

DAILY LIFE EMOTIONAL NEEDS  
HUMANISTIC CARE REFLECTED IN ARCHITECTURE

SOCIAL PROBLEMS FUNCTION INTEGRATION EXPERIMENTAL EXPLORATION  
CONCEPTUAL ARCHITECTURAL DESIGN

ARCHITECTURE

DESIGN

YIFEI

DONG

PORT

2023  
/  
2024

OF

FOLIO

PERSONAL  
SELECTED WORKS



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01

A NEW ARCHITECTURE OF INVISIBILITY

Building renovation design in a future electrical energy context

Jun-Aug , 2023

Instructor: Dan Wood

Instructor Email: dxwood@work.ac

dw314@columbia.edu

Location: New York , New York

Project type: Academic Studio Design

Individual work

Software: Rhino (Grasshopper) /

Audition / Illustrator

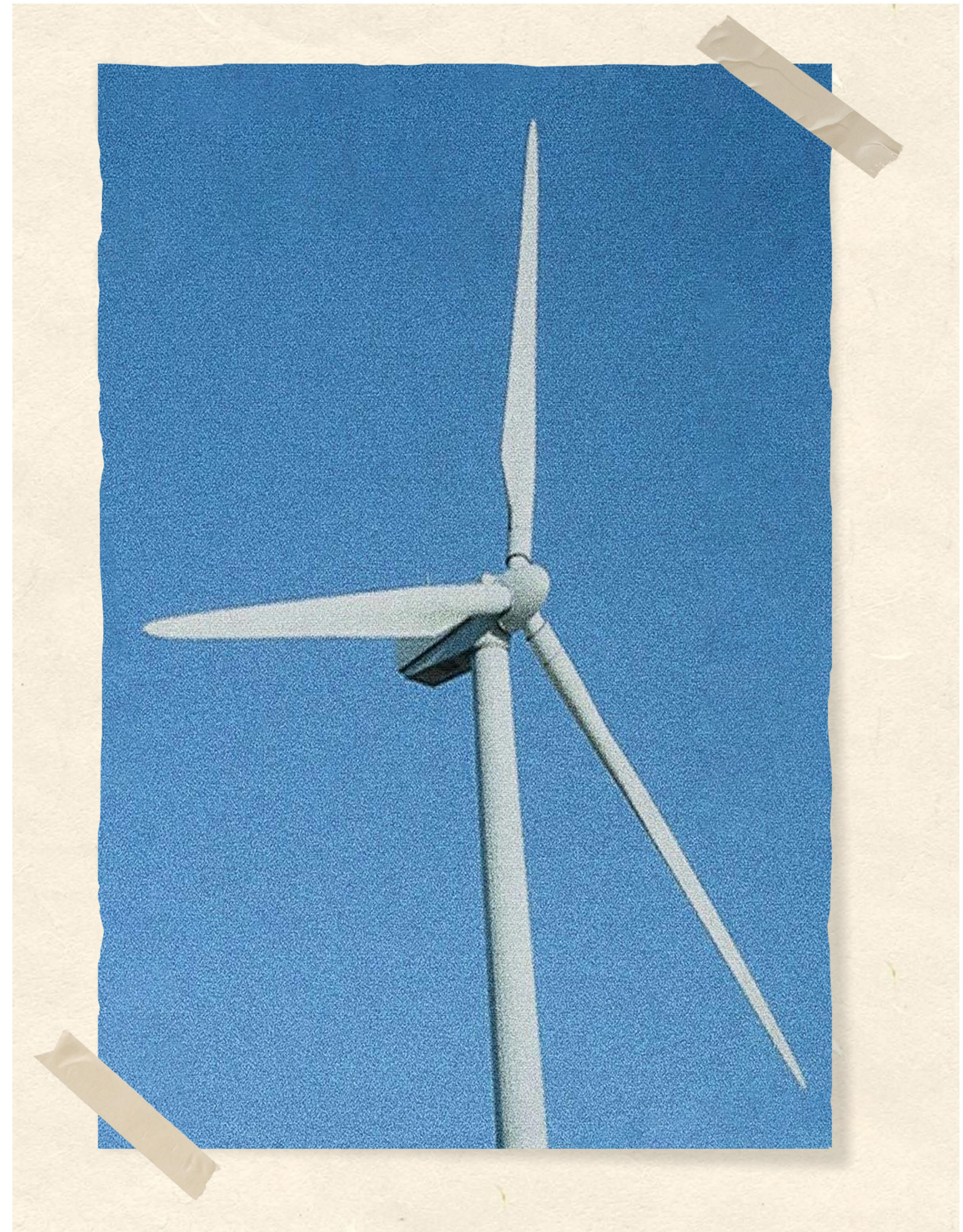
Photoshop

The arrival of **electricity** revolutionized apartment living. Electric lighting brightened interiors, extended active hours, and improved quality of life. Electric elevators allowed for vertical expansion, accommodating more residents.

**Electricity** also powered appliances and facilitated plumbing systems, enhancing convenience and sanitation within apartment buildings. The influence of electricity transformed the way people lived and shaped the development of apartment buildings.

For the project, we worked to combine **Electrical** and **Wind Infrastructure** with **Public Space** and **Institutions** in a spirit of **reinvention** and **experimentation**. Imagine there is a “neighborhood-amenity” in the form of a substation or Transformer, designed not to hide behind walls or disguised as “simply technology” but rather celebrated as an integral part of what makes the city run and – as well – what is working to allow this city and state to be carbon-free for 2050.

Using DESIGN, we created new **hybrid structures** that illustrate and expounded on new ways to live in and experience the city. These structures would point the way towards a better future, when infrastructure is celebrated and redesigned to combat climate change, address systemic social inequalities and define a new 21 st Century Architecture.





# A New Architecture of Invisibility

## SITE&S 125 Street Station

Subway station in New York City, New York

COLUMBIA UNIVERSITY GSAPP 2023AAD SUMMER STUDIO

Subway Station-Suspension

**Subway Station**  
 My conceptual idea is to design an airy book reading room to utilize the foot traffic from the subway station. I think it could make use of the time people spend waiting for the subway. It can utilize the time people spend waiting for the subway or for those who like to spend time in these subway stations. A lot of people have commented that the elevated subway at 125 St is a great place, and it's rare to find a place in Manhattan where you can easily see the neighborhood and get a breath of fresh air.



**The Wallach Art Gallery at Columbia University Lenfest Center of the Arts**



### RESIDENTIAL AREA

**The Center for Jazz Studies**  
 Students  
 Artists  
 Audience for music  
 People with Free Time

**Claremont Residency**  
 Residents  
 Quiet Environment  
 Family's Plan for Spare Time

**Manhattan School of Music**

**Claremont Ave**  
 The unique location and neighborhood features make this area's residents more familiar with peaceful activities. This means that there is a relatively high demand for creative architectural spaces.

**Manhattan School of Music; Getz Dance Library**  
 Artists  
 Faculty  
 Art Competitions  
 Art Activities

### EDUCATIONAL AREA

**Columbia University Teachers College**



**Education Area**  
 Number of schools and buildings used for student activities

**Early Childhood Learning Center**

**Columbia University Art & Gym Center:**  
 Columbia University: Lenfest Center for the Arts;  
 VITAL Climbing Gym - West Harlem;  
 Columbia University's Arts & Crafts Center Building contains functional buildings for both sports and arts relating activities. There are large groups of students that are active in this area.

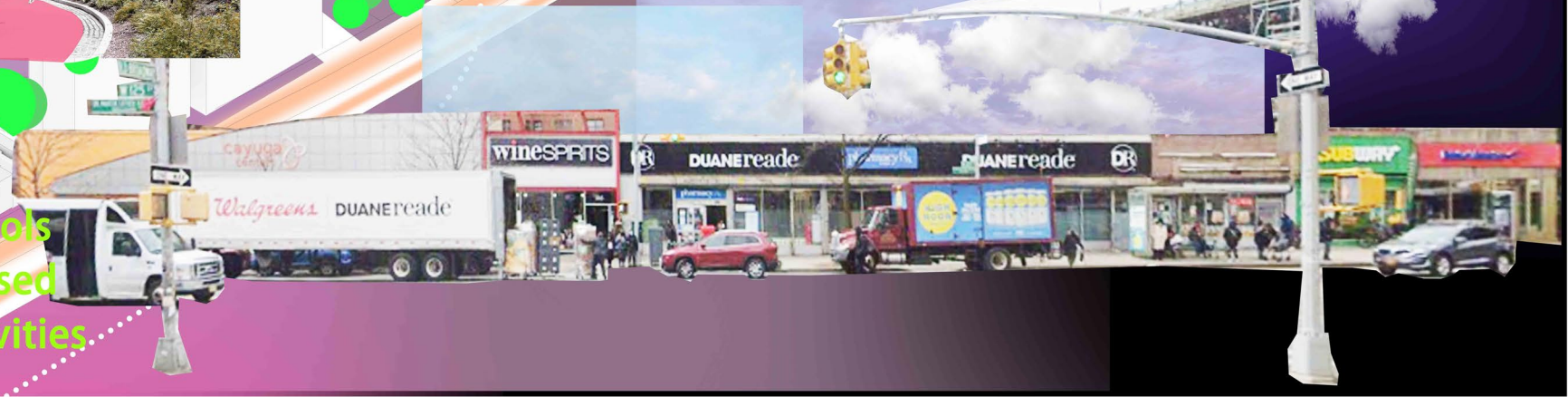
**George Bruce Library:**  
 spacious children's room;  
 cultural programs for all ages are held in the auditorium, which includes a stage built by the WPA project.  
 Heavily used by children and teenagers who come to read and study.

**Morningside Heights Housing Corporation**

**United Pentecostal Church**

**125th Street Commercial Business:**  
 Supermarket; Pharmacy; Grocery Store; Beverage stores.  
 Gathering a large number of residents, with more thriving commercial development. There is a large amount of foot traffic.

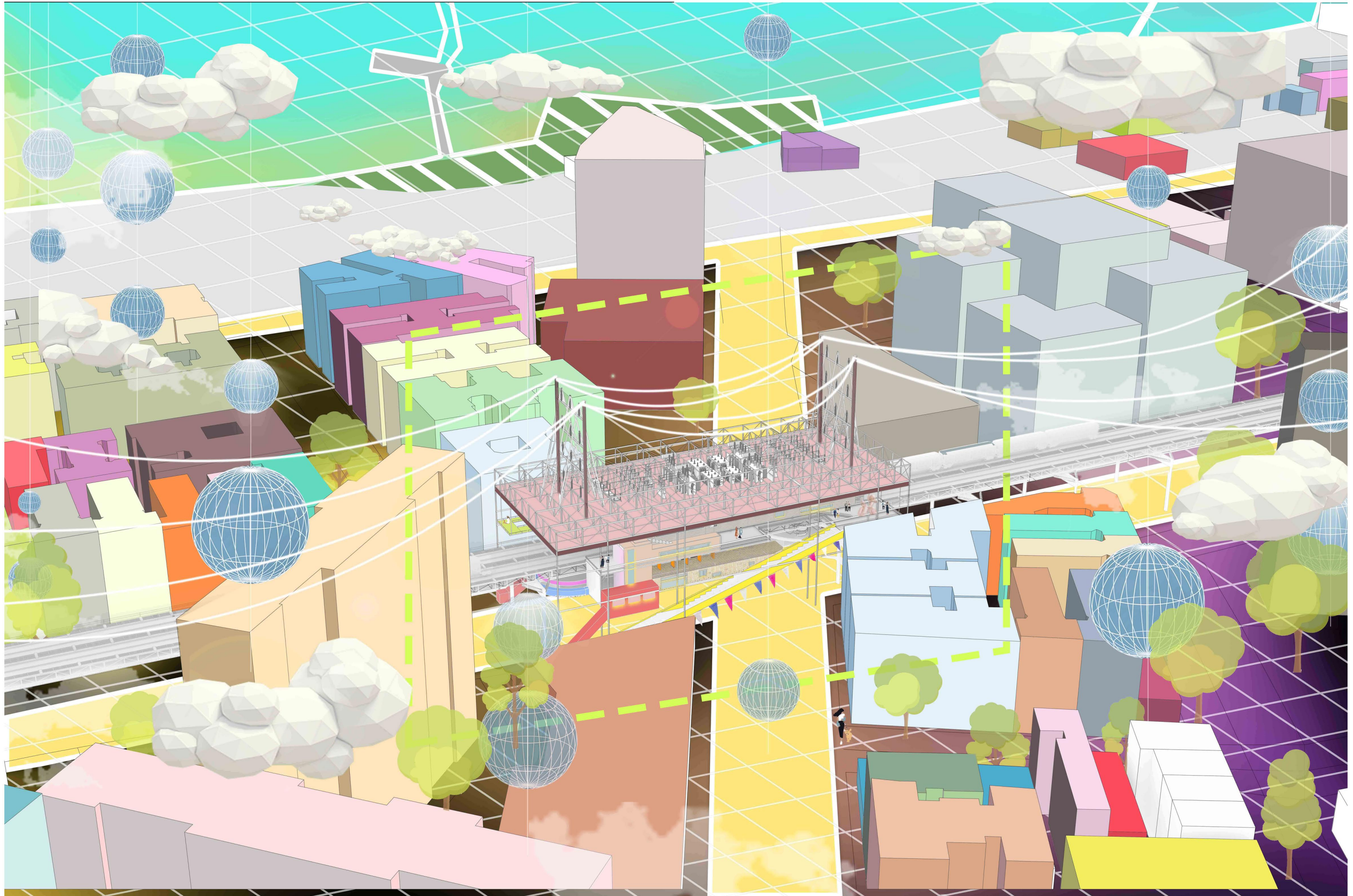
### COMMERCIAL AREA



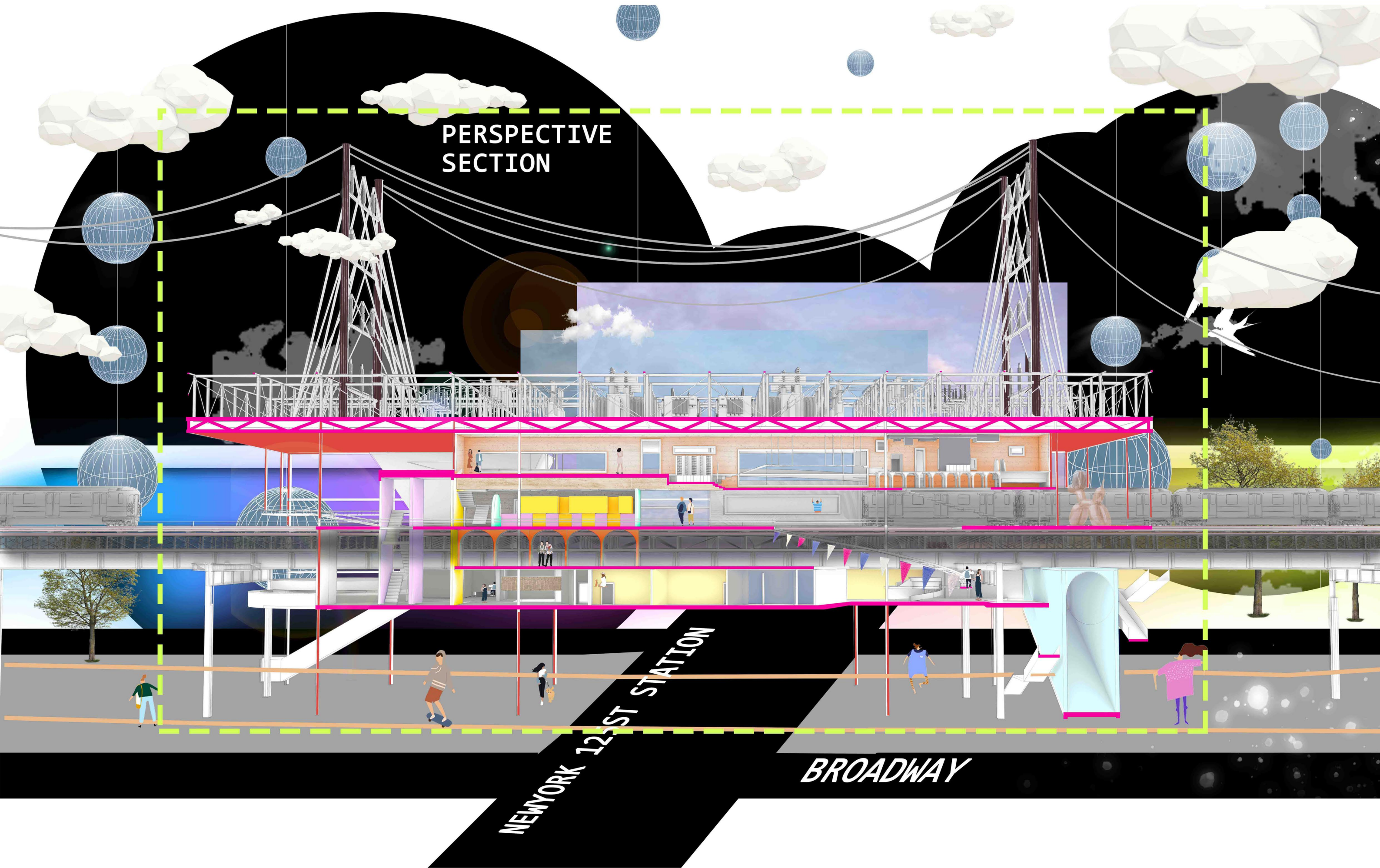
**The COVID Busters Medical center in NYC**









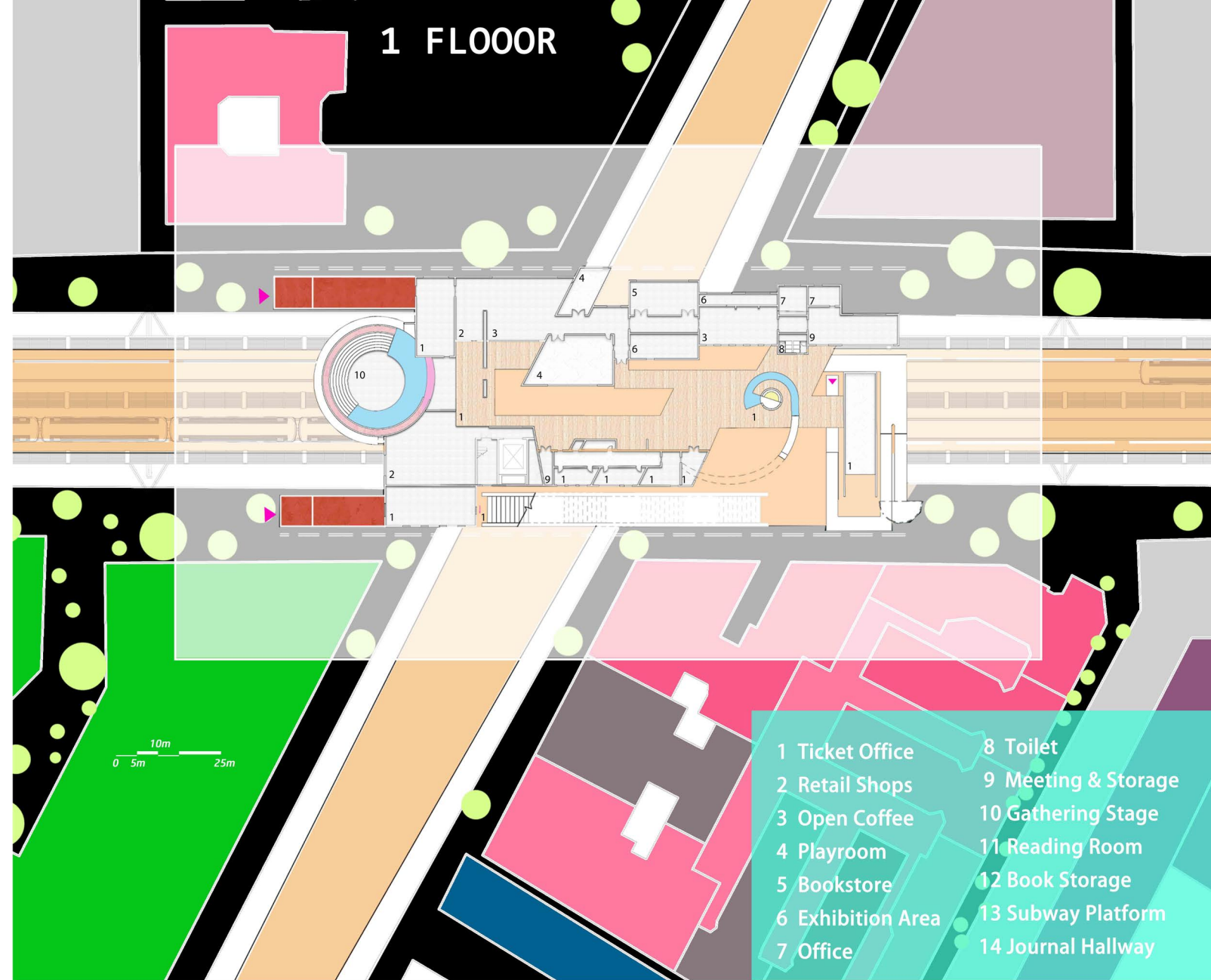
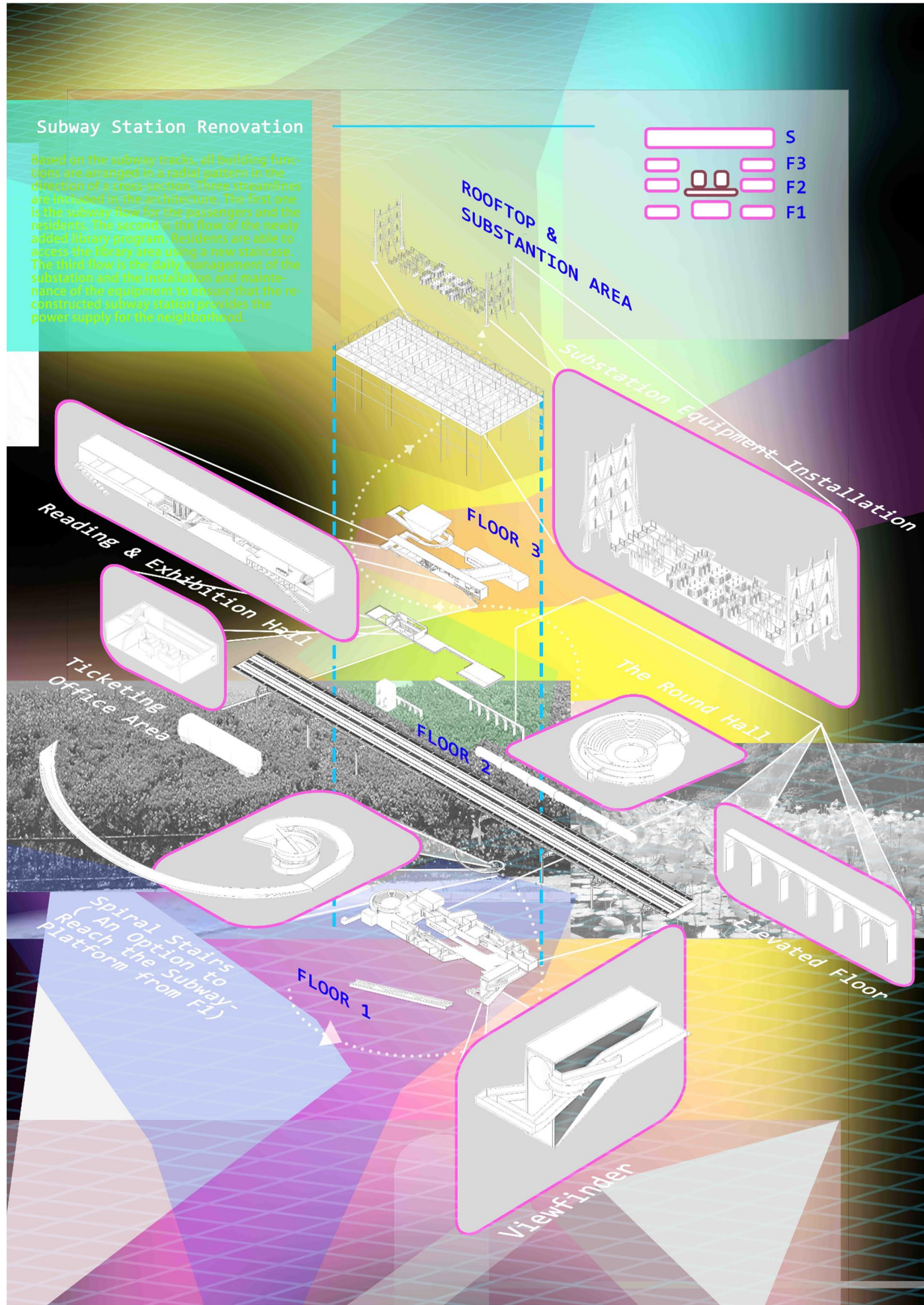


PERSPECTIVE SECTION

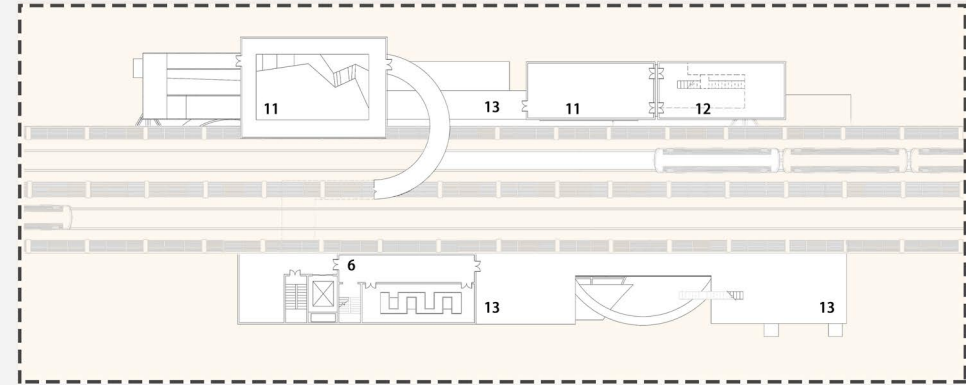
NEW YORK 125th STATION

BROADWAY

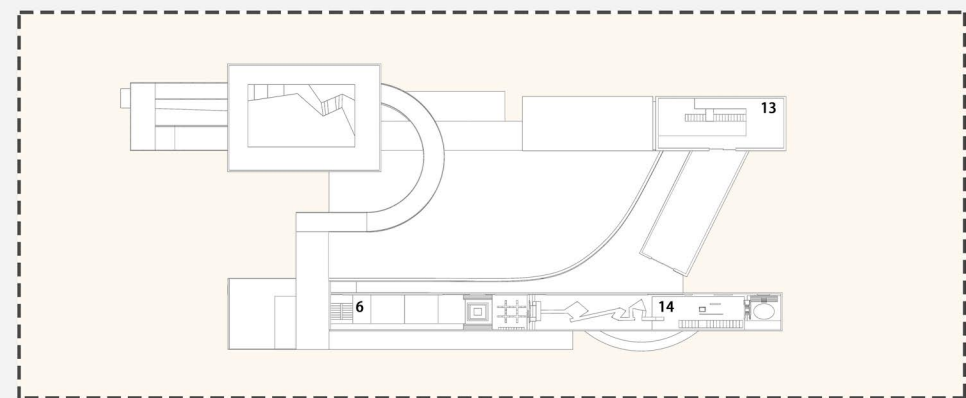




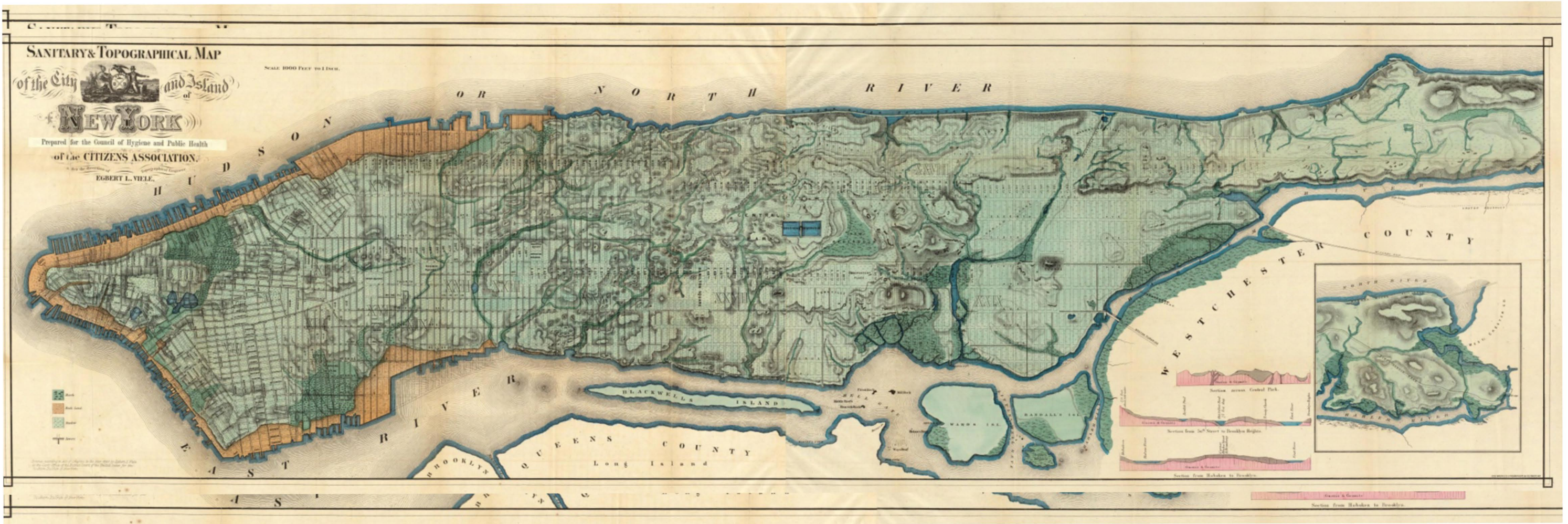
FLOOR 2



FLOOR 3







02

DISPATCHES: UNSETTLING ARCHITECTURE  
AND THE INSTABILITIES OF MODERNITY

Urban Acoustic Environment Improvement and Sound Experience Design

Sep-Dec , 2023

Instructor: Mario Gooden, Raven Chacon  
Instructor Email: mag6@columbia.edu  
ravenchacon@gmail.com

Location: Bronx , New York  
Project type: Academic Studio Design

Individual work

Software: Rhino (Grasshopper) /  
Audition / Illustrator  
Photoshop

This studio is going to unsettle architecture to reveals its **complicity** with such regimes and systems of power that advance the project of modernity for the sake of progress and Western hegemony. Historically, the discipline of architecture seeks legibility, fixity, and stasis that denied the relational complexities and nonfixity of space.

Taking the conceptual score Dispatch conceived collaboratively by Navajo Nation composer Raven Chacon and Carcross/Tagish curator and writer Candice Hopkins as an intellectual prompt, the studio conducted **field recordings**; developed notational systems that map embodiment through sound; composed a soundscape for an architectural **intervention**; and translated the intervention into the conditions of materiality, detail, and action / event.

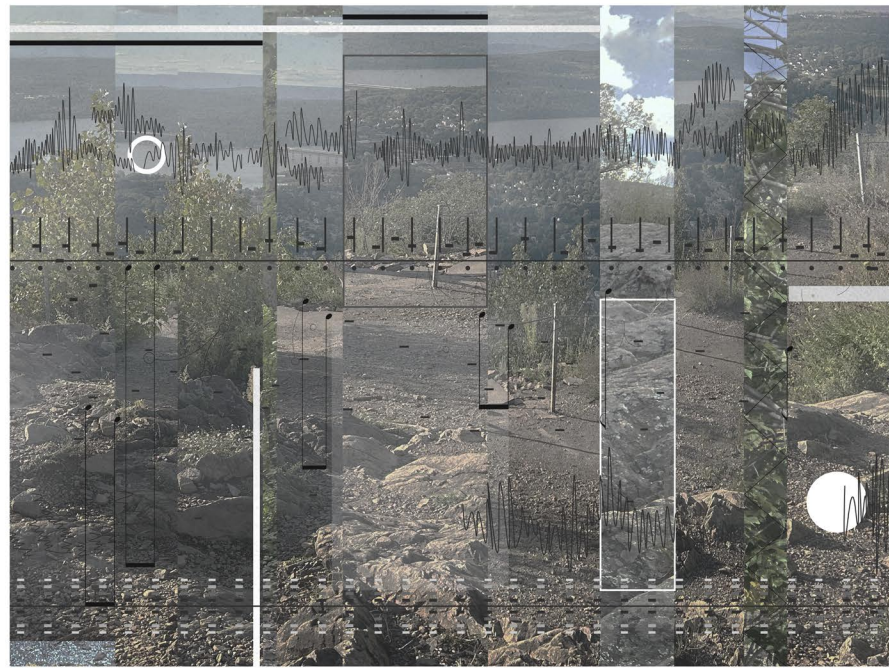




According to architect and theorist, Bernard Tschumi, "Architecture allows us to apprehend that world, and it is equally about asking questions and providing answers to problems of use or social activity."

Nevertheless, architecture's inescapable materiality is what makes it different from philosophy, mathematics, or literature. By its very nature, architecture involves the materialization of concepts or ideas." Hence, if architecture is the materialization of concept, then the architectural detail(ing) is the material and structural articulation of meaning(s).

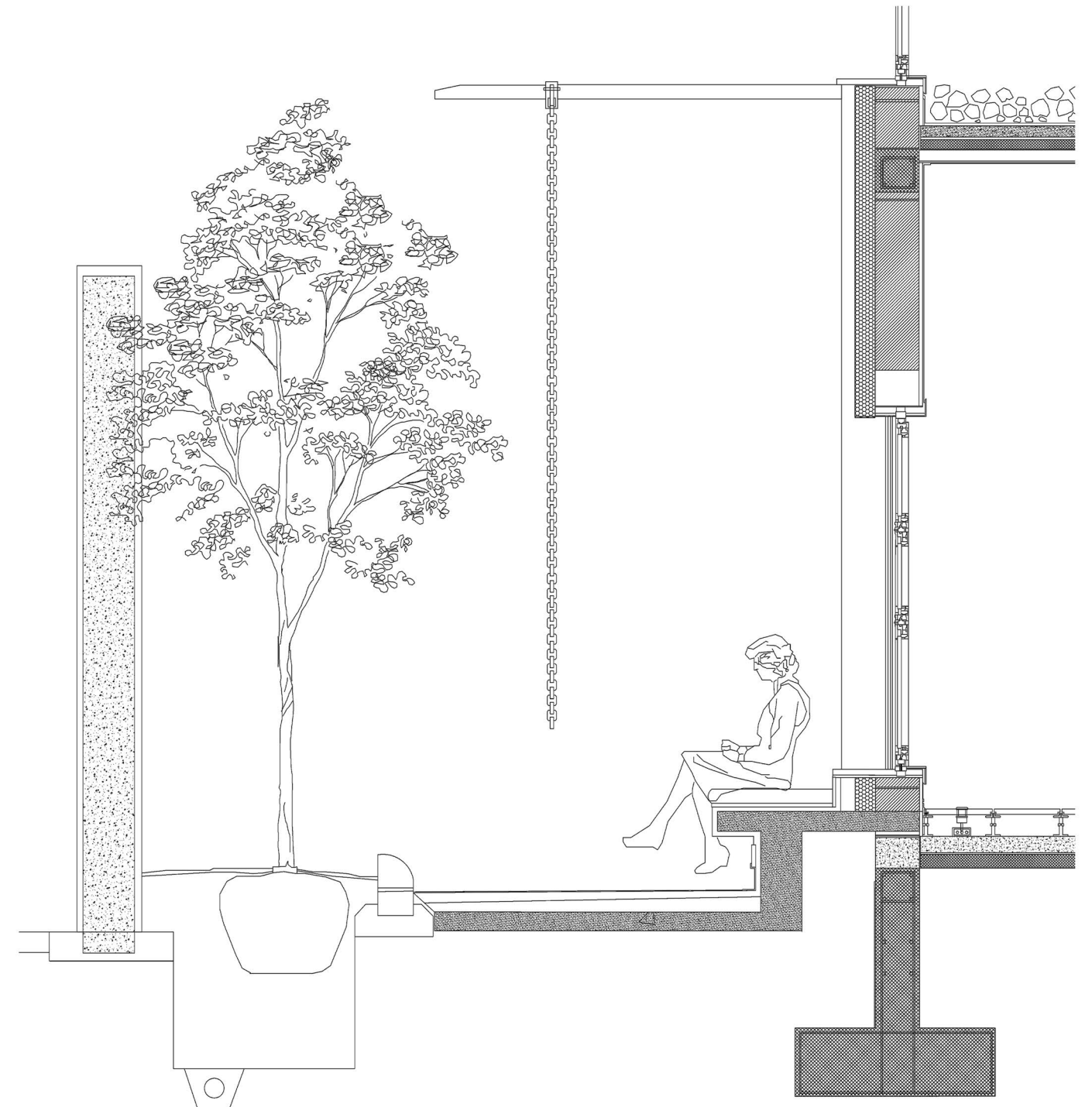
However, rather than a linear progression that begins with concept at the overall scale of that design eventually arriving at the intimate scale of the detail, might the consideration of the production meaning initiate at the scale of the detail? For the usual modes of the "production of meaning" expose the hegemony of Enlightenment and colonial epistemologies.



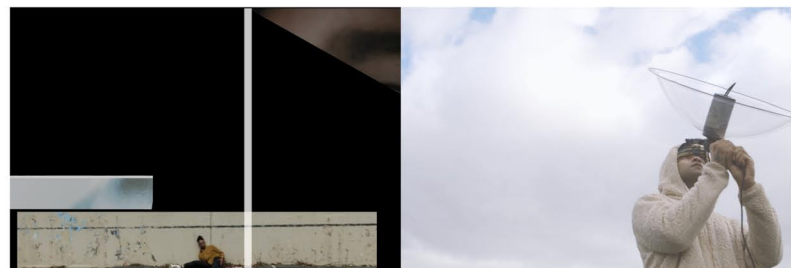
SCORE BAECON

Therefore, the consideration of the architectural detail must be critical while simultaneously situating other ways of knowing including embodied and indigenous knowledge. While details are enactors of power ( "God is in the details" ...Mies van der Rohe) and assemblages of labor; resource extraction; capital accumulation; anthropocentrism; and segregations --- inside vs outside; human vs non-human; weather vs. climate ---So we developed architectural details as the responses to the scores and instruments for embodied knowledge.

One of the recordings for the wind, I recorded a lot of sounds from nature. The wind is like a thickness wall that integrates all the natural sound. This multi-layered feature is also reflected in my other detail drawings later on. I set up three layers of sound in the detail drawing here. The first layer is the outermost layer of trees. The wind blows the trees, bringing the sound of vibrating leaves. The second layer is the rain chain. The rain chain attached to the ceiling of the outdoor balcony makes sounds by wind or rain vibrations. The third layer is the indoor part. I set up a stone wood panel. People walking in-doors can make the sound of stones rubbing against each other.



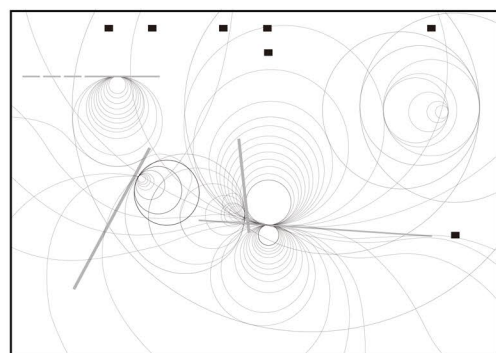
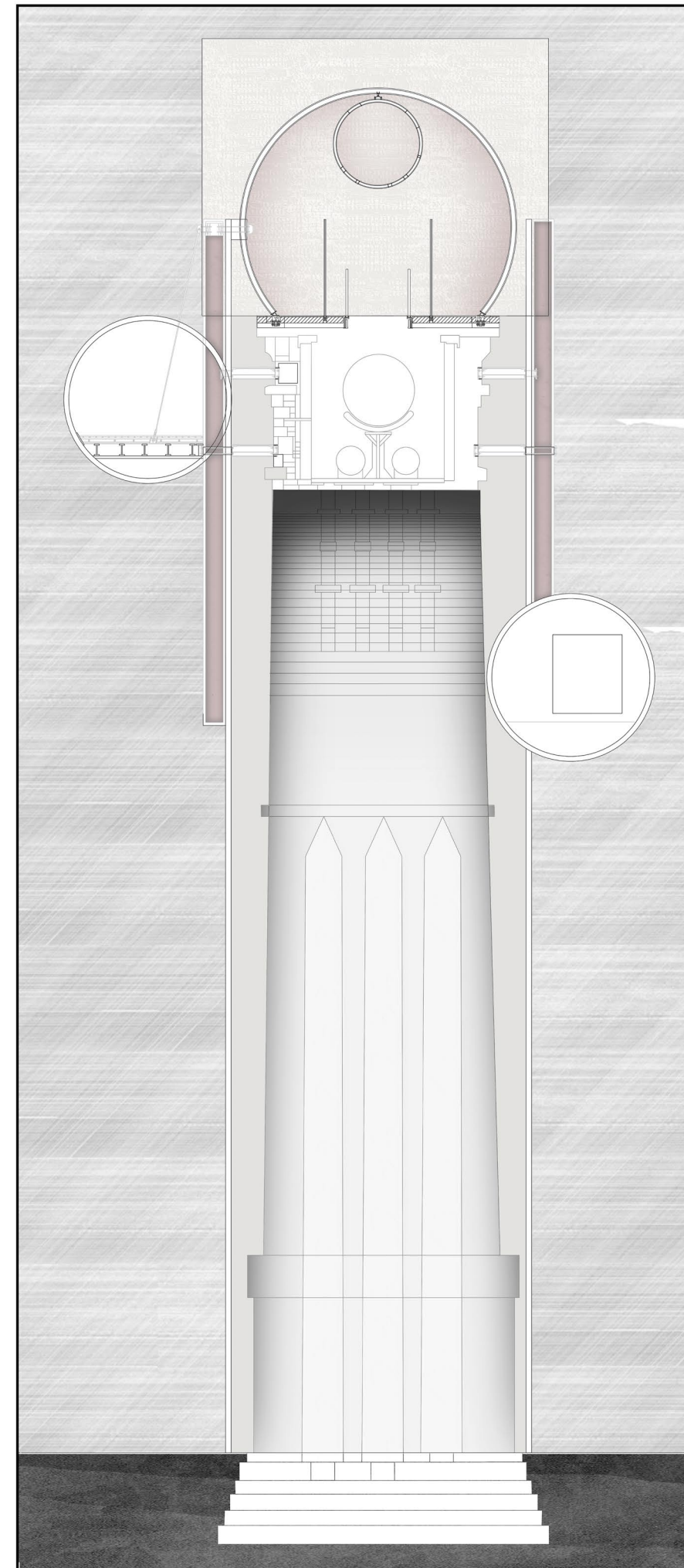
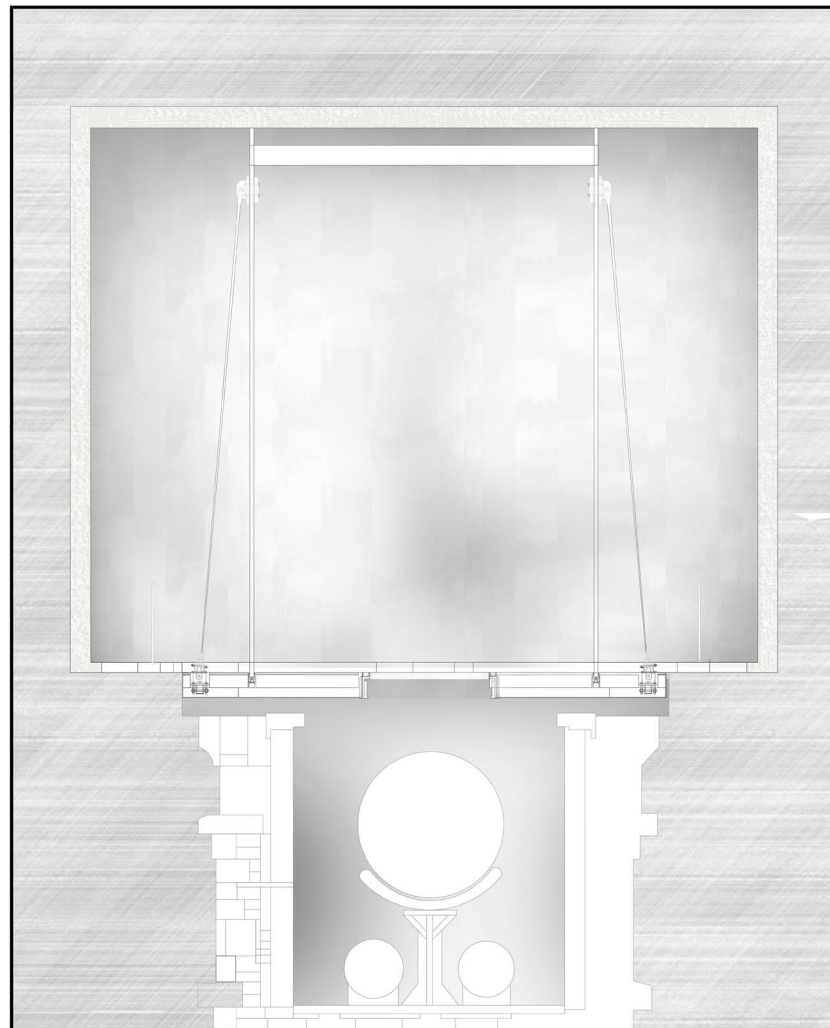
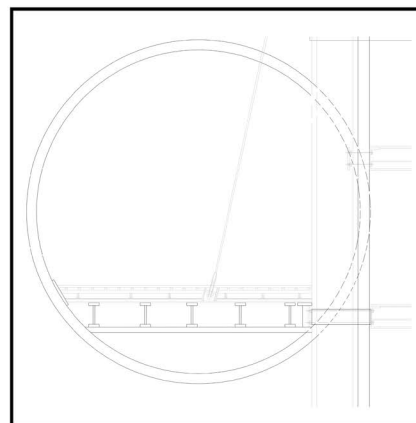
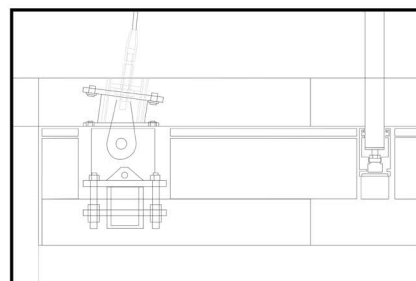
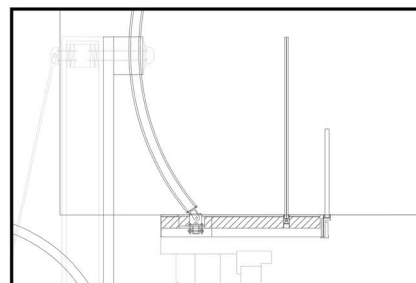




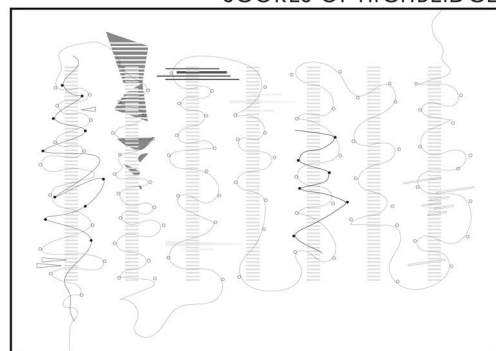
Research the histories and entangled ecosystems of highbridge. And contemplate the histories of colonialism, extraction, exploitation, displacement, labor, and power relationships of many forms. Design my own intervention to hypothesize the ways in which the sound(s) of each site may reveal these histories and other concepts.

Because the High Bridge is an important piece of infrastructure for New York's aqueduct system, it has a special significance for New Yorkers because of its historical influence. Its historical influence gives it special significance to New Yorkers. The construction of the High Bridge represents part of the city's modernization during the late colonial period. It marked the evolution of the city from a colonial society to a modern metropolis, and this development was an important turning point in the history of the city and the history of the United States. So I wanted to enhance the historical significance of the High Bridge site. To investigate more of the characteristics and manifestations of urban sounds based on the interior pipes.

And therefore....  
I went to listen to the inside of the water pipes on the outside wall of the gatehouse, and it's the closest I can get to the internal water pipes of the highbridge right now. It responds to sounds from outside and how the inside of the water

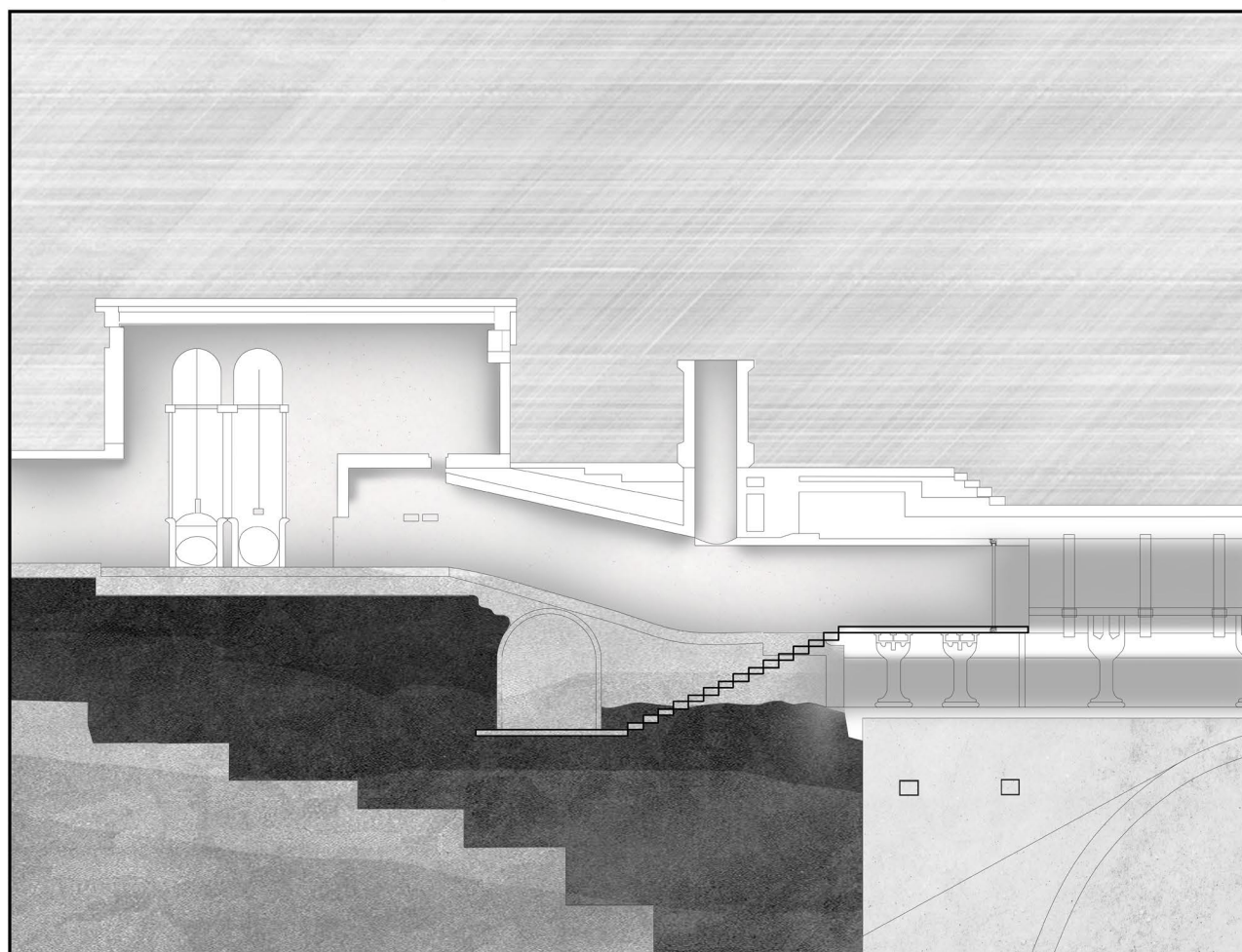


SCORES OF HIGHBEIDGE

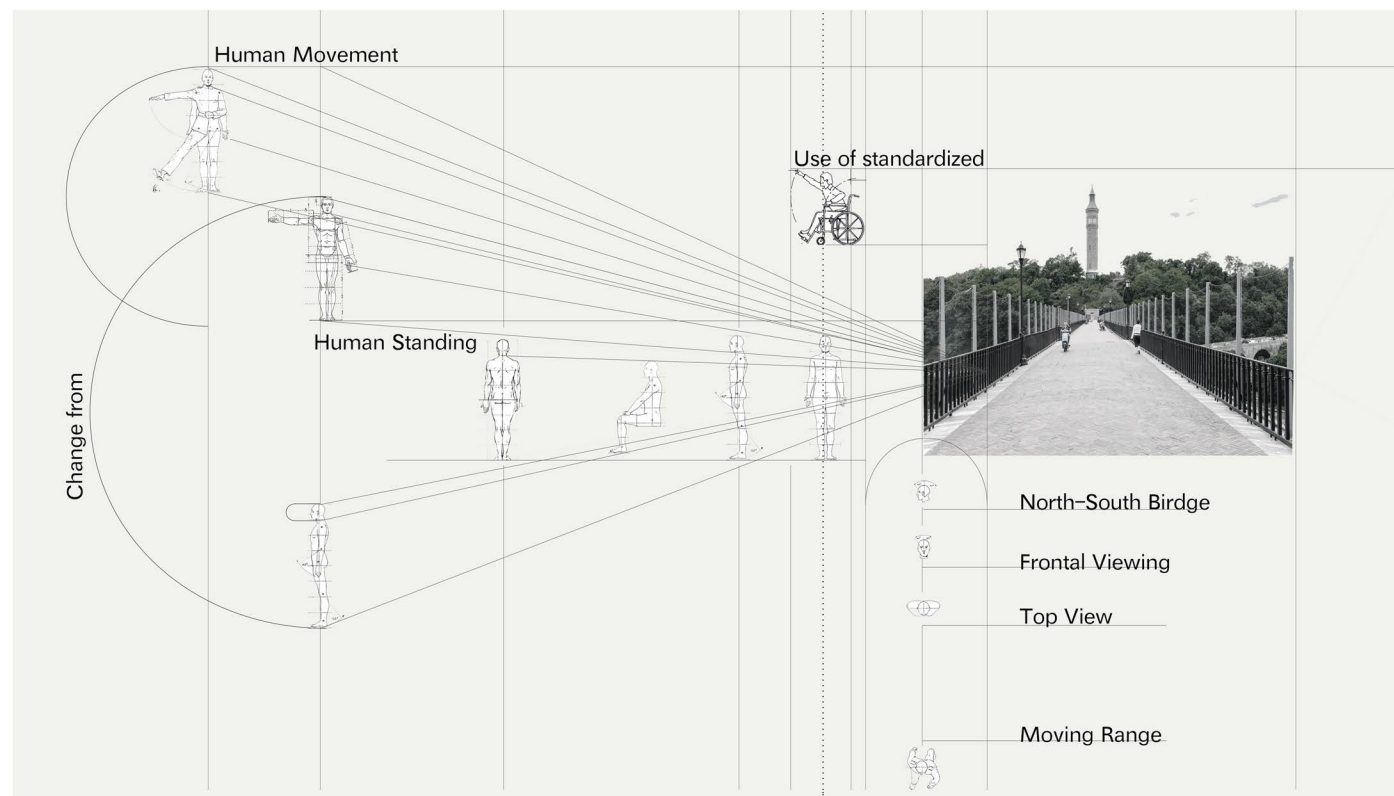
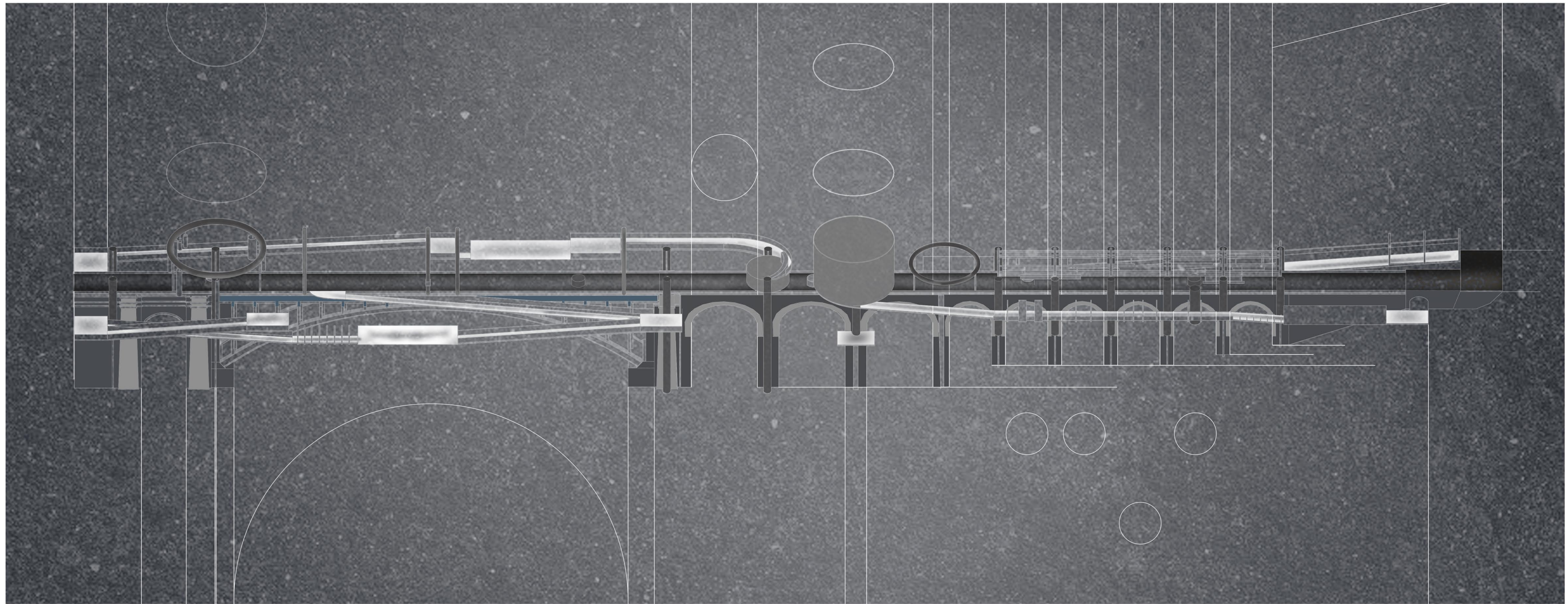


In the SCORE here, I wanted to use circles to represent the echo effect of the sounds in the recording. There are different groups of circles, and the different groups represent some of the most obvious sounds.

In the other SCORE, each column-like lines represents a one-minute timeline. To Record the sound changes for each minute. In this recording, there are few ups and downs in sound, mainly sounds are from different cars. I used a gray background to represent the watery sound that these cars make after being edited.







As for my INTERVENTION, because I wanted to amplify the sound and impact of the pipes on the underside of the high bridge. And based on the critic of the two professors, I set up some glass pipes hanging on the upper part of the high bridge. And the structure of the suspension is made in the shape of a circle, imitating the form of pipes. It is like people can walk on the pipe and walk in the pipe. Or even walk under the pipe. The upper part of the suspended glass pipe is holed to collect rainwater, and the lower part is also get small holed. Rainwater can be left through the small holes and interact with the people walking. There are also holes at part of the high bridge where you can take a tour. It is like a vertical glass pipe placed at the deck of the high bridge. People can see the original pipes inside the bridge. Feel its historical vibe.



# 03

## ARCHITECTONICS OF MUSIC

Music-themed Chapel Design

Mar-May, 2024

Instructor: Steven Holl and Dimitra Tsachrelia

Instructor Email: dt2236@columbia.edu

Location: Granada, Spain

Project type: Academic Studio Design

Individual work

Software: Rhino (Grasshopper) /  
Audition / Illustrator  
Photoshop

“It’s probable that in the artistic hierarchy birds are the greatest musicians existing on our planet...In nature I find the ultimate inspiration for my compositions. The perfect **harmony** and **balance** can be found in the simplest of things.” ”

Music is the **bridge** between the physical and the spiritual, a vessel through which we can glimpse the transcendent... My goal in composing is to capture the essence of the divine and make it tangible through sound... I believe that music has the power to heal, to uplift, and to transform.” - Olivier Messiaen

The initial studies in the studio will focus on experiments in the language of architecture inspired by music. The conceptual design ideas were first abstracted from the selected music chapters, and the design language was further summarized on the basis of the spatial model. And it is used in the extended design phase of the building’s function.

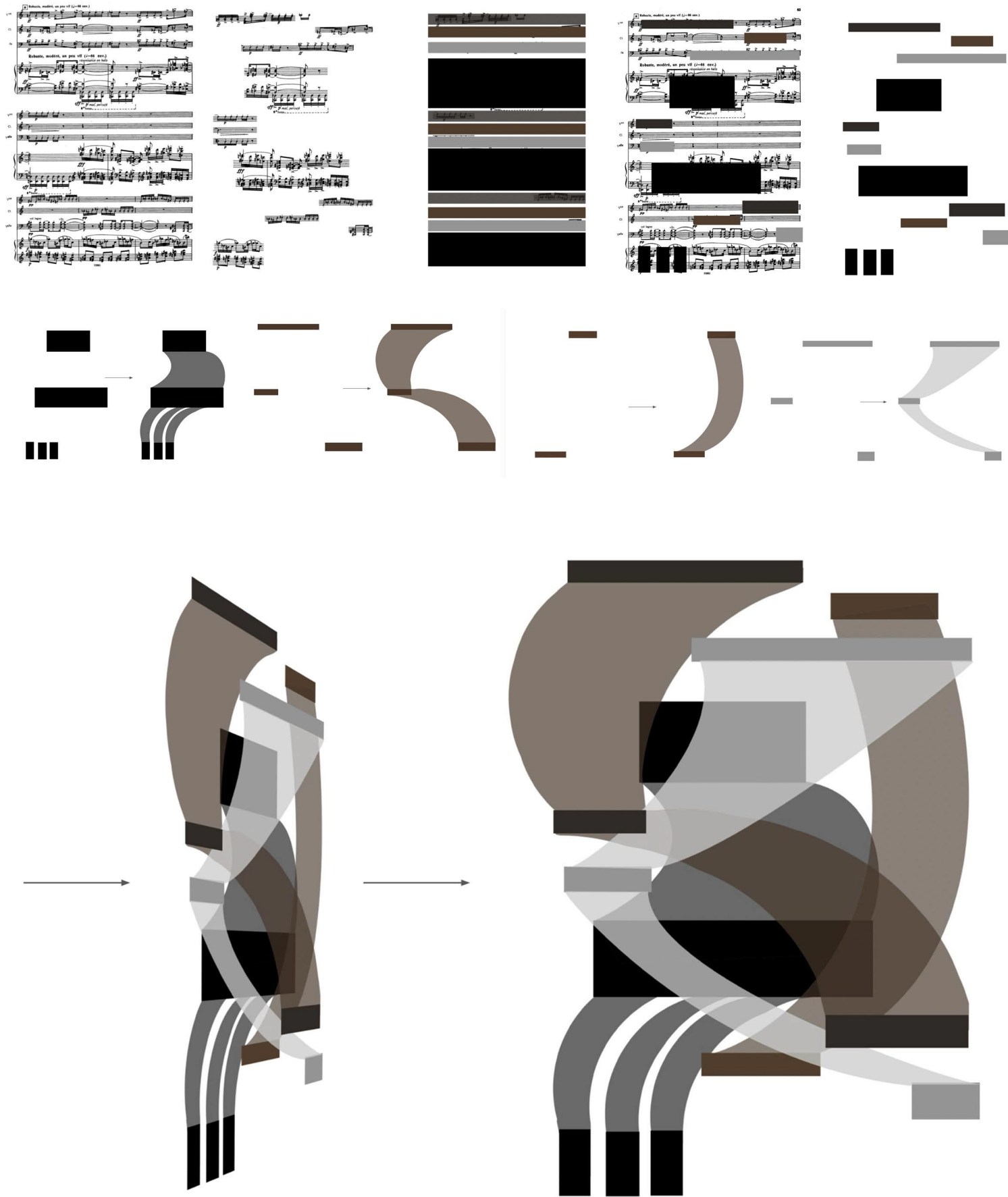
Finally, under the realistic conditions of the actual site, functions such as **chapel**, **library** and **reception** were added to integrate the music language into the building design.



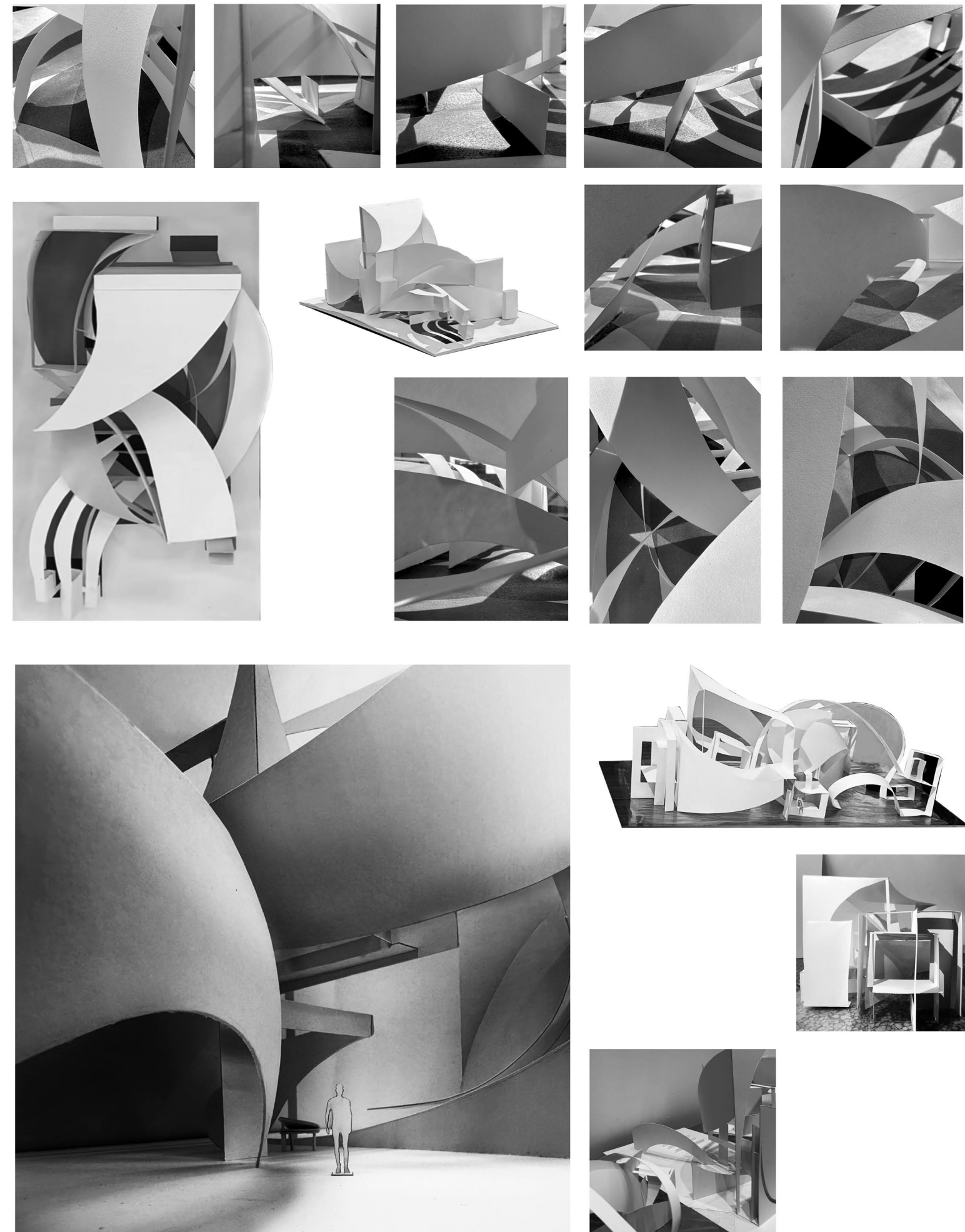


MUSICE LANGUAGE WORK ----- > Spacial model design

Start from the score: Graphic diagram



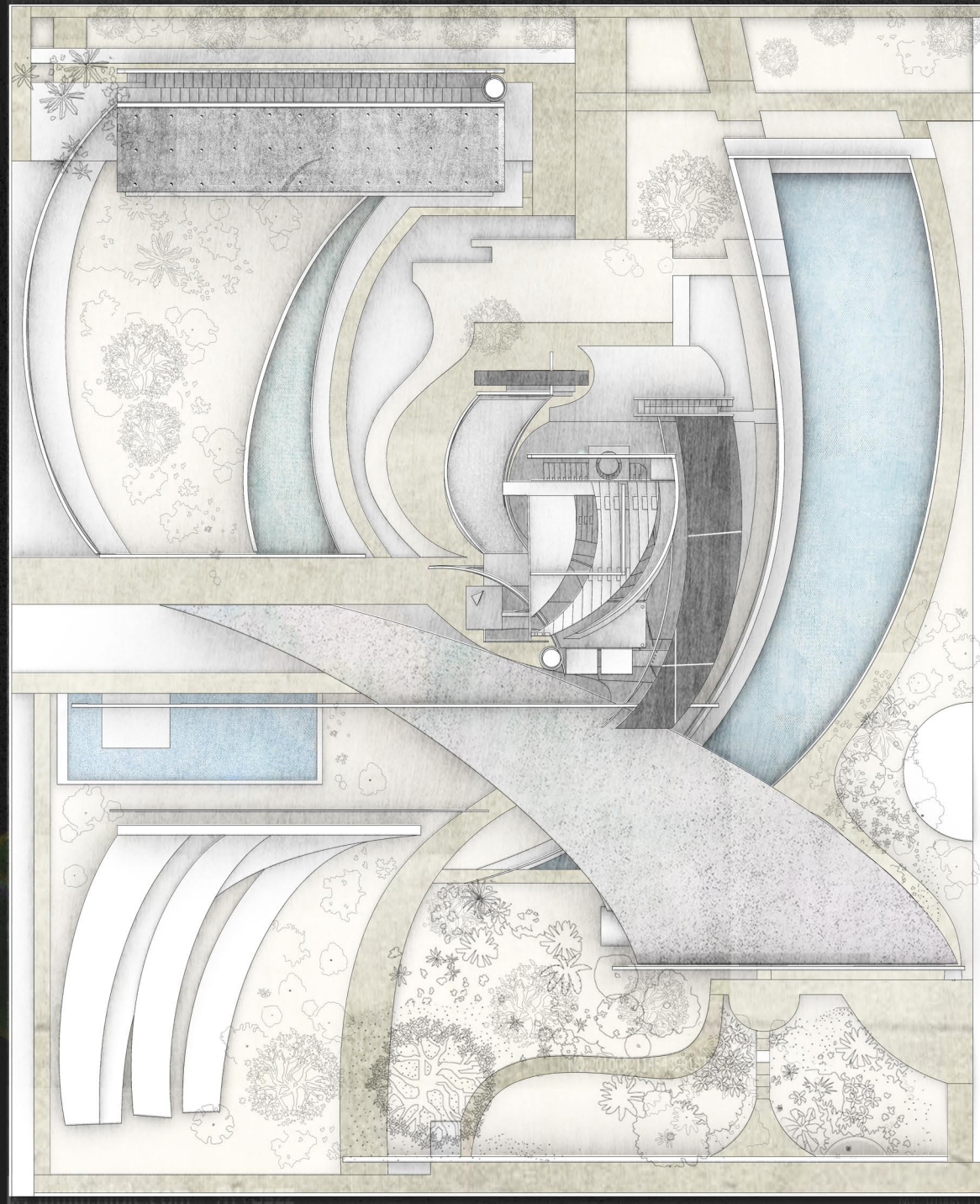
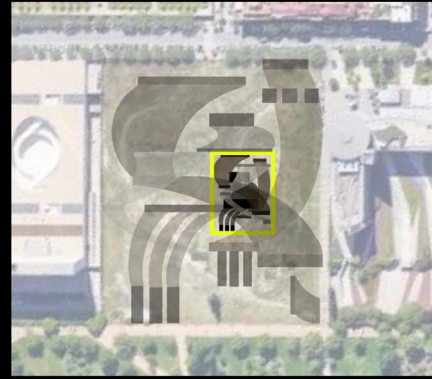
MUSICE LANGUAGE WORK ----- > Physical model





Just as the music spreads a sense of romance in the space, I wanted my design to also extend the overall feeling throughout the site. So I incorporated graphic design throughout the site, and I utilized the graphic design of sheet music once again in the chapel building. That's my design language, showing variations of graphic design in different scales.

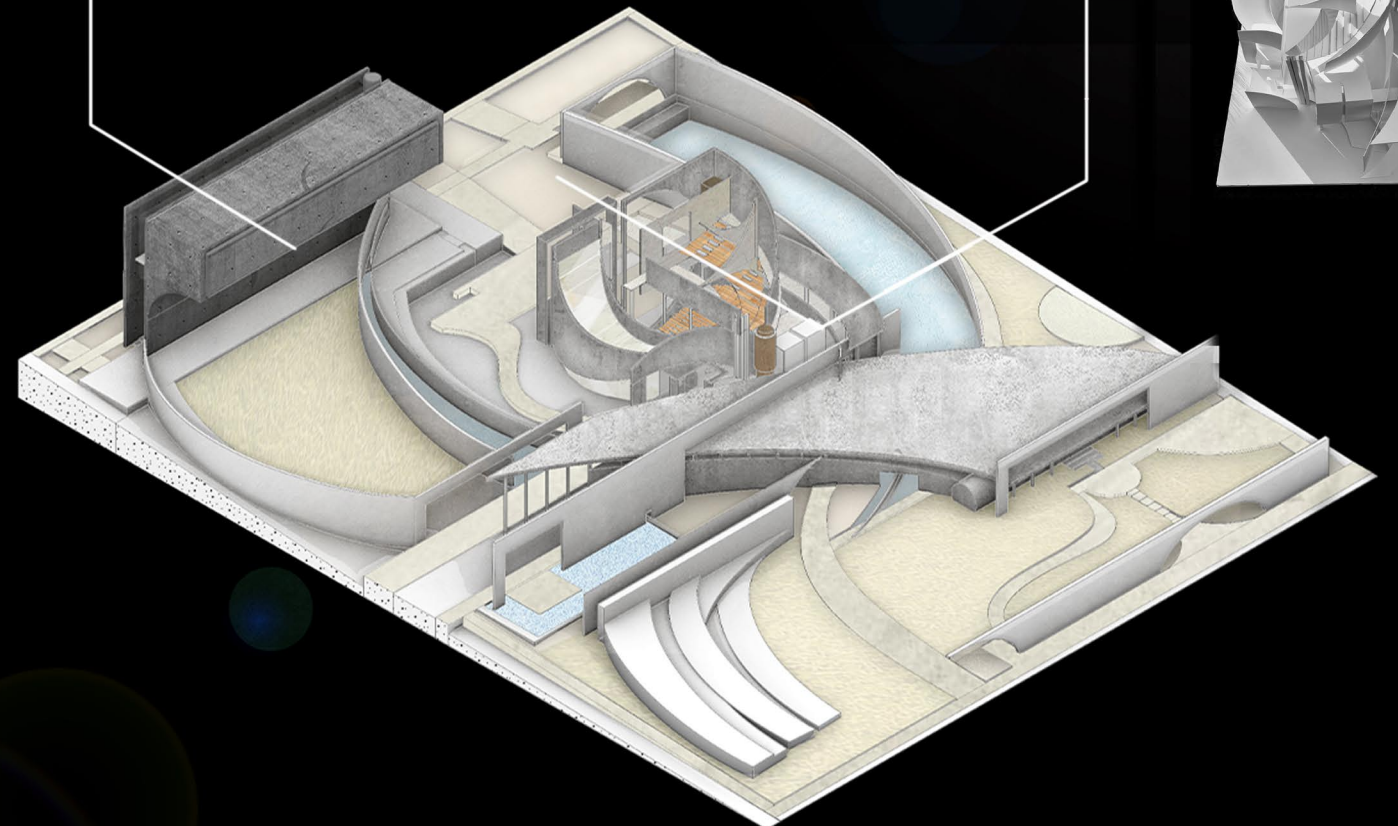
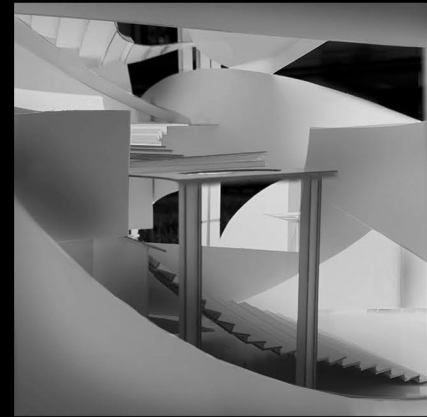
That's THINGS IN A THING.



Music Library Section



Chapel Section







# 04

## RE-THINKING BIM - High-rise Building Design

BIM Elective Course Architecture Design

Sep-Dec , 2023  
Instructor: Joe Brennan  
Instructor Email: jab2315@columbia.edu  
Location: New York  
Project type: Academic Project Design for Visual Studies / Computation  
Individual work  
Software: Revit / Rhino / Grasshopper(ladybug)

There are different interpretations of the term **BIM**, which stands for Building Information Modeling. Most people will tell you it equates to **Revit**. Others correlate it more closely with parametric design.

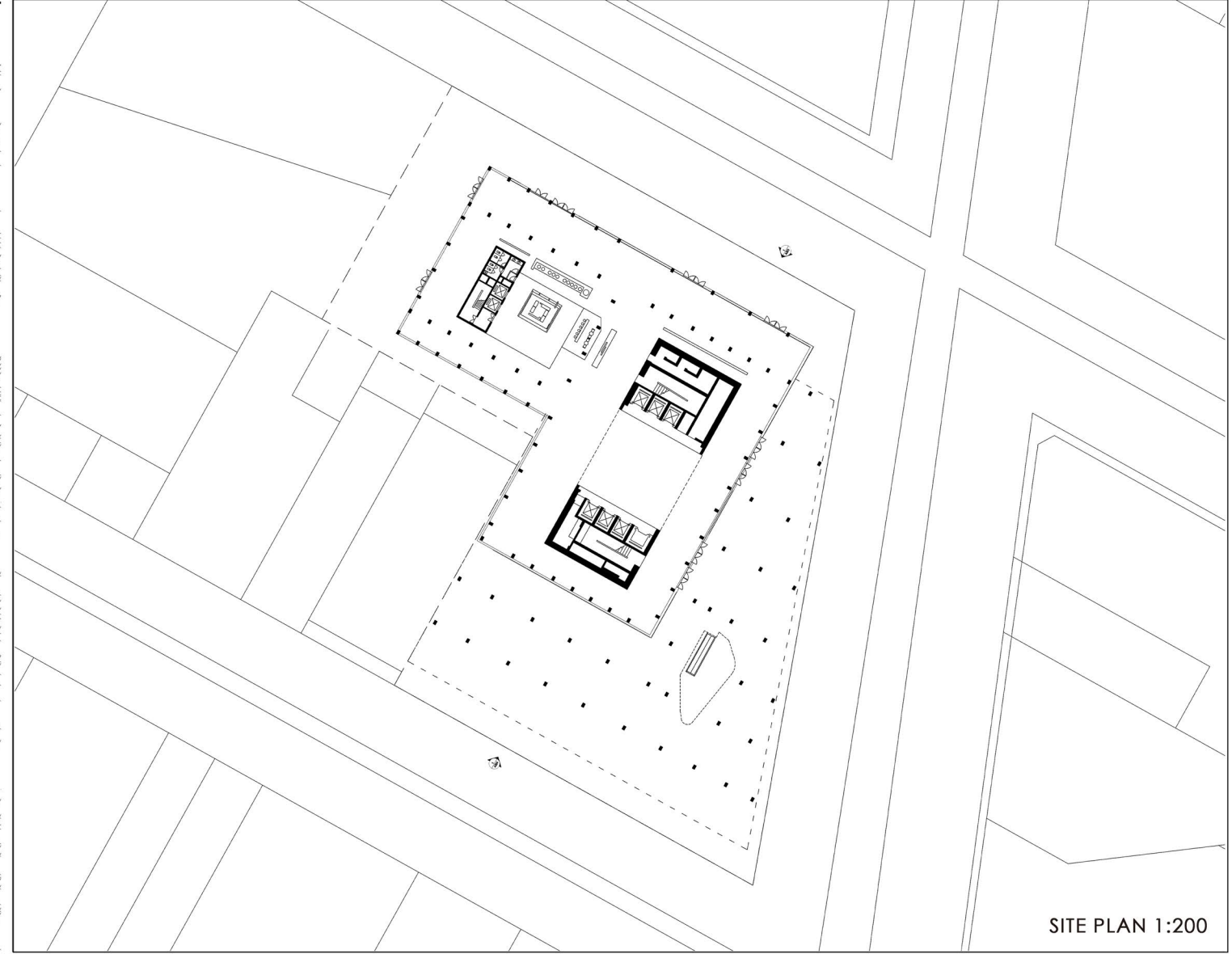
Rethinking BIM will challenge its participants to explore different methods of leveraging **BIM** to enhance all processes within our industry.

One of the critical drivers of success is our ability to collaborate with other members of the development, architecture, engineering, and construction (**DAEC**) industry. Therefore, we examined how these related disciplines function. Concurrently, we developed processes to understand different priorities better and exchange information more seamlessly. We also took inspiration from outside the industry from tech and manufacturing. Finally, we leveraged drawing and diagramming to visualize and explain these collaborative processes.

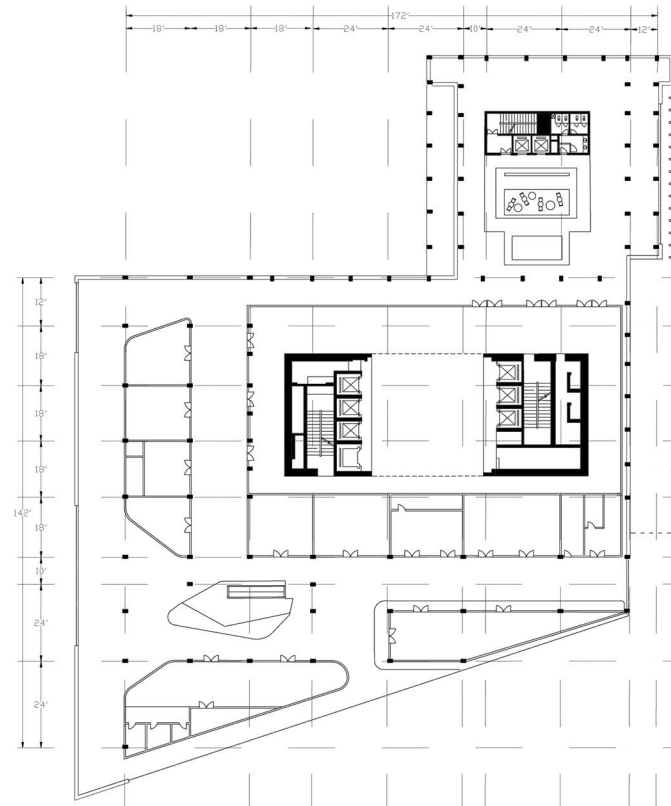
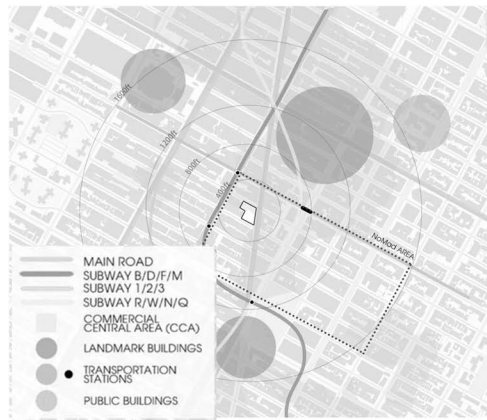




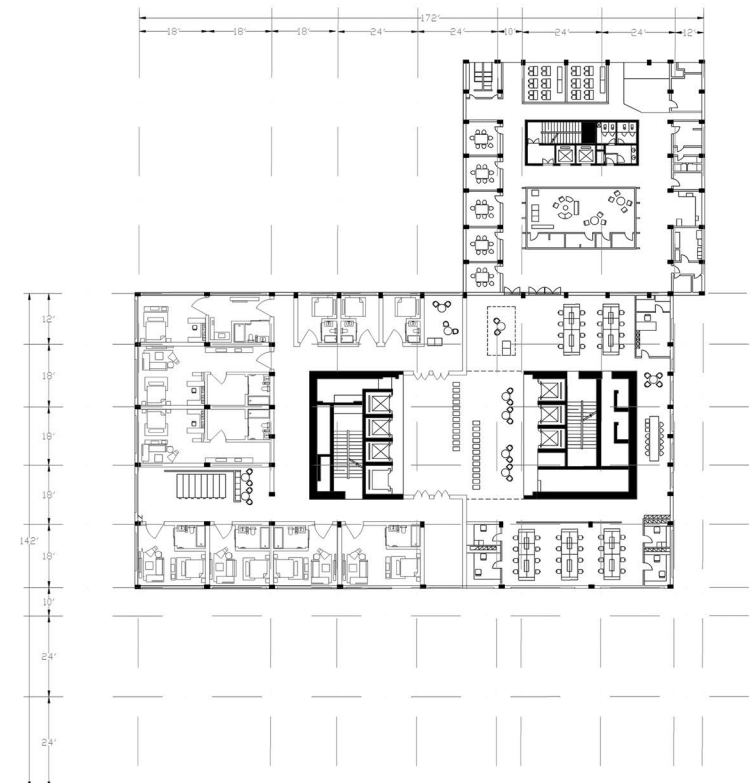
SITE PLAN 1:800



SITE PLAN 1:200

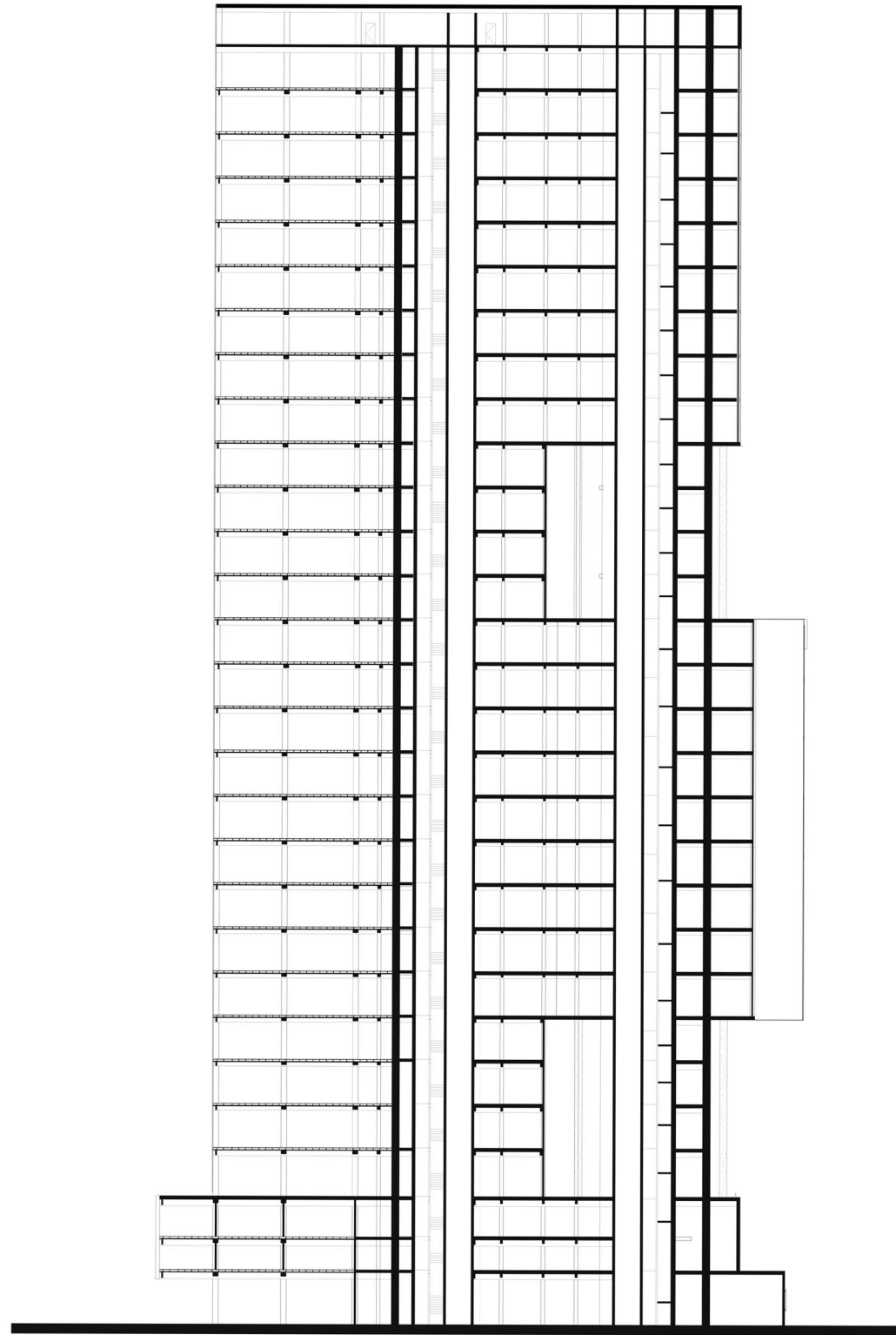


SITE PLAN 1:200

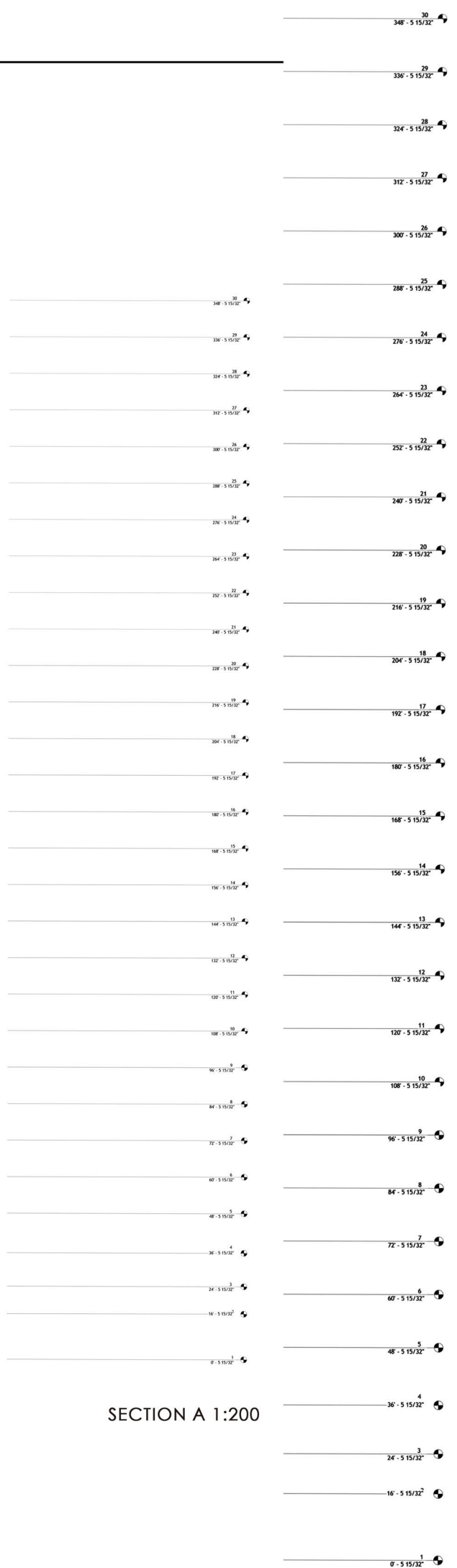


SITE PLAN 1:800

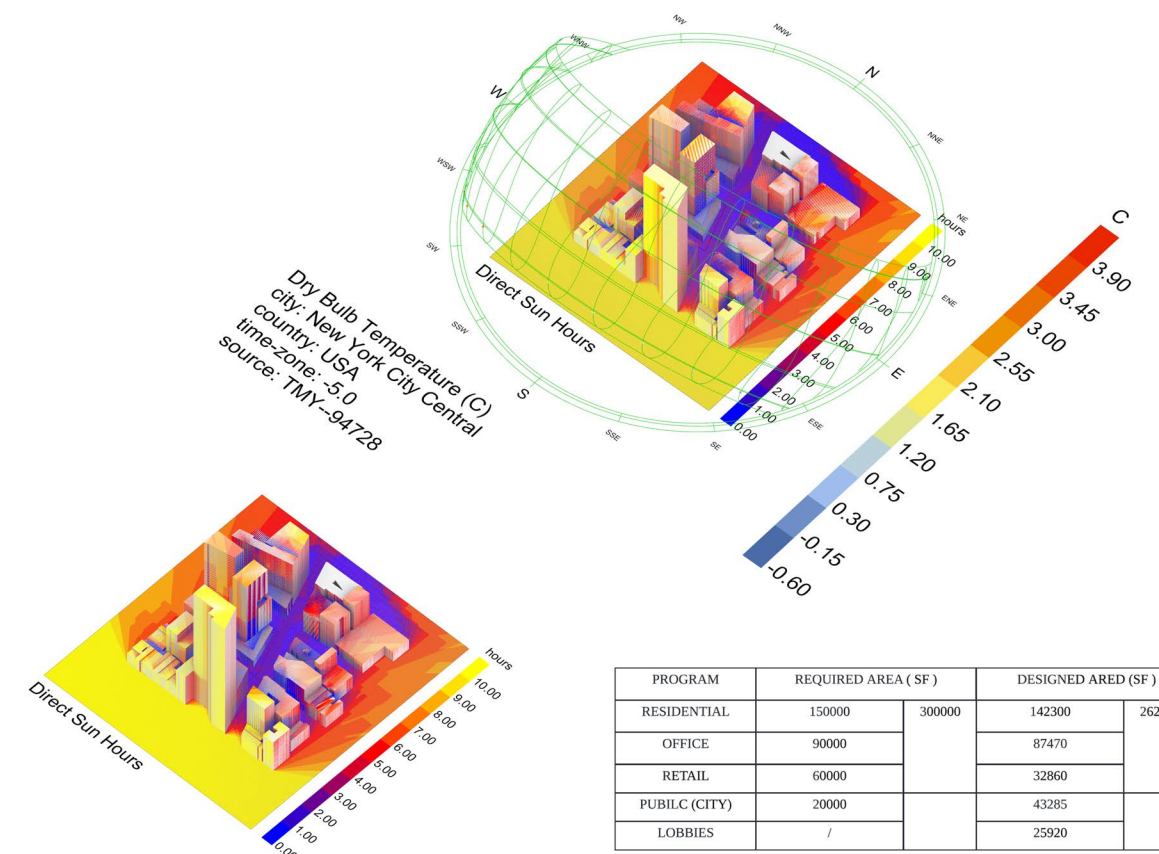




SECTION A 1:200

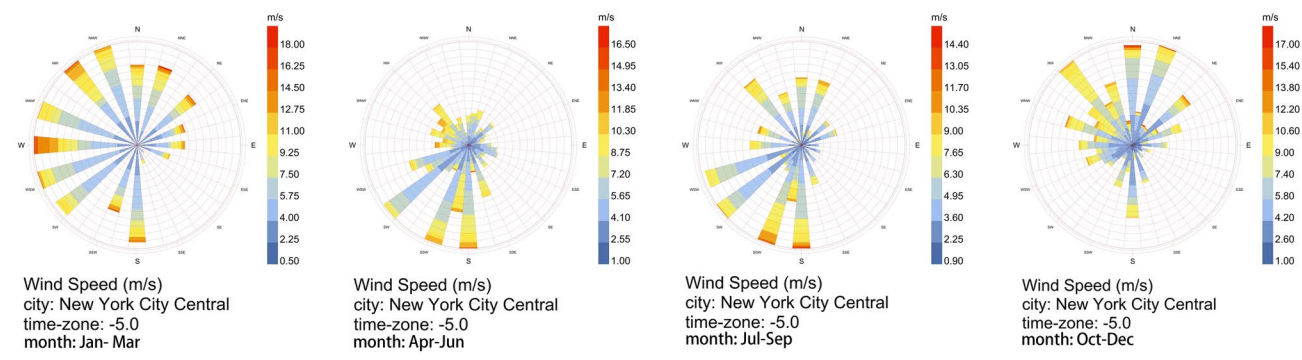


BUILDING ANALYSIS---Solar Radiation Analysis

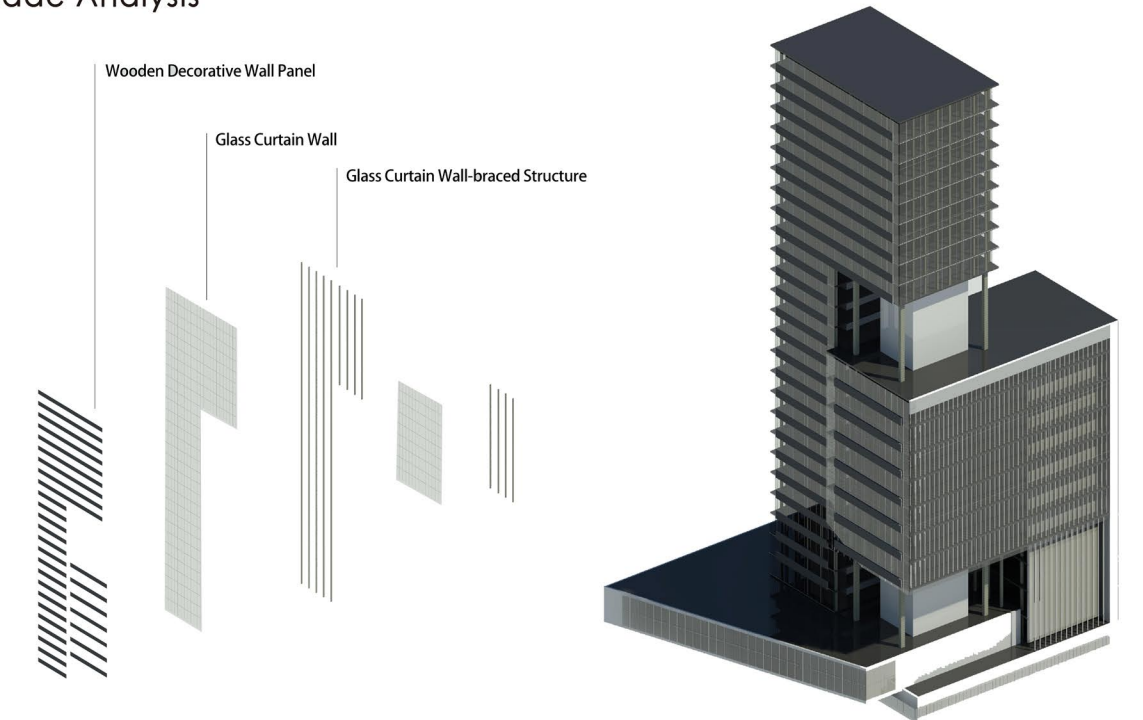


PROGRAM	REQUIRED AREA ( SF )	DESIGNED ARED ( SF )	FLOORS
RESIDENTIAL	150000	300000	27
OFFICE	90000	87470	13
RETAIL	60000	32860	3
PUBILC (CITY)	20000	43285	/
LOBBIES	/	25920	30

Wind Rose Diagram



Facade Analysis







# 05

## SEED BOMBS TECHNOLOGIES IN ECOLOGICAL DESIGN

American Eel Restoration Unit

Sep-Dec , 2023  
Instructor: Emily Bauer  
Instructor Email: eab2254@columbia.edu  
Location: New York  
Project type: Academic Project Design for Visual  
Studies / Computation  
Group work with Siraphob Khuptiphongkun  
Design of models and analytical drawings  
Software: Revit / Rhino / Grasshopper

The ecosystem lies at the heart of our architectural structures and community design and functionality. We strive to delve deep into the symbiotic relationship between the **built environment** and **ecosystems**, exploring the relevant technological foundations and the systems they sustain.

Grounded in **ecological design**, with a focus on enhancing water quality, revitalizing local ecosystems, and improving community well-being, we conceptualize and implement a **new** system of floating marine landscapes. Through ongoing collaboration with the local non-profit organization **RETI Center**, this tactile experience will be enriched to assess the ecological impacts of intervention measures. From intricate design details to overarching urban systems, we ultimately embody our research in a hands-on modular installation tested in the **New York Harbor**.

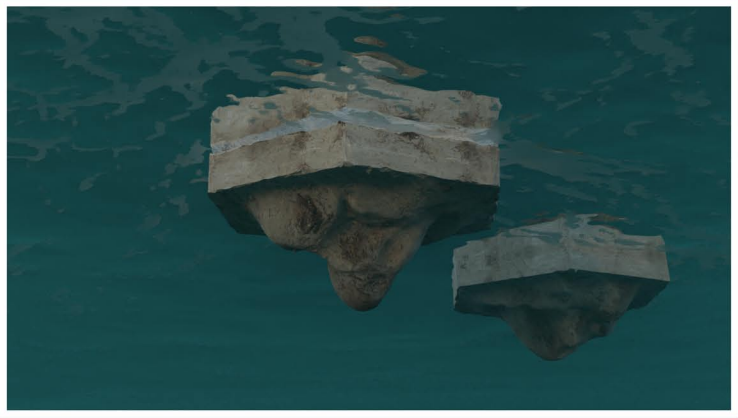


# American Eel Restoration Unit

## Project Statement :

American eel is an endangered species found along the Atlantic Coast. This project aims to soften the water edge condition of New York City, which has been transformed into hard edges that is not suitable to habit for the eels, by deploying float that the eels can reside in.

American eels' role in the small bay area at Red Hook, Brooklyn is complimentary with the local mussel populations, which we will utilize in creating concrete for our float.



**upper layer :**  
collecting rainwater (freshwater) and providing an intertidal habitat for endangered american eels



**ropes :**  
can be used to cultivate mussels to filter the water and become food for fish, birds, and humans before their shells are collected to be used in concrete

**concrete shell :**  
using crushed mussel shells as substitute for sand and gravel

**emerging plant species**

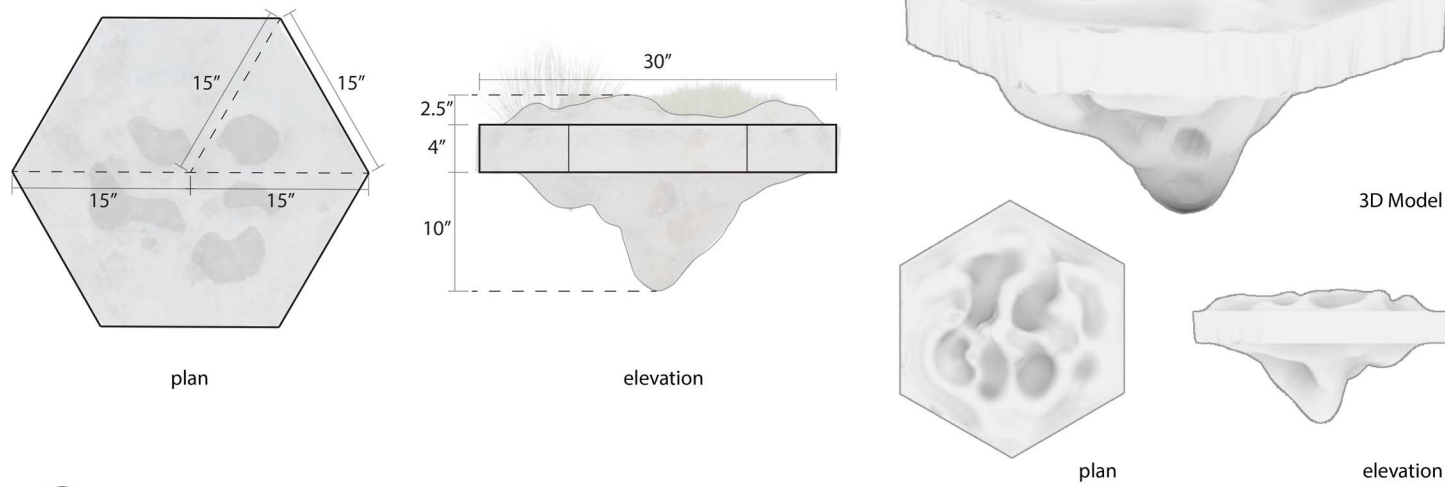
**eye lag screw :**  
keeping the foam in place when casting concrete

**foam :**  
keeping the concrete shell afloat



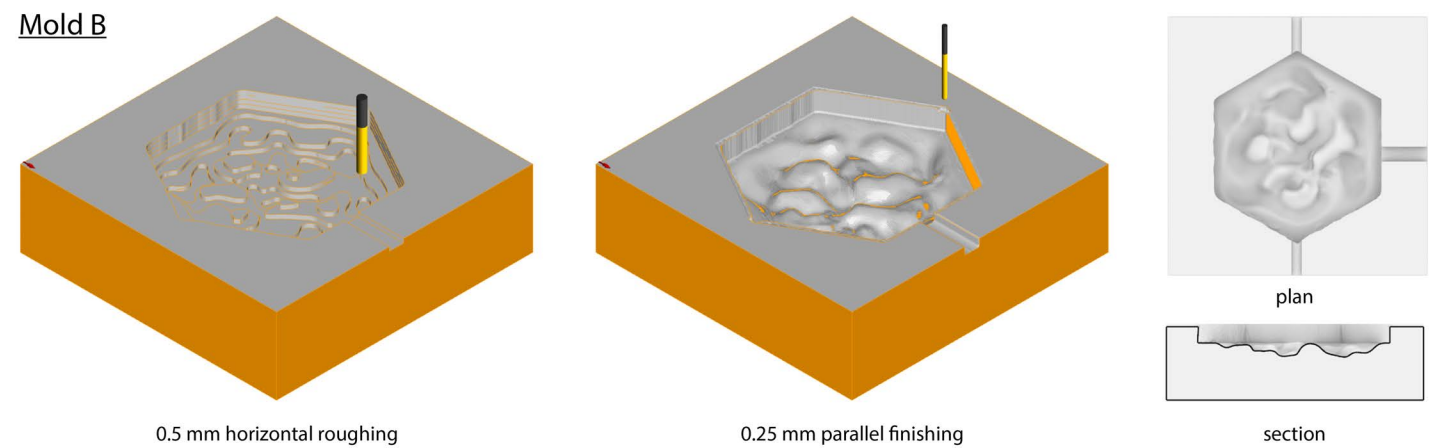
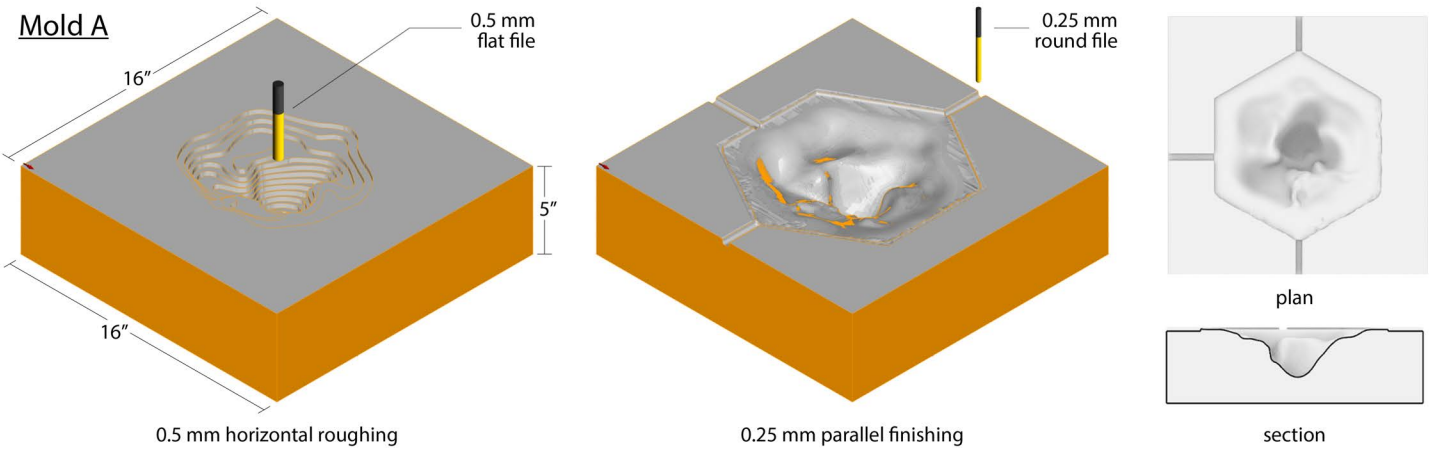
# 1 Concept + 3D Modeling (Rhino3D + Blender)

## Idealized Dimensions



# 2 3D CNC Model (Rhino3D + RhinoCAM)

CNC = computer numerical control



### Lessons Learned :

- CNC machine limitations
  - 5 inch material depth
  - 3 inch file depth
- Concrete limitation + model adjustment
  - Consequently, the float's crust had to be thickened disproportionately to meet 2-inch thickness to prevent the concrete from snapping.
  - The float had to be scaled down to match these CNC machine limitations.

### Future Considerations :

- If a larger float is more desirable, consider dividing the mold into multiple parts before reassembling them in further steps.

# 3 CNC Process



### Lessons Learned :

- Wood block made from glued wood scraps is usable, but can result in uneven surfaces
- Wood scraps used for this project are mixed between plywood and hardwood, which required consultation with the shop manager to adjust CNC file setting
- Glued wood should be dried for 2-3 days before entering the CNC machine to prevent delamination
- Small, thin scraps of wood can be torn off by the CNC file despite wood glue application

### Future Considerations :

- Identify and separate plywood from hardwood scraps when making glued wood boxes
- Avoid using small wood scraps
- Potential experimentation on how different wood qualities can affect the surface finishes

# 4 Preparing the Mold before Concrete Casting



step 1 : apply tape

step 2 : apply vaseline



step 3 : add top layer materials

step 4 : position wood frame + foams

### Lessons Learned :

- Applying tape and vaseline helps preventing concrete from seeping into the wood mold
- plastic / trash bags can also be used, but might be difficult to hold the desired shape
- The shrank size and thinness of the float limited sufficient use of wood and foam to increase the float's overall buoyancy

### Future Considerations :

- Different textures of tapes can create different effects on the float's texture
- Larger and thicker float should be less limited by the required minimum thickness needed by concrete to maintain integrity



## 5 Concrete Mix



crushed mussel shells



sand substitute



gravel substitute



mix with Rockite

### Concrete Mix Ratio :

- Rockite cement 12.75 lb
- crushed mussel shells ( sand substitute ) 1.125 lb
- crushed mussel shells ( gravel substitute ) 1.125 lb
- water 7.5 lb

### Future Considerations :

- More testing of concrete mix ratio is needed
- Rockite made the float considerably heavy, so other cement should be tested
- Water ratio can perhaps be increased, depending on qualities of other materials

## 6 Concrete Casting



### Lessons Learned :

- The mold needs to be clamped evenly and placed on a plate to contain any spilled concrete
- Concrete should be poured into the mold while it is still runny after being stirred for about 12 minutes
- Concrete can dry really fast and waiting for it to feel stickier can result in late pouring and ruin the casting
- Water ratio can perhaps be increased, depending on

### Failures :

#### Attempt #1 :

- In our initial attempt, we misjudged the amount of concrete required for our float
- We also failed to properly evenly clamp the sides of the mold, which resulted in some concrete leaking out

#### Attempt #2 :

- In our second attempt, we waited too long to pour the concrete, which started to dry during the pouring process



Attempt #1



Attempt #2

## 7 Float Testing ( Failed )



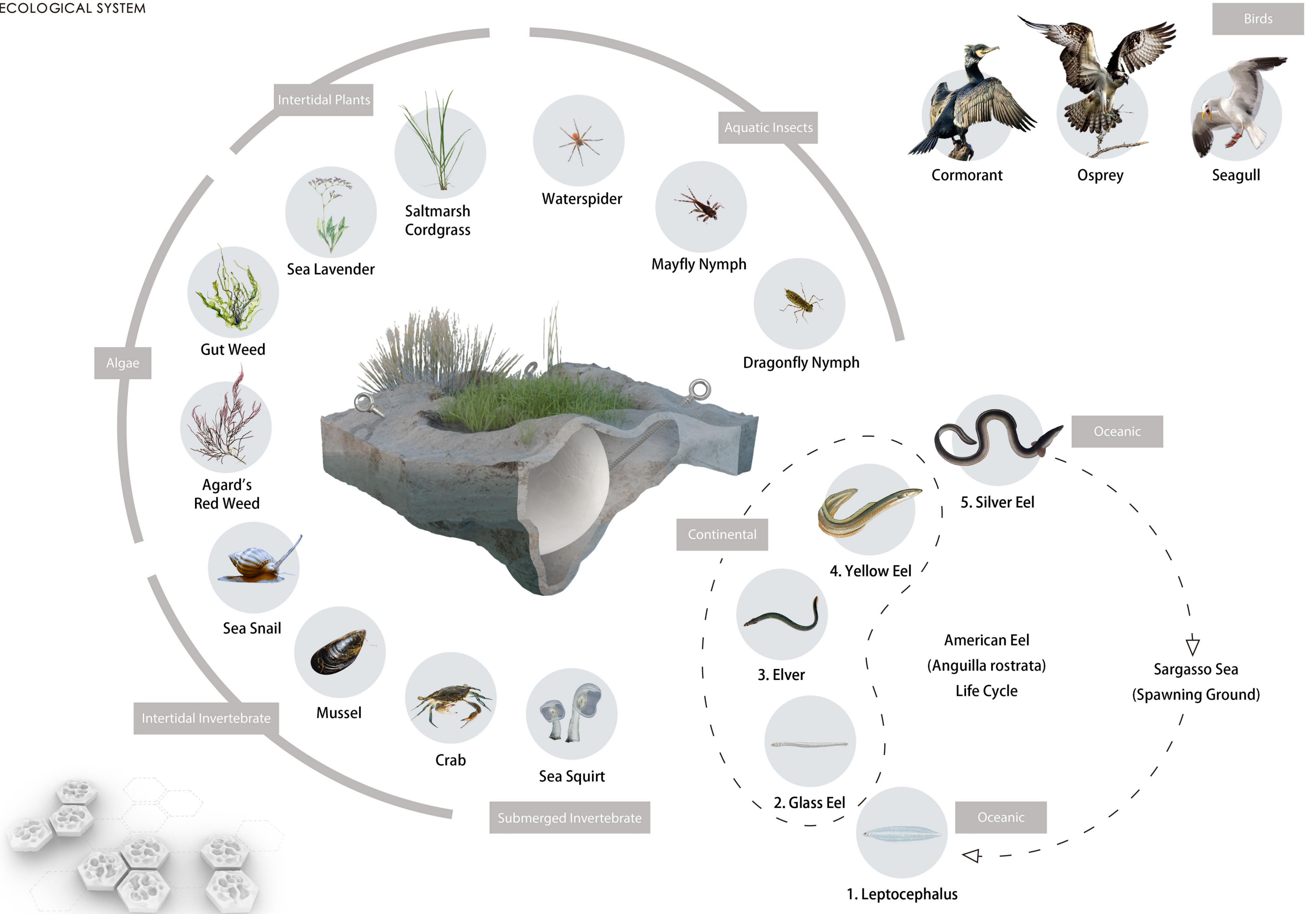
### Lessons Learned ( Summary ) :

- Our current combination of concrete mix and amount of buoyancy provided by foams was not enough to keep the float afloat
- The shrunk scale of the actual float also prevented more positions where the foam to be inserted, because of the minimum thickness required for a concrete layer
- CNC machine had more restriction than we actually thought and any future work should be consulted with the shop manager early on
- Wood scraps worked well as base materials for the mold, but plywood and hardwood should be separated to not create problems with the CNC file settings
- Applying tape and vaseline on the mold helped prevent concrete from seeping into the wood
- The current mold can still be used to cast and test other materials or different concrete mix in the future

### Future Considerations ( Summary ) :

- Larger molds should be separated into more smaller parts to meet the CNC machine's restriction before assembled together later
- Different brands of cement should be tested, because Rockite is very heavy
- Different mix ratio should also be tested
- Plastic / trash bags can be used in place of tape and be reused again multiple times, depending on their individual durability
- Even smaller molds can be made and used for testing inherent buoyancy of casted materials







# 06 ETERNAL ECHOES

Generative design: archival memories through sound

Mar-May, 2024

Instructor: Danil Nagy

Instructor Email: dn2216@columbia.edu

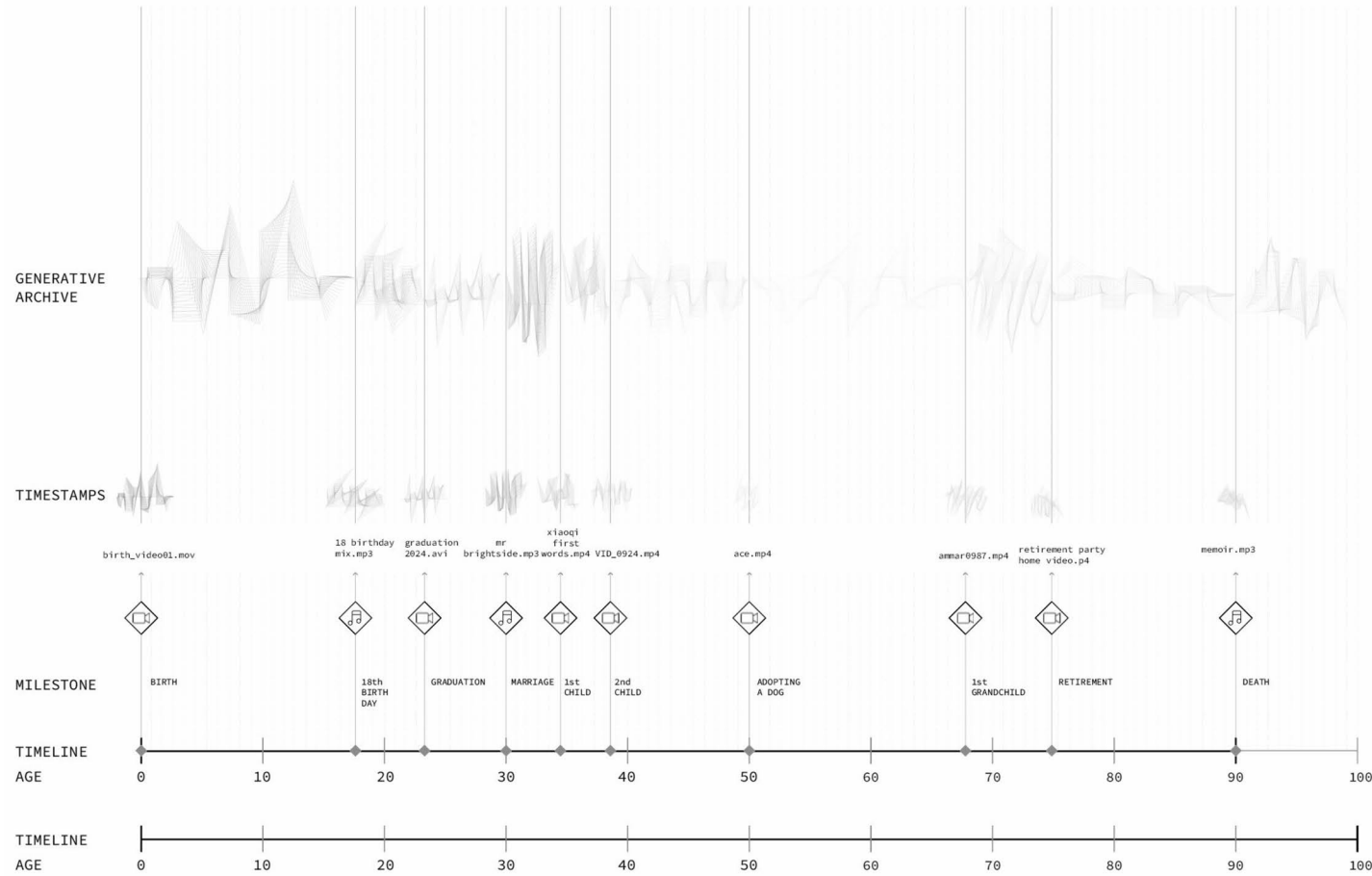
Location: New York

Project type: Building Science & Technology Elective

Group work with: Ammar Rassai, Devansh Shah,

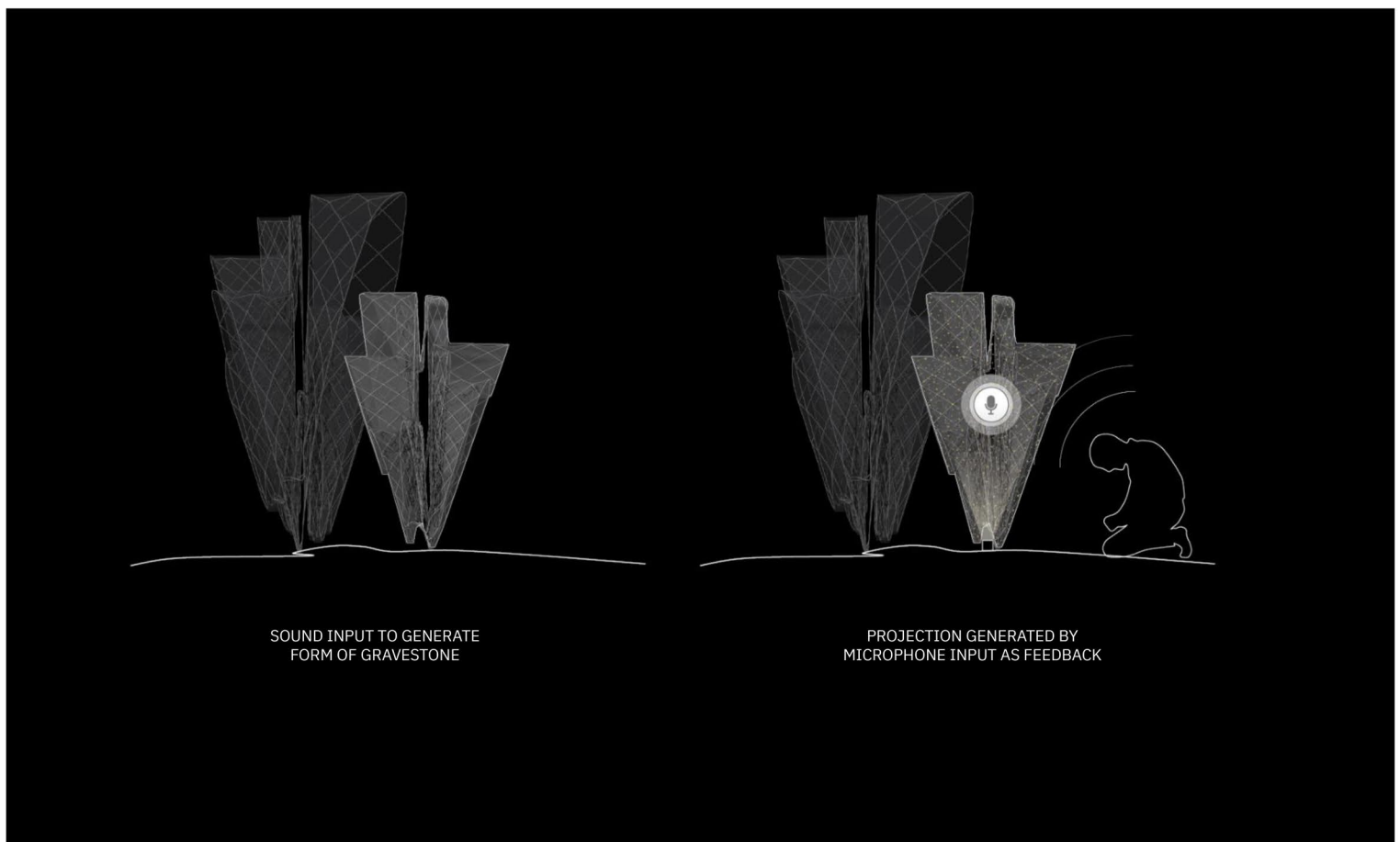
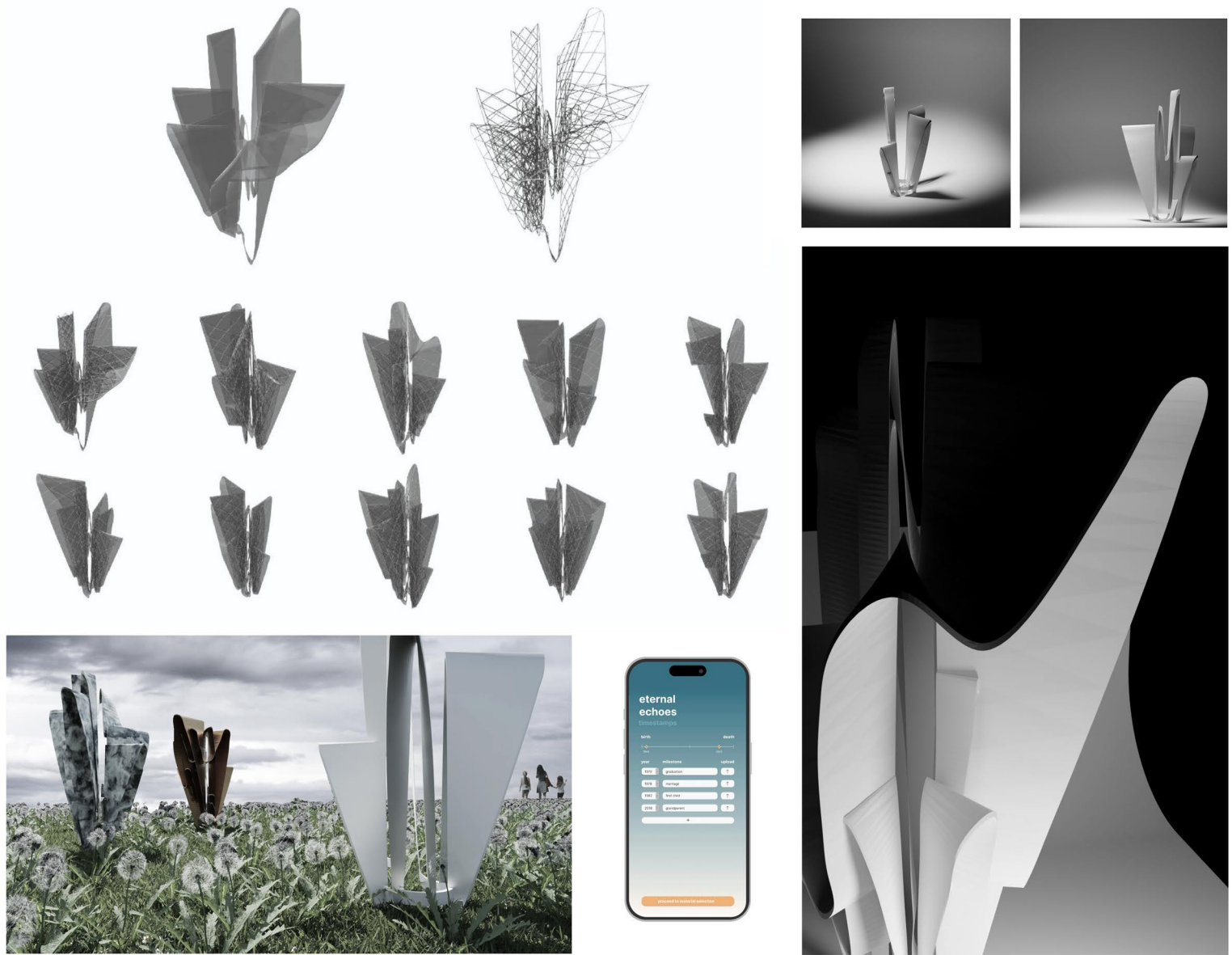
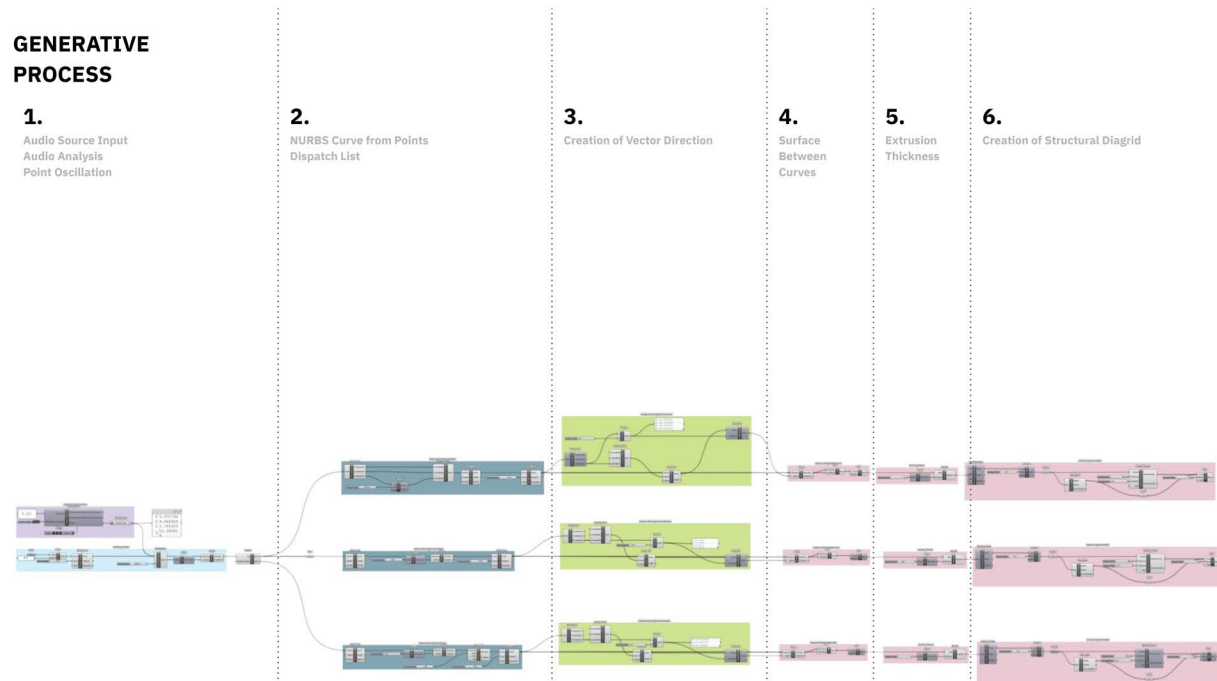
Xiaoqi Shen, Yi Wu Design of models and model making

Software: Rhino / Grasshopper



## GENERATIVE PROCESS

- 1.** Audio Source Input  
Audio Analysis  
Point Oscillation
- 2.** NURBS Curve from Points  
Dispatch List
- 3.** Creation of Vector Direction
- 4.** Surface Between Curves
- 5.** Extrusion Thickness
- 6.** Creation of Structural Diagrid





# 07

## 1:1 CRAFTING AND FABRICATION OF DETAILS

Architectural Details and Fabric Study

Mar-May, 2024

Instructor: Zachary E. Mulitauaoepele

Instructor Email: zem2105@columbia.edu

Location: New York

Project type: Building Science & Technology Elective

Group work with Xiaoyu Zhang, Zhihao Xu  
Design of models and model making

Software: Rhino / Grasshopper



# 08

## SUBJECT\_OBJECT

Conceptual Object Interaction and Creation Research

Mar-May, 2024

Instructor: Suchi Reddy

Instructor Email: sr4047@columbia.edu

Location: New York

Project type: Building Science & Technology Elective

Group work with Ziyi Zhu  
Design of models and analytical drawings

Software: Rhino / Grasshopper

