

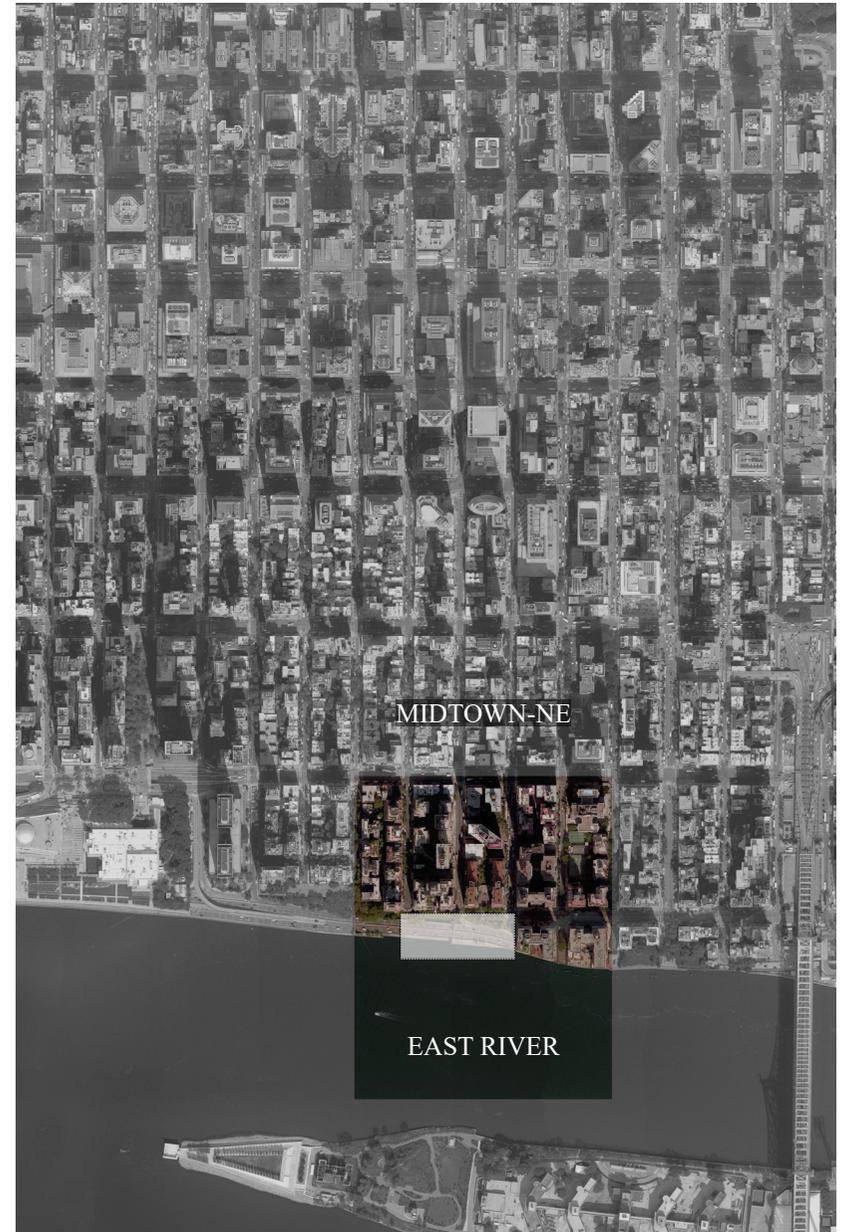
[Aquatic Center]

The Zone of Water Purification

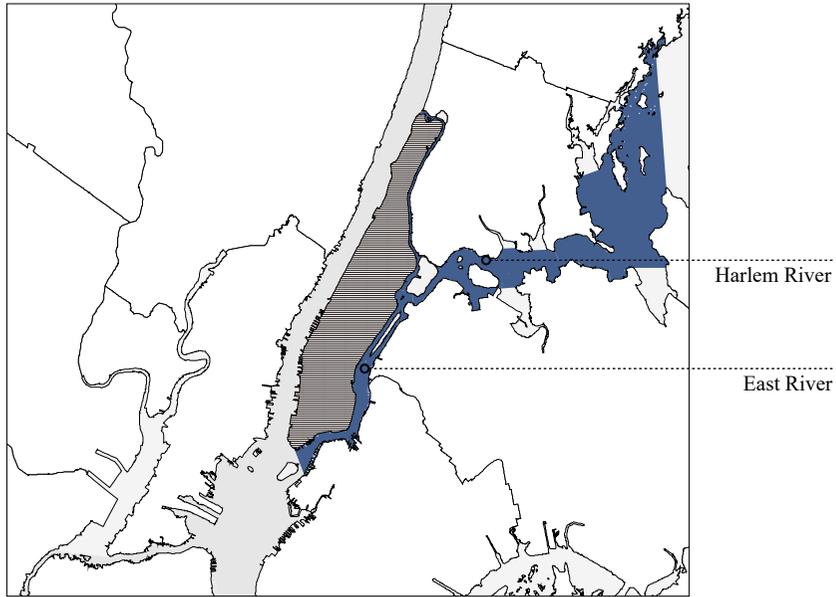
Location: Manhattan, Midtown, New York
Academic | Graduation project
AR3CP010 | Oct. 2019-Jul. 2020

The study site, NE-Midtown, is an extremely dense area fully occupied by the mixed commercial and residential buildings. It's tightly linked to the East River, which is one of the most important natural assets in the region. Over decades of development, the city has expanded radically and is projected to grow significantly. The process leads to the unpleasant fact that the natural waterway is badly polluted by the increasing swage discharge. The water pollution crisis has caused serious consequences, like the destruction of ecosystems, risks of human health and water culture detachment, finally, put threats on economic development. Factors, such as the aging sewer system, temperature rising and population growth, are mainly responsible for the noticeable crisis. These can only intensify the decline of water quality. The area is in desperate need of restoration in this term.

The project seeks to establish a new connection between the traditional wastewater purification infrastructure and public space, to allow a scheme that will not only eliminate the regional water pollution issue but allow a direct interaction between the people and their water resources. By adjusting the way that we experience space we have the potential to greatly increase awareness of the environmental impact, ultimately, as a response, we can begin to make the necessary adjustments to our society, and to the way that we live, in order to mitigate disaster.



The chosen site is a perfect location to merge land, water and neighborhoods.

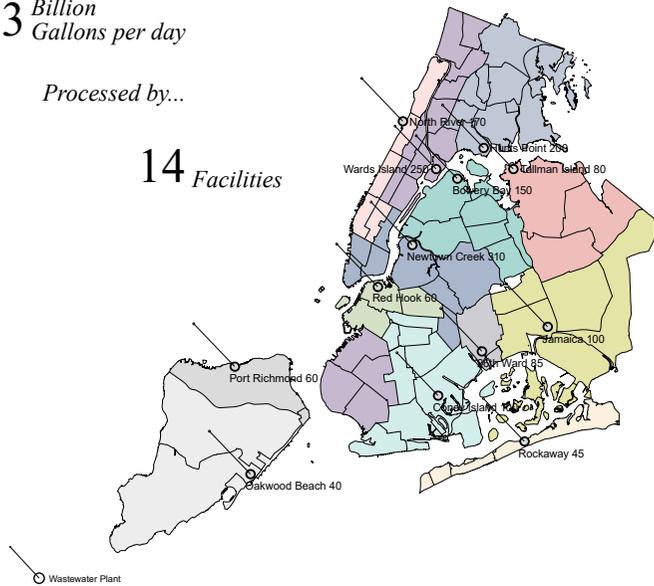


East River and Harlem River are listed as impaired for the pollutants

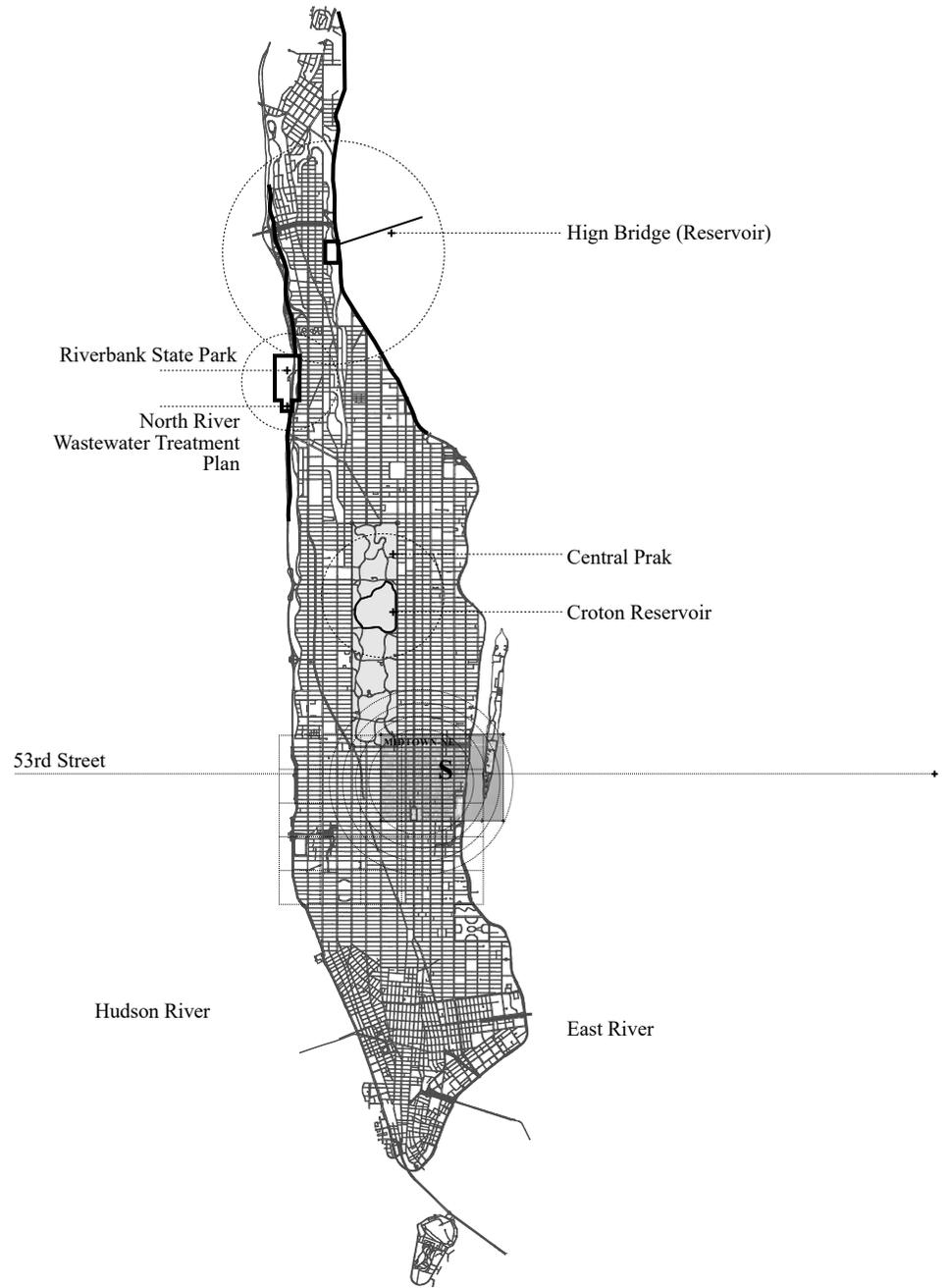
1.3 Billion Gallons per day

Processed by...

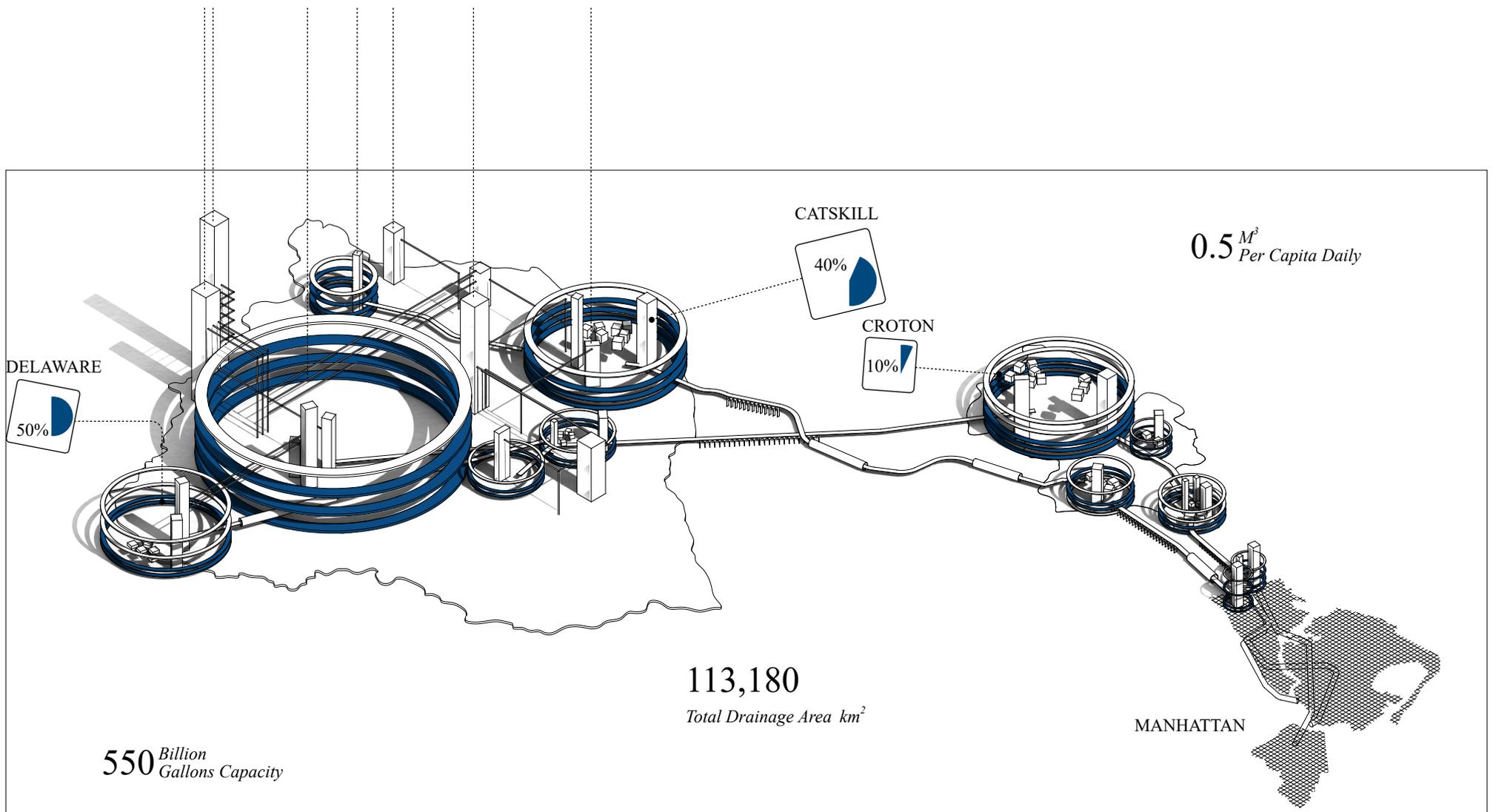
14 Facilities



The city relies on its 14 sewage treatment plants to clean its waste water. It costs much to maintain and update the facilities every year.

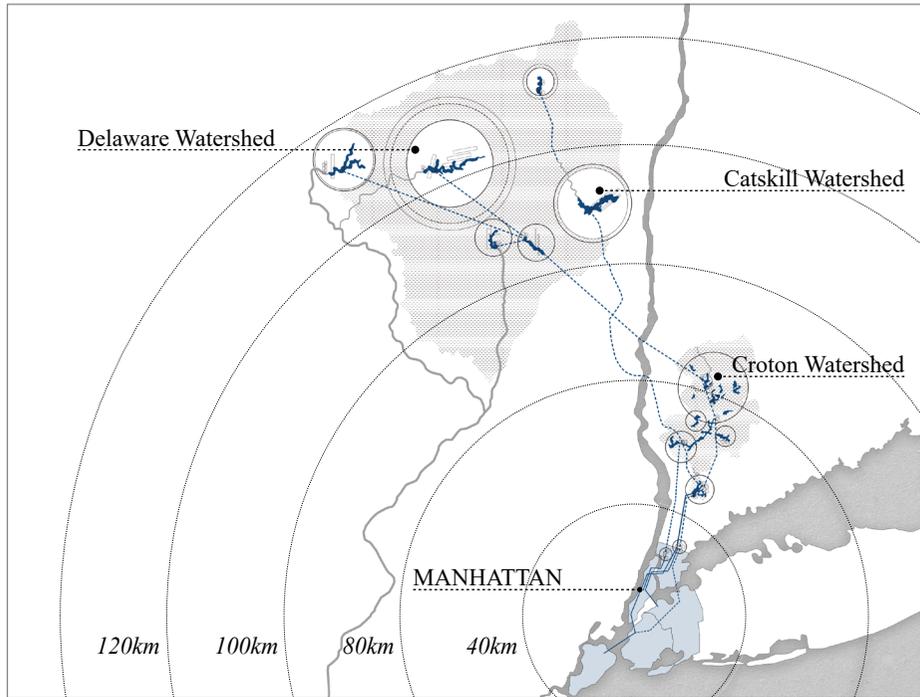


Infrastructures control and power the inhabitation of the Border Territory. The new project will reconnect public, waterways and infrastructure.

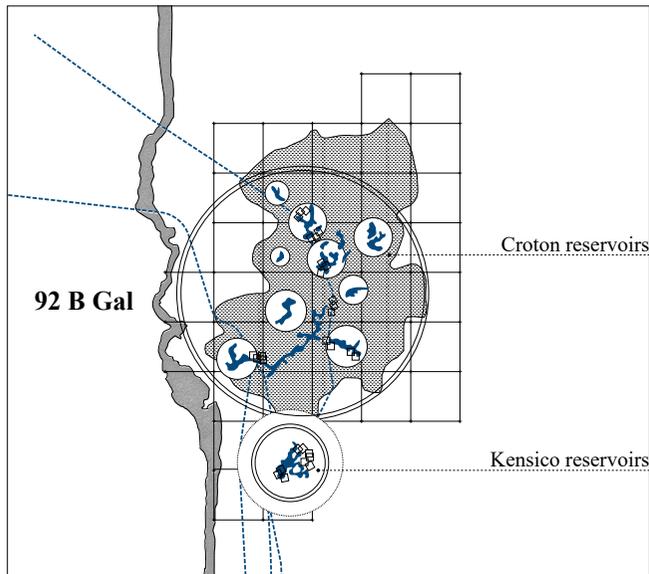


NYC WATER SUPPLY

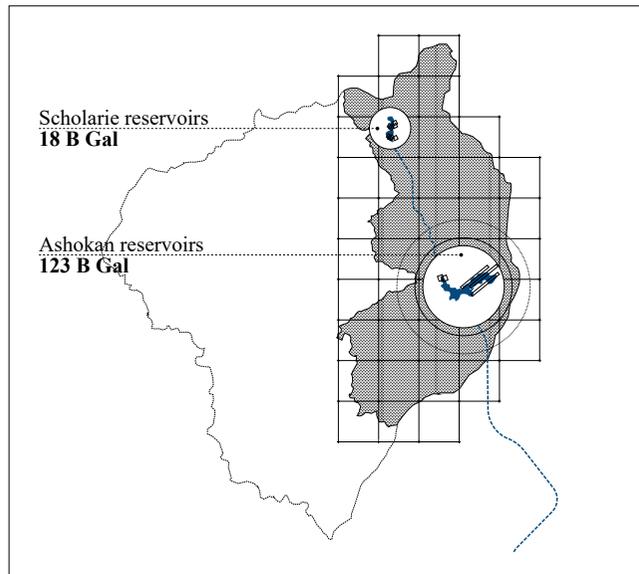
A transcription of physical parameters which define the network, highlighting it's spatial consumption and how it sits as an abstraction to the urban realm.



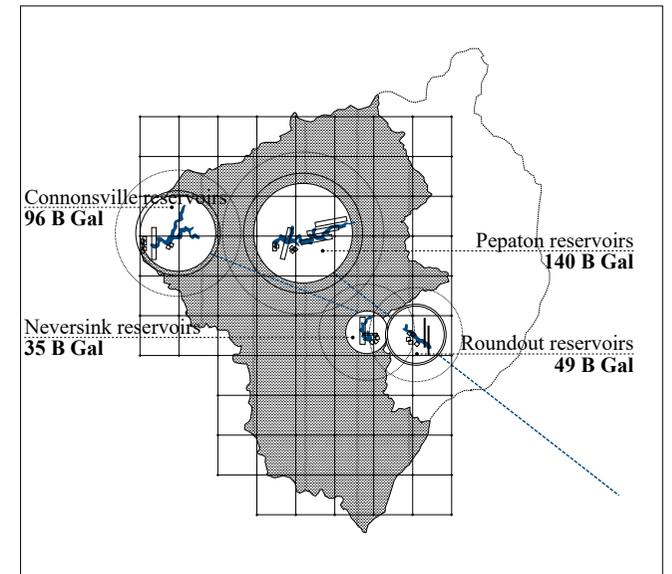
To serve its rapidly growing population, the city shifted the local water source to a network of watersheds many miles boundary. The network relies almost entirely on watersheds within the state's national parks.



1890 Croton watershed

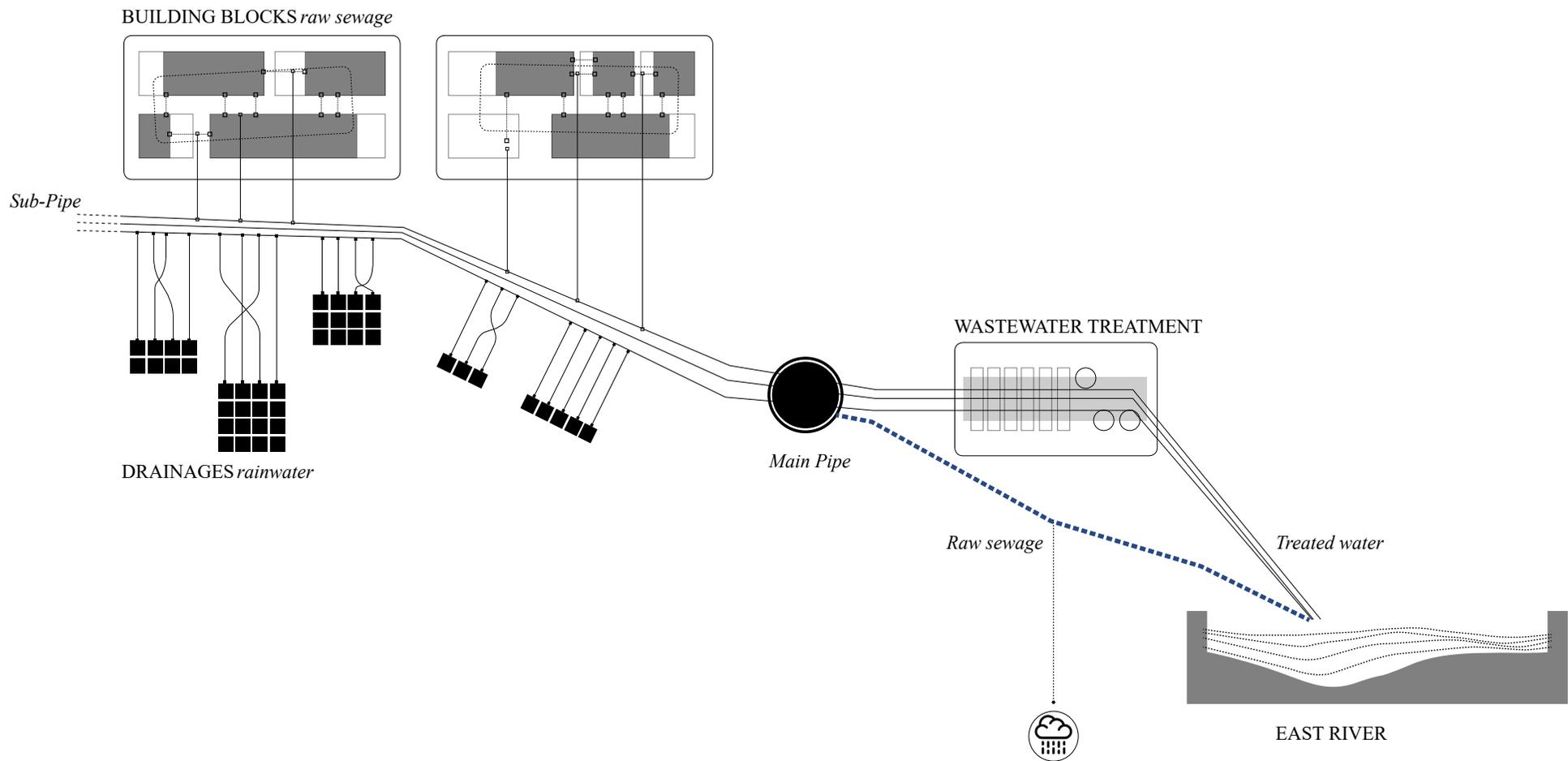


1916 Catskill watershed



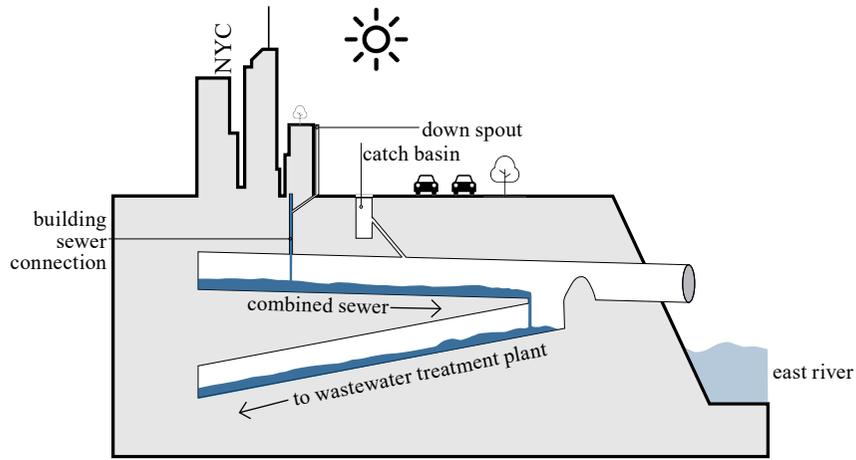
1945 Delaware watershed

---- aqueduct ■ reservoir



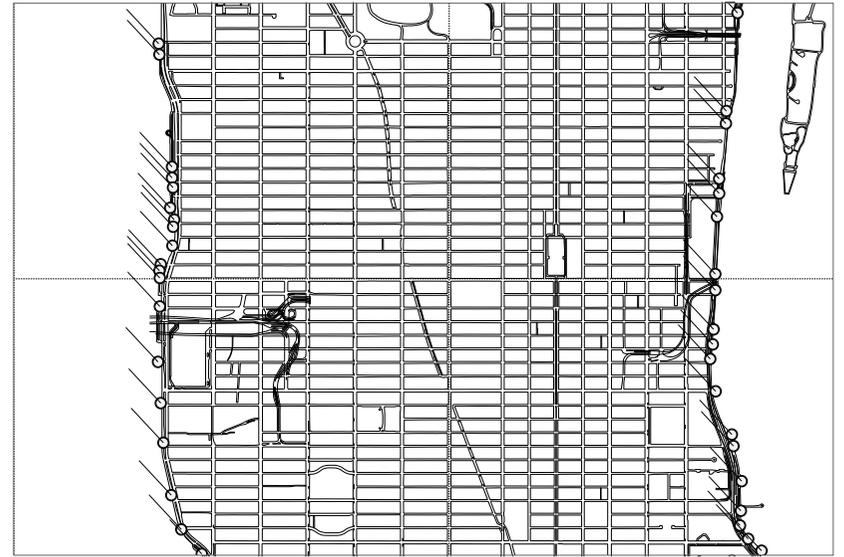
NYC SEWAGE COLLECTION NETWORK

On average CSO (Combined Sewer Overflow) events occur about once per week and the average weekly polluted discharge is about 19000 m³ Citywide.



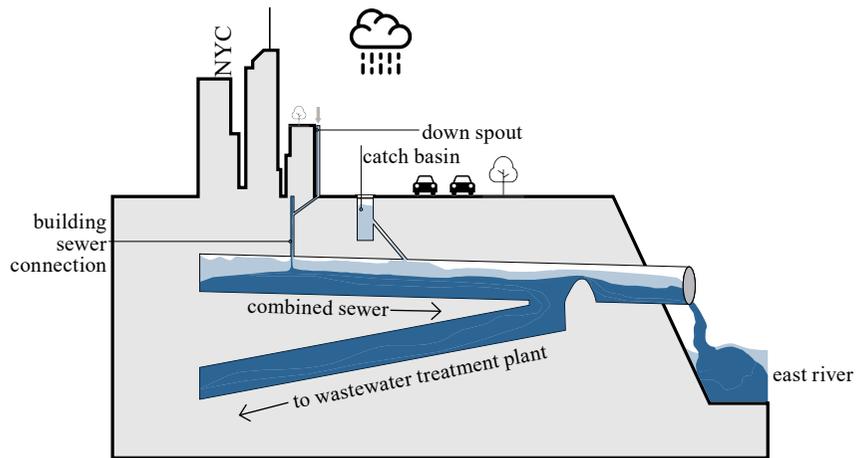
Combined Sewer System- Dry Weather

During dry weather, the combined system poses no problems: the treatment plants handle the waste from the sanitary sewers.



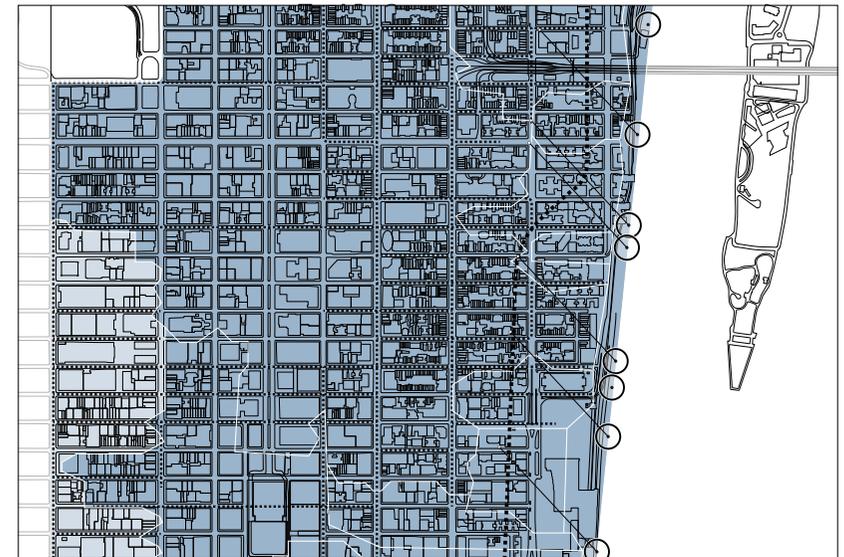
Outfalls Distribution (Midtown)

There are around 40 outfalls around the Midtown, 8 of them in the shoreline of NE-midtown,



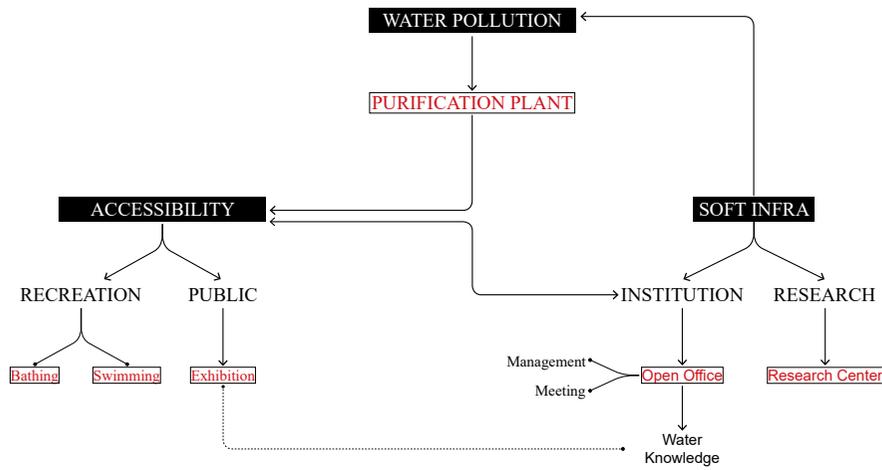
Combined Sewer System- Wet Weather

During wet weather, rain results in the run-off exceeding the capacity, the system risks. Wastewater and stormwater will be discharged to the east river directly.



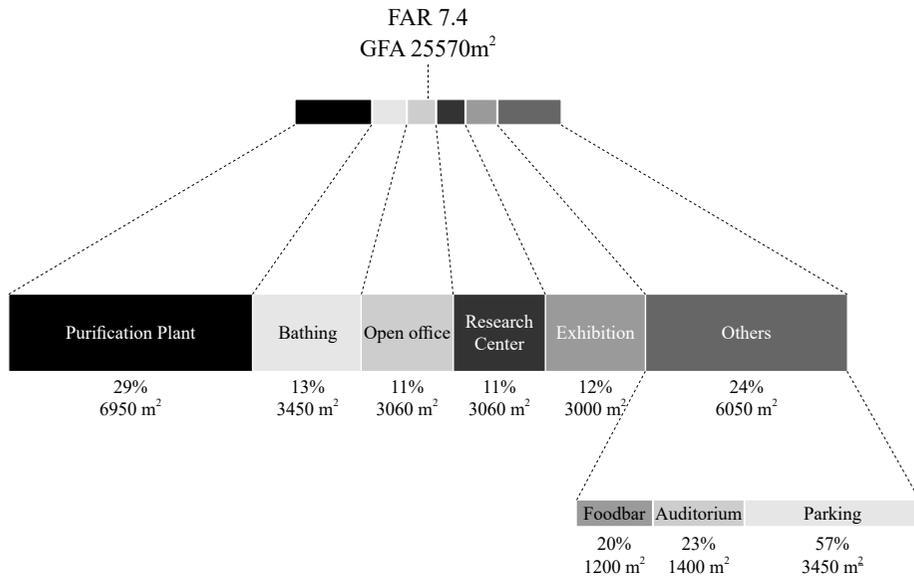
Outfalls Distribution (Midtown-NE)

The mixture of raw sewage and stormwater runoff is diverted to the nearest water body through outfalls.



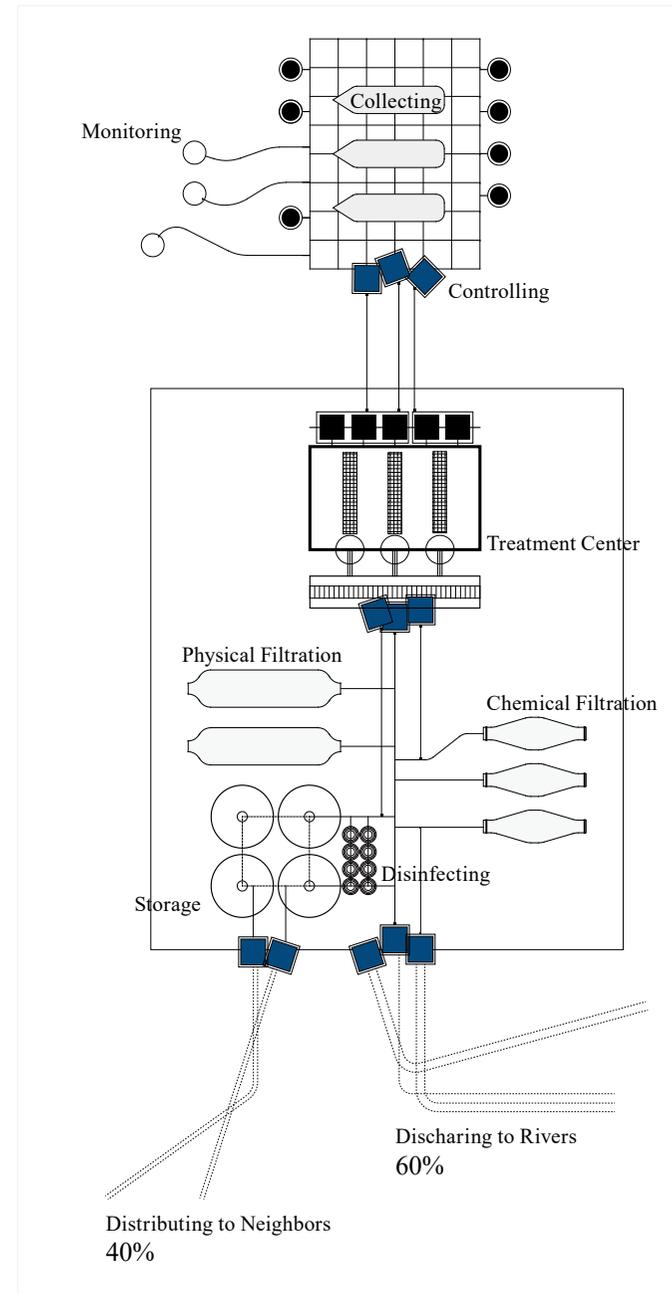
Programmatic Compositions

The type of the new project defined as Public Infrastructure. It is comprised of three main functional requirements. *Wastewater purification infrastructure, Bathing facilities, and Soft Institutions.*



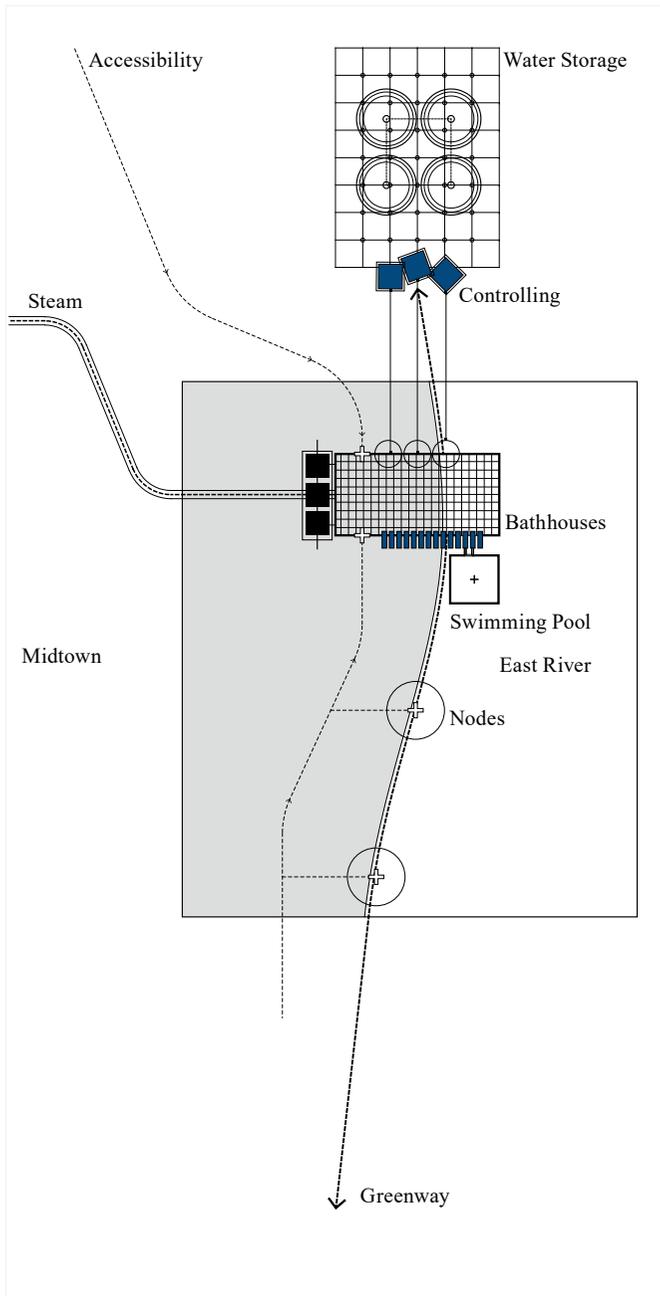
Program Bar

The floorareas of the purification plant defines the square meters of the other accessorial functions.



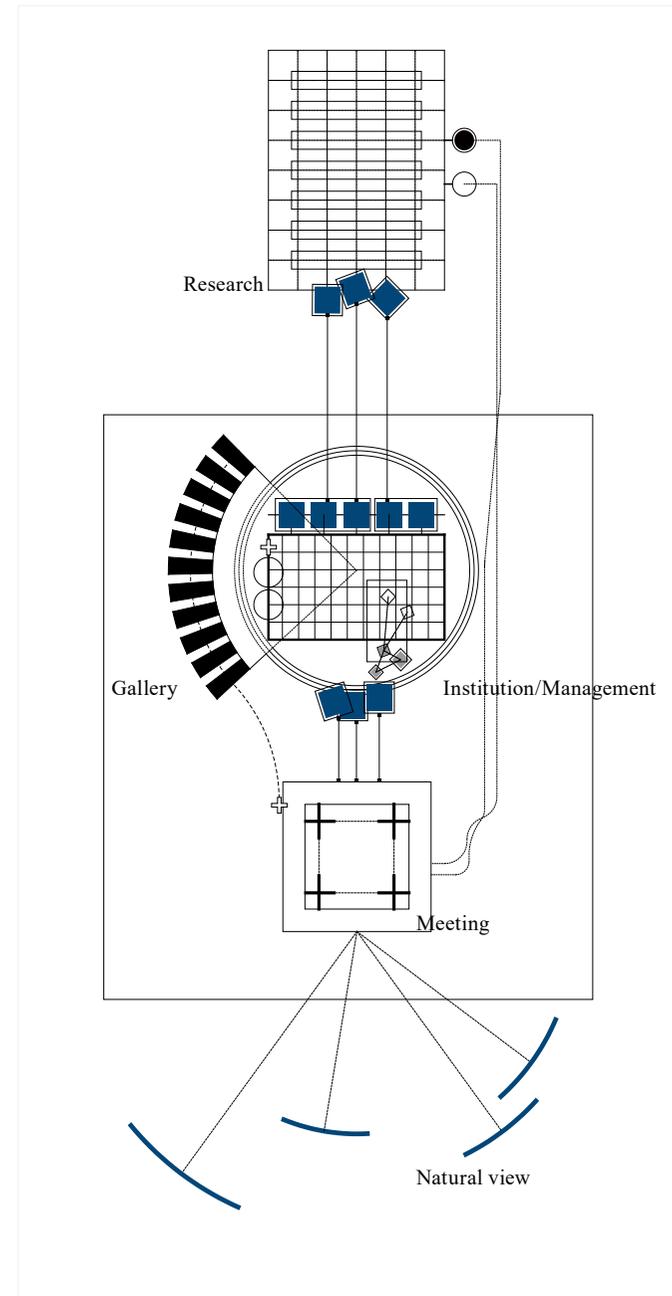
Wastewater Infrastructure

The wastewater infrastructure will retreat the sewage, which then be discharged to the river afterwards.



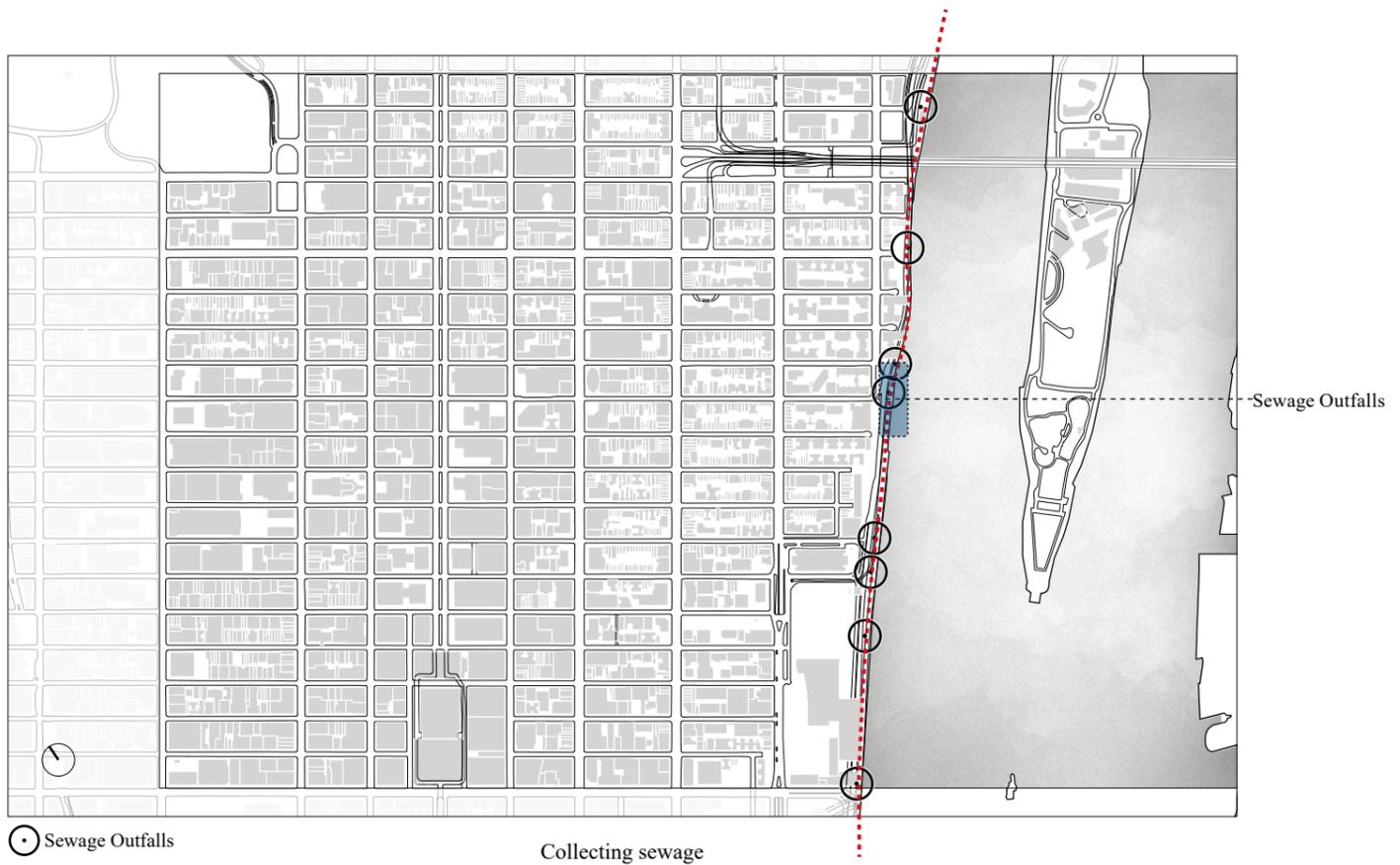
Public Space

By adding public appeals like bathing facilities to make the municiple building more attractive, meanwhile, the accessibility to the river is increased.

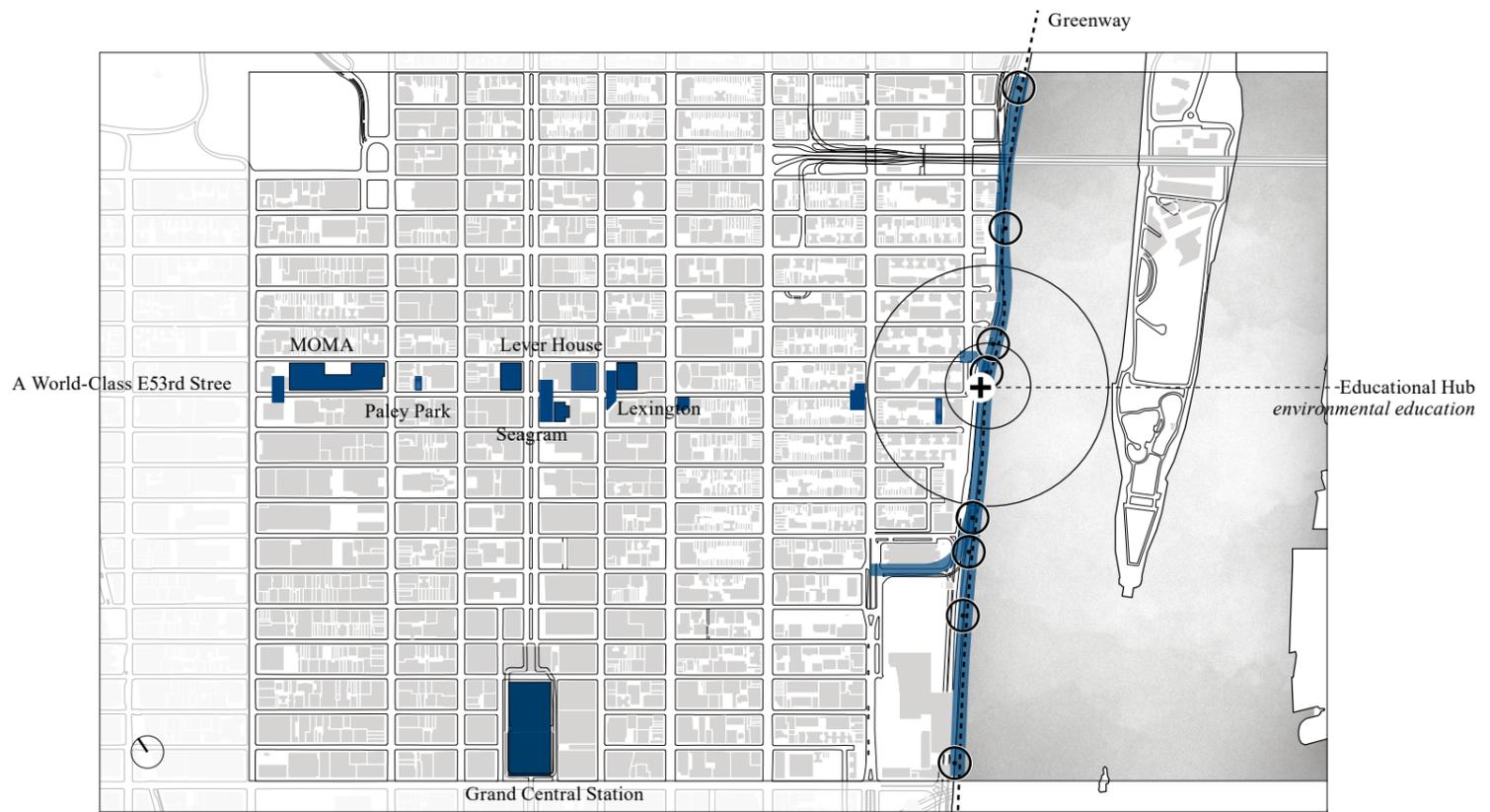


Soft Infrastructure

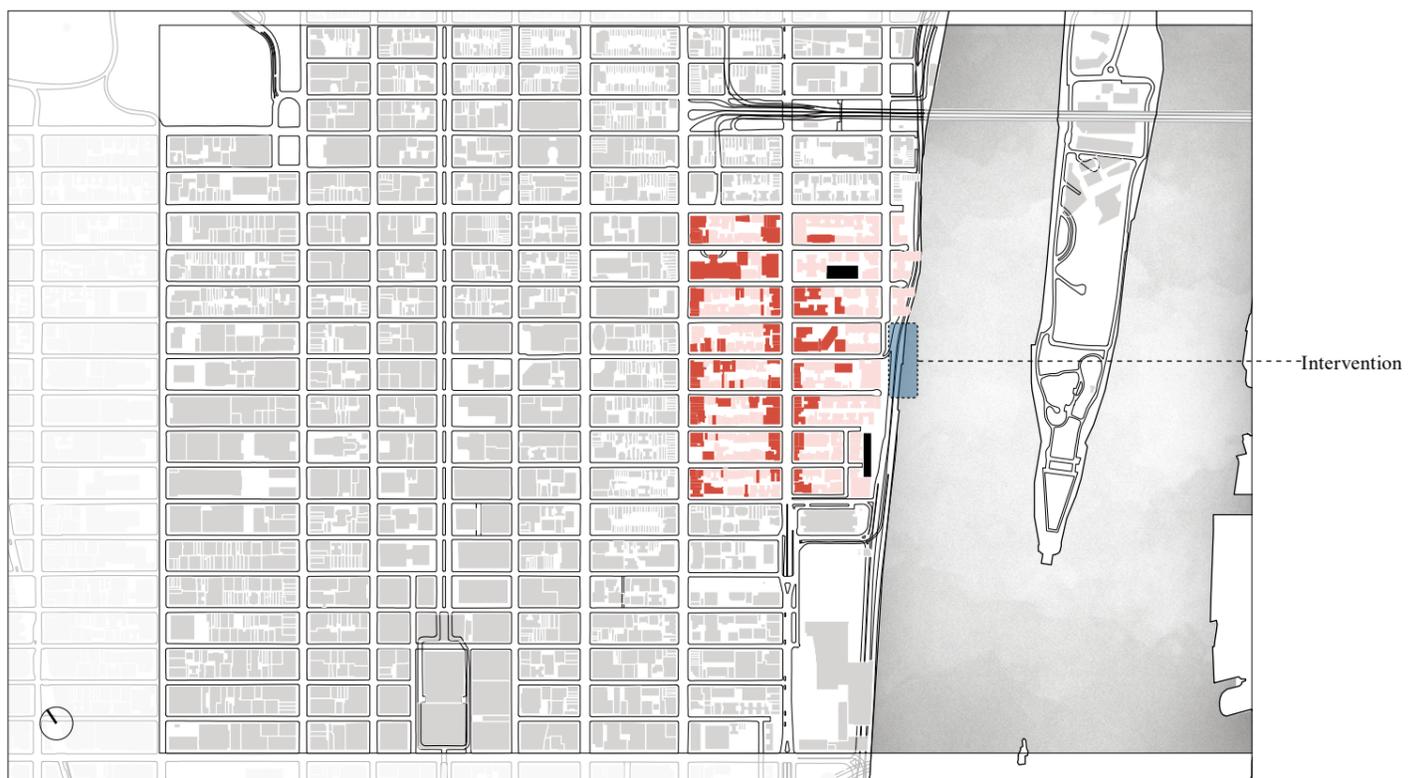
The sofe infrastructure is responsible for conducting research, communicating with community and provideing environmental education.



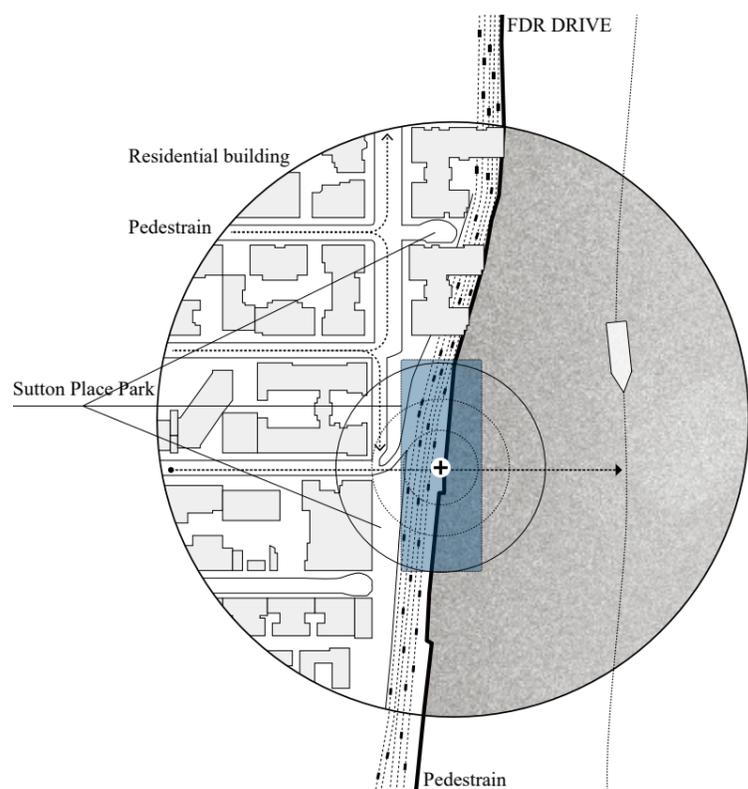
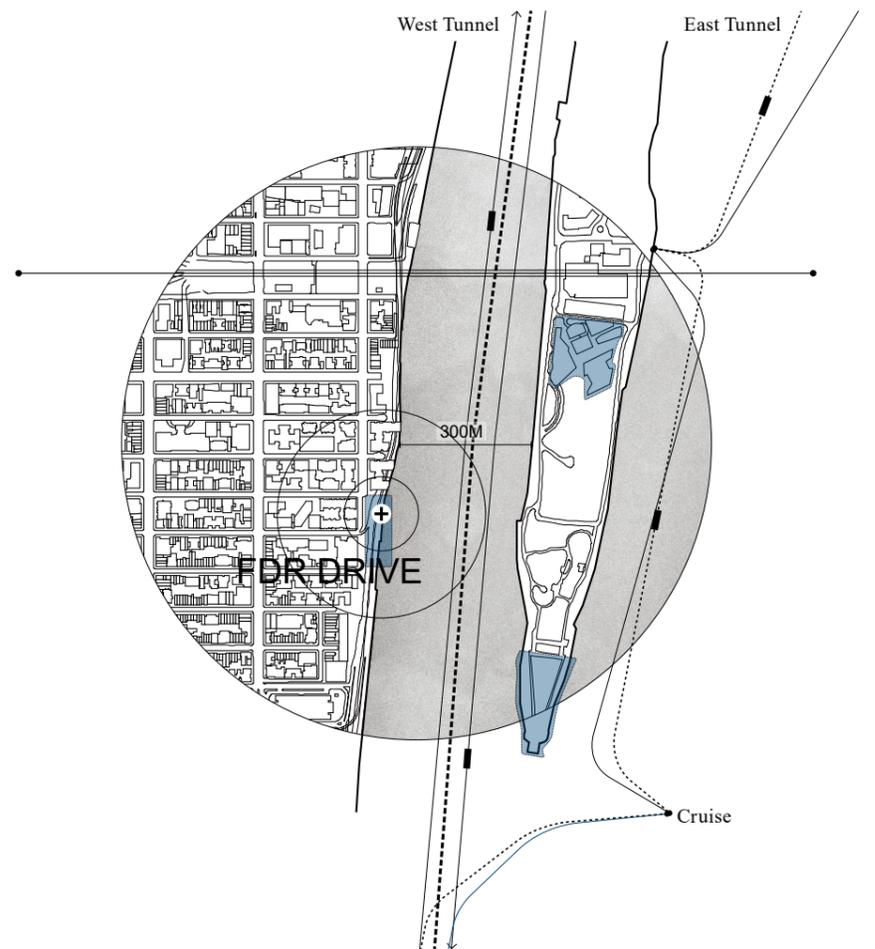
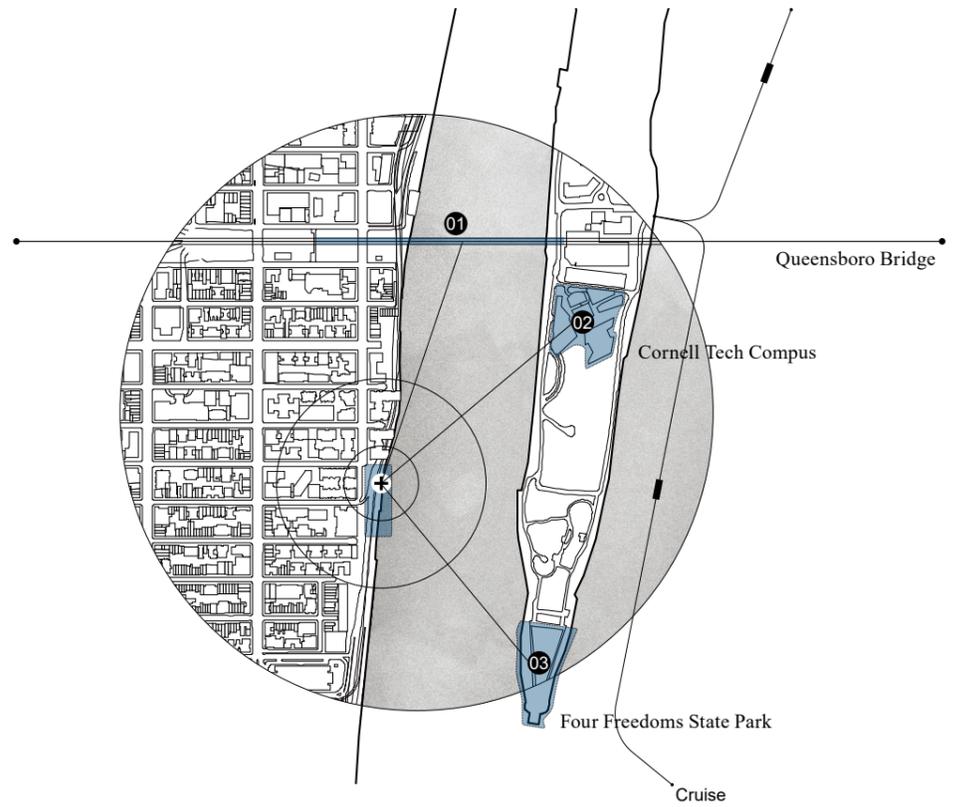
An efficient location to collect the swage discharged from the outfalls



It's located on the intersection of the greenway and the 53rd street, connecting the valley of Giant to the East River.



The new intervention will support the neighborhood by distributing the recycling water and cleaning the domestic sewage.



Supporting Neighborhood

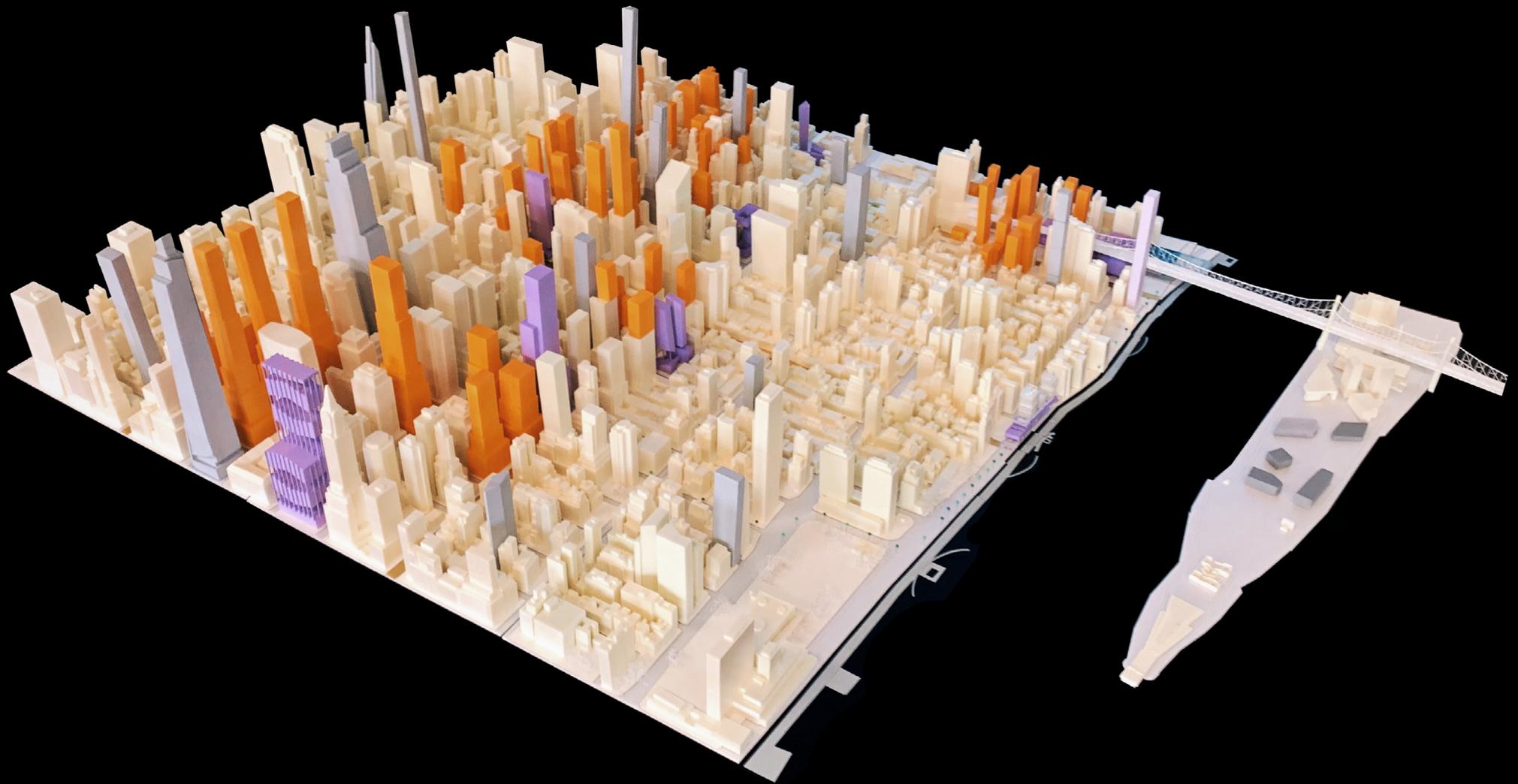
Firstly, the proposed site is very eye-catching. It establishes visual links with Roosevelt Island Park, Cornell Tech Campus, and Queensboro Bridge. Secondly, about the cruise condition on East River, the main industrial transportation is concentrated in the East Tunnel, while the West Tunnel only has one cruise route that transports passengers between 34th and 90th street.

Despite the advantages the proposed site holds, FDR Drive becomes one big constraint on the site. The continuous expressway creates a physical barrier between the area and the East River and brings the noise to the surrounding environment. Solving obstacle restriction and site noise issues will challenge the architecture design.

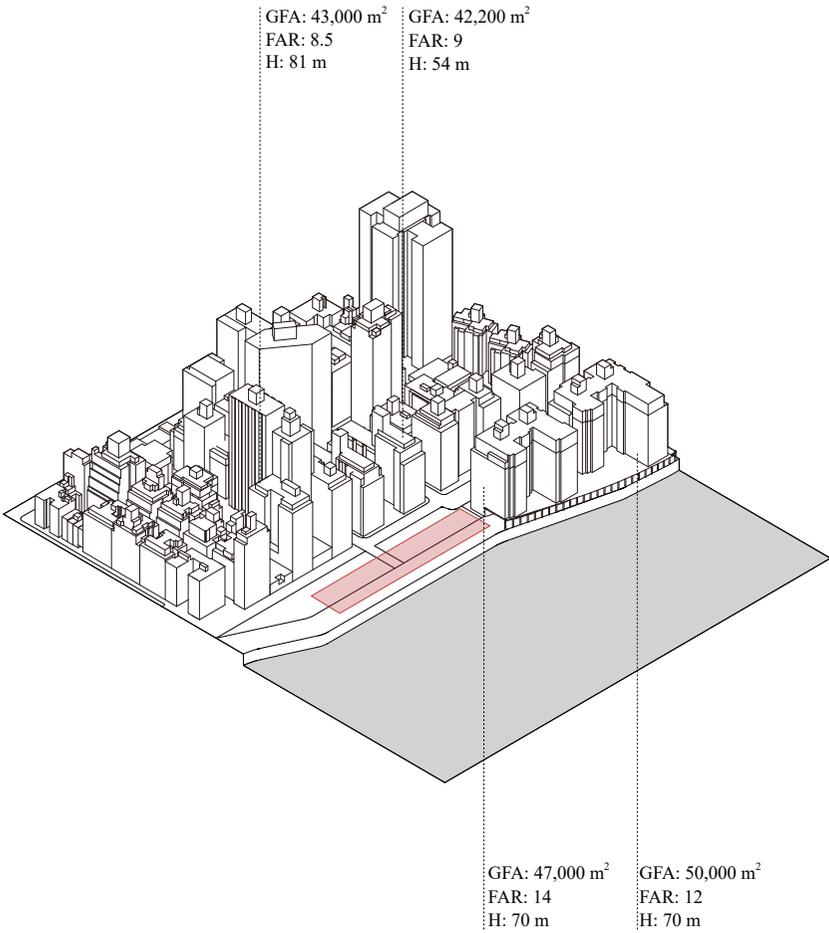


Projects
 Landmarks
 Axes

Individual Interventions
1:10000

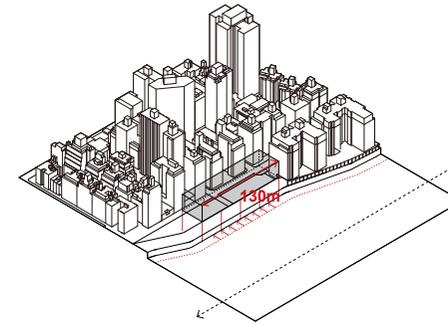


Group Site Model
1:10000

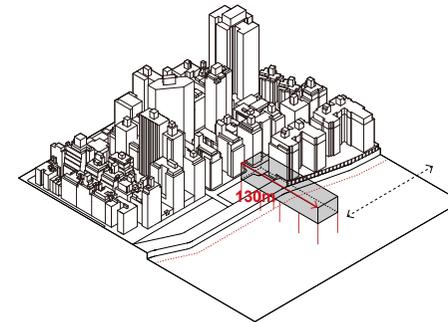


Data of the Context

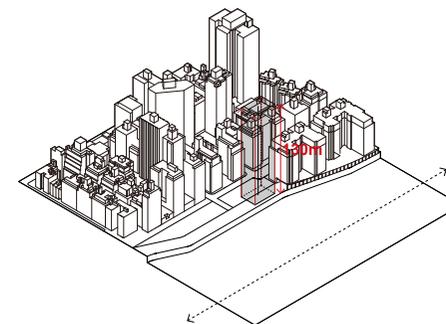
The analysis of the near by buildings allows the new project more reliable, while the coming building can fit in the context.



- Structural feasibility
- More production of purification
- Avoiding the conflict of the cruise route

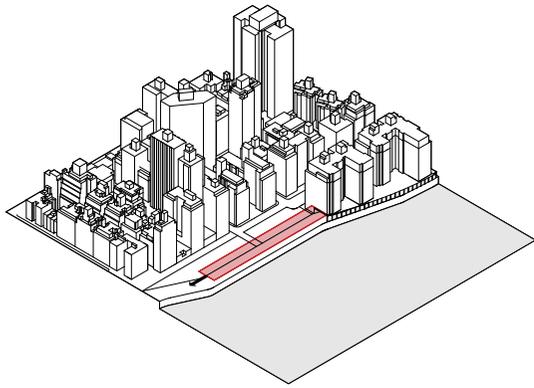


- Increasing flooding risks
- Influencing the cruise route

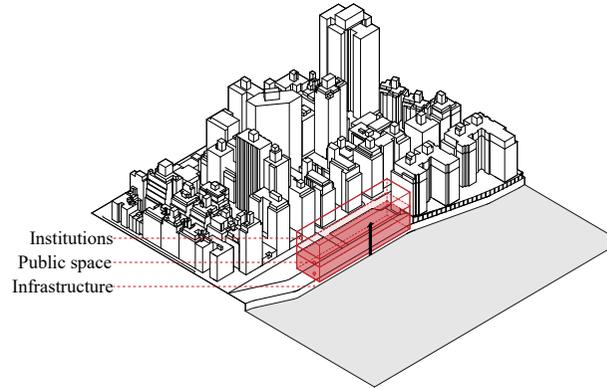


- The structural conflict with FDR Drive
- Less production of purification

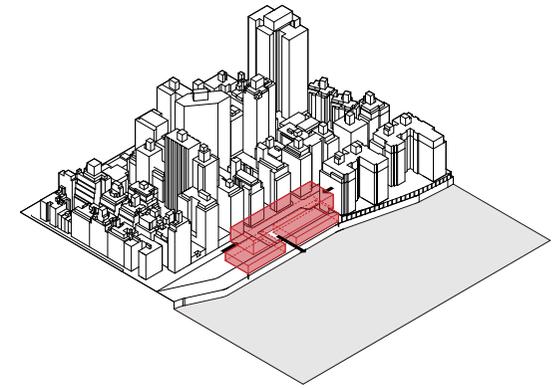
Building Orientation



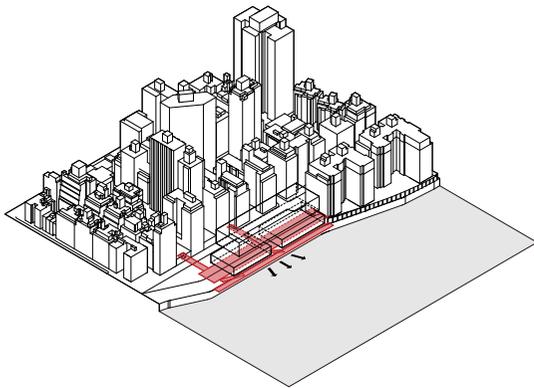
Expanding the platform



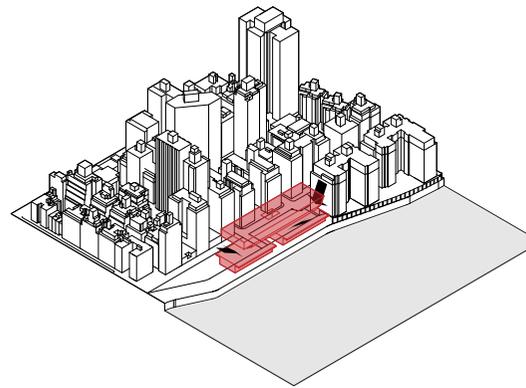
Orranging the programs



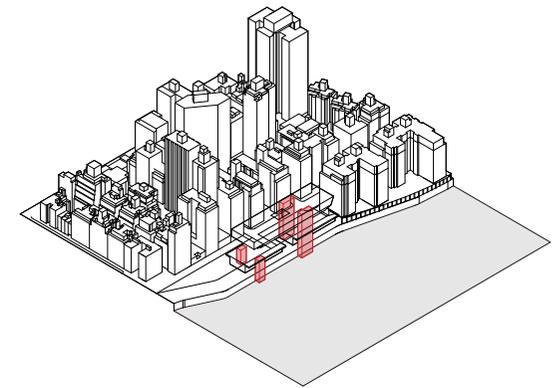
Enabling sight through



Urban implementation (horizontal connection)



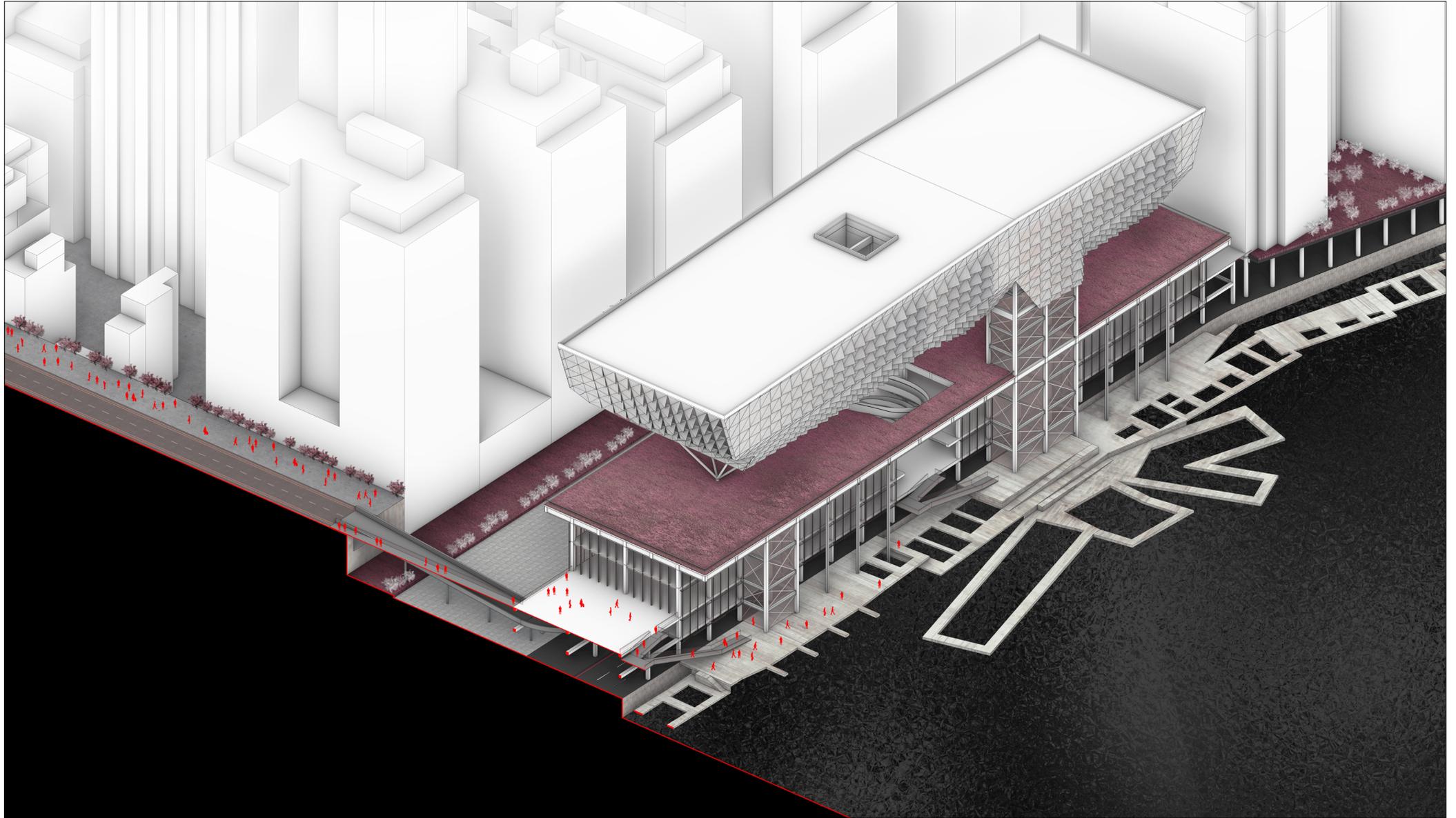
Climatic responses



Circulation (vertical connection)

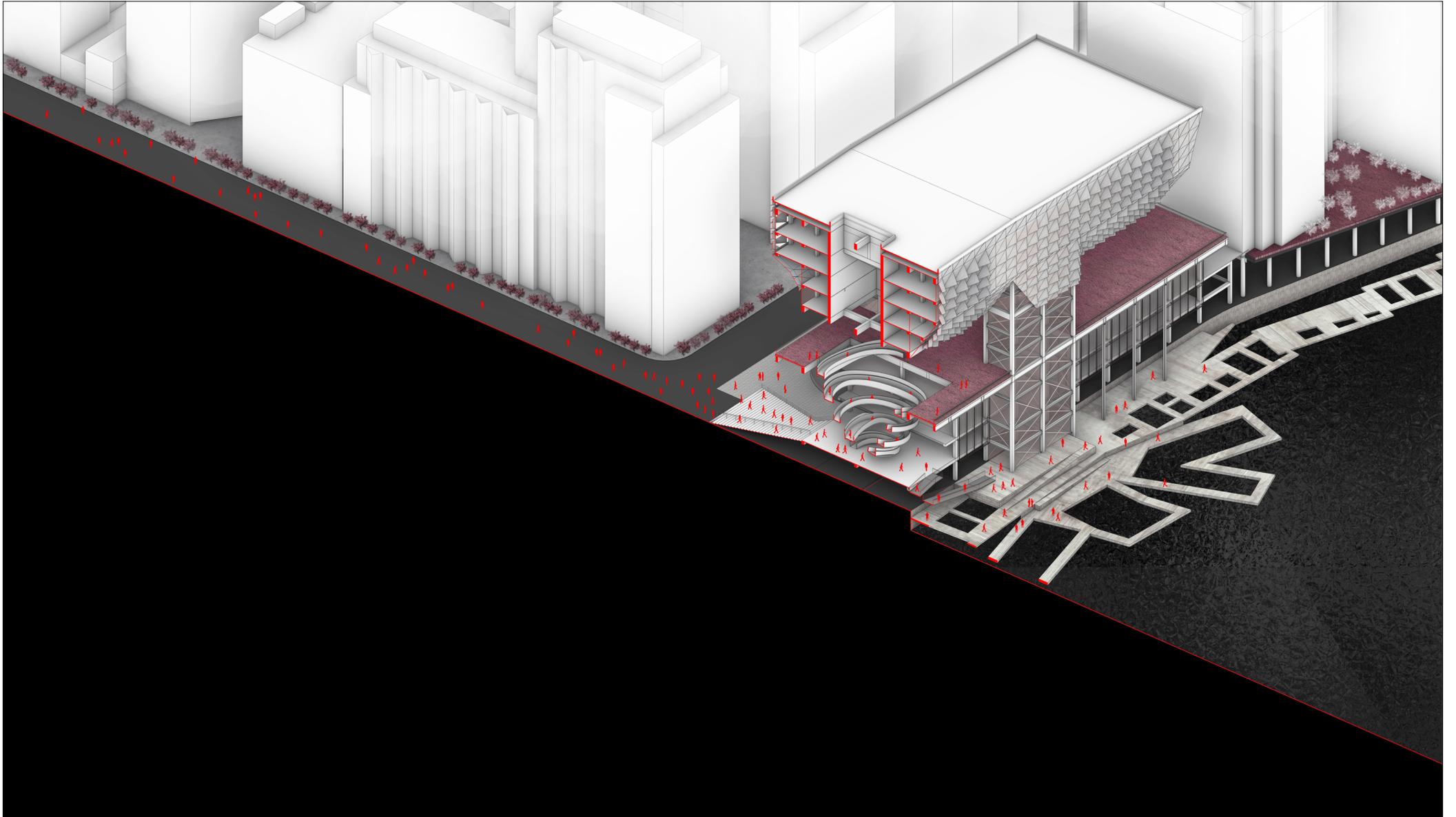
Formation Principles

The first step is to expand the existing platform alongside the FDR Drive to avoid the conflict of the expressway and reduce the noise pollution. Base on the built solid platform, the water infrastructure, public functions, and private institutions are vertically arranged and connected by the main steel core on the north side. As a result, the island and the River is relinked by the new water platform which closely brings people back to the water. Meanwhile, as the rising and recessing treatments, the new building allows the sight to go through in west-east direction with less obstruction and natural ventilation.



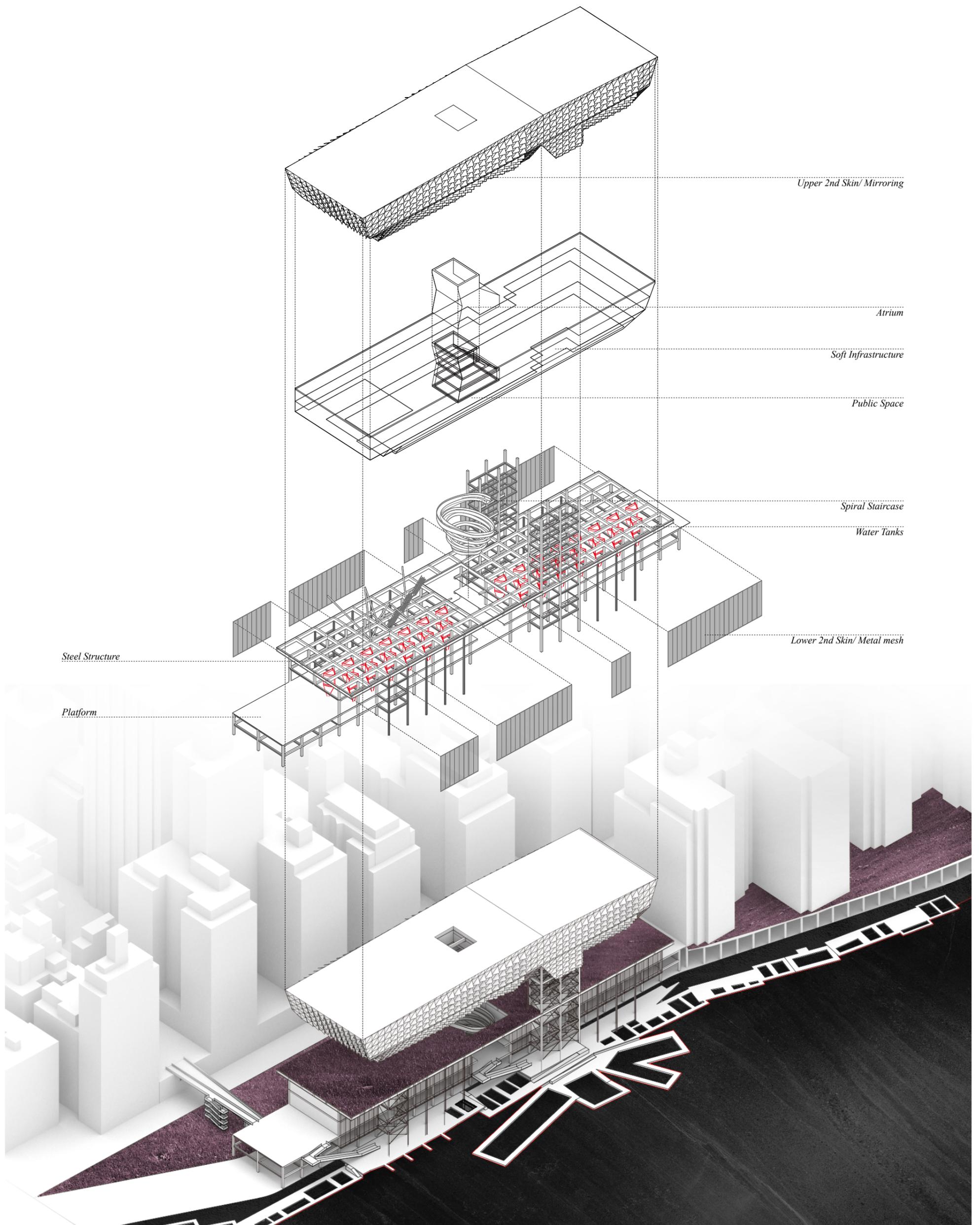
Connecting Island & River (52nd Str)

The building links the island and the East River by the 52nd street on 10m level



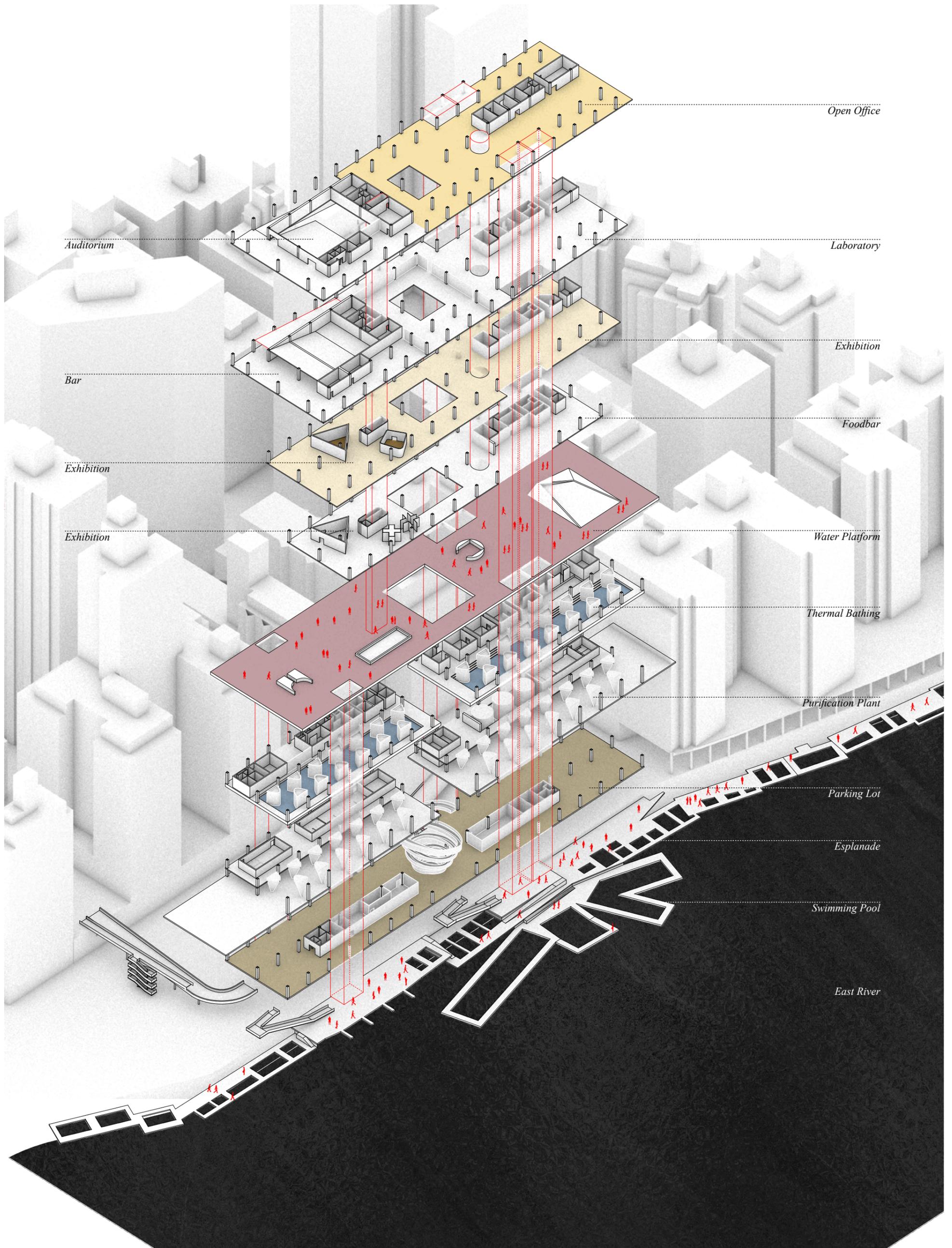
Connecting Island & River (53rd Str)

The building links the island and the East River by the 53rd street on ground level



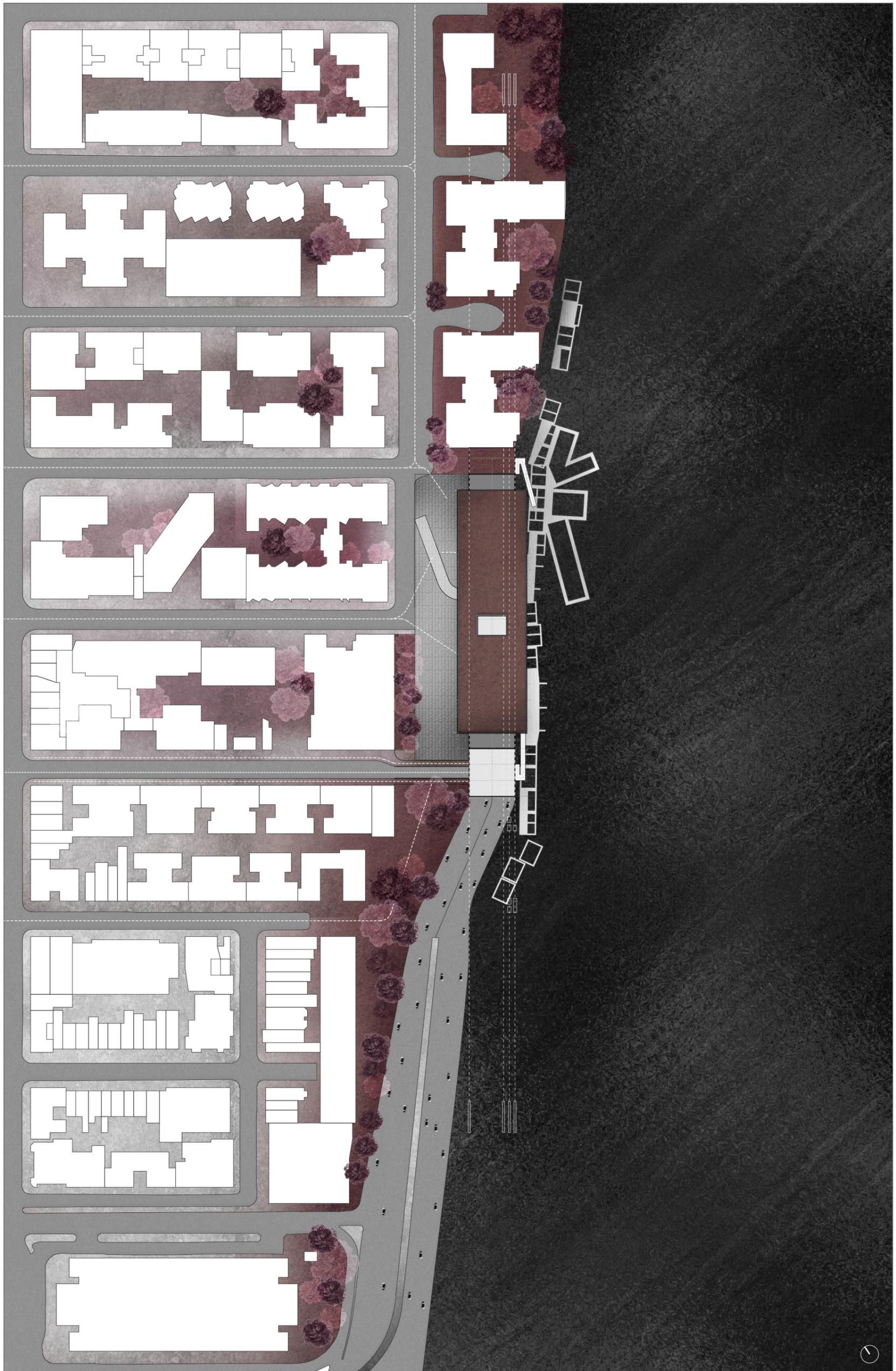
Axonometric Drawing

The building consists of two parts: the lower volume for the water infrastructure and the upper volume for the public functions and soft infrastructure.



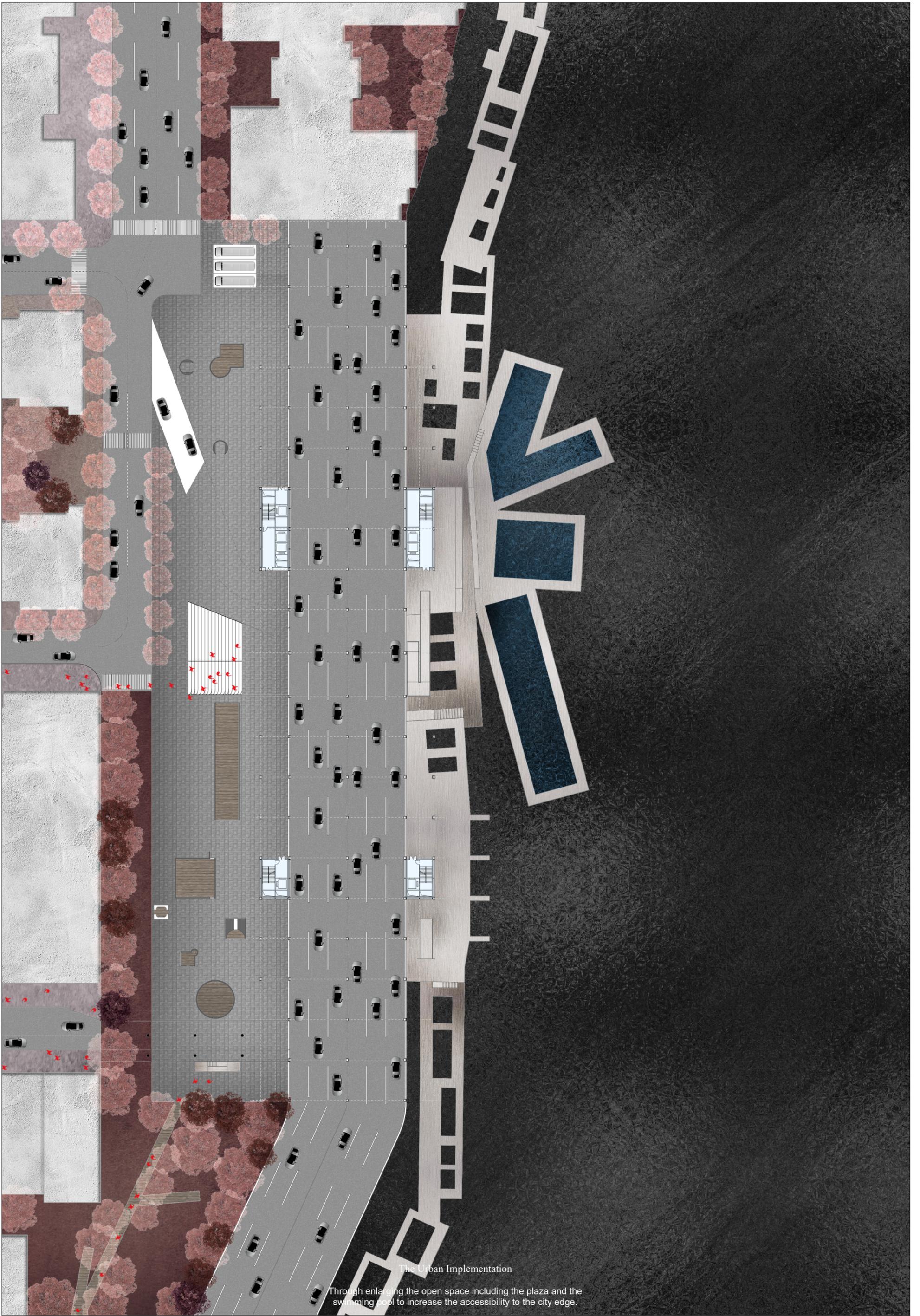
Axonometric Drawing

The lower level consists of infrastructural facilities: the water purification plant and the parking lot. The intermediate level is composed of the public space: the bathing facility, the water Pplatform, the restaurant and the exhibition. The open office, the research center and the auditorium are organized on the top level.



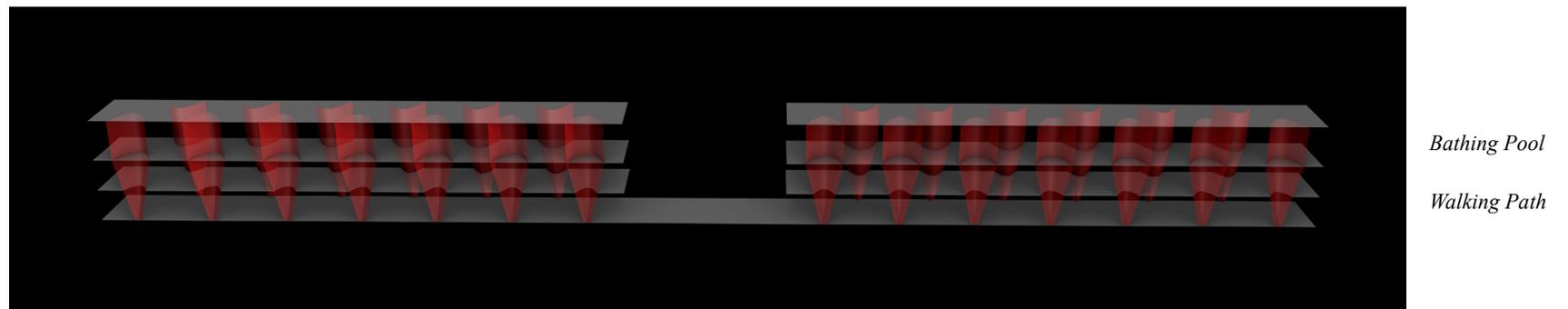
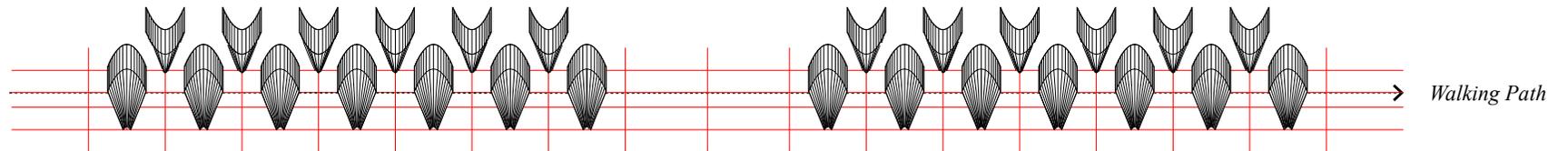
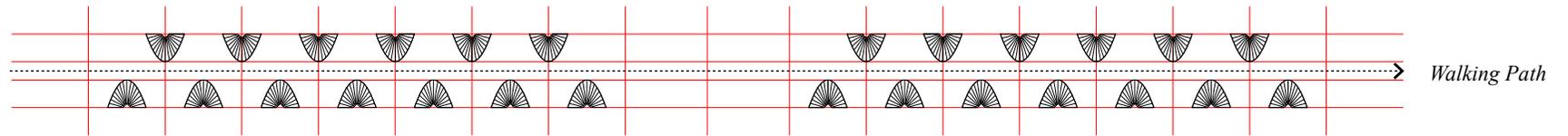
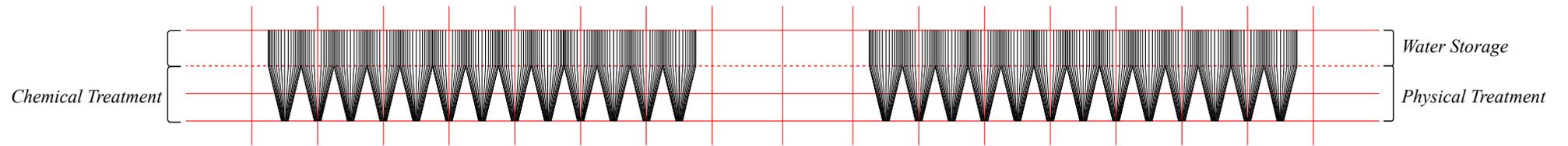
The Site Plan

The new project will help to support the community by purifying the domestic sewage and stormwater, as well as cleaning the polluted river water.

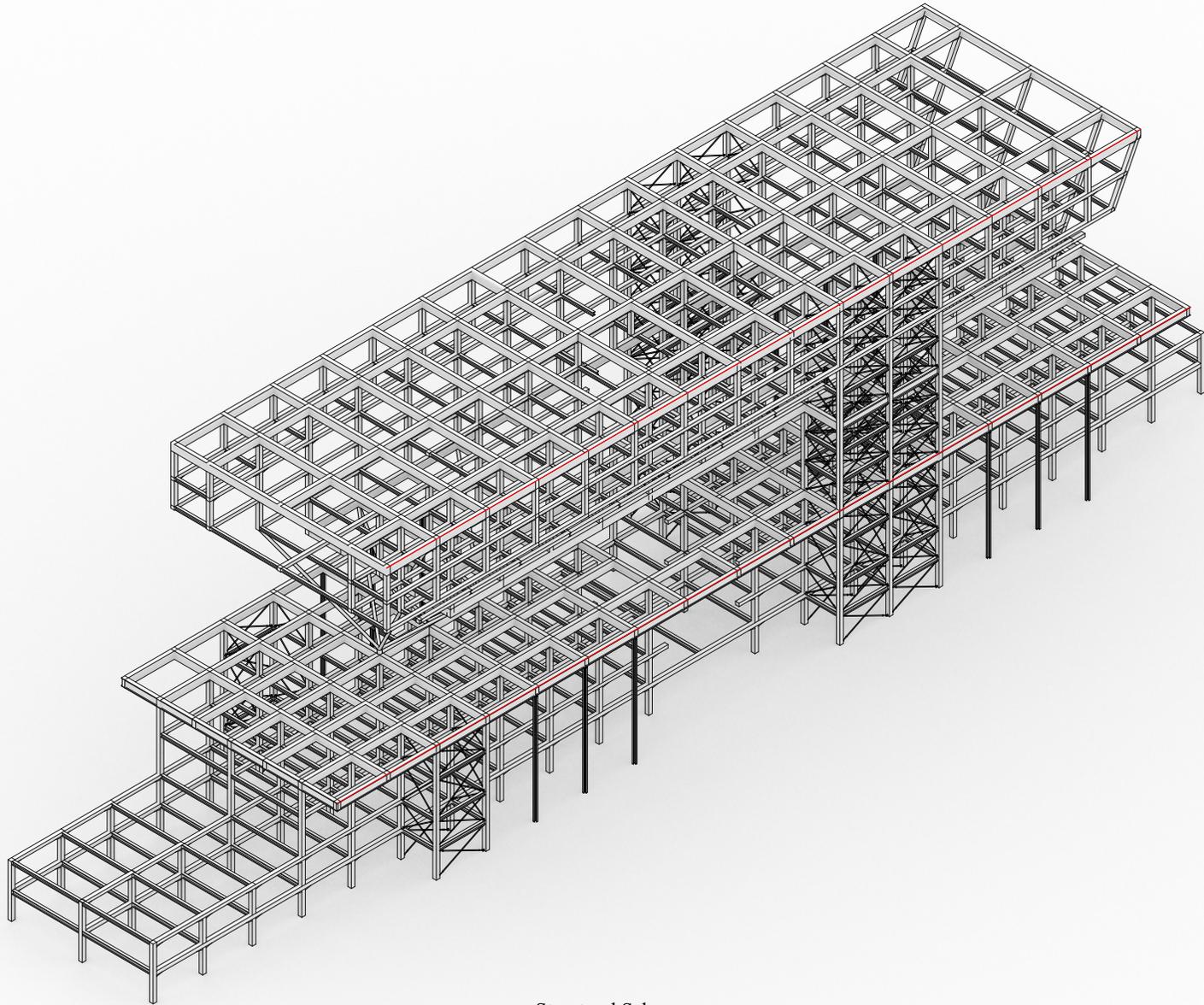


The Urban Implementation

Through enlarging the open space including the plaza and the swimming pool to increase the accessibility to the city edge.



Water Tanks



Structural Scheme

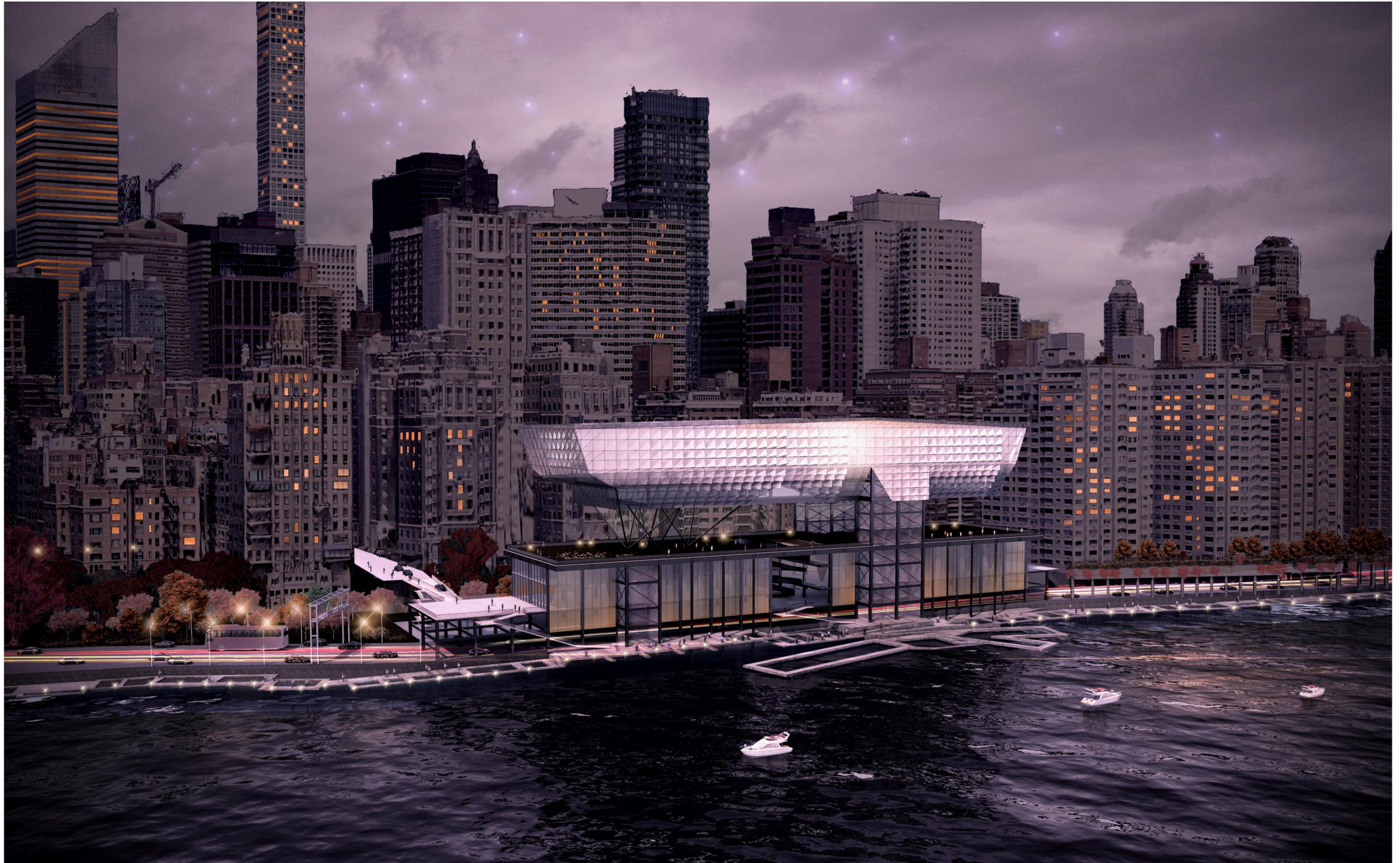
The ensemble is made of Vierendeel Trusses. It has a main core for circulation purposes, while some expressively sloping steel columns standing on the left side assists to make the structure strong.



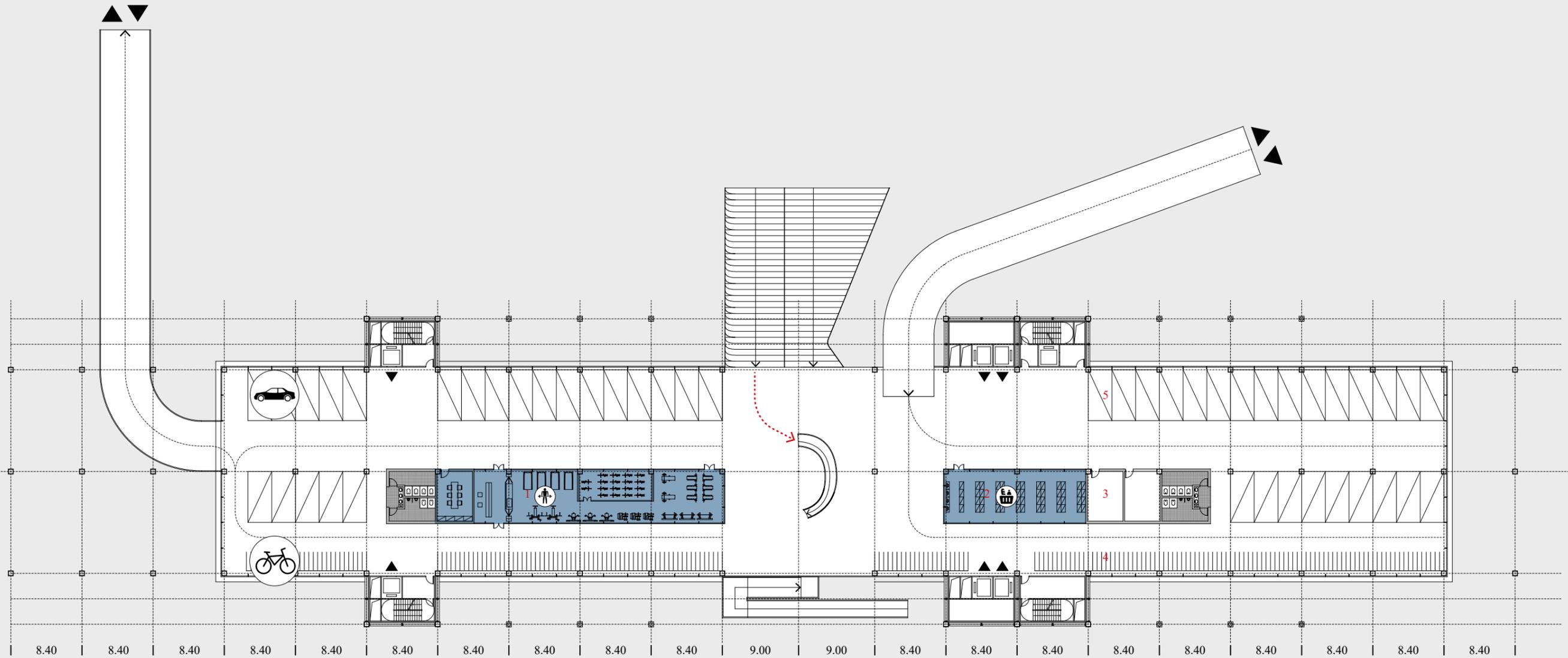
The Swimming Pool



The Bathing Pool



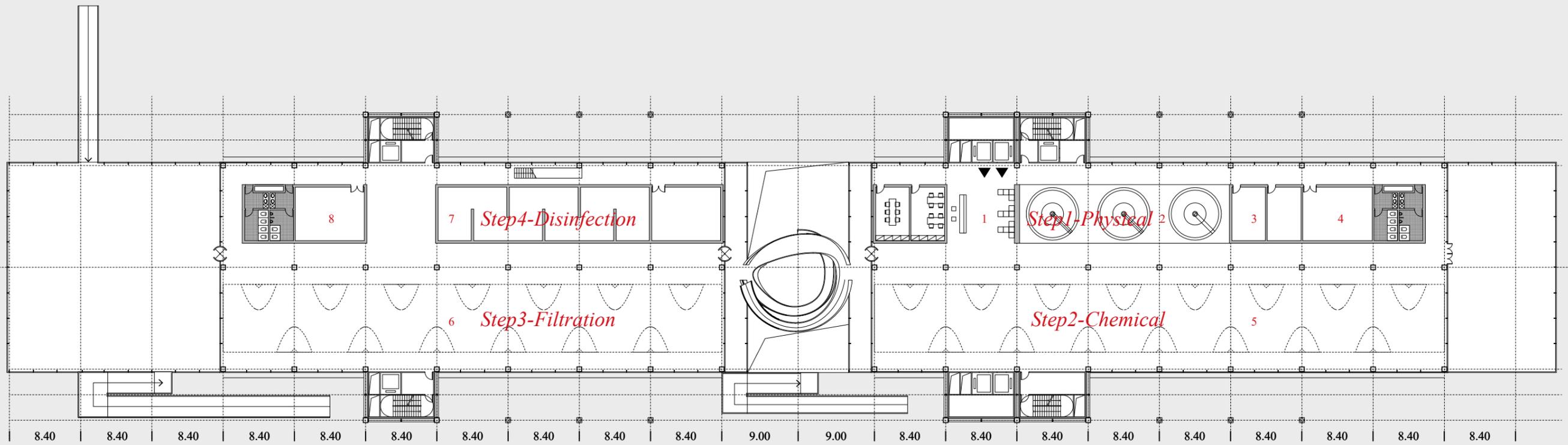
The Night View



Parking Floor Plan 5.5 m Level 

0 5 10

- 1. Gym
- 2. Grocery
- 3. Storage
- 4. Bike Parking
- 5. Car Parking
- ▲ Access

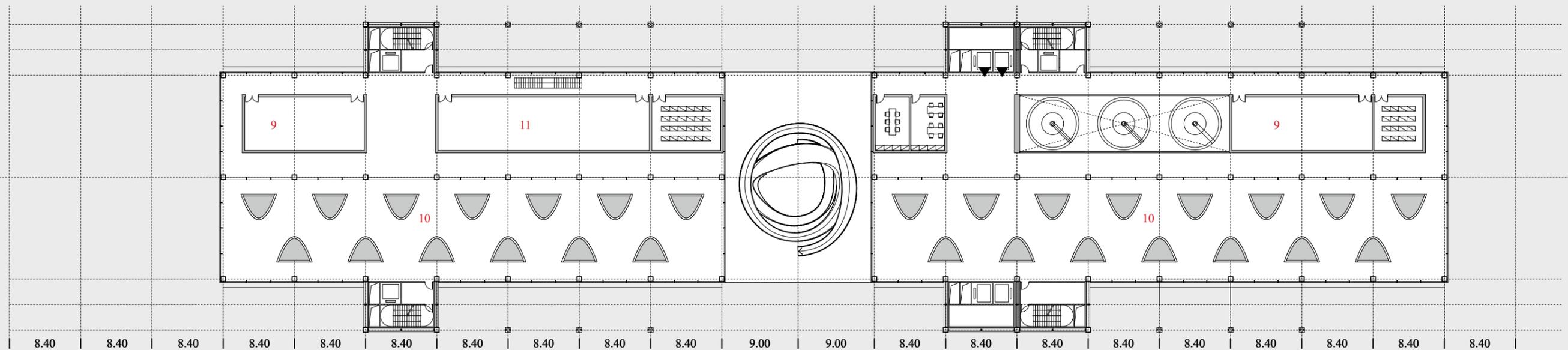


Wastewater Plant 10m Level



0 5 10

- 1. Lobby
- 2. Physical Treatment
- 3. Sand & Oil Storage
- 4. Sand & Oil Treatment
- 5. Chemical Treatment
- 6. Filtration
- 7. Disinfection
- 8. Ultra violet Treatment

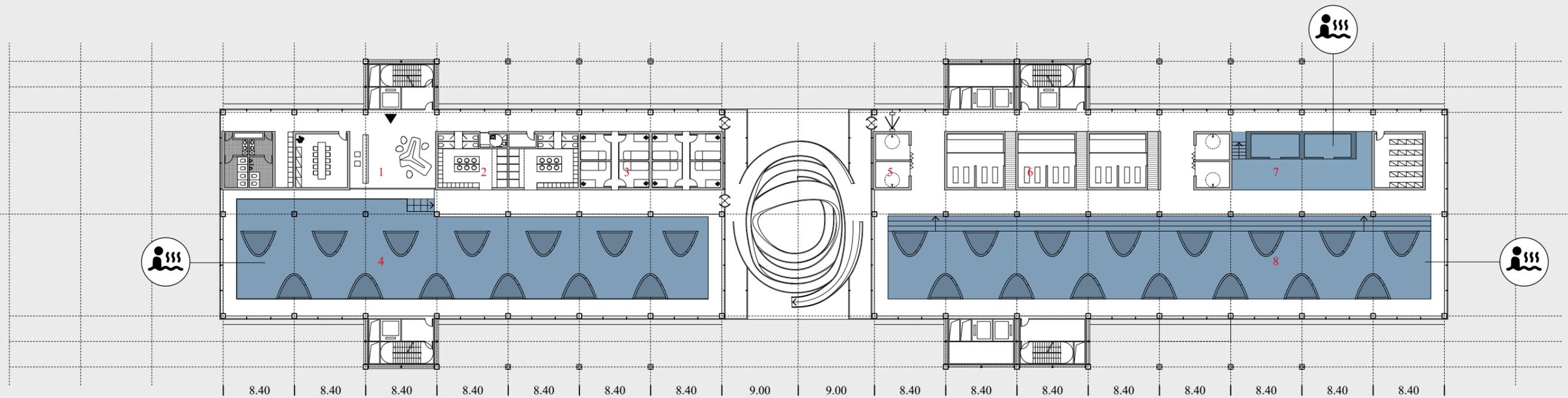


Wastewater Plant 13m Level



0 5 10

- 9. Electrical Room
- 10. Walking Path
- 11. Finished Water Pumps

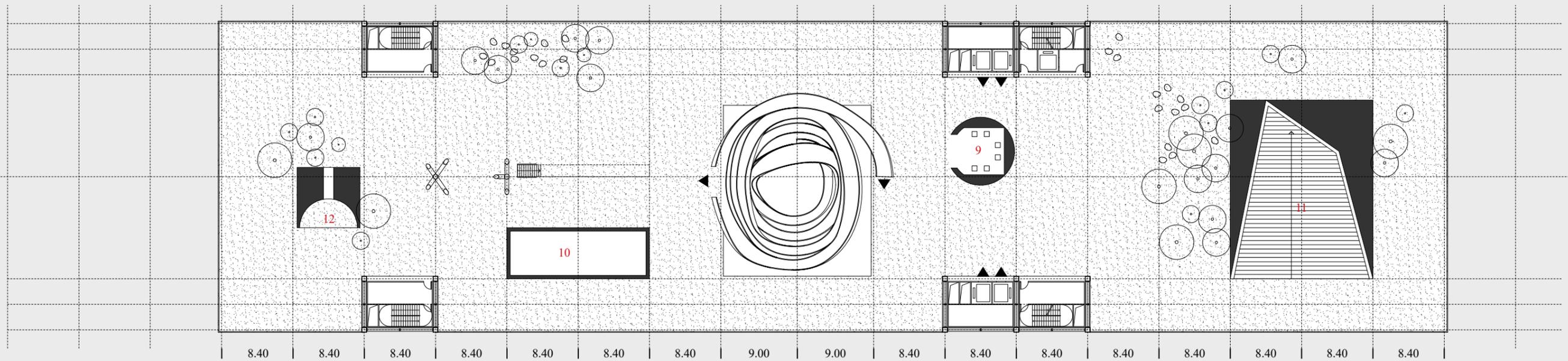


Thermal Bath 16.00m Level

0 5 10

▲ Access

- | | |
|--------------|--------------|
| 1. Lobby | 5. Showers |
| 2. Cloakroom | 6. Rest Room |
| 3. Massage | 7. Warm Pool |
| 4. Cool Pool | 8. Hot Pool |



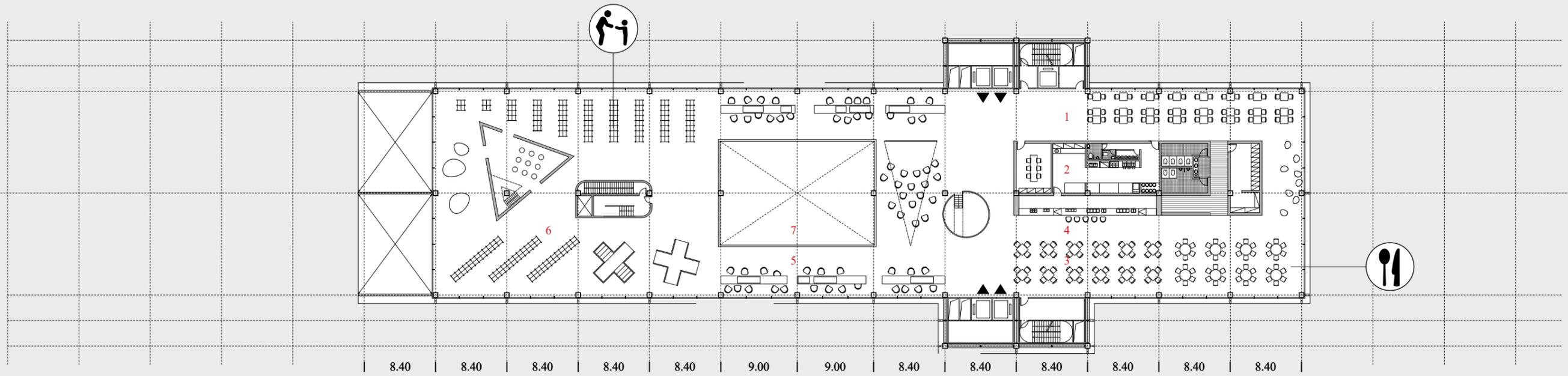
Water Platform 22.0m Level

0 5 10

▲ Access



- 9. Reception
- 10. Fountain
- 11. Viewing Place
- 12. Waterfall

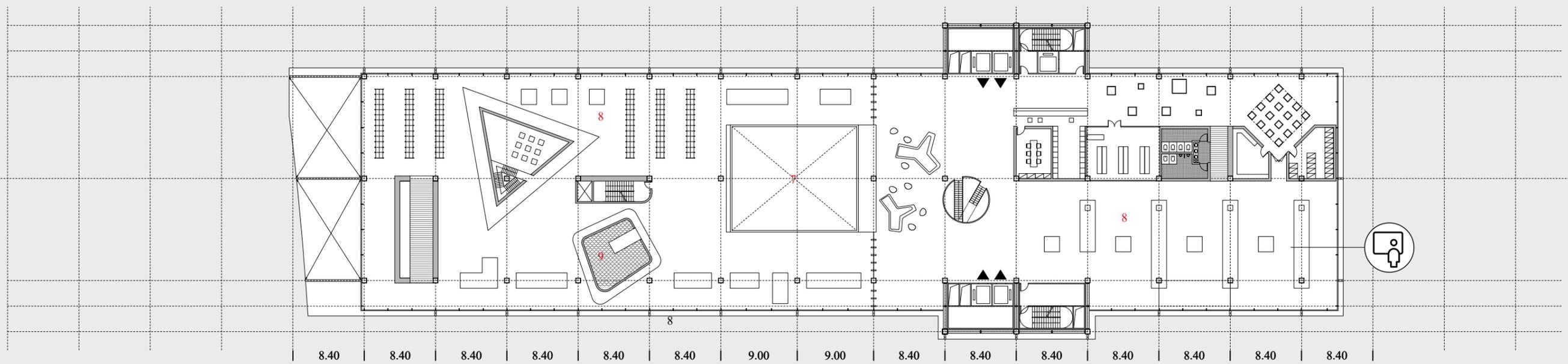


Foodbar & Workshop 35m Level

0 5 10



- 1. Lobby
- 2. Kitchen
- 3. Seatings
- 4. Bar
- 5. Coffee
- 6. Workshop (Parents-Child)
- 7. Atrium

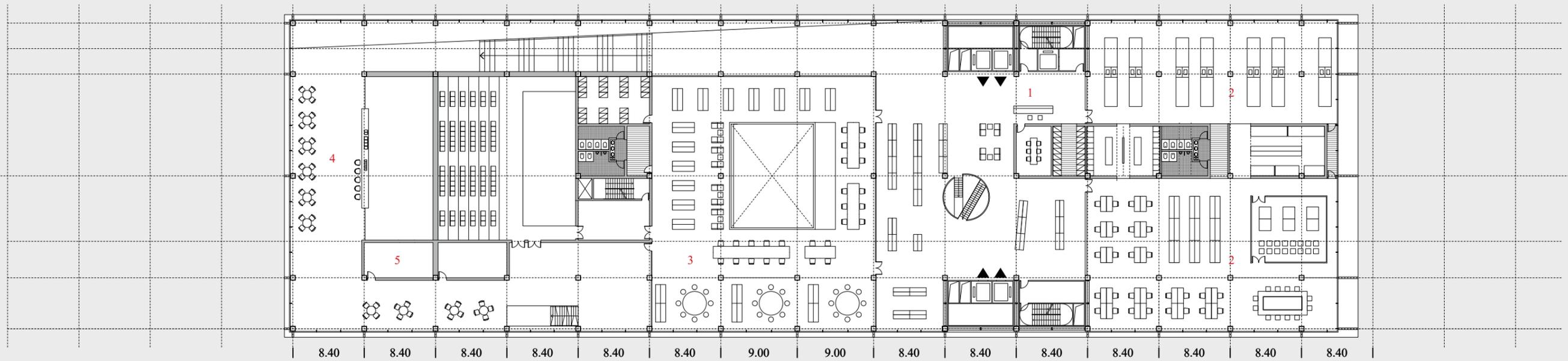


Exhibition 39.2m Level

0 5 10



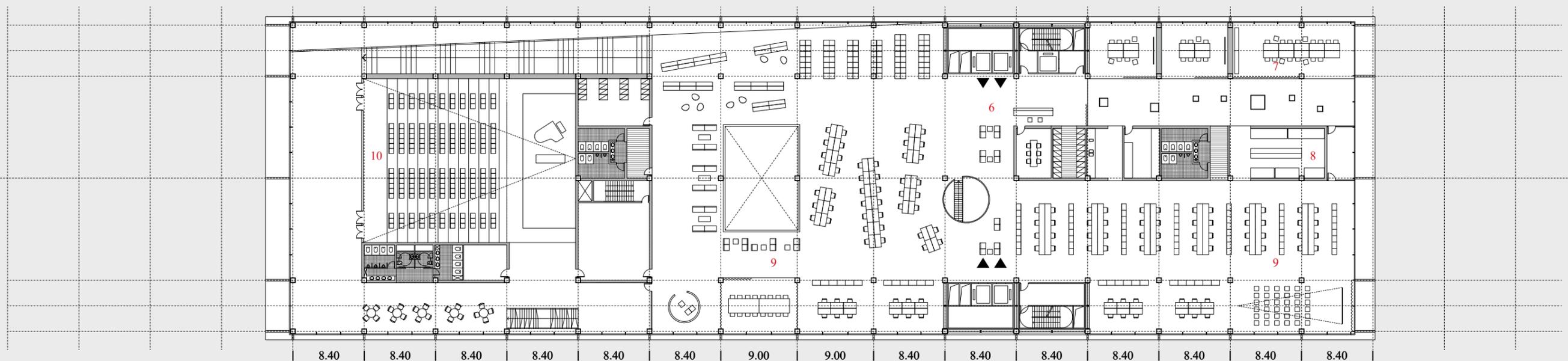
- 7. Atrium
- 8. Open Gallery
- 9. Interactive Rooms



Research Center 43.4m Level

0 5 10

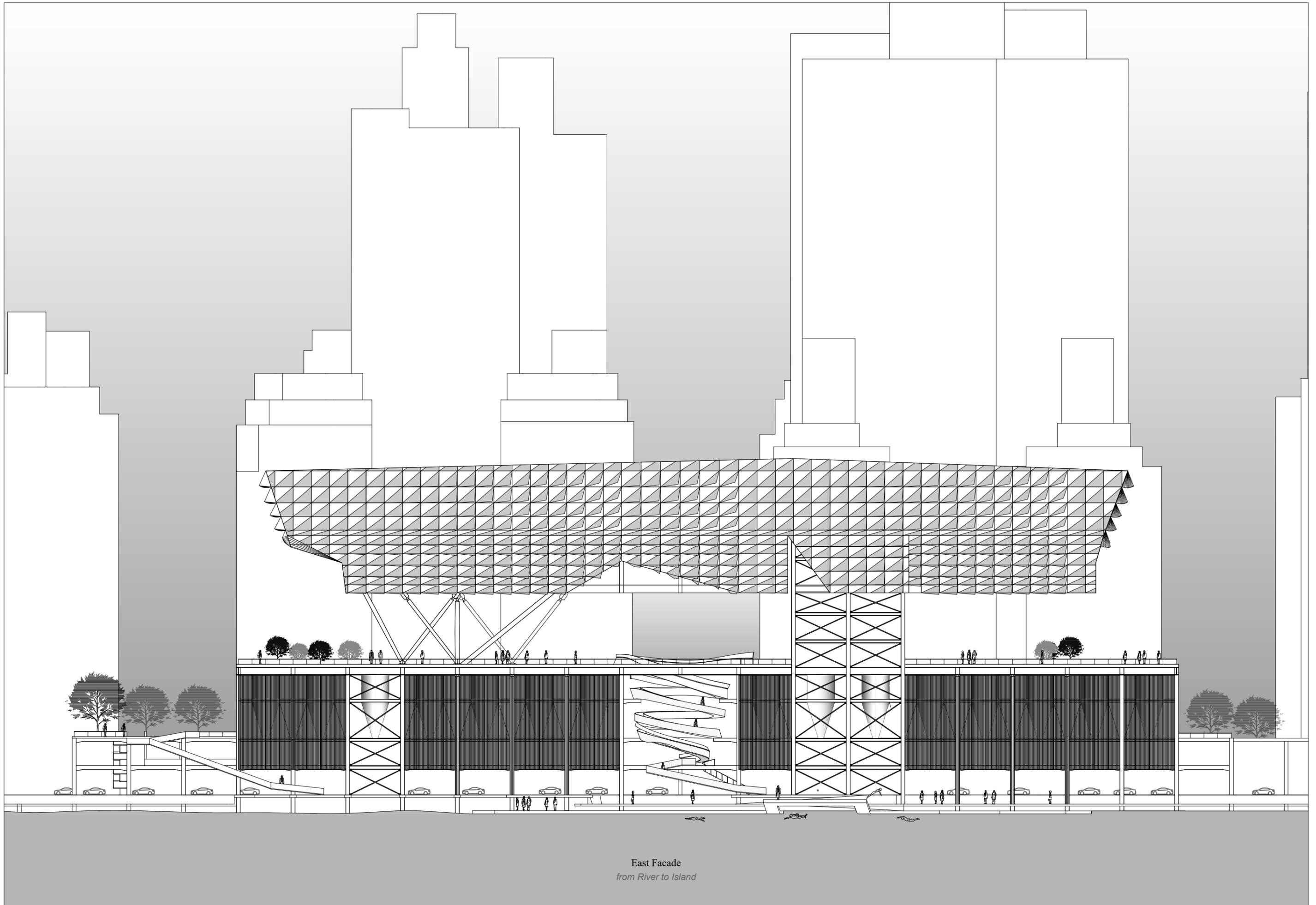
- 1. Lobby
- 2. Labs
- 3. Archive
- 4. Bar
- 5. Storage



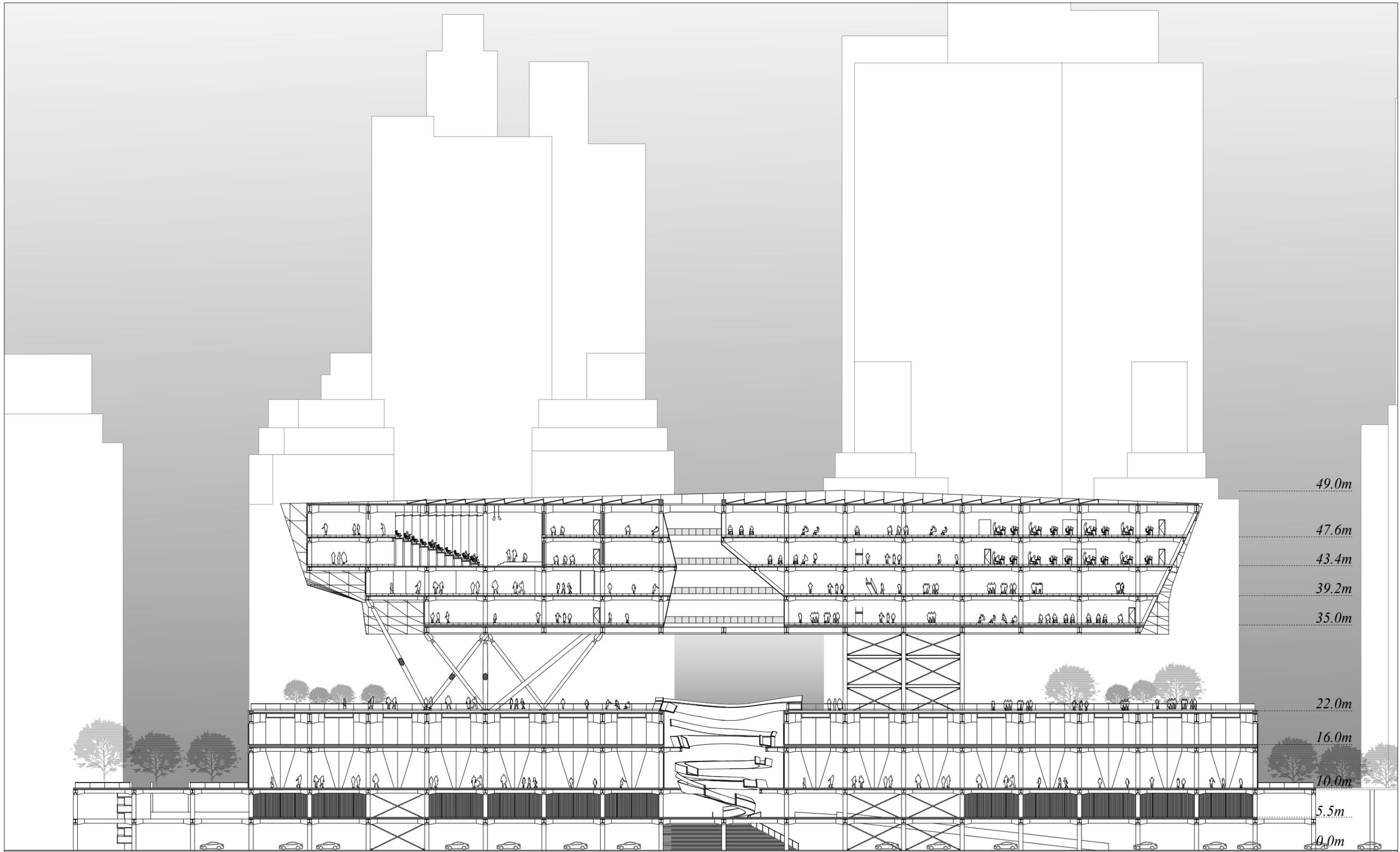
Office 47.6m Level

0 5 10

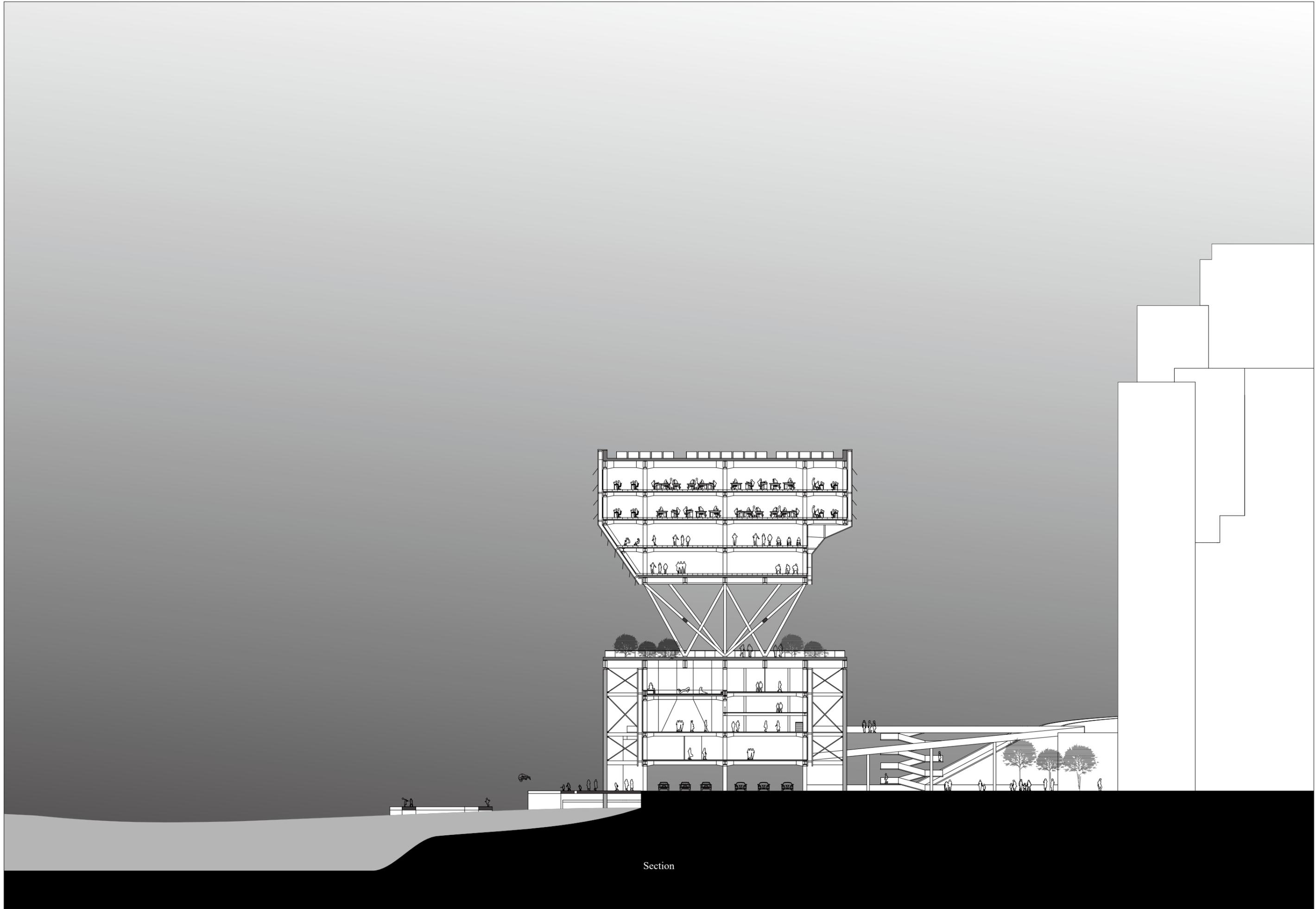
- 6. Office Lobby
- 7. Meeting Rooms
- 8. Printing
- 9. Open Office
- 10. Auditorium



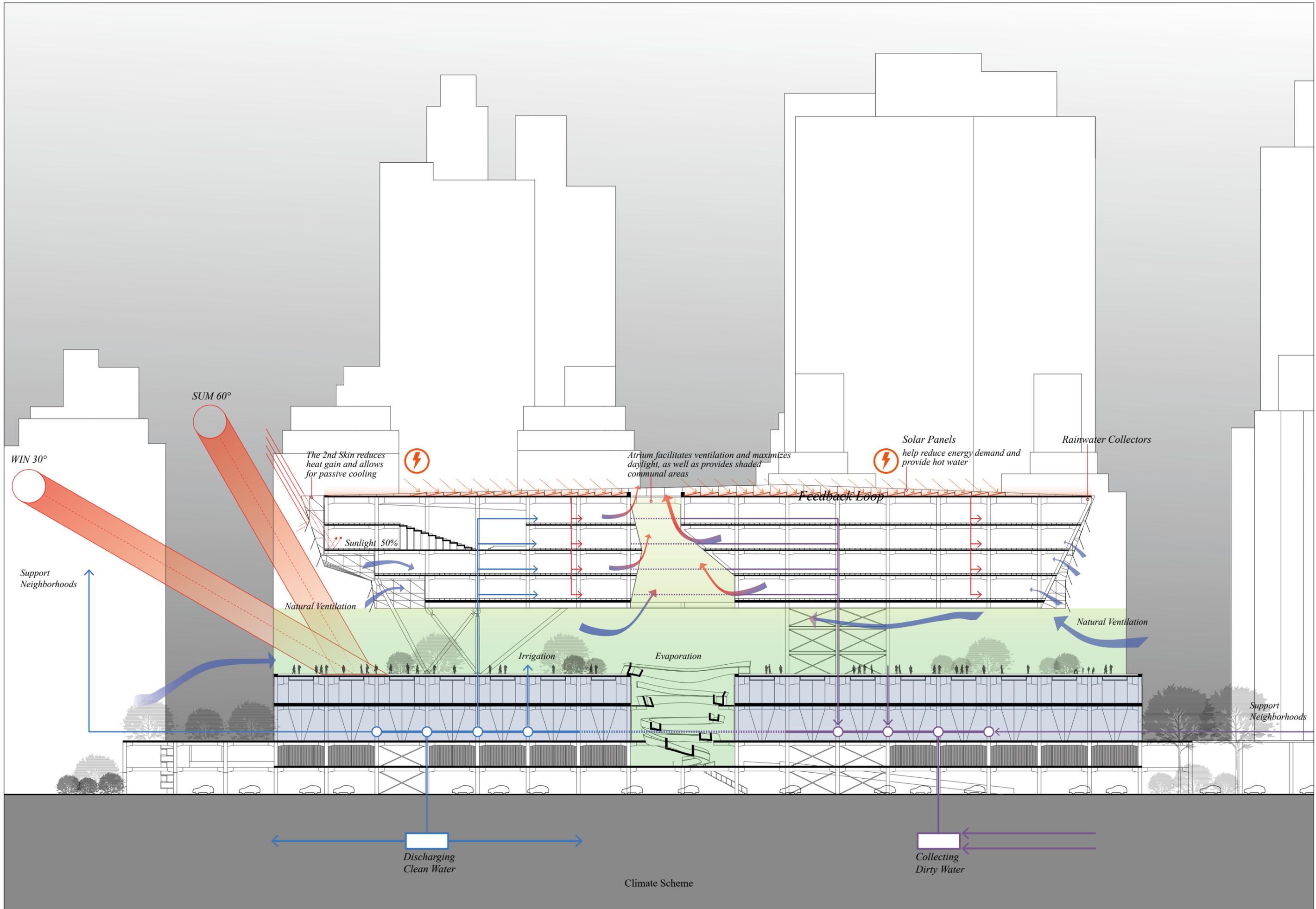
East Facade
from River to Island



Longitudinal Section



Section



Climate Scheme



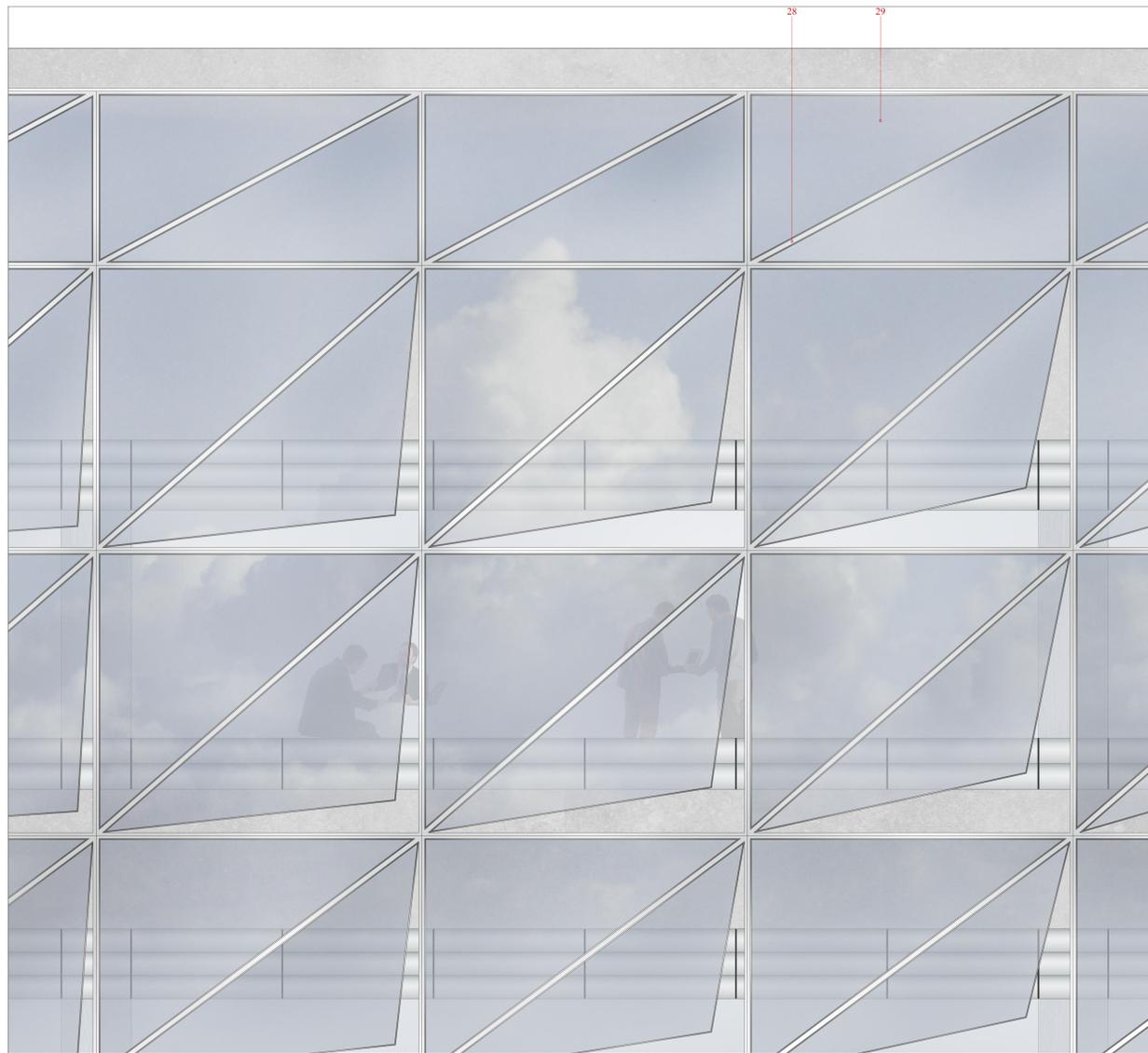
The Aerial View

The building is located on the edge of the site, overlooking the river and potentially becoming another city engine.



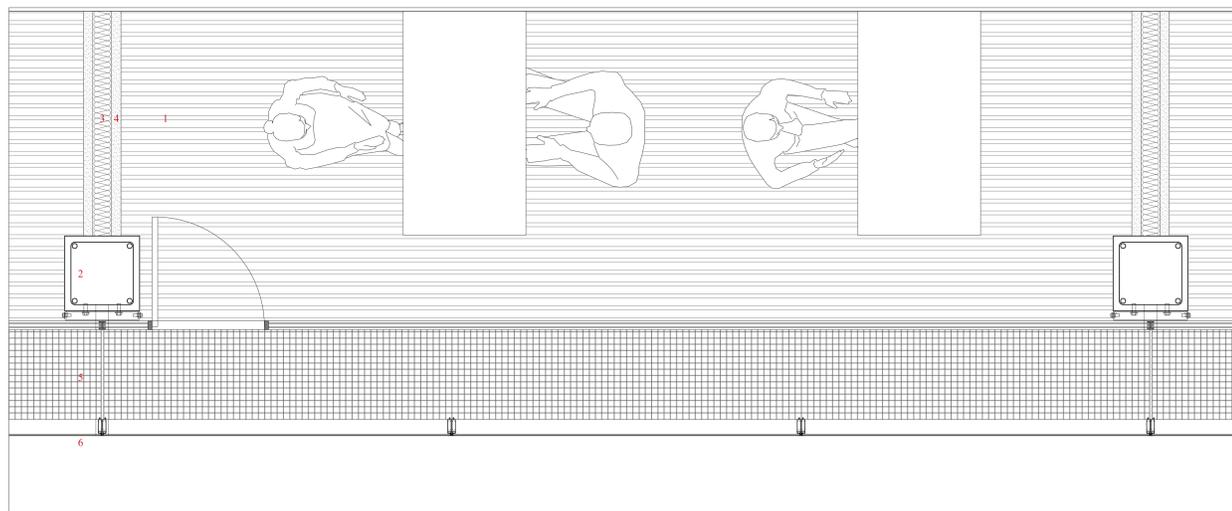
The Street View

The building follows the axis of the street, and has a big contrast with the nearby buildings in terms of the material and structure.



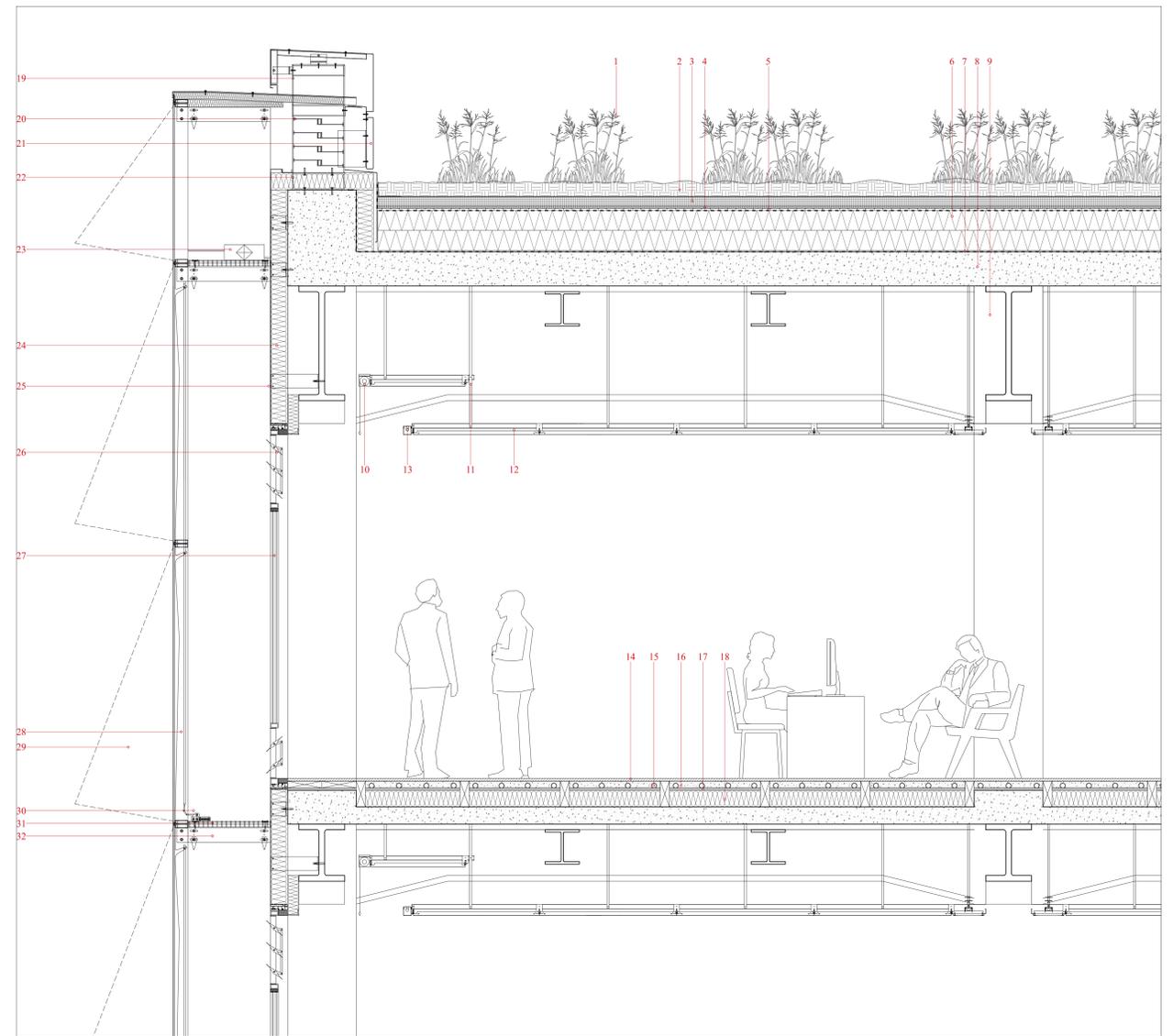
ELEVATION / 1:20
VIEW FROM THE OUTSIDE

- THE 2ND SKIN
28. aluminium glazing mullion
29. single ply glazing



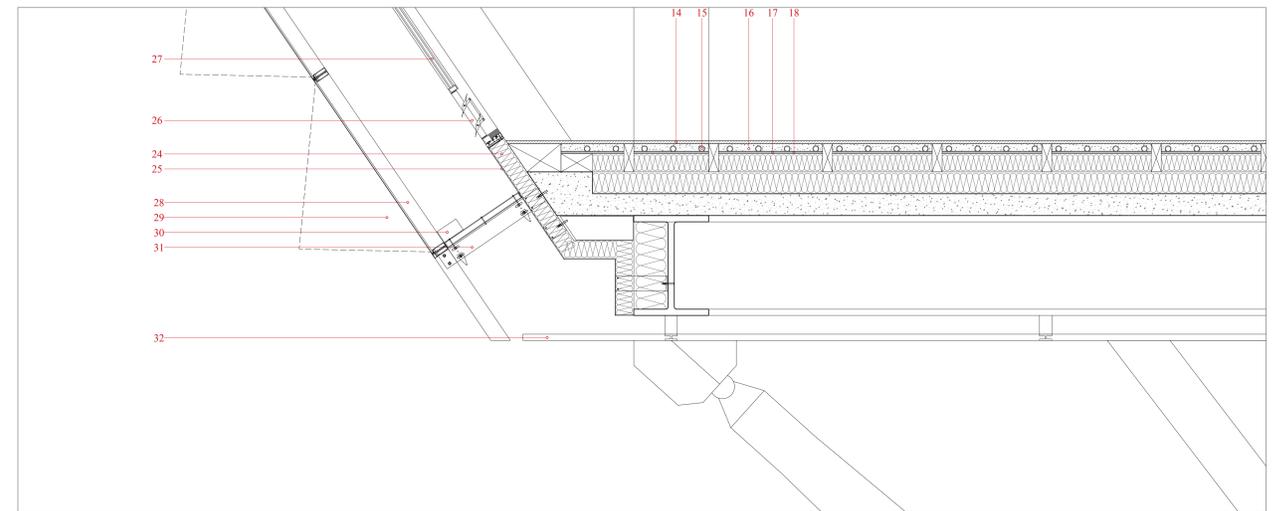
FLOOR PLAN / 1:20

1. wooden floor
2. steel column
3. thermal insulation
4. sound absorbing insulation
5. steel catwalk
6. the 2nd skin



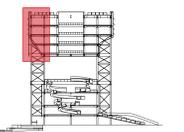
CROSS SECTION / 1:20

- | | | | | | | |
|---|---|--|---|--|--|--|
| GREEN ROOF | CEILING SYSTEM | FLOOR SYSTEM | VENTILATION SYSTEM | CURTAIN SYSTEM | THE 2ND SKIN | |
| 1. plantings
2. growing medium
3. drainage layer
4. protection course
5. waterproof layer | 6. 2 layers of roof insulation
7. air, water vapour barrier
8. concrete slabs 300mm
9. steel beams 700mm | 10. motorized blinds
11. aluminium rod for ceiling panels
12. metal suspended ceiling panels
13. perimeter fluorescent light fixing | 14. floor plank
15. heating pipes
16. dry sand/cement mix
17. sterling board
18. thermal insulation | 19. wind post
20. anodized aluminium ventilation blades
21. perforated anodized aluminium cladding
22. rectangular hollow section framing
23. heat Exchanger | 24. insulation, mineral wool
25. aluminium sandwich panel
26. louvers
27. laminated double glazing (insulation glass) | 28. aluminium glazing mullion
29. single ply glazing
30. motor for openable facade
31. aluminium grid platform for maintenance access
32. T-beam |



CROSS SECTION / 1:20

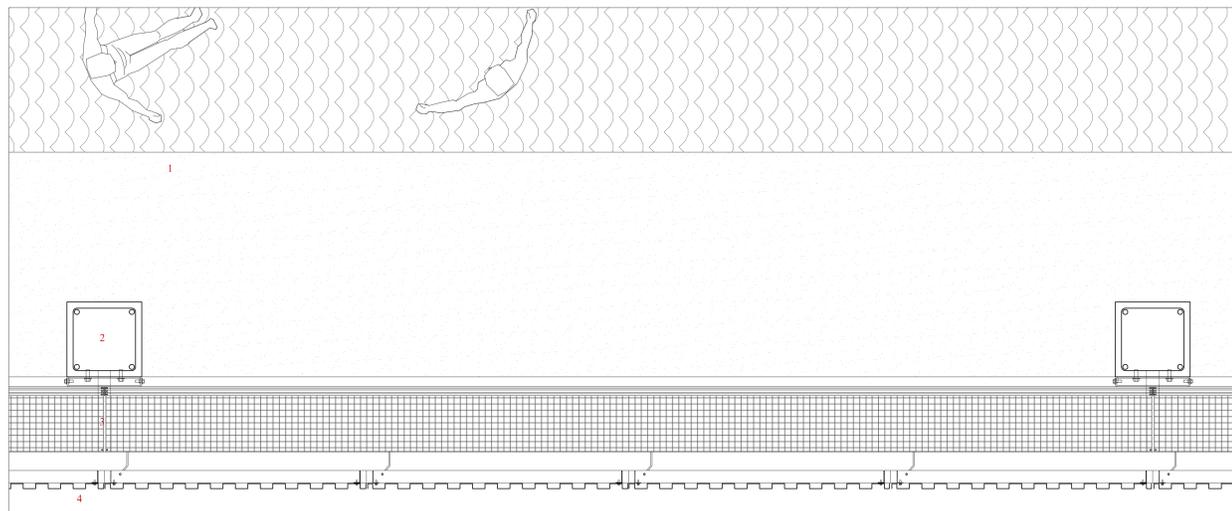
- | | | |
|--|---|---|
| CURTAIN SYSTEM | THE 2ND SKIN | FLOOR SYSTEM |
| 24. insulation, mineral wool
25. aluminium sandwich panel
26. louvers
27. laminated double glazing (insulation glass) | 28. aluminium glazing mullion
29. single ply glazing
30. motor for openable facade
31. T-beam
32. mirroring ceiling | 14. floor plank
15. heating pipes
16. dry sand/cement mix
17. sterling board
18. thermal insulation |





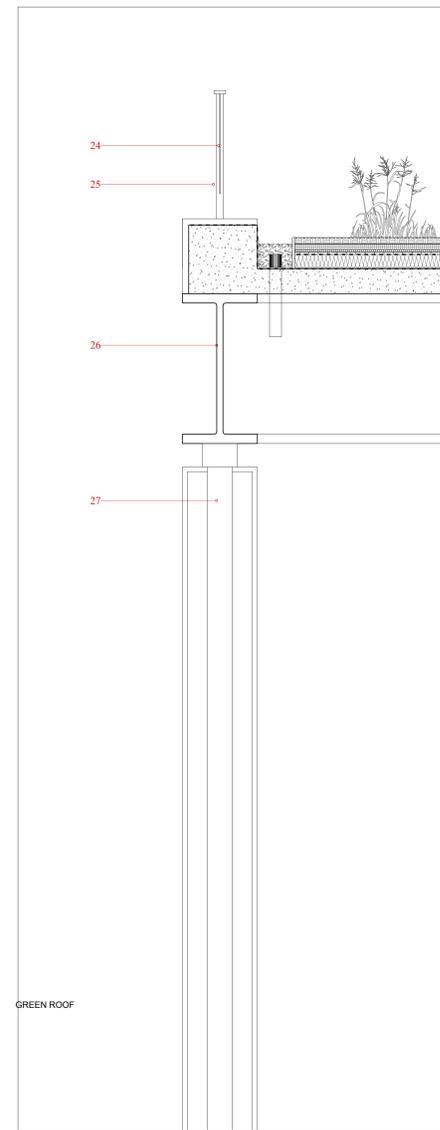
ELEVATION / 1:20
VIEW FROM THE OUTSIDE

- | | |
|----------------|------------------------------|
| THE 2ND SKIN | HANDRAIL |
| 21. metal mesh | 24. glazing |
| | 25. aluminum glazing mullion |
| | 26. T-beam |
| | 27. steel column |



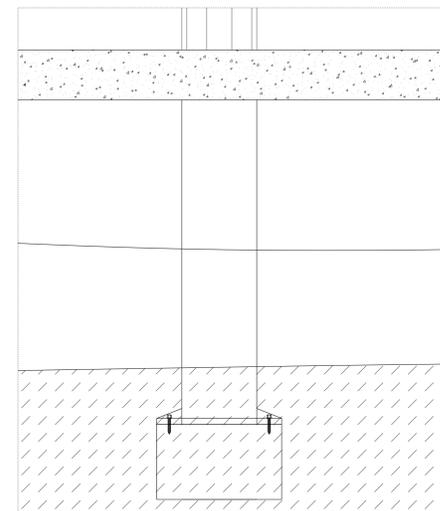
FLOOR PLAN / 1:20

1. finished mortar
2. steel column
3. steel catwalk
4. mesh metal



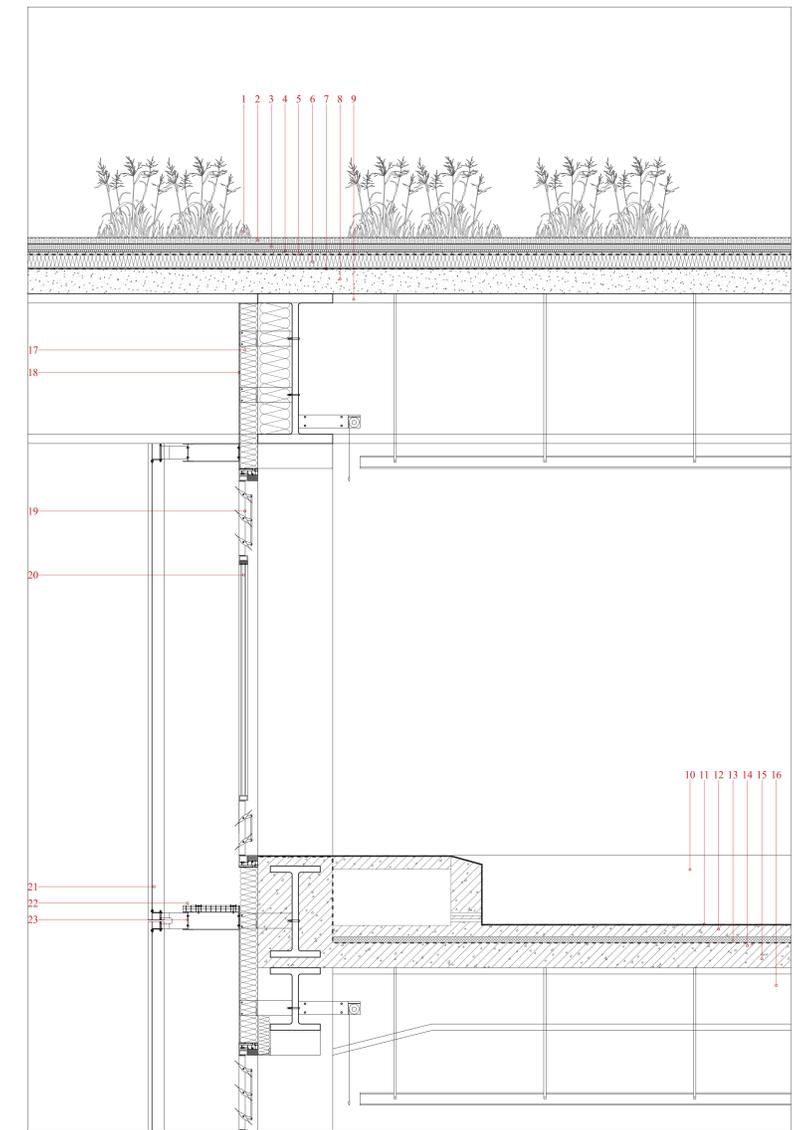
CROSS SECTION / 1:20

- | | |
|------------------------------|-------------------------|
| ROOF SYSTEM | POOL SYSTEM |
| 1. plantings | 10. water |
| 2. growing medium | 11. finished mortar |
| 3. drainage layer | 12. reinforced concrete |
| 4. protection course | 13. insulation board |
| 5. waterproof layer | 14. waterproof |
| 6. roof insulation | 15. concrete slab |
| 7. air, water vapour barrier | 16. steel beam |
| 8. concrete slabs 300mm | |
| 9. steel beams 700mm | |



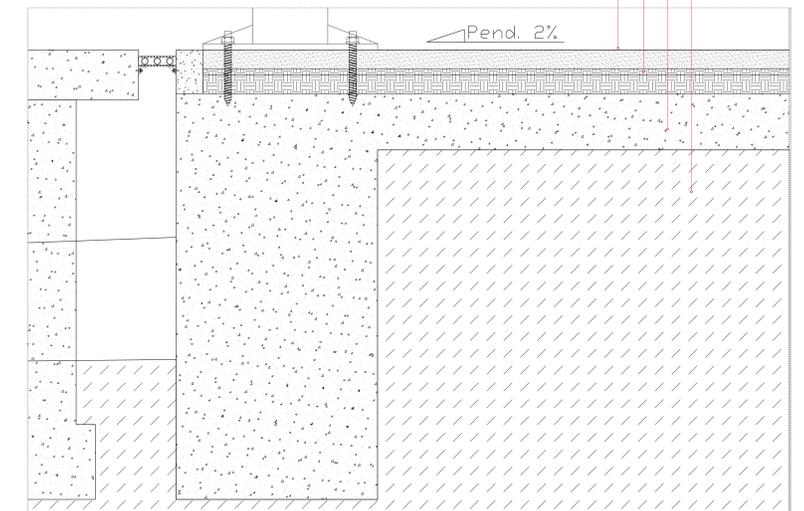
CROSS SECTION / 1:20

- GROUND
1. bituminous Pavement 150mm
 2. granular Base Course
 3. embankment
 4. earth foundation



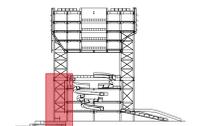
CROSS SECTION / 1:20

- | | | |
|---|---|------------------------------|
| CURTAIN SYSTEM | THE 2ND SKIN | HANDRAIL |
| 17. insulation, mineral wool | 21. metal mesh | 24. glazing |
| 18. aluminum sandwich panel | 22. aluminum grid platform for maintenance access | 25. aluminum glazing mullion |
| 19. louvers | 23. T-beam | 26. T-beam |
| 20. laminated double glazing (Insulation glass) | | 27. steel column |



CROSS SECTION / 1:20

1. bituminous Pavement 150mm
2. granular Base Course
3. embankment
4. earth foundation



DETAIL LOWER VOLUME / 1:20