



GLACIER

IPEK DUZOVA GRADUATION PROJECT | SPRING 2021

CONTENTS

A futuristic architectural rendering of a building complex. The building features a prominent, glowing green aurora borealis in the night sky. The architecture is modern and angular, with a large, illuminated, geometric structure that resembles a dome or a large, open-air pavilion. The building is situated on a grassy area next to a body of water, which reflects the lights from the building and the aurora. The overall scene is set against a dark, starry night sky.

I CONTEXT

II LITERATURE REVIEW

III CASE STUDIES

IV THE DESIGN

CONTEXT

I

- ICELAND
- REYKJAVIK
- URBAN PROPOSAL



ICELAND

Iceland is a Nordic island country located on the North Atlantic Ocean, just below the Arctic Circle. It is becoming a very popular destination for tourists mainly because of its beautiful natural sceneries of volcanoes, waterfalls, mountains, geothermal lakes, etc., and its rich marine biodiversity. It is also possible to see the northern lights from Iceland, which is another feature affecting Iceland's increasing popularity.

Until the COVID-19 outbreak, tourism was booming in Iceland, which has the potential to become a dangerous situation. Since Iceland is attractive to tourists mostly because of its nature, designing and implementing a sustainable tourism mechanism is crucial, which this project aims to achieve.



natural landscapes



marine biodiversity



northern lights



ICELAND: WHALE-HUNTING

This project was initially influenced by the whale-hunting situation in Iceland. Since whales are **critically endangered animals** having important roles especially for maintaining marine ecosystems, most countries have banned commercial whale-hunting, though three countries are currently continuing such practices, which are **Japan, Norway, and Iceland**.

However, it has been recently realized that **“whale tourism”** (i.e. people coming from all around the world for whale-watching) contributes to the Icelandic economy much more than “whale-hunting”. Therefore, aiming to design a research and education center to protect the marine life and natural heritage of Iceland by increasing awareness regarding endangered and vulnerable species such as the Blue Whale, Fin Whale, Minke Whale, Humpback Whale, Tiger Shark etc. was the starting point of my design process.



Forbes

EDITORS' PICK | May 10, 2020, 12:49pm EDT | 12,161 views

Iceland To Stop Killing Whales In 2020, Choosing To Watch Them Instead



Commercial whaling may be over in Iceland

Citing the pandemic, whale watching, and a lack of exports, one of the three largest whaling countries may be calling it quits.



ICELAND: ENVIRONMENTAL PROBLEMS



Iceland Is Growing New Forests for the First Time in 1,000 Years

deforestation

erosion

loss of vegetation

draining of wetlands

“Exotic species such as Siberian larch cannot tolerate the consistently warmer climate as a result of climate change.”

The New York Times

CLIMATE

Vikings Razed the Forests. Can Iceland Regrow Them?

The country lost most of its trees long ago. Despite years of replanting, it isn't making much progress.

By HENRY FOUNTAIN Photographs and video by JOSH HANER
OCT. 20, 2017

“Iceland became among the worst examples in the world of deforestation.”

(from 35% of land area covered with forests to 1%)

“Iceland's native tree species, **Birch, Aspen and Rowan**, are now unsuitable for withstanding the ever-warming climate of Iceland.”

Why Iceland is filling in ditches

21.11.2018 - 13:57 English

In the drive for dry land, Iceland lost some 90 percent of its wetlands, which is bad not only for the climate, but also for birds, insects, and plant life. As most of this new dry land is not actively used by farmers today, it is possible to fill in the ditches and allow water to rise again.



ICELAND: CLIMATIC PROBLEMS

ICELAND
REVIEW

News

Magazine

Features +

wind

harsh climate (esp. in winters)

low daylight availability (in winters)

Icelanders More Depressed Than Rest of Europe

Iceland Review

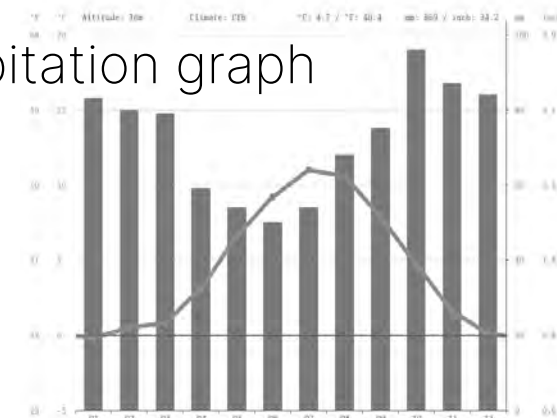
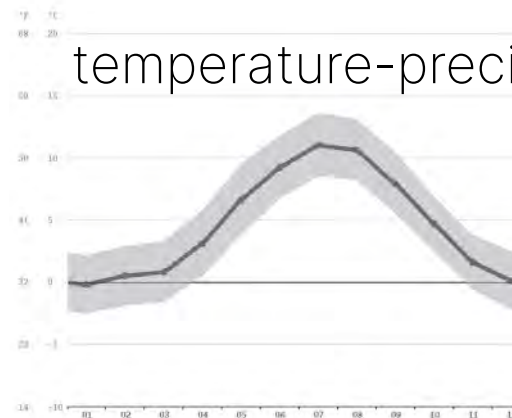
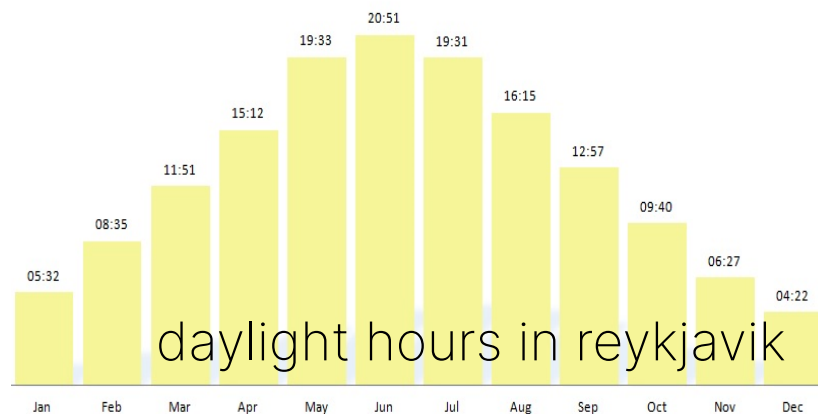
September 14, 2017

x News

Despite the fact that poverty in Iceland is generally low and the income and employment rates of Icelanders are very high, according to 2017 data, **world's highest rate of anti-depressant consumption** is in Iceland, and Seasonal Affective Disorder (SAD) is also quite common. This is often linked to the cold climatic conditions of Iceland and low daylight availability in winters (Reykjavik receives only 4 hours of daylight on December 21) which makes it difficult for Icelanders to enjoy spending time outdoors.

The sea around Iceland does not freeze because of the **warm ocean currents** coming from the Atlantic Ocean including the **Gulf Stream**.

Temperatures are generally higher when compared to any other place in the world on the same latitude.



REYKJAVIK: URBAN ISSUES

“too many cars for a very small population”

👤 population of iceland: 356.991 (2019)
🚗 number of registered vehicles: 314.806 (2019)

“isolated lifestyle”

“low density settlements”

“lack of public transportation”

“car dependency”

“parking areas”

“urban sprawl” | “heavy infrastructure”



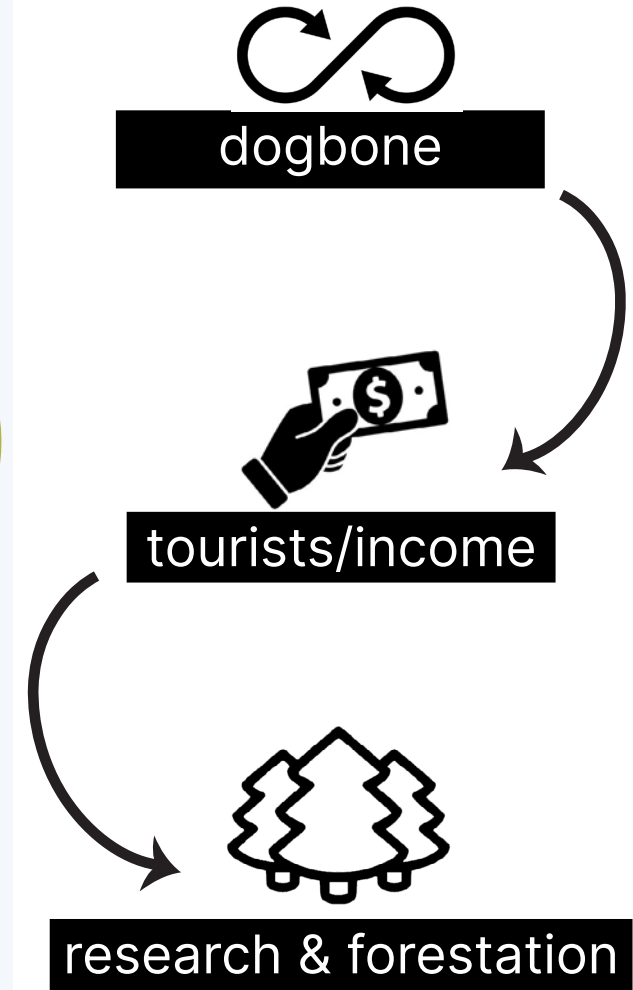
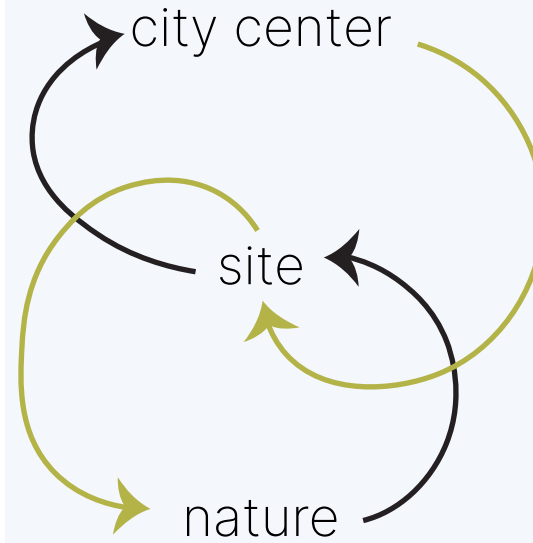


REYKJAVIK: DOGBONE CONCEPT

- 1 Downtown Reykjavik
- 2 Project Site
- 3 Mountain/River Ecosystem

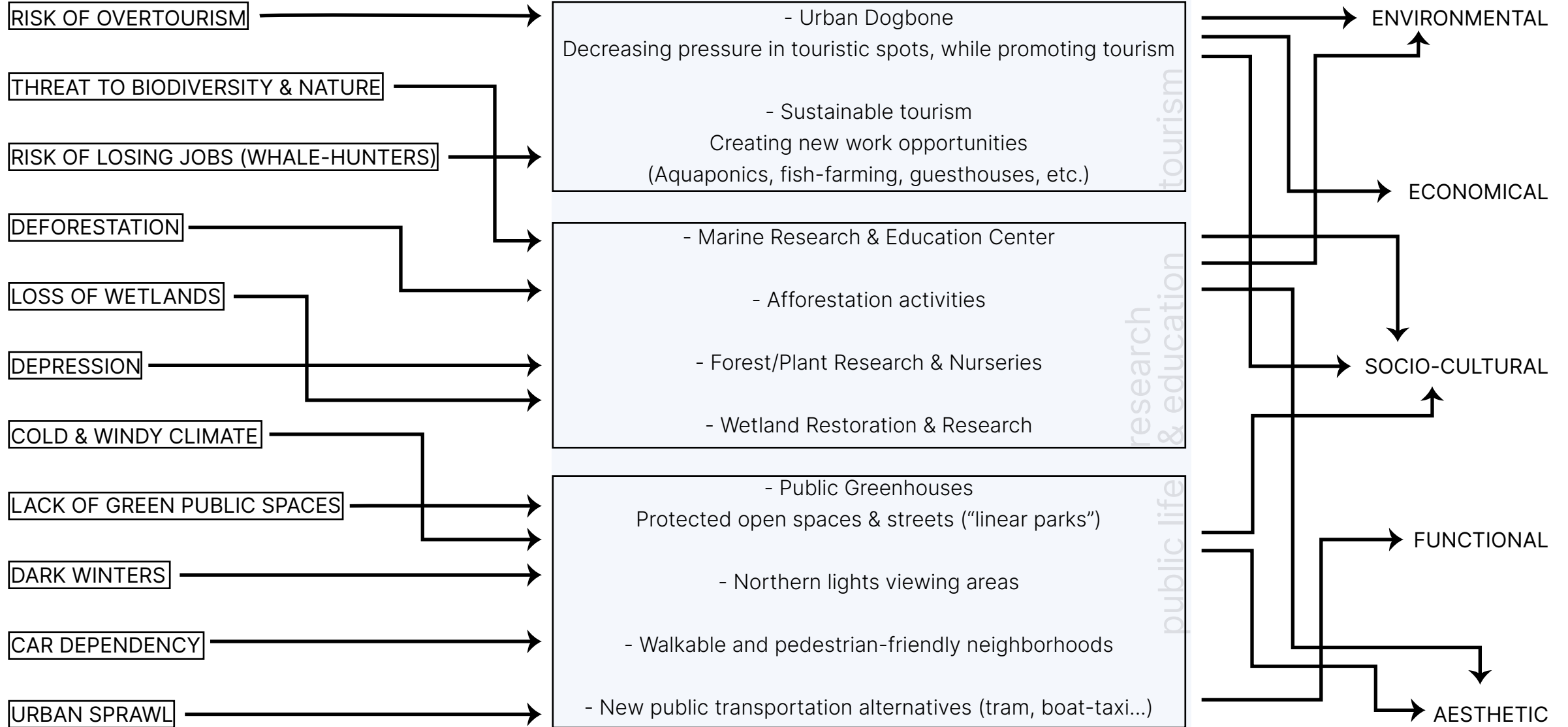


Connecting touristic spots in a walkable way
Distributing stress





PROPOSAL OVERVIEW



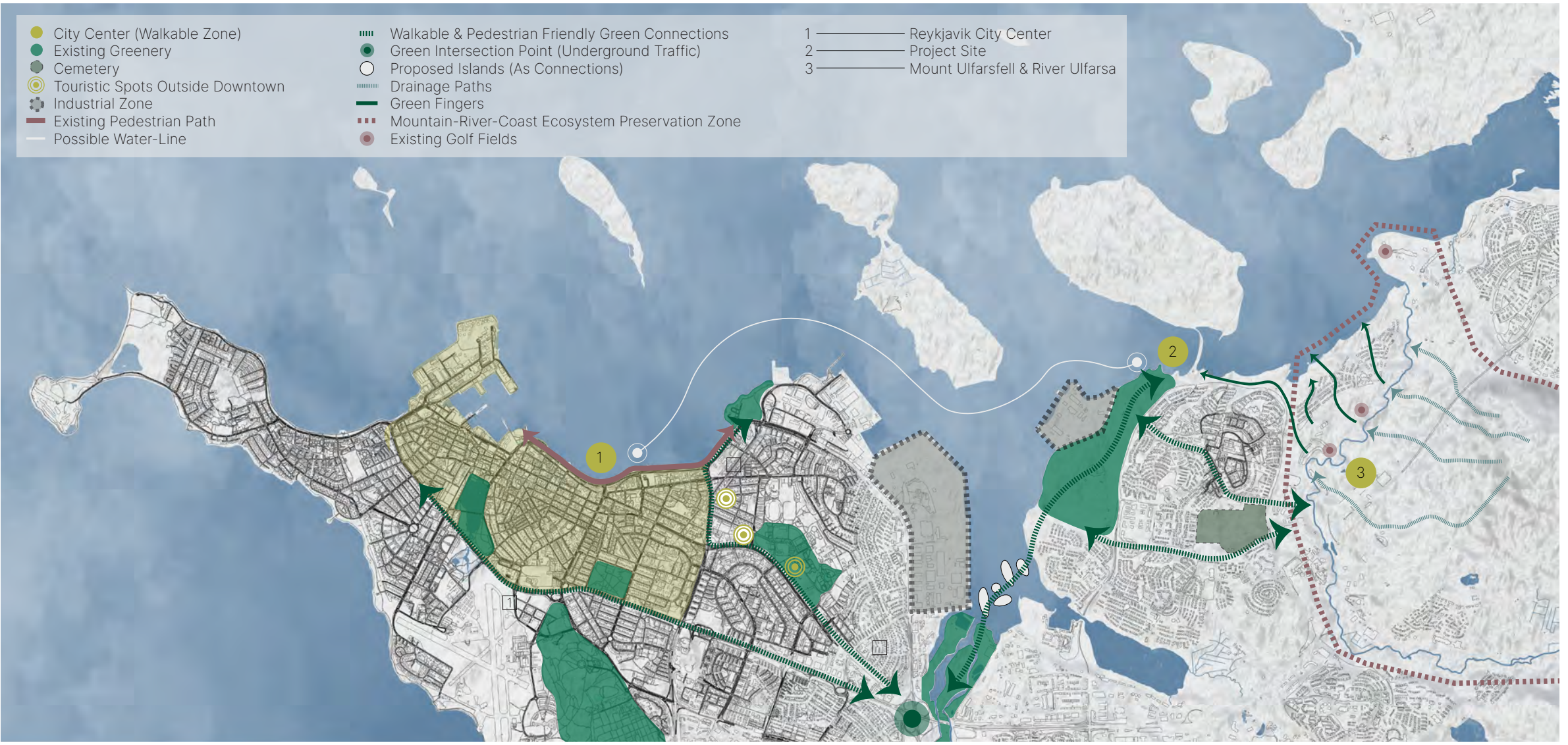


CITY SCALE

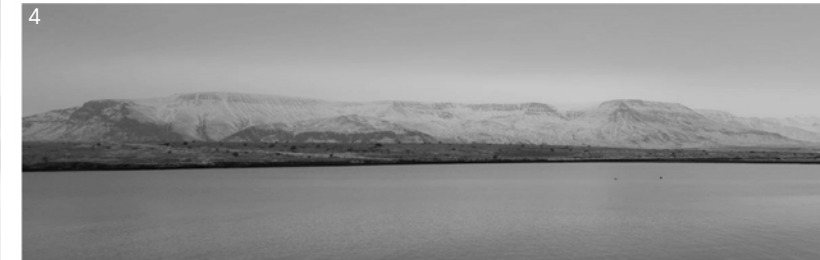
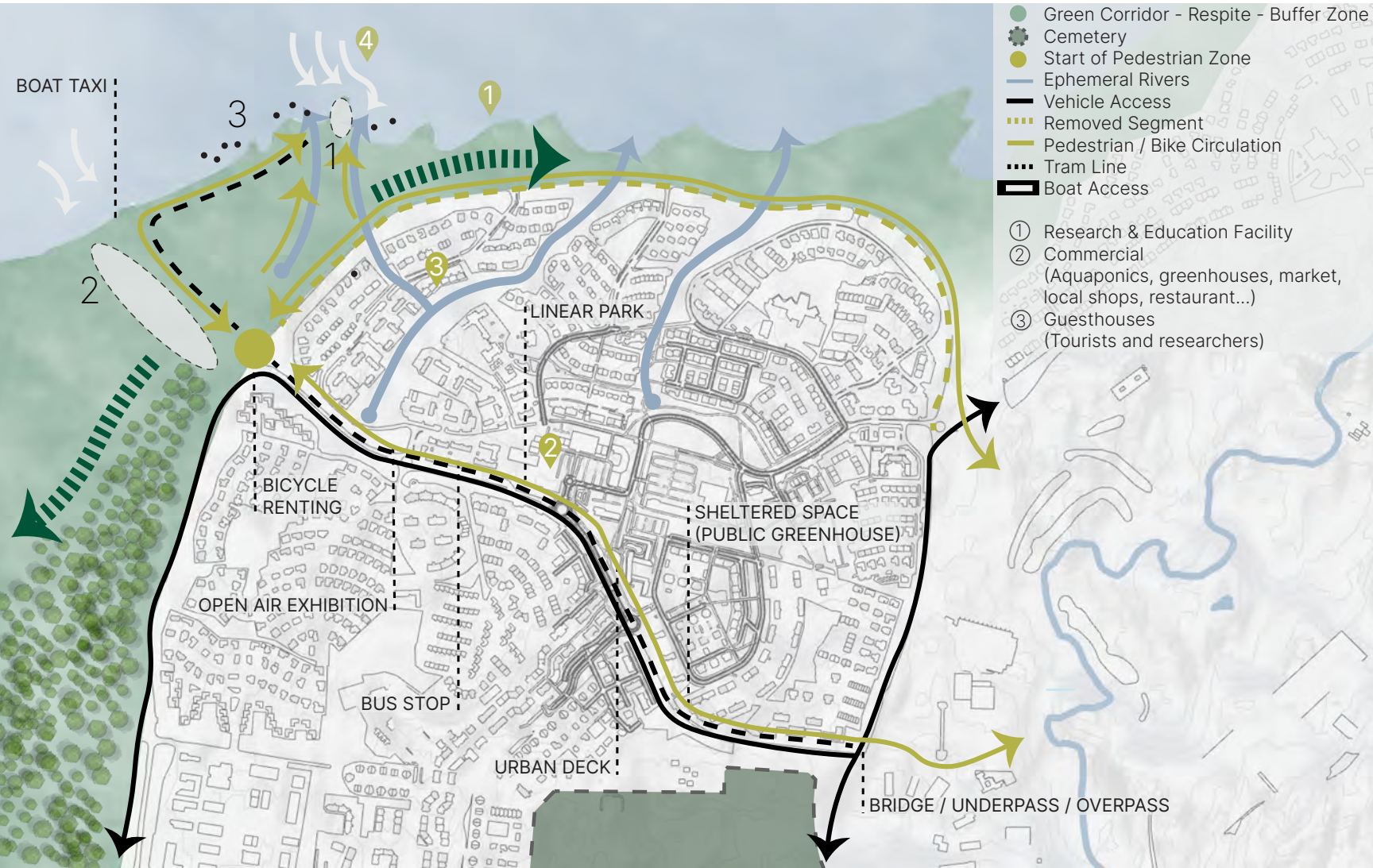
- City Center (Walkable Zone)
- Existing Greenery
- Cemetery
- Touristic Spots Outside Downtown
- ⊕ Industrial Zone
- Existing Pedestrian Path
- Possible Water-Line

- ▤ Walkable & Pedestrian Friendly Green Connections
- Green Intersection Point (Underground Traffic)
- Proposed Islands (As Connections)
- ▤ Drainage Paths
- Green Fingers
- ▤ Mountain-River-Coast Ecosystem Preservation Zone
- Existing Golf Fields

- 1 — Reykjavik City Center
- 2 — Project Site
- 3 — Mount Ulfarsfell & River Ulfarsa



NEIGHBORHOOD SCALE



LITERATURE REVIEW



- SMART GROWTH
- SUSTAINABLE TOURISM
- ICE PROTECTION SYSTEMS

SMART GROWTH

create walkable neighborhoods

“Walkable communities are desirable places to live, work, learn, worship and play, and therefore a key component of smart growth. Walkable communities make pedestrian activity possible, thus expanding transportation options, and creating a streetscape that better serves a range of users -- pedestrians, bicyclists, transit-riders, and automobiles. To foster walkability, communities must ensure safe and inviting pedestrian corridors where the streets and sidewalks balance all forms of transportation.

Many communities -- particularly those that are dispersed and largely auto-dependent -- employ street and development design practices that reduce pedestrian activity (i.e. Reykjavik). However, the personal and societal benefits of pedestrian friendly communities are becoming realized – benefits which include lower transportation costs, greater social interaction, improved personal and environmental health.”

preserve open space

“Smart growth uses the term “open space” broadly to mean natural areas that provide important community space, habitat for plants and animals, recreational opportunities, places of natural beauty and critical environmental areas (e.g. wetlands). Open space preservation supports smart growth goals by bolstering local economies. The availability of open space also provides significant environmental quality and health benefits. Preservation of open space benefits the environment by combating air pollution, attenuating noise, controlling wind, providing erosion control, and moderating temperatures.”

communities with a strong sense of place

“Smart growth seeks to create interesting, unique communities which reflect the values and cultures of the people who reside there, supporting a more cohesive community fabric.

By creating high-quality communities with architectural and natural elements that reflect the interests of all residents, there is a greater likelihood that buildings (and therefore entire neighborhoods) will retain their economic vitality and value over time. In so doing, the infrastructure and natural resources used to create these areas will provide residents with a distinctive and beautiful place that they can call “home” for generations to come.”

3rd street promenade, los angeles



olympic sculpture museum, seattle



SUSTAINABLE TOURISM

“Sustainable tourism refers to the environmental, economic, and socio-cultural aspects of tourism development, and a suitable **balance** must be established between these three dimensions to guarantee its long-term sustainability. It is a **continuous process**, involving the **participation of all stakeholders**. Sustainable tourism development guidelines and management practices are applicable to all forms of tourism in all types of destinations.”

principle #1: environmental sustainability

“Make optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity.”

principle #2: socio-cultural sustainability

“Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance.”

principle #3: economic sustainability

“Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, social services to host communities, and contributing to poverty alleviation.”

Reference: UN World Tourism Organization.

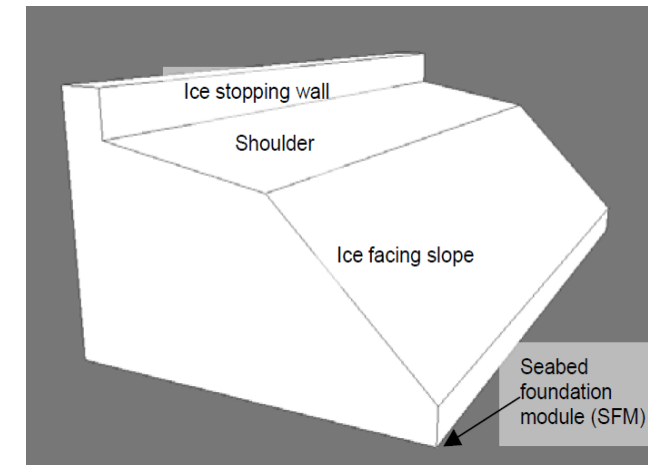
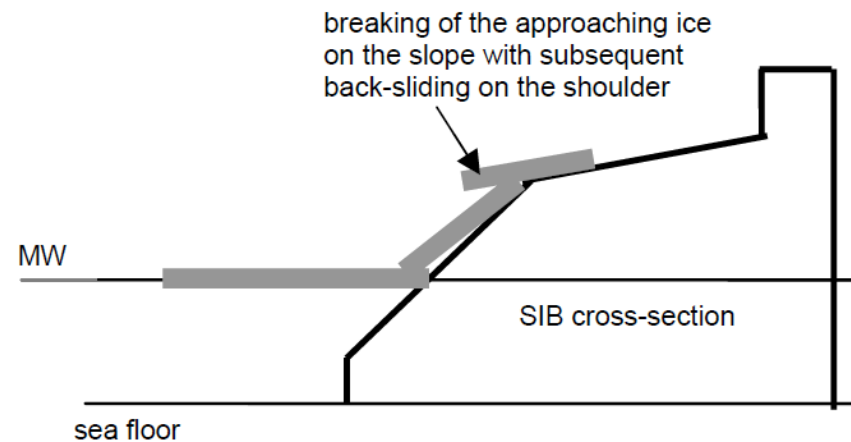
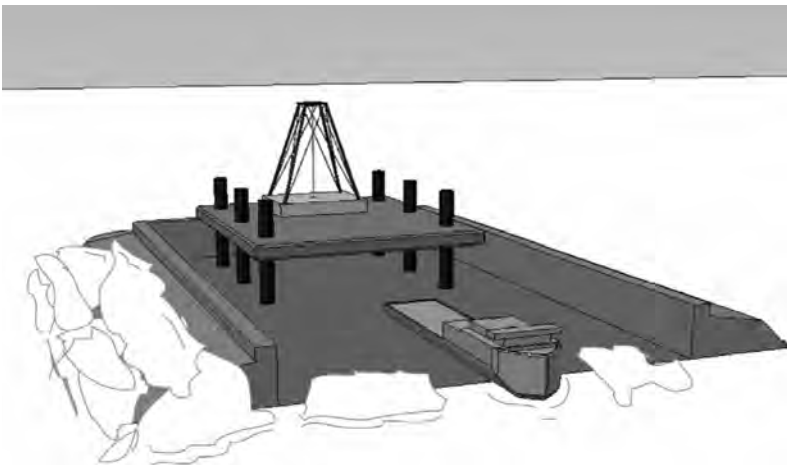
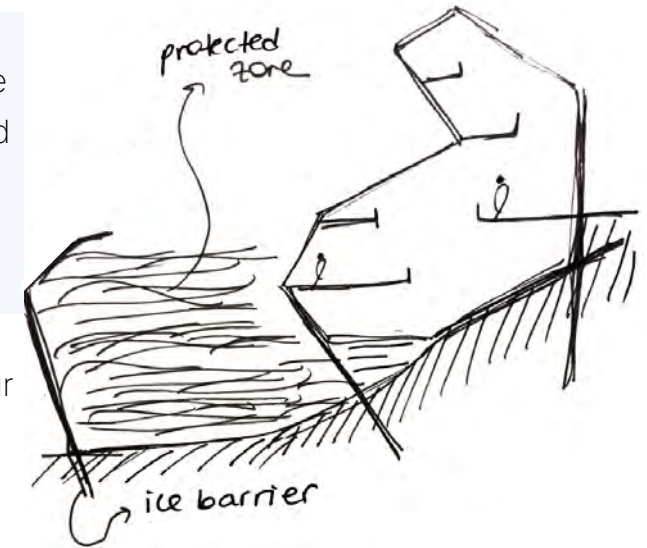
<https://www.unwto.org/sustainable-development>



ICE PROTECTION SYSTEMS

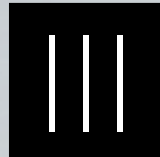
The Caspian Sea is a location where the climate changes drastically throughout the year. During the winter, it is possible to encounter ice formations on the sea which makes it difficult for the oil drilling activities (currently taking place on the Caspian) to continue safely. In order to solve this problem, Shoulder Ice Barriers (SIBs) are temporarily installed surrounding the oil-drilling structure. These barriers' function is to break the ice when it hits the SIB. If the ice pieces are not sufficiently broken, the SIB prevents the ice from reaching the structure through causing it to back-slide through friction.

Even though the sea bordering Reykjavik does not freeze because of warm ocean currents, such a problem can occur in the future, due to global warming, and icebergs freely floating along the ocean. Therefore, this solution can be applied if necessary, to prevent ice hitting the building by creating a safe zone between the building and the barrier.



Reference: Gudmestad & Løset, Innovative Ice Protection for Shallow Water Drilling.

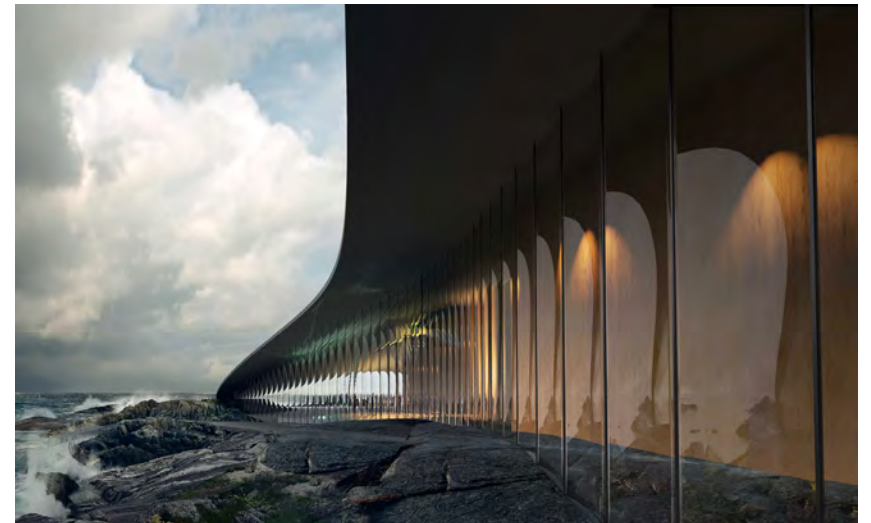
CASE STUDIES



- THE WHALE - DORTE MANDRUP
- MALMÖ CONCERT HALL & CONFERENCE CENTER - SNOHETTA
- HARPA REYKJAVIK - HENNING LARSEN
- "THE TWIST" - BIG
- MEDIA COMPLEX - STUDIO CAAT
- KEW GARDENS PRINCESS OF WALES CONSERVATORY - GORDON WILSON



THE WHALE NORWAY



ARCHITECT Dorte Mandrup Arkitekter A / S

LOCATION Andenes, Norway

YEAR Competition won in 2019

TYPE Culture & Landmark

Located in one of the best places in the world for whale-watching, “The Whale” designed by Denmark based architectural design office Dorte Mandrup, is the winner of a competition. The integration of the building with the rocky landscape, how the building is emerging from the ground like the Earth’s crust lifting off and creating a cavity could be stated as the most distinctive and inspiring features of the design.



MALMÖ CONCERT HALL & CONFERENCE CENTER



ARCHITECT	Snohetta
LOCATION	Malmö, Sweden
YEAR	2010 Competition Proposal
TYPE	Public Space, Landscape, Performance Space

Designed for the City of Malmö and among the finalists of the competition, the transition from the building to the public space (and the juxtaposition between them) is worth investigating. Generous and protected public spaces equipped with multiple functions, inviting and publicly accessible facade are important features, considering the climatic conditions of Sweden.



HARPA REYKJAVIK

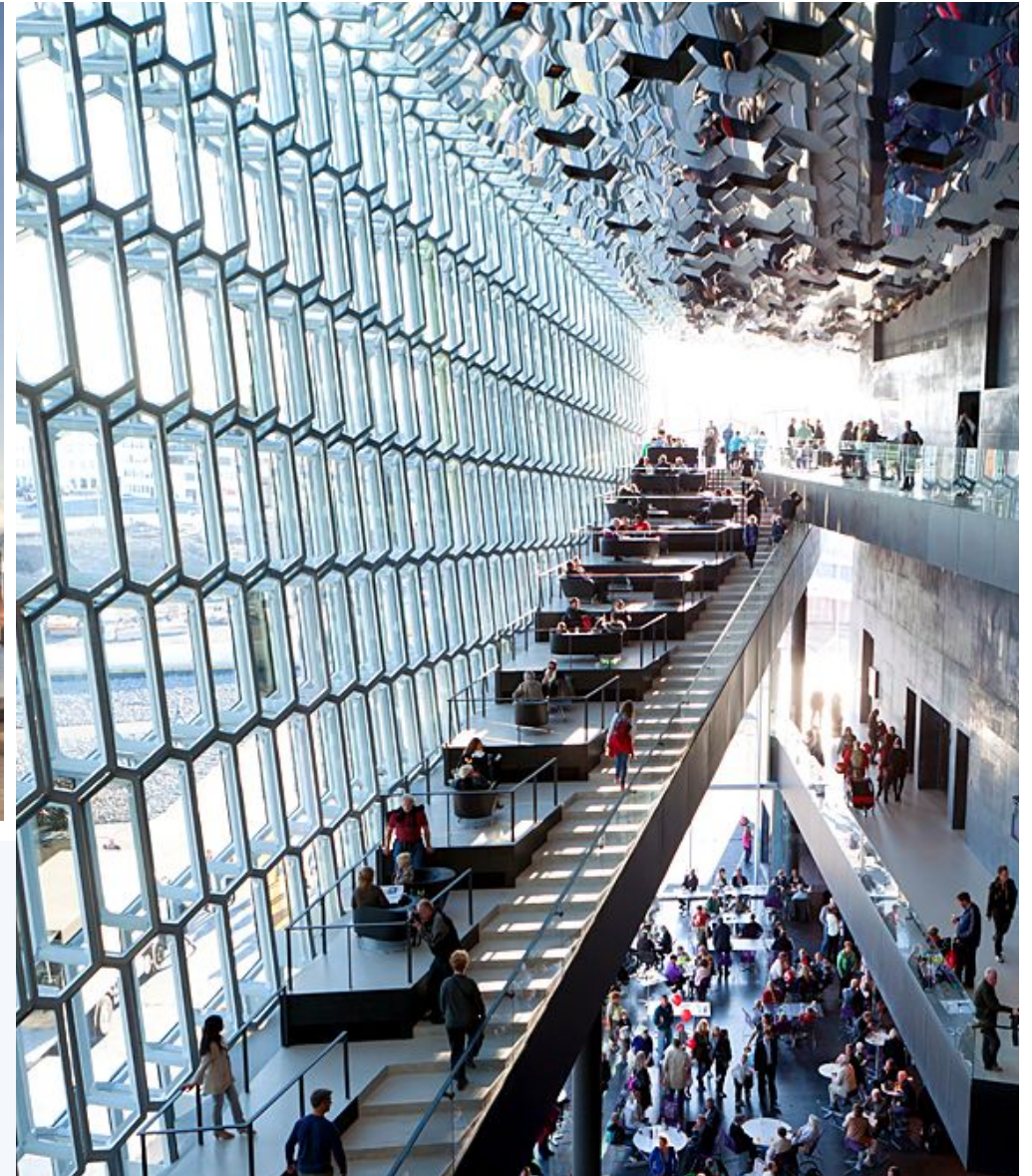


ARCHITECT: Henning Larsen

LOCATION: Reykjavik, Iceland

YEAR: 2011

Harpa Reykjavik Concert Hall & Conference Center has become an icon for Iceland, and a public space for the Icelanders. It is one of the most visited attractions in Iceland, hosting various events from yoga classes and playing children to international conferences and concerts. The building has won the Mies van der Rohe Award in 2013, and it was a particularly interesting case study to examine since it was also located in Reykjavik.





HARPA REYKJAVIK

QUASI-BRICK FACADE

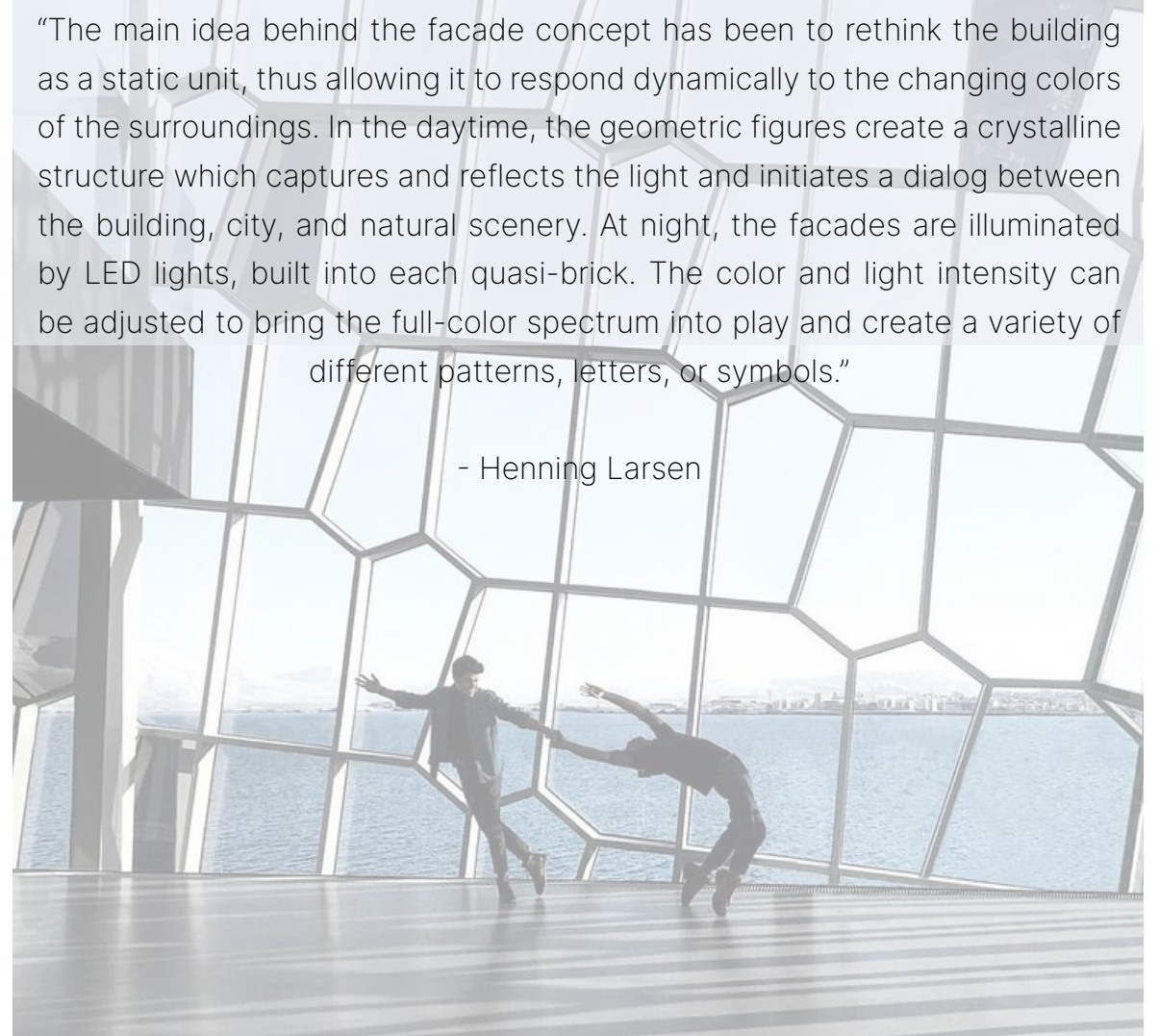


“Reminiscent of the crystalline basalt columns commonly found in Iceland, the geometric facades of Harpa are based on a modular, space-filling structure called the quasi brick. The quasi brick modules incorporate panes of colour-effect filter glass; the building shimmers, reacting to the weather, time of year or day, and the position and movements of viewers.”

- Olafur Eliasson and Studio Olafur Eliasson

“The main idea behind the facade concept has been to rethink the building as a static unit, thus allowing it to respond dynamically to the changing colors of the surroundings. In the daytime, the geometric figures create a crystalline structure which captures and reflects the light and initiates a dialog between the building, city, and natural scenery. At night, the facades are illuminated by LED lights, built into each quasi-brick. The color and light intensity can be adjusted to bring the full-color spectrum into play and create a variety of different patterns, letters, or symbols.”

- Henning Larsen





KISTEFOS MUSEUM (“THE TWIST”)



This project’s unique twisted geometry, interior perspectives and hallways, the glazing continuously spreading both to the side and to the roof of the building, and the steel frame gave me a lot of design ideas.

ARCHITECT: Bjarke Ingels Group (BIG)

LOCATION: Jevnaker, Norway

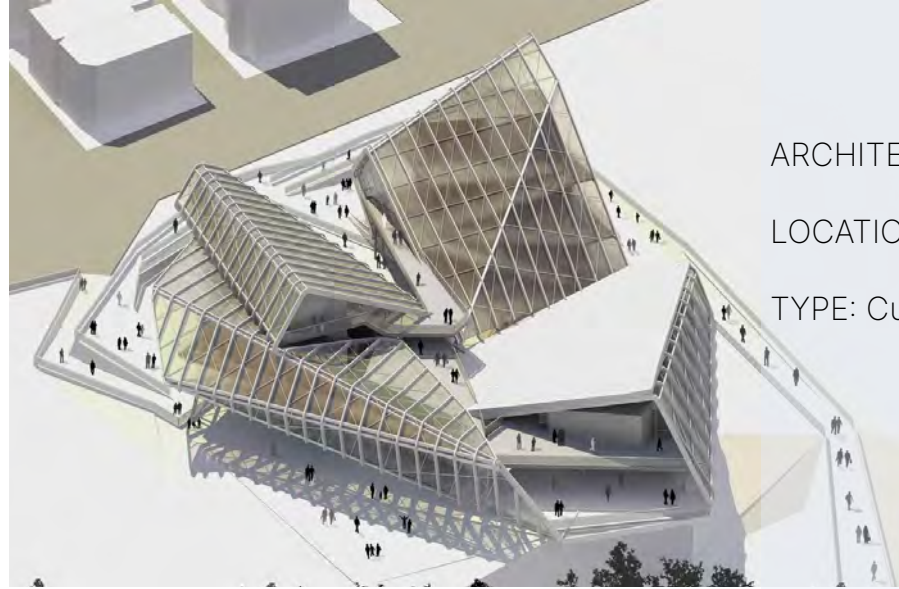
TYPE: Museum, Cultural

YEAR: 2019





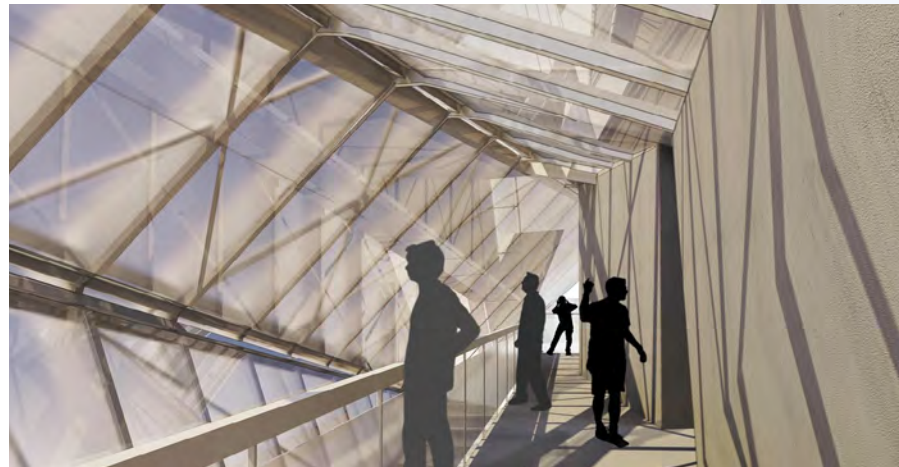
MEDIA COMPLEX



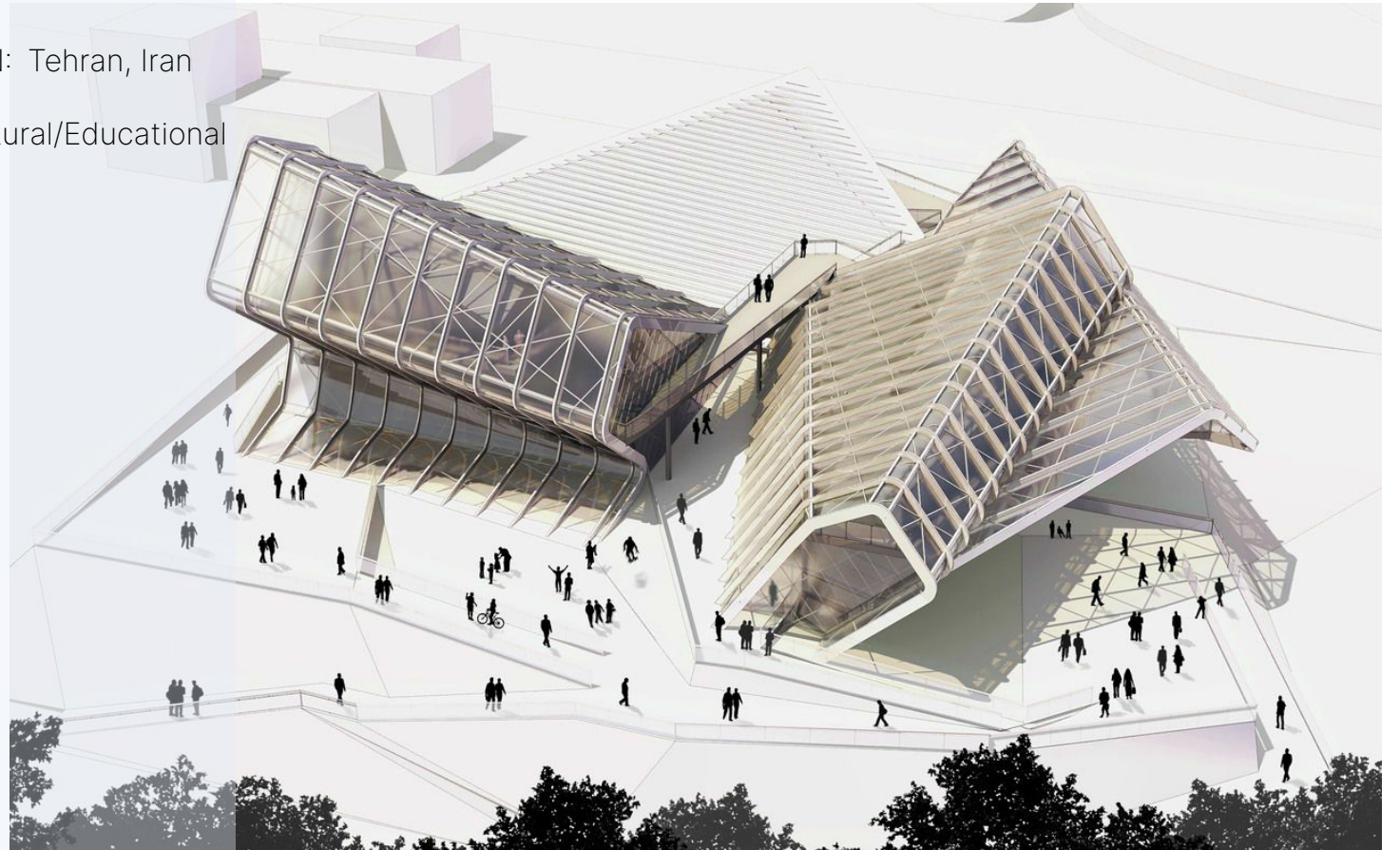
ARCHITECT: CAAT Studio

LOCATION: Tehran, Iran

TYPE: Cultural/Educational



This case study was relevant to investigate in terms of forms and structure. The folded geometries of the building, and the continuous structure wrapping around the design had influence on the development of my structural concept.



KEW GARDENS PRINCESS OF WALES CONSERVATORY



“The Princess of Wales Conservatory is equipped with multiple environmental strategies. There are 10 climatic zones in the conservatory, from the cool desert to the tropical mountain and rainforest. All zones are maintained by a computer which adjusts heat, ventilation and humidity automatically. Hot water pipes are used for heating, and the conservatory sits below ground to conserve heat while its specially designed stepped glass roof effectively collects solar energy. Three water tanks collect rainwater under the glasshouse, and all the water given to plants are purified by reverse osmosis.

Many level changes, glass partitions, and columns are present along the glasshouse, separating the biomes and creating space division.”



CONCEPT DEVELOPMENT ●

SITE PLAN ●

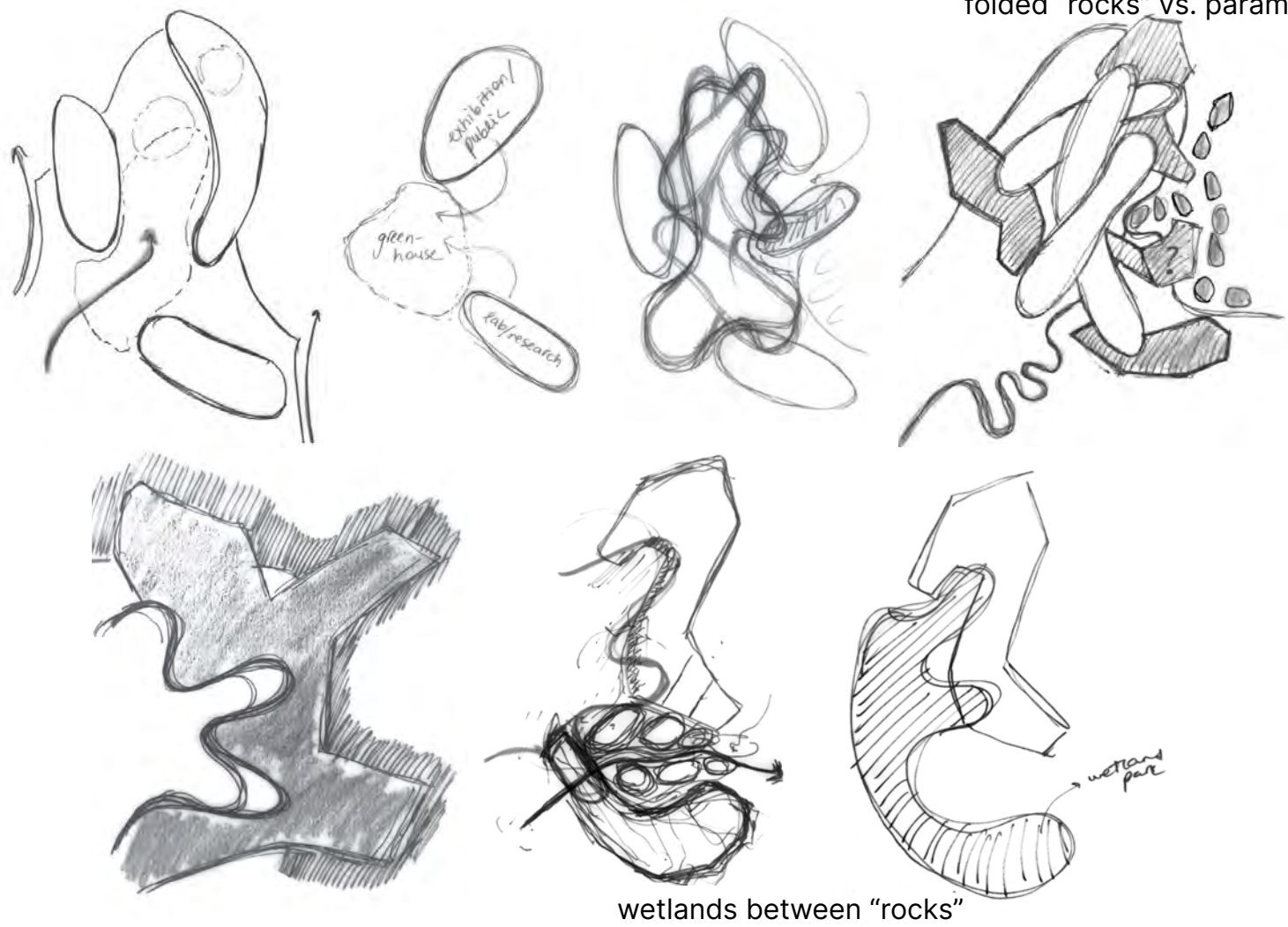
THE DESIGN

IV

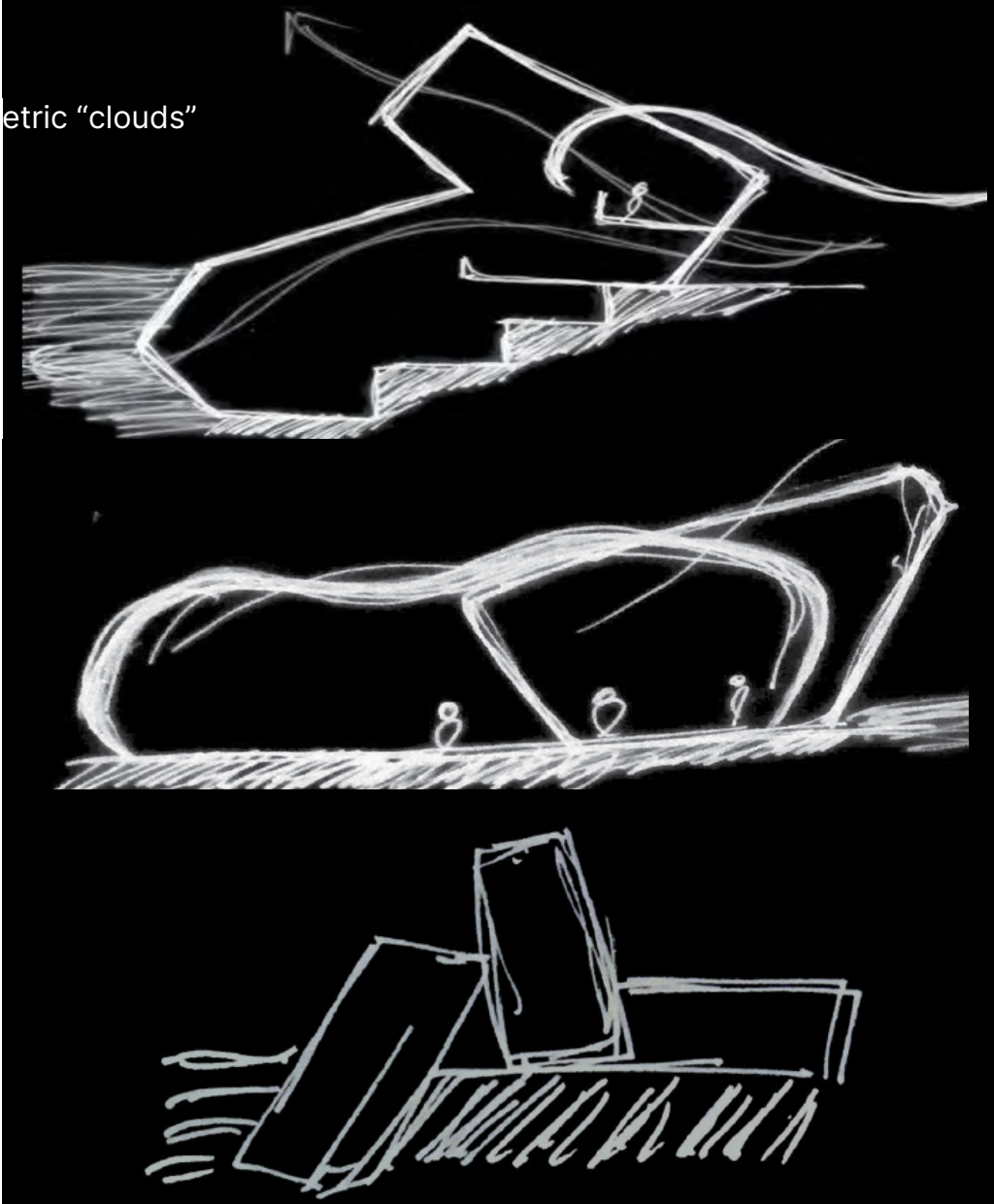
- FORM DEVELOPMENT
- STRUCTURAL ASSEMBLY
- FUNCTIONAL LAYOUT
- SECTIONS
- PERSPECTIVES



CONCEPT DEVELOPMENT

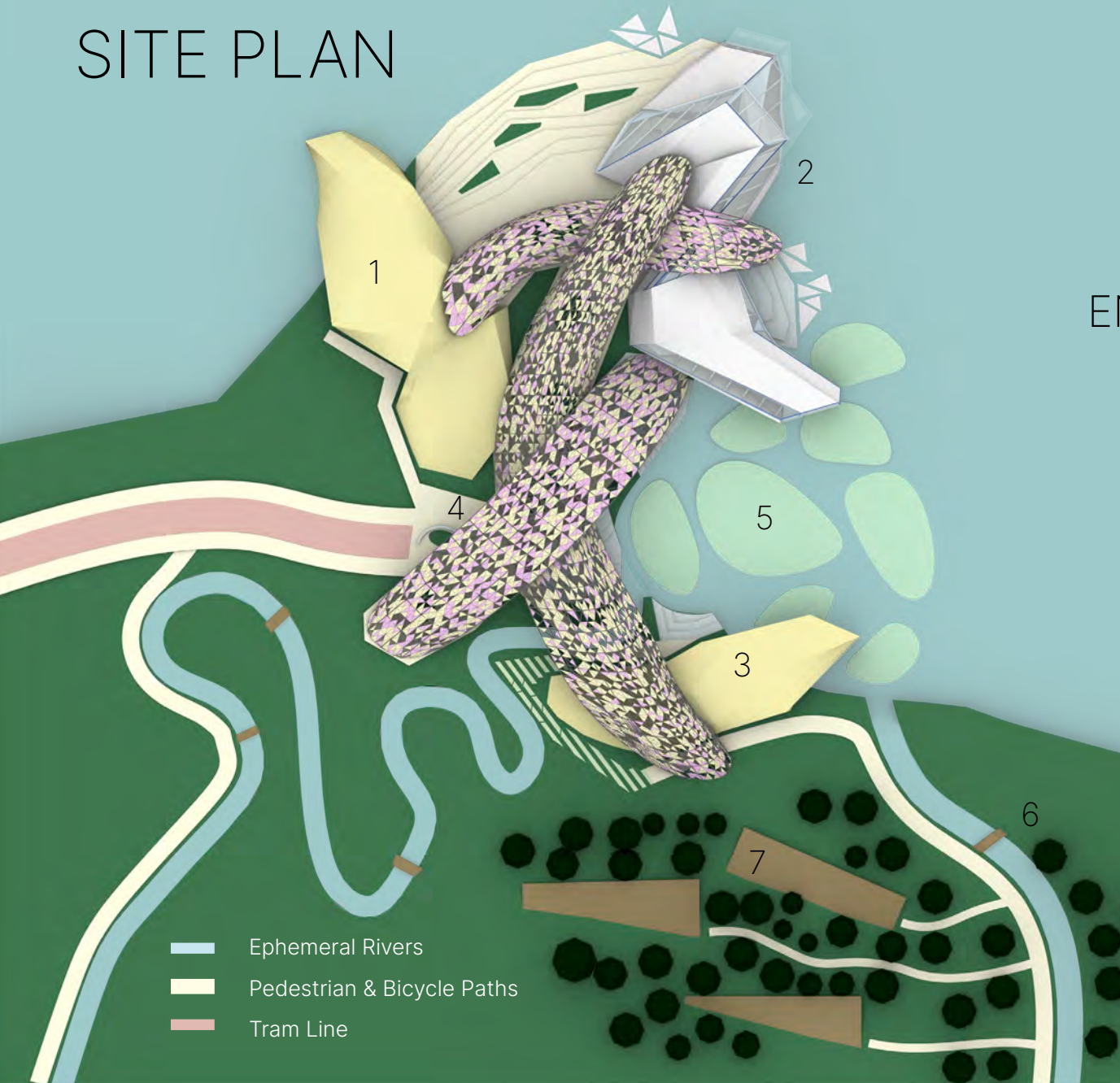





folded "rocks" vs. parametric "clouds"

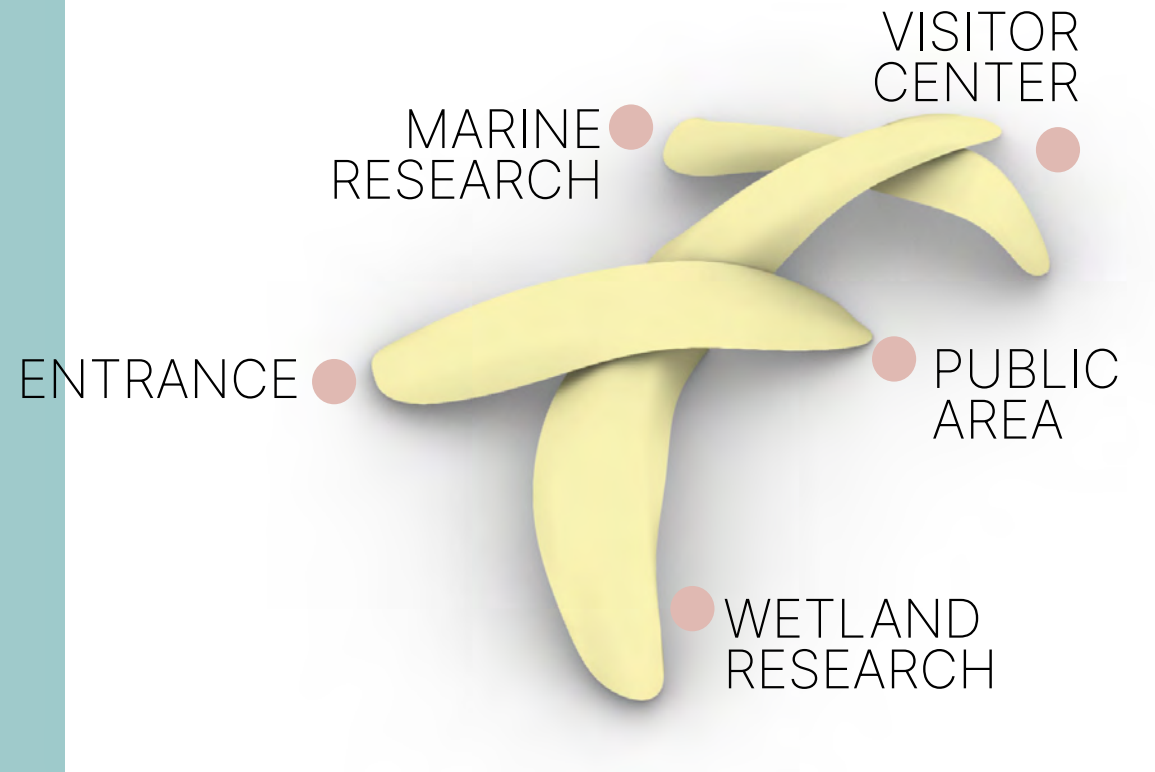


wetlands between "rocks"

SITE PLAN

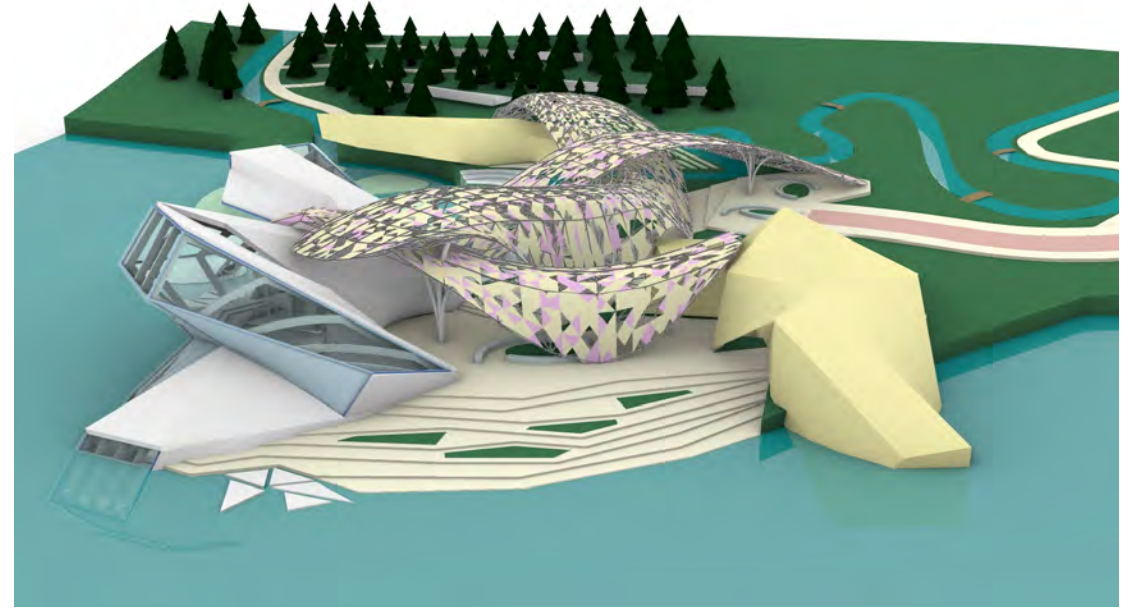
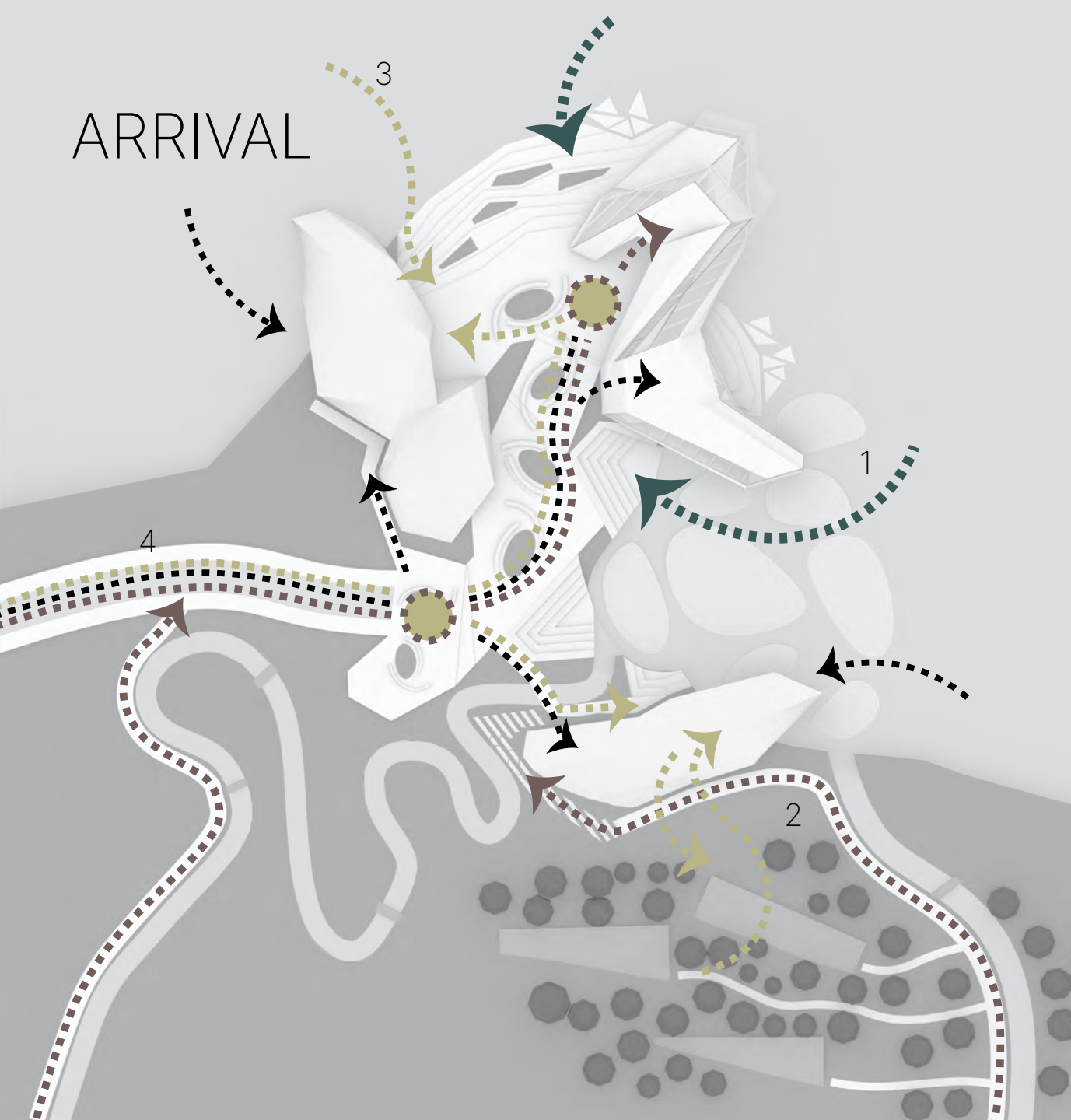


-  Ephemeral Rivers
-  Pedestrian & Bicycle Paths
-  Tram Line



- 1 Marine Research Center (Water & Soil Analysis Labs)
- 2 Observatory & Visitor Center
- 3 Wetland & Forest Research Center (Plant DNA Labs, Forest Nursery)
- 4 Outdoor Public Area
- 5 Wetlands
- 6 Pilot Foresting Area
- 7 Viewing Terraces

ARRIVAL

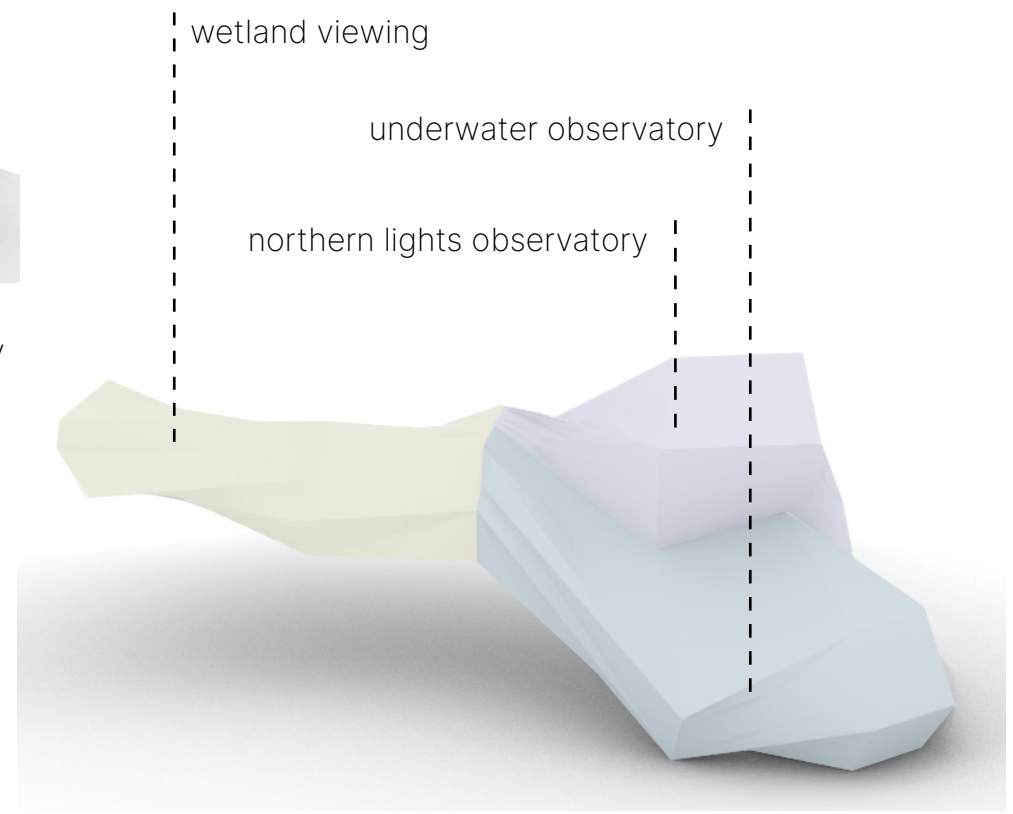
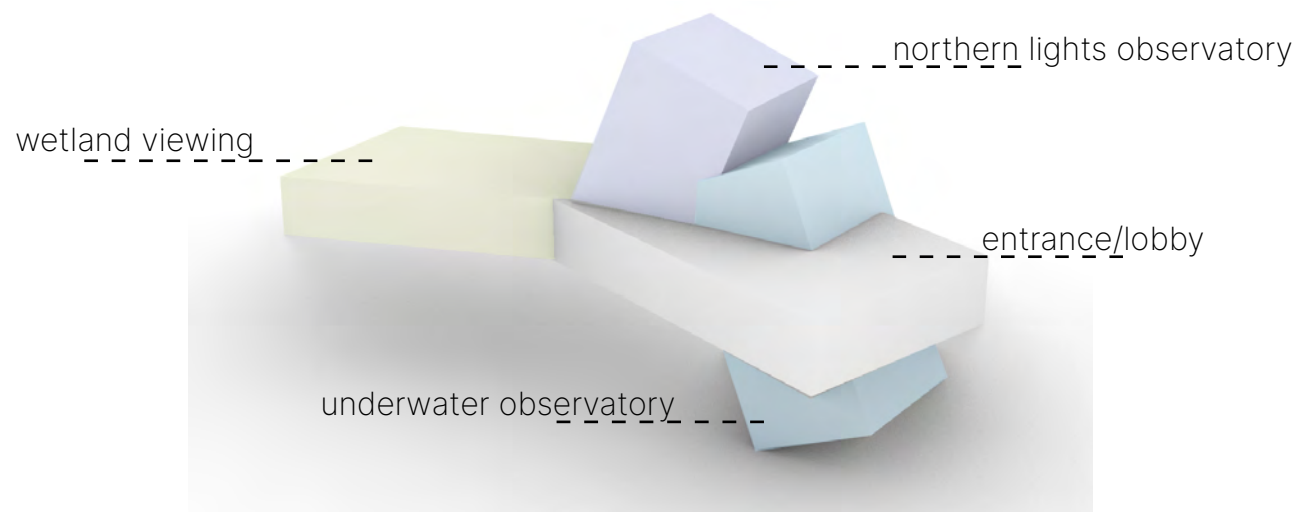
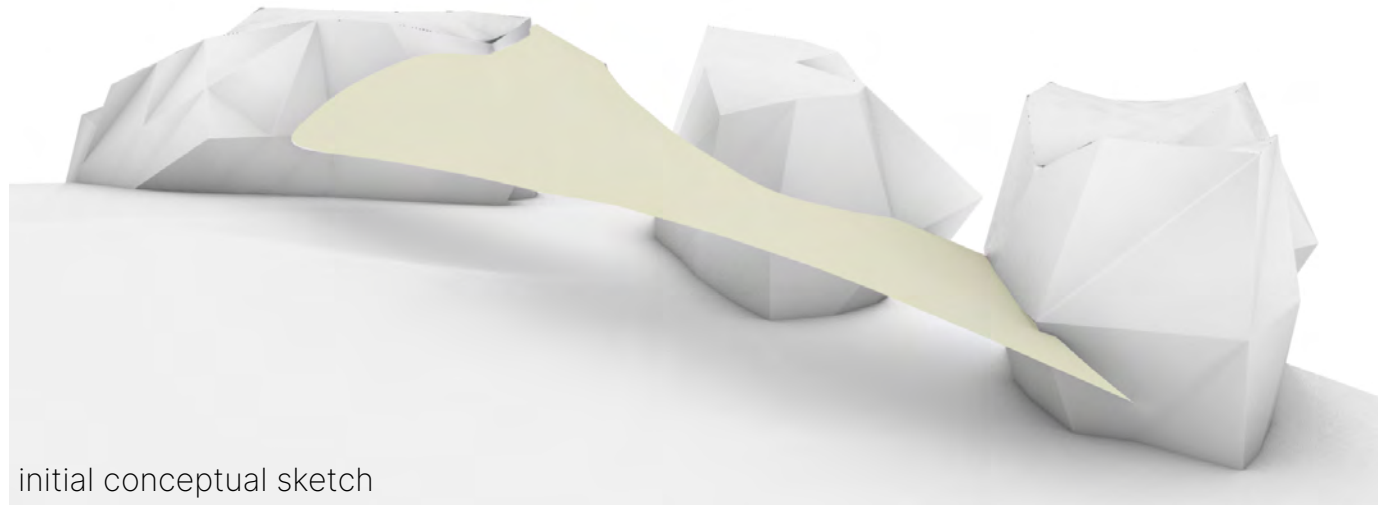


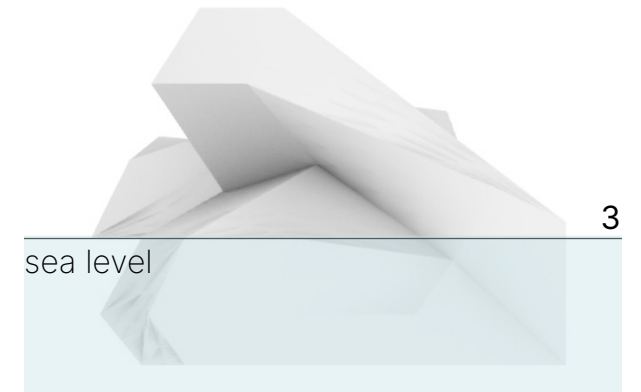
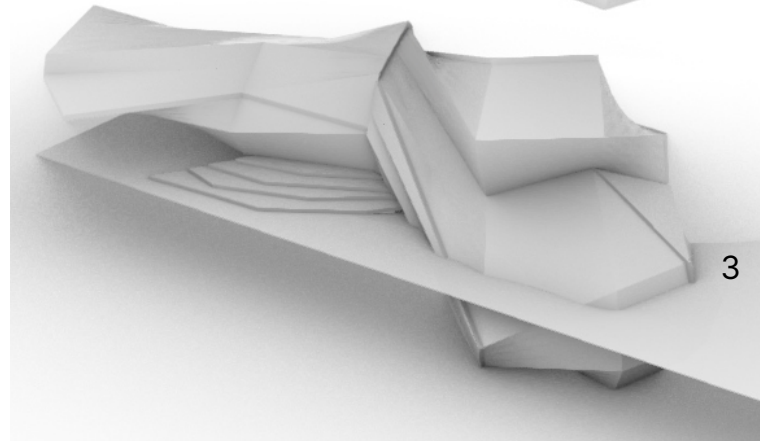
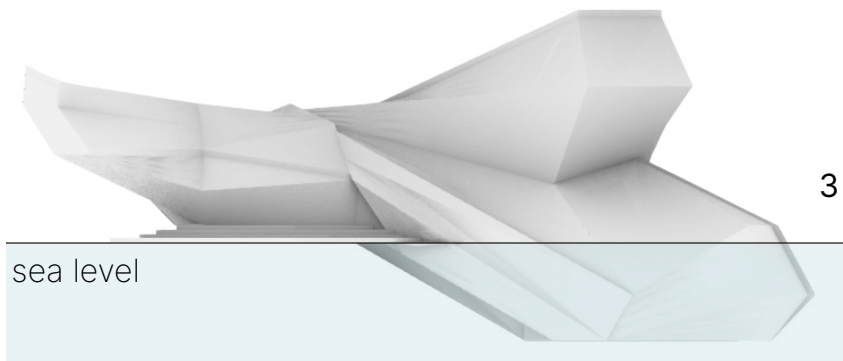
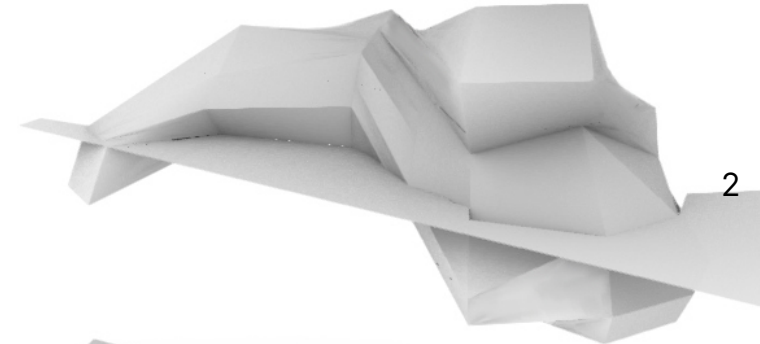
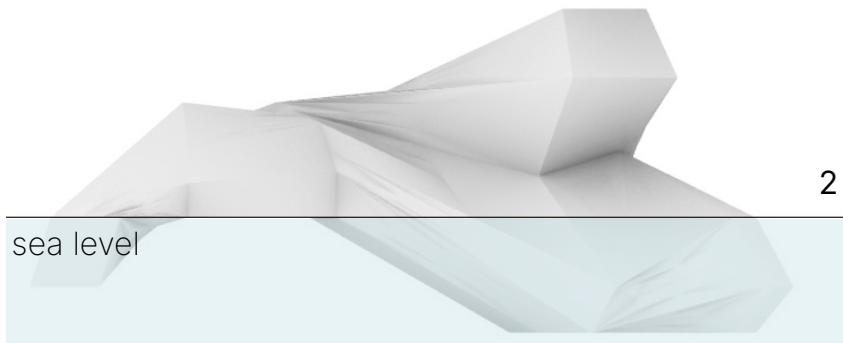
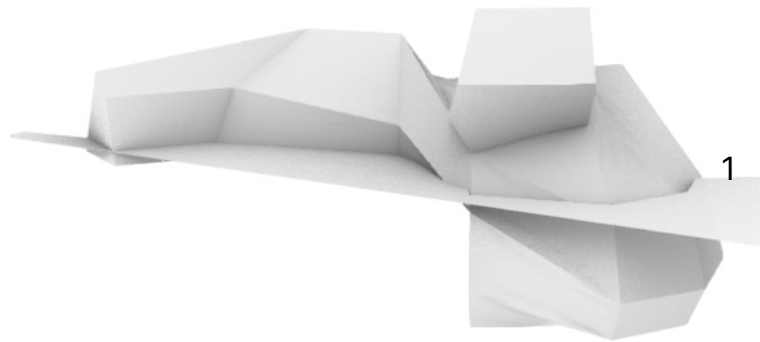
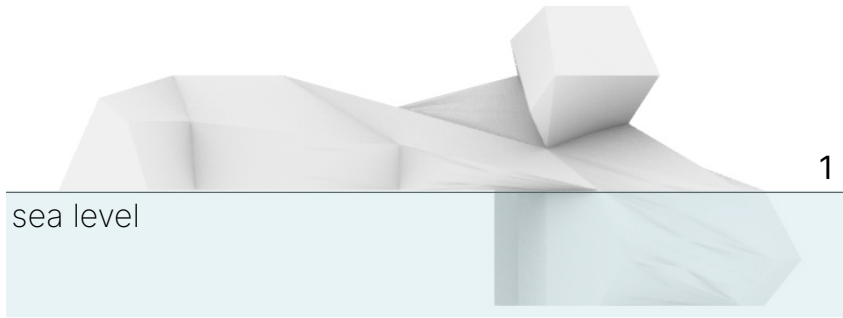
- ■ ■ Locals
- ■ ■ Tourists
- ■ ■ Researchers
- ■ ■ Service

- 1 A tourist visiting the observatory after a whale-watching boat tour on the Atlantic
- 2 Local family hiking along the forest and wetlands to watch the Aurora
- 3 Marine biologist coming to work from Downtown Reykjavik in a boat taxi
- 4 Tram line accessible for all sequences during different times of the day



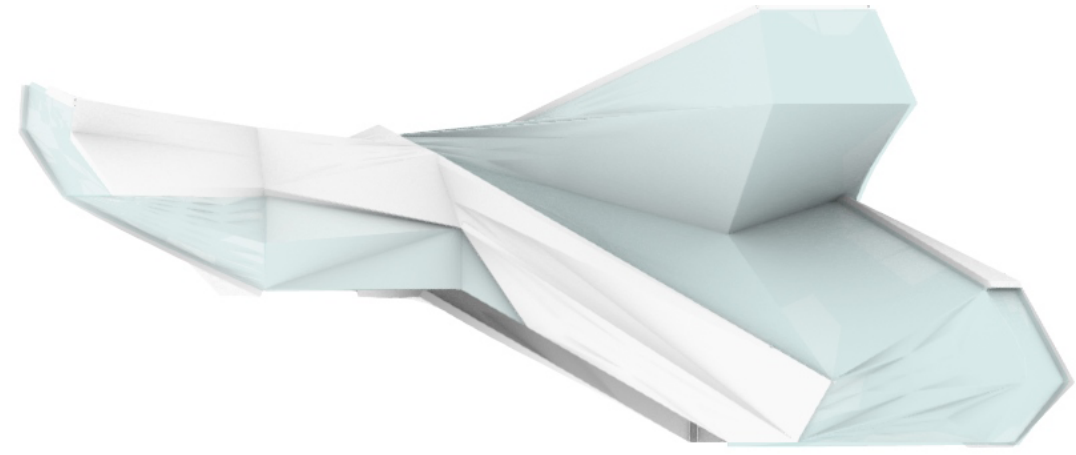
FORM DEVELOPMENT



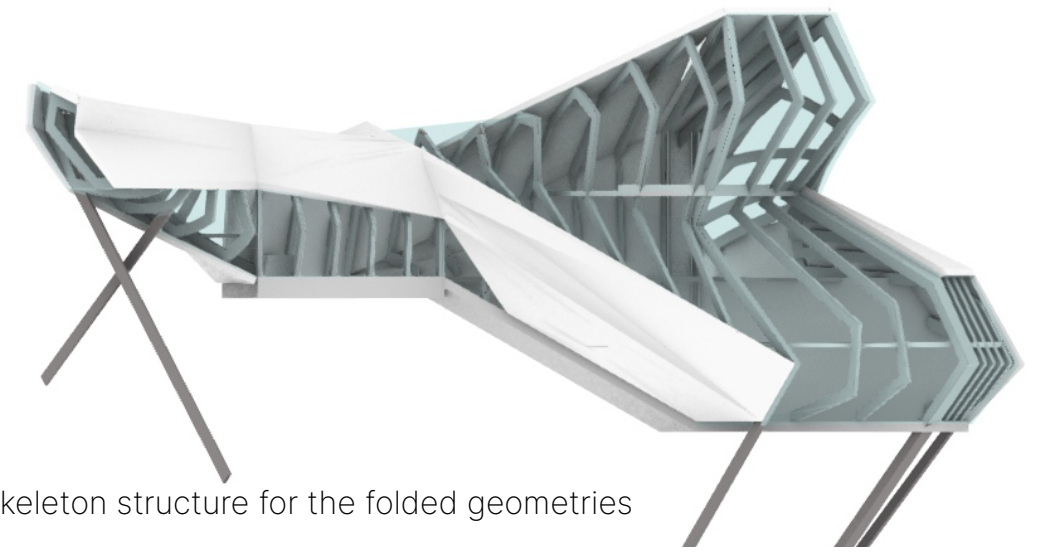




STRUCTURAL ASSEMBLY



Structural glazing to allow for view



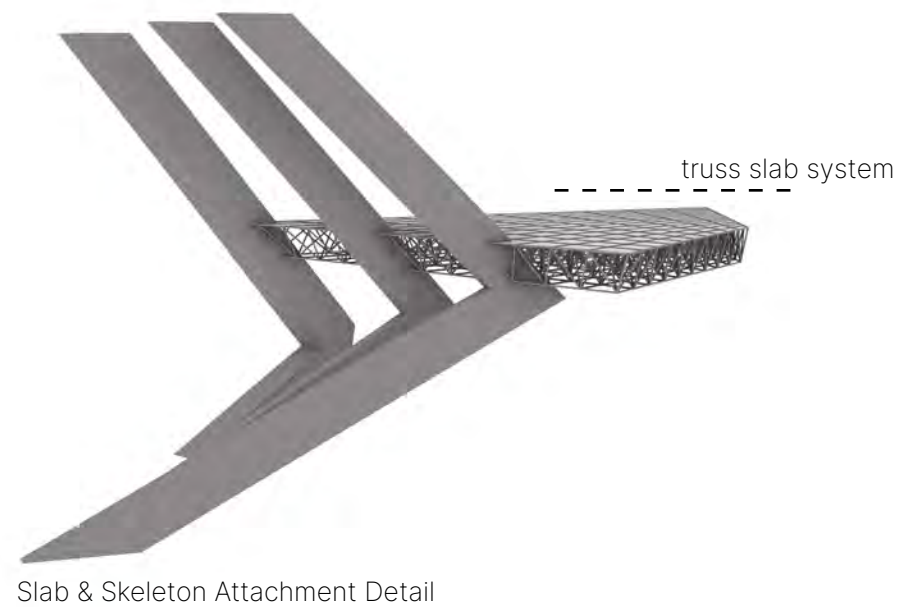
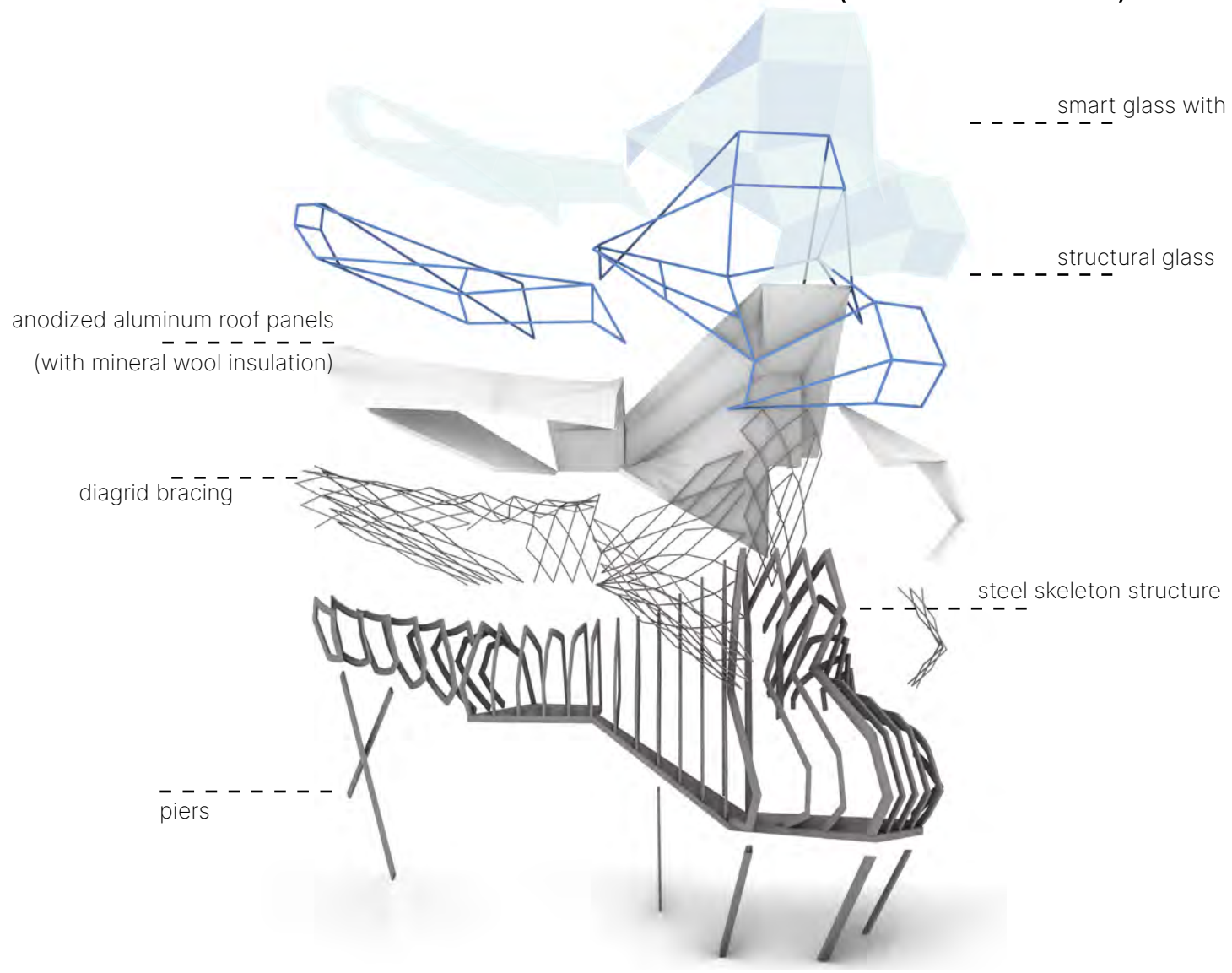
Skeleton structure for the folded geometries



Space frame for the parametric geometries

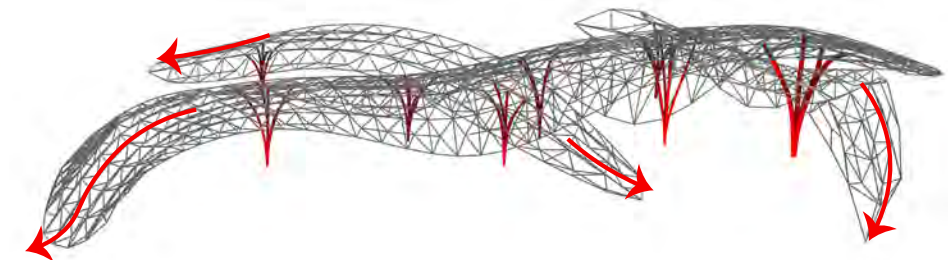
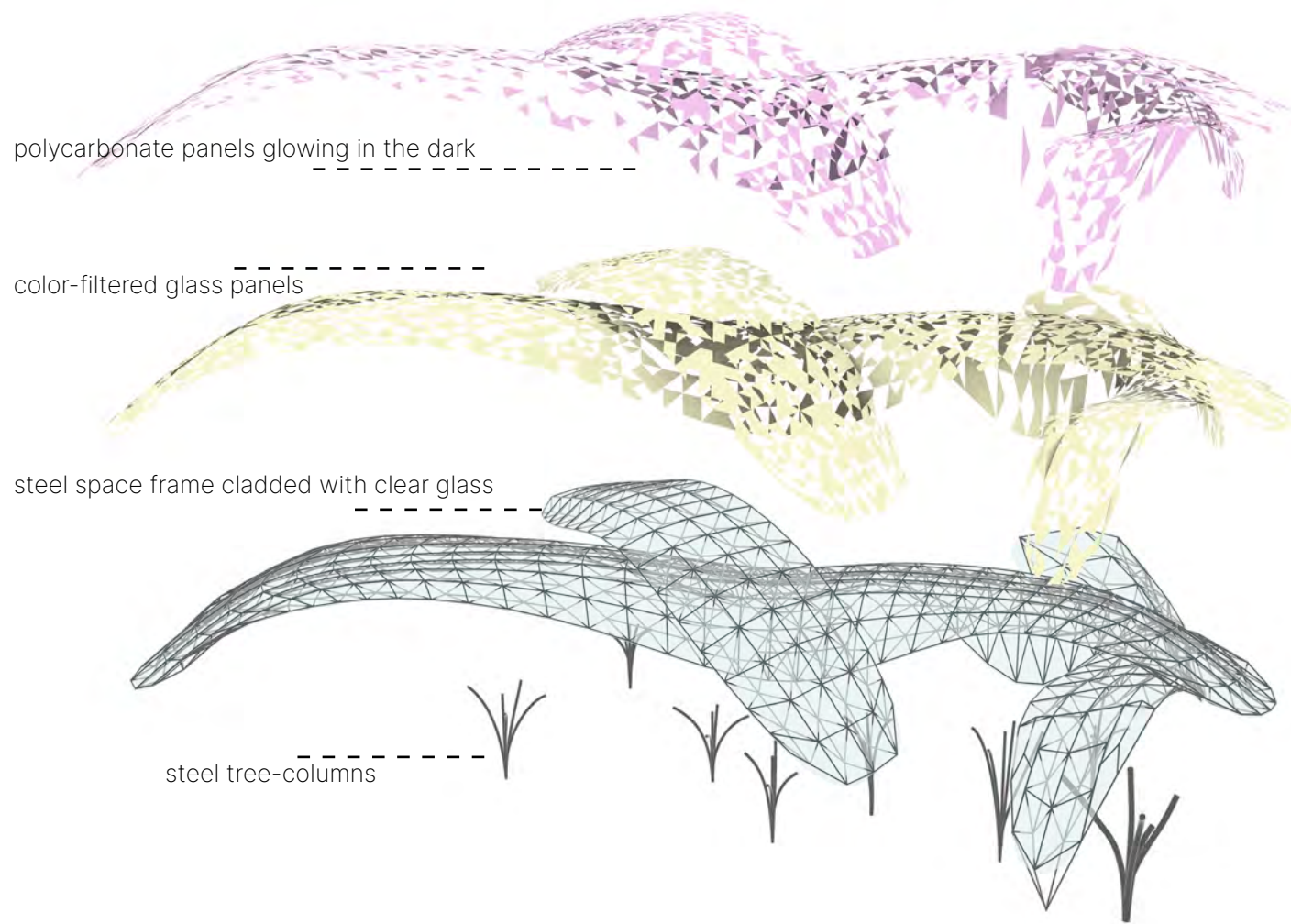


STRUCTURAL ASSEMBLY (FOLDED)





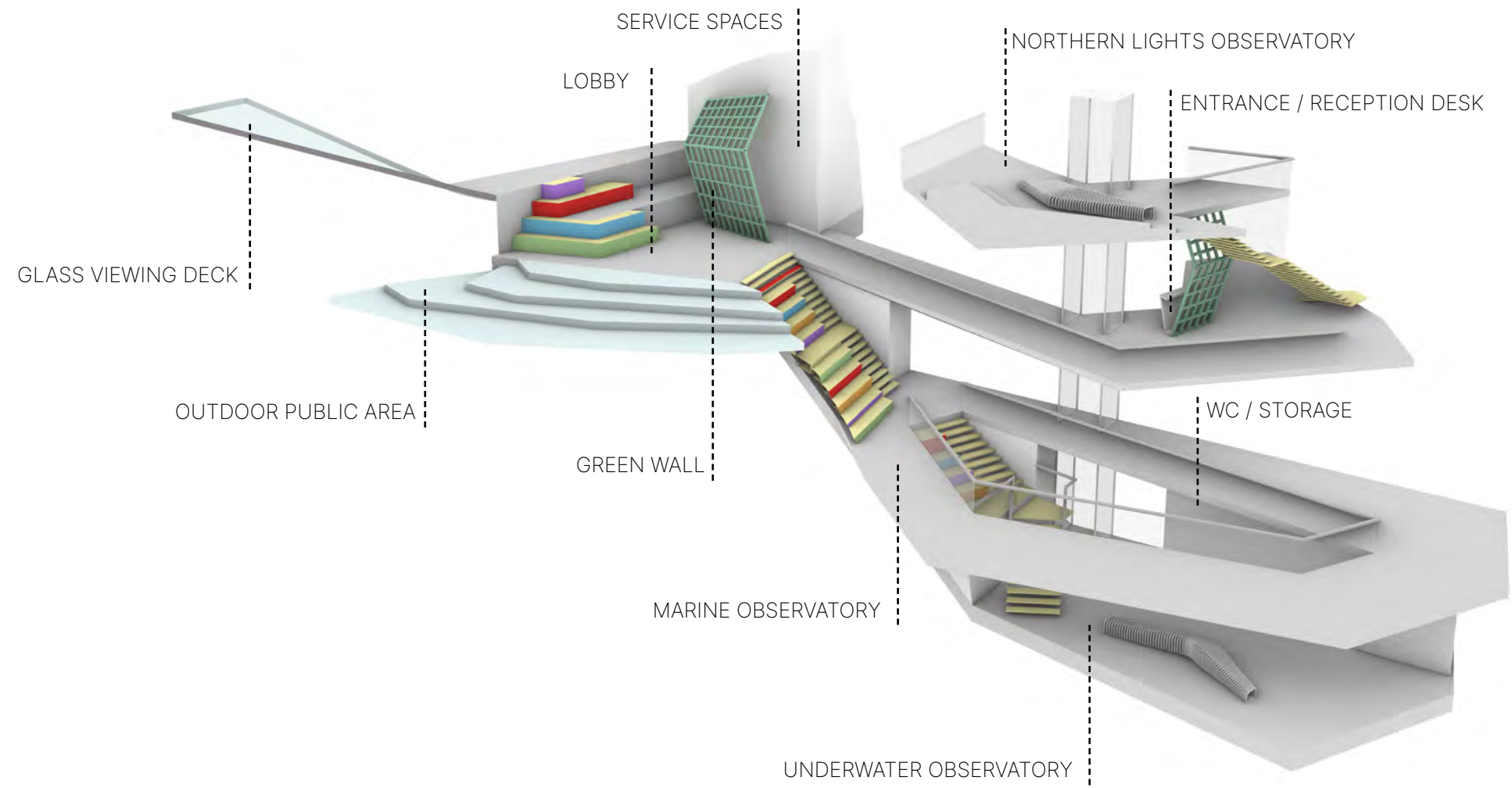
STRUCTURAL ASSEMBLY (PARAMETRIC)



Load distribution through the columns and space frame

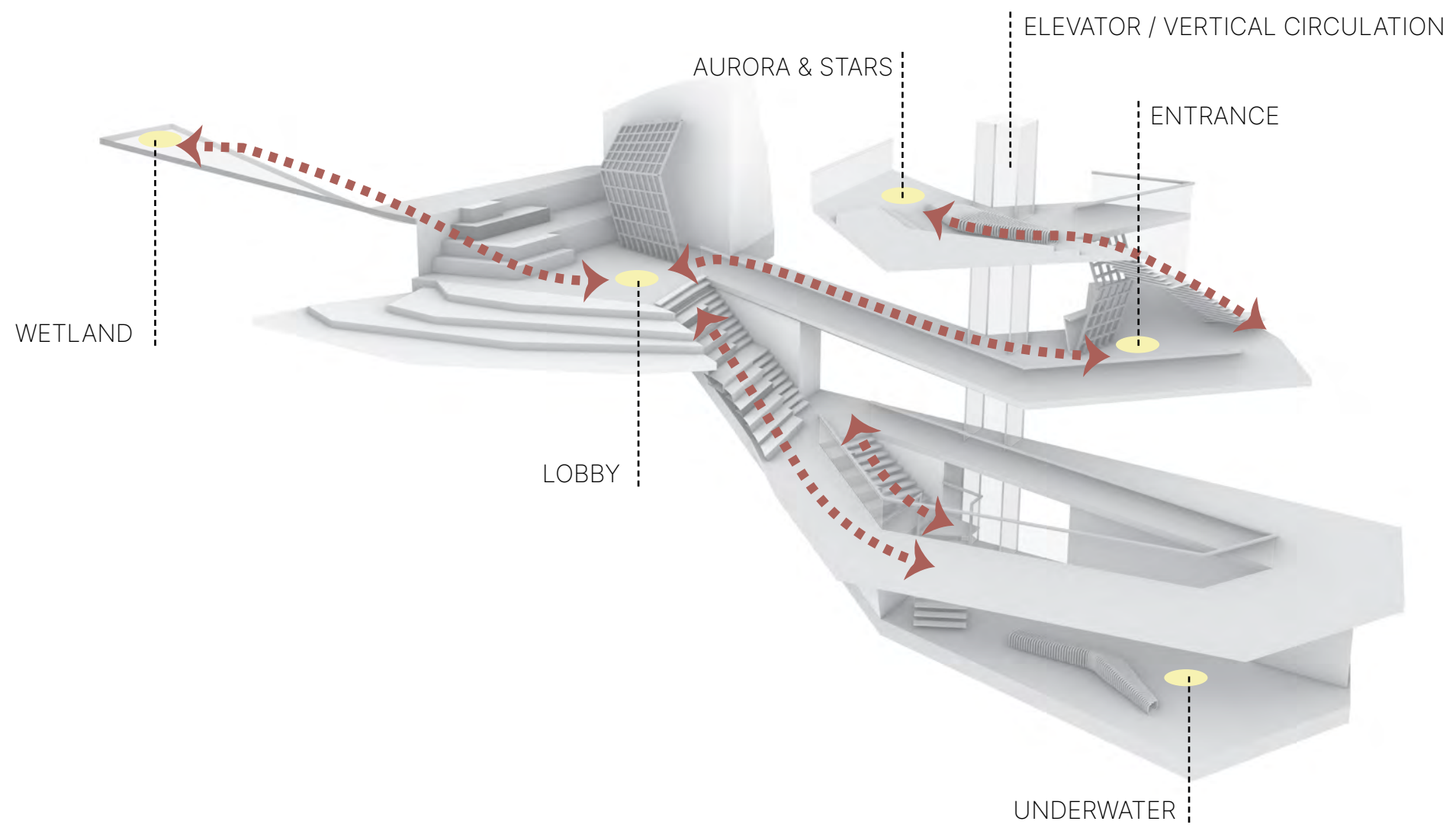


FUNCTIONAL LAYOUT & CIRCULATION

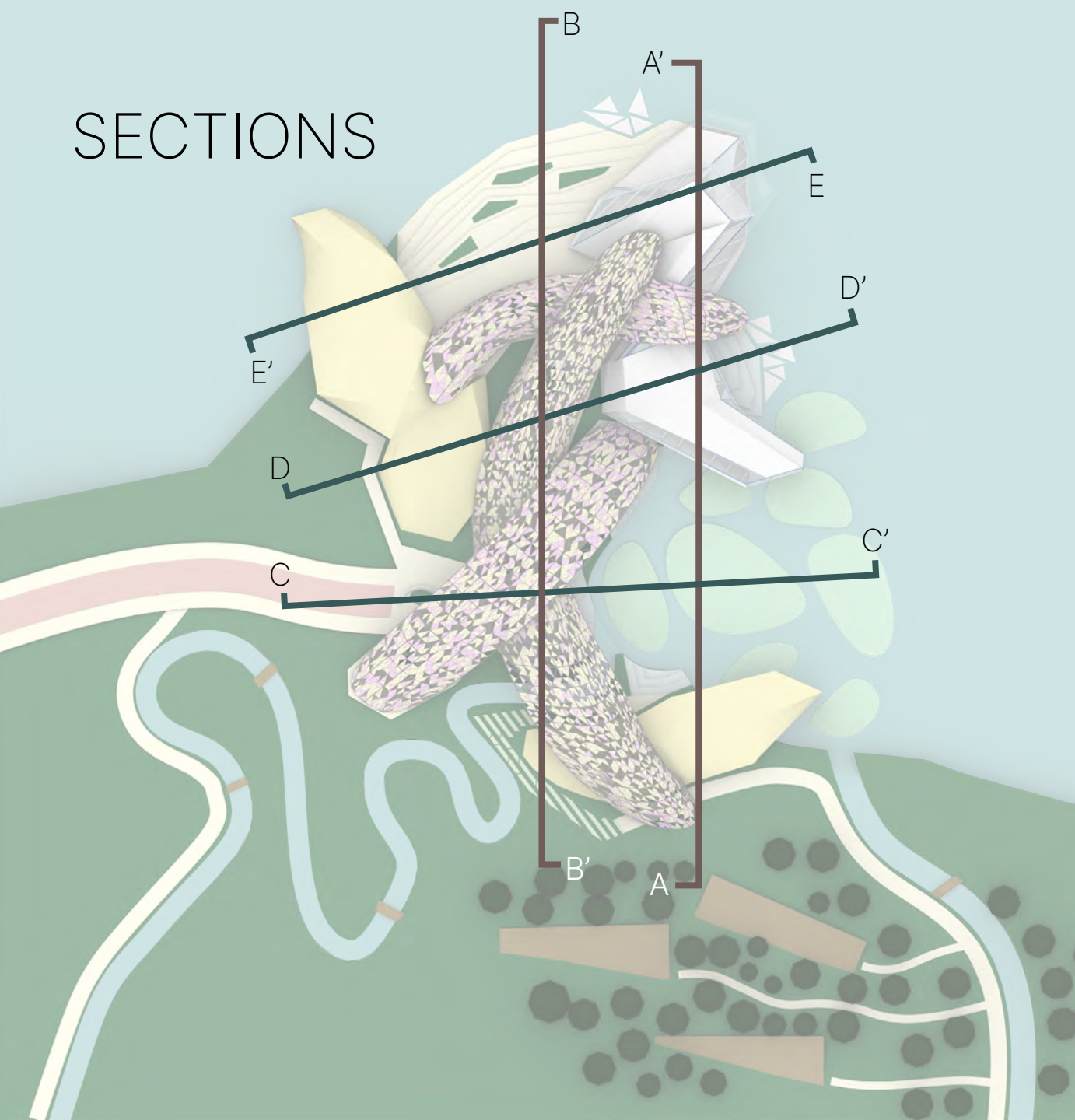




FUNCTIONAL LAYOUT & CIRCULATION



SECTIONS



CUT THROUGH PLAN

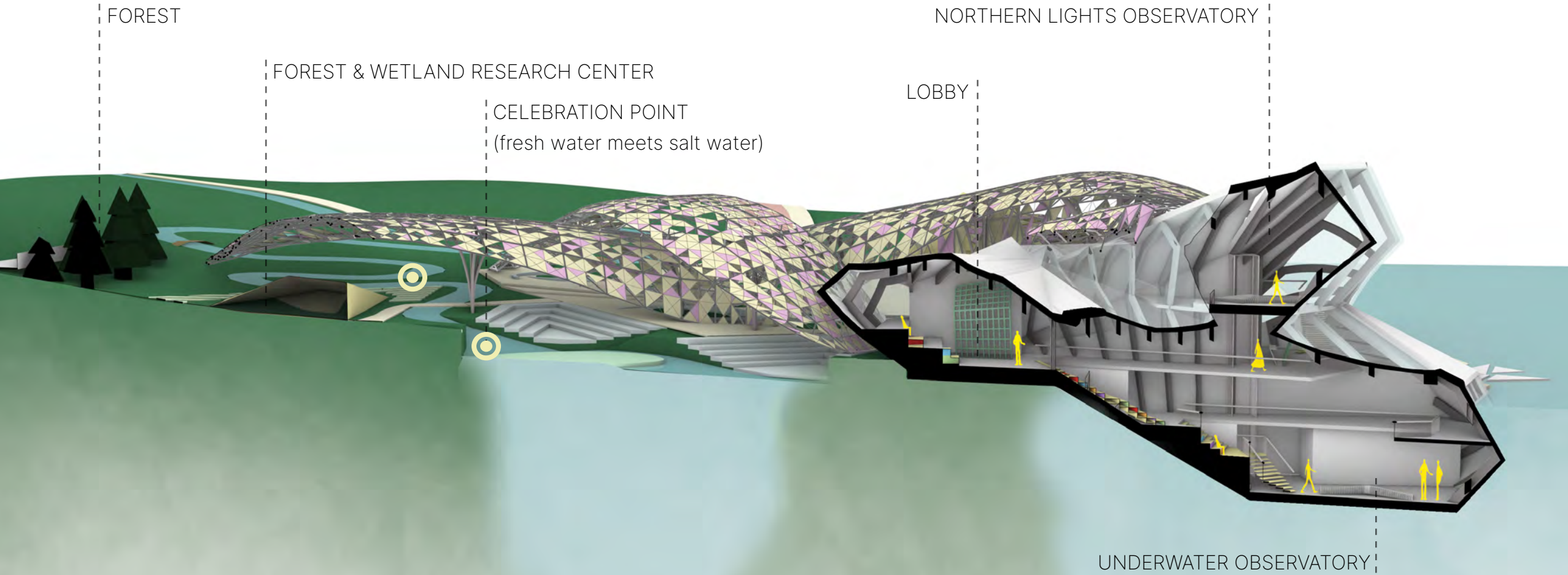


CUT THROUGH SECTION





SECTION AA'



FOREST

FOREST & WETLAND RESEARCH CENTER

CELEBRATION POINT
(fresh water meets salt water)

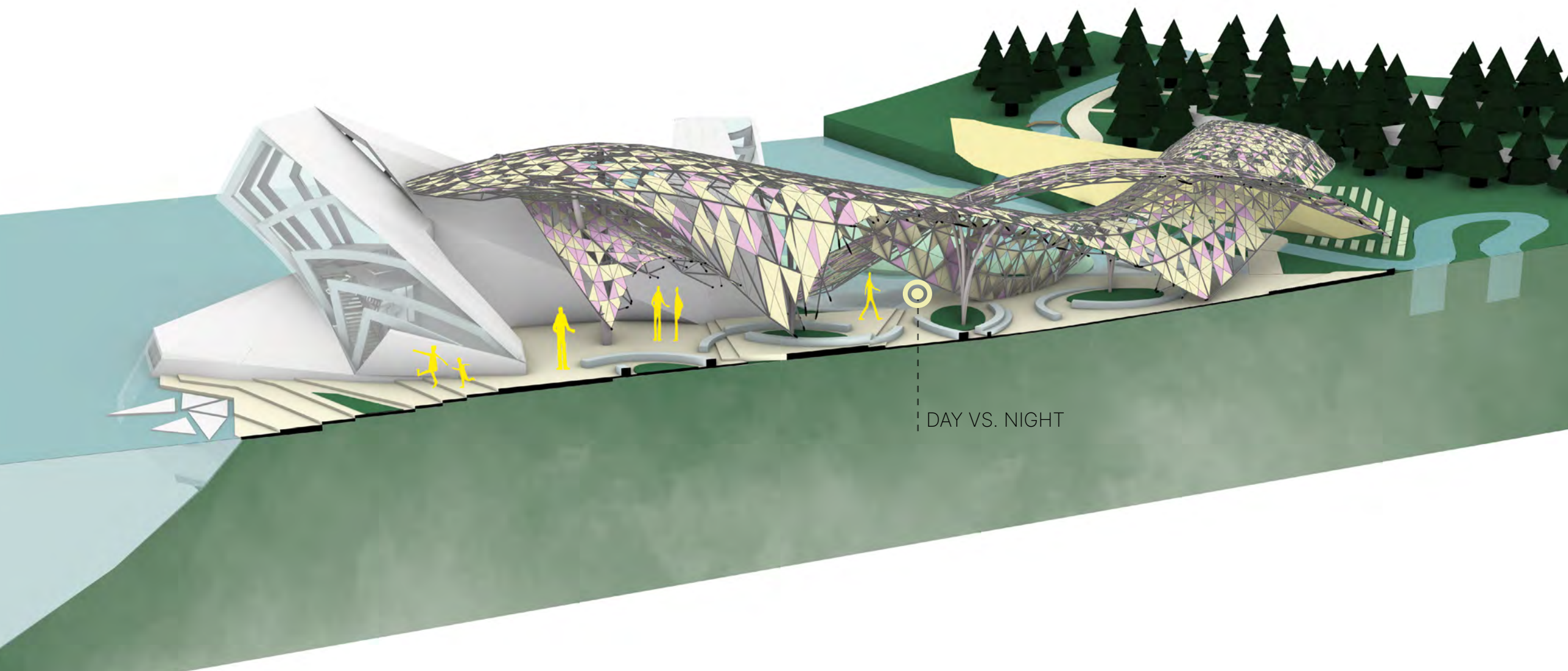
LOBBY

NORTHERN LIGHTS OBSERVATORY

UNDERWATER OBSERVATORY



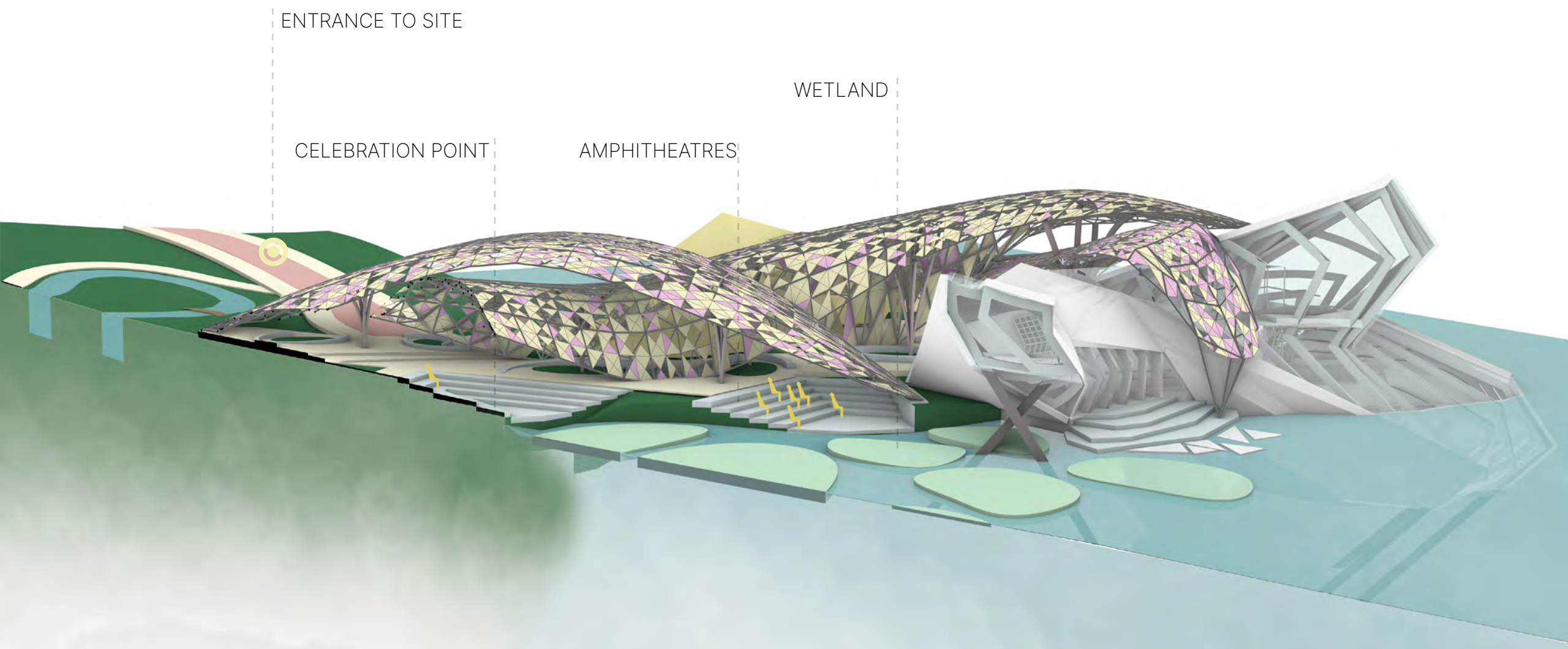
SECTION BB'



DAY VS. NIGHT

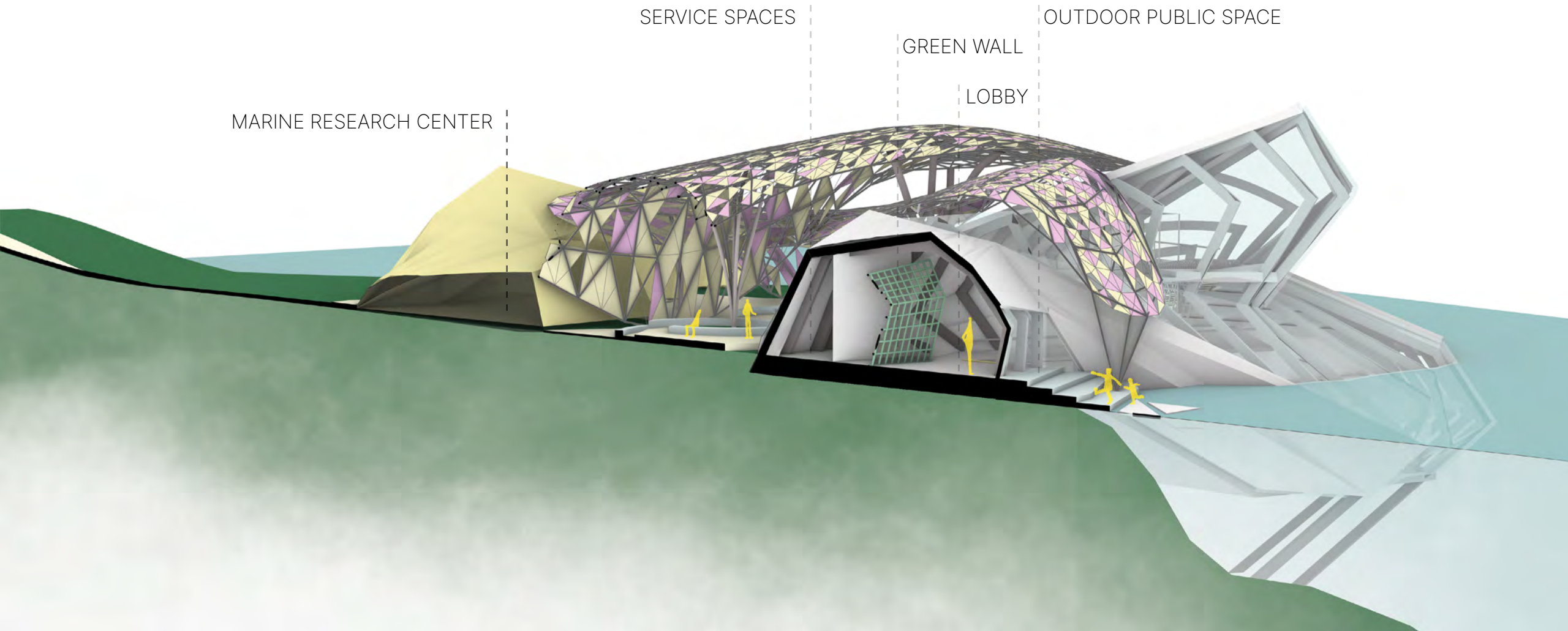


SECTION CC'

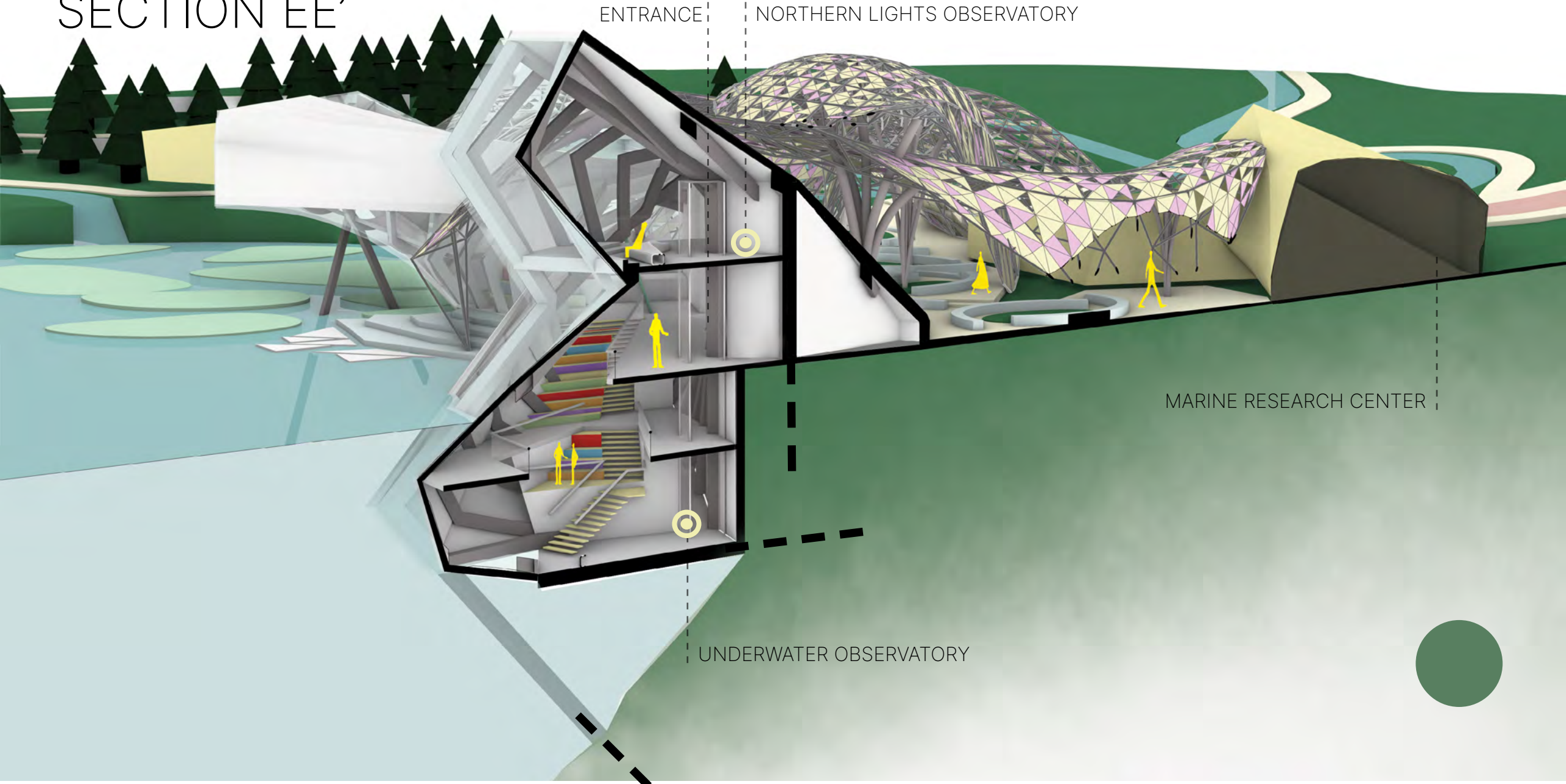




SECTION DD'



SECTION EE'



ENTRANCE

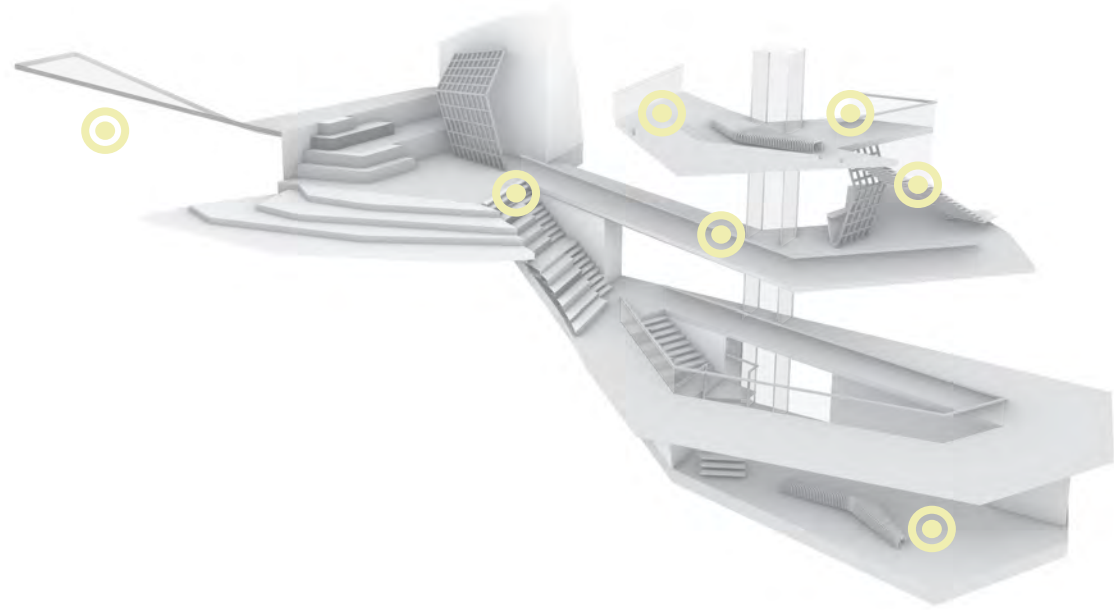
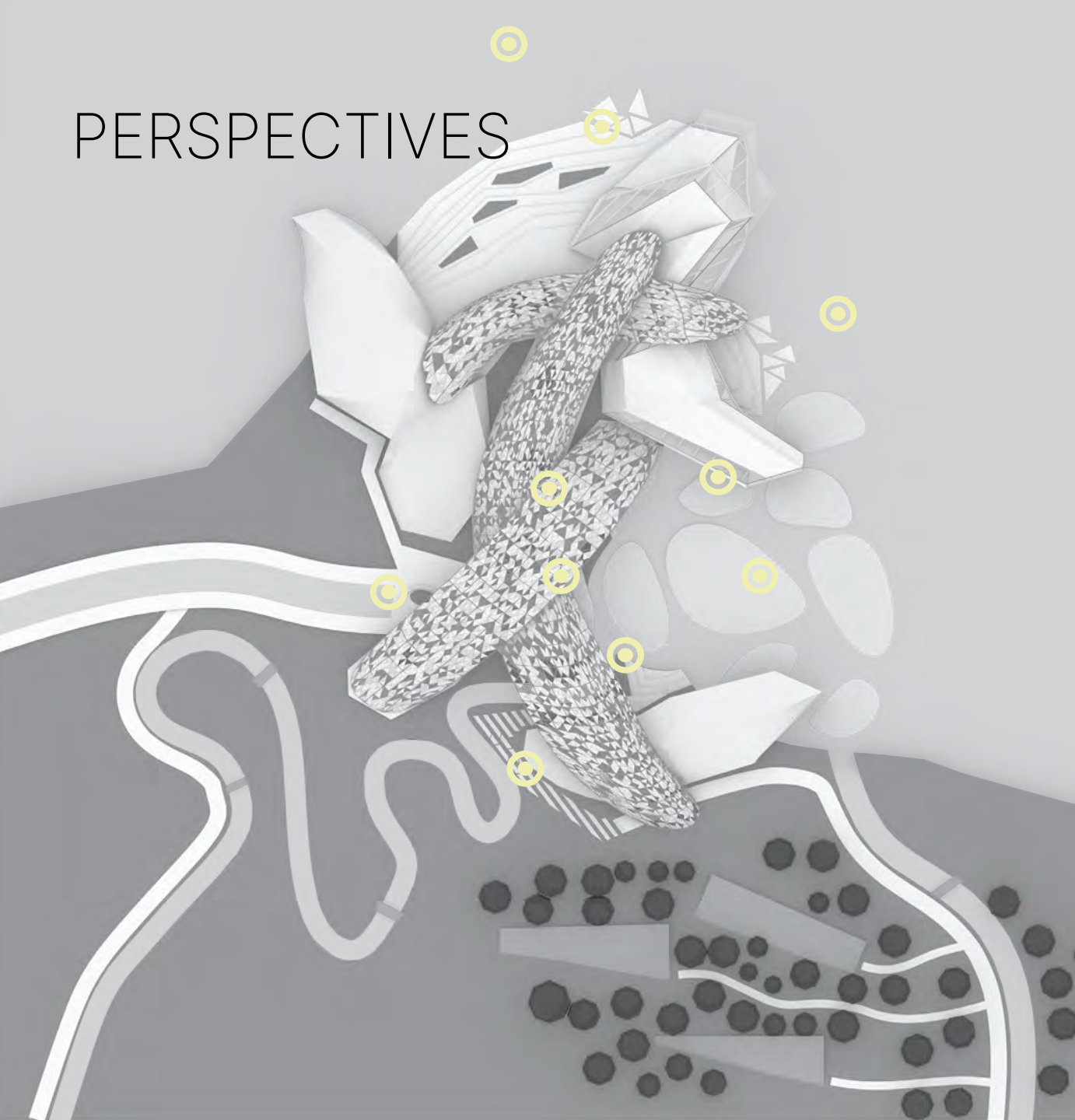
NORTHERN LIGHTS OBSERVATORY

MARINE RESEARCH CENTER

UNDERWATER OBSERVATORY



PERSPECTIVES



NIGHT



DAY



WINTER

INTERIORS



FLY-THROUGH



BACK



