

## ABSTRACT

Title of Thesis: SUSTAINABLE ISLAND WATER CULTURE:  
COLLECT, PROTECT, RESPECT

Justin Agustin Manongdo, Master of  
Architecture, 2016

Thesis Directed By: Associate Professor, Madlen Simon, and School  
of Architecture, Planning and Preservation

As fresh water globally declines, our local communities are affected. This phenomenon is particularly acute in the islands of Hawai'i. The Hawaiians have a concept called *Ahupua'a*, which refers to the traditional land division system in Hawai'i. The goal of the research is to see how we can re-imagine island water culture to reintroduce authentic principles of the *Ahupua'a* to make modern developments sustainable. By addressing and understanding the experience, value of water, and history of its context, architecture can better be used as a tool for collecting, protecting and respecting water to create a deeper appreciation of this resource. This thesis project explores the human connection between water and landscape by utilizing architecture as a means for understanding the importance of this delicate resource. The research will be applied to the design of the Ala Wai Canal waterfront and boathouse in Waikiki. This project will serve as a test case for modern development with a focus on principles of the *Ahupua'a* and lessons to take for global uses.

SUSTAINABLE ISLAND WATER CULTURE:  
COLLECT, PROTECT, RESPECT

By

Justin Agustin Manongdo

Thesis submitted to the Faculty of the Graduate School of the  
University of Maryland, College Park, in partial fulfillment  
of the requirements for the degree of  
[Master of Architecture]  
[2016]

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## Preface

Born and raised on the island of Oahu, Hawai'i, I have grown to love and respect the *'Āina*, which is Hawaiian for the land that feeds us—not just physically, but emotionally and spiritually. Water is present everywhere from the streams to the ocean and the water we consume; I worry that one day, this delicate resource, will be gone. Seven years have passed since I have set foot in Hawaii. Just recently, I have gone back home to Hawai'i and I must admit, after seven years, the island seems to be much more crowded than what I remember. As the population continues to grow, water will be used more. Along with climate change affecting the sea level to rise and how it will affect the shapes of our shores. This realization made me believe that we need to make a change and that architecture can be one way to help save the source that is a giver of life as well as a power to respect.

## Acknowledgements

I cannot express how grateful I am to all of those with whom I have had the pleasure to work with during this project and other related projects. Each of the members of my Dissertation Committee has provided me extensive personal and professional guidance and has taught me a great deal about both architecture and life in general. I offer my deepest and sincere appreciation for all the continued support that I have received as well as the learning opportunities that I was provided by my committee.

To Madlen Simon, chairperson of my thesis committee – Thank you, I am most grateful for all the guidance that you have given me. I could not have made it through this process without you. As a teacher and mentor, you have taught me more than I could give you credit for here. Whether it be as a teaching assistant for you or as a student, your impact has helped me to flourish as a person. You have shown me, by your example, what an architect and person should be. I am very excited to collaborate with you once again in the later future.

To Michael A. Ambrose, committee member and coordinator – Thank you for all the continued support and guidance throughout this process. You have enhanced my perspective about this thesis and future projects to come. I sincerely hope to work with you again in the near future.

To Brain Kelly, committee member – Thank you for pushing me throughout this entire process. You have helped me to appreciate architecture to the fullest with the knowledge and wisdom I have acquired from you and many others throughout the years that I have been at the University of Maryland. I sincerely hope to work with you in the near future as well.

To all my teachers along the way, I would like to express my gratitude for the faith you have placed in me, the learning opportunities that were bestowed and the desire to do better.

Finally, I would like to acknowledge with my deepest gratitude to all my family and friends who have supported me throughout this process. Without your continuous love and support this thesis project would not have come to be a great milestone achieved.

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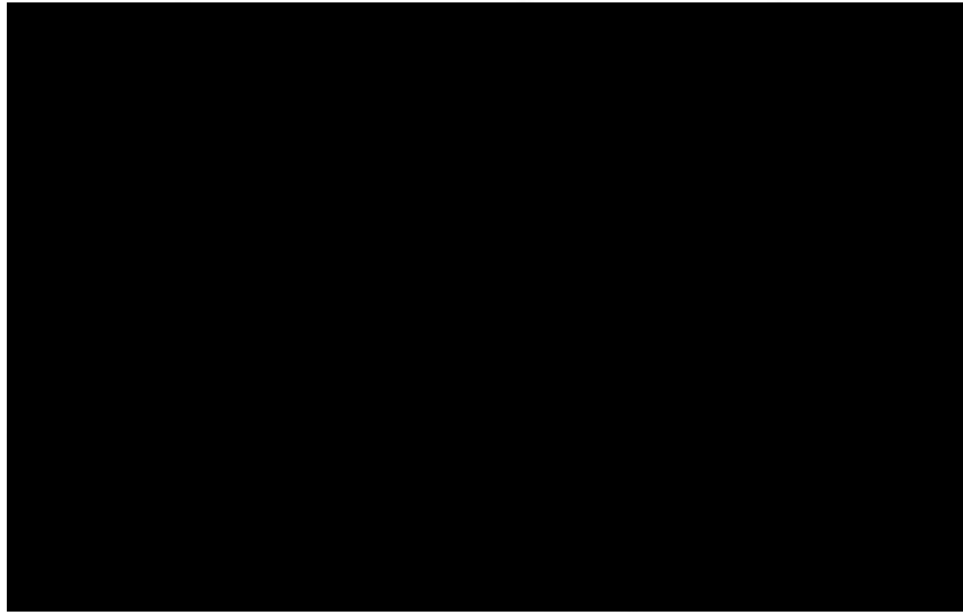
# Chapter 1: Introduction

## Section 1: Purpose and Goals

As fresh water globally declines, our local communities are affected. This phenomenon is particularly acute in the islands of Hawai'i. The Hawaiians have a concept called Ahupua'a, which refers to the traditional land division system in Hawai'i. The goal of the research is to see how we can re-imagine island water culture to reintroduce authentic principles of the *Ahupua'a* to make modern developments sustainable. By addressing and understanding the experience, value of water, and history of its context, architecture can better be used as a tool for collecting, protecting and respecting water to create a deeper appreciation of this resource. This thesis project explores the human connection between water and landscape by utilizing architecture as a means for understanding the importance of this delicate resource. The research will be applied to the design of the Ala Wai Canal waterfront and boathouse in Waikiki. This project will serve as a test case for modern development with a focus on principles of the *Ahupua'a* and lessons to take for global uses.

Section 2: Water Today and the Future

Freshwater availability is changing, as the world is experiencing climate change. Just less than three percent of the water on our planet is freshwater, as seen in Figure 1-1.



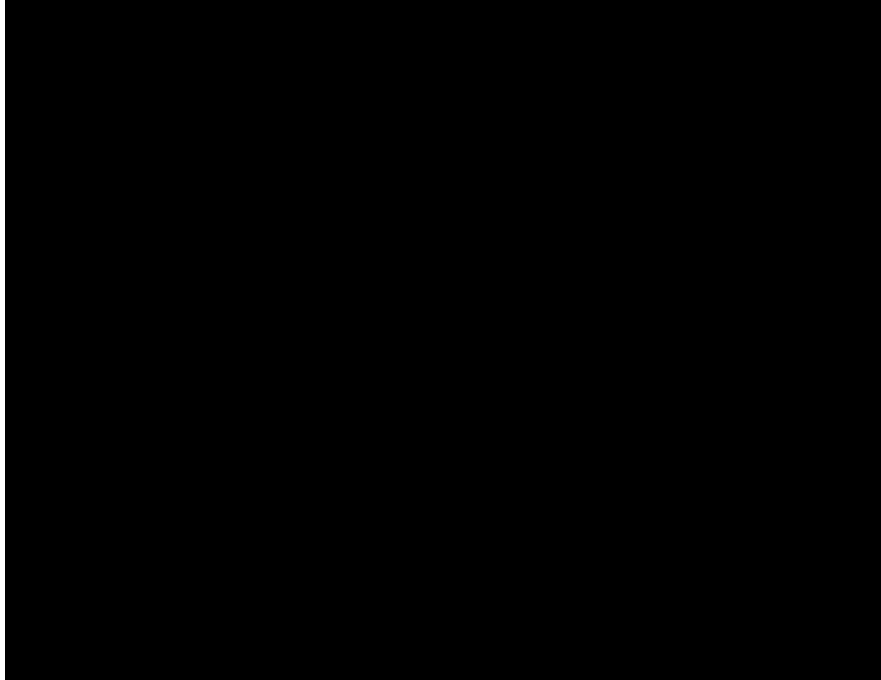
**Figure 1-1:** Fresh Water Availability (Source: UNESCO and Frost & Sullivan [http: www.frost.com](http://www.frost.com))

A majority of this water, about two percent of the world total, is contained in glaciers and ice sheets or stored below ground. The remaining one percent is found in lakes, rivers, and wetland areas or transported through the atmosphere in the form of water vapor, clouds, and precipitation. Rain and snowfall replenishes these freshwater sources.

The U.S. National Climate Assessment is projecting future rates of sea level rise to be challenging. As models suggest a range of additional sea level rise from



about two feet to as much as six feet, by year 2100, this scenario is projected in Figure 1-2<sup>1</sup> with respect to emissions.



**Figure 1-2:** Past and Projected Changes in Global Sea level (Source: Global Sea Level Rise Scenarios for the United States National Climate Assessment. NOAA Tech Memo OAR CPO-1)

### Section 3: Why Hawai'i?

Hawai'i is the most isolated landmass in the world, thousands of miles away from any other landmass, surrounded by the Pacific Ocean. Hawai'i draws millions of visitors around the globe and is home to over a million people. There is a need to protect the *'Āina*, the land that which feeds us, not just physically but emotionally and spiritually. At the heart of Hawaiian values is the concept of *Malama i ka 'Āina*, which means 'to take care of the land.'

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<sup>1</sup> M. Vermeer and S. Rahmstorf, "Global Sea Level Linked to Global Temperature," Proceedings of the National Academy of Sciences 106, no. 51 (2009): 106.

Architecture can support in the way people collect, protect, and respect water. Water is an essential element that is being taken for granted but also drives all other important elements in our daily lives. To the Hawaiians, water is greatly valued. “Their word for wealth is *waiwai*, meaning lots of water. Whomever was blessed to have lots of water was wealthy.”<sup>2</sup> Water is essential for our health and for our personal hygiene. It is also essential for growing the food we eat. The Hawaiians have a poetic way of talking about water as shown in the quote below.

“So Hawaiians believe we are blessed that God created our water (*Wai*) to travel, from the mountains where the *Ohia Lehua* trees grow, down to the sea, thereby sharing it's life giving gifts to all along the way. Once *Wai* reaches the sea it joins all the waters of the ocean and rejoices to remember it is a part of the greater whole. And the cycle continues as *Wai* evaporates and seems to disappear, only to reappear as clouds, grow heavy and once again fall back to earth. This blessed cycle of life of *Wai* is symbolic of another cycle, that of birth. The *lehua* blossoms are mostly red, so *Wailehua* could be red waters, or blood, blood that also nourishes the fetus, which, feeling nurtured and loved, dances playfully there. Yet another cycle represented here is that of human emotions. Divine Love coming from God above travels easily and as it's shared, this love helps us to dance through life, it helps us remember who we are. We are no stranger to love, to our divine happy selves, to our unity. Like the water drops in the ocean, we are truly one!”<sup>3</sup>

The more we can understand and teach the Hawaiian *Ahupua'a* system, the better we can inspire the multitude of visitors that come and learn about the culture.

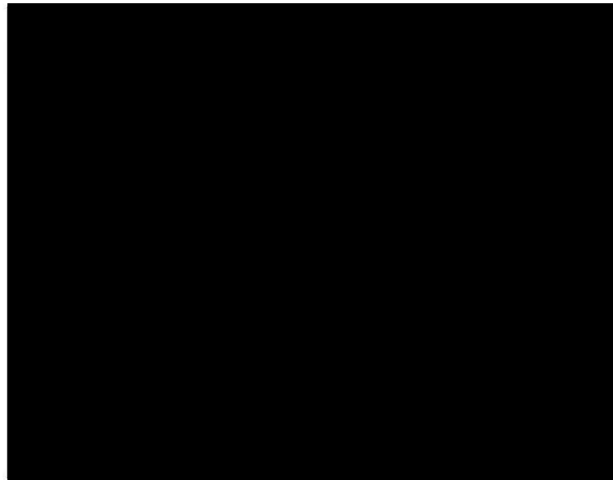
Hawai'i relies on freshwater provided from rain, as it is the most vital natural resource of the island and its residents. According to the Hawaii Community

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<sup>2</sup> Susan Pa'iniu Floyd, “The Blessing of Water,” Aloha International (2014): 1, accessed Mar 11, 2016, <http://www.huna.org/html/blesswater.html>.

<sup>3</sup> Floyd, “The Blessing of Water”

Foundation, “Hawai‘i has been blessed with consistent rainfall, advantageous geology, and high-quality drinking water stores for centuries. Recent findings, however, have raised concern about long-term fresh water security for our Islands. University of Hawai‘i and other scientists have documented troubling trends including reduced rainfall, higher evaporation rates, and declining stream flows in recent decades. These findings, coupled with the demand of an ever-increasing population, suggest that Hawai‘i is entering an era of fresh water uncertainty”<sup>4</sup>.



**Figure 1-3:** Mean Annual Rainfall State of Hawaii (Source: Rainfall Atlas of Hawaii Department of Geography, University of Hawaii at Manoa)

Figure 1-3 shows the mean Annual Rainfall for the state of Hawai‘i. In addition, urban and agricultural activity leaves streams prone to runoff containing harmful effluents, such as chemicals, toxins, and other pollutants, which damage wetlands, reefs, and marine habitats.

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<sup>4</sup> Hawaii Community Foundation, “A Blueprint for Actions Water Security for an Uncertain Future,” Hawaii Fresh Water Initiative (2016-2018): 3.

#### Section 4: Methodology

This thesis will study and examine the authentic ways the Hawaiians have dealt with water historically as a way to frame water use strategies moving forward. It will look at the Ahupua'a and the function of the Hawaiian system. It will then look at how Hawai'i relates to the water cycle. The thesis will then determine the scope of study from the different site scales. From these findings, this will determine what the right site is from the parameters set forth. From there, the thesis will look at different scopes of precedents to study and learn from. Overall, looking from the precedent study, the thesis will determine options for strategies that will meet collect, protect, respect, and sustain. Next, application of these strategies to the design, with the context of the site, will occur. In concluding, an analysis of this will see if the thesis met the framework of study from the beginning.

#### *Ahupua'a*

“The Hawaiians have local, authentic, and historical understandings of the land called, *Ahupua'a*, which are land divisions that span from mountain to reef, where a community can live comfortably since all their resources are present.”<sup>5</sup> An essential component to an *Ahupua'a* is the water since it is visible and used throughout the land. However, today many waterways have been covered over or redirected due to urban growth causing the *Ahupua'as* to break its living ecological

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<sup>5</sup> “Ahupua'a,” Kumukahi Living Hawaiian Culture, 2015, accessed November 12, 2015, [http://www.kumukahi.org/units/ka\\_honua/onaepuni/ahupuaa](http://www.kumukahi.org/units/ka_honua/onaepuni/ahupuaa).

system. This thesis will use the concept the *Ahupua'a* as a framework that drives the design of what the site analysis or context is calling for.

#### *Site Analysis and Environment*

Site Analysis will be explored from three scales the macro, micro, and building procedure. The site analysis will be used as a way to determine where and the reasoning of the building and what program will be happening in this space.

#### *Precedent Research*

Waterfront precedents will be studied for its program and how it reactivates the unused or opportunity spaces. Each precedent will be looked at for how each will bring people to these spaces. What will also be looked at are the implemented systems incorporated to make the space sustainable such as either how they deal with storm water runoffs to how they clean the waters.

Resilient Architecture is necessary to study because of the unfavorable prevailing climate change. Rising sea levels will only worsen in the near future. The research scope is looking at ways landscape projects dealt with flooding to the machine technology that prevents damage to coastal areas.

Tropical Architecture precedents will also be studied looking at how other architects have designed for this type of climate. This will be done by looking at it at all elements from the wind, the sun, water, and environmental impact with a focus on how water is implemented or defended to each project. Subsequently, sustainable characteristics will be looked at from shading to passive energy.

Boathouse Architecture will be looked at for its programmatic research, which will expose ways architecture can demonstrate or expose the varied presences to water. Events and spaces that allow for people, land, nature and the environment to proclaim water in all its value will be developed in the architectural programming of this project. A comparison of the different programmatic differences to community centers to intuitional will be included as well.

Tectonics / Materials will be researched to determine the construction characteristics to complement the program. Finding materials that are local to the area and using the techniques that are used. Exploring the historic aspect of how things were constructed and easy to use materials.

The overall precedent research will primarily focus on an exploration of architects', strategies and robust architectures that have collected, protected, and respected water. Some architects include are Glenn Murcutt and Geoffrey Bawa, who understand building in a tropical climate. By understanding the other elements and condition, this will complement the experience of water.

### *Strategies*

Waterfront developments strategies include how to collect, protect, respect, and sustain water. Looking at strategies to bring people to these spaces. Followed by exploring how the hard and soft edges work and spaces created.

Resilient Architecture strategies include how to protect the coastal or flooding areas from disaster. Exploring how landscape and mechanical systems work to these lowland areas.

Tropical Architecture strategies include how to design with all the different climate elements. Looking into how we can collect, protect, respect, and sustain water. It is a great opportunity to create a passive energy building or even off the grid.

Boathouse Architecture strategies are to compare the size of spaces and see what space connects to one another. Then incorporate the ideas of the collection, protection, respect, and sustainability with water.

Tectonics / Materials strategies include using local materials. Then using the local construction and techniques used to create the structures of Hawai'i.

#### *Application and Conclusion*

Overall, looking from the precedent study will determine options for strategies that will meet collection, protection, respecting, and sustainability. Following suit will be the application of these strategies to the design with the context of the site in mind. In conclusion, an analysis will then determine whether the thesis met the framework of study from the beginning.

## Chapter 2: Ahupua'a

Here we will talk about what is an *Ahupua'a*, how the *ahupua'a* is divided, and how each is taken care of by many different people. Then looking at the three zones that create the *ahupua'a* and what goes on in each zone.

### Section 1: Ahupua'a – Hawaiian Roots

*What is an Ahupua'a?*

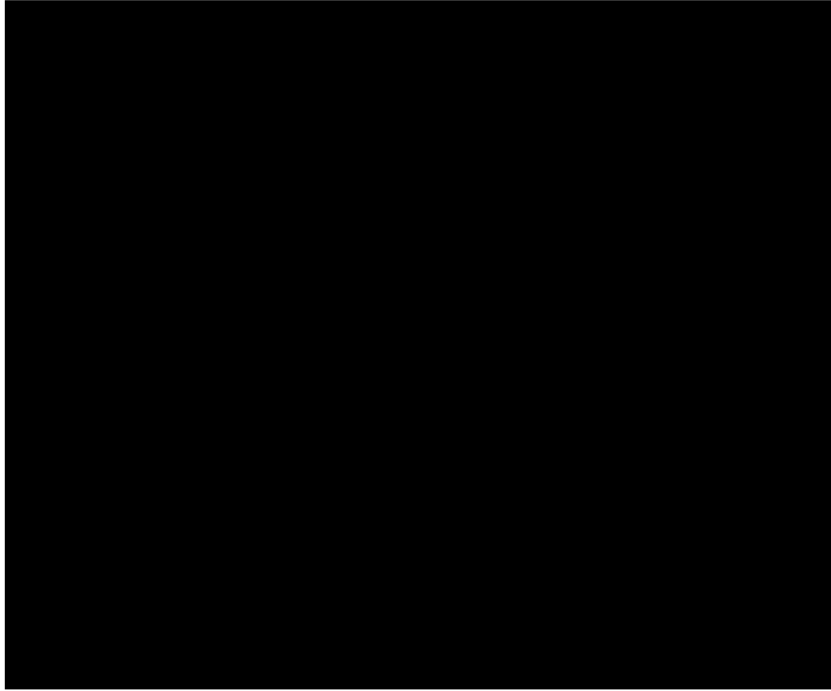
“An *Ahupua'a* is a traditional land division system in Hawai'i. The islands are divided up into several *ahupua'a*. Each *ahupua'a* is usually divided by natural boundaries, like mountain ridges. They can stretch from the mountain ridges to the coral reef system and vary in size. Some are as small as 100 acres. Others are as large as 100,000 acres. Each *ahupua'a* has the resources for 'ohana, or families, to live comfortably.”<sup>6</sup>

Why did Hawai'i create *ahupua'a*? During the 13th century there were no land divisions, therefore food was limited, and chiefs argued over land rights. A great chief named *Mā'ilikūkahi* wanted to ensure that the people had enough resources to live comfortably. *Mā'ilikūkahi* orders his chiefs to survey the island and have them mark the boundaries for each land division. Figure 2-1 shows how Oahu was divided within the mountain ridges.

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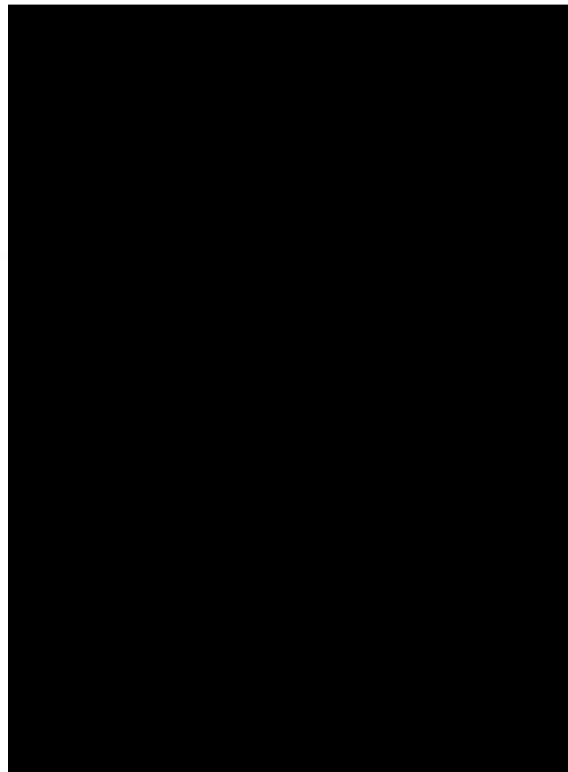
<sup>6</sup> Kamehameha Schools, “Ahupua'a,” Kumukahi Living Hawaiian Culture, 2016, accessed Jan 25, 2016, [http://www.kumukahi.org/units/ka\\_honua/onaepuni/ahupuaa](http://www.kumukahi.org/units/ka_honua/onaepuni/ahupuaa).





**Figure 2-1:** Ahupua'a Names on Oahu (Source: Kamehameha School)

The island of Oahu was first divided into *moku* (large districts), then further into *ahupua'a*, and even further into smaller tracts. Figure 2-2 shows the land division this thesis will be studying. The organization of the land and the people into different groups and subgroups made life easier. The land and the people became even more productive. In the process, resources became abundant and would last long into the future.

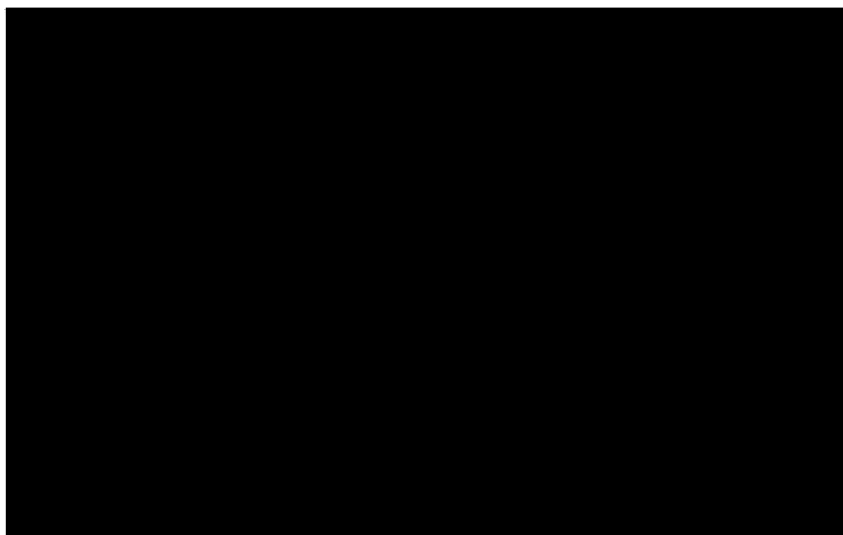


**Figure 2-2:** Ahupua'a Land Breakdown (Source: Kamehameha School)

*Mā'ilikūkahi* orders for the division of land brought peace. The *ahupua'a* was a self-sustaining unit, where everyone had access to the resources they needed to live well. If they could not make or get what they needed, they could get them from other *ahupua'a* by trading. When resources were limited, they were conserved and placed

under *kapu*, which means no trespassing, till available in the future. For example, *kapu* is placed on certain fish during their reproductive season. The people thrived and the land thrived.

“*Mā’ilikūkahi* assigned high chiefs to each of the six *moku*. They were called *ali’i ‘ai moku*. The people who ruled over the *ahupua’a* were the *ali’i ‘ai ahupua’a*. It was their *kuleana* (responsibility) to make sure the *‘āina* was productive. The *konohiki* (land steward) were involved with the day-to-day operations of the *ahupua’a*. They were a lesser rank of chiefs called *kaukauali’i*. The *konohiki* were usually related to the chiefs of the district or even the *ali’i nui* (high chief). The *konohiki* supervised the activities of the fisher and farmer.”<sup>7</sup> Figure 2-3, is how people worked and lived in the *ahupua’a*. The smaller parcels were each assigned to *kaukauali’i*. The *maka’āinana* became stewards of the *ahupua’a* where they lived. Their hands worked directly with the land, and so their work was very important to the health and wealth of the *ahupua’a*.



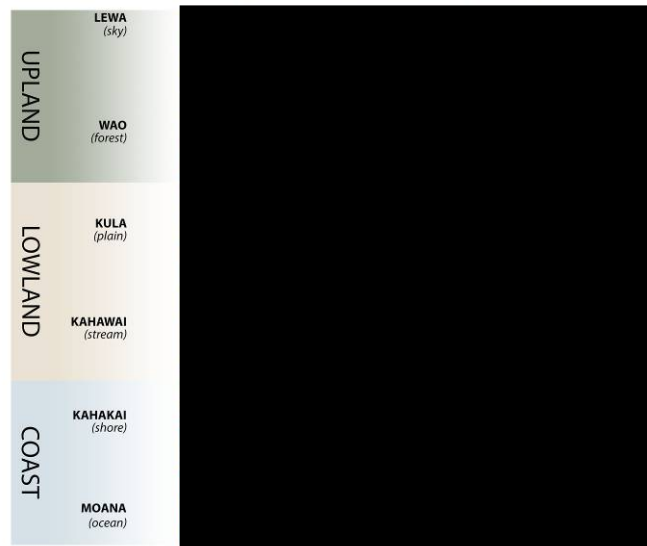
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<sup>7</sup> “Ahupua'a,” Kumukahi Living Hawaiian Culture

**Figure 2-3:** *Ahupua'a* System (Source: Painter Marilyn Kahalewai, Kamehameha School)

Section 2: *Ahupua'a* Zones

Understanding the history of the *Ahupua'a* is a major part of this thesis. With three zones the Upland, Lowland, and Coastal, need to be examined that is because each zone relies on each other, as seen in Figure 2-4. If one zone were to fail the rest of the *ahupua'a* system will fail, that is the reason why we need to look at the system as a whole. Therefore, understanding the water cycle is another aspect to keep in mind, as it is the way water and land work together to create this living system.



**Figure 2-4:** *Ahupua'a* System Zones (Source: Painter Marilyn Kahalewai, Kamehameha School)

After finding the implication for the three zones and how the system works, the study will move into creating a model of how each zone could work in the modern development. By reintroducing them in this three terms Collect, Protect, and Respect.

### *Collect*

In the collect zone, we will be looking for ways to collect water by finding precedents that collect water from different layers. Which bring to the question of whether we collect from the top of the canopy or from the ground of the soils or both? Creating diagrams that show the water cycle and how in first touches the earth from the top of the tree canopies to the ground and soil. It is showing how water is collected and how it moves within a physical or natural environment.

### *Protect*

In the protection zone, we will be looking for ways to slow down and filter the water. This will be conducted by looking for precedents that can compare with what this zone was before, which is farmlands. *Lo'i*, which are taro patches are ways that the Hawaiians created to grow their food. However, the *Lo'i* was not only a place to grow their food but a way to divert stream water into to slow down the flow of water to the ocean. So, finding modern precedents like raceways or terracing that help slow down water flow as well as filtering water with natural vegetation. Here there is a need to look how to filter out storm water runoff from the buildings and streets that enter the streams. Therefore, by creating sectional diagrams we will be able to see how water flows to buildings, streets, and sources of water in a way that will allow one to study how we can help the ecosystem. In addition, systems that can protect from rising sea levels or flooding will also be looked at.

### *Respect*

Respect is a zone that needs to be dynamic as it is the point fresh and salt water comes together. It is a place where flooding can happen. Knowing the where

the sea level rise is going to be. Sectional diagrams will be important to understand where that flood line is at all views. This is a place to celebrate but also be aware that water is a living and powerful element we need to respect. Importantly it is the place for learning and gathering. Bringing the community together as a whole to celebrate and give thanks to the *'āina* for what it has provided.

## Chapter 3: Site and Environment

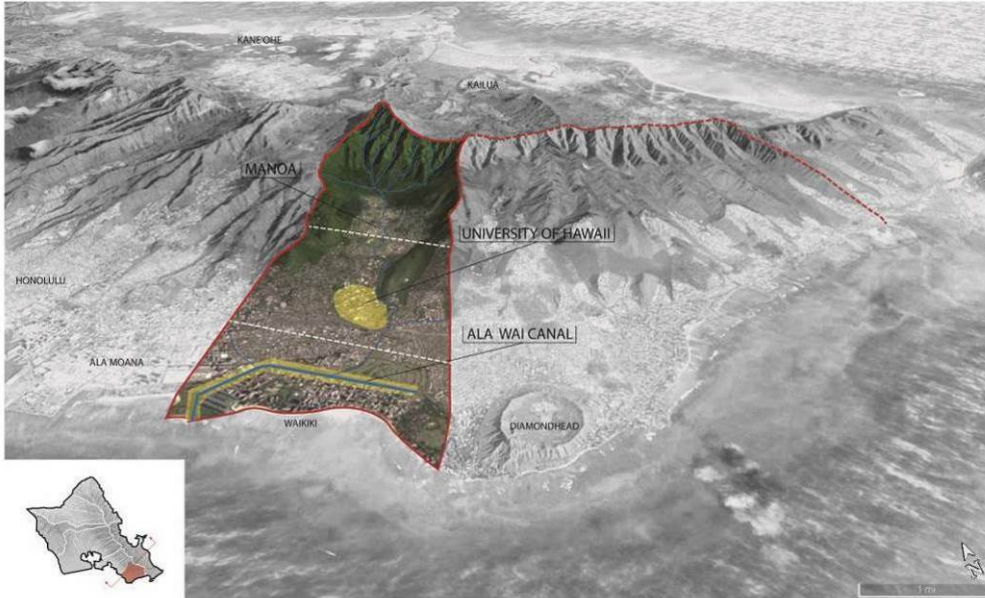
In Site and Environment, we will be talking about the Waikiki Ahupua'a as the macro scale. The steps to determine the focus site are:

1. Diagraming the urban fabric and the surrounding context.
2. Focusing on how the ahupua'a relates to the water cycle and to the site of the Ala Wai Canal.
3. Determine what makes a good site.
4. Careful analysis of each site and choosing the site where the building will be built.
5. Show reasoning of how the site is chosen and what the program is going to be within the site.

This thesis will follow these steps to determine the focus site.

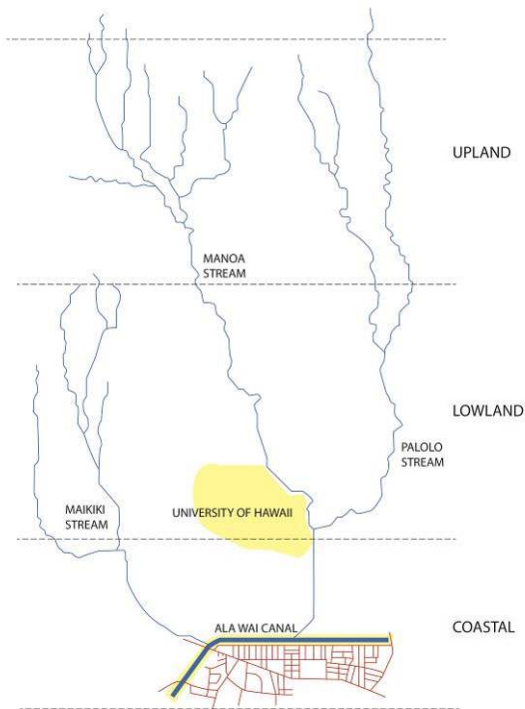
### Section 1: Waikiki Ahupua'a

This thesis will focus on the Waikiki *Ahupua'a*, which is located on the southeast of Oahu as seen in Figure 3-1 where the urban scale site is between Ala Moana from the west and Diamondhead to the east. The Ala Wai Canal is the outlet



**Figure 3-1: Waikiki Ahupua'a** (Source: Author, Justin Manongdo)

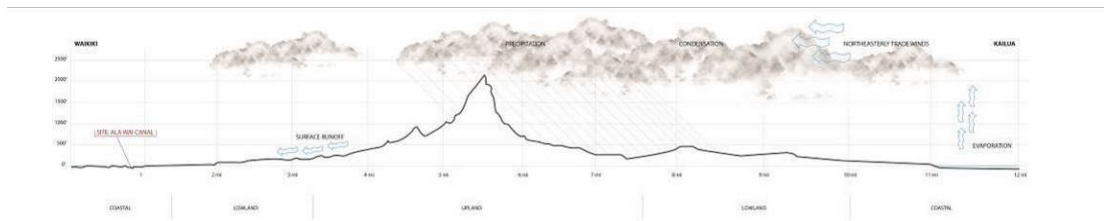
of three streams as seen in Figure 3-2. Maikiki, Manoa, and Palolo Stream out pour to the Ala Wai Canal then out to the ocean from the Harbor. The Waikiki Ahupua'a is



**Figure 3-2: Waikiki Ahupua'a Stream Diagram** (Source: Author, Justin Manongdo)



an excellent example of how Hawai'i is a great place to understand the water cycle. Figure 3-3 shows the transect through the *ahupua'a*. Here you can see that water is evaporated from the Kailua side or northeast where condensation happens. Then it rains from east to west as the trade winds blow the clouds from the northeast. Where the wettest side is the east and rain lessens moving to the west. The peak of the *ahupua'a* is 5.5 miles inland and the site Ala Wai Canal is about 1 mile from the coast.



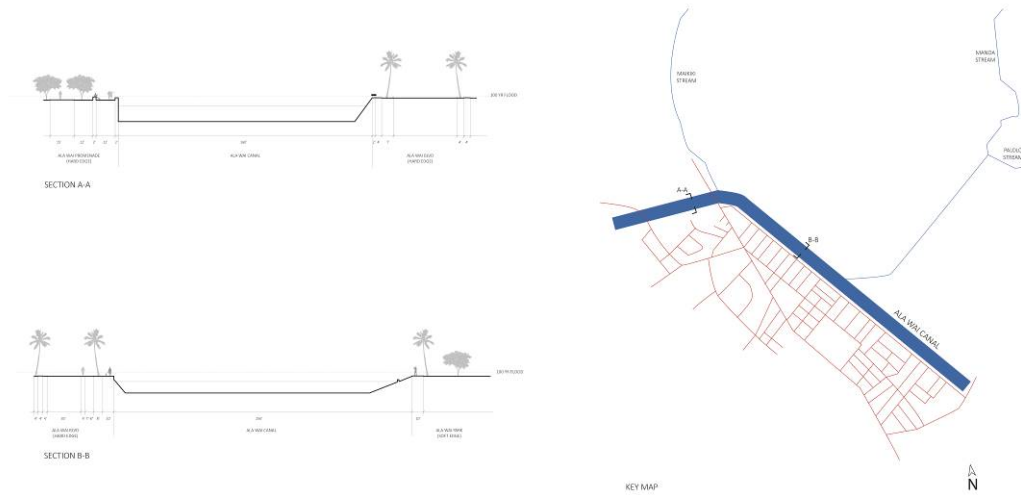
**Figure 3-3:** Transect Waikiki Ahupua'a (Source: Author, Justin Manongdo)

As we look at the site shown in Figure 3-4, the Waikiki area is surrounded by the Waikiki beach to the south, Manoa to the north, and Ala Wai Canal in between.



**Figure 3-4:** Aerial View of Waikiki (Source: Google Earth)

EXISTING CANAL SECTION



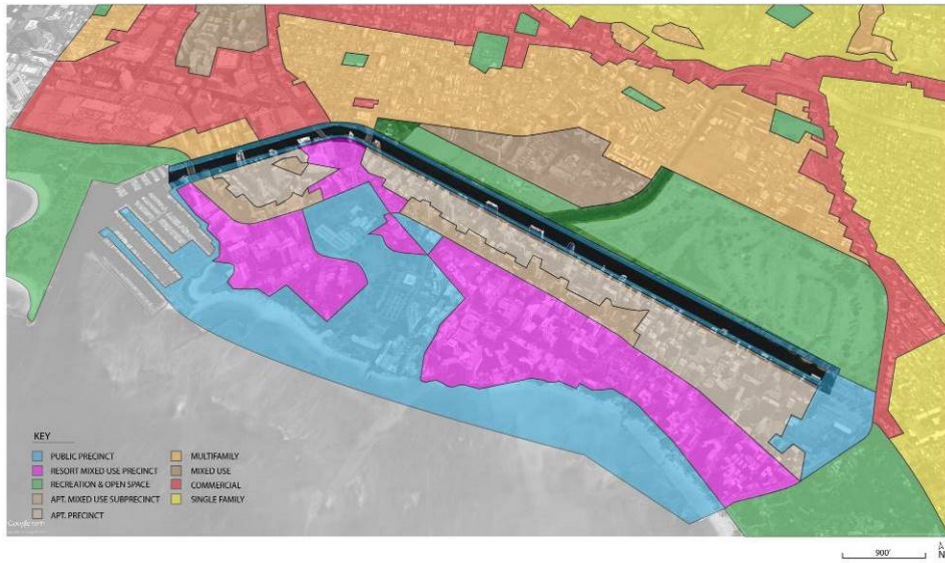
**Figure 3-5:** Existing Section Ala Wai Canal (Source: Author, Justin Manongdo)

Figure 3-5 shows the existing section of the canal. The top section is the typical section from the west side of the canal showing both being hard edges. The bottom section is the typical section through the long stretch of canal. It shows both sides being a hard edge. From here will look at the site as seen in Figure 3-6. The Ala Wai Canal being 72 acres, site 1 4.95 acres, site 2 1.16 acres, and site 3 0.56 acres.



**Figure 3-6:** Ala Wai Canal (Source: Author, Justin Manongdo)

It is a total of about 1.5 miles of the canal. Looking at the land use of the surrounding context in Figure 3-7, notice that the canal is filled with mainly resort mix use and apartment mix use to the south of canal. What is also seen is recreational and open space to the north. The west is mainly commercial buildings. Judging by what can be seen in this land use map, there could be an opportunity to develop off the north side of the canal.



**Figure 3-7:** Land Use (Source: Author, Justin Manongdo)

The site shows that the canal has hard edges to both the west and south side as seen in Figure 3-8. The surrounding context is



**Figure 3-8:** Soft vs Hard Edges (Source: Author, Justin Manongdo)

covered with a minimal amount of green spaces as seen in Figure 3-9. From the west, you have Ala Moana Beach Park and Magic Island. Then the Ala Wai Promenade that wraps to the park then ends. The east has an Ala Wai Golf Course and southeast has Honolulu Zoo. There is also a great community garden that sits to the west of site 3. With all of these green spaces, we have the opportunity to connect the green spaces as a loop.



**Figure 3-9:** Green Spaces (Source: Author, Justin Manongdo)

Next, we look at the street circulation in Figure 3-10. Here we see that Waikiki has one-way roads that wrap around the town and flows west on the south side of the canal. There are only three bridges that cross the canal to enter Waikiki. McCully St. has the most interaction with the sites, site 1 being intersected from Kapiolani Blvd on the north and Ala Wai Blvd to the south. Here giving site 1 more presents to people going to Waikiki, acting like a gateway.



**Figure 3-10: Street Circulation** (Source: Author, Justin Manongdo)

After determining the area, we create places or districts as seen in Figure 3-11. From west to east, you have the convention district that brings the world to this area from the conventions center building. Next, the Park District, which includes the community center and an opportunity to reactivate the area as it is in the middle of all the main intersections. Then we have the Education District, which houses multiple schools, which can bring a place to learn about cleaning the waters of the Ala Wai. Then there is the golf district to the east and all three Waikiki districts to the south.



**Figure 3-11:** Places or Districts (Source: Author, Justin Manongdo)

Section 2: What can be determine in the Macro/urban scale?

First, looking at the canal it feels like a divide as seen in Figure 3-12.



**Figure 3-12:** Canal as a divide (Source: Author, Justin Manongdo)

The divide is seen between the north to the shores to the south. From this, the question at hand is, how would we reconnect both sides? We look at the streets and the context around the area, shown in Figure 3-13.



**Figure 3-13:** Street conditions (Source: Author, Justin Manongdo)

From Figure 3-13, only three bridges to the west can be seen. These three bridges cross the canal and the only other way is to go around from the east. When taking a closer look towards the streets in particular, two axis of streets are seen. Both can be future possible connection(s) to both ends. Figure 3-14 show the two connections that could happen.





**Figure 3-14:** Possible future connections (Source: Author, Justin Manongdo)

First, the axis that directly connects University of Hawaii to Kalakaua Ave is Kalaimoku St to University Ave. The second connection would be from Lewers St across to site 3, which could be a great opportunity to build on this because in effect it will give access to the new building and connect both sides of the canal. If we were going for the second option, then it could look like Figure 3-15.



**Figure 3-15:** Possible design connection (Source: Author, Justin Manongdo)

As shown in Figure 3-15, it would create a new bike and pedestrian bridge that connects to Lewers St and connecting to Kalakaua Ave with a new greenway. Overall, this will connect the university and beach back together.

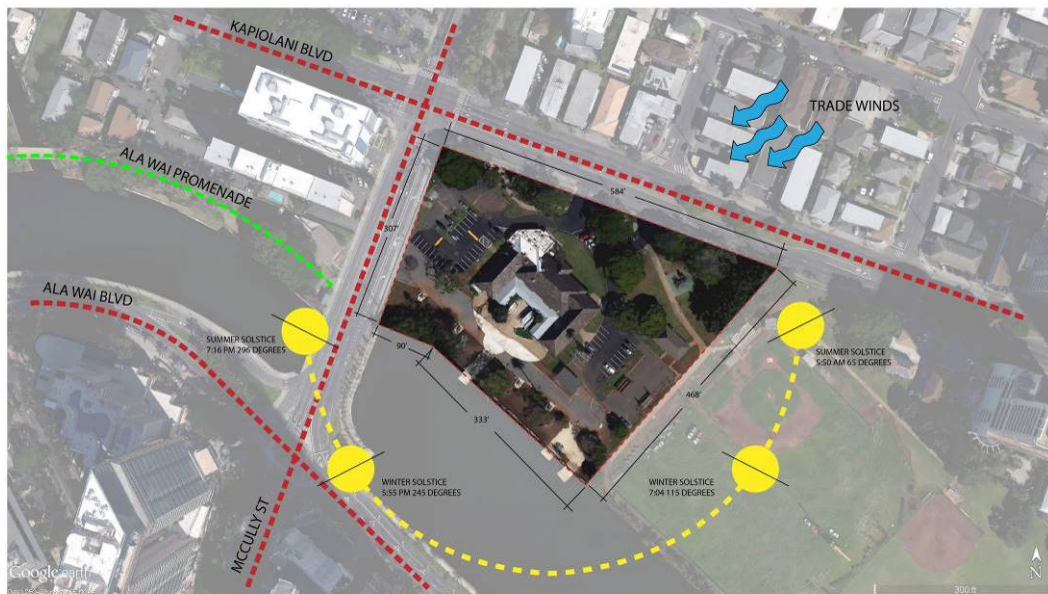
### Section 3: What constitutes a good site?

As we look at the area at a macro scale to understand the overall area, we can now move into the micro scale to observe site details. A good site includes the opportunity to be next to the canal, area to see the flow of water, and engage in the surrounding context. It also looks at the solar connection to the site and the direction to where the wind blows. This could help determine the feasibility of creating a passive energy building or not. Consider the three sites, one being at the intersection of McCully St

and Ala Wai Blvd, the other next to Ala Moana Blvd., and the remaining site on the outlet of Manoa-Palolo stream.

Section 4: Site 1, Ala Wai Community Center

Site 1 is located at the intersection of McCully St and Kapiolani Blvd. with the canal waterfront to the south and street traffic to the west and north, as shown in Figure 3-16 below. The trade winds come from the northeast with no barriers to block it. This allows the capture of the wind for cooling and a possibility of a wind power system for buildings. The solar path is not in site of any shadows. The west of the site is close to the existing Ala Wai Promenade.

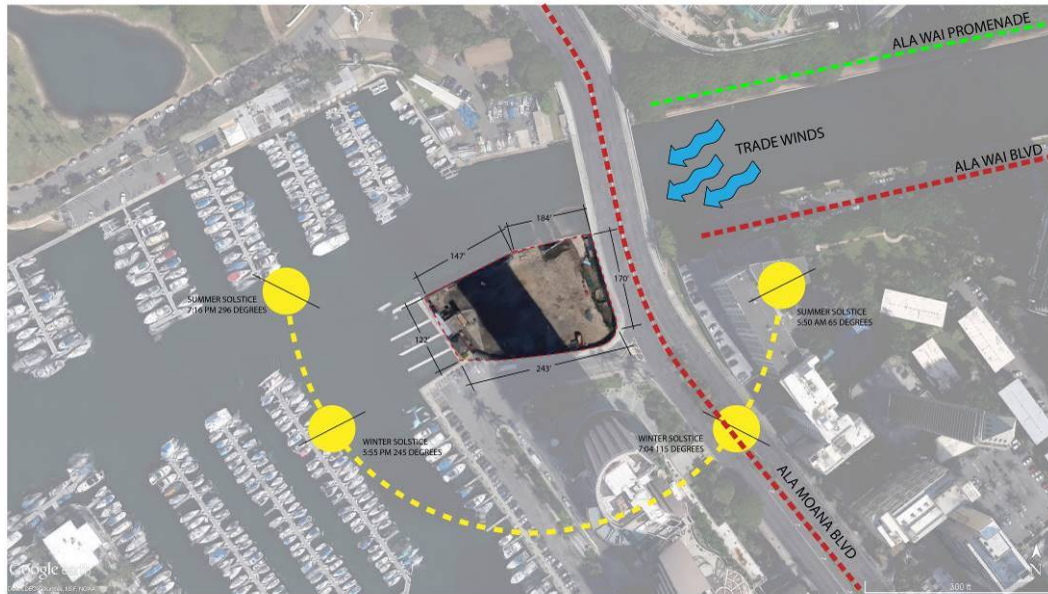


**Figure 3-16:** Site 1 Ala Wai Community (Source: Author, Justin Manongdo)

Section 5: Site 2, Ala Wai Harbor

Site 2 is located on the west side of Ala Moana Blvd before you enter into Waikiki, as seen in Figure 3-17. The site has hard edges all around. The building to

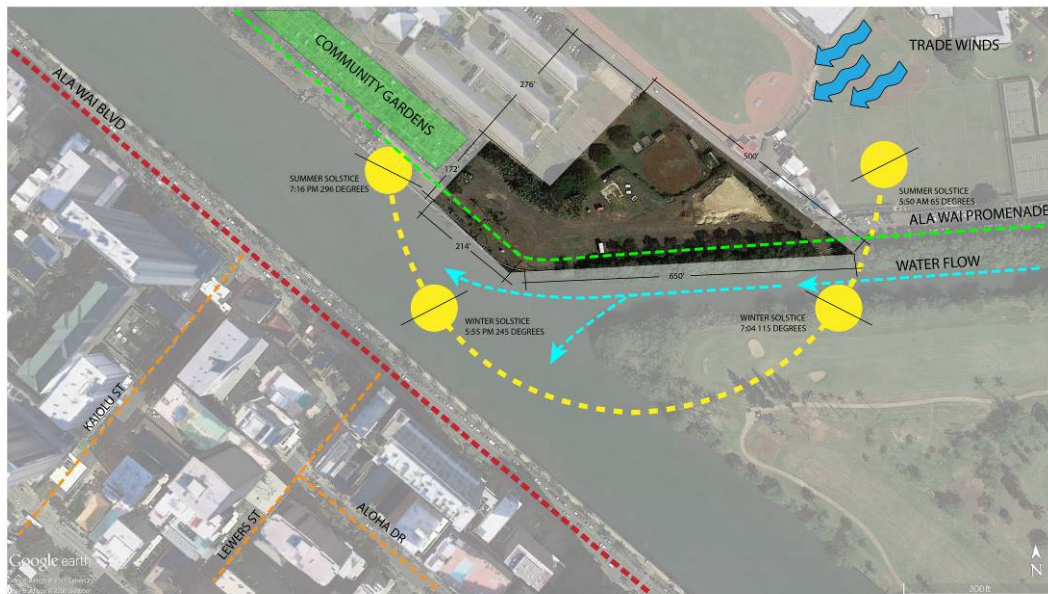
the south of the site cast a large shadow throughout the day. There is only one way to get to this site. The site is too far from the main stretch of the canal, which would discourage people from using the canal. This site is able to capture the wind since there are no barriers as the wind flows northeast to site.



**Figure 3-17:** Site 2 Ala Wai Harbor (Source: Author, Justin Manongdo)

Section 6: Site 3 Manoa-Palolo Stream Intersection

Site 3 is located on the Manoa-Palolo Stream intersection, southeast of the community garden, in Figure 3-18. It has the opportunity to collect and clean water from stream outlet to the southeast. The site receives sunlight throughout the year and is in shadow for a little bit during the winter from the neighboring apartment across the canal. Wind blows consistently throughout the day from the northeast as people pass this place from the bike and pedestrian path on the site.



**Figure 3-18:** Site 3 Manoa-Palolo Stream Intersection (Source: Author, Justin Manongdo)

After analyzing all the sites, site 1 is one that meets some of my consideration to what makes a good site. It meets the water and is a connector of different scales to vehicles to the pedestrian. Site 1 has a great opportunity to play the relationship with architecture and landscape. Site 2 is just far away from where the connection with water flowing at it is basically the end of the canal. Site 3 in the other hand is the right

site to work on. It is on the edge where water can be collected, protected and respected to join architecture, landscape and culture.

Section 7: Site 3 Analysis

The site chosen lies on the intersection of Manoa-Palolo stream and the Ala Wai Canal. Figure 3-19 shows the selected site boundaries. Consisting of three acres of land, the site includes an existing dog park and baseball field. The site chosen sits near the Ala Wai Canal. As seen in Figure 3-20, the site chosen is adjacent to Ala Wai Canal. Therefore, flooding on the site will occur when canal rises.



**Figure 3-19:** Selected Site Boundaries (Source: Author, Justin Manongdo)



**Figure 3-20:** Relationship of Selected Site to Canal and Stream (Source: Author, Justin Manongdo)

The site is cornered by two schools as seen in Figure 3-21. Ala Wai Elementary to the north and Iolani School to the Northeast of the site. This can later be an opportunity to leverage the educational aspect when working on the program. On site, there is an existing green space that can be connected with this site. In Figure 3-22, it shows the Ala Wai Park and the Ala Wai Community garden connecting to one another and possibly able to connect with site selection.



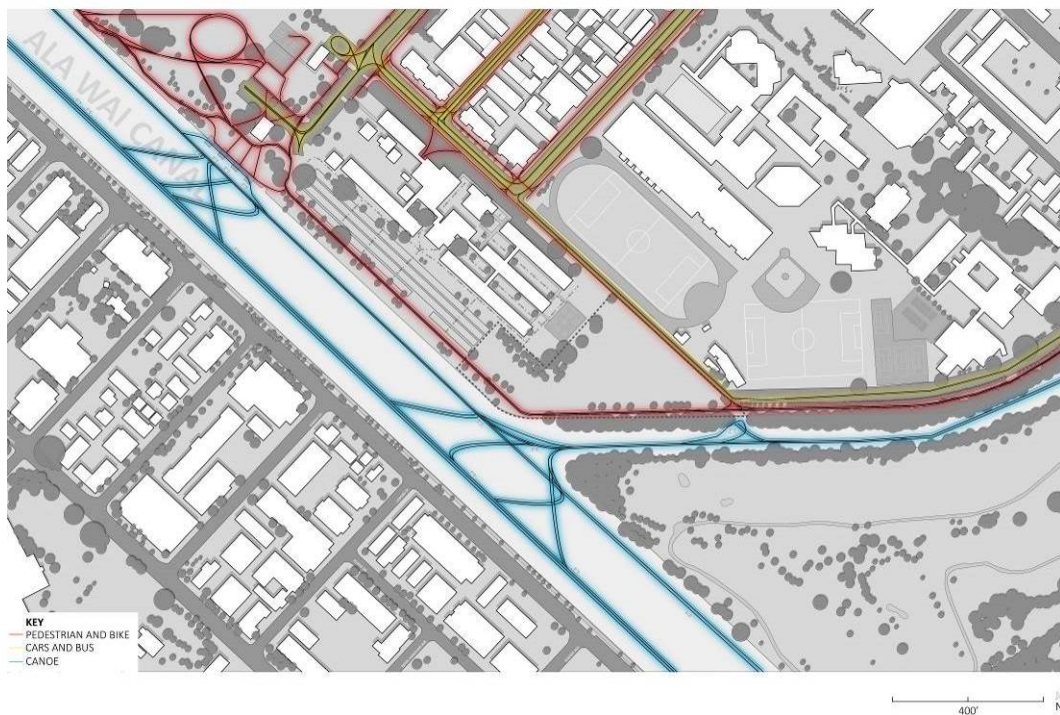
Figure 3-21: Schools around the Area (Source: Author, Justin Manongdo)



Figure 3-22: Green Spaces (Source: Author, Justin Manongdo)



Figure 3-23 illustrates the different transits from pedestrian, bike, cars, bus, and canoes. This shows how people move around the site. From this analysis it can be determined that the site holds three access points, as shown in Figure 3-24. Being that the site is close to the canal flooding occurs. Figure 3-25 shows the existing hydrology flow around and on the site. Notice that there are places that water sits, which provides the opportunity to collect water. Hawaii is blessed to have trade winds that blow consistently. In Figure 3-26, the wind blows from the northeast. Therefore, creating a west-east orientation building would help to make the building become a passive energy structure. Lastly, in Figure 3-27 shows how the sun moves on the site. This will help determine where shading is necessary.



**Figure 3-23:** Transit (Source: Author, Justin Manongdo)



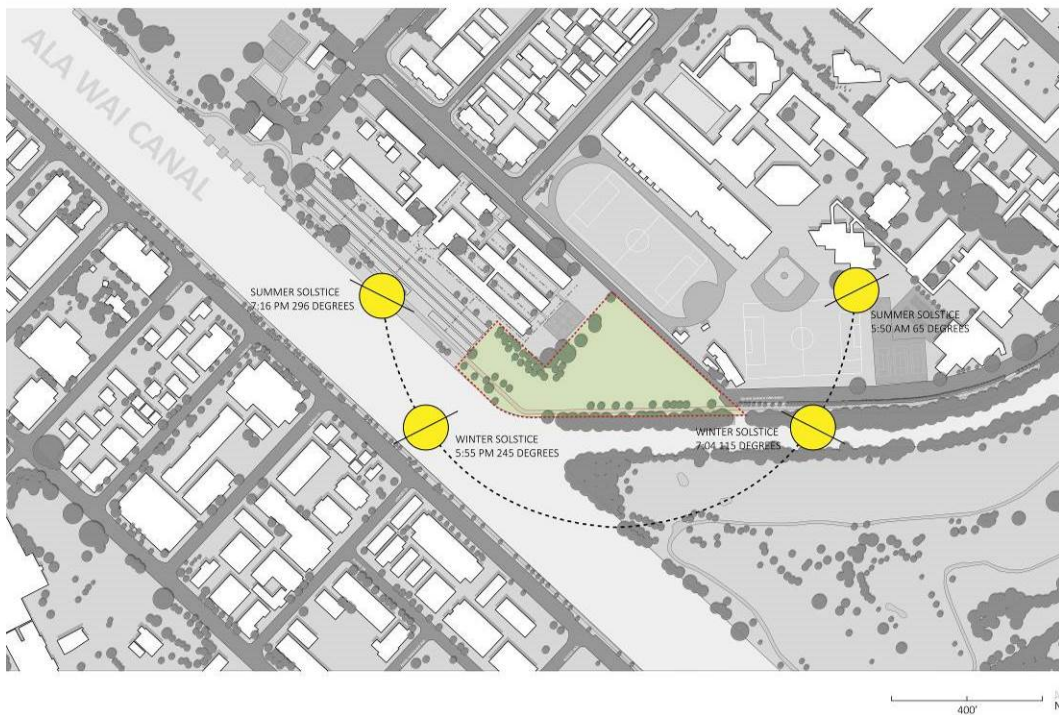
**Figure 3-24: Access Points** (Source: Author, Justin Manongdo)



**Figure 3-25: Hydrology Flow** (Source: Author, Justin Manongdo)



**Figure 3-26: Wind Direction** (Source: Author, Justin Manongdo)



**Figure 3-27: Solar Movement** (Source: Author, Justin Manongdo)

## Chapter 4: Program

In Program, we will talk about who are the users, how each person experiences the space, and see which spaces are used. From there we will describe the characteristics of collect, protect, and respect. Some characteristics will include how water is expressed in each space whether physically or expressively. Then focus on how lighting comes into the building, as well as whether we want it in the space, keep it away, or stay in the shade. Next is the wind factor. Here we discuss how we create spaces that will let wind flow through the spaces without making the space uncomfortable. Lastly, showing the spaces size and relationship to one another whether it be there are indoors, outdoors, or in between.

The program will explore a boathouse community center where the community and tourists can come and learn how to build outrigger canoes and learn about the *Ahupua'a*. It allows for an educational aspect to it with the opportunity for children from their respective schools to learn about the culture and the environment they live in.

### Section 1: The Users and Experiences

To start, the program is to understand what and who the types of people are who will be coming to this place. Therefore, we needed to figure out who the users are and what they are doing in this space. Several questions come to mind when determining this. Such examples include, How does one experience each space and in what sequence? What method of transportation is used to arrive to the specific space? There are a variety of questions that need to be answered. Figure 4-1 shows some of

the users that are coming to this place and their experience. In red are the spaces that each user experiences in a typical day in this place.

## THE USERS

BIOGRAPHY, EXPERIENCES, ROLES

### COMMUNITY RESIDENCES

(FAMILIES, TEACHERS, HOBBY)

### STUDENTS

CLUBS, YOUTH, TEAMS

### TOURIST

TRAVELERS, NEWLYWEDS, VISITORS



	NAME	BIOGRAPHY	NARRATIVE
COMMUNITY RESIDENCES	<b>KAHU WENDELL KALANIKAPUAE'U SI'VA</b> <small>KAHUNA NUI, HIGH PRIEST, TEACHER</small> 	<p>HE IS AN AUTHENTIC HAWAIIAN KAHUNA, DESCENDED THROUGH A LINEAGE THAT HAS KEPT THE SACRED AND SECRET NATIVE HAWAIIAN CULTURAL TRADITIONS FOR CENTURIES. KAHU SI'VA IS REGARDED AS A KAHUNA NUI (HIGH PRIEST). AS KAHUNA NUI, KAHU FULFILLS THE SPIRITUAL DUTIES OF HIS OFFICE IN THE ROLES OF A KAHUNA PU'E (PRAYER EXPERT), A KAHUNA A'O (TEACHING MINISTER), AND A KAHUNA KALIA (SEER). HIS PRIMARY MISSION IS TO EDUCATE, ENLIGHTEN AND SHARE THE LEGACY OF ANCIENT WISDOM AND KNOWLEDGE HANDLED DOWN FROM GENERATION TO GENERATION BY HIS SPIRITUAL MENTORS AND CHERISHED HAWAIIAN ANCESTORS.</p>	<p>KAHUNA SI'VA COMMUTES FROM KALIA WHERE HE IS DROPPED BY HIS DAUGHTER IN THE MORNING. HE ARRIVES AT THE <b>PARKING LOT</b> THROUGH IOLANI SCHOOL DRIVEWAY. HE THEN WALKS UP TO THE <b>ENTRANCE</b> FROM THE NORTHEAST WHERE HE PROCEEDS TO HIS <b>OFFICE ROOM</b> PASSING THE <b>LOBBY</b>. IN HIS <b>OFFICE</b> HE CHANGES TO HIS OUTFIT AND DOES A DAILY PRAYER FOR THE DAY. THROUGHOUT THE DAY HE GREETES PEOPLE IN THE <b>LOBBY</b>. SI'VA TEACHES VISITORS ABOUT THE HISTORY OF THE HAWAIIAN CULTURE IN THE <b>OUTDOOR GARDEN</b>. BY EXPLAINING AND SHOWING THE AHUPU'UA SYSTEM THROUGH THE BUILDING ARCHITECTURE. HE THEN EXPLAINS THE HISTORY OF THE OUTRIGGER CANOE AND SHOWS RITUALS OR PRAYERS THAT IS GIVEN TO NEWLY BUILT CANOES IN THE <b>HALLAU</b>, OR <b>CANOE SHED</b>. HE THEN WATCHES THE CANOES LUNCHES FROM THE <b>DOCK</b>.</p>
	<b>JOHN PUAKEA</b> <small>DESIGNER, COACH, PADDLER</small> 	<p>JOHN IS A CANOE BUILDER AND COACH WHOSE CAREER HAS EVOLVED ALONG SIDE PADDLE SPORTS. HIS KNOWLEDGE OF BODY MECHANICS COMPLEMENTS HIS STRENGTHS IN CANOE BUILDING. JOHN'S FATHER, MASTER CANOE BUILDER BOBBY PUAKEA, PASSED ON TRADITIONAL CRAFTSMANSHIP AND SENSIBILITIES. JOHN'S ROLE IS TO TEACH THE COMMUNITY AND VISITORS HOW TO BUILD CANOES TRADITIONALLY AND CONTEMPORARY. HE ALSO COACHES A AFTER SCHOOL PROGRAM TO THE YOUTH ON PADDLING, AS WELL AS TEACH NEW COMERS TO THIS SPORT/HOBBY.</p>	<p>JOHN LIVES AROUND THE AREA AND BIKES TO THE ALA WAI COMING FROM THE WEST. HE PARKS HIS BIKE AT THE <b>BIKE RACKS</b> AT THE NORTHEASTERN SIDE OF THE BUILDING. HE THEN ENTERS THROUGH THE <b>LOCKER ROOMS</b> AND HIS <b>OFFICE</b>. HE WALKS OUTSIDE THROUGH THE <b>LANAI</b> PASSING THE <b>GARDENS</b> AND TO THE <b>HALLAU</b> WHERE HE HELP STUDENT PRACTICE PADDLING OUT ON THE CANAL. HE COACHES IN THE MORNING AND AFTERNOON. IN THE REST OF THE DAY HE MOSTLY SHOWS THE VISITOR HOW THEN BUILD CANOES IN THE <b>WORKSHOP</b> AND HOW TO PADDLE. HE <b>SHOWERS</b> AND RINSE OFF BEFORE HEADING BACK HOME. DURING THE WEEKEND HE COACHES RACES IN THE CANAL. THEN HELPS RACES CLEAN UP CAN PUT AWAY CANOES IN <b>STORAGE</b>.</p>
	<b>UNCLE CLAY</b> <small>LOCAL, FATHER, SHOP OWNER</small> 	<p>UNCLE CLAY IS A FATHER OF ONE SON. HE IS THE FOUNDER AND OWNER OF "UNCLE CLAY'S HOUSE OF PURE ALOHA IN AINA HANA, WHICH IS A SHAVE ICE PLACE. HE IS ONE OF THE MOST FRIENDLY PEOPLE YOU WILL VERY MEET. HE SHOW PEOPLE THE REAL MEANING OF SHOWING ALOHA TO EVERYONE. HE ENJOYS TALKING TO THE COMMUNITY AND TOURISTS. HE SOMETIMES GO TO THE ALA WAI CANAL TO ENJOY THE RACES AND OUTDOOR EVENTS, WHILE SELLING SHAVE ICE IN HIS POP-UP SHOP.</p>	<p>UNCLE CLAY DRIVES FROM AINA HANA FROM THE EAST OF THE ISLAND AND COMES DOWN FROM UNIVERSITY AVENUE AND PARKS IN THE ALA WAI COMMUNITY GARDEN <b>PARKING LOT</b>. HE WALKS TO THE BUILDING PASSING <b>SITTING AREA</b> FOR PEOPLE TO WATCH PADDLES ON THE CANAL, AS WELL AS <b>FISHING AREAS</b>. HE ENTERS FROM THE SOUTH WEST HEADING TO THE <b>SNACK BAR/CAFÉ</b>. HERE HE OPENS UP SHOW TO MAKE SHAVE ICE FROM THE COMMUNITY AND VISITORS. HE SOMETIMES GO OUT TO THE <b>CANAL DOCKS</b> AND WATCH RACES AND AT TIMES TRY TO GO OUT AND PADDLE HIMSELF.</p>
STUDENTS	<b>PEDRO REYES</b> <small>FATHER, CARETAKER, LOCAL</small> 	<p>MIR. REYES IS A FATHER AND HAS A FAMILY OF FOUR, HIS WIFE AND TWO SONS. HE WORKS VERY HARD TO SUPPORT HIS FAMILY. HE WORKS IN THE ALA WAI BOATHOUSE TO KEEP THE PLACE WELL CLEAN FOR THE PEOPLE WHO SHOW UP IN THE NEXT DAY. HE SOMETIMES WATCH THE CLUBS GO OUT TO THE CANAL TO PADDLE BEFORE HE GOES BACK HOME AFTER HIS WORK.</p>	<p>MIR. REYES TAKES THE BUS TO THE SITE IN THE EVENING. HE GETS OFF BUS IN THE INTERSECTION OF DATE ST AND LAUAI ST AND WALKS DOWN IOLANI SCHOOL TRAIL TO THE BUILDING FROM THE NORTHEAST. WHERE HE SEES THE REMAINING STUDENTS AND VISITORS PUTTING AWAY THE CANOES IN THE <b>STORAGE</b>. HE WALKS AROUND THE SITE TO SEE WHAT HAS TO BE DONE THEN HEADS TO THE <b>BACK STORAGE</b> TO GATHER HIS EQUIPMENT TO CLEAN THE PLACE UP. CLEANING THE <b>LANAIS, BATHROOMS</b> AND <b>LOCKERS</b>. IN THE MORNING HE SITS ON THE <b>BERMS</b> WATCHING THE SUN RISING ABOVE DIAMOND HEAD AS WATCHING STUDENT AND TEAMS PRACTICE IN THE MORNINGS. THEN HE HEADS BACK HOME ON THE BUS.</p>
	<b>KALAWANI</b> <small>YOUTH, KID, PLAYFUL</small> 	<p>KALAWANI IS A 5-YEAR OLD WHO ATTENDS ALA WAI ELEMENTARY AND SHE IS IN KINDERGARTEN. SHE ENJOYS GOING TO THE BEACH WITH FAMILY AND PLAYING WITH HER FRIENDS AT SCHOOL. SHE LOVES LEARNING NEW THINGS AND HAVE BEEN LEARNING THE HULA.</p>	<p>KALAWANI COMES TO THE BUILDING AFTER SCHOOL. SHE APPROACHES THE BUILDING FROM THE SOUTHWEST PASTING THE <b>BERMS</b> FROM THE CANAL SIDE. SHE WALKS UP TO THE <b>OUTDOOR CLASSROOM</b> WHERE SHE MEETS UP WITH THE KAPUNA AND HER FRIENDS. HERE SHE PRACTICES HULA. AFTER PRACTICE SHE GETS A SNACK FROM THE <b>CAFÉ</b> AND SITS IN THE <b>GARDEN</b> WATCHING <b>WATER FLOWING</b> THROUGH THE SITE, WHILE SHE WAITS FOR PARENTS TO COME. THEN LATER IN THE EVENING SHE IS PICKED UP BY HER PARENTS FROM THE NORTHEAST <b>PARKING LOT</b>.</p>
	<b>BRANDON LOREZZO</b> <small>HIGH SCHOOLERS, ACTIVE, SCHOLAR</small> 	<p>BRANDON IS A SENIOR STUDENT WHO ATTENDS IOLANI HIGH SCHOOL. HE IS VERY ACTIVE IN HIS STUDIES AND DIFFERENT TYPES OF SPORTS INCLUDE TENNIS AND CANOE PADDLING. HE IS ALSO THE PRESIDENT OF HIS GRADUATING CLASS.</p>	<p>BRANDON COMES TO THE SITE FROM THE NORTHEAST, WALKING DOWN THE IOLANI SCHOOL TRAIL. RASTING BY CANAL HE READS TO THE LOCK ROOMS TO CHANGE TO GET READY FOR CANOE PRACTICE. THEN HEADS TO THE <b>CANOE STORAGE</b> AND GETS A CANOE WITH TEAMMATES TO THE <b>LAUNCH DOCK</b>. AFTER PRACTICE HE RINSE OFF IN THE <b>OUTDOOR SHOWER</b> AND RINSE OFF CANOE ON <b>DOCK</b>. THEN PROCEED TO <b>LOCKERS</b> THEN GOES HOME.</p>
TOURIST	<b>LEILANI</b> <small>COLLEGE STUDENT, ADVENTUROUS, OUT-GOING</small> 	<p>LEILANI IS A JUNIOR IN THE UNIVERSITY OF HAWAII, MAJORING IN THE DENTAL FIELD. SHE ENJOYS SPENDING OUTDOORS WHENEVER SHE CAN. LUCKILY THE WEATHER THE HAWAII CAN PROVIDE THAT OPINION THROUGHOUT THE YEAR. IN HER FREE-TIME, SHE RIDES HER BIKE TO THE ALA WAI CANAL WHERE SHE CANOES FOR FUN AND SOMETIMES WATCHES THE RACES THAT OCCUR DURING THE WEEKENDS.</p>	<p>LEILANI RIDES HER BIKE TO THE CANAL WITH HER DOG. SHE GOES TO THE <b>DOG PARK</b> THAT IS SET ON THE WEST SIDE OF THE BUILDING. OTHER DAYS SHE COMES TO THE BUILDING TO PADDLE SO SHE GOES TO THE <b>LOCKERS</b> TO CHANGE. THEN HEADS TO THE <b>CANOE STORAGE</b> AND VENDOR TO TAKE OUT A CANOE. AFTER HER TIME ON THE CANAL SHE RINSE THE CANOE ON THE <b>DOCK</b> THEN PLACES IT ON THE <b>DRYING AREA</b>. SHE THEN RINSE HER SELF OFF AT THE <b>OUTDOOR SHOWER</b> BEFORE HEADING TO THE LOCKER ROOMS TO CHANGE. THEN GRABS A SNACK FROM THE <b>CAFÉ</b> AND SITS OUTSIDE TO WATCH THE SUNSET ON THE <b>BERM SITTING</b>.</p>
	<b>MADLEN SIMON</b> <small>PROFESSOR, SCHOLAR, TRAVELLER</small> 	<p>MADY IS A PROFESSOR IN THE UNIVERSITY OF MARYLAND IN THE SCHOOL OF ARCHITECTURE, PLANNING AND PRESERVATION. SHE LOVES TEACHING AND LEARNING NEW THINGS. SHE SPECIALLY LIKES TO TRAVEL SPECIALLY IF WATER IS INVOLVED. THIS TIME AROUND SHE WILL BE VISITING HAWAII FOR THE FIRST TIME AND HOPES TO LEARN ABOUT THE CULTURE AND EMBRACE THE WONDERFUL CLIMATE THAT HAWAII HAS TO OFFER.</p>	<p>MADY ARRIVES FROM THE NORTHEAST <b>PARKING LOT</b> BY TAXI. SHE THEN ENTERS TO THE <b>LOBBY</b> AND IS GREETED BY THE <b>FRONT DESK</b>. SHE PICKS UP THE BROCHURE TO SEE WHAT IS OFFERED IN THIS BUILDING THEN WALKS OUT THE <b>BALCONY</b> WHERE SEE IS OPEN DOWN BELOW THE <b>STREAM</b> THAT FLOWS BACK TO THE CANAL. SHE SAW THAT THERE WAS A HISTORY TOUR AND MET UP WITH KAHUNA SI'VA AND WALK THROUGH THE <b>GARDEN</b>. LATER SHE MET WITH MR. PUAKEA AND LEARNED ABOUT OUTRIGGER CANOE IN THE <b>HALLAU</b> AND THEN WHEN TO <b>LOCKERS</b> TO PUT AWAY BELONGING AND HEADED BACK TO DOCK. WHERE CANOE WAS READY FOR HER AND MR. PUAKEA READY TO TEACH HER. THEN SHE RINSE OFF IN <b>SHOWER</b> AND CHANGE AND GOT HER BELONGINGS IN <b>LOCKERS</b>. THEN WENT TO THE <b>GIFF SHOP</b> TO GET SOME SOUVENIRS.</p>

Figure 4-1: The User and Experience (Source: Author, Justin Manongdo)

Section 2: Characteristics of Collect, Protect, and Respect

This thesis then looked at collect, protect, and respect characteristics. In Figure 4-2, it illustrates each characteristic of collect, protect, and respect in regards to water, sun, and wind. Where as shown, water is the most important among the three. Respect is one that characterizes and helps educate and learn from the history.

When looking at the elements of sun and light coming into the spaces we did not want strong and harsh light. Therefore, *Lanais* or porches must be taken into account within the design.



**Figure 4-2:** Characteristics of Collect, Protect, and Respect. (Source: Author, Justin Manongdo)

Section 3: Spaces

After determining the users and the spaces, we created three types of spaces: indoor, between, and outdoor. Figures 4-3 and 4-4 shows the different spaces based on the user's needs.



<p><b>INDOOR</b> (12,120 sqft)</p> <ul style="list-style-type: none"> <li>- LOBBY (300 sqft) <ul style="list-style-type: none"> <li>- ENTRANCE</li> <li>- FRONT DESK</li> <li>- WAITING ROOM</li> <li>- BALCONY</li> </ul> </li> <li>- ADMINISTRATION (900 sqft) <ul style="list-style-type: none"> <li>- OFFICES</li> <li>- BATHROOMS</li> </ul> </li> <li>- OFFICES (300 sqft) <ul style="list-style-type: none"> <li>- KAHUNA OFFICE</li> <li>- PUAKEA OFFICE</li> </ul> </li> <li>- WEIGHT ROOM (1000 sqft)</li> <li>- LOCKERS (1800 sqft) <ul style="list-style-type: none"> <li>- MEN'S BATHROOM/SHOWERS</li> <li>- WOMEN'S BATHROOM/SHOWERS</li> </ul> </li> <li>- INTERIOR CANOE STORAGE (7000 sqft)</li> <li>- JANITOR STORAGE (100 sqft)</li> <li>- MECHANICAL ROOM (720 sqft)</li> <li>- CORRIDOR</li> </ul> <p>TOTAL: (+/- 23,350 sqft)</p>	<p><b>BETWEEN</b> (5,080 sqft)</p> <ul style="list-style-type: none"> <li>- COMMUNITY ROOM (600 sqft) <ul style="list-style-type: none"> <li>- GATHERING</li> <li>- MEETING</li> </ul> </li> <li>- CLASSROOMS (500 sqft) <ul style="list-style-type: none"> <li>- HULA, TAI CHI, ACTIVITIES</li> </ul> </li> <li>- GRILLING AREA (1500 sqft) <ul style="list-style-type: none"> <li>- KITCHEN</li> <li>- SITTING AREA</li> </ul> </li> <li>- WORKSHOP (1400 sqft)</li> <li>- CANOE AND KAYAK VENDOR OFFICE (130 sqft) <ul style="list-style-type: none"> <li>- CANOE AND KAYAK RACKS</li> </ul> </li> <li>- CANOE AND KAYAK STORAGE (950 sqft) <ul style="list-style-type: none"> <li>- HALAJI</li> <li>- CANOE RACKS</li> </ul> </li> <li>- CORRIDOR <ul style="list-style-type: none"> <li>- LANAI</li> </ul> </li> </ul>	<p><b>OUTDOOR</b> (+/- 6,150 sqft)</p> <ul style="list-style-type: none"> <li>- GARDEN <ul style="list-style-type: none"> <li>- BIORSWALE</li> <li>- BIORETENTION POND</li> <li>- RAIN GARDEN</li> <li>- STREAM</li> <li>- LO'I KALO</li> </ul> </li> <li>- BOAT/CANOE LAUNCH (2800 sqft)</li> <li>- CANOE RINSE/DERIGGING AREA (1700 sqft)</li> <li>- OUTDOOR SHOWERS (150 sqft)</li> <li>- DOCKS (1500 sqft) <ul style="list-style-type: none"> <li>- FISHING AREA</li> <li>- SITTING AREA</li> </ul> </li> <li>- BERMS <ul style="list-style-type: none"> <li>- VIEWING AREA</li> </ul> </li> <li>- WALKWAY/BOARDWALK</li> <li>- BIKE RACKS</li> <li>- PARKING LOT <ul style="list-style-type: none"> <li>- DROP OFF</li> </ul> </li> <li>- MAINTENANCE <ul style="list-style-type: none"> <li>- TRASH</li> <li>- RECYCLE</li> </ul> </li> <li>- CORRIDOR <ul style="list-style-type: none"> <li>- SIDEWALKS</li> </ul> </li> </ul>
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**Figure 4-4:** Spaces organized into indoor, outdoor, or between. (Source: Author, Justin Manongdo)



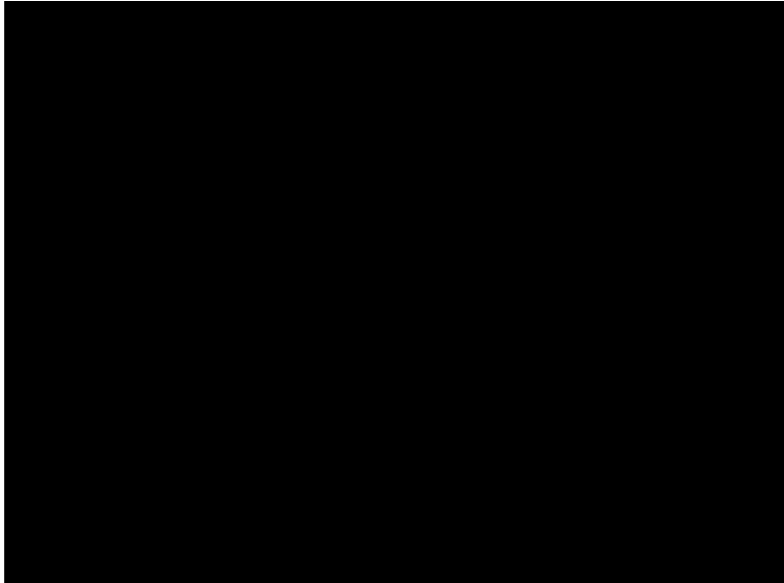
## Chapter 5: Case Studies (Precedents)

In this chapter, we look at the scope study among different precedents. One being waterfronts, resilient architecture, tropical architecture, boathouse, and tectonic and materials. This chapter will highlight what they have done and how we can take the lessons learned to improve or incorporate the ideal into our own project. Each topic precedent will then be simplified as strategies to be applied to the design.

### Section 1: Waterfront

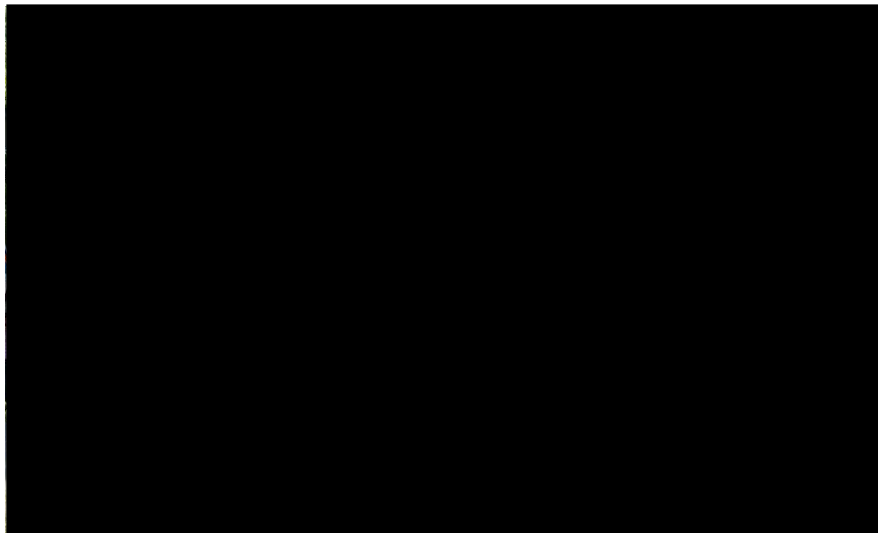
Waterfront precedents will be studied for its program and how it reactivates the unused or opportunity spaces. Each precedent will be looked at for how each will bring people to these spaces. What will also be looked at are the implemented systems incorporated to make the space sustainable through either how they deal with storm water runoffs to how they clean the waters.

Shanghai Houtan Park, designed by Turenscape as seen in Figure 5-1, is a great example of a brownfield industrial site turned into a demonstration park that highlights different systems to actively cleaning the river. Houtan Park is a constructed wetland, ecological flood control. It reclaimed industrial structures and materials. The park recovered the degraded waterfront in an aesthetically pleasing way.



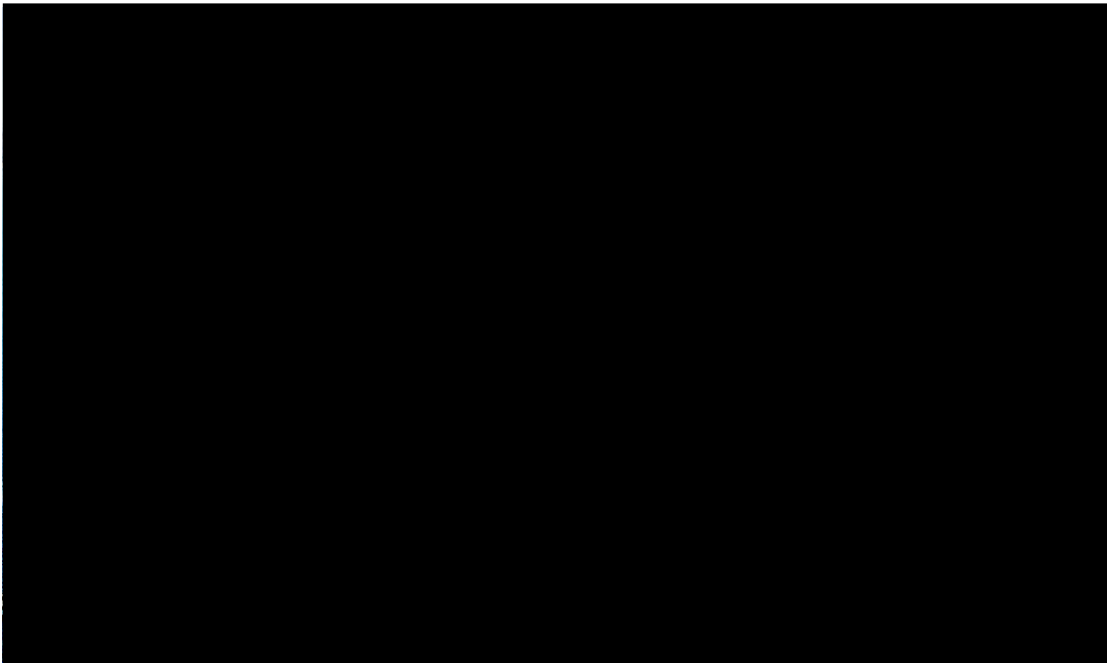
**Figure 5-1:** Shanghai Houtan Park (Source: ArchDaily)

The Cheonggyecheon River in Seoul, South Korea is designed by Seoann Total landscape as seen in Figure 5-2. This project was designed under an old highway. It was designed to protect a flood for up to a 200-year flood. The project helps increases biodiversity, reduces the urban island effect, improve circulation with transportations around the area, and increase property price around the area.



**Figure 5-2:** Cheonggyecheon River (Source: ArchDaily)

The Seattle Waterfront design by the Seattle department of transportation is seen in Figure 5-3. The project created consists of continuous sidewalks, a cycle track, a planted median, and planted buffers between the road and the sidewalk. This project is great in understanding the different edges as well as how people and vehicles can communicate with one another within the same space.

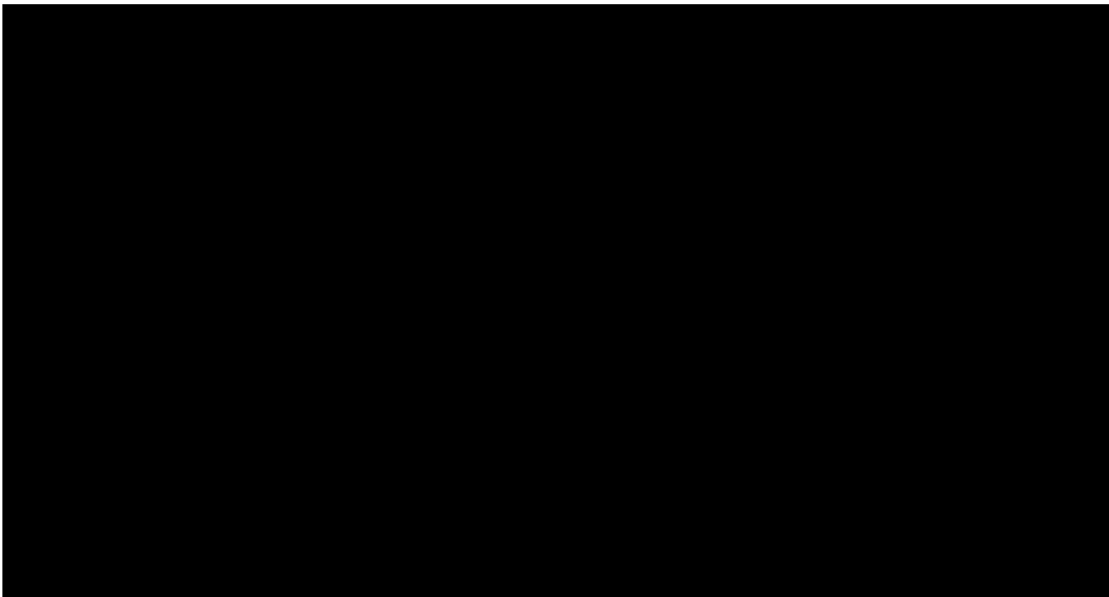


**Figure 5-3:** Rendering of Seattle Waterfront Design (Source: City of Seattle and James Corner Field Operations)

### Section 2: Resilient Architecture

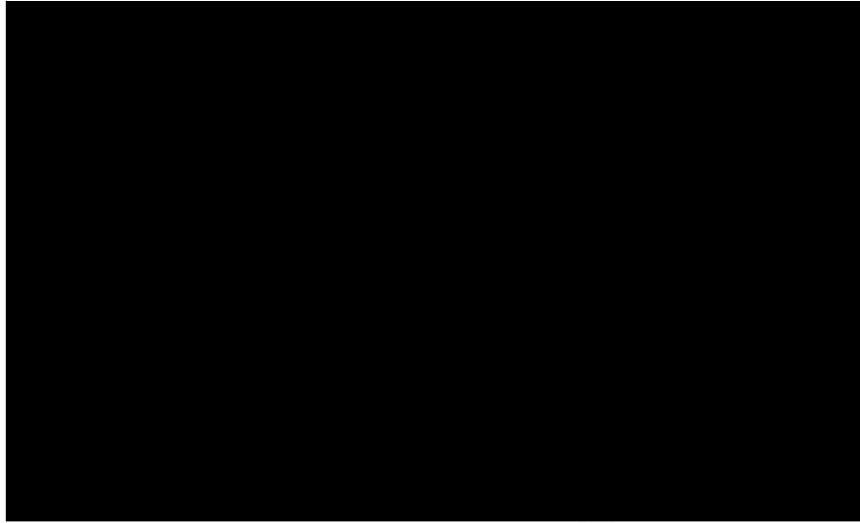
Resilient Architecture is necessary to study because of the unfavorable prevailing climate change. Rising sea levels will only worsen in the near future. The research scope is looking at ways landscape projects dealt with flooding to the machine technology that prevents damage to coastal areas.

The New York's Future Defenses against storm and rising sea level project designed by Bjarke Ingels Group is a project that highlights resilient architecture that can be implemented to many coastal places in the near future, as seen in Figure 5-4. This project consists of constructed parks, elevated areas, and flood barriers. It has breakwaters to slow waves, raised green spaces, and hidden floodwalls that flip down during a flood event.



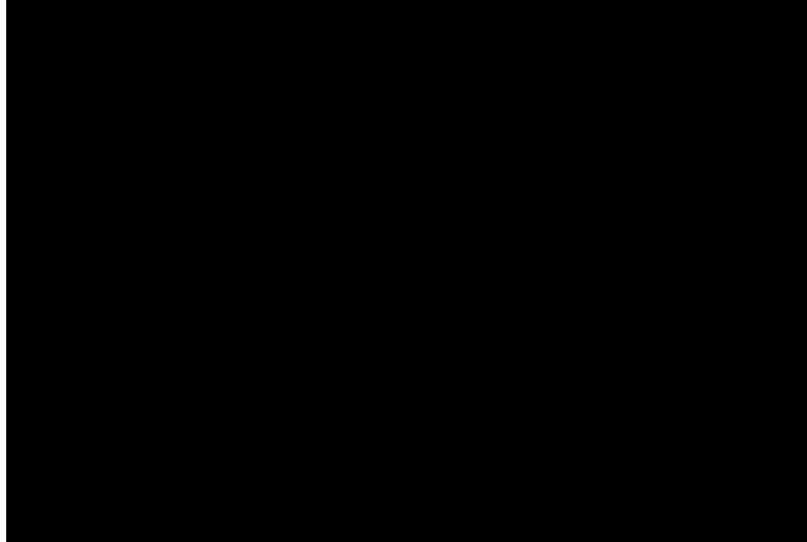
**Figure 5-4:** New York's future defenses Render (Source: Rebuild by Design <http://www.rebuildbydesign.org>)

The project Sea change: Boston design by Sasaki Associates advocating for a long-term resiliency strategy for the Greater Boston area as seen in Figure 5-5. This project designs ways to live when sea level rise while looking at it at multiple scales



**Figure 5-5:** Section of Sea Change: Boston (Source: Sasaki Associates <http://www.sasaki.com>)

This thesis also looked at mechanical systems that can help protect flood areas. Like the self-closing flood barrier, seen in Figure 5-6. This system is powered by water and is run by itself. The wall has a 100% no failure and is used around the world.

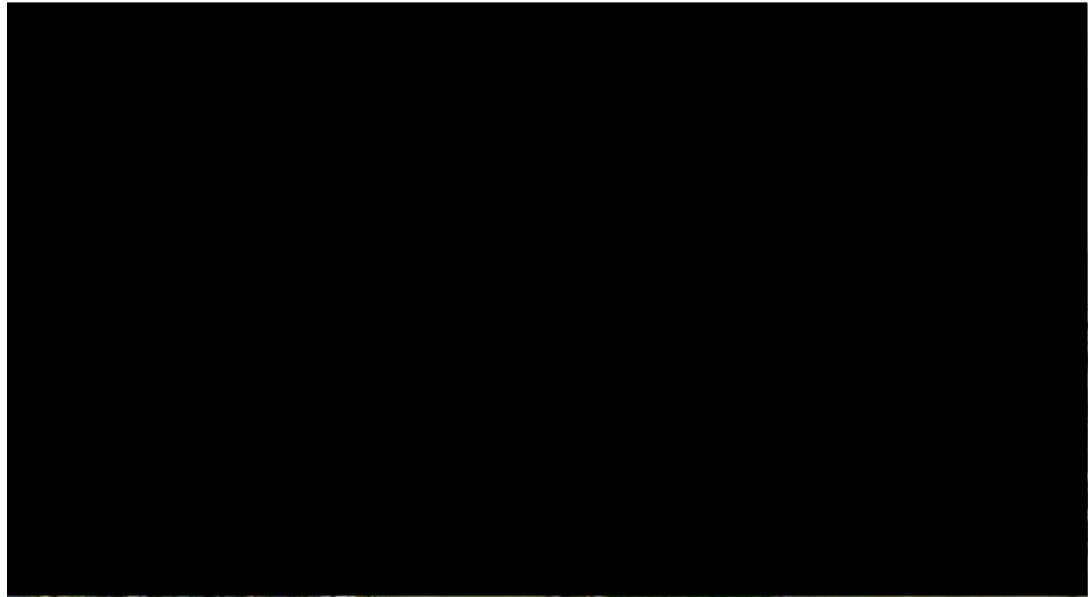


**Figure 5-6:** Self-closing flood barrier (Source: Presray <http://www.presray.com>)

### Section 3: Tropical Architecture

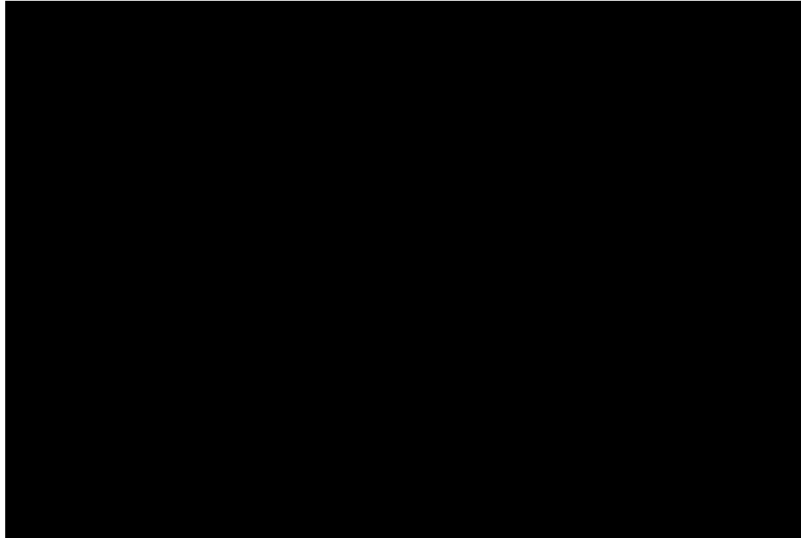
Tropical Architecture precedents will be studied, looking at how other architects have designed for this type of climate. This will be done by looking at it at all elements from the wind, sun, water, and environmental impact with a focus on how water is implemented or defended to each project. Next, will be observing the sustainable characteristics from shading to passive energy.

The Garden by the Bay design by Grant Associates is a fusion of nature, technology, and environmental management, which creates a place for both leisure and education, as seen in Figure 5-7. The project works with the climate as it is in a tropical climate. It also has water systems collection and reuse of water.

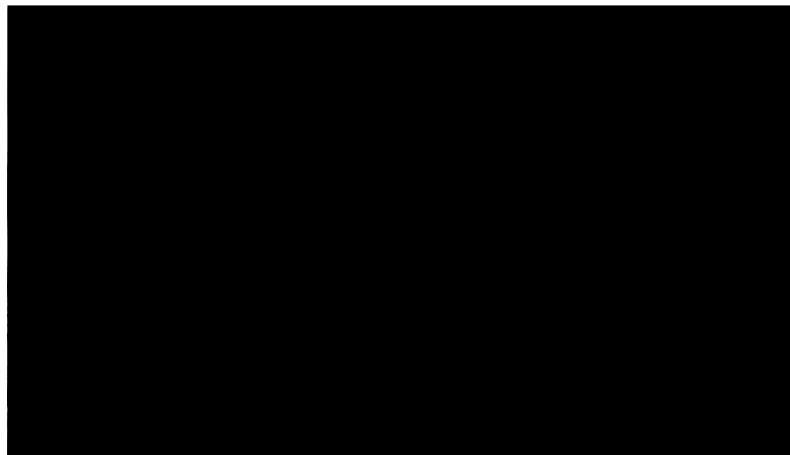


**Figure 5-7:** Garden by the Bay (Source: ArchDaily)

The thesis also looked at two tropical architects Glenn Murcutt and Geoffrey Bawa. Glenn Murcutt's project Marika-Alerton House in Figure 5-8 is a great example of designing with the climate. This project is a bioclimatic architecture, restricts solar gain, air movement, and evaporative cooling. Geoffrey Bawa's project Blue Water Hotel in Figure 5-9 is similar to Murcutt's project as it designs with the climate just Bawa's was in Sri Lanka and Murcutt's is in Australia.



**Figure 5-8:** Marika-Alerton House (Source: <http://www.ozetecture.org>)



**Figure 5-9:** Blue Water Hotel (Source: <http://www.srilankanexpeditions.com>)

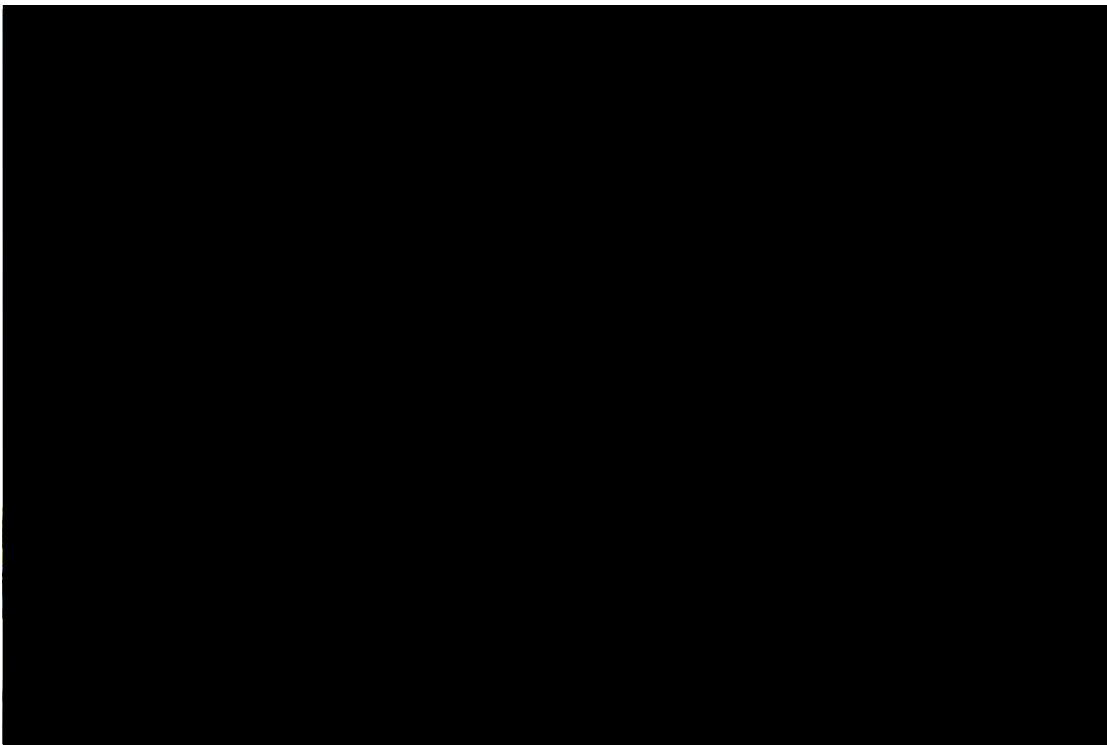
#### *Section 4: Boathouse Architecture*

Boathouse Architecture will be looked at for its programmatic research that will expose ways architecture can demonstrate or expose the varied presences to water. Events and spaces that allow for people, land, nature and the environment to proclaim water in all its value will be developed in the architectural programming of



this project. Then comparison of the programmatic differences to community centers to institutional.

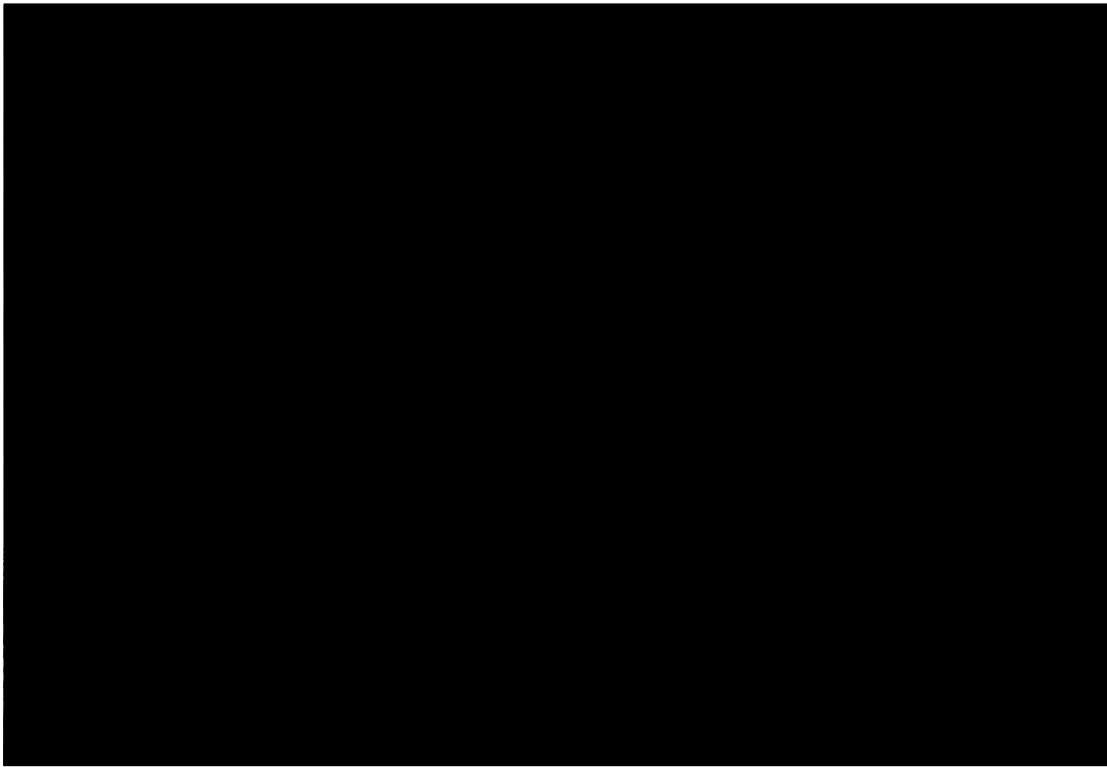
This thesis looked at different boathouse from the community center to reactivating areas too intuitional. The Community Rowing Boathouse designed by Animahian Winton Architects in Figure 5-10 is a great example of bringing the community together to learn about the sport of rowing and getting out on the waters.



**Figure 5-10:** Community Rowing Boathouse (Source: ArchDaily)

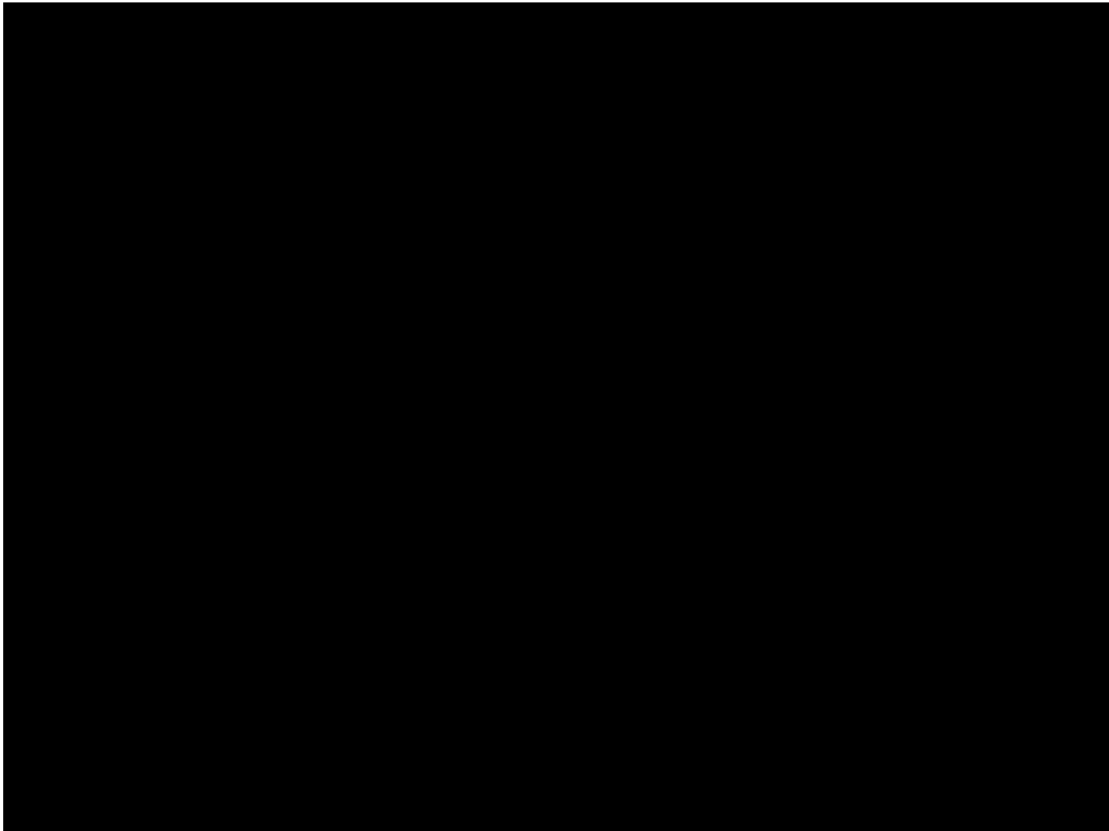
Then you got WMS Boathouse at Clark Park seen in Figure 5-11, designed by Studio Gang Architects who reactivate the river with the boathouse. The project offers a wide range of indoor and outdoor activities year round, including learn to row sessions both in tanks and on the river, youth and masters team rowing, ergometer training, rowing-inspired yoga classes, and lessons tailored to individuals with

disabilities. The project provided a publically accessible riverfront; it also reveals the larger movement toward an ecological and recreational revival of the Chicago River.



**Figure 5-11:** WMS Boathouse at Clark Park (Source: Steve Hall <http://www.archdaily.com>)

The C. Bernard Shea Rowing Center at Princeton in Figure 5-12 is designed by Peterson Architects. This is an intuitional rowing boathouse where its program is designed for the team. Coaches have their own space as well as all the essentials for the team including a gym, lockers, and clubrooms.



**Figure 5-12:** C. Bernard Shea Rowing Center (Source: Jamie Redman <http://jamieredman.wordpress.com>)

Doing this project in *Hawai'i* water is present everywhere you go, from the streams to the ocean, water is always there. Therefore, bringing the water into the building to showcase that water is the important driver to a living environment.

#### *Section 5: Tectonics / Materials*

Tectonics / Materials will be researched to determine the construction characteristics to complement the program. Finding materials that are local to the area and using the techniques are used. Exploring the historic aspect of how things were constructed and easy to use materials. Some material this thesis is looking at is glulam construction and outrigger canoe construction.



## **Chapter 6: Strategies (synthesis)**

In this chapter, we will talk about how we can use the precedent studies done from the last chapter and create strategies to use during the design part of the thesis. We will be looking at strategies from how we can collect, protect, respect, and sustain water. Many of these precedents relate to one another and are not final to any one type of solution or theme.

### *Section 1: Waterfront*

Some strategies include collecting water whether we put them in cisterns or rain gardens it a way to recharge the ground waters. Recycling water and then reusing it as grey water.

Planning for sea level rise and flood in low coastal areas. Designing with the 100-year flood in mind, creating landscape systems from berms, levees, and floodwalls ensures efficient use of the water along with the architect. This also ensures that we are protecting the environment including the habitat and landscape.

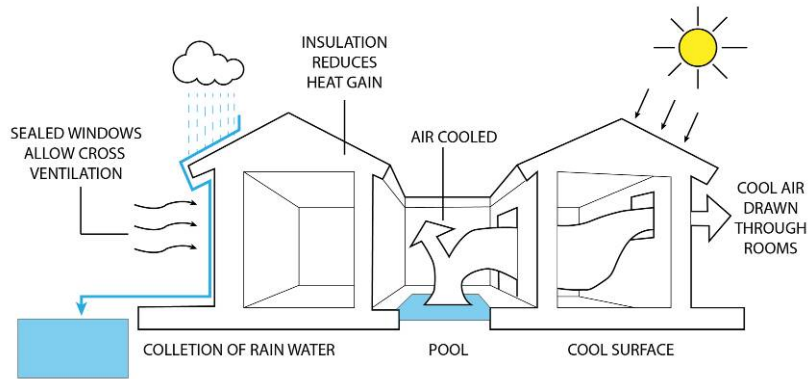
We need to respect the water as water can bring us either good or bad. To sustain we need to think about the environment, social, and economic aspects.

### *Section 2: Resilient Architecture*

Here we must design to protect from flooding as sea level rise our shores will change over time. Designing with flooding in mind will help design to those situations. Then respecting the power of water, it can give us either joy or hard time so we must respect it.

Section 3: Tropical Architecture

The diagram below in Figures 6-1 and 6-2 show how we can design for tropical climates. From observing water and how we can collect, protect, and respect. Followed by looking at how we can design for the solar gain and air movement since it is essential to keep in mind as we intergrade between architecture and landscape.



**Figure 6-1:** Strategies of Designing (Source: Author, Justin Manongdo)

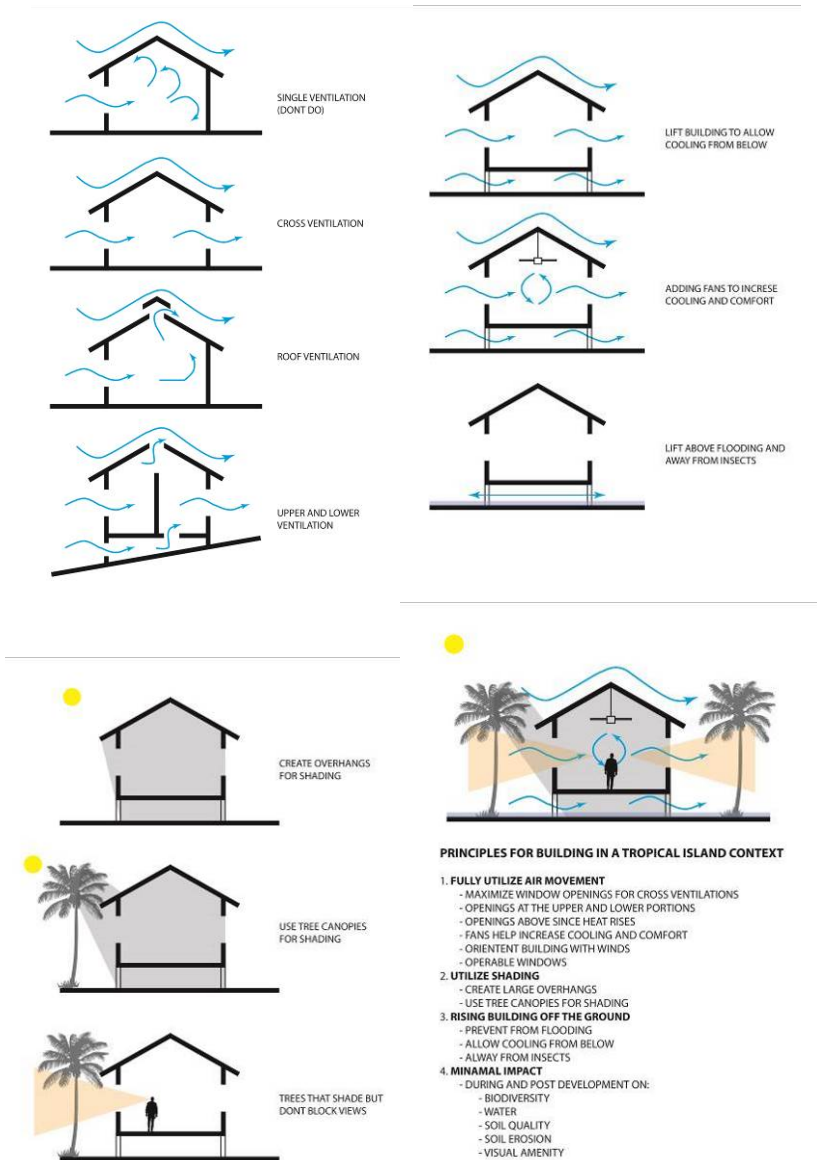


Figure 6-2: Principles for building in a tropical climate (Source: Author, Justin Manongdo)

Section 4: Boathouse Architecture

Designing a boathouse that can collect, protect, respect, and sustain. Allowing the architecture to have water present. So understanding the relationship with water whether it be physically or just visual.

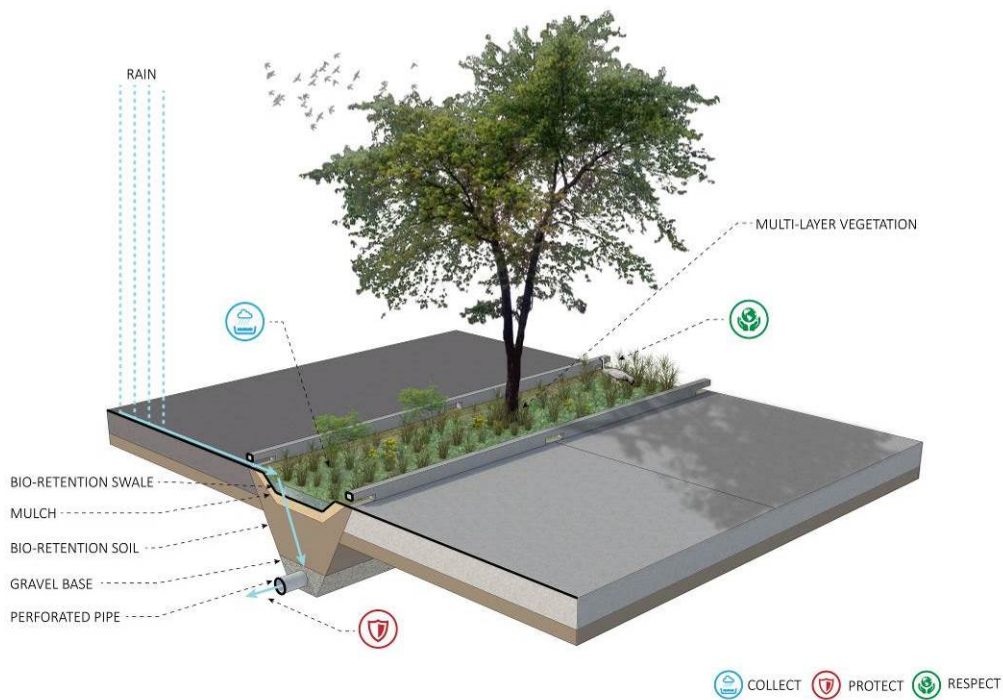
Section 5: Tectonics / Materials

Materials and construction need to be sustainable. Using local resources is the right direction so we know that the material belongs in the area. Then using the local construction methods to keep the cultural aspect and historic value.

Section 6: Catalog of Strategies for Collect, Protect, Respect

Bioswales

Figure 6-3 is a typical Bioswale. It slows, collects, and purifies water when surface runoff enters a swale. The purification of water helps to protect the water source when returned into stream. At the same time, it restores wildlife habitat thus respecting the natural environment.

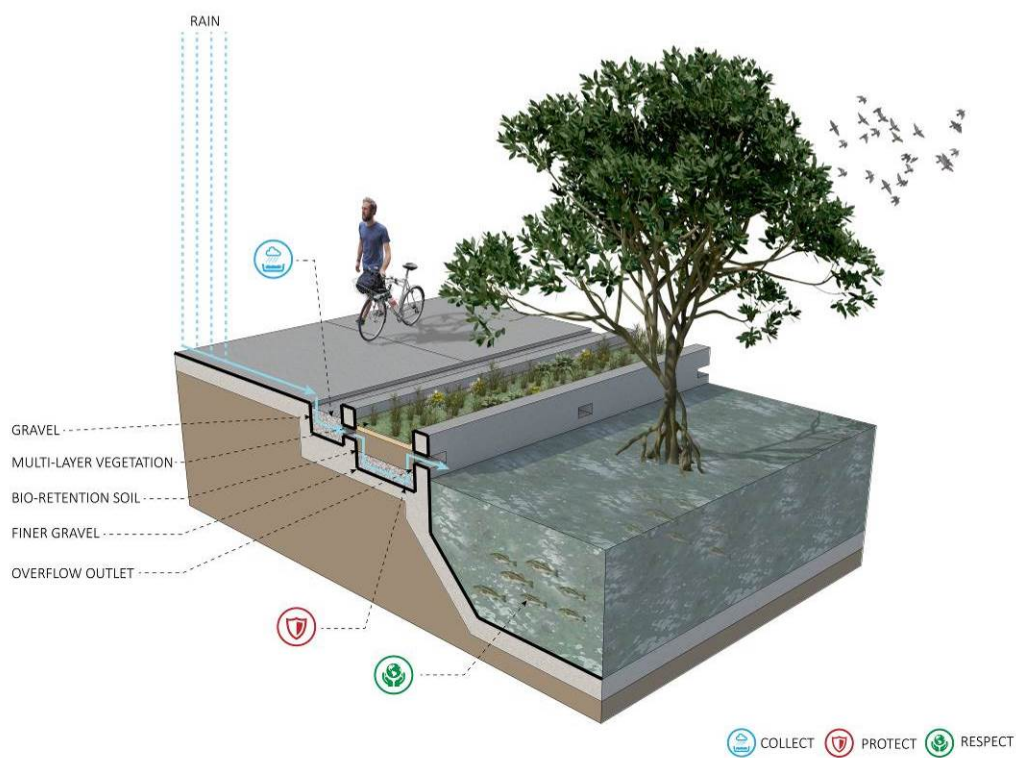


**Figure 6-3:** Bioswale (Source: Author, Justin Manongdo)



## Sidewalk Stormwater Management

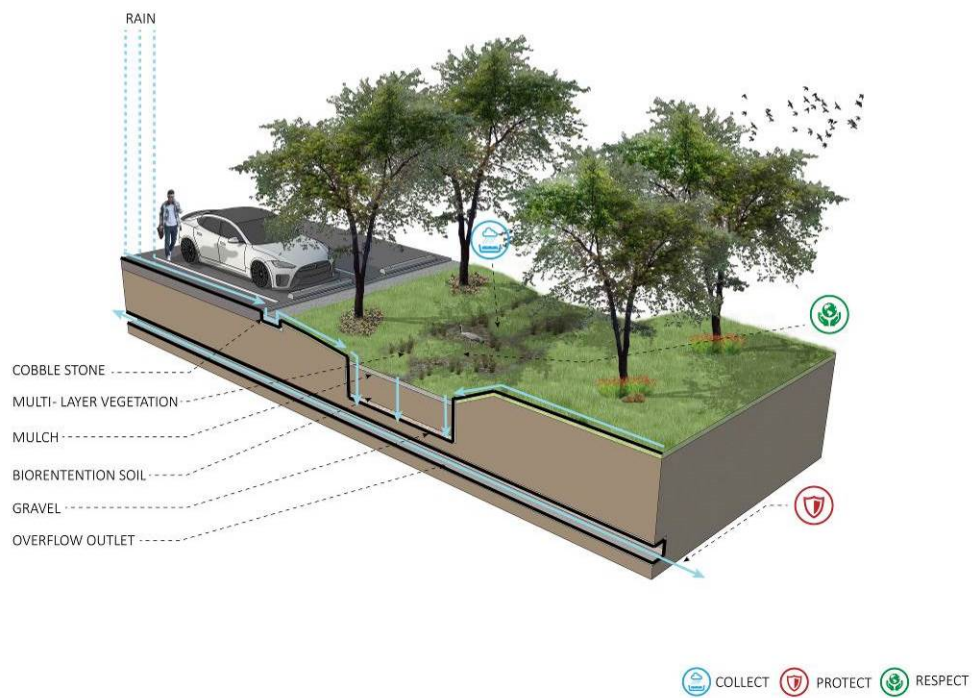
Figure 6-4 is a sidewalk stormwater management system. This system separates large trash items then it slows and purifies water before it enters the mangrove. Mangroves are important because it provides its own community of plants and the growth of restoring wildlife.



**Figure 6-4:** Sidewalk Stormwater Management (Source: Author, Justin Manongdo)

## Bioretention Pond

Figure 6-5 is a Bioretention Pond. Here it collects rainwater and surface runoffs and slows the process of returning into sewers or water sources. However, if it flows into water sources it will have been purified. Lastly, it restores wildlife by bringing back native animals to local areas.



**Figure 6-5:** Bioretention Pond (Source: Author, Justin Manongdo)

### Roof Water Collection

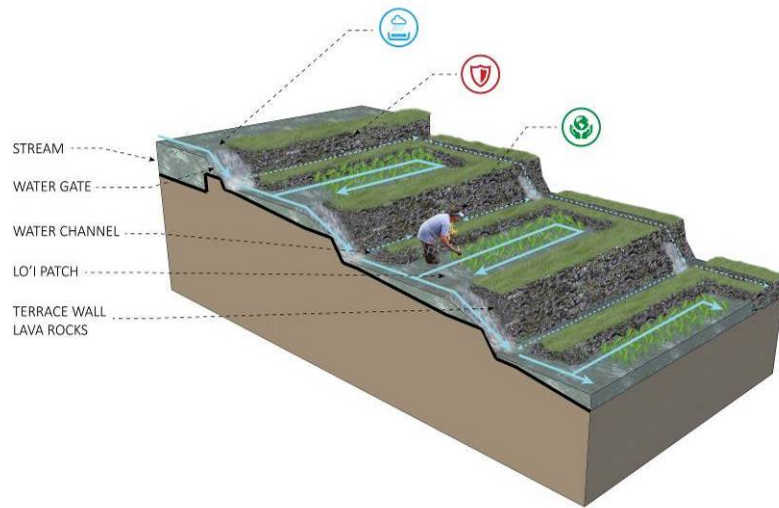
Figure 6-6 is a roof water collection system. Here it collects rainwater by the runoff from the roofs. The slope of the roof allows water to flow into the drain, which is then channeled into a cistern. The cistern holds water for use for toilets and prevents water from flooding as quickly.



**Figure 6-6:** Roof Water Collection (Source: Author, Justin Manongdo)

### Terracing

Figure 6-7 is a terracing system. This is a Hawaiian strategy that was used from the beginning of civilization in the ahupua'a. Here it diverts stream water into a terracing taro patches. Where it slows, purifies and irrigates the plants within the system.



 COLLECT  PROTECT  RESPECT

**Figure 6-7:** Terracing (Source: Author, Justin Manongdo)

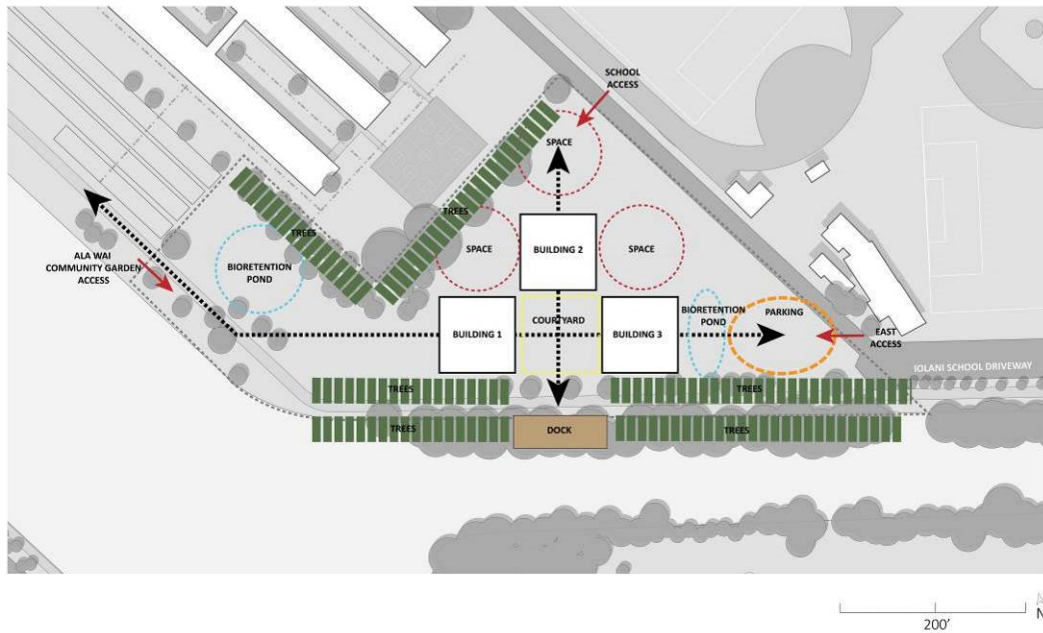
## Chapter 7: Design

In this chapter, we will talk about the schemes, organization, and how we applied the strategies of collect, protect, and respect into the design of an eco-tourism facility. Then show the thesis boards that were defended during the thesis presentation.

### Section 1: Schemes

#### Cardinal Flow Scheme

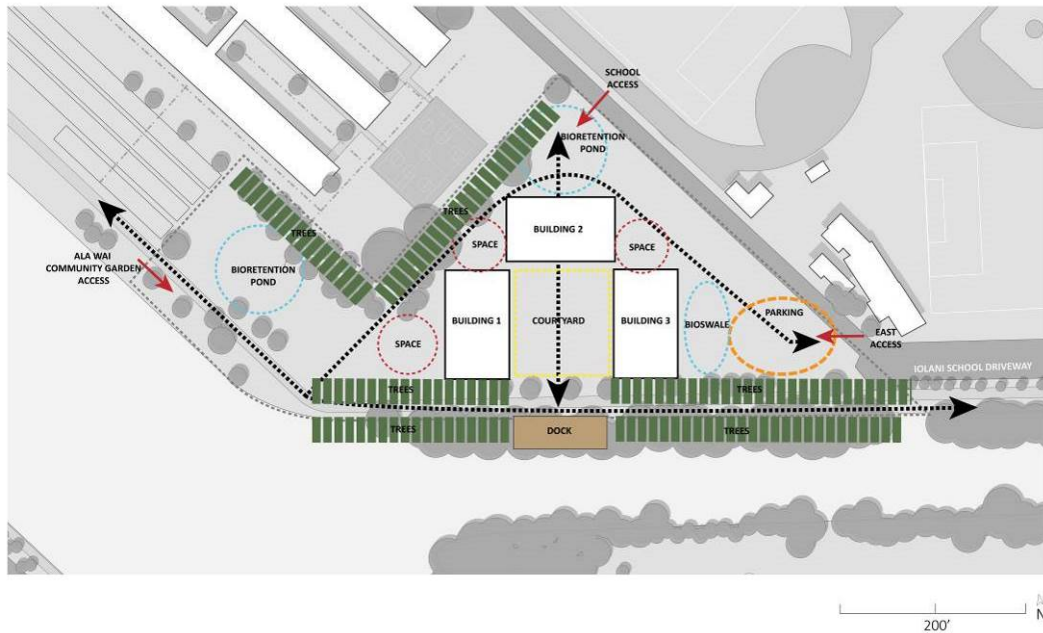
In Figure 7-1, the scheme is called the cardinal flow. Here the buildings and axis are aligned with the cardinal direction. The scheme moves the existing walking path from the south to go through the site courtyard. Then moves from the north- to the south of the docks. Some of the negatives of this scheme are little connection to the waterfront; courtyard gets hot in the hot hours, and forcing people through the building.



**Figure 7-1:** Cardinal Flow Scheme 1 (Source: Author, Justin Manongdo)

Direct Flow Scheme

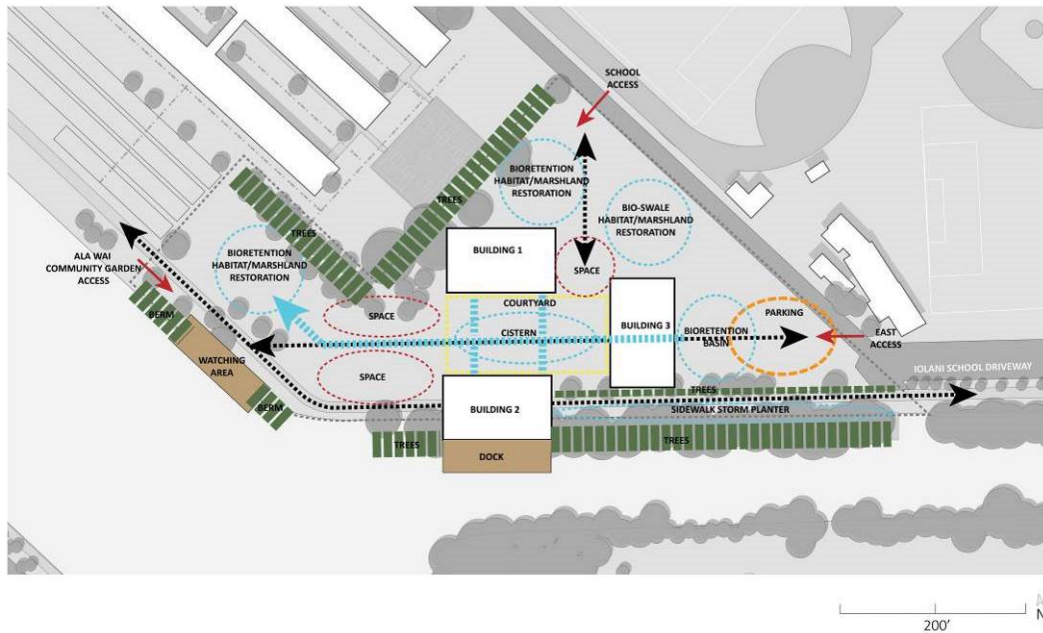
In Figure 7-2 the scheme is called the direct flow. Here the walkway directs the user from one way from the north and can either walk around or go through the existing path. The north pathway is not the best place from the entrance since most people would pass by if not noticing area. It would pose a problem with the orientation of the buildings since the courtyard would be under direct sunlight, which you do not want.



**Figure 7-2:** Direct Flow Scheme 2 (Source: Author, Justin Manongdo)

### Streamside Courtyard

In Figure 7-3, the scheme is called streamside courtyard. Here the buildings are aligned west-east, which allows the wind to flow through the buildings providing cooling. The alignment of the building also provides some shading to the courtyard, especially the south building. The strategies of collect, protect, and respect can fit within this scheme. The scheme allows three access points to the building courtyard. This scheme also allows more access to the waterfront.



**Figure 7-3:** Streamside Courtyard (Source: Author, Justin Manongdo)

#### Comparison and Selection

In comparison, both scheme 1 and 2 allows too much sun exposure to the courtyard and blocks natural wind that may cause the building to use more energy. However, scheme 3 benefits with the west-east direction of the building, allowing the courtyard to be cooler and comfortable. Scheme 3 also allows a better fit for strategies of collect, protect, and respect by having spaces to program these systems.



## Section 2: Organization

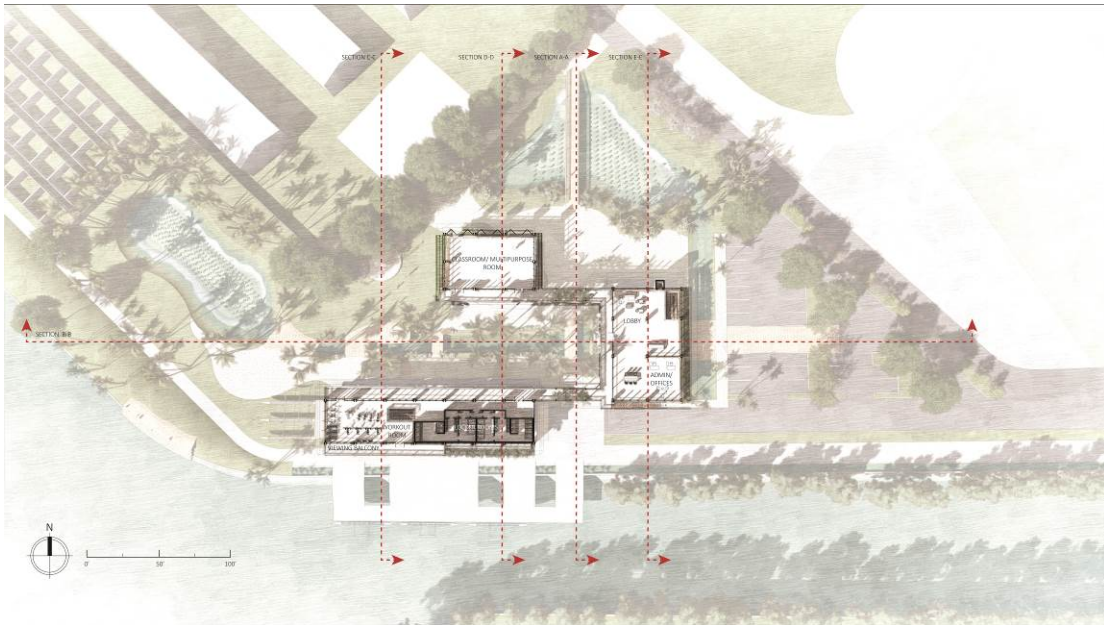


**Figure 7-4:** Ground Floor (Source: Author, Justin Manongdo)

### Ground Floor

The Ground Floor as shown in Figure 7-4 are spaces that can be flooded if it were to flood in the near future. The program includes the following; the outrigger canoe storage and workshop, the kayak storage and vendor, and the grill and gathering spaces. The space is centered by the watercourse, which is fed by the roof water collection and is collected and stored in the cistern. From the south is a floating dock, which allows people to go out on the canal to the canoe. To the west and north are bioretention ponds and to the south edge are sidewalk stormwater management systems. Lastly, to the far west is a viewing platform where users come to watch races or people watching on the canal. The existing walk and bike path is still there allowing people to either come into the space or go around.

## Second Floor



**Figure 7-5:** Second Floor (Source: Author, Justin Manongdo)

In the second floor is where the supporting programs are located. Some of the spaces include; the classroom/multipurpose rooms, the lobby and admins, and the workout and locker rooms. The second floor consists of *lanais* or balconies that provides shade to protect users from the sun.

## Water Flows



**Figure 7-6:** Water Flows (Source: Author, Justin Manongdo)

In Figure 7-6 is a water flow diagram that shows the different water systems and how they all work together. Figure 7-6 also shows the solar energy from the PV panels. Notice how the water system holds the water before even coming out to the canal.

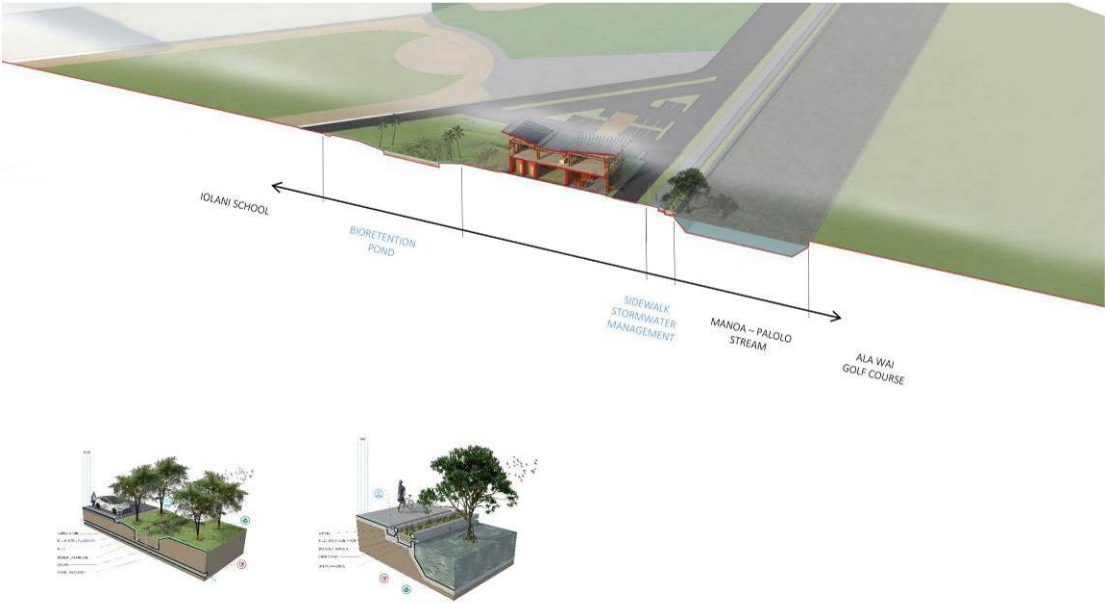
*Section 3: Strategies applied to Waikiki Wa'a Cultural Center*



**Figure 7-7:** Multi-Section Waikiki Wa'a Cultural Center (Source: Author, Justin Manongdo)

Figure 7-7 is a multi section drawing of the water systems integrated to the local context. This shows the overall system as a whole while showing the building itself as well. Below is an illustration that shows how the section is split and how each of the strategies were incorporated.

Breakdown of Section Drawing



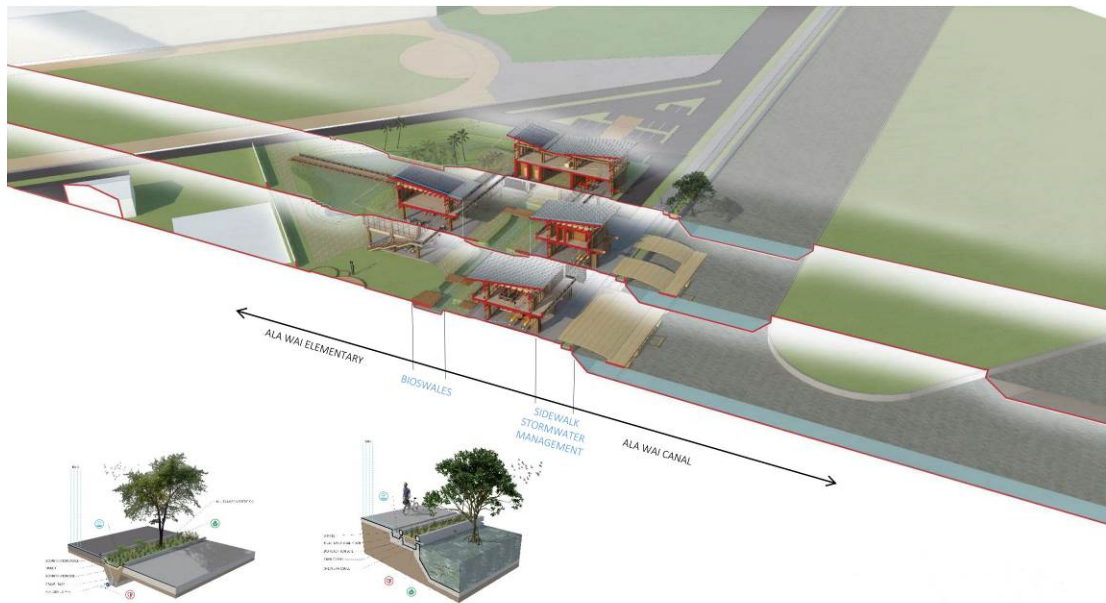
**Figure 7-8:** Section E-E | Bioretention Pond | Sidewalk Stormwater Management (Source: Author, Justin Manongdo)

Figure 7-8 includes the bioretention pond to the north of the site and a sidewalk stormwater management system to the south. The strategy was modified to integrate to Hawaii’s climate and ecology wildlife.



**Figure 7-9:** Section D-D | Terracing | Roof Water Collection (Source: Author, Justin Manongdo)

Figure 7-9 includes the terracing, roof water collection, and sidewalk stormwater management. The terracing allows the water from surface runoff to be purified while irrigating the plants. Where the roof water collection occurs, the rain water is collected and then stored within the water course and cistern.



**Figure 7-10:** Section C-C | Cistern | Sidewalk Stormwater Management (Source: Author, Justin Manongdo)

Figure 7-10 includes the bioswale and the sidewalk stormwater management. The bioswale is located within the watercourse to pick up the leftover surface runoff that has not been purified from any other water systems. This was a breakdown of the water strategies within the site and drawing of the sections.

## Cross-Sections



**Figure 7-11:** Section A-A Water Collection (Source: Author, Justin Manongdo)

Figure 7-11 shows how the water system connects within this one section cut. The cistern on the right is hidden and flows to the center watercourse once it is full. This section also shows the connection to the sun movement and how much solar energy this building can receive.

Figure 7-12 show the long cross section through the site. Where you can see the parking has perorated pavers to collect water then moves it to the bioswale to filter and purify before heading out to canal.



**Figure 7-12:** Section B-B Water in Relationship to Site (Source: Author, Justin Manongdo)

Perspectives



**Figure 7-13:** Northeast Approach Crossing over Bioretention Pond (Source: Author, Justin Manongdo)



**Figure 7-14:** Main Entrance Waterfall Roof Water Collection (Source: Author, Justin Manongdo)





**Figure7-15:** Classroom Second Floor view to Water Course (Source: Author, Justin Manongdo)



**Figure 7-16:** Outrigger canoe dock on Manoa-Palolo Stream (Source: Author, Justin Manongdo)

Section 4: Thesis Defense Presentation

# SUST'ĀINABLE ISLAND WATER

ĀINA MEANS "LAND." THE NATIVE HAWAIIANS SEE THEIR IDENTITY AND WELLBEING



WAIKIKI WA'A CULTURAL CENTER



SECTION A-A WATER COLLECTION



SECTION B-B WATER IN RELATIONSHIP TO SITE

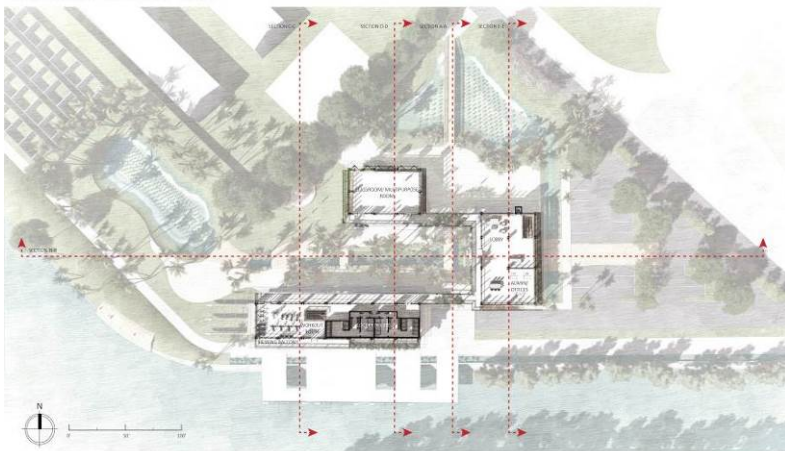
Figure 7-17: Thesis Board 1 (Source: Author, Justin Manongdo)

# ER CULTURE: COLLECT, PROT

ENTWINED WITH THE LAND. THEREFORE, RESPECTING THE LAND AND LIVING IN IT ARE



GROUND FLOOR PLAN



SECOND FLOOR PLAN



Figure 7-18: Thesis Board 2 (Source: Author, Justin Manongdo)

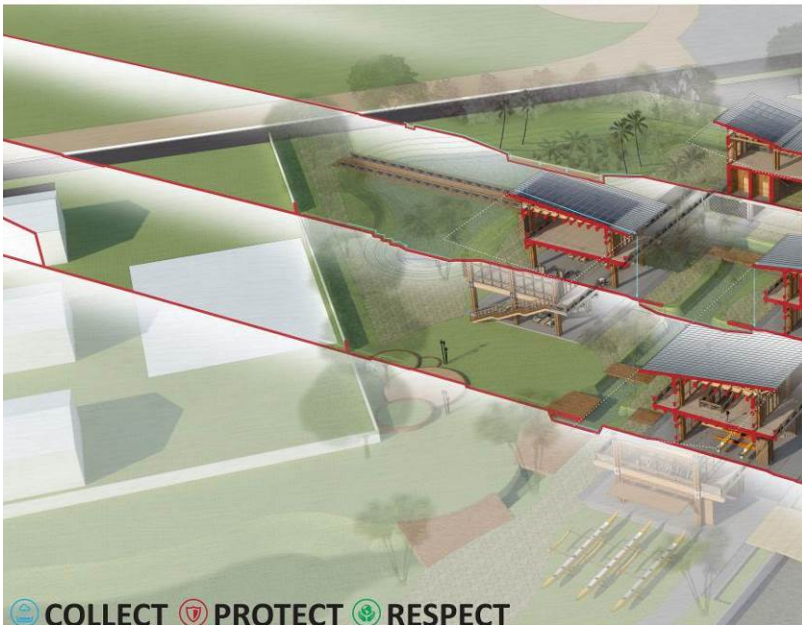
# ECT, RESPECT

OF THE UTMOST IMPORTANCE.

COMMUNITY KALO FIS  
AHUPUA'AW  
TARO FAMILY PLAN



CLASSROOM. SECOND FLOOR VIEW TO WATER COURSE



**COLLECT** **PROTECT** **RESPECT**  
STRATEGIES APPLIED TO WAIKIKI WA'A CULTURAL CENTER

BIOSWALE



SIDEWALK STORMWATER MANAGEMENT



BIORETENTION POND



CATALOG OF STRATEGIES FOR COLLECT, PROTECT, RESPECT

Figure 7-19: Thesis Board 3 (Source: Author, Justin Manongdo)

5TH TEAM HOKULE'A MALAMA 'AINA WAIKIKI KAUIAI MA  
 WATER WA 'A VOYAGE ALOHA MOLOKAI HAW  
 TS OUTRIGGER LIVE PONO GODIS LOVE KAHO'OLAW



OUTRIGGER CANOE DOCK ON MANOA- PALOLO STREAM

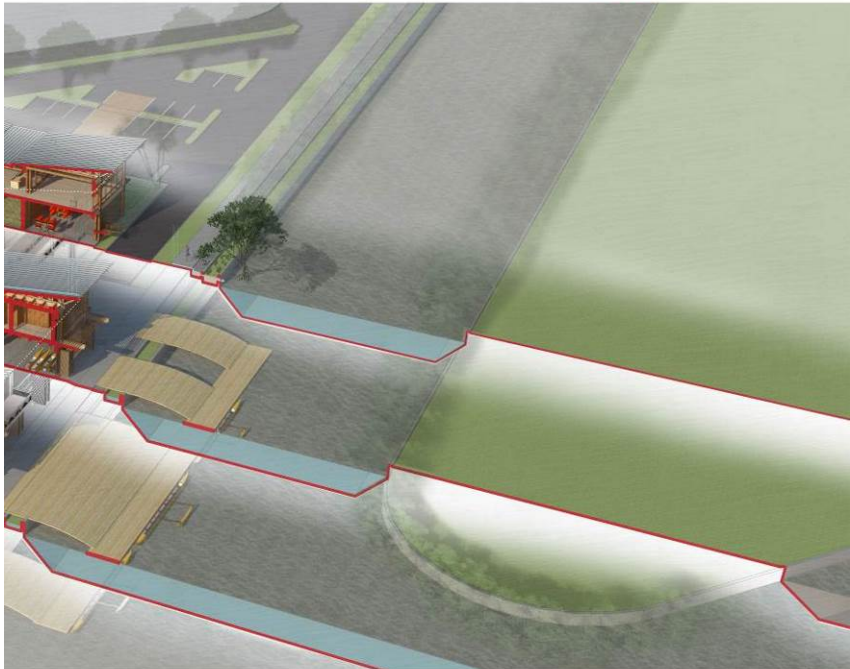




Figure 7-20: Thesis Board 4 (Source: Author, Justin Manongdo)



NORTHEAST APPROACH CROSSING OVER BIORETENTION POND 



MAIN ENTRANCE WATERFALL ROOF WATER COLLECTION 



WEST APPROACH IN THE STRUCTURE VALLEY 

**Figure 7-21:** Thesis Board 5 (Source: Author, Justin Manongdo)

## **Chapter 8: Conclusion**

### *Section 1: Presentation + Critic Response*

The critics took the thesis very well, but wanted to see the amount of attention to detail I worked on with the strategies and effort integrated into a more designed architecture. They wanted to see more tectonics of the building and how it would be put together. I agree that I should have put more time on the architecture design. I think I did not explain the concept of the *ahupua'a* too well because I wanted to show that my building was trying to take the ideas from the traditional values. Overall, the critic feedbacks were very helpful and will aid in the expansion of developing the project even further with their responses in mind.

### *Section 2: Conclusion*

In conclusion, I have applied my developed strategies to a case study on one of the Hawaiian Islands. Where the lessons learned is important in all of the Hawaiian Islands and is applicable around the world where land and water meets.

## Glossary

**‘Āina** – Land, earth

**Ahupua’a** – Large traditional socioeconomic, geologic, and climatic subdivision of land

**‘Akua** – deity; God

**Ali’i** – Hawaiian Royalty

**Aloha** – Love, affection, compassion, mercy, sympathy, pity, kindness, sentiment, grace, charity; greeting, salutation, regards; sweetheart, lover, loved one; beloved, loving, kind, compassionate, charitable, lovable; to love, be fond of; to show kindness, mercy, pity, charity, affection; to venerate; to remember with affection; to greet, hail. Greetings! Hello! Good-by! Farewell! Alas!

**Heiau** – Hawaiian worship site

**Kahuna** – Healer; a Hawaiian shaman.

**Kapu** - is a Hawaiian word that means forbidden, but now it is used as a No Trespassing or Stay Out or Keep Out

**La’au Lapa’au** – Traditional Hawaiian medicine and spirituality; “Solving the problems of body, mind and spirit. In Hawaiian Healing the mental is not separate from the spiritual and physical. Rely on spiritual insight and most of all, guidance from Akua” – Papa Henry Auwae, Po’okela

**Lanai** – Patio, porch, or balcony

**Lehua** – A Hawaiian tree, with bright red flowers, yielding a hard wood

**Lo’i** - taro patch

**Malama** – To take care of, tend, attend, care for, preserve, protect, maintain; care, preservation, support, fidelity, loyalty; caretaker, keeper.

**Malama i ka ‘Āina** - to take care of the land

**Moku** – Cut of island, Land Division of Large Districts

**Mo’olelo** – Mo'o" means succession, and "olelo" means words. A story.



**‘Ohana** – Family

**Ohia Lehua** – An evergreen tree or shrub of the Hawaiian Islands, having hard wood and showy red flowers with numerous long stamens

**Wai** - Water

**Waiwai** – Wealth, lots of water

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