetic that is familial, and a functions that are cooperative of each other.

There are certain key principles to which surfing – and relatively this architectural design – must adhere to, to be successful. The main ones are…

Use of existing forces – Fundamentally, surfing is based on the provision – and the manipulation of, natural forces and energies. Such parallels can be assumed in the architectural design by utilising natural provisions – The Sun, for functional lighting electrical generation, the winds, for passive ventilation or electrical generation, and the rain, for collection of consumable water supplies.

Adaptability and obedience to the environmental conditions – Surfing requires alteration in equipment such as wetsuits and board types, to suit ocean temperature, weather, and the type of waves ridden. In similar fashion, the proposed design must give attention to environmental factors such as Sun, prevailing winds, proximity to salt water, topological features, native flora and fauna, and occasional weather anomalies (cyclones). This also may incorporate the use of current locally produced materials such as greywacke stone, and excavated pine timber.

Temporary nature and low footprint – From the investigations done in the design considerations, it was seen that the surfing actions are physically short lived, leaving only a temporary trail of evidence behind it. In turn, the design for these structures should aim to have a contact to the ground that is minimal, and a nature that should show little evidence of its existence if ever removed.

Other factors to consider…

Use of surf-industry waste – where possible, the up-cycling of waste surfboards could be used as a construction material, due to its traits of lightness and insulation.

Encouragement of Visual Simulation – The design's interpretation from a surfer's perspective should be personally recognisable, and encourage an interactive response that stimulates the afore-mentioned occurrence of mind-surfing.

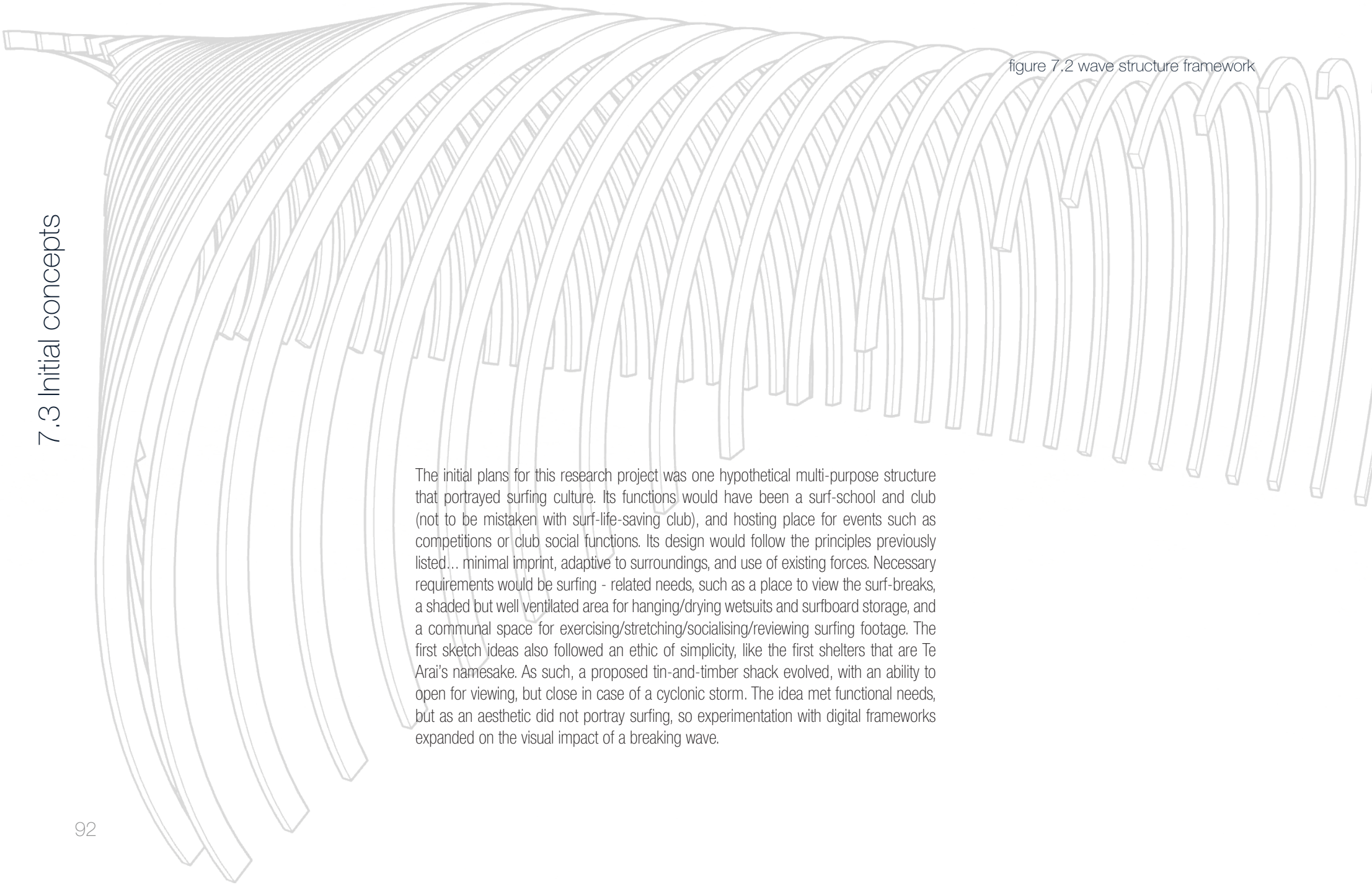


figure 7.2 wave structure framework

The initial plans for this research project was one hypothetical multi-purpose structure that portrayed surfing culture. Its functions would have been a surf-school and club (not to be mistaken with surf-life-saving club), and hosting place for events such as competitions or club social functions. Its design would follow the principles previously listed... minimal imprint, adaptive to surroundings, and use of existing forces. Necessary requirements would be surfing - related needs, such as a place to view the surf-breaks, a shaded but well ventilated area for hanging/drying wetsuits and surfboard storage, and a communal space for exercising/stretching/socialising/reviewing surfing footage. The first sketch ideas also followed an ethic of simplicity, like the first shelters that are Te Arai's namesake. As such, a proposed tin-and-timber shack evolved, with an ability to open for viewing, but close in case of a cyclonic storm. The idea met functional needs, but as an aesthetic did not portray surfing, so experimentation with digital frameworks expanded on the visual impact of a breaking wave.

figure 7.3 surf shack

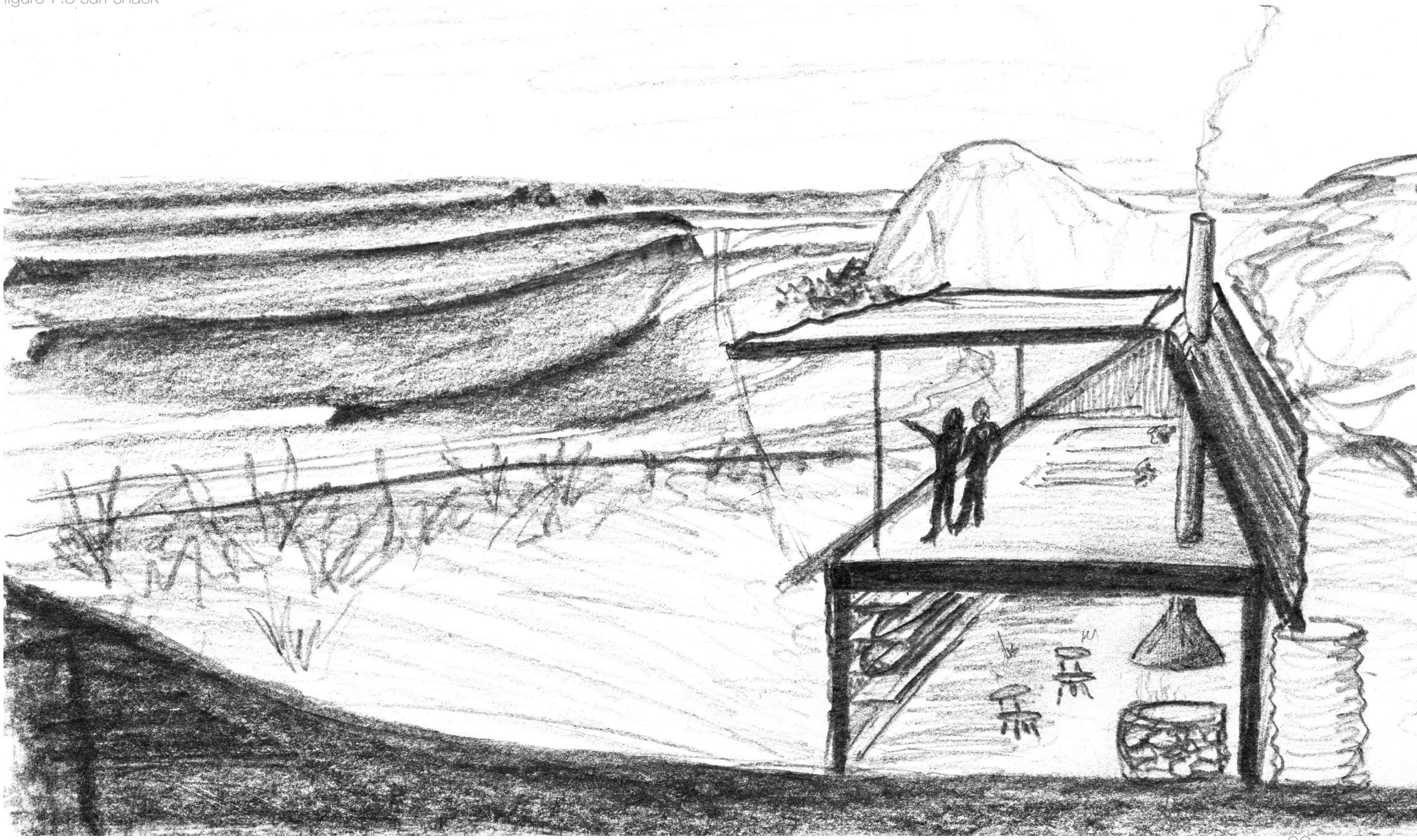
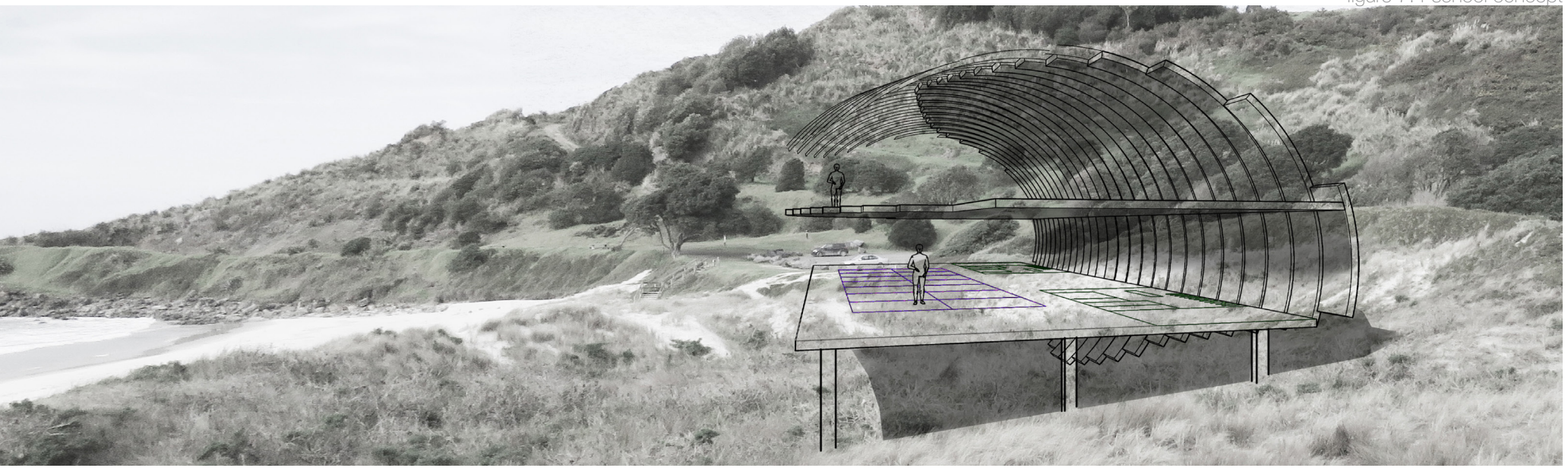
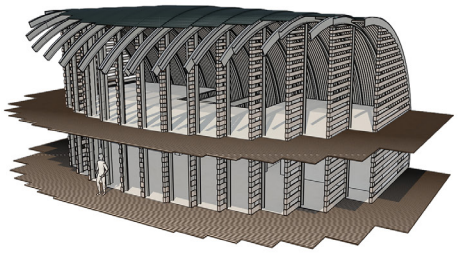
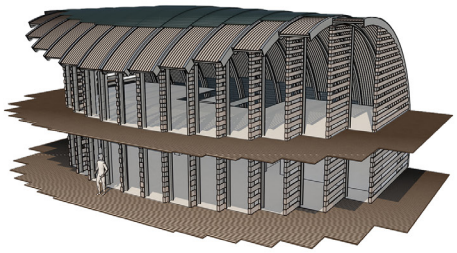


figure 7.4 school concept







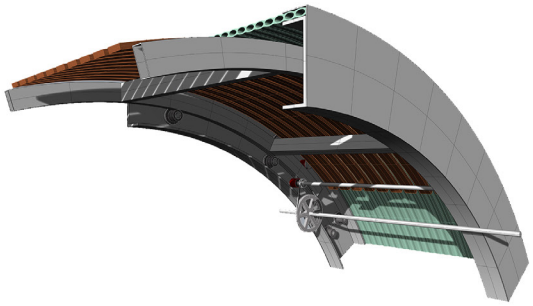
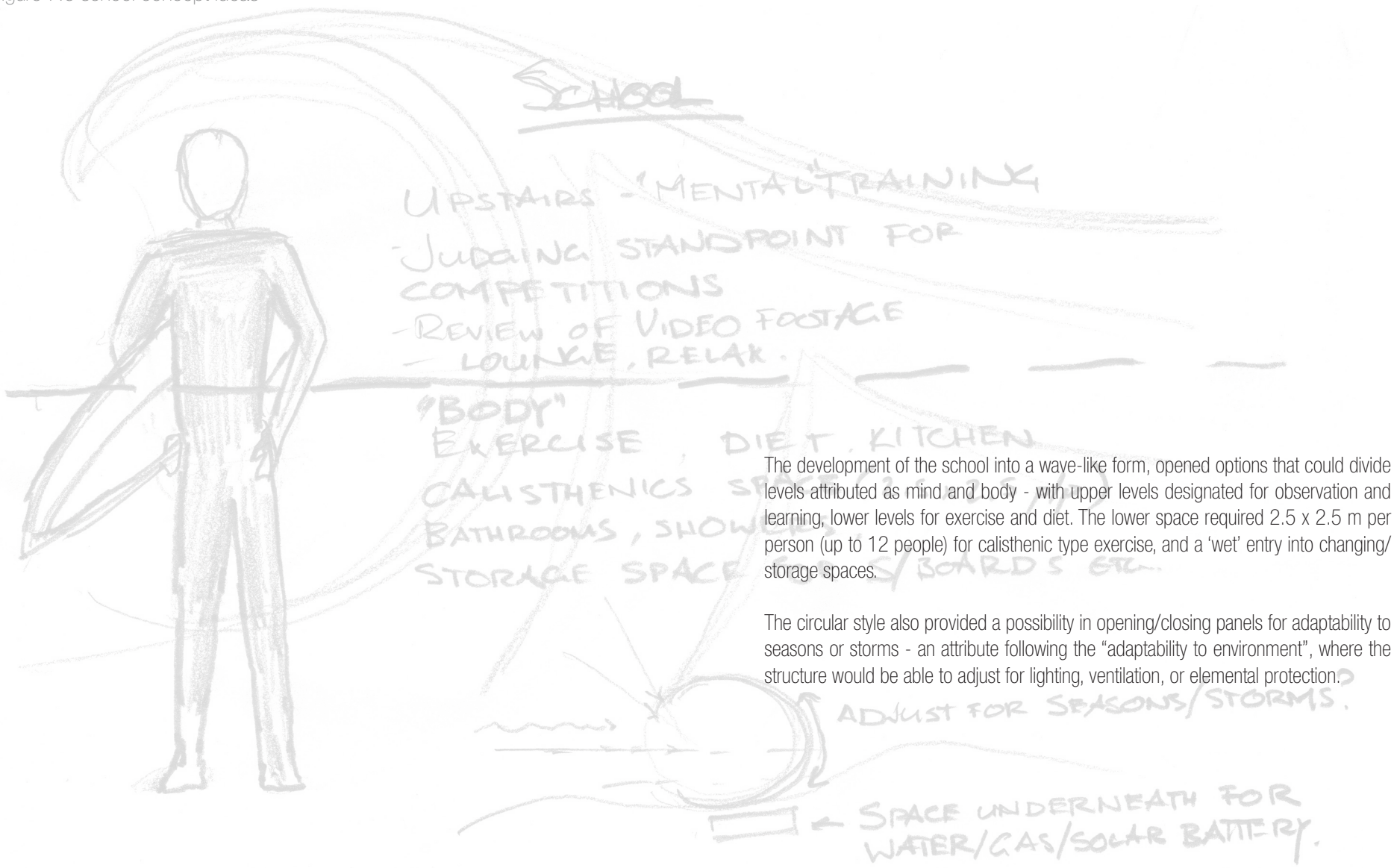


figure 7.5 moving parts

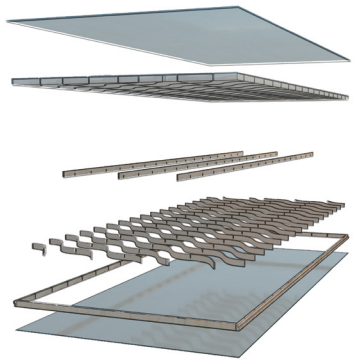
figure 7.6 school concept ideas



The development of the school into a wave-like form, opened options that could divide levels attributed as mind and body - with upper levels designated for observation and learning, lower levels for exercise and diet. The lower space required 2.5 x 2.5 m per person (up to 12 people) for calisthenic type exercise, and a 'wet' entry into changing/ storage spaces.

The circular style also provided a possibility in opening/closing panels for adaptability to seasons or storms - an attribute following the "adaptability to environment", where the structure would be able to adjust for lighting, ventilation, or elemental protection.

figure 7.7 sandwich panel pull-apart



What started as confined and hypothetical concept, took on a wider, holistic, and realistic approach. With the inclusion of 2 more structures comes the challenge of making them cohesive on an aesthetic, functional, and communal level. First attempts focus on functionality, with investigation into linking aesthetics by material similarities. This includes the use of local timber, and proposed reuse of surfboard waste to make insulated prefabricated panels

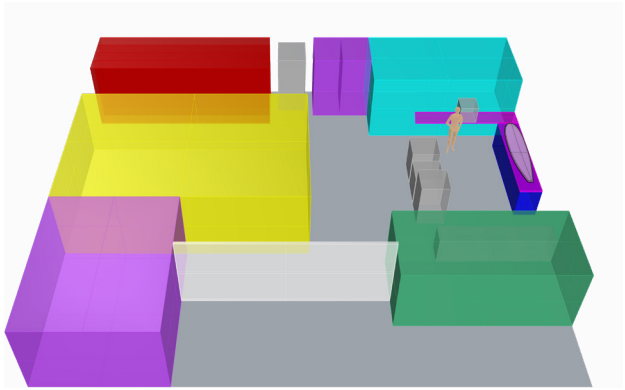


figure 7.8 workshop spacial analysis

figure 7.9 sandwich panel concept

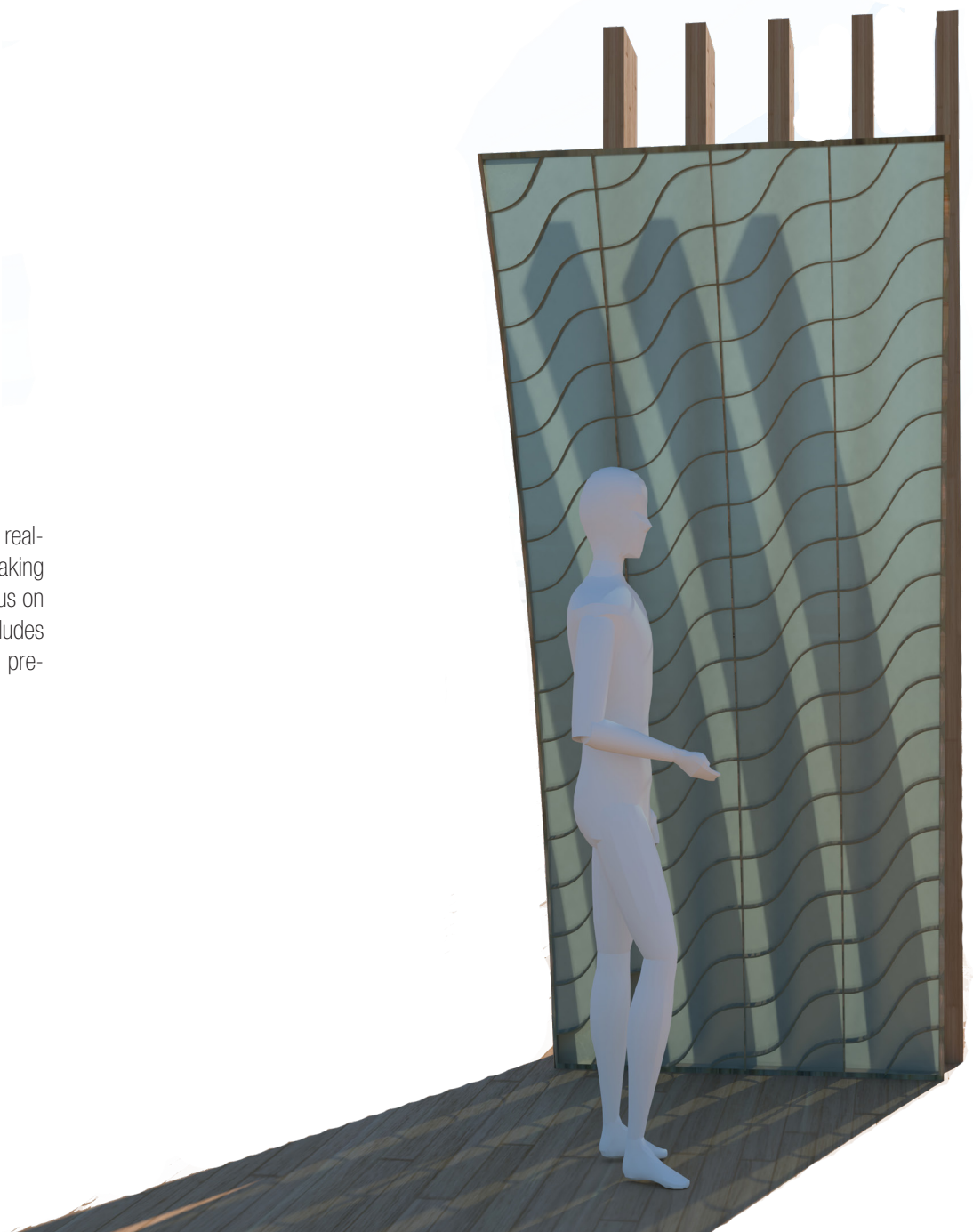


figure 7.10 nursery concept ideas

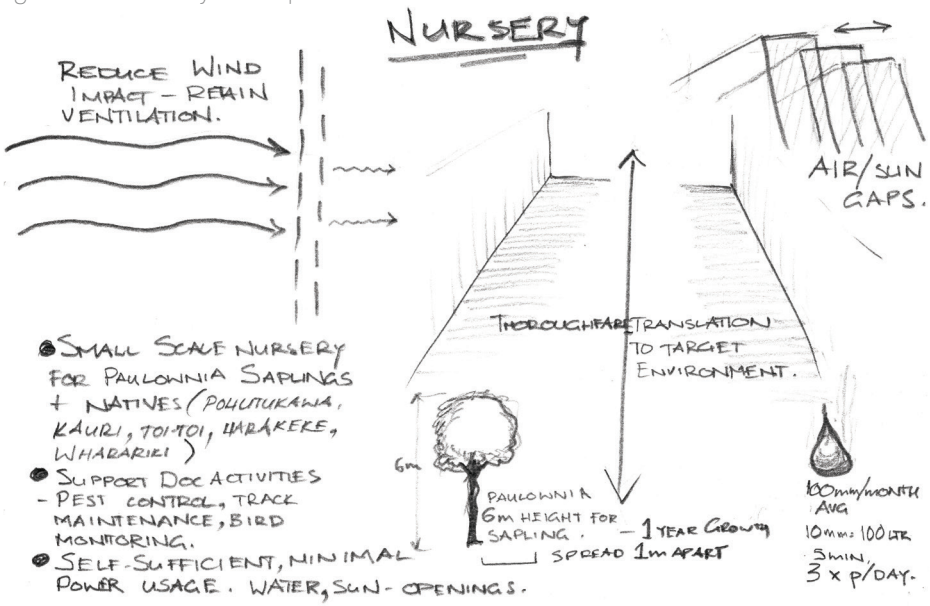
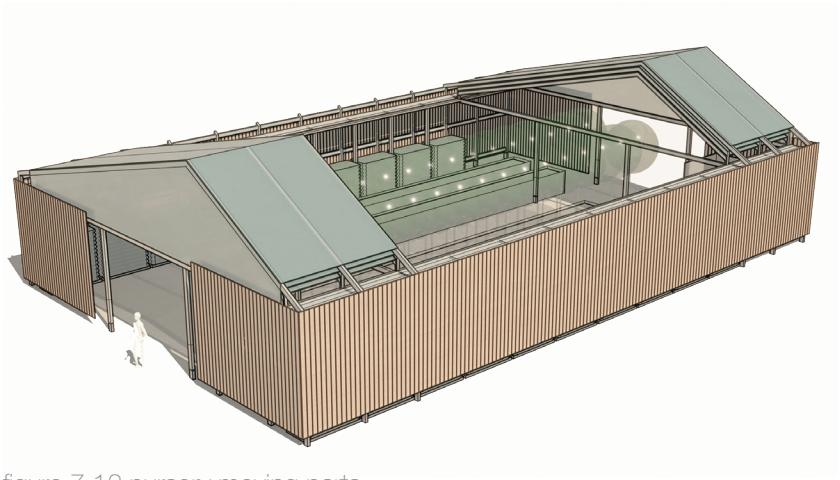


figure 7.11 nursery concept render on photo



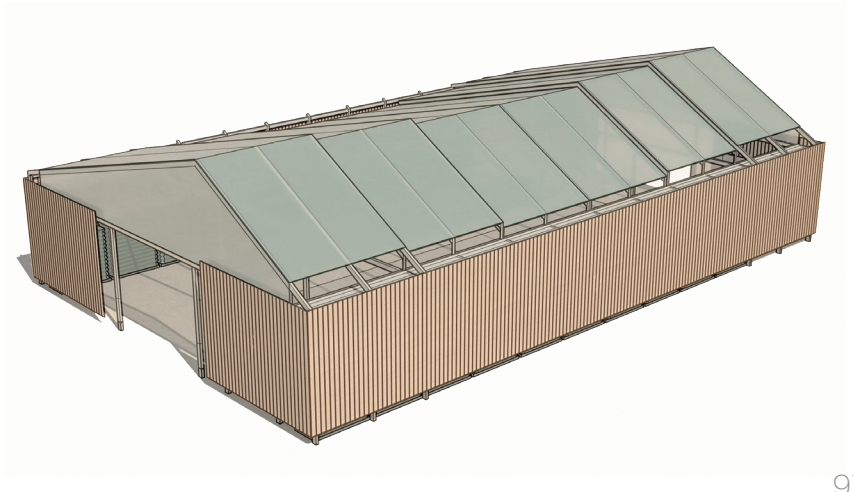


figure 7.12 nursery moving parts

figure 7.13 developed plan

With the original building designs being un-cohesive, a change in method is undertaken. Instead, by viewing the topography as a 'wave', and formulating instinctive 'ride' paths like a surfer would, an opportunity arises for structures that are linked through a journey, and are able to fit to their particular demographics. The resulting forms are similar to the displaced 'spray' patterns which expel from the rail of a surfboard when turned. The directions of the structures use an existing path as a rail but deviate around it, adding dynamic to the route.

The major difference between the three structures, is that the workshop and school are on existing flat ground, and the nursery is proposed to be on a former quarry area which ascends the Point.

The workshop and school by functionality require weather tightness, and a controllable internal environment. Utilising a spaced timber panel canopy above the habitable areas, acts as a sunshade, and 'buffer' for heavy rain and winds. The spacings between timber panels can be angled to allow open light in winter months, and shaded - but ambient light, in summer. Opening wall panels can offer ventilation when required, or adjustment to access views.

The nursery only requires partial shelter from strong winds - as saplings are vulnerable from snapping. Roofing structures will be designed to be long-span, so groundworks go uninhibited. By utilising the quarried 'steps' on the slope, Paulownia saplings can have room to grow, as they reach up to 6metres before being ready to plant. Smaller plants can be placed where height allowances are less. Roofing surfaces can have substantial openings, to allow natural rainfall in, and the surfaces that are used can be directed for excess water collection, and the mounting of solar panels for electricity generation. The electricity generated can be supplied to storage cells in the workshop and school, for their use, which diminishes the structure's environmental impact.

figure 7.14 existing pathways

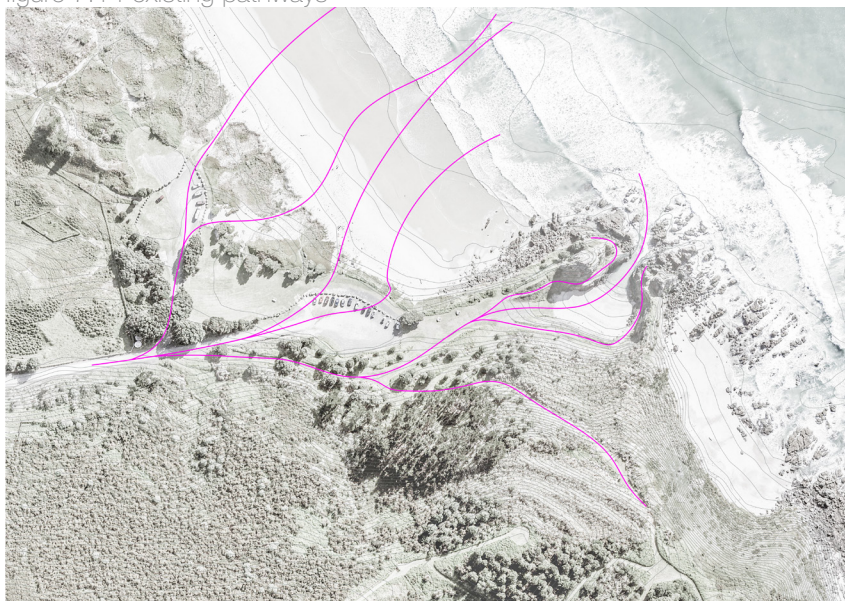


figure 7.15 imagined pathway

figure 7.16 seasonal lighting study

this lighting study tests the fixed positioning of louvres to restrict light in summer months, and allow light in winter months

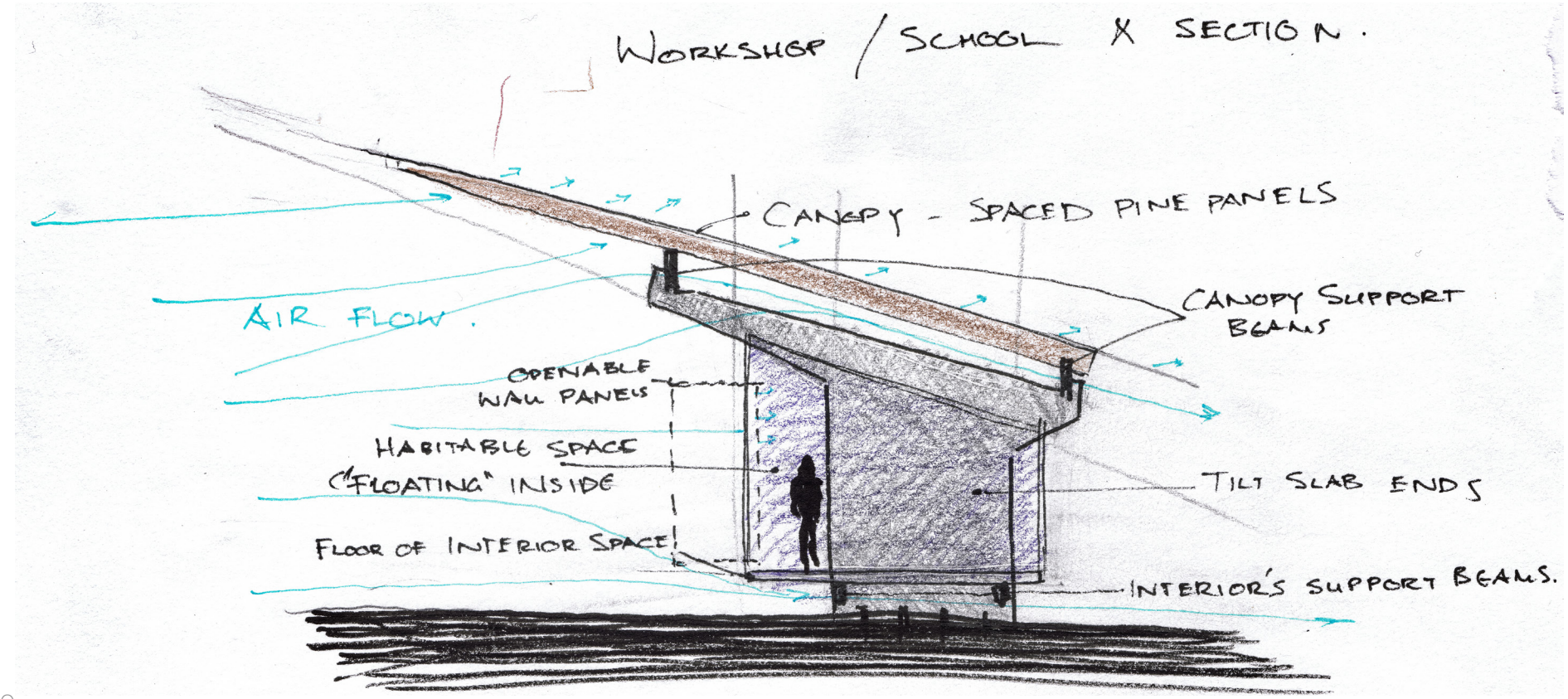


figure 7.17 workshop/school concept ideas

The designs for the school and workshop structures, are based on the forces behind the turning action that a surfer makes. The turns in reality are a manipulation of the body's centre of gravity, in relation to the surfboard and the wave's energy. In these structures, their main mass is elevated slightly off the ground, and supported by concentrated contact to the Earth, like a surfboard that uses its control edges to retain stability. Above the structures bulk, is a canopy that allows a controllable amount of light and weather to pass it, reducing stresses on the forms beneath it. Between the base, and the canopy, are lightweight and functional arrangements, made of steel framing skinned with translucent polycarbonate materials, causing the light within to be ambient, and better suited for workshop detailing. The canopy's supports are independant of the interior spaces, so energies of any physical forces they endure is passed to the Earth, and not felt by the rest of the structure. The forms of these structures are based on the curvature of a breaking wave, something that would be identifiable by a surfer, as something belonging to surfing culture. These forms also are identifiable from positions in the ocean, to which a surfer can align, in order to mark their ideal placement for catching waves.

figure 7.18 workshop/school structural concept models

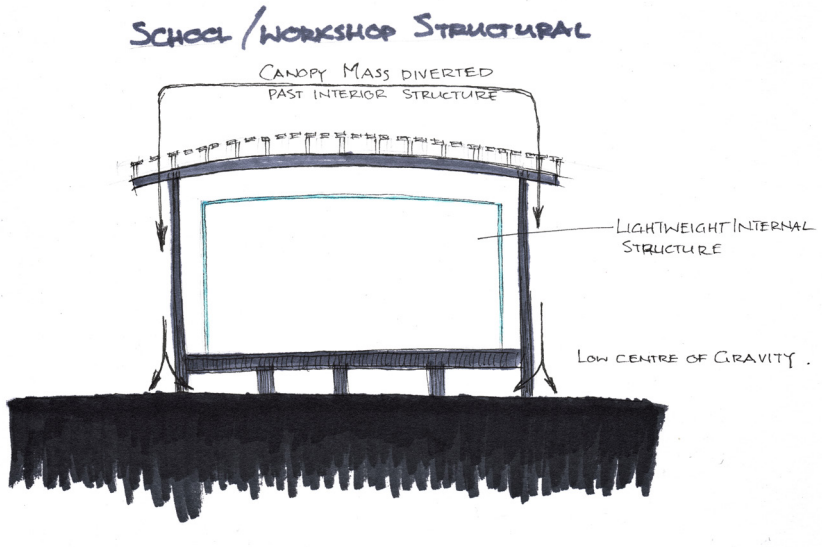


figure 7.19 structural test model - fin system

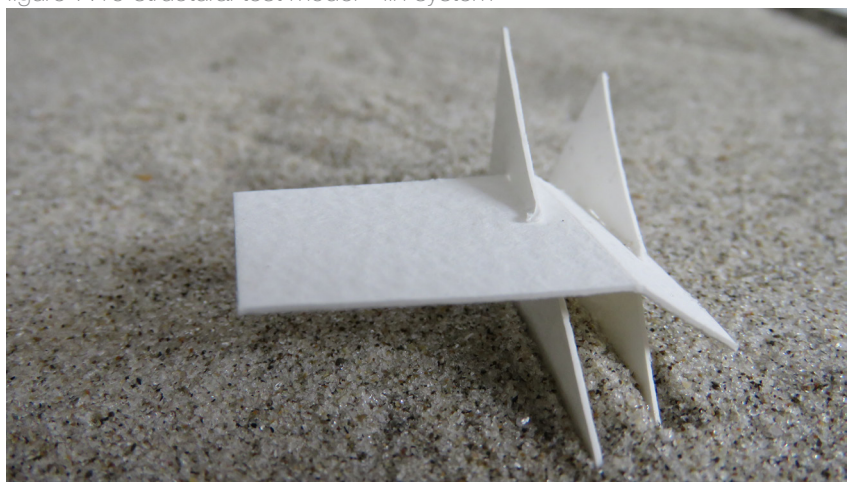


figure 7.20 structural test model - arch

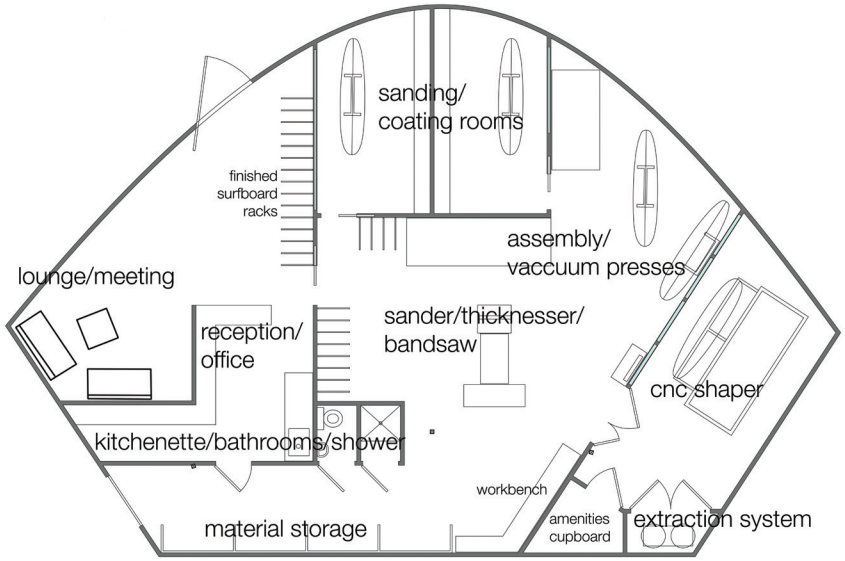


figure 7.21 workshop floor plan

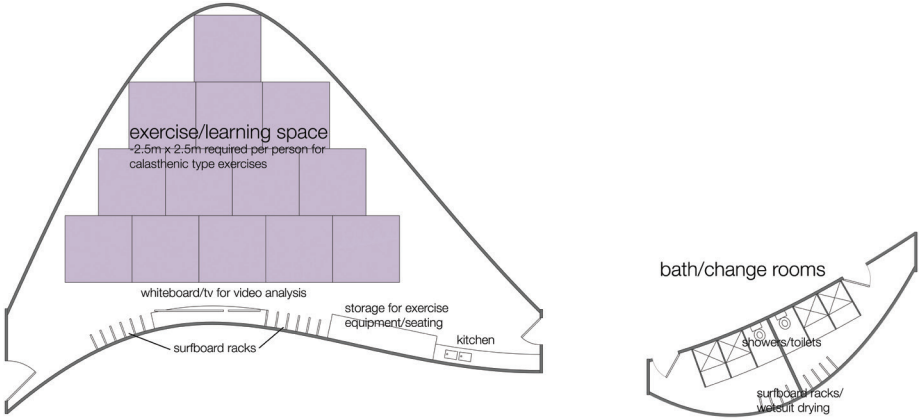


figure 7.22 surf-school floor plan

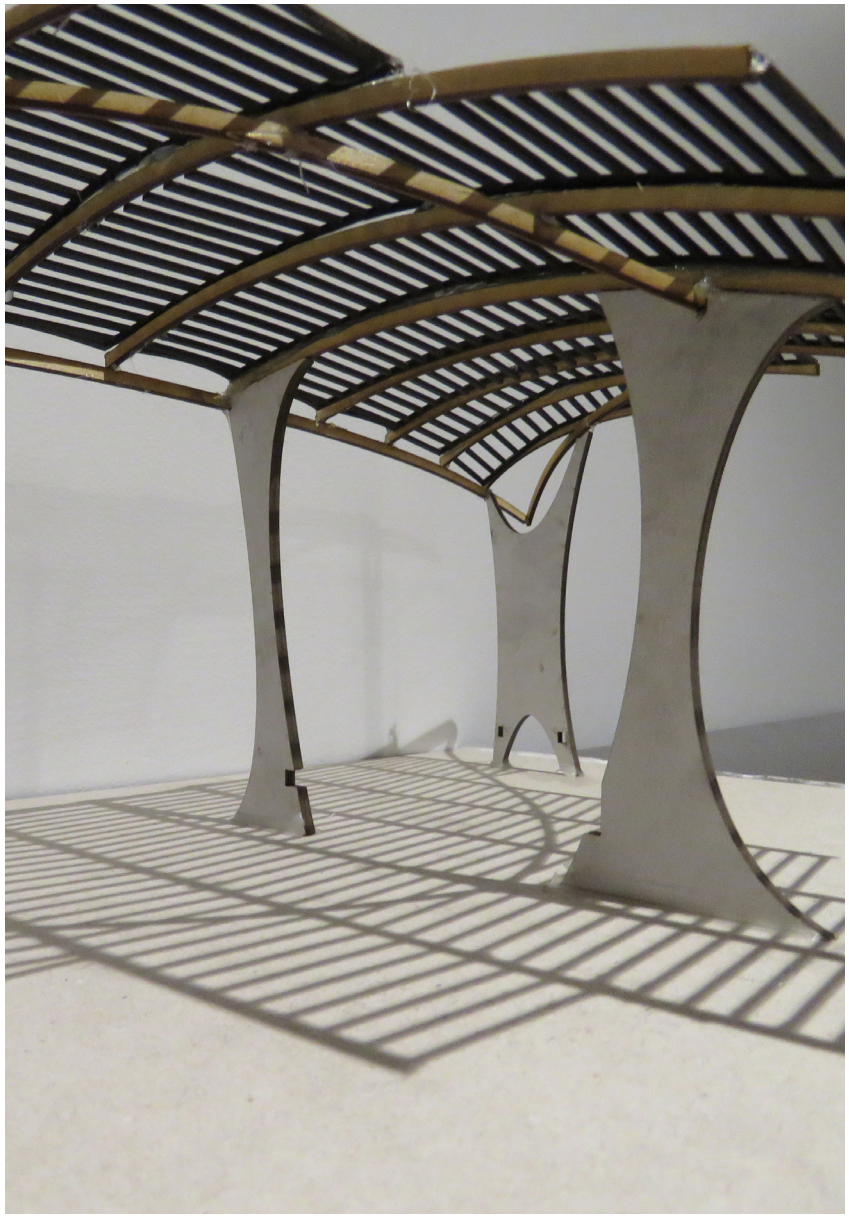
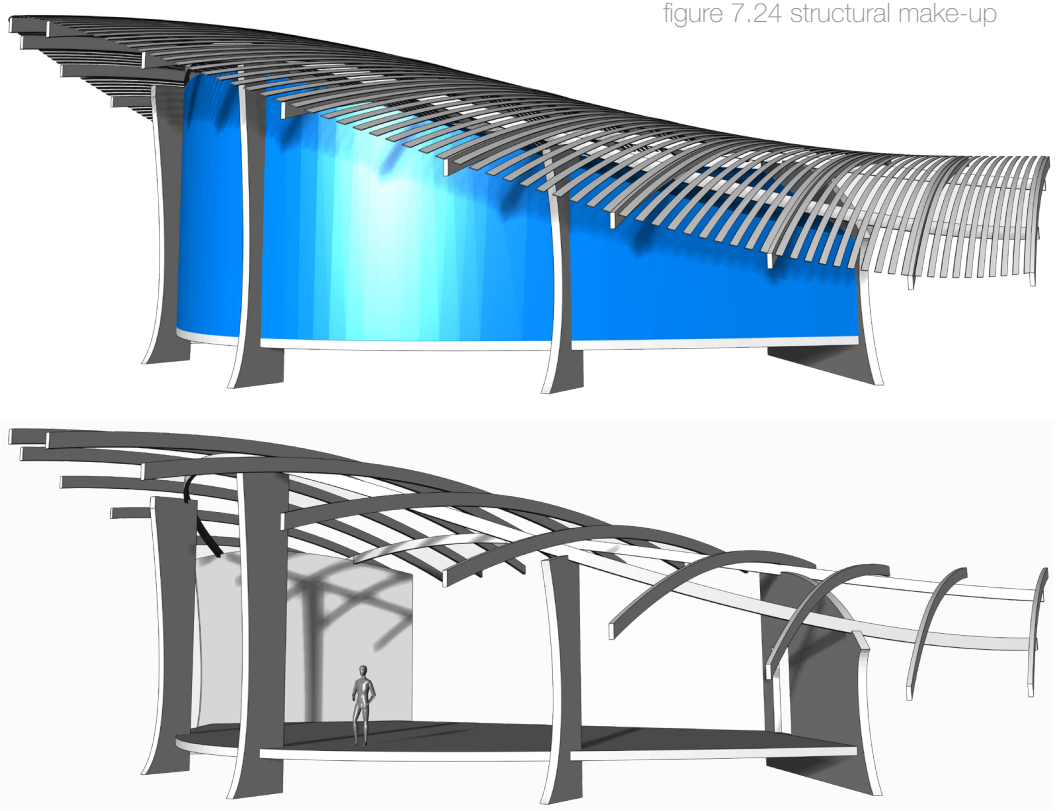


figure 7.23 canopy structural test model

figure 7.24 structural make-up



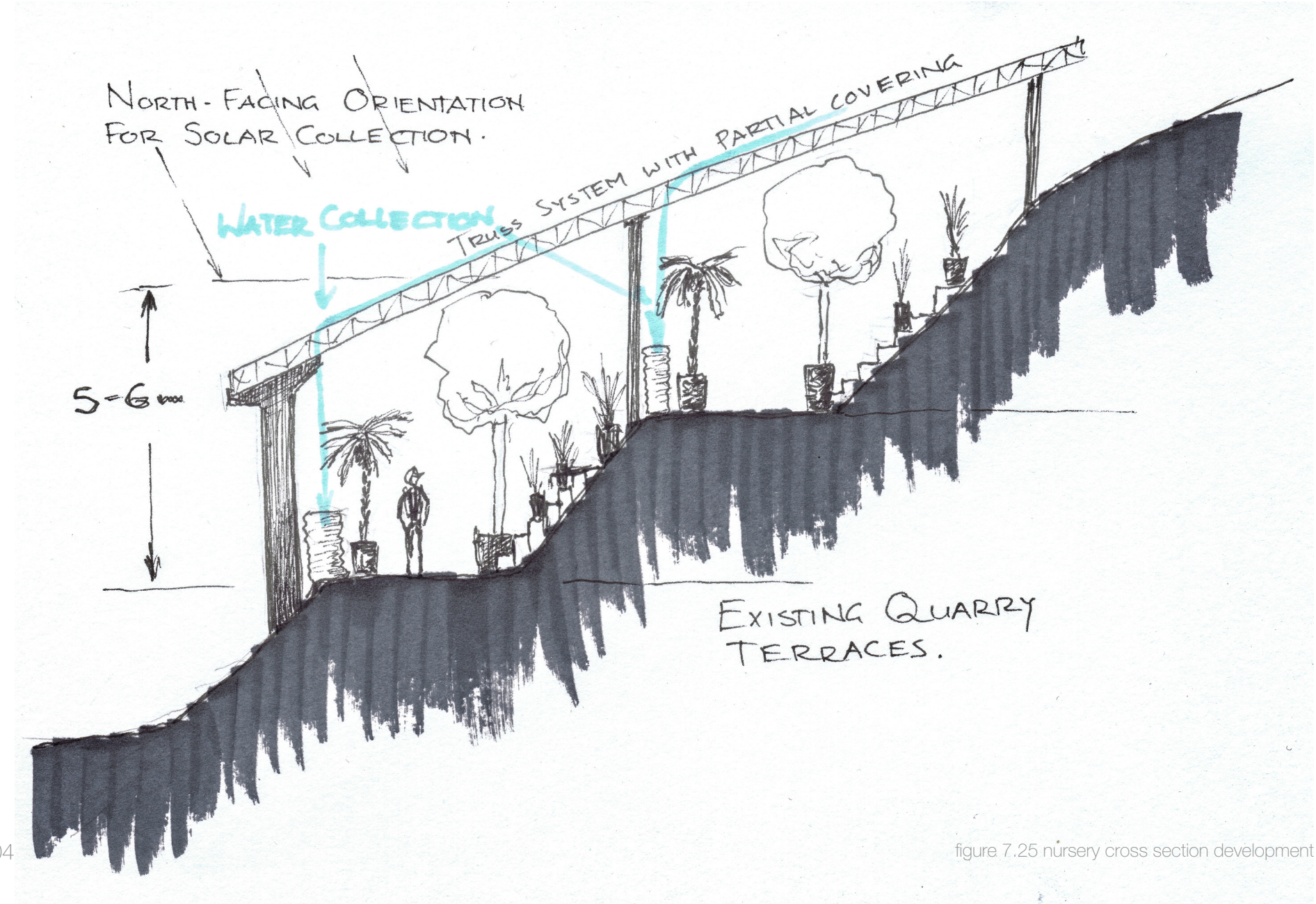


figure 7.25 nursery cross section development

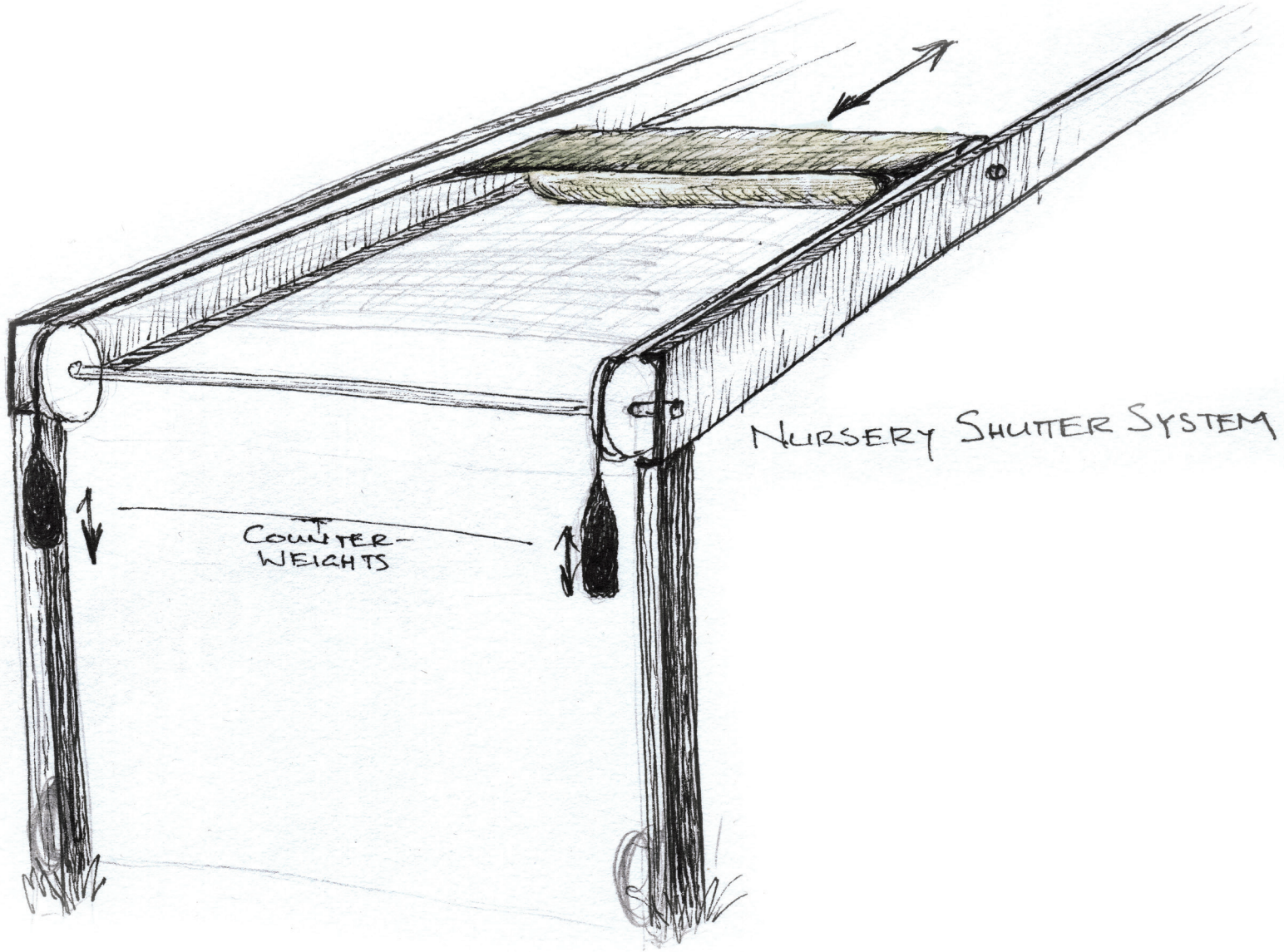


figure 7.26 nursery retractable canopy development

8.0 CONCLUSION

With New Zealand being a nation that has easy access to beaches, a consistent population of surfers is inevitable. As the nation's population grows, relatively, so too does the surfing population, and with surfing's current culture, the likelihood of resulting environmental damage could become obviously noticeable.

Surfers, and surfing culture have already had a significant impact on coastal property values and commercial industry, and these market's ripple effects to surfing have made surfing more of a commodity than a lifestyle. Modern surfing tends more to be a few superficial hours in the ocean - with any knowledge of its heritage, etiquettes, and impacts, made to 'go by the wayside.'

The territorialism that has always been part of surfing's legacy, has changed from being grounded in custodial ownership, to that of financial ownership - a by-product of a globalist economy and mind-set. Surfing is fleeting, and seen by many to be a breeding ground for 'trouble-makers,' but, there is no denying the powerful captivation it holds on surfers, or the physical and mental benefits of partaking in it. It is because of this power, and the ways that this power is being misdirected, that this research project has come to fruition.

This project's motivation is to promote change to the current surfing culture, through actions, education, and products – bound together by a strategy that has a realistic – and needed – structure. With the project's outlook to regenerative restoration of a damaged site – in particular Te Arai Point in Northland, environmentally friendly surfboard production, and reconciliation of harmful dairy industry by-products, comes an ability to be a repeatable strategy in many parts of New Zealand - even internationally. It is no guarantee that this strategy can

change modern surfing culture's desire for toxic materials, or its globalist mindset, but it is at least a viable option that would be accepted by many.
With regards to this project's architectural design, functionally – and realistically, the proposed strategy could operate out of a few 'tin sheds,' but it is an opportunity to engage the playful side of surfing through architectural representation. It is also a way of approaching site engagement in a way that detours from a 'change the land to suit the plan,' – to, 'adapt the plan to suit the land.'

From investigating how balance and manipulation of physical forces forms surfing's foundational actions, rises a questioning that asks that if foundational architectural design principles – such as Vitruvis' Venustas, Firmitas, and Utilitas – are conceptually and logistically balanced, could the resulting architecture be considered successful, or complete?

The potential of this project's strategy is realistic, and to this project's author, is a motivation to support aspects of this strategy – wherever they may be. It is also this author's hope that this strategy will be actioned, and bring change to surfing, before it is *forced* to change.

List of Figures

al-center
6.4 Bi-centennial conservatory interior – web image, www.architectureanddesign.com.au/features/features-articles-bicentennial-conservatory/adelaide
6.5 Bi-centennial conservatory exterior – web image, www.architectureanddesign.com.au/features/features-articles-bicentennial-conservatory/adelaide
6.6 Organic Dynamic Workshop sign - digital photo, by author
6.7 Organic Dynamic Workshop machines – digital photo, Jack Candlish
6.8 Lyall Bay Renovation - digital photo, by author
6.9 Rodeca Polycarbonate Cladding - digital photo, by author
7.1 canopy render and surfboard hut – digital render and sketch, by author
7.2 wave framework – digital render, by author
7.3 surf shack – sketch, by author
7.4 school concept – digital render on photo, by author
7.5 moving parts – digital renders, by author
7.6 school concept ideas – sketch, by author
7.7 sandwich panel pull-apart – digital render, by author
7.8 workshop special analysis – digital render, by author
7.9 sandwich panel concept – digital render, by author
7.10 nursery concept ideas – sketch, by author
7.11 nursery concept – digital render on photo, by author
7.12 nursery moving parts – digital render, by author
7.13 developed plan – digital render on photo, by author
7.14 existing pathways – sketch on digital photo, by author
7.15 imagined pathway – sketch on digital photo, by author
7.16 seasonal lighting study – digital render, by author
7.17 workshop/school cross section concept ideas – sketch, by author
7.18 workshop/school structural concept ideas – sketch, by author
7.19 structural test model fin system – digital photo, by author
7.20 structural test model arch – digital photo, by author
7.21 workshop floor plan – diagram, by author
7.22 surf-school floor plan – diagram, by author
7.23 canopy structural test model – digital photo, by author
7.24 structural make-up – digital render, by author
7.25 nursery cross section development - sketch, by author
7.26 nursery retractable canopy development - sketch, by author

Bibliography

Note: much of the information in this project is intertwined with the roughly 30 years of surfing experience and observations accumulated by the author…

Ardley, Robert. *The Territorial Imperative: A Personal Inquiry into the Animal Origins of Property and Nations*. New York : Atheneum, 1966.

Best, Elsdon. *Games and Pastimes of the Maori*. Wellington, New Zealand: A. R. Shearer, 1976.

Black, Kerry and Mead, Richard. "Predicting the Breaking Intensity of Surfing Waves," *Journal of Coastal Research* 29 (2001). Accessed April 13, 2020. https://www.jstor.org/stable/25736205

Bustin' Down the Door. DVD. Directed by Jeremy Gosch. Los Angeles: Screen Media Films, 2008.

Couldwell, Andrew. "History of the surfboard." *COTW*, April 11, 2006. Accessed June 18, 2020. https://clubofthewaves.com/feature/history-of-the-surfboard/

De Alessi, Michael. "The Customs and Culture of Surfing, and an Opportunity for a New Territorialism?". Last modified January 2009. https://s3.amazonaws.com/academia.edu.cocuments/46454436/The_Customs_and_Culture_of_Surfing.

Dictionary.com. "centripetal force." Accessed September 10, 2020. https://www.dictionary.com/browse/centripetal-force

Dictionary.com. "culture." Accessed April 13, 2020. https://www.dictionary.com/browse/culture?s=t

Dictionary.com. "gravity." Accessed September 10, 2020. https://www.dictionary.com/browse/gravity?s=t

Dictionary.com. "inertia." Accessed September 10, 2020. https://www.dictionary.com/browse/inertia?s=t

Emmons, Paul, Jane Lomholt, and John Shannon Hendrix. *The Cultural Role of Architecture: Contemporary and Historical Perspectives*. London: Taylor & Francis Group, 2012.

Graham, George. "Te Toka-Tu-Whenua. A Relic of the Ancient Waiohua of Tamaki," *Journal of The Polynesian Society* 34, no. 134 (1925): 3. http://tearai.kete.net.nz/site/documents/show/22-te-toka-tu-whenua

Hutchinson, Thomas J. *Ten Years' wanderings among the Eghiopians – with sketches of the manners and customs of the civilized and uncivilized tribes, from Senegal to Gaboon*. London: Hurst and Blackett, 1861. https://openlibrary.org/books/0L7203893M/Ten_years'_wanderings-among_the _Ethiopians

Lopez, Matias. "South American Surf History – On Top of the Wave." *legendarysurfers.com*, January, 2011. Accessed April 13, 2020, http://www.legendarysurfers.com/2011/01/south-american-surf-history.html

Melekian, Brad. "Rough Justice." *Outsider Magazine*, November, 2008. Accessed April 14, 2020. http://outsideoline.com/outside/culture/200811/surfing-hawaii-1.html

Neill, Kate. Nelson, Wendy. "Beautiful Browns – a guide to the large brown seaweeds of New Zealand." *Stunning Seaweeds*, version 1 (2016). https://niwa.co.nz/static/web/MarineidentificationGuidesandFactsheets/Beautiful_Browns_Ver1-2016-NIWA.pdf

Newton, Isaac. *Principia Mathematica* : 2nd Edition. London : Oxford University Press, 1965.

NZ Wood. "Paulownia." Accessed August 4, 2020. www.nzwood.co.nz/forestry-2/paulownia/

rpbw.com, “Jean-Marie Tjibaou Cultural Center.” Accessed September 14, 2020. www.rpbw.com/project/jean-marie-tjibao-cultural-center

Schilling, Philip S. “History of Surfing/Sports and Recreation”, accessed March 19, 2020, https://www.centralhome.com/Surfing-History.htm

Seafriends.org.nz. “Mining the Sea Sand.” Accessed February 26, 2020. http://www.seafriends.org.nz/oceano/seasand.htm

“*Splinters*.” Amazon Video. Directed by Adam Pesce. Los Angeles: Adam Pesce 2011
Stephenson, Sharon. “House of the week: Converted Wellington Cinema.” Stuff.co.nz (Blog). February 1, 2017. https://wwwlstuff.co.nz/life-style/home-property/house-of-the-week/88940333/house-of-the-week-converted-wellington-cinema

Surfertoday.com. “How Many Surfers are there in the World?” Accessed May 2, 2020. http://www.surfertoday.com/how-many-surfers-are-there-in-the-world#

Surfertoday.com. “How to Mind Surf.” Accessed May 15, 2020. http://www.surfertoday.com/surfing/how-to-mind-surf

Surf-Forecast.com. “Te Arai Point Water Temperature and Wetsuit Guide,” accessed August 12, 2020. https://www.surf-forecast.com/breaks/Te-Arai-Point/seatemp#

“Surfing the Eco-design Wave – Jack Candlish-TEDxWellington,” filmed June 27, 2017, YouTube Video, 9:41, posted by “TEDx Talks,” June 2017, https://www.youtube.com/watch?v=DAAfxp2NXMM.

Surfing-waves.com. “Surfing Etiquettes.” Accessed May 2, 2020. http://www.surfing-vaves.com/surfing-etiquette.htm

Tanner, Vanessa. “Statement of Evidence of Vanessa Tanner on behalf of Auckland Regional Council”, accessed February 26, 2020, http://tearai.kete.net.nz/documents/0000/0000/0041/V.Tanner_Archaeologist.pdf

Thornton, Jocelyn. *The Reed Field Guide to New Zealand Geology*. Auckland, New Zealand: Reed Publishing, 2000.

Visit Wellsford. “Explore Te Arai”, visitwellsford.co.nz, accessed June 12, 2020, https://www.visitwellsford.co.nz/explore/te-arai

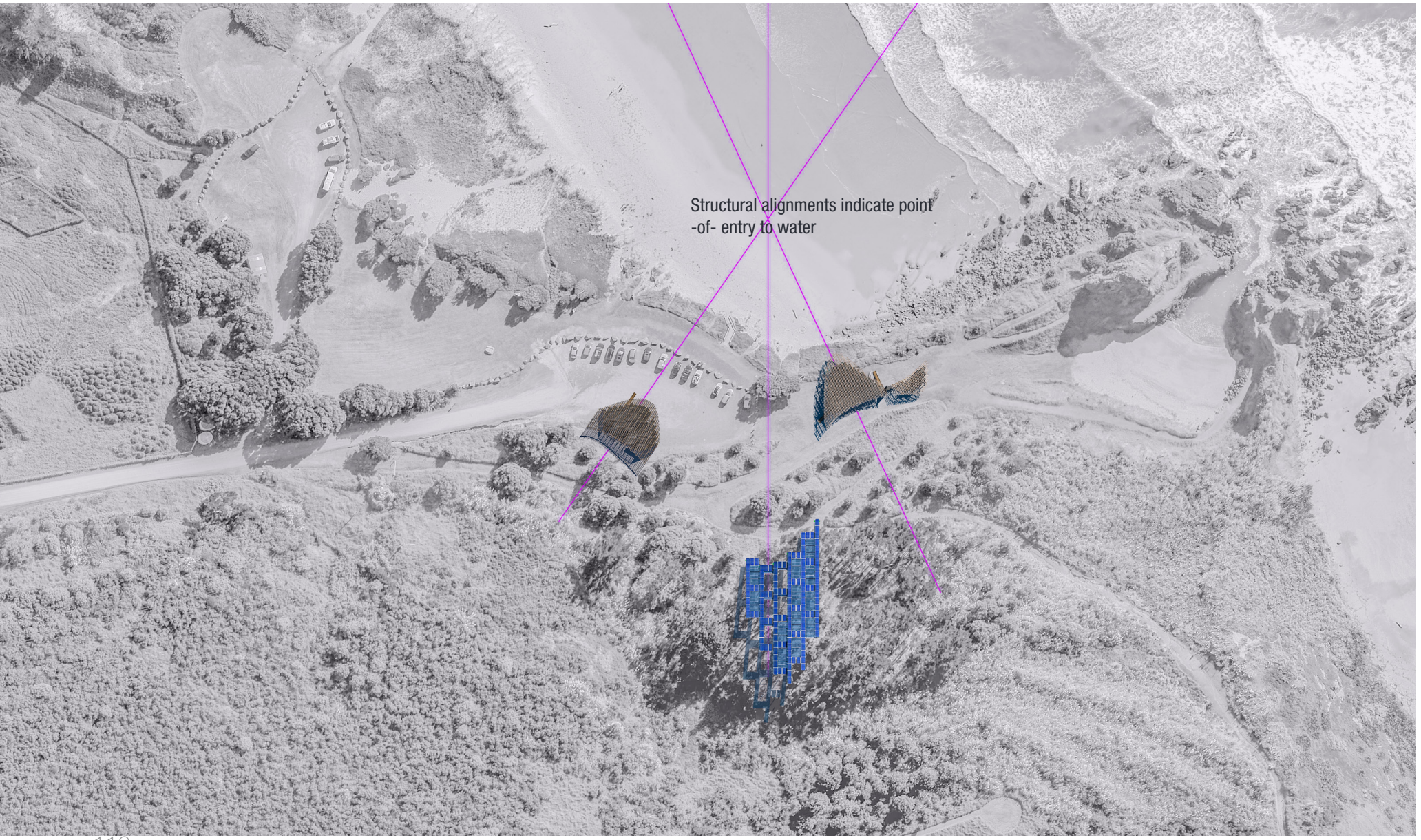
Wheeler, Tone. “AAA looks at the Bicentennial Conservatory,” *Architecture and Design*, October 10, 2019, accessed September 30, 2020, https://www.architectureanddesign.com.au/features/features-articles/bicentennial-conservatory-adelaide

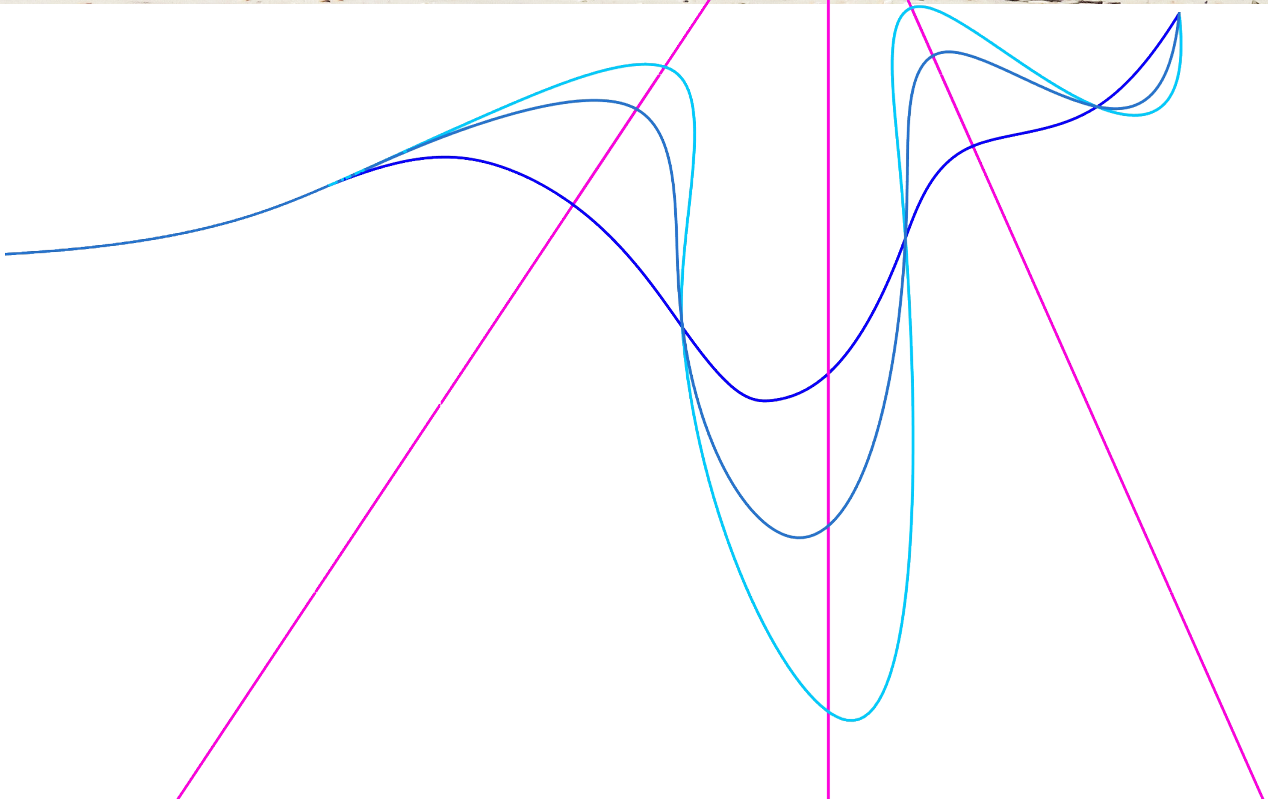
Wild, Christine, “Te Arai Dune Lands,” New Zealand Herald, 2013. Accessed February 26, 2020, http://media.nzherald.co.nz/webcontent/document/pdf/201343/Te_Arai_Chris_Wild.pdf

Winton, Tim. *Breath*, Australia: Penguin Group, 2008.

World Weather Online. “Te Arai Monthly Climate Averages,” accessed August 12, 2020. https://www.worldweatheronline.com/te-arai-weather-averages/nz.aspx

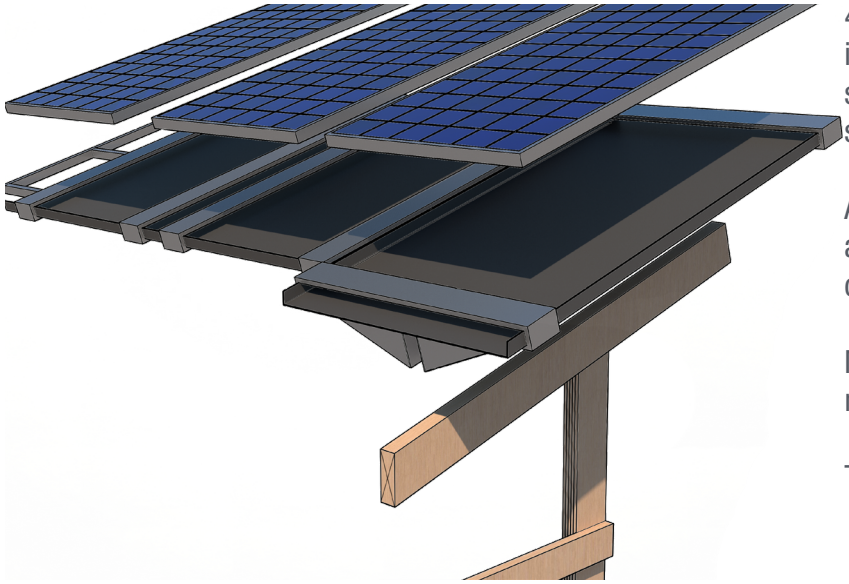
FINAL DESIGN


Structural alignments indicate point
-of- entry to water



Site Arrangement

Plant nursery



450 watt solar cells with direct inversion to 230 mains voltage, supplies energy to workshop and school

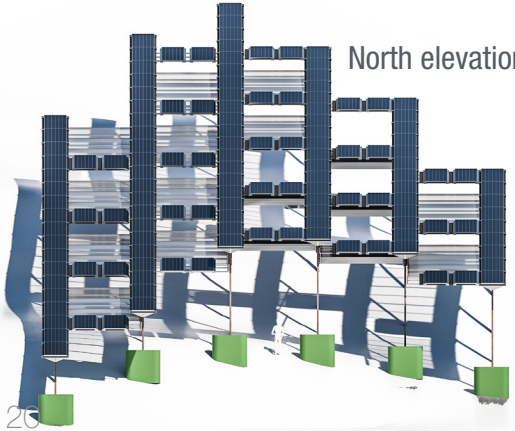
Aluminium framing and anodised aluminium guttering for rain water collection

Marine grade stainless steel mounting brackets

Treated LVL timber framing

Retractable polycarbonate screens for high wind protection.

North elevation



West elevation


AOTEAROA
MFP616
HYB794
BWJ539

Surfboard Workshop


Verdure

Paulownia ‘slats’, angled at 38deg for minimum sun angle

Treated, engineered timber canopy frames

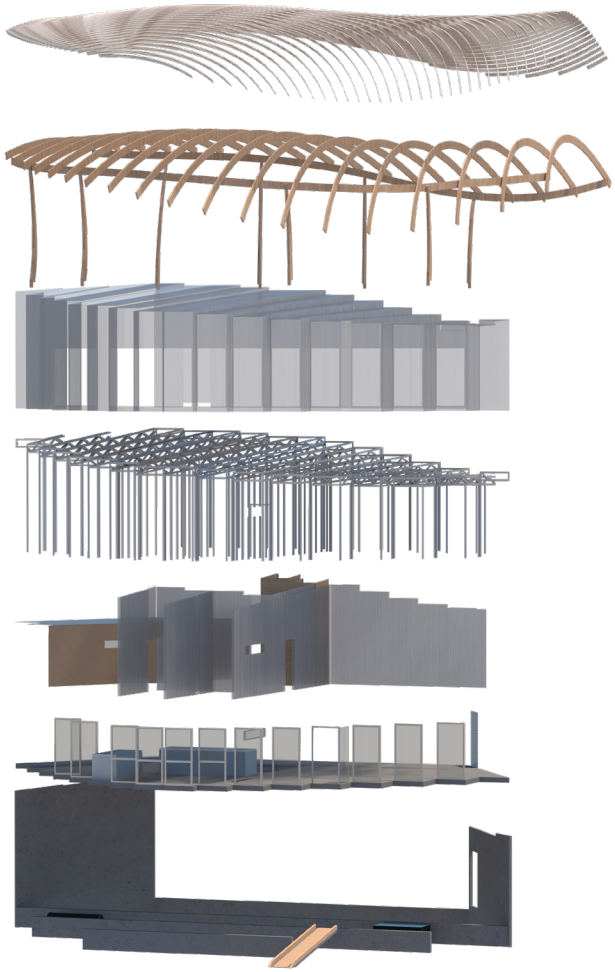
Translucent polycarbonate weatherskin for interior structure

Aluminium internal framework

Translucent polycarbonate, and plywood walls for interior spaces

Aluminium joinery, glazing, and precast concrete slab flooring

Precast concrete slab uprights, spaces underneath flooring for freestanding water and septic tanks

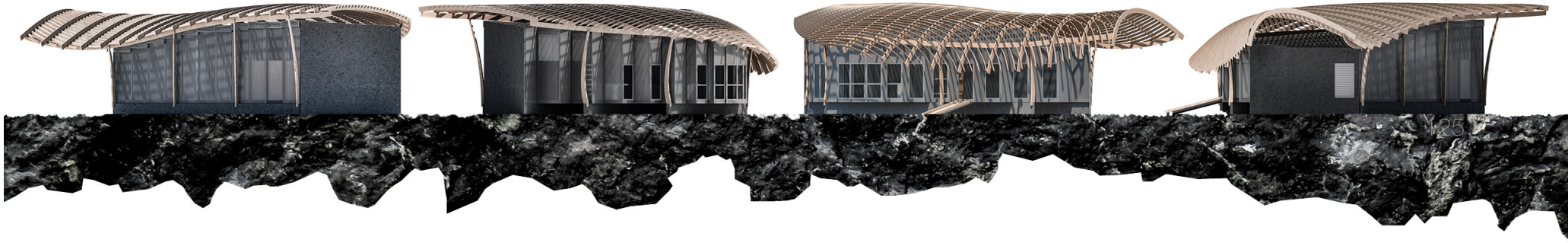


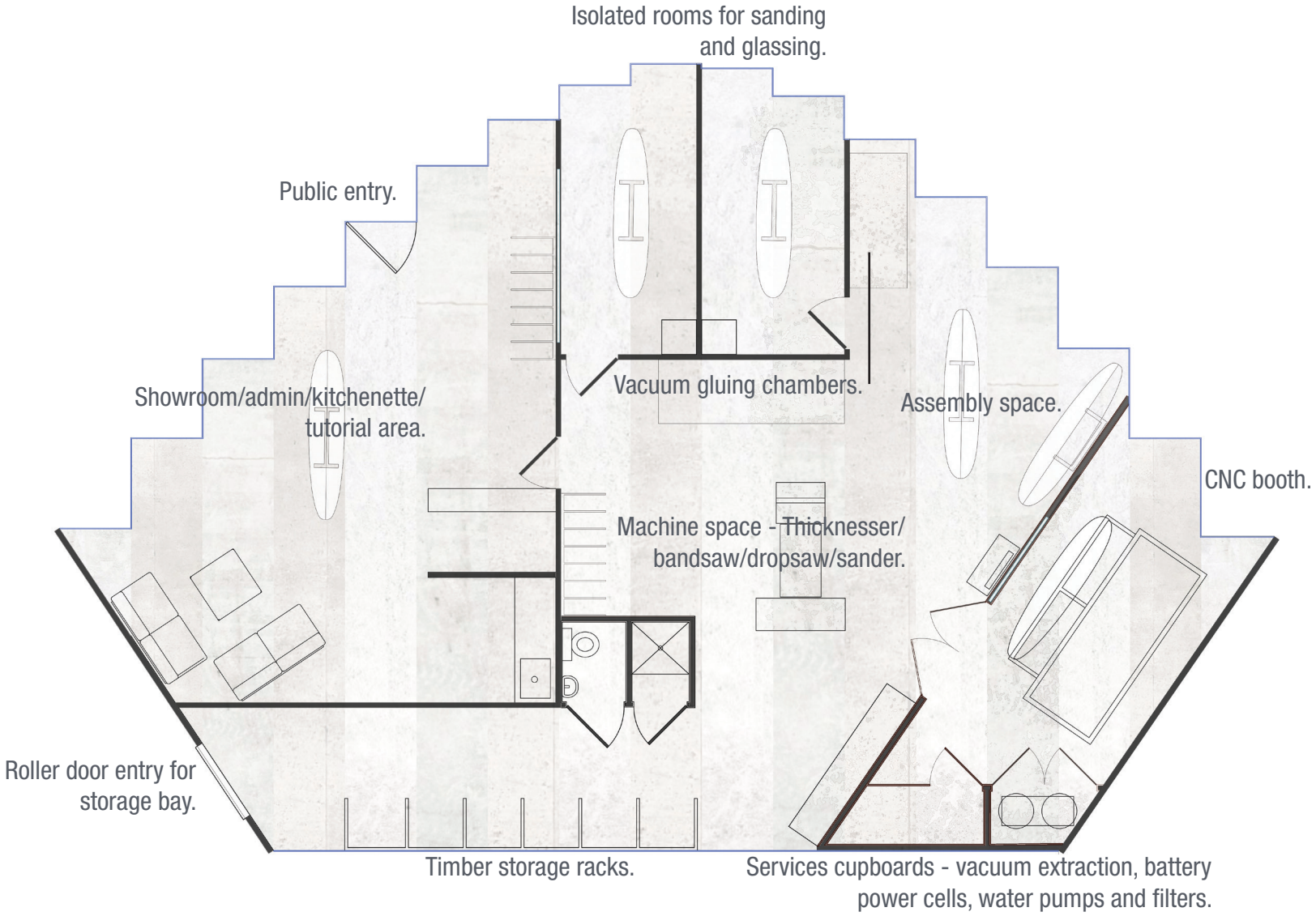
South elevation

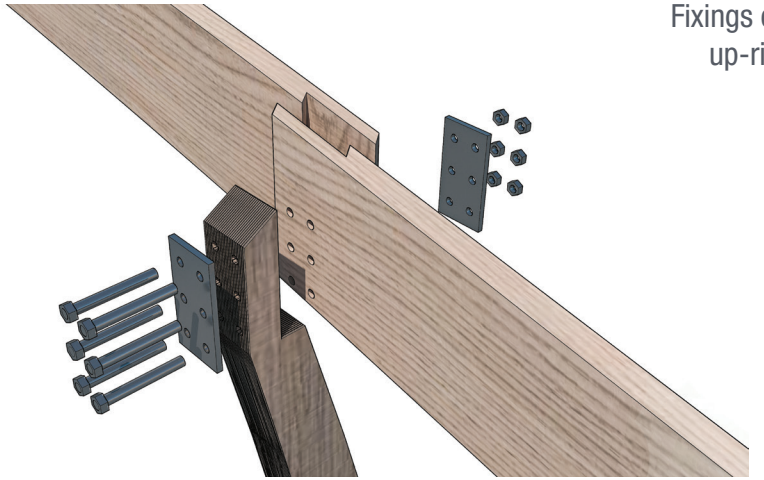
East elevation

North elevation

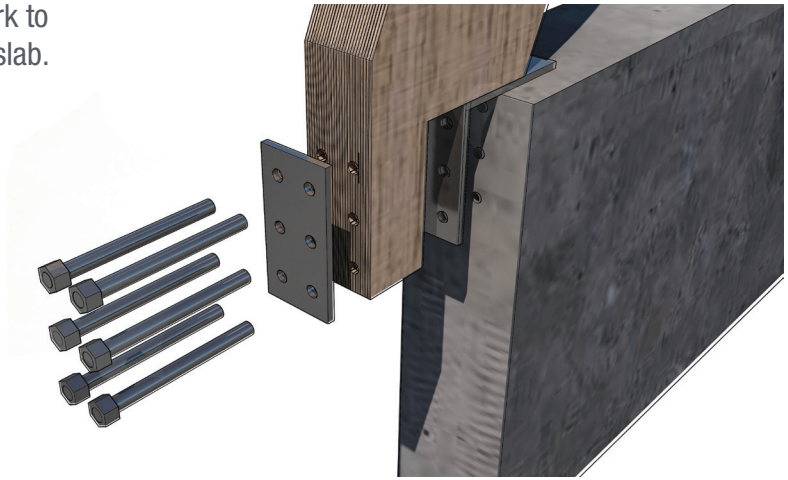
West elevation



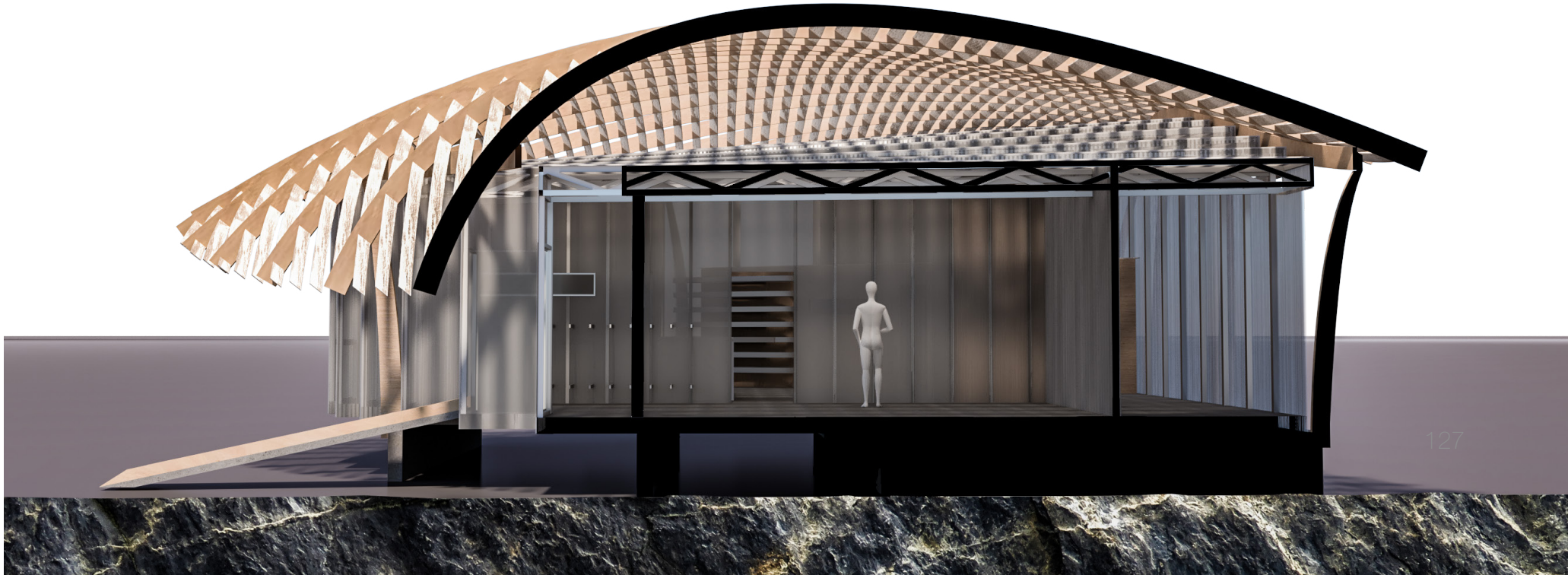

Isolated rooms for sanding
and glassing.
Public entry.
Showroom/admin/kitchenette/
tutorial area.
Vacuum gluing chambers.
Assembly space.
CNC booth.
Machine space - Thicknesser/
bandsaw/dropsaw/sander.
Roller door entry for
storage bay.
Timber storage racks.
Services cupboards - vacuum extraction, battery
power cells, water pumps and filters.

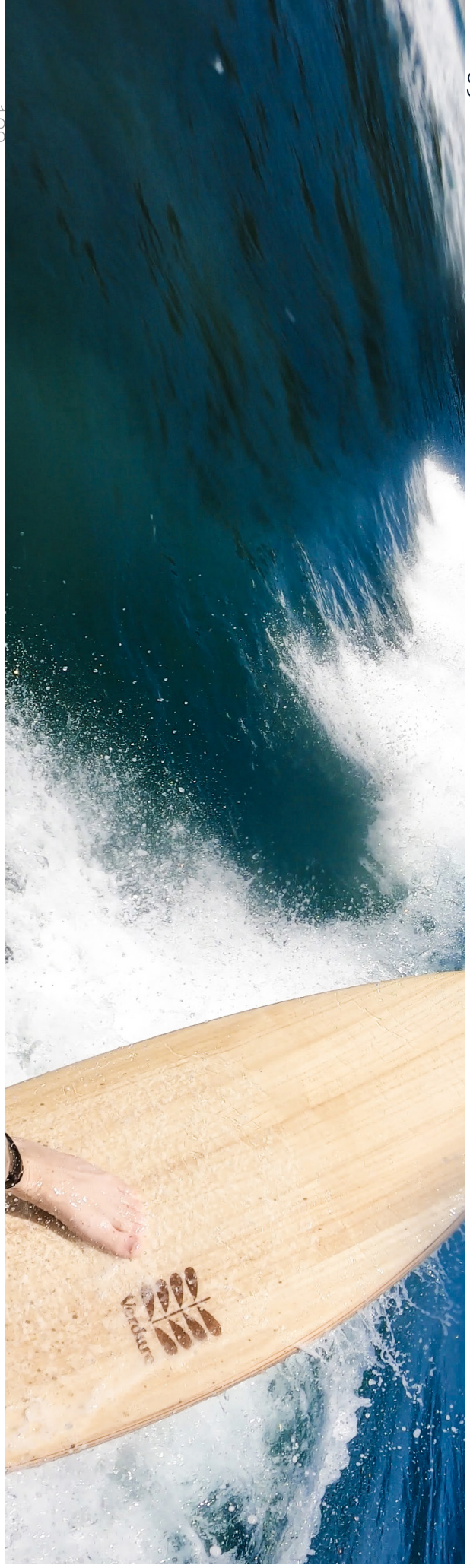


Fixings of canopy framework to up-rights and concrete slab.



The canopy structure of the surfboard factory and surf-school take influence from the construction of a surfboard, which has a protective shell on the outside, and a lightweight interior for it's form.




Verdura

Paulownia ‘slats’, angled at 38deg for minimum sun angle

Treated, engineered timber canopy frames

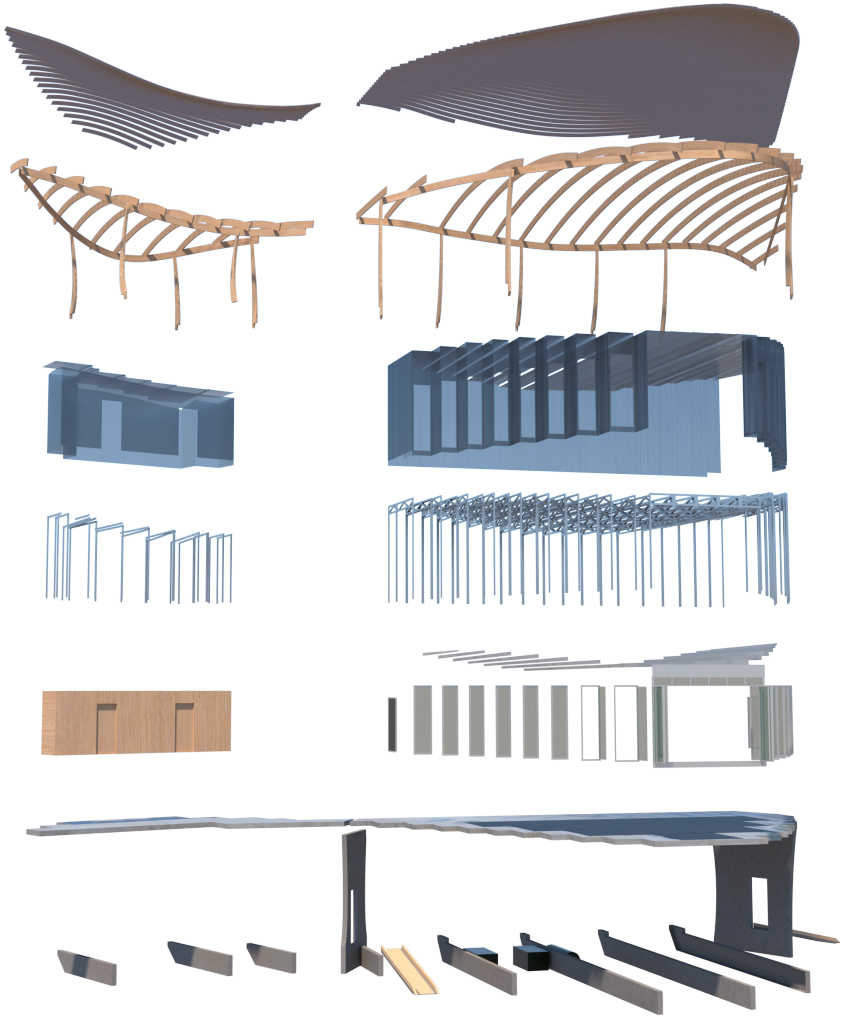
Translucent polycarbonate weatherskin for interior structure

Aluminium internal framework

Translucent polycarbonate, and plywood walls for interior spaces

Aluminium joinery, glazing, and precast concrete slab flooring

Precast concrete slab uprights, spaces underneath flooring for freestanding water and septic tanks

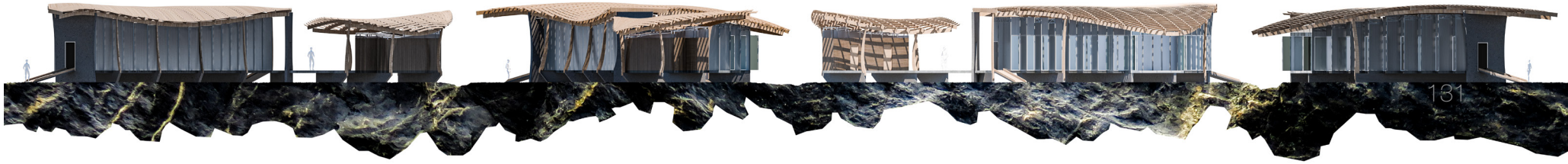


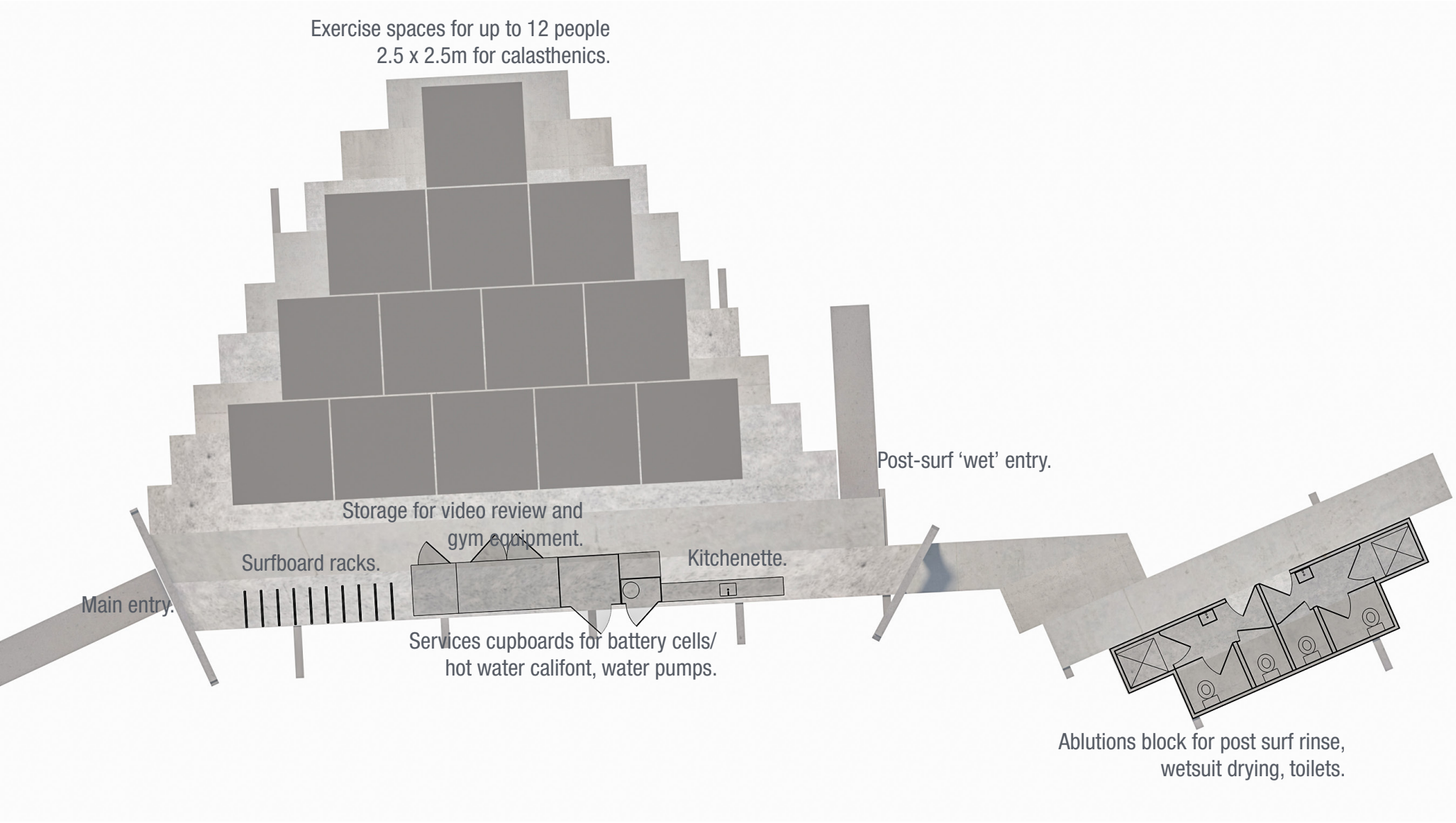
South elevation

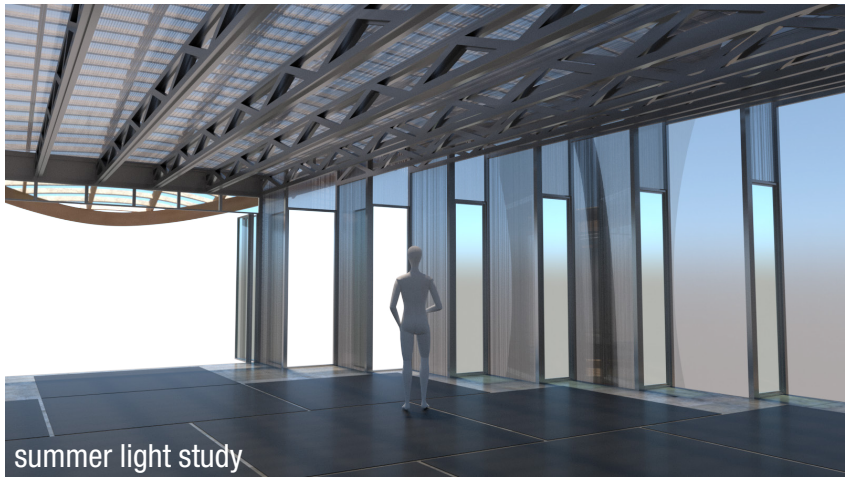
East elevation

North elevation

West elevation



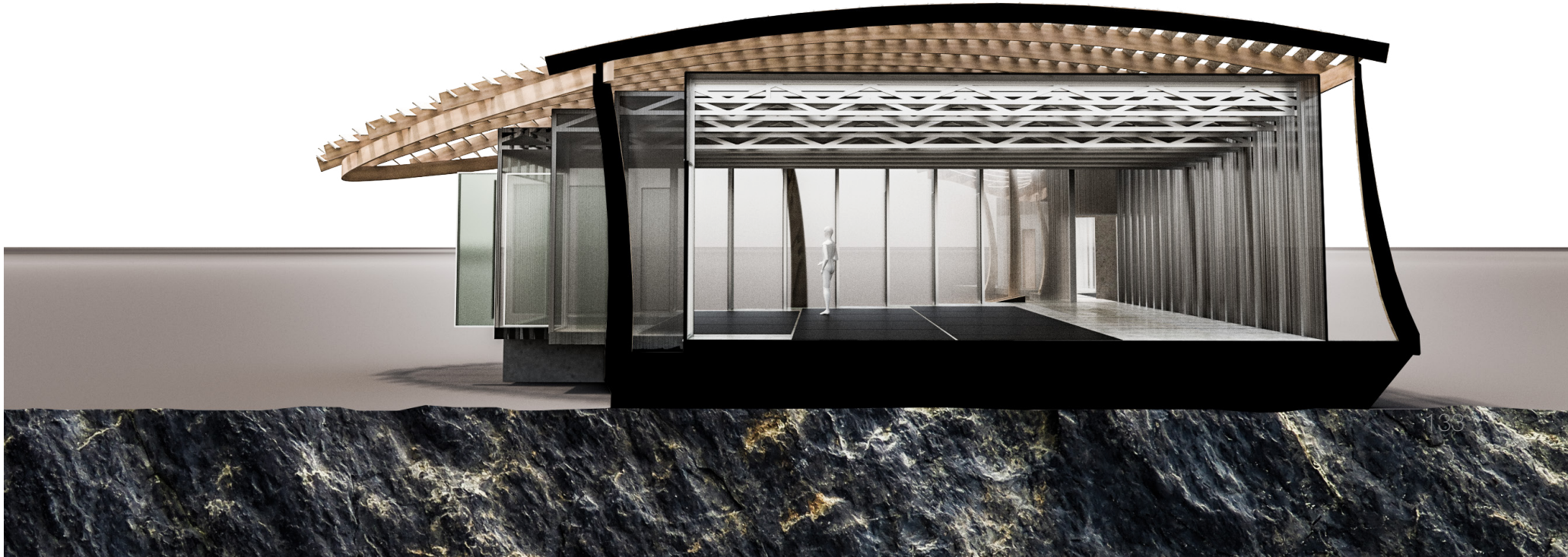

Exercise spaces for up to 12 people
2.5 x 2.5m for calasthenics.
Post-surf ‘wet’ entry.
Storage for video review and
gym equipment.
Surfboard racks.
Kitchenette.
Main entry.
Services cupboards for battery cells/
hot water califont, water pumps.
Ablutions block for post surf rinse,
wetsuit drying, toilets.



summer light study

winter light study

The combination of the canopy's pitched louvres, and the translucent polycarbonate weatherskin, create an interior with a consistent ambient light level which is passively controlled in all seasons.



Final Presentation