



ANA LUCIA MORATAYA QUAN

BUILDING AS REEF

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A thesis submitted in partial fulfillment of the requirements for the degree
Master of Design in Interior Studies [Adaptive Reuse] in the Department of
Interior Architecture of the Rhode Island School of Design

By Ana Lucia Morataya Quan
2017

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ABSTRACT

We are in a new era, one that will require the most radical transformation that coastal communities have seen yet. Starting mid 21st century, subsequent generations will be witness to a time in which sea level rise manifests within the urban fabric, not only in the form of storm surges, but also in an increasingly permanent manner within the projected floodplain. Rising tides will create a shift from solid ground plane to a fluctuating one. Encroaching sea levels will bring marine life and hydrologic conditions that the built environment hasn't been designed or prepared for. Urban circulation, infrastructure and ultimately community life will have to adjust to accept this new sea level. It's imperative to be proactive now, as the impact of sea level rise on areas of human habitation will be determined by their position and ability to adapt. With 400 miles of coastline, Rhode Island is particularly vulnerable to this future.

Rhode Island's waterfront communities developed out of the typical opportunities that a vicinity to water provides, like access to food, industry and trade; the result is a built environment which evolved with its inhabitants and their use of waterways. In the case of Providence, urbanization of the city resulted in a series of expansions and adaptations to the Providence River. Initially the river was used as an early settlement, food source and means of transportation, and was developed for energy and manufacturing use during the Industrial Revolution. During the twentieth century use of the river for heavy transit ended, but as a higher value for land was established a large portion of the river was defiled to give way to expansion of the city's infrastructure. More recently work was undertaken to peel away and reveal the river, which was obscured by the widest bridge in the world at the time, and to reinvent the spirit of this historic industrial city.

The Rhode Island School of Design, whose campus lies largely along the Providence River, has been instrumental in the effort to embrace the city's past and has become part of the riverfront identity. Former textile warehouses and colonial homes have been adapted to studio spaces, galleries and classrooms. The most prominent of these historical structures is the Hospital Trust Bank Building, on 15 Westminster Street. Standing tall at the riverfront, 15 West is an emblematic point of convergence for RISD. As the main residence for students, it also houses a dining hall and the Fleet Library, making the building's dominant role as an instigator for social life.

In adapting 15 West to withstand the projected forces of sea level rise, much of the activity that previously existed on the ground level must move to higher floors. A void is left in the structure of our community that is filled by a life amidst water. It will then be necessary to tailor a new type of ground level in all buildings which addresses resilience. This new ground level is to serve as a transition space, reconciling people with their newly defined surrounding and encouraging a functional habitation of marine life with structures intended as riverine filters. A vision for a new living scenario is presented as potential methodology for a wet urbanity in which buildings promote social sustainability, estuarine restoration, and sea level adaptation.

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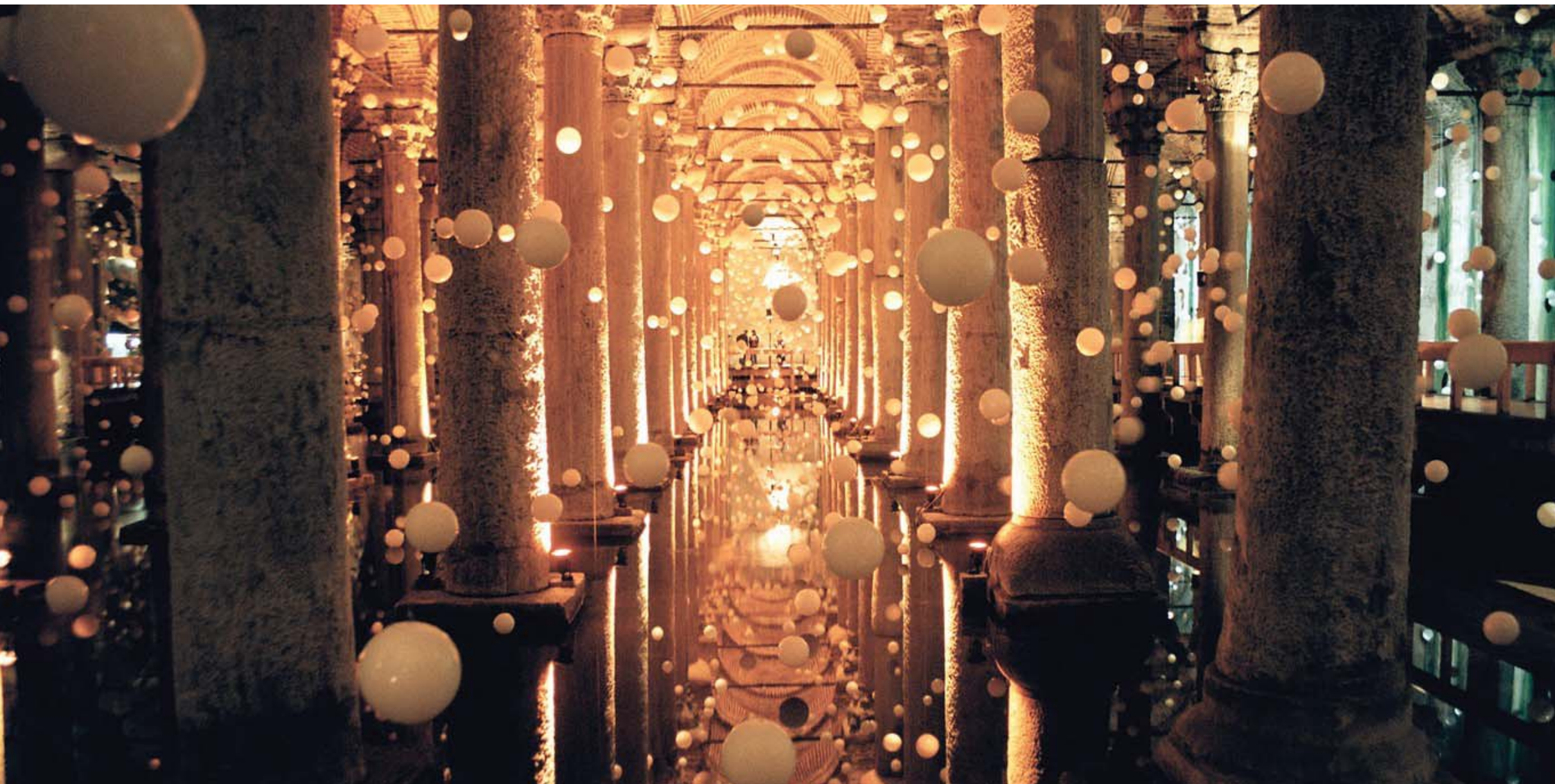
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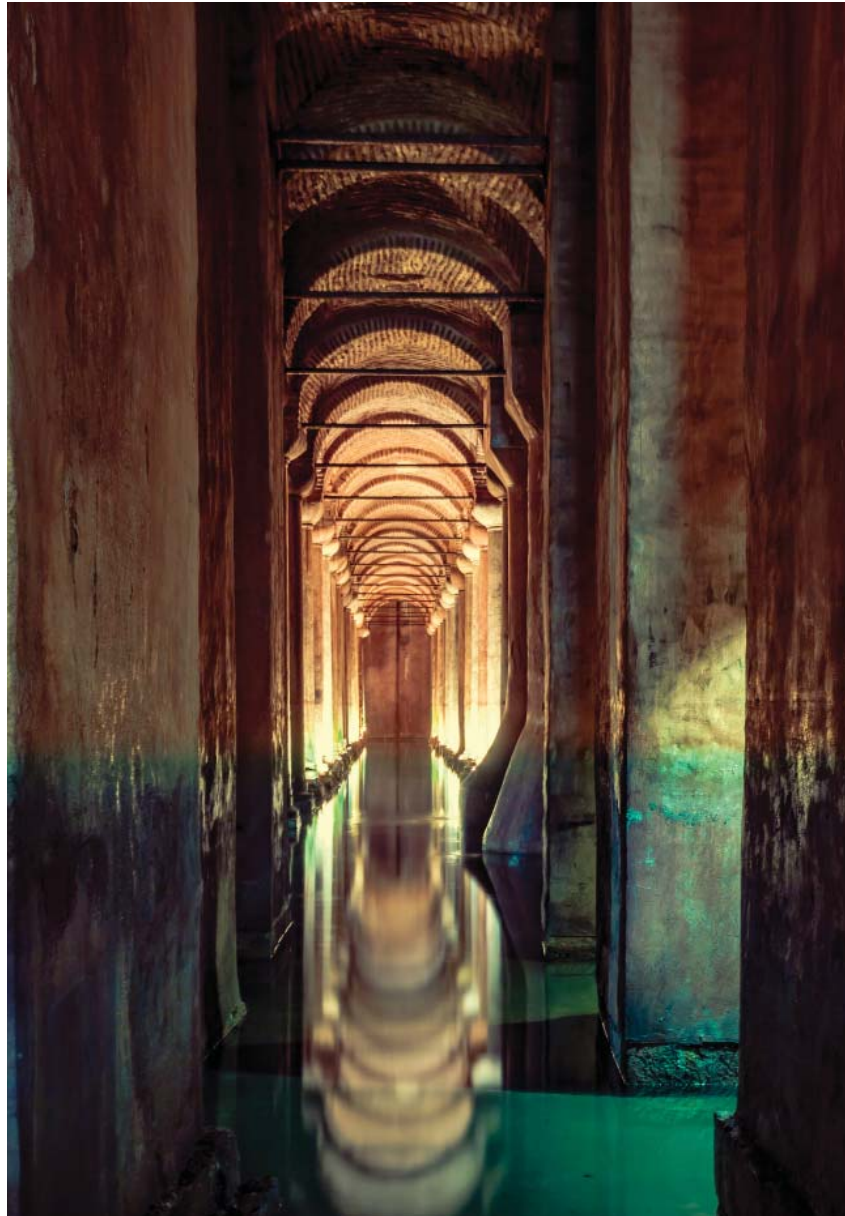
Basilica Sestern

Istanbul

The Basilica Sestern of Istanbul once held water for the city. In spite of the slight amount of water remaining it is home to fish and habitat. As one walks throughout the space arches and pillars seem to multiply due to water's reflectivity and visitors experience is enhanced with the play between light and water.



Installation inside Istanbul Sestern⁴



Clockwise from top left: fish living in the water², reflection of arches and vaulted ceiling³, reutilizing Medusa statue from another building to support columns⁴

Louvre Abu Dhabi

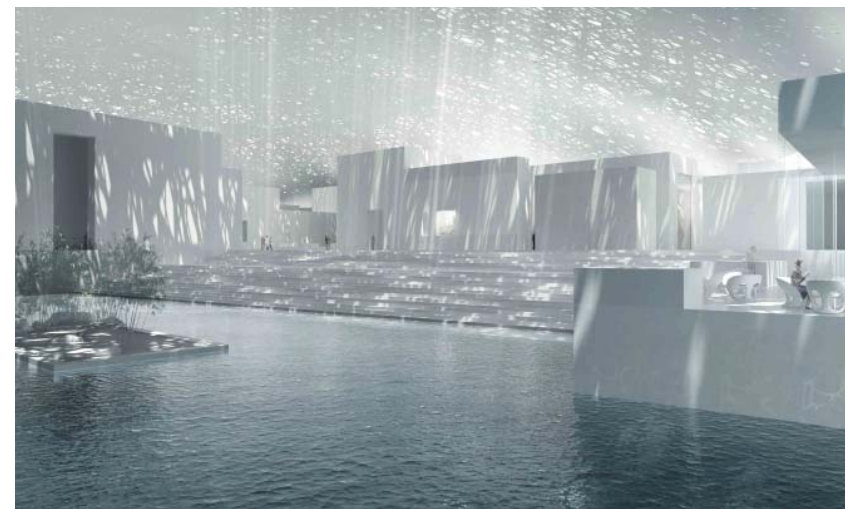
Jean Nouvel

Abu Dhabi, United Arab Emirates

The Louvre Abu Dhabi is a project by Jean Nouvel and currently under construction. It stands as an archipelago of exhibition rooms surrounded by water, and accessible by boat or by foot. Hovering above it is a perforated double dome which allows for a rain of light to be cast inside.⁸

The Louvre Abu Dhabi presents itself as a juxtaposition of light/shadow, cool/warmth, inside/outside all to create an ethereal experience for those who visit this oasis. Water in this case has been used for circulation, as a material for its thermal and reflective properties, and as a symbol of utopia.

Clockwise from top left: site under construction⁵, sense of arrival through entrance, includes retail and grand staircase⁵, elevation⁵





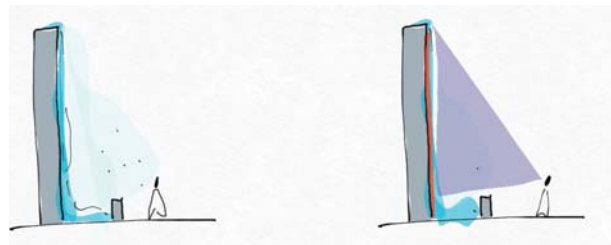
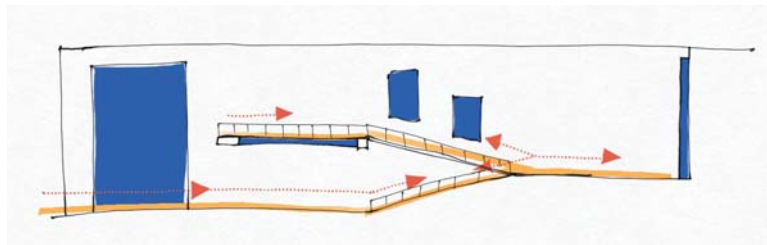
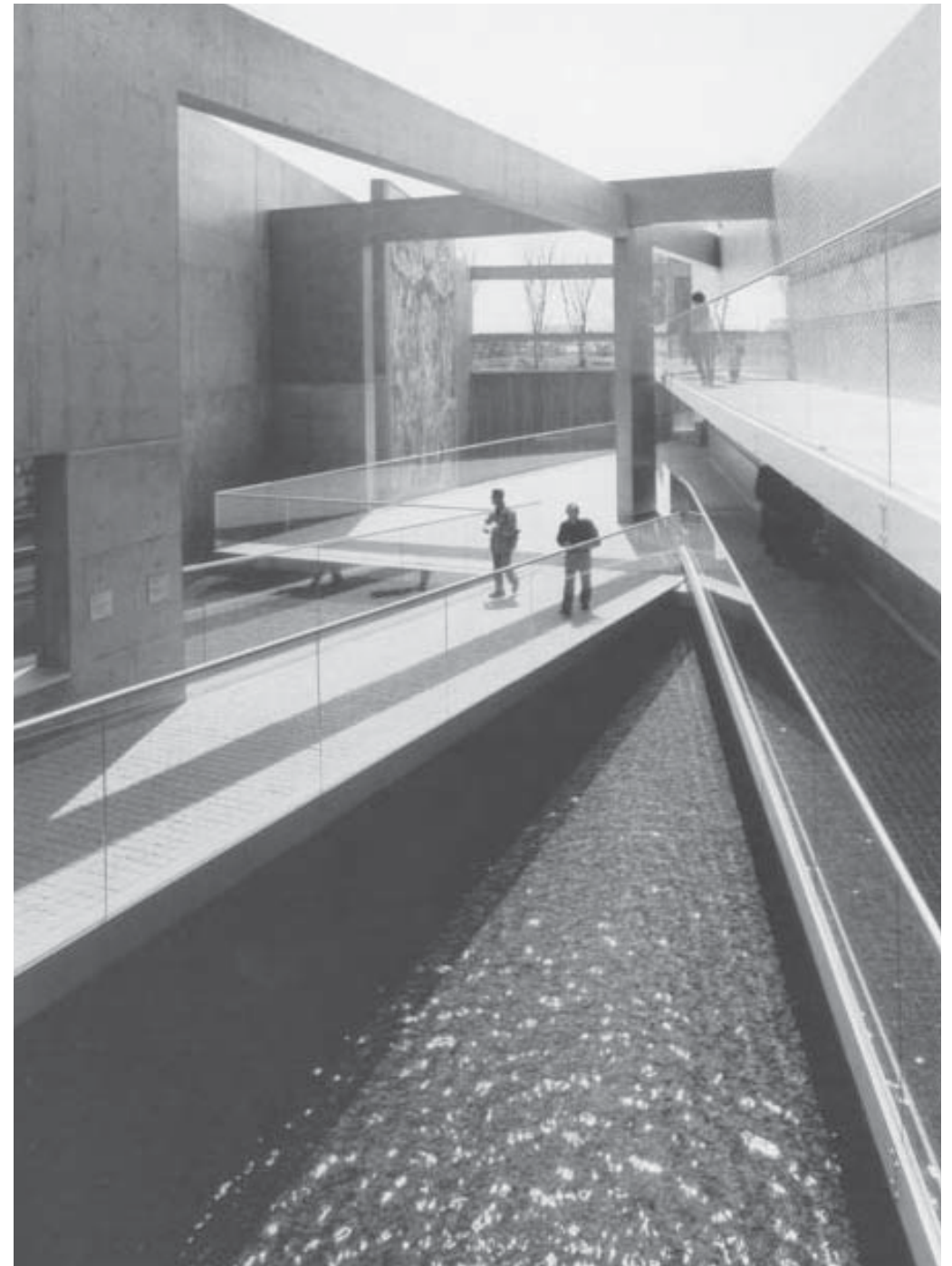
Top view, archipelago composition ⁵



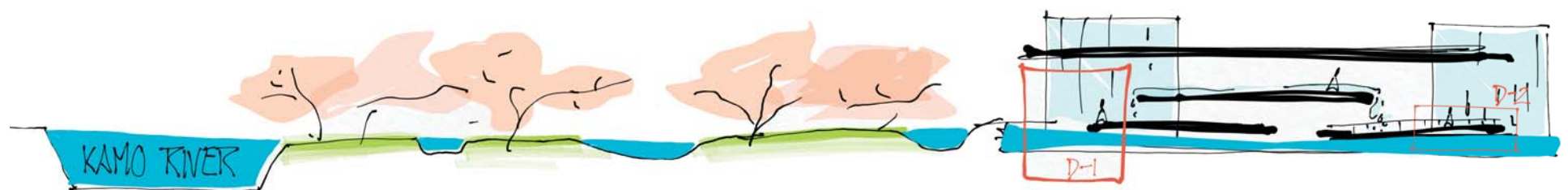
Kyoto's Garden of Fine Arts

*Tadao Ando
Kyoto, Japan*

Tadao Ando's Garden of Fine Arts sits on the edge of Kyoto Botanical Garden. As a general theme, and playing homage to the Kamo River, water accompanies and sets the rhythm for visitors who travel through this outdoor gallery space. There are eight ceramic panels which exhibit famous paintings such as Mone's *Water Lilies*, Michelangelo's *The Last Judgement*, and Da Vinci's *The Last Supper*, amongst others. Each one of these panels exists in harmony in its unique relationship with water. Visitors are taken through a sensory experience with water, as it plays a key role in the perception of the panels (wether by sound, or sight).



Left to right: Looking art through water, entrance of Kyoto's Garden of Fine Arts⁶ vertical circulation and ramp⁶



Paley Park

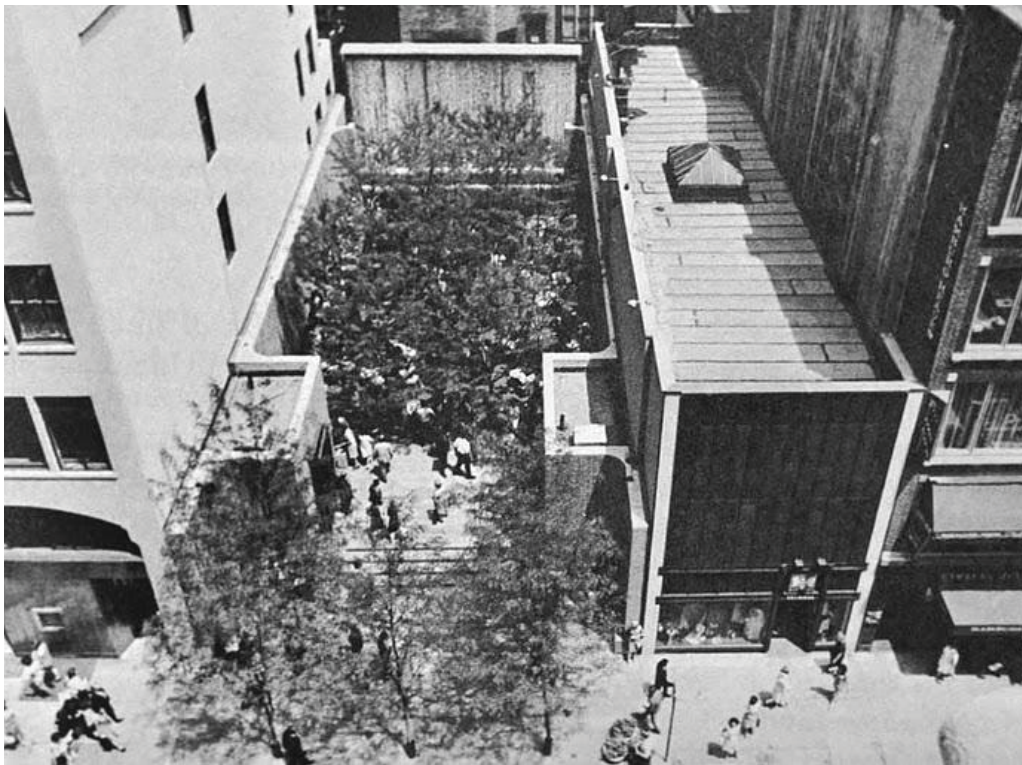
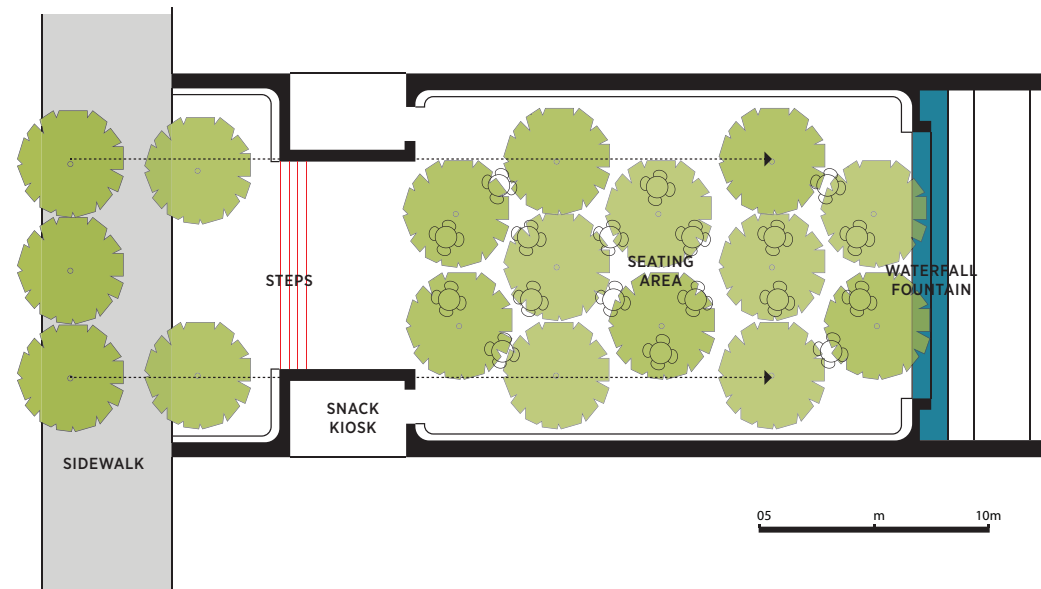
New York City

Noise level: 75 decibels

White sound that masks noise of the city

Enjoy a sense of privacy

Design of steps and trees going on to the sidewalk invite people in



Left to right: People meeting up and having lunch at Paley Park, the available seating is welcoming and convenient⁷ Historical picture of Paley Park, an oasis within the city⁸



Paley Park is a nook in New York City, an oasis that blocks out the busy sounds of the streets and leaves in its stead a constant waterfall

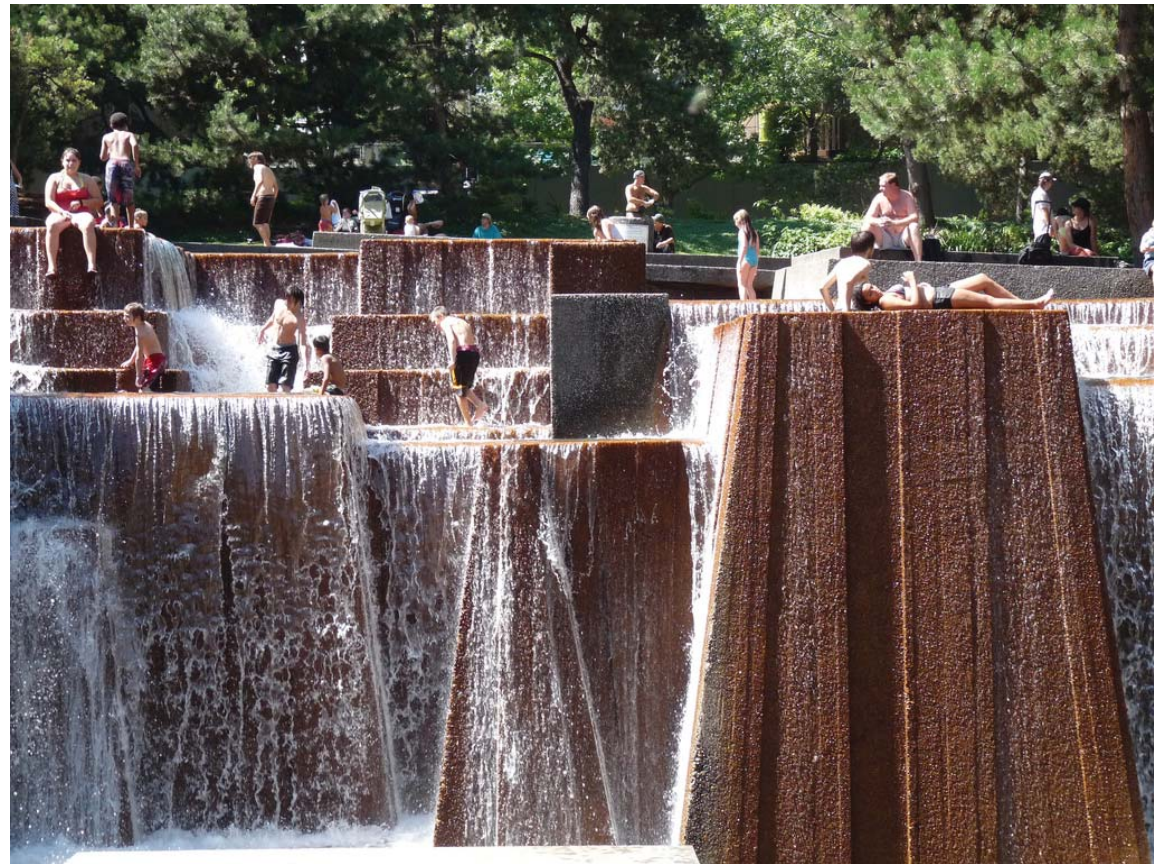
Ira Keller Fountain Park

Portland, Oregon





Original Sketch by Halprin¹¹



Original Sketch by Halprin¹¹

Cheonggyecheon River

Seoul, South Korea

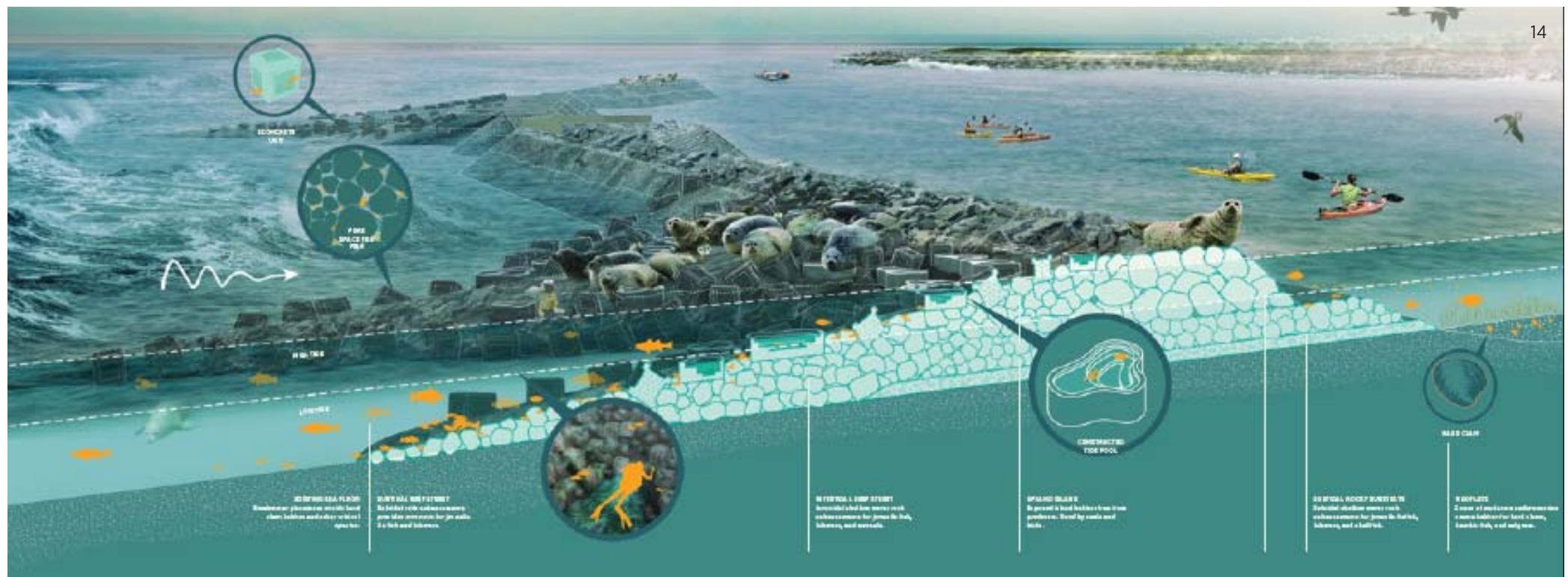
Cheonggyecheon is a 7 mile long stream running through Seoul, eventually connecting with Jungnancheon, the Han River, and eventually emptying into the Yellow Sea. During the fifties and with the rise of migration population rose in that area which resulted in a highly polluted stream due to sewage and industrial use. For the next decades the stream would be covered up with concrete and highways.⁷

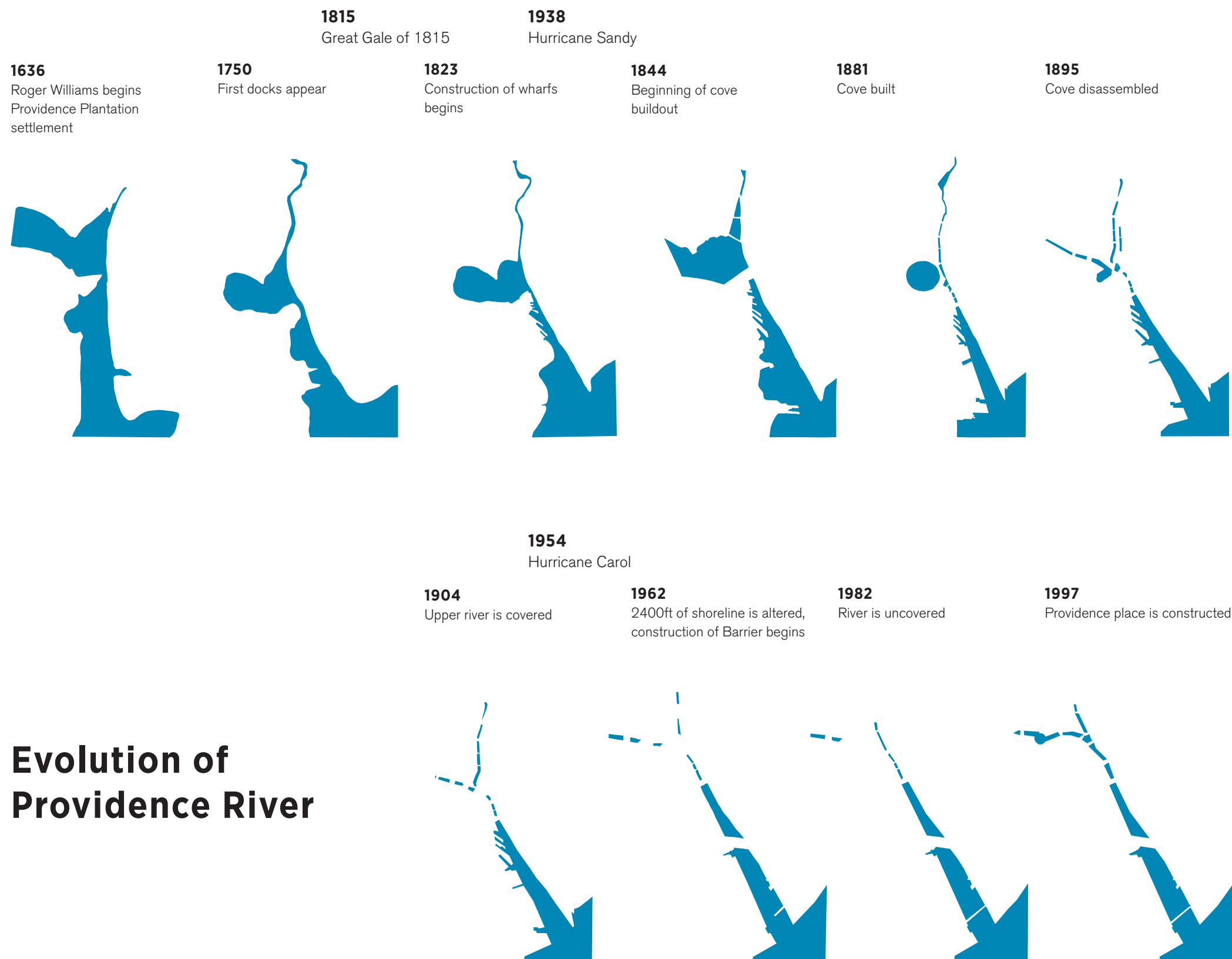
A big part of Lee Myung-bak's campaign for mayor in 2002 was his proposal to demolish that concrete and in its stead restore the original stream. After great efforts in establishing a healthier water quality and the years of construction, the Cheonggyecheon Stream opened to visitors in 2005. It offers almost 4 miles long of continuous green space and is designed to withstand up to a 200-year flood event.¹ This project has increased property values, helped local economy and successfully reinjected nature into the heart of Seoul.



Living Breakwaters Rebuild

A proposal for resilience in NYC that also encourages habitat growth by use of ECOconcrete







"Dedicated to the men and women, architects and engineers, in the public and private sectors, who working together with foresight and ingenuity brought about a notion for a new visual appreciation and economic growth opportunity for the city of Providence, RI, by moving and reclaiming rivers and revitalizing this beautiful city at the water's edge, for the benefit of all who follow."

Ronald G. Julbert
Engineer - Facilitator

William D. Warner
Architect - Visionary



Left to right: 1. Rooftop view of Providence River from 15 West
2. Sign found on College St. Bridge, a quote by the engineer and architect in charge of the work that revealed the river

PAST



Crawford Bridge
1906



Crawford Bridge
circa 1920

PRESENT
DAY



Evolution of Providence River

Tiles showing the evolution of
the river installed on bridge over
Providence River





1896



1920s



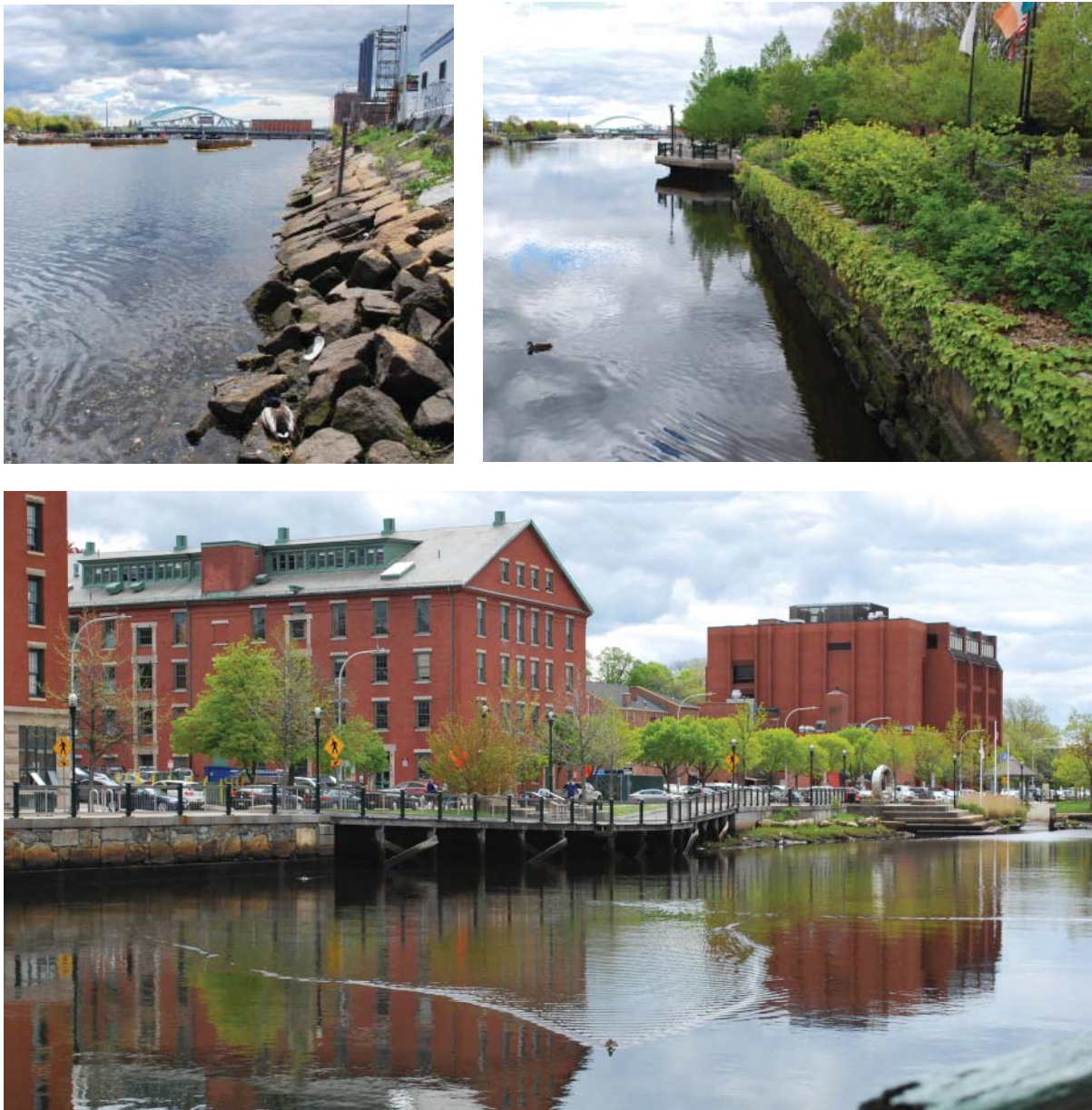
1924



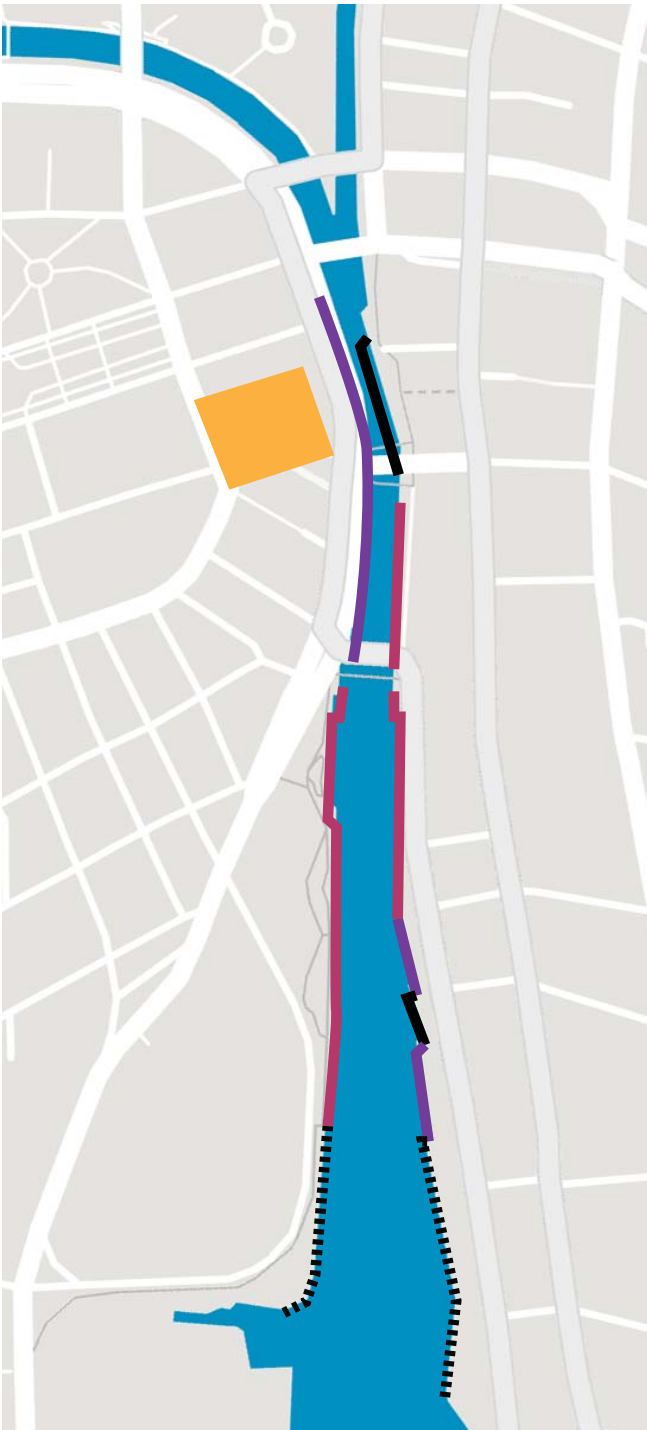
1. Aerial view of Providence 1896
2. Providence River improvement and new bridge south of Crawford Bridge 1920s¹⁷
3. Aerial view of Providence 1924
4. View from roof of 15 West

River Edge

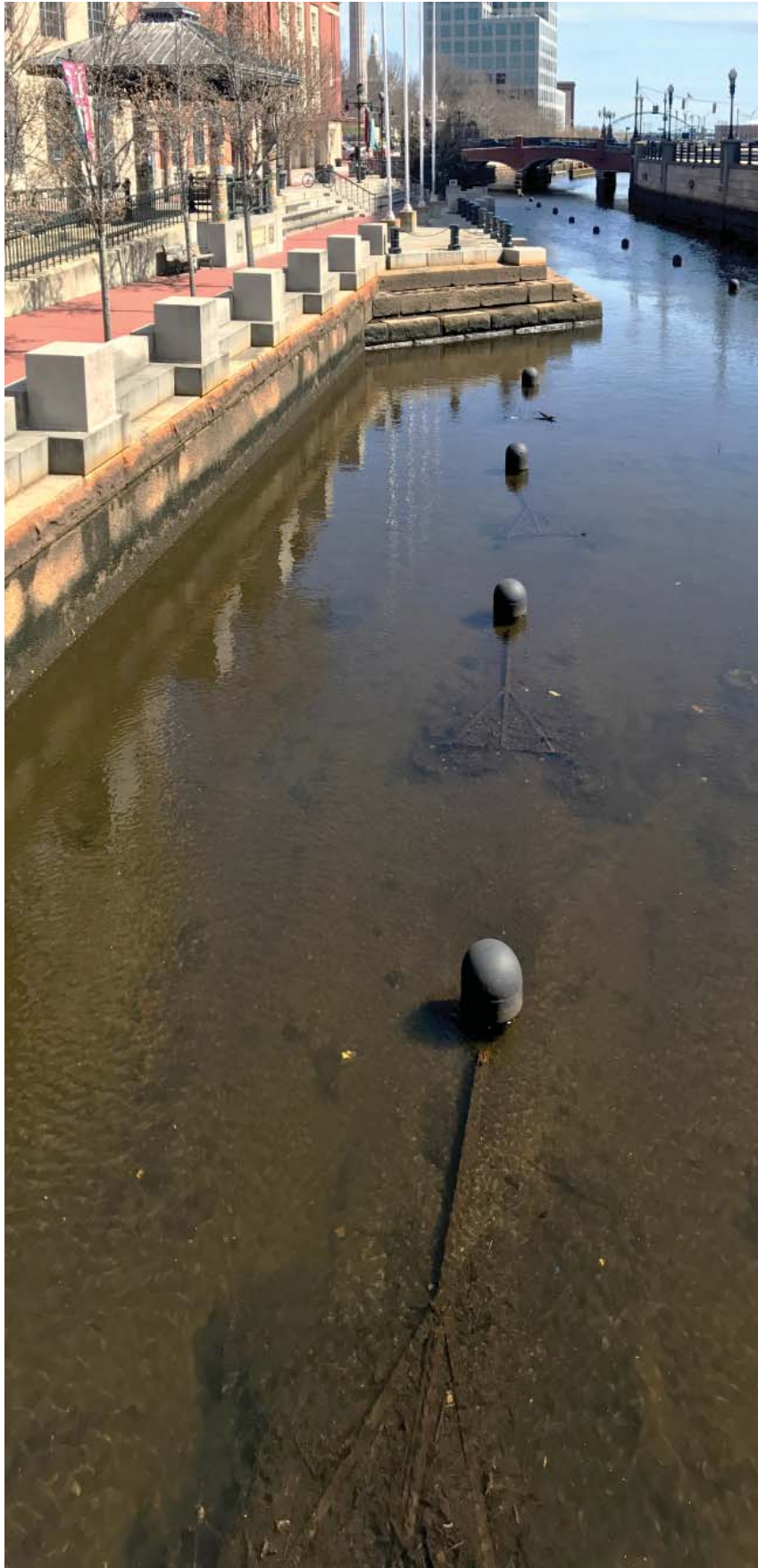
Site Analysis





Clockwise from top left: permeable edge, semi-permeable edge, hanging structure, edge that adjusts to tides



- hanging structure
- man-made semi-permeable
- edge adjust to tide
- permeable edge
- SITE





-  *RISD buildings at higher elevation*
-  *RISD buildings affected by SLR*

Sea Level Rise 2100

site documentation & analysis





Past Storm Surges

environmental analysis



HURRICANE SANDY 1938



HURRICANE CAROL 1954

Typologies of Resilient Ground Levels

JOHNSON & WALES CULINARY SCHOOL

SACRIFICIAL LEVEL

The Cuisinart Center for Culinary Excellence is located in Johnson & Wales' Harborside Campus in Providence. It is set in a coastal floodplain, which means there are state and federal regulations requiring the project to consider future storm surges.² Housing 30 classrooms, 11 specialty labs and 9 kitchens, this building is considered to be of high technology in the culinary world. With a part of the building sitting atop the landscape and the rest on "stilts", the first floor has been deemed a sacrificial level. The windows are designed to pop out in the case of a severe flood, keeping the building intact and safe.⁴



HAFENSTADT, HAMBURG

WATERPROOF BUNKER

This part of the city is water proof and has been made to withstand floods.



NESEALANDE, ROTTERDAM

FLOATING STRUCTURES

The land that was dug out in order to make this artificial pond was utilized as a barrier at its side to prevent coastal floods. By regulating the quality and presence of water, floating housing is a viable solution.





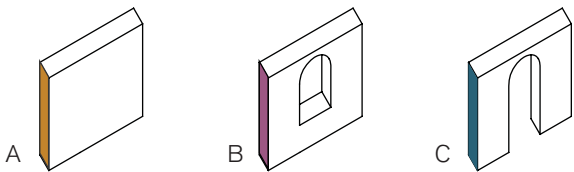
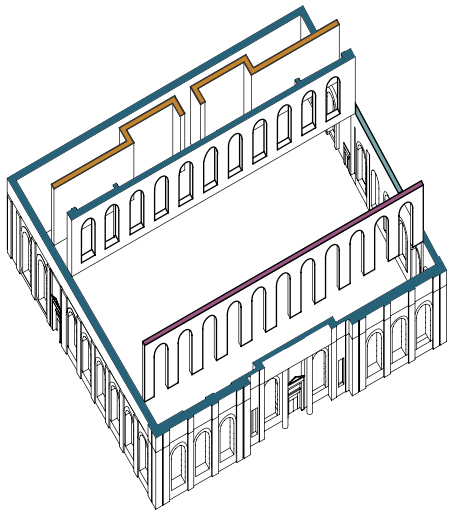
As water takes over roads and sidewalks there will be a shift from automotive circulation to pedestrian and water transportation. As a result, the affected areas will become slow-moving. Much like in Venice, as people walk the city at an average of 3mph they also get an enhanced and more detailed sensory impressions of their surroundings. Slowing down means being able to appreciate the fine details not only of the built environment but more importantly of the activities and the life within.³

“We are on our way, watching people and events, inspired to stop to look more closely or even stay or join in”

Jan Gehl, Cities for People

Crawford bridge 5mph restriction for water transit

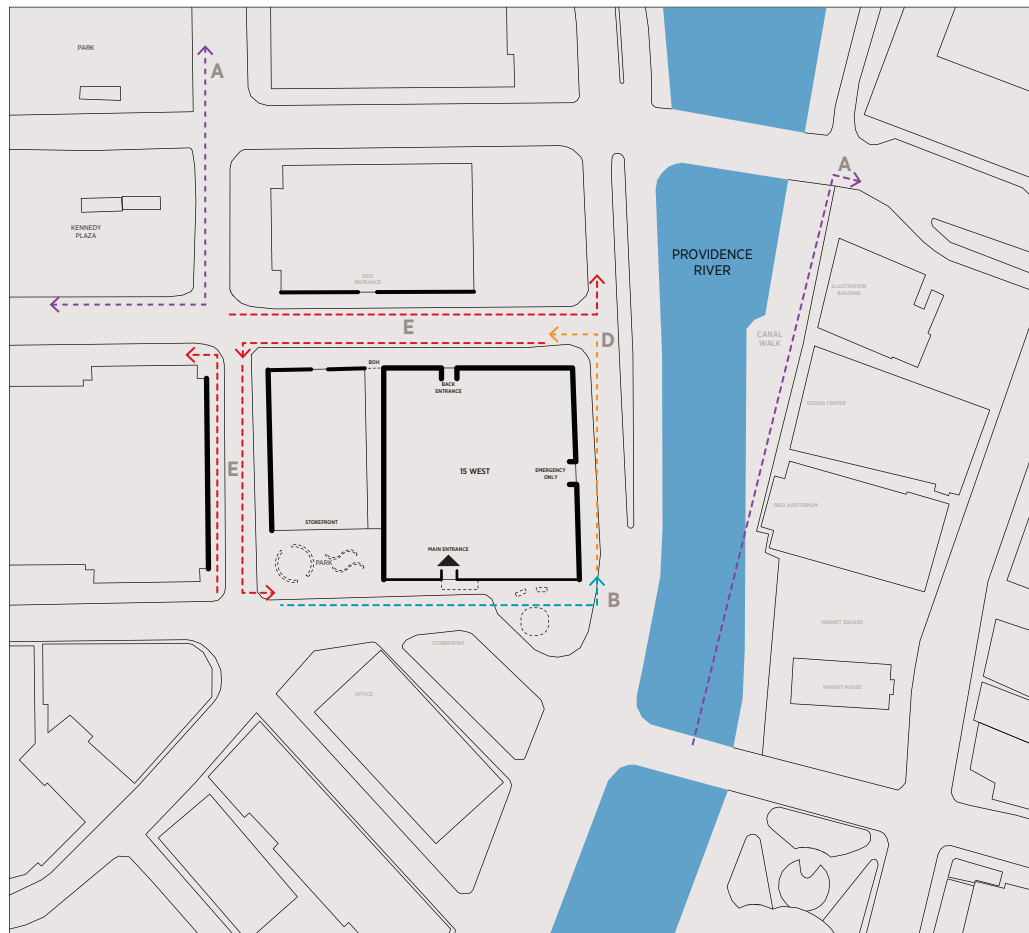
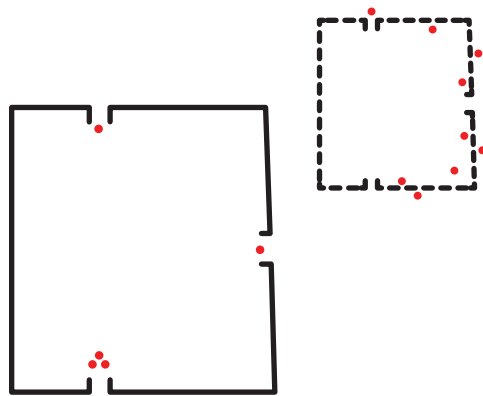
From fortress to social platform



FORT
PRIVATE
HARD EDGE
LIMIT

SOCIAL PLATFORM
OPEN
SOFT EDGE
CIRCULATION





Parameter developed for the city of Stockholm when analyzing the degree of activity at ground level Downtown³

A- ACTIVE

Small units, many doors
(15-20 doors per 100m/328ft)
Large variation in function
No blind and few passive units
Lots of character in facade relief
Primarily vertical facade articulation
Good details and materials

B-FRIENDLY

Relatively small units (10-14 doors per 100m/328ft)
Some variation in function
Few blind and passive units
Facade relief
Many details

C-MIXTURE

Large and small units (6-10 doors per 100m/328 feet)
Modest variation in function
Some blind and passive units
Modest facade relief
Few details

D-BORING

Large units, few doors (2-5 doors per 100m/328ft)
Almost no variation in function
Many blind or uninteresting units
Few or no detail

E-INACTIVE

Large units, few or no doors (0-2 doors per 100m/328ft)
No visible variation in function
Blind or passive units
Uniform facades, no details, nothing to look at

15 WESTMINSTER

site analysis



The building that is now known as 15 West was originally designed in 1917 by New York firm York & Sawyer as the Hospital Trust Building. It stands tall and elegant, and embodies what at the time was considered to be an exceptional Bank Building. Inspired by Italian palazzi of the High Renaissance, one can find components of this time and style which all contribute to the building's great presence.

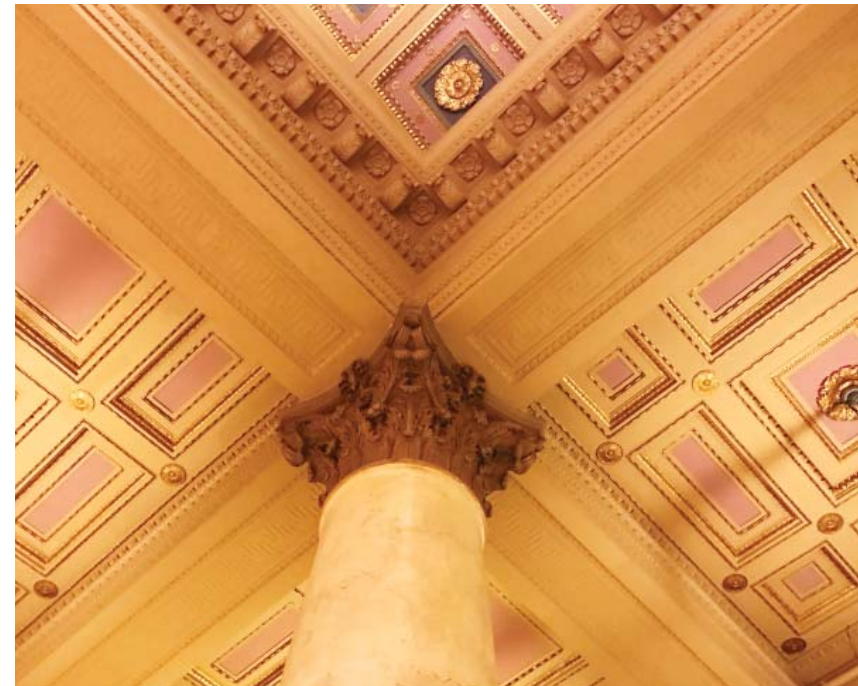


Ceilings

-one thinks, as perhaps York & Sawyer did, of the Palazzo Colonna in Rome -- or, because of its plan, even as a basilica of that period

Columns

colossal Corinthian columns of tawny marble on slightly raised octagonal bases

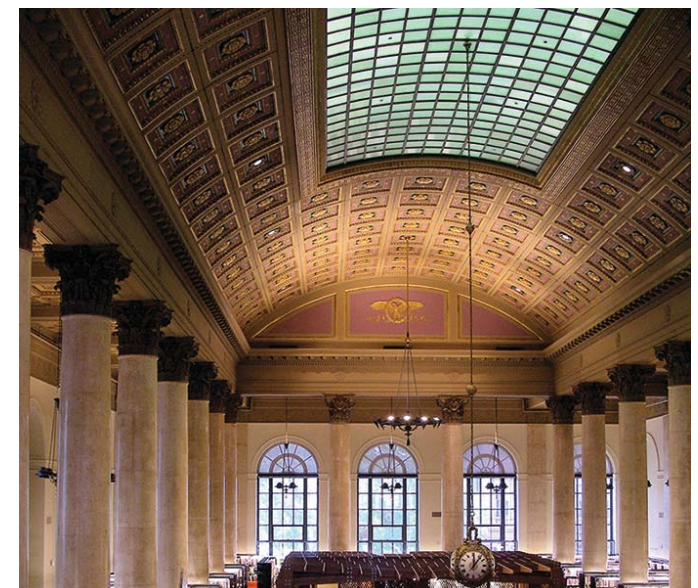
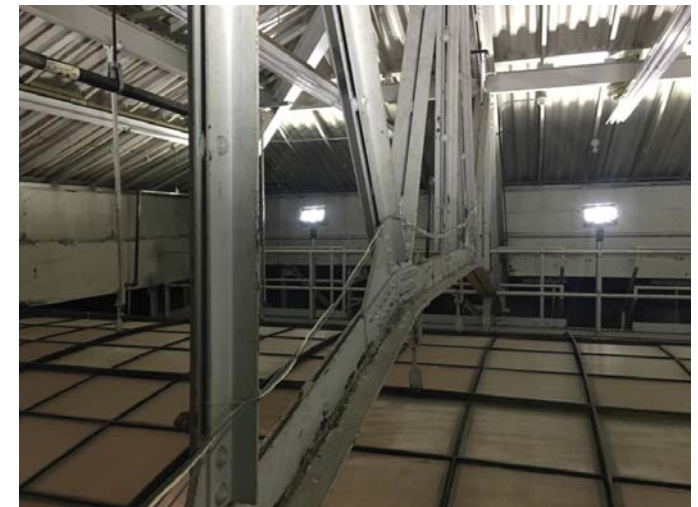
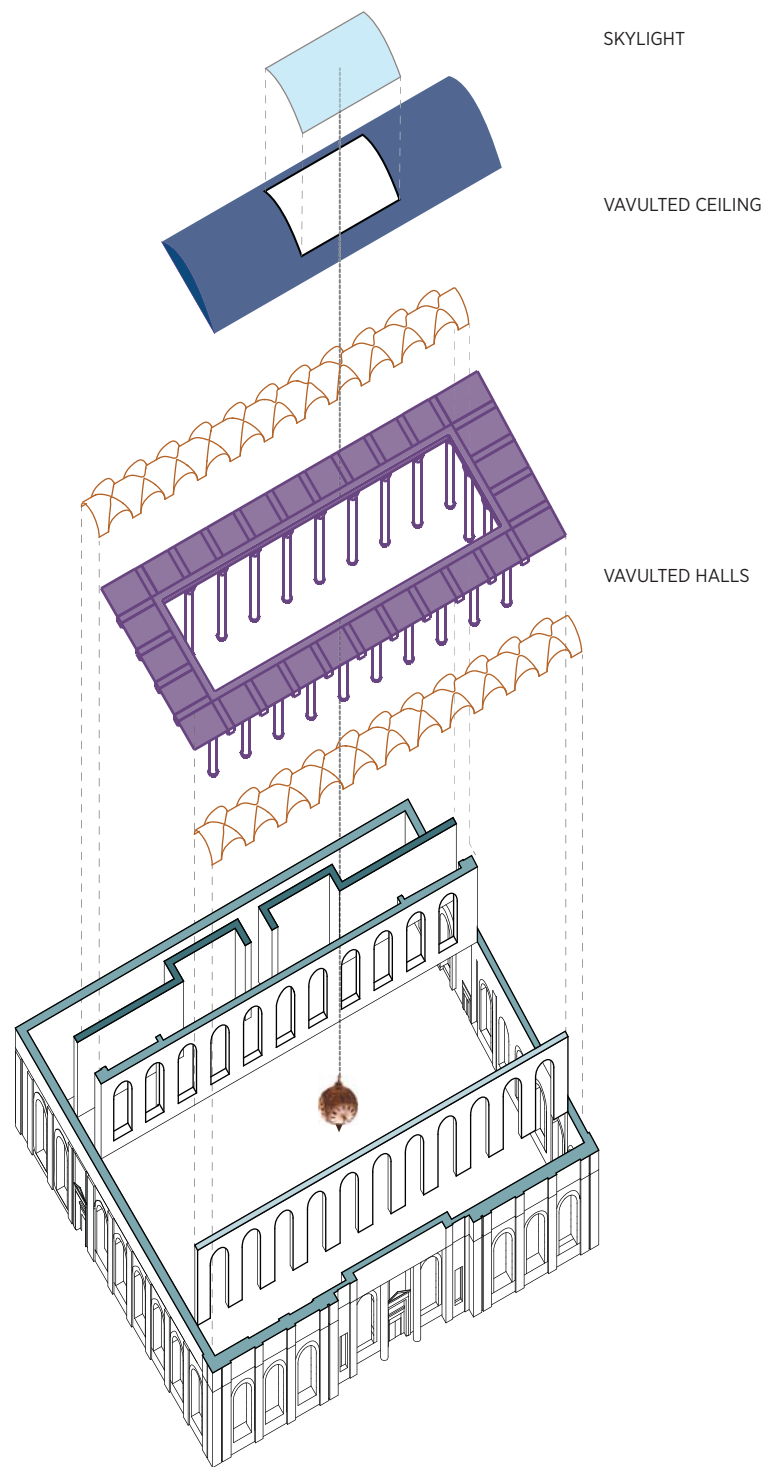


Structural

Characteristic modern structural methods were used in the construction of the Hospital Trust Building - these included pile pile foundations with steel and concrete footings driven many feet below the waterline of the Providence River; the so-called "fireproof construction of steel frame with stone facing; and an elaborate ventilating system

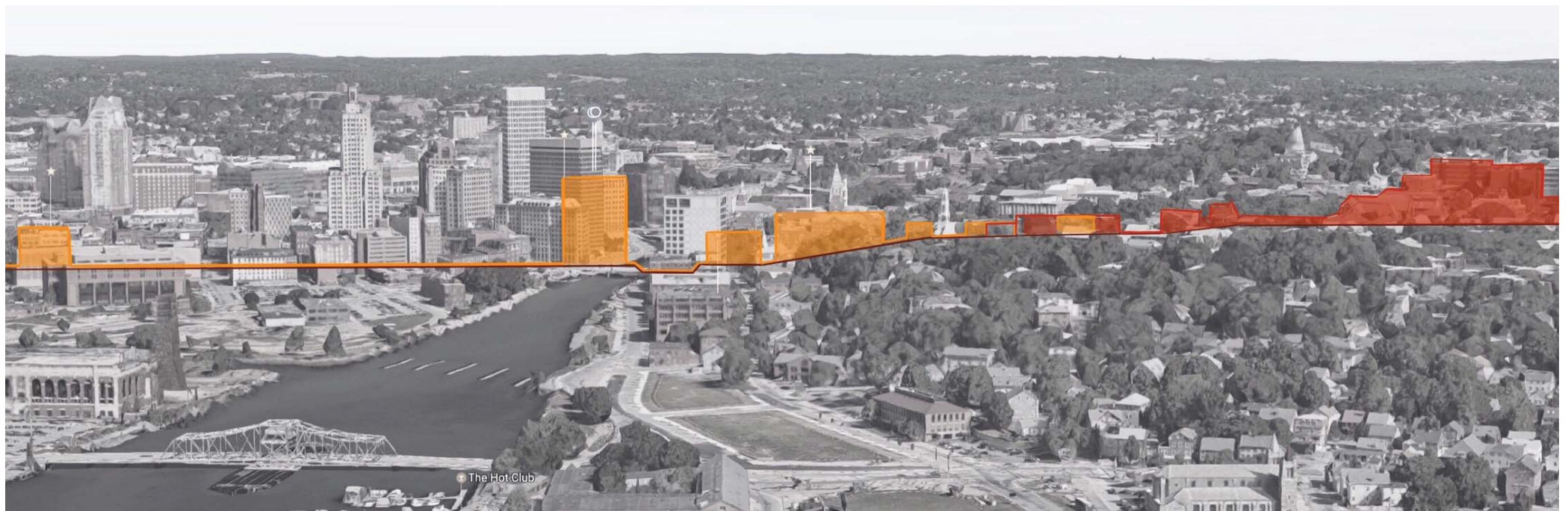
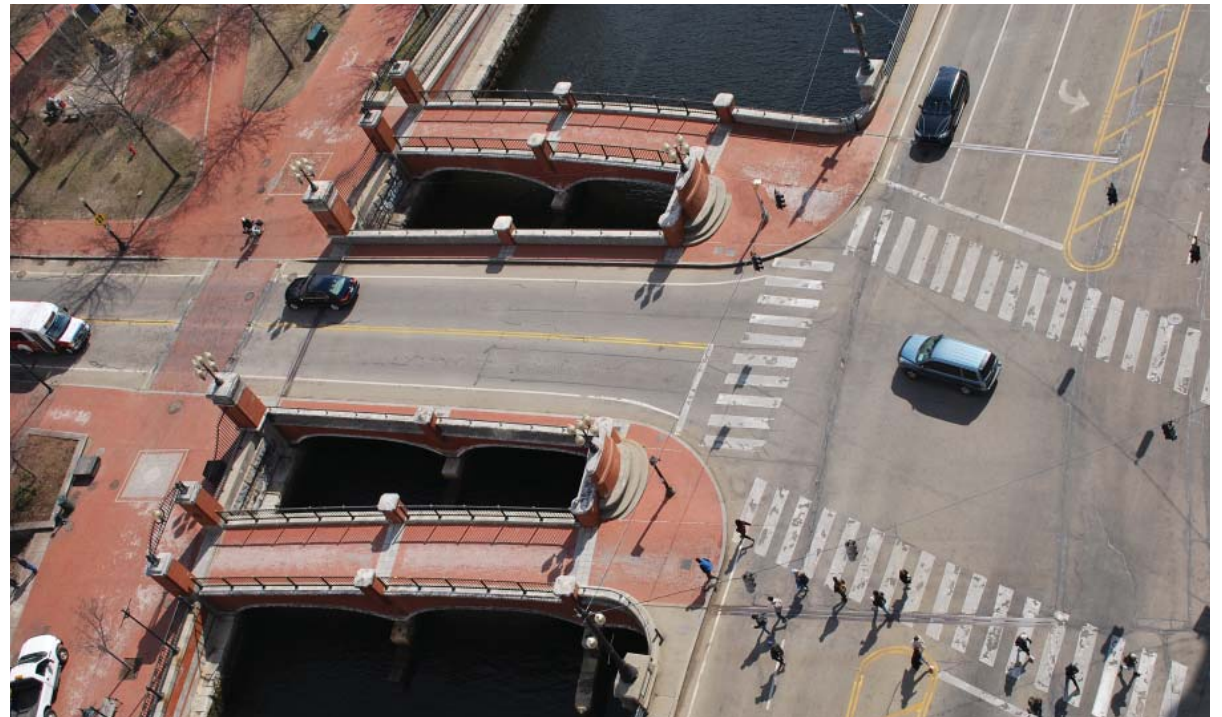
Nomination Form

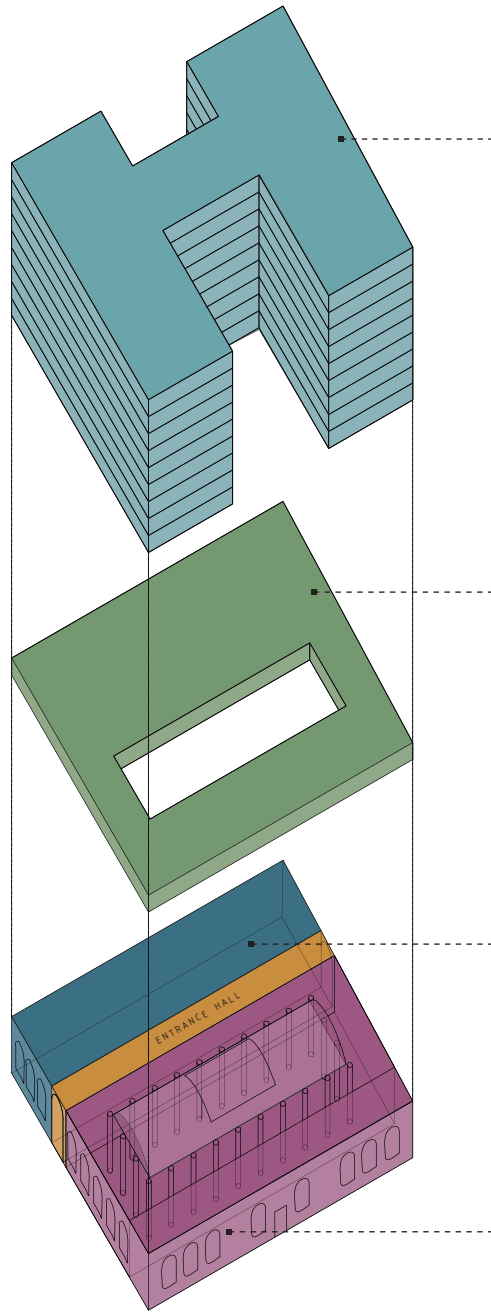
National Register of Historic Places



BETWEEN EAST & WEST

site analysis





15 West Residence Hall
- 500 students



Graham Visual Resource Center
Archives & Special Collectios



RISD Dinning
Portfolio Cafe

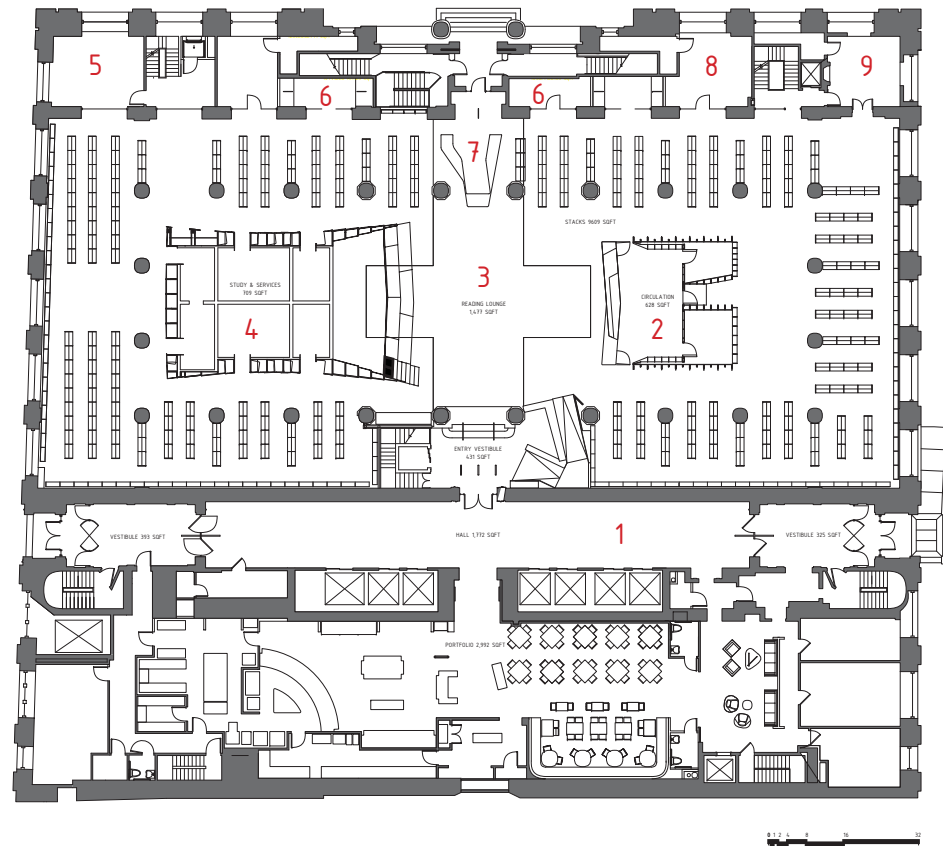
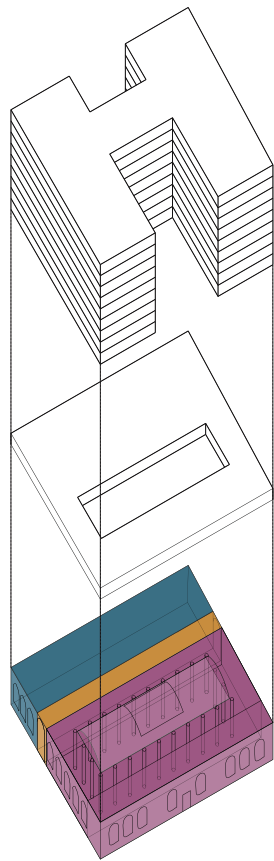


RIS's Fleet Library

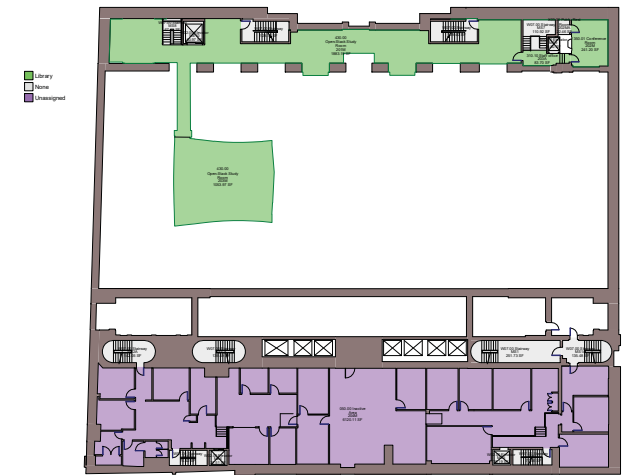
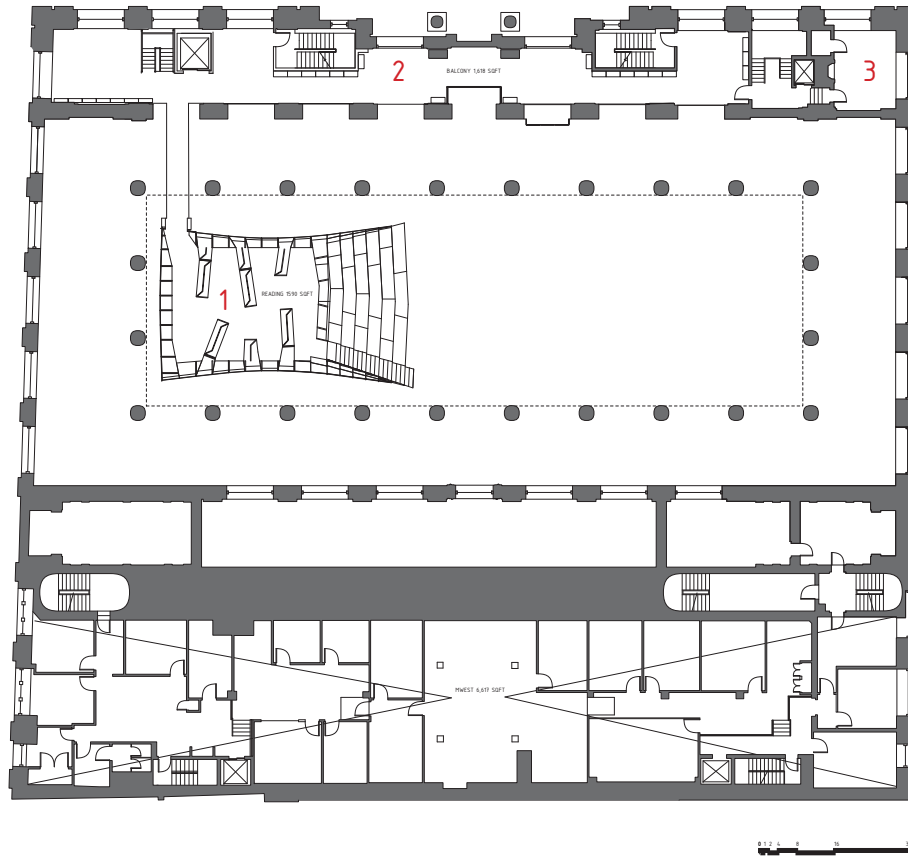
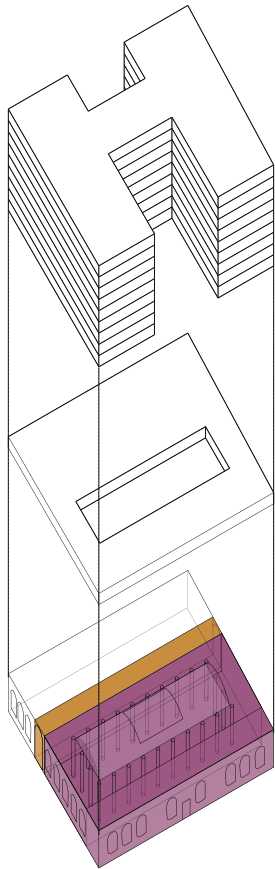
Gross Area - Gross Square Feet	
Level	Area
12th Floor	16,547.92 SF
11th Floor	23,051.33 SF
10th Floor	23,051.33 SF
9th Floor	23,381.51 SF
8th Floor	23,381.51 SF
7th Floor	23,381.51 SF
6th Floor	23,381.51 SF
5th Floor	23,381.51 SF
4th Floor	23,381.51 SF
3rd Floor	23,381.51 SF
2nd Floor	25,267.55 SF
Mezzanine	18,380.92 SF
1st Floor	31,372.88 SF
Basement	36,082.66 SF
	337,425.15 SF

Net Square Feet by Department	
Department	Area
Unassigned	13,648.82 SF
Residence Life	146,214.43 SF
Public Safety	130.57 SF
None	67,663.34 SF
Library	38,016.04 SF
Information Technology	1,125.58 SF
FAV	503.26 SF
Facilities	3,376.66 SF
Dining & Catering	5,434.29 SF
Academic Affairs	83.55 SF
	276,196.54 SF

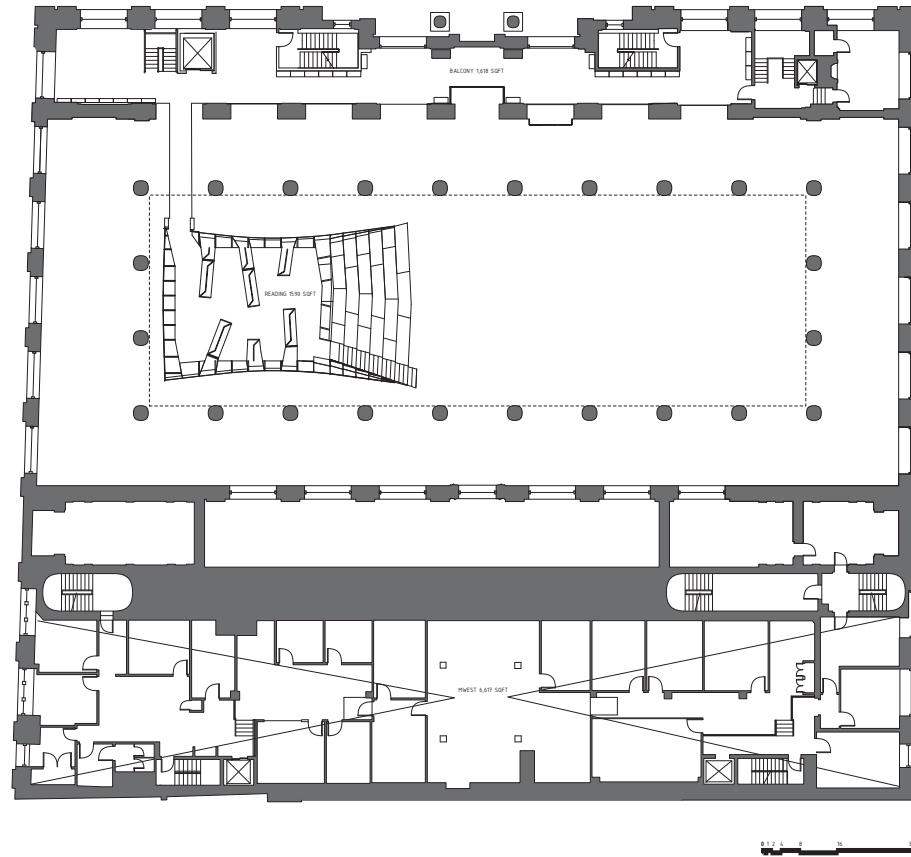
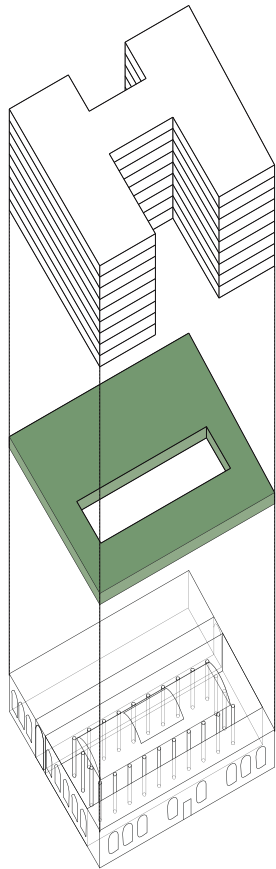
Net Assignable Square Feet by Department	
Department	Area
Unassigned	13,648.82 SF
Residence Life	146,214.43 SF
Public Safety	130.57 SF
Library	38,016.04 SF
Information Technology	1,125.58 SF
FAV	503.26 SF
Facilities	3,376.66 SF
Dining & Catering	5,434.29 SF
Academic Affairs	83.55 SF



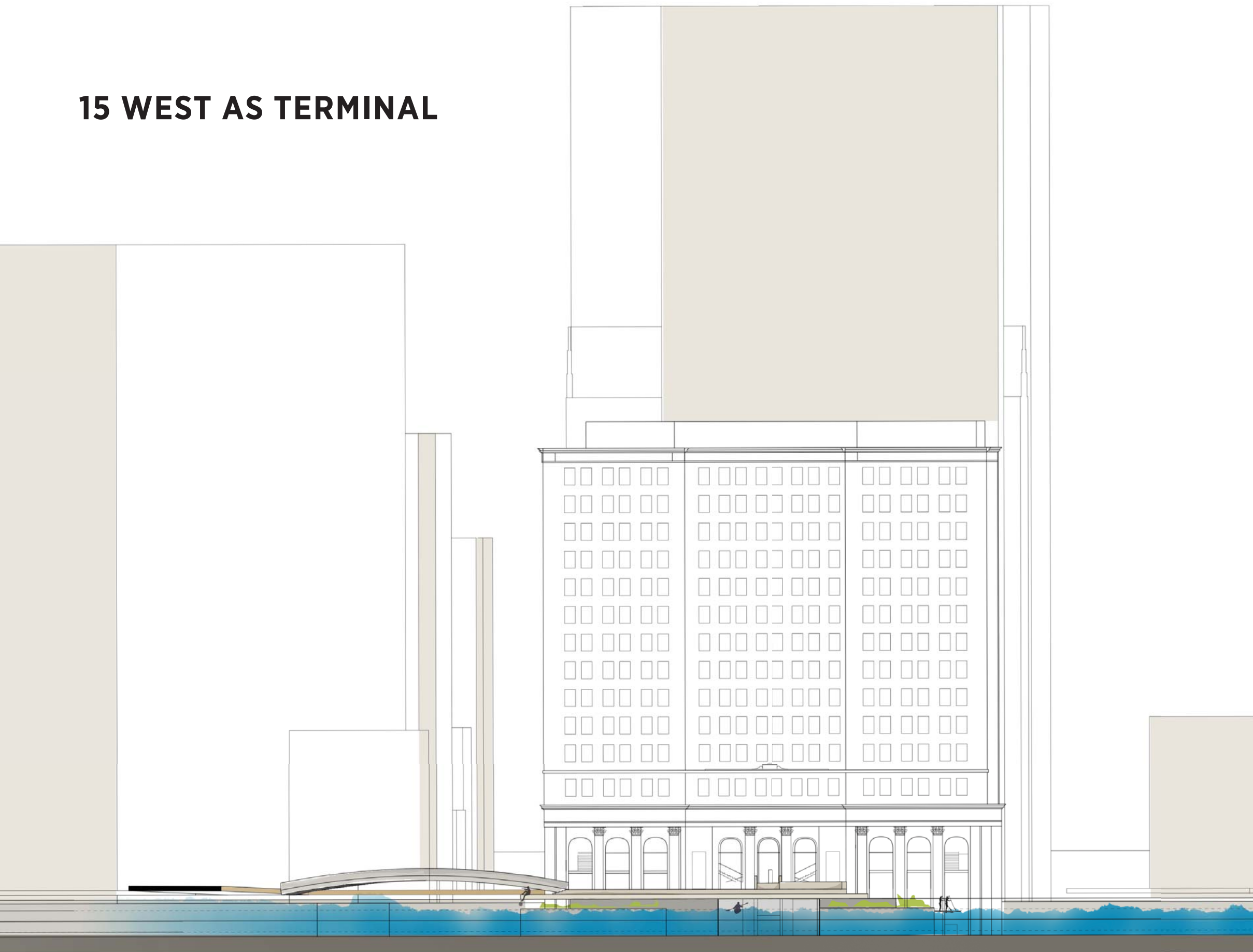
1. Esther Chester Entranceway
2. Circulation Center
3. "Living Room" + Beyond
4. Study Pavilion
5. Goldberg Classroom
6. Video Viewing Rooms
7. Reference desk
8. Macaulay Conference Room
9. Reeves Office

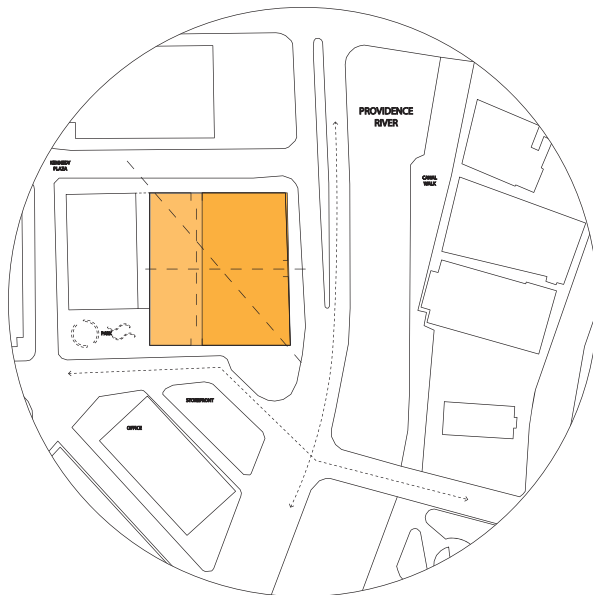
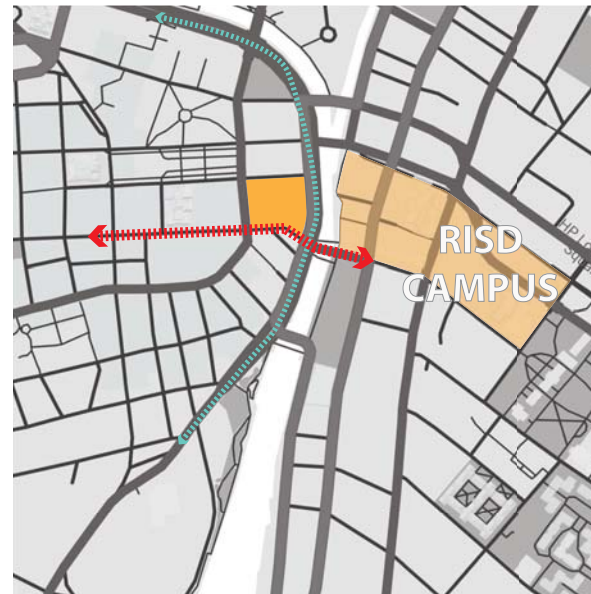


1. Van Beuren Periodicals Reading Balcony
2. Study Terrace/Bridge
3. Bierman Conference Room



15 WEST AS TERMINAL



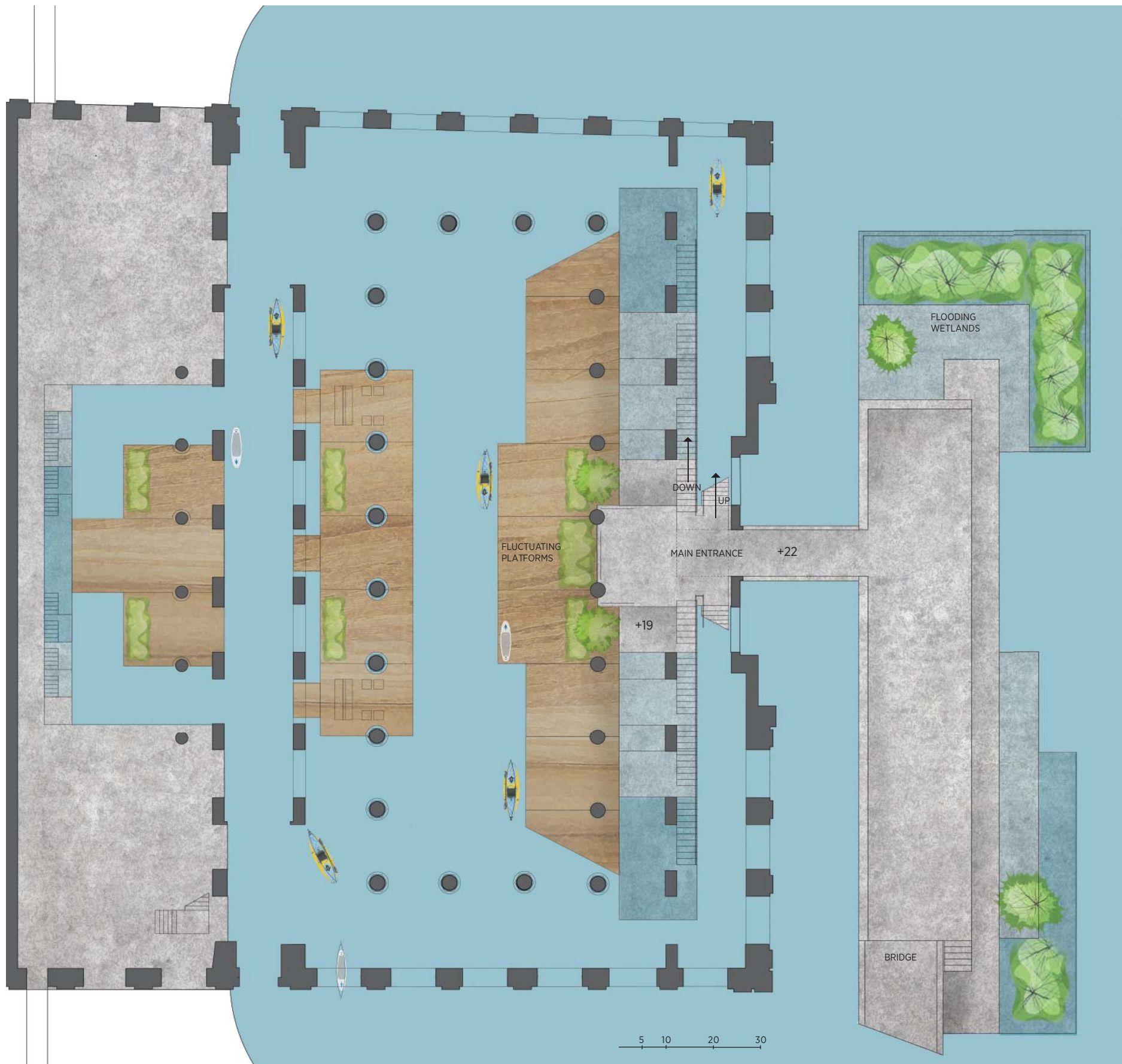




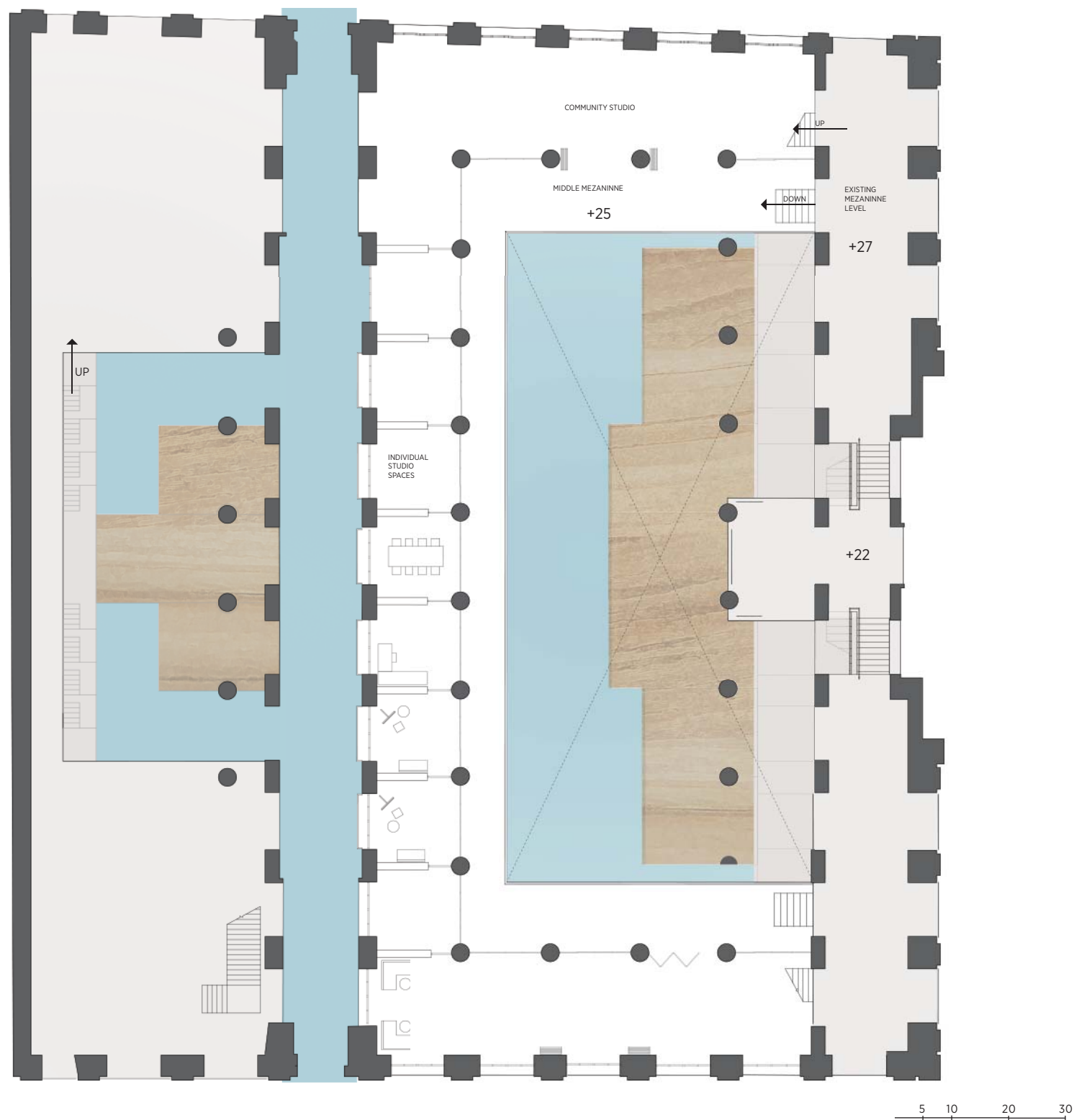
BUILDING AS FILTER DEVICE

A large amount of pollution from human activity ends up in our oceans. As the separation between land and water becomes ever more blurry with rising tides, this pollution will become more evident. By utilizing ECOconcrete, a material which has been designed for marine structures, one can encourage habitat growth even further.

Combining the use of this concrete with floating gardens, the building then becomes a filtering device.



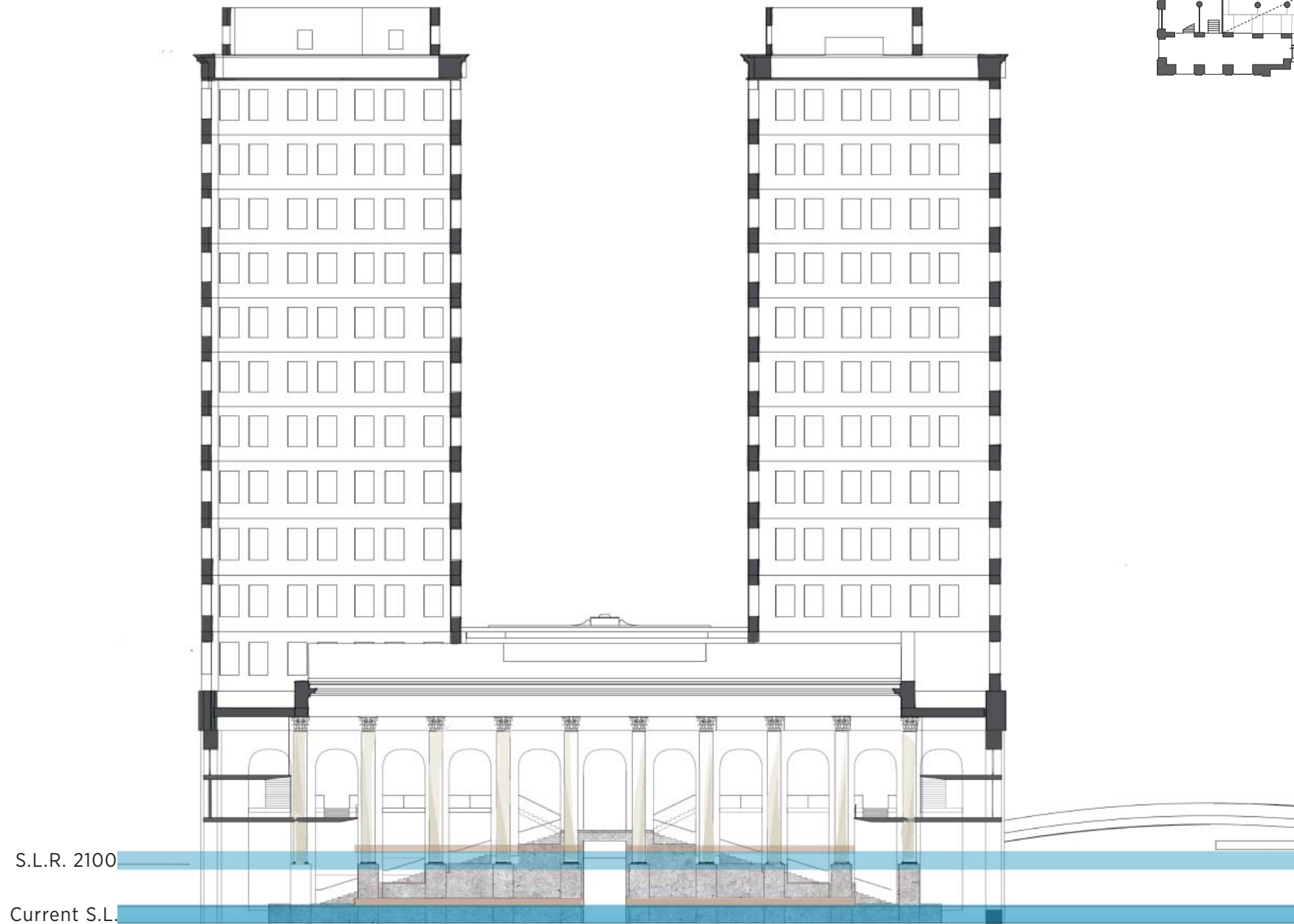
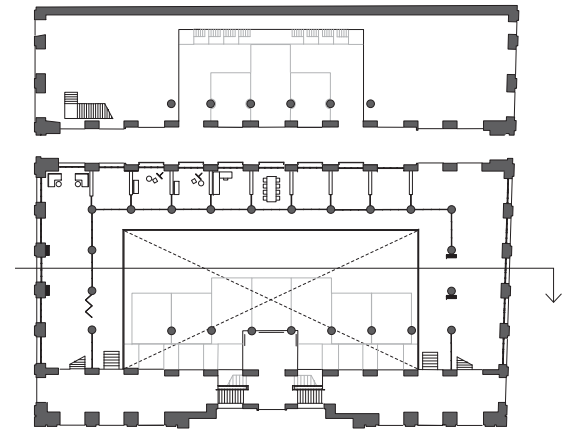
SEA LEVEL



FIRST MEZANINNE LEVEL
STUDIO SPACES



The Fleet Library is currently the largest and one of the only study areas outside of a student's department. However, the type of work that can be done is quite limited due to the scale, materials and context of the work which may not be suitable for a library. This new scheme contemplates flexible studio spaces which would allow students to elaborate an even wider array of work in this site.



MAIN STAIRCASE ELEVATION

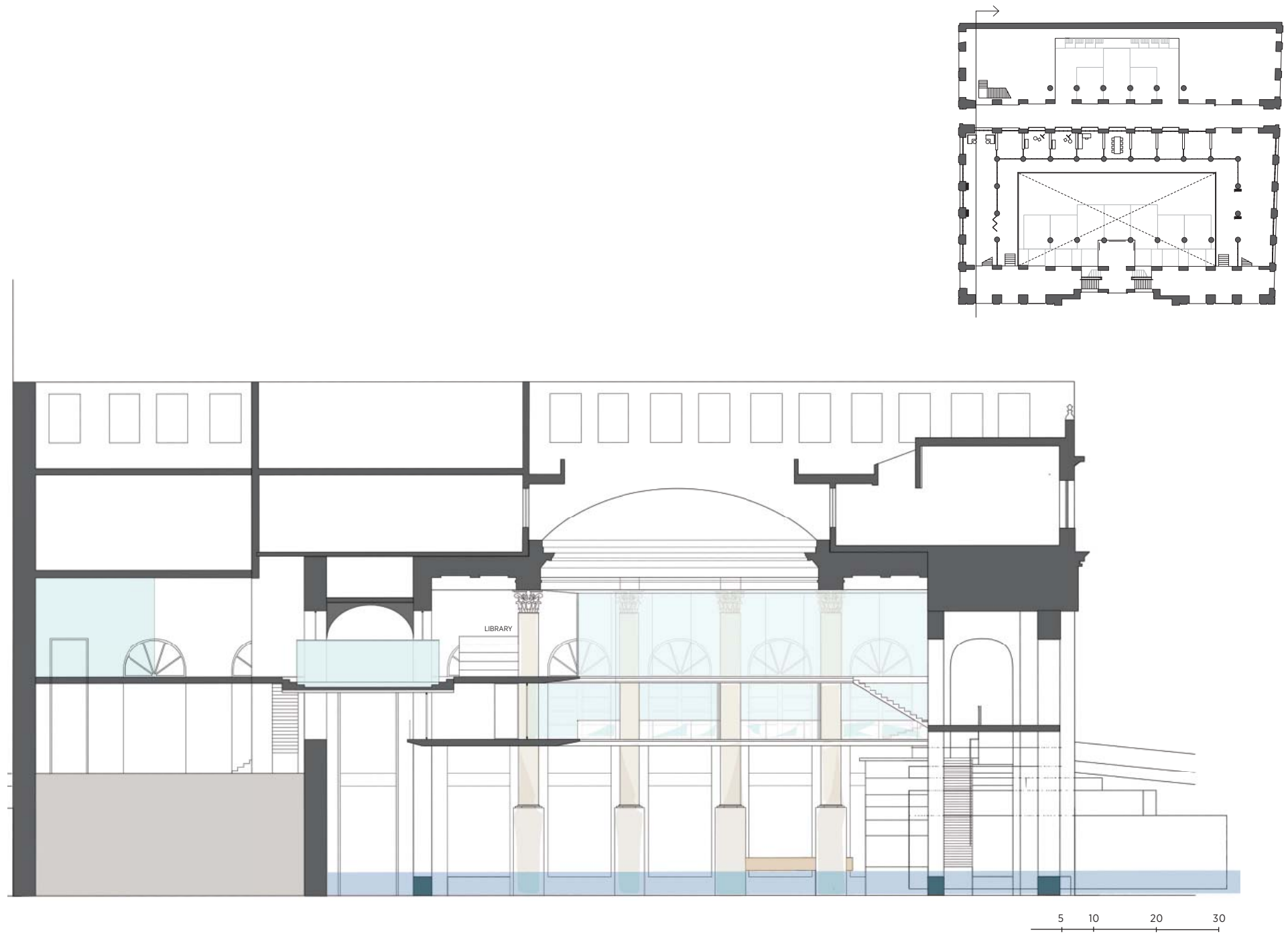
VERTICAL CIRCULATION



Left to right: Model picture of platform staircase, Canal Walk's steps that hide under fluctuating water level, existing staircases along Providence Canal



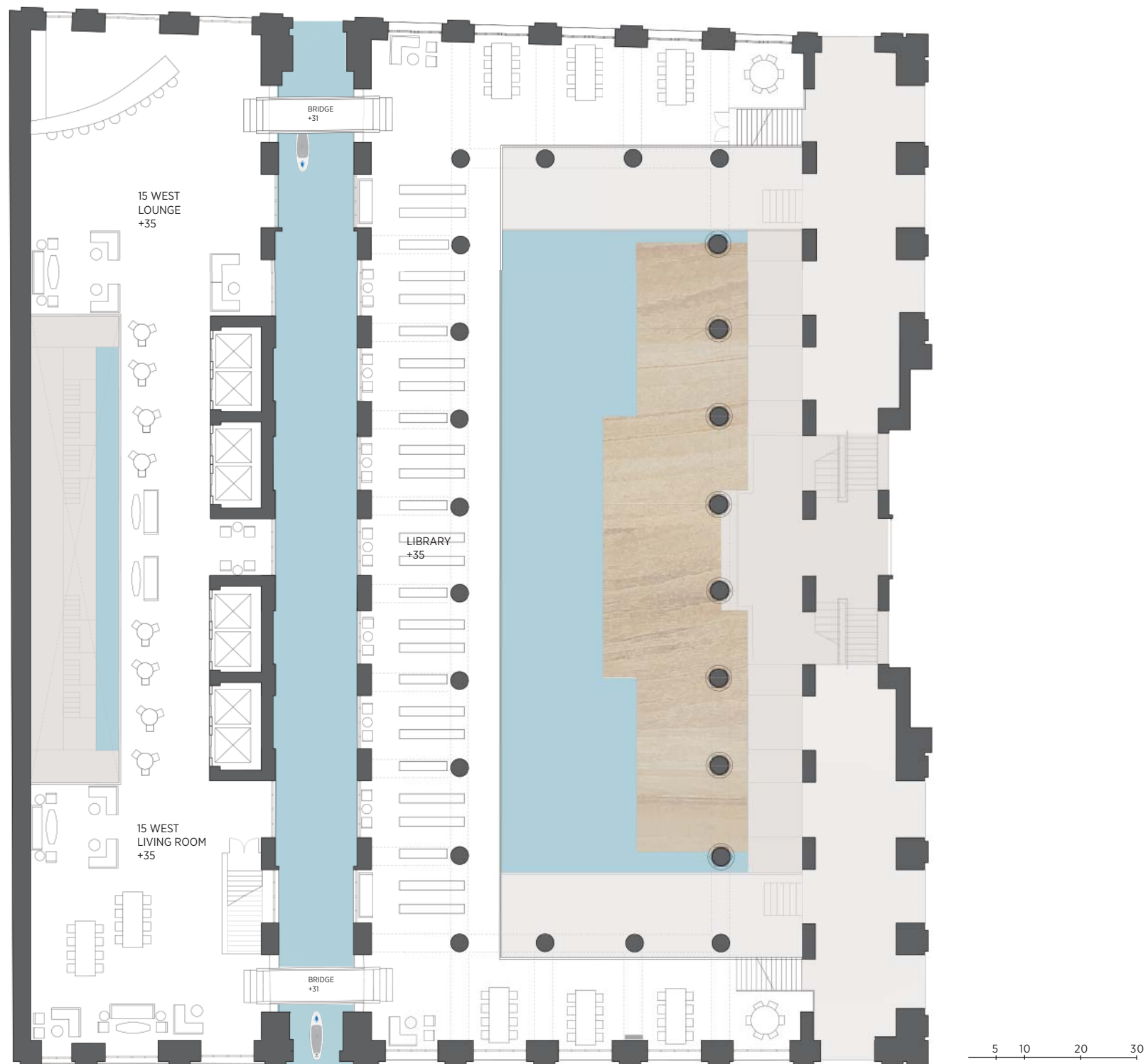
Double staircase allows for standard circulation and platforms where fluctuating water level can plug into



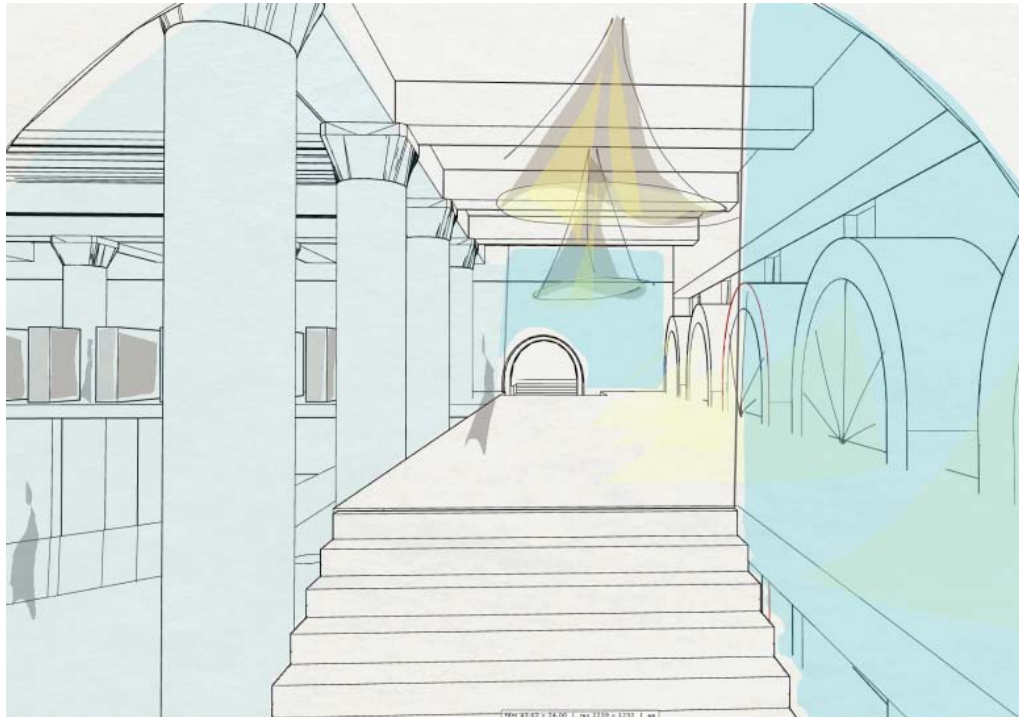
SECTION

Model picture depicting main hall and view
into the library/studio spaces





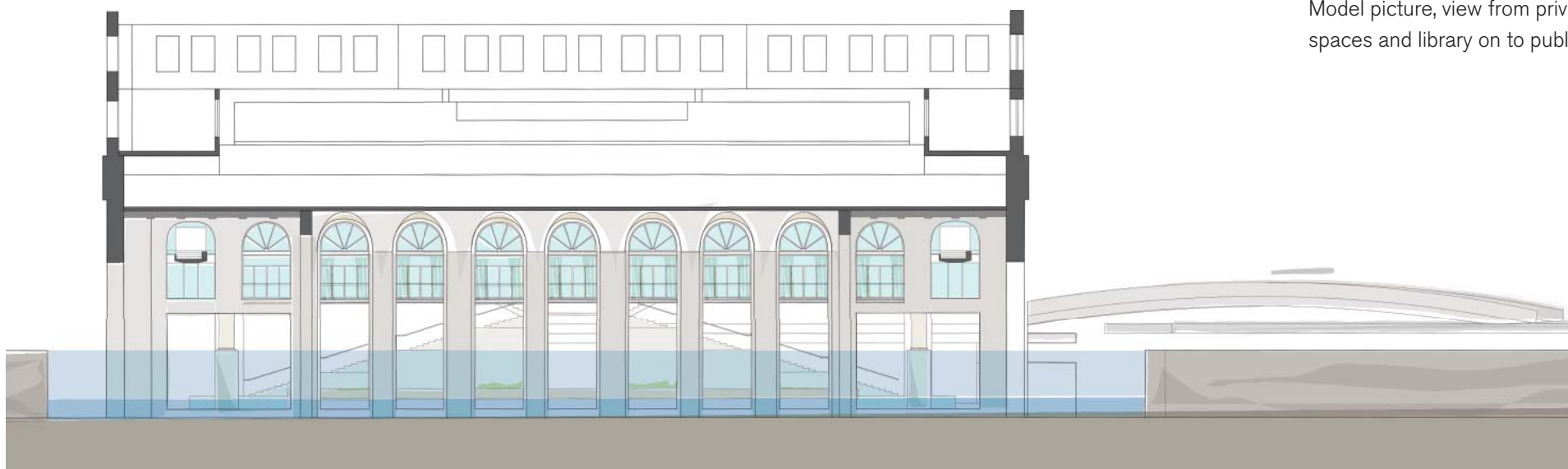
**SECOND MEZANINNE LEVEL
LIBRARY & LOUNGE**



Original sketches and model picture



Model picture, view from private studio spaces and library on to public path





"Series of murals painted on a few of the thousands of icebergs freshly broken off from a nearby glacier. In the short time I was there, I witnessed the extreme melting rate first hand as the sound of ice cracking was a constant background noise while painting. Within a few weeks these murals will be forever gone, but for those who find them, I hope they ignite a sense of urgency, as they represent the millions of people in need of our help who are already being affected from the rising sea levels of Climate Change."

Sean Yoro

Sean Yoro is a muralist whose pieces are done in relation to water. He uses his paddle board not only as his transportation but it becomes an extension of his expression.¹⁷





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HOSPITAL TRUST BANK BUILDING



RISD FLEET LIBRARY

"Throughout history, art has made a valuable quality contribution to city space monuments, sculpture fountains, buildings details and decor. Art communicates beauty, monumentality remembrance of important events, comments on life in society, fellow inhabitants and city life together with surprises and humor. Now as ever, city space can serve an important function as an interface between art and people."

William H. Whyte

ENVIRONMENTAL

1. Sasaki & Boston Harbor Association, Preparing for the Rising Tide Series, Volume 2 August 2014

Sasaki in collaboration with BHA presents this report of twelve case studies on the matter of projects dealing with rising tides. The projects reviewed range in scale and in approach.

2. Watson, Donald / Adams, Michele. Design for Flooding : Architecture, Landscape, and Urban Design for Resilience to Climate Change. USA 2011

A complete guide of how to design for floods, includes fundamentals, best practices, construction, air/ocean.

SOCIAL / URBAN PLANNING

3. Jan Gehl, Cities for People. Washington, DC: Island Press , 2010

A guide to understand how we utilize public spaces in cities and how they can be improved upon for a better quality of life of the public.

4. William H. Whyte, The Social Life of Small Urban Spaces. Washington, DC. The Conservation Foundation 1980

A guide on social life in public spaces and what factors to be taken into account that affect it.

SITE

5. Rhode Island School of Design, Fleet Library at RISD <https://library.risd.edu/pdfs/fleetlibraryrisd.pdf>

Document indicating highlights of Fleet Library

6. National Register of Historic Places Inventory - Nomination Form. #10-300 Rev 10.74

Nomination form to enter 15 West in the National Register of Historic Places containing survey and description.

- 6.1 Alison Silver, RISD library fuses modern style with old architecture <http://www.browndailyherald.com/2013/02/12/risd-library-fuses-modern-style-with-old-architecture/>

PRECEDENTS

7. “Cheonggyecheon Stream Restoration Project”, Landscape Architecture Foundation
<http://landscapeperformance.org/case-study-briefs/cheonggyecheon-stream-restoration>

An article depicting environmental, social and economic data regarding the restoration of Cheonggyecheon Stream

8. Castro, Fernanda. In Progress: Louvre Abu Dhabi/Jean Nouvel
<http://https://archdaily.com/793182/in-progress-louvre-abu-dhabi-jean-nouvel>

An overview of Jean Nouvel’s Louve Abu Dhabi and his use of water as a material and tool of cultural relevance.

9. After the Putti, the Baby Calamari, Larry Rohter - <http://www.nytimes.com/2010/01/29/arts/29museumfood.html>

New York Times article depicting design and the experience of Robert at the Museum of Art and Design.

10. The Wright Restaurant Opens in Guggenheim Museum, Nicholas Tamarin - <http://www.interiordesign.net/projects/9311-the-wright-restaurant-opens-in-guggenheim-museum/>

Images and description of The Wright restaurant in the Guggenheim.

11. Carlos Zeballos, Garden of Fine Arts - Tadao Ando <http://architecturalmoleskine.blogspot.com/2010/01/tadao-ando-garden-of-fine-arts.html>

An architectural journal on Tadao Ando's Garden of Fine Arts with a general overview of the project and description of water's role in this outdoor gallery.

12. James Carpenter Design Associates www.jcdainc.com/projects/ice-falls

An overview of Ice Falls project, where glass bricks are utilized to reflect light into an otherwise dark entrance lobby and enhance threshold experience.

13. nArchitects <http://narchitects.com/work/momap-s-1-canopy-3/>

nArchitects' overview of Canopy at PS1, a bamboo installation that has four environments which utilize water in different ways to create humidity and temperature variation.

14. Luis Eduardo Guísar Benítez, Stunning Green Atrium Brings it All Together <https://landarchs.com/stunning-green-atrium-brings-it-all-together/>

Description of the Green Atrium project which consists of a semi-private common waiting area, it presents a harmonious play between water, daylight and plants within the building.

15. Ira Keller Fountain Park
https://en.wikiarquitectura.com/index.php/Ira_Keller_Fountain_Park

An overview of Ira Keller Fountain Park, a project that enables visitors to interact with water in multiple ways while experiencing it from diverse levels.

16. Paley Park <https://www.pps.org/places/squares-parks/paley-park/>

17. <http://byhula.com/>
Pictures and story about Sean Yoro, artist and paddle boarder

IMAGES

Unless otherwise noted, photos are the work of the author

1. Adobe Photo Stock file # 72435326
2. National Geographic, photograph by Magdalena Biskup
3. Adobe Photo Stock file # 106799028
4. <https://www.dreamstime.com/photos-images/basilica-cistern-interior-istanbul.html>
5. Louvreabudhabi.ae
6. <https://hellokyoto.wordpress.com/2013/01/27/saluting-mr-ando-tadao-2/>
7. <https://www.pps.org/blog/category/blog-categories/great-public-spaces-blog/>
8. http://classconnection.s3.amazonaws.com/371/flashcards/812371/jpg/paley_park_21321226295129.jpg
9. <http://www.moderndesign.org/2012/02/harry-bertoia-side-chair-at-paley-park.html>
10. <https://architecturalheritagecenter.z2systems.com/np/clients/architecturalheritagecenter/event.jsp?event=1612>
11. <https://tclf.org/sites/default/files/microsites/halprinlegacy/ira-keller-forecourt-fountain.html>
12. <https://shinni101.wordpress.com/2015/01/05/kik-the-cheonggyecheon-stream-%EC%B2%AD%EA%B3%84%EC%B2%9C/>
13. https://www.tripadvisor.com/LocationPhotoDirectLink-g294197-d1046419-i224023545-Cheonggyecheon_Stream-Seoul.html
14. <http://www.scapestudio.com/projects/living-breakwaters-competition/>
15. http://www.shorpy.com/node/9239?size=_original
16. <http://sos.ri.gov/virtualarchives/items/show/202>
17. <http://www.epodunk.com/cgi-bin/genealogyInfo.php?locIndex=13448>
18. <https://www.providenceri.com/photogallery/set/72157629863724500>
19. <http://www.smithhill.ducstudio.com/img/tour/RHiX17459.jpg>
20. Taken at flood memorial next to 15 West
21. https://en.wikipedia.org/wiki/1938_New_England_hurricane
22. <https://storify.com/DigitalFirst/the-worst-northeastern-u-s-hurricanes>
23. <https://www.jwu.edu/content.aspx?id=52585>
24. <http://www.hafencity.com/de/ueberblick/die-geschichte-des-ortes.html>
25. <http://palmbout.nl/projecten/>