COLLEEN DUONG

Bachelor of Architecture | 2021
Carnegie Mellon University

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CONTENTS

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EDUCATION

Masters of Science in Sustainable Design
Carnegie Mellon University, Pittsburgh PA
Aug 2020 - May 2022 GPA 4.25/4.00

Bachelors of Architecture
Carnegie Mellon University, Pittsburgh PA
Aug 2016 - May 2021 GPA 3.52/4.00
Minor in Animation & Special Effects

AWARDS

2021 ULI Hines Student Competition
Honorable Mention

CMU Fourth Year Design Awards
Finalist

Carnegie Mellon University
Dean's List, College Honors, & University Honors

SKILLS

Software
Adobe Software (Photoshop, Illustrator, InDesign, Premiere), Rhinoceros 3D, Grasshopper, GIS, ClimateStudio, AutoCAD, Revit, SketchUp, Lumion, Enscape, KeyShot, Fusion 360, RobotStudio, BlueBeam, AutoDesk Maya, 130 WPM

Fabrication
CNC Machining (Mill and Lathe), Woodwork, Lasercutting, 3D Printing, Industrial Robot Arm

Programming
P5JS, Javascript, HTML

RELEVANT COURSES

- LEED Buildings Green Design
- Environmental Performance Simulation
- Building Performance Modeling
- Sustainable Health Productivity
- Environment I: Climate & Energy
- Environment II

WORK EXPERIENCE

Master's Thesis: Architectural Reef - Artificial System
Carnegie Mellon University, Pittsburgh, PA
September 2021 - Present
- Designing a hybrid system that fosters positive relationships between humans and nonhumans
- Conducting a case study on existing artificial reefs (design form & material composition) and a design analysis on a potential reef implementation on an existing site, Hanauma Bay.

Teaching Assistant: 48-640 M.Arch Praxis-2 Studio
Carnegie Mellon University, Pittsburgh, PA
Professor Azadeh Omidfar Sawyer, Professor Matthew Huber
January 2022 - Present

Research Assistant, Bird Friendly Patterns
Carnegie Mellon University, Pittsburgh, PA
Professor Azadeh Omidfar Sawyer
March 2021 - Present
- Formatting booklet of grasshopper-generated glass-facade panels to give to future clients.
- Compiling documents and files to distribute for pattern testing and printing.
- Producing drawings and renderings of patterns for booklet.
- Designing additional patterns to be tested and incorporated into the booklet.

Teaching Assistant: 48-743 Intro to Ecological Design & Thinking
Carnegie Mellon University, Pittsburgh, PA
Professor Dana Cupkova
Fall Semester
- Provided comments and feedback for weekly written summary analyses on various topics related to ecological design and thinking (via weekly guest lectures and readings).

Remote Virtual Architectural Summer Intern
G70 Architects, Honolulu, HI
July 2020 - Aug 2020
- Worked on graphics and diagrams for submittals: AIA Honolulu Design Awards 2020.
- Provided support with various other projects.

Architectural Summer Intern
G70 Architects, Honolulu, HI
June 2019 - Aug 2019
Project Submittal won Award of Merit for AIA Honolulu Design Awards 2019.
- Worked on graphics and diagrams for submittals: AIA Honolulu Design Awards 2019, due diligence reports, and multiple project proposals.
- Construction Administration work done.

ACTIVITIES

Alpha Phi Omega Kappa Chapter
Carnegie Mellon University, Pittsburgh, PA
August 2018 - May 2021

Fellowship VP Fall 2019
- Approved project proposals and in charge of planning large brotherhood bonding events such as Fall Retreat.

Spring Booth Committee Chair Spring 2019 - Spring 2020
- Prepared construction details for the upcoming CMU Carnival Spring Booth Concessions event and lead the actual construction and design of the booth.

PR Chair Spring 2020 - Summer 2020
- Updated social media and the organization's website.
- Communicated with other organizations and advertises service activities to the campus.
- Compiled information, designed, and formatted Lobster Tale booklet to send out to alumni.

Rush Design Team Spring 2020 - Summer 2020
- Design posters, calendars, stickers, and t-shirts for the positive promotion of the fraternity.

Split House
co-housing

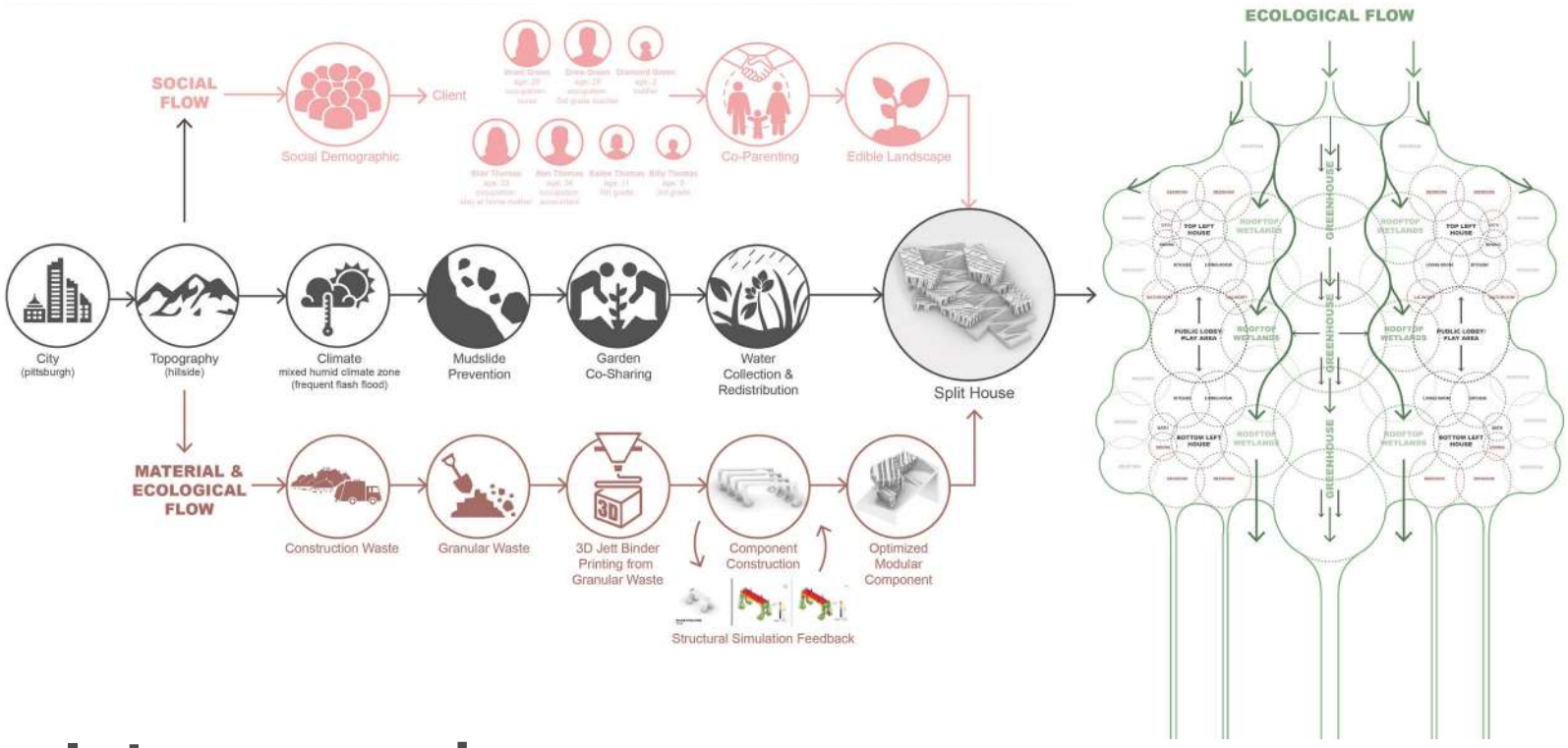
Hazelwood, PA
Lithopic_NOW Studio
advised by Dana Cupkova

Embedded in an ecological hillside, the co-house focuses on taking advantage of landslides that occur in Pittsburgh due to heavy rain. The central greenhouse and co-housing rooftops collect mud and water and redirects it over, through, and around the architecture, allowing occupants to directly interact with the environment around them.

Housing Context

Hillside Topographical Condition

Water Flow Simulation of new house-landform



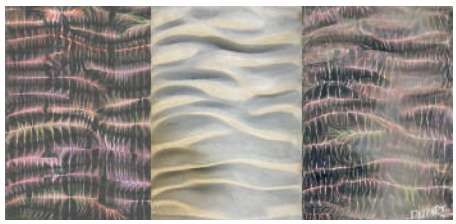
Interweaved Flows

Social | Material | Ecological

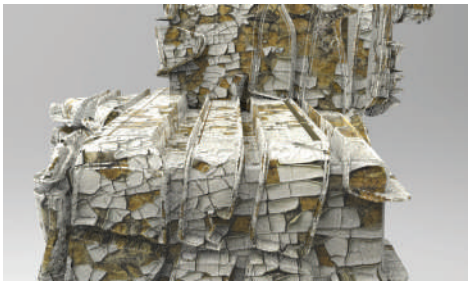
Coming out of a research studio "Lithopic (Living Stone) House: Ecologies of Earthen Matter", that was led in conjunction with a material science seminar, the design approach is underpinned by a potential of construction waste recycling through direct 3d binder-jet printing. This cradle-to-cradle method would reduce CO_2 levels by reducing the volume of new architectural materials, as well as offsetting waste streams heading to industrial landspills. Shaping printable components for minimal material use aligned with structural and ecological potential is coupled with a desire to integrate new landscape and biomass directly into the architectural form, function and experience.

The image above is a flow chart that shows the different properties of each flow category and how they all interweave with one another in the Split House.

The image to the right shows GAN (Generative Adversarial Networks) images that study how ecological textures affects a landscape.



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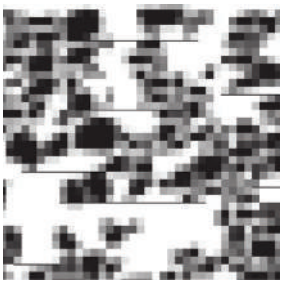
Water Flow Direction — *Biosmass Texture*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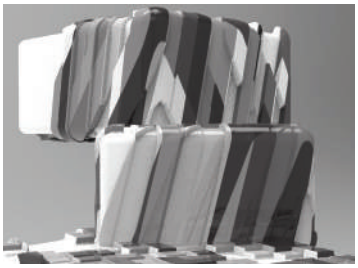
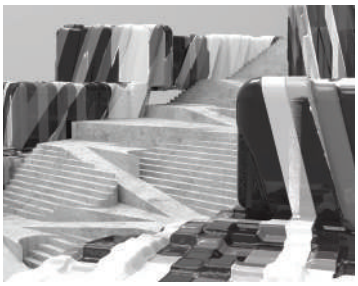
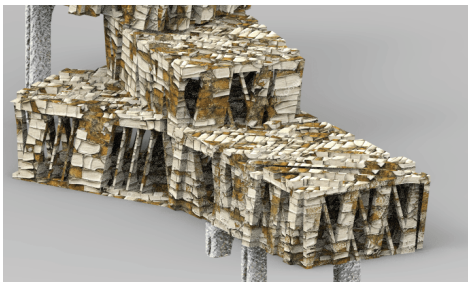
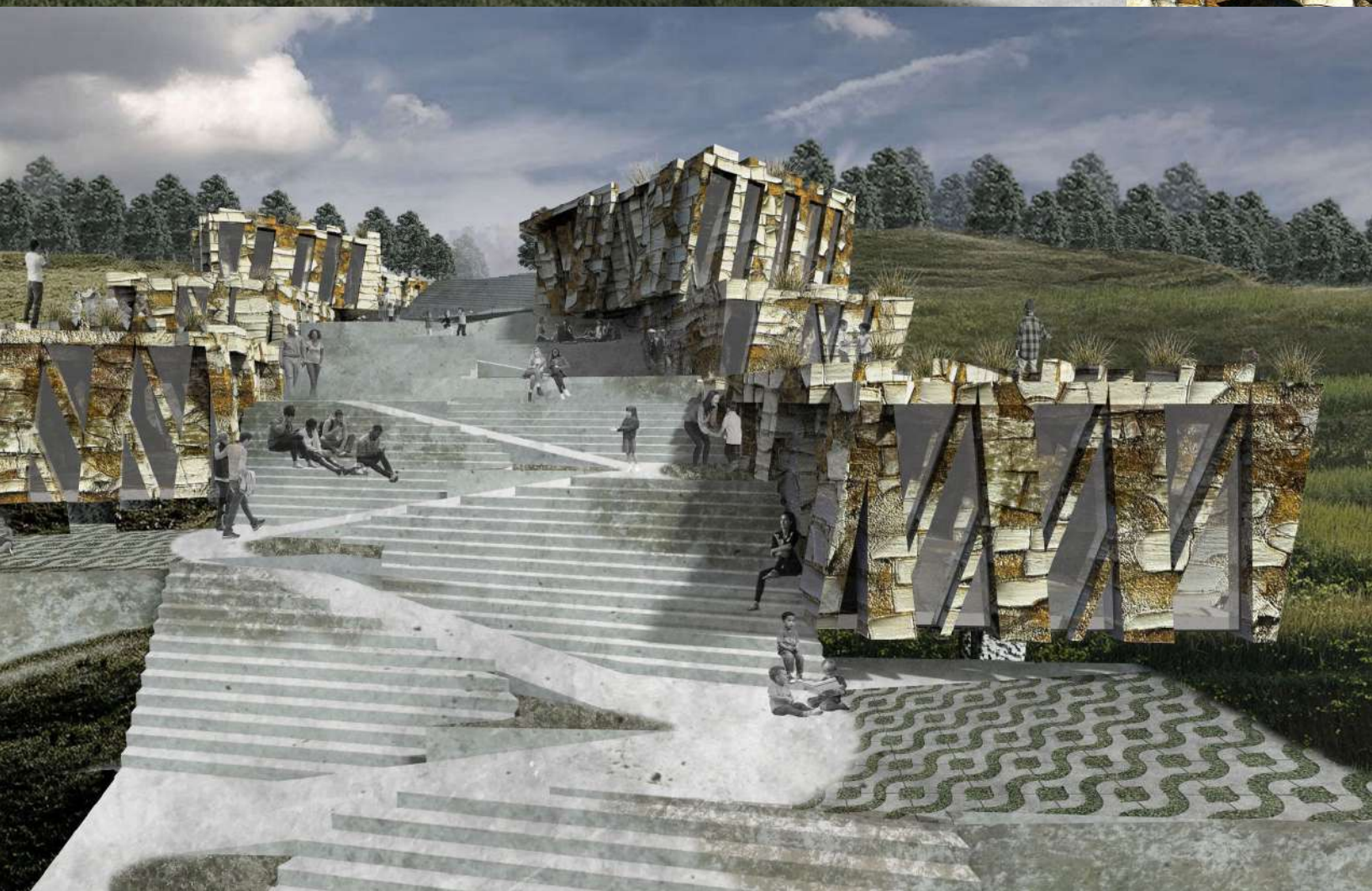


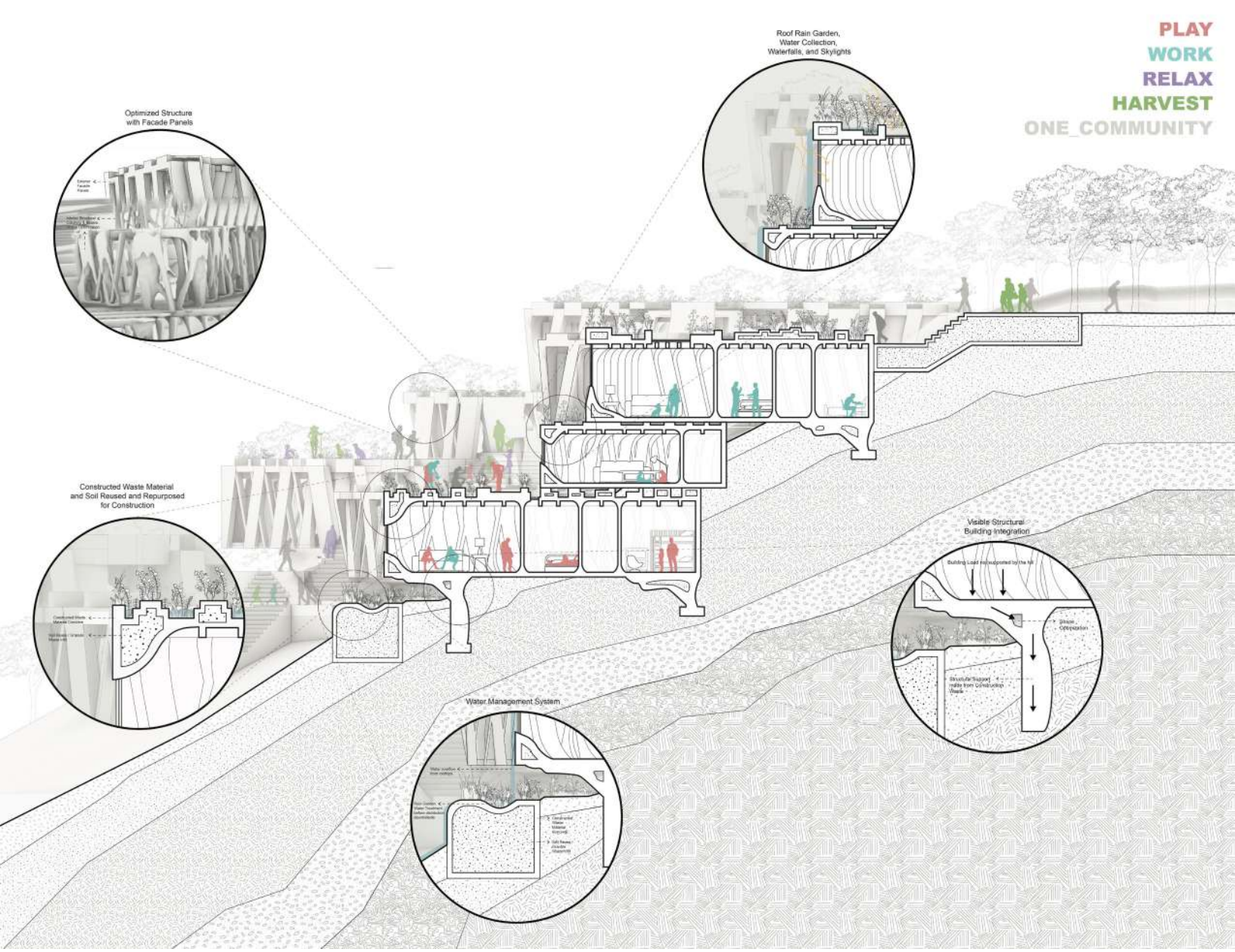





Design Process Workflow

Using artificial intelligence to identify ecological patterns that would support plant growth integrated into material form of the house.

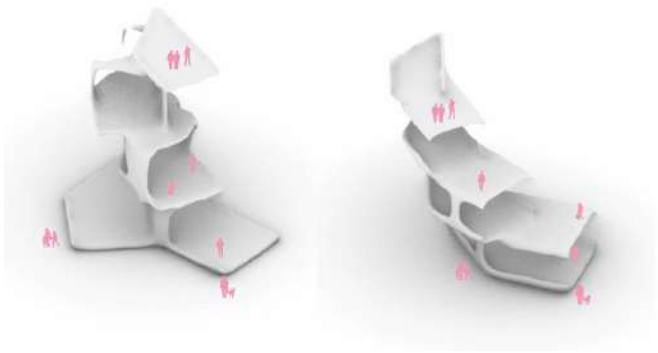




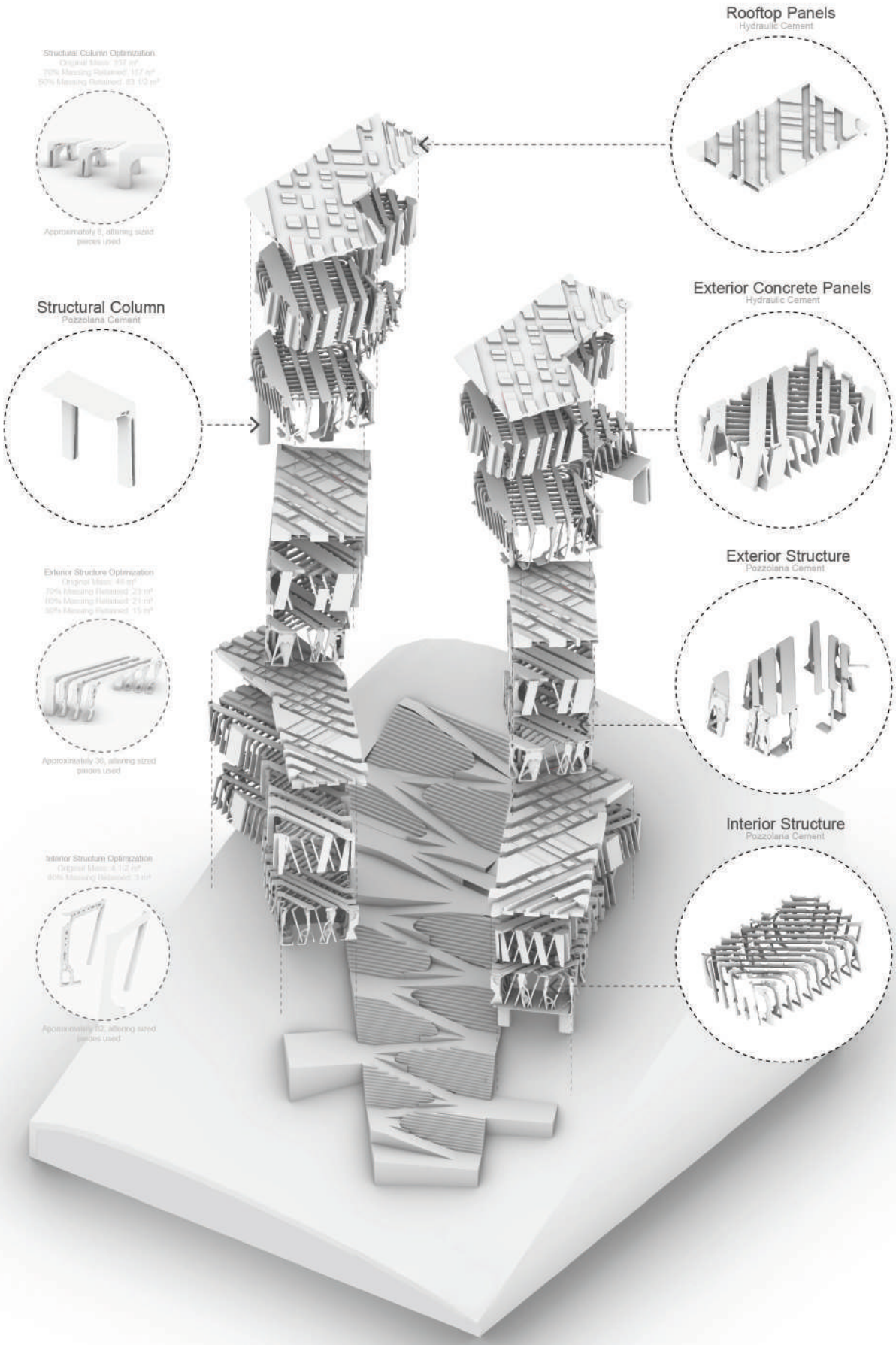
Hillside Condition

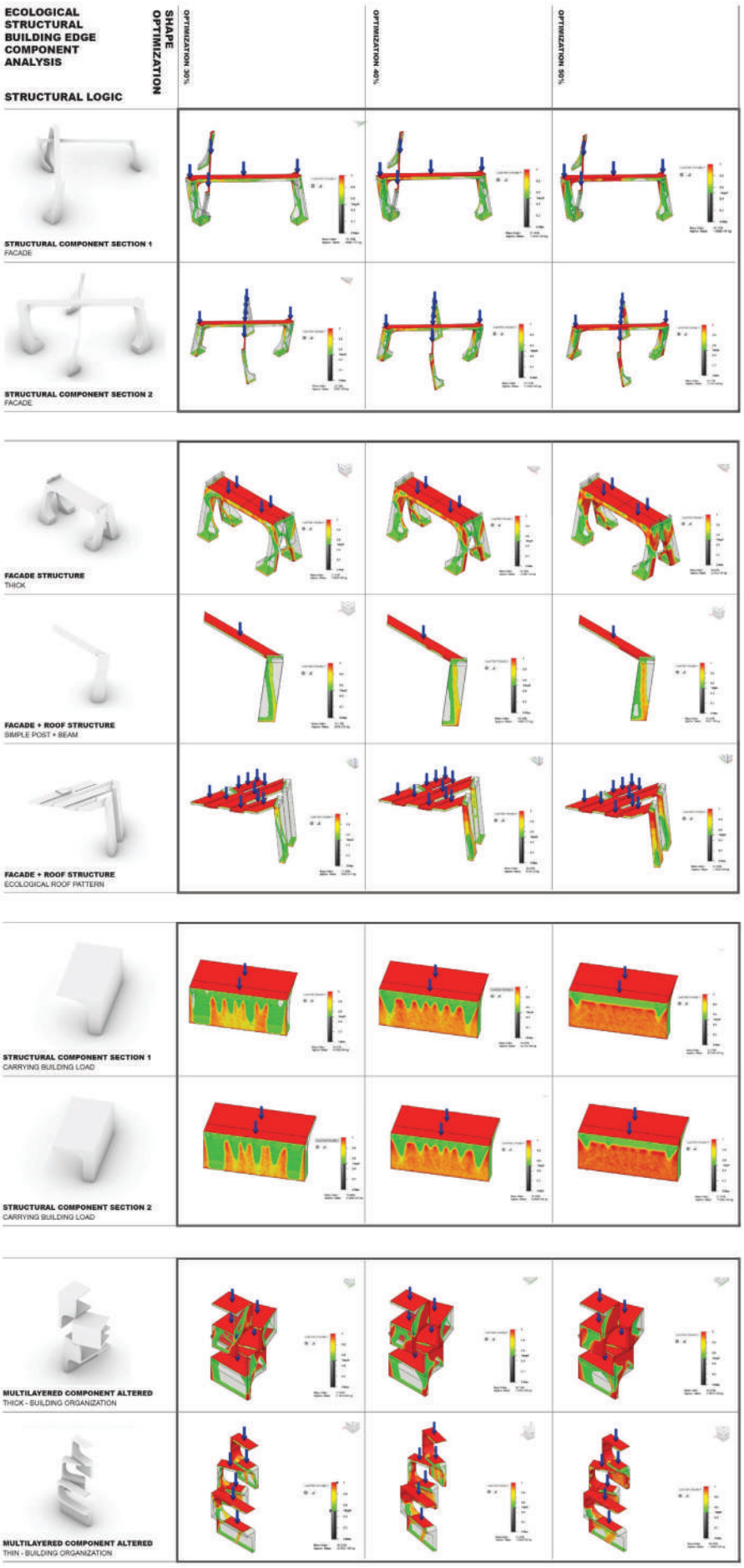
Material | Ecological Flows

Split House is a garden embedded into a hillside. It creates a form that allows flows of mud, water, and debris to be moved through, around, and over the entire structure, capturing the sediments into a new landform. Enforced by a central split that holds a stair-ramp circulatory greenhouse, this playscape manages natural flows, as well as acting as a shared public space for families and for the community of Hazelwood.



The image to the left displays a short series of form-finding studies to determine how spaces would be shared amongst various families and how different spaces would be placed on top another.


Rooftop Panels
Hydraulic Cement
Structural Column Optimization
Original Mass: 157 m³
70% Massing Retained: 117 m³
50% Massing Retained: 83 1/2 m³
Approximately 8, altering sized pieces used
Exterior Concrete Panels
Hydraulic Cement
Structural Column
Pozzolana Cement
Exterior Structure
Pozzolana Cement
Exterior Structure Optimization
Original Mass: 48 m³
70% Massing Retained: 29 m³
60% Massing Retained: 21 m³
50% Massing Retained: 15 m³
Approximately 36, altering sized pieces used
Interior Structure
Pozzolana Cement
Interior Structure Optimization
Original Mass: 4 1/2 m³
60% Massing Retained: 3 m³
Approximately 92, altering sized pieces used



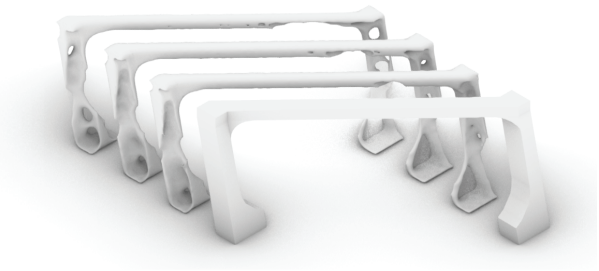
Material Optimization

Construction Waste & Recycling

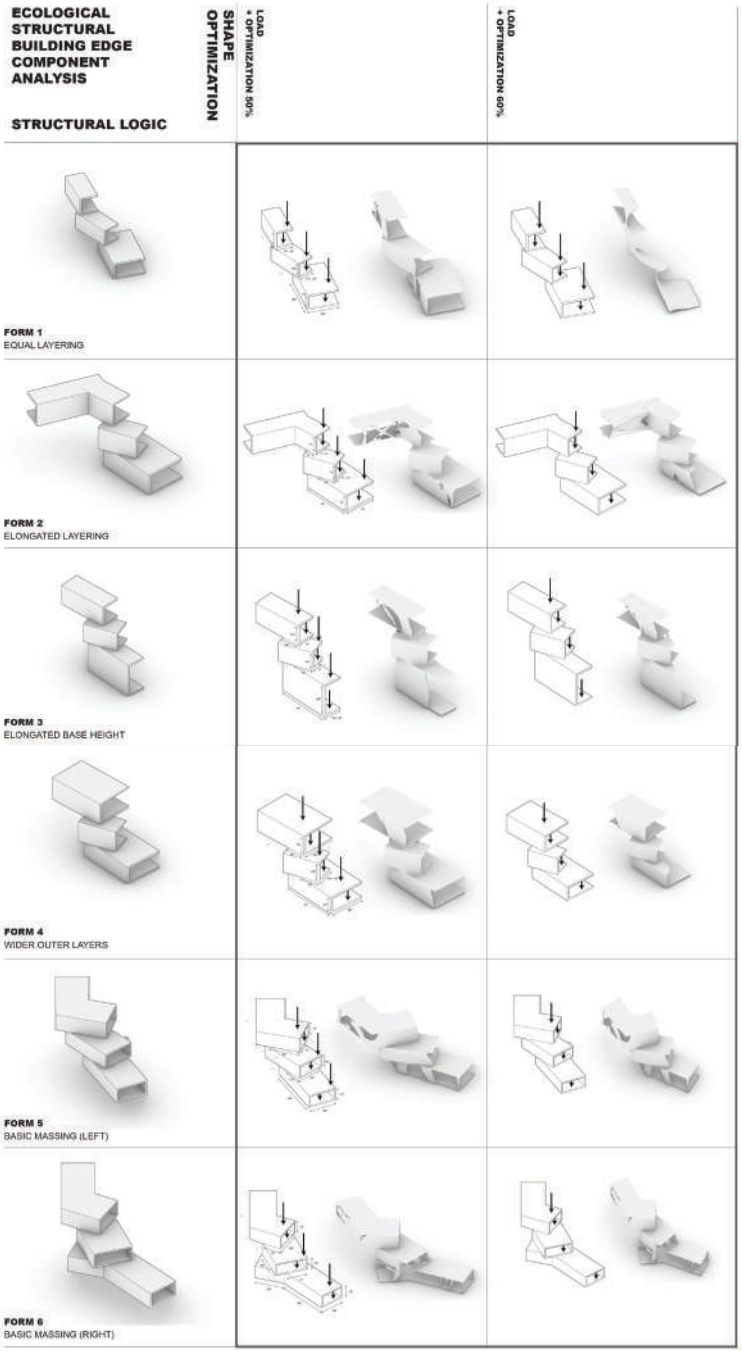
The structure of Split House is made up of three main components: a thin interior column-beam system, a thick exterior column-beam system, and a structural support for the base of the building. The structural support is a component that embeds itself into the landscape to hold the building in place during landslides.

The images shown on the left are component studies that focus on understanding how much material can be opitmized in the overall component's form to save material and reduce weight.

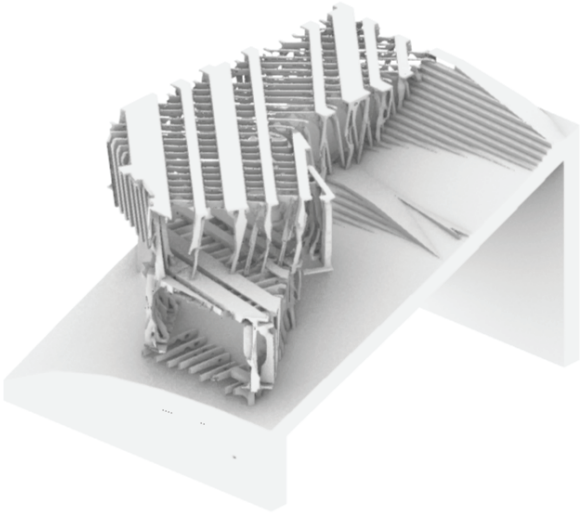
The design idea is for these different components to be optimized at different levels (60%, 70%, 80%, etc.) and be used at different parts of the building structure depending on which section needs more strength and which needs less.



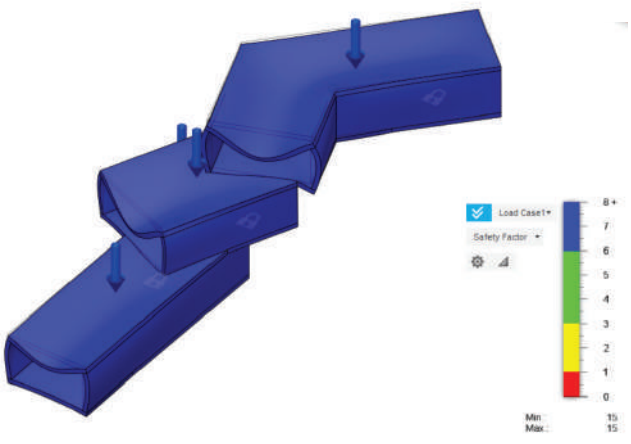
The image above shows the thick facade component and the different optimized levels of it (from left to right) - material retained: 50%, 60%, 70%, 100%.

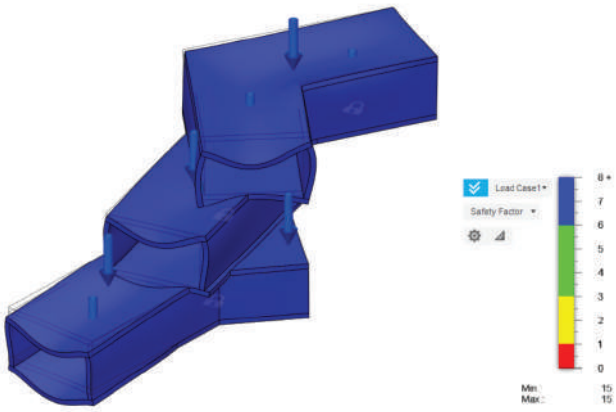


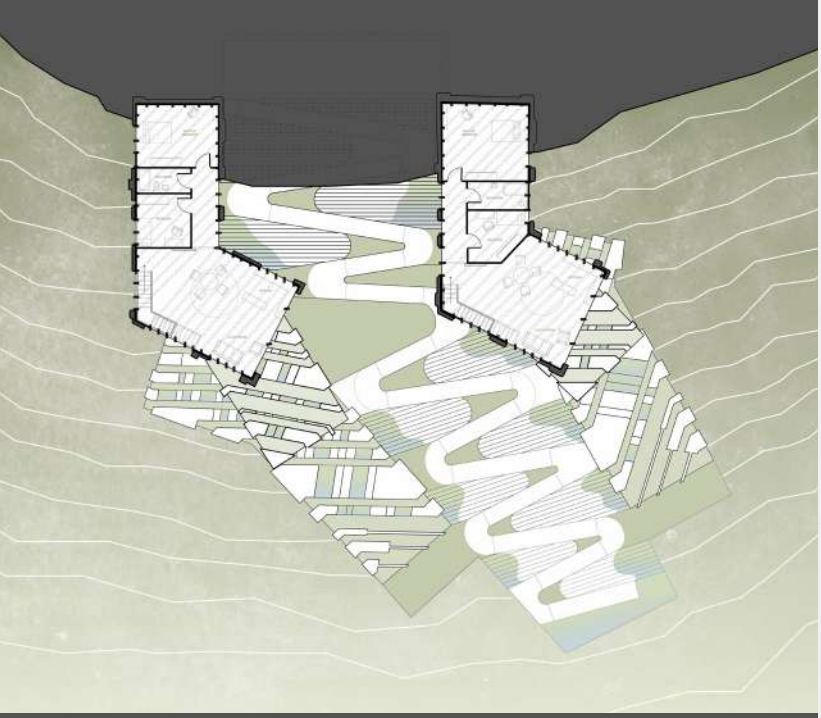
The images shown on the left are studies of how different masses can be stacked and which set of masses are the strongest to allow for more optimized components to be used in the overall structure.

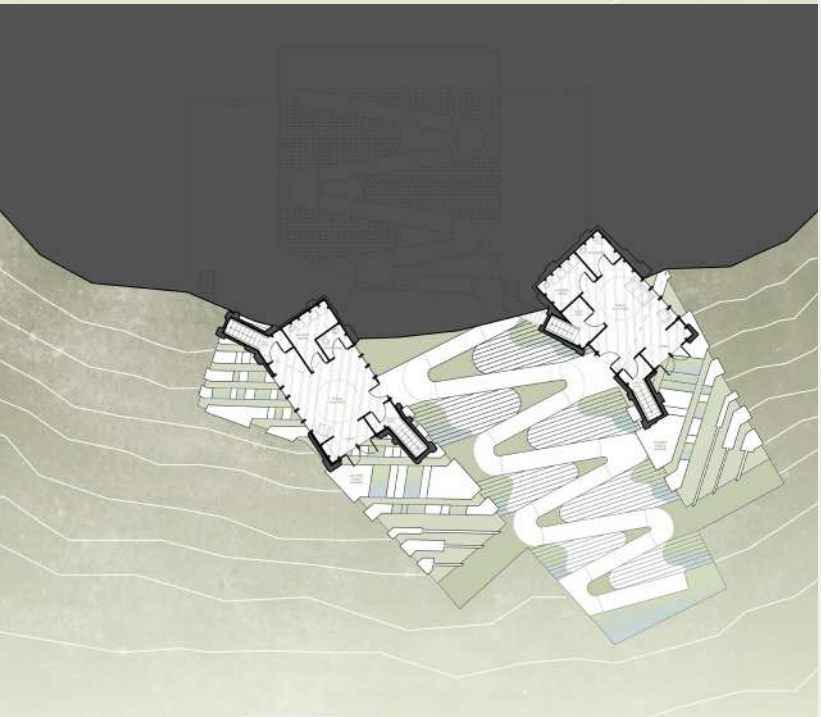


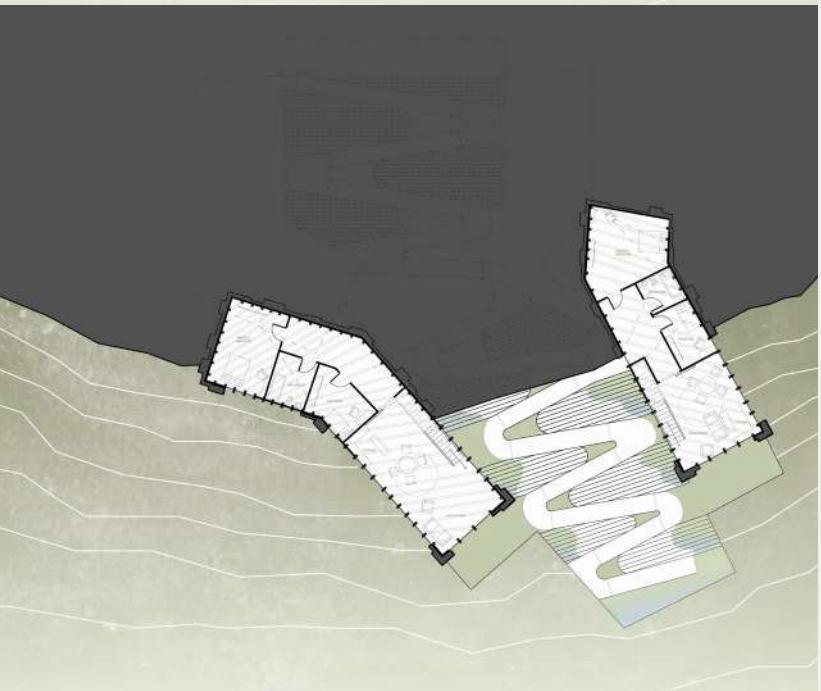
The two images below study the stress applied to the housing masses and where more strengthened components are needed.

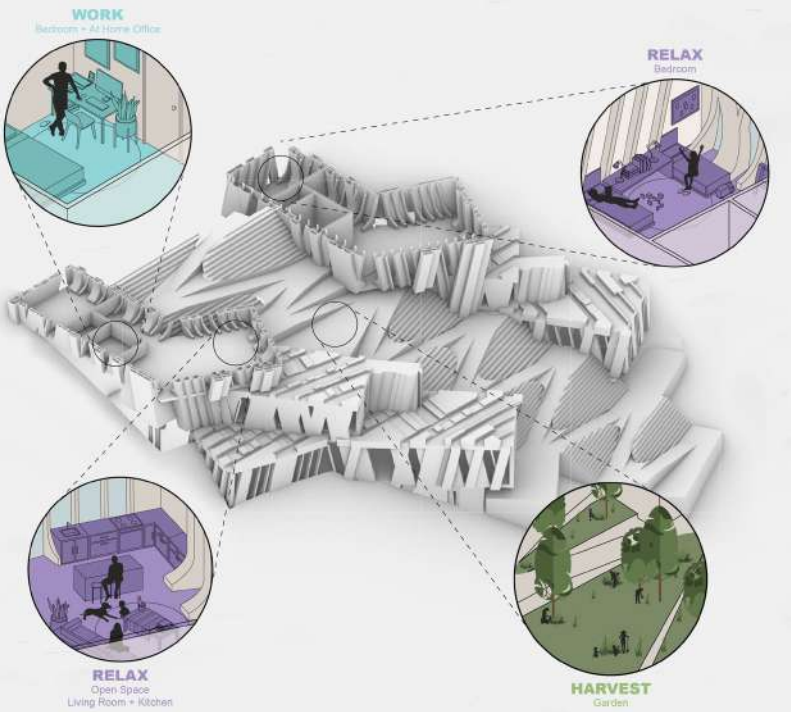


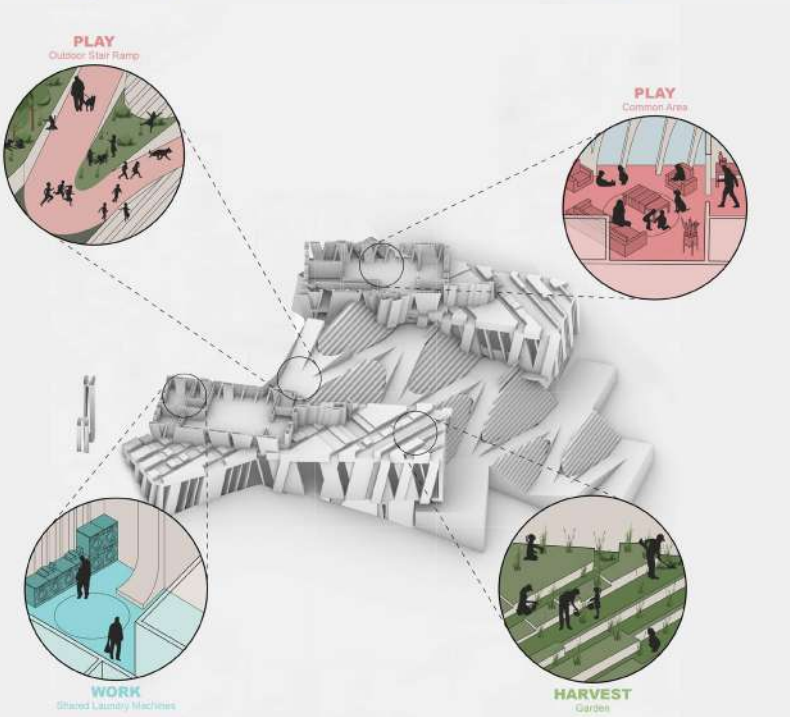


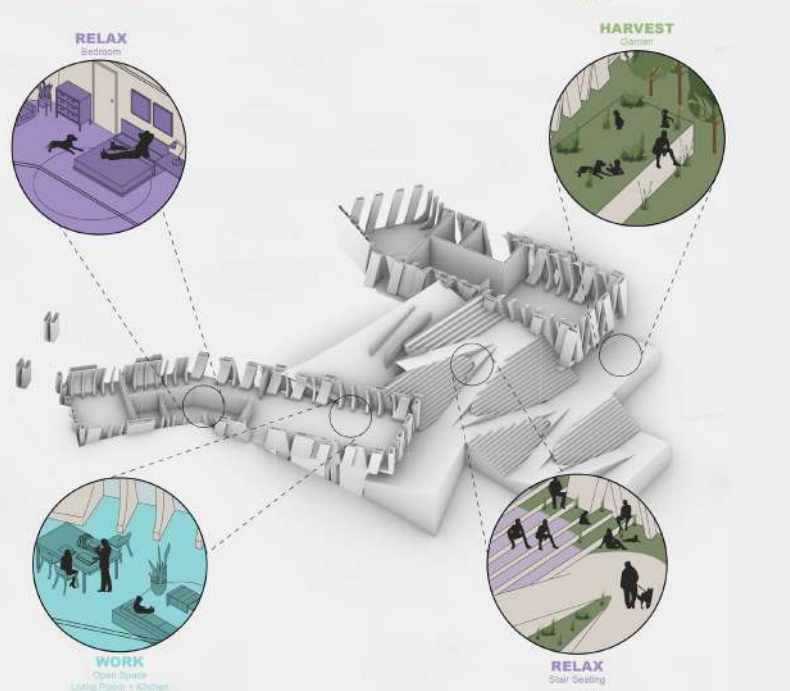


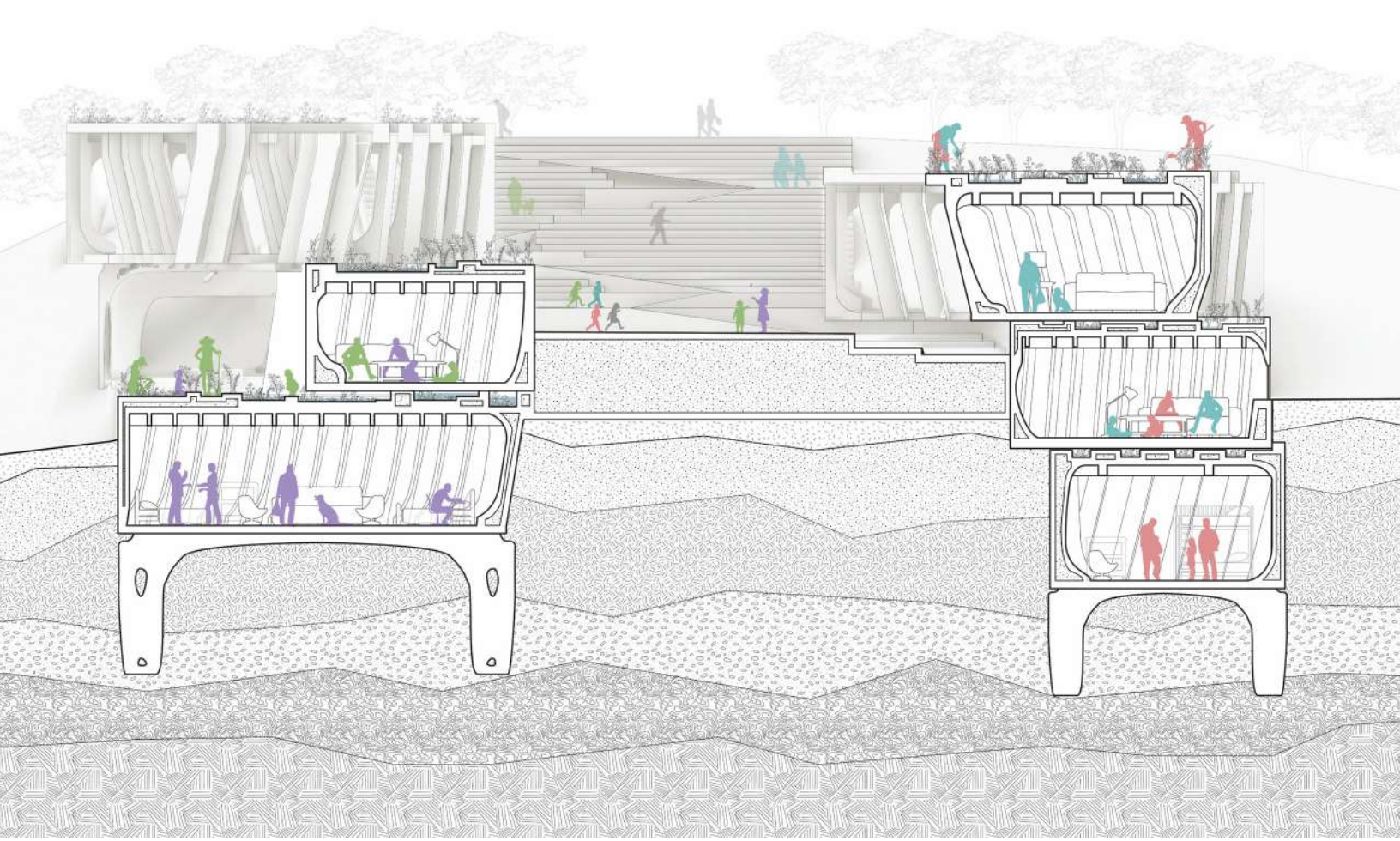





WORK
Bedroom + At Home Office
RELAX
Bedroom
RELAX
Open Space
Living Room + Kitchen
HARVEST
Garden


PLAY
Outdoor Stair Ramp
PLAY
Common Area
WORK
Shared Laundry Machines
HARVEST
Garden


RELAX
Bedroom
HARVEST
Garden
WORK
Open Space
Living Room + Kitchen
RELAX
Stair Seating



Co-Housing & Co-Parenting

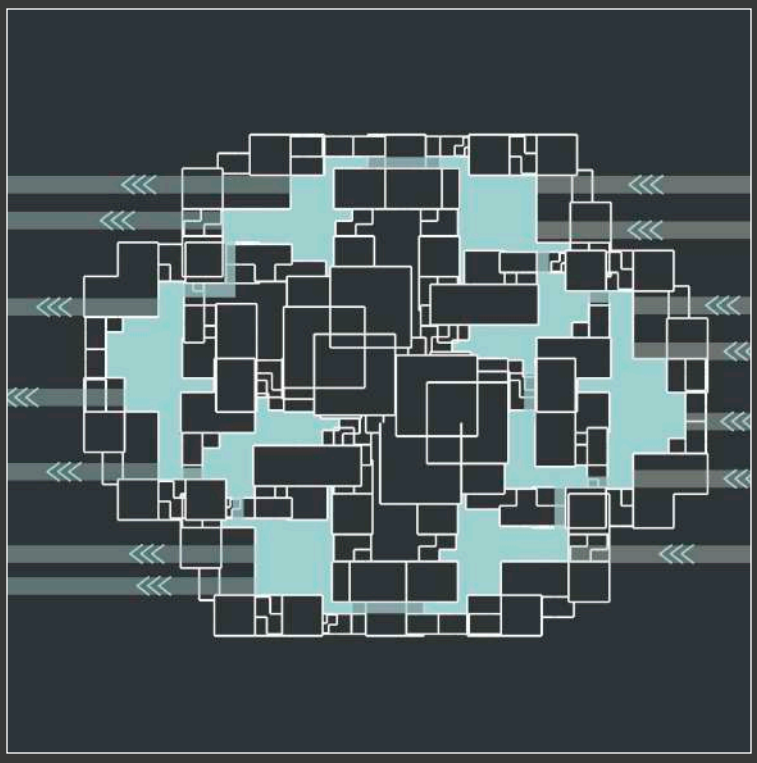
Social Flows

Hazelwood's primary inhabitants belong to a racially diverse, underserved, economically and socially vulnerable demographic. Split House aims to enable a better future for the children of low-socioeconomic households by stabilizing the landscape into edible playscapes.

This spatial organization of the house proposes co-living, co-sharing, and co-parenting. Double house reduces square footage by overlapping spaces to allow for co-parenting in conjunction with urban gardening and encourages collaborative decision- and place- making.

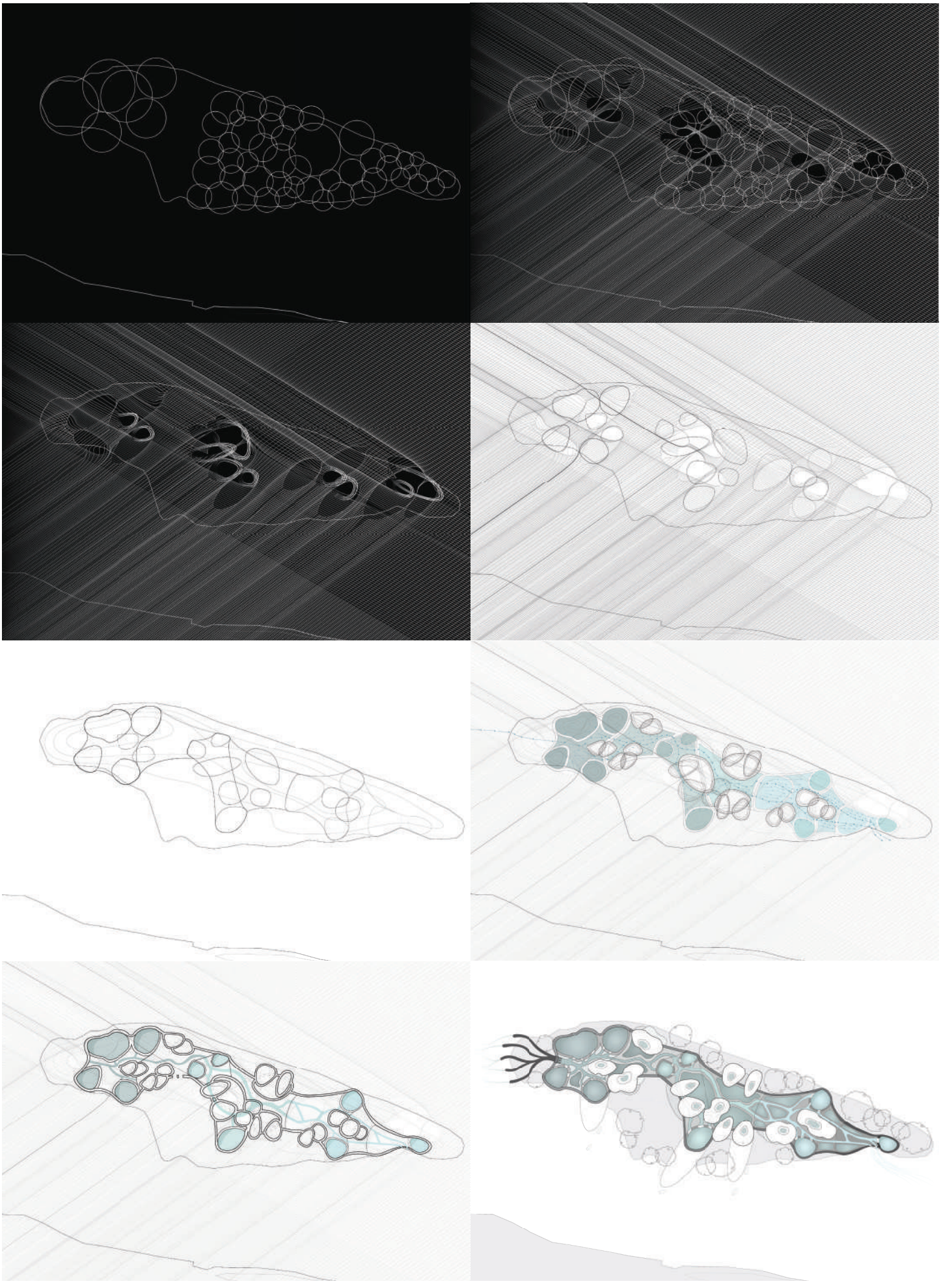
Adequate housing is critical for determining the health and education of children. 49% of people that live in Hazelwood are families with children under the age of 18, with the median household income of $37,091. America struggles with creating "affordable housing" options because of the market pressure, causing homes to rise in price. However, sharing space for parenting time overlaps, utilities and urban gardens could help lower the housing cost.

ECO-MACHINE
co-housing

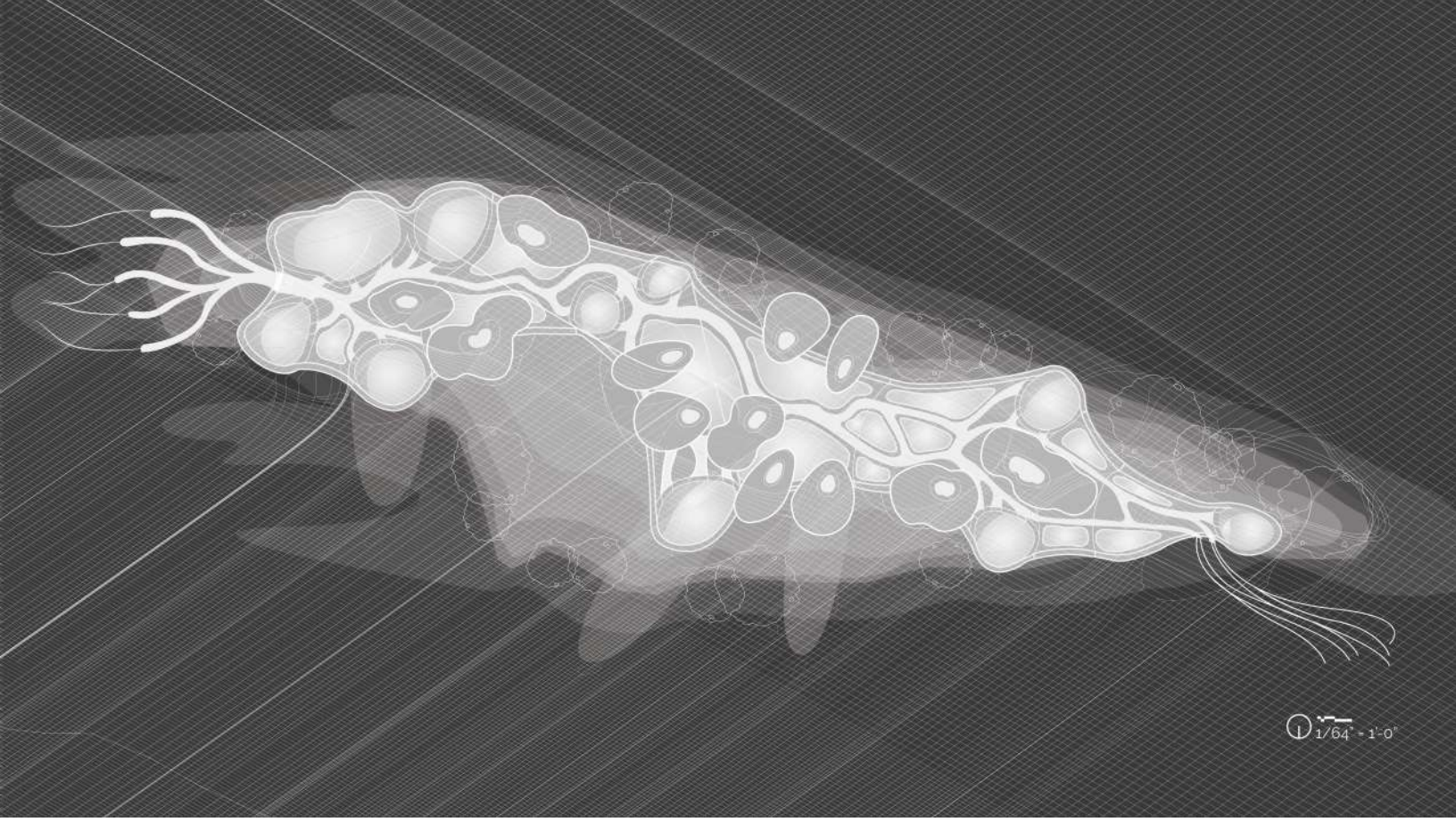


Six Mile Island, PA
Environment Form & Feedback: Water Communities
advised by Matthew Huber & Dana Cupkova

Students developed urbanization strategies to create co-housing and eco-machine prototypes onto the site. The project began by allowing students to develop an understanding and focused knowledge of a specific system's behavior and logic to get a clear understanding of how it could be incorporated into the site and integrated into the lives of those living there. The goal of this design was to design a large biofiltration system that would take water from the Allegheny River, clean it, and return it back to the river. The biofiltration system aims to use streams, waterfalls, and greenwalls to treat the water.



The architecture was carved through a wind analysis on the island. The images above show form finding through multiple simulation analyses on the existing site. These studies were then reshaped into architectural form that responds to the environment around it.



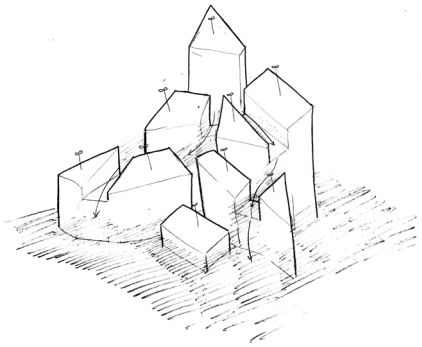
Island Over Time

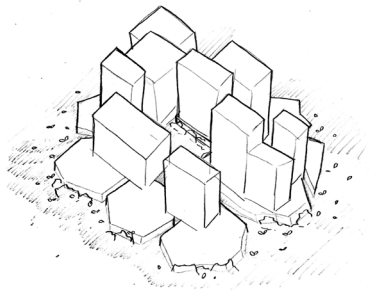
Over time the island will start to grow smaller and smaller (with the rising sea levels and erosion), but the architecture aims to still stay standing even as the island begins to fade away into the river. .

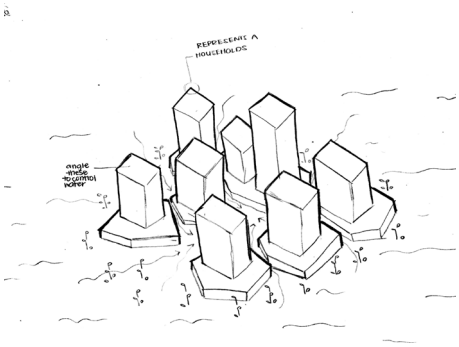
Site Plan Top Level

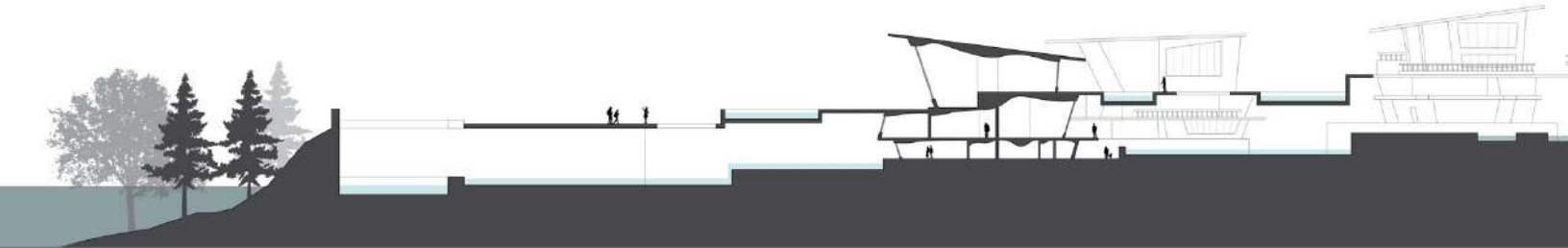
Series of streams and openings that help guide the water through the structure and allow water to fall through the top and into the bottom layer of the system. The pump at the beginning tries to mimic the appearance of water flow streams and helps bring water into the system.

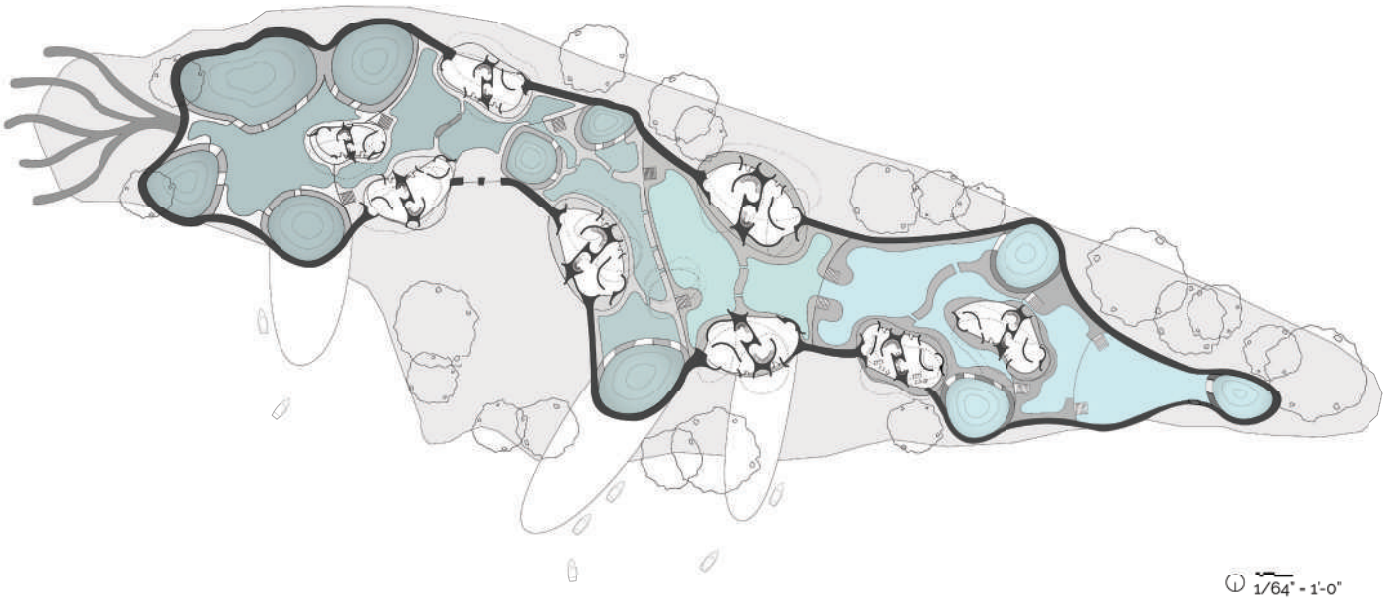
The image below displays a series of initial sketches that conveyed the idea of using streams to dictate paths and circulation of the water and the residents moving.











1/64" - 1'-0"

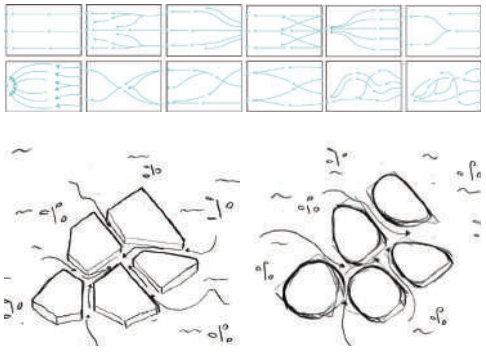
Site Plan Bottom Level

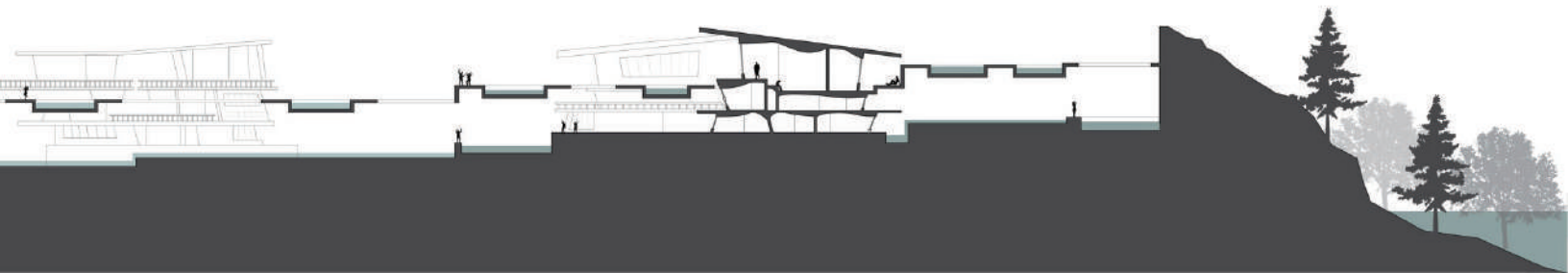
The bottom level of the system consists of a series of large pools that are surrounded by walkways to allow for residences to get into their homes. The water from the top level flows into these pools to create a waterfall effect for the residents to experience.

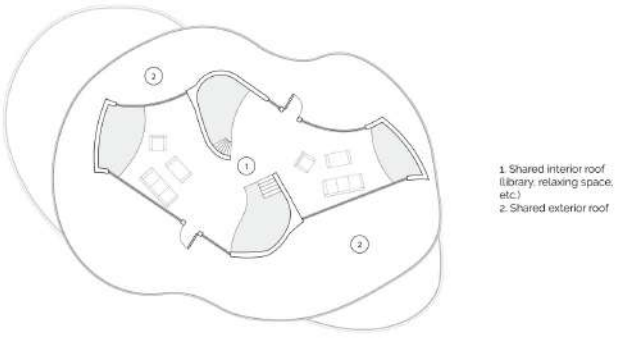
Architectural Form

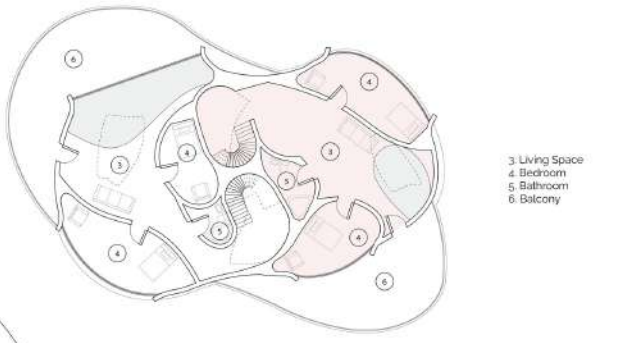
The overall architectural form derived from an understanding of how water flows. Water tends to erode sharp turns and likes to free-flow through curved paths, which helped create the final form which mimicked the language of the water's movement.

The image to the right displays a series of diagrammatic studies to understand how water flow patterns can be affected by physical objects, like buildings, and help dictate overall form.









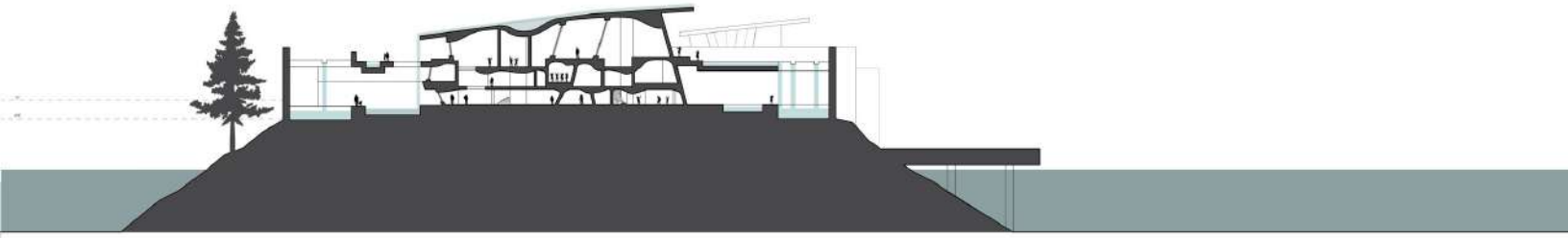
Co-Housing Plans

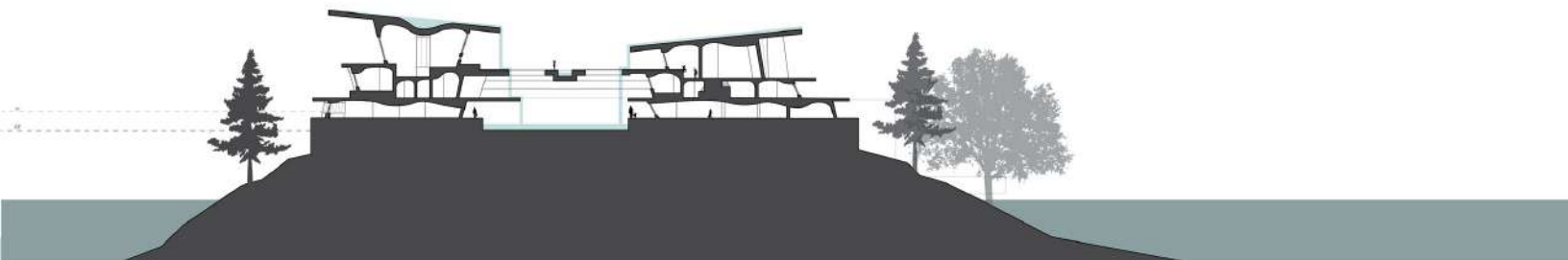
Each building holds multiple housing units depending on the shape of it. The core of the building consists of stairs that help inform the orientation of each floor; each floor is rotated a specific way (the first floor is rotated to follow waterflow, the second floor is rotated to get as much sunlight as possible, and the third floor is shaped by the wind).

The walls of the unit help inform the circulation flow that someone would walk while going through the house.

Section Series

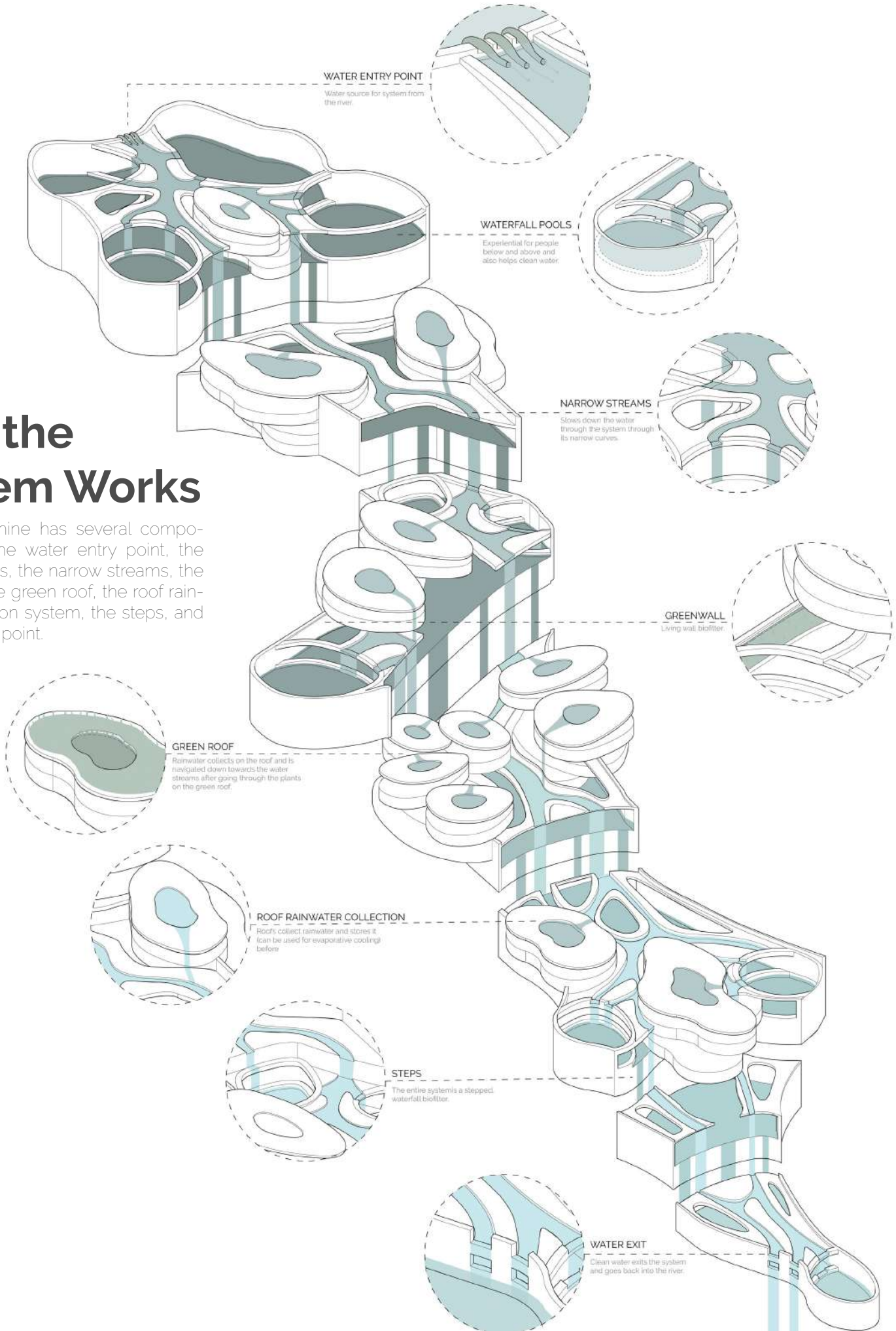
The sections help show the main concept of the design, that water travels through both the system and the buildings at differing ground elevations.





How the System Works

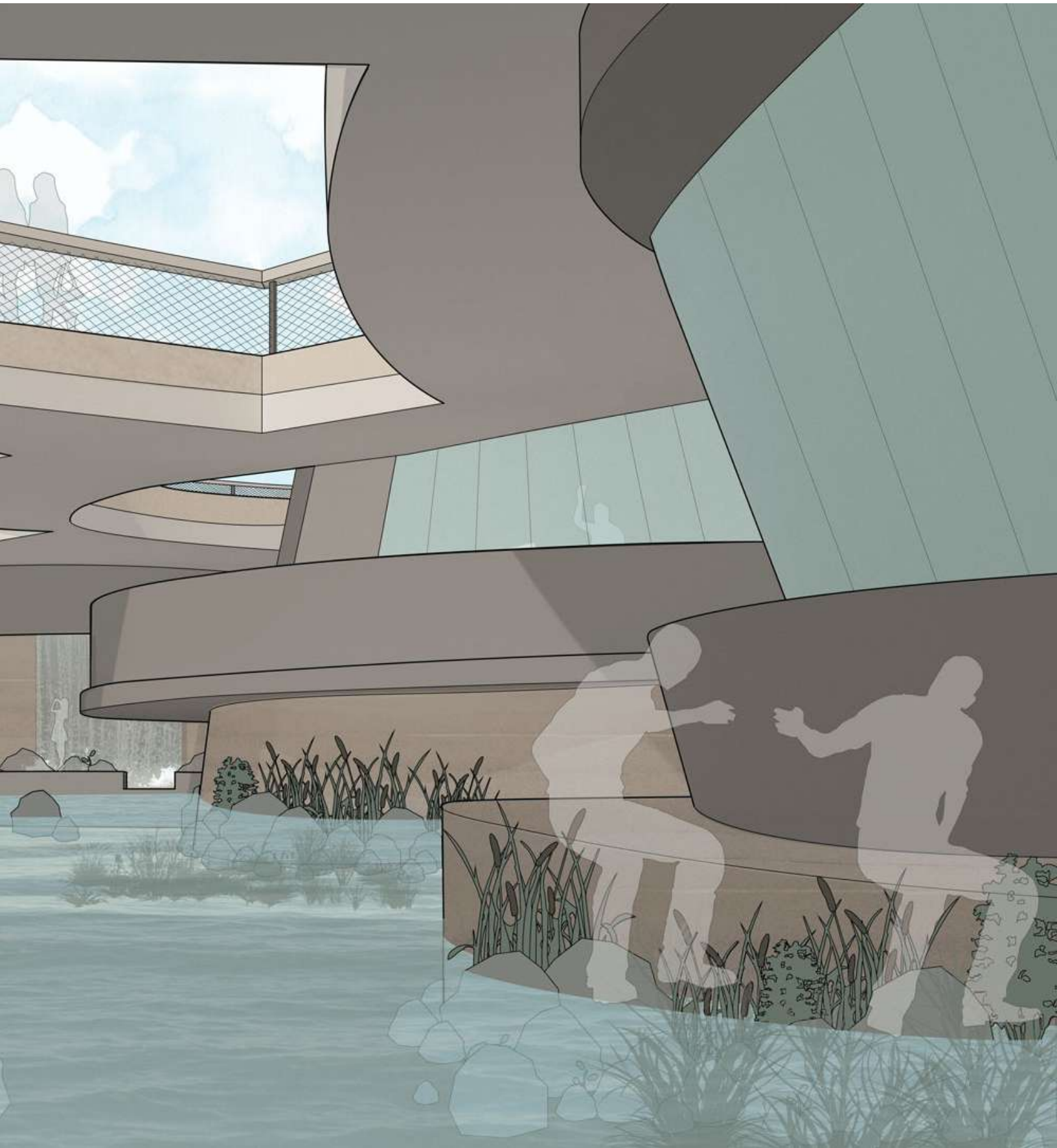
The ecomachine has several components to it: the water entry point, the waterfall pools, the narrow streams, the greenwall, the green roof, the roof rainwater collection system, the steps, and the water exit point.



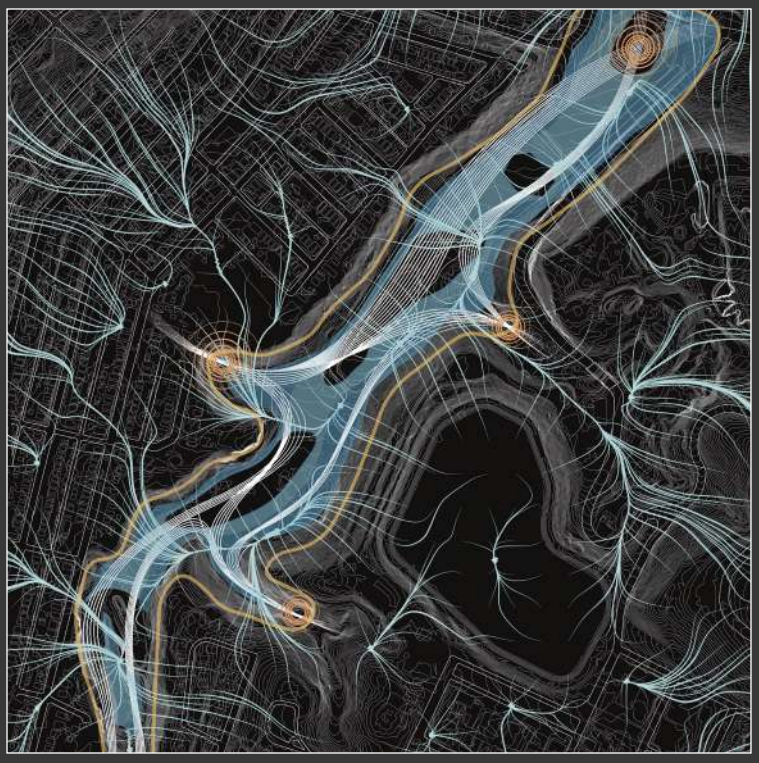
Materiality & Experience

The materiality of the architecture is mainly concrete because the goal of this structure is to make sure it doesn't erode or dissolve with the constant contact with water. However, rammed earth walls and floors are also present in the structure (not the housing units) that would potentially wear away over time, but wouldn't wear away too quickly. This opens the architecture to multiple possibilities of what it could become in the future. The rammed earth material is also used at the top level where residents walk to potentially wear away the streams at the top level and create new water openings, al-

lowing for more water pathways. Another potential material that couldn't be shown in this perspective view is sand, which enhances the idea of architecture changing over time; this material would be used in pools or streams to create a certain textured feel for people experiencing the clean water physically.



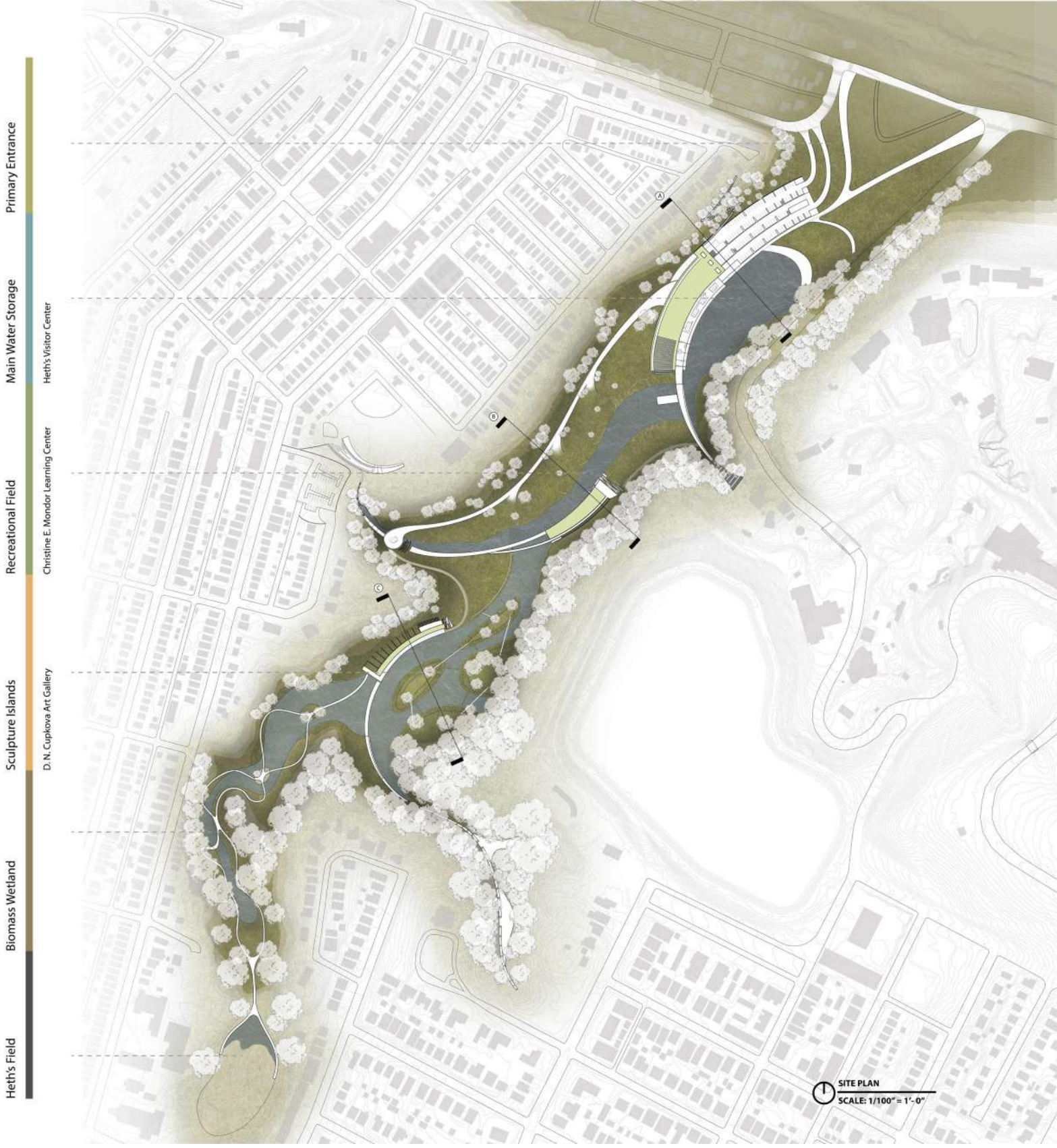
SCULPTURE PARK



Highland Park, PA
INFRAstructure Studio
advised by Christine Mondor
in collaboration with Claire Koh

This Sculpture Park aims to act as a recreational site for learning and for the environment. This project assumes that the animals have been freed from the Highland Park Zoo and the existing parking lot is no longer there, leaving the valley clear for design. Taking into consideration the existing reservoirs, the Sculpture Park collects the water from the neighborhood above at various entry points and brings the water down into the site.

Throughout the park there are different ecological conditions located on this site depending on the part of the valley it is within: wetlands, grasslands, streams, forests, etc. The site is constantly changing depending on the weather and the seasonal conditions, which will affect the experiential aspect of the site for visitors.



Zones

The sculpture park is separated into four different zones that have four different conditions and experiences.

Hardscapes

Each zone is separated by dams that allow for water to overflow from one zone to another (each zone is at a different elevation from the last) and also acts as a bridge for the main circulatory path on the site for visitors.

These dams are also shaped in a way that guide the water and collect them into the different water channels in each zone.

Zone 1

The **First Zone** is the where the main water storage is located. It is also where the main entrance to the park is and where the main parking lot is located. This zone contains the visitor's center. The water from this water storage is collected and stored until there is an overflow of water, which will flow into an existing depression underneath the bridge at the end of the site. This pathway is connected to the Allegheny River.

Zone 2

The **Second Zone** is the recreational field. This zone contains the learning center and the ampitheater on top of the visitor center. Since this area is made up of grasslands, it is used for more flexible outdoor activities and outdoor stage performances.

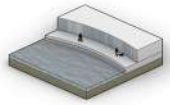
Zone 3

The **Third Zone** is the outdoor sculpture park, which also houses the indoor art center. This zone has several streams that form these sculptural islands that visitors can walk on. Depending on how much water is on the site (light, heavy, or no rain) the islands can change in size, altering the experience visitors can have. This zone is partially dry and wet.

Zone 4

The **Fourth Zone** to the south of the site is a Biomass Wetland. Connected to this zone is a rain garden at Heth's Field, located above the valley. This field collects the majority of the water from the neighborhood and transfers it to the wetlands with pipes. This zone is considered the wettest zone on the site since it is in the narrowest part of the valley.


Biomass Wetland


Building Edge

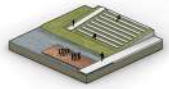

Bridge


Tributary


Sculpture Islands


Soft Waterfront


Circular Plaza

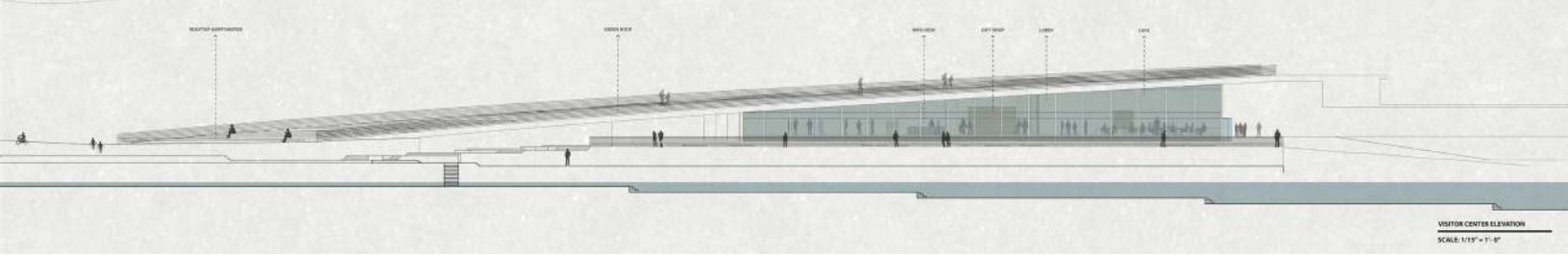

Stage + Amphitheatre


Productive Woodland

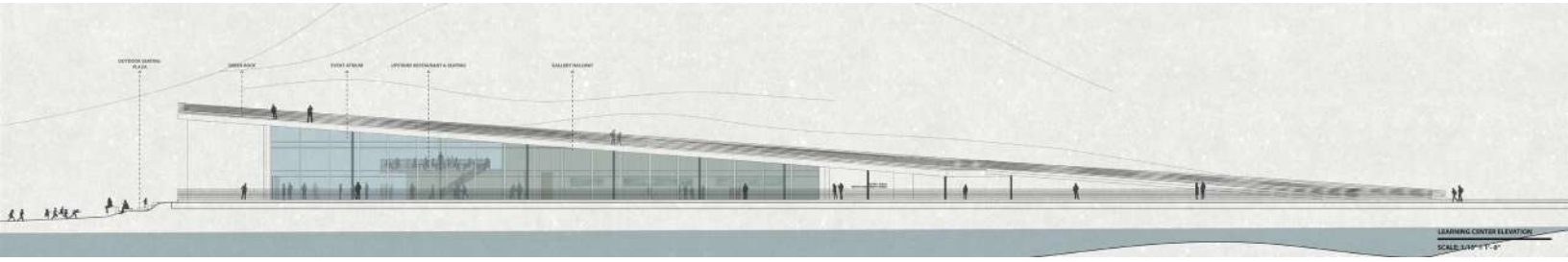

Fractured Plaza


Rainwater Stair + Filter

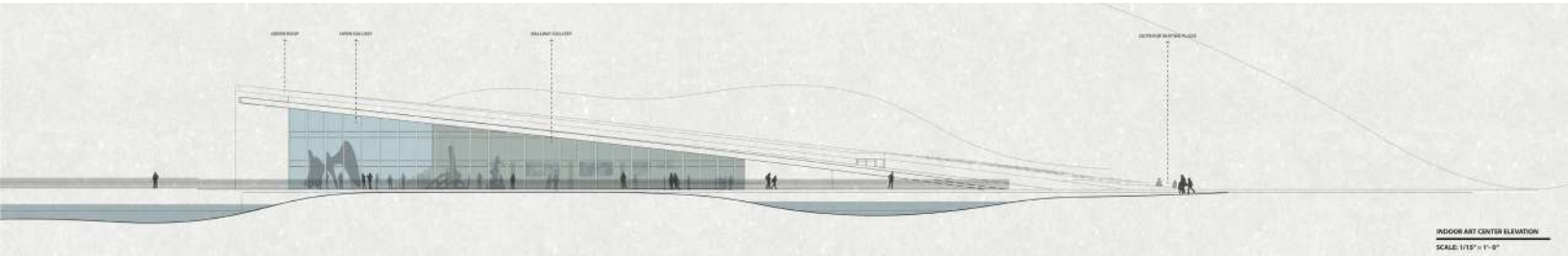

Natoli Rain Garden



The Visitor's Center



The Learning Center



The Indoor Art Center

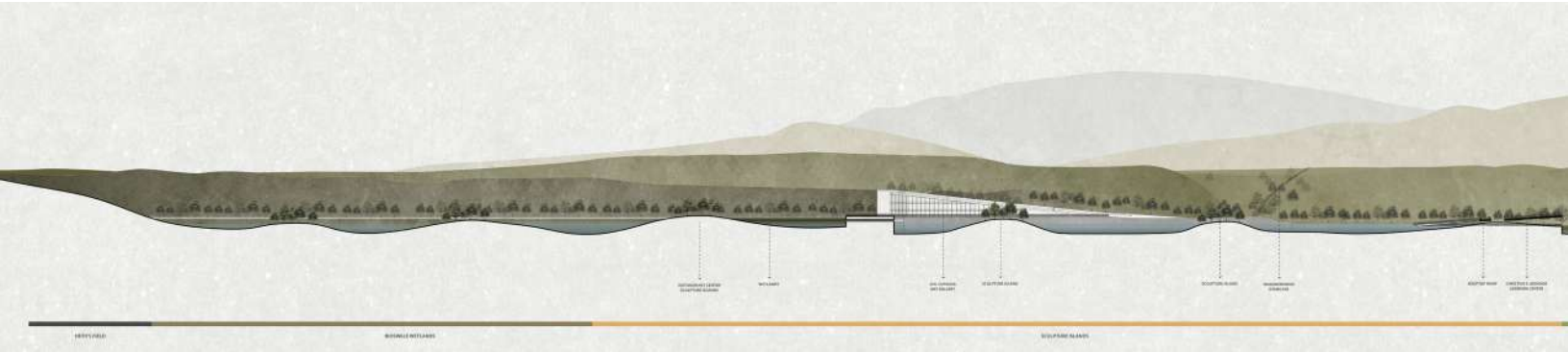
The Architecture

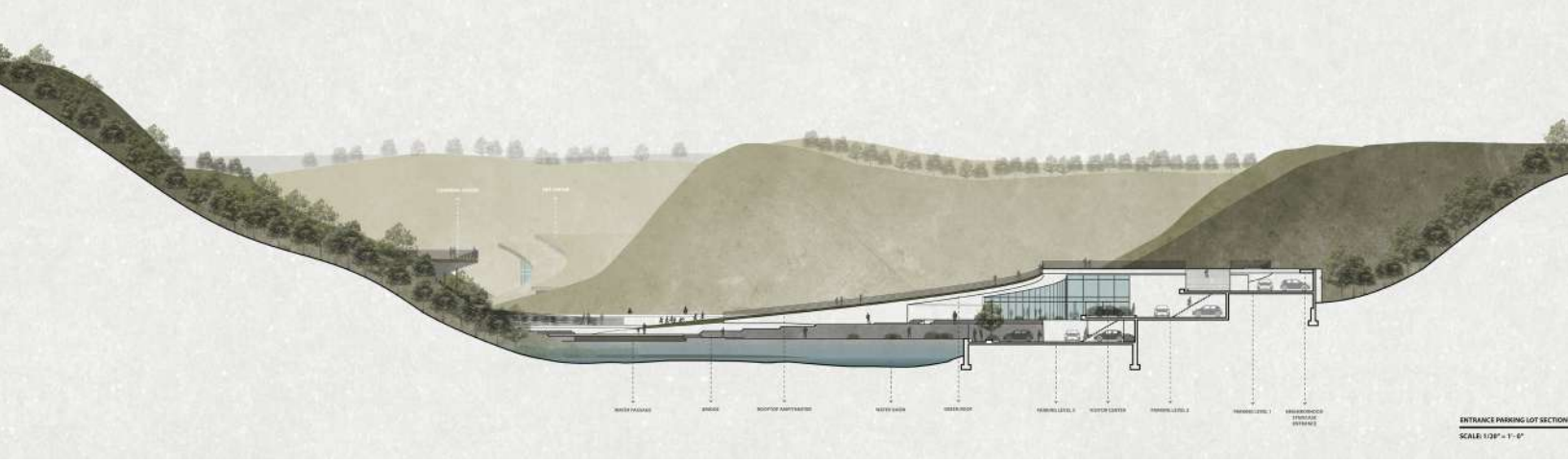
The architecture is integrated into the landscape. Each building hugs the edge of the landscape and actually brings it into the building when necessary. The side that hugs the landscape is where more private activities take place, depending on the building. The more open side of the building is a glass facade that allows for people to have a full view of the water next to the building. Each building also integrates a different rooftop condition.

The visitor center and learning center have a roof that slants into the grass and becomes a part of the landscape. This allows for people to go onto the roof and see an unobstructed view of the entire site in different perspectives.

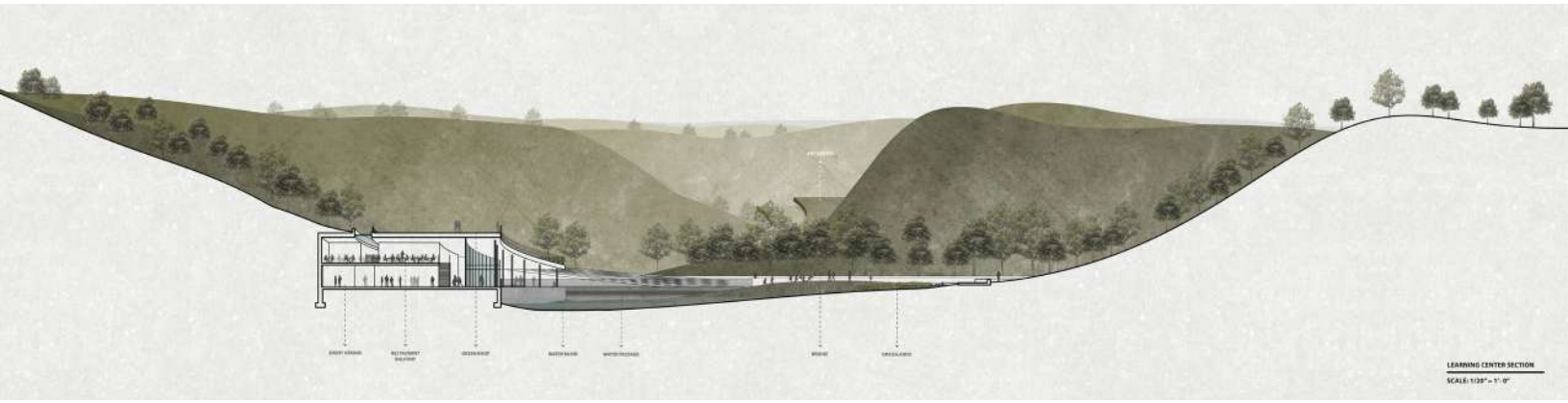
The learning center's roof is also split into two parts to allow for light to filter into the hallway that is pushed against the landscape.

The art center's roof is split into two parts to allow for light to come into the building and shine onto the artwork.

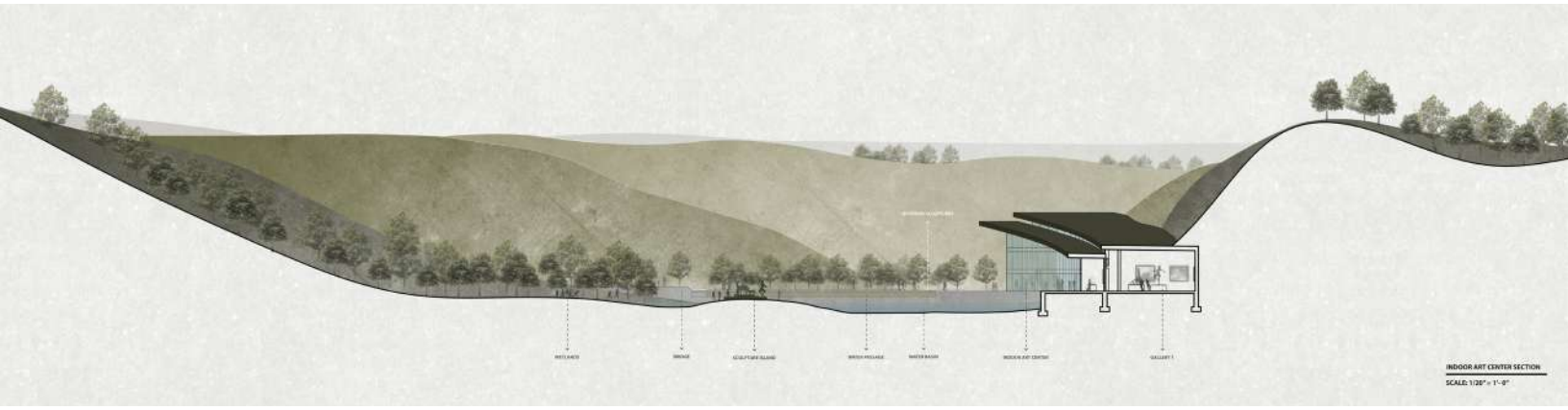




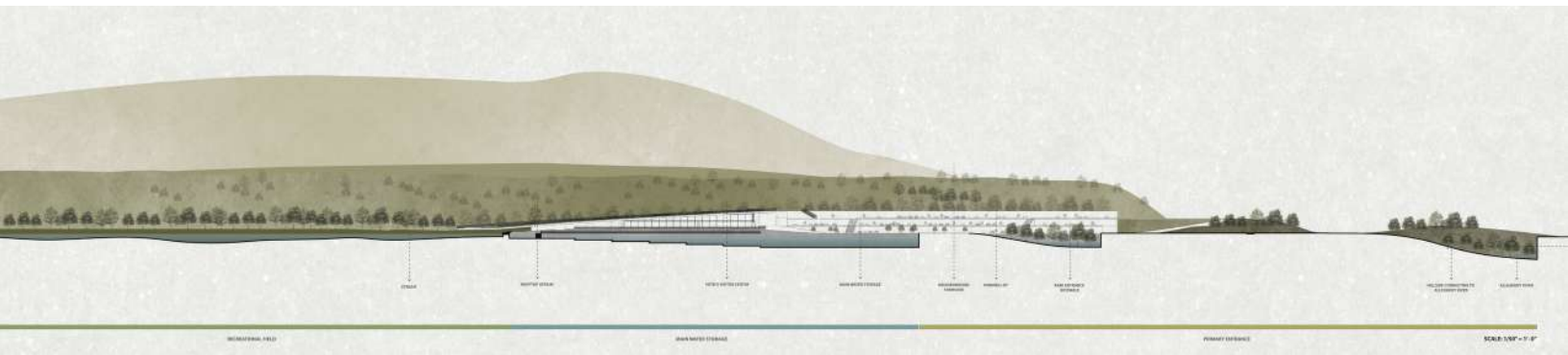
The Visitor's Center



The Learning Center



The Indoor Art Center



Thank you

Please feel free to contact me if you have any questions.
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