MĀLAMA ʻĀINA PLAN MOKU O LOʻE

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Hawaiʻi Institute of Marine Biology (HIMB)

University of Hawaiʻi Community Design Center (UHCDC)
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FINAL REPORT

◄ *Cover Page:*
Net fisherman on the western shore of Moku o Loʻe; the niu grove extends the length of the shore, ca. 1920

Source: The Bishop Museum Archives

ACKNOWLEDGMENTS

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Note:
This report summarizes a proof of concept and serves as a conceptual design guide intended to inform future planning requests for proposals (RFPs) for Moku o Loʻe. The report does not serve as a traditional planning document.

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INTRODUCTION

Project Background

The HIMB received a Castle Foundation grant to develop a biocultural resource management plan (Mālama ʻĀina Plan) for Moku o Loʻe, the largest offshore islet in Kāneʻohe Bay and location of HIMB. The University of Hawaiʻi Community Design Center (UHCDC) was asked to provide proof of concept planning, engagement and design to explore the stewardship and climate adaptation of the moku. The Mālama ʻĀina Plan is meant to guide HIMB in its stewardship of the islet as a Native Hawaiian Place of Learning in concert with the institute's Strategic Plan. The Mālama ʻĀina Plan additionally addresses the future impacts of shoreline erosion and sea level rise on Moku o Loʻe. Most importantly, its place-based approach to adaptation strategies for the moku, grounded in Native Hawaiian culture, is expected to serve as a model for Oʻahu and beyond. Additional support for this effort was provided by the Heʻeia National Estuarine Research Reserve.

The Mālama ʻĀina Plan

The Mālama ʻĀina Plan provides an overall vision for pono stewardship of Moku o Loʻe, home of HIMB, which is an Organized Research Unit (ORU) of the University of Hawaiʻi at Mānoa (UHM). The Plan is situated within a framework of Indigenous stewardship, and uses the eight realms of consideration of pono stewardship as developed by elder councils (ʻAha Kiole) in Hawaiʻi (Kaʻimikaua, 2000 and Winter et. al., 2018). The knowledge and wisdom of this system guide the

◀ *Moku o Loʻe and adjacent patch reefs, 1921*

Source: Map Collection, University of Hawaiʻi at Mānoa Library

process of conceptualizing contemporary adaptation strategies to address conservation, sustainability, and climate resilience. In fulfillment of UHM's Strategic Plan, the project considers community input to position Moku o Loʻe as a Native Hawaiian Place of Learning within the ahupuaʻa of Heʻeia and the moku of Koʻolaupoko. The Plan includes preliminary recommendations for climate change adaptation strategies and stewardship practices, and aspires to serve as a model for climate adaptation strategies on Oʻahu and elsewhere. It established working groups with participants drawn from HIMB faculty, staff, and student body, the NERR Kūpuna Council, and other community members. Each working group included a cultural practitioner and professional subject matter experts to provide insight and guide participants in exploring nature-based climate adaptation strategies.

Goals of the Mālama ʻĀina Plan:

- Balance the needs of the human population, research station functions, and ecological integrity of Moku o Loʻe
- Guide stewardship practices and programs of Moku o Loʻe as a Native Hawaiian Place of Learning
- Guide near and long-term strategies for emergent climate adaptation issues such as shoreline erosion and sea level rise
- Create a holistic Mālama ʻĀina Plan that serves as a model for land stewardship and climate adaptation for the University of Hawaiʻi, Oʻahu, and beyond

Moʻolelo Keahiakahoe

A Note to the Reader:

This moʻolelo is a full transcription of Hawaiian scholar Mary Kawena Pukui's archival records (Pukui, Bishop Museum Archives). The moʻolelo has no deletions, or insertions, with only minor diacritic adjustments made when a typo was evident. We encourage readers to visit the original source material at the Bishop Museum.

O keia ka puu oioi loa ma ke kuahiwi ma luna ae o Keaahala ma Kaneʻohe. He mau hoahanau keia no Moku-ume-ume ame Kahua-iki ma Ewa, a i kipaku ia aku hoi no ko lakou hakaka mau e na makua. He 4 lakou i kipakuia aku, o ia o (Kahoe (kane)) Keahiakahoe, (Kahua-nui (kane)) oia o Kahua-uli ma Luluku, Pahu or Puupaha (kane) and Loʻe (wahine) e ikeia nei o Mokuoloʻe i keia la.

> *That is the tallest peak on the mountain above Ke-aʻa-hala (The-hala-root) at Kaneʻohe. There were brothers [and a sister] from Moku-ʻume-ʻume (Ford Island) and Kahua-iki at Ewa, who were expelled for constantly fighting with their parents. The four who were sent away were Kahoe of Ke-ahi-a-Kahoe (male), Kahua-nui (male) who was also known as Kahua-uli, whose home was at Luluku, Pahu or Puʻupahu (male) and Loʻe (female) whose name is found in Moku-o-Loʻe to this day.*

Ua loaa mai kela inoa Ke-ahi-a-Kahoe mamuli o na hana a Pahu ia Kahoe me Loʻe ma o keia wahi moolelo pokole la ma lalo iho nei: He mahiai ka Kahoe hana e noho ana ma ka huli Haiku o Keaahala, a, pela no hoi o Kahuauli ma Kaakauwai and Luluku; he lawaiʻa hoi ka Pahu hana e noho ana ma ka huli Heeia o kela puu e ikeia nei i keia manawa o Puu Pahu, a, o ko lakou kaikuahine ma kela wahi no e ikea nei ma ka inoa o Moku-o-Loʻe.

The name Ke-ahi-a-Kahoe was derived from a deed committed by Pahu against Kahoe and Loʻe, which is given in the following account. Kahoe was a farmer who lived on the Haʻikū side of Ke-aʻa-hala and so was Kahua-uli at Ka-ʻakau-wai at Luluku. Pahu was a fisherman, living on the Heʻeia side of that hill now known today as Puʻu Pahu (Pahu Hill). Their sister lived at the place that is still known as Moku-o-Loʻe (Loʻe's island).

I na la mua o ko lakou nohoana, he maikai loa ma na ano a pau; aka, aia na manao maua a pi iloko o Pahu me ka ike a maopopo ole i kona mau hoahanau a me ko lakou kaikuahine. Oia i loko o ia mau la, ke pii aku o Pahu i uka i o Kahuauli and Kahoe la, e hoi mai ana oia me ke kaumaha i na kumaupoi mai ia laua mai. Pela no hoi ko lakou kaikuahine, na na kaikunane no e lawe mai.

All went well in the first days of their settling in that locality but there was an indifference and stinginess in Pahu that was not recognized by the other brothers and their sister. In those days Pahu went up to visit Kahua-uli and Kahoe and always returned laden with loads of poi from them. With the sister, the brothers always brought her share to her.

Aka nae, i ka hala anaʻe o kekahi manawa ia lakou (na kane) i noho wahine ae ai, ua hoomaka mai la ke ano e o ko lakou noho ana. Oiai, ua noho ae la o Pahu or Puupahu me Pau, he kaikamahine e noho ana ma kekahi aoao mai o ke awawa a kahawai e mahiai ana. Aia ia wahi ma uka o kekahi lalanipuu e kaupale a e hookaawale ana ia Keaahala a me Kapukauki.[1]

After a passage of time the man took wives to themselves and an unhappy condition began. Pahu or Puʻu-pahu mated with Paʻū, a maiden across the valley and stream where he farmed. This place is on the upper side of a row of hills that separates Ke-aʻa-

hala and Ka-puka-ʻuki

I kekahi la, ua iho mai la o Puupahu mai uka mai o kahi o Paʻu ka wahine i ka lawaiʻa i ke kakahiaka nui i ukaliia e ke kai koekoe. I ka u-hoʻi ana aku nae i ke ahiahi, ua kipaku aku la o Puupahu e hoi ma ka huli ma kai o ka lalanipuu a Kualapa e kaupale la ia Keaahala and Kapuukauki; a hoi aku la no hoi o ia wale no ma ke alo ma uka e hiki aku a i kahi a Kahoe e mahiai anai ana, i ka hui ana aku ua pane aku la ua Puupaha nei. "Make no oe e (kuaana or kaina instead of name) Kahoe, he mau wahi Poomaunu wale no kaʻu e hoi la." O ka manao maoli o keia mau olelo, e hoike aku ana ia he ia Koena-maunu wale no kana mau wai iʻa mahuahua o ka nui iho he ia makalii wale no. O keia iho la ka hoomaka ana o ka Epa a Apiki o keia moolelo, oiai nae ka kaikoeke e hoʻi ae la he alahele okoa, me ke ka Ulua oo Kahala. Ua hoomauia keia no kekahi manawa loihi.

One day Puʻu-pahu came down from the upland home of Paʻū, his wife, accompanied by his brother-in-law, to fish in the early morning. Upon returning in the evening, Puʻu-pahu sent the latter to go home by the sea ward side of the row of hills or ridge. separating Ke-aʻa-hala and Ka-puka-ʻuki. He went on alone before it to the upland where Kahoe was farming. As they met, Puʻu-pahu said, "You are indeed in need, O brother Kahoe, for all I have returned with is some bait." The meaning of these words was that he had some left over fish used as bait and the remainder were tiny ones. This was the beginning of deceit, as told in this tale, for the brother-in-law who went on another path had the ulua and kahala fish. This practice went on for a long time.

I loko nae o keia manawa a pau, aole i loaa iki ia Kahoe ka hoohuoi a hiki i ka hoea ana aku o Loʻe i mua ona i wahi ai nana, oiai nae i ke ahiahi aku no ka hoi ana aku o Puupahu me kala and keia ano ia nunui. I kona hiki

ana aku nae a hui me ke kaikunane, o ka mea mua loa o kana ninau ana aku ia Kahoe i ka i ana aku: “Ua huai ae nei kau imuulua? Kaumaha o Pahu i ka Ulua o ke kaiko-eke no hoi a olua i ke kahala i u-hoʻi mai ai i ke ahiahi nei. He mau wahi Amomomi ae kaʻu.”

In all of this time Kahoe had no suspicion whatever until Loʻe arrived to get some vegetable food. It was after the evening that Puʻu-pahu had gone home with some kahala and other large fish. When she met her brother [Kahoe], her first question to him was, “Have you removed the cooked ulua fish from the imu? Pahu returned with the brother-in-law of you two laden with kahala last evening. I received some amomomi.”

Nana mai la ke kaikunane a pane mai la i ka i ana mai: “He wahi Poo-maume wae no ia e hoi mai nei i na ahiahi a pau!” I kela pane ana aku ana, ua hoomanao ae la ia (Kahoe) i kana i lohe mai ai i kekahi o kona mau hoa-mahiai, aia nae, ua hooho koke ae la o Loʻe. “Auwe, i na wa a pau ana e hoi mai ai mai ke kailoa mai, aole loa he manawa i hoʻi nele mai ai. Awahua ino ka hoi.” a kulu iho la kona waimaka. Ua oleloia ma kahi a ka waimaka o Loʻe i kulu iho ai, ua lana a lilo ia i mapunawai[2] ma ke alo nei o ke pali o Keahiakahoe e huli iho la e nana ia Paʻu a hoea mai paha i keia la.

The brother stared at her and replied, “He has been returning with bait fish every evening!” After saying this he recalled something some fellow farmers had told him. Loʻe exclaimed at once, “Oh! whenever he returned from the deep sea, there was never a time he had come without fish. How heartless of him!”, and with this her tears fell. It was said that where Loʻe’s tears fell, they formed a spring in front of the cliff of Ke-ahi-a-Kahoe, facing Paʻū and there it is to this day.

2 Aole loa au i hoomaopopo i keia punawai, oiai, aole loa au i lohe mua i keia moolelo i koʻu manawa i Kaneʻohe; na ka hele e huli i na mea e pili ana i ka A. Dickey i hoike mai iaʻu mai Ewa mai. Ua kapaia kela hapuna o Loʻe-wai.

I do not remember this spring, for I did not hear this tale while I was in Kaneʻohe; I had gone there from ʻEwa to seek the things told to me by A. Dickey. The spring was named Loʻe-wai.)

Mahope mai o keia lohe ana aku o ua Kahoe nei i ka ike ana mai i ke kulu ana iho o na waimaka, ua hoololi aku la oia i kona nohoana ame kona mahina-ai ana ma ka huli Haiku or Heeia o kela pali e ku nei; a, ua hoopau ae la no hoi oia i ka nana a hoomaopopo ana mai ia Puupahu, koe wale iho no a hoea kino aku i ka ipuka a-hale alaila loaa mai. Aole hoi e like me ma mua aku ko Kahoe lawe kino mai. I keia loli ana ae la o kahi noho o ua Kahoe nei, a he mau pule ma ia hope mai, ua hoi aku la o Mr. Pahu and ka wahine a noho paa i kai o Kaopulolia, me kona hoomau no i ka hele mau i ka lawaia. E iho mau mai ana no hoi ke kaikoeke a hookahi ka hele pu ana i ka lawaia.

After Kahoe had heard this and saw the falling of her tears, he changed his residence and his farming place to the Haʻiku or Heʻeia side of the cliff standing there. He stopped doing for Puʻu-pahu except when he came in person to the door of his house. Only then did the latter receive anything. It was not like before, when Kahoe brought food to him. A few weeks after Kahoe had changed his place of residence, Pahu and his wife went down to Ka-ʻopū-lōlīa to make their permanent residence. He continued in his trade of fishing. His brother-in-law always came down and the two went fishing together.

I keia hoi ana akula o Puupahu i kai Kaopulolia, na ke kaikoeke e hoolawa ana ia lakou i ka ai; oiai, he kanaka mahiai mau no oia, he kakaikahi ka lohia o kona hale and kona ohana e ka pololi ai. Aka nae, mamuli o keia hui ana ae me ka ohana o kona kaikuahine Paʻu and ka laua mau keiki, ua kipa keke aku la o Mr. Pololi and Mrs. Wi i ona la a me kona ohana a pau. Aole walehoi ia lakou wale, aka, ua holo laula ae la ka nele a ka ai a puni o Heeia ame Kaneʻohe; koe aku ko Kahuauli ohana and ko Kahoe (a me kekahi poe kakaikahi no, aka, aole no lakou ka moolelo and keia kamailio ana. No laila e hoʻihoʻi pono ae ka kaua kamailio ana ma luna o Ke-ahi-

a-Kahoe and Puupahu na Oua i Kahua-loa.

When Puʻu-pahu went to Ka-ʻopū-lōlīa to live, his brother-in-law supplied him with vegetable food. He, too, was a farmer and rarely was it ever heard that his home and family ever lacked food. But since his family was added to by his sister Paʻū and her children, Mr. Hunger and Mrs. Famine and their families came along very soon. Not only to them alone but the lack of food spread throughout Heʻeia and Kaneʻohe. Kahuauli, Kahoe and a few others not mentioned in the story were exceptional cases. So let us turn back our narration to Ke-ahi-a-Kahoe and Puʻu-pahu, the two "dwellers of Kahua-loa".

I keia nohoana nae, aole loa i haalele o Kahoe o ka mahi ana ia Keaahala i ka uala, ka palaai, a me na meaai no a pau i kupono i na aina kula e like la me ia, na meaai ulu hoi i ka wai o ia kana e kanu ai ma kela huli o Haiku a hala loa aku i kai o Hoi. (He wahi ka keia aia i waena aku o ka awawa o Heeia e holo la a hiki i ka loko o Heeia uli, aole nae au i ike a lohe mua i keia inoa oiai au ma Koolau).

In the meantime, Kahoe did not leave off farming at Ke-aʻa-hala, where he grew sweet potatoes, pumpkins and other food plants suitable for a plain like this one. The food plants requiring much water was planted on the other side of Haʻikū, all the way to the lowland of Hoi. This was a place in the center of Heʻeia Valley, that led to the fishpond of Heʻeia-uli. (I had not known or heard of this name while I was at Koʻolau.)

I keia hoi ana mai o Puupahu a noho hou ma kai o Kaopulolia, ua hoomau aku no oia i ka lawaia i kela la me keia la, oiai nae i loko o ia mau la e kaukai aku ana i ko laua ola ana i ke kaikoeke a me Kahuauli, oiai nae aole o Kahoe i hoole maoli mai i ka haawi ana mai i ka ai

iaia (Puupahu). Aka nae, ua maopopo a ua lohe mai oia, ua lohe a ua maopopo ia Kahoe kana mau hana lokoino o na la i hala aku.

When Puʻu-pahu returned again to dwell at Ka-ʻopū-lōlīa, he continued his daily fishing, but in those days life depended on the brother-in-law and on Kahua-uli. Kahoe did not actually refuse to give Puʻu-pahu any food, but the latter knew and heard that he had learned of his unkind deeds in the past.

Nolaila, he mau mahina mahope mai o kela hoi ana aku a laua me Paʻu i kai, a i ka wai hoi a ka pololi and ka wi e hahana ana i luna o ka aina; ua pii aku la o ia i uka i o Kahuauli la i wahi ai na laua, ma ia pii ana a ua ua Puupahu nei i halawai aku ai o ia me Kahoe. Oiai nae he mau mahina loihi ko laua ike ole ana kekahi i kekahi, ua mahamaha like ae la no ko laua halawai ana. Aka nae, ia laua e kamailio ana no ke ano o ka nohona o ia mau la, ua puka aku la i ua Puupahu nei ka nui o ko laua pilikia o ka noho ana; me ka hoonuinui ana aku o ko laua pilikia, me ka puka pu hou ana aku o keia mau olelo, ka mea hoi nana i hoala aku i na hoomano ana i loko o Kahoe ia (Pahu) ia i olelo aku ai i keia mau olelo:

It was several months after he and Paʻū had moved to the lowland that hunger and famine began to rage over the land. He went up to Kahua-uli to get some food and on the way he met with Kahoe. They had not seen each other in many months and were delighted at the meeting. As they were talking of the conditions of those days, Puʻu-pahu mentioned the trouble that they were in. He magnified the trouble and mentioned something that recalled a thought to Kahoe's mind:

"He mau wahi poomaunu wale no kaʻu hele ae la i o (Kahuauli and kaikoeke) lakou la ma kela kapa o ia hoi ma kela aoao o kahi awawa e hookaawale ana ia *Paʻū*

and Keaahala, ka mea hoi nana i hookomo a hoala aku i ka wela anaina) i loko o Kahoe a pane mai la ia ia: “He oiaio kela, ua nui maoli no kahana a ka wi i keia mau la e nohoia aku nei, o kahi Ola (ai) e noho ia aku nei; he pu-ikaika maoli no. Nolaila, e nele na no oe, he wahi Kūōō wale no kahi ola e noho ia aku nei.”

“I just took some bait fish to the others (Kahua-uli and his brother-in-law) on that side.” He meant the other side of the valley that separated Pa‘ū and Ke-a‘a-hala. This raised the heat of anger in Kahoe, who replied, “How true that is. The famine in these days is indeed great. The bit of life-giving food is hard indeed to obtain. Therefore you are not receiving anything for all I have to sustain life are some broken pieces of sweet potatoes.”

Mahope iho o ka laua kamailio pokole hou ana aku, ua hoomau aku la oia i kana huakai hele no kahi o ke Kaikoeke; ua nele mai la nae ka loaa ana o kahi manaai iaia, nolaila, ua hoea loa aku la oia i mua o Kahuauli ma kela aoao aku o Luluku. Iaia (Pahu) i hiki aku ai i o Kahuauli la, ua hoea aku oia i ka manawa pololei a Kahuauli and kona ohana e hoopohole ai mai ana; nolaila i kena mai ai o Kahuauli i ua Pahu nei e alu like aku i ka ihi ana i ka ili o ka ai i pau ae i ka wa malamalama. I ka pau ana nae i ka ihi, ua ahiahi loa aku la; oiai hoi o Pa‘u e noho mai la i kai o Kaopulolia me ka laua ohana keiki i ka pololi, a, ke hele loa aku la i ka poeleele.

After a short conversation which followed this, Pu‘u-pahu went on his way to his brother-in-law’s. He failed to obtain any food at all from there and so he continued on to the presence of Kahua-uli on the other side of Luluku. When he reached Kahua-uli’s place, he came at a time when the latter and his family were peeling taro and so Pahu was asked to join them in the work so as to have it done while

it was day. As the peeling ended, it was late in the evening. Pa‘ū and the children were down at Ka-‘opū-lōlīa waiting with hunger as darkness fell.

Oiai hoi aole i hoao iki o Pahu e ku‘i ai i na la a pau o kona ola ana, ua lilo loa i mea e hoopilikia ia ai kona noonoo no keia poeleele loa o kona noho ana i uka. Aka nae, mamuli no o ke aloha a me ka oluolu o Kahuauli i kena ae ai o ia i kekahi o na kanaka e noho ana ma lalo o kona malu e hoopiha mai i kana (Pahu) apahuai i ka popoai e wali mua ae ana. I ka loaa ana mai nae i ua Pahu nei o kana ai e lawa ai lakou no ka pule a no ke anahulu la paha ua poeleele loa iho la ia manawa (ma kahi paha o ka hora 8 a 9 o keia wa a kakou e noho nei). Ia loaa ana mai la, ua hoi aku la oia me ka awiwi nui no ka manao i ka pololi o kona ohana. I kona hoea ana aku nae i kauhale, ua aumoe loa ia manawa; (*about 11 or 12 o‘clock at midnight*).

Pahu had never tried to pound poi in his life and this remaining in the upland until dark distressed his mind. Because of the love and kindness of Kahua-uli, he commanded some men who lived under him to fill Pahu’s container with the first batch of poi made. When Pahu received enough poi to last them a week or ten days it was already dark. (Perhaps it was the equivalent of eight or nine o’clock to us of today). After receiving it, he hastened home, thinking of his family’s hunger. It was quite late when he arrived at home, about 11 or 12 o’clock at midnight.

I keia hoea ana aku o ua Pahu nei; i kauhale, ua pau kahiko ka ohana i ka hiamoe, ka mea hoi nana i hoala mai i ka nohono eneenenemi a hakaka ma waena o laua. Aka, e hoomau aku ko kaua kamailio ana ma kahi i loaa mai ai o ka inoa “Ke-ahi-a-Kahoe” i ke pali o Keaahala a hoea loa mai i keia la e nohoia nei e kakou na hanauna hou o keia lahui, ka mea hoi a ka hapaneei o na opio Hawaii e kapa nei he hupo a hoopau manawa

ka huli ana i na moolelo o ia ano.

Upon reaching home, he found his family asleep. This caused anger and quarrelling between the two [his wife and himself]. Let us go on talking about the source of the name. Ke-ahi-a-Kahoe, on the cliff of Ke-aʻa-hala. It remains to this day in which the modern generation of this people live, the majority of the Hawaiian youths, who regard the seeking of the old lore a stupid and time wasting occupation.

E hoomanaoia i loko o kela mau la a ka hahana a ka wi e nee ana, he kunaia ka hoomoʻa ana i ka ai. No ka mea, ina e ikeia ae ana kou hoomoʻa ana i kau ai, a, ma mua ae o ka huaʻi ana ae o kau imu ai; e piha mai ana ia i ka poe makilo a pilikia hoi i ka nele a ka ai. No laila ua maa lakou i ka huna i ka manawa e hoomoʻa ai i ka lakou mau imu ai, oiai nae ka hopaneei o ko lakou manawa kalua ai, aia no la i ke ahiahi, a i oleia, i ka po (between 9pm. and daybreak) okoa no, i ao au ia, ua pau ka ai i loko o na kumau a umekeai. He hoonanea wale no ko ke ao (daytime) ana ae hana e hele ana i o a i anei e huli ai i na mea e ae e pono ai ka nohona ohana ana. E hoomanao pu ia hoi o ka uwahi (smoke) o ka imu ka mea nana e hoike aku i ka lehulehu, "ke kaluaai mai la o mea, a, e makaalo loa ia ana ka manawa e moʻa huai ia ae ai ia imuai. Ke huai ia ae, o ka piha mai la no ia o ka imu i na wahine and na kamalii, e hui pu mai ana no me na kane i kekahi manawa wahi a ka oleloia. O ka hao ka kela, a ka hapuku ka keia, hele loa iho la ae ka mea nana ka imuai i ka nele and ka hoaa. Pela iho i kaluaiai ka imuai i ka po, aka, he like no nae a like ka hopena e loaa mai ana.

Remember that in those days when the famine was at its worst, the cooking of food was kept a secret, because when it was noticed, the place would be full of hungry people who looked with longing before the imu was opened. Therefore the others made it

a habit to hide the imu full of food; to postpone the time of cooking until evening or at night, between nine o'clock and daybreak. When day came, the food was prepared and in the bowls and containers. In the day light hours they whiled the time going to and fro seeking things to benefit the family. Remember, it was the smoke of the imu who told the public, "So-and-so is baking food," and the time for the opening was then eagerly watched for. As soon as the imu was opened, women and children gathered about and it was said that some men did likewise. This one scooped, that one grabbed, and before long the owner of the imu had nothing at all. That was why the cooking was done at night, but later the result was just the same.

No keia Kahoe nae a kakou e kamailio nei, aole loa he wa ona i kahu a i hoomoʻa ai i ka lakou ai i ka po; no ka mea, he kakaikahi loa ka manawa e ikeia aku ai ka uwahi o kana imu ke a mai a hoi iho no hoi, he eleu loa oia a me kona ohana i ka ihi hoopohole ana a me ke kuʻi a paluku ana i na kalo e moʻa ae ana a pau i ka wali ma mua o ka hoea ana mai o ka (lehulehu) mahalua e hao ia ae ai a nele lakou. I ka mahalua (puulu o ka poe makilo) e aku ai, e hoolaʻi mai ana lakou la; ua pau na mea a pau i ka wali a komo i loko o na kumauai (umeke nunui) kahi e waiho mai la i loko o ka hale.

As to this Kahoe, whom we are discussing, he did no preparing or cooking at night, for rarely was the smoke of his imu seen. Besides that, he and his family were quick in peeling and pounding the taro as they cooked. The poi was mixed before the people gathered to scoop up the food, and this deprived them. By the time the cheeky beggars arrived, they were sitting quietly, with all the food mixed and in large containers inside of the house.

O kekahi kumu e loaa pono ole ai o ko Kahoe wa e

kahuimu ai, o ia no ka ike ole ia o ka uwahi a kana imu i ka manawa e a ae ai ka imu e hoʻa ia ai. No ka mea, i ka manawa o ka imu e a ae ai, aole loa ia e ikeia mai ana e ka poe a pau e akenui aku ana e ike aku i ka manawa e ae ai ka imu. He elua wahi a keia Kahoe e noho ai, he hookahi ma loko o kekahi awawa ma ka huli Haiku o ka pali e ikeia nei ma kona inoa, a, pela no hoi ma kekahi awawa ma ke alo nei o Keaahala, ka huli e nana aku la ia kai o Kaneʻohe. O keia mau hale nae a i elua o ua Kahoe nei e noho la i loko o kela mau awawa, he mamao loa ia mai kahi a ka uwahi e huaʻi aku a i luna o kela pali e ikeia nei ma kona inoa. No ka mea, i ka manawa o ka imu e a ae ai ke ahi, e holo aku ana ka uwahi no ka hapalua a hookahi paha mile okoa ma mua ae o kona pua ai ana ae i luna o ka piko o ka pali o Kahoe. Nolaila, i na manawa a pau a kana imu e a ae ai, he pomaikai loa ka hiki i kekahi kane a wahine paha ke hoomaopopo i ka manawa o ka imu a ua Kahoe nei e hoʻa ae ai.

The reason that Kahoe was never caught cooking was his ability to conceal the smoke of the imu he lighted. While the imu was light, all those who watched eagerly for it never saw it. He had two dwellings, one was in a valley on the Haʻikū side of the cliff bearing his name, and the other in another valley in front of Ke-aʻa-hala, on the side looking out toward the sea of Kaneʻohe. The two homes in which Kahoe lived in these valleys were far away from the spot where the smoke rose on the cliff which bore his name. When the fire was lighted in the imu, the smoke travelled a half or a whole mile before it appeared at the summit of the cliff of Kahoe. Therefore whenever the imu was lighted, rarely did any man or woman recognize the time that Kahoe did it.

E hoomaopopoia mai ano, i ka wa o ka imu kaluaai a ua Kahoe nei e a ae ai; aole loa e ikeia mai ana ka uwahi a kela imu i kapii ae ma kela wahi a ka imu e a la a ma kekahi wahi paha e kokoke iki mai ana ma laila. Aka, e

kokolo aku ana ia i loko o ke awawa e holo aku la i hoea i kahi i oleloia, he mamao hoi i aneane e piha ka hapalua mile okoa mai kahi aku a ka imuahi e a la.

Remember now, when the imu made by Kahoe was being readied for the food, the smoke was not seen rising from that spot at all or anywhere near it. It crept along inside of the valley to the spot mentioned, a distant place of over a half a mile from where the fire was burning. This helped him greatly in keeping secret the time for the lighting of his imu for the food of his family before beggars, the result of the bitter famine, arrived there.

E hoomanaoia, o keia mau hale o ua Kahoe nei a i elua e ku ana ma Haiku a ma Keaahala, ua loaa like ia laua keia haawina laki; a, e puka a e hoea like ana ka uwahi ma kela wahi hookahi no e huai la ka uwahi i luna o ka welelau pali.

Remember, these two homes of Kahoe, standing at Haʻikū and at Ke-aʻa-hala, were alike in being so well situated. The smoke appeared at the same spot and rose at the edge of the cliff.

Nolaila, e hoihoi hou ae ka kaua kamailio ana ma kela manawa a ua Pahu (puu) nei me kona ohana i hoi aku la i kai o Kaopulolia. I ka hala ana ae he ekolu a eha malama ma hope iho o kela hoi ana aku a lakou i kai o Kaopulolia me ka oi loa ana ae o ka lahana o ka nele a ka ai and ka pololi o ka wi, ua nele loa mai la na waena mahinaai i ke kaikoeke o ua Pahu nei i laa ka ai maloo he uwala et. al, a me ka ai wai he kalo. No laila, ua kaukai aku la ke ola o keia mau ohana ekole ma luna o hookahi wale no mea nana e hanai mai, o ia no kela Kahuauli o Luluku; he mamao o aneane e hookahi mile okoa mai Paʻu aku, kahi a ke kaikoeke o ua (puu) Pahu la e noho nei me kona ohana.

Now let us turn our conversation to Pahu and his family down at Ka-ʻopū-lōlīa. About three or four months after they had moved to Ka-ʻopū-lōlīa, where they found the worst of hunger because of the lack of food, the planting fields of his brother-in-law failed to grow dry land food, such as sweet potatoes, and wet land food such as taro. Therefore the welfare of three families depended on one person to feed them and that was Kahua-uli at Luluku, a distance of about a mile from Paʻū, where Pahu's brother-in-law lived with his family.

No laila i kekahi la ikiiki o na malama hahana o ka wela o ka Makalii, ua noho iho la o Loʻe a hoomanao ae la ia Kaimihana kekahi o kana mau (kane) ipo aloha; he kaikinane punahele hoi ia no Ulaikapoki, a, e noho like ana no laua ma ka hikina ae o ko Pahu e noho ana me kana wahine and ka laua mau keiki. E hoomanao iho oe e ka Meaheluhelu, o keia ka la i puka aku ai ia Loʻe ka mea e pili ana i kela pali o Kahoe; ma muli o ka loaa pono ana aku ia ia i ua ahiahi la e ku ana ma ka hakala o ko laua halau a e nana ana i uka o Keaahala me ka peʻa ana ae o na lima i ke kua. No ka mea, ma muli o ka nele i ka ai me ka pololi o ua (puu) Pahu nei i ua lala, a me kona hoomanao i kana mau mea i hana aku ai ia Kahoe me ke kaupale ole mai hoi o Kahoe iaia; ua puka ae la o ia u i ua ahiahi nei me ka peʻa ana ae i na lima i ke kua, ua haliu aku la kona alo i uka a nana aku la i Keaahala, kahi (Kalahi?) a ke kaikuaana e noho mai la.

On one of the warmest days of the warmest month, Makalii, Loʻe thought of Kaʻimi-hana, a lover of hers. He was the favorite brother of ʻUla-i-ka-poki and the two lived on the eastern side of the place where Pahu dwelt with his wife and children. Remember, O Reader, this was the day on which Loʻe mentioned something about Kahoe's cliff. It [the smoke] was discovered as he [Pahu] stood by the wall of their shed and gazed up at Ke-aʻa-hala. His arms were

3 *Uncertain diacritic marks in the original text.*

crossed behind him [in sorrow] that day because of his lack of food and hunger. He recalled the things he did to Kahoe, who in turn, did not disown him. He had come out doors that evening with hands crossed behind his back and turned his face to look at Ke-aʻa-hala where his oldest brother was living.

I ua Pahu (puu) nei nae e nana la i uka me ka huli ole ae i (kai) hope e nana ai, o ia ka manawa a Lo'e, i hoea mai ai. Mamuli no hoi o ko Loʻe aloha i ke kaikunane makua, me ka hoomanao pu ana ae i ka keia kaikunane i ana i lohe ai i ka hana ana i panai aku ai i ke kaikuaana, ua pane aku la o ia me ka leo kuoo i ka olelo ana aku; "Ku ana ma ka hakala-hale a nana aku na maka i Ke-ahi-a-Kahoe, ea!"

As he looked toward the upland, without turning behind him to the sea, Loʻe arrived. Because of Loʻe's affection for her oldest brother and remembrance of what she had heard of the unkindness of this brother to him, she said to him sternly, "So! Standing at the wall of the house with eyes gazing at Ke-ahi-a-Kahoe (Kahoe's fire)".

Ua hoohikilele loa ia aku ua Pahu nei i ka lohe ana mai i keia leo o ke kamailio ana aku ma hope aku o ke kua, i ka haliu ana mai nae i hope; ua ike mai la o ia i ke kaikuahine e ku aku ana me na helehelena aʻka-pʻa-henehene.[3] Aole no nae ua Pahu nei i panai mai i kana pane, oiai, ua hailukuia mai no o ia e Loʻe no kana mea i hana aku a ia Kahoe i loko o kekahi manawa ae nei i hala. No laila, i kona ike ana mai i ke ku aku o ke kaikuahine, ua haliu, hou aku la oia a hoʻi i loko o ka hale; oiai hoi ke kaikuahine i kona hoʻi ana aku i loko o ka hale, ua hoomau loa aku la oia ma kana huakaihele i o Kaimihana la ka mea ho-ʻehaʻeha puuwai.

Pahu was startled by the voice behind him, and when he turned about he saw his sister with an amused

look on her face. He offered no reply for she had already given him a verbal lambasting in the past for his treatment of Kahoe. Therefore at seeing his sister standing, he looked up once more and returned indoors. After he had gone in, she continued on her way to Kaʻimi-hana, her heart's desire.

Ke hoomanao nei au i keia inoa o Kaimihana, he inoa ia no kekahi wai mapuna e ku ana ma ke kihi komohana o ka loʻi kalo nui e pili la me Ulaikapoki ma uka nei; ka inoa hoi i hea pu ia aku ai ua loi nui la i ka wa e ola ana o Alapai and Kikaha koʻu mau makua aloha i hala mua aku ma kela huli o ka Poepoehonua, kahi a na mea a pau e hele aku ai; a o kahi hookahi no hoi a au nei e ukali aku ai ia laua.

I recall the name Ka-ʻimi-hana, as the name of a spring on the west corner of the large taro patch lying close to and above ʻUla-i-ka-poki. The name was also applied to the large taro patch during the life time of Alapaʻi and Kikaha, my beloved parents who have gone to the other side of the round world, where all must go. There also will I follow them

Source:
Pukui, M.K. Legend of Ke-ahi-a-Kahoe. HEN vol. 1, 2181-2188, 3179-3185. Honolulu: Bishop Museum Archives.

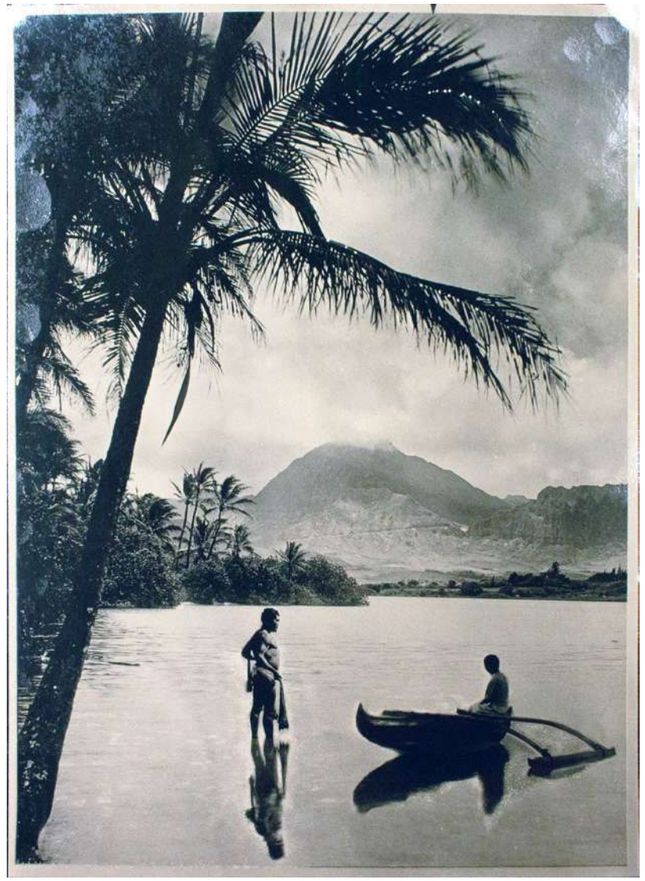
Site History + Significance

Moku o Loʻe is located in Kāneʻohe Bay. The bay is referenced in a number of archival records and oral history as the "koʻa mokumoku o Heʻeia," describing the reefs, islands, hills, and mountains that are made up of coral in the ahupuaʻa of Heʻeia (K. Hewett, personal communication, July 30, 2025). The moku has gone through significant transformations over the course of its history. In ancient times, as emphasized in the moʻolelo no Keahiakahoe and described by historical accounts, the island was inhabited and cultivated, and it played an important role in the fishing lifeways of Kānaka ʻŌiwi (Native Hawaiians) (Klieger et. al., 25). In 1857, Princess Bernice Pauahi Bishop inherited Moku o Loʻe from her father, Abner Pākī. The Princess held an ʻahaʻaina for Dowager Queen Emma in 1884 during which many niu (coconut) were planted on the western side of the moku. This created the grove that informed the moku's English name, Coconut Island (Klieger et. al., 2007, p. 45).

Christian Holmes, an heir to the Fleischmann Yeast fortune, purchased Moku o Loʻe from the Bishop Estate

Net fisherman on the western shore of Moku o Loʻe; the niu grove extends the length of the shore, ca. 1920 ▶

Source: The Bishop Museum Archives



◀*Fishermen on the North-western edge of the islet, looking towards Kōnāhuanui, ca. 1930*

Source: The Bishop Museum Archives

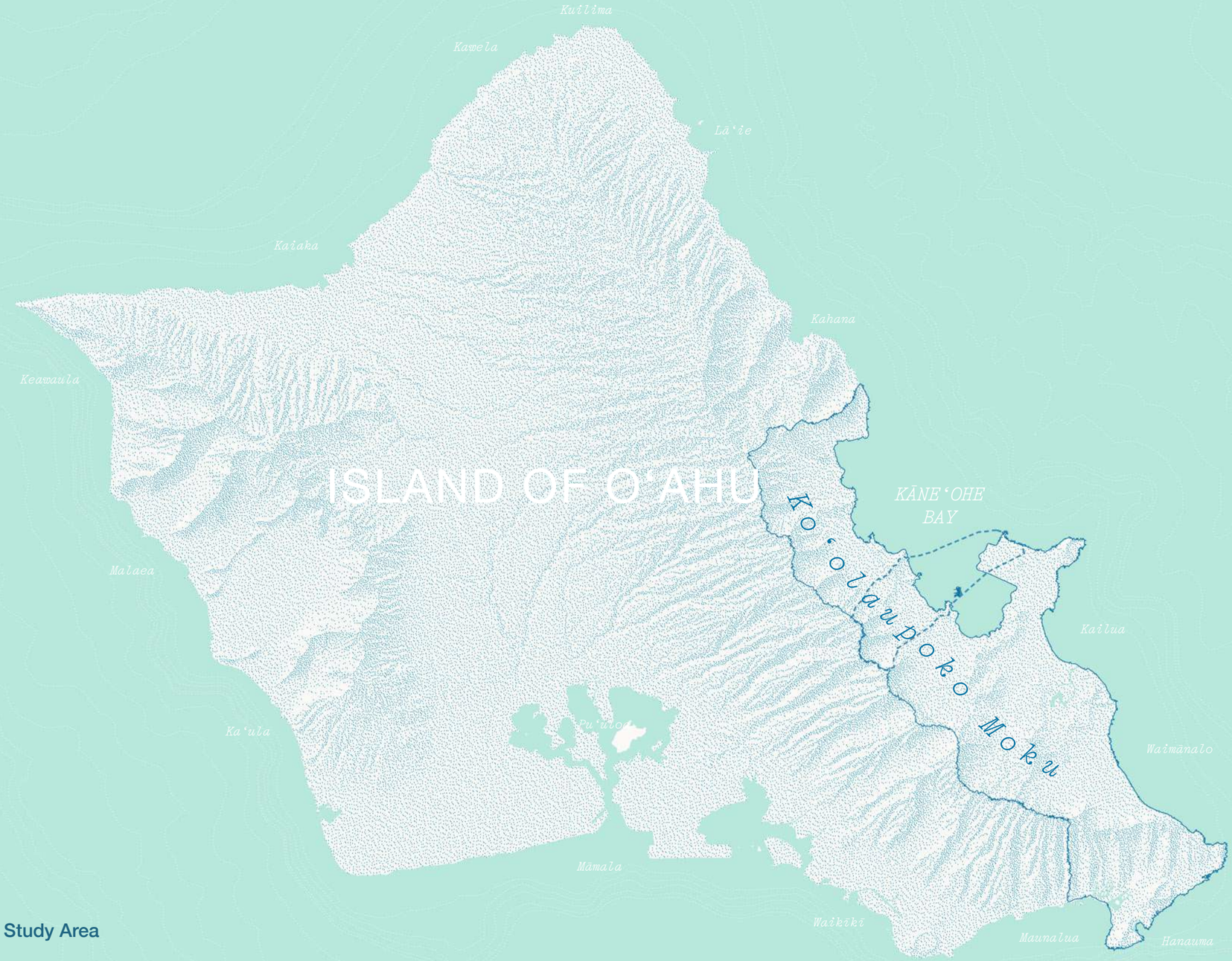
in 1937. It was during this time that the landmass was transformed dramatically. Intent on creating a tropical paradise estate, Holmes dredged coral and sand from the nearby reef shelf and sandbar and added a total of 16 acres and several waterways to the moku (Klieger et. al., 2007, p. 28). Many of the lagoons and spits that were formed during this time still exist today.

After Holmes died in 1944, Moku o Loʻe was sold to a group of businessmen from the continental United States, including Edwin Pauley, an oil magnate from California. Pauley eventually bought out the other owners and used the moku as a private family retreat. A philanthropist known for promoting the sciences, Pauley encouraged the Hawaiʻi Marine Laboratory to

move to Moku o Loʻe in 1947. The Pauley Foundation eventually donated the entirety of the moku to the University of Hawaiʻi Foundation in 1995 for the use of teaching and research activities by HIMB. HIMB is now a leader in marine research and is committed to place-based education, community engagement, and ocean stewardship (HIMB, 2023).

The Old Pauley labs, 1968 ▶

Source: Bishop Museum Archives



Moku o Loʻe Islet, Project Study Area

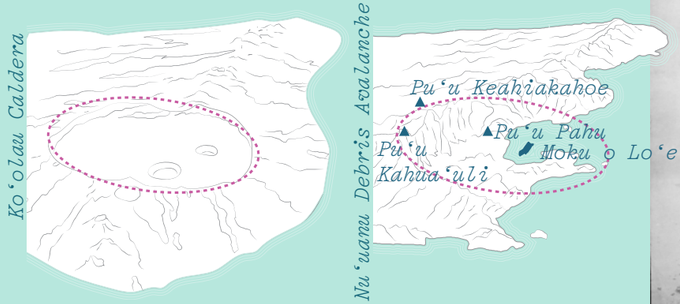
Heʻeia Ahupuaʻa

Koʻolaupoko Moku

Source: Hawaiʻi State GIS Program, Heʻeia NERR Management Plan 2022-2026, Nā Puke Wehewehe

AHUPUAʻA OF HEʻEIA

ʻEleao
Waiāhole Stream
Waiāhole Stream
Kaʻalaea Stream
Waiheʻe Stream
Kahaluʻu Stream
ʻAhuimanu Stream
Kahaluʻu
Puʻu Kaiwipoʻo
Puʻu Kahuauli
Puʻu Keahiakahoe
ʻIoleka ʻa
Puʻu Māʻeliʻeli
Heʻeia Stream
Ahu ʻo Laka
Puʻu Lanihuli
Paepae o Heʻeia
Koamanu
Kapapa
Kāneʻohe Stream
Keaʻahala Stream
Puʻu Kōnahuanui
Puʻu Pahu
Liilipuna Pier
Kāwa Stream
MOKU O LOʻE
Waikalua Loko Iʻa
Kekepa
Kauʻa
Puʻu Hawaiʻiloa
Keaʻalu
Puʻu Pāpaʻa
Nuʻupia
Kawanui Marsh
Halekou
Kawanui
O ʻAHU
Kaluapuhi
Puʻu Ulupaʻu
Waikulu
Moku Manu



1884 Luau May Be Cited In Suit Over Coconut I.

Fred Beckley, Expert On Hawaiiana, Expected To Take Stand

Frederick K. Beckley, former speaker of the house of representatives and an authority on Hawaiiana, is expected to be called to the witness stand today in the case of the Bishop Estate on trial before Judge Albert M. Cristy in the territorial land court. The Bishop Estate seeks registration of its title to Moku-o-Loa, the 12-acre islet in Kaneohe bay generally known as Coconut island and now leased to Christian R. Holmes.

Beckley attended a luau given on Moku-o-Loe back in 1884 in honor of Queen Emma. Ownership of the island, the Bishop Estate alleged, passed to Princess Bernice Pauahi Bishop from her father Paki.

Several Hawaiians are opposing the claims of the Bishop Estate and, in turn, are claiming adverse interests in the little island. A number of witnesses were on the stand yesterday representing...

HE AHAAINA MA MOKUOLOE.

E ka Hoku Loa:

Aloha oe;—I ka la 24 o Augate, oia ka poaha, he la ahaaina ia makai o Mokuoloe; he wahi mokupuni uuku ia ma ka Hikina Akau o Kaneohe, ulu nae na mea kanu maluna iho, uala, ipu, maia, niu, a me kahi ulu kukui malumalu olaila. O ka uala nae a me ka ipu ke kumu o ka ahaaina ana; he wahi ahaaina maikai, nui na kanaka i hele mai, no Kahaluu, a me Mokapu mai, a oluolu loa hoi i ka malu o ke kukui, lawa no na mea hele mai e ai malaila, a he kamahao ka ahaaina nui ana ina mea ulu o ia Ailana liilii i malama ponoia e na mahiai olaila, a he nani ia no lakou, ina pela e malama nui ia'i na kuleana o kakou, alaila, e-ai nui ia auanei na mea ai. Me ka mahalo, ko oukou hoa aloha. D. Kaialau.

1859 - 1933

Moku o Lo'e has a high peak that served as a lookout for fishing

Ko'olau Caldera was the original landform on the windward side of the island
2.5 Million Years Ago

Nu'uanu Debris Avalanche reveals Kāne'ohe Bay. Brothers Kahua'uli, Pahu, Kahoe and sister Lo'e were sent to Kāne'ohe, place names reflecting areas in which they farmed, fished, or resided.
1.7 Million Years Ago

The Great Māhele
1848

Kāne'ohe was a productive agricultural area with numerous lo'i and loko i'a
1880

Princess holds an 'aha'aina for Dowager Queen Emma in 1884 during which many niu were planted
1883

Proprietorship:

1759 - 1819	1819 - 1824	1824 - 1848	1848 - 1855	1855 - 1858	1858 - 1884	1884 - 1890	1890 - 1936
Kamehameha I	Kamehameha II Abner Pākī (Konohiki)	Kamehameha III Abner Pākī (Konohiki)	Abner Pākī	Laura Konia	Bernice Pauahi Bishop	Charles Reed Bishop	Bishop Estate

Sources: Jokiel, USGS, Klieger-Moku o Lo'e, State of HI State Archive, Roadside Geology of HI, Bishop Museum

1934 - 1945

Christian Holmes increases size of Moku o Lo'e from 12.8 acres to over 28 acres
1934 - 1939

Holmes purchases and eventually moves the SS Seth Parker to Moku o Lo'e
1935

Celebrities flock to the islet including Amelia Earhart, Shirley Temple, Duke Kahanamoku
1935 - 1940

Filiming of The Wake of the Red Witch on location with Seth Parker as prop
1940s

Bombing of Pearl Harbor and raid on Mōkapu during World War II
1941

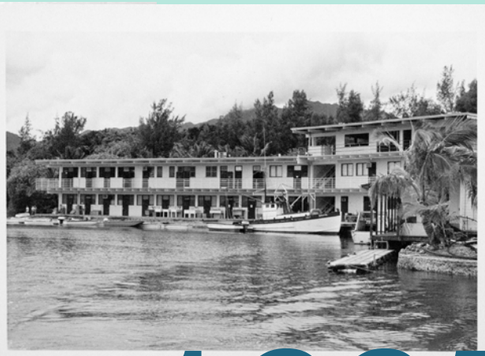
$150,000 spent on construction and improvements
1945

Proprietorship:

1936 - 1944
Christian Holmes II

1944-1946
Holmes Estate

1945
U.S. Government-HMCAS



1946 - 1995

Pauley offers space on Moku o Lo‘e to Hawai‘i Marine Lab (HML), establishing first use of islet for marine research
1947

Coconut Island Club International develops Coconut Island Hotel
1949

Fire of 1961 destroys main laboratory building
1961

NSF Laboratory constructed with National Science Foundation grant
1964

Political figures and stars frequent Moku o Lo‘e
1960s-70s

Proprietorship:

1946-1964
Moku-o-Loe Corp.

1964-1973
Ed Pauley/American Life Insurance

1973-1974
Ed Pauley/Sheridan Ing

1974-1981
Ed Pauley

1981-1987
Barbara Pauley Pagan

1987-1995
Katsuhiro Kawaguchi

Proprietorship of Filled Land:

1947
Territory of Hawai‘i (HML)
Attorney General Shiro Kashima determines the Territory of Hawai‘i remains "riparian proprietor" of filled land

1962-present
State of Hawai‘i (HML & HIMB)

MOKU O LO‘E ISLET + ADJACENCIES
1921

Source: Map Collection, University of Hawai‘i at Mānoa Library

MOKU O LO‘E ISLET + ADJACENCIES
1968

Lilipuna Pier

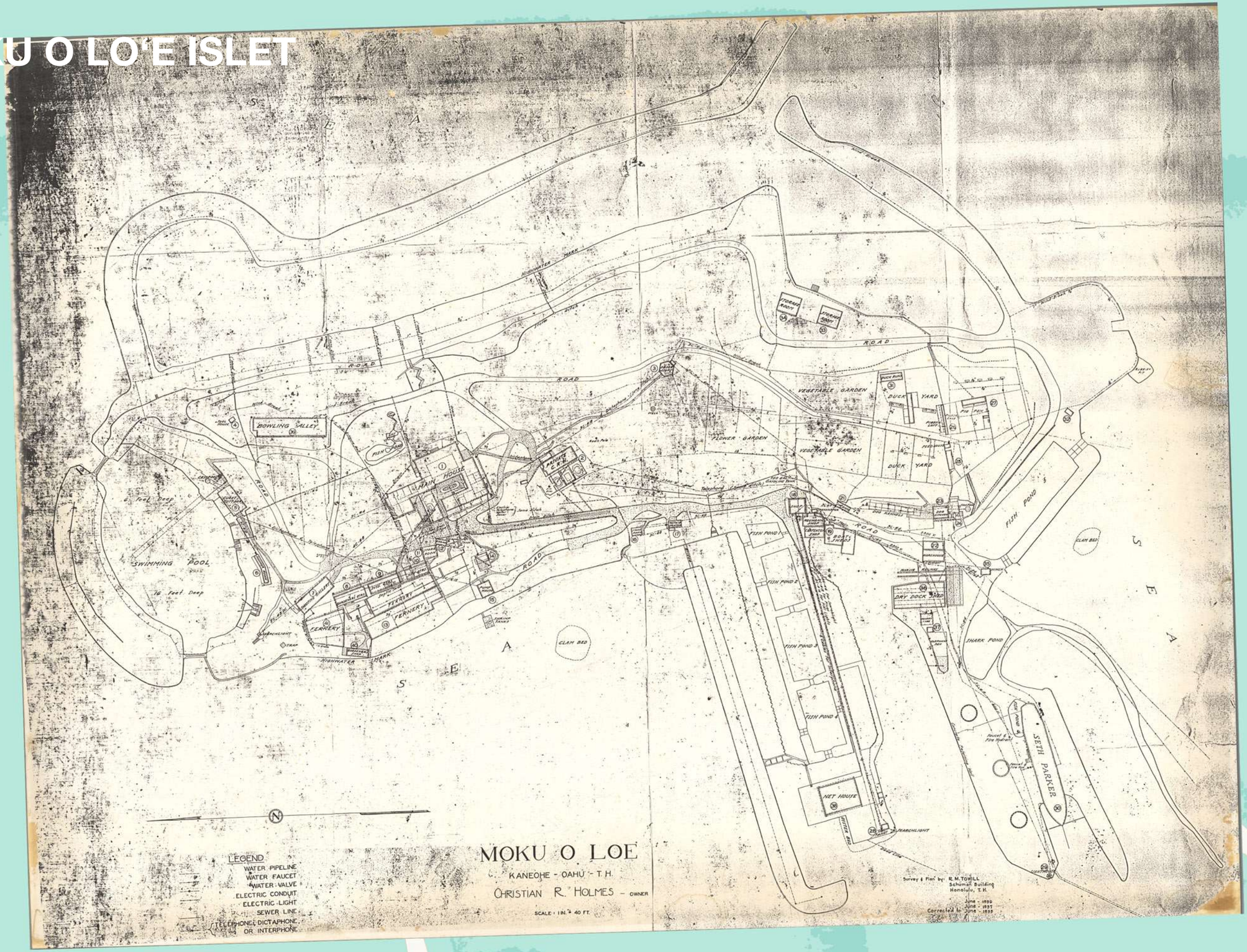
Source: Map Collection, University of Hawai‘i at Mānoa Library

MOKU O LO‘E ISLET + ADJACENCIES
2021

Lilipuna Pier

Source: Google Earth

MOKU O LO'E ISLET
1938



0' 75' 150' 300'

Source: HIMB NERR Office

◄ *HIMB strategic planning session in January 2023*

Photo Credit: Phoebe White

CONTEXT

HIMB's Long Range Development Plan (1998) outlined its vision for future expansion to accommodate research and related activities while preserving the natural beauty of Moku o Lo'e. The Strategic Plans (2018, 2023) provided a roadmap for HIMB as an ORU of the University of Hawai'i at Mānoa – helping them align operations, resources, and people to achieve this shared vision.

2023 HIMB Strategic Plan

In January 2023, HIMB embarked on a strategic planning process including surveys of HIMB students, staff, faculty, and community and engaging 50 members of the HIMB 'ohana in a 2-day workshop. The following themes were highlighted:

- HIMB's location is ideal for science and research excellence – adjacent to reef and ocean within a chain of islands with a unique evolutionary history across a broad environmental gradient

- HIMB aspires to become a model for institutional resilience, have a shared vision with local community, and vibrant communications and public relations

- HIMB needs to modernize its facilities, decrease its administrative burden, and strengthen ties with community

- Over the last two decades, HIMB has strengthened its connections with community and diversified its 'ohana to reflect and serve local, regional, and

◄ *HIMB strategic planning session in January 2023*

Photo Credit: Phoebe White

global needs; it has a progressive, diverse, and multidisciplinary faculty rooted in the Native Hawaiian context

HIMB identified five goals for its 2023 - 2028 strategic plan:

1. **Research Excellence:**
   HIMB exemplifies scientific excellence in globally-relevant marine biology research, addressing important, often risky, scientific questions through innovative methods, study design, and technology. Breakthroughs in fundamental and applied research are rapidly and effectively disseminated through scientific journals and public media outlets.

2. **Community and Collaboration:**
   HIMB is a thriving scientific and social community where there are many opportunities to learn about each other's work, socialize on and off island, collaborate with labs at HIMB and on campus, and welcome colleagues from around the world.

3. **Multiple Ways of Knowing:**
   HIMB welcomes and offers multiple ways of generating knowledge and creates opportunities for faculty, staff, and students to learn, practice, and be fully engaged in multiple ways of knowing.

4. **Sustainable Funding:**
   HIMB has sustainable funding to support institutional resilience with respect to facilities, land, and culture, reflected in effective messaging and philanthropic support of HIMB.

5. **Sustainable Infrastructure:**
   HIMB is implementing a long-term plan for sustainable infrastructure to support research, education, and community.

2018 HIMB Strategic Plan

HIMB's 2018 Strategic Plan was based on input from 50-60 faculty, staff, and students through feedback sessions, a survey, phone and in-person interviews, focus groups, a strategic planning workshop to draft goals and strategies, and informal conversations. The plan describes HIMBas a global hub for cutting-edge science and technology aimed at understanding and conserving tropical marine and coastal ecosystems. Its values encompass ocean stewardship, science and innovation, educational integrity, diversity, equity, and inclusion. It emphasizes innovative science, place-based education, and community engagement to advance knowledge and stewardship of the ocean. HIMB's location on a near-shore coral island, with access to diverse and interconnected reef, coastal, estuarine, and deep ocean ecosystems and advanced laboratory technology are its strengths.

Three Main Themes

- Global leadership in marine research
- Transformative marine education and training

- Community engagement in marine science and stewardship

Cross-Cutting Themes
- Institutional sustainability
- Sustainability and stewardship
- Top-notch facilities and services

Process
- A situation analysis that gathered input from faculty, staff, and students through feedback sessions, a survey, phone and in-person interviews, focus groups, a strategic planning workshop to draft goals and strategies, and informal conversations
- About 50-60 participants in the situation analysis and planning process

Key Findings
- Strengths – location, recent infrastructure improvements, world-class research faculty and education specialists for K-12, community partnerships, reputation globally and nationally.

- Challenges – reduced funding and declining budgets, especially from government sources; climate change adaptation and sea level rise (SLR) (immediate threat to island, and threat to reefs/ocean life); internal community disconnection and missed opportunities for cooperation and collaboration; need to expand and strengthen community education, dialogue, and collaborations.

- Opportunities – collaborative research; field-based research and educational opportunities; partnerships with external organizations; NERR; expansion of undergraduate programs/courses.

- Threats - climate change and sea level rise – a threat to island facilities but opportunities for research and applied solutions/island sustainability.

- Trends - Increased stress to coral reefs, and rising seawater levels. Need to move some facilities higher; growing public awareness of the plight of coral reefs.

- Possible responses - HIMB is well-positioned to build on existing programs related to climate change adaptation, SLR, ocean management, and protection, and to work with local, island communities, and the state on related issues through applied research, education, and training.

- Future directions pointed to the need to improve i) institutional environmental protection and sustainability practices (energy, waste) and ii) technology, communications, and media, including social media.

1998 HIMB Long Range Development Plan (LRDP)

Summary

A long range development plan for the entire island and the property at Lilipuna Road was prepared by Group70 International, Inc. in June 1998 with input from the Coconut Island Advisory Committee. It outlined four major themes to guide development on the island (Group 70, 1998, pp. 1-1-1-6):
- Focus to be on scientific research
- Public education and sustainability to be major focus areas in applied and pure science
- The island as a model for sustainability
- Activities to promote stewardship of the living oceans

The LRDP considered HIMB's existing and future requirements to support these themes and delineate zones for research and non-research activities. It included a management plan. The proposed spatial configurations encouraged interaction and preserved views of Kāneʻohe Bay and the Koʻolau mountain range.

Design guidelines were developed for a unifying visual vocabulary for the island.

UH Mānoa Strategic Plan + Becoming a Native Hawaiian Place of Learning

The Mālama ʻĀina Plan references the University of Hawaiʻi at Mānoa Strategic Plan and its goal "to become a Native Hawaiian place of learning and an Indigenous-serving institution grounded in aloha ʻāina" (UHM Strategic Plan 2015-2025, p. 19). The four strategic focus areas outlined in the Strategic Plan are:

1. **Native Hawaiian Student Success:**
   Native Hawaiian students are holistically supported from recruitment through graduation, and est practices gleaned from efforts to support Native Hawaiian students are applied to success strategies for all students across the campus

2. **Staff and Faculty Development:**
   Native Hawaiian faculty are supported holistically from recruitment to tenure and promotion, and all staff and faculty are more knowledgeable and culturally rooted in Mānoa and Hawaiʻi

3. **Native Hawaiian Environments:**
   UH Mānoa is a physical, cultural, spiritual, and interactive environment that exemplifies the values of ʻohana mālama ʻāina kuleana; thereby perpetuating Native Hawaiian values, culture, language, traditions, and customs

4. **Native Hawaiian Community Engagement:**
   UH Mānoa and Native Hawaiian communities are consistently connected and engaged so that there can be reciprocal teaching and learning for positive impact throughout Hawaiʻi

UHM's Strategic Plan calls for all colleges and schools and non-academic units to develop strategic plans that address each of the four strategic focus areas relevant to their units. In Chapter 6, we describe how the concept design for Moku o Loʻe aligns with these focus areas.

◀ *Kānʻeohe Bay in 1951*

Source: Map Collection, University of Hawaiʻi at Mānoa Library

THE EIGHT CONSIDERATIONS OF PONO STEWARDSHIP

The older lineages of Hawaiian Knowledge speak of the time, before the aliʻi arrived to the shores of Hawaiʻi from Tahiti, when these islands were stewarded through the formation of ʻAha Kiole (the people's council). ʻAha (lit., rope; fig., council) symbolizes leadership strengthened by weaving expert knowledge from different realms to engage in collective decision-making to steward the people, land, waters, and associated resources. Kiole are the large schools of fish that once shrouded the shorelines in times of abundance and were a metaphorical reference to the abundant human population that was supported through this system of stewardship. The ancient ʻAha Councils used eight realms of consideration as the ethical foundation for decision-making about the ʻāina, impacts on the ʻāina, and potential solutions to the problems that arose from a growing human population in the context of limited island systems (Kaʻimikaua, 2000; Winter et al., 2018).

The Mālama ʻĀina Plan is structured around these eight considerations and will be viewed through a contemporary lens such that the Plan will bring the wisdom of the past to address and help navigate 21st century issues, including the uncertain outcomes of global climate change and sea level rise. Within the Plan's process, each consideration had a dedicated working group consisting of 6-8 members representing the HIMB faculty, staff, and students, NERR Kūpuna Council members and its broader community, subject matter experts, and UHCDC team members. Each group participated in two co-design workshops. The

working groups and topics are as follows:

01 Moana-nui-ākea (Ocean Biome)
The integrity of everything extending from the high tide mark to the horizon as is seen from the highest vantage point on land.

02 Kahakai Pepeiao (Shoreline Ecotone)
The integrity of everything extending from the high tide mark to where the soil (lepo) begins; splash zone for crab, limu, and ʻopihi; characterized by sea cliffs, coastal strand vegetation and sand dunes; nesting area for seabirds and turtles.

03 Mauka (Terrestrial Biome)
The integrity of everything extending from the point where the soil (lepo) starts to the highest point of land.

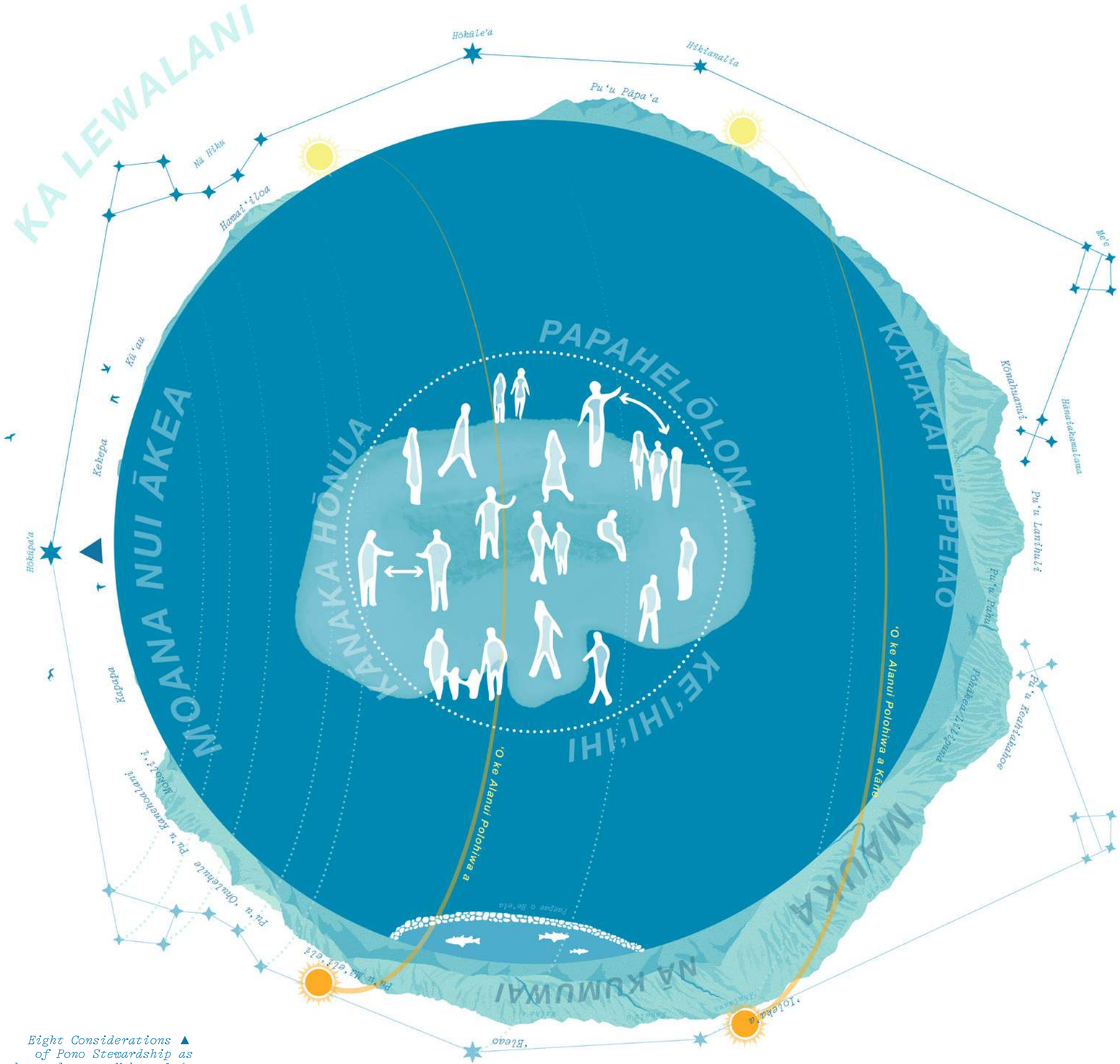
04 Nā Kumuwai (Freshwater Sources)
The integrity of all sources of freshwater – groundwater, rivers, streams, springs, including springs along the coastline that mix with seawater.

05 Ka Lewalani (Atmosphere)
The integrity of everything that is above the land – the sky, the clouds, the winds, the birds, the rains, and the rainbows.

06 Kānaka Hōnua (Sustainability)
Providing for the needs of the people.

07 Papahelōlona (Indigenous Knowledge Systems)
Maintaining the Indigenous Knowledge system anciently stewarded by kahuna (e.g., history, healing, astronomy, civil engineering and infrastructure, vessel construction, etc.).

08 Keʻihiʻihi (Spirit of Place)
Caring for that which maintains the pono in the land (e.g., sacred places and practices).



Eight Considerations of Pono Stewardship as they relate to Moku o Loʻe ▲

◄ *Submerged shoreline west of the Lānai Suites during a King Tide event in August 2023*

Photo Credit: Phoebe White

ENGAGEMENT PROCESS + PROJECT TIMELINE

Purpose
The purpose of engagement was to gather input at two stages of the project. The results informed the UHCDC team's preparation of the Mālama ʻĀina Plan. HIMB's recent Strategic Plans (2023 and 2018) provided background and context and its key takeaways were considered when drafting the engagement plan for the project.

Methods
The process included four phases: Archival + Field Research, Engagement Workshops, Feedback, and the Final Mālama ʻĀina Plan.

Archival + Field Research (Site Conditions + Opportunities)
The UHCDC team conducted three guided site visits with HIMB faculty and staff to learn about existing facilities, shoreline conditions, and flora. An un-guided site visit was conducted in August to observe the impacts of King Tide on the moku. These were followed by additional visits throughout the design process, as needed, and archival research.

01 Facilities + Amenities
The first visit focused on the moku's existing facilities. The visit began at Lilipuna Point, which consists of a parking lot for HIMB faculty, students, and staff. The parking lot is very steep and terraced, with some signs of erosion. It is dominated primarily by invasive grassland vegetation. There is opportunity here to

01 ARCHIVAL + FIELD RESEARCH

GOALS:
- Establish a common + accessible knowledge of Moku o Loʻe, HIMB, and the goals of the HIMB 2023 Strategic Plan
- Form Working Groups

MILESTONES:
- 01.30.2023-01.31.2023 HIMB Strategic Planning Sessions 01 and 02
- 06.13.2023 Site Visit: Facilities
- 06.17.2023 Site Visit: Shoreline
- 06.18.2023 Site Visit: Vegetation
- 06.20.2023 Bishop Museum Archives Visit
- 08.15.2023 HIMB Advisory Group review of storymap materials
- 08.17.2023 Documentation of 1936 Christian Holmes Plan of Moku o Loʻe at the UHM Hamilton Library Map Collection
- 08.29.2023 Site Visit: King Tide
- 09.2023 Launch storymap website

02 ENGAGEMENT WORKSHOPS

WORKSHOP 01 LISTEN + LEARN:
- Listen and learn from working group members to inform climate adaptation strategies and stewardship approaches
- Translate common themes into design principles and spatial concept designs

DRAFT CONCEPT DESIGN:
- Develop concept design approach and options based on Workshop 01 findings

refine based on feedback

WORKSHOP 02 CO-DESIGN:
- Interactive co-designing engagement to refine concept design options

MILESTONES:
- 10.06.2023 Workshop 01, Session 01
- 10.13.2023 Workshop 01, Session 02
- 10.28-29.2023, Field School
- 11.03.2023 Workshop 01, Session 03
- 12.01.2023 Workshop 02

03 DESIGN + FEEDBACK

GOALS:
- Refine and develop final concept design based on findings from workshops
- Gather input from HIMB community members and subject matter experts on final concept design

MILESTONES:
- 02.27.2024 HIMB Advisory Group reviewed draft concept design
- 03.12.2024 draft concept design submitted to HIMB community for comment
- 06.10.2024 concept design submitted to subject matter experts for feedback

04 FINAL MĀLAMA ʻĀINA PLAN

GOALS:
- Create an accessible and comprehensive final Mālama ʻĀina Plan Report that contains recommendations on concept design principles, climate adaptation strategies, and stewardship programs

MILESTONES:
- 06.18.2024 HIMB Advisory Group reviewed draft Mālama ʻĀina Plan Report
- 08.30.2024 Mālama ʻĀina Plan share out with HIMB, community, and participants

SPRING - SUMMER 2023 | **FALL 2023** | **SPRING 2024** | **SUMMER - FALL 2024**

◀*Observing the Point Labs during the facilities site visit*

Photo Credit: Phoebe White

introduce native and culturally-significant coastal plants that could assist with erosion control and create a sense of welcome. At the base of the parking lot is the pier where HIMB community members catch the shuttle boat.

Once on the moku, the team surveyed the existing buildings starting at the entry spit, which includes the historic lighthouse, welcome shed, the Marine Mammal Research Program (MMRP) building and the facilities shop. The MMRP building is built on the foundation of the Christian Holmes era elephant pen and the shop is also from the Holmes era. Both are adjacent to significantly eroding shorelines. Other amenities in this area include floating docks and two boat ramps, one of which is in disrepair. The boat ramps are essential for receiving construction materials, offloading rubbish, among other things. There are a few storage sheds and electrical utilities near the shop as well.

The team then surveyed the classroom and lab facilities, starting at the Pauley Classrooms and kitchenette. Adjacent to them are the New Pauley Labs and the

Miranda House, which is from the Holmes era and has been renovated for graduate student offices. These three buildings form a quad landscape where events are sometimes held and HIMB community members socialize at picnic tables.

The majority of the labs, classrooms, and experimental tanks are located along the Marina and eastern edge of the moku. The Marina contains a series of floating docks where research and utility boats are moored. The Old Pauley Lab, National Science Foundation (NSF) Lab, and Pelagic Fish Lab are located along the edge of the Marina and contain lab spaces, classrooms, and storage. The Old Pauley Labs is one of the largest buildings on the moku and recently underwent a substantial renovation. The Pelagic Fish Lab was undergoing a renovation during the team's visit. HIMB members on the tour commented on how this is one of the busiest locations on the moku during the academic year and summer sessions. There is an opportunity to amplify the educational and social functions of this space by introducing places for outdoor learning and gathering, particularly those that can be adapted to sea level rise.

Located in between the labs are several experimental tanks. The tanks are mostly located outdoors and are serviced by a seawater system line. The seawater intake facilities are located on the eastern spit known as "The Point." In addition to the seawater intake, tower, and pump, The Point contains storage and lab sheds from the early HIMB era in the 1960s, a weather station shed, and experimental tanks. All of these facilities are situated at a low elevation and are adjacent to a severely eroding shoreline. HIMB community members commented on how the structures often flood during king tide events. The Point and the Marina are made accessible by two floating docks, which also enclose a research pen.

The Coral Resilience and Maturation Labs are located on the southern edge of the moku. Lab functions here are also supported by a series of experimental tanks, some of which are located along eroding shoreline. To the east of the labs is the Hale Hīnālea dormitory, part of which was being renovated to host meetings and small classes. There are four other student and visitor residences on the moku. Hale Kākū and the Miller House are just north of the NSF Lab. The Graduate Student Residences and the Lānai Suites are located in another cluster of buildings on the northern half of the islet. The Graduate Student Residences are housed in what was the main residence during the Christian Holmes era and across from the Marine Science Research Learning Center, which has a classroom lab and offices. The Christian Holmes era “Retreat” currently houses offices for the NERR.

The Lagoon Pavilion (also referred to as the Beach House) is located on the northernmost edge of the moku adjacent to an artificial lagoon that was excavated in the 1930s to create a diving pool. This building contains a kitchenette, bathroom, and dining area used by residents and visitors in the Lānai Suites, Graduate Residences, and other dorms on the moku. This space was described as an important social and educational site that provides a stopping point for tour groups. Classes are also occasionally held in the Lagoon Pavilion.

In addition to the re-purposed buildings, there are several remnants from the Christian Holmes era still found on Moku o Loʻe. These include basalt rock walls, old foundations, and several artificial waterways and fishponds. A few of the fishponds are still used for experiments or access to experimental pens such as the coral nursery. Some of the fishponds, however, are in disrepair, are severely eroded, and contain ponding water. The need to repair and address the water quality issues of these ponds offers an opportunity to consider alternative configurations and access to the experimental pens, particularly on the western edge of the moku.

Buildings and grounds, watercraft support, and storage structures are located throughout the moku. HIMB community members commented on how this sometimes leads to inefficient vehicular circulation and storage of heavy machinery, particularly for the boat repair workshop on the north eastern edge of the moku. Not only is the location of this workshop far from the Marina, but it is also sited directly across from the Iwi Kūpuna, where archaeological remains were interred during trench excavation for fire hydrant water lines in 2009. The adjacency of the boat repair shop to the Iwi Kūpuna is not ideal given its cultural significance. Aggregating the majority of the facilities and watercraft support functions into one designated space could allow for easier watercraft access for repairs and construction materials.

Utilities such as the sewage pump, chiller, water lines,

The Boat Repair Shop, ▶ the Iwi Kūpuna, and niu along a major access route observed during the facilities site visit

Photo Credit: Phoebe White

and electrical lines are found primarily at the lower elevations of Moku o Loʻe. Some of these utilities are located along eroded shoreline conditions and many will be impacted by 3 feet of sea level rise. The need to relocate these utilities in anticipation of sea level rise offers an opportunity to consider introducing alternative forms of water collection and use, cooling, and energy production.

Most of the pedestrian circulation routes on the moku are currently not ADA-accessible and are a mix of material types including concrete, compacted earth, and crushed stone. Introducing an ADA-accessible route not only offers the opportunity to expand physical access to Moku o Loʻe, but also create a cohesive experience and identity that can educate about the significance of the moku.

02 Shoreline

The second visit was to assess the shoreline conditions. It began at the lighthouse pier (which also houses a temporary structure). The deck along this stretch shows undercutting of the seawalls. At several locations where

◀ *Dr. Kuʻulei Rodgers showing the UHCDC team areas of erosion during the shoreline site visit; here the team observes the erosion at the Christian Holmes era fishponds on the west side of the islet*

Photo Credit: Phoebe White

the seawalls are damaged, the shoreline is showing signs of retreating. Temporary measures – concrete bags backfilled with rocks – can be seen at some of these spots. This entrance area has a boat ramp that is currently in need of repair and the first cluster of buildings includes a maritime shed/boat repair area and the shed (Old Shop) which is very close to the edge impacted by erosion.

The mangroves along the shore are being removed due to their invasive nature and impact on the sedimentation channels. The seawall along the Lānai Suites is relatively intact. The spit adjacent to the North Lagoon is not used frequently. It provides a good viewing point for visitor groups and could be used for cultural practices, among other uses. A portion of the shoreline along this lagoon was improved using Blue Green Shoreline infrastructure containing Geotech mesh and native planting to stem erosion.

Moku o Loʻe Beach has public access and is used mainly for educational tours. It provides more space to explore/set up experiments without stepping on the coral reef. The mesocosms outside the Coral Reef Ecology Lab are located in close proximity to the seawater pumping station. Further down, however, the shoreline is receding and the seawall is undercut.

The Marina is the second most heavily used boat area. It has floating docks, shark pens, and mesocosms. The most heavily used boat area is the drop off point adjacent to the Lighthouse. There is another area where the 48-passenger vessel *Ka Noelo Kai* is docked, which is used for school groups and tours. The Blue Green Shoreline project is pilot testing nine different erosion control materials (e.g., eco-concrete, terracotta). The goal is to determine whether benthic organisms can be successfully recruited by these materials. Although there are places where these techniques have been

◄ *The UHCDC team on a boat tour of the shoreline; undercutting and slumping is visible at the decommissioned entry pier; the historic lighthouse is leaning as a result*

Photo Credit: Phoebe White

used, the outcomes remain unclear so far.

The need to repair and replace failing seawalls presents an opportunity to explore a combination of hard and soft shoreline resiliency strategies. The shoreline can be protected by constructed dunes, recycled riprap, living shorelines and breakwaters. Similarly, elevating and reconfiguring existing facilities by re-purposing submerged lands for cut and fill, and repositioning critical infrastructure can adapt them to future sea level rise.

03 Flora

Canopy

An existing tree inventory was performed and provided by the Citizen Forester Program, which was the starting point for identifying and recording trees on Moku o Lo‘e. The UHCDC team made additional site observations of significant trees and plants, including groundcovers, shrubs and understory layers, plants included in a blue-green infrastructure pilot project, and existing and removed mangroves. Google Earth imagery assisted in determining location and canopy spread.

Examining the canopy layer offers some insights into the different periods of occupation on Moku o Lo‘e. Along the north-western edge are a collection of niu (*Cocos nucifera*) that honor and may contain remnants of the grove planted in 1884 by Bernice Pauahi Bishop for Queen Emma (Klieger et. al., 2007, p. 45). It is estimated that nearly 350 niu grow on Moku o Lo‘e today, many of which are over 40 feet tall and located adjacent to circulation routes. In the 1930s, introduced plants were brought to the moku to create the pleasure ground and paradise of Christian Holmes' imagination. These included a succulent garden, food trees, and many Victorian-era picturesque trees such as ironwoods (*Casuarina equisetifolia*), with smaller groupings of swamp she-oak (*C. glauca)* and river oak (*C. cunninghamiana)*, and date palm (*Phoenix dactylifera*). Historical photographs reveal that many of the ironwoods were planted along the shorelines during the Christian Holmes era. Several of these species can be found dominating the shorelines today, though a large, dense spontaneous stand has grown on the upper elevations of the moku as well. It is likely that evergreens such as Cook pine (*A. columnaris*) were

Christian Holmes Era ornamental cactus gardens photographed in 1938 looking towards Kōnāhuanui; some of these species are still found on the islet today ►

Photo Credit: The Bishop Museum Archives

a part of this collection. Several trees that are used across the urban landscape on Oʻahu can be found on Moku o Loʻe including monkeypod (*Albizia samans*), shower trees (*Cassia x nealiae*), banyans (*Ficus spp.*) and a selection of palms including MacArthur palm (*Ptychosperma macarthurii*), Manila palm (*Adonidia merrillii*), and Chinese fan palm (*Livistona chinensis*).

There are also several spontaneous canopy with invasive habits on Moku o Loʻe, particularly mangrove (Rhizophora mangle) along the coastal edges and haole koa (*Leucaena leucocephala*) found on a large portion of the eastern edge of the puʻu (the highest point in elevation). These introduced species are some of the tallest canopy on the moku today. They choke waterways, diminish breezes, and block views out to the greater bay and Koʻolau mountains. These views were once an important part of the moku's role as a kilo for fishermen. Actively removing, managing, and replacing these invasive species offers an opportunity to restore biodiversity and the viewsheds that are essential to Moku o Loʻe's sense of place.

◄ *The UHCDC team on the vegetation tour of the islet*

Photo Credit: Phoebe White

Many of the trees were planted decades ago and currently provide a mature canopy that offers protection from wind and sun, but are not reflective of a Hawaiian sense of place. Some Indigenous, endemic, and canoe plants are included in the tree inventory: loulu (*Pritchardia sp.*), wiliwili (*Erythrina sandwicensis*), ʻiliahialoʻe (*Santalum ellipitcum*) and milo, (*Thesepesia populnea*). Plants commonly associated with lei making include plumeria (*Plumeria* hybrids), and pua kenikeni (*Fragea berteroana*).

Existing trees with comestible fruit include macadamia nut (*Macadamia integrifolia*), pea (avocado, *Pesrsea americana*), mango (*Mangifera indica*), ʻōhiʻa ʻai (mountain apple, *Syzygium malaccense*), soursop (*Annona muricata*), maiʻa (banana, *Musa* hybrid), and ʻulu (breadfruit, *Artocarpus altilis*).

Groundcover

Two main lawns appear to be composed of either St. Augustine grass (*Stenotaphrum secundatum*) or zoysia grass (*Zoysia sp.*) with other swaths of these two grasses covering various, non-contiguous sections across the moku. The next predominant groundcover is wedelia (*Spheagneticola trilobata*). There is a small section of non-native plumbago (*Plumbago ariculata*) at the base of the slope nearest the Pelagic Fish Lab. These groundcovers are commonly found across the current urban environment. On the northern-most spit, a blue green infrastructure project is testing the capacity of naupaka (*Scaevola taccada*) and pōhinahina (*Vitex rotundifolia*) paired with a geotextile to minimize the erosion caused along the northern edge exposed to the most extreme wind and wave activity. A row of ʻānapanapa (*Colubrina asiatica*) can be found at the edge of the southmost fish pond. The spit protecting the East Lagoon houses a lone hau (*Hibisucs tiliaceus*) and kulikuli (*Batis maritima L.*). Some common shrubs include mock orange (*Murraya paniculata*), bird of

paradise (*Strelitzia reginae*), oleander (*Nerium oleander*), *Ixora sp.*, *Hibiscus spp.*, *Agave spp.*, and Queen Emma lily (*Crinum pendunculatum*). Other notable cultural plants across the landscape include ti (*Cordyline fruticosa*), laua'e (*Microsorum scolopendria*), *Carex wahuensis*, and 'uki'uki (*Dianella sanwicensis*).

04 King Tide

In August of 2023 the team visited Moku o Lo'e during a King Tide event to observe the impacts of the higher water levels on the moku. Several areas were submerged, including portions of The Point and Point Labs. Some of the Coral Reef Ecology Labs had water undercutting the foundations of the buildings. The public access beach on The Point was also entirely submerged and waves were over-topping the seawall in that location. Much of the western shoreline north of where the Super Sucker normally docks was also inundated, making most of that edge, particularly just west of the Lānai Suites, inaccessible. The remnant fishpond spit on this side of the moku was also inundated in several locations, which made accessing the Coral Nursery difficult.

◄ *Dr. Ku'ulei Rodgers walking through ponded water on The Point spit during a king tide event*

Photo Credit: Phoebe White

Workshops

The UHCDC team hosted two workshops on Moku o Lo'e in partnership with HIMB. Its team members, subject matter experts, and a cultural practitioner guided the participants – HIMB faculty, staff, students, and NERR Kūpuna Council members – to gather input about design and programmatic efforts important in perpetuating the eight considerations of pono stewardship. The HIMB participants were primarily drawn from a survey conducted by HIMB to gauge interest and availability to attend one or more workshop sessions. The subject matter experts, including the NERR Kūpuna Council members, were recruited from a list recommended by HIMB and the UHCDC team (Appendix B: List of Participants).

Workshop 01: Listen and Learn

Entailed six thematic sessions. Each session saw between 8-15 participants and took about two hours to complete.

Workshop 02: Co-Design

Day-long event with four consecutive two-hour sessions. Each session was assigned a facilitator and recorder. Participants also had an opportunity to provide additional feedback to the UHCDC team by filling out comment cards or leaving Post-It notes on the concept design boards.

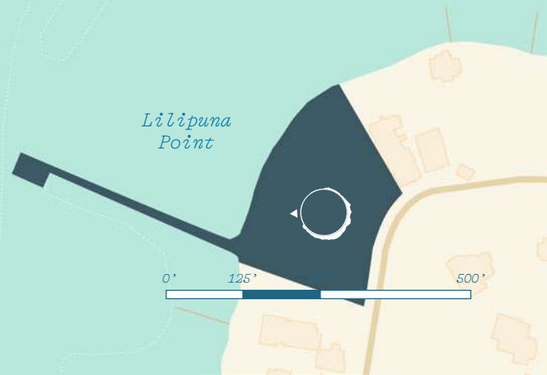
Workshop findings are presented in the following chapter.

EXISTING PROPRIETORSHIP OF MOKU O LOʻE ISLET

- Work in the water below the MHHW line (+1.1 feet MSL) are subject to:
  - Department of Army Section 10
  - Clean Water Act Section 404

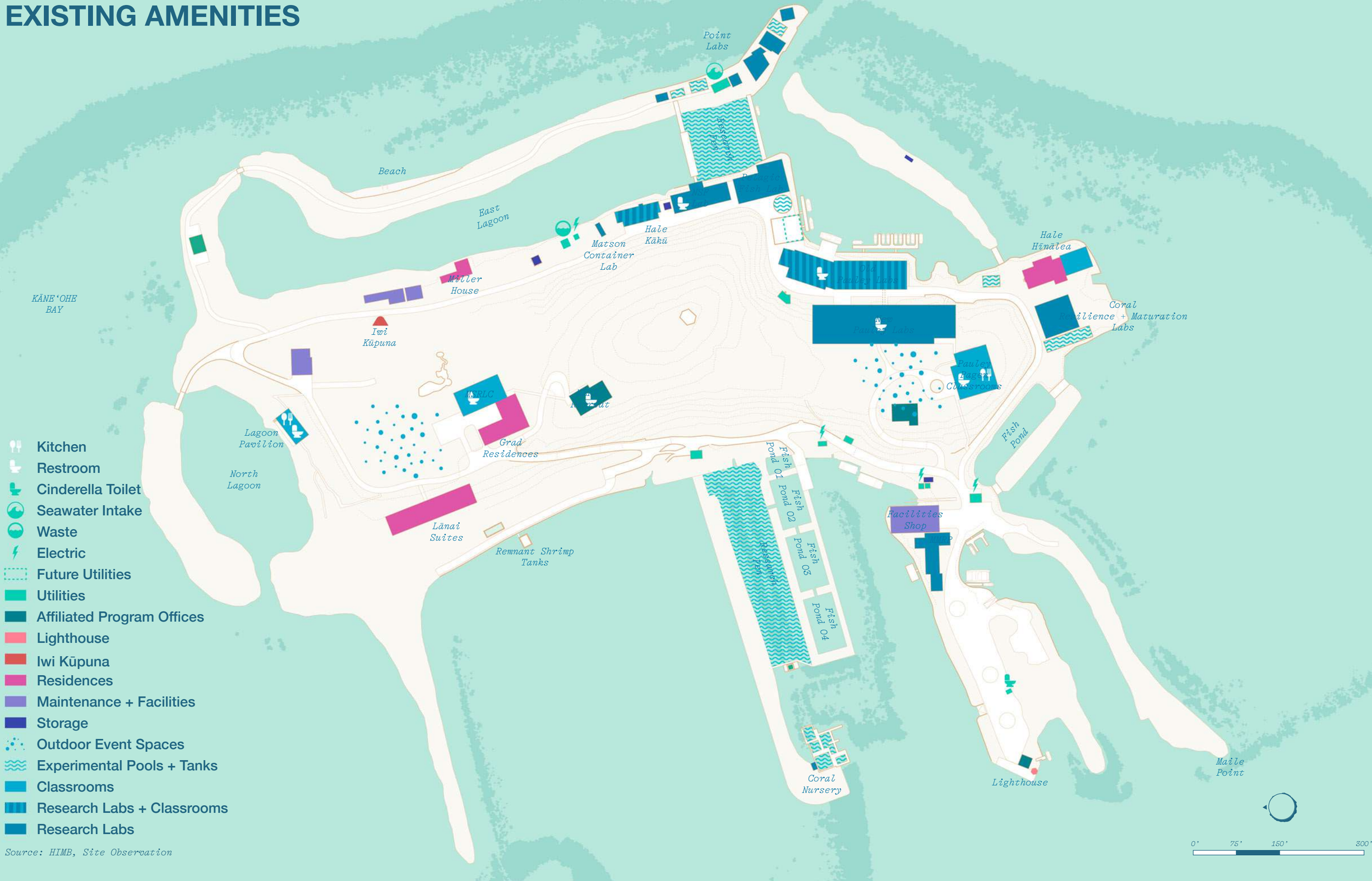
  Additional approvals or permitting may be required:
  - State Department of Health Section 401 Water Quality Certification
  - State Coastal Zone Management
  - Shoreline Certification (establishes jurisdictional boundary between Conservation District & Special Management Area
  - NOAA Office of National Marine Sanctuaries
  - US Fish and Wildlife Services
  - State DLNR Conservation District Use Permit (for work completed in the water)
- UH Foundation
- University of Hawaiʻi
- Hawaiʻi Marine Laboratory Refuge

Source: Google Earth, HIMB, TMK Plat Map, DLNR-HRS §188-36, Coconut Island Coastal Assessment



EXISTING MOKU O LO'E ISLET

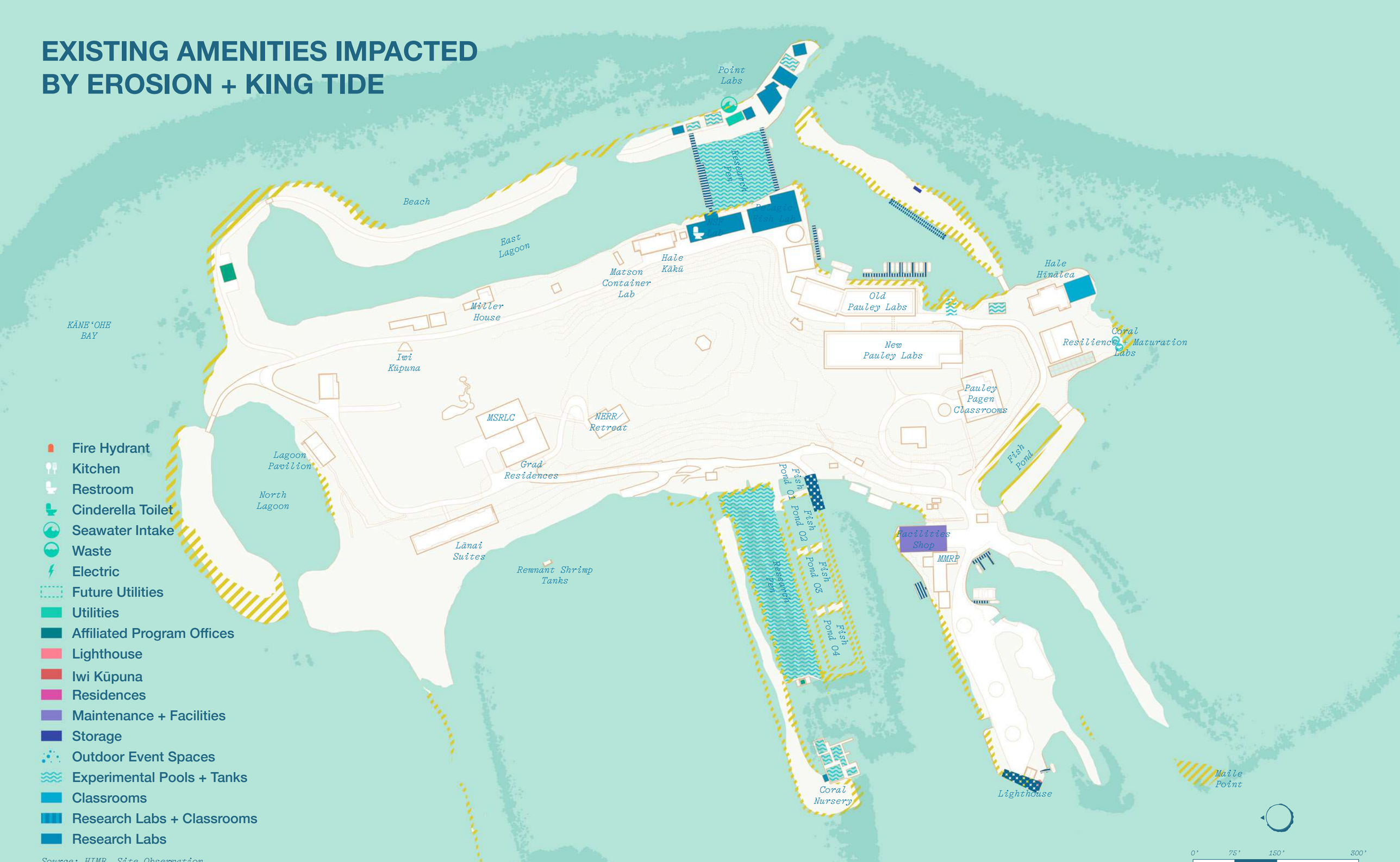
EXISTING AMENITIES



- Kitchen
- Restroom
- Cinderella Toilet
- Seawater Intake
- Waste
- Electric
- Future Utilities
- Utilities
- Affiliated Program Offices
- Lighthouse
- Iwi Kūpuna
- Residences
- Maintenance + Facilities
- Storage
- Outdoor Event Spaces
- Experimental Pools + Tanks
- Classrooms
- Research Labs + Classrooms
- Research Labs

Source: HIMB, Site Observation

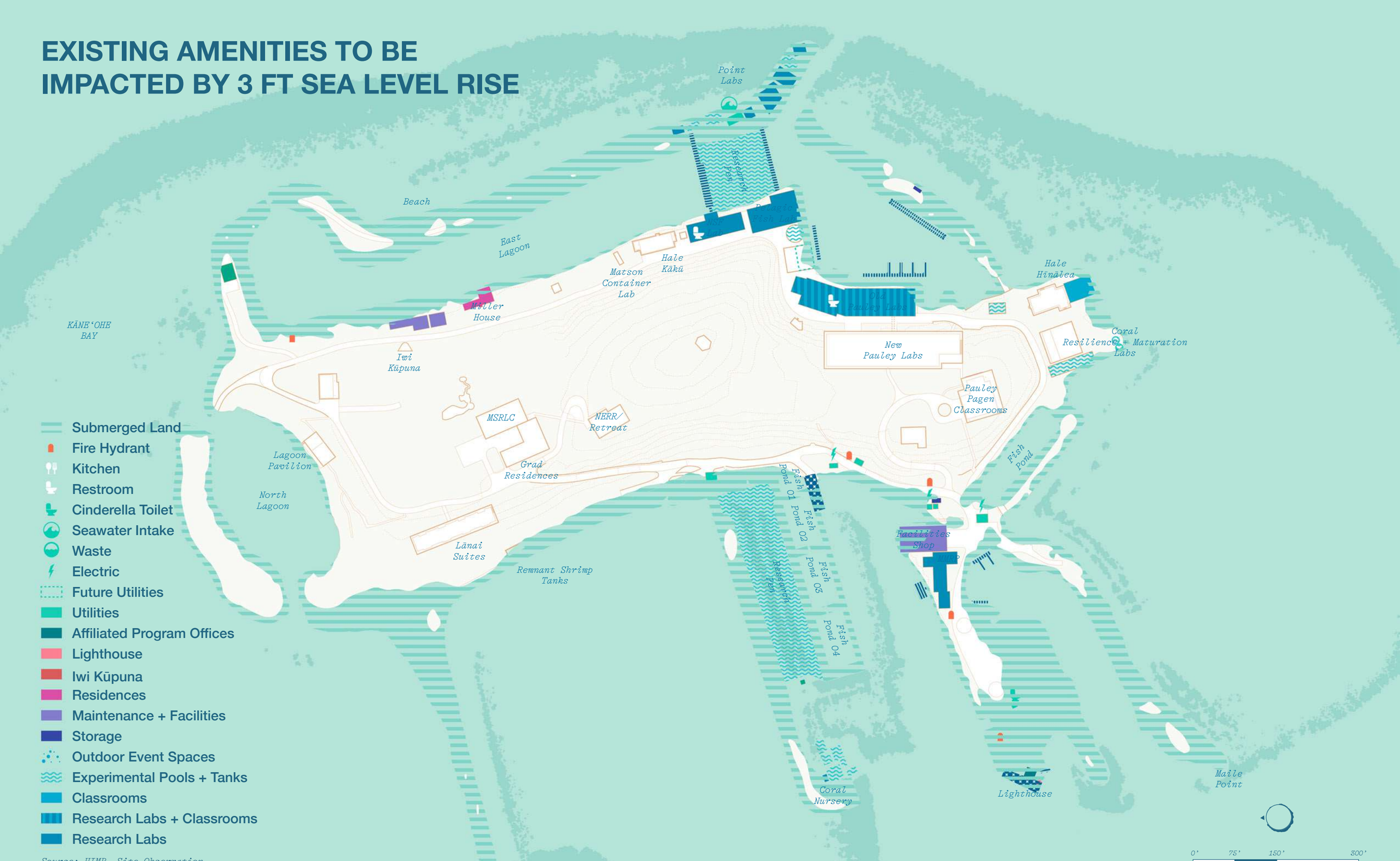
EXISTING AMENITIES IMPACTED BY EROSION + KING TIDE



- Fire Hydrant
- Kitchen
- Restroom
- Cinderella Toilet
- Seawater Intake
- Waste
- Electric
- Future Utilities
- Utilities
- Affiliated Program Offices
- Lighthouse
- Iwi Kūpuna
- Residences
- Maintenance + Facilities
- Storage
- Outdoor Event Spaces
- Experimental Pools + Tanks
- Classrooms
- Research Labs + Classrooms
- Research Labs

Source: HIMB, Site Observation

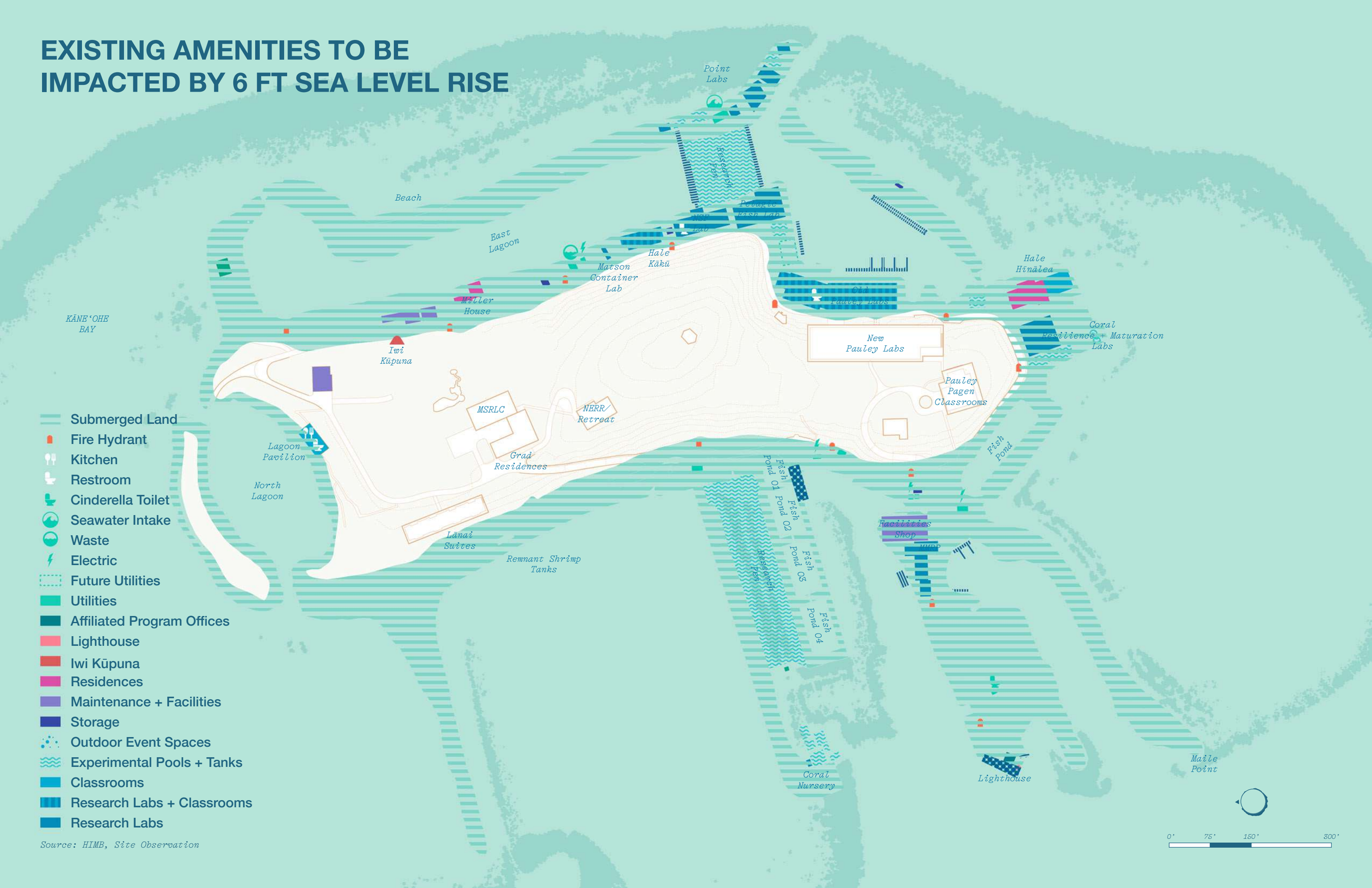
EXISTING AMENITIES TO BE IMPACTED BY 3 FT SEA LEVEL RISE



- Submerged Land
- Fire Hydrant
- Kitchen
- Restroom
- Cinderella Toilet
- Seawater Intake
- Waste
- Electric
- Future Utilities
- Utilities
- Affiliated Program Offices
- Lighthouse
- Iwi Kūpuna
- Residences
- Maintenance + Facilities
- Storage
- Outdoor Event Spaces
- Experimental Pools + Tanks
- Classrooms
- Research Labs + Classrooms
- Research Labs

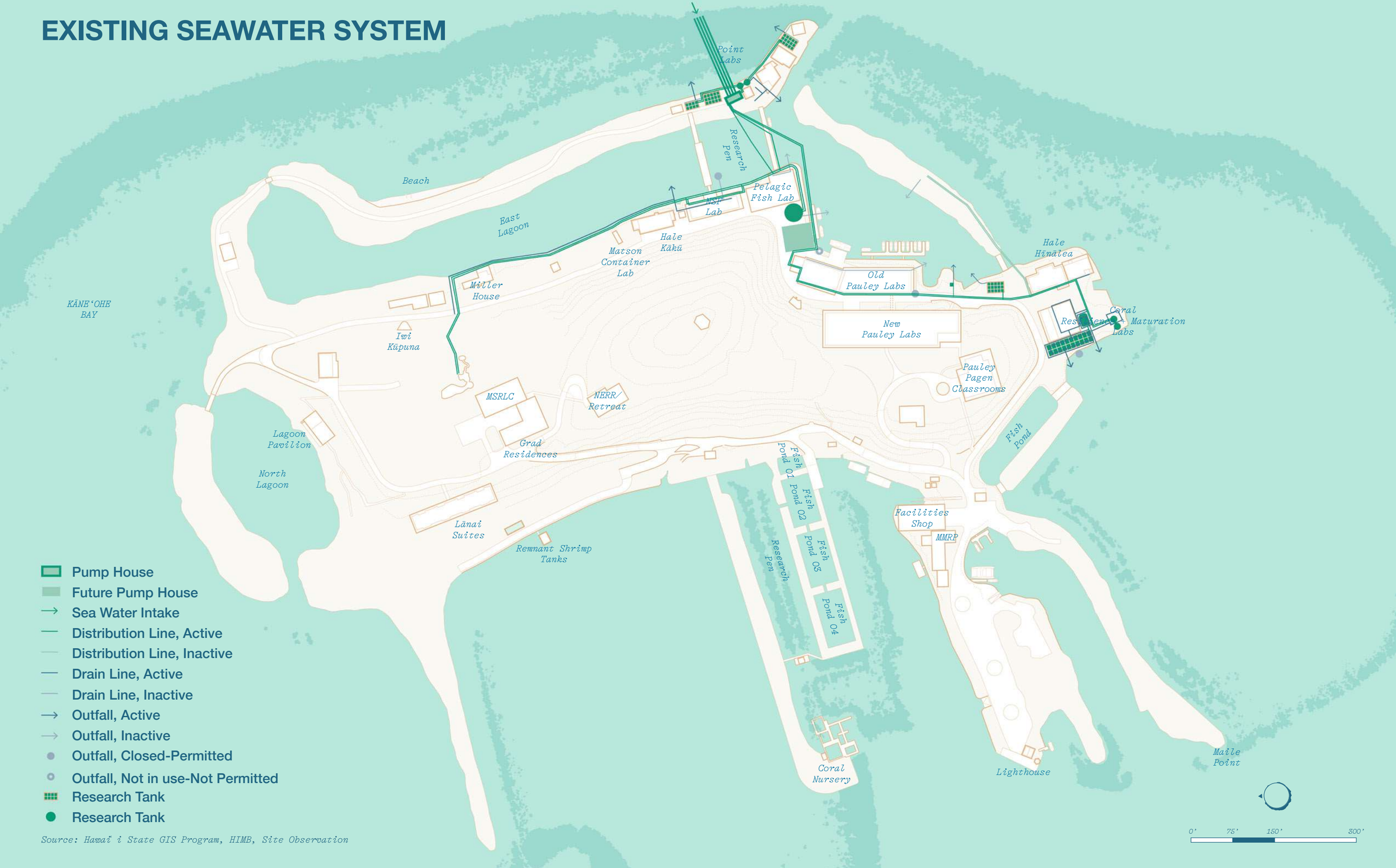
Source: HIMB, Site Observation

EXISTING AMENITIES TO BE IMPACTED BY 6 FT SEA LEVEL RISE



Source: HIMB, Site Observation

EXISTING SEAWATER SYSTEM



Source: Hawai i State GIS Program, HIMB, Site Observation

EXISTING WATERCRAFT ACCESS

He‘eia Kea Small Boat Harbor

He‘eia Kea Valley Nature Park

He‘eia State Park

He‘eia Fishpond

KĀNE‘OHE BAY

Mōkapu Peninsula

Moku o Lo‘e Islet

Lilipuna Point

Goodyear

Windward Mall

- Study Site and Community Partners
- Offsite Parking
- Bus Stop
- Honu Kai Route
- Kaeolo Route
- Ka Noelo Kai Route
- Super Sucker Route
- Reserach Skiff Route
- Utility Boat Route
- Ferry Shuttle Route
- Kayak (Community Access) Route
- Vehicular Shuttle

Source: HIMB, Google Earth

0’ 500’ 1,000’ 2,000’

EXISTING WATERCRAFT ACCESS

- Concrete Dock
- Future Dock
- Floating Dock
- Inoperative Infrastructure
- Boat Ramp
- Maintenance Route
- Boat Maintenance + Repair
- Honu Kai Route
- Honu Kai
- Kaeolo Route
- Kaeolo Catamaran
- Ka Noelo Kai Route
- Ka Noelo Kai
- Super Sucker Route
- Super Sucker
- Research Skiff Route
- Research Skiff
- Utility Boat Route
- Utility Boat
- Ferry Shuttle Route
- Ferry Shuttle
- Kayak

Source: HIMB, Site Observation

KĀNE'OHE BAY

To Greater Kāne'ohe Bay

Point Labs

Research Pen

Beach

East Lagoon

NSF Lab

Pelagic Fish Lab

Hale Kākū

Matson Container Lab

Miller House

Iwi Kūpuna

Hale Hīnālea

Old Pauley Labs

New Pauley Labs

Coral Resilience + Maturation Labs

Pauley Pagen Classrooms

MSRLC

NERR/ Retreat

Lagoon Pavilion

North Lagoon

Grad Residences

Lānai Suites

Remnant Shrimp Tanks

Fish Pond

Fish Pond 01

Fish Pond 02

Fish Pond 03

Fish Pond 04

Research Pen

Facilities Shop

MMRP

Low Tide

Weekend

Weekday

Coral Nursery

Lighthouse

Maile Point

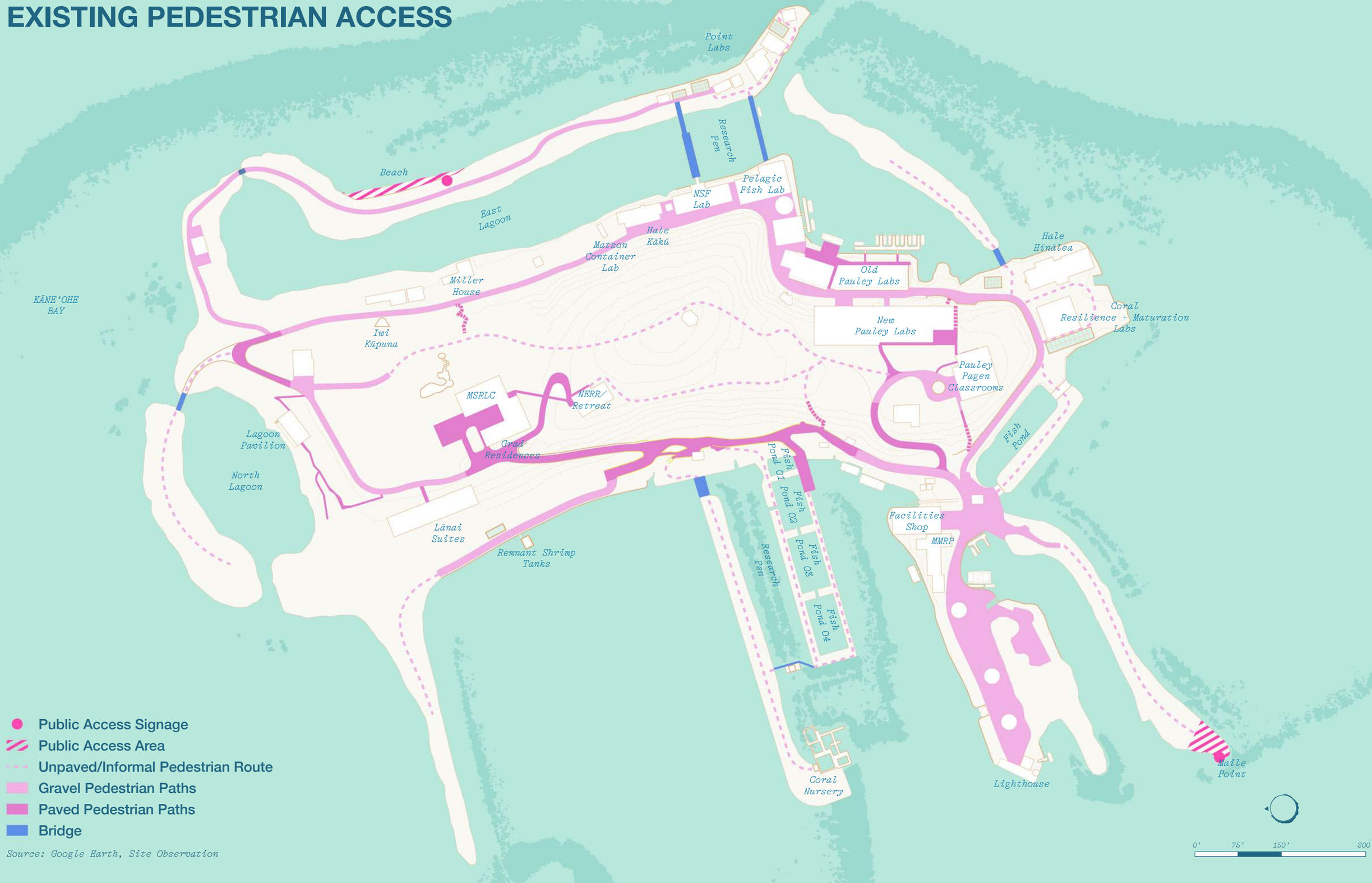
To He'eia Kea Small Boat Harbor

To Greater Kāne'ohe Bay

To Lilipuna Pier

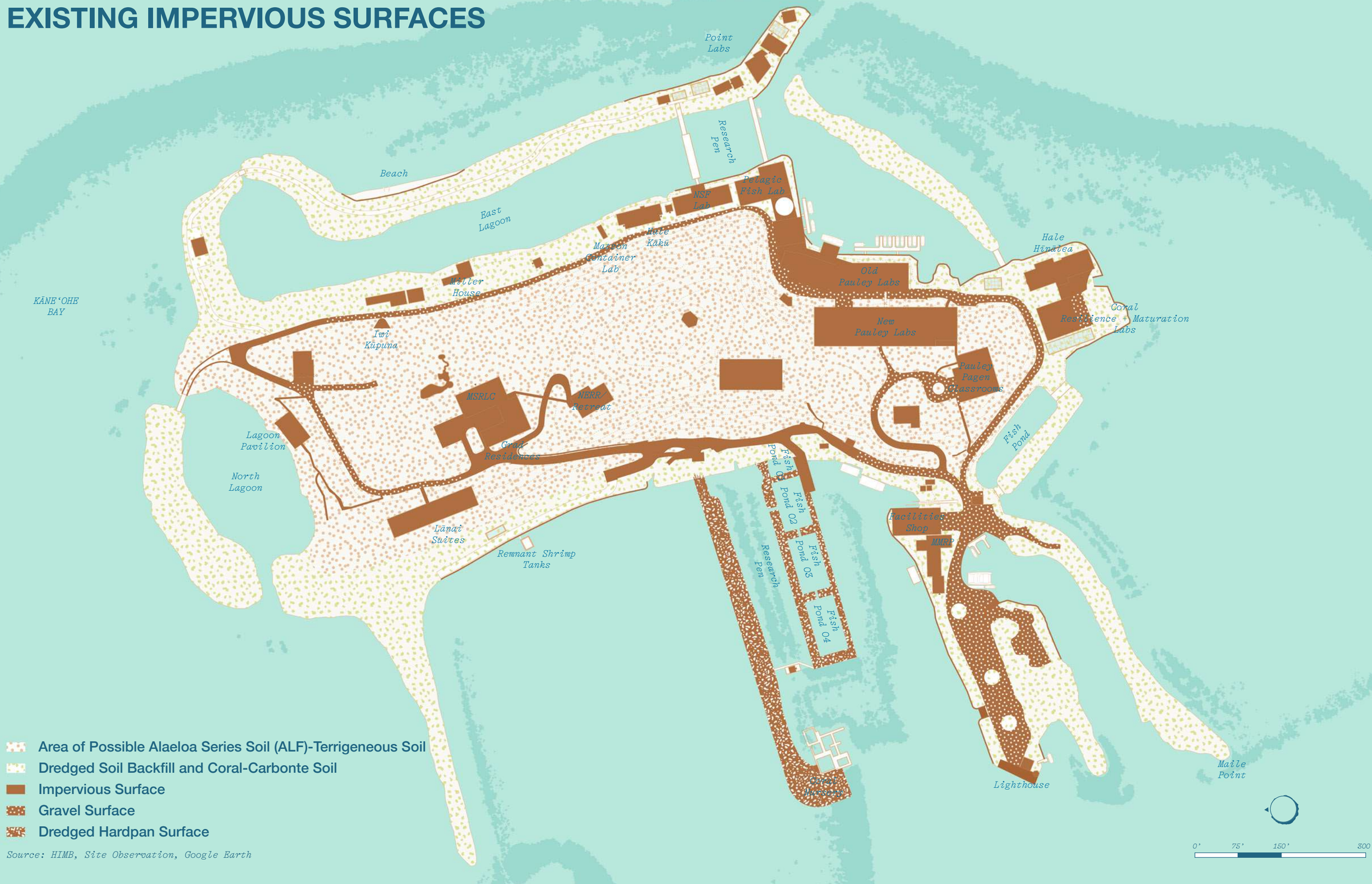
0' 75' 150' 300'

EXISTING PEDESTRIAN ACCESS



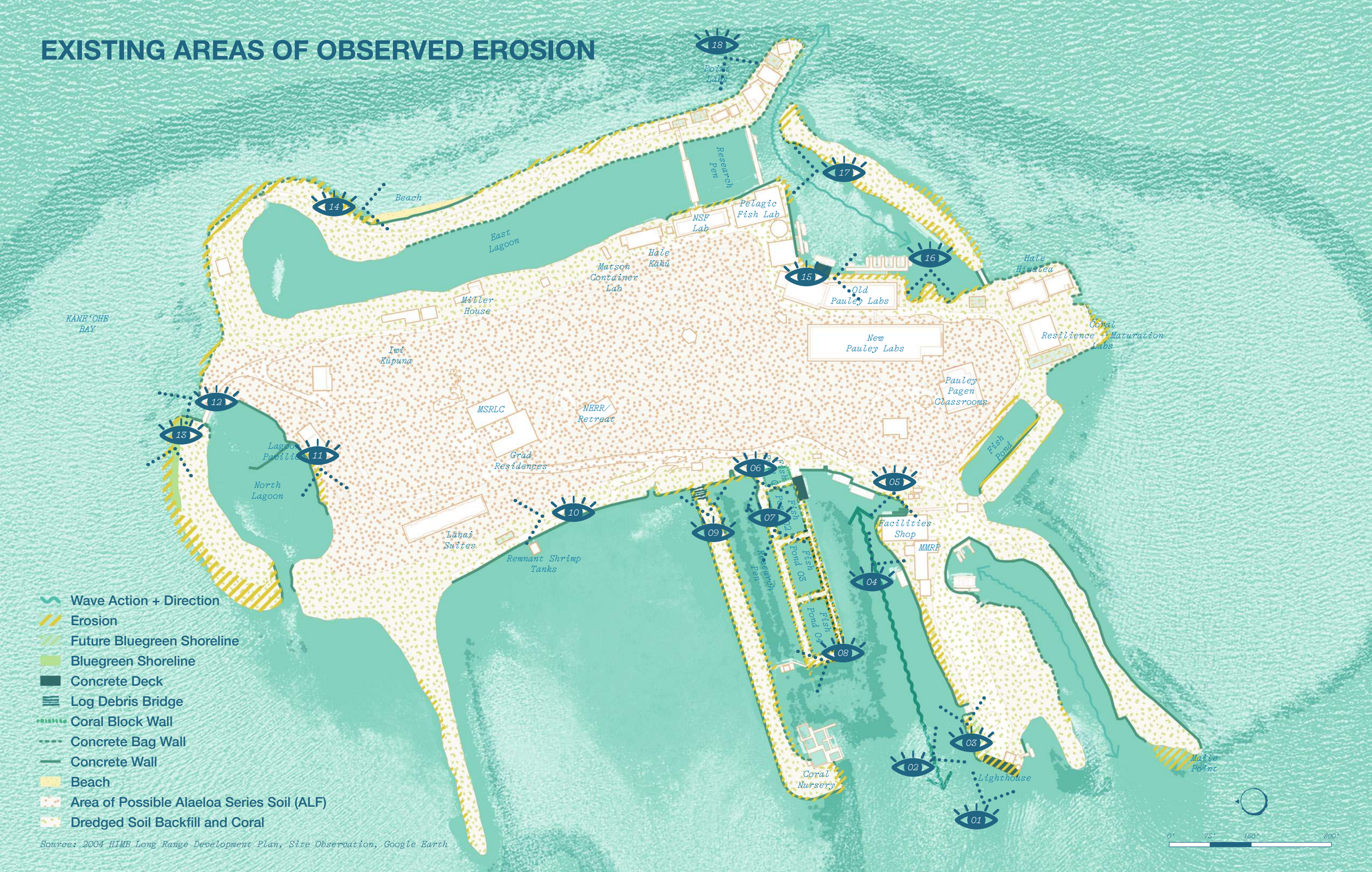
Source: Google Earth, Site Observation

EXISTING IMPERVIOUS SURFACES



Source: HIMB, Site Observation, Google Earth

EXISTING AREAS OF OBSERVED EROSION



Source: 2004 HIMB Long Range Development Plan, Site Observation, Google Earth

01 Erosion at at Lighthouse Concrete Deck

02 Erosion at at Entry Boat Ramp

03 Erosion at at Entry Boat Ramp

04 Erosion at Boat House Shop

05 Erosion at Boat House Shop

06 Coral Block Wall

07 Erosion at Research Pens and Concrete Bag Walls

08 Erosion Research Pens and Concrete Bag Walls

09 Log Debris Bridge


10 Remnant Shrimp Tank and Concrete Wall


11 Erosion at North Lagoon


12 Concrete Bag Wall Erosion + Bluegreen Shoreline


13 Bluegreen Shoreline


14 Erosion at Beach


15 Erosion at Utility Boat Docks


16 Erosion at Southern Portion of Boat Marina

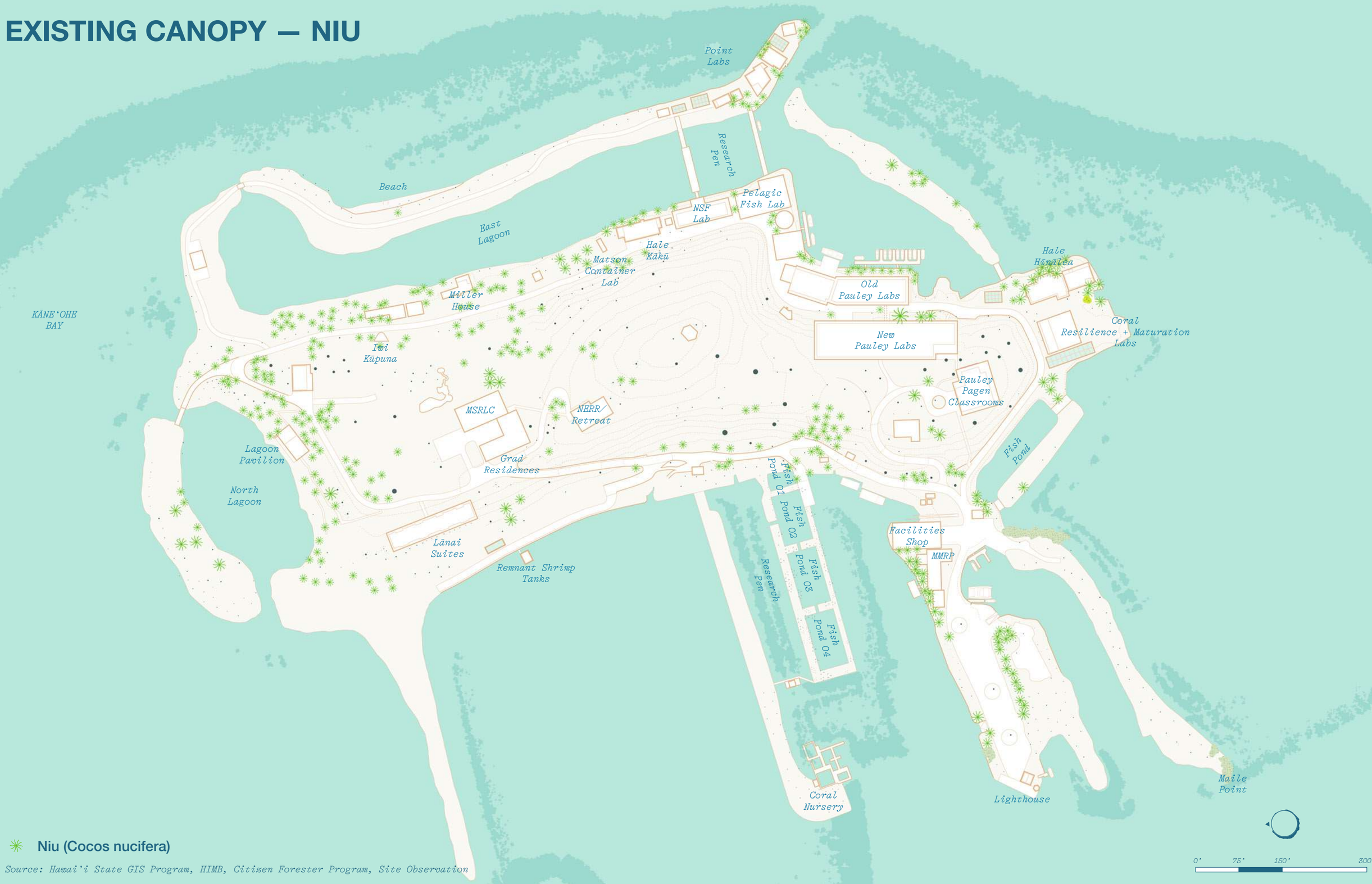

17 Erosion Outside Pelagic Fish Lab


18 Concrete Bag Wall at Point Labs

EXISTING CANOPY

Source: Hawai'i State GIS Program, HIMB, Citizen Forester Program, Site Observation

EXISTING CANOPY — NIU



Niu (Cocos nucifera)

Source: Hawai'i State GIS Program, HIMB, Citizen Forester Program, Site Observation

EXISTING SHRUBS + GROUNDCOVER

Coastal

- Naupaka (Scaevola taccada)
- Pōhinahina (Vitex rotundifolia)
- ʻĀnapanapa (Colubrina asiatica)
- Kulikuli kai/Pickleweed (Batis maritima L.)

Biocultural

- Native Planting (ʻUkiʻuki, Carex, ʻIliahi a Loʻe)
- Lauaʻe (Microsorum scolopendria)
- Ti (Cordyline fruticosa)

General

- Ornamental Screen
- Flowering Shrub
- Plumbago auriculata
- Wedelia (Sphagneticola trilobata)
- Grass—St. Augustine (Stenotaphrum secundatum)
- Grass—Zoysia (Zoysia sp.)

Source: Hawai'i State GIS Program, HIMB, Site Observation

◀ *The UHCDC team setting up the co-design model for Workshop 02*

Photo Credit: UHCDC

WORKSHOP 01 + 02 FINDINGS

HIMB Community Engagement
The UHCDC team co-hosted two workshops between October and December of 2023.

Workshop 01: Listen + Learn
Workshop 01 was hosted at HIMB on October 6, October 13, and November 3, 2023. The goal was to arrive at a shared understanding of the guiding design and planning principles for climate adaptation on the moku by gathering input from the participants on spatial elements, programs, and practices as they relate to the eight considerations of pono stewardship. The workshop had six thematic working groups:

1. **Moana-nui-ākea (Ocean biome) + Kahakai Pepeiao (Shoreline Ecotone)**

2. **Mauka (Terrestrial Biome), Nā Kumuwai (Freshwater Sources) + Ka Lewalani (Atmosphere)**

3. **Kānaka Hōnua (Sustainability) — Tranit + Cultural Access**

4. **Kānaka Hōnua (Sustainability) — Landscape, Food + Biocultural Aesthetics**

5. **Kānaka Hōnua (Sustainability) — Waste, Water/ Seawater + Energy**

6. **Papahelōlona (Indigenous Knowledge Systems) + Keʻlhiʻihi (Spirit of Place)**

There were a total of about 85 participants, with some individuals participating in more than one session.

Participants were asked to review the project story map, including a video recording by Dr. Kawika Winter, describing each of the eight considerations of pono stewardship developed by elder councils (‘Aha Kiole) in ancient Hawai‘i. The project story map houses information about the context, history, and changing landscape of Moku o Lo‘e.

A facilitated discussion explored how each of the eight considerations can inform climate adaptation (coastal erosion and sea level rise) on Moku o Lo‘e. The UHCDC team provided a set of precedents for each theme to elicit responses. A cultural practitioner and subject matter experts guided the discussion. Prompts included the following:

- How do you think HIMB could steward the [e.g., Ocean Biome, Shoreline Ecotone] on Moku o Lo‘e? What do you want Moku o Lo‘e to look like in the future?
- How do you think place-based knowledge and practices could inform climate adaptation strategies [e.g., Ocean Biome, Shoreline Ecotone] on Moku o Lo‘e?

Each session ended with a “Keep, Re-think, Create” activity that asked participants to add their site-specific mana‘o to the Moku o Lo‘e aerial map.

- **Keep:** Are there areas you would like to see protected? Are there landmarks that make Moku o Lo‘e special?
- **Re-Think:** Are there spaces you would like to see relocated or reorganized?
- **Create:** Are there new spaces you would like to see on Moku o Lo‘e?

The workshop session on Papahelōlona (Indigenous

Workshop 01 Keep, Re-Think, Create exercise

Photo Credit: Phoebe White

Knowledge Systems) and Ke‘Ihi‘ihi (Spirit of Place) focused on UHM's Strategic Goal of becoming a Native Hawaiian Place of Learning. The questions that guided the discussion were:

- As an ORU of UHM, what is HIMB's kuleana to Indigenous Knowledge Systems in He‘eia, Hawai‘i, and Oceania?
- As an ORU of UHM, what is HIMB's kuleana to honor the spirit (mauli) of Moku o Lo‘e?
- How could HIMB embody UHM’s five principles of being a Native Hawaiian Place of Learning?
  a. Mo‘okū‘auhau — the many genealogies that shape us
  b. Kaikua‘ana and Kaikaina — intergenerational interdependent relationships
  c. Kuleana — our responsibilities and privileges
  d. Hānai and Ho‘omalu — nourishing and protecting each other
  e. Mālama — tending to and caring for one another
- Are there any other Native Hawaiian principles that HIMB embodies that should be listed here (e.g., kuahine/kunāne relationships with the He‘eia community)?

◄ *Workshop 01 session on Papahelōlona (indigenous knowledge systems) and Ke‘Ihi‘ihi (spirit of place)*

Photo Credit: Phoebe White

- How could HIMB support UHM's four focus areas of being a Native Hawaiian Place of Learning?
  a. Native Hawaiian Student Success
  b. Native Hawaiian Environments
  c. Staff and Faculty Development
  d. Native Hawaiian Community Engagement

The results from Workshop 01 were collated by the UHCDC team to develop themes/design principles for the concept plan for Workshop 02.

Workshop 02: Co-Design

Workshop 02: Co-Design was hosted on December 1, 2023. Co-design privileges shared authorship of the collective process for a deep and meaningful engagement. The goal was, therefore, to engage participants in the design process and gather feedback on two concept design options. The primary tool was a large, generative, 8′ x 4’ “co-design” physical model of Moku o Lo‘e composed of movable blocks representing existing buildings, and a kit of possible design elements. Participants were asked to discuss the concept design and propose adding or removing

elements, or reorganizing existing spatial configurations. There were four sessions (with 15 minutes between sessions for the UHCDC team to record the model). Participants could choose to attend any one session. This workshop saw about 38 participants in all, with some who had not participated in the previous workshop.

The UHCDC team provided a plenary recap of Workshop 01 and described the co-design process. They shared the themes that informed the conceptual plan, its assumptions, and what it seeks to accomplish. The team also explained how to use the kit of parts (building blocks, icons) in conjunction with the eight considerations. The co-design process focused on four key zones:

- Seawater, Research Labs, Adaptation + Sustainability
- Promenade Loop + Overlooks
- Culture + Place-Based Education
- Canopy + Planting

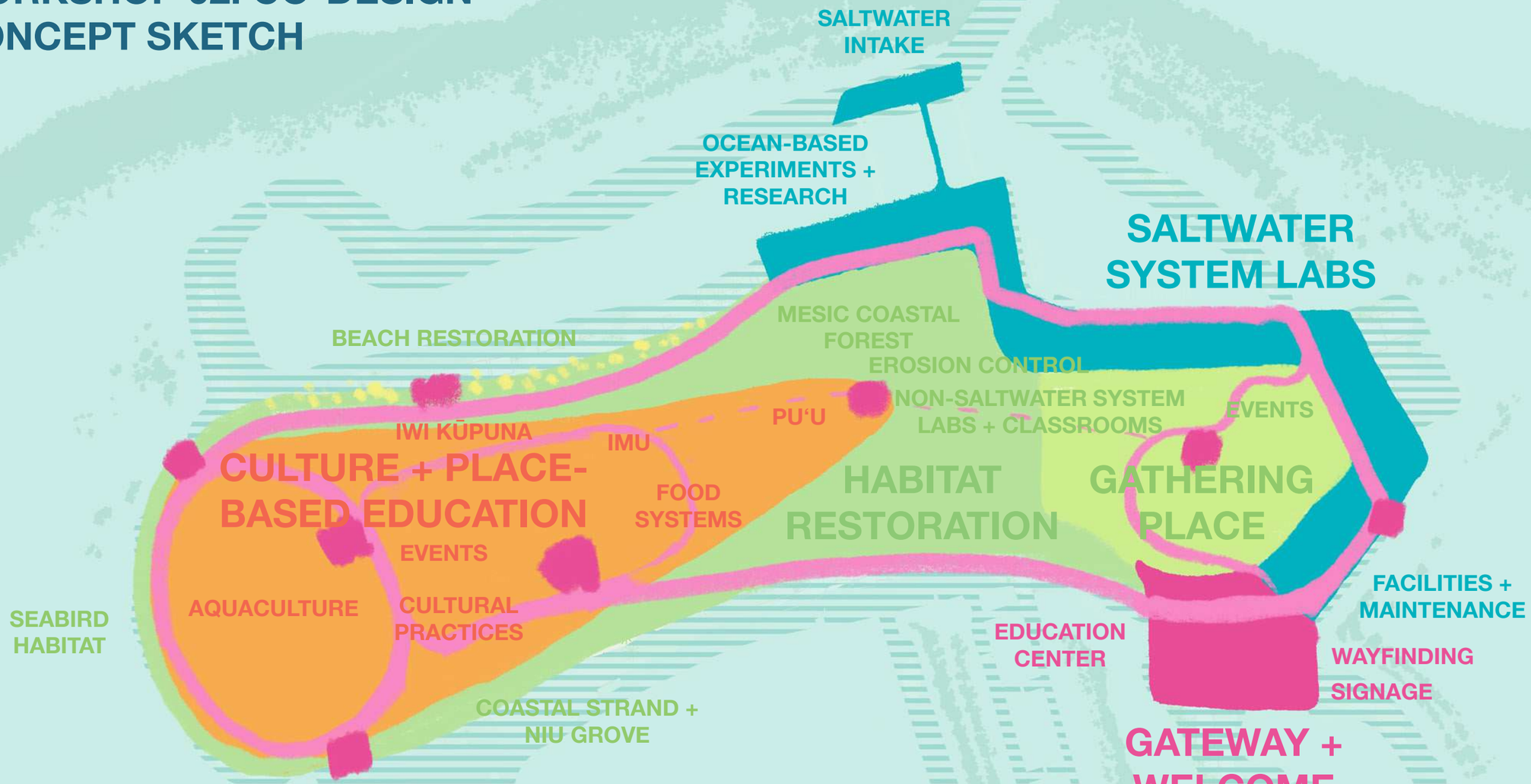
The prompts for this exercise were:

- What do you like about the conceptual plan? Are

Workshop 02 ►
Co-Design exercise

Photo Credit: Phoebe White

WORKSHOP 02: CO-DESIGN CONCEPT SKETCH



WORKSHOP 02: CO-DESIGN
MODEL LEGEND

SEA WATER RESEARCH LABS, ADAPTATION + SUSTAINABILITY

- COASTAL STRAND
- BEACH
- WATER CATCHMENT
- SOLAR
- CONSTRUCTED WETLANDS
- SHARK PEN
- COCONUT COIR
- LIVING SHORELINE
- LIMU
- CORAL NURSERY
- DOCKS
- SEA WATER MESOCOSM
- RIPRAP BREAKWATER

CULTURE + PLACE-BASED EDUCATION

- AQUACULTURE
- OPEN PLAZA
- CULTURAL PRACTICES
- BIOCULTURAL AESTHETICS + LEI
- EDIBLE GARDEN
- FOOD FOREST

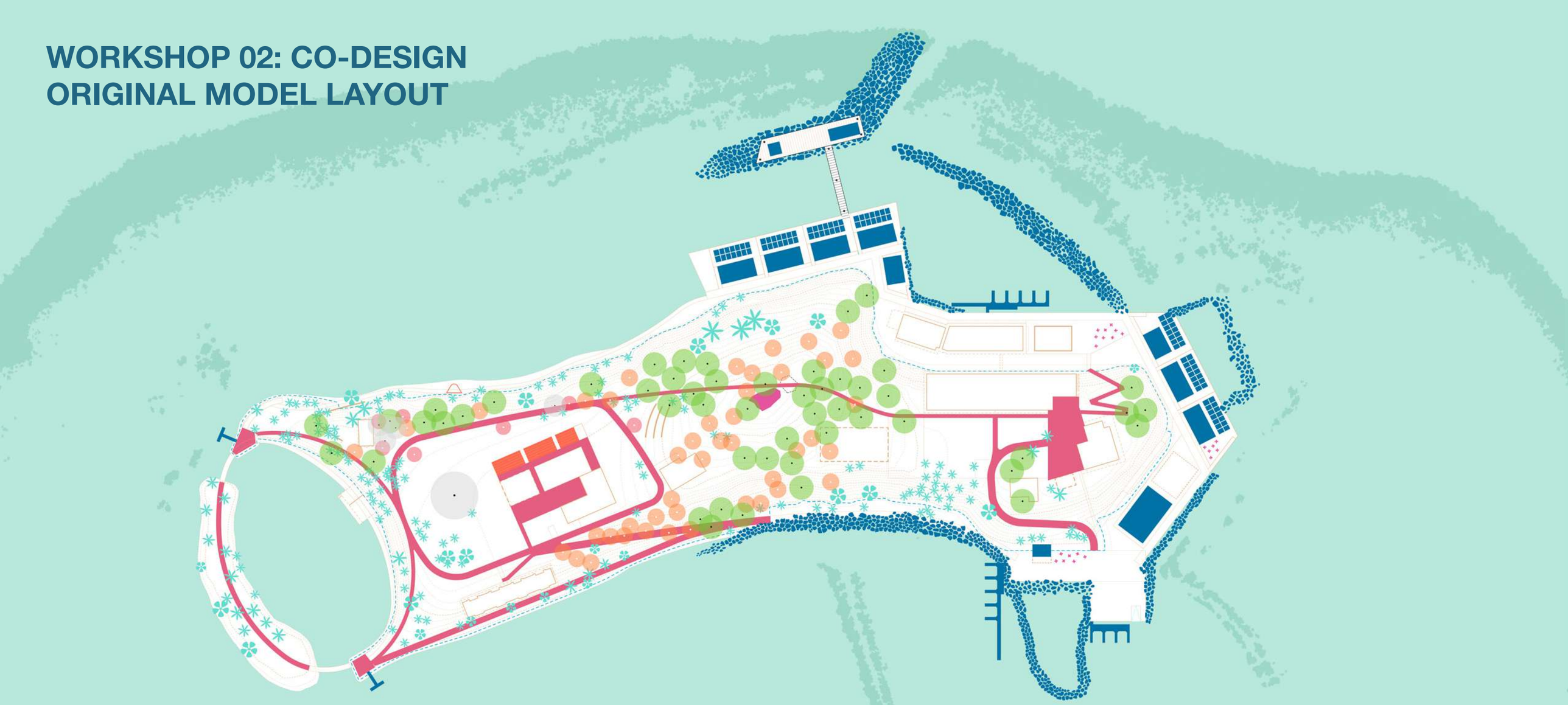
PROMENADE LOOP + OVERLOOKS

- PICNIC SEATING
- BENCH SEATING
- VIEWS
- WAYFINDING
- EDU SIGN
- KAPU
- PU'U
- PUBLIC NODE
- CULTURAL NODE
- EDUCATIONAL NODE

PLANTING

- LAWN
- EXISTING
- COASTAL STRAND
- COASTAL FOREST
- NIU
- LOULU

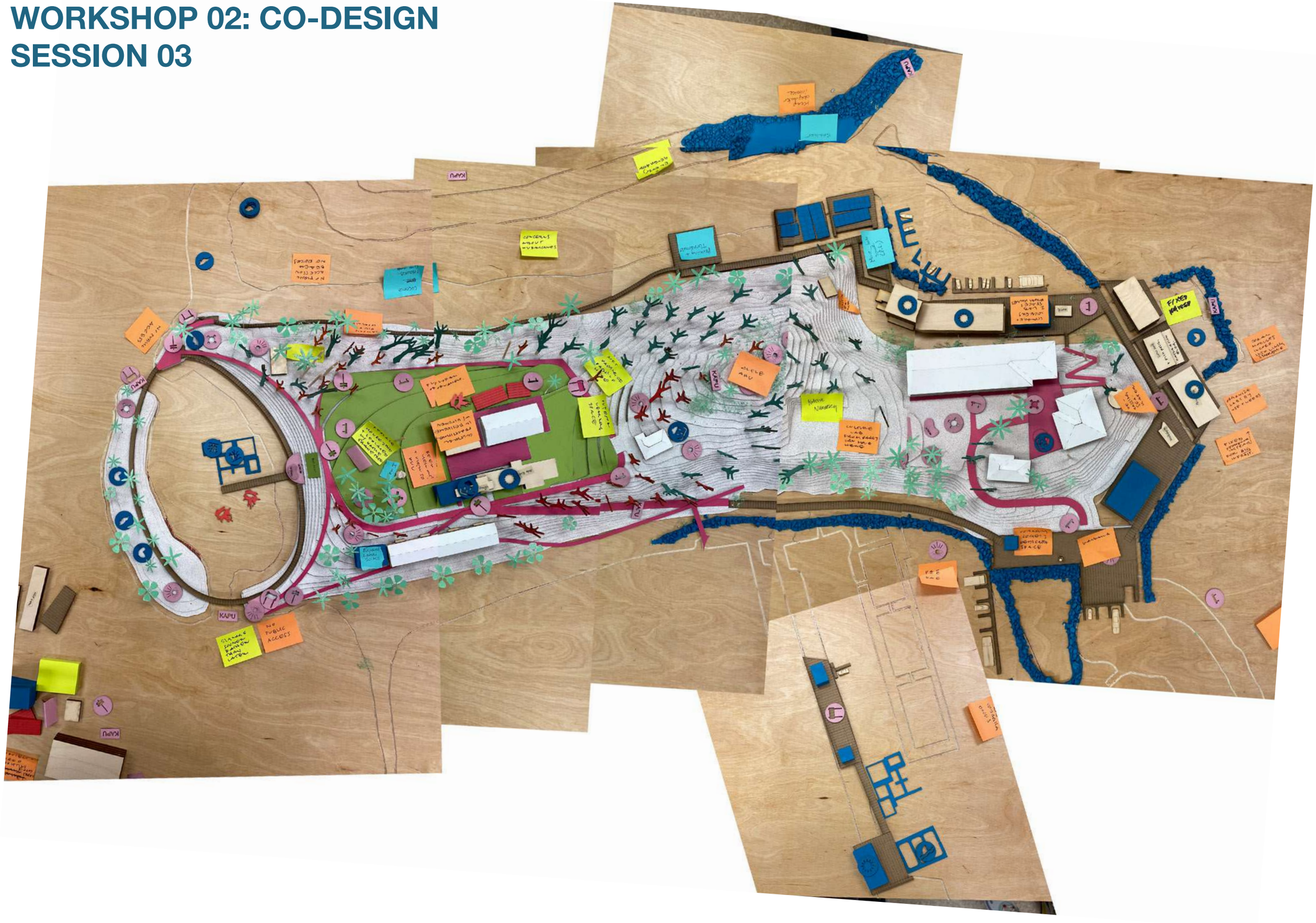
WORKSHOP 02: CO-DESIGN
ORIGINAL MODEL LAYOUT



WORKSHOP 02: CO-DESIGN
SESSION 01

WORKSHOP 02: CO-DESIGN
SESSION 02

WORKSHOP 02: CO-DESIGN
SESSION 03



there particular spaces that resonate with you? (Keep)
- Is there anything you would like us to re-think? (Re-think)
- Is there anything you do not see on the plan that you would like us to consider? (Create)

Workshop 02 concluded with the UHCDC and HIMB sharing the project timeline and how the plan/report will be shared.

Workshop 02 Areas of Importance/Priorities
This section provides a summary of comments from the workshops for each of the four priority areas in the conceptual plan.

1. **Seawater Research Labs, Adaptation, Sustainability**
   Participants discussed spatial reorganization and associated trade-offs. They expressed the need for better integration of spaces for research with those for education that are open to visitors. They also scrutinized the proposed adaptation strategies and debated filling versus elevating or floating structures.

   Summary of Comments:
   - With SLR how will the soggy areas (submerged lands) transition? Seabird habitat?
   - Proposed shoreline treatment is necessary but attention needs to be paid to hardening the landscape/improving resilience to disaster (near Lānai suites)
   - Floating labs are not feasible; unstable, difficult to use a scale; some activities not affected by buoyancy can be done in floating labs; labs on the shoreline should be fixed, less maintenance; Coral Resilience & Fish labs are together currently. It would be expensive to make these floating; Pelagic–raised (fixed); need precedent for floating labs; coral nursery, tanks, and mesocosms can float; can be a shared mesocosm space (~100 tanks); coral nursery could be partially anchored and accessed by boat
   - Pros and cons of fill vs raised deck
   - Consider designing/reorganizing by category of research rather than individual labs (as currently); a lot of the stuff in the Pauley labs does not need access to water so it can be moved up
   - Raised deck road might need to allow for use by a cement truck
   - Point Lab: A huge amount of construction to adapt; does it make sense? What are the trade-offs? Could be moved to shoreline w/ longer seawater pump
   - Pauley Lab: flood adaptation; concern about structural issues; current functions do not need to be on shoreline (can be moved inland)
   - Relocate MMRP upland
   - New building: more useful for meeting space and labs rather than dorms
   - Concern about silo between research and education; progress was made but this design takes things right back to old silo; link programmatically? Suggestion to put research on both ends to force integration - labs want to stay close together where they need to access certain infrastructure; some may be easier to relocate; currently Hawaiian activities including research are segregated
   - How does relocating labs to the cultural side impact the spirit of place? Currently, the segregation feels like it creates a safe space for culture; better to include culture in other areas; maybe integrating cultural spaces and education into the research side would be better; how to make all researchers feel comfortable and make the space feel more Hawaiian?
   - Academic quad is not the appropriate description

– re-think
- What would it look like to create decentralized cultural/education nodes? Add more cultural aspects on the central research quad (traditional hale, signage); use plants as biocultural integrators; create opportunities for researchers to make lei, mālama ʻāina, etc. will make them feel more invested and grow pilina; researchers not trained as educators (different skillset). It is easier for them to incorporate education coordinators into their budgets
- Build makahiki activities and include researchers; weaving knowledge systems - call out how to do this better
- Are we tied to the majority of lab buildings along the current (windward) side of the island? Could we reorient the island to make use of the leeward side more?
- Make buildings on the windward side hurricane-proof (as climate changes will likely see more hurricanes where now they are uncommon)
- Can we incorporate wave energy generation as part of a breakwall? Outer breakwater could be made smaller (if Point Lab is moved)
- Green waste processing should be located by the garage as long as the imu is moved
- If the island is being reduced due to SLR, then maximum occupancy should be reduced as well; submerged land is cheaper to adapt instead of just creating new facilities/areas and adaptations

2. **Culture and Place-based Education**
The kūpuna suggested the puʻu as the central point with a 360-degree unobstructed view of the bay. This could be achieved by removing the invasive trees that are currently obstructing views, and installing a star compass or an ʻahu at the summit. Niu was discussed as an essential element of the cultural landscape; it was suggested that for every niu

removed for safety reasons, a new descendant tree should be planted in a more appropriate location thereby maintaining the same niu population size as before.

Summary of Comments:
- Like to see a star compass and/or an ʻahu; consider planting coconut/loulu trees on puʻu that do not obstruct views
- ʻIwi kūpuna possible redesign; need conversation with Burial Council; think seven generations ahead; move up to puʻu; hardened underwater burial example on Hawaiʻi Island; ʻahu for the ʻiwi; underwater burial areas are fine and common but what about the ʻiwi that are washed up?
- Imu: not next to the building (b/c smoke) but near the kitchen; should be high ground and well-drained area/soil; imu on the west because of the trade winds; would be good to have a kitchen on both ends of the moku
- Possibly expand Lānai Suites to replace the loss of dorms
- Add a traditional hale as a distinct cultural piece near the entry/labs near the entry; Waikalua Heʻeia views from hale
- Limu nursery w/ education node in lagoon
- Terraced outdoor classroom (amphitheater)
- Cultural practitioner in residence - resident graduate students and cultural practitioner are oil & water; can be in the same building as the kitchen

3. **Promenade Loop and Overlooks**
Participants added kapu signs (on-site and off shore) with educational information and instructions for visitors about how to best experience the moku. They suggested using submerged lands as fill material.

Summary of Comments:
- Promenade with proper signage will enhance

connectivity across the moku
- Public access: How much, if any? Can boats show up? Currently, the public does not respect the place when they visit
- Access is dependent on the channels
- If a sandy beach is created, it will be difficult to keep people off
- No motorized boats; add remote signage to help control; do not kapu the landing until there is a program to handle the interest
- In the lagoon area signs could direct people (kayakers, visitors) to appropriate access locations; gates can limit access; lagoon can house aquaculture; include a sign indicating lagoon is an active research area to discourage trespassing
- Docks in remote spaces (like lagoon area) are not safe; the academic side should be accessible to public through sponsor
- Northwest is probably the best boat/kayak access for the public
- Reuse of submerged land material: reuse mangrove material from spits for fill - fill material - will have to pay for it or move it around from existing submerged lands; need to consult an expert
- Aquaculture: mixed use; pond would be good to use as a classroom; add a new event space
- Moku o Loʻe should not be a tourist attraction; enhanced access would invite uncontrolled visitation; ~200 carrying capacity for researchers on the island
- Plant signage; keep sightline; traditional hale for outdoor classrooms (not very close to iwi but near iwi)
- Kūpuna access to puʻu, maintain view to puʻu; with views and signage, connect to significant spots like fishpond hale at Paepae o Heʻeia, Kānehoalani, etc.
- There is an issue with erosion and mud with use of

golf carts; think about how to best manage
- Do not lose sight of taking care of Lilipuna shuttling (possibly from Kākoʻo ʻŌiwi) & cross-island shuttles

4. **Canopy**
Participants emphasized the need to protect existing trees to the extent possible and suggested terraced food gardens.

Summary of Comments:
- Incorporate terraced food gardens by the Lānai Suites; food gardens where terracing currently exists
- Be mindful that coconut trees are difficult and costly to maintain and can be dangerous - any niu that are removed should be reused - plant the Samoan variety that does not grow tall (approved by kūpuna); save and use bases of cut down coconut trees (e.g., for drums)
- Food forest/garden close to kitchen
- Native plant nursery where basketball courts used to be

Workshop 02 Themes to be Reflected in the Mālama ʻĀina Plan
Participants agreed with concept design elements such as the loop consistent with universal design principles, a floating dock and coral nursery, elevated NSF labs, and the welcome/education center. They generally supported the relocation of the facility sheds and removing coconut trees around circulation areas. Recycling the collected material and replanting the niu in less trafficked areas were also recommended. Ensuring a clear view from the puʻu by planting low shrubs was important. Other comments highlighted the need for proper signage to direct visitors.

Workshop 02 Themes to be Explored Further
Participants expressed some concern about the programmatic and spatial division between cultural and academic zones. They debated public and cultural access (e.g., having less or no public access), and floating structures versus fixed lighter infrastructure for floating facilities. They suggested revisiting the programmatic direction for HIMB – for instance, what has to be located on Moku o Loʻe and what can be located off-site?

Concept Design Principles
Drawing on the feedback gathered from the workshops, the UHCDC team developed three design principles that provide the foundation for the final concept design.

1. **Restore a Hawaiian Sense of Place**
   Historically, the shoreline on Moku o Loʻe was a reflection of ocean and cultural processes. This is evident in historical aerial photographs, which show the accretion of a beach on the eastern side of the moku, a result of the predominant wind and wave direction, and a large niu grove on the western side of the islet, the result of a planting event held by Bernice Pauahi Bishop celebrating Queen Emma in 1884.

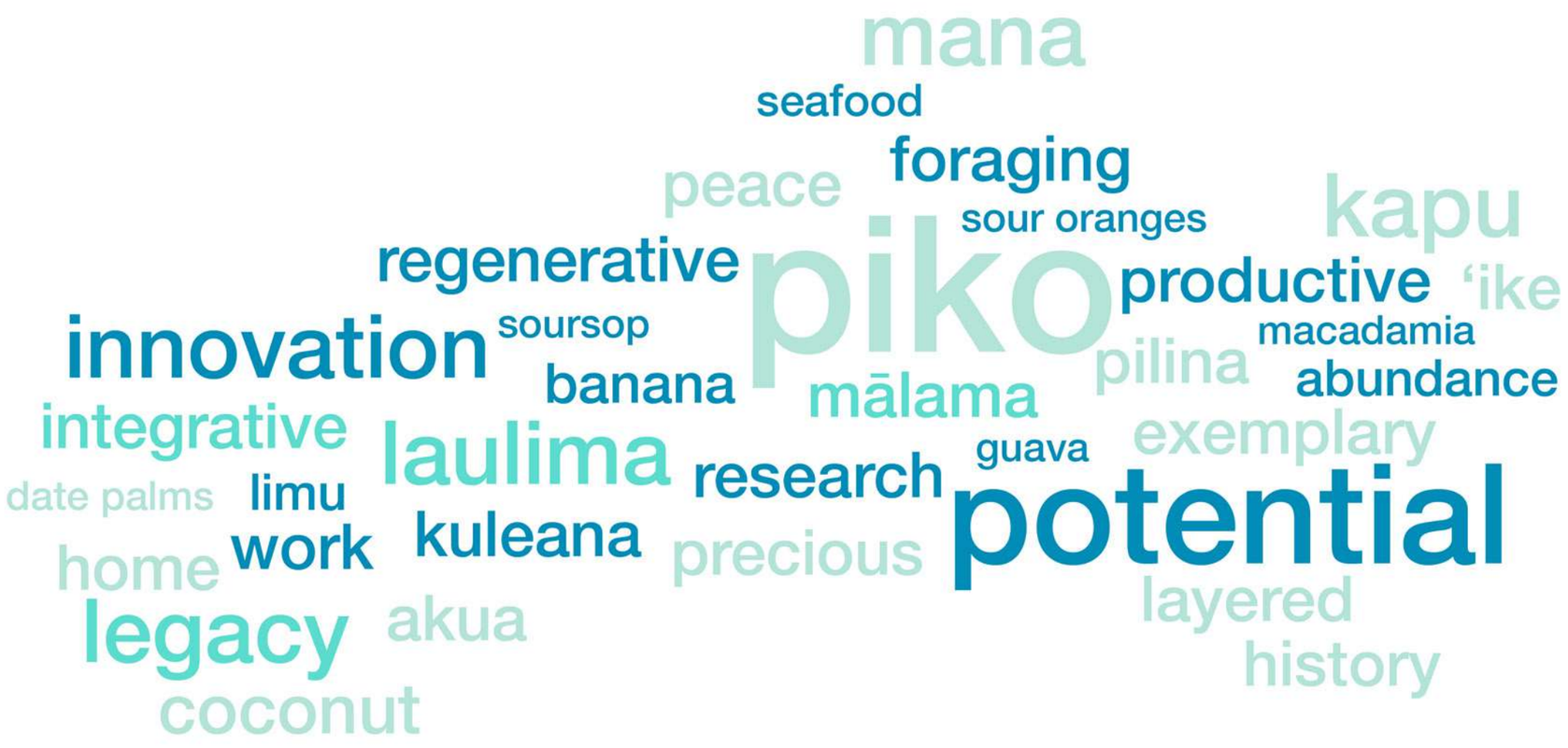
   The site observations indicate that HIMB's inherited shoreline is both vulnerable to ocean processes and acts as a barrier to the larger cultural context of Kāneʻohe Bay. Vertical concrete seawalls that oppose wave action are severely eroded and undercut, creating an unsafe shoreline condition. Despite containing many significant infrastructural and research elements that are essential to HIMB, such as watercraft access, docks, boat launches, laboratories, seawater distribution pipes and tanks, and mesocosms, the shoreline is particularly vulnerable to impacts from king tide events and future sea level rise. Dense remnant stands of introduced ironwood, haole koa, and spontaneous mangrove block views out to the surrounding context, isolating Moku o Loʻe from the larger cultural landscapes of Kāneohe Bay, Heʻeia, and the greater Koʻolaupoko.

   The concept design positions sea level rise adaptation, biocultural stewardship, and habitat restoration as essential elements of restoring sense of place on Moku o Loʻe.

2. **Expand Cultural and Physical Access**
   Feedback gathered from the community engagement workshops revealed that, to many, the experience of Moku o Loʻe feels unwelcoming, fragmented, and disorienting. Creating a cohesive, safe, and welcoming experience of the moku will increase opportunities for restoring its sense of place and provide the foundation for cultural stewardship, amenities and programs.

3. **Support Research Excellence and Perpetuate Research and Educational Legacy**
   Moku o Loʻe has served an educational role since ancient times and is today a leader in marine research and place-based education. Many workshop participants expressed a desire for expanded educational and stewardship programs that allow for greater HIMB community participation on the moku. Such amenities and programs are, therefore, a key consideration of the concept design.

What word comes to mind when you think of Moku o Lo'e?



CONCEPT DESIGN PRINCIPLES

01
Restore a Hawaiian Sense of Place

02
Expand Cultural + Physical Access

03
Perpetuate Research + Educational Legacy

◄ *Concept design of the Place-Based Education Core and Pu‘u at 3-foot SLR*

Photo Credit: UHCDC

FINAL CONCEPT DESIGN

Final Concept Design

Based on the feedback gathered in Workshops 01 and 02, the UHCDC team developed a final concept design for Moku o Lo‘e that evolves across two scenarios: 3- and 6-foot sea level rise (SLR). According to the City and County of Honolulu Climate Change Commission Sea Level Rise Guidance, critical coastal infrastructure should be designed for a 6-foot sea level rise scenario because it is projected to impact areas at high risk decades earlier than 2100 (2018).

The character and programmatic elements of the design remain largely the same across both scenarios. These elements, which the design refers to as ‘Character Zones,’ include the Welcome Dock and Education Center, the Flexible Quad, the Seawater System Labs, the Culture and Place-Based Education Core, the Educational Lagoon, and the Pu‘u. The connective tissue unifying these zones are areas of habitat restoration and the Loop: a continuous ADA-accessible walk that circles the moku and contains ‘activity nodes.’ These activity nodes are the primary wayfinding elements and include outdoor classrooms, social gathering spaces with tables and chairs, overlooks and culturally-significant sites. Educational signage can be found at many of these nodes that provide information on the history of place and significant sites both on Moku o Lo‘e and in the greater context of Kāne‘ohe Bay, He‘eia and Ko‘olaupoko.

Final Concept Design + 8 Considerations of Pono Stewardship

The Mālama ʻĀina Plan is based on three overarching design principles: restore a Hawaiian sense of place, expand cultural and physical access, and enrich and perpetuate educational and research legacies. Several features of the Plan respond to ongoing efforts at UHM to become a Native Hawaiian place of learning with four strategic focus areas. These are briefly described below.

Native Hawaiian Student Success

The Plan weaves cultural and place-based education spaces, with a flexible quad where research facilities are located to encourage interaction and strengthen the connection between the two spaces. This spatial layout will facilitate a weaving of knowledge systems, as well as programmatic integration between culture, education, and research. For instance, a star compass at the summit will elevate Indigenous Knowledge systems within the context of university-based research, and a food forest along with other biocultural landscaping could ensure that plant-based Hawaiian lifeways – such as eating Hawaiian fruits and making lei – are perpetuated on the moku.

Staff and Faculty Development

Biocultural aesthetics, outdoor classrooms, and nodes within a connective loop around the moku spotlight culturally significant sites with educational signage. They offer opportunities for staff, faculty, and visitors to learn about the place by integrating local culture, history, ecology, and community into these spaces and educational signage which are also bilingual.

Native Hawaiian Environments

The Plan is anchored by the Puʻu which sits at the highest elevation of the moku, and once stood as a visual connection to the surrounding ahupuaʻa. The Plan recommends restoring the summit of the island in a culturally appropriate manner by restoring the view planes between the summit and the prominent peaks in the Koʻolau, and installing either a star compass or an ʻahu to elevate Hawaiian knowledge systems within the institution. It also envisions the restoration of biocultural landscapes and habitats by reintroducing plant communities that populated the moku historically. The existing niu planted by Bernice Pauahi Bishop in 1884 to celebrate Queen Emma is preserved as an element of the cultural landscape of Moku o Loʻe. A food forest is located close to the Puʻu. Iwi Kupuna mark the past and present, and maintain a spiritual connection to the moku. Space for a cultural practitioner in residence, an imu, a traditional hale, and outdoor areas for cultural practices serve as important landmarks. Kapu signage protects the moku and reminds visitors of the importance of preserving its ecological integrity.

Native Hawaiian Community Engagement

The Plan creates spaces designated for cultural activities that are valued in the community (e.g., hula), as well as gathering spaces for community needs. The Plan also supports programs like the cultural practitioner in residence, which could be tied to education about growing and harvesting limu. Similarly, plantings that have aesthetic biocultural significance and the foraging loop could do the same for cultural practices like lei making.

Shoreline Adaptation Strategies

The concept design positions shoreline adaptation as an essential part of restoring a sense of place on Moku o Loʻe and creating an overall more resilient moku. The design proposes eight different coastal resiliency and sea level rise adaptation strategies. These strategies do not just create a more resilient shoreline for Moku o Loʻe; they also help to restore a cohesive experience of place and restore plant communities that historically

existed on the moku, but were displaced by introduced species such as mangrove and ironwood.

ELEVATE: Repurposed Cut and Fill
The first sea level rise adaptation measure proposed by the concept design is adaptive retreat through cut and fill processes. The design suggests using the dredged materials now found in the artificial spits, which are severely degraded, to build up selective areas along the shore to at a minimum 1-foot above the projected mean sea level at the 6 foot scenario. This gives new purpose to land areas that would otherwise be submerged due to sea level rise.

In the 3-foot SLR scenario, fill material is used to elevate infrastructurally significant spaces that are essential to access and research activities on the moku. This includes the Welcome Plaza and Education Center, the Facilities and Boat Repair area, the relocated MMRP building, the relocated Weather Station, Matson Lab and Point Labs, and the Seawater Intake System. Elevating these spaces above the 6-foot SLR elevation ensures that they will remain functional in not only at 3-foot SLR rise but also in the event of severe flooding or storm surge during this scenario. Universally-accessible ramps are located at each of these spaces to ensure equitable access. The severely eroded edges along the marina of the Seawater System Labs are also filled to maintain important research functions and watercraft access at the 3-foot SLR option.

Additionally, the fill is used to create a more accessible and ecologically resilient shoreline. Dredged fill is used to create ADA-accessible routes to the Flexible Quad and the Culture and Place-Based Education Core (both of which are currently not ADA-accessible). Microtopographies are sculpted in the Constructed Marine Wetland and Coastal Strand habitats along the western edge of the moku and the Constructed Dunes

in the northeast. While these landforms do not deter sea level rise, they create a diversity of solar and moisture gradients that can host diverse plant species that add to the ecological health and resilience of the moku.

An in-depth geotechnical study is recommended to evaluate the feasibility of repurposing cut and fill, the ability of this fill to handle large structural loads such as single-story lab buildings, decks, and boardwalks, and the impacts to the adjacent patch reef. If the use of dredged fill is not feasible, it is suggested that elevated decks be used as a substitute.

ELEVATE: Elevated Deck/Boardwalk
Elevated boardwalks and decks are an adaptation strategy used for structures and circulation in areas that are likely to experience inundation daily at high tide and areas that will be heavily impacted by 3 and 6-foot sea level rise.

In the 3-foot SLR scenario, boardwalks are used for part of the Loop located immediately north of the Welcome Plaza and Dock and the seabird habitat lagoon on the northernmost point of the moku. These circulation areas are situated in flood-adapted constructed wetlands and sensitive coastal strand habitat; utilizing boardwalks in these areas helps to maintain circulation in inundation events and provides universal access. The Seawater Intake System and Pump is adapted in place by being elevated on a deck and piles located above the 6-foot sea level rise scenario. A 12% slope ramp and floating dock provide ADA access to this area.

In the 6-foot SLR scenario, elevated decks and boardwalks are the primary adaptation strategy used for the Seawater System Labs and Marina. This area will experience significant inundation in this scenario but is essential to experiments conducted at HIMB. The labs that require access to the seawater system, gear and

dive storage, experimental mesocosms, and tanks will all be located in this space and elevated on a series of decks and boardwalks at a minimum elevation of one foot above the mean sea level. The Concept Design also suggests locating an elevated boardwalk along the constructed dunes and accreted beaches in this scenario. This will allow for ADA access to this area and the Iwi Kūpuna.

PROTECT: Basalt Riprap

Riprap is a type of shoreline revetment that consists primarily of large rock modules. Revetments are sloped, porous structures that are used to protect shorelines, structural pilings, and infrastructure from coastal erosion and scouring caused by wave energy, and storm surge (New York City Department of City Planning, 2017, p. 27). Riprap is a more resilient alternative to traditional vertical seawalls for several reasons. Porous revetments like riprap have been found to have less environmental impact on adjacent marine habitats than traditional seawalls (Griggs, 2005, p. 18). Unlike vertical concrete seawalls, porous riprap is able to attenuate wave energy rather than just reflect it (Sanitwong-Na-Ayutthaya et. al., 2023, p. 4). However, studies have shown that if located along beachfronts, riprap can sometimes exacerbate coastal erosion due to reflection and scouring (Rangel-Buitrago et. al.). Additionally, riprap can sometimes exacerbate erosion down-current (New York City Department of City Planning, 2017, p. 47). Given the location of Moku o Loʻe and the wave and current conditions of the moku, the design team felt that riprap would not cause significant erosion on adjacent sites. A more in-depth study on riprap's possible impacts on adjacent sites and the patch reef ecosystem is recommended.

In the 3-foot SLR scenario, the concept design proposes using basalt riprap as a protective measure parallel to significant infrastructure such as the

Welcome Plaza and Education Center, the Facilities and Boat Repair Shop, and the Seawater System Labs and Marina. Basalt is the suggested material for the riprap as it is a locally-sourced material and has close aesthetic ties to Hawaiʻi.

In the 6-foot SLR scenario, much of this riprap will be submerged except those areas built above the 6-foot sea level elevation, which include the Welcome Dock and Education Center, the Facilities and Boat Repair, the MMRP building and intertidal classroom, and the living breakwaters at the Seawater Intake System east of the Marina.

PROTECT + ADAPT: Living Shoreline + Breakwaters

Living shorelines and breakwaters are a type of coastal edge that use a combination of revetment and plant species to protect against storm surge, coastal erosion, and attenuate wave energy (New York City Department of City Planning, 2017, p. 46). Unlike purely hard shoreline strategies, living shorelines help to create flood-adapted habitat. They are an appropriate adaptation strategy where there is ample space to incorporate habitat and planting areas.

The 3-foot SLR concept design scenario proposes implementing living shorelines along the southern edge of Hale Hīnālea and the Coral Resilience and Maturation Labs. Living breakwaters are proposed at the Seawater Intake site and the spit east of the Marina. These two breakwaters protect the Seawater System Labs and infrastructure from the predominant northeast trade wind waves and create calm waters for watercraft (Sea Engineering Inc., 2022, p. 14). The design suggests that the breakwaters be built up to an elevation above that of the mean sea level in the 6-foot sea level rise scenario.

The living shorelines and breakwaters proposed in

the concept design will utilize basalt riprap as well as artificial reef propagation modules. These will create coral and fish habitats as sea levels rise and will be a unique opportunity to integrate HIMB research into the resiliency strategies.

PROTECT + ADAPT: Constructed Dunes
The constructed dunes proposed in the concept design are a type of living shoreline that integrate revetment, sand, and coastal strand vegetation. The dunes are constructed from repurposed fill and sand sourced from the spits, chipped material from downed trees, and they are reinforced with revetment materials recycled from the site such as the concrete bags and coral blocks. The riprap edges are located on the makai side of the constructed dunes, which will help to attenuate waves and protect against coastal erosion.

Constructed dunes are located on this side of the moku because it is where sand naturally aggregates. The hope is that over time the dunes will continue to grow and ultimately allow for beach accretion, even in the 6-foot sea level rise scenario.

ADAPT: Flood-Adapted Habitat
Flood-adapted habitats help to dissipate wave energy, slow flood waters, provide erosion control, and collect and filter stormwater before it enters the adjacent patch reef (New York City Department of City Planning, 2017, p. 76). While the flood-adapted habitat does not necessarily deter sea level rise, it adds to the overall social-ecological function, biodiversity, and resilience of Moku o Loʻe.

The concept design suggests several types of flood-adapted habitat depending on the location and shoreline conditions of the moku. The Constructed Marine Wetlands can help buffer against flood waters and also capture terrigenous sediment and runoff

generated by the steep slopes and Flexible Quad. Because these wetlands are constructed on top of repurposed fill, they will be most functional during the 3-foot SLR scenario and intertidal at the 6-foot SLR scenario.

Intertidal and coastal strand plant communities are proposed along the western and eastern edges of the moku as well as the northern lagoon and spit. The use of erosion control measures such as fascines created from recycled mangrove wood or revetments are recommended for areas with steep slopes and exposure to wave action. The measures will protect against wave energy, retain sediment, and maintain the integrity of the plant community (New York City Department of City Planning, 2017, p. 77).

By the 6-foot SLR scenario the majority of the initially planted flood-adapted communities will be submerged (primarily along the eastern edge of the moku). However, these areas should be managed and planted in such a way that they are allowed to migrate up slope, preserving biodiversity and habitat over time.

ADAPT: Float
Floating docks are used as another sea level rise adaptation strategy primarily for maintaining access to water and watercraft in both concept design scenarios. Two proposed floating docks are located at the Welcome Dock and Education Center; the northern dock is for watercraft such as the *Ka Noelo Kai*, the *Super Sucker*, and utility boats and access for educational groups and other visitors. To the west of the Welcome Dock is a system of floating docks containing experimental pens and the coral nursery. This space provides access to the depths of water these experiments require.

Another set of floating docks is located at the Seawater

System Labs and the Seawater Intake. The two located off the main walkway provide docking space for research and utility vessels. The third provides access to the Seawater Intake system and deck. Hinged gangways are located at all floating docks to ensure ADA access regardless of the tidal elevation and sea level rise scenario.

ADAPT: Flood
Flooding is the only in-situ sea level rise adaptation strategy proposed in the concept design. At the 6-foot SLR scenario, the concept design suggests flooding the ground floor of the Old Pauley Labs. The uses and utilities of this space are to be relocated to new flood-adapted buildings in the Seawater System Labs area if they require access to seawater and the Flexible Quad if they do not. Dive gear and storage are also relocated to a new building to the south of the Old Pauley Labs.

Plant Communities

The concept design proposes four different plant communities: Coastal Strand, Marine Wetland + Stormwater Filtration, Mesic Coastal Forest, and Biocultural Aesthetics + Event Lawns. The goal of these plant communities is to improve the resilience of Moku o Loʻe, restore habitat and biodiversity, enhance biocultural function, and promote opportunities for community stewardship. To realize these plant communities, the concept design proposes the removal and active management of all invasive species as well as those plants with low biocultural function. A more in-depth study to identify the significant specimens of trees, shrubs, and groundcovers to preserve is recommended.

Coastal Strand
The Coastal Strand plant community is located along the northern shoreline of Moku o Loʻe. This community contains endemic, Indigenous, and Polynesian-introduced vines, forbs, shrubs, and trees that are salt-tolerant, adapted to tidal and storm surge inundation. This zone will help to stabilize the shoreline, dissipate wave energy, and restore seabird habitat for species such as the ʻUaʻu kani (Wedge-Tailed Shearwater), particularly along the northernmost spit. The community will add significant biodiversity to the shoreline, which is currently a homogenous condition of primarily mangrove and ironwood species.

Marine Wetland + Stormwater Filtration
The Marine Wetland + Stormwater Filtration plant community is located in the southern portion of Moku o Loʻe along the shoreline and at the base of steep slopes. This community contains endemic, Indigenous, and Polynesian-introduced sedges, forbs, and shrubs that are salt-tolerant and adapted to tidal inundation and flood events. While this and the Coastal Strand communities do not deter sea level rise, they help to absorb wave energy, slow floodwaters during a storm surge, and provide habitat for fish and other intertidal species (New York City Department of City Planning, 2017, p. 44). Moreover, this community helps to catch, store, and filter stormwater runoff generated from the moku's impervious surfaces before it enters the adjacent patch reef. This is an important aspect of the Marine Wetland community because stormwater can contain sediments that might be detrimental to reef communities (New York City Department of City Planning, 2017, p. 44). This community will therefore contribute to the overall ecological health of both the moku and potentially its adjacent patch reef.

Mesic Coastal Forest
The Mesic Coastal Forest plant community is located at the mid to upper slopes of the moku. It contains endemic, Indigenous, and Polynesian-introduced ferns, forbs, and shrubs that are salt tolerant and adapted to steep slopes and basaltic soils. This community

will help to improve the overall ecological health and function of the moku and restore habitat that has been dominated by introduced species like koa haole, banyan, and ironwood. The roots of this understory layer combined with the canopy found in this zone will help prevent erosion, which is currently an issue in this area (New York City Department of City Planning, 2017, p. 46). The branches and foliage of the shrubs and canopy act as a windbreak, buffer against severe wave energy, and screen views to essential infrastructure on the moku (New York City Department of City Planning, 2017, p. 46).

Biocultural Aesthetics + Event Lawns
The Biocultural Aesthetics + Event Lawns plant community is located primarily along major circulation routes in the Flexible Quad, Culture and Place-Based Education Core, and the Puʻu. This community consists of Indigenous, Polynesian-introduced, naturalized, and introduced ornamental plant species that have multiple biocultural functions and cultural aesthetic significance in Hawaiʻi. Some of these biocultural functions include food, healing, cordage, lei, hula, and many others. It can be identified by its high concentration of food and flowering plants, particularly along the Foraging Loop, which includes a food forest. While all of the plant communities contain plant species that have biocultural functions and require some level of community stewardship, the Biocultural Aesthetics + Event Lawn zone requires the most level of care, which is why it is located close to access areas. This zone is located in high-use and programmed areas so it contains event lawns to create space for community gathering and recreation, cultural practices, and ceremonies such as commencement.

Canopy
The concept design recommends 8 different types of proposed canopy: Loulu, Niu, Coastal Strand, Outdoor Classroom Shade Trees, Specimen Shade Trees (e.g., Kamani or mango), Food Forest, Biocultural Aesthetics, and Coastal Forest. The Design also identifies, at a conceptual level, existing niu, edible trees, and specimen canopy that should remain. It is suggested that significant existing specimens and edible canopy as well as those with high biocultural and ecological functions be identified and remain in place. All invasive and introduced species without biocultural function should be removed, recycled for use as mulch and other materials, and replaced with ecologically and biologically resilient species.

Loulu
Loulu *(Pritchardia hilebrandii)* are located primarily in the Coastal Strand and Mesic Coastal Forest plant communities as well as along primary access routes from the Welcome Dock to the Seawater System Labs. As Hawaiʻi's only endemic palm, the loulu are integral to reinforcing the identity of Moku o Loʻe, which is why they can be found in a cluster at the Welcome Dock and along the Marina of the Seawater System Labs. Loulu is also recommended to replace niu in high circulation areas for safety purposes.

Niu
Niu (*Cocos nucifera*) are a significant element of the historical and cultural landscape at Moku o Loʻe. For this reason, it is suggested that as many existing niu remain as possible. For every niu that requires removal due to cut and fill earthwork, new construction, or safety concerns, it is recommended that a descendant niu be re-planted on moku in a more suitable location, such that the total niu population on the moku remains at approximately 400. The concept design proposes locating niu along the shoreline in the Coastal Strand plant community and away from major circulation routes, with the exception of those proposed in the Foraging Loop. Niu that are planted

for biocultural purposes such as food should be dwarf varieties that are maintained at a lower height and located along circulation routes in the Foraging Loop for ease of access to the fruit. A large Niu Memorial Grove is proposed to the west of the Lānai Suites as a commemorative space to the moku's historical shoreline and to the stand that was planted by Princess Bernice Pauahi Bishop.

Coastal Strand
Coastal Strand canopy such as milo (*Thespesia populnea*), ʻaʻaliʻi (*Dodonea viscosa*), hala (*Pandanus tectorius*), and ʻIliahialoʻe (*Santalum ellipticum*) are salt tolerant, adapted to coastal conditions (and intertidal, in the case of milo), and can act as a buffer against wave action during a storm surge and wind. Additionally, their network of roots help to prevent erosion along the shoreline. The concept design suggests locating the Coastal Strand canopy at the lowest elevations of the moku, the living shorelines, and in the Marine Wetland zones. In the 6 feet SLR scenario, it is suggested that many of these species be replanted at higher elevations as the majority planted in the 3-foot SLR scenario will be submerged.

Loop Shade Trees
The concept design proposes clusters of Loop Shade Trees in the outdoor classrooms and seating areas found along the moku's main circulation routes. This canopy is meant to provide shaded spaces that will support comfortable conditions for learning outdoors and social gatherings. Kukui (*Aleurites moluccanus*) and kou (*Cordia subcordata*) would be potentially suitable Loop Shade Trees.

Specimen Shade Trees
The concept design suggests locating Specimen Shade Trees in the event lawns. These trees are meant to provide ample shade for social gatherings, recreation, events, and cultural practices. Kamani (*Calophyllum inophyllum*), Kukui (*Aleurites moluccanus*), and gourmet mango (*Mangifera indica*) would be potentially suitable Specimen Shade Trees.

Food Forest
The Food Forest is an important part of providing opportunities for community stewardship and food production on Moku o Loʻe. The concept design proposes locating food-producing shrubs and trees along the Foraging Loop - a walk along which food can be gathered. This route connects the Culture and Place-Based Education Core, the Puʻu, and the Flexible Quad and takes advantage of the many existing food-producing trees that exist on the moku. Maintaining as many of these existing edible plants as possible is a priority of the concept design (Appendix D).

Biocultural Aesthetics
The Biocultural Aesthetics shrubs and canopy consist of primarily ornamental species that have biocultural functions such as floral adornments (e.g., lei) and arrangements, or edible landscaping; they also reinforce the visual identity of the cultural landscape. The concept design proposes locating the majority of the Biocultural Aesthetics plant species along primary circulation routes such as the Foraging Loop and the main walk to the Flexible Quad from the Welcome Dock. Examples of biocultural aesthetic plant species include ornamental gingers, nāʻū (native gardenia), pua kenikeni (*Fagraea berteriana*), crown flower (*Calotropis gigantea*), and plumeria cultivars such as the ‘Pauahi Aliʻi’, which is named to honor the 150th anniversary of Princess Bernice Pauahi Bishop’s birth date (Criley, 2005, p. 18). Like the Food Forest, the Biocultural Aesthetics canopy and shrubs create opportunities for community stewardship and cultural practices.

Mesic Coastal Forest
The Mesic Coastal Forest canopy species are proposed at the upper elevations of the moku. The role of this category is to restore habitat, prevent erosion and sediment runoff, and to help buffer against wind. Tree species located here could include loulu (*Pritchardia hilebrandii*), wiliwili (*Erythrina sandwicensis*), ʻaʻaliʻi (*Dodonaea viscosa*), among others. The Mesic Coastal Forest encompasses the Puʻu - the highest point on Moku o Loʻe and an important site for cultural practices, such as navigation, and community gathering. Therefore, the Coastal Mesic Forest canopy should be planted at an elevation that does not obstruct views out to important stars and culturally significant sites in the greater Koʻolaupoko region. Lower shrub species such as pōhinahina (*Vitex rotundifolia*), naupaka (*Scaevola sericea*), lower ʻiliahialoʻe (*Santalum elliipticum*), and other understory species should be planted immediately surrounding the Puʻu.

Pedestrian Access
The main goals of the proposed circulation system are to create a welcoming, cohesive, and safe experience of Moku o Loʻe. To achieve this, the concept design proposes that all main circulation routes be made ADA-accessible. This requires re-grading the slopes to meet ADA code requirements, particularly in what are currently the drives up to the Lānai Suites and the Flexible Quad, and the installation of ADA-accessible paving materials such as permeable pavers, asphalt, or concrete. Permeable pavers and asphalt are recommended for mitigating stormwater runoff.

The main circulation route around the moku is called The Loop. The Loop creates a cohesive experience of Moku o Loʻe and provides expanded access to the water, labs and classrooms, research infrastructure, culturally-significant sites, and views out to the Bay. The materiality of the Loop could be a durable material

such as stabilized crushed basalt fines or an exposed aggregate asphalt. Both materials would reduce stormwater runoff to the reef and are universally-accessible. Activity Nodes are found throughout the Loop. The Nodes facilitate wayfinding and contain signage that articulate significant historical, cultural, research, and educational sites on the moku, in Kāneʻohe Bay, and beyond; outdoor classrooms for HIMB community members and visitors on educational tours; and seating and tables for social gatherings. It is recommended that the Activity Nodes consist of identifiable permeable pavers, which will help to reduce stormwater runoff and differentiate them from the other access elements on Moku o Loʻe.

New accessible circulation is proposed down to the Lagoon Pavilion and spit, which will provide universal access to unique educational opportunities and social spaces. Another new route includes the ramp that leads down from the Flexible Quad to the Seawater System Labs, which will help reinforce the ties between the two spaces.

A new kayak and canoe launch as well as a larger loading dock for the Honu Kai and other offloaders are located at the Gateway Dock, reinforcing its role as the main watercraft entry to the moku. Other proposed access points to the water include the Wetland Classroom, the Intertidal Classrooms at the MMRP and the Seawater System Intake, and the Lagoon Pavilion Classroom.

It is not recommended that the path going up to the Puʻu from the Culture and Place-Based Education Core and the Flexible Quad be made ADA-accessible because this would require significant re-grading and disturbance to this site. Given its cultural significance, such disturbance to the landform is not recommended. A golf cart route is suggested as an alternative from

the Place-Based Education Core, which could be articulated by mowing or mulch.

Boardwalks are recommended around sensitive habitat areas such as the seabird habitat and areas prone to inundation and flooding such as the Marine Wetland and the Seawater Intake facility. In the 6-foot SLR scenario, the circulation along the Seawater System Labs is converted to an elevated boardwalk and deck system. These boardwalks are all elevated above a minimum of 1 foot above the waterline during this scenario.

Vehicular Access

The vehicular access on Moku o Loʻe should support the necessary maintenance activities on-moku, while also not detracting from the overall pedestrian experience. The concept design proposes three main vehicular routes, which remain largely the same for both the 3-foot and 6-foot SLR scenarios. The routes provide access to the Culture and Place-Based Education Core, the Flexible Quad, and the entire length of the Seawater System Labs. 2-3 parking spots are proposed at the terminus of each route. Additional parking is proposed at the facilities and boat repair building. All vehicular access runs through the Welcome Dock and Education Center, which contains two proposed boat launches for watercraft such as the *Honu Kai*. A limited vehicular access route is proposed at the Ornamental Garden and Foraging Loop and along the constructed dunes on the northeastern edge of the islet. Vehicle access in these locations, however, should be limited to emergencies and smaller vehicles such as golf carts. A golf cart-only path is proposed for access to the Puʻu where ADA access was not possible without disturbing much of the site. All routes are shared with pedestrians and other modes of transportation such as bicycles and golf carts.

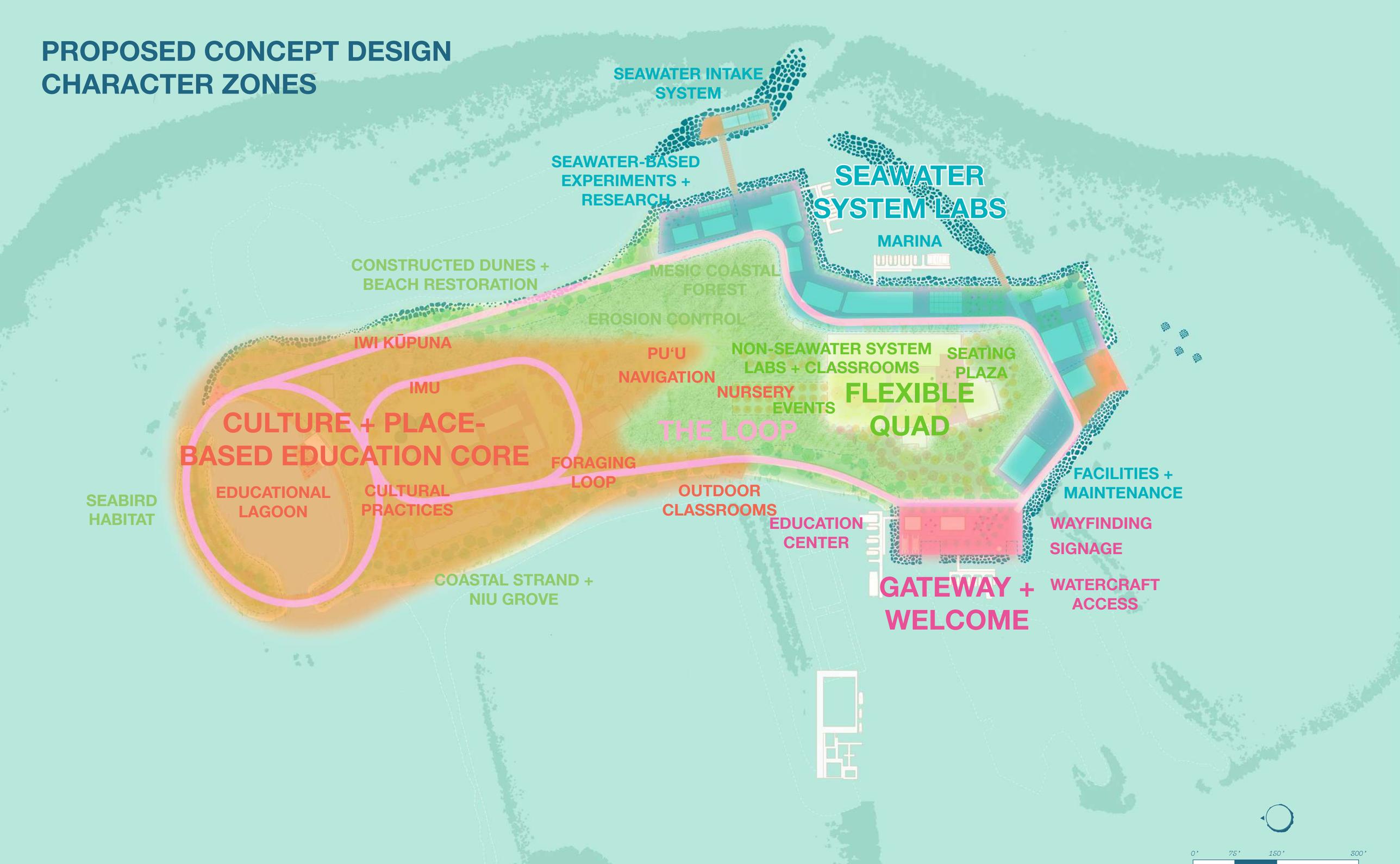
Amenities + Programs

The concept design proposes amenities and programs that aim to expand the educational and research activities at HIMB. Amenities are concentrated in Activity Nodes, which build upon existing programs and infrastructure found on Moku o Loʻe today. Each Activity Node contains a cluster of mixed educational and research amenities, spaces for social activities, and signage for clear wayfinding. Each Node is unified and made accessible by the Loop.

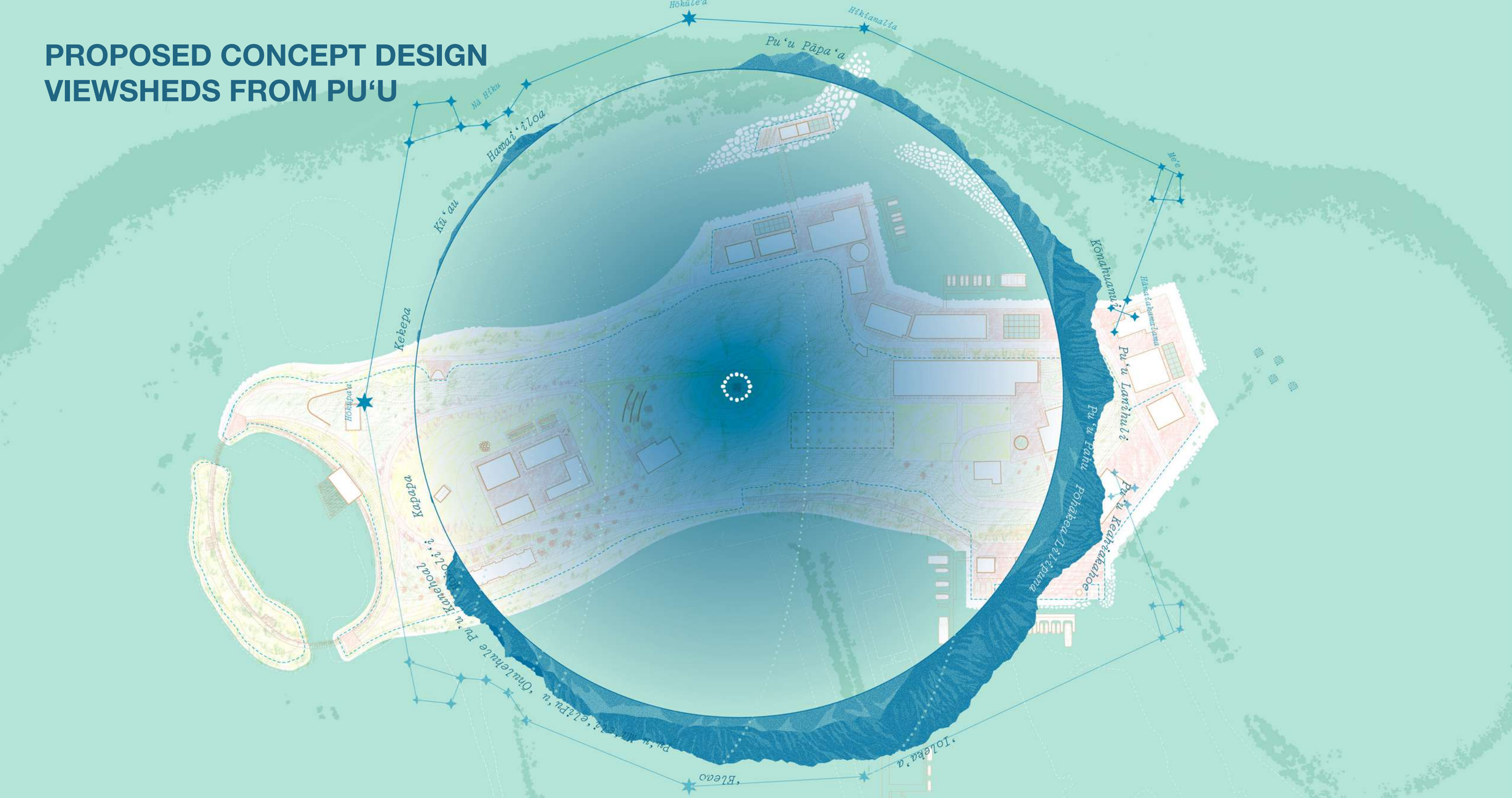
Proposed amenities include place-based education classrooms and offices, outdoor classrooms, and event spaces; spaces for cultural practices; cultural sites such as the Iwi Kūpuna and Puʻu; dorms; labs and classrooms; research support infrastructure such as experimental tanks; facilities and watercraft support hubs; and two boat launches for both small watercraft such as kayaks and larger watercraft. New laboratories that require access to the seawater system are concentrated in the Seawater System Labs zone along the south and southeastern edges of the moku. Added programs such as spaces for cultural practices and practitioners are meant to not only expand the educational and research opportunities at HIMB, per its 2023 Strategic Plan, but also help to strengthen the sense of place at Moku o Loʻe.

Where possible, all proposed structures should incorporate sustainable building technologies and passive systems such as water catchment and recycling, passive cooling, and solar power production. All structures in areas that will be impacted by sea level rise incorporate sea level rise adaptation strategies to ensure the perpetuation of the research and educational activities at HIMB in the future. A more in-depth study of the relocation of utilities is recommended.

PROPOSED CONCEPT DESIGN CHARACTER ZONES



PROPOSED CONCEPT DESIGN VIEWSHEDS FROM PU‘U



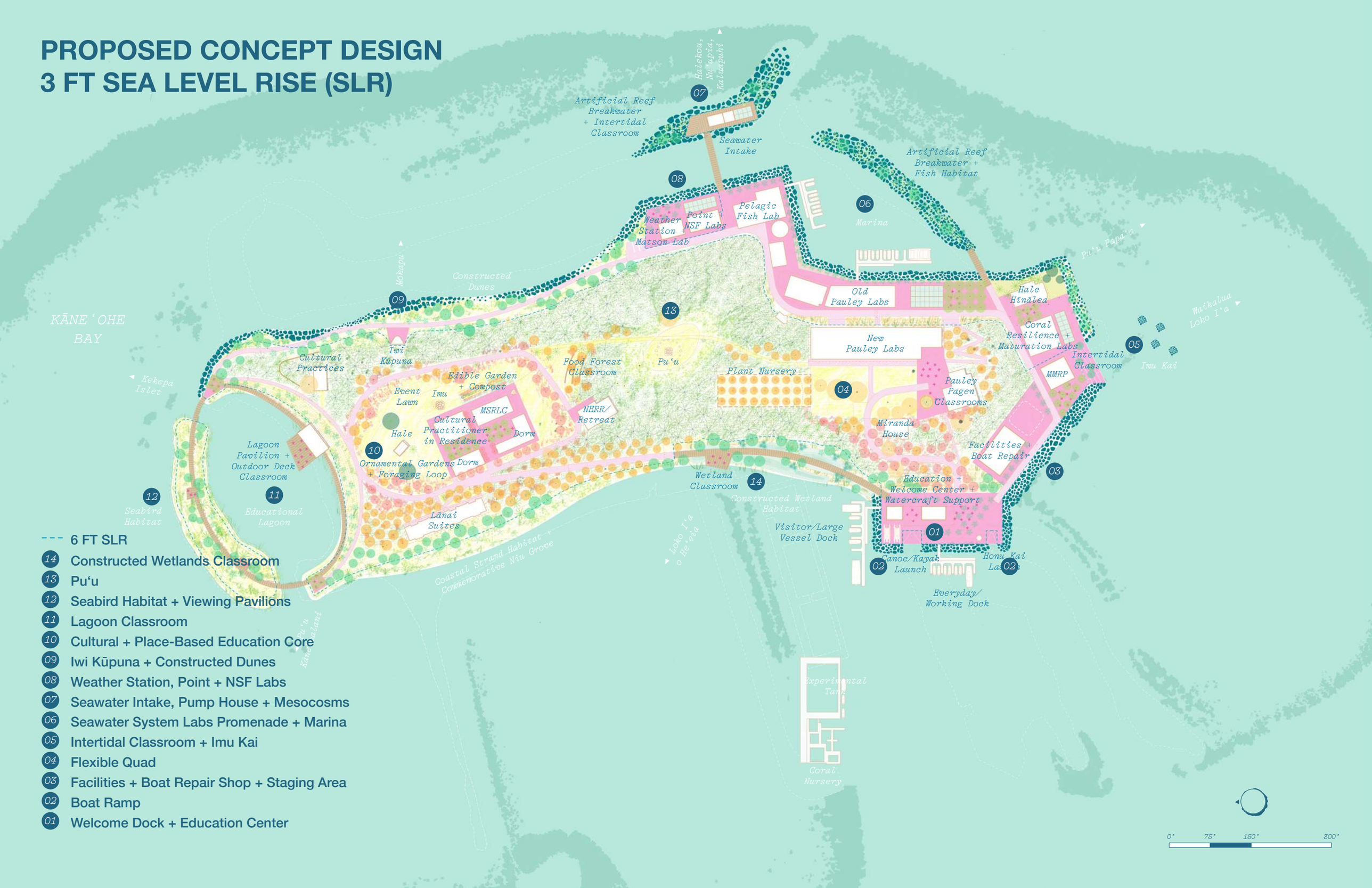
Star Compass

Star Location During Winter Solstice

Star Location During Summer Solstice

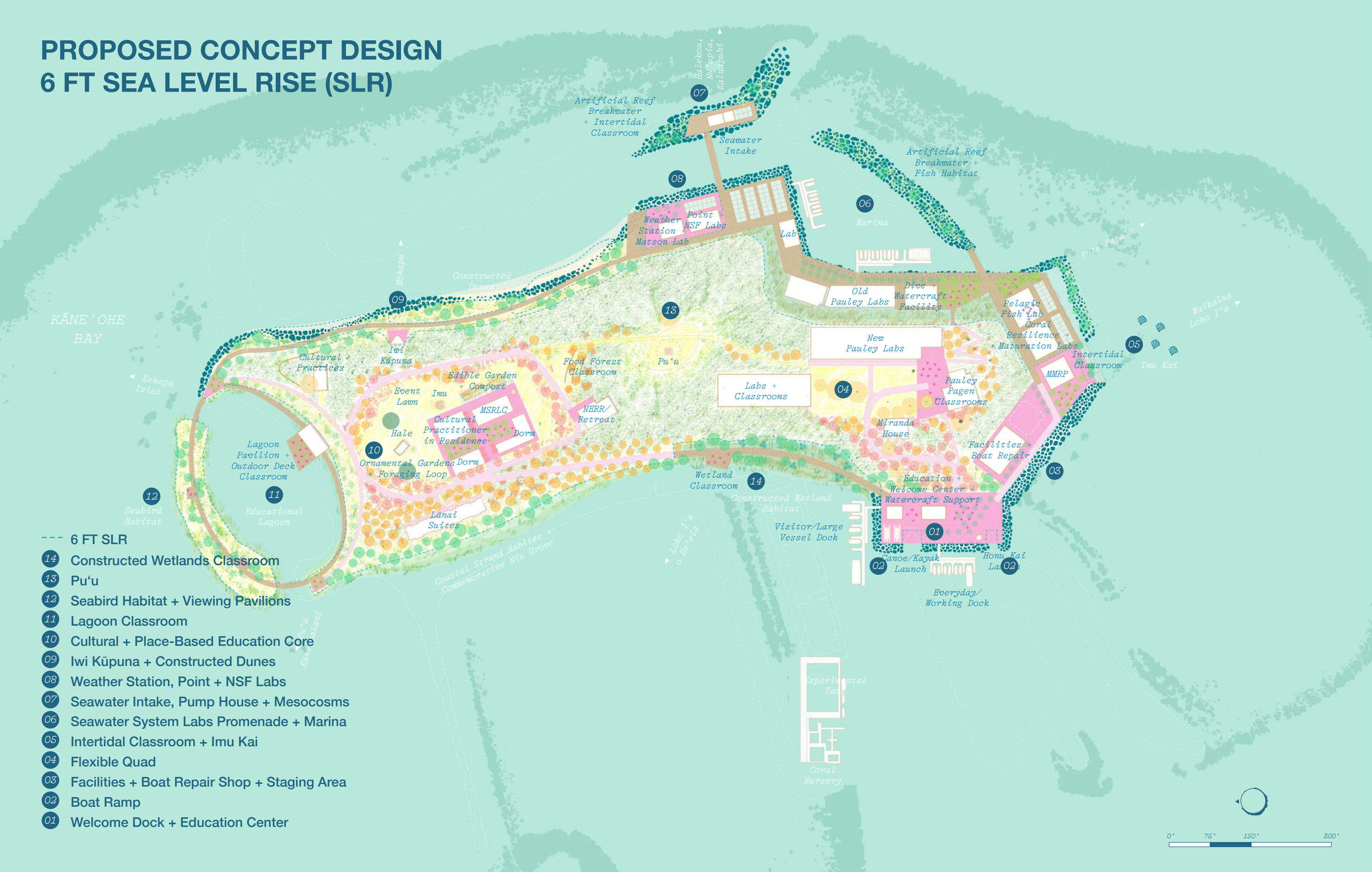
0’ 75’ 150’ 300’

PROPOSED CONCEPT DESIGN
3 FT SEA LEVEL RISE (SLR)



- 6 FT SLR
- 14 Constructed Wetlands Classroom
- 13 Pu'u
- 12 Seabird Habitat + Viewing Pavilions
- 11 Lagoon Classroom
- 10 Cultural + Place-Based Education Core
- 09 Iwi Kūpuna + Constructed Dunes
- 08 Weather Station, Point + NSF Labs
- 07 Seawater Intake, Pump House + Mesocosms
- 06 Seawater System Labs Promenade + Marina
- 05 Intertidal Classroom + Imu Kai
- 04 Flexible Quad
- 03 Facilities + Boat Repair Shop + Staging Area
- 02 Boat Ramp
- 01 Welcome Dock + Education Center

PROPOSED CONCEPT DESIGN
6 FT SEA LEVEL RISE (SLR)



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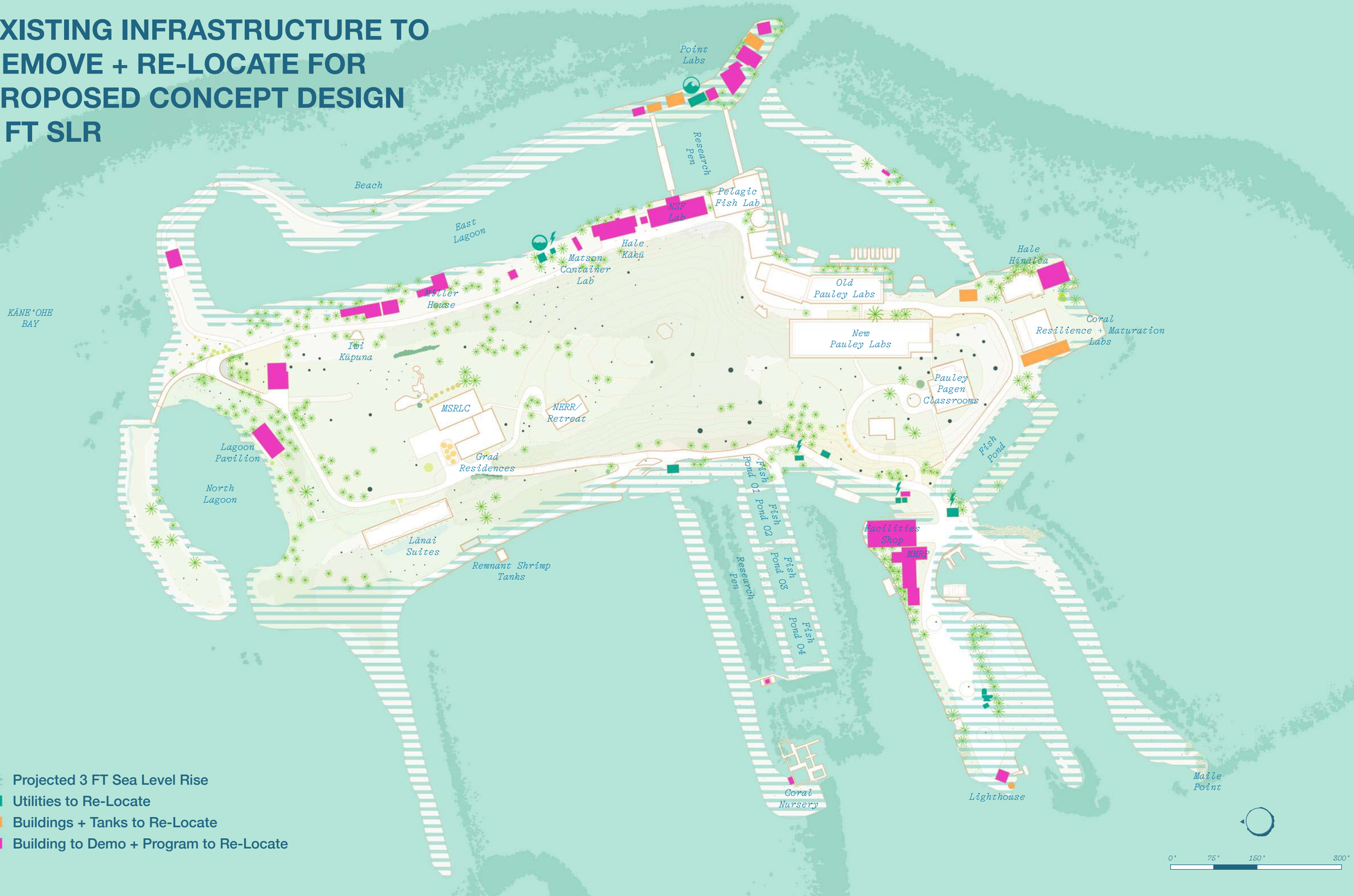
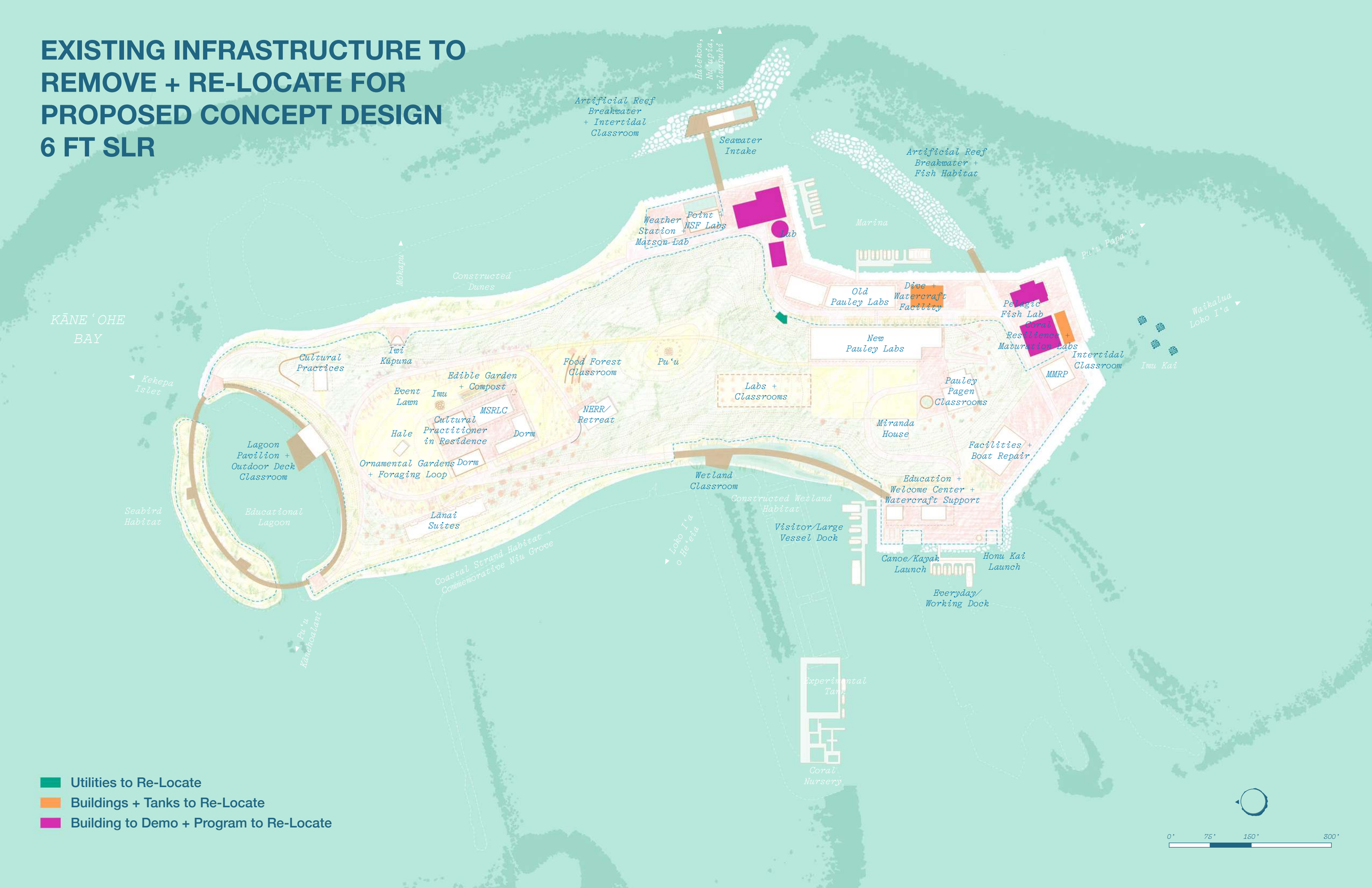
- 03 Facilities + Boat Repair Shop + Staging Area
- 02 Boat Ramp
- 01 Welcome Dock + Education Center

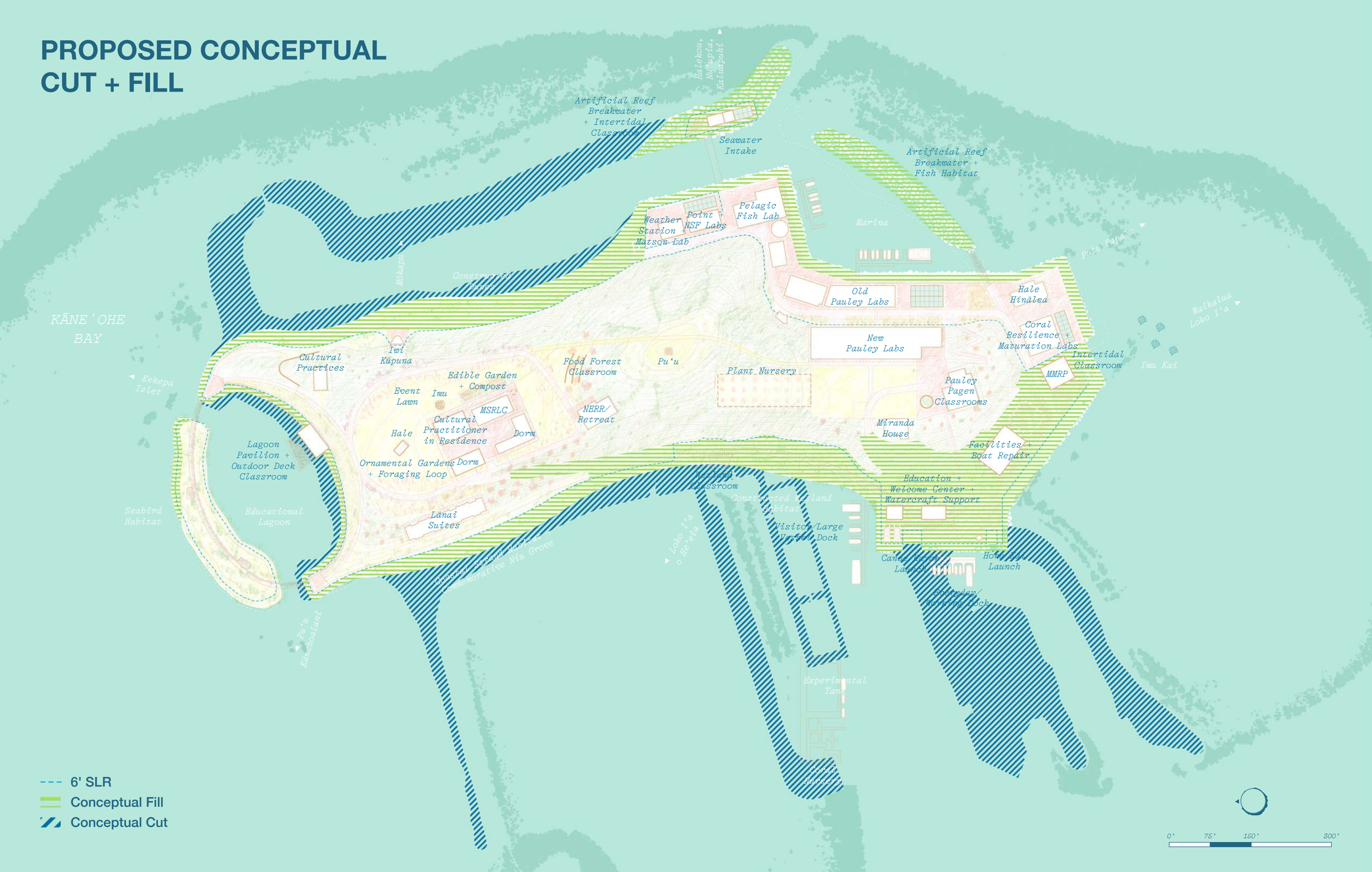
EXISTING INFRASTRUCTURE TO REMOVE + RE-LOCATE FOR PROPOSED CONCEPT DESIGN 3 FT SLR



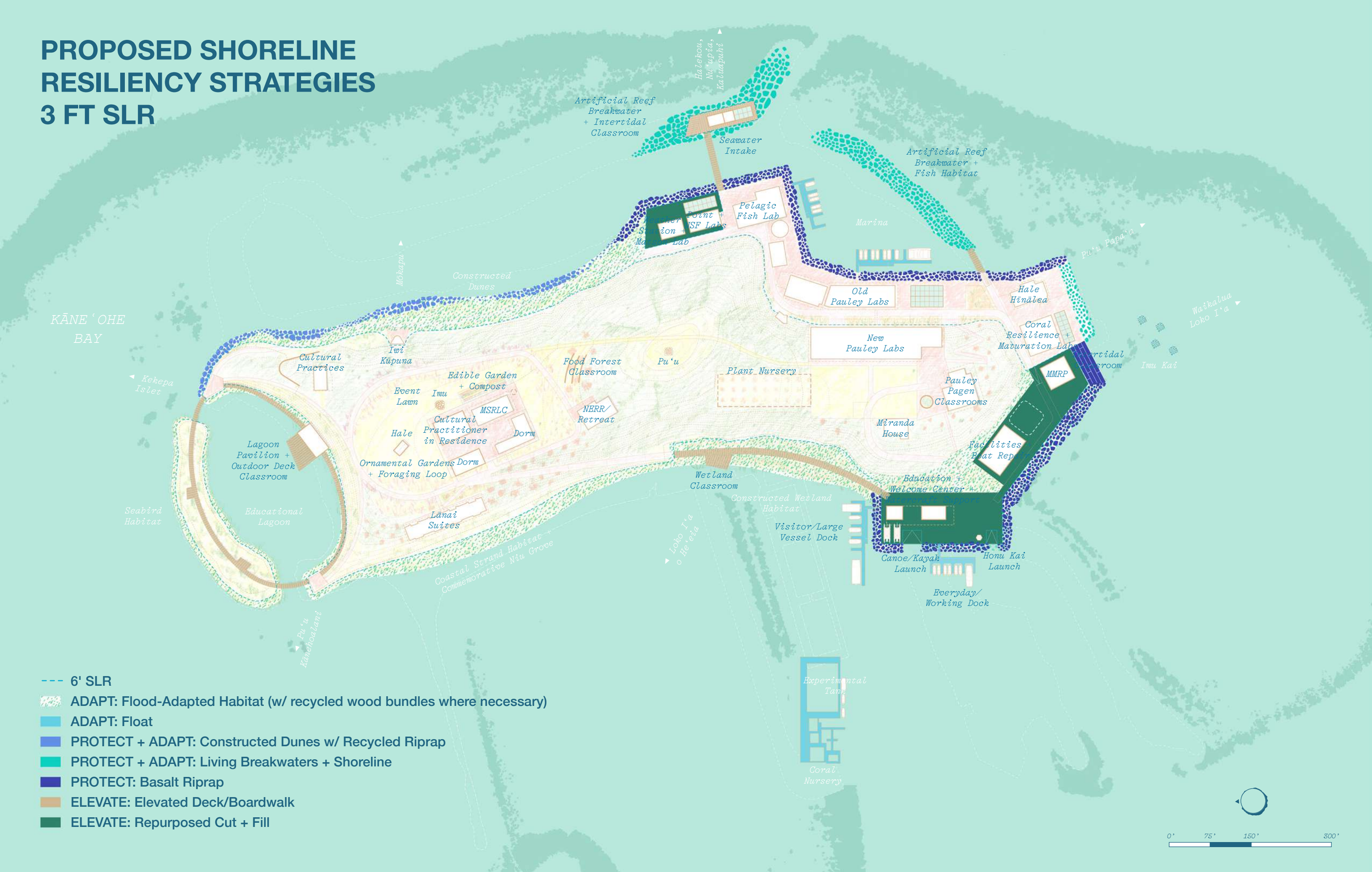
EXISTING INFRASTRUCTURE TO REMOVE + RE-LOCATE FOR PROPOSED CONCEPT DESIGN 6 FT SLR



PROPOSED CONCEPTUAL CUT + FILL

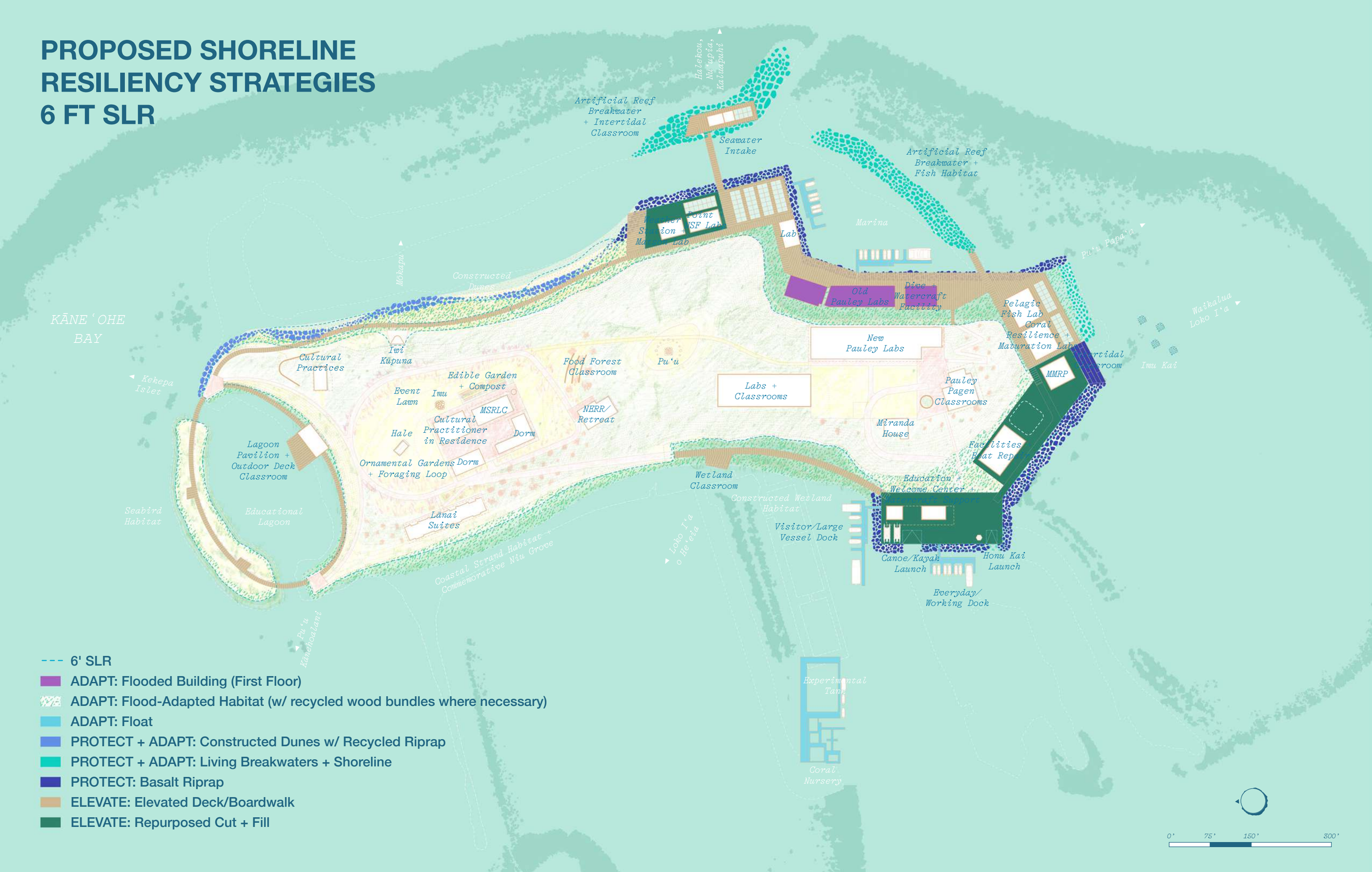


PROPOSED SHORELINE RESILIENCY STRATEGIES
3 FT SLR



- 6' SLR
- ADAPT: Flood-Adapted Habitat (w/ recycled wood bundles where necessary)
- ADAPT: Float
- PROTECT + ADAPT: Constructed Dunes w/ Recycled Riprap
- PROTECT + ADAPT: Living Breakwaters + Shoreline
- PROTECT: Basalt Riprap
- ELEVATE: Elevated Deck/Boardwalk
- ELEVATE: Repurposed Cut + Fill

PROPOSED SHORELINE RESILIENCY STRATEGIES
6 FT SLR



REPURPOSED CUT + FILL

a. GTL Landschaftsarchitektur. Conversion of Airfield Bonames. Frankfurt am Main-Bonames, Germany. https://gtl-landschaftsarchitektur.de/en/projekt/conversion-airfield-bonames-frankfurt-am-main-bonames-2/

ELEVATE: Elevated Deck/Boardwalk

b. Luuk Kramer. Architectenbureau Marlies Rohmer. Ijburg Elevated Piers. Amsterdam, Netherlands. https://www.archdaily.com/120238/floating-houses-in-ijburg-architectenbureau-marlies-rohmer

PROTECT: Basalt Riprap

c. MVVA. Brooklyn Bridge Park Kayak Launch. New York, New York. https://www.mvvainc.com/projects/brooklyn-bridge-park

PROTECT + ADAPT: Living Shoreline + Breakwaters

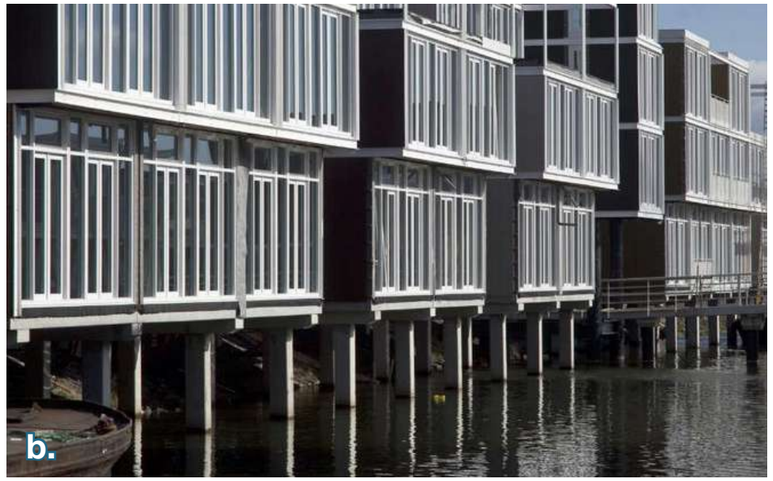
d. PWP, Barangaroo Reserve. Sydney, Australia. https://www.asla.org/2019awards/641545-Barangaroo_Reserve.html

ADAPT: Flood-Adapted Habitat

e. Phoebe White (2023). Ka‘ena Point Coastal Strand. O‘ahu, Hawai‘i.

ADAPT: Float

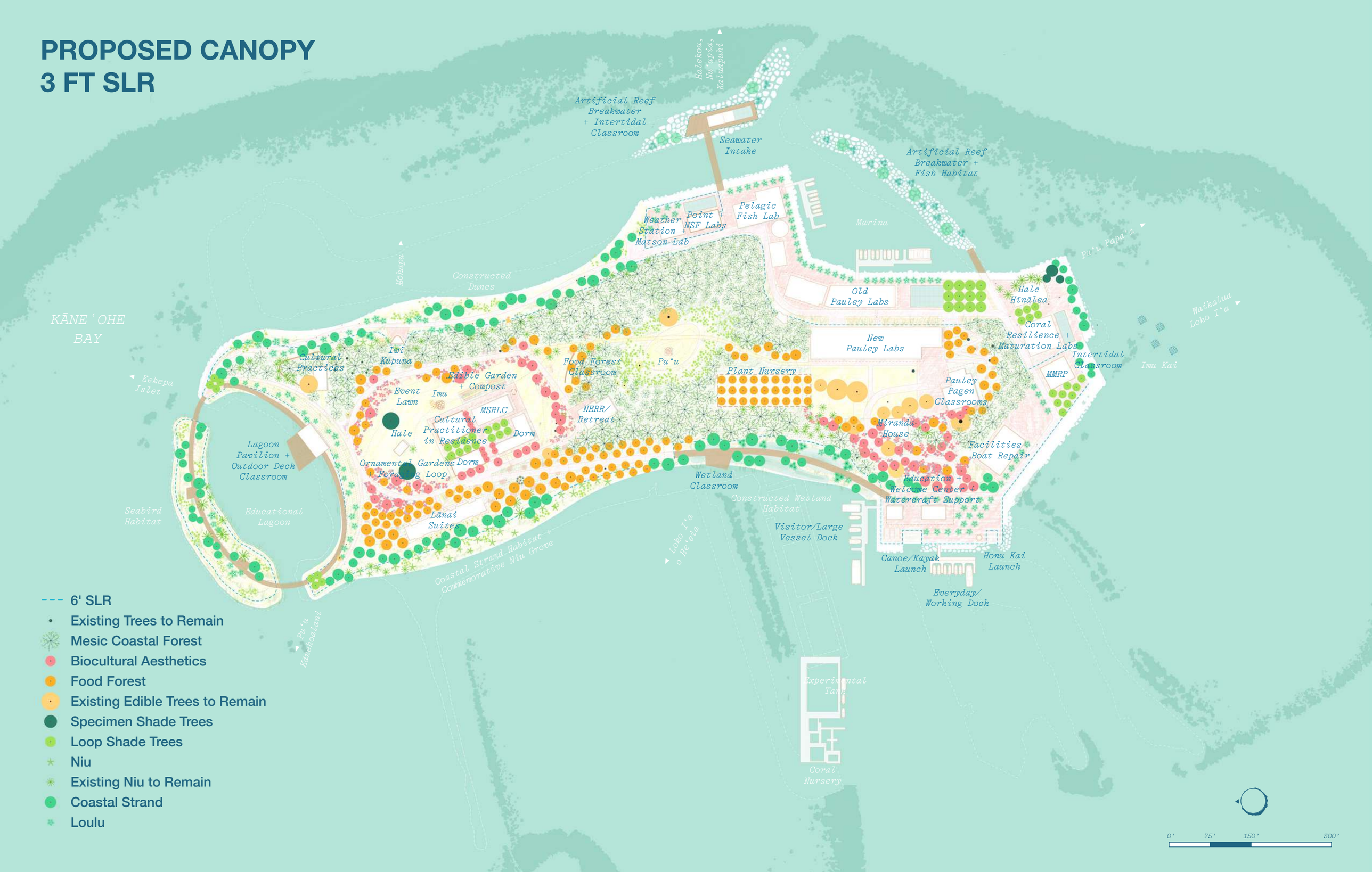
f. Dock Doctors. Floating Dock with Integrated Wave Attenuator. Port Henry, New York. https://thedockdoctors.com/commercial-marina-docks



PROPOSED PLANT COMMUNITIES
3 FT SLR

PROPOSED PLANT COMMUNITIES
6 FT SLR

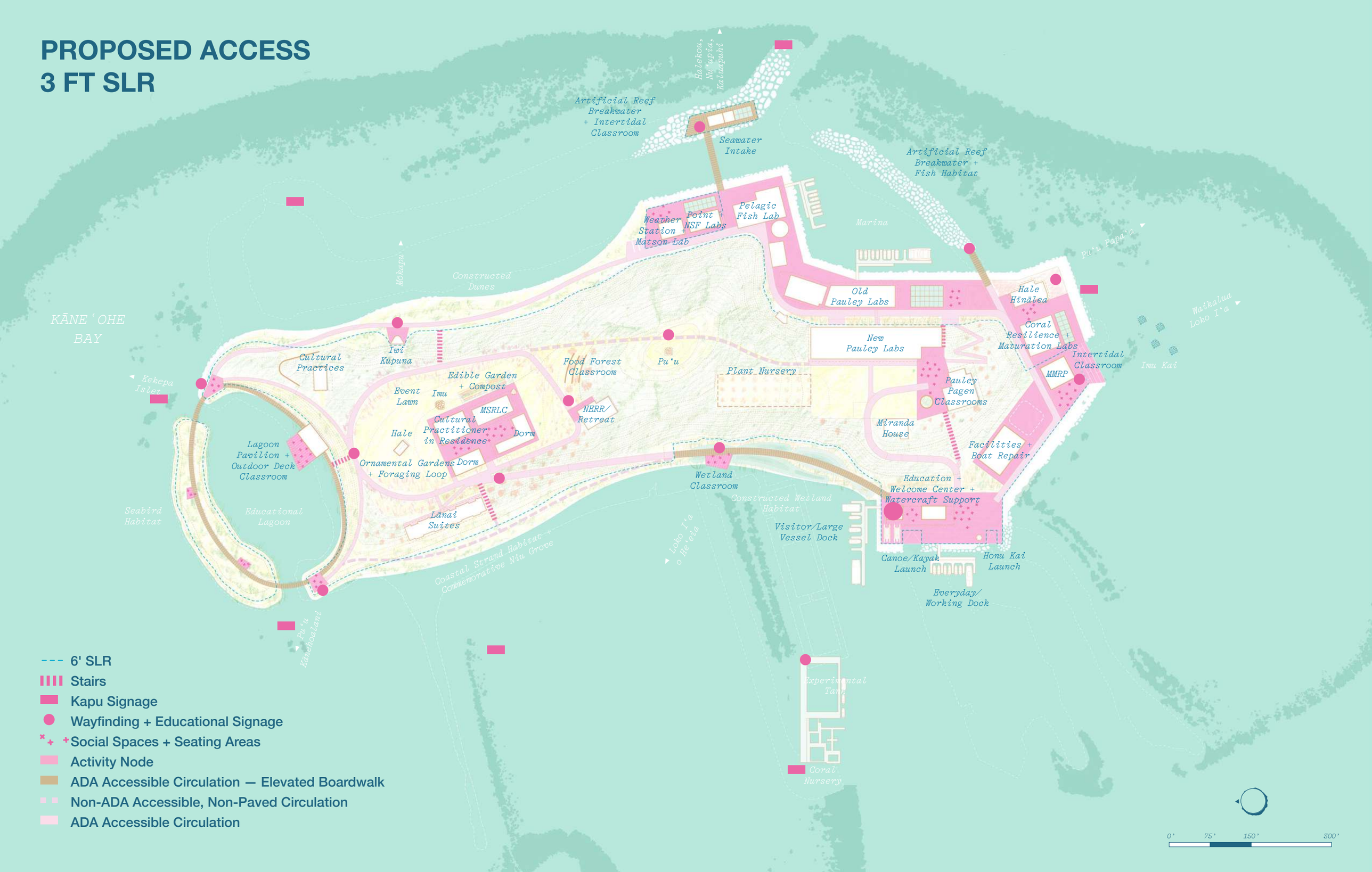
PROPOSED CANOPY
3 FT SLR



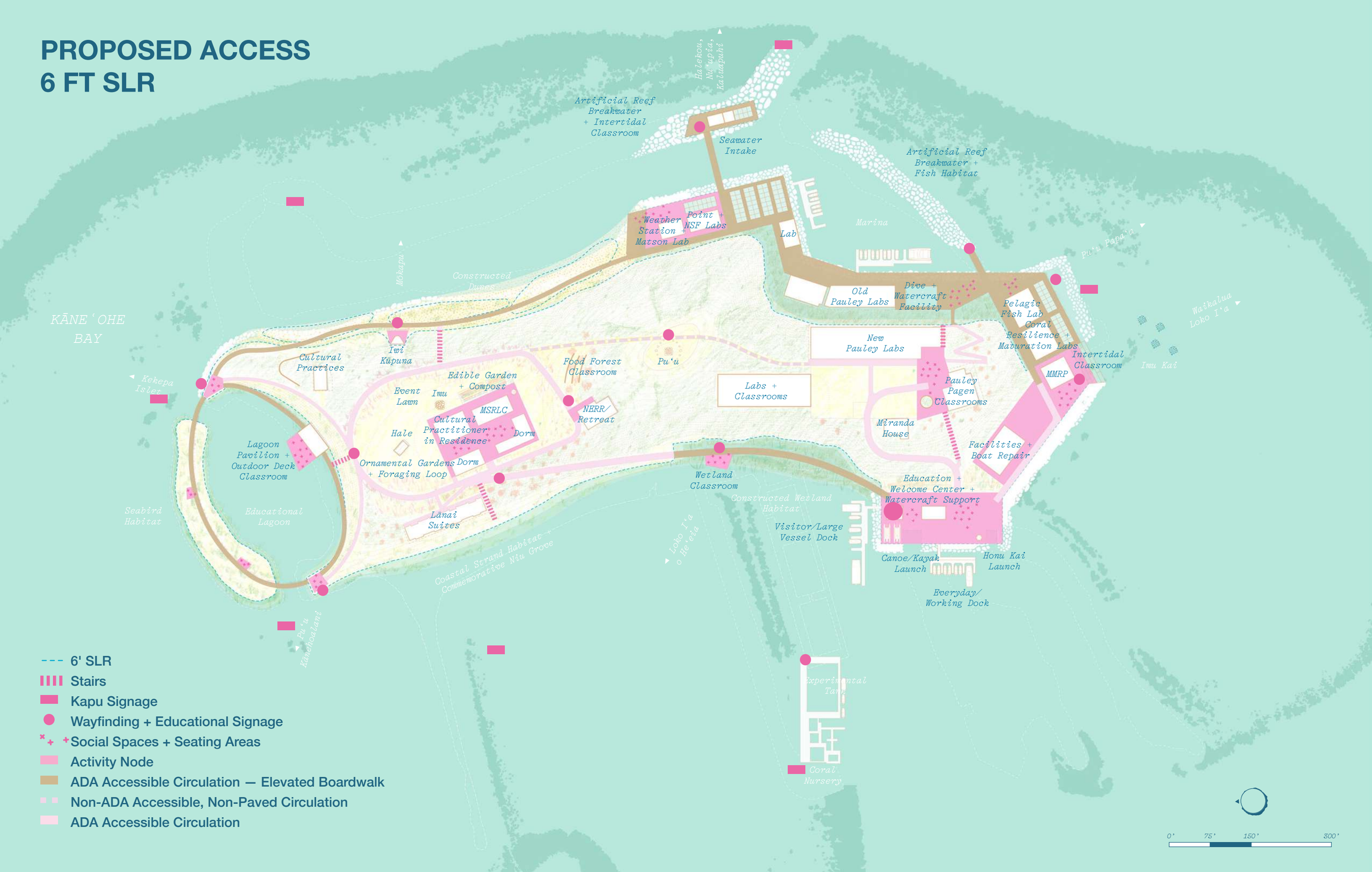
PROPOSED CANOPY
6 FT SLR

- 6' SLR
- Existing Trees to Remain
- Mesic Coastal Forest
- Biocultural Aesthetics
- Food Forest
- Existing Edible Trees to Remain
- Specimen Shade Trees
- Loop Shade Trees
- Niu
- Existing Niu to Remain
- Coastal Strand
- Loulu

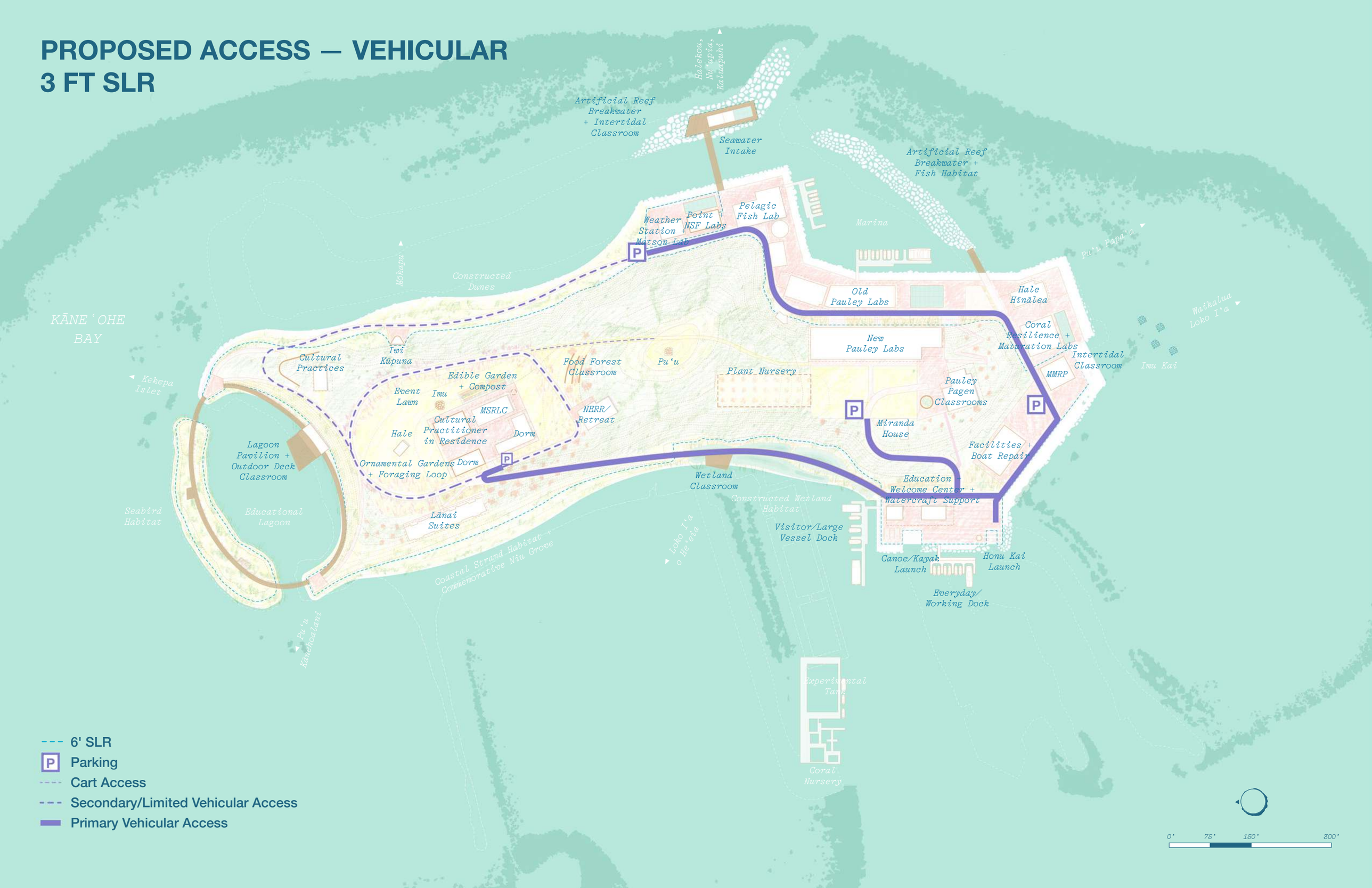
PROPOSED ACCESS
3 FT SLR



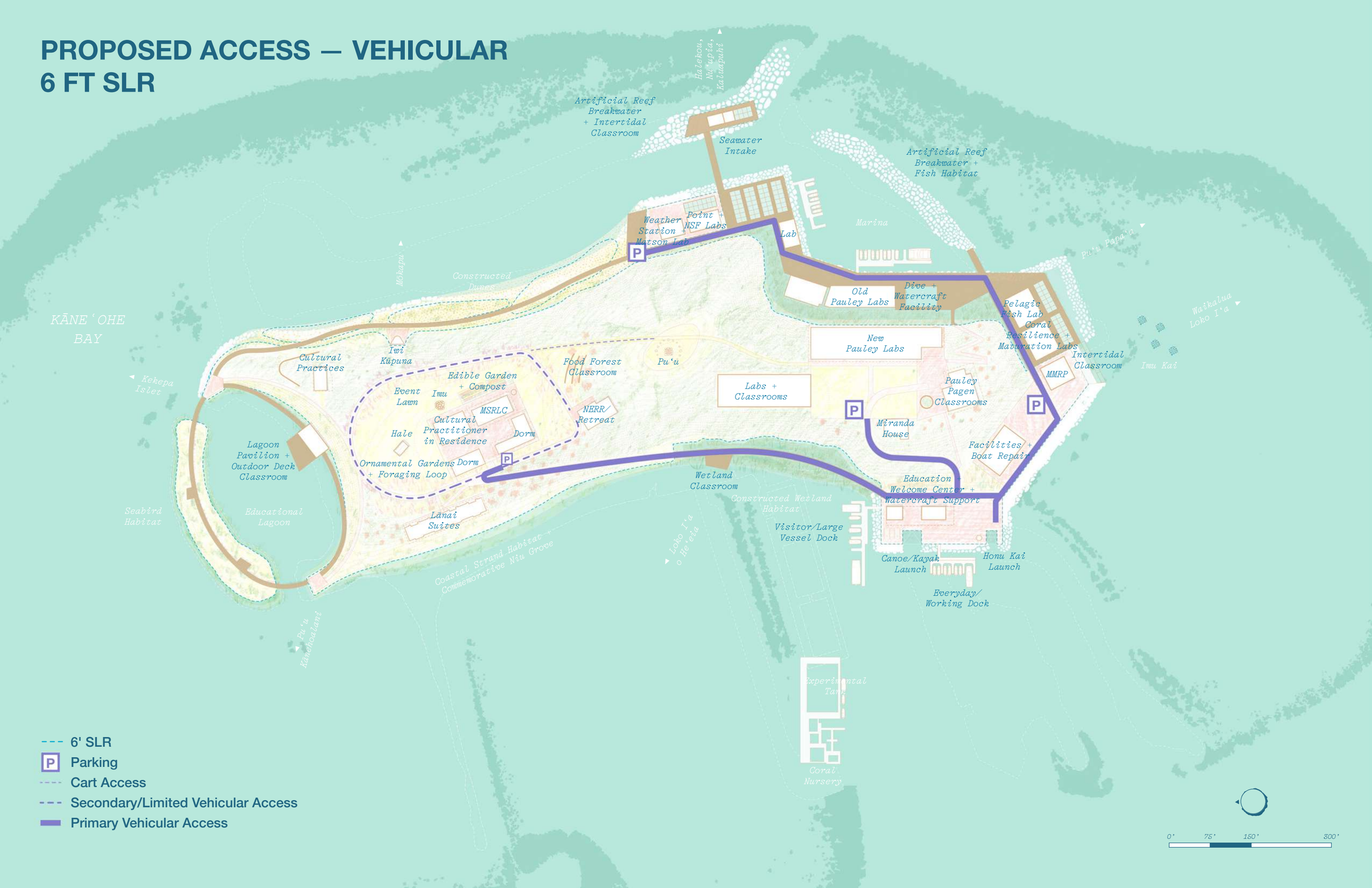
PROPOSED ACCESS
6 FT SLR



PROPOSED ACCESS — VEHICULAR
3 FT SLR



PROPOSED ACCESS — VEHICULAR
6 FT SLR



ADA-ACCESSIBLE PAVING AT LOOP

a. Ki Concepts. Stabilized + Recycled Crushed Basalt Fines at Nanakuli Boys and Girls Club. O‘ahu, Hawai‘i. https://www.kiconcepts.com/work/nanakuli-youth-education-town?itemId=3y1mt1oelm1ul7sn3ov3f5rc2a1ny1

WAYFINDING + SIGNAGE

b. MKSK. Summit Park Interpretive Signgage. Blue Ash, Ohio. https://mkskstudios.com/projects/summit-park-interpretive-signage

ACTIVITY NODE PAVING + SEATING

c. Graeme Massie. Bonn Square Plaza. Oxford, UK. https://landezine.com/bonn-square/

d. Ben Wrigley. TCL. Northern Plaza, Monash University Clayton. Melbourne, Australia. https://landezine.com/a-social-setting-northern-plaza-monash-university-clayton-by-t-c-l/

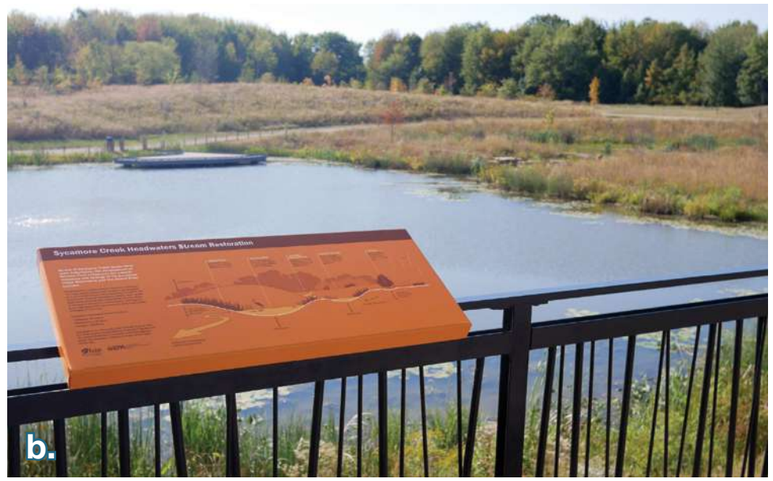
OUTDOOR CLASSROOMS

e. Landlab. Laasby Sea Park. Lasby, Denmark. https://landezine.com/laasby-sea-park-by-labland/

OVERLOOKS

f. Johnny Davis. ASPECT Studios. Westhaven Promenade. Auckland, New Zealand. https://landezine.com/westhaven-promenade-by-landlab-and-aspect-studios/

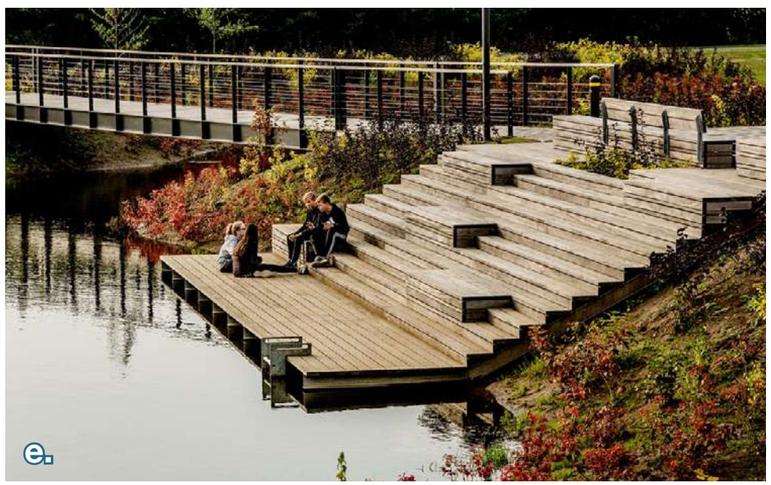

a.



b.

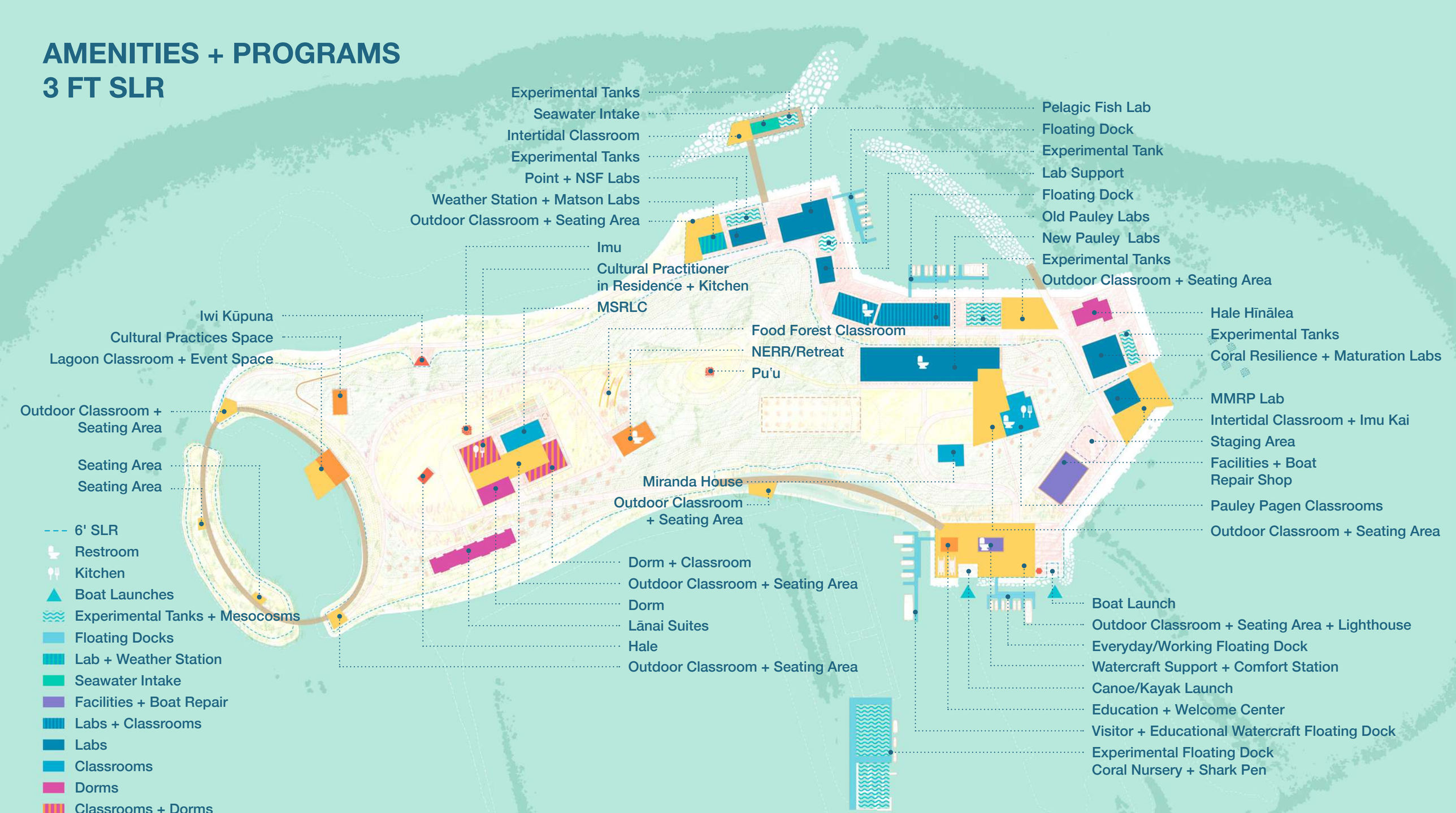

c.


d.


e.


f.

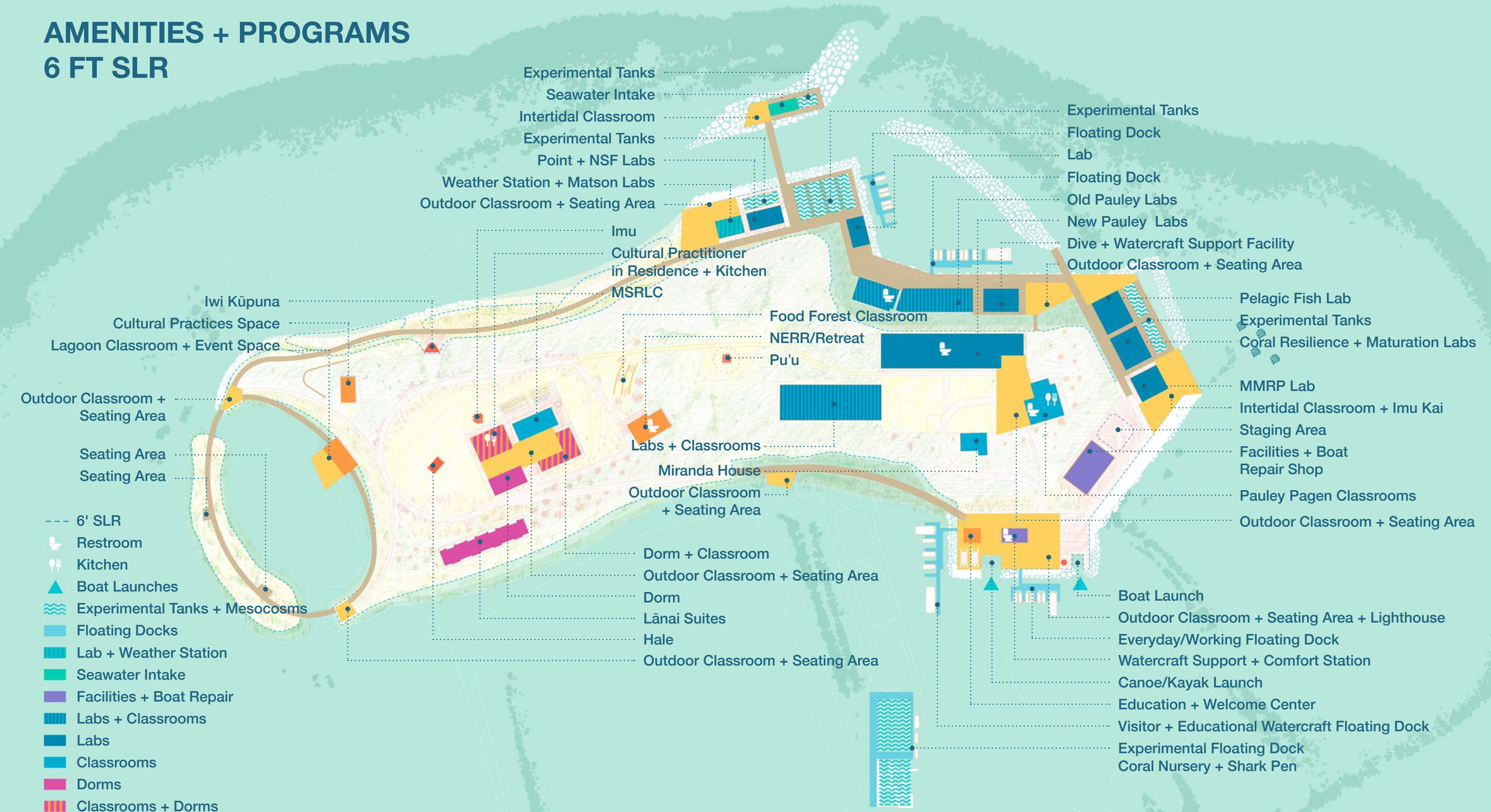
AMENITIES + PROGRAMS
3 FT SLR



- 6' SLR
- Restroom
- Kitchen
- Boat Launches
- Experimental Tanks + Mesocosms
- Floating Docks
- Lab + Weather Station
- Seawater Intake
- Facilities + Boat Repair
- Labs + Classrooms
- Labs
- Classrooms
- Dorms
- Classrooms + Dorms
- Place-Based Education: Cultural Site
- Place-Based Education: Outdoor Classroom + Event Space
- Place-Based Education: Classroom + Offices

0′ 75′ 150′ 300′

AMENITIES + PROGRAMS
6 FT SLR



WELCOME DOCK + EDUCATION CENTER

a. James Ewing. ARO. Hudson River Education Center and Pavilion. Beacon, New York. https://www.archdaily.com/197073/hudson-river-education-center-and-pavilion-architecture-research-office

FLEXIBLE QUAD LABS + CLASSROOMS

b. Lake Flato. Indian Springs School. Birmingham, Alabama. https://www.architectmagazine.com/project-gallery/indian-springs-school_o

SEAWATER SYSTEM LABS + CLASSROOMS: Elevated on Fill

c. Lake Flato. Indian Springs School. Birmingham, Alabama. https://www.architectmagazine.com/project-gallery/indian-springs-school_o

SEAWATER SYSTEM LABS + CLASSROOMS: Deck

d. Lake Flato. Marine Education Center. Ocean Springs, Mississippi. https://www.lakeflato.com/eco-conservation/marine-education-center/

EDUCATIONAL LAGOON PAVILION

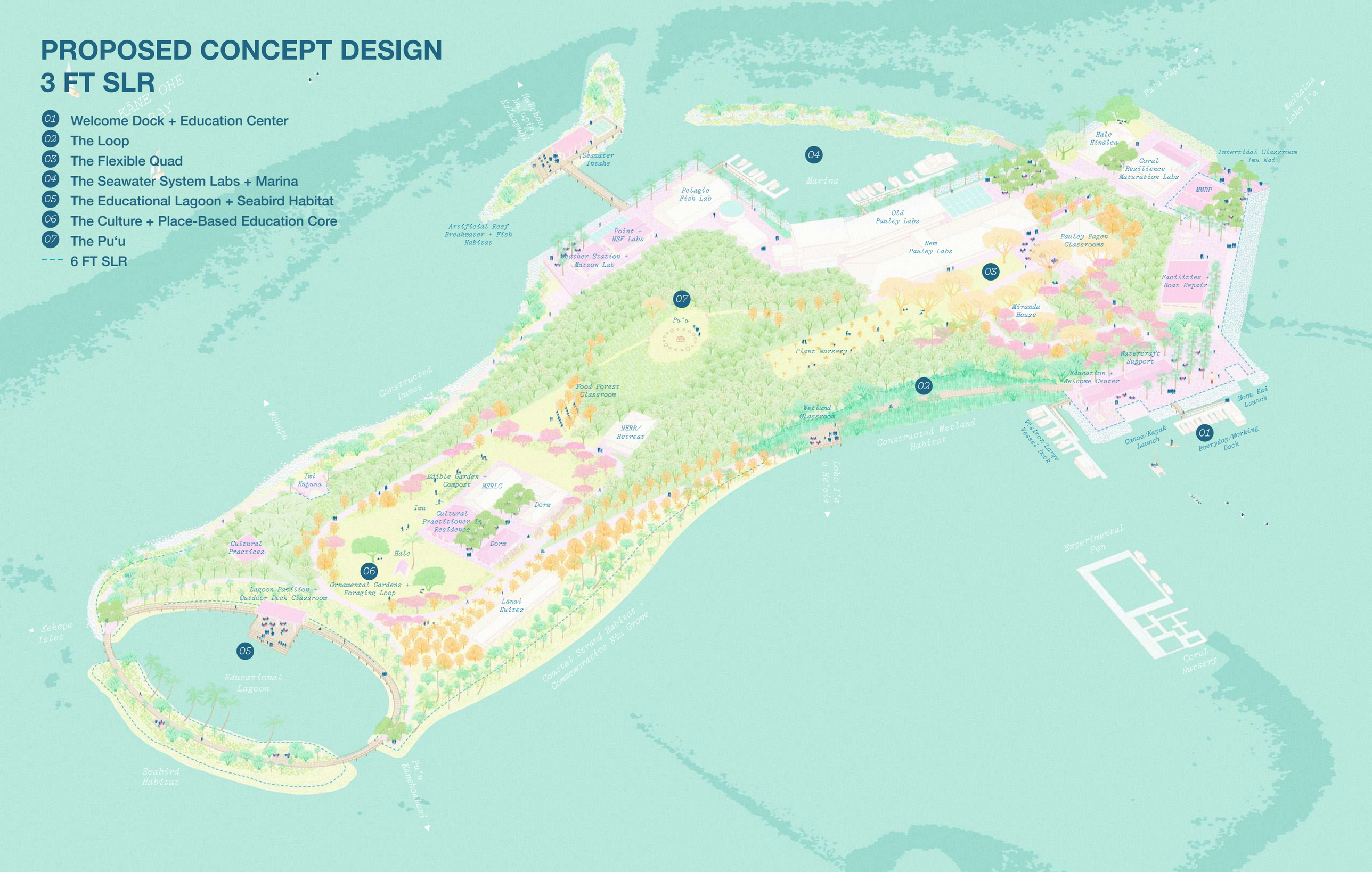
e. Atelier Bow Wow. Canal Swimmer's Club. Bruges, Belgium. https://projects.archiexpo.it/project-29390.html

CULTURAL PRACTITIONER IN RESIDENCE + DORMS

f. Lake Flato. Marine Education Center. Ocean Springs, Mississippi. https://www.lakeflato.com/eco-conservation/marine-education-center/

PROPOSED CONCEPT DESIGN
3 FT SLR

- 01 Welcome Dock + Education Center
- 02 The Loop
- 03 The Flexible Quad
- 04 The Seawater System Labs + Marina
- 05 The Educational Lagoon + Seabird Habitat
- 06 The Culture + Place-Based Education Core
- 07 The Pu‘u
- --- 6 FT SLR



PROPOSED CONCEPT DESIGN
6 FT SLR

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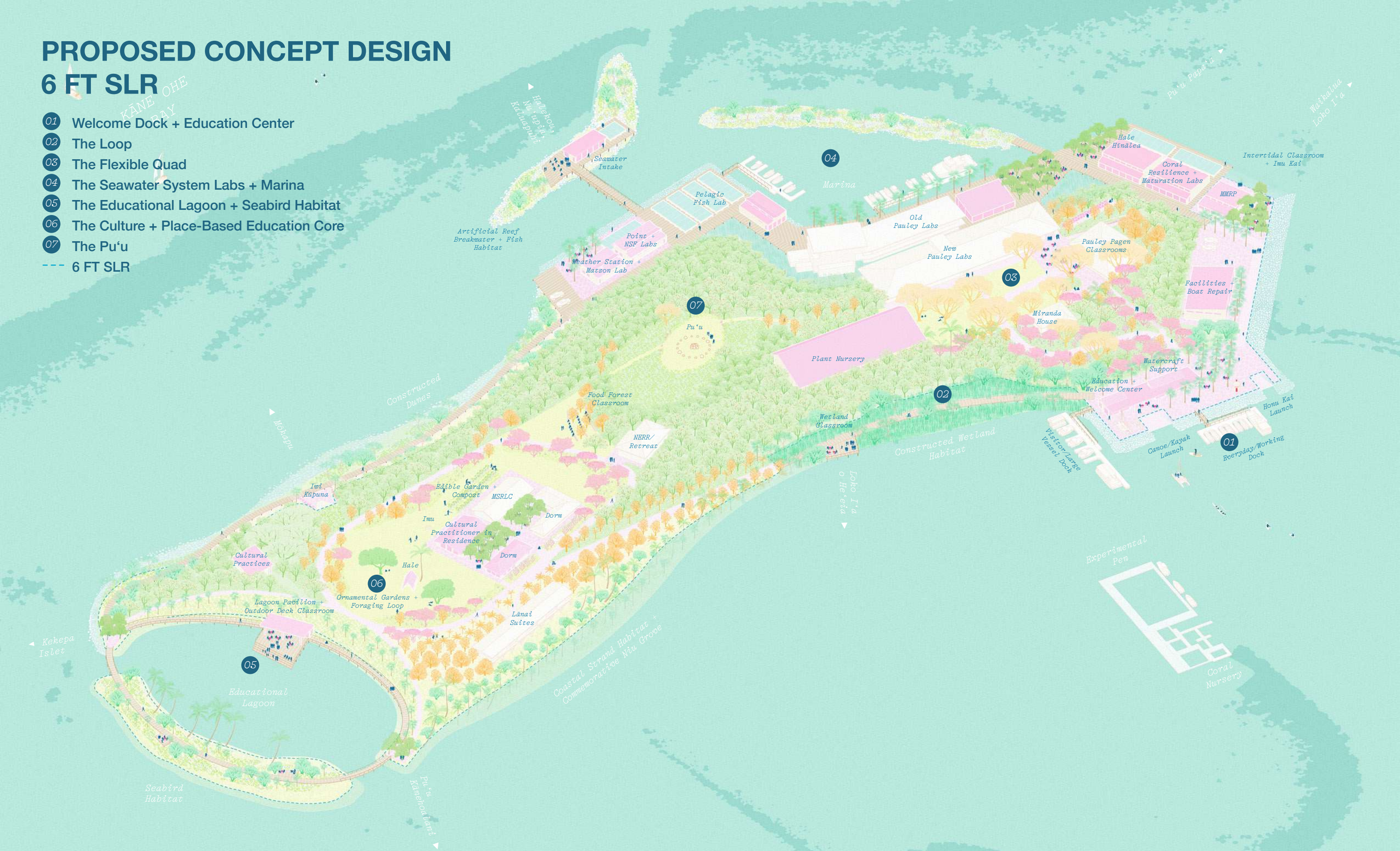
--- 6 FT SLR



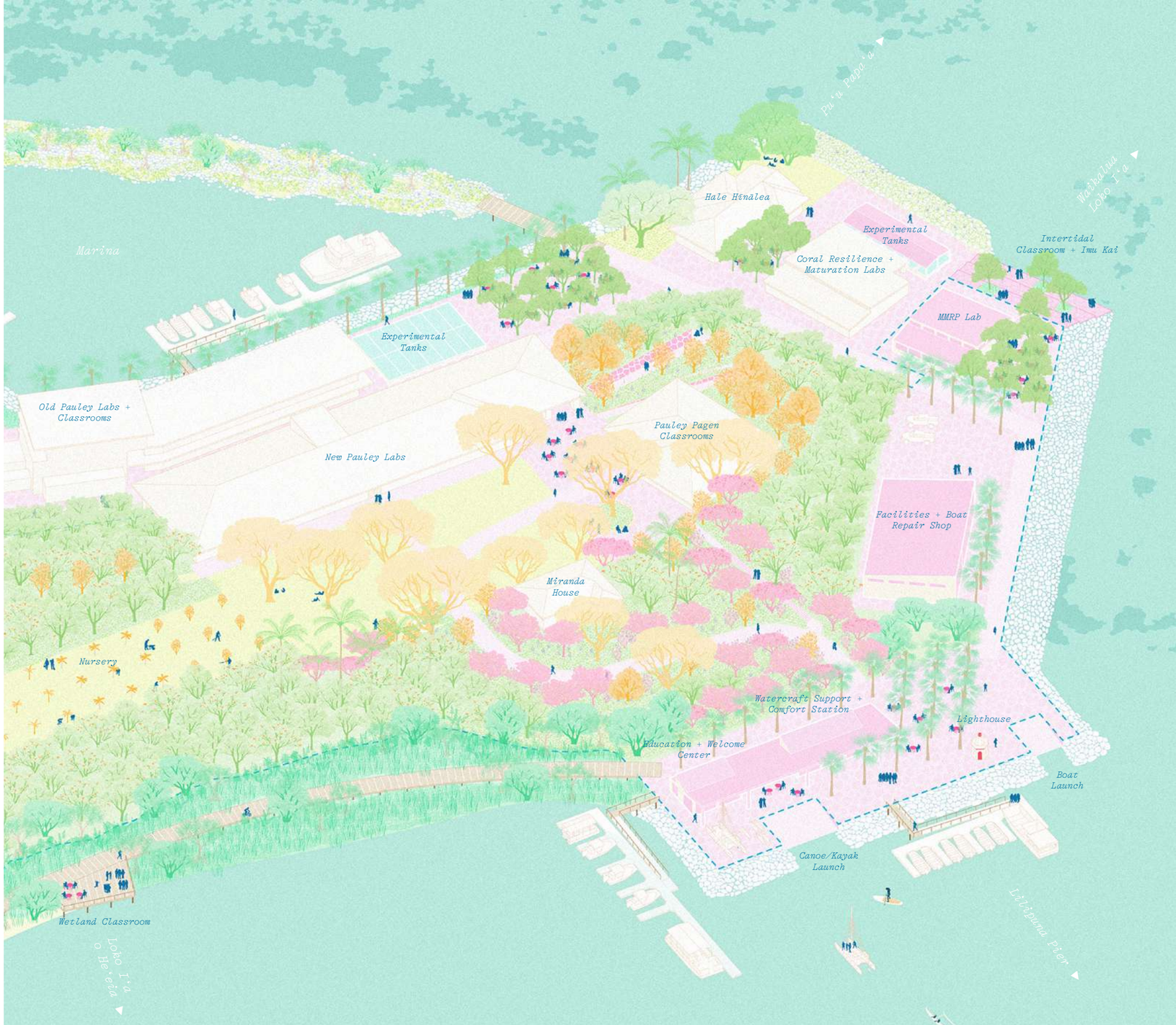
The Welcome Dock + Education Center

The Welcome Dock and Education Center is the gateway to Moku o Loʻe. There is a dock for visitors and education groups and a working dock that moors the day-to-day watercraft such as the shuttle boats and *Honu Kai*. There are two boat launches: one for smaller watercraft such as outrigger canoes, kayaks, and paddle boards and one dedicated to larger watercraft and the loading and unloading of materials for the *Honu Kai*.

An Education Center is located in the core of the Welcome Dock. The Center contains wayfinding and signage elements that help to orient visitors to the moku and its history and classroom space for place-based teaching, learning, and community events. The Education Center also contains space for bathroom facilities and watercraft support such as storage for small watercraft, repair supplies, and an office for shuttle boat staff. The Welcome Dock is unified by a bosque of loulu palms that provide a comfortable shaded area for tables and chairs, creating an opportunity for a lively social space and outdoor classroom.

The Loop

The Loop is the main pedestrian access route on Moku o Loʻe and is an important element for creating a cohesive, safe, and ADA-accessible experience of the moku. A contiguous walk along the Loop tells a holistic story of Moku o Loʻe and its place in Heʻeia and Kaneʻohe Bay. Wayfinding, signage, and overlooks are key storytelling elements of the Loop and are found at important historical and cultural sites and Activity Nodes. The identity of the Loop is reinforced by unique paving, consistent canopy coverage and views out to the bay. Proximity to bioculturally significant plants expands opportunities for education and landscape stewardship.



PROPOSED CONCEPT DESIGN
3 FT SLR

The Flexible Quad

The Flexible Quad is located east of the Welcome Dock and is enclosed on three sides by the Pauley Classrooms, Old Pauley Lab, and the Miranda House. Open lawn and plazas contain ample space for seating and chairs for socialization, outdoor learning, and events such as career fairs. The Quad is made ADA-accessible by a walkway from the Welcome Dock, an existing stair, and a ramp that provides access to the Seawater System Labs. Defining features of the Quad include the many existing comestible trees and the planting with biocultural and aesthetic value. In the 3-foot SLR scenario, a plant nursery is located on the northern edge of the Quad. In the 6-foot SLR scenario, a lab and classroom building are inserted on the site of the nursery. Overall, the Quad fosters a sense of community by providing social and learning spaces that leverage the abundance of activity present in this part of the moku.

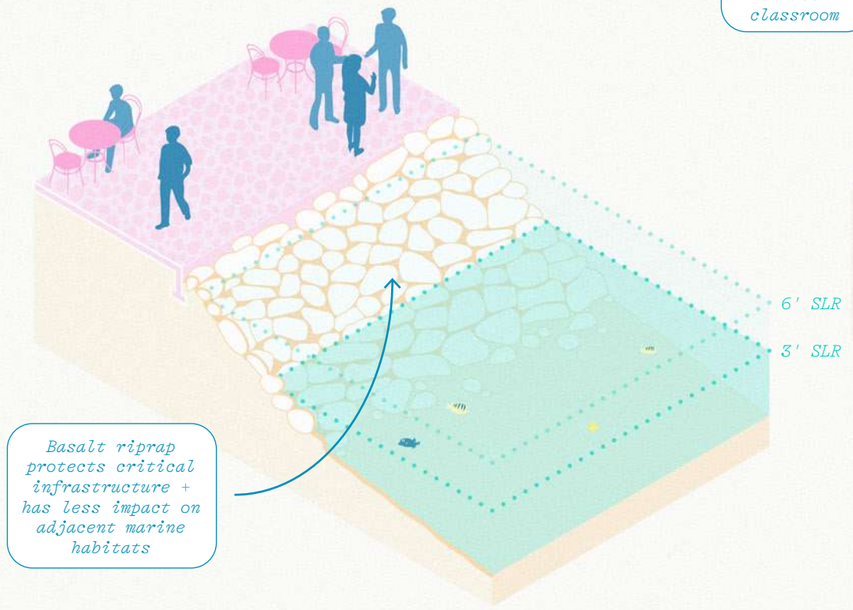
The Seawater System Labs + Marina

The Seawater System Labs and Marina are located along the southeastern shoreline of Moku o Lo‘e. Access to seawater is essential for the laboratories and classrooms in this zone. Defining features of the Seawater System Labs include the waterfront walk, consistent loulu canopy, stormwater filtration planting, clusters of tables and chairs for socializing and learning, and designated spaces for experimental tanks and mesocosms. Important infrastructure such as the Seawater Intake system is elevated on a deck at a minimum of 1 foot above the 6-foot SLR elevation to ensure it remains functional even during severe flood and king tide events. Two sets of living breakwaters protect the Labs and Marina from wave action. Outdoor classrooms at the Seawater Intake deck and the intertidal classroom extend teaching and learning opportunities into the moku's shoreline-ocean interface. In the 6-foot SLR scenario, labs, experimental tanks,

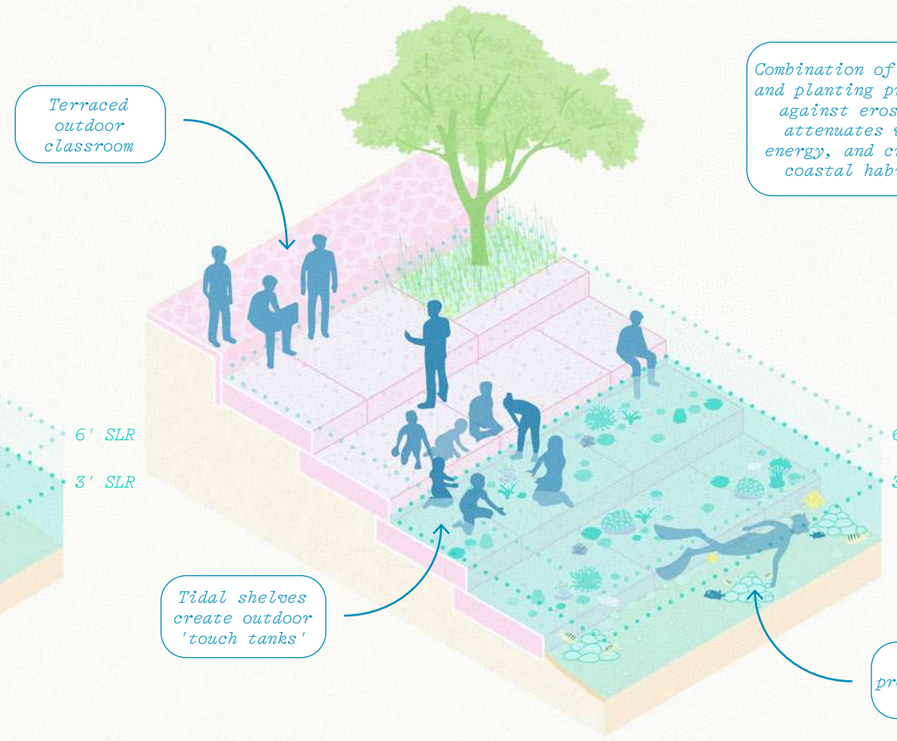
PROPOSED CONCEPT DESIGN
6 FT SLR

PROPOSED SHORELINE RESILIENCY STRATEGIES

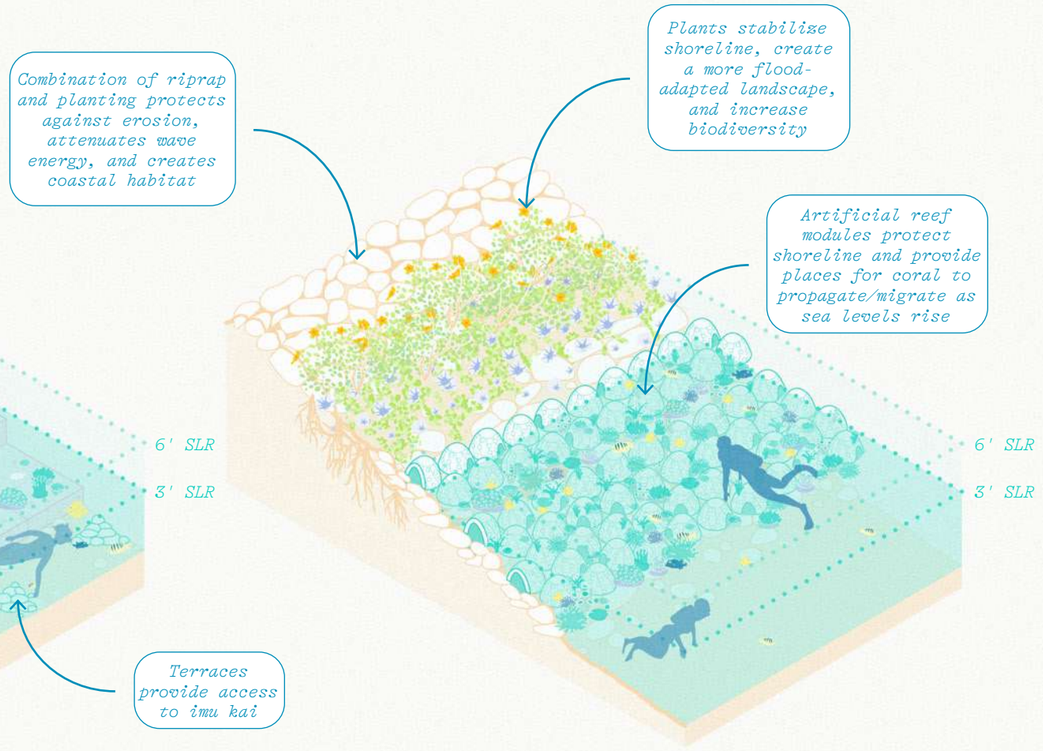
BASALT RIPRAP



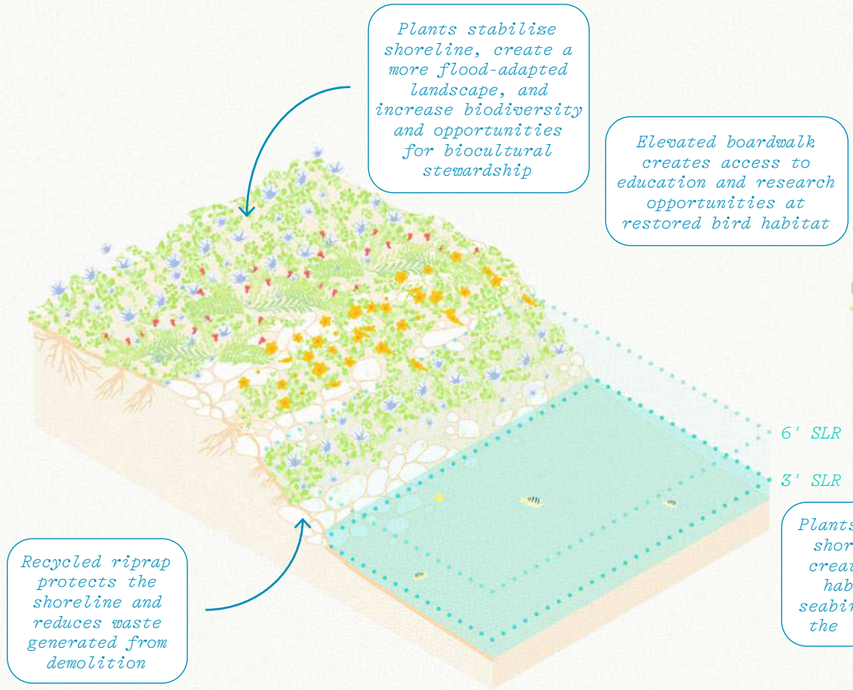
BASALT RIPRAP: *Intertidal Classroom*



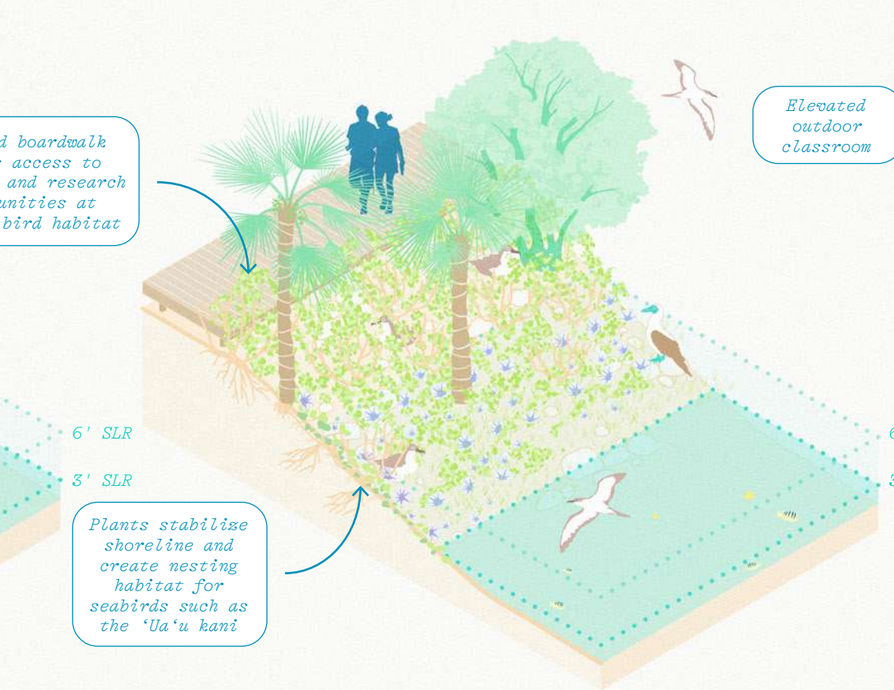
LIVING SHORELINE: *Artificial Reef Modules*



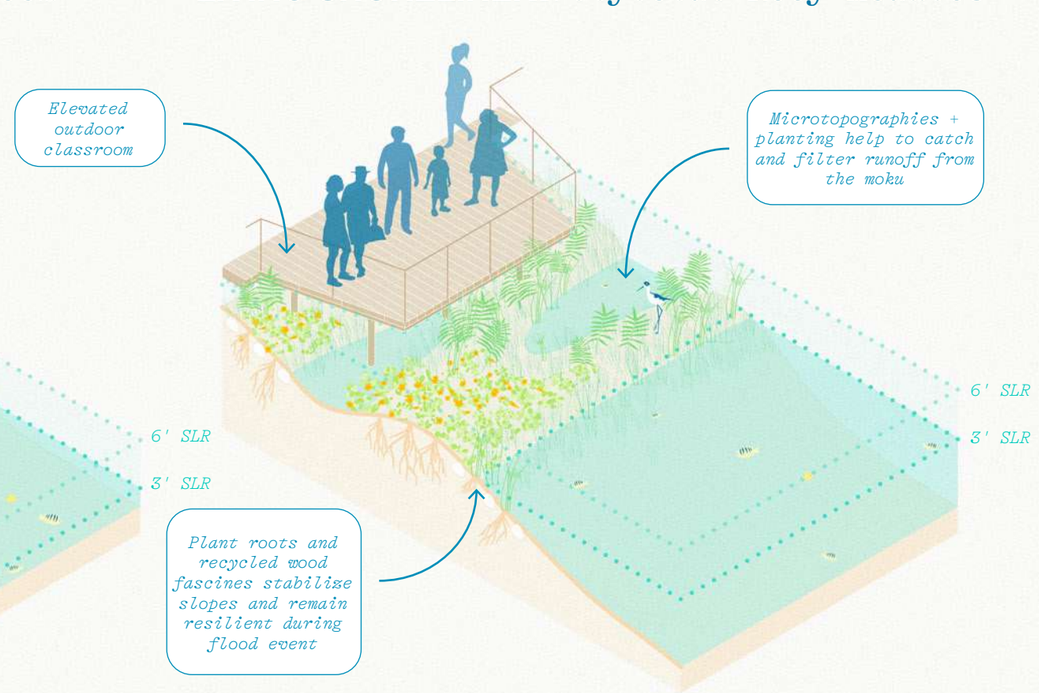
CONSTRUCTED DUNES



FLOOD-ADAPTED HABITAT: *Seabird*



FLOOD-ADAPTED HABITAT: *Marine Wetland*



EXISTING FACILITIES SHOP

PROPOSED WELCOME DOCK + EDUCATION CENTER
3 FT SLR

EXISTING WATERCRAFT SLIP + FACILITIES SHOP

Existing niu trees by circulation routes, to be removed + replanted away from main circulation

Existing Facilities Shed/Shop

Existing/ decommissioned small watercraft boat slip

Existing seawall with significant erosion

Existing seawall with significant erosion

6' Sea Level Rise

3' Sea Level Rise

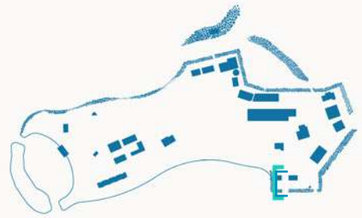
King Tide

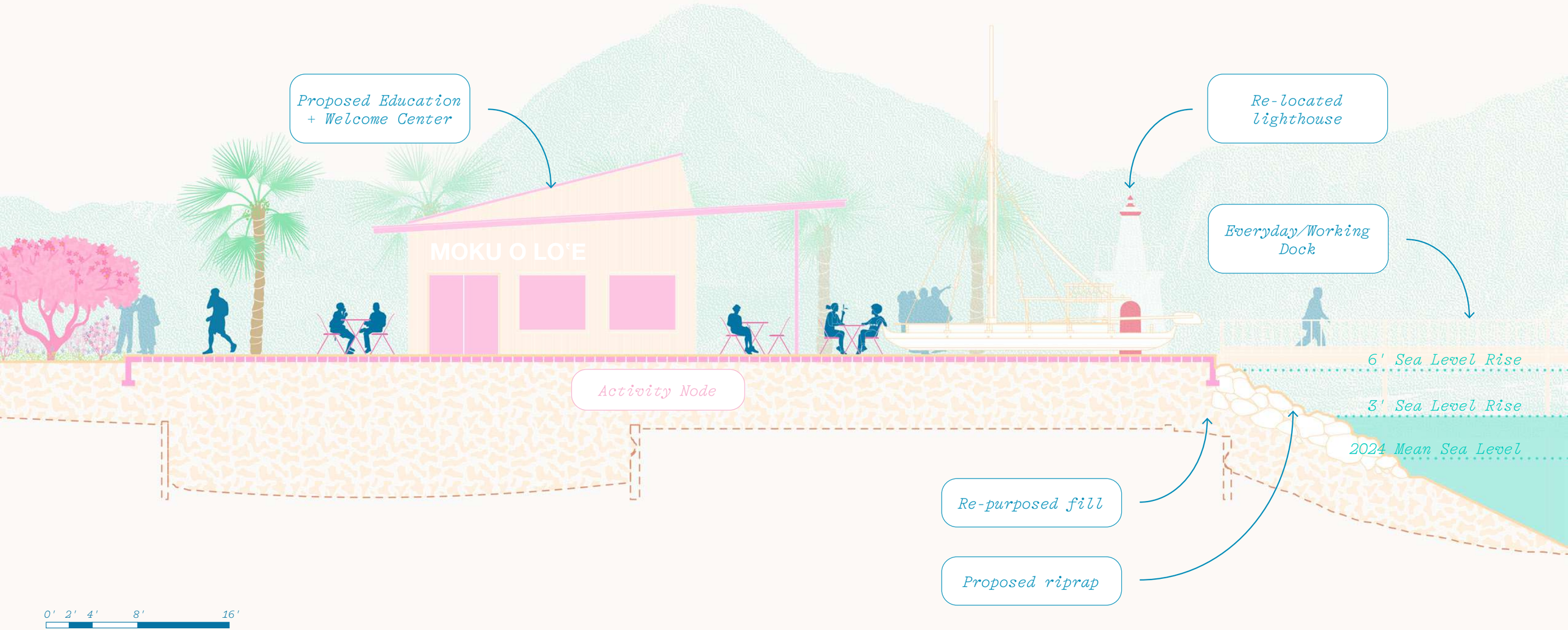
2024 Mean Sea Level

Mean Low Low Water

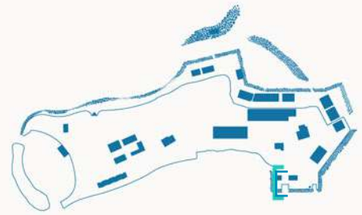
0' 2' 4' 8' 16'

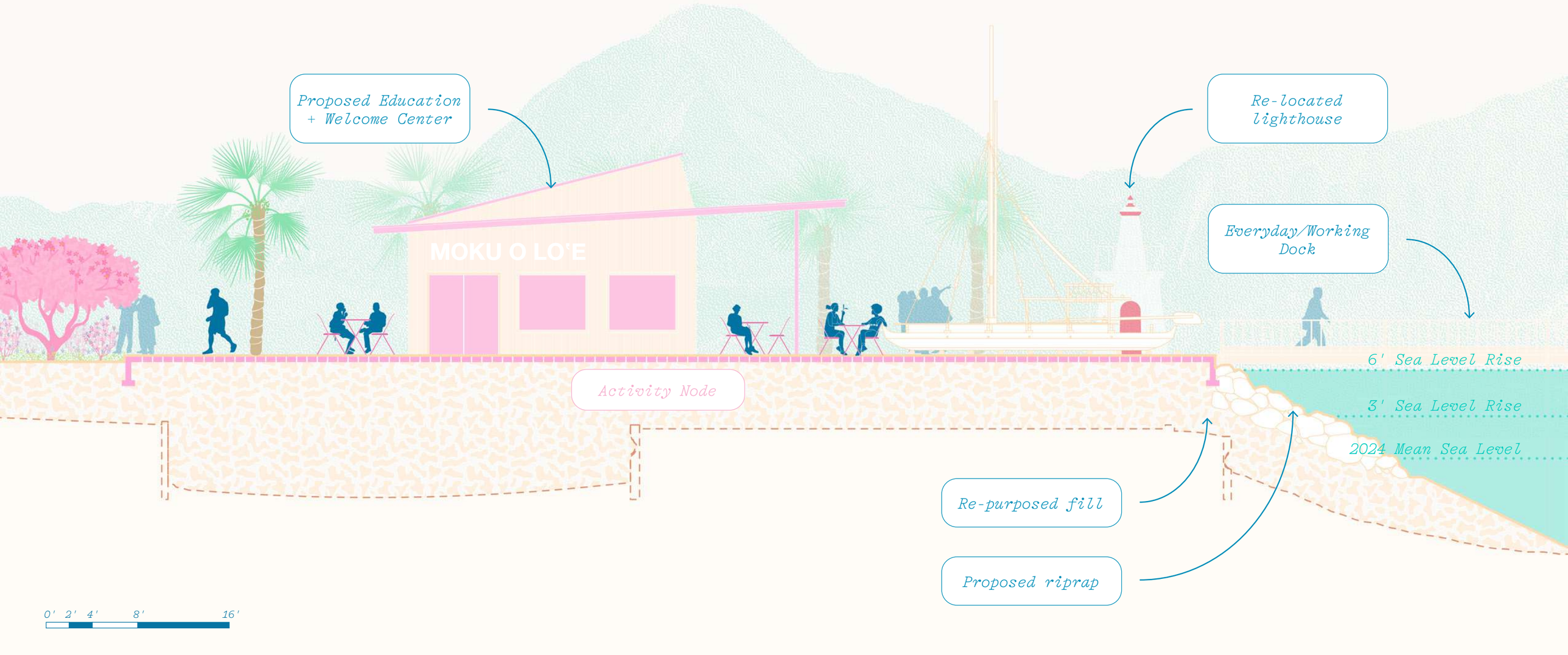
PROPOSED WELCOME DOCK + EDUCATION CENTER
3 FT SLR





PROPOSED WELCOME DOCK + EDUCATION CENTER
6 FT SLR

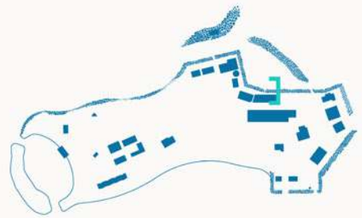




EXISTING OLD PAULEY LAB + MARINA

PROPOSED OLD PAULEY LAB + MARINA
3 FT SLR

EXISTING OLD PAULEY LAB + MARINA



Existing niu trees by circulation routes, to be removed + replanted away from main circulation

Existing ADA-inaccessible plank boat access

6' Sea Level Rise

3' Sea Level Rise

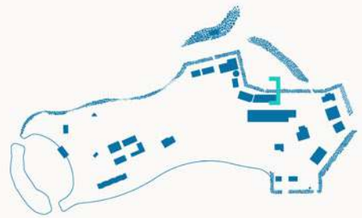
King Tide

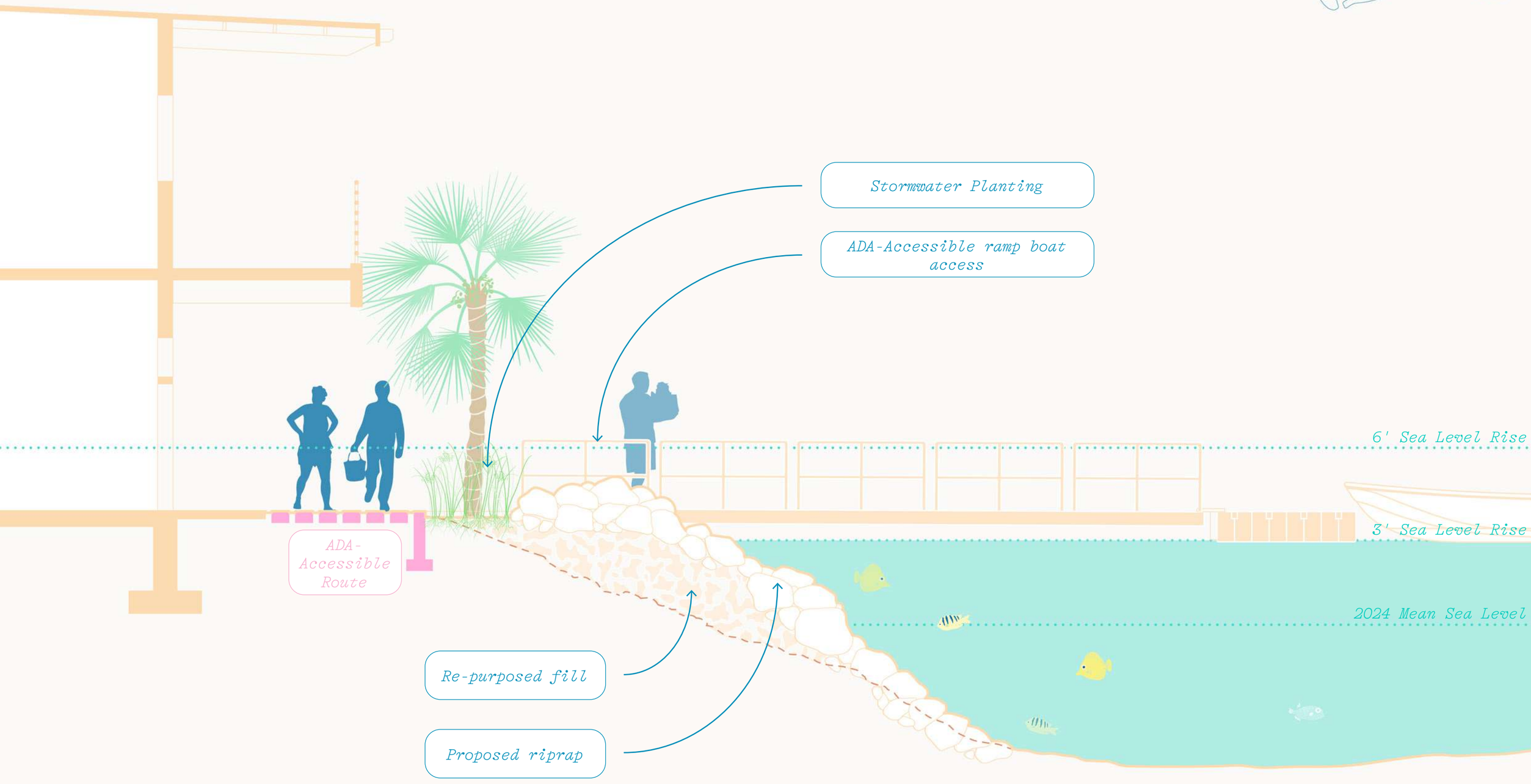
2024 Mean Sea Level

Mean Low Low Water

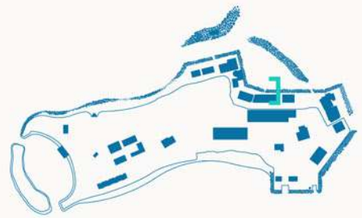
0' 1' 2' 4' 8'

PROPOSED OLD PAULEY LAB + MARINA
3 FT SLR





PROPOSED OLD PAULEY LAB + MARINA
6 FT SLR



Elevated deck with step and ramped access + seating

Accessible ramp boat access

6' Sea Level Rise

3' Sea Level Rise

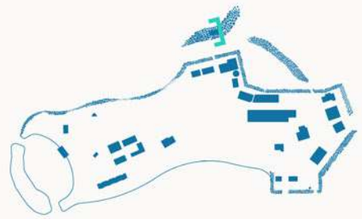
2024 Mean Sea Level

Re-purposed fill

Proposed riprap

0' 1' 2' 4' 8'

EXISTING POINT LABS + SEAWATER INTAKE



Existing mangrove + invasive species to be removed + managed

Existing seawater intake system

Existing ad-hoc seawall with erosion

6' Sea Level Rise

3' Sea Level Rise

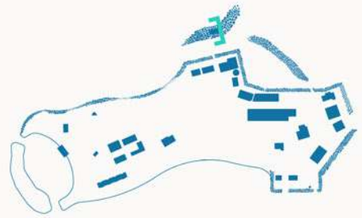
King Tide

2024 Mean Sea Level

Mean Low Low Water

0' 1' 2' 4' 8'

PROPOSED SEAWATER INTAKE
3 FT SLR



Proposed seawater infrastructure on elevated deck

Proposed ramped boardwalk

6' Sea Level Rise

3' Sea Level Rise

2024 Mean Sea Level

Living shoreline

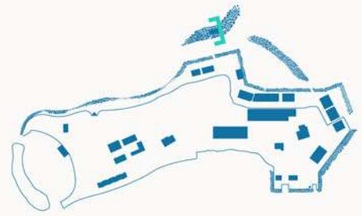
Re-purposed fill

Artificial reef modules create opportunities for coral propagation and fish habitat

Learning and research integrated into sea level rise adaptation strategies

0' 1' 2' 4' 8'

PROPOSED SEAWATER INTAKE
6 FT SLR



Proposed seawater infrastructure on elevated deck

Proposed boardwalk

6' Sea Level Rise

3' Sea Level Rise

2024 Mean Sea Level

Living shoreline

Re-purposed fill

Artificial reef modules create opportunities for coral propagation and fish habitat

Learning and research integrated into sea level rise adaptation strategies

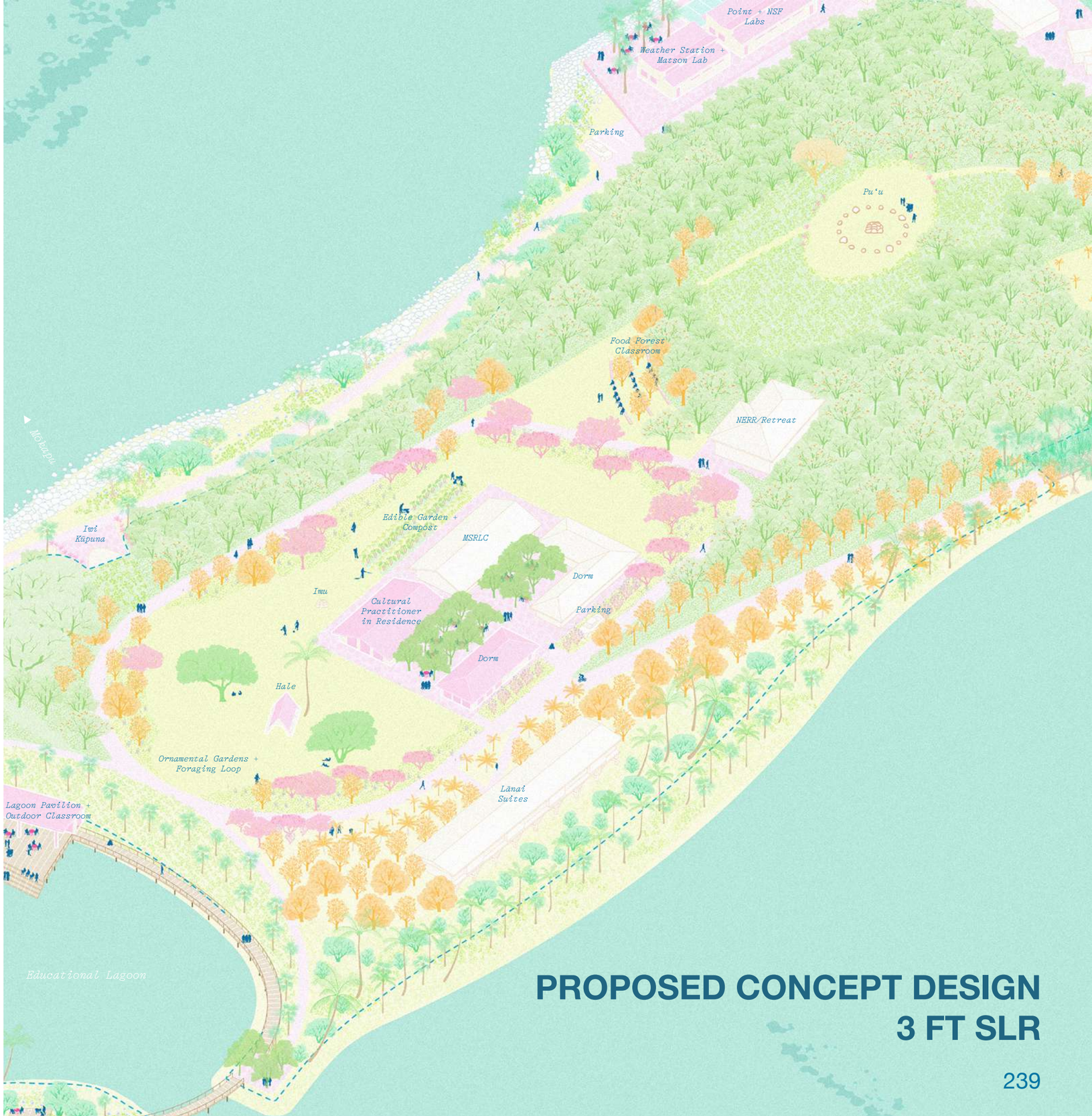
0' 1' 2' 4' 8'

and circulation are elevated on a deck system at a minimum of 1 foot above the waterline.

The Educational Lagoon + Seabird Habitat
The Educational Lagoon and Seabird Habitat are located north of the Culture + Place-Based Education Core. An ADA-accessible boardwalk takes visitors through restored bird habitat on the northern spit and down to the Lagoon Classroom and Event Space. Small overlooks for sitting and observation along the boardwalk open important views out to the bay. The Lagoon Classroom is elevated on a deck that steps down to the water, which provides access for swimming and creates an outdoor learning space for students to observe sea life in the Educational Lagoon.

The Culture + Place-Based Education Core
The Culture + Place-Based Education Core contains a cluster of classrooms, residences, and programs dedicated to teaching, researching, and learning about place in Hawai‘i. A cultural practitioner in residence classroom, living space, and a kitchen and new dorm are proposed north of the MSRLC and graduate residences – forming a courtyard-like plaza with shaded seating areas. A restored imu and cultivated food garden are located immediately outside the cultural practitioner in residence classroom for easy access to the kitchen. A traditional hale offers opportunities to learn about indigenous construction methods and a place for cultural practices.

Unifying the Culture + Place-Based Education Core is an ornamental garden and foraging loop. The foraging loop contains plant species with biocultural functions such as food and lei and creates an opportunity for HIMB community members and visitors to contribute to food production on Moku o Lo‘e. A food forest classroom creates a space for experiential learning about productive food landscapes and stewardship



PROPOSED CONCEPT DESIGN
3 FT SLR

practices.

The Puʻu

The design of the Puʻu seeks to restore its historical role as a kilo (lookout) point. As the highest point at the center of Moku o Loʻe, the Puʻu is a place for community members to learn about celestial navigation and important cultural landscapes found in Kāneʻohe Bay, the ahupuaʻa of Heʻeia, and the Koʻolaupoko region. A star compass and informational signage help to educate visitors about these topics. An ahu demarcates the Puʻu's significance as a historical, cultural, and spiritual site. To keep views open to cultural landscapes such as Puʻu Keahiakahoe, planting is kept low around the Puʻu and trees are planted at an elevation that allows for unobstructed views to significant sites in the Koʻolau.

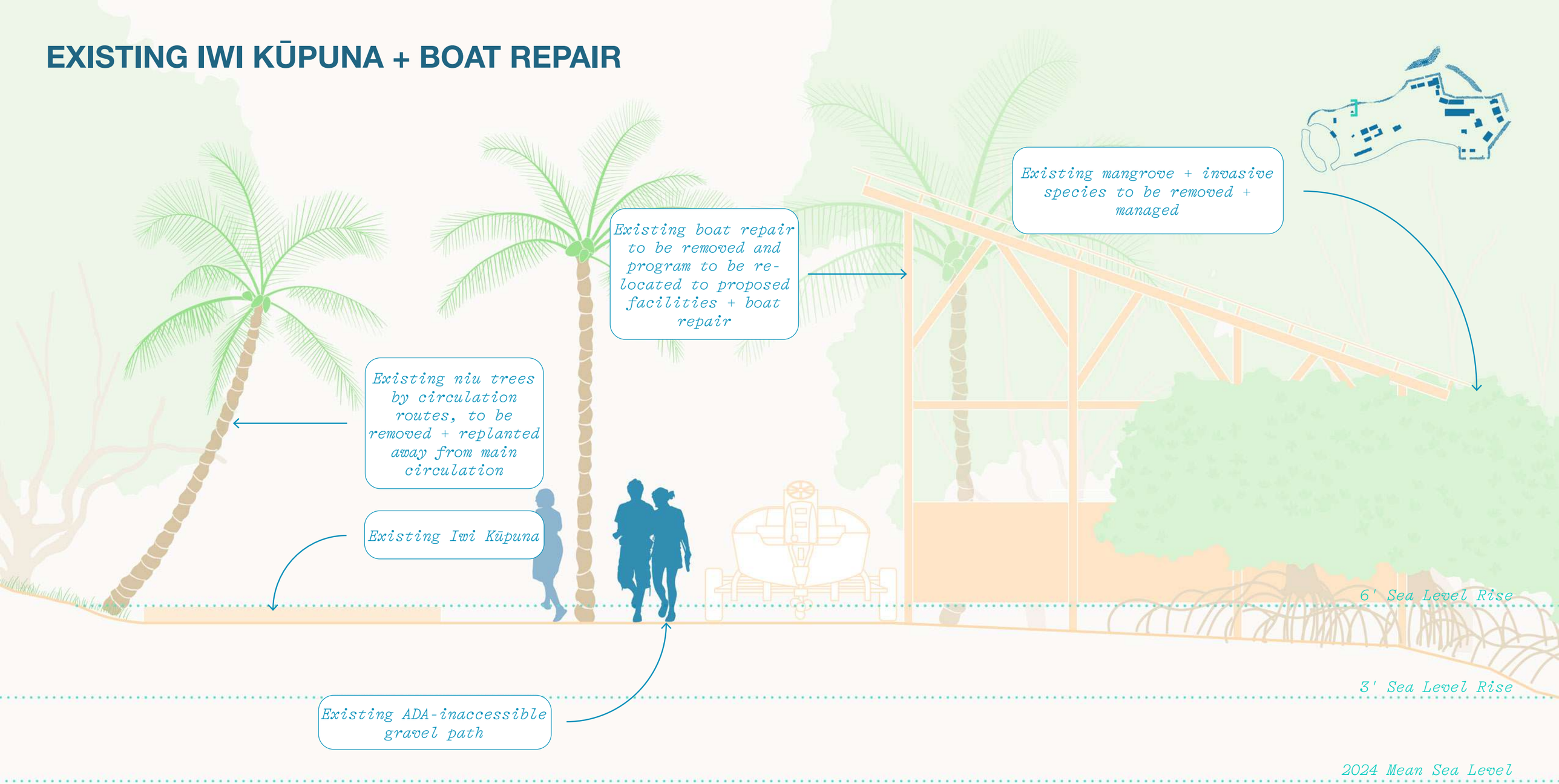
Lilipuna Parcel

Lilipuna Parcel is the primary access to Moku o Loʻe. The plan proposes improved signage with educational information to enhance its legibility as a gateway and facilitate effective wayfinding for visitors to the moku. Rain shelters should be located at the entryway and at the pier, providing protection for visitors and the HIMB community.

Many of the Malama ʻAina Plan design guidelines should be applied to the Lilipuna Parcel, particularly the restoration of Indigenous and endemic plant communities, the installation of permeable paving, and a clear ADA-accessible route.

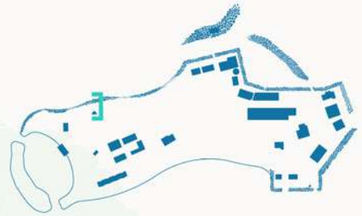
PROPOSED CONCEPT DESIGN
6 FT SLR

EXISTING IWI KŪPUNA + BOAT REPAIR



0' 1' 2' 4' 8'

PROPOSED IWI KŪPUNA
3 FT SLR



Plants with biocultural aesthetic function help to define space

Re-interment demarcator

Activity Node/ space for Iwi Kūpuna

ADA-Accessible Route

Constructed dunes with recycled riprap

Coastal strand planting helps to stabilize shoreline and prevent erosion

Re-purposed fill

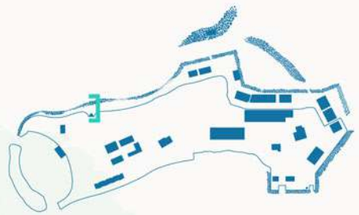
6' Sea Level Rise

3' Sea Level Rise

2024 Mean Sea Level

0' 1' 2' 4' 8'

PROPOSED IWI KŪPUNA
6 FT SLR



Possible location for remains exposed by sea level rise; Burial Council to be consulted

Constructed dunes with recycled riprap

Coastal strand planting helps to stabilize shoreline and prevent erosion

6' Sea Level Rise

Activity Node/ space for Iwi Kūpuna accessible at low tide

Boardwalk

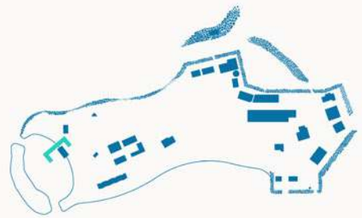
Re-purposed fill

3' Sea Level Rise

2024 Mean Sea Level

0' 1' 2' 4' 8'

EXISTING LAGOON PAVILION



Existing ADA-inaccessible gravel path

Existing lagoon pavilion

Existing niu trees by circulation routes, to be removed + replanted away from main circulation

Existing mangrove + invasive species to be removed + managed

Existing seawall with erosion and rubble

Steep slope with erosion at base

6' Sea Level Rise

3' Sea Level Rise

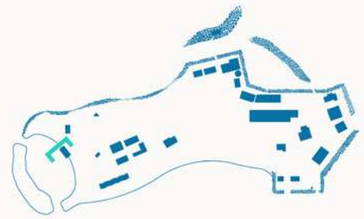
King Tide

2024 Mean Sea Level

Mean Low Low Water

0' 2' 4' 8' 16'

PROPOSED EDUCATIONAL LAGOON
3 FT SLR



Proposed Lagoon Pavilion on Elevated Deck

Proposed outdoor classroom and event space with access down to water

ADA-Accessible Route

Slope made less steep and planted with coastal species that help with erosion control

Flood-adapted plant species help to create bird and juvenile fish habitat

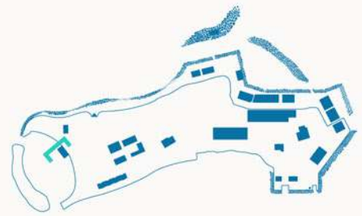
6' Sea Level Rise

3' Sea Level Rise

2024 Mean Sea Level

0' 2' 4' 8' 16'

PROPOSED EDUCATIONAL LAGOON
6 FT SLR



Proposed Lagoon Pavilion on Elevated Deck

Proposed outdoor classroom and event space with access down to water

ADA-Accessible Route

Migrated flood-adapted plant species

Slope made less steep and planted with coastal species that help with erosion control

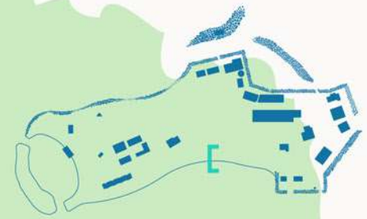
6' Sea Level Rise

3' Sea Level Rise

2024 Mean Sea Level

0' 2' 4' 8' 16'

EXISTING PATH



Existing ADA-inaccessible concrete path

Existing basalt stone walls to be removed + re-purposed

Existing spontaneous + invasive species to be removed, managed + recycled

Existing seawall

6' Sea Level Rise

3' Sea Level Rise

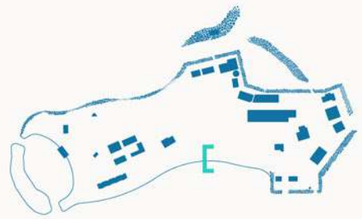
King Tide

2024 Mean Sea Level

Mean Low Low Water

0' 1' 2' 4' 8'

PROPOSED WETLAND CLASSROOM
3 FT SLR



ADA-accessible elevated boardwalk

Proposed outdoor wetland classroom

Marine wetland planting helps to filter runoff from the islet before it enters the patch reef

Re-purposed fill

Flood-adapted habitat reinforced with recylced wood bundles for additional erosion protection

Flood-adapted plant species help to create bird and juvenile fish habitat

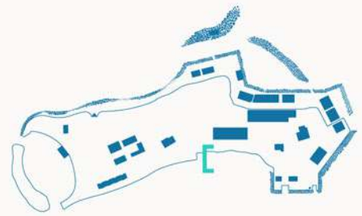
6' Sea Level Rise

3' Sea Level Rise

2024 Mean Sea Level

0' 1' 2' 4' 8'

PROPOSED WETLAND CLASSROOM
6 FT SLR



ADA-accessible elevated boardwalk

Proposed outdoor wetland classroom

Re-purposed fill

6' Sea Level Rise

3' Sea Level Rise

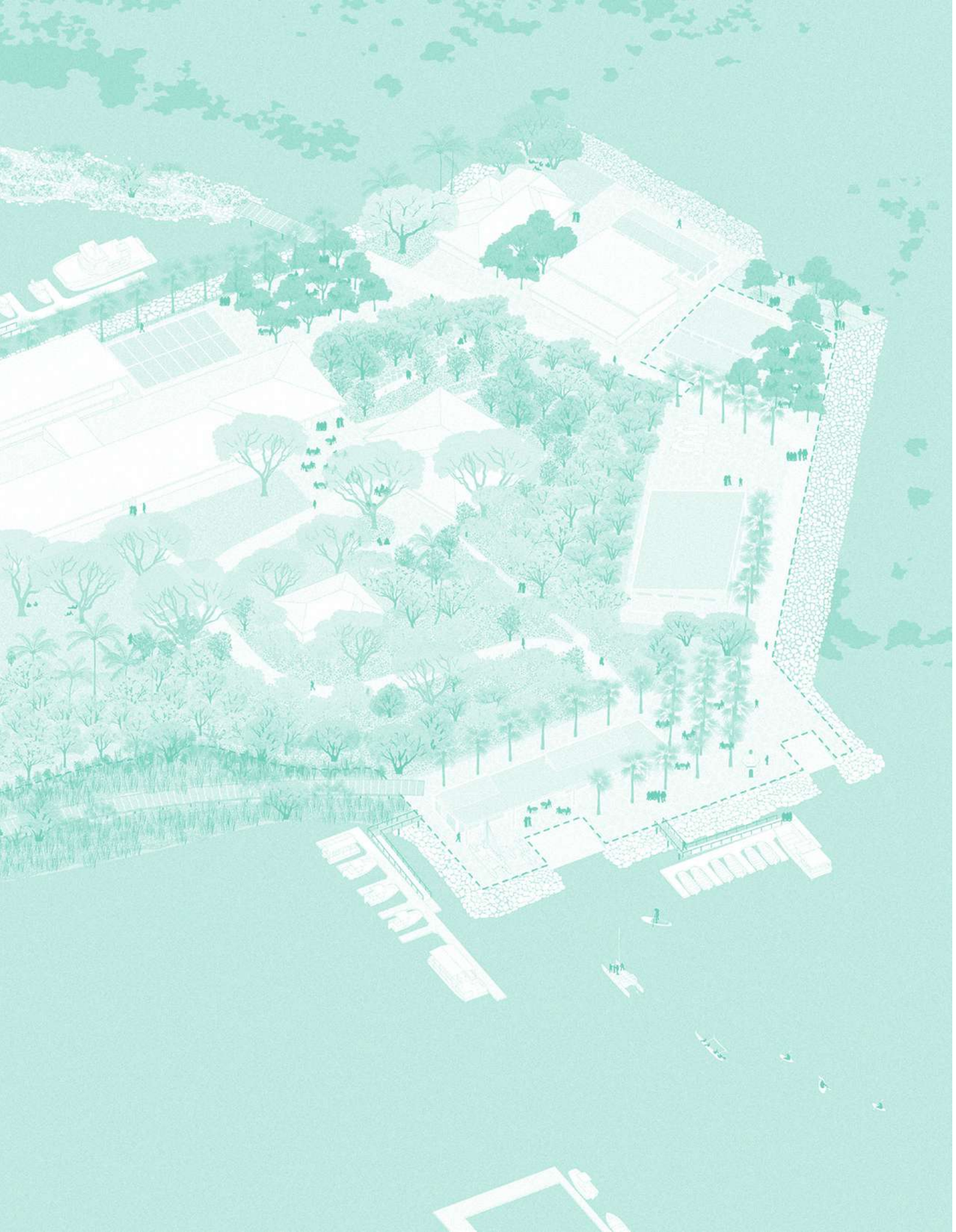
2024 Mean Sea Level

0' 1' 2' 4' 8'

EXISTING PU‘U

PROPOSED PU‘U

PROPOSED PU‘U



◄ *Concept Design of the Welcome Dock + Education Center at 3-foot SLR*

Photo Credit: UHCDC

CONCEPTUAL COST ESTIMATE

The conceptual phasing and cost estimate were prepared to guide plan implementation and future budgeting. The conceptual cost estimate was prepared by J. Uno and Associates on May 9, 2024, based on the 3 and 6-foot sea level rise concept designs. The phases were informed by flood risk, accessibility, and character zones. Appendix C presents a breakdown of costs for four phases of the conceptual plan.

Note that actual costs during implementation are subject to change since implementation may not begin immediately. Detailed cost estimates will need to be generated once the facilities in the proposed plan are designed.

The cost estimate included in this report is based on the following assumptions:

- The extent of utility relocations necessary is unknown at this time. The estimate provided for this line item is, therefore, general and may vary.

- Not all of the cut material from the edges of the island will be usable as fill material. Areas where new buildings are proposed will need stable soil. The cost for fill material may fluctuate based on the quantity of fill material needed.

- The estimate includes an allowance for the relocated niu trees. The cost may fluctuate if more trees are relocated than estimated.

- The cost for the different facilities will vary based on individual building designs.

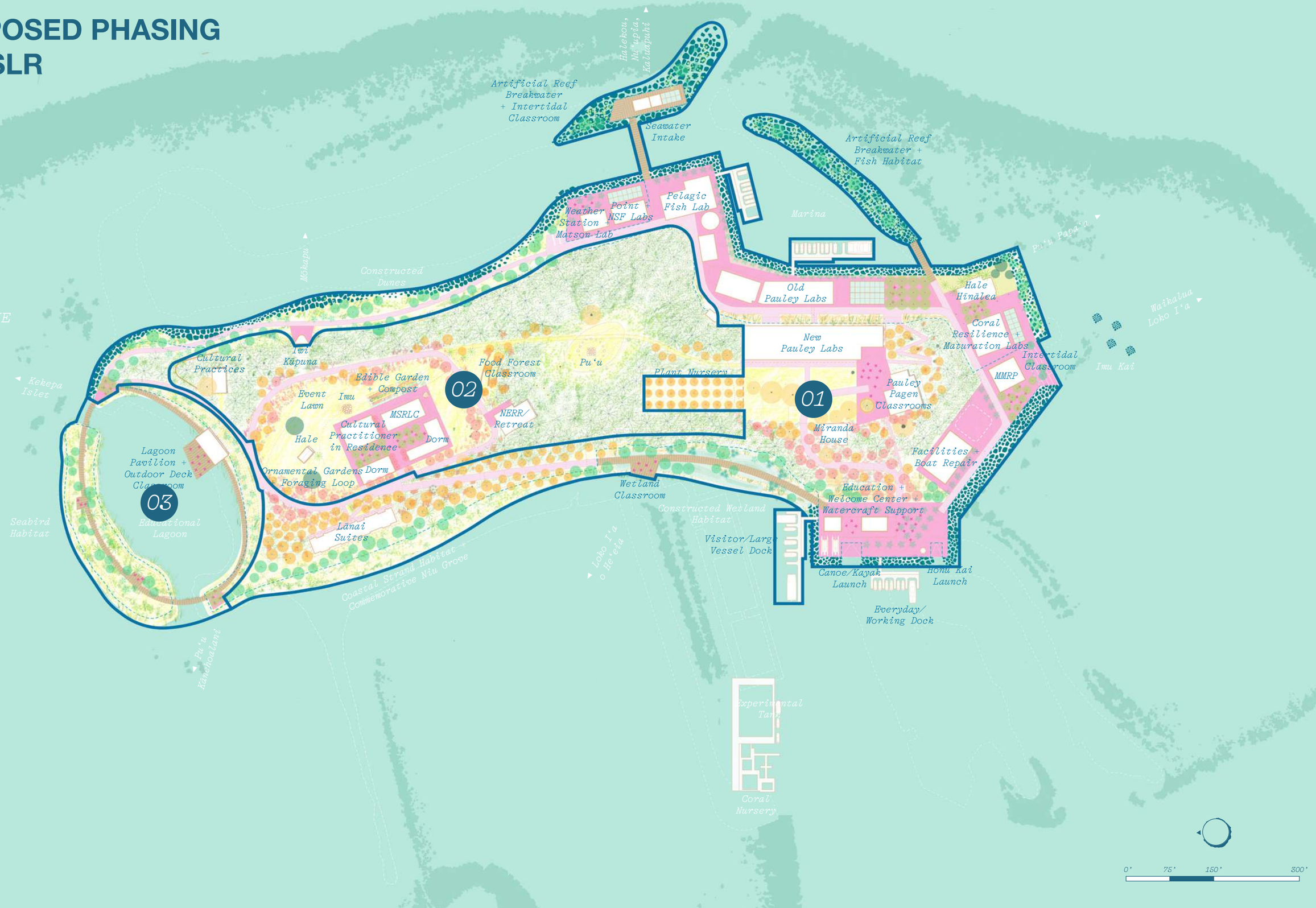
- All green waste will be turned into mulch and reused on the island so there is no cost for removing the green waste from the island.

- The cost for a concrete silo is included since it is unknown at this time if the contractor will mix the concrete needed or bring a concrete silo to mix the concrete on site.

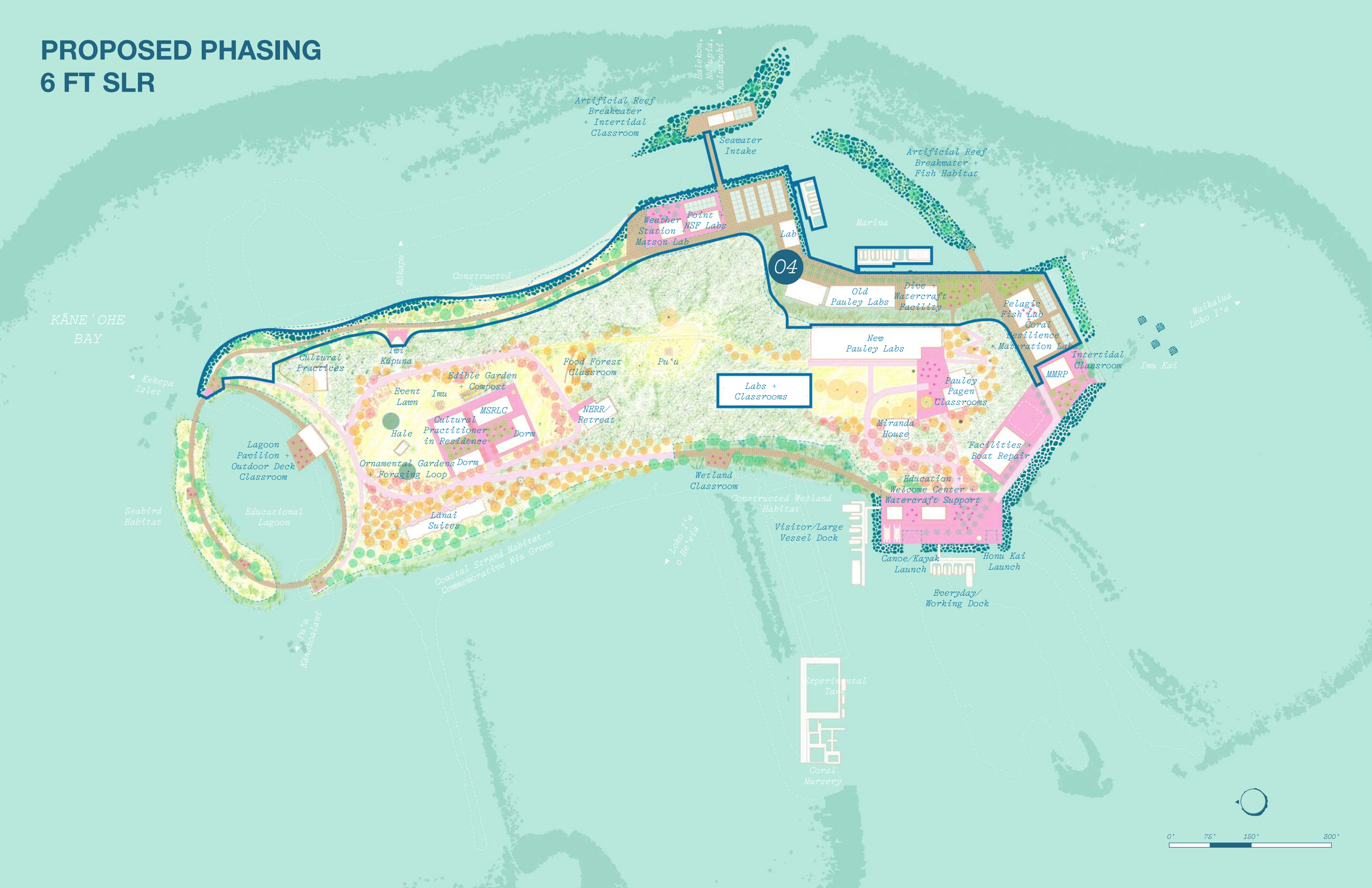
- The markup for the location is high to account for access to the island. Escalation to the midpoint will fluctuate depending on when each phase goes to bid. The rest of the markups are based on the level of design and contractor overhead.

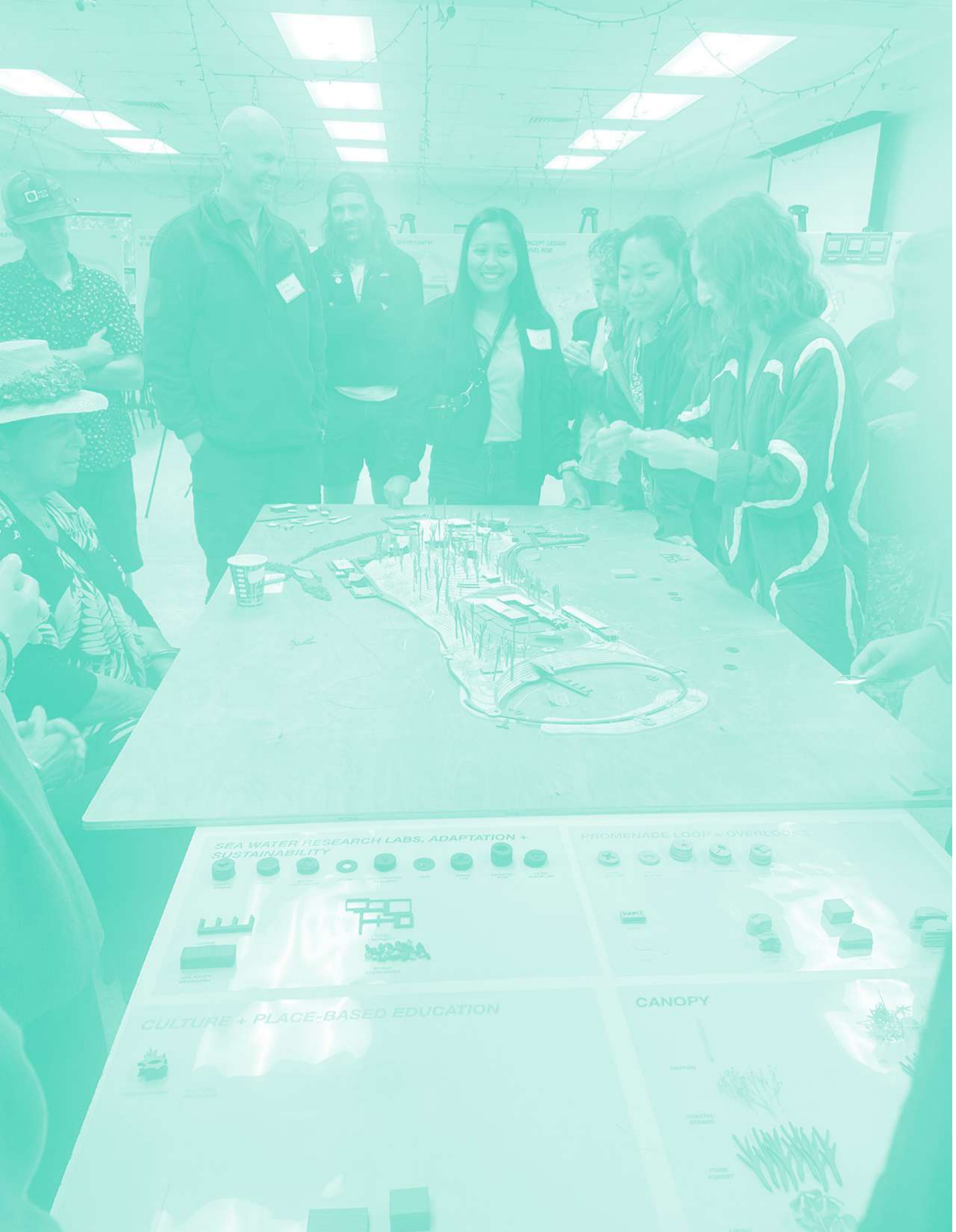
- The estimate includes construction costs but not the cost for any possible contaminated material or hazardous material that could be encountered. The suggestion is to set aside a budget for contingencies including hazardous material or archaeological findings during construction.

PROPOSED PHASING
3 FT SLR



PROPOSED PHASING
6 FT SLR





CONCLUSION

The project and its process are emblematic of collaboration among HIMB's community members. The well-attended workshops (Appendix B), saw engaged discussions about how to move forward given the immediate infrastructural needs to support HIMB's goals of science, and research excellence and the desire to become a Native Hawaiian Place of Learning.

The Mālama ʻĀina Plan for Moku o Loʻe illustrates an approach to stewardship on the moku that is anchored by the salience of place. First, it integrates the research needs of HIMB with restoration efforts that improve the moku's ecological integrity. Second, the proposed spaces and programs foreground the moku as a Native Hawaiian Place of Learning and offer a biocultural approach to mālama ʻāina, a shared vision of land stewardship with the local community. This responds to HIMB's strategic goal of bringing multiple ways of knowing into its research and education activities. Third, it illustrates adaptation strategies to address coastal erosion and projected sea level rise that are regenerative, draw on ecological design principles, and help to reinforce the moku's sense of place. Overall, the Plan serves as a guiding document for HIMB, and together with its Strategic Plan, will help to inform the future of HIMB's vision for and stewardship of Moku o Loʻe.

◀ Workshop 02 Co-Design Session

Photo Credit: UHCDC

COMMITMENTS + RECOMMENDATIONS

HIMB is committed to pono stewardship of its lands and surrounding waters as a part of its function as an Organized Research Unit of the University of Hawai‘i at Mānoa. Referencing the teachings of the late Kumu Hula, John Ka‘imikaua, it will follow the frameworks used by the ancient 'Aha councils, which made decisions using eight considerations of pono stewardship (Ka‘imikaua 2000, Winter et al. 2018). This sets forth HIMB’s intentions and recommendations for fulfilling this kuleana:

Moananuikea (Ocean Biome):
The people of the island of O‘ahu have the kuleana to care for the physical and biological integrity of the ocean from the shoreline to the horizon, as is seen from the summit of the mountain ridges. Within this context, the people of the moku of Ko‘olaupoko have the kuleana to care for the waters of Kāne‘ohe Bay from the shoreline to the edge of the barrier reef, and the people of Moku o Lo‘e have the kuleana to care for waters from its shoreline to the edge of its fringing reef. As such, HIMB will care for the physical and biological integrity of its reefs, and ensure that its research activities will not have long standing negative impacts on the physical and biological integrity of the reefs within Kāne‘ohe Bay.

Recommendations:

- HIMB will keep an inventory of all its research, including all research materials and instrumentation, within the Bay and set protocols for both deployment and decommissioning such that no HIMB research

◄ *‘Ioleka‘a seen from the western shore of Moku o Lo‘e*

Photo Credit: UHCDC

materials or instrumentation will be abandoned in our reefs.
- Efforts to restore the physical and biological integrity of the reefs surrounding Moku o Loʻe will be consistently supported by HIMB.
- HIMB will implement on-shore strategies for improving reef and ocean integrity such as permeable paving and Stormwater Filtration planting.

Kahakai Pepeiao (Shoreline Ecotone):
In light of the drastic alterations to Moku o Loʻe that have happened in the last century and the sea level rise that is projected in the coming century, HIMB is committed to improving and maintaining the integrity of the shoreline, and will support the restoration of the biological integrity of coastal strand vegetation and associated seabird populations where possible.

Recommendations:
- HIMB will seek funding to support the restoration of native habitats and associated species within the areas so designated by this Mālama ʻĀina Plan.
- HIMB will work with seabird experts and organizations to plan for and fund the restoration of seabird populations on Moku o Loʻe.
- HIMB will implement erosion control and sea level rise adaptation measures that benefit intertidal habitats and improve biodiversity.
- Future development along the shoreline should be limited to laboratories requiring access to the Seawater Intake System, infrastructure essential for this system, outdoor education areas, and ADA-accessible circulation.

Mauka (Terrestrial Biome):
In light of the drastic alterations to Moku o Loʻe in the last century, HIMB is committed to maintaining the physical remains of the native soil on the moku and supporting the restoration of the biological integrity of

native coastal forest where possible.

Recommendations:
- HIMB will seek funding to support the restoration of native habitats and associated species within the areas so designated by this Mālama ʻĀina Plan.
- HIMB will recycle green waste such as removed trees and compost to the maximum extent possible as a means of improving the soil health on the moku.
- HIMB will develop a biosecurity plan to address (prevent or otherwise mitigate) the threat of invasive species (e.g., rats, coconut rhinoceros beetle, etc.).
- Future development of the moku should be concentrated within the designated Activity Nodes outlined in the Mālama ʻĀina Plan so as to limit the impact to habitat restoration and cultural areas.

Kumu Wai (Fresh Water):
Given that Moku o Loʻe is an offshore islet with no streams and no known springs or aquifer, the applications of this consideration are limited, but it is an important consideration nonetheless. Within this context, HIMB is committed to stewarding the moku such that it holds onto, and retains within its soil, as much of the water that falls as rainfall as possible.

Recommendations:
- HIMB will restore multi-tiered forests (e.g., native forest and agro-forest) as described herein, and mulch as much as possible to increase the ability of the moku to retain moisture.
- HIMB will implement plant communities such as the Stormwater Filtration and Marine Wetlands to filter and retain the moku's fresh water.

Ka-lewa-lani (Air and Atmosphere):
HIMB is committed to the physical and acoustic integrity of the air around and the atmosphere above Moku o Loʻe.

Recommendations:
- HIMB will aspire to carbon positivity (i.e., sequestration > emissions) by reducing its carbon emissions and maximize its carbon sequestration to the maximum extent practicable.
- HIMB will continue to work with Marine Corps Base Hawai‘i to reduce and minimize the noise pollution of its military activities.

Kānaka Hōnua (Sustainability):
HIMB is committed to the wellness of its faculty, staff, and students, as well as its visitors. This includes maintaining the sense that Moku o Lo‘e is a Hawaiian Place that exists within and is a part of the ahupua‘a of He‘eia, and ensuring all basic human needs can be met by people while on-island.

Recommendations:
- The carrying capacity of the moku will be determined considering the limitations of our transportation, water, sewage, and electrical infrastructure; and HIMB will manage research, education, and visitor programs within that context.
- HIMB will implement and maintain edible landscapes such as the Food Forest to help generate food to support the HIMB population and visitors on Moku o Lo‘e.
- Future renovations and development will prioritize energy efficiency and the use of sustainable materials and building systems.
- The biocultural stewardship of the moku’s landscape will be designed to increase the connectivity of people to Place. This includes planting edible landscapes (e.g., Food Forest), as well as lei- and other culturally-significant plants to the maximum extent practicable.
- HIMB is committed to implementing programs and designating spaces for arts and cultural practices on Moku o Lo‘e. Establishing an “artist-in-residence” and/or a “Cultural Practitioner-in-Residence” are examples of such programs outlined in the Mālama ‘Āina Plan.
- Efforts to integrate research, education, and culturally-focused programmatic initiatives will be consistently supported by HIMB.

Papahelolona (Indigenous Knowledge Systems):
HIMB, in alignment with UH Mānoa’s Strategic Plan, is committed to becoming a “Native Hawaiian Place of Learning.”

Recommendations:
- HIMB will support its Native Hawaiian students in deepening their connection with and understanding of their ancestral knowledge systems while being trained in conventional science, and support all students in becoming weavers of knowledge.
- HIMB will support the desires of its faculty, staff, and students to understand and know more about Native Hawaiian perspectives and lifeways.
- HIMB will work with the Kūpuna Council of the He‘eia NERR to determine HIMB’s role in supporting the restoration of Indigenous Knowledge Systems within the ahupua‘a of He‘eia, and the moku of Ko‘olaupoko.
- HIMB will designate and maintain cultural spaces on-island where Indigenous Knowledge can be transferred between the generations in manners that are consistent with Indigenous lifeways.

Ke ‘ihi‘ihi (The Spirit of the Land):
HIMB is committed to maintaining the features of the island that have been identified by the kūpuna as sacred, as well as cultural access pathways that needed to be maintained.

Recommendations:

- The integrity of the summit on the moku – known as the Puʻu – will be maintained, and the invasive vegetation on it cleared such that visual connectivity between that point and other prominent points in both the ahupuaʻa and the moku can be restored.
- The iwi kūpuna should be cared for. Rubbish, green waste, and equipment should be relocated to maintain a reverent, sacred space.
- Open spaces will be maintained for cultural practices (e.g., hula, makahiki ceremony and games, etc.) that are needed to honor the spirit of Place.
- Access from the open cultural spaces to the ocean will be maintained such that practices of hiʻuwai, pīkai, and others can be done as needed.

Future planning, programming, and activities will be done within the framework above. Ideas regarding solutions to problems should be weighed in light of these eight considerations. In order to fulfill the commitments, **it is an overarching recommendation of this Mālama ʻĀina Plan that a new faculty committee within HIMB be created to ensure that these intentions are met.** It would be the purview of this committee to ensure that the recommendations above are followed, or adjusted as needed as circumstances evolve in the future. Additionally, this Plan recommends the establishment of Campus Architect and Landscape Architect positions for HIMB and Moku o Loʻe. These two positions, as well as additional Building and Grounds staff, would ensure a coordinated implementation of the Mālama ʻĀina Plan over time and the continued maintenance of the moku.

Moku o Lo‘e in 1914

Photo Credit: Mid-Pacific Magazine

APPENDIX A: STORYMAP WEBSITE

The Story Map of the Mālama ʻĀina Plan serves as a repository for the project. It provides the project context, its goals, process, and outcomes in a format that can be easily accessed and disseminated. In the map, spatial data is supported by research, including archival photos, offering a compelling way to communicate information and engage audiences.

The website can be accessed via this link.

◀ *HIMB Coral Nursery*
Photo Credit: UHCDC

APPENDIX B: WORKSHOP PARTICIPANTS

Workshop 01 Listen + Learn
October 06, 2023:
Ocean Biome + Shoreline Ecotone

Megan Donahue	Interim Director, HIMB
Sarah Chang	CZM Project Analyst, Office of Planning & Sustainable Development
Dianna Miller-Greene	Lab Supervisor, HIMB
Michael Rappe	Faculty, HIMB
Amelia Meier	Post-doctoral Researcher, HIMB
Robert Toonen	Faculty, HIMB
Kerri Luttrell	Student, HIMB
Mahealani Cypher	Kūpuna Council, NERR
Ku‘ulei Rodgers	Faculty, HIMB
Oceana Francis	Faculty, Civil, Environmental and Construction Engineering
Keli'i Kotubetey	Founder, Assistant Executive Director, Paepae o Heʻeia
Rocky Kaluhiwa	Kūpuna Council, NERR
Joshua Madin	Faculty, HIMB
Kawika Winter	Reserve Director, NERR
Casey Ching	Coastal Training Program Coordinator, NERR

October 06, 2023:
Cultural & Transit Access

Gagandeep Lally	Student, HIMB
Andrew Brown	Staff, HIMB
Robert Toonen	Faculty, HIMB
Hayley Luke	Staff, Post-Doc, Coastal

	Resilience Lab, HIMB
Christine Ambrosino	Staff, REMS, HIMB
Punihei Lipe	Native Hawaiian Affairs Program Officer, UH Mānoa
Malia Rivera	Faculty, HIMB
Makena Coffman	Director, Institute for Sustainability & Resilience
Rocky Kaluhiwa	Kūpuna Council, NERR
Mahealani Cypher	Kūpuna Council, NERR
Casey Ching	Coastal Training Program Coordinator, NERR
Megan Donahue	Interim Director, HIMB

October 13, 2023:
Terrestrial Biome, Freshwater Resources, Atmosphere

Emily Conklin	Student, HIMB
Daniel Schar	Assistant Specialist, HIMB
Mahi Kaluhiwa	Staff, HIMB
Edgar Javier	Staff, HIMB
Mahealani Cypher	Kūpuna Council, NERR
James 'Gus' Robertson	Staff, HIMB
Kim Falinski	Coastal Scientist, The Nature Conservancy
Van Wishingrad	Faculty, HIMB
Samuel Hendersen	Staff, HIMB
Kerri Lutrell	Student, HIMB
Kawika Winter	Reserve Director, NERR
Megan Donahue	Interim Director, HIMB
Casey Ching	Coastal Training Program Coordinator, NERR

October 13, 2023:
Indigenous Knowledge & Spirit of Place

Mahealani Cypher	Kūpuna Council, NERR
Rocky Kaluhiwa	Kūpuna Council, NERR
Herb Lee Jr.	CEO, Pacific America Foundation
Hiʻilei Kawelo	Board President, KUA

Jacob Snyder	Student, HIMB
Shreya Yadav	Student, HIMB
Mindy Mizobe	Staff, HIMB
Maluhia Stark-Kinimaka	Student, HIMB
Rachel Dacks	Faculty, HIMB
Aimee Sato	Staff, NERR
Alii Miner	Kākoʻo ʻŌiwi
Robert Toonen	Faculty, HIMB
Samuel Henderson	Staff, HIMB
Punihei Lipe	Native Hawaiian Affairs Program Officer, UH Mānoa
Ziona Kawika Winter	Reserve Director, NERR
Megan Donahue	Interim Director, HIMB
Casey Ching	Coastal Training Program Coordinator, NERR

October 13, 2023:
Food & Landscape Aesthetics

Wally Ito	Project Coordinator, Ewa Limu Project, IndAquaculture
Miwa Tamanaha	Co-founder & Former Director, KUA
Lisa McManus	Faculty, HIMB
Kelsey Malery	Faculty, HIMB
Mindy Mizobe	Staff, HIMB
Robert Toonen	Faculty, HIMB
Mahi Kaluhiwa	Staff, HIMB
James 'Gus' Robertson	Staff, HIMB
Ariel Dungca	Landscape Architect/Research Associate, UHCDC
Kawika Winter	Reserve Director, NERR
Megan Donahue	Interim Director, HIMB
Casey Ching	Coastal Training Program Coordinator, NERR

November 3, 2023:
Waste, Water, Seawater, & Energy

Jon Hosaka	Project Manager, USACE

Lauren Van Heukelem	Faculty, HIMB
Scott Sullivan	Vice President, Sea Engineering
Andrew Brown	Staff, HIMB
Malia Rivera & Taiatea	Faculty, HIMB
Daniel Schar	Assistant Specialist, HIMB
Yoshimi Rii	Research Coordinator, NERR
Frederick Reppun	Education Coordinator, NERR
Mindy Mizobe	Staff, HIMB
Kim Falinski	Coastal Scientist, The Nature Conservancy
Kira Hughes	Managing Director, Coral Resilience Lab, HIMB
Kawika Winter	Reserve Director, NERR
Megan Donahue	Interim Director, HIMB
Casey Ching	Coastal Training Program Coordinator, NERR

Workshop 02 Co-Design
December 01, 2023
(Open to the HIMB community, drop-in)

Meredith Pfennig
Kaleonani Hurley
Robert Toonen
Erik Franklin
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Kelsey Maloney
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Cameron Angulo
Kim Falinski
Kawika Winter
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APPENDIX C: CONCEPTUAL COST ESTIMATE

◀ *Tiger shark at HIMB Shark Pen*

Photo Credit: UHCDC

◀ ARCH 696 Students on a field visit to Moku o Loʻe with Dr. Kawika Winter and Kelsey Maloney; here Dr. Winter explains some of the important features of the Puʻu test site

Photo Credit: Phoebe White

APPENDIX D: ARCH 696 COURSEWORK

In the Spring of 2024, Assistant Professor Phoebe White from the UHCDC team taught a graduate elective in the UHM School of Architecture titled ‘Cultivating the Coast.’ In the course students explored how to design biocultural test gardens that implemented some of the design guidelines and eight considerations of pono stewardship outlined in the Mālama ʻĀina Plan.

The 10 enrolled students were split into three groups to develop their projects. Each group was assigned a plant community and test site on Moku o Loʻe. The plant communities included: Food Forest + Biocultural Aesthetics, Coastal Strand + Coastal Mesic Forest and Coastal Strand + Marine Wetland. The test sites included the entrance to what will become the Foraging Loop south of the Lānai Suites, the Northern Spit, and the Puʻu.

Students were encouraged to consider the biocultural and ecological functions of their test gardens, how these functions change over time, and how stewardship opportunities can be integrated into design. The coursework included in this appendix is a collection of the final project booklets submitted by each group.

◄ *Moku o Loʻe in 1947; remnant niu grove is visible on the western shore*

Photo Credit: Los Angeles AP News

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