



# COLLEEN DUONG

Bachelor of Architecture | 2021  
Carnegie Mellon University

[colleenduong.com](http://colleenduong.com)  
cduong@andrew.cmu.edu  
808 • 429 • 6239



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Hazelwood, PA

### ECOLOGY MORPHOLOGY TYPOLOGY

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Highland Park, PA

### BRADDOCK COMMUNITY HUB

Braddock, PA



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## EDUCATION

### Masters of Science in Sustainable Design

**Carnegie Mellon University**, Pittsburgh PA  
Aug 2020 - May 2022

### 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, 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

### 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**  
September 2021 - Present

### 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.

### CMU Ambassador,

**Carnegie Mellon University, Ruffalo Noel Levitz**, Pittsburgh, PA  
April 2017 - Oct 2018  
• Connected with alumni, parents, and friends of the University to gain an understanding of how their collective experience shaped their lives  
• Developed strategies to encourage new or increased participation

## ACTIVITIES

### Alpha Phi Omega Kappa Chapter

**Carnegie Mellon University**, Pittsburgh, PA  
August 2018 - Present

#### 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.

### Habitat for Humanity

**Carnegie Mellon University**, Houston, TX  
January 2018

- Assist with the construction of houses to help with the hurricane relief program in Texas after events with Hurricane Harvey.

# Split House co-housing

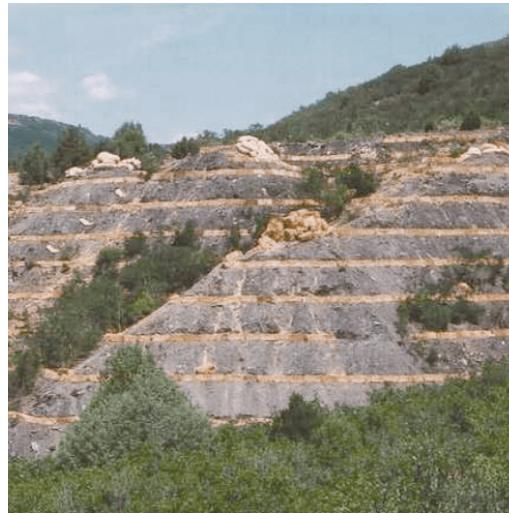


*Hazelwood, PA  
Lithopic\_NOW Studio  
advised by Dana Cupkova*

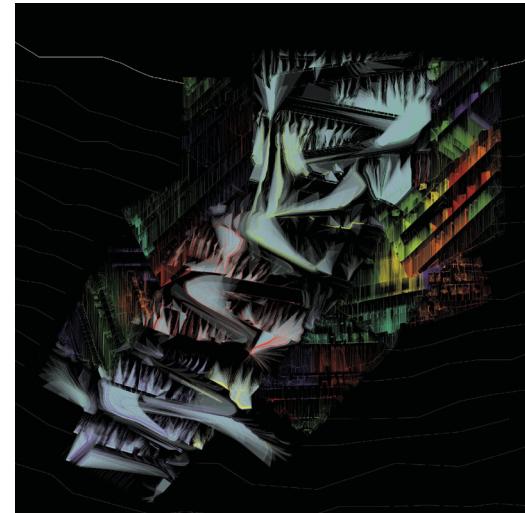
Embedded in an ecological hillside, the co-house focuses on taking advantage of landslides that occur in Pittsburgh due to heavy rain. The central greenhouse and co-housing rooftops collect mud and water and redirects it over, through, and around the architecture, allowing occupants to directly interact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



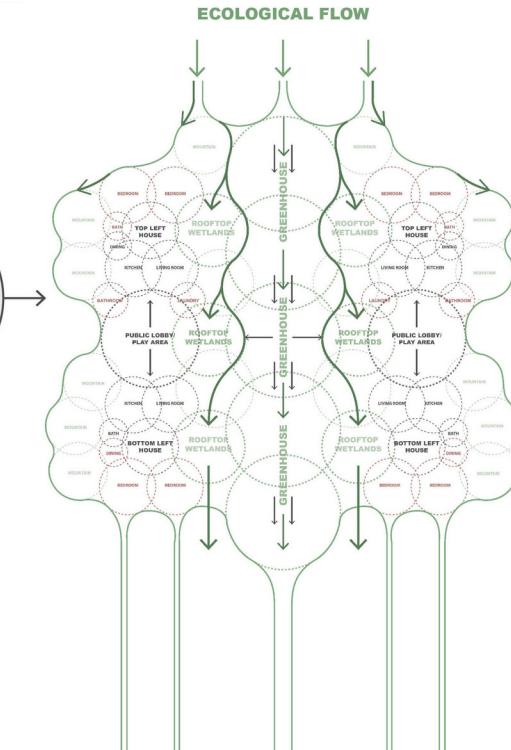
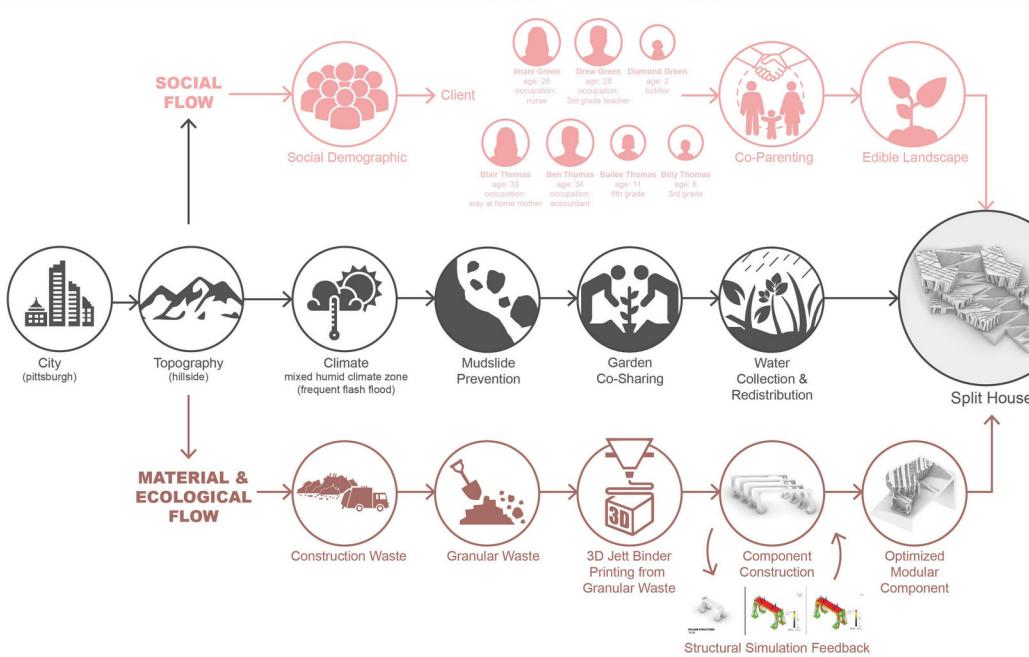
Housing Context



Hillside Topographical Condition



Water Flow Simulation of new house-landform



# Interweaved Flows

Social | Material | Ecological

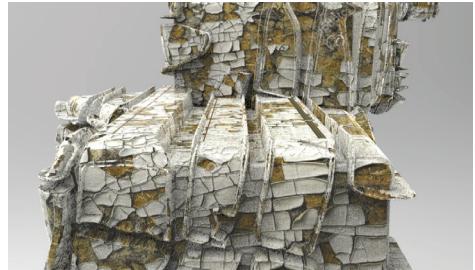
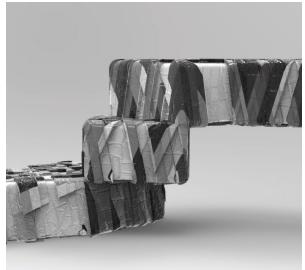
Coming out of a research studio "Lithopic (Living Stone) House: Ecologies of Earthen Matter", that was led in conjunction with a material science seminar, the design approach is underpinned by a potential of construction waste recycling through direct 3d binder-jet printing. This cradle-to-cradle method would reduce CO<sub>2</sub> levels by reducing the volume of new architectural materials, as well as offsetting waste streams heading to industrial landfills. Shaping printable components for minimal material use aligned with structural and ecological poten-

tial 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.*

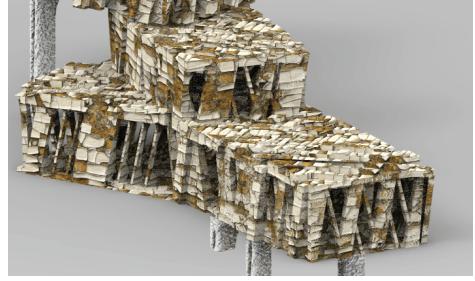
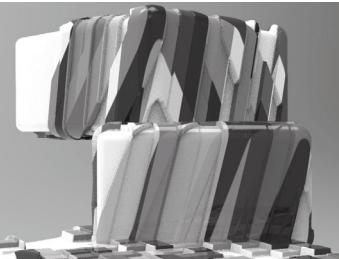
*The image to the right shows GAN (Generative Adversarial Networks) images that study how ecological textures affects a landscape.*





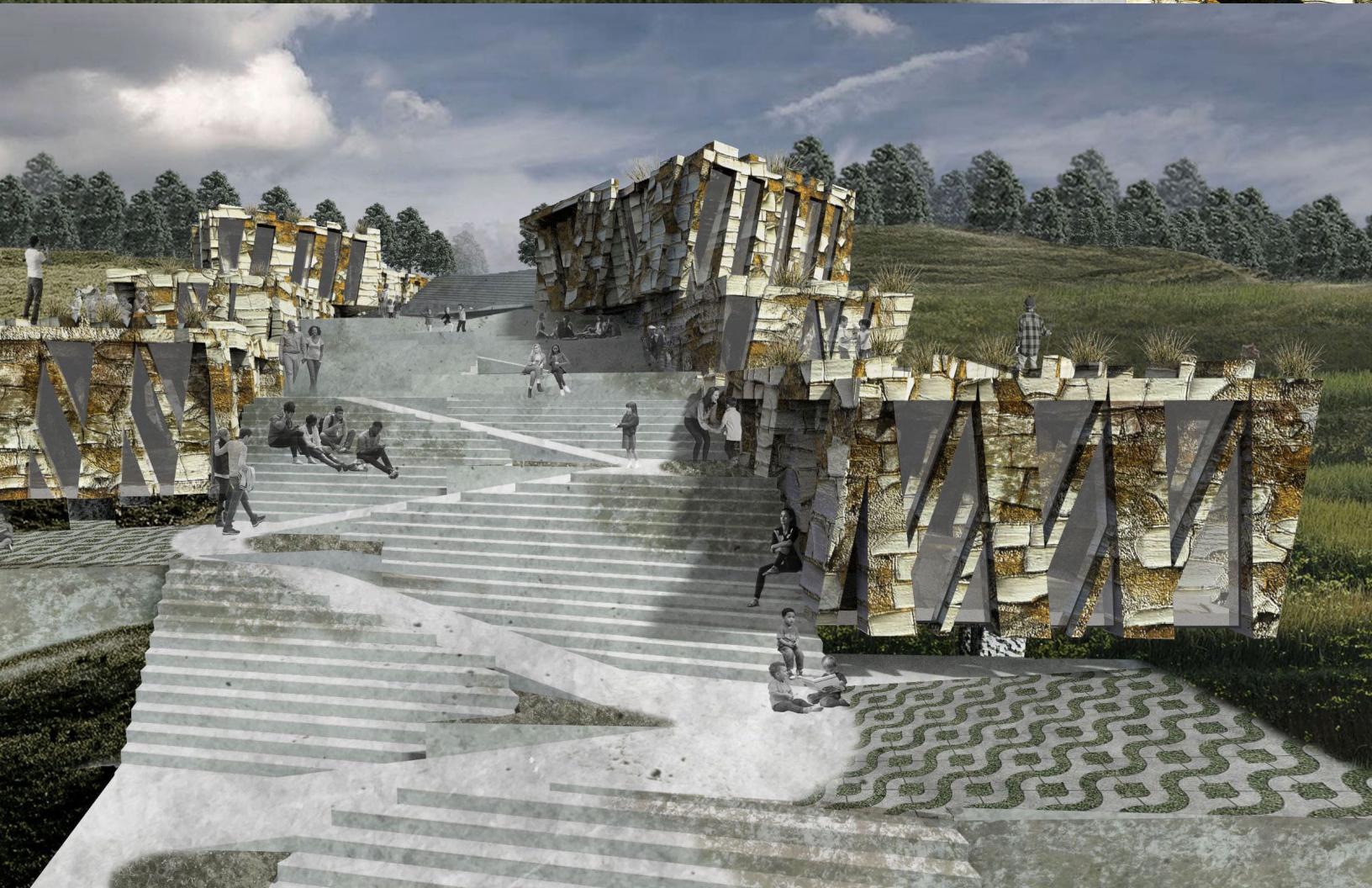
Water Flow Direction

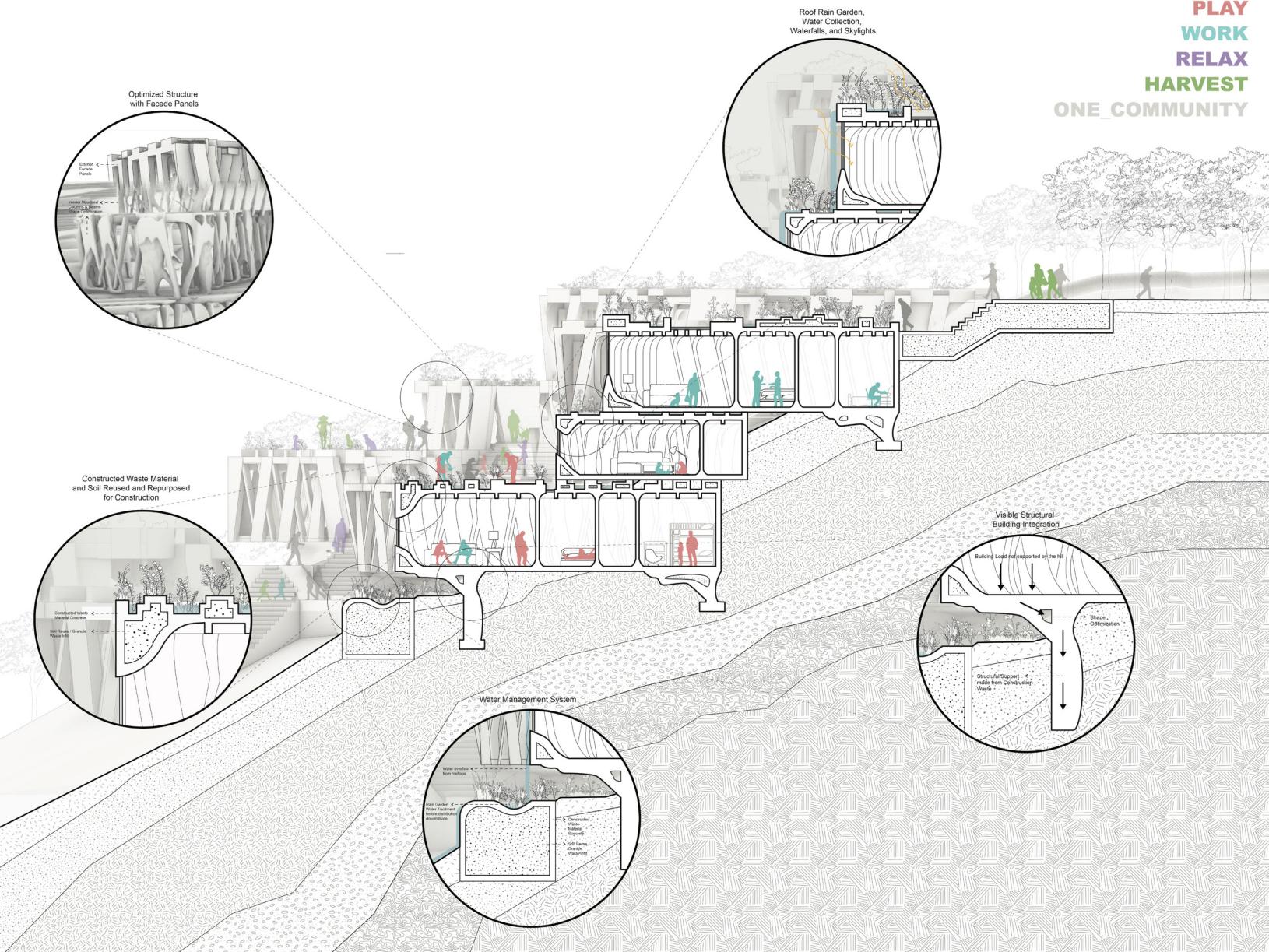
Biomass Texture



## Design Process Workflow

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

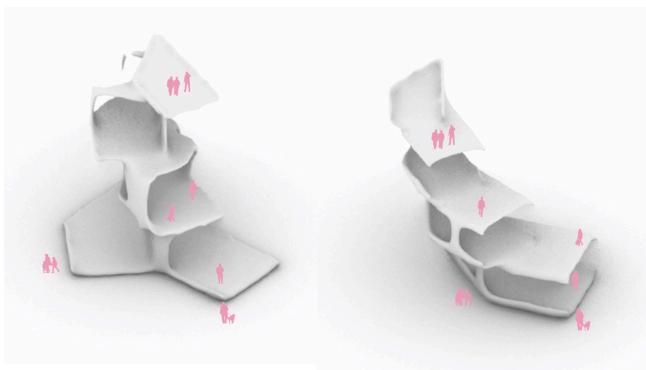




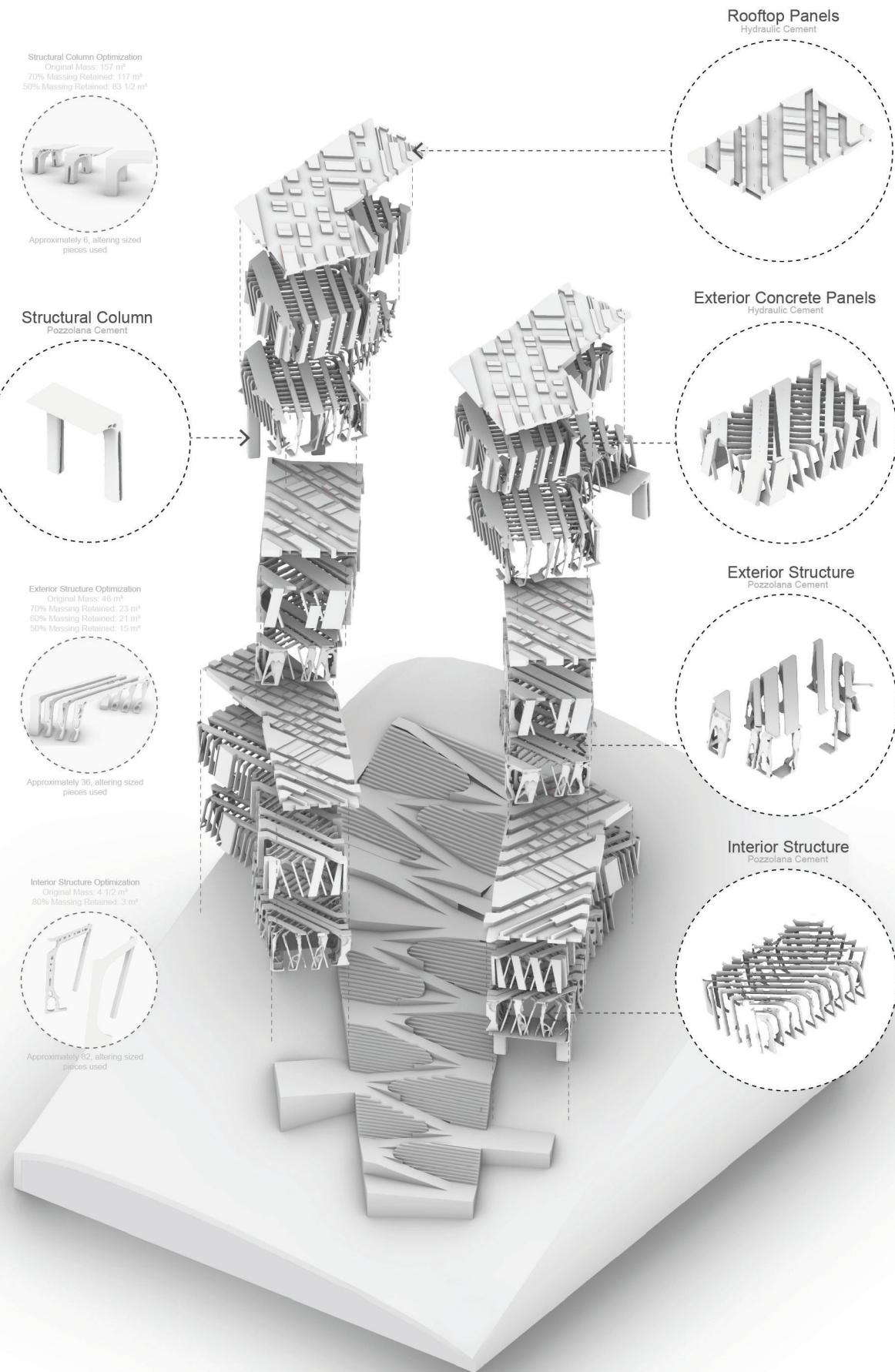
# Hillside Condition

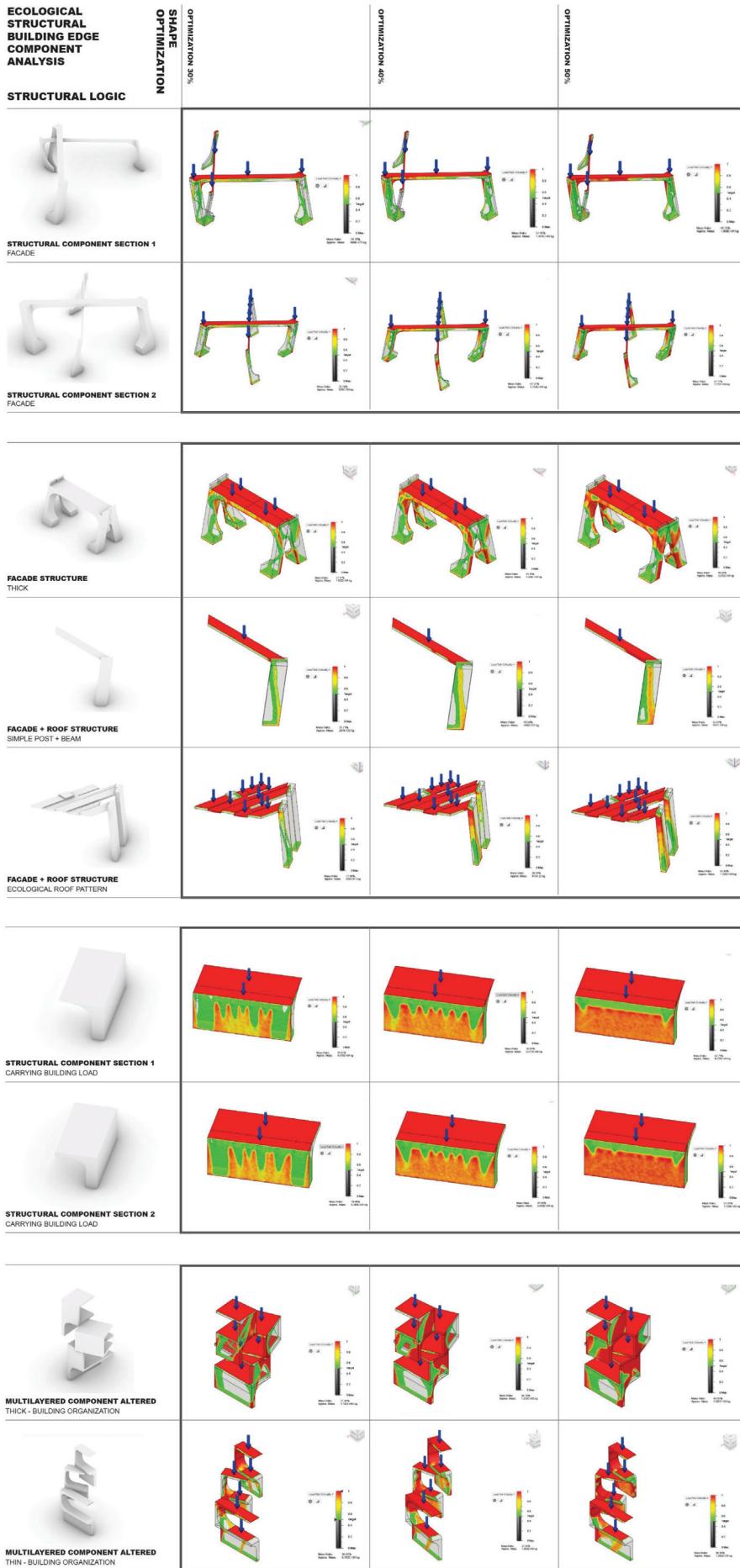
Material | Ecological Flows

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.





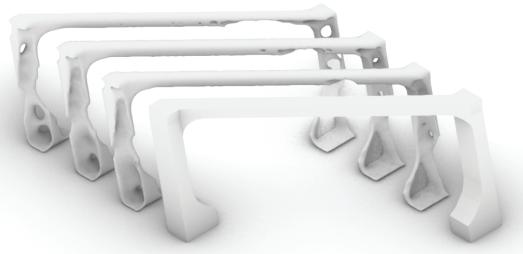
# Material Optimization

## 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 optimized 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%.*

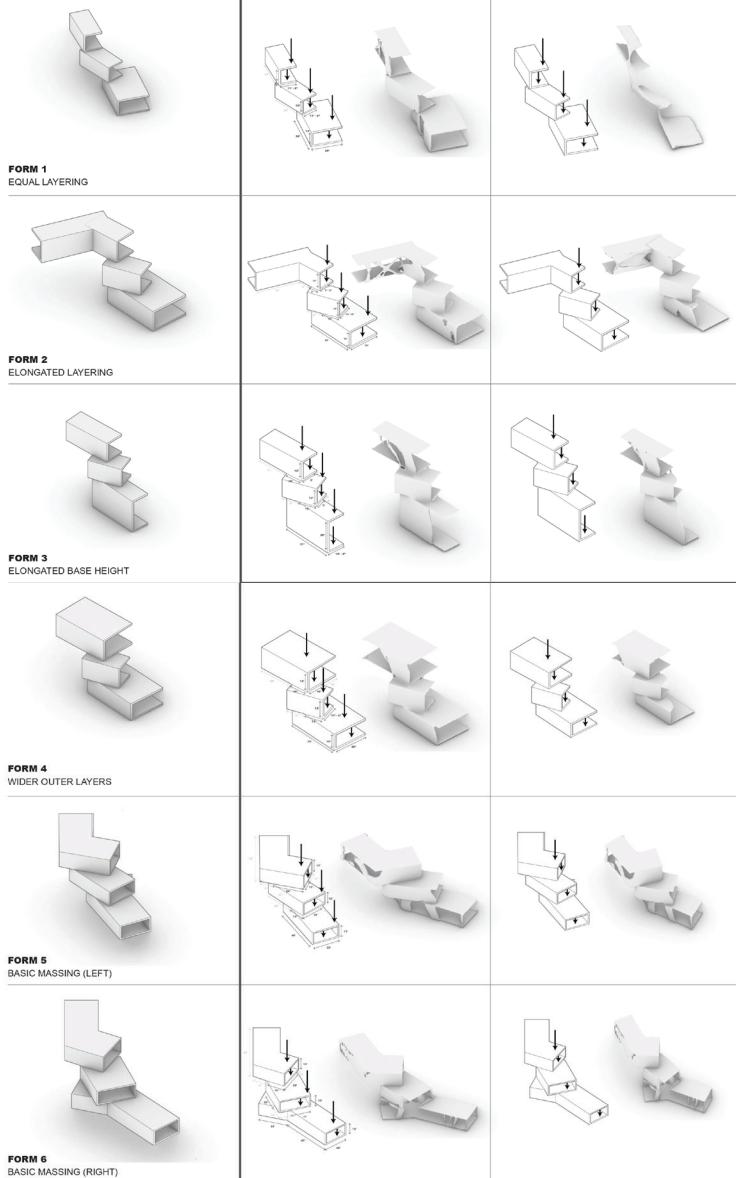
**ECOLOGICAL  
STRUCTURAL  
BUILDING EDGE  
COMPONENT  
ANALYSIS**

**STRUCTURAL LOGIC**

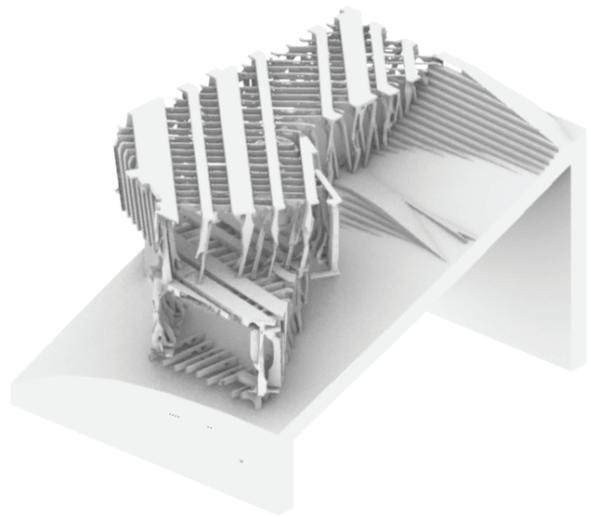
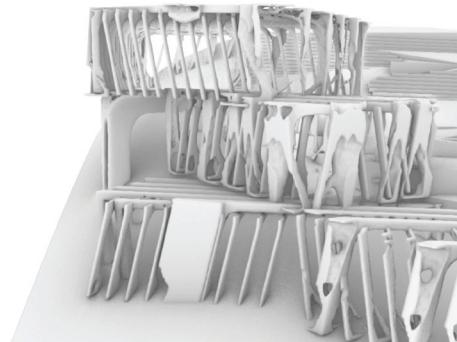
**LOAD  
OPTIMIZATION 50%**

**SHAPE  
OPTIMIZATION**

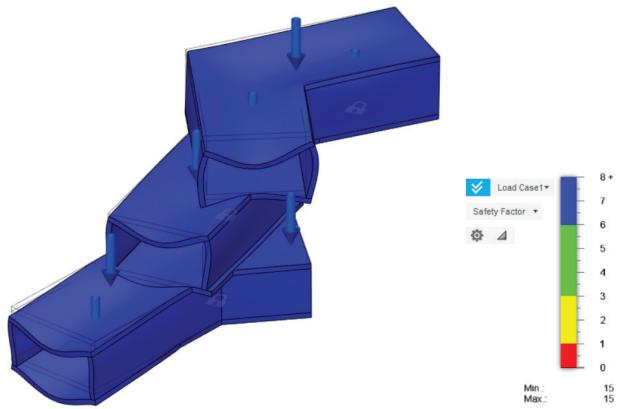
**LOAD  
OPTIMIZATION 60%**

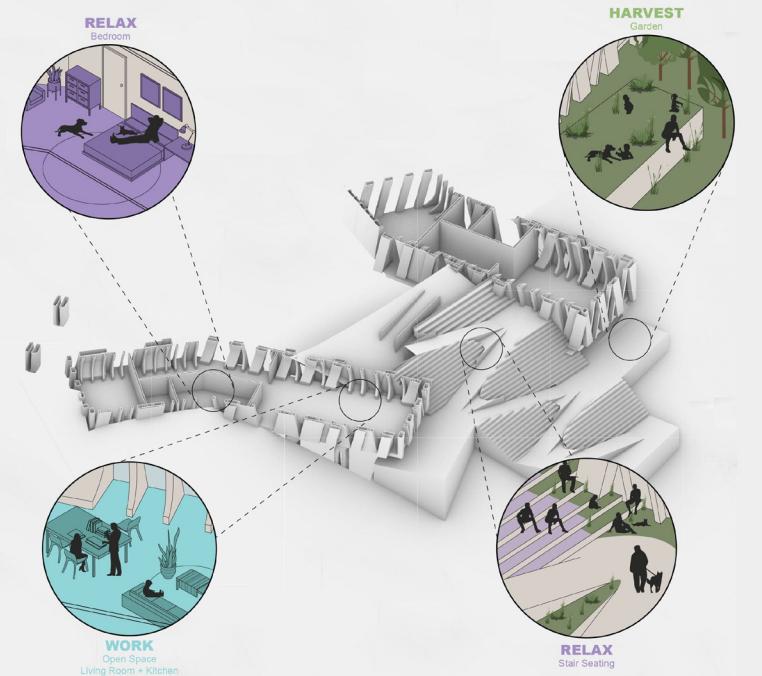
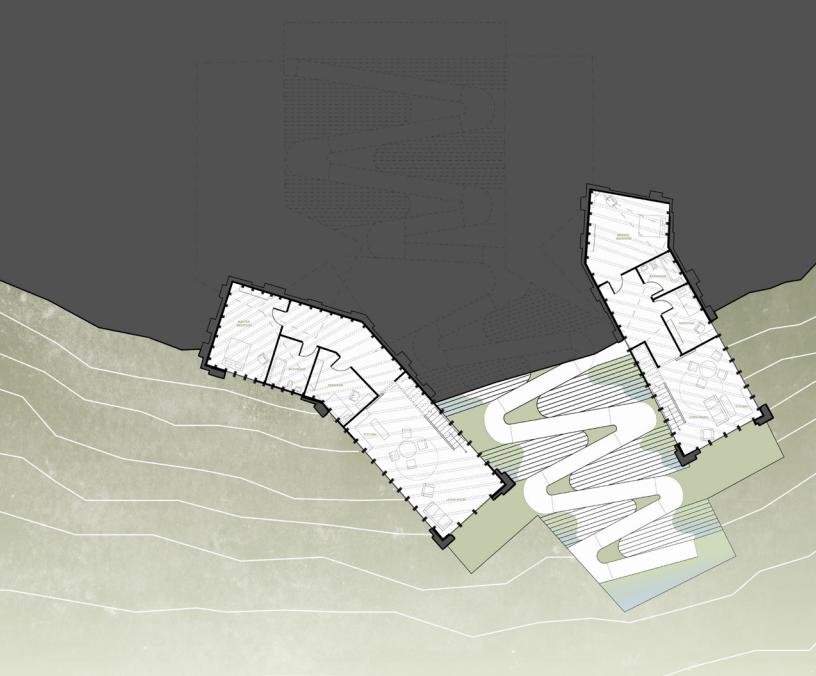
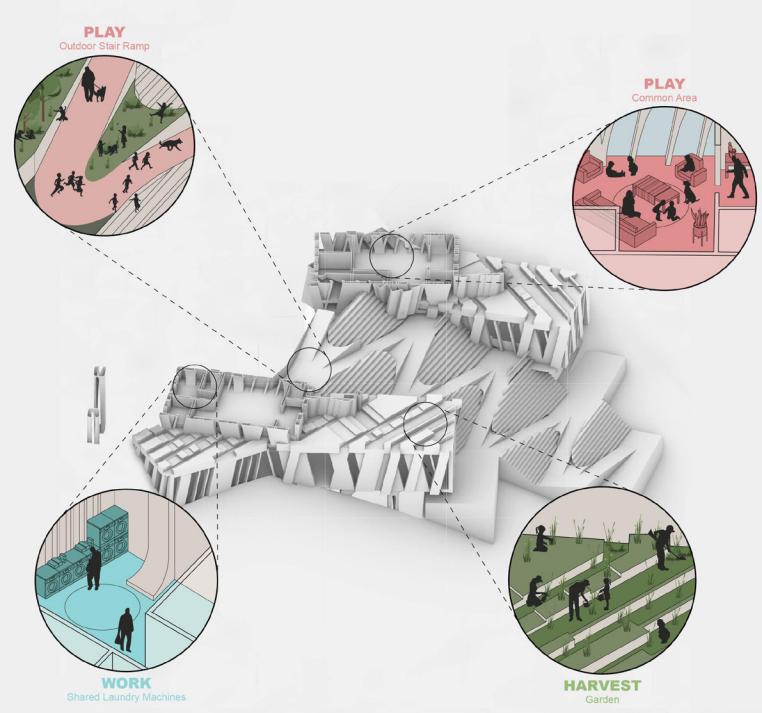
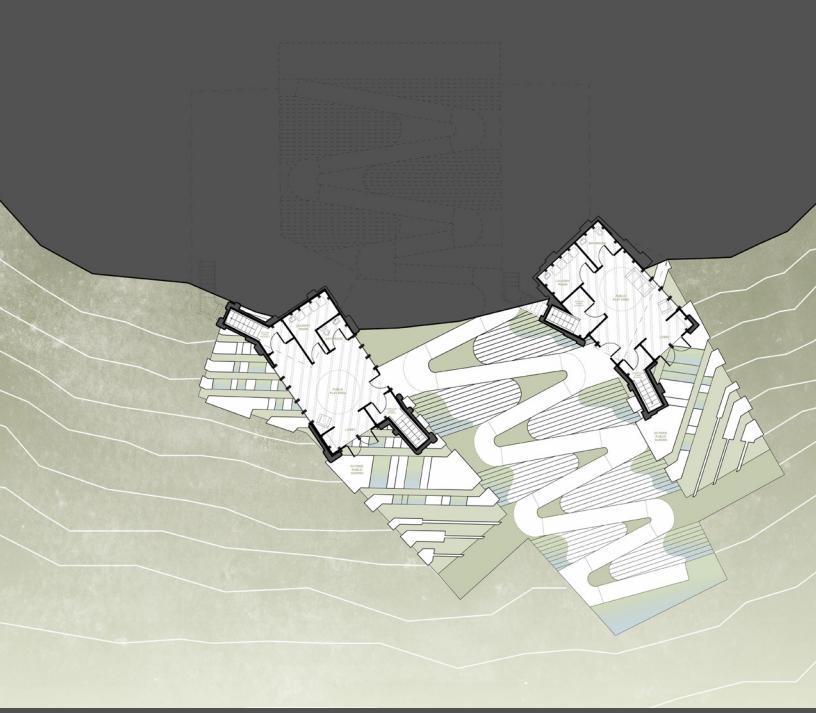
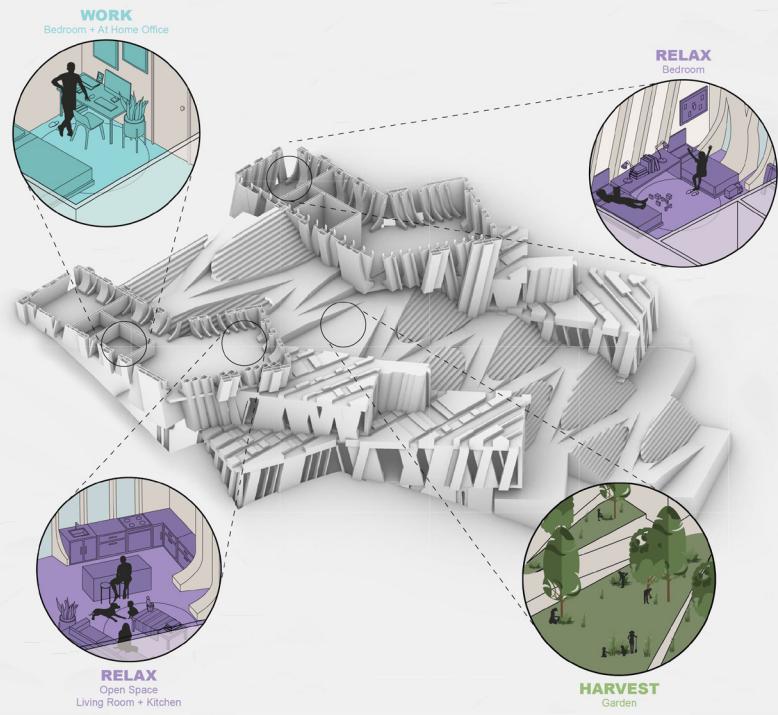
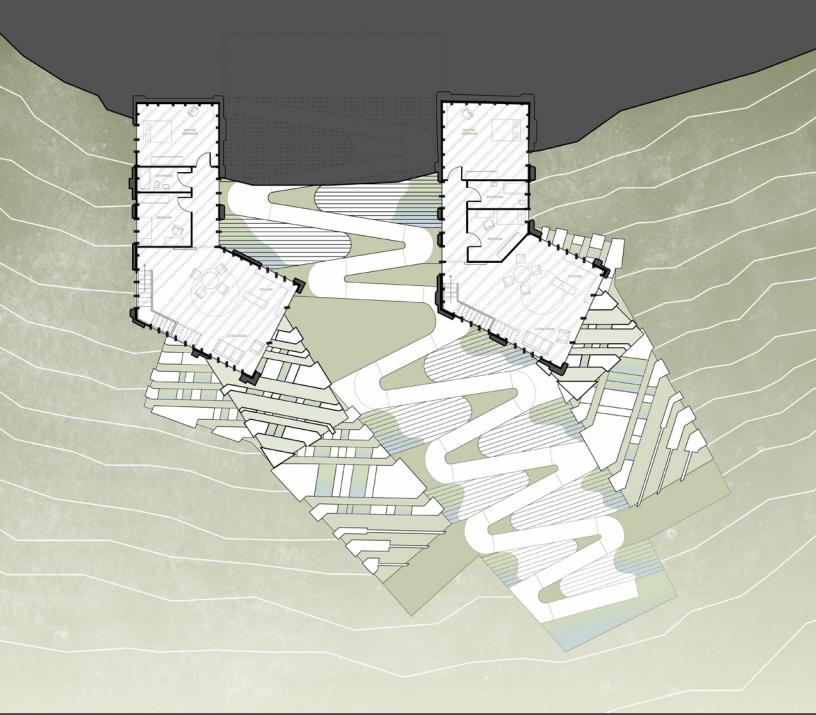


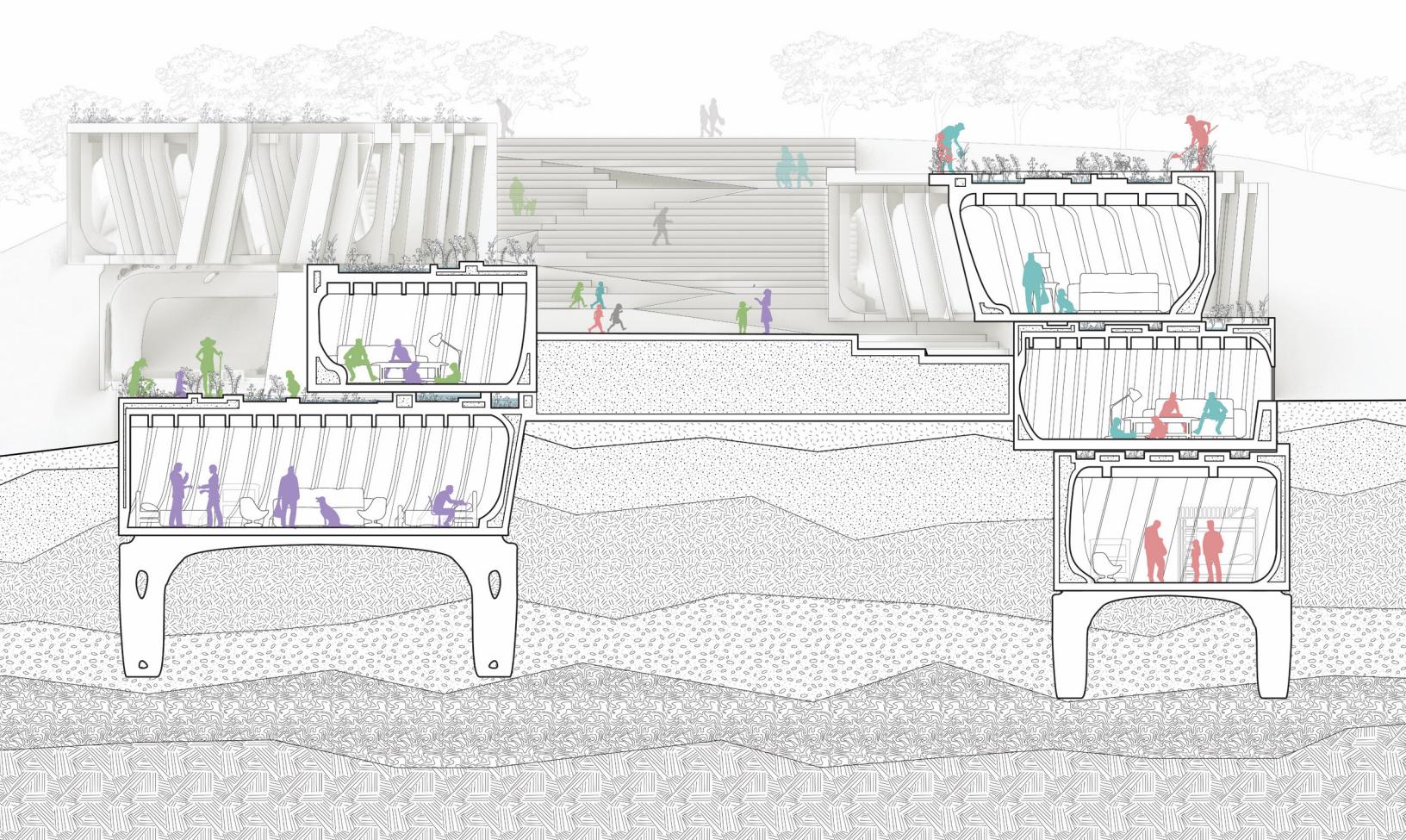
The images shown on the left are studies of how different masses can be stacked and which set of masses are the strongest to allow for more optimized components to be used in the overall structure.



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







# 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

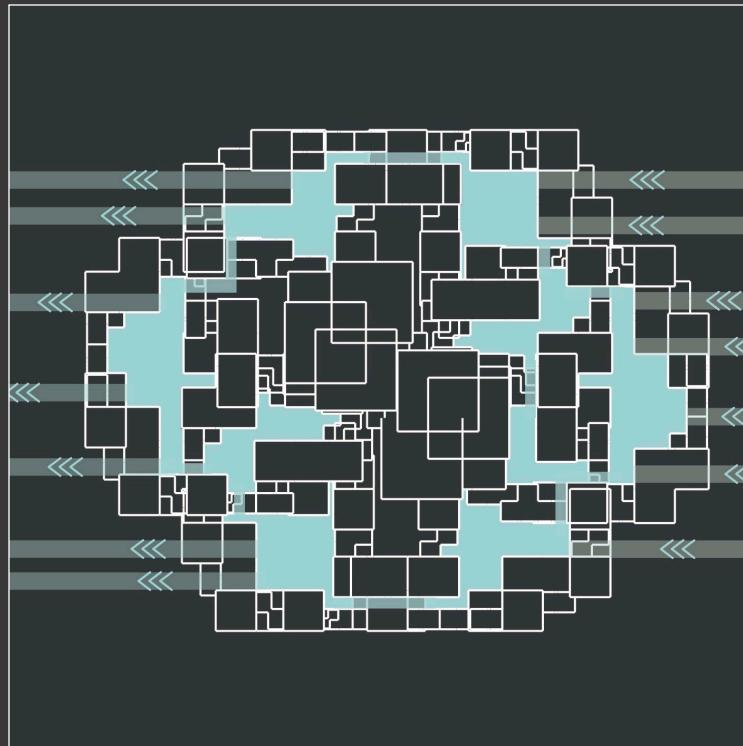
square footage by overlapping spaces to allow for co-parenting in conjunction with urban gardening and encourages collaborative decision- and place-making.

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. Amer-

ica 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.

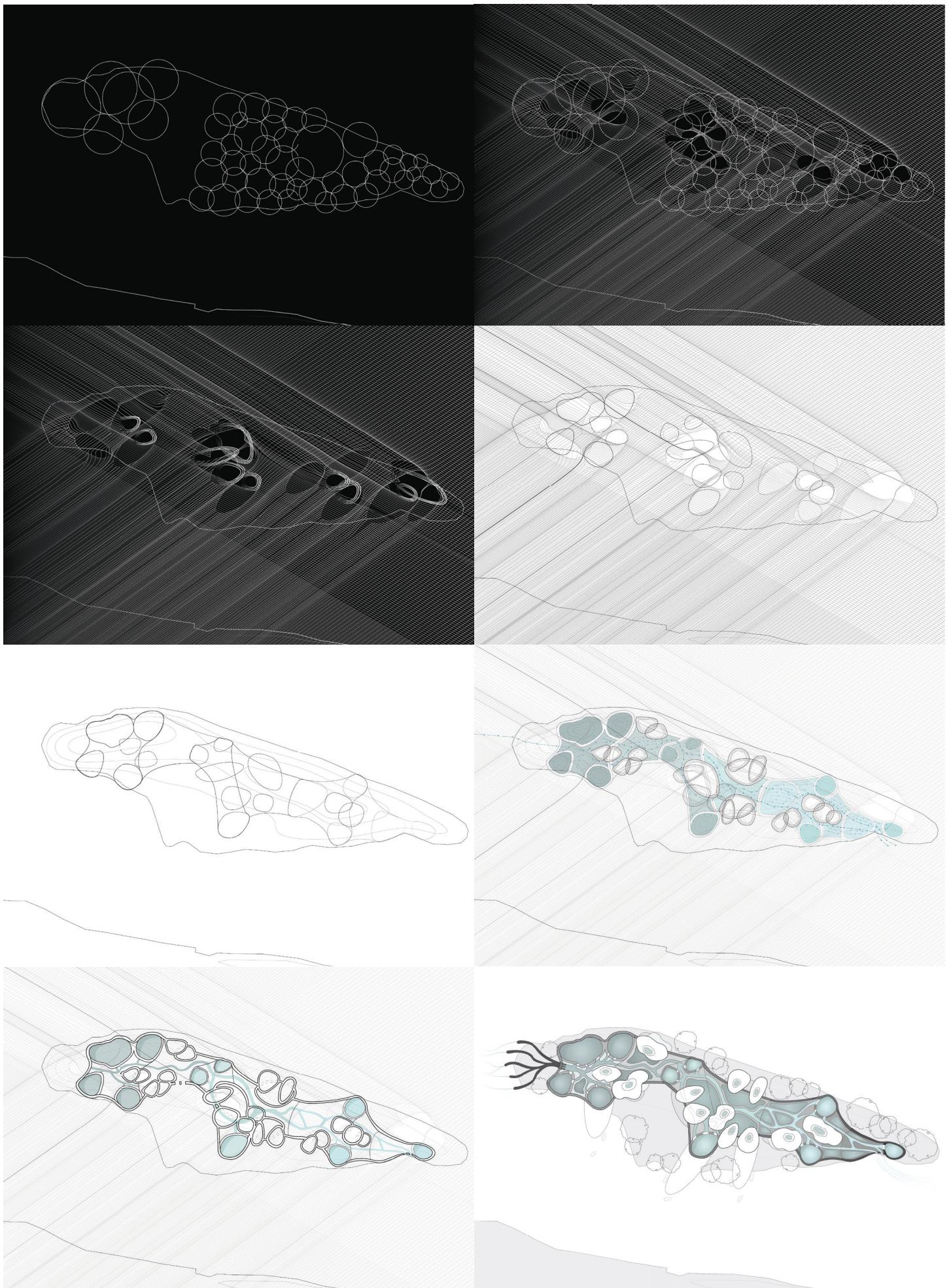


# ECO-MACHINE co-housing

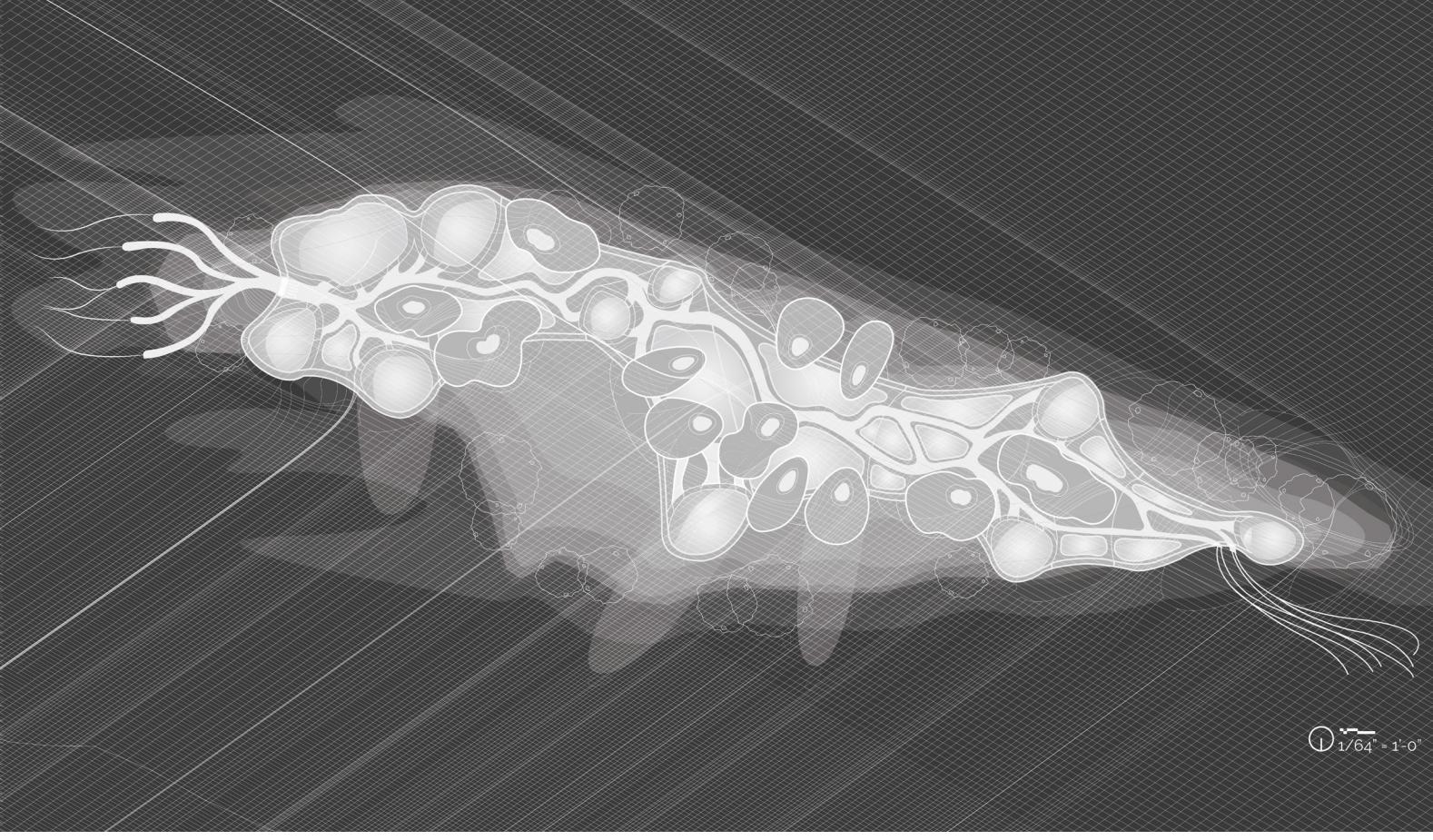


*Six Mile Island, PA  
Environment Form & Feedback: Water Communities  
advised by Matthew Huber & Dana Cupkova*

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.



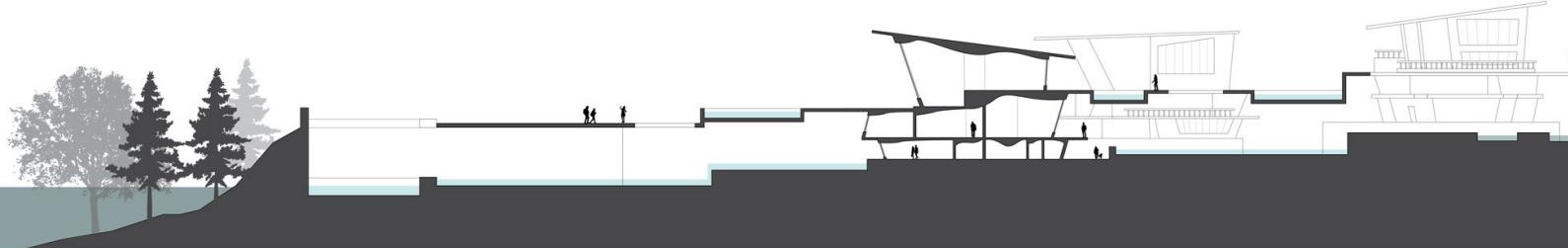
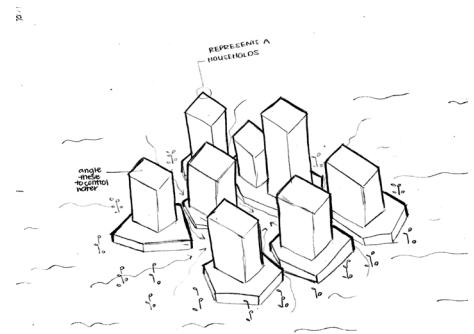
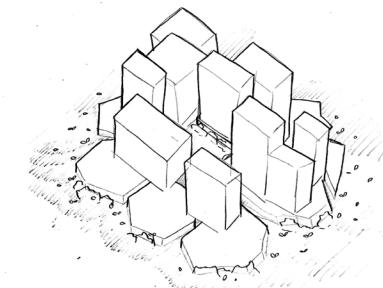
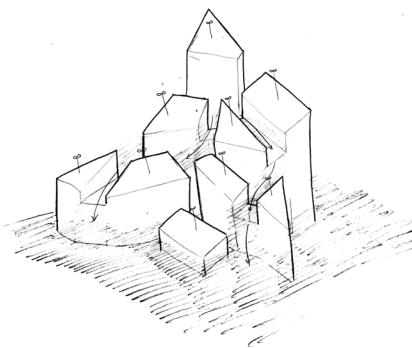
# Island Over Time

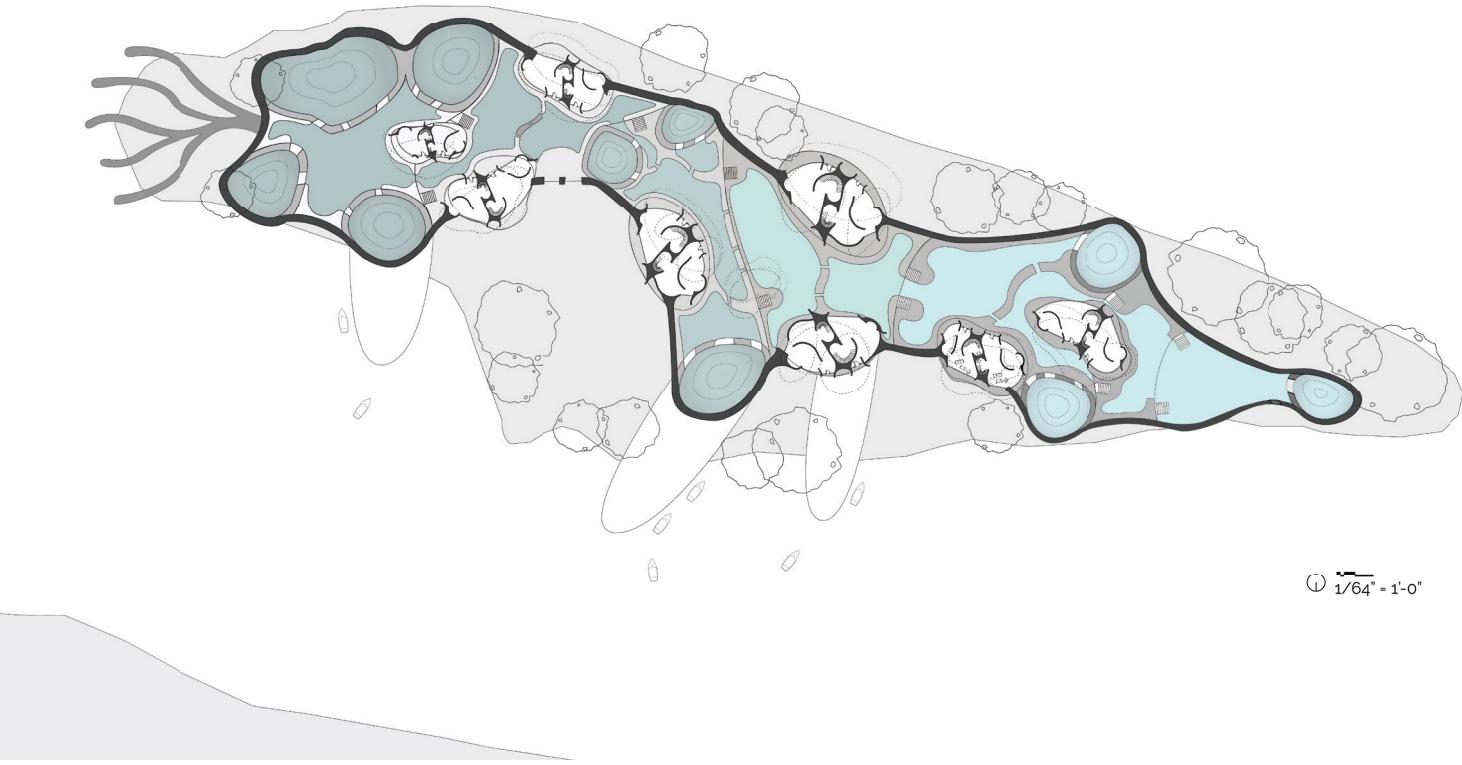
Over time the island will start to grow smaller and smaller (with the rising sea levels and erosion), but the architecture aims to still stay standing even as the island begins to fade away into the river..

## 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.





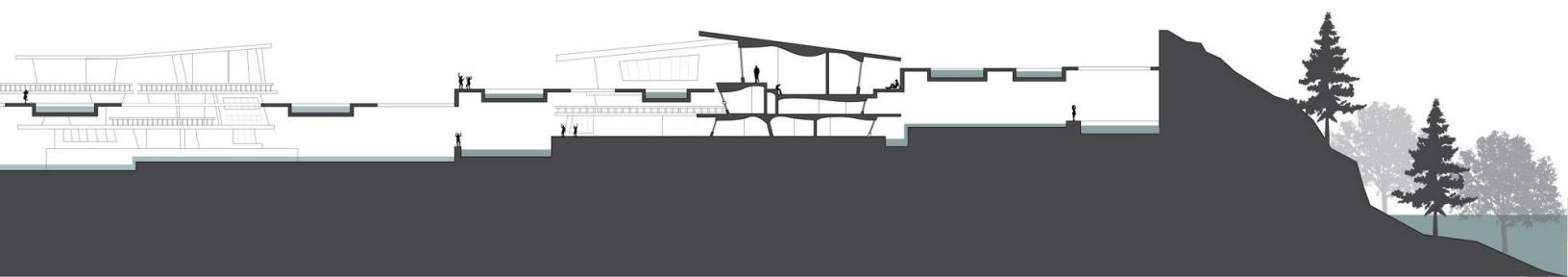
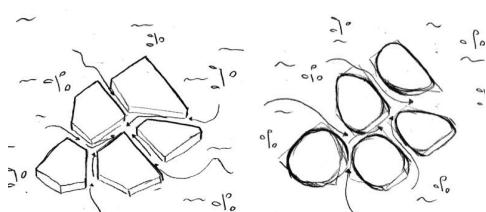
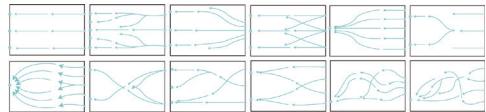
## Site Plan Bottom Level

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.*



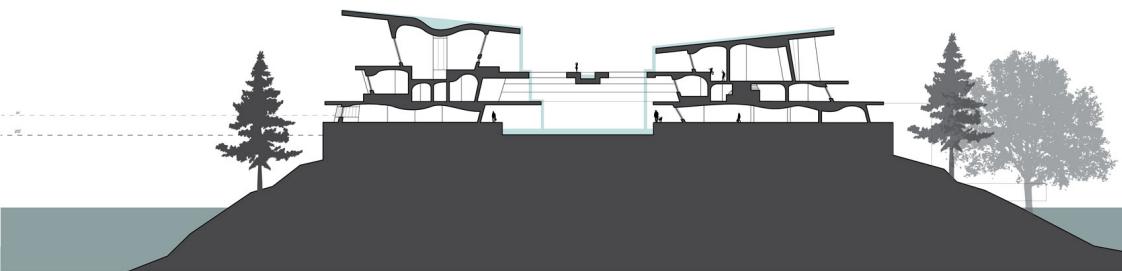
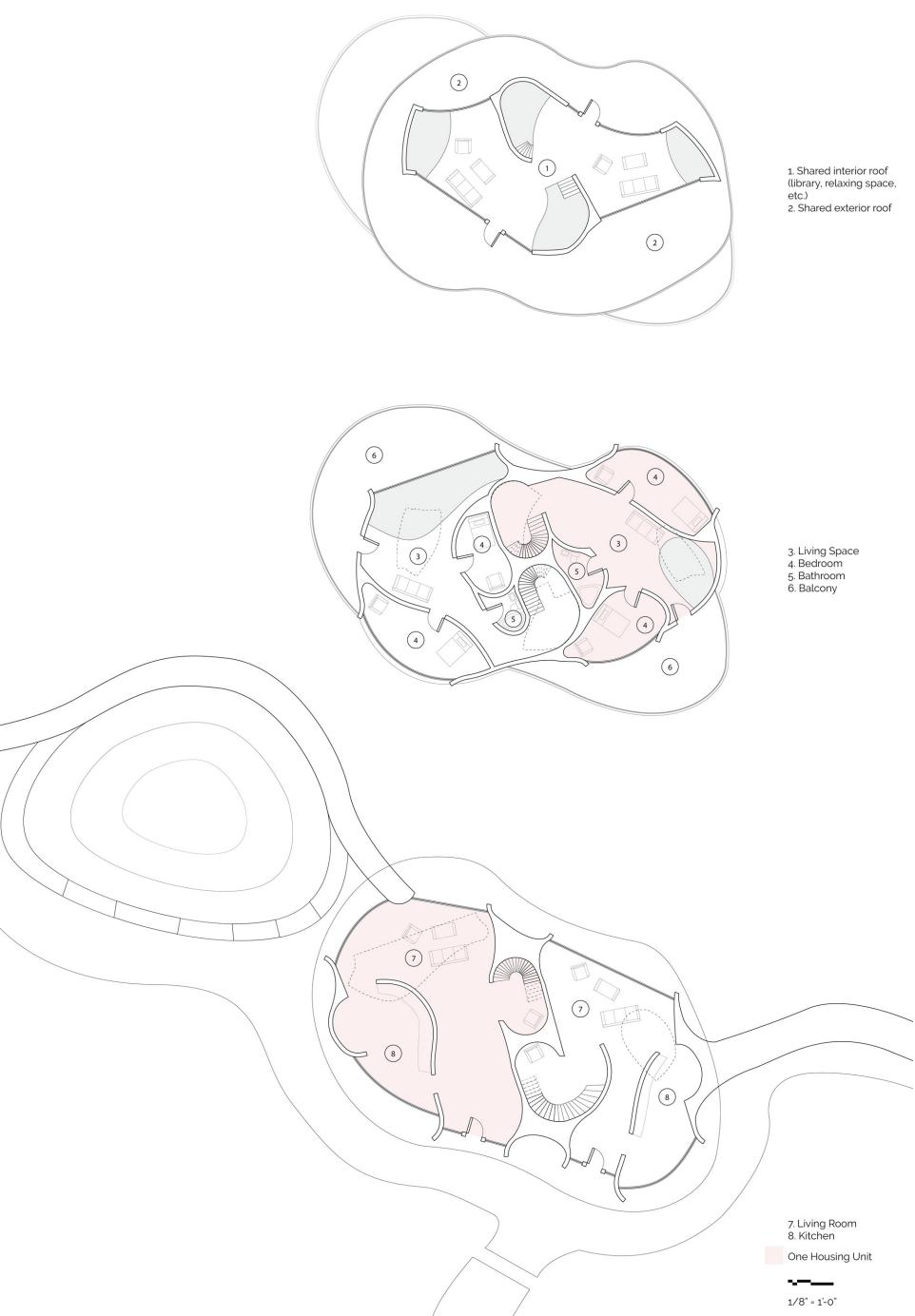
# Co-Housing Plans

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.

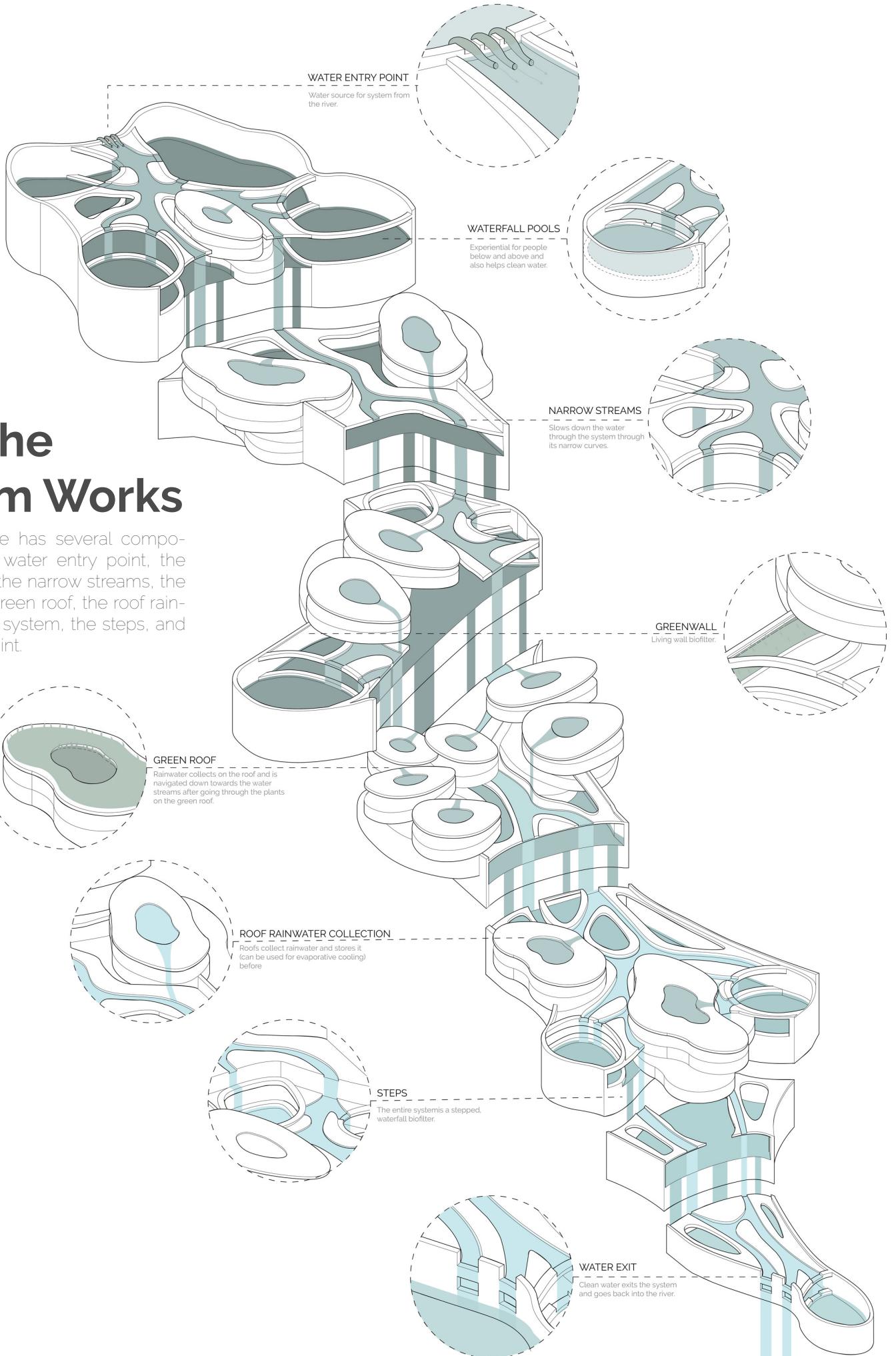
## Section Series

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

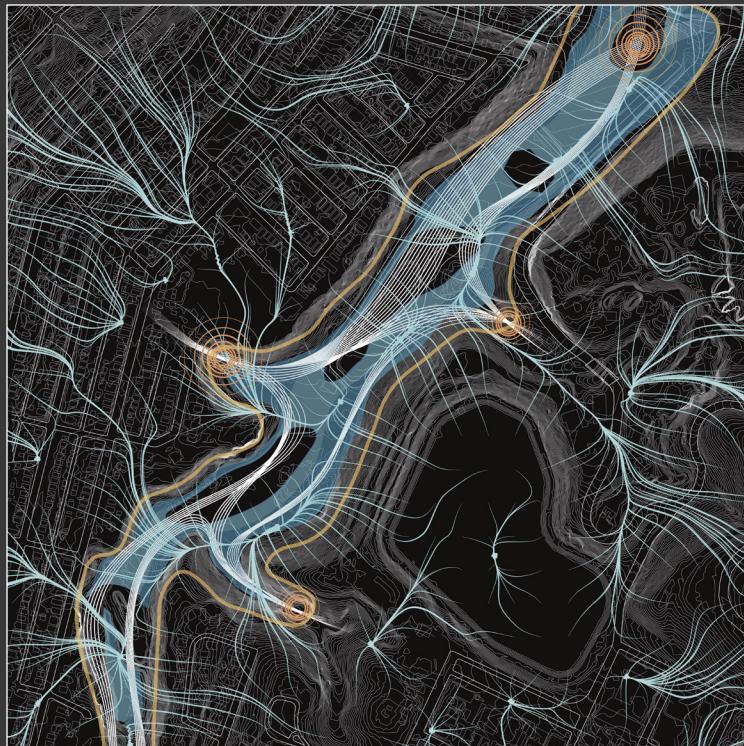


# How the System Works

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.



# 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.

Primary Entrance

Main Water Storage

Recreational Field

Sculpture Islands

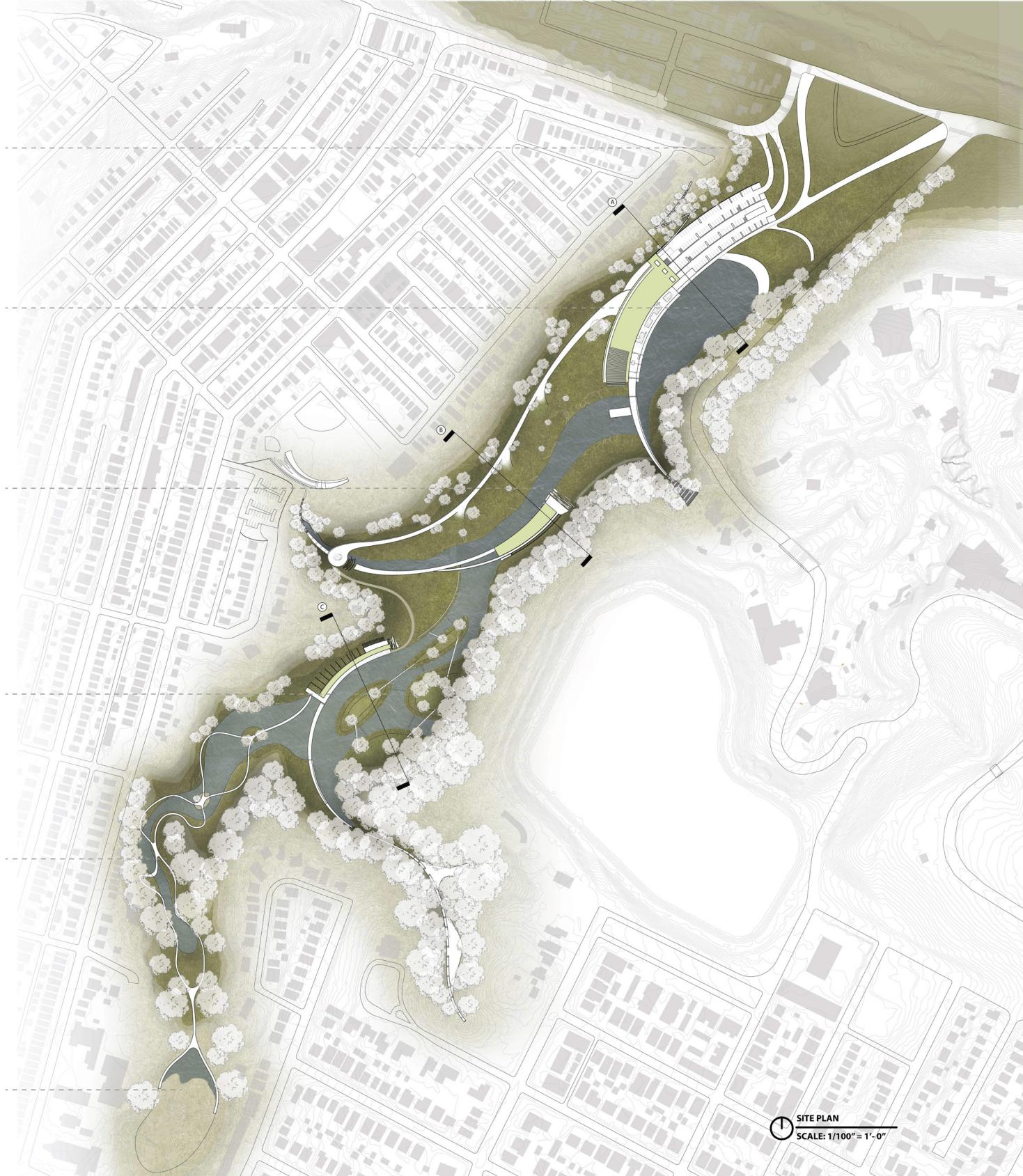
Biomass Wetland

Heth's Field

Heth's Visitor Center

Christine E. Mondor Learning Center

D. N. Cupkova Art Gallery



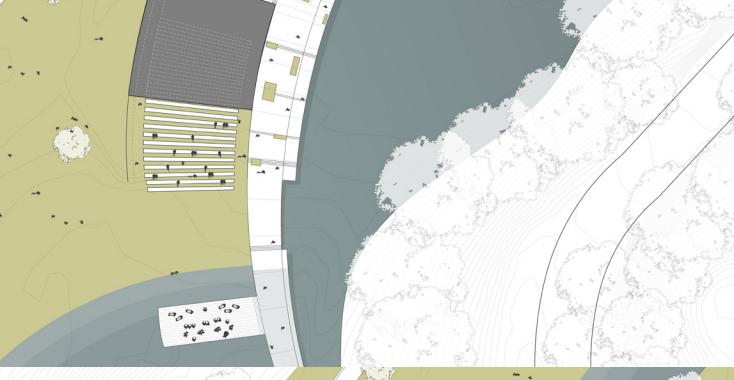
## Zones

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

## Hardscapes

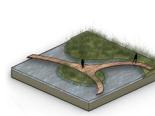
Each zone is separated by dams that allow for water to overflow from one zone to another (each zone is at a different elevation from the last) and also acts as a bridge for the main circulation path on the site for visitors.

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.



Biomass Wetland



Building Edge



Bridge



Tributary



Sculpture Islands



Soft Waterfront



Circular Plaza



Stage + Amphitheatre



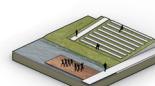
Productive Woodland

## Zone 2

The **Second Zone** is the recreational field. This zone contains the learning center and the amphitheater 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.



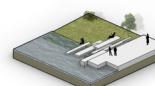
Fractured Plaza



Rainwater Stair + Filter

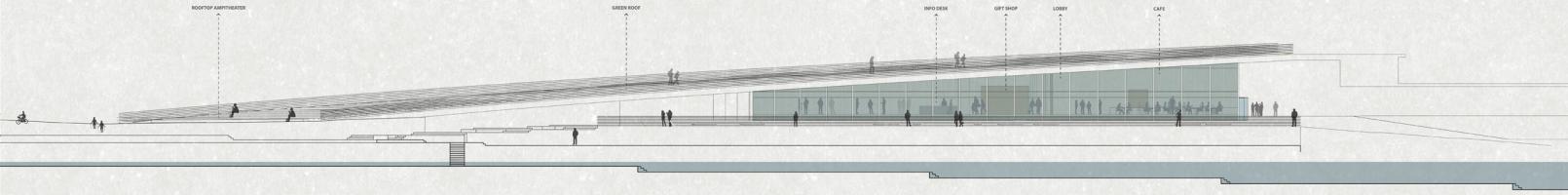
## Zone 4

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.

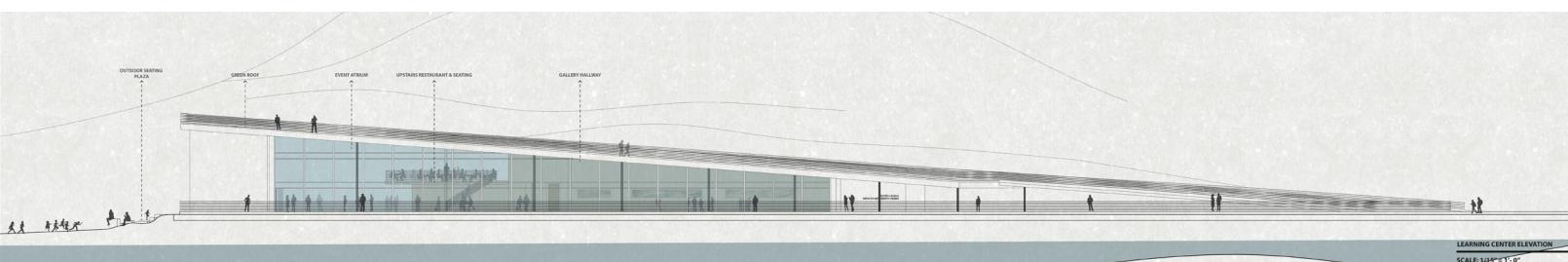


Natoli Rain Garden

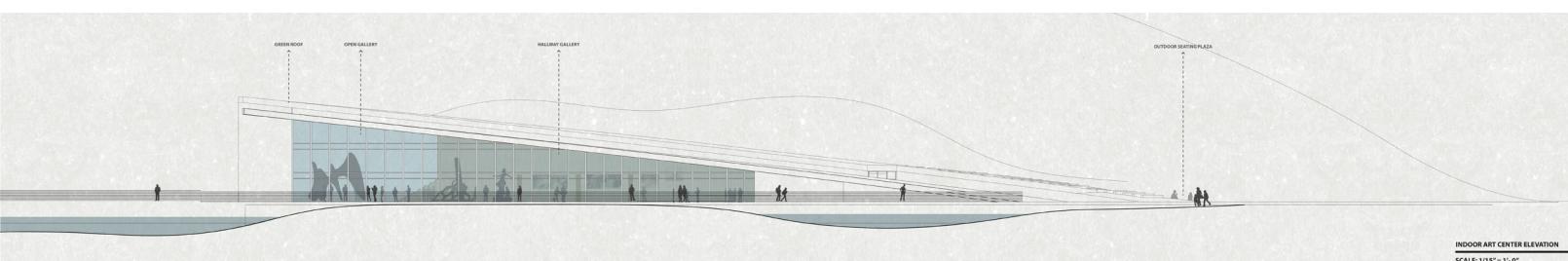




The Visitor's Center



The Learning Center



The Indoor Art Center

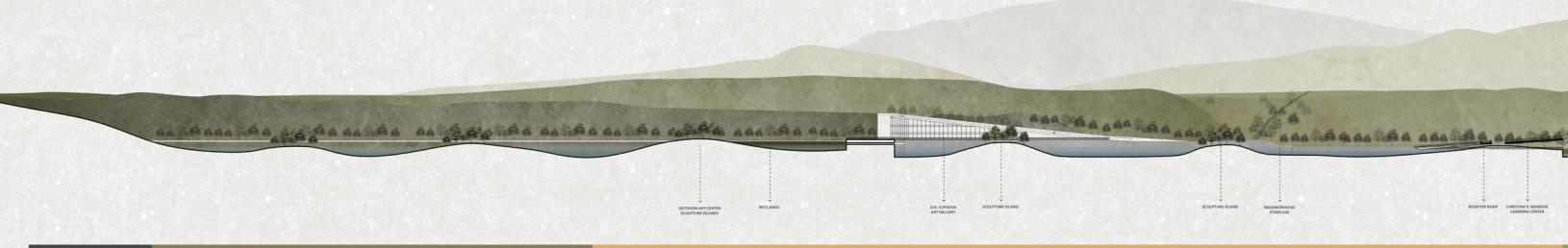
# The Architecture

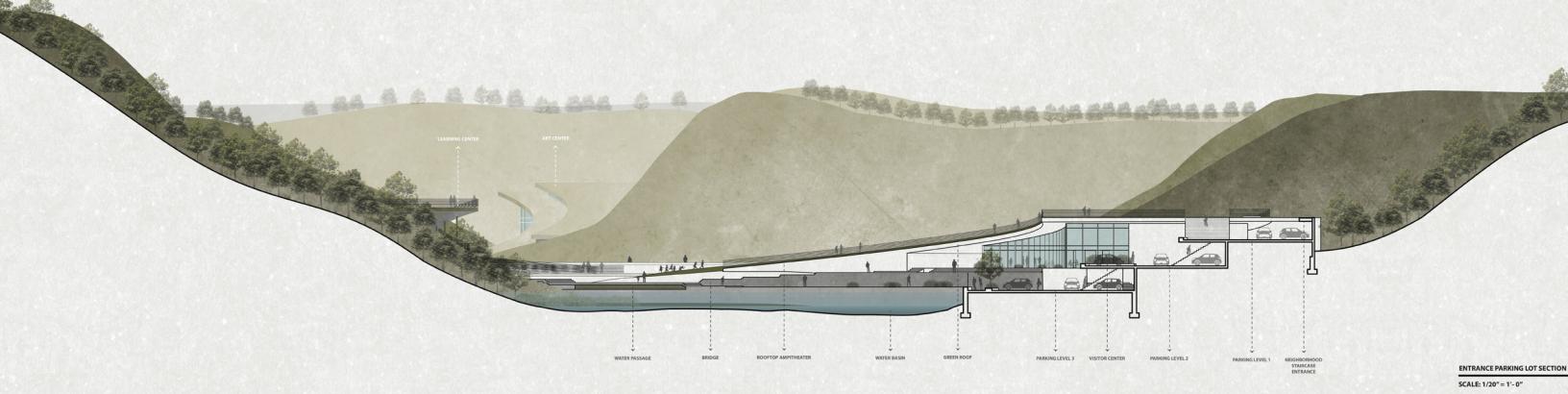
The architecture is integrated into the landscape. Each building hugs the edge of the landscape and actually brings it into the building when necessary. The side that hugs the landscape is where more private activities take place, depending on the building. The more open side of the building is a glass 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.

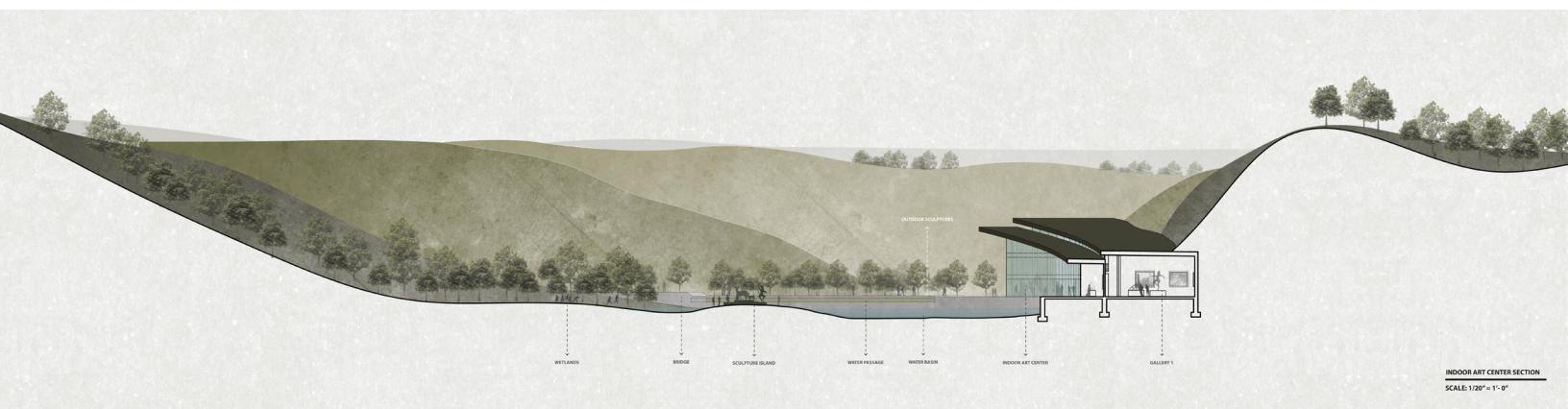




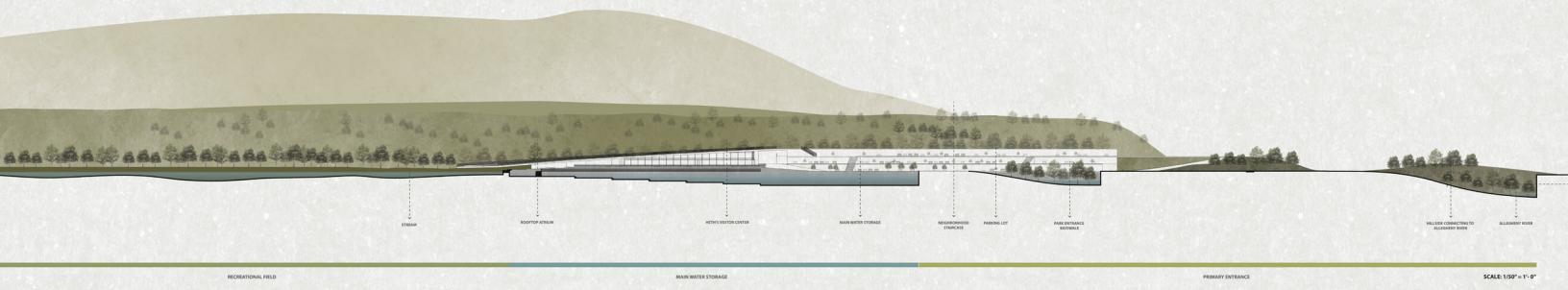
The Visitor's Center



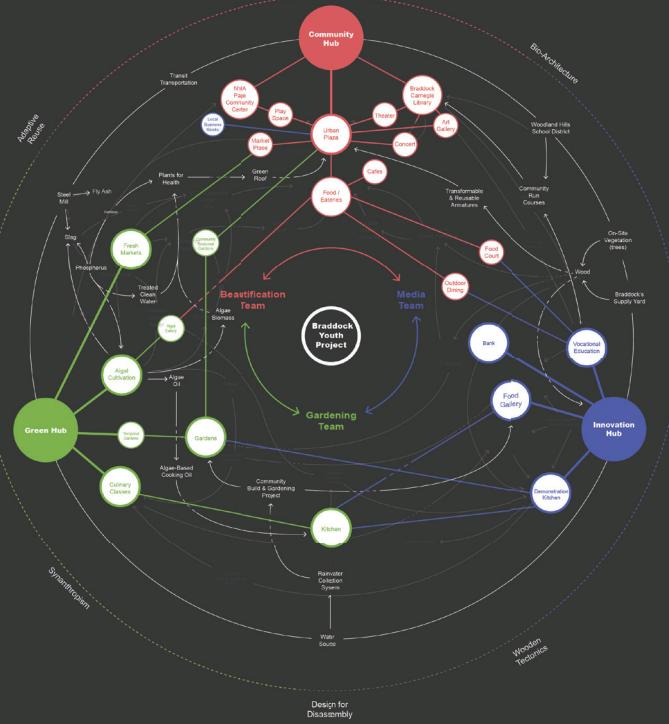
The Learning Center



The Indoor Art Center



# The Braddock Community Hub



Braddock, PA  
Radical Food Studio  
advised by Sarosh Anklesaria

The Community Hub envisions a reality where the currently existing parking lot is re-designed into a public plaza that could be transformed into different types of events throughout the year in partnership with the Braddock Youth Project, the Braddock Carnegie Library, and the NYIA Page Community Center in the Braddock neighborhood. The public plaza would be programmed around four main event-types which are a parking lot, a concert and theater space for performances, a marketplace, and a play space for the youth of Braddock using methods of temporalities, adaptive reuse, design for disassembly, and urban conviviality.

# The Site

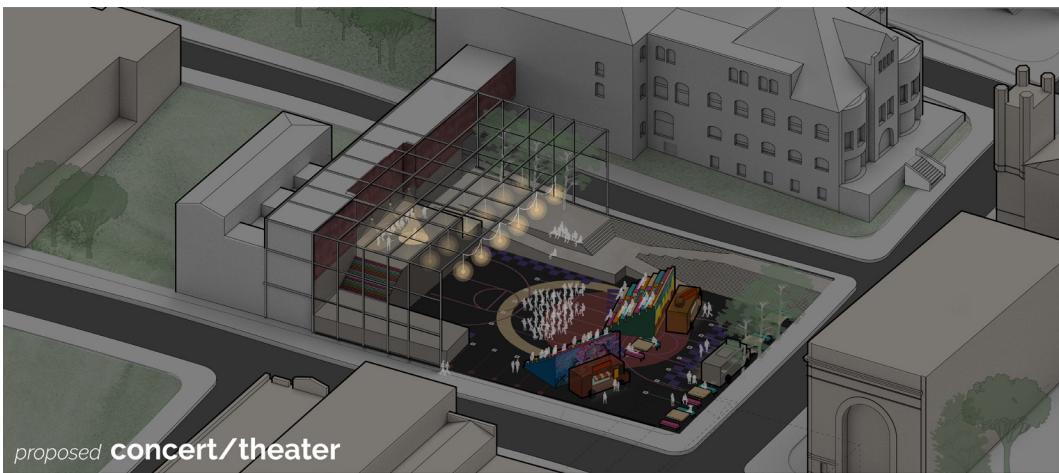
Despite the rich tapestry of programs that occur on this site such as:

Community Cleanups  
Birthday Parties  
Library's Summer Camp  
Braddock Community Day  
Zumba Classes  
and many more...

the urban realm still only registers this site as a parking lot both formally and aesthetically. This site is so rich in its communal use, so this project suggests providing infrastructural supports to help support these rich activities that take place here.

The four scenarios that are studied in this design are:

A Parking Lot.  
A Marketplace,  
A Playspace,  
A Concert & Theater space,



FRAMEWORK	SEATING	STALLS/OTHER ARMATURE	CONFIGURATION
ORIGINAL			
PARKING LOT			
PLAY SPACE			
THEATER/ CONCERT			
MARKETPLACE			

## Armatures & Infrastructures

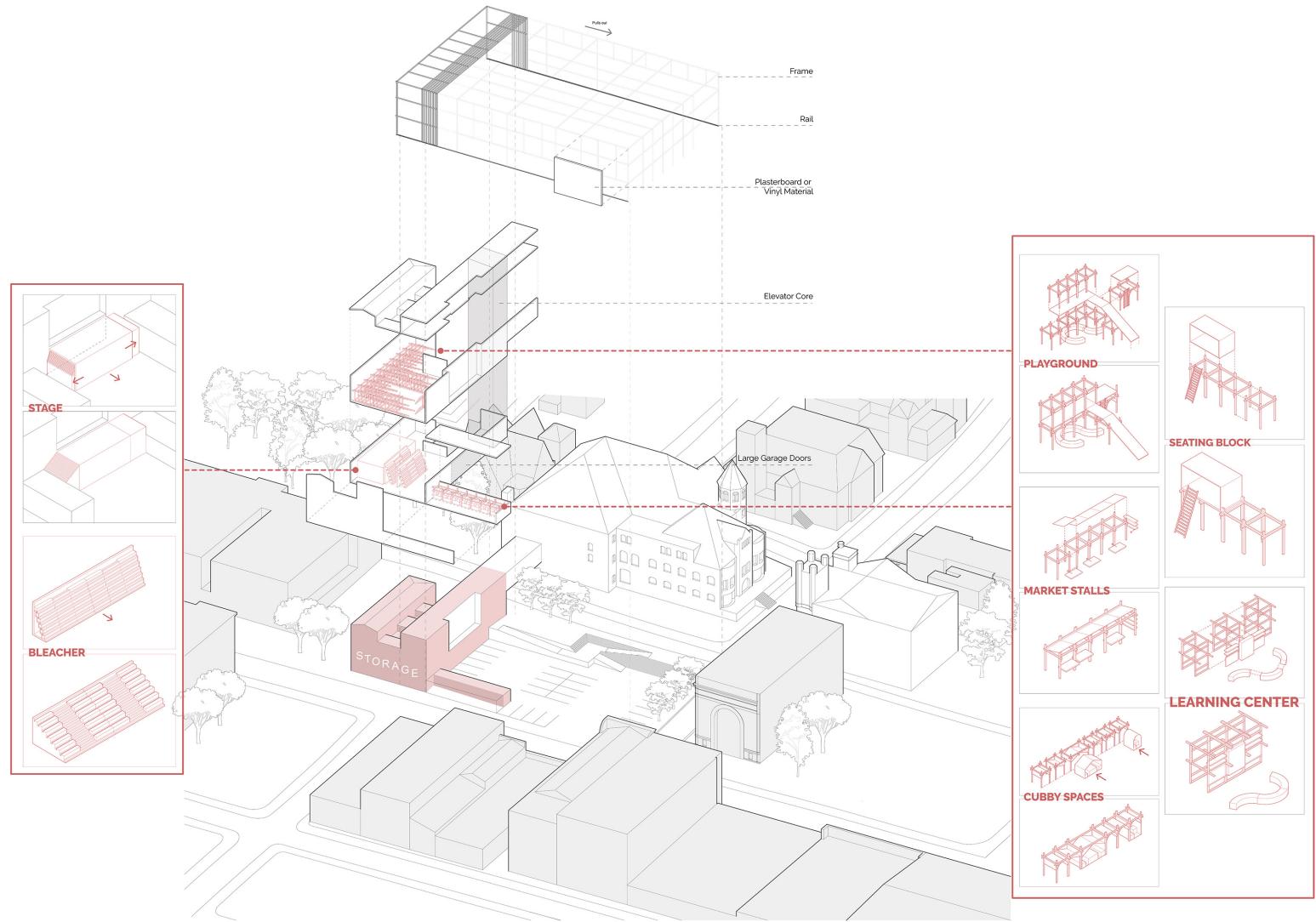
The concept of this project is for the site to be transformed for multiple uses based on what the community wants and needs by allowing them to bring out different armatures onto the site, thus allowing for the flexibility of use on the site for various events throughout the year. The exterior structure would also allow for the site to be used in accommodation to Pittsburgh's varying weather conditions throughout the year (i.e. closing or opening it up).



Some proposed Site Floor Paint Designs that can be altered and painted by community members or in partnership with the Braddock Carnegie Library's art program that layers different pieces of information related to the different events that the site was re-programmed around.

The layers include:

Parking Stalls for the Parking Lot; Diagonal Rectangle Series for the Concert Bleachers; Small Squares for the Marketplace Kiosks; A Basketball Court Design, etc.



# Reusing Abandoned Lots & Buildings

The design utilizes the existing vacant building directly next to the site, allowing this building to be reused for a new purpose. The building is repurposed to become a storage space to store the armatures when they are not in use. As shown, the armatures can easily be disassembled or compressed to be put away easily in the repurposed space next door.

These armatures are designed using simple wooden tectonics, which can also act another community art proj-

also act another community art project in partnership with the Braddock Carnegie Library and the Youths of Braddock, like the Beautification Team in the Braddock Youth Project. These wooden pieces are thought to be easily duplicated, painted in various colors or have multiple designs painted onto them, and then put together using various colored pieces to create colorful armatures to create vibrancy in the event space.

# The Parking Lot

As mentioned, the site was transformed around four main event types. The first is the parking lot, which allows for cars to park on the site when the site is not in use. The site has also been re-designed with a stair-ramp to allow for easy access from the Braddock Carnegie Library and creates for informal event spaces that the library can use on the designed platforms of this stair-ramp even when the site is being utilized as a parking lot.



The current existing site parking lot

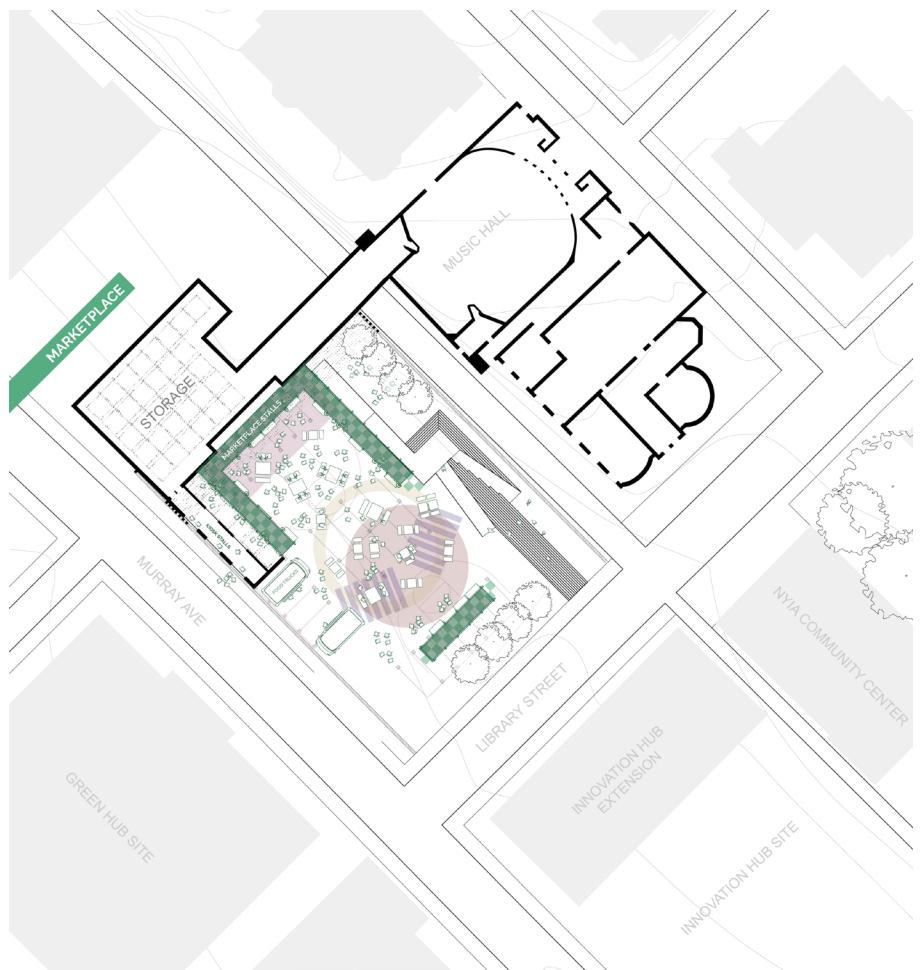


# The Marketplace

The marketplace brings out movable armatures that could be transformed into stalls or food kiosks and brings food trucks onto the site to surround a central plaza with public seating for community gathering. Local farmers and families can come onto site to hang out, exchange goods, or trade gardening secrets with one another that they can bring back to their homes.

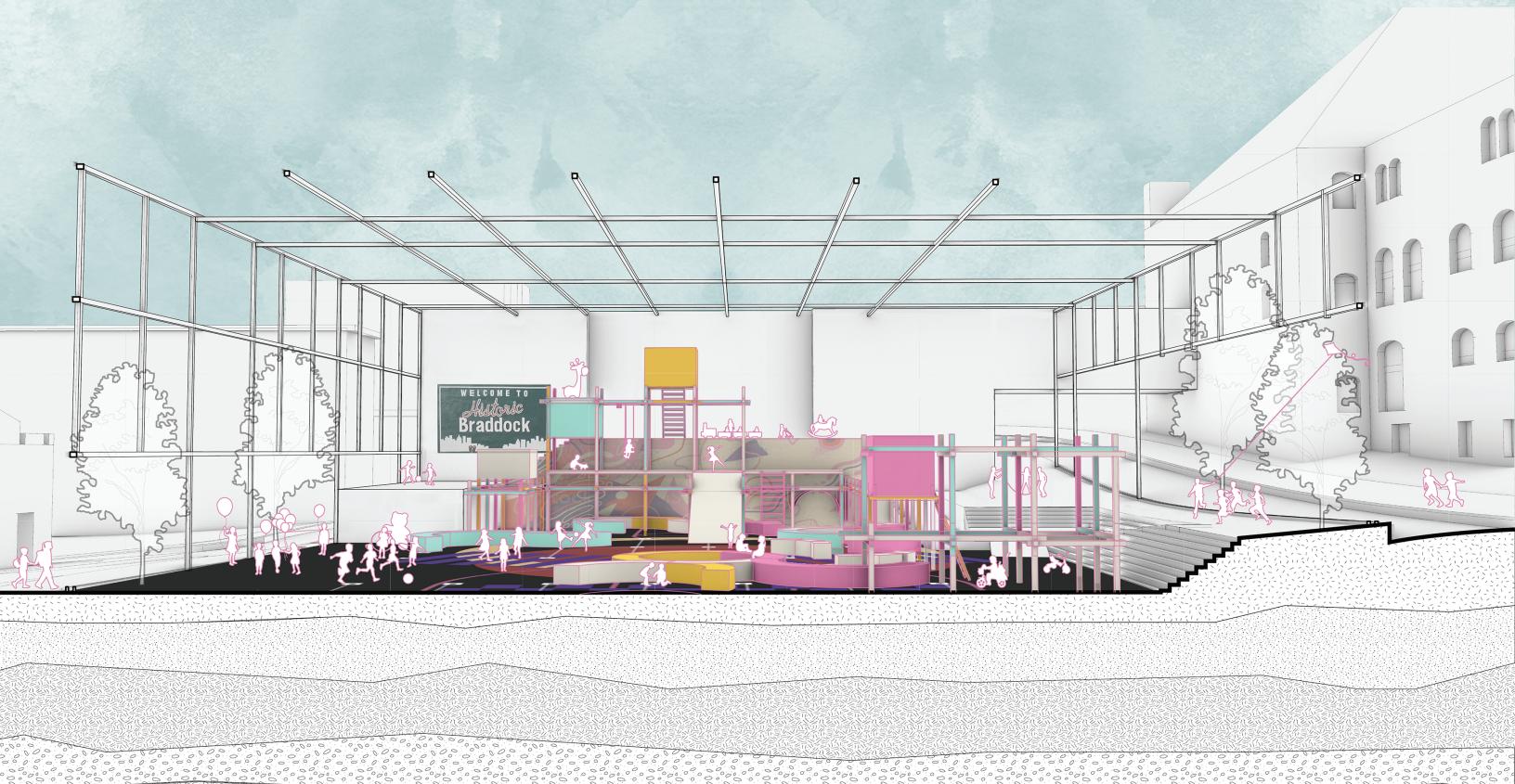
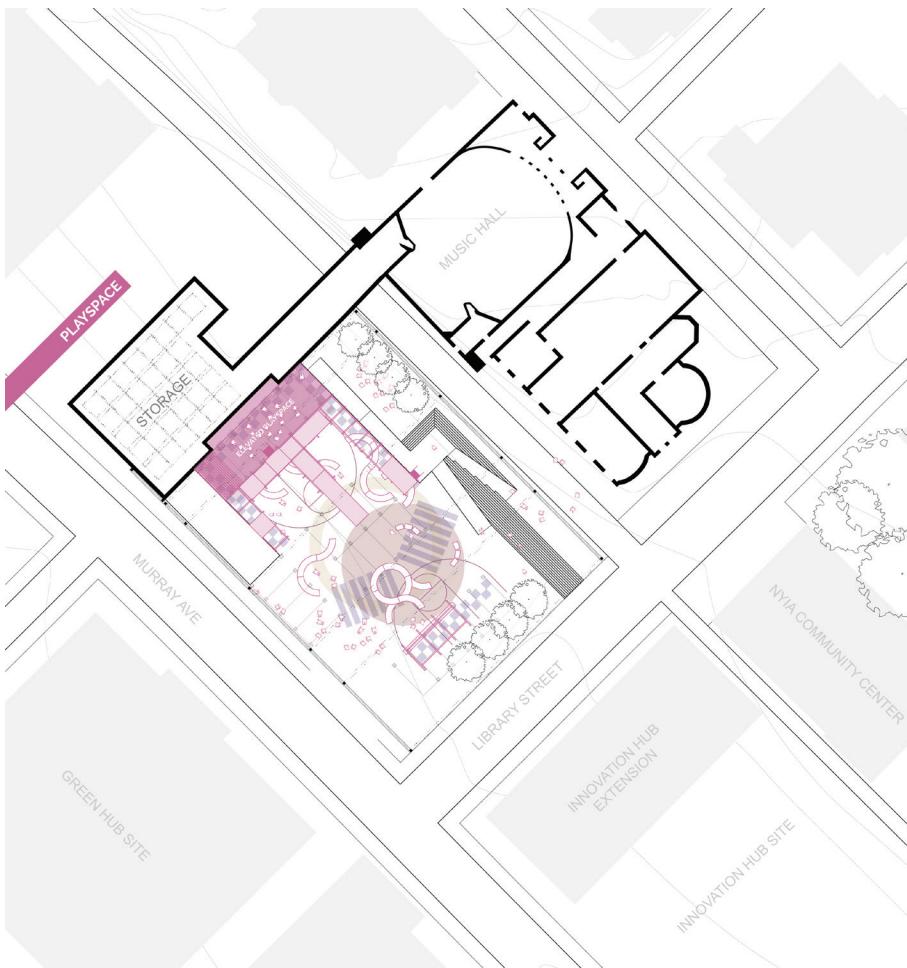


*The Singapore Food Market from theculturetrip.com*



# The Playground

The playspace begins to bring out multiple armature pieces that were previously used for other events, like the stage from the concert event space and the wooden structures for the food kiosks in the marketplace. These armatures can be transformed and moved for the children to create their own playground space as they see fit.

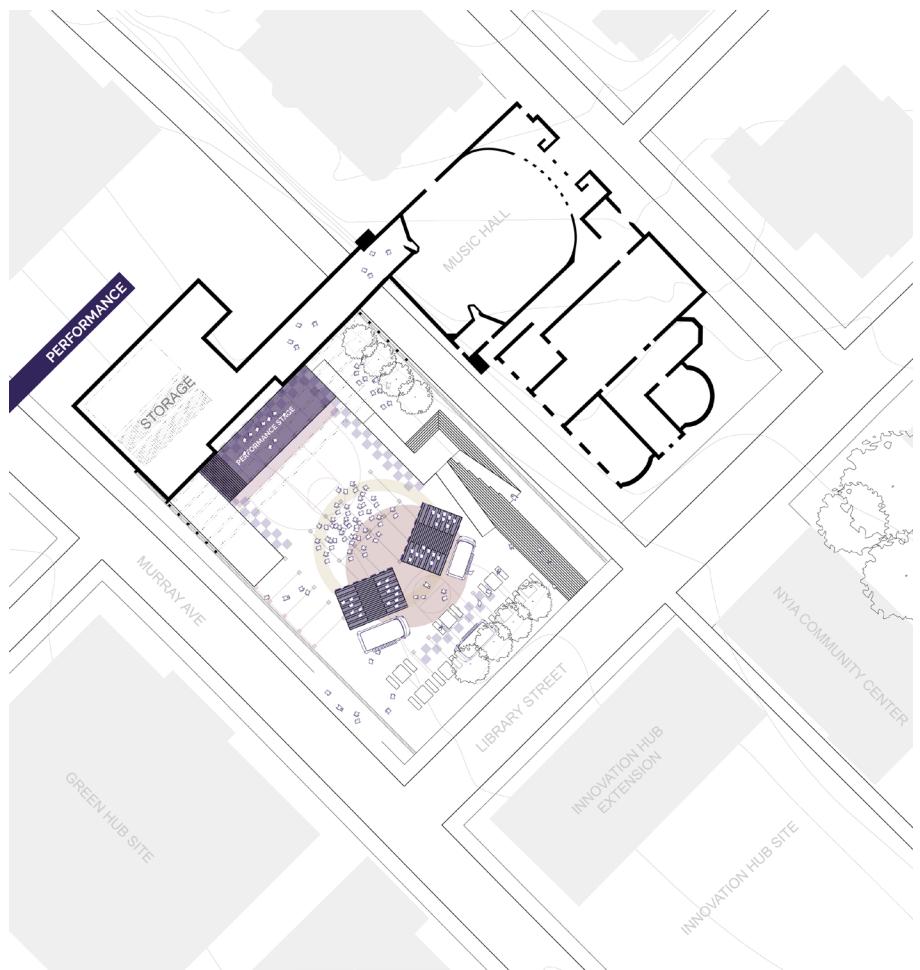


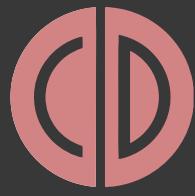
# The Theater

The concert and theater space brings out a stage platform and a bleacher-like structure or residents to sit back and enjoy a performance with a live orchestra that can easily come directly onto the site from the Music Hall in the Braddock Carnegie Library via the proposed bridge connection between the abandoned building and the Library or visitors can watch a film together that can be projected on the existing building.



Backyard movie nights image from parents.com.





Thank you

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

Visit [colleenduong.com](http://colleenduong.com) for more works.