A Renewed Water Infrastructure

Integration Design of Infrastructure with Architecture

Xiangqian Feng 4602528

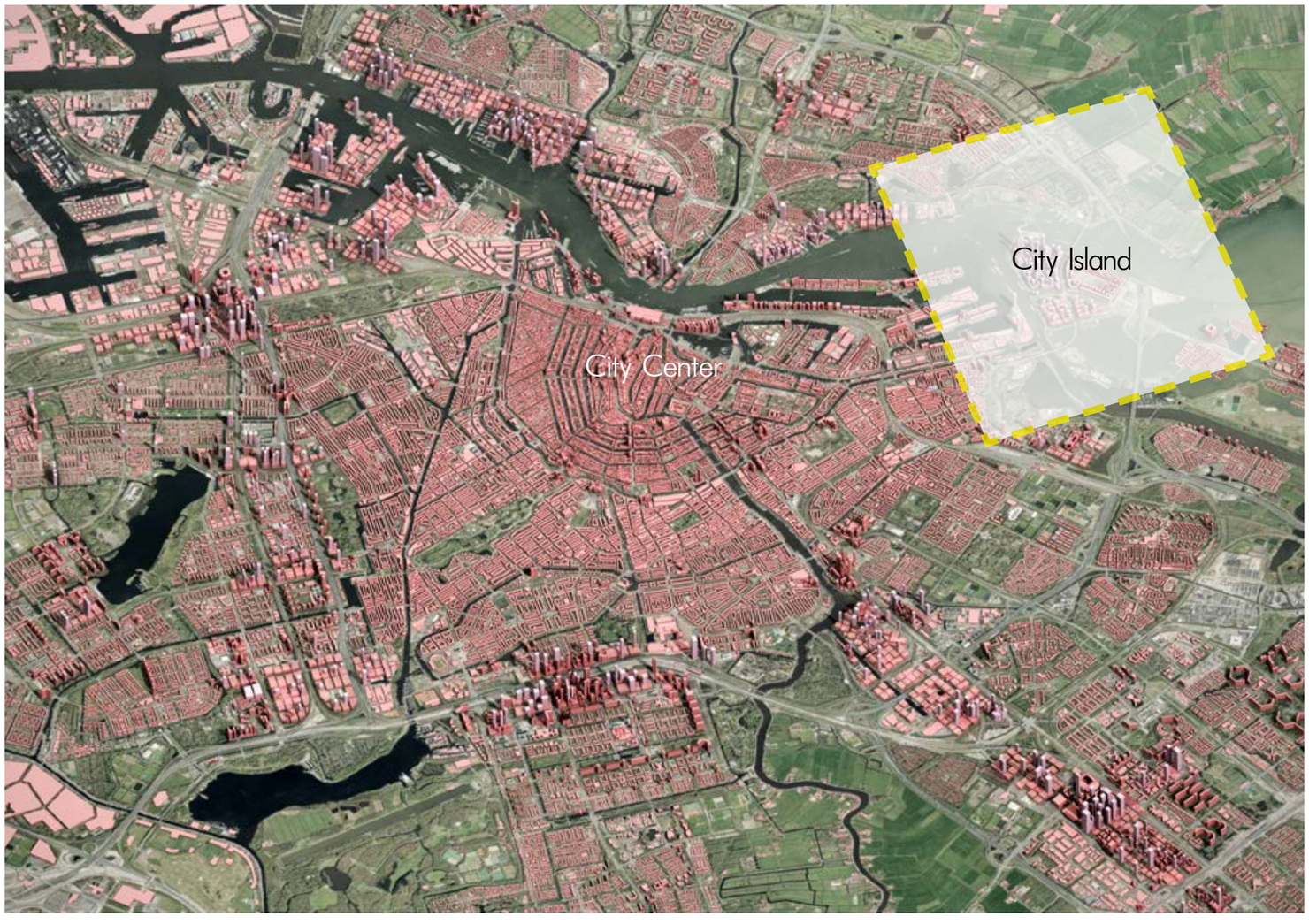
CP

Introduction

Research (Hard and Soft)

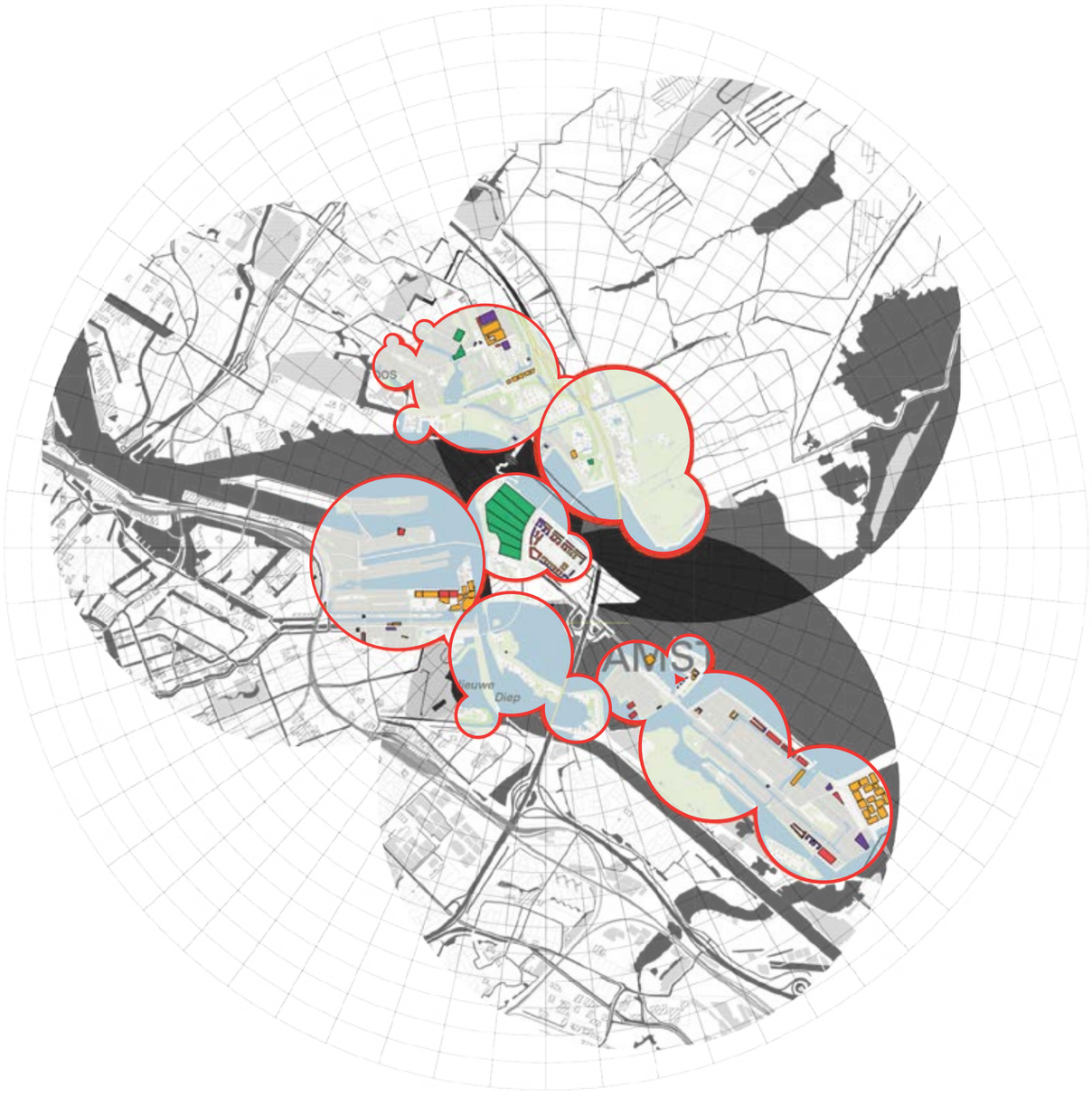
Space (Typology)

Design Proposal

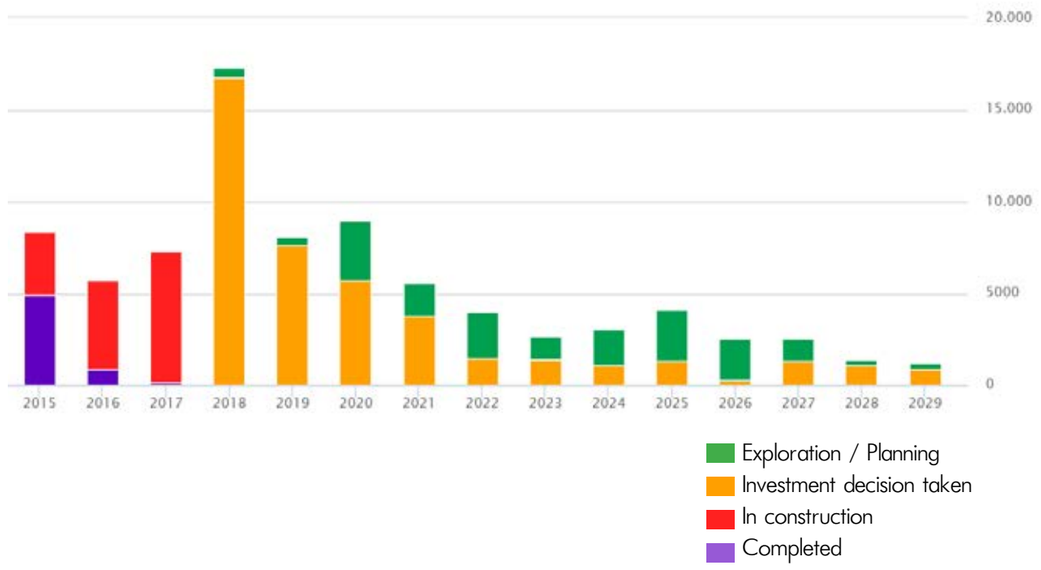


Amsterdam


Amsterdam-noord
city center
IJ burg



2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
0	0	0	538	500	3274	1814	2504	1235	2000	2775	2200	1200	329	329
0	0	0	16737	7586	5692	3747	1476	1411	1068	1323	296	1315	1064	861
3475	4847	7115	0	0	0	0	0	0	0	0	0	0	0	0
4893	855	149	0	0	0	0	0	0	0	0	0	0	0	0
8368	**5702**	**7264**	**17275**	**8086**	**8966**	**5561**	**3980**	**2646**	**3068**	**4098**	**2496**	**2515**	**1393**	**1190**



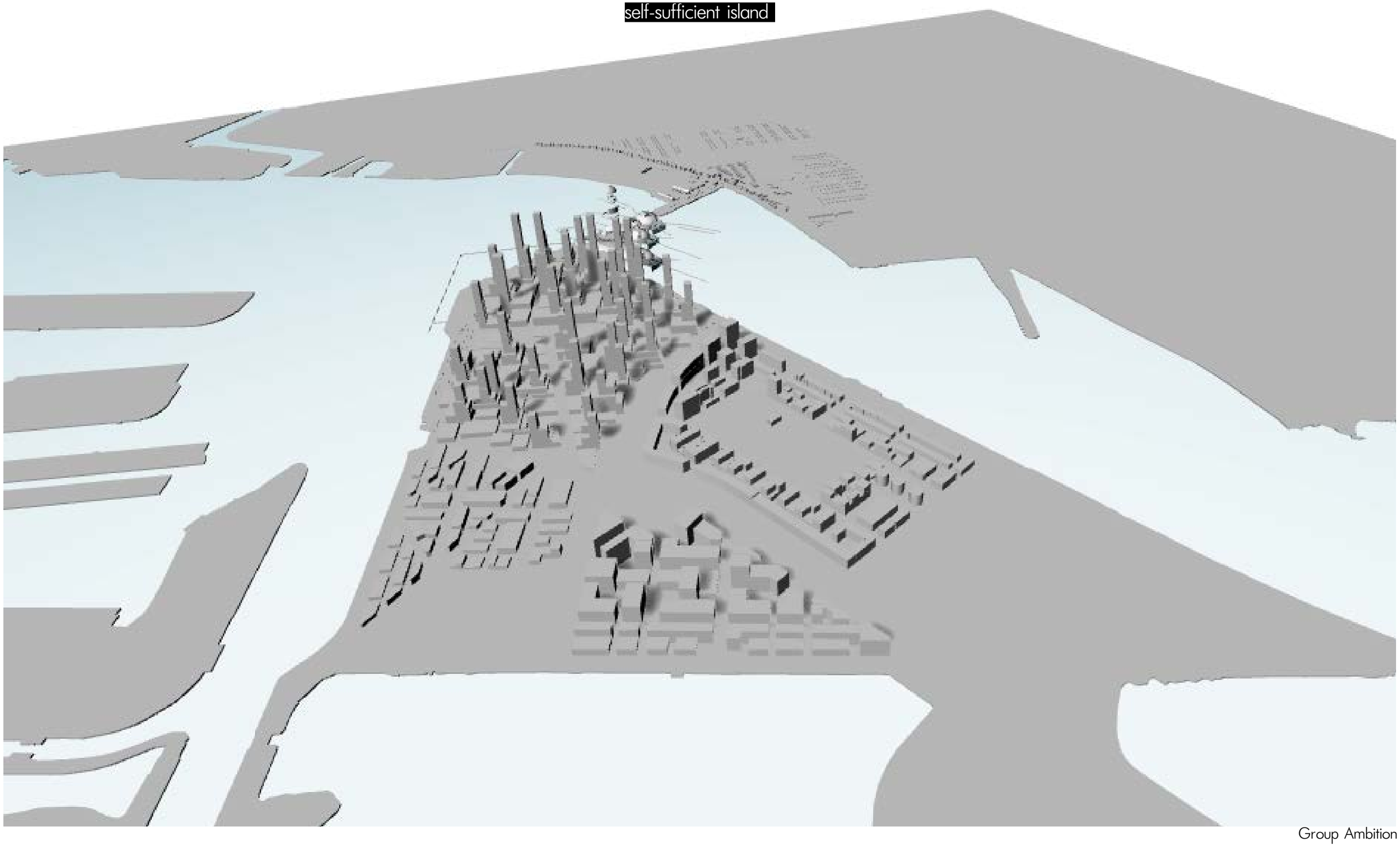
Housing plans, source: city of Amsterdam

	Zeeburgereiland	Schellingwoude	Eastern Docklands	IJ Burg (exclude zeeburgerisland)
NOW	≈2178	≈1800	≈17000	≈22000
2050	+5500	almost stay	grow slightly	grow slightly

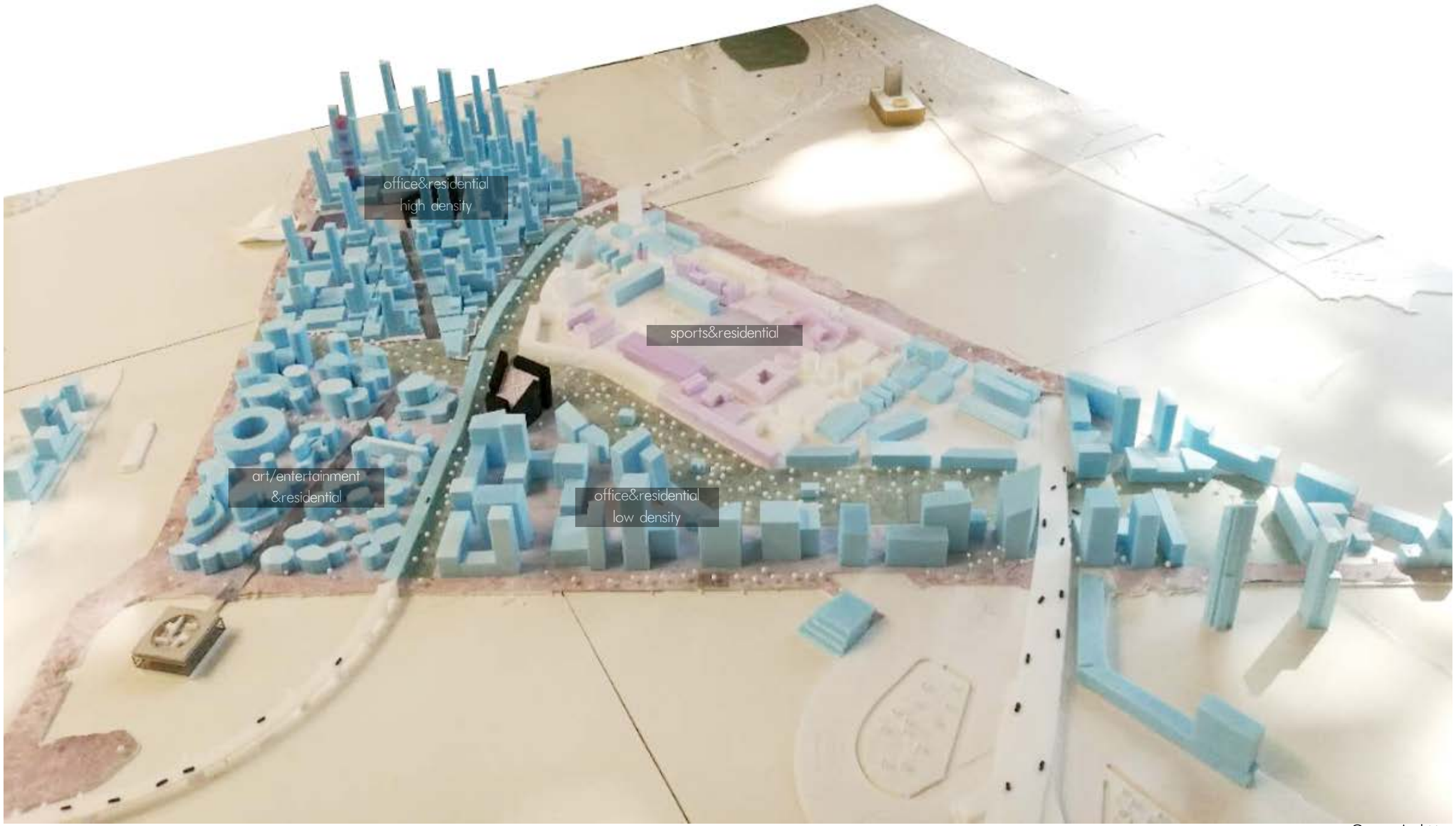
source: wikipedia, city of Amsterdam

center

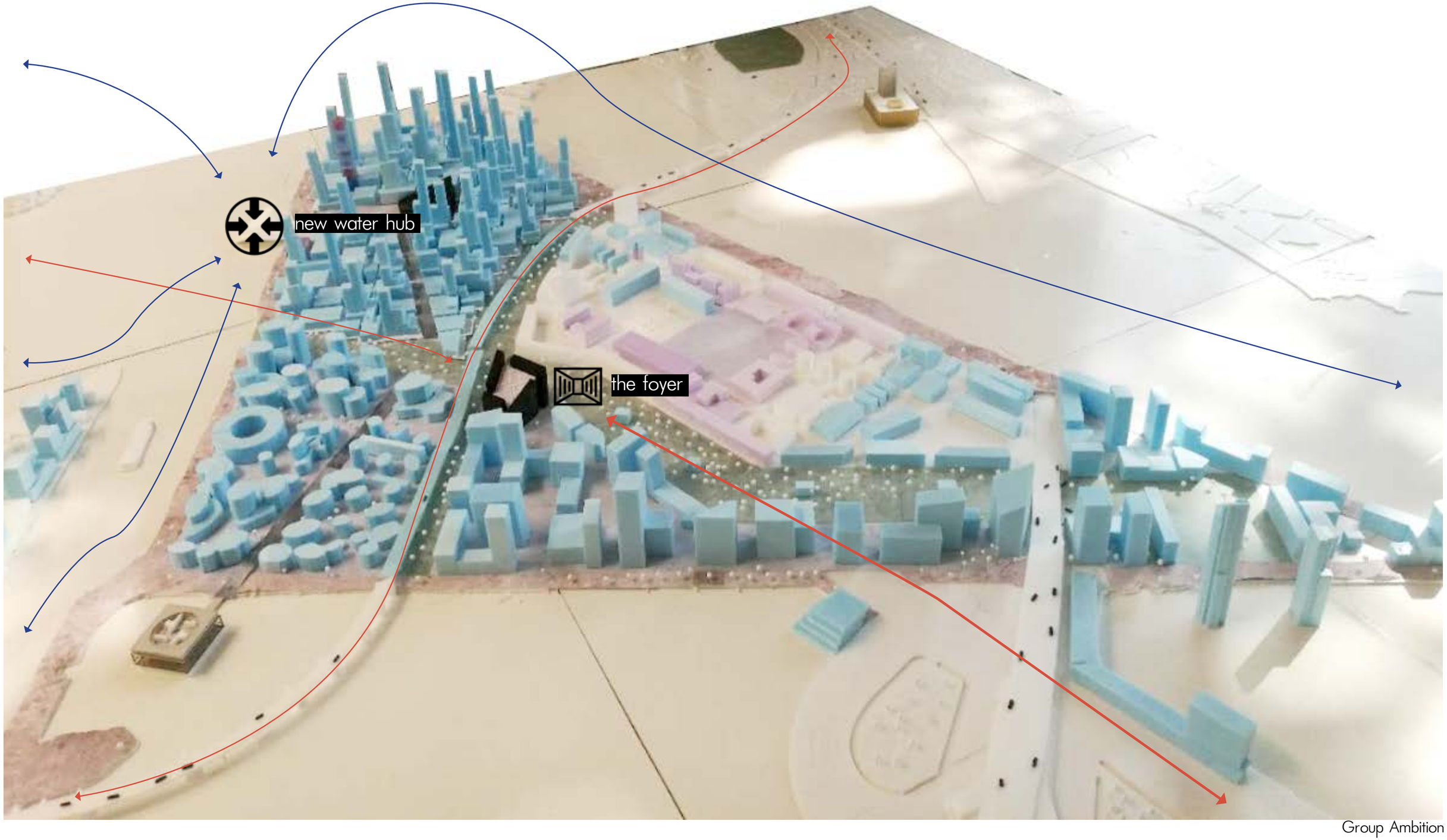
self-sufficient island



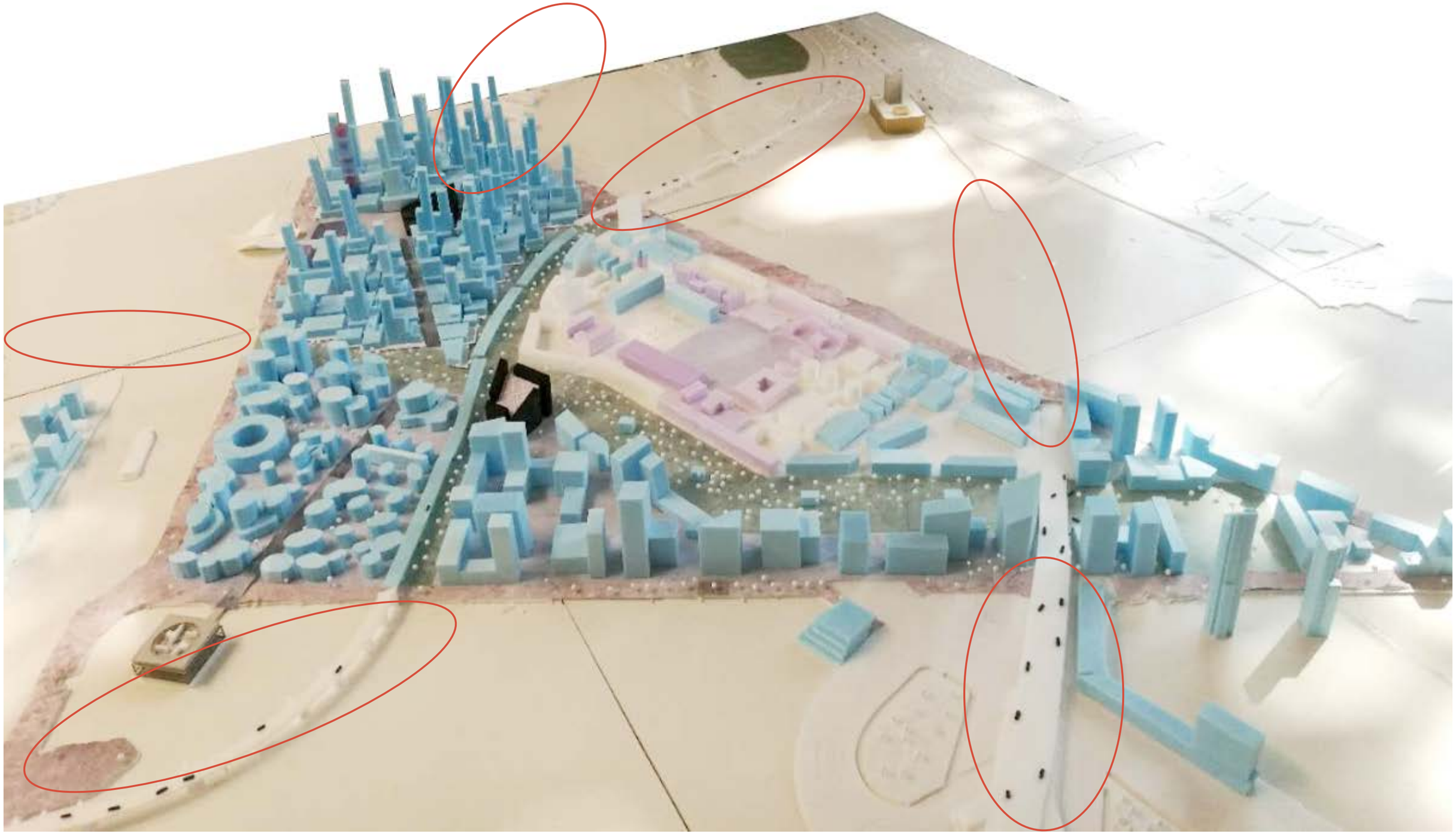
15.000+ inhabitants

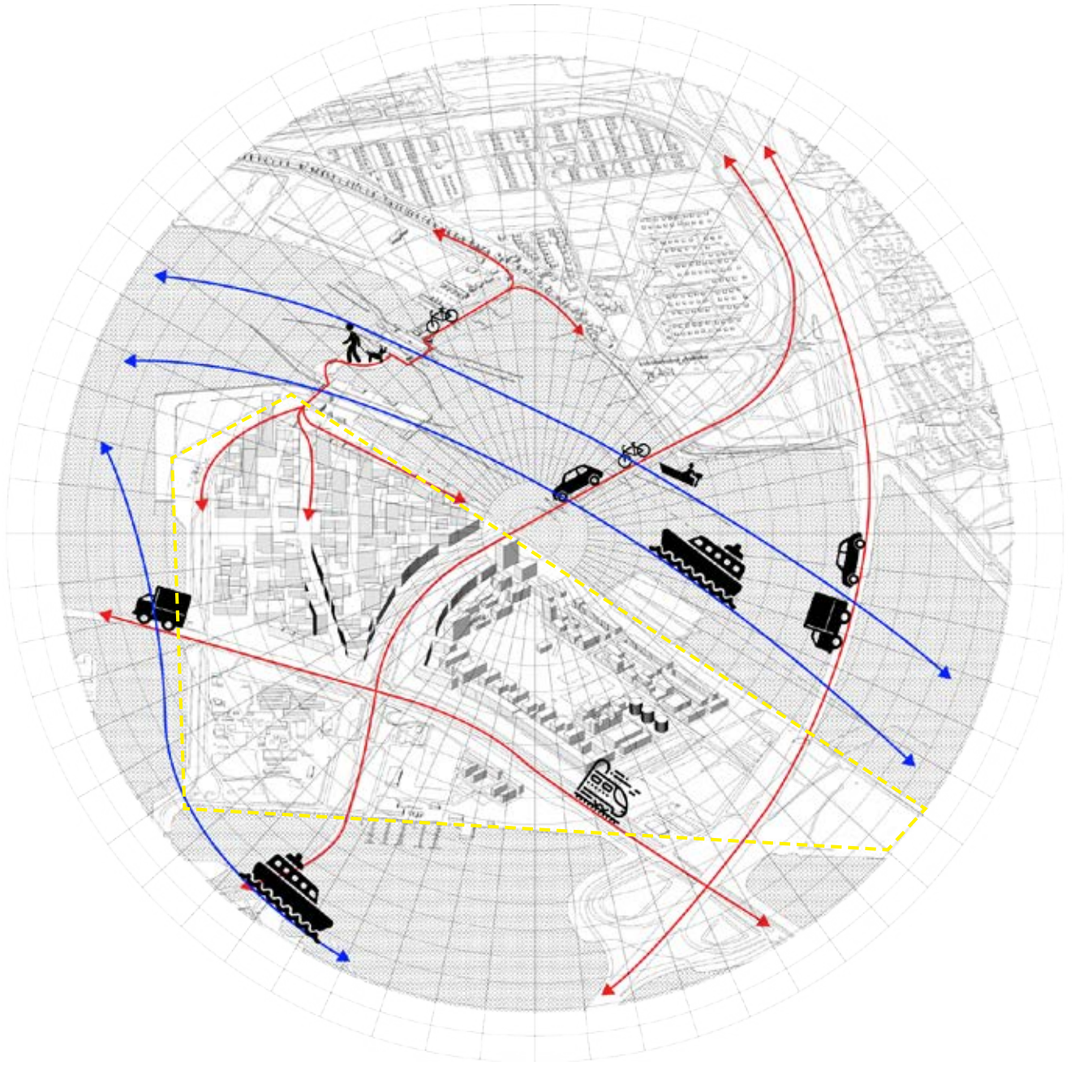


Group Ambition

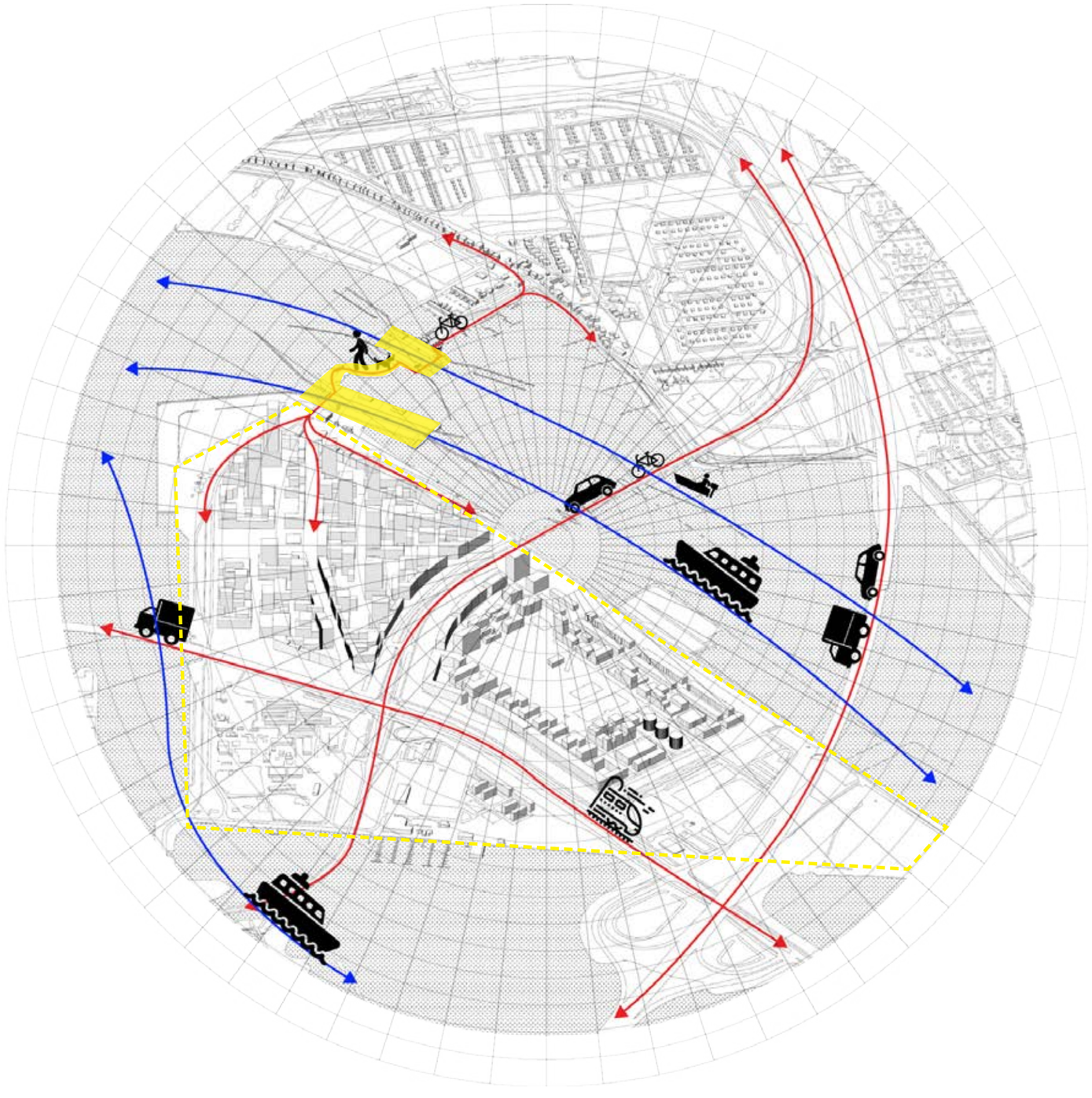


Group Ambition

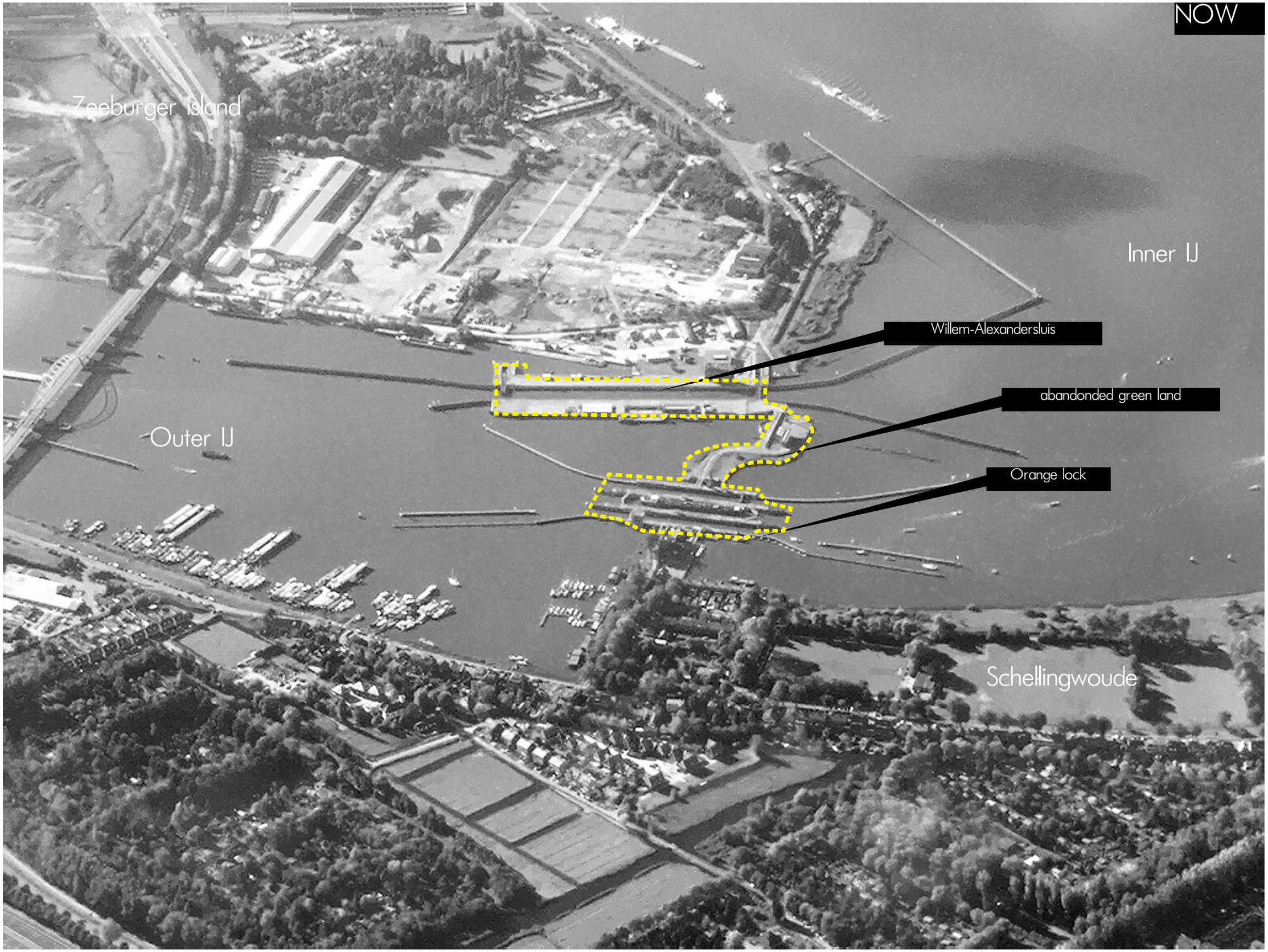


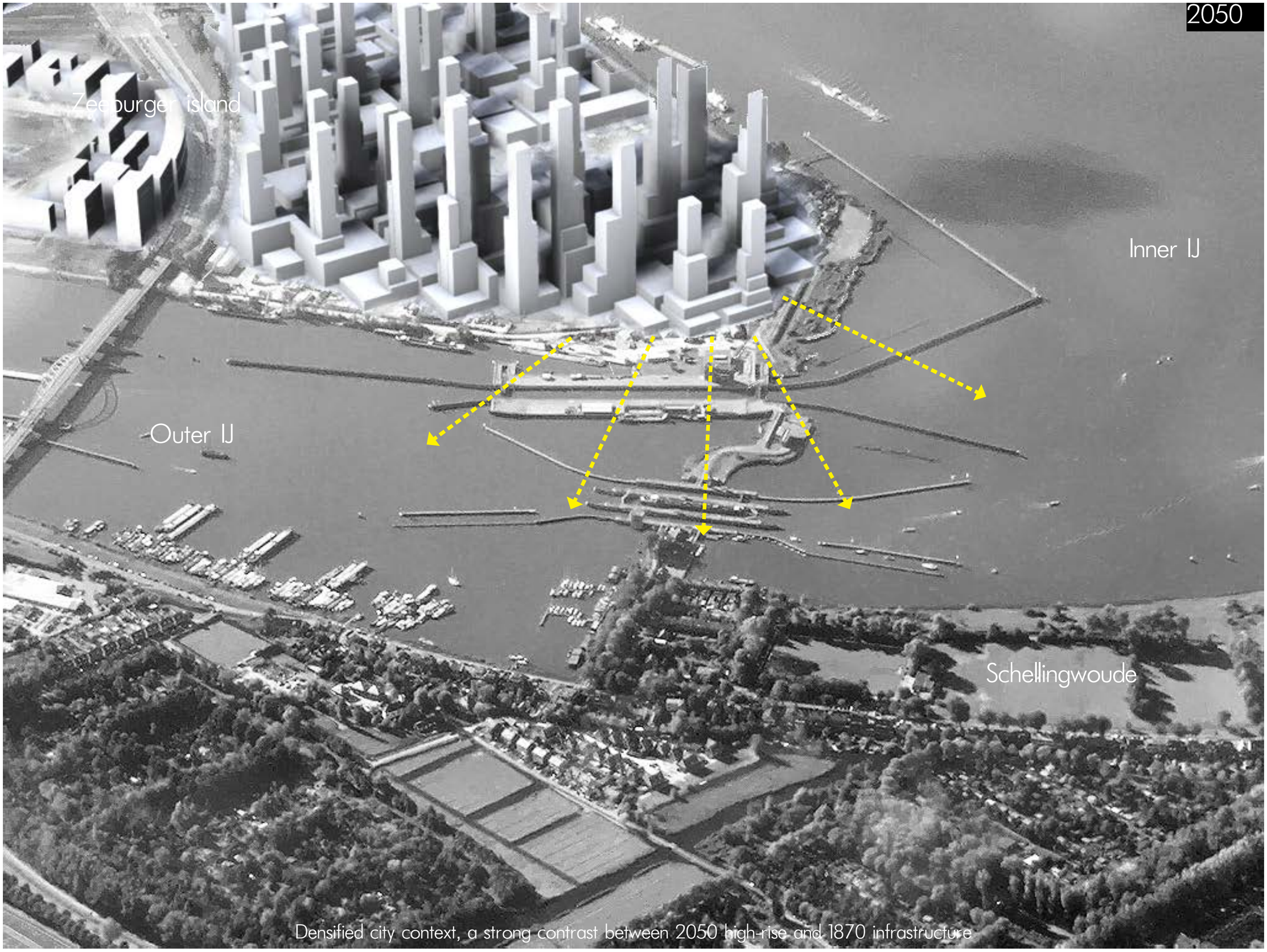


Two types of connections



The water lock stands as
a crossing stop for boats from Almere to Amsterdam
a physical connection for Zeeburgerisland and Amsterdam-Noord
a boundary of the Inner River IJ


NOW
Zeeburger island
Inner IJ
Willem-Alexandersluis
abandonded green land
Orange lock
Outer IJ
Schellingwoude



Densified city context, a strong contrast between 2050 high-rise and 1870 infrastructure

Water Vision Amsterdam 2040
English Summary (september 2016)

Amsterdam: City of Water

Blue treasure

Amsterdam cherishes its water – and rightly so. Amsterdam is a city of water pur sang. About 35% of the city's surface area consists of water. In the Dutch Golden Age of the 17th century as well as today, water is a source of income, beauty and amusement: blue treasure. The 17th-century ring of concentric canals is a UNESCO World Heritage Site. With 3 million visitors a year, canal cruises through this area are one of the country's most popular attractions. The IJ waterway is teeming with inland barges, passenger ferries, cruise ships and recreational boats. The city's canals are filled with pleasure craft on summery days and during major events such as King's Day. The growing number of visitors and inhabitants places increasing pressure on public space, water included – the balance of the water's use is at issue. The Amstel is a scenic river that channels water into the city like a blue carpet. The banks of this languid peatland river rank among the city's most important recreational cycle routes, and they provide relaxation and a chance to cool down for city-dwellers. The water is still of inestimable value to Amsterdam and its inhabitants.

Water in the genes

Over the centuries the people of Amsterdam have learned to 'live with water'. Water is in the city-dwellers'

The IJ and the port

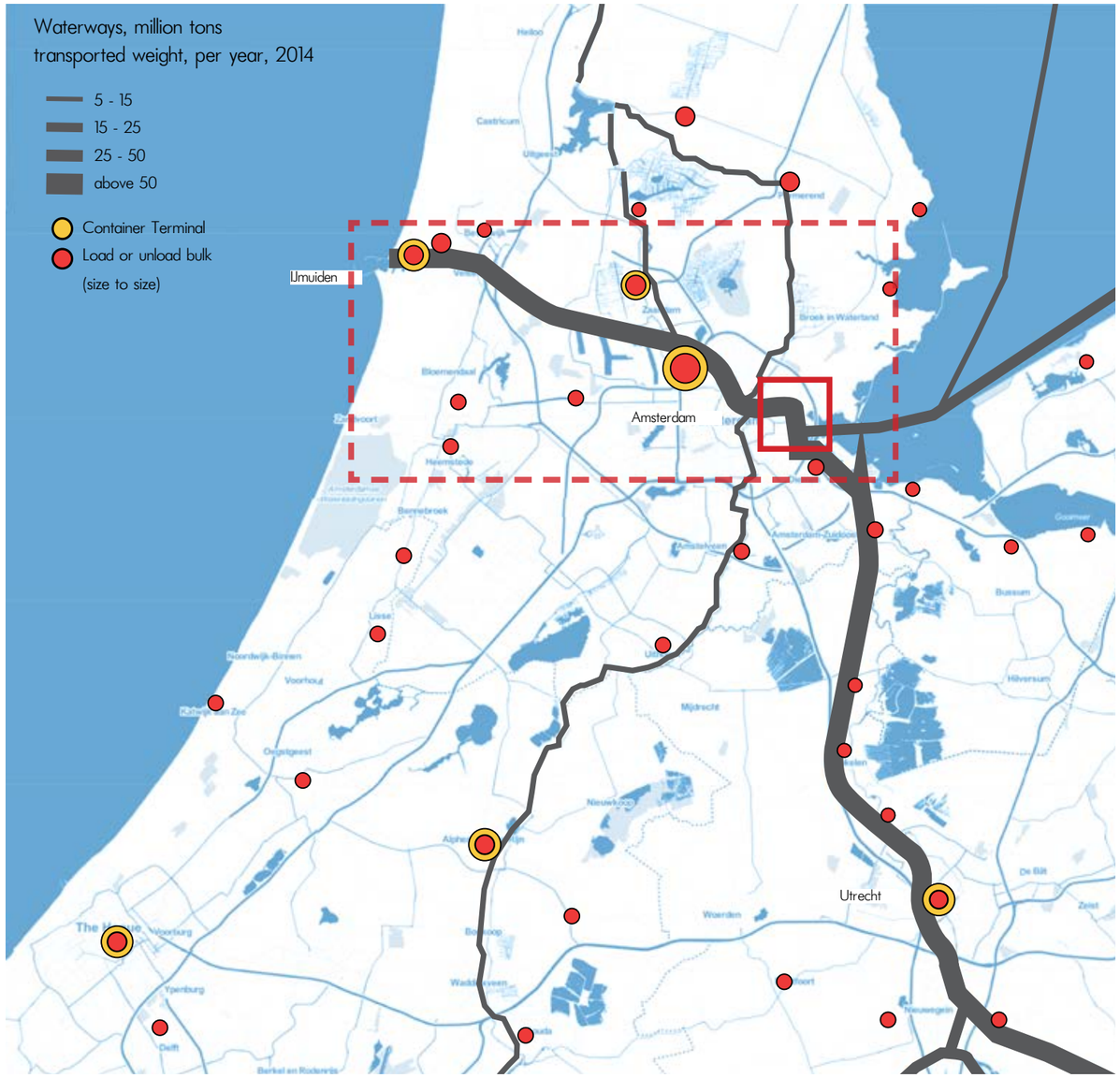
The IJ is an important link in the trans-Atlantic passage of cargo vessels sailing between the Ruhr Area, the Port of Amsterdam, other Dutch inland ports and international seaports. The Port of Amsterdam is Western Europe's fourth largest seaport by cargo tonnage and boasts the world's largest petroleum and cocoa ports – its economic significance is considerable. We are aiming to manage the accessibility and use of space within the port precincts more intensively and more efficiently. The port area also serves as a testing ground for business ventures and experimentation with new sustainable technologies.

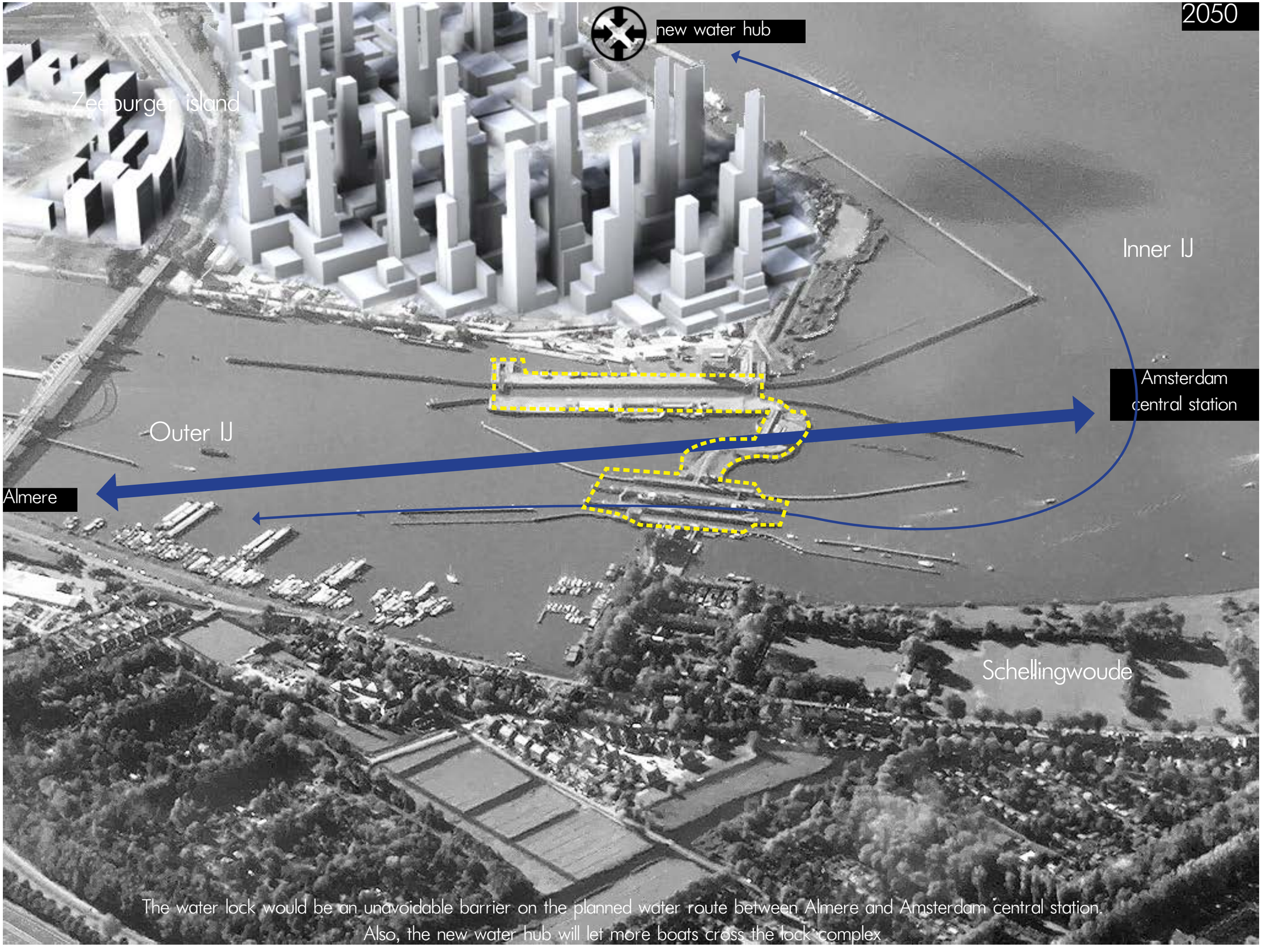
The frequency and number of passenger ferries on

Rediscovery of the water

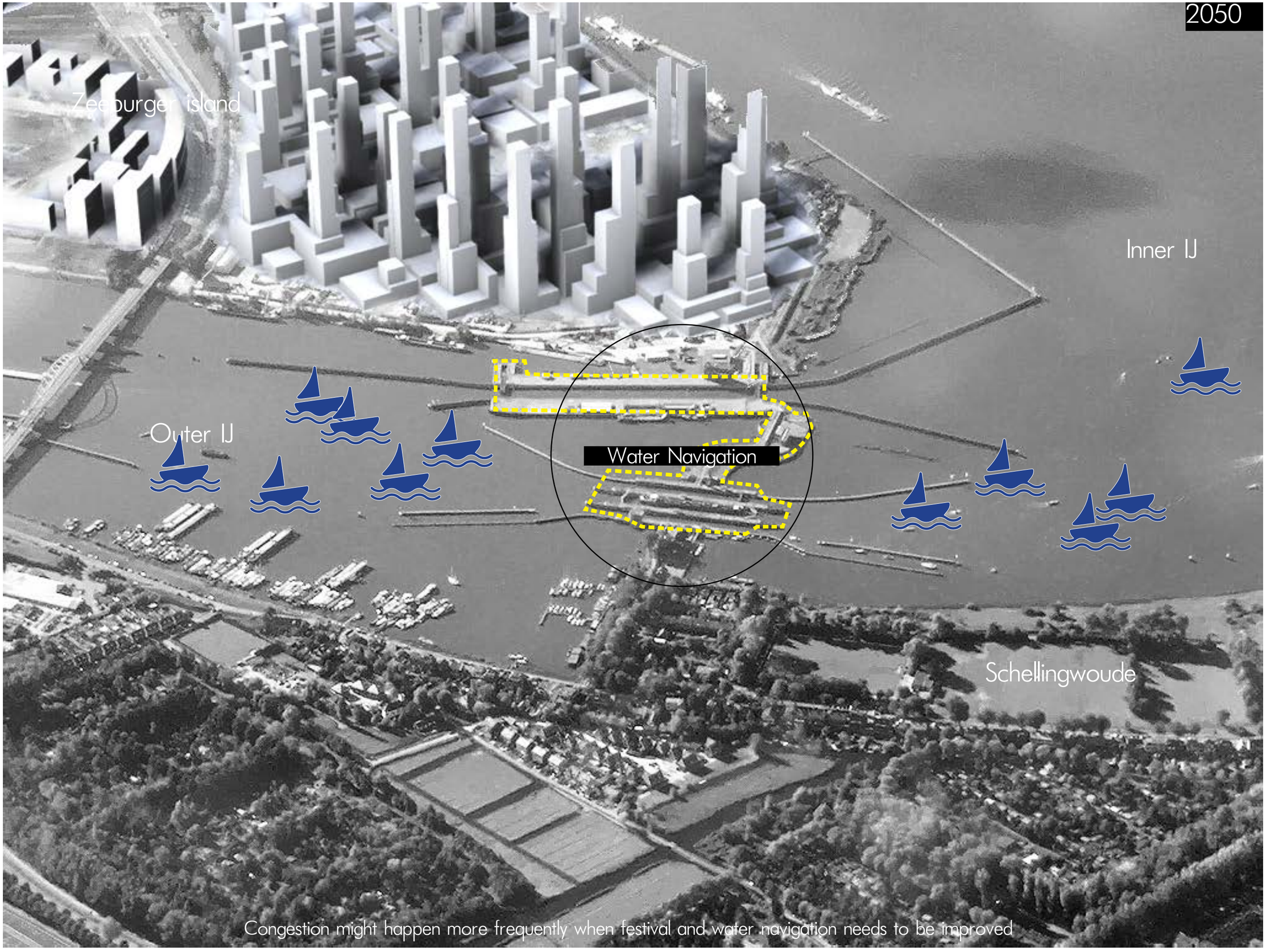
Before the 19th century, Amsterdam's water was most important for the water management of this marshy city and for the transportation of goods. The latter was of considerable economic importance. In the Golden Age the ships of the VOC – the Dutch East India Company – moored along the IJ, whereupon the cargo was transferred to smaller boats and conveyed to the canal-side warehouses via the canals. The barge canals were important routes for inland transportation. The construction of Central Station marked a reversal in Amsterdam's relationship with the water: road and rail became the main modes of transport and the city centre's waterways fell into disuse as transport arteries. The city was visually closed off from the IJ, where shipping remained important. Nowadays the canals and waterways are primarily used by canal cruise operators, recreational boats and houseboats. Since the 1990s a completely new urban waterfront has taken shape around the IJ, with new public amenities such as the Muziekgebouw aan 't IJ concert hall, the redeveloped NDSM shipyard and the EYE Film Museum, as well as wonderful new public spaces on the waterside. Amsterdam has rediscovered the IJ. Thanks to the opening of the Hermitage and the large landing stage at its front entrance and the Amstel Quarter's development of Park Somerlust, the River Amstel is likewise being rediscovered as an important public space for the city.

the IJ will be increased and the distribution of the ferries along the IJ waterway is being optimised. In addition, before 2020 we are keen to gain clarity about the construction of one or more bridges (for slow-moving traffic), a tunnel or a cableway in order to be able to handle the future growth in passenger traffic across the IJ. We want to continue the development of new public attractions along the Banks of the IJ and provide publicly accessible greenery on the Northern Banks of the IJ with cycle routes continuing through to Zaandam and Marken. At various locations along the IJ there is space for new marinas as well as small-scale moorings for floating and amphibious dwellings or houseboats. We are also going to scout out locations for the growing river cruise sector along the IJ and in the region, as well as for a second Passenger Terminal Amsterdam for ocean-going cruise ships in the Western Harbour Area/North Sea Canal Area.





The water lock would be an unavoidable barrier on the planned water route between Almere and Amsterdam central station.
Also, the new water hub will let more boats cross the lock complex

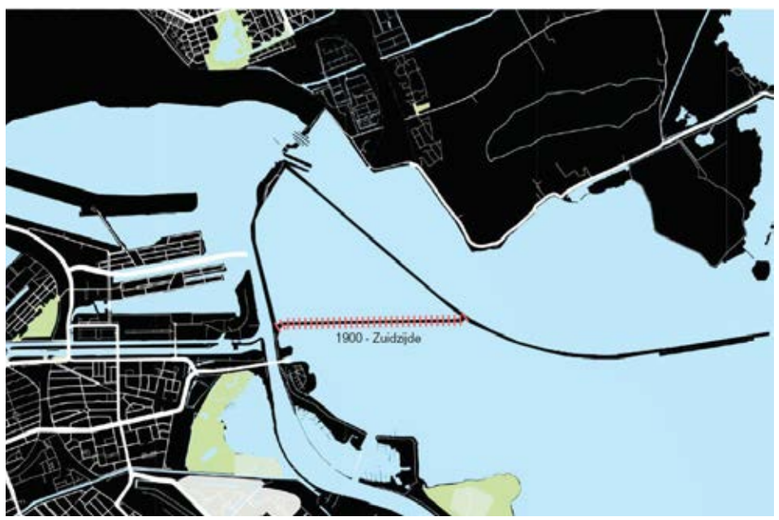

2050
Zeeburger island
Inner IJ
Outer IJ
Water Navigation
Schellingwoude
Congestion might happen more frequently when festival and water navigation needs to be improved


13th century - St. Antonisdijk


1872 - Oranjesluizen


1890 - Strekdam

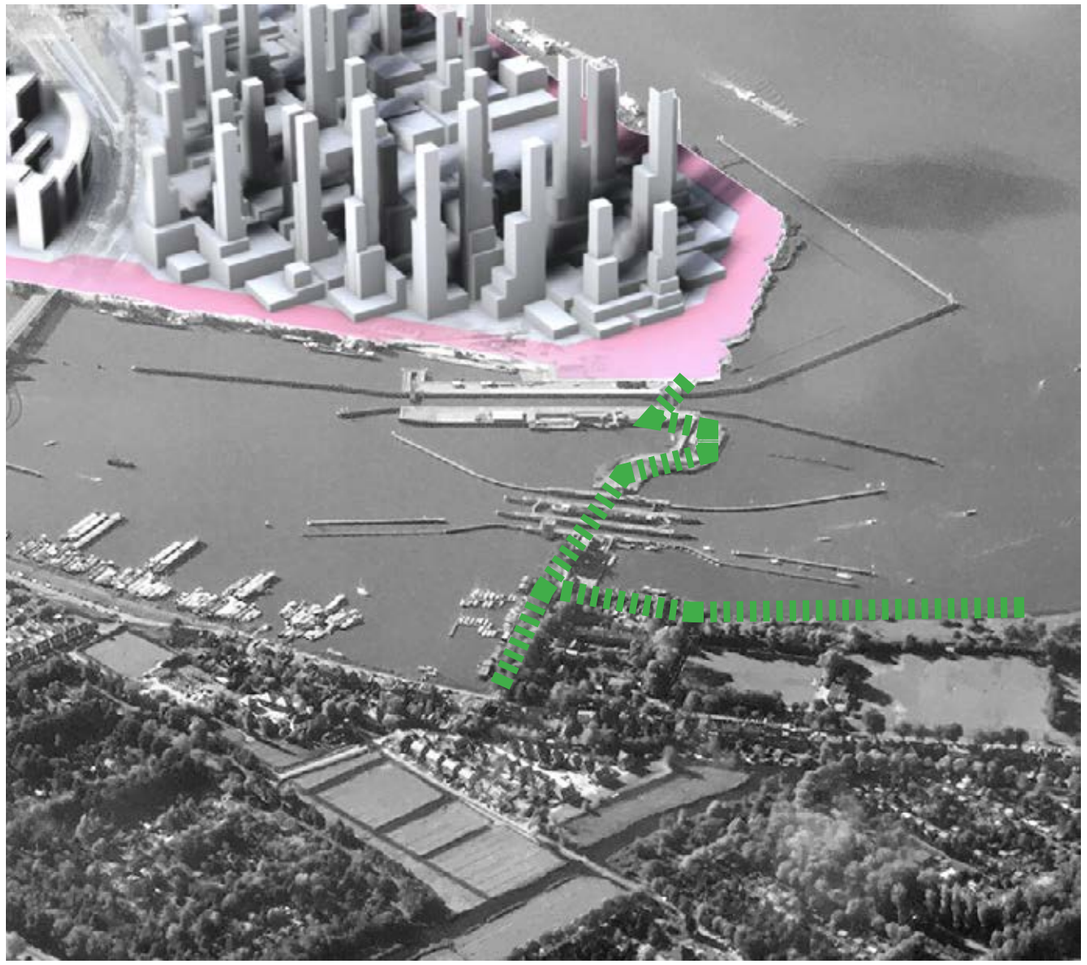

1892 - Zuider Ddijk


1900 - Zuidzijde

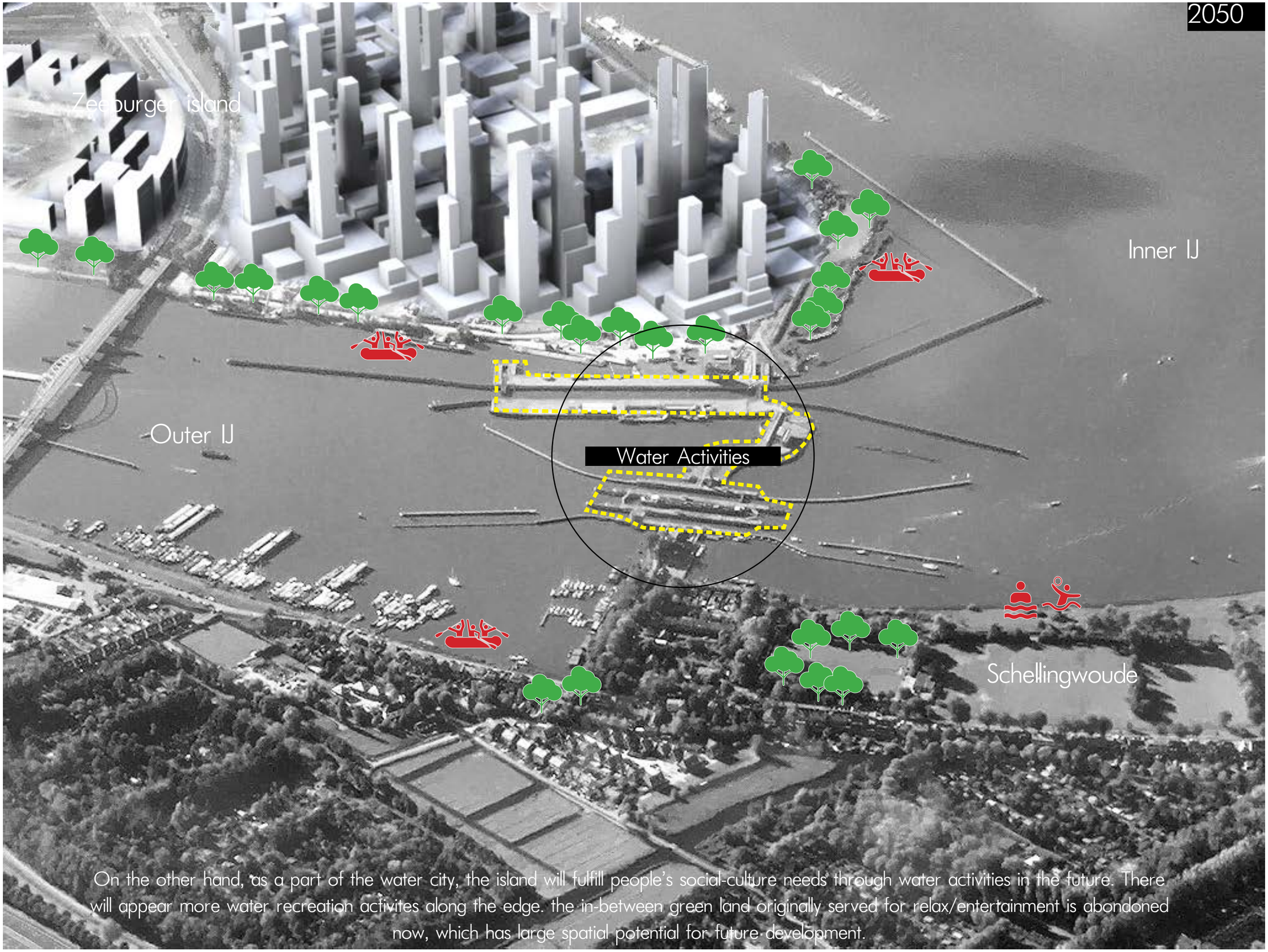

beginning 20th century -
filled with bagger

the lock complex together with the island dam contribute to form the water-friendly landscape of the island

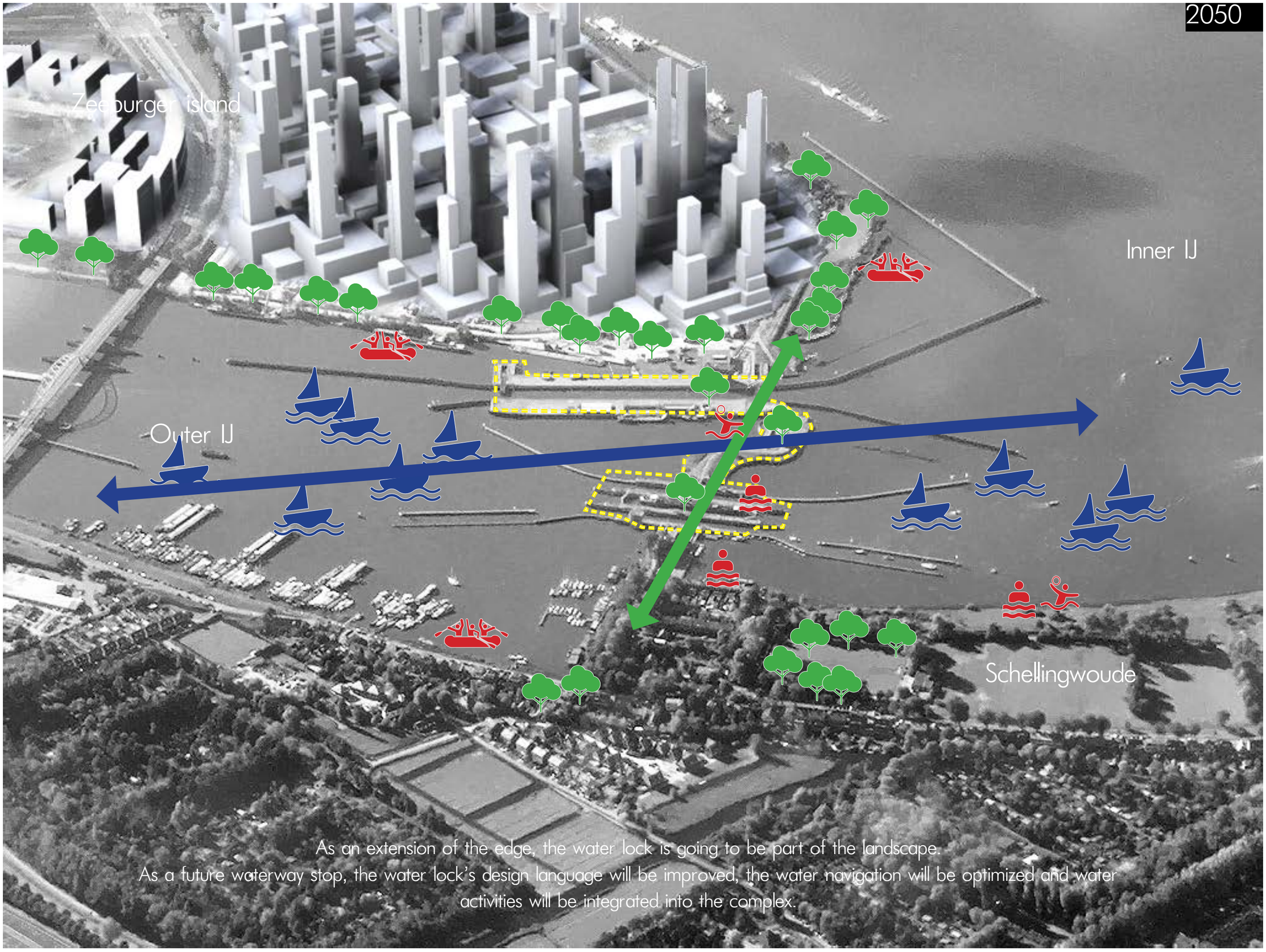
water activities extension



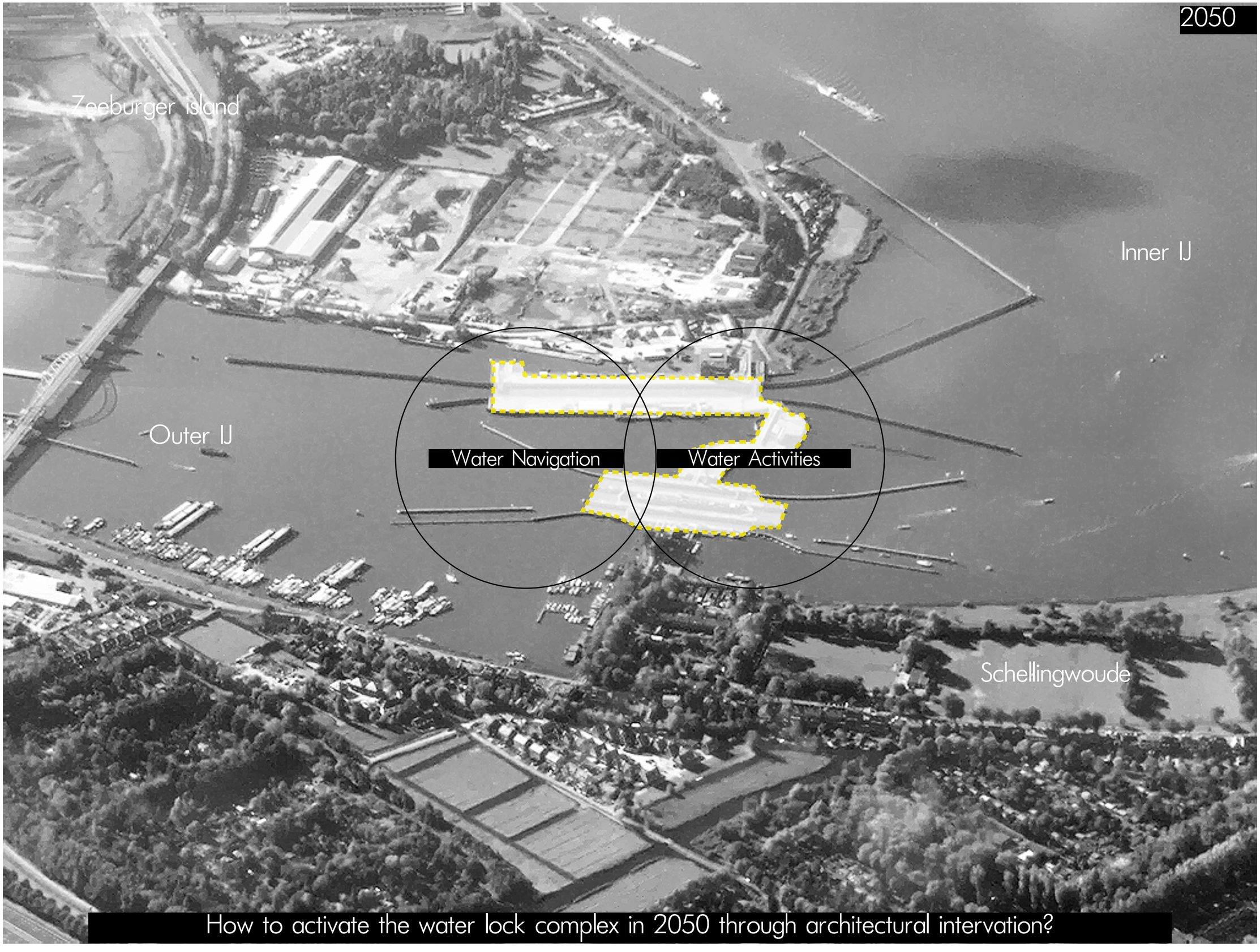
The current abandonded entertainment land together with the lock complex will be integrated and contribute to the whole island landscape



On the other hand, as a part of the water city, the island will fulfill people's social-culture needs through water activities in the future. There will appear more water recreation activites along the edge. the in-between green land originally served for relax/entertainment is abondoned now, which has large spatial potential for future development.

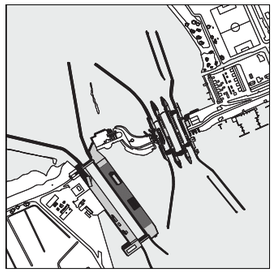


As an extension of the edge, the water lock is going to be part of the landscape.
As a future waterway stop, the water lock's design language will be improved, the water navigation will be optimized and water activities will be integrated into the complex.


2050
Zeeburger island
Inner IJ
Outer IJ
Water Navigation
Water Activities
Schellingwoude
How to activate the water lock complex in 2050 through architectural intervation?

Research

Main Object



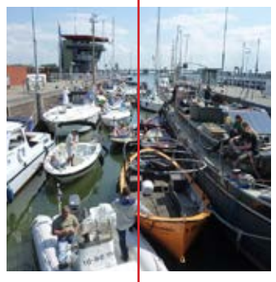
The Schellingwoude Lock Complex

Function

Water Navigation

Water Activities

future
scenario



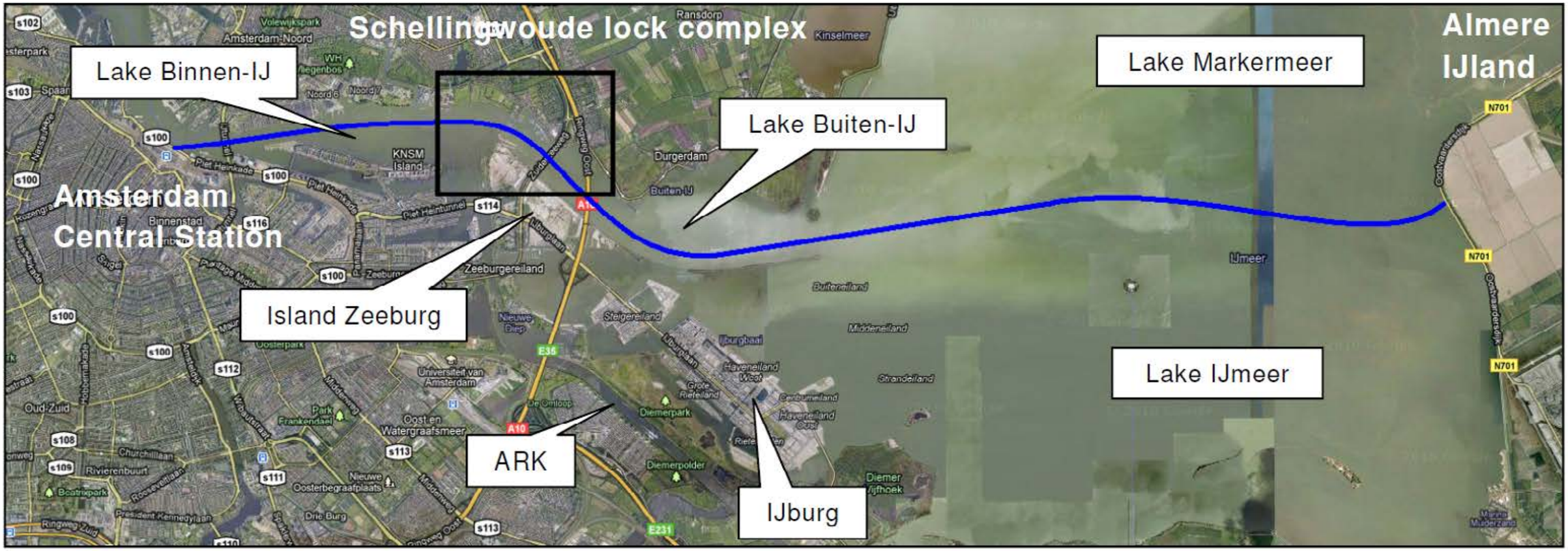
Planned waterway

Social-culture needs

Future
Result

A Renewed Water Infrastructure

The blue line indicates the possible future transport demand on the route between Amsterdam Central Station and Almere IJland, which forms an important motivation to perform the nautical function study.



The deployment of a fast ferry on the route between Amsterdam Central Station and Almere is essential.
However, the crossing of the water lock complex is unavoidable in the existing situation.

Transport mode	No. of transfers	Distance	Rush hour	Average velocity	Travel time	
					Mean (μ)	St. dev. (σ)
Car [4]	0	27.5 km	No	59 km/h	28 min	2.00 min
			Yes	33 km/h	50 min	10.00 min
Land based public transport [5]	1	32.5 km	No	56 km/h	35 min	1.00 min
			Yes	56 km/h	35 min	5.00 min
Water based public transport	0	15.7 km	-	22.5 km/h	42 min	10.50 min

Passengers prefer to travel to their destination in a short and reliable time frame with the least amount of transfers. In order to make sure that water based public transport offers a reasonable alternative to land based public transport, the average travel time of water based public transport should be lowered by 7 minutes. This margin can only be found within the locking process at the Schellingwoude lock complex.

Stage	Location	Distance	Average velocity	Partial time	
				Mean (μ)	St. dev. (σ)
Embarking	Amsterdam Central Station	-	-	2.00 min	0.50 min
De-berthing	Amsterdam Central Station	200 m	20 km/h	1.00 min	0.00 min
Sailing	Lake Binnen-IJ	3.700 m	50 km/h	4.50 min	1.00 min
Sailing	Western outer port Schellingwoude lock complex	300 m	12 km/h	1.50 min	0.00 min
Lockage	Lock chamber at Schellingwoude lock complex	-	-	15.00 min	10.00 min
Sailing	Eastern outer port Schellingwoude lock complex	300 m	12 km/h	1.50 min	0.00 min
Sailing	Lake Buiten-IJ / Lake Markermeer	11.000 m	50 km/h	13.50 min	3.00 min
Berthing	Almere IJland	200 m	20 km/h	1.00 min	0.00 min
Disembarking	Almere IJland	-	-	2.00 min	0.50 min
Total	**Preferred route**	**15.700 m**	**22.5 km/h**	**42.00 min**	**10.50 min**

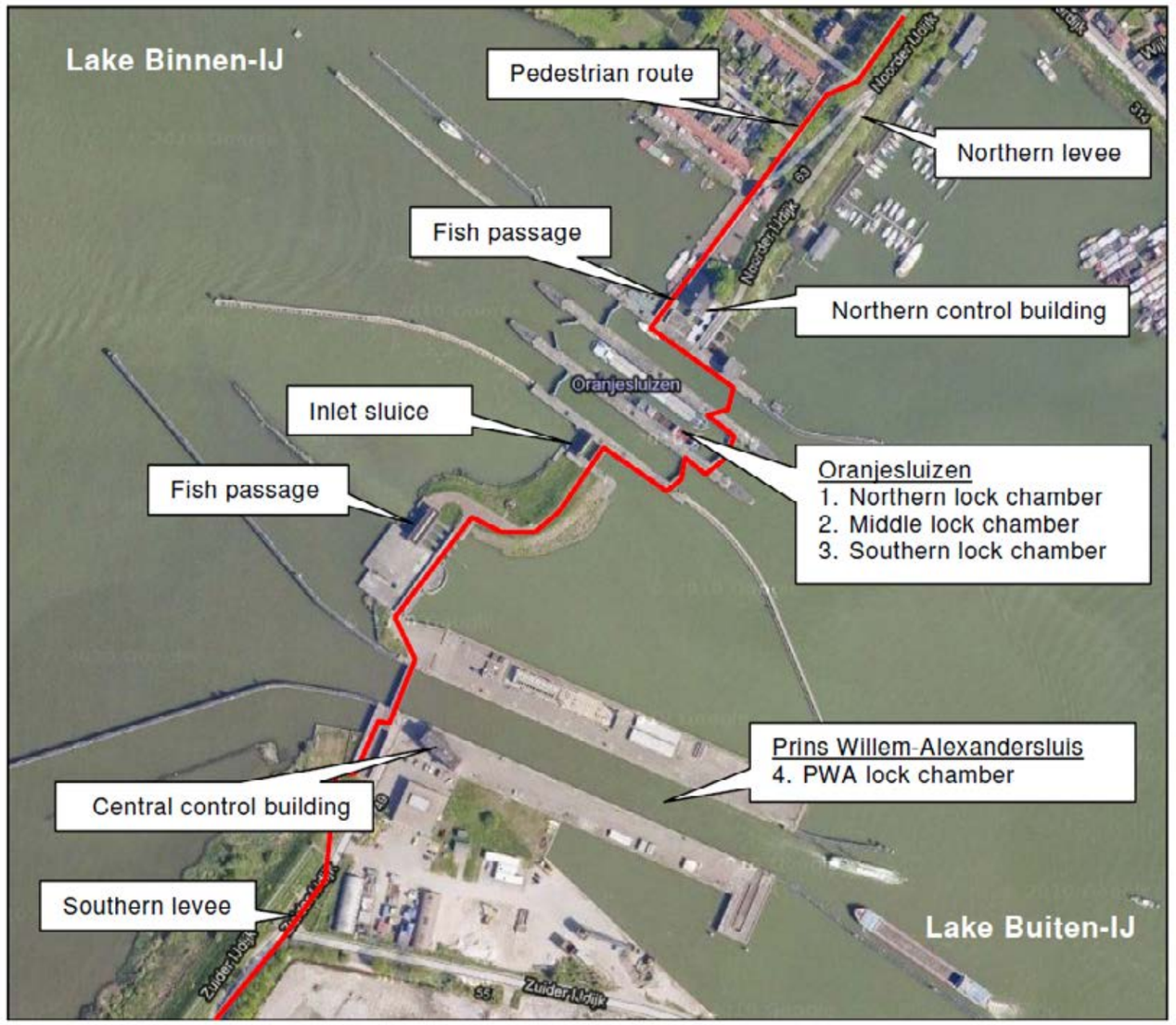
From the travel time analysis we can conclude that the locking process at the Schellingwoude lock complex is of great influence on the total travel time.

Stage	Location	Passage time		
		Mean (μ)	St. dev. (σ)	Upper 95% confidence band
Lockage	Lock chamber at Schellingwoude lock complex	8.00 min	3.60 min	15.00 min

source from Rijkswaterstaat and multiple (public) shipping companies involved in previous attempts to exploit a feasible water based public transport connection passing the Schellingwoude lock complex

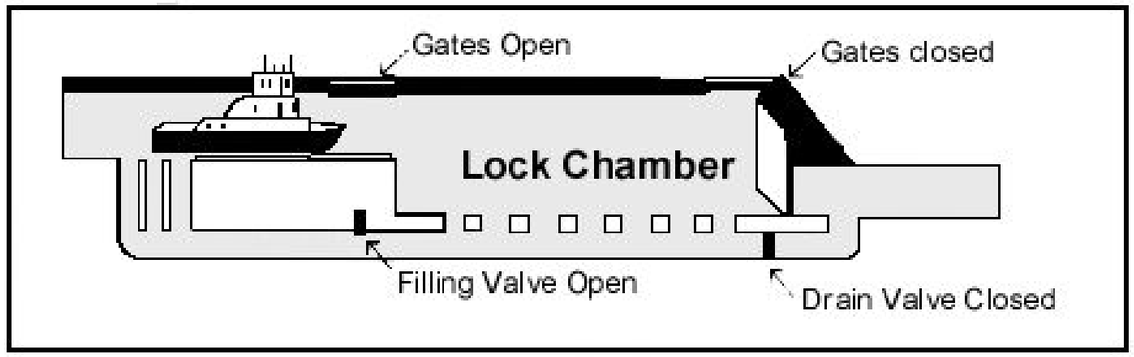
the locking process at the Schellingwoude lock complex is considered to be a significant bottleneck in the water based public transport route between Amsterdam Central Station and Almere.

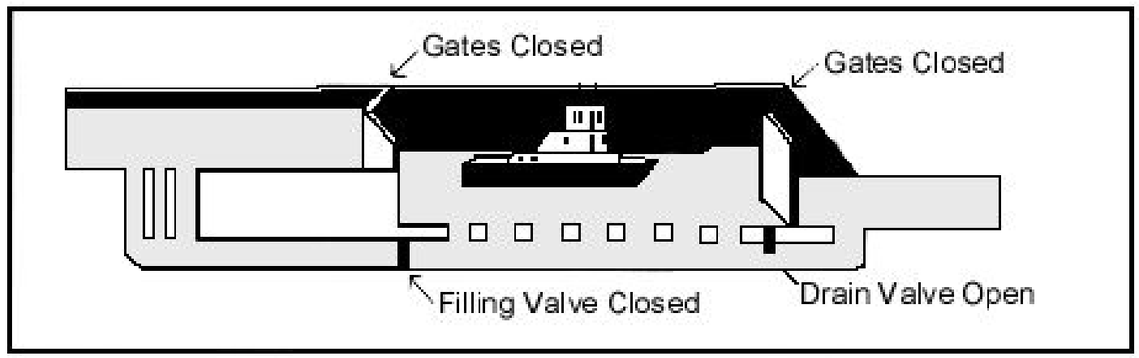
Locking process of Schellingwoude lock complex

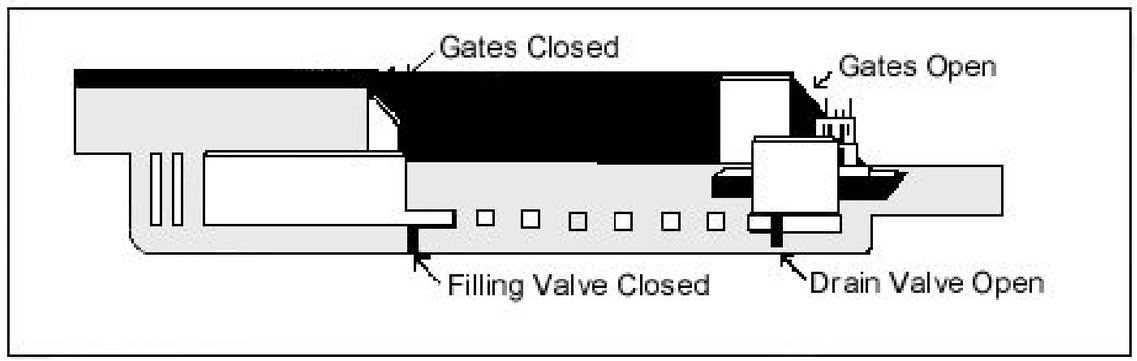


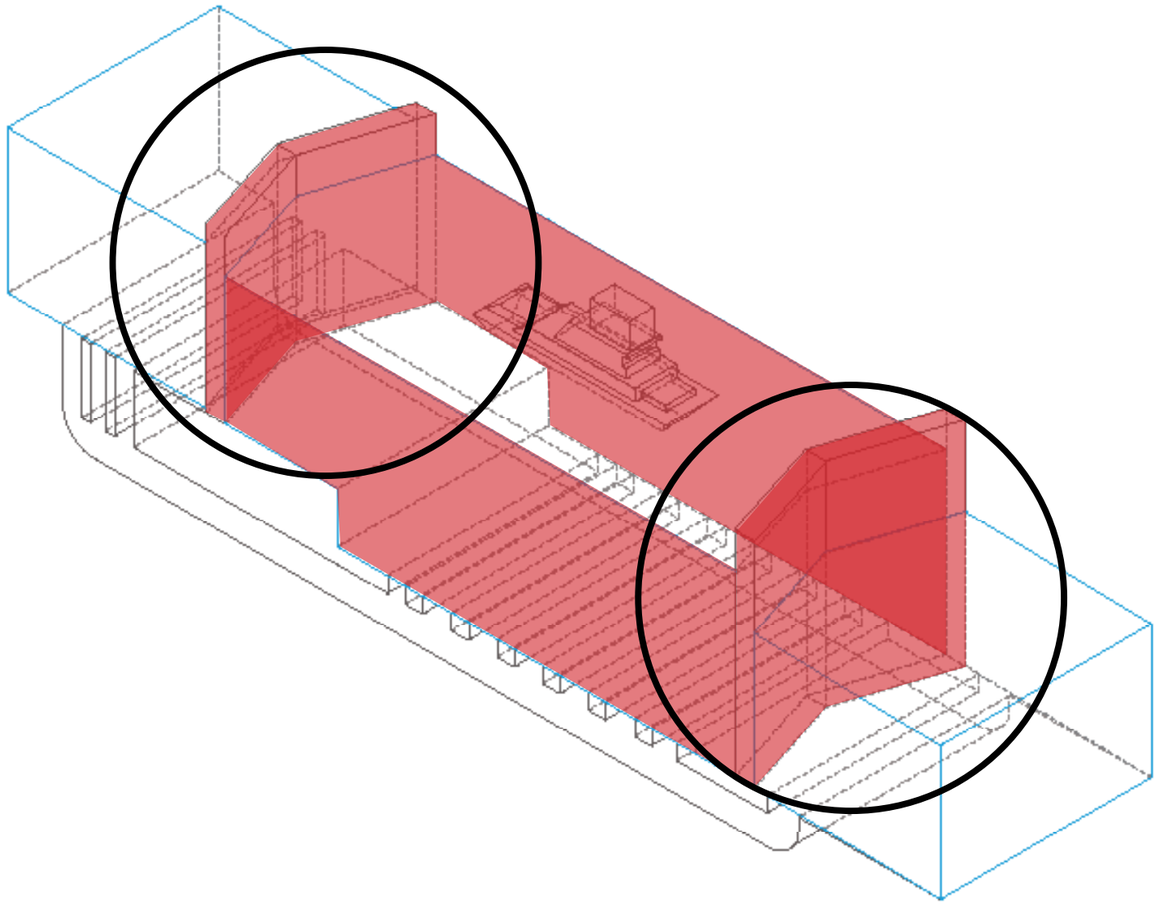
#	Description	Dimensions lock chamber (L_k x W)	Entrance depth	Dimensions design vessel	Normative allowable vessel class
1	Northern lock chamber	72.8 m x 14.0 m	NAP -4.5 m	70.0 m x 13.0 m	CEMT-class III
2	Middle lock chamber	95.2 m x 18.0 m	NAP -4.5 m	90.0 m x 17.0 m	CEMT-class IV
3	Southern lock chamber	72.8 m x 14.0 m	NAP -4.5 m	70.0 m x 13.0 m	CEMT-class III
4	PWA lock chamber	200.0 m x 24.0 m	NAP -4.7 m	197.0 m x 23.7 m	CEMT-class VIb

(normal Amsterdam level)

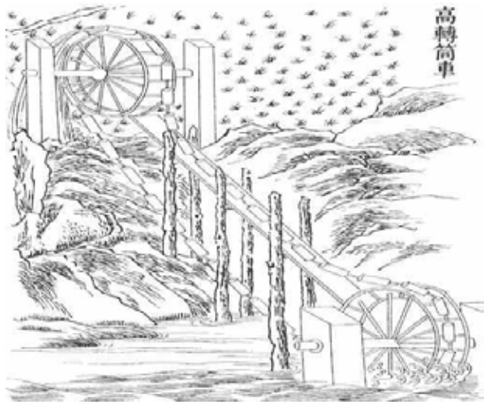

Gates Open
Gates closed
Lock Chamber
Filling Valve Open
Drain Valve Closed


Gates Closed
Gates Closed
Filling Valve Closed
Drain Valve Open


Gates Closed
Gates Open
Filling Valve Closed
Drain Valve Open

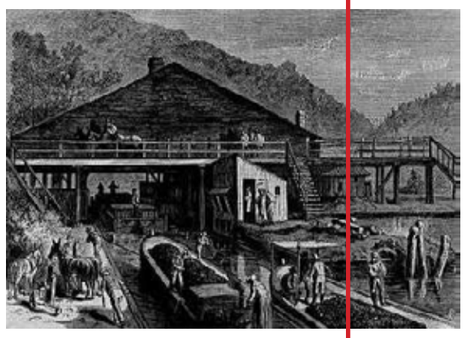


The principle of water lock is to provide a temporary closed space for water transfer which means the chamber doesn't have much potential for development at the basis of ensuring the capacity and linear waterway for crossing boats.
It can be seen that only the moving parts, the lock's gate could be largely improved



Pound locks were first used in medieval China during the Song Dynasty (960-1279 AD), having been pioneered by the Song politician and naval engineer Qiao Weiyue in 984

The first true pound lock was built in 1396 at Damme near Bruges, Belgium.



In medieval Europe a sort of pound lock was built in 1373 at Vreeswijk, Netherlands.This pound lock serviced many ships at once in a large basin.

The Italian Bertola da Novate (c. 1410-1475) constructed 18 pound locks on the Naviglio di Bereguardo (part of the Milan canal system sponsored by Francesco Sforza) between 1452 and 1458.

King Willem III laid the first stone on April 29, 1870 . Five years ago, work had been done with a lot of setbacks on the construction of the cofferdam that formed the largest part of the closure. On 25 September 1872 the first ship sailed through the lock.

AD 984

AD 1396

AD 1373

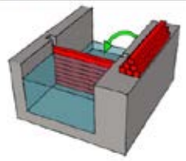
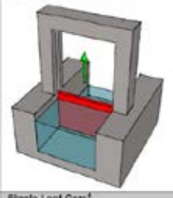
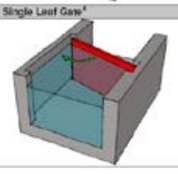
AD 1410-1475

AD 1870

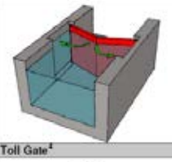
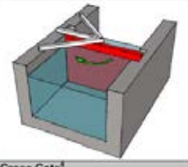
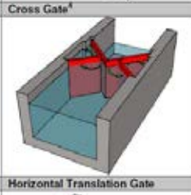
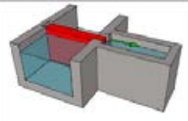
AD 1995

AD 900 AD 1000 AD 1100 AD 1200 AD 1300 AD 1400 AD 1500 AD 1600 AD 1700 AD 1800 AD 1900 AD 2000

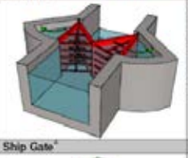
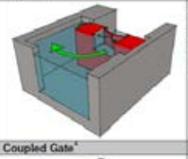
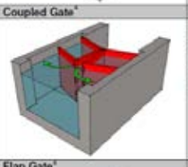
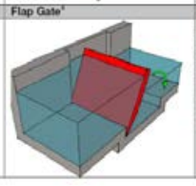
Historic overview of lock gate types

1	**Stop Logs**	**10th Century**
		The most basic gate type, where wooden logs or steel/concrete beams are lowered in a recess. Was only used as operative lock gate in the very early ages of navigation locks. Currently they often service as emergency or maintenance closure of a lock. For regular lock operation in modern day locks this method is too time consuming. Presumably stop logs where used for the first locks in china (986 AD)[1][2].
2	**Vertical Lift Gate**[3]	**13th Century**
		Used, presumably for the early European locks. The Vertical Lift Gate evolved from Stop Logs. They consisted of a wooden frame work that was hoisted manually with a lifting structure. Dimensions where limited due to the friction and the weight of the gate structure. After the industrial revolution the Vertical Lift Gate made a break through in inland navigation lock design. With rollers and mechanical operation equipment, the Vertical Lift Gate was able to fit modern day lock dimensions. Engine powered ships weren't presented with the disadvantage of lowering masts to pass under the gate. It became a common technology for modern day inland navigation locks, as ships generally have limited dimensions for which unrestricted clearance is not required. They are hardly ever used for maritime locks, as these do require unrestricted clearance. For detailed description see paragraph
3	**Single Leaf Gate**[4]	**13th Century**
		The first rotating lock gate, that also gave unlimited clearance and easy operation. Common for mid-evil lock design and later for small locks. They have clear structural disadvantages compared to other similar gate types, but due to their simplicity they can still be found in operation in numerous small locks today. The span of the gate was limited due to the forces on the hinges and the long gate recess and thus lengthy chamber made it relatively expensive for wider span locks.

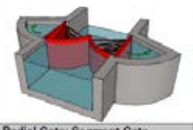
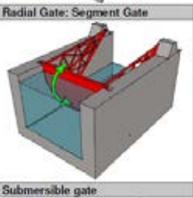
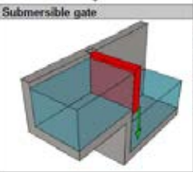
Historic overview of lock gate types

4	**Mitre Gates**[5]	**15th Century**
		Mitre Gates evolved from Single Leaf Gates, being able to close a larger span, due to the arch action and limited forces on the hinges. The gates where relatively light weight and easy to operate. Though they could (in early days) only retain water in one direction. Nowadays Mitre Gates are the most commonly applied lock gates from; small wooden gates to the largest high head gates in the world. They can only retain a limited reverse head and can't be operated under a head difference or in flowing water. For detailed description see paragraph 5.2
5	**Toll Gate**[4]	**15th Century**
		A typically Dutch lock gate, first used in 1500. It was able to retain water in two directions and to open under a head difference. The gate turns around a vertical axis in the center of the gate, balancing out the hydrostatic forces on both sides. Hence the moments around the axis, when operating under a head difference are approx. zero. Later the design was adapted to provide unlimited clearance, making it a popular gate type in the golden era (1568 – 16 48) due to its unique advantages. Nowadays this gate type can hardly be found. It no longer has unique advantages and the use of space is very inefficient. The delta gate (7) evolved from the Toll Gate and was a much more effective alternative.
6	**Cross Gate**[4]	**16th -17th Century**
		Also a typical Dutch lock gate from the golden era (end 16th century). It was able to retain water in two directions and open under a head difference. It was fully hydraulically operated (by opening and closing valves) and gave unlimited head clearance for ships to pass. Though its construction was very complex and only found limited application.
7	**Horizontal Translation Gate**	**16th -17th Century**
		Horizontal Translation Gates where first applied in the Netherlands around 1600. The wooden gate was moved along bronze rollers situated in a recess on the bottom of the lock. The early applications weren't very successful. The Horizontal Translation Gate didn't make a breakthrough until the 19th century, when the gate was supported by a carriage rolling on rail tracks[4]. Nowadays rolling doors are commonly applied and the widest locks on earth are equipped with these doors (Berendrecht lock: 68m wide)[3]. The horizontal translation can commence in the following ways: – Rolling: wheels on rail tracks[4] – Sliding: hydro-foot[6] – Hanging: on rails or crane type structure above water[4] – Floating: rolling along rails above water[4]. For detailed description see paragraph 5.3

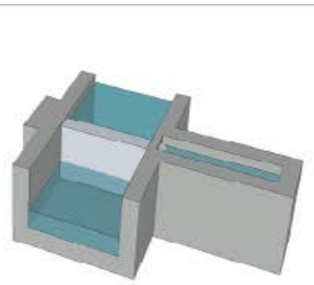
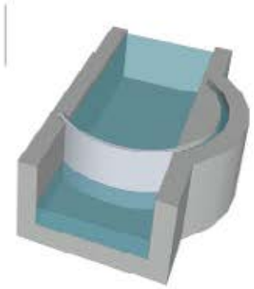
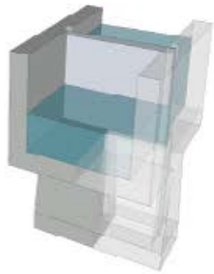
Historic overview of lock gate types

8	**Delta Gate**[4]	**18th Century**
		Also a Dutch invention, first designed in 1777. The delta, mostly applied in pairs (see picture), consisted of two retaining doors sturdily connected to form a triangle. The delta gate (after some modifications) had evolved from the Toll Gate. The gate could be fully (or partially) hydraulically operated by altering the water level in the gate recess. The door could be operated in flowing water and retain water in two directions. Though complex and costly, they where very popular and replaced the Toll Gate being more rigid and easy to operate. Modern sector and Segment Gates replaced the Delta Gate, though some are still operative in the Netherlands.
9	**Ship Gate**[4]	**18th -19th Century**
		A ship door is a caisson like structure sometimes with an integrated Mitre Gate. They can be used for large locks and are reliable. Their operation is very time consuming and are only used when operation is required sporadically. The integrated gate can provide smaller vessels regular (fast) passage, but due to the time consuming operation they are only used for ship docks.
10	**Coupled Gate**[4]	**19th Century**
		Presented as 'cheaper' alternative for the delta gate in 1823. It consists of two hinged wooden 'water tight' parallelograms that meet each other in the middle of the lock when in operation. Operation is fully hydraulic, by altering the water level in the parallelogram via conduits and valves. They have the same operative advantages as the delta gate, but never became very popular, presumable due to their complexity, large weight and maintenance problems.
11	**Flap Gate**[4]	**20th**
		Flap gates with a top hinge are the oldest known gate types, used in the roman era. They where used for discharge sluices and ducts. Flap gates can be bottom hinged or top hinged depending on their application. Not until the 19th century where Flap gates also used for navigation locks and shipping docks (bottom hinged). Flap gates are mostly used for weirs and movable barriers. Maintenance and inspection of the bottom hinge requires closure of the lock and sedimentation can cause frequent problems. Therefore they are hardly applied for navigation locks[7].

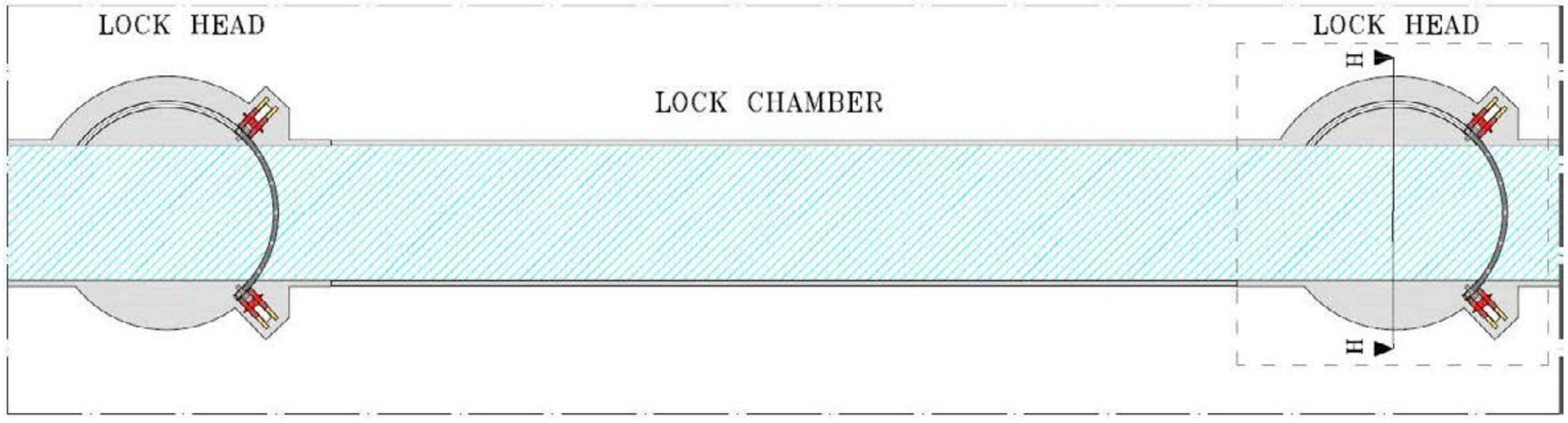
Historic overview of lock gate types

12	**Radial Gate: Sector Gate**	**20th**
		A Sector Gate, is like the delta gate but with a curved front skin plate. It is more or less the modern version of it. The inside leaf is also closed with a skin plate, so the gate can be operated fully hydraulically by altering the water level in the gate recess. Sector Gates can be applied with a vertical and horizontal axis. Both also applied for navigation locks. They are especially suitable for limited- head locks where operation in flowing water is essential, or where the filling and emptying must commence through the doors[7]. For detailed description see paragraph 5.4
13	**Radial Gate: Segment Gate**	**20th**
		Invented in the 20th century by the German professor H. Krey. It is quite similar to the Segment Gate but only has one closed plane, namely the front curved plane. Operation is by electro mechanical or oil hydraulic equipment, making them suitable for higher heads then the Sector Gate. They are especially popular for use as movable weir or storm surge barrier and have been used for extremely large spans or high heads[4]. But also find application in navigation lock design, where the gate must be able to operate in flowing water or under a head difference. They are especially suitable for limited head locks where operation in flowing water is essential, or where the filling and emptying must commence through the doors. For detailed description see paragraph 5.4
14	**Submersible gate**	**20th**
		Submersible gates have vertical translation like the Vertical Lift Gate, accept they translate in downward direction when opening. They can operate with a head difference and close in flowing water. Often find application as upstream gate in very high head lock[8], where the sill of the lock is so high and the gate does not need a recess in the bottom lock chamber (See picture). Under normal circumstances, the gates would require major excavation, limiting their application for larger locks. Also sediment and maintenance issues contribute in their limited application.

source:
Gate Design For Large, High Head Locks
"The development of an innovative lock gate". J.W. Doeksen

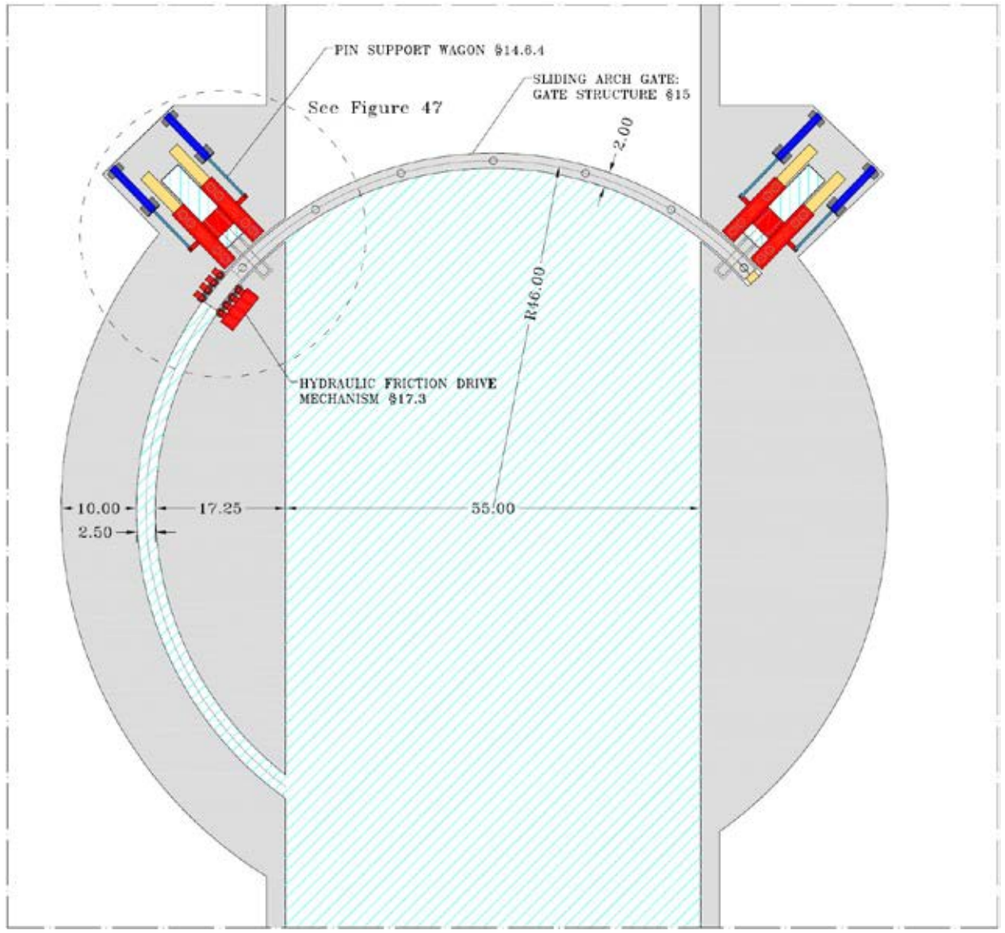
			
	Ship Gate	**Sliding Arch (Tension)**	**Submersible gate**
Reliability	+4	+4	-4
Safety	+2	0	+4
Accesibility	0	+2	0
Water consumption	-4	+2	+4
Use of Space	-2	+1	+2
Energy Consumption	+1	+1	-2
Total score	**+1**	**+10**	**+4**

source:
Gate Design For Large, High Head Locks
"The development of an innovative lock gate". J.W. Doeksen

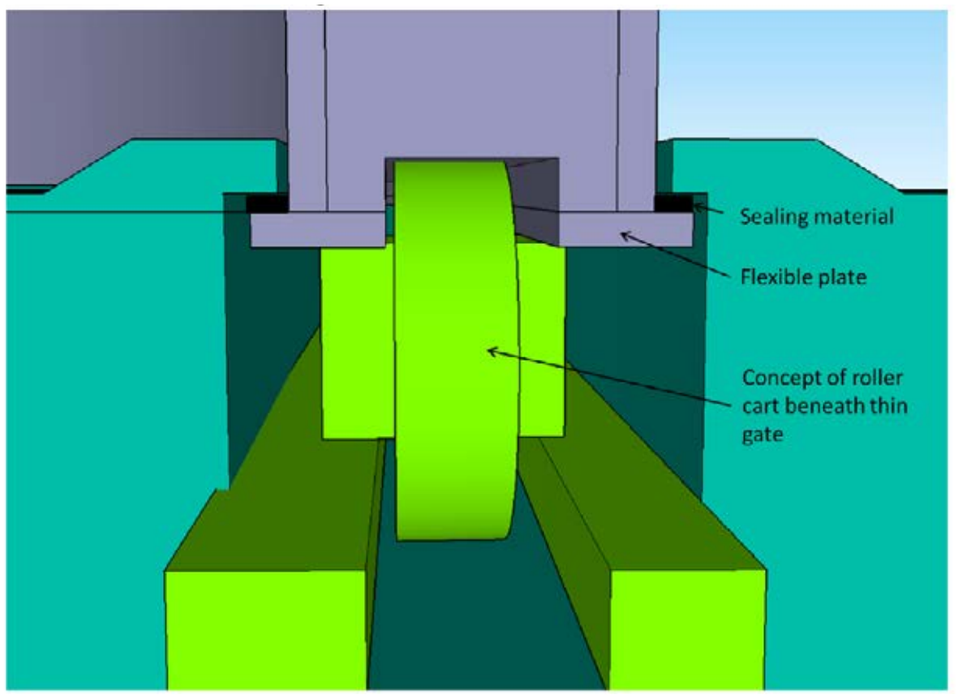


The optimized water lock

source:
Gate Design For Large, High Head Locks
“The development of an innovative lock gate”. J.W. Doeksen

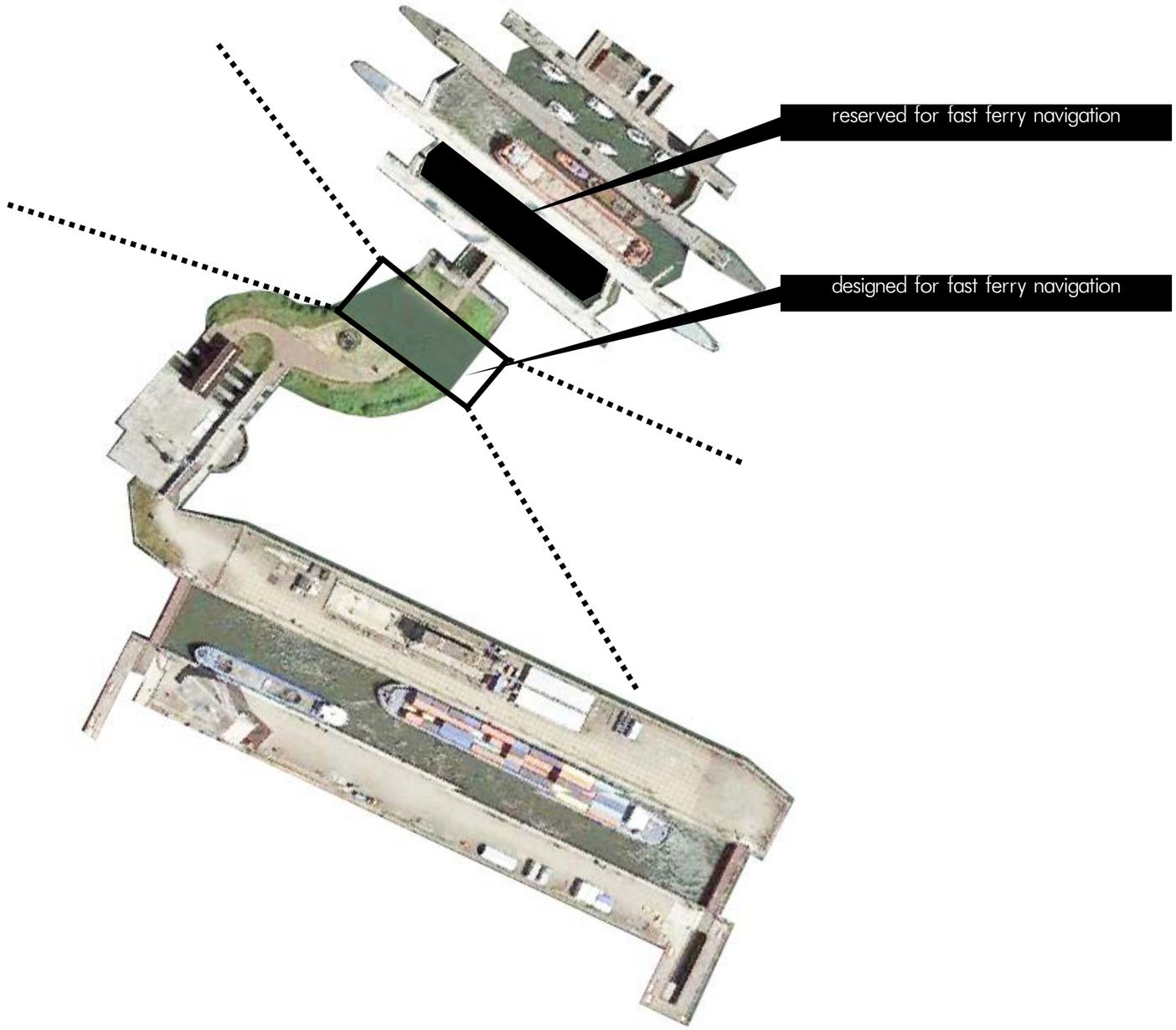


source:
Gate Design For Large, High Head Locks
"The development of an innovative lock gate". J.W. Doeksen

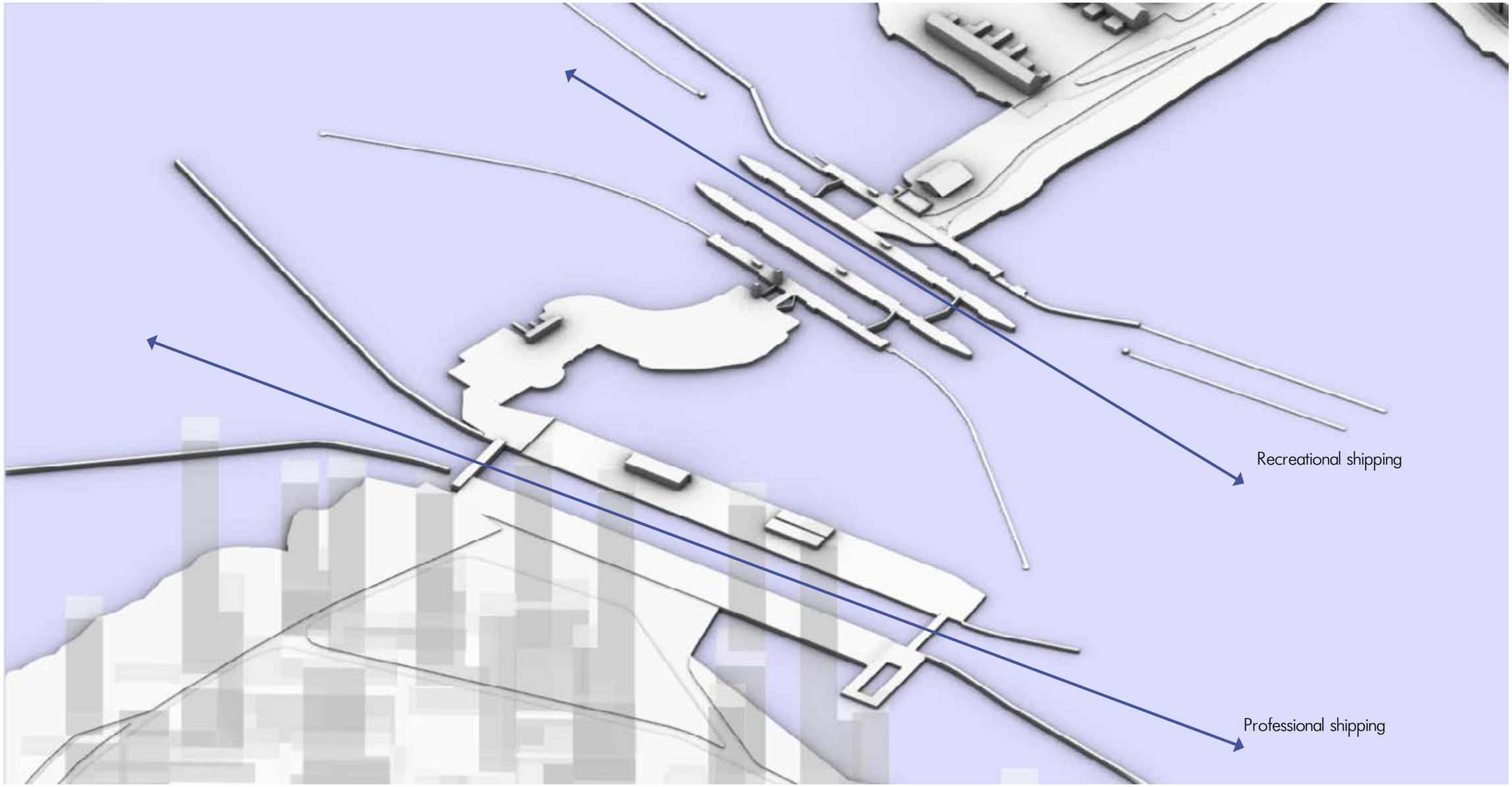


source:
ROAD TOWARD A STANDARDIZED LOCK GATE
DESIGN OF A CONCRETE MODULAR ROLLING ARC GATE. SEBASTIAAN VAN ROSSUM

Water lock complex

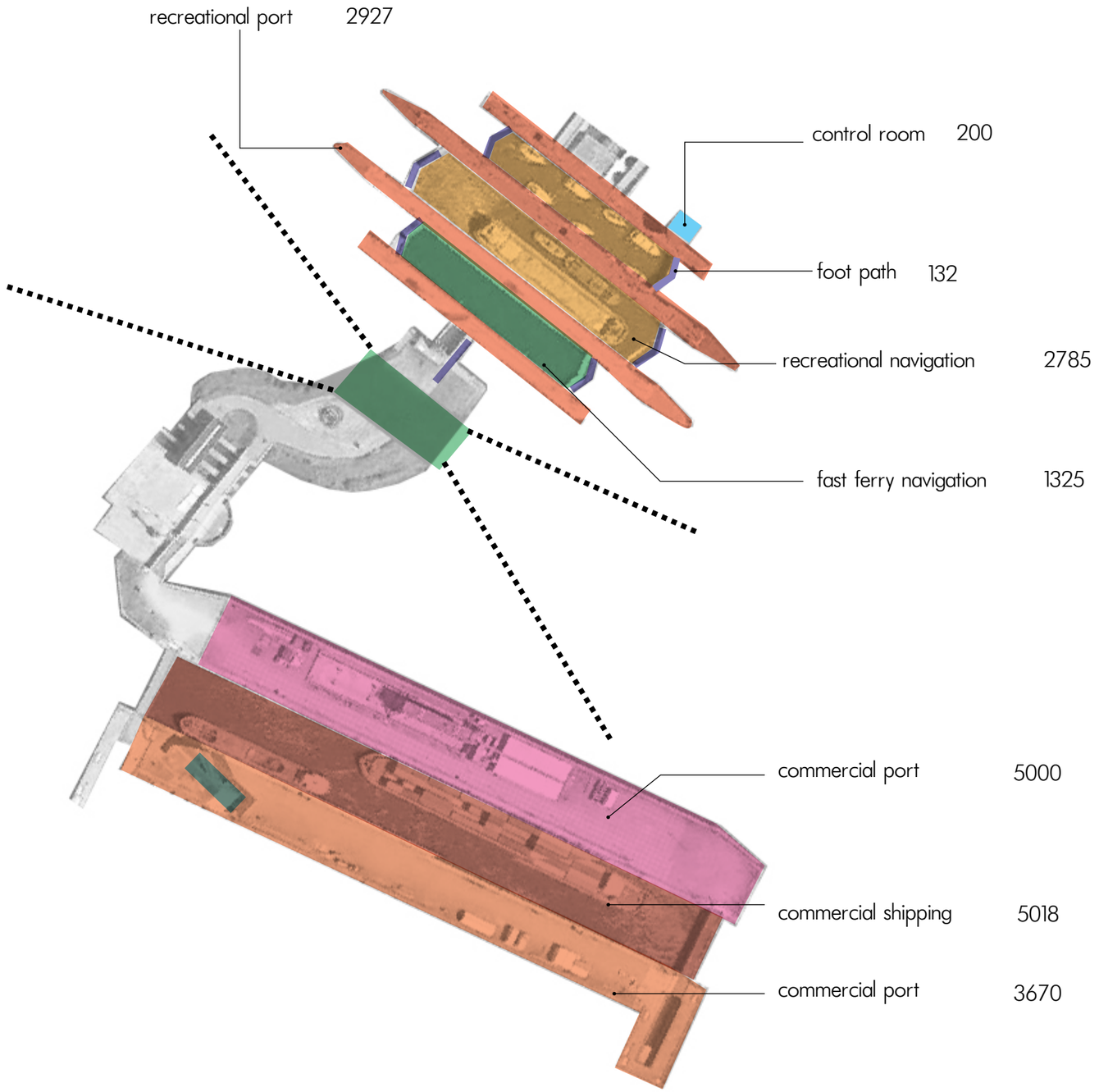


Built year: Oranjesluizen 1870
(renewed in 1997)
Prince Willem-Alexander lock 1995

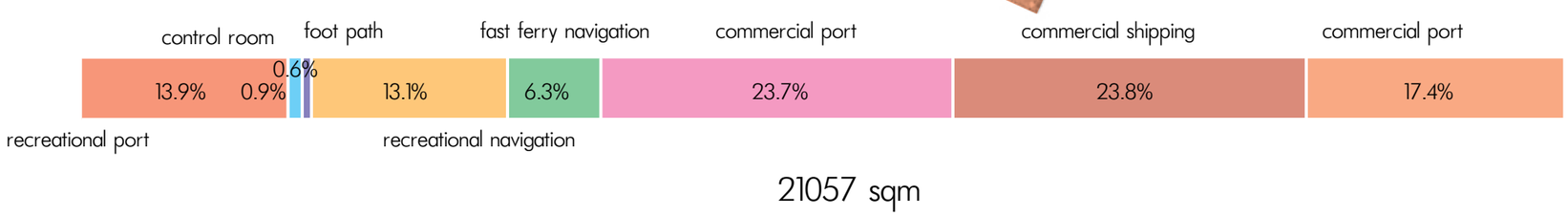


1. Old water lock

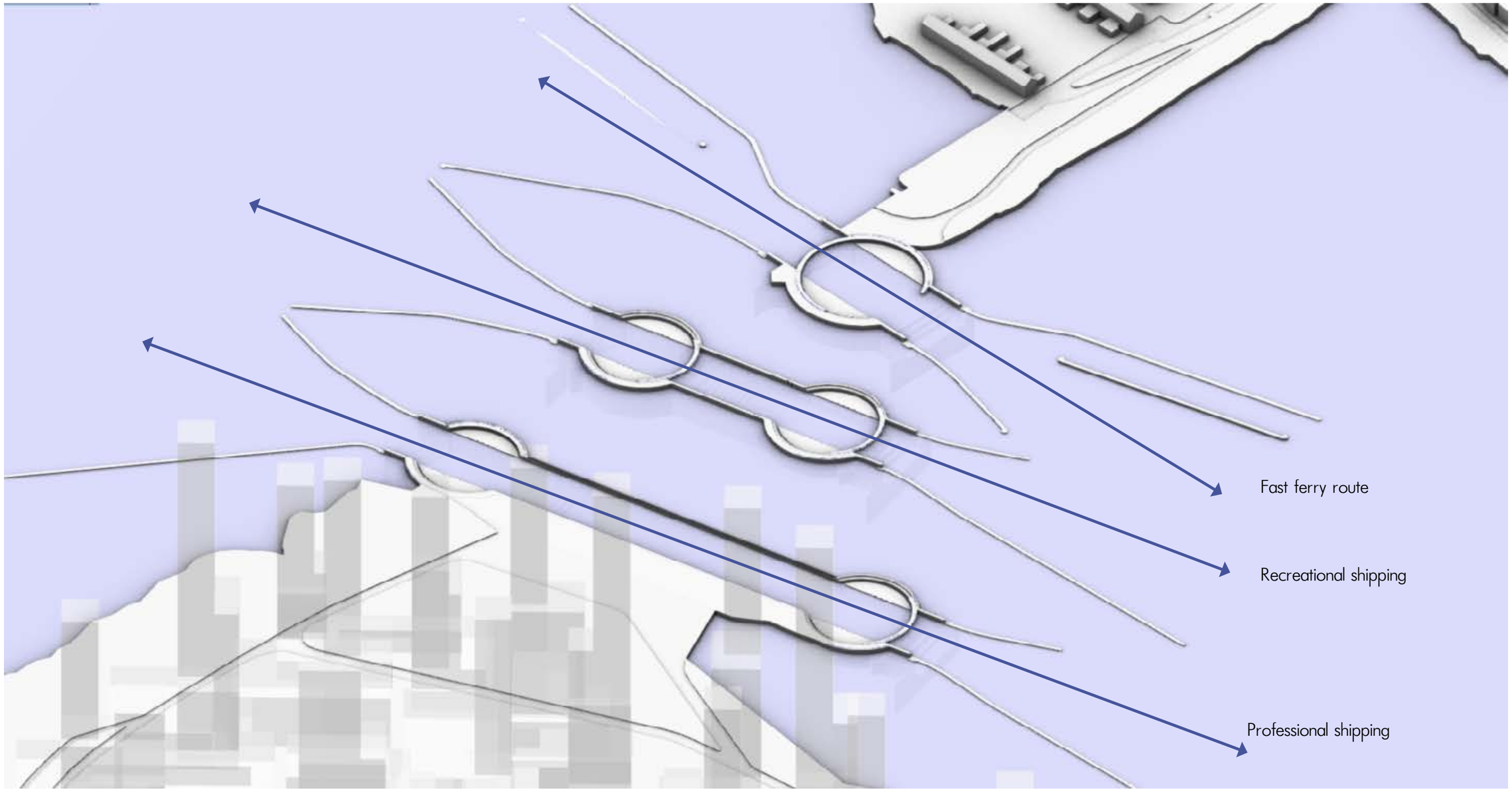
Water lock complex



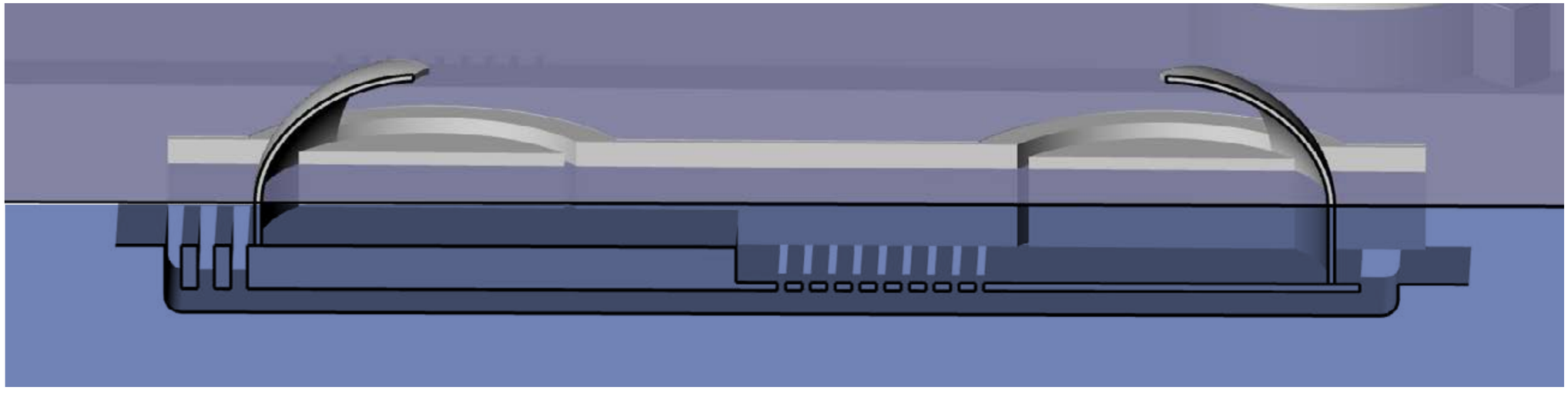
Built year: Oranjesluizen 1870
(renewed in 1997)
Prince Willem-Alexander lock 1995

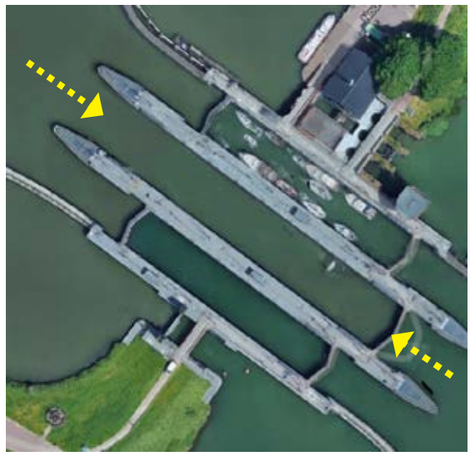


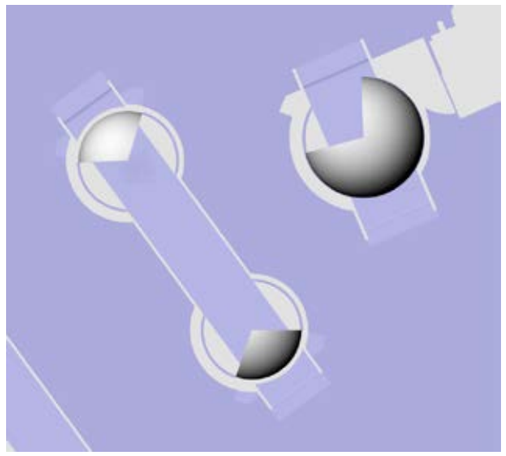
21057 sqm

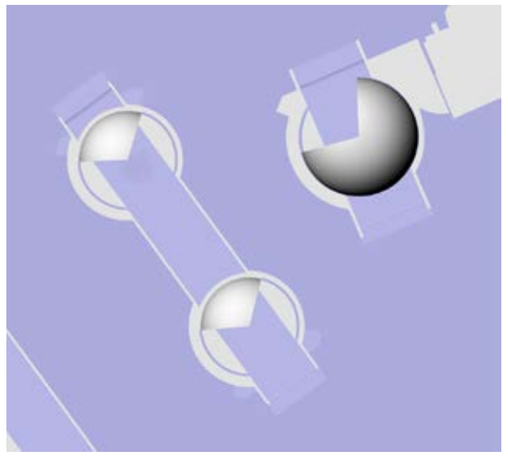


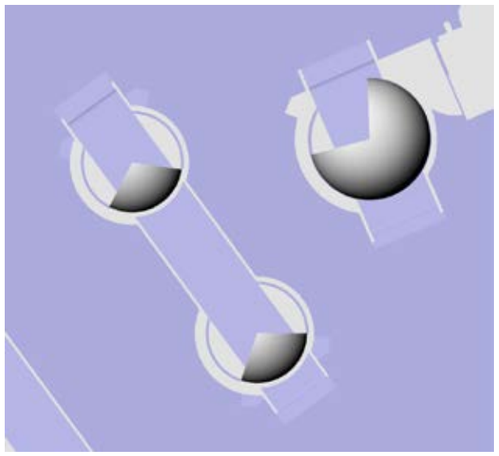
2. Rearrange the waterway by adding a fast ferry route





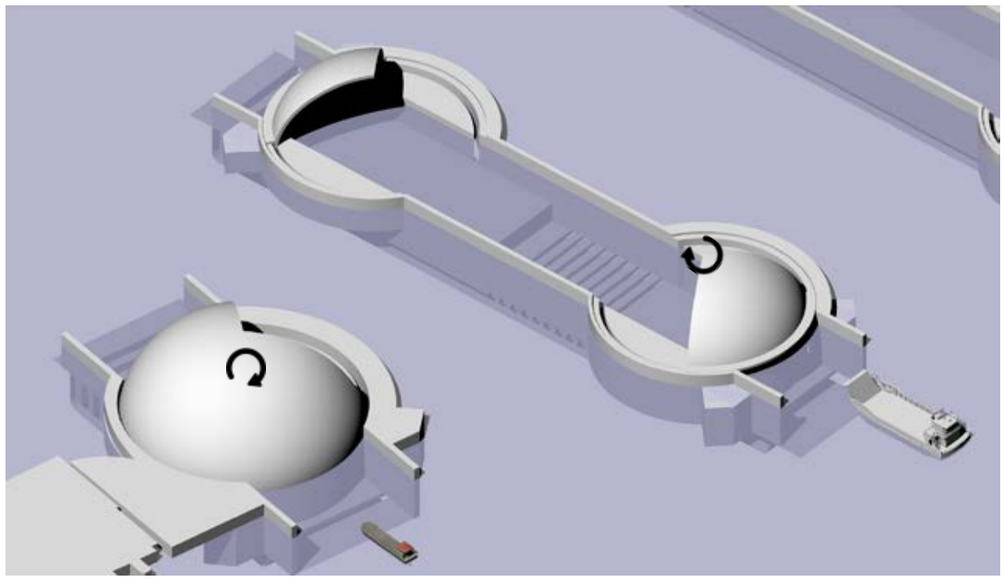






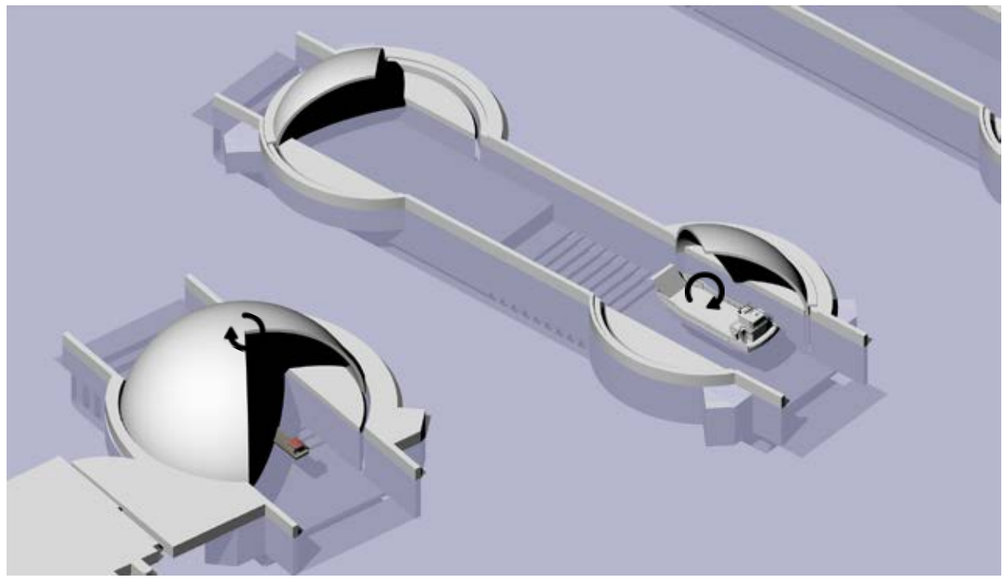
Different gate closed status because low water pressure there

1



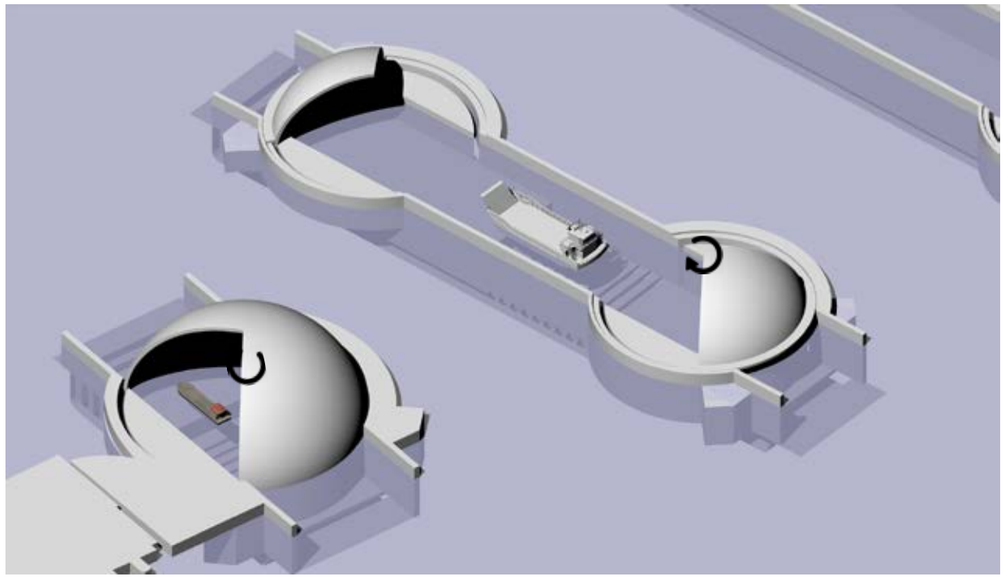
Fast ferry Recreational boat

2



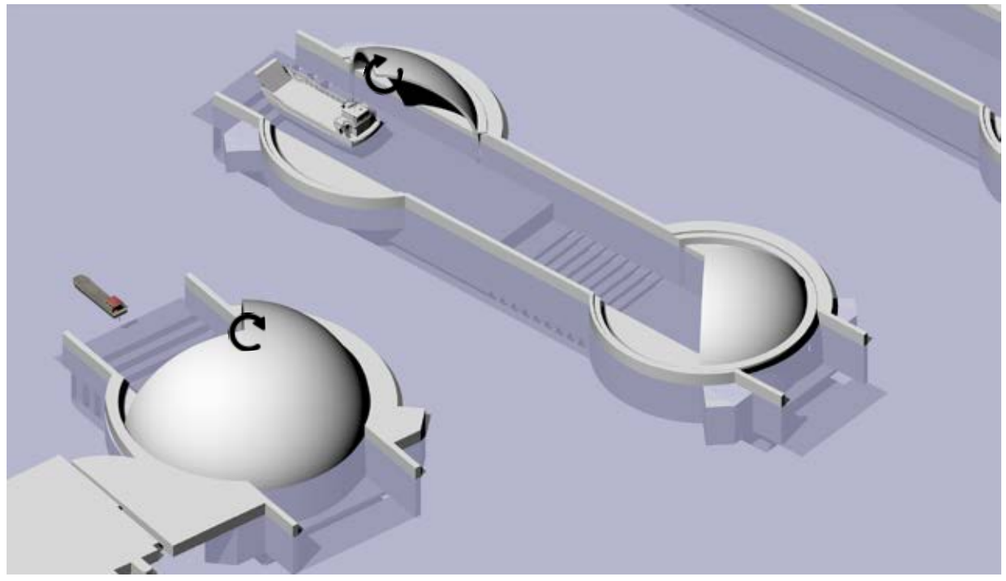
Fast ferry Recreational boat

3



Fast ferry Recreational boat

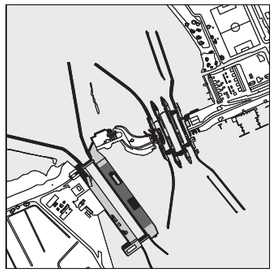
4



Fast ferry Recreational boat

Compared with ordinary water lock. The water lock for fast ferry route saves time in theory by one 120 degree revolution of the lock's gate, which causes the water level within it to gradually fill and conversely drain, allowing boats to reach both river levels with little time waiting here

Main Object



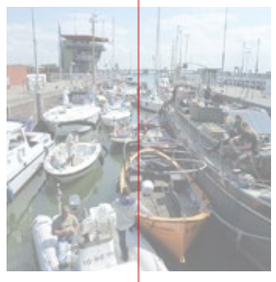
The Schellingwoude Lock Complex

Function

Water Navigation

Water Activities

future
scenario

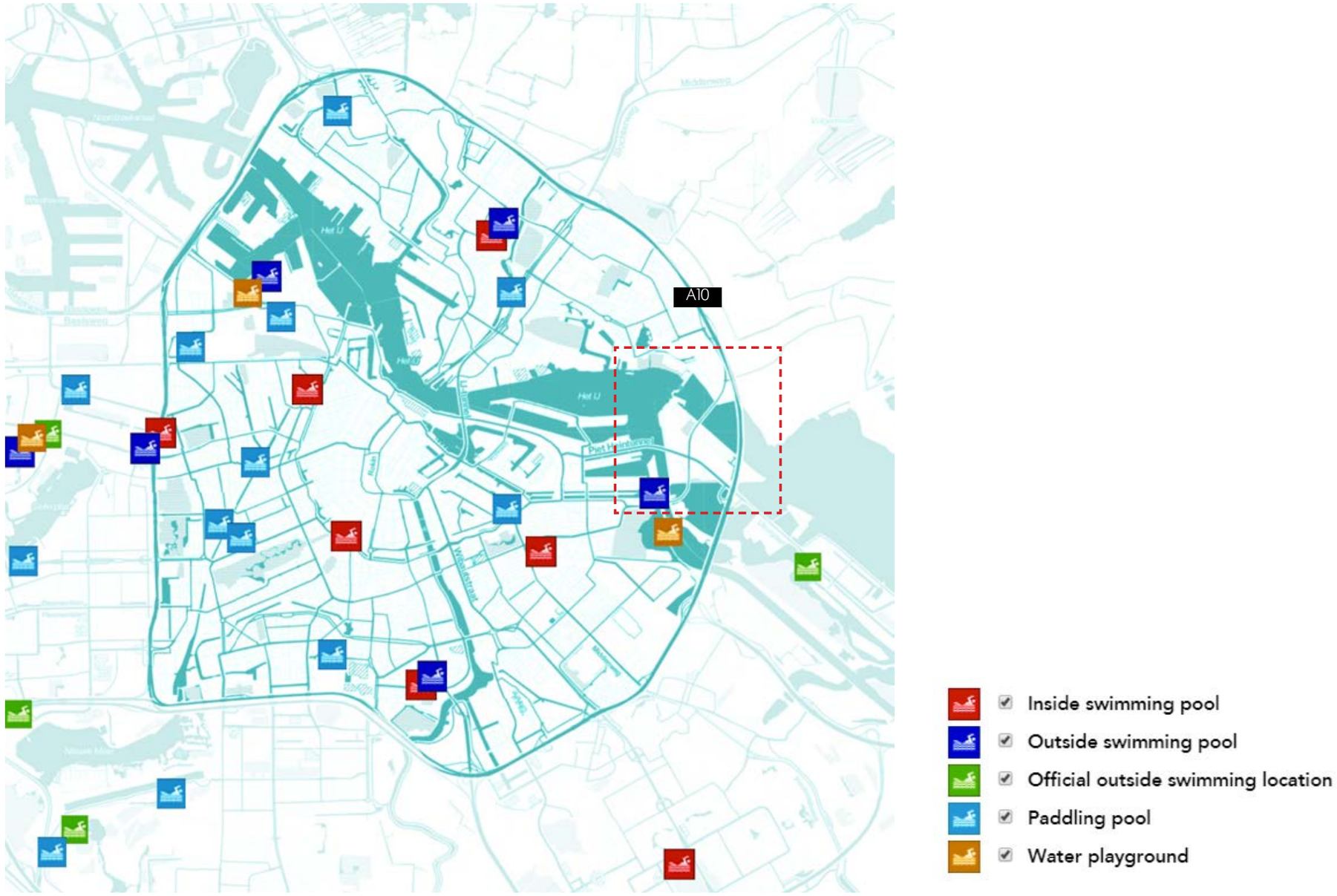


Planned waterway

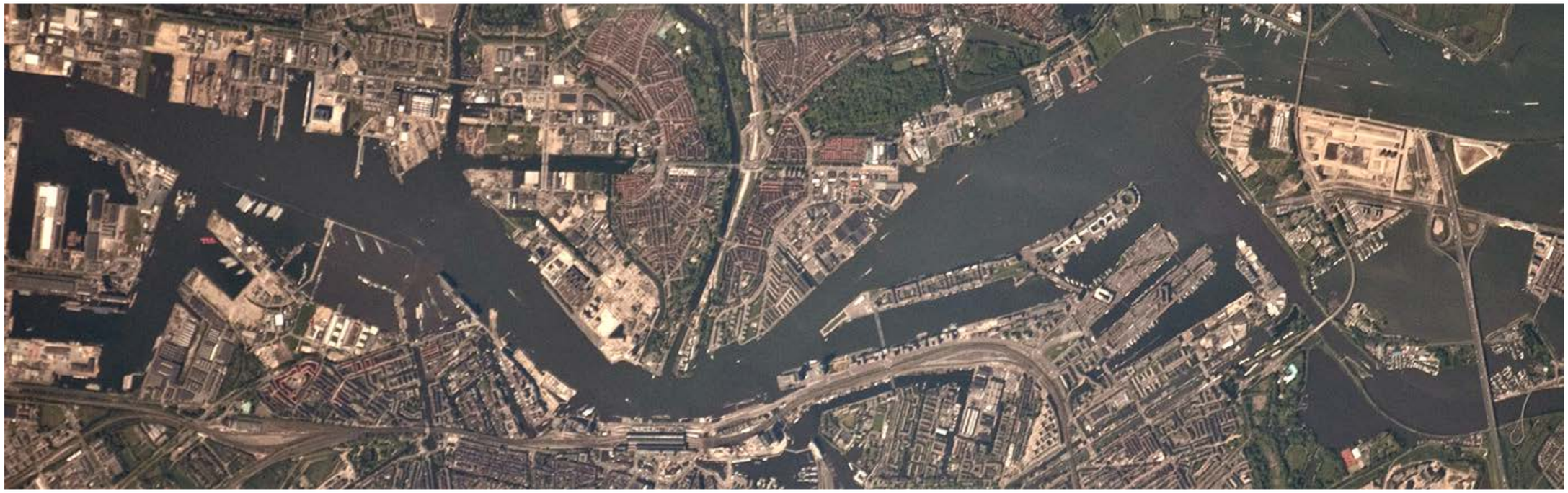
Social-culture needs

Future
Result

A Renewed Water Infrastructure

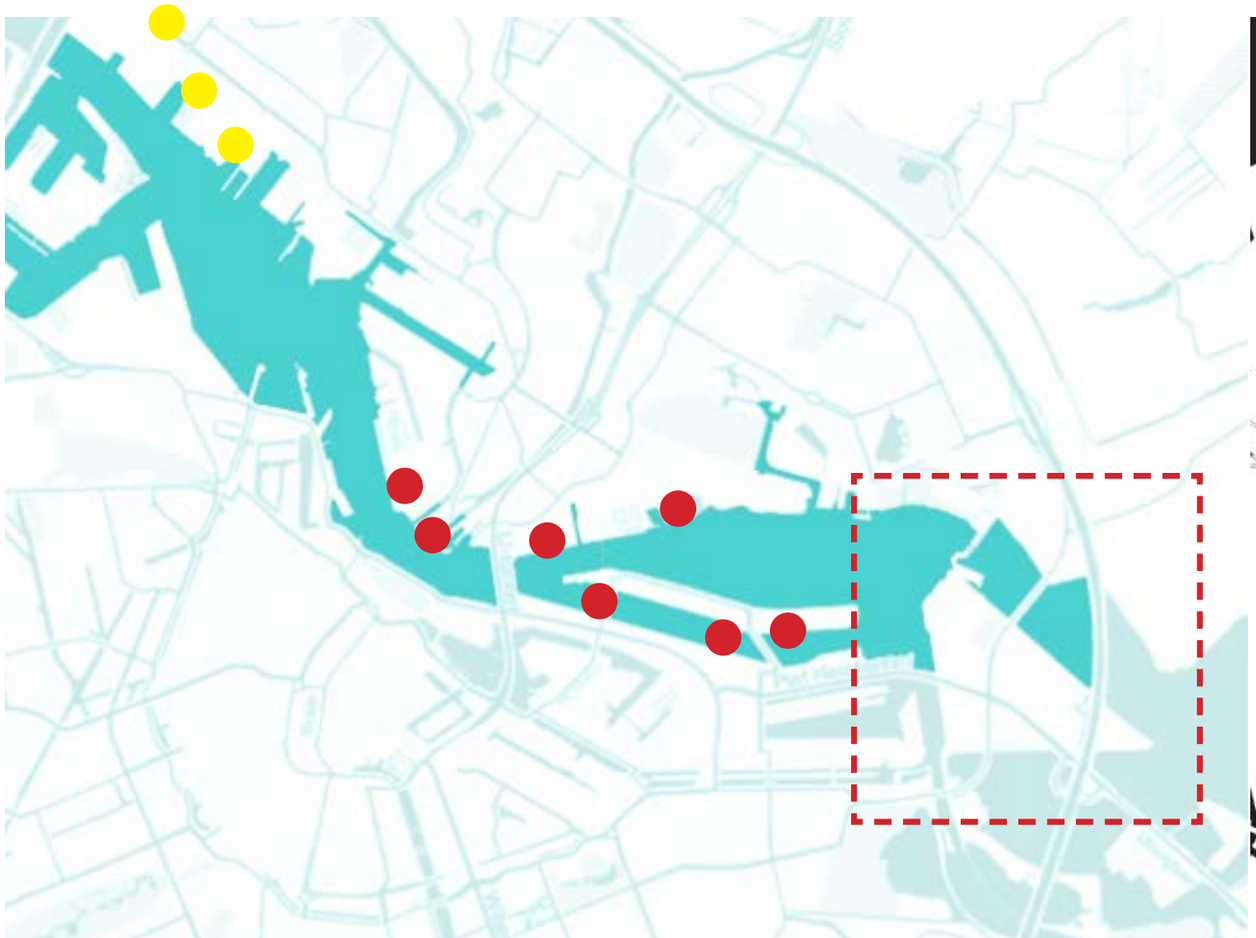


There are more than 40% water public space within the A10 ring, but most of the water entertainment space is located a little bit far from the river IJ, In our site, around the sluisbuurt and schellingwoude, there are large area of natural water resource with good accessibilities but are not well developed for water recreation now.



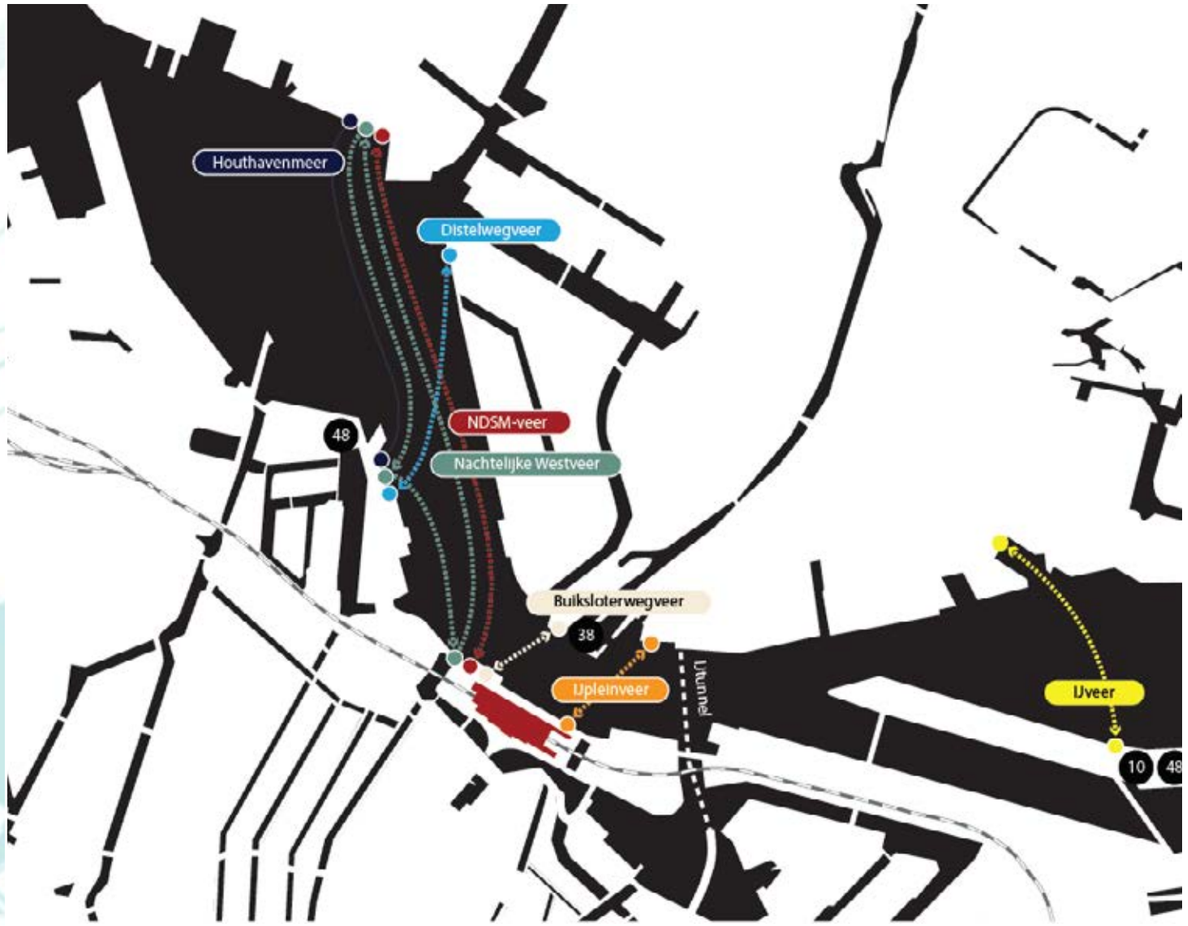
River IJ stands as an important role for people's water entertainment needs


Rediscover the potential of the river IJ



recreational place and / or catering with view of the water

planned recreational place and / or catering with view of the water



current connections between each recreational place

It can be seen positive things along the IJ developments, but still much needs to be done.
The greatest chance lies in the development of the whole IJ banks as a new public space for the city

Water Vision Amsterdam 2040
English Summary (september 2016)

Amsterdam: City of Water

Blue treasure

Amsterdam cherishes its water – and rightly so. Amsterdam is a city of water pur sang. About 35% of the city's surface area consists of water. In the Dutch Golden Age of the 17th century as well as today, water is a source of income, beauty and amusement: blue treasure. The 17th-century ring of concentric canals is a UNESCO World Heritage Site. With 3 million visitors a year, canal cruises through this area are one of the country's most popular attractions. The IJ waterway is teeming with inland barges, passenger ferries, cruise ships and recreational boats. The city's canals are filled with pleasure craft on summery days and during major events such as King's Day. The growing number of visitors and inhabitants places increasing pressure on public space, water included – the balance of the water's use is at issue. The Amstel is a scenic river that channels water into the city like a blue carpet. The banks of this languid peatland river rank among the city's most important recreational cycle routes, and they provide relaxation and a chance to cool down for city-dwellers. The water is still of inestimable value to Amsterdam and its inhabitants.

Water in the genes

Over the centuries the people of Amsterdam have learned to 'live with water'. Water is in the city-dwellers'

The IJ and the port

The IJ is an important link in the trans-Atlantic passage of cargo vessels sailing between the Ruhr Area, the Port of Amsterdam, other Dutch inland ports and international seaports. The Port of Amsterdam is Western Europe's fourth largest seaport by cargo tonnage and boasts the world's largest petroleum and cocoa ports – its economic significance is considerable. We are aiming to manage the accessibility and use of space within the port precincts more intensively and more efficiently. The port area also serves as a testing ground for business ventures and experimentation with new sustainable technologies.

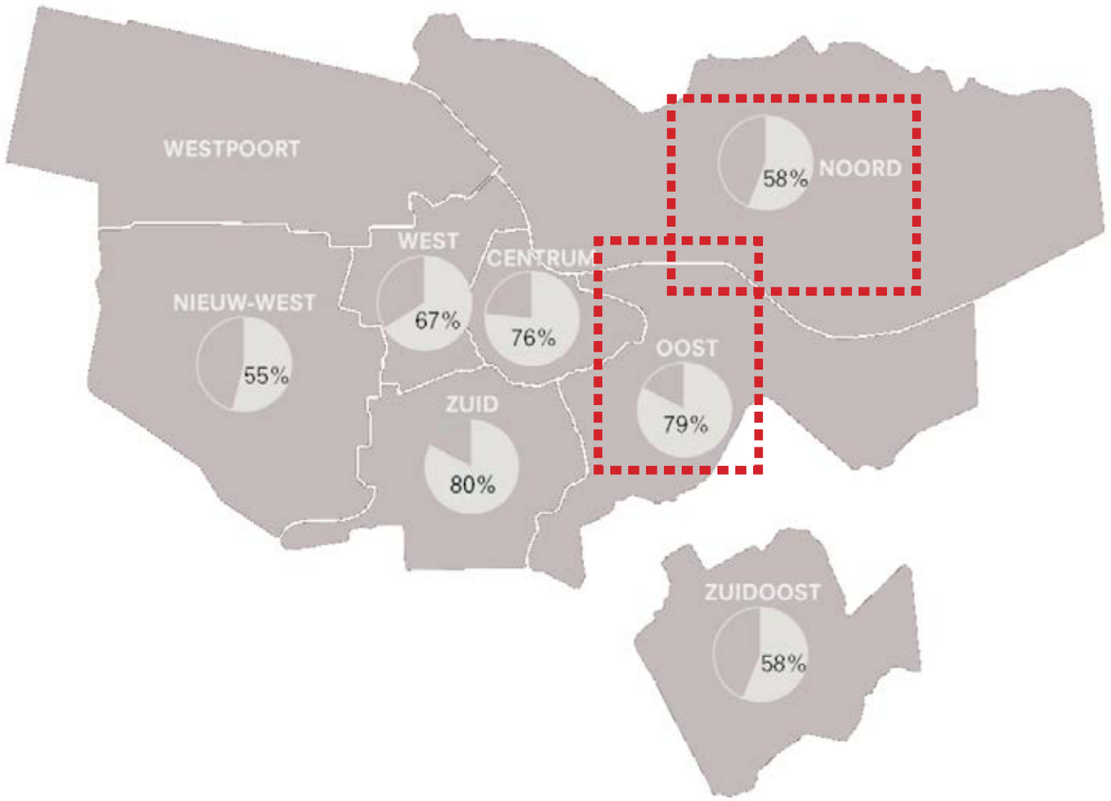
The frequency and number of passenger ferries on

Rediscovery of the water

Before the 19th century, Amsterdam's water was most important for the water management of this marshy city and for the transportation of goods. The latter was of considerable economic importance. In the Golden Age the ships of the VOC – the Dutch East India Company – moored along the IJ, whereupon the cargo was transferred to smaller boats and conveyed to the canal-side warehouses via the canals. The barge canals were important routes for inland transportation. The construction of Central Station marked a reversal in Amsterdam's relationship with the water: road and rail became the main modes of transport and the city centre's waterways fell into disuse as transport arteries. The city was visually closed off from the IJ, where shipping remained important. Nowadays the canals and waterways are primarily used by canal cruise operators, recreational boats and houseboats. Since the 1990s a completely new urban waterfront has taken shape around the IJ, with new public amenities such as the Muziekgebouw aan 't IJ concert hall, the redeveloped NDSM shipyard and the EYE Film Museum, as well as wonderful new public spaces on the waterside. Amsterdam has rediscovered the IJ. Thanks to the opening of the Hermitage and the large landing stage at its front entrance and the Amstel Quarter's development of Park Somerlust, the River Amstel is likewise being rediscovered as an important public space for the city.

the IJ will be increased and the distribution of the ferries along the IJ waterway is being optimised. In addition, before 2020 we are keen to gain clarity about the construction of one or more bridges (for slow-moving traffic), a tunnel or a cableway in order to be able to handle the future growth in passenger traffic across the IJ. We want to continue the development of new public attractions along the Banks of the IJ and provide publicly accessible greenery on the Northern Banks of the IJ with cycle routes continuing through to Zaandam and Marken. At various locations along the IJ there is space for new marinas as well as small-scale moorings for floating and amphibious dwellings or houseboats. We are also going to scout out locations for the growing river cruise sector along the IJ and in the region, as well as for a second Passenger Terminal Amsterdam for ocean-going cruise ships in the Western Harbour Area/North Sea Canal Area.

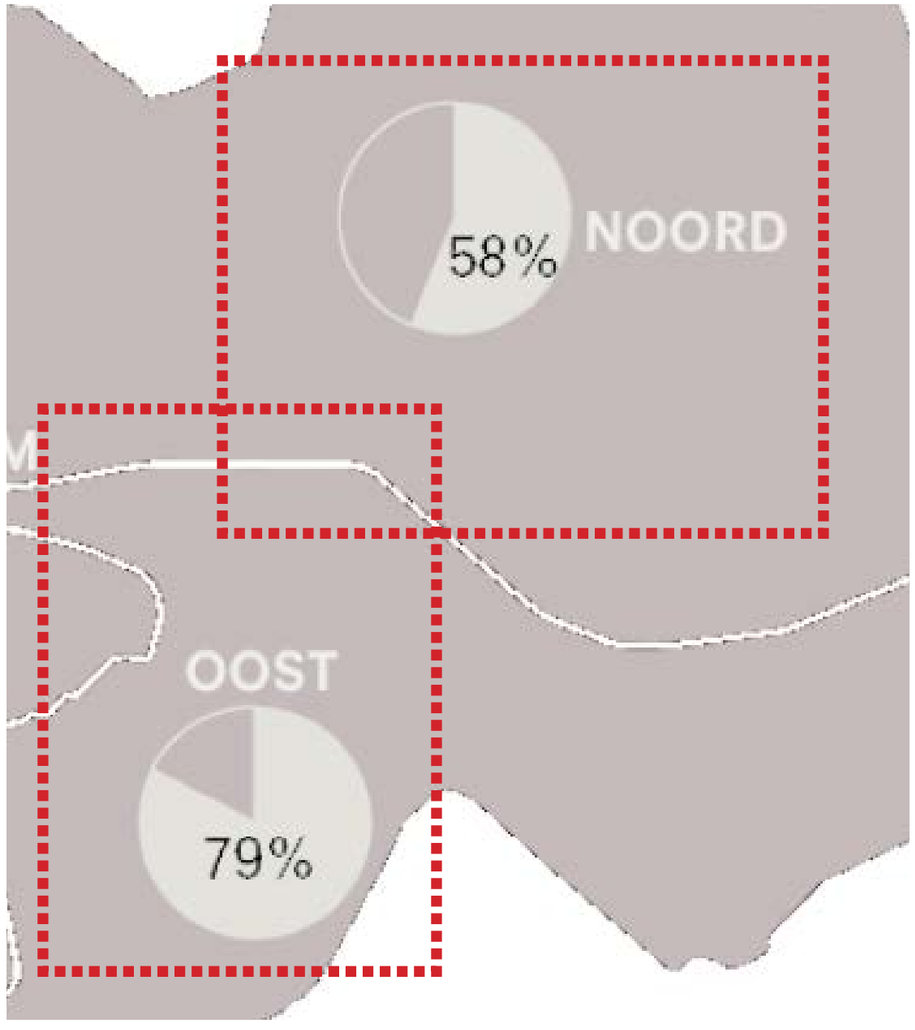
future scenario: the lock complex will contribute to the whole recreation network of the IJ



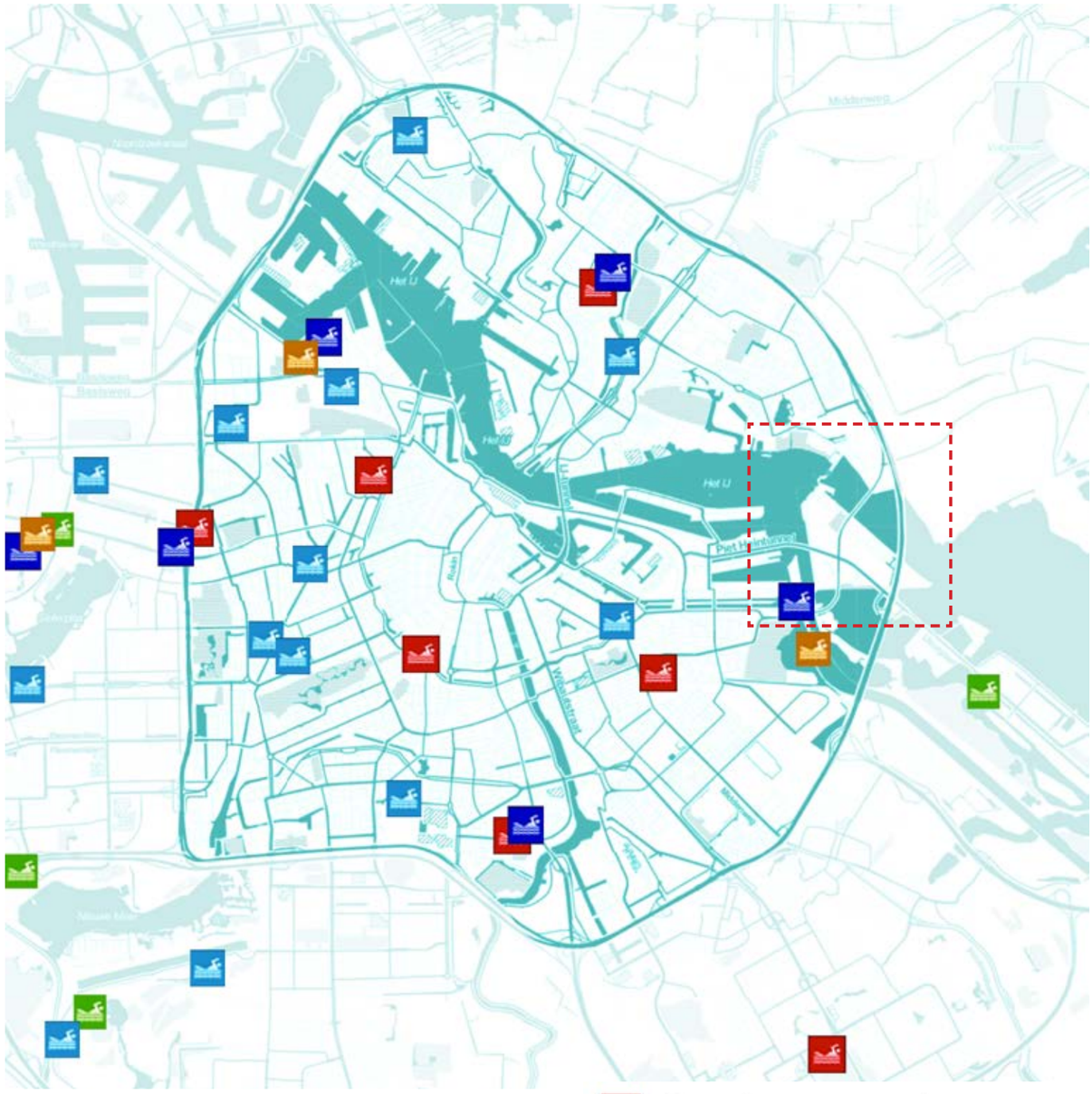
regular recreation activities participation, by district

		total	men	women
1	swimming	38	34	42
2	leisure cycling/cycle racing	20	23	16
3	fitness/aerobics	17	14	21
4	walking	15	13	16
5	running/jogging	12	15	10
6	football	12	20	3
7	in-line/roller skating	11	9	12
8	tennis	11	13	9
9	skating	9	10	8
10	sailing/rowing/canoeing/surfing	8	9	7

swimming most popular among aged 6-79.



these number will be increased

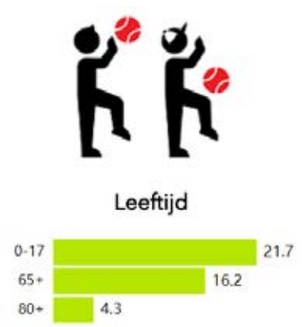


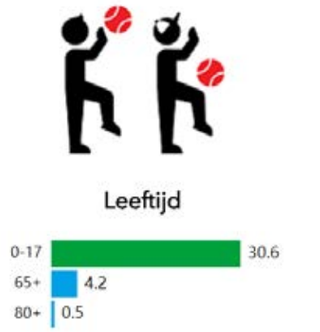
Visiors:
270 boats/day

Zeeburgerisland
population: >15000 (future)

Schellingwoude
population: 1800

groups of people





Schellingwoude
population: 1800

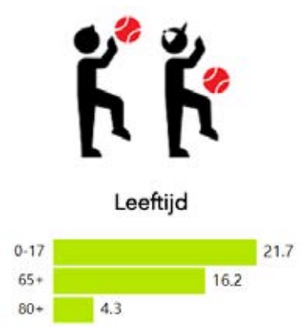
Zeeburgerisland
population: >15000 (future)

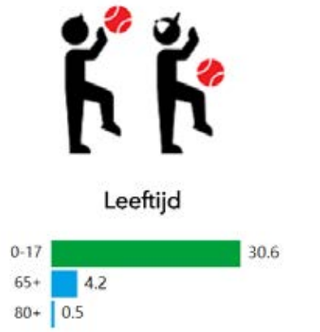
Visiors:
270 boats/day

Water
Activities

spatial needs

groups of people





Schellingwoude
population: 1800

Zeeburgerisland
population: >15000 (future)

Visiors:
270 boats/day

spatial needs

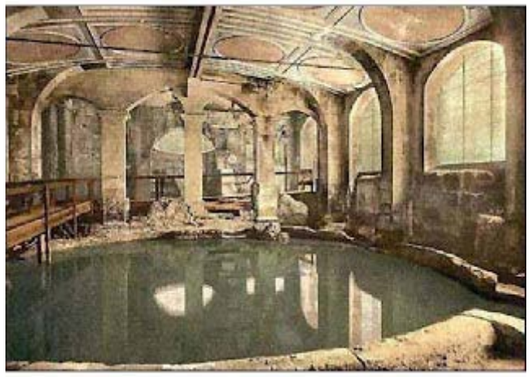
Water
Activities

Playable

Relaxation

Outdoor landscape

In AD 305 the Romans built an incredible pool that was over 900,000 square feet. This pool was used for bathing and was also heated by giant fires in the basement beneath the floors of the pool; the columns and walls pumped the heat up to the pool above.

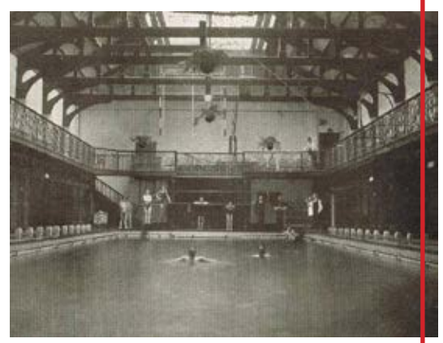


1900: The Paris Olympics feature an obstacle swimming event in the Seine River.

78 AD: Romans introduced swimming as a social event to Britain.

The “great bath” is the earliest public water tank in the ancient world. It existed over 5000 years ago in the Pakistani city settlement of Mohenjo-daro. Most scholars agree that this tank would have been used for special religious functions where water was used to purify and renew the well being of the bathers.

In the 6th to 8th Century BC, the ancient Greeks had “Palaestras” which were essentially an open court area between columns and rooms where one could come and wrestle, box, play ball type games and other miscellaneous exercises. But most importantly, there were pools here for swimming, bathing and socializing

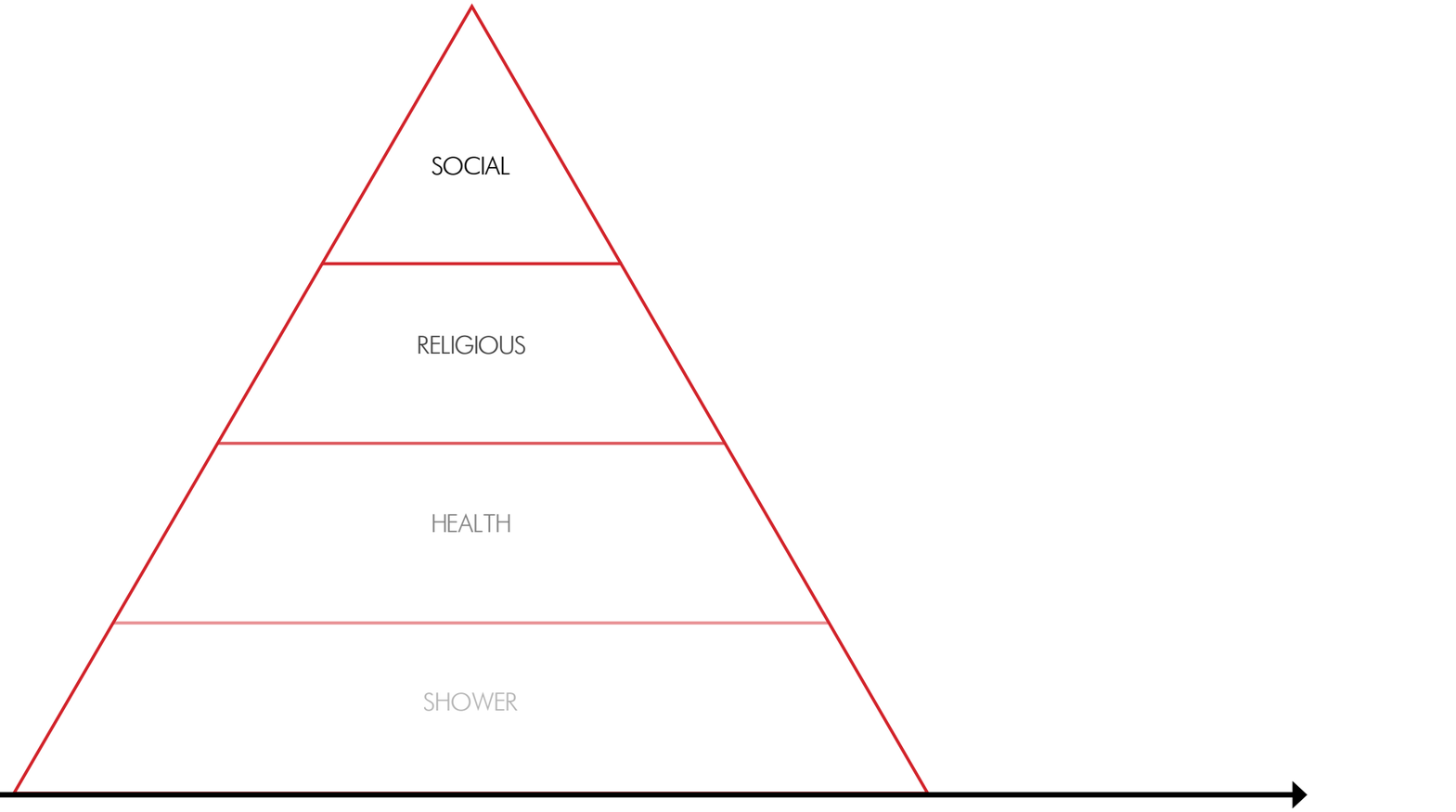


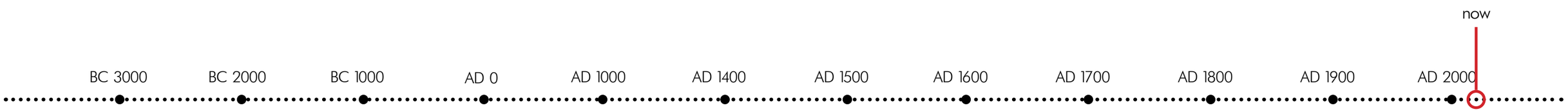
1830s: Swimming clubs are established in England.

BC 2500

BC 600

BC 3000 BC 2000 BC 1000 AD 0 AD 1000 AD 1400 AD 1500 AD 1600 AD 1700 AD 1800 AD 1900 AD 2000

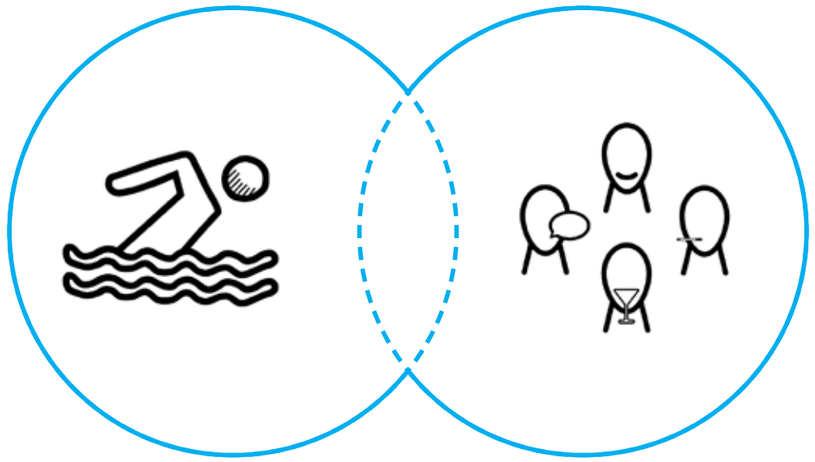

SOCIAL
RELIGIOUS
HEALTH
SHOWER


now
BC 3000
BC 2000
BC 1000
AD 0
AD 1000
AD 1400
AD 1500
AD 1600
AD 1700
AD 1800
AD 1900
AD 2000

swimming

isolated

SOCIAL



water-social culture

groups of people

Schellingwoude
population: 1800

Zeeburgerisland
population: >15000 (future)

Visiors:
270 boats/day

Water
Entertainment

spatial needs

Playable

Relaxation

Outdoor landscape

pool with different themes

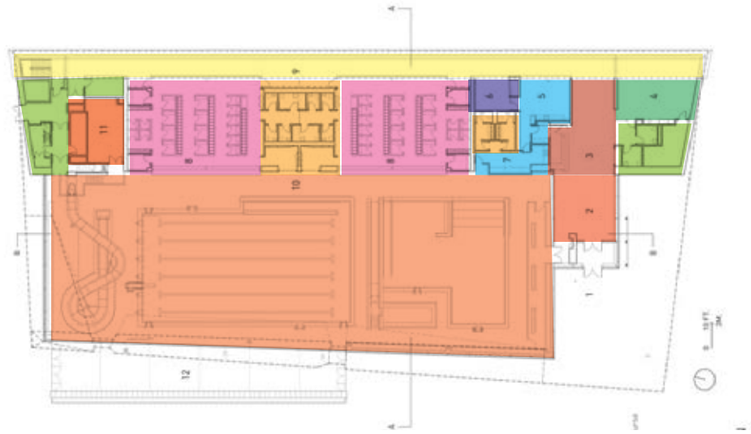
group social

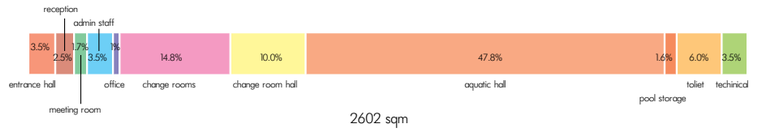
playable pool

children care

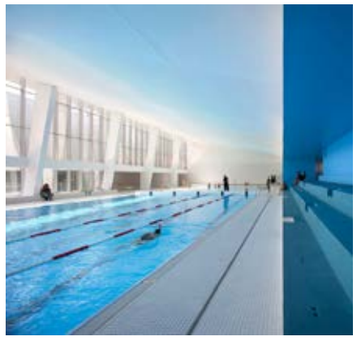
personal mediation

Regent Park Aquatic Centre
/ MacLennan Jaunkalns Miller Architects



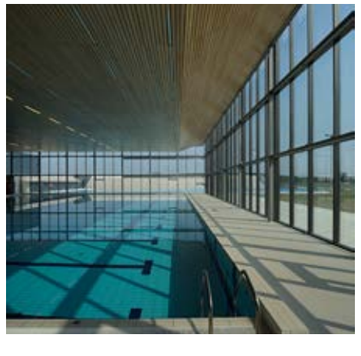


2602 sqm

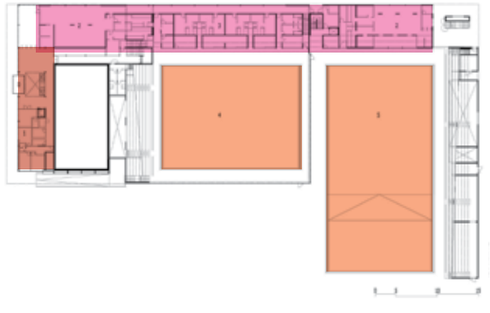


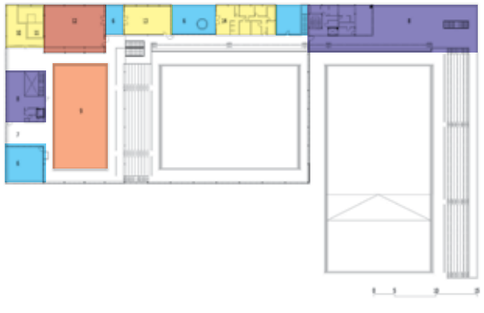
Swimming Pool Extension in Bagneux
/ Dominique Coulon & associés

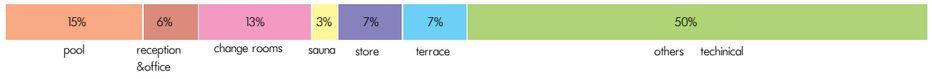
3431 sqm

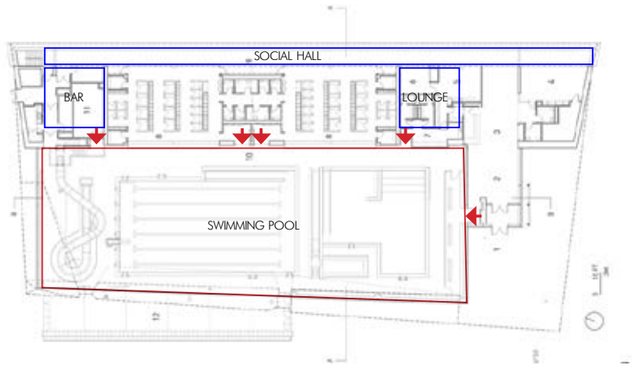


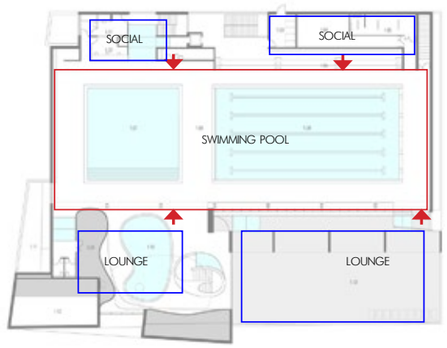
Swimming Center Viju□
/ SANGRAD architects + AVP Arhitekti

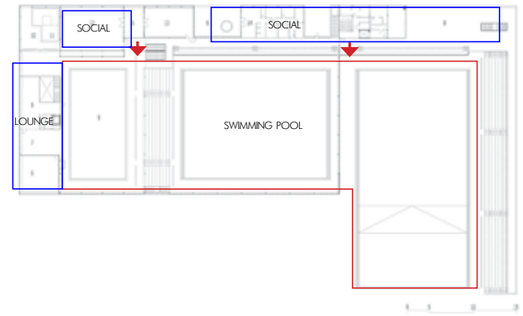


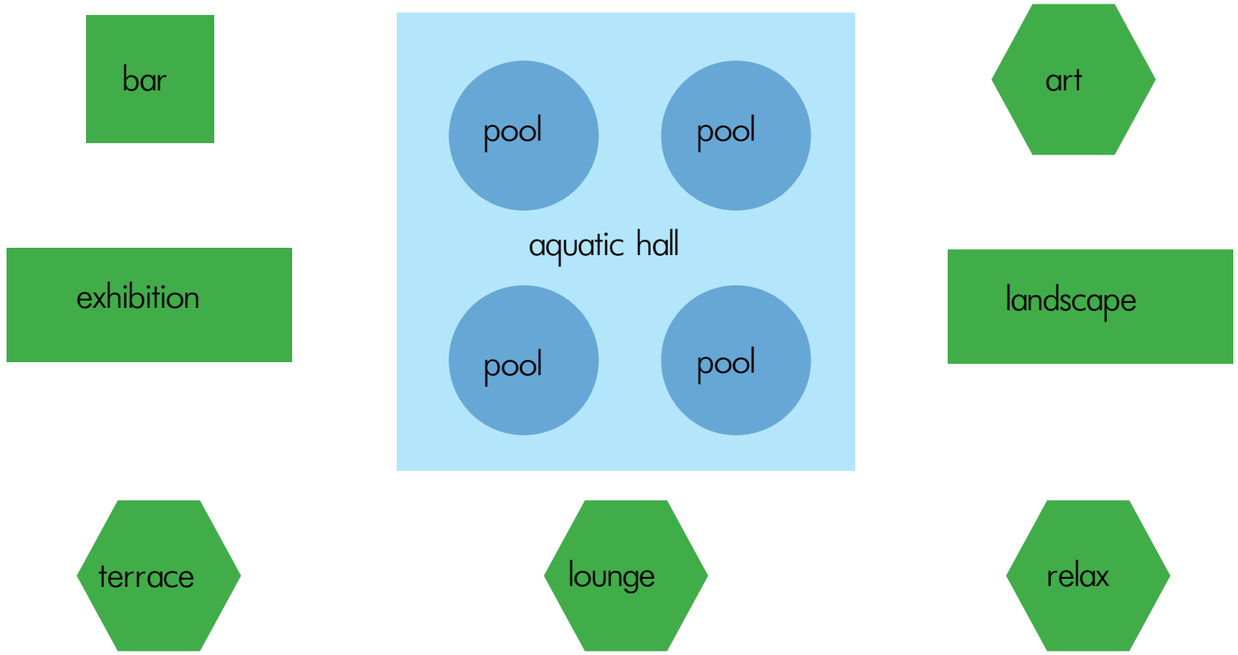






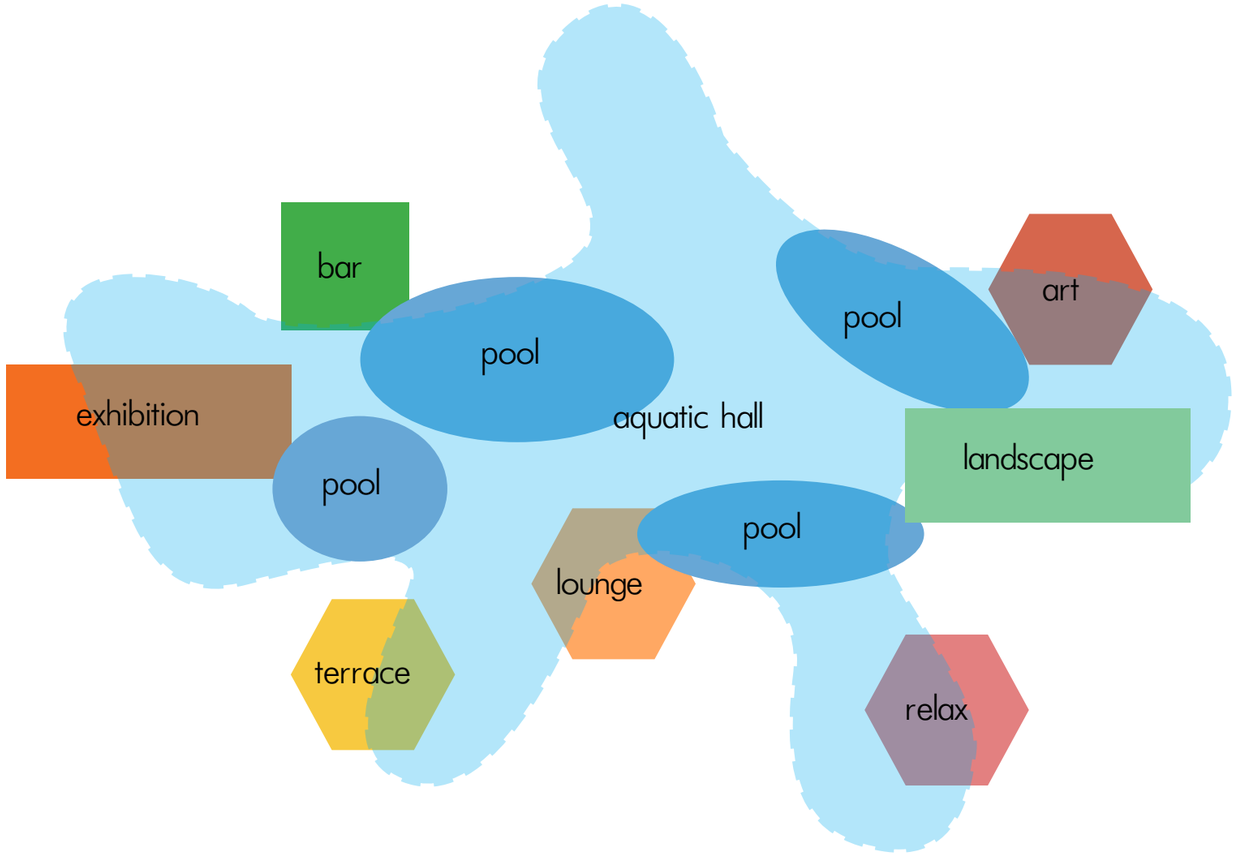






Problem:

1. each program is designed as an independent object, but few connection
2. lack different intertwined experience
3. each program lacks its own character

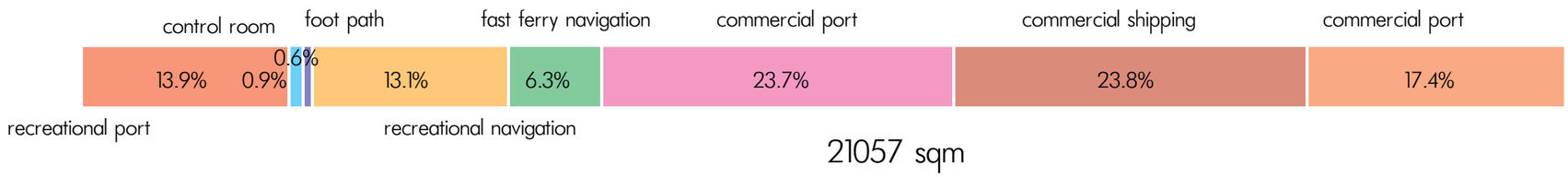


Improvement:

1. emphasis on different water experience
2. water as a media to connect each program
3. Homogeneous space defined by composition of each program

Typology improvement

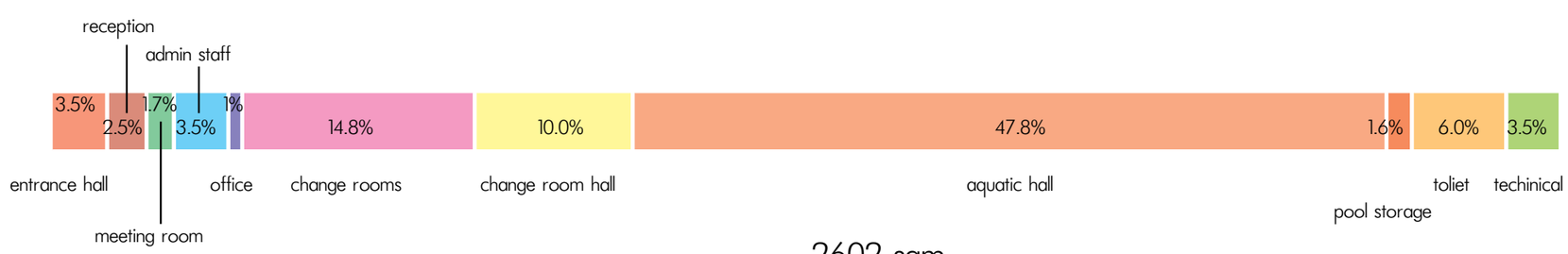
Optimized Water Navigation



21057 sqm

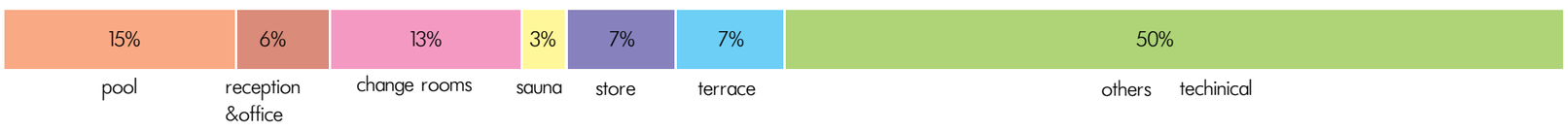
Water Entertainment Center

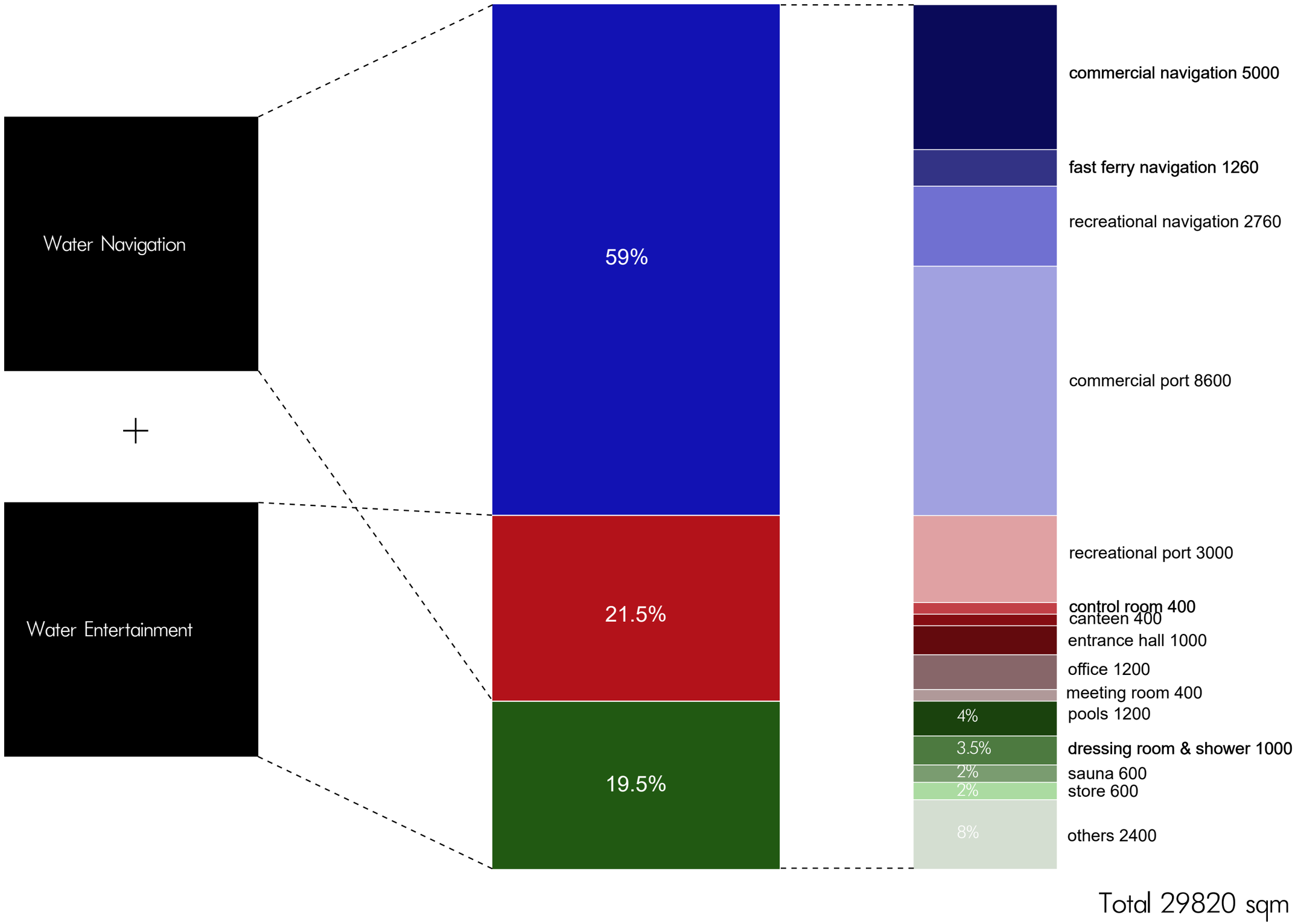
2430 sqm

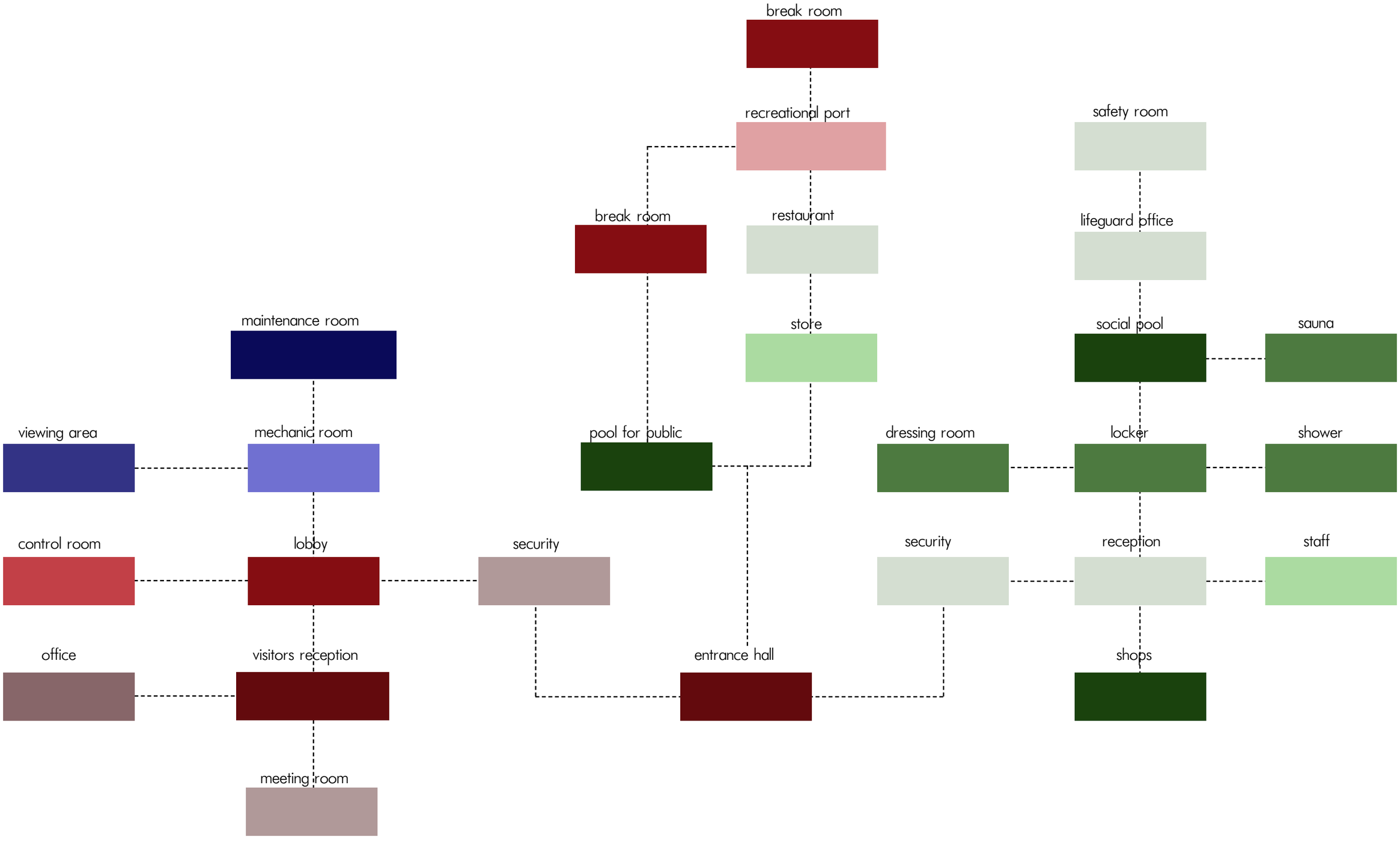


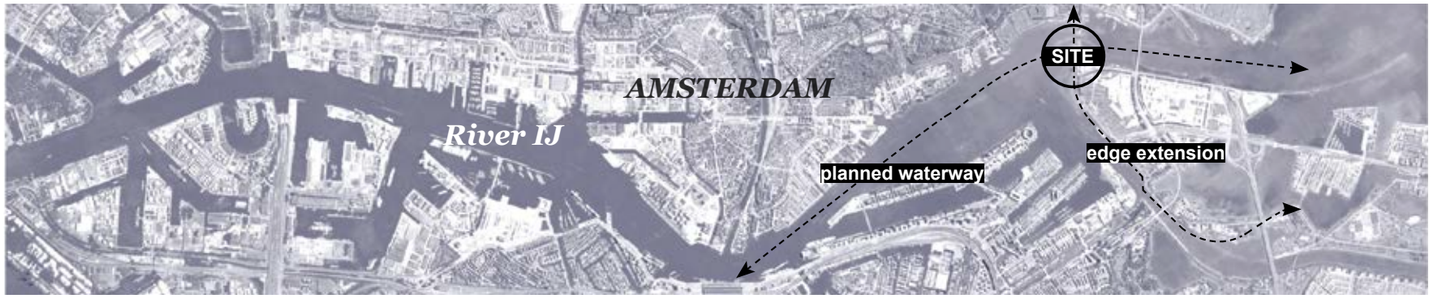
2602 sqm

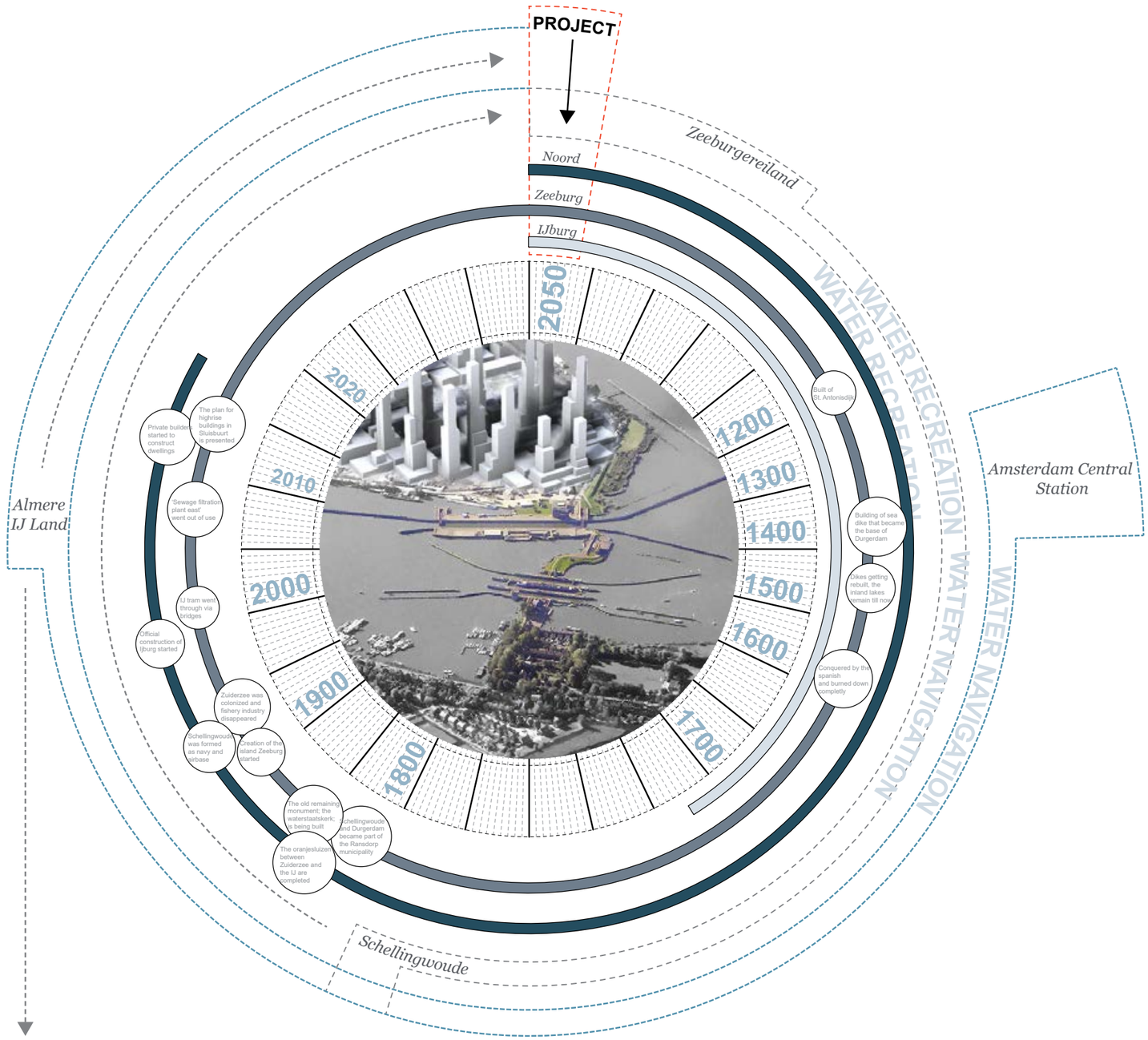
3431 sqm

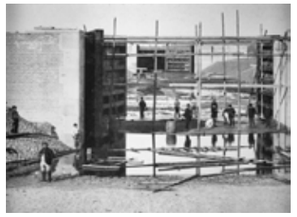


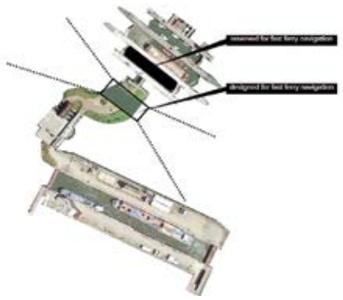

Water Navigation
+
Water Entertainment
59%
21.5%
19.5%
commercial navigation 5000
fast ferry navigation 1260
recreational navigation 2760
commercial port 8600
recreational port 3000
control room 400
canteen 400
entrance hall 1000
office 1200
meeting room 400
4%
pools 1200
3.5%
dressing room & shower 1000
2%
sauna 600
2%
store 600
8%
others 2400
Total 29820 sqm

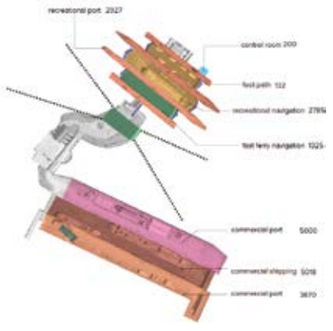

break room
recreational port
safety room
break room
restaurant
lifeguard office
maintenance room
store
social pool
sauna
viewing area
mechanic room
pool for public
dressing room
locker
shower
control room
lobby
security
security
reception
staff
office
visitors reception
entrance hall
shops
meeting room


AMSTERDAM
River IJ
SITE
planned waterway
edge extension


PROJECT
Zeeburgereiland
Noord
Zeeburg
IJburg
WATER RECREATION
WATER NAVIGATION
2050
2020
2010
2000
1900
1800
1700
1600
1500
1400
1300
1200
Built of St. Antoniesdijk
Building of sea dike that became the base of Durgerdam
Dikes getting rebuilt, the ijland lakes remain till now
Conquered by the spanish and burned down completly
Schellingwoude and Durgerdam became part of the Ransdorp municipality
The old remaining monument; the waterstaatskerk; is being built
The oranjesluizen between Zuiderzee and the IJ are completed
Schellingwoude was formed as navy and orbase
Creation of the island Zeeburg started
Zuiderzee was colonized and fishery industry disappeared
Official construction of IJburg started
IJ tram went through via bridges
'Sewage filtration plant east' went out of use
Private builders started to construct dwellings
The plan for highrise buildings in Sluisbuurt is presented
Almere IJ Land
Amsterdam Central Station
Schellingwoude



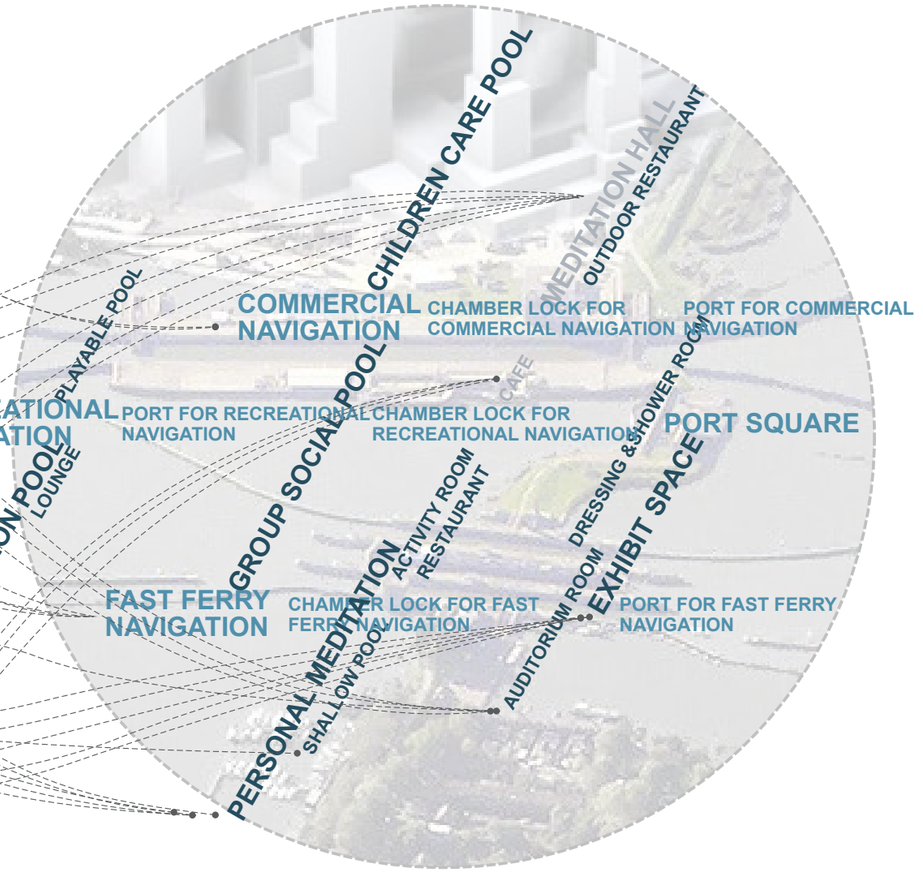




5000 CHAMBER LOCK FOR COMMERCIAL NAVIGATION
8600 PORT FOR COMMERCIAL NAVIGATION
660 CHAMBER LOCK FOR FAST FERRY NAVIGATION
600 PORT FOR FAST FERRY NAVIGATION
2760 CHAMBER LOCK FOR RECREATIONAL NAVIGATION
3000 PORT FOR RECREATIONAL NAVIGATION
200 MAINTAINANCE ROOM
200 CONTROL ROOM
1000 PORT SQUARE

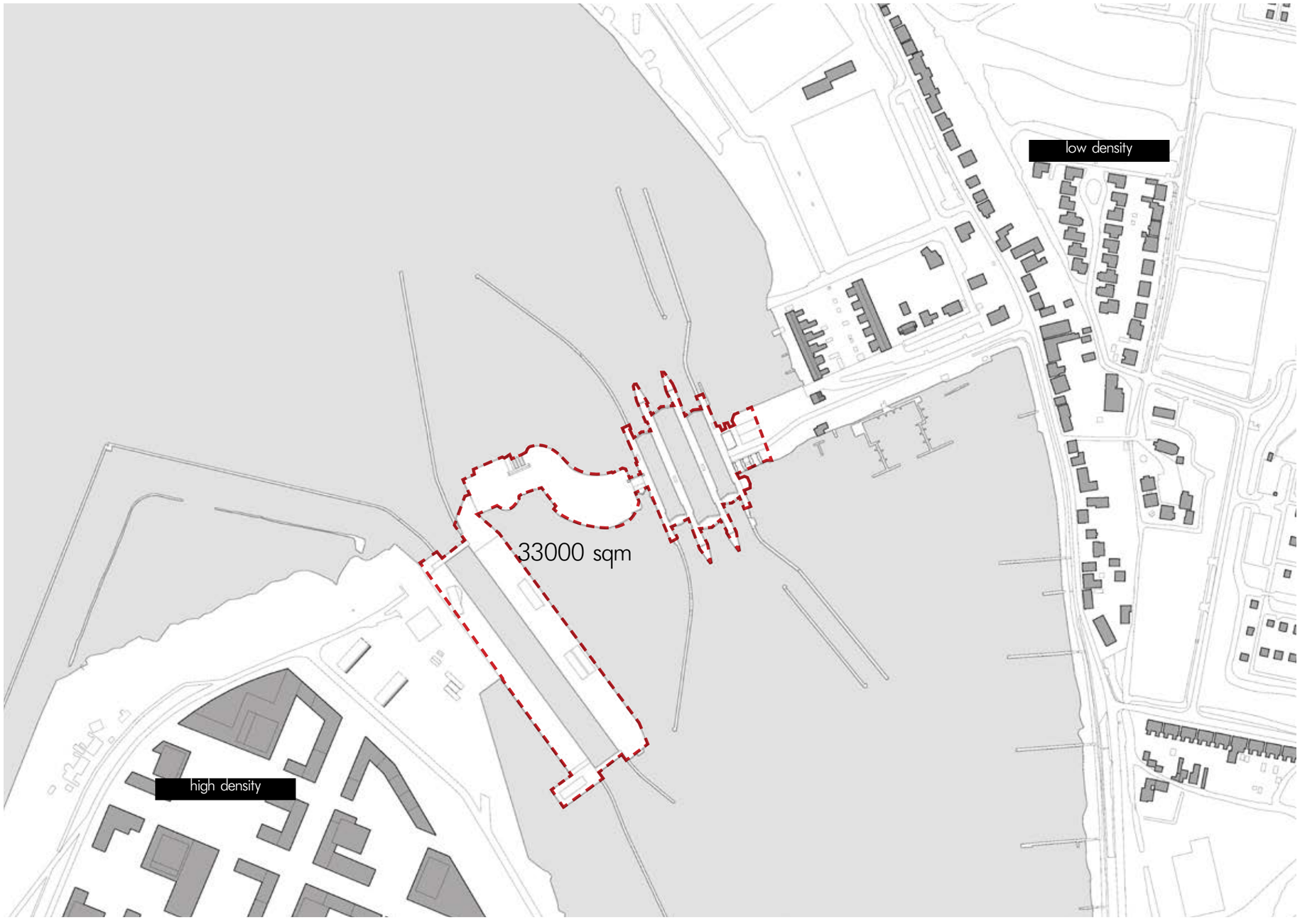
800 LOGISTICS ROOM
100 RECEPTION
200 ENTRANCE HALL
50 SHOPS
200 CAFE
100 MEDITATION HALL

100 ACTIVITY ROOM
150 LOUNGE
600 OFFICE
150 CONFERENCE ROOM
50 MEETING ROOM
150 AUDITORIUM ROOM
220 PLAYABLE POOL
360 GROUP SOCIAL POOL
300 CHILDREN CARE POOL
200 PERSONAL MEDITATION
260 SHALLOW POOL
200 EXHIBIT SPACE
1000 DRESSING &SHOWER ROOM
200 SAUNA
50 KITCHEN
200 PREPARATION ROOM
200 RESTAURANT
100 OUTDOOR RESTAURANT
1000 MECHANICAL ROOM

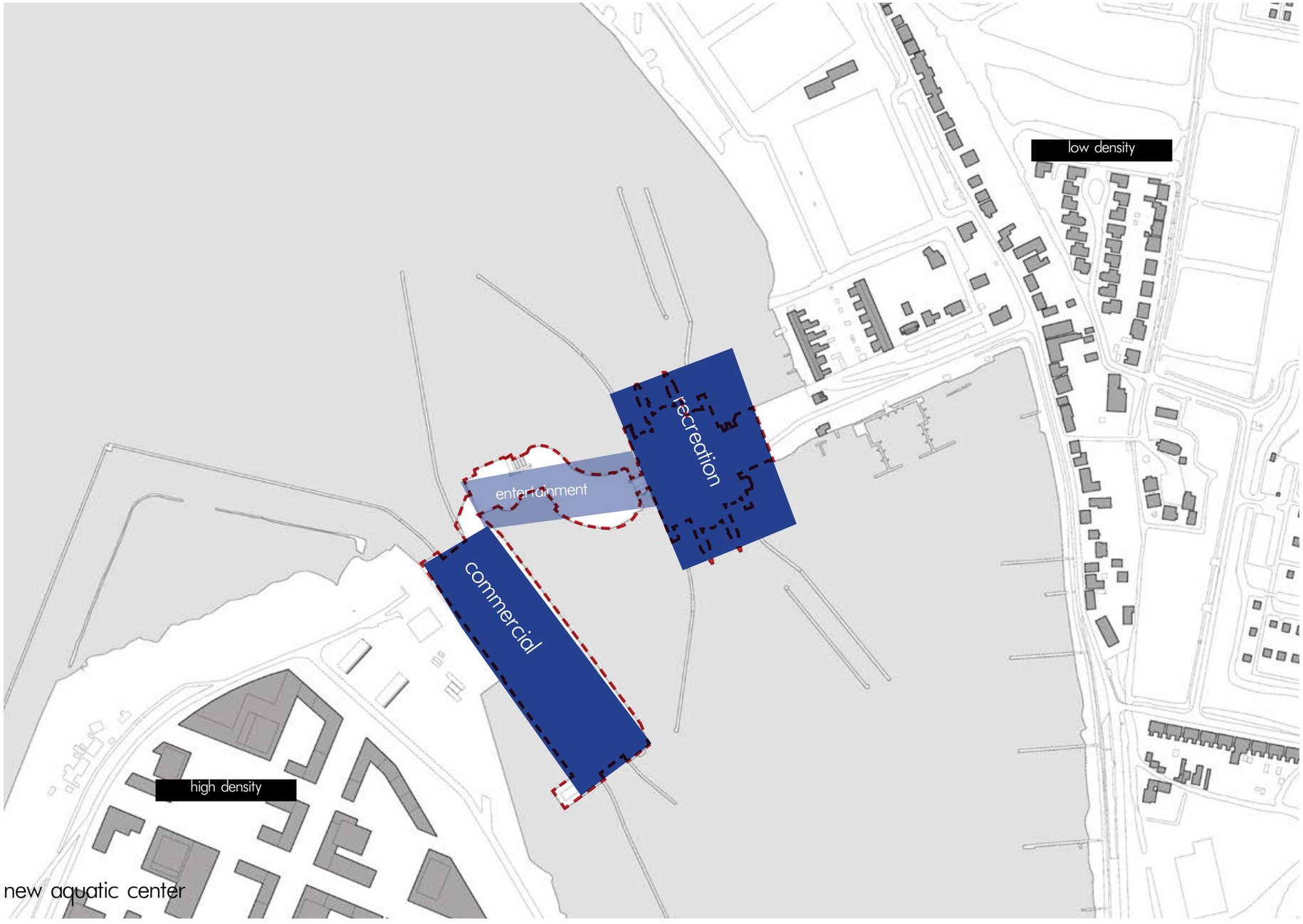


Space strategy

current site

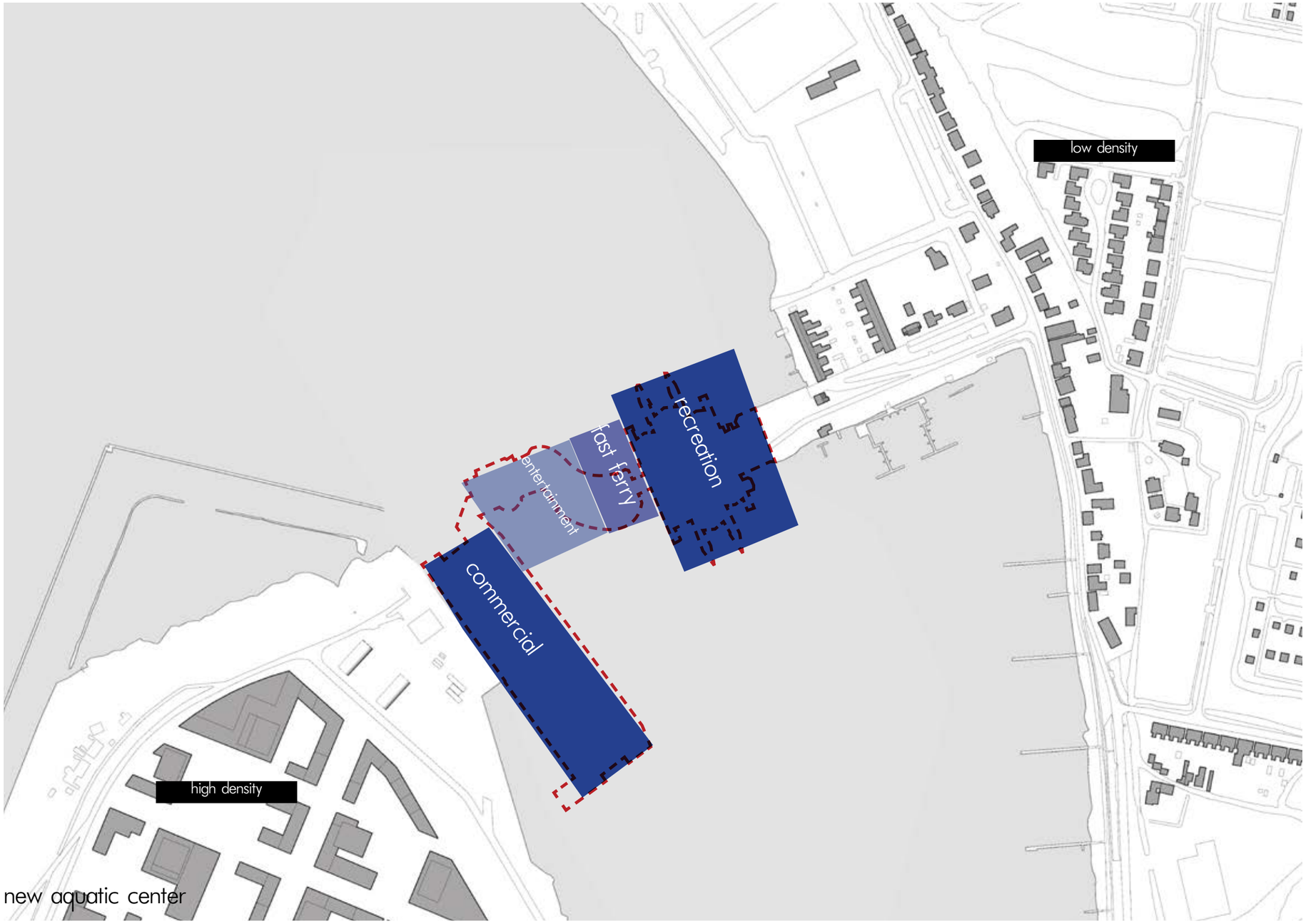


current site



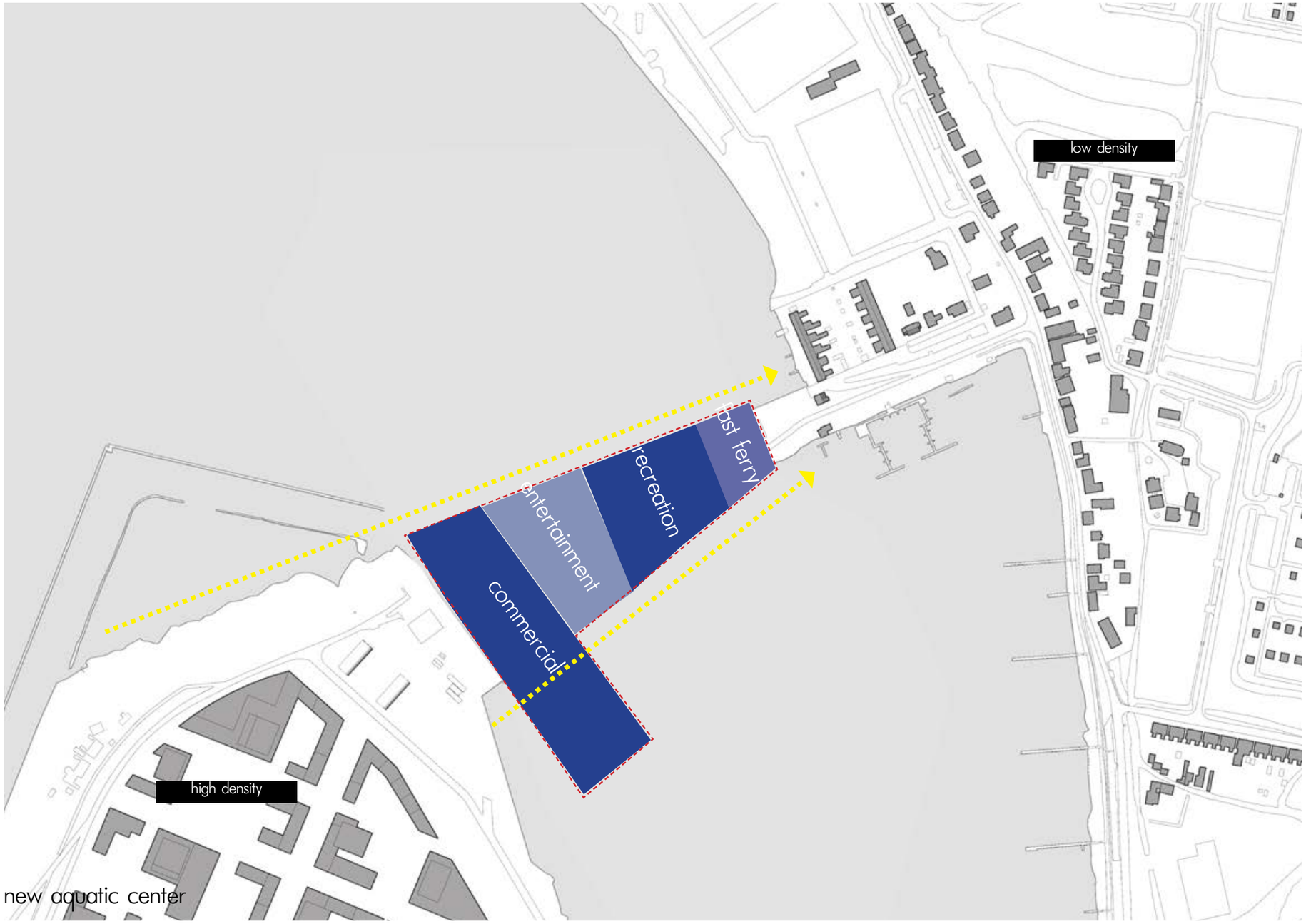
new aquatic center

Add fast ferry route



new aquatic center

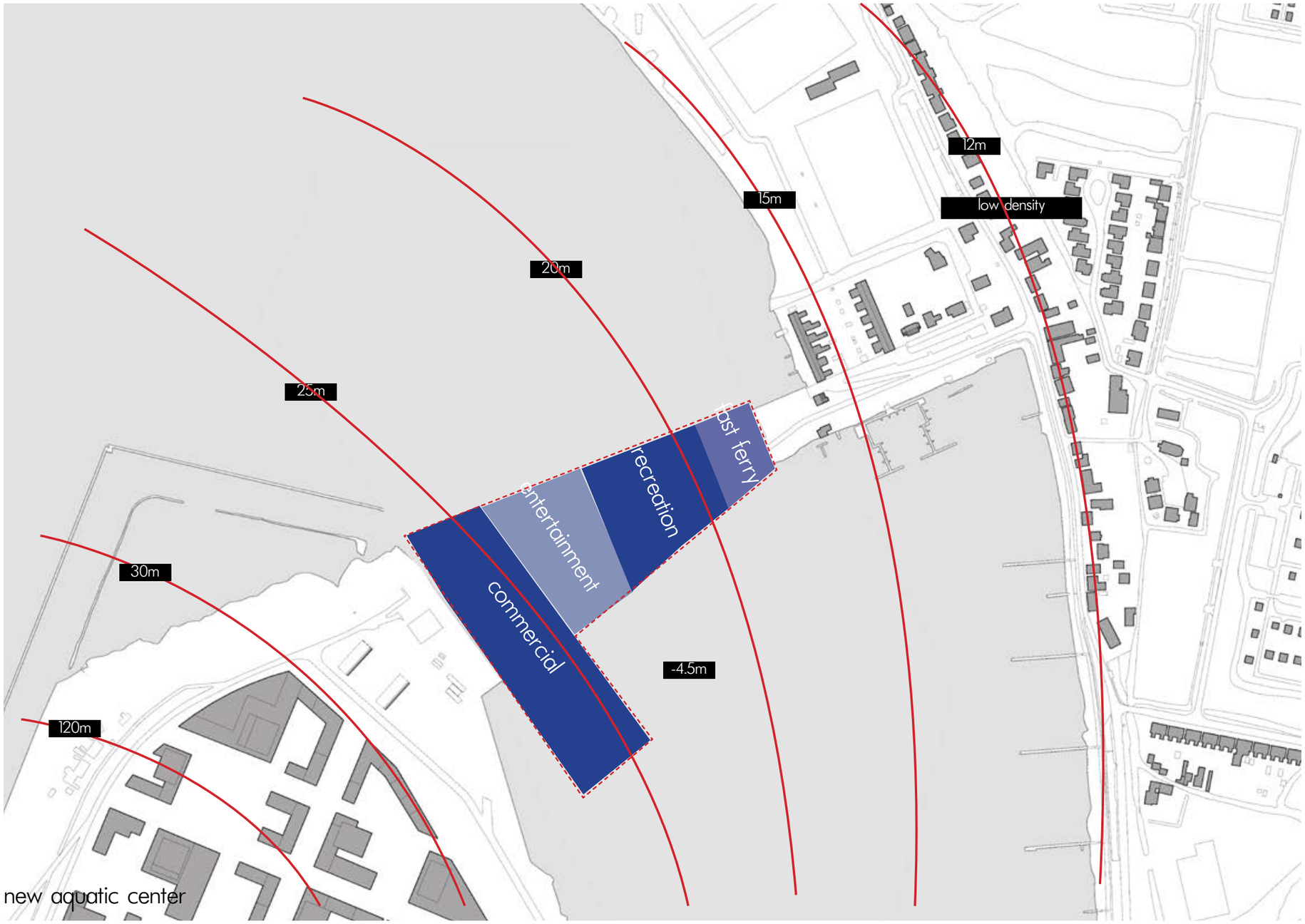
Re-arrange site use



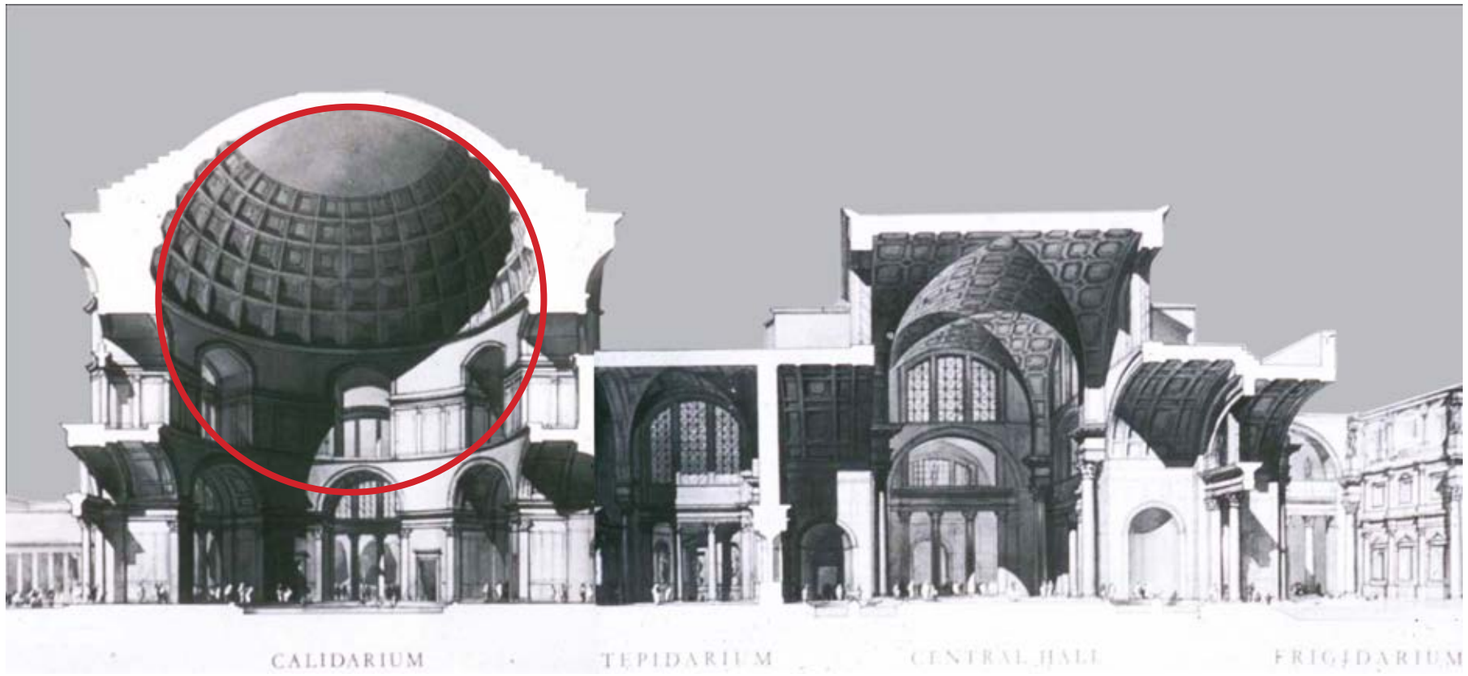
preliminary site use

new aquatic center

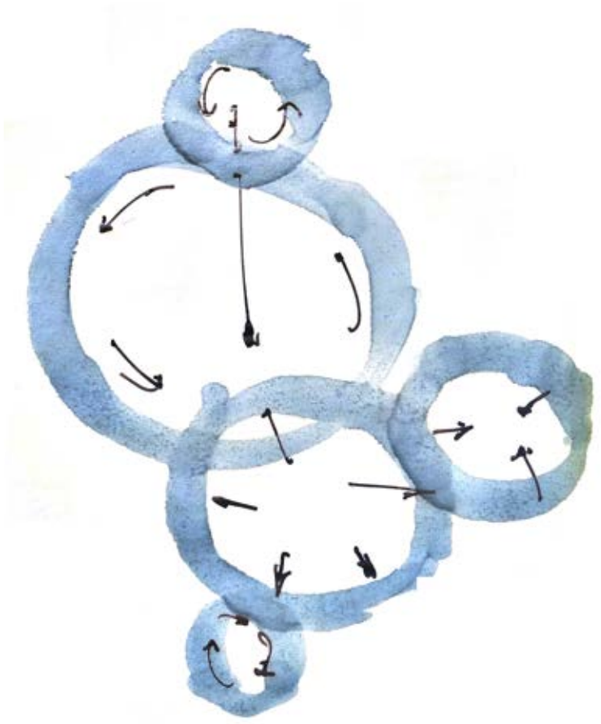
Height constraint



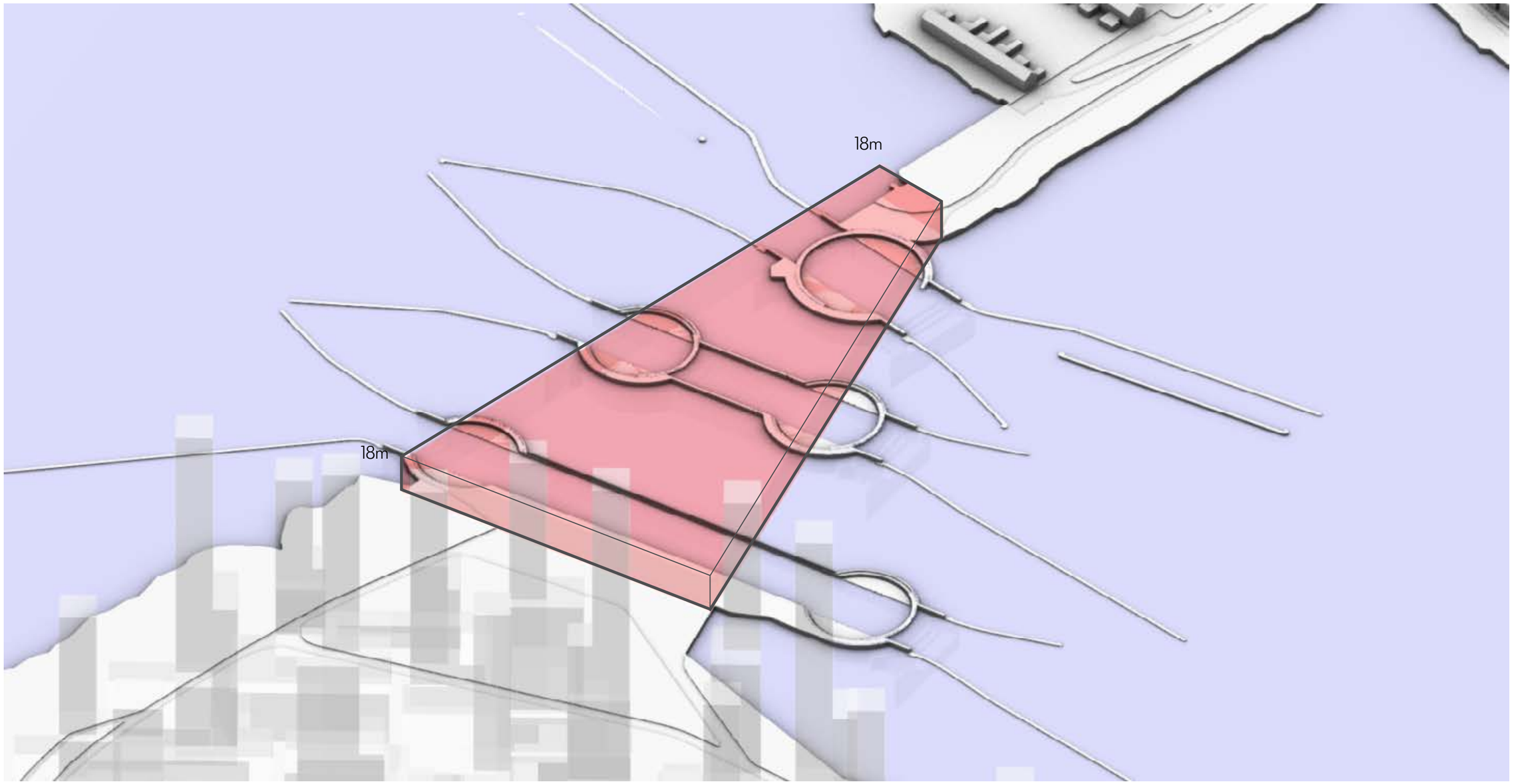
Design Proposal



The arch strengthening the centralization and uniqueness of the space further highlights the important position of the lower sphere space for social-cultural event.



The space created by a set of spherical boolean operations can provide or commemorative shelter or socially open space

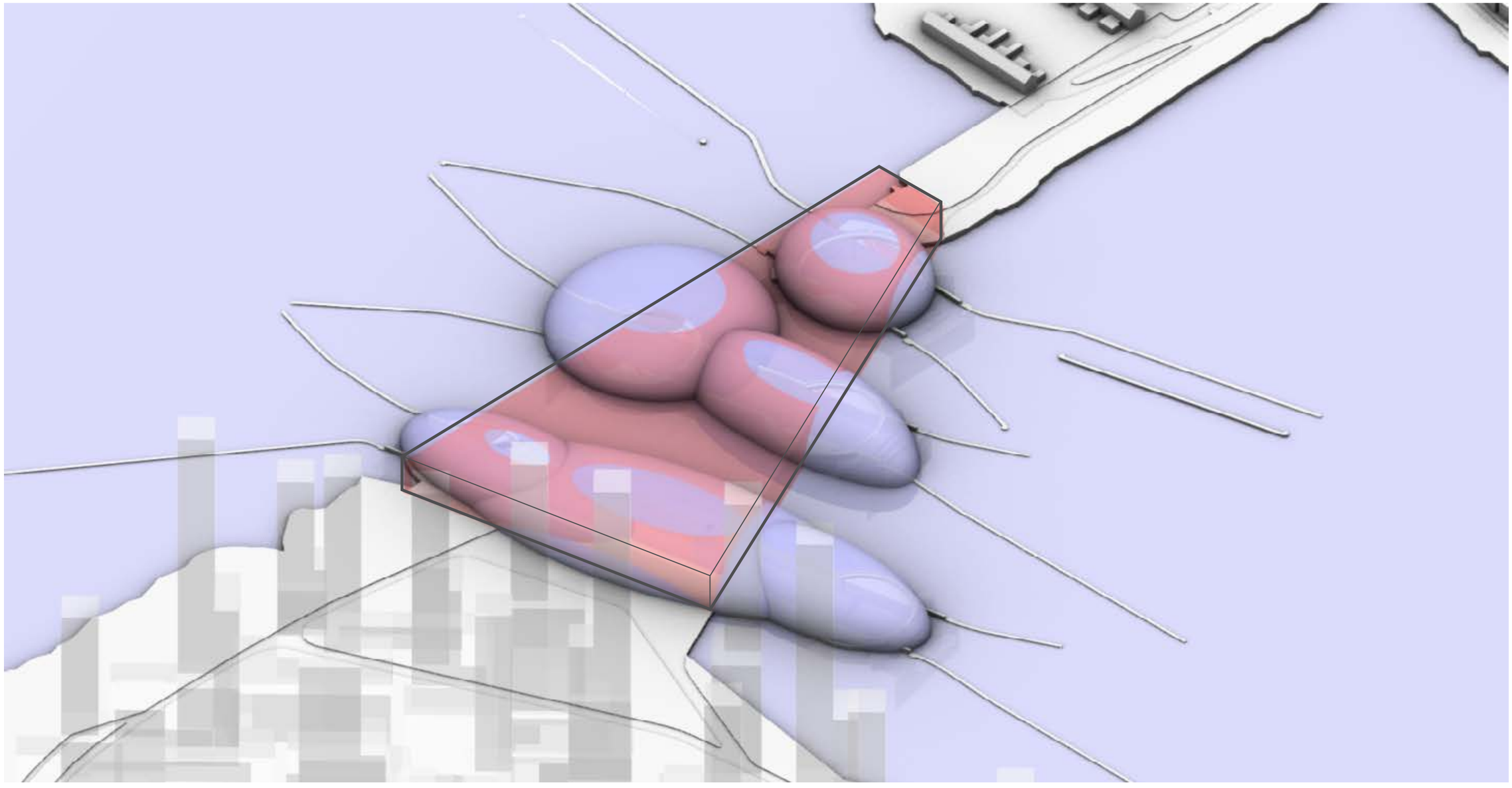


3. Basic volumn

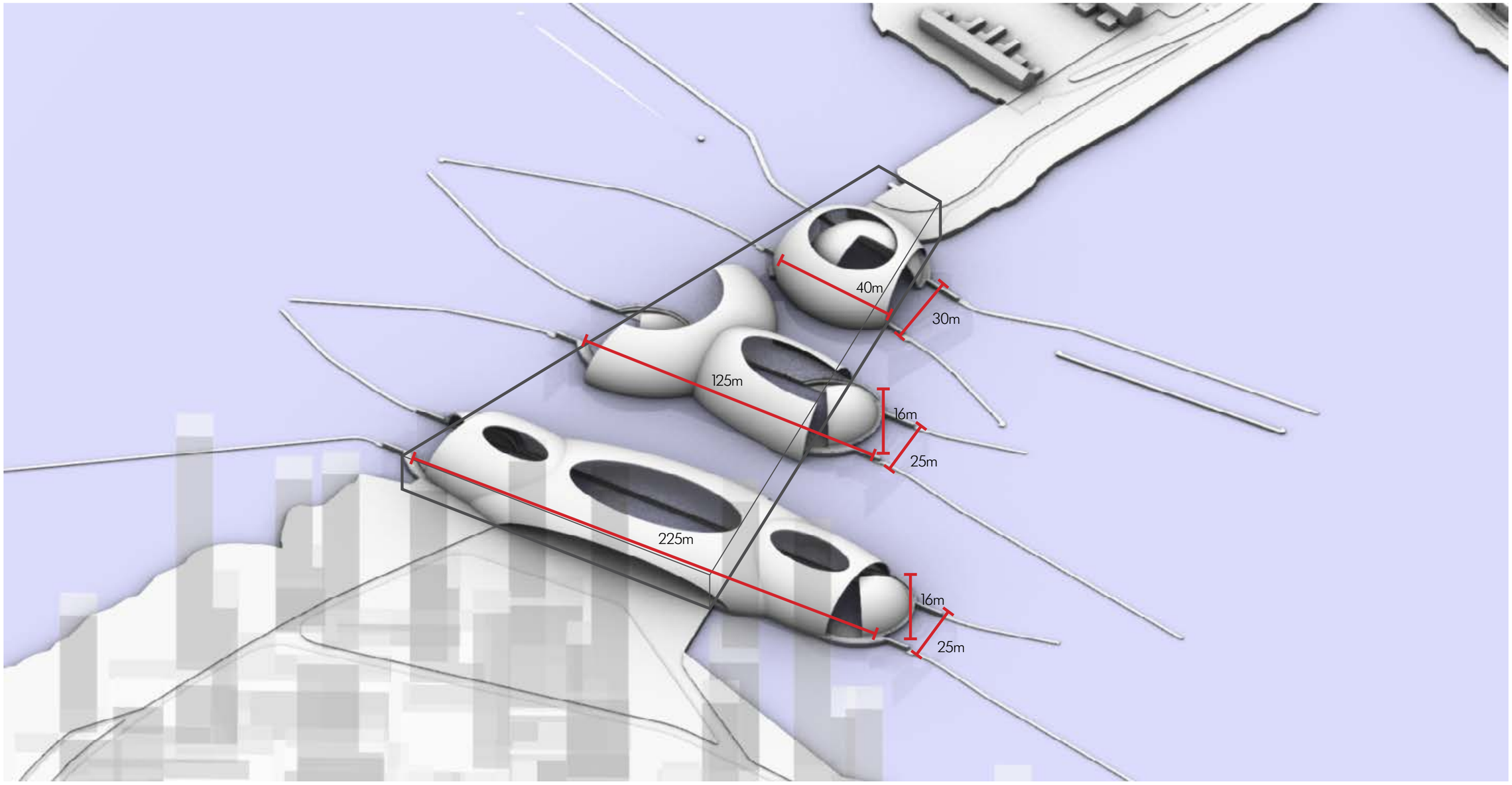
#	Description	Dimensions lock chamber (L_k x W)	Entrance depth	Dimensions design vessel	Normative allowable vessel class[1]
1	Northern lock chamber	72.8 m x 14.0 m	NAP -4.5 m	70.0 m x 13.0 m	CEMT-class III
2	Middle lock chamber	95.2 m x 18.0 m	NAP -4.5 m	90.0 m x 17.0 m	CEMT-class IV
3	Southern lock chamber	72.8 m x 14.0 m	NAP -4.5 m	70.0 m x 13.0 m	CEMT-class III
4	PWA lock chamber	200.0 m x 24.0 m	NAP -4.7 m	197.0 m x 23.7 m	CEMT-class VIb

CEMT class	type vessel	length L (m)	width B (m)	draught T (m) empty	draught T (m) loaded	clearance H (m)
I	Spits - Peniche	39	5.1	1.2	2.2	5.0
II	Kempenaar- Campinois	55	6.6	1.4	2.5	6.0
(IIa) **)	Hagenaar	56 of 67	7.2	1.4	2.5	6.3
III ***)	Dortmunder	67 of 80	8.2	1.5	2.5	6.3
IV	Rijn-Hernekanaalschip	85	9.5	1.6	2.8	6.7
Va	Big Rhine barge Push barge	110	11.4	1.8	3.5	6.7/8.8 *)
Vb	Pushed convoy	186,5	11.4	1.8	4.0	8.8
Vla	Side-by-side formation	110	22.8	1.8	4.0	8.8
Vlb	Pushed barge train	186,5	22.8	1.8	4.0	8.8

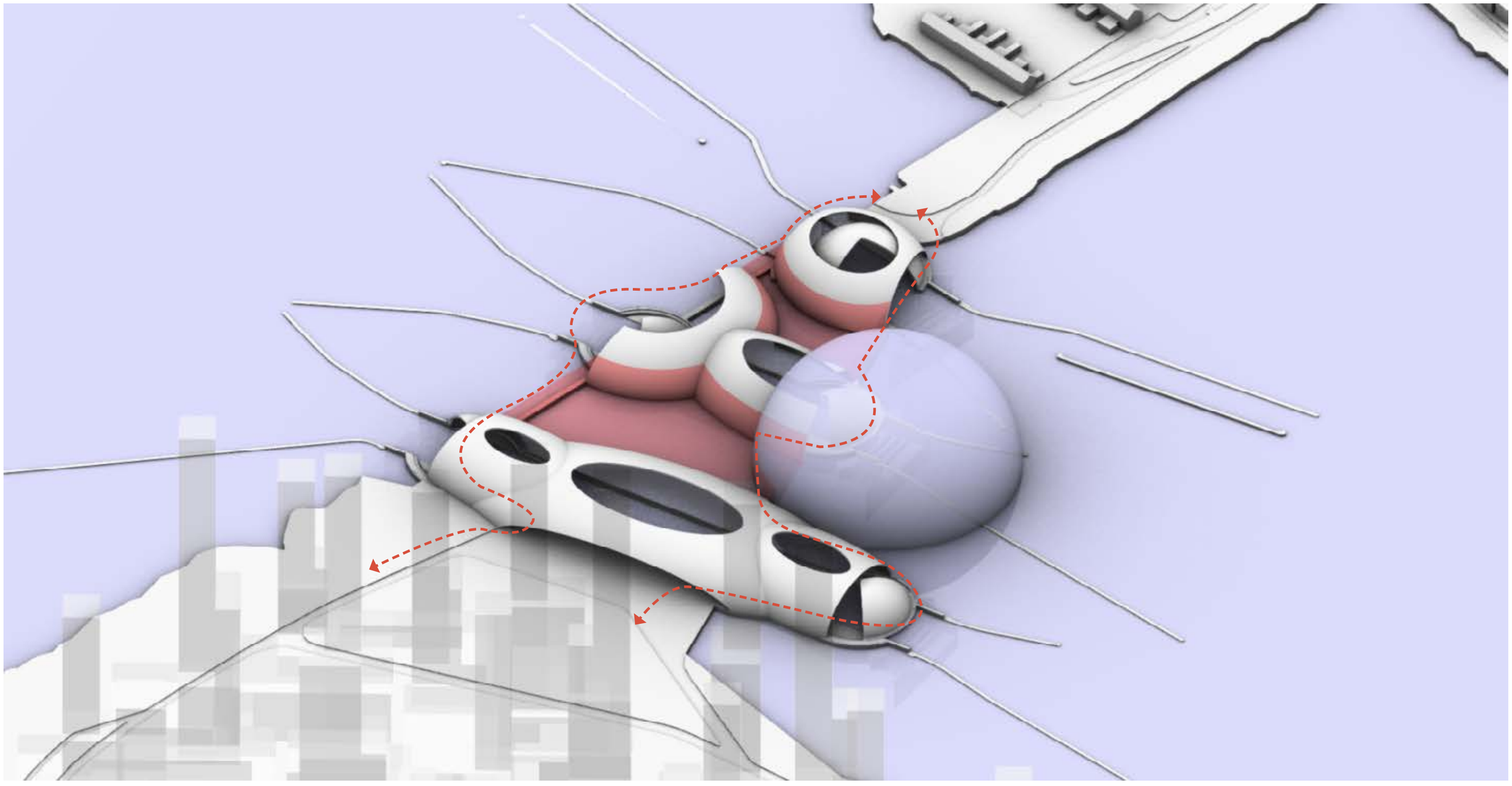
Data about crossing vessels



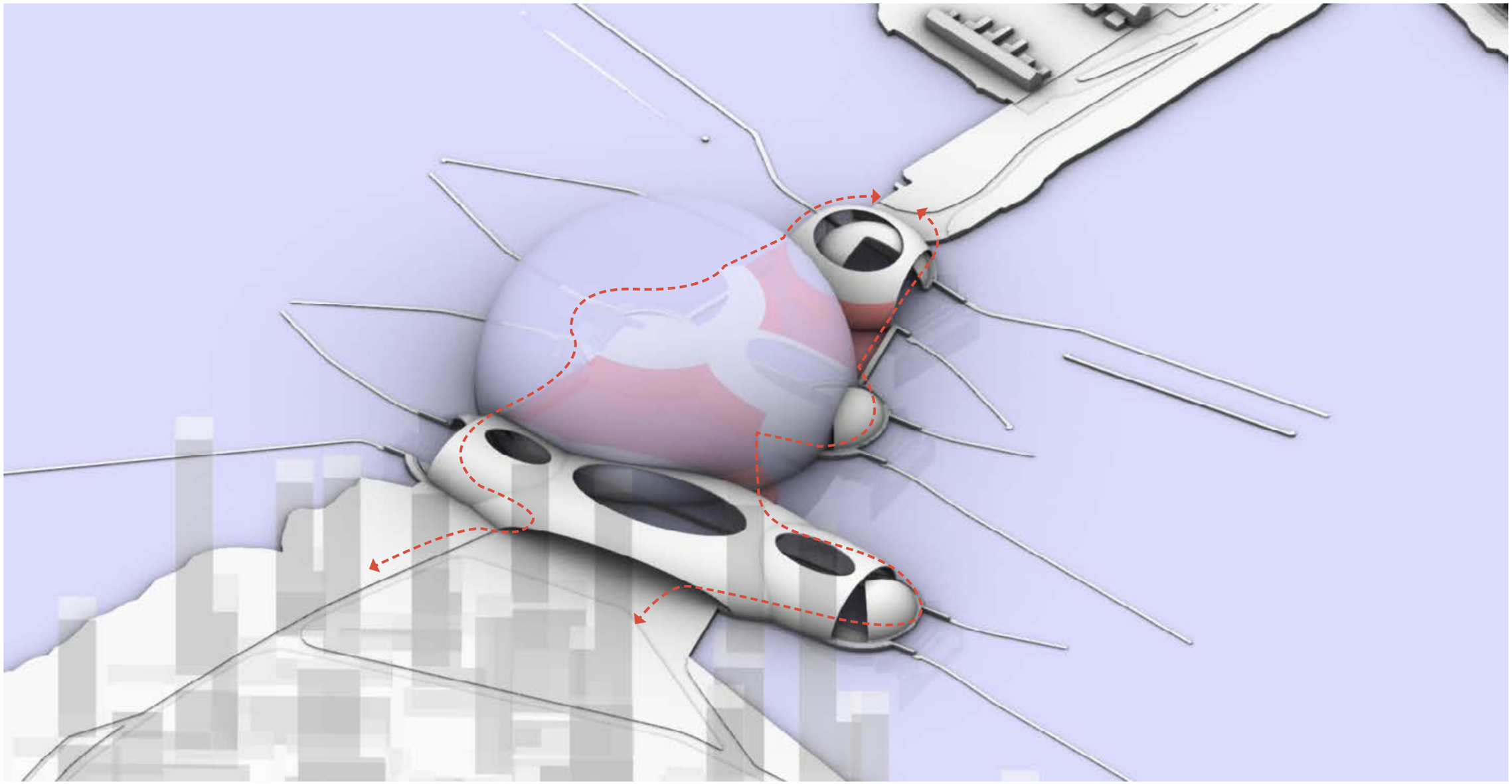
3. Dome space for interacting with rotating gates



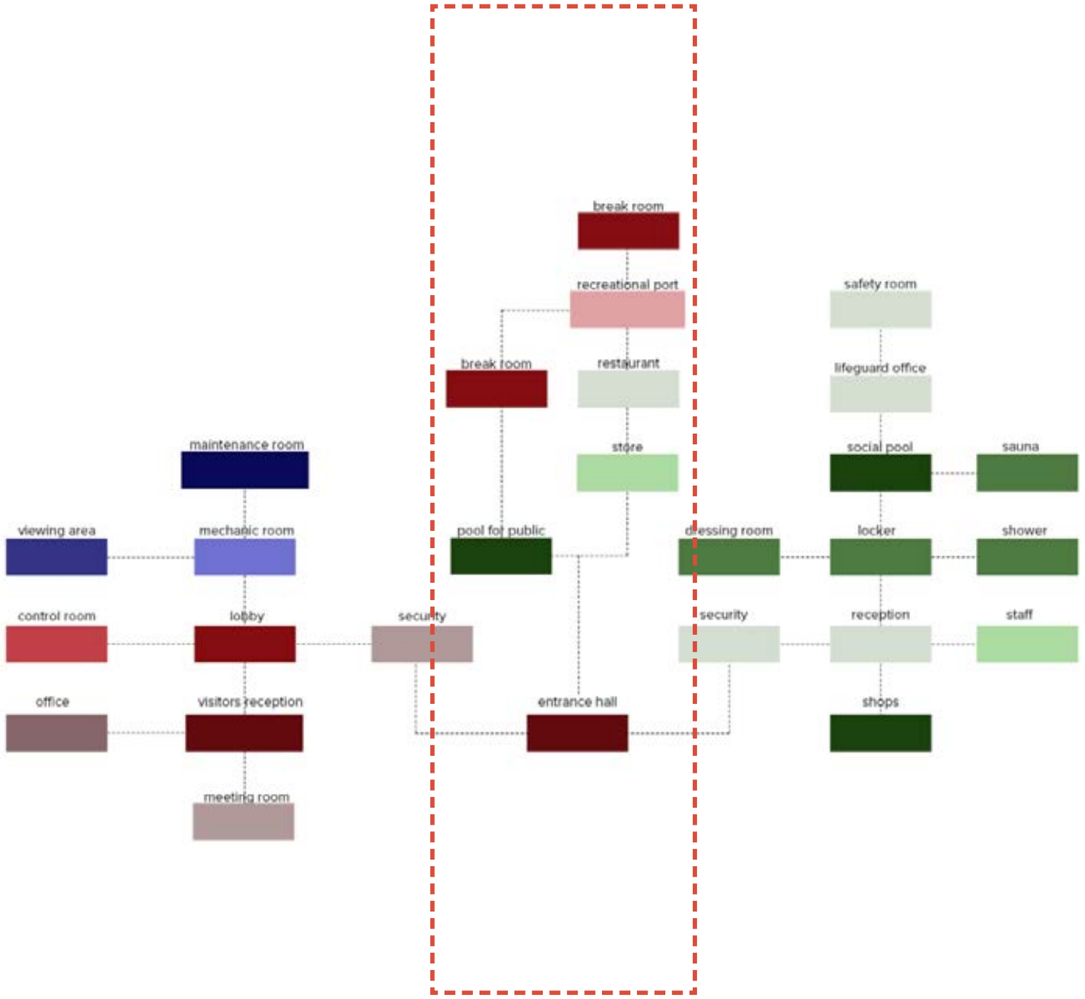
4. In order to reduce the impact of high-rises on Schellingwoude's old houses and provide spaces for public events, shelters will be implemented

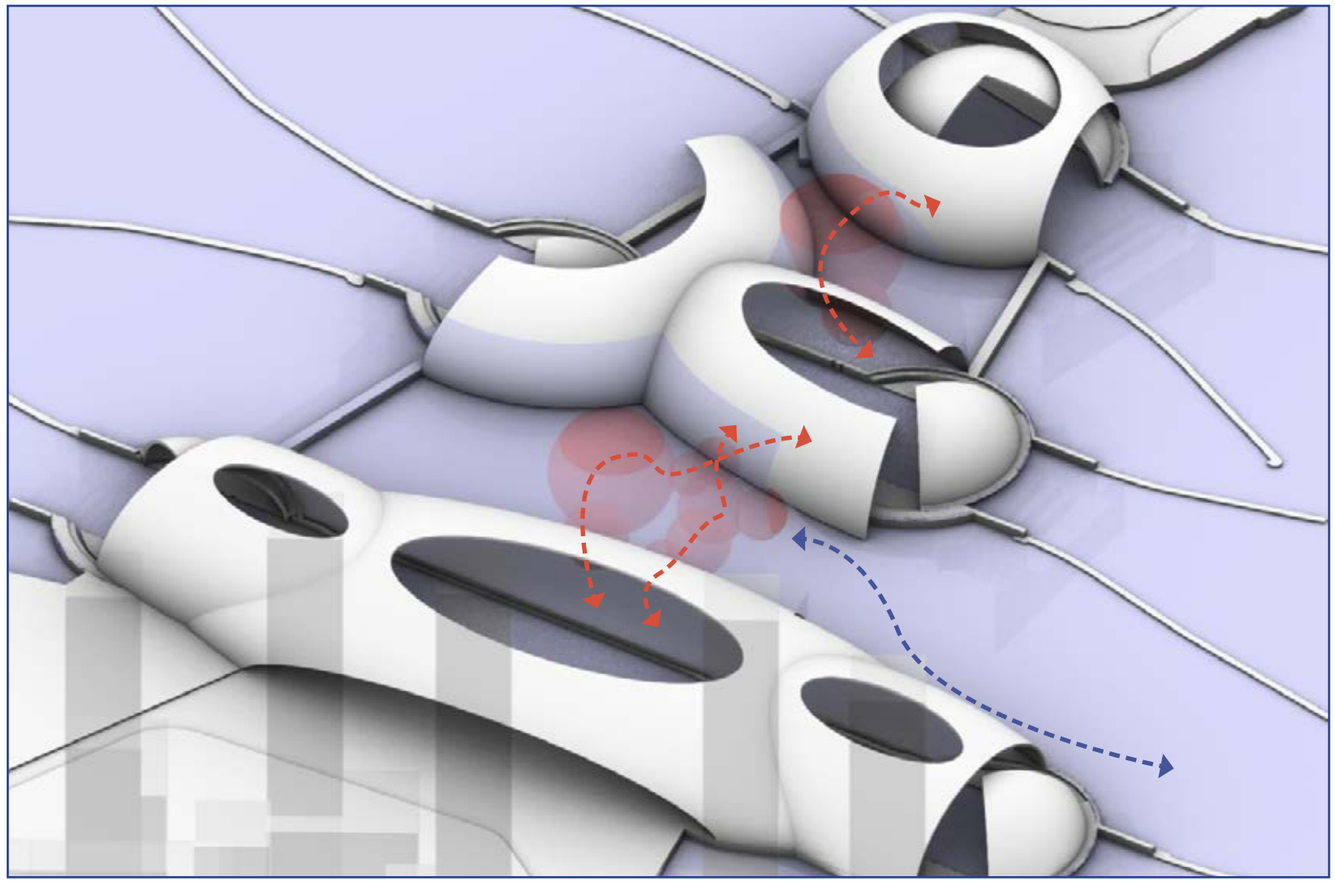


5. Boolean space for boat's accessibility and add the foot passage for pedestrain crossing

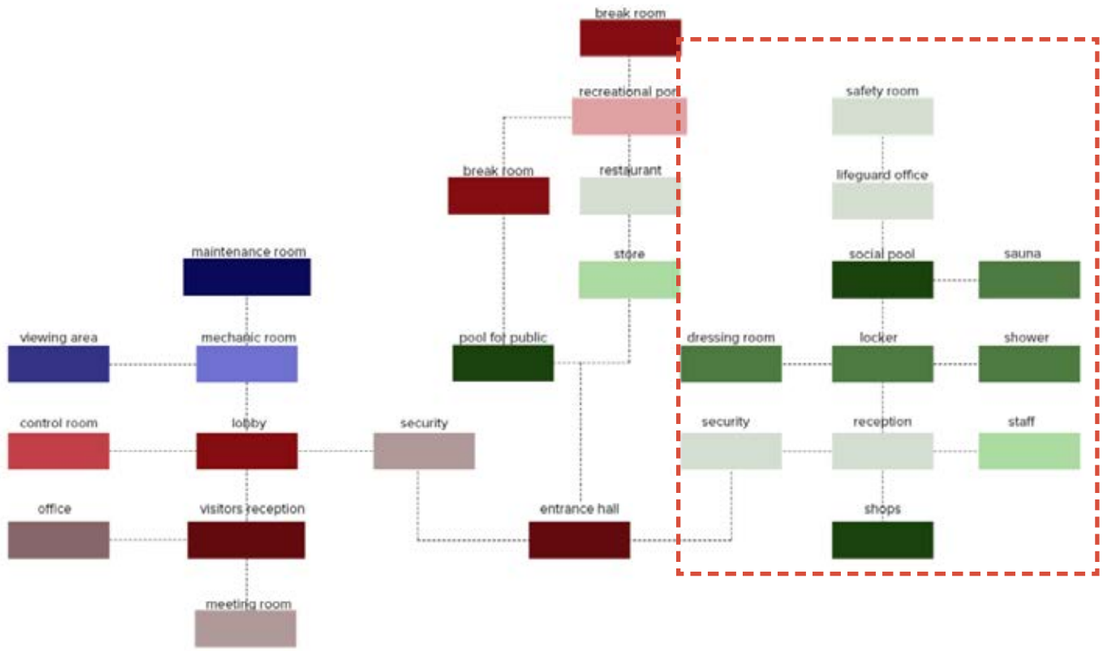


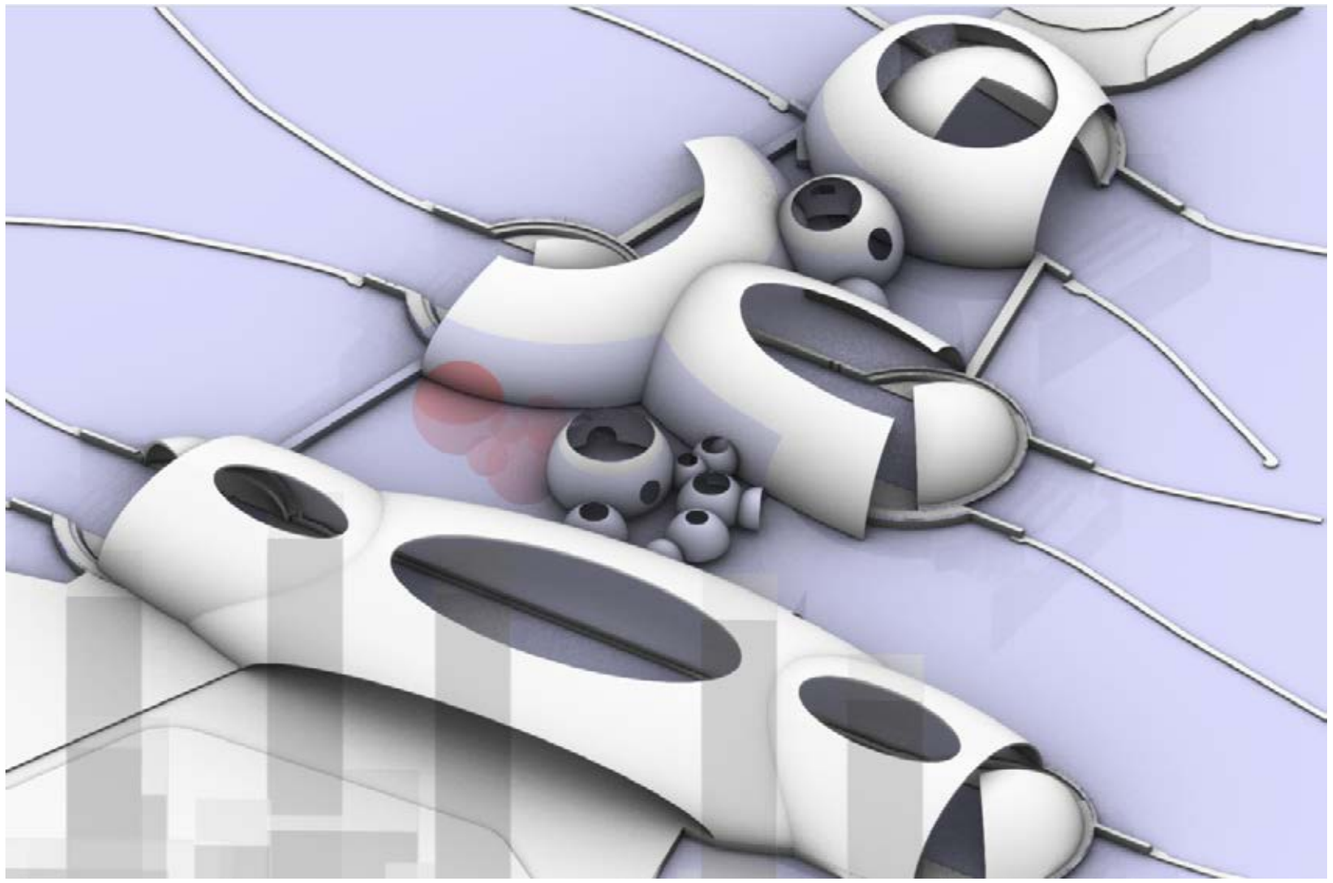
6. Boolean space for water landscape



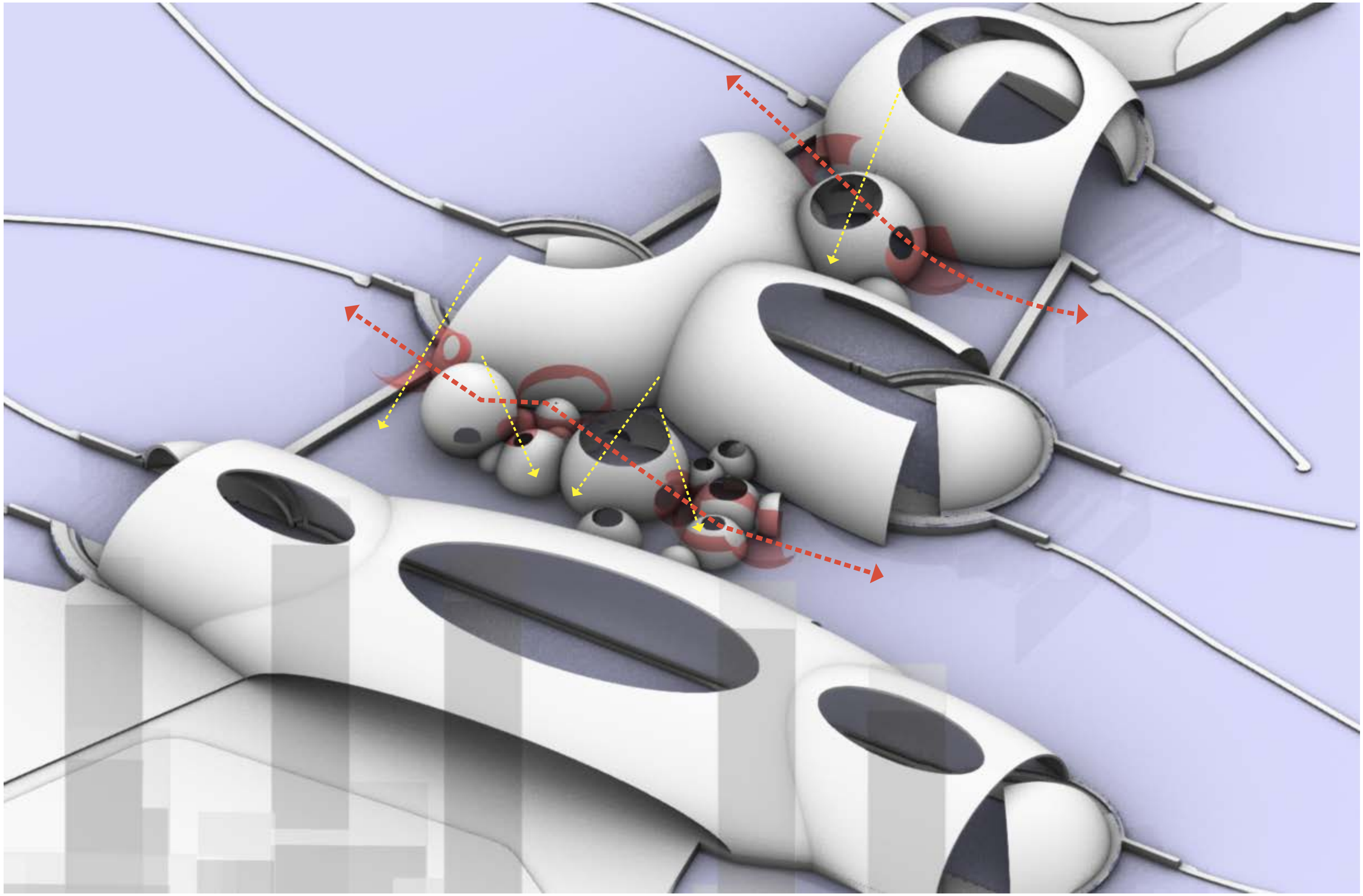


7. Arrange the space program for public route to improve the public accessibility

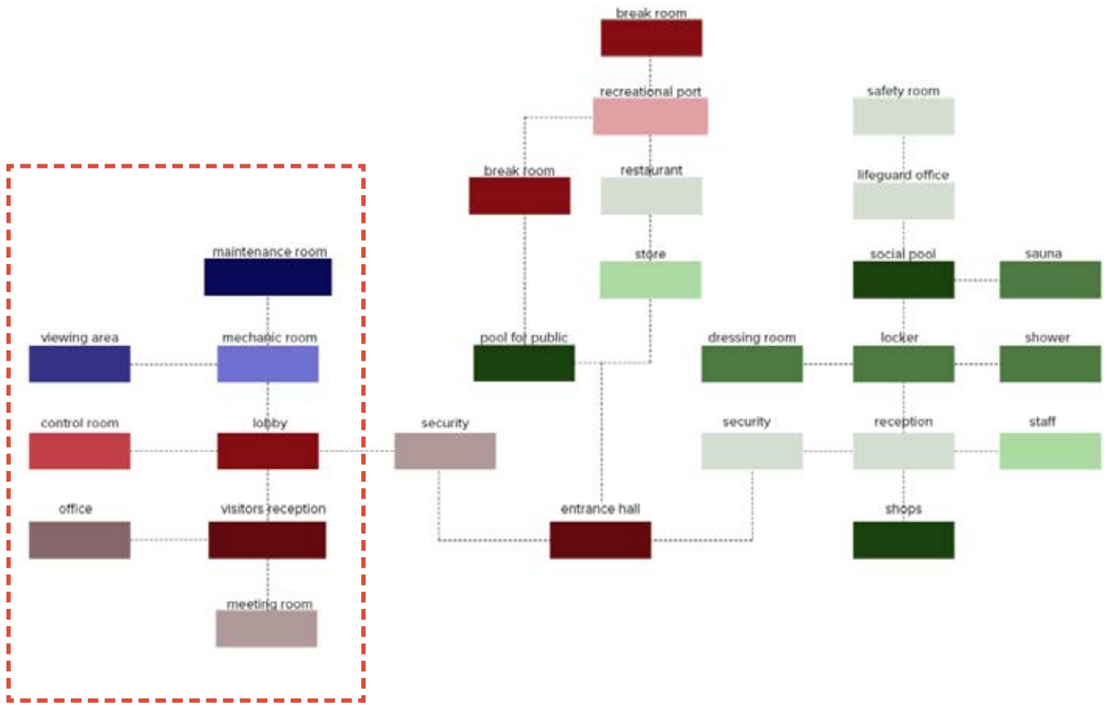


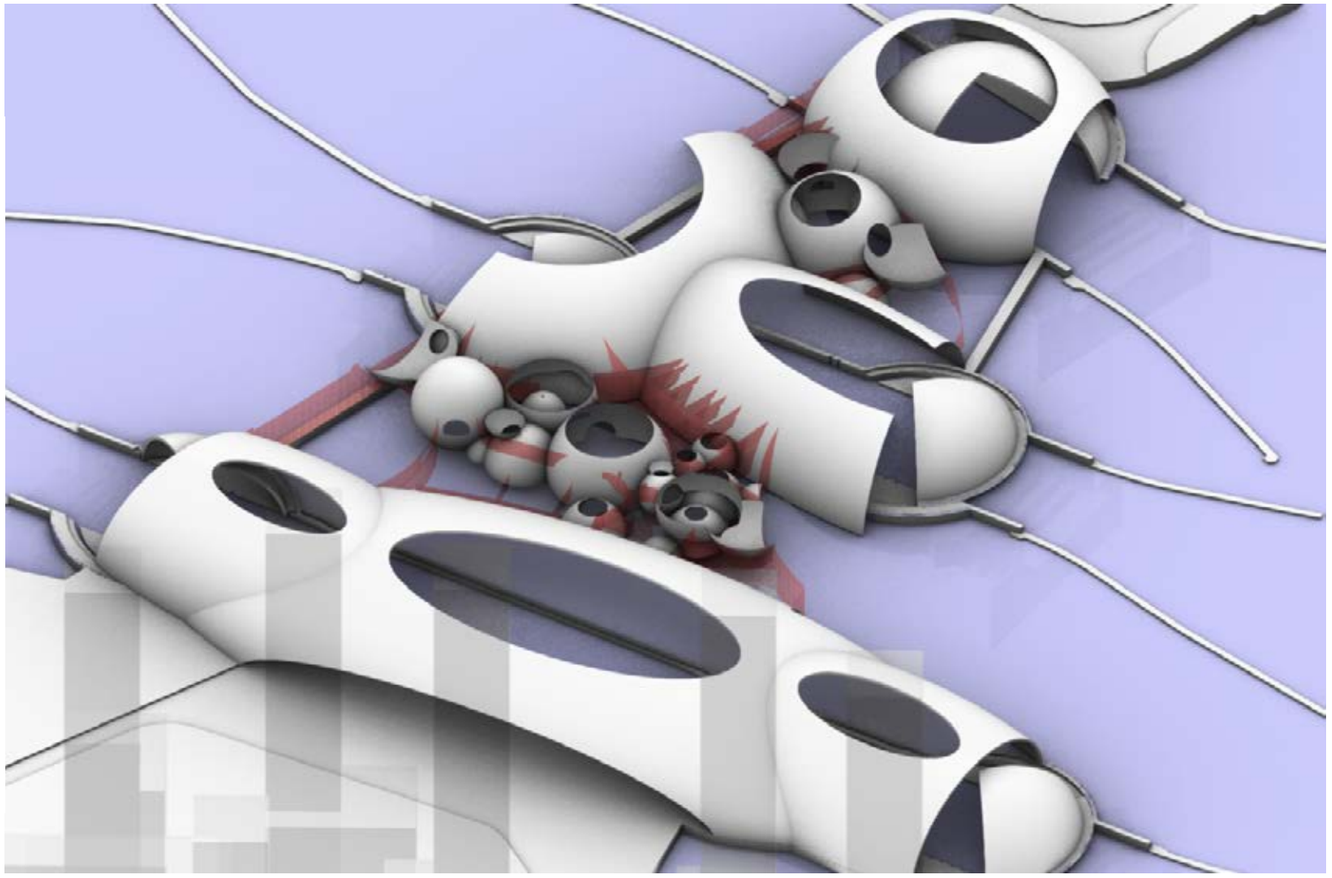


8. Arrange the space program for different pool space

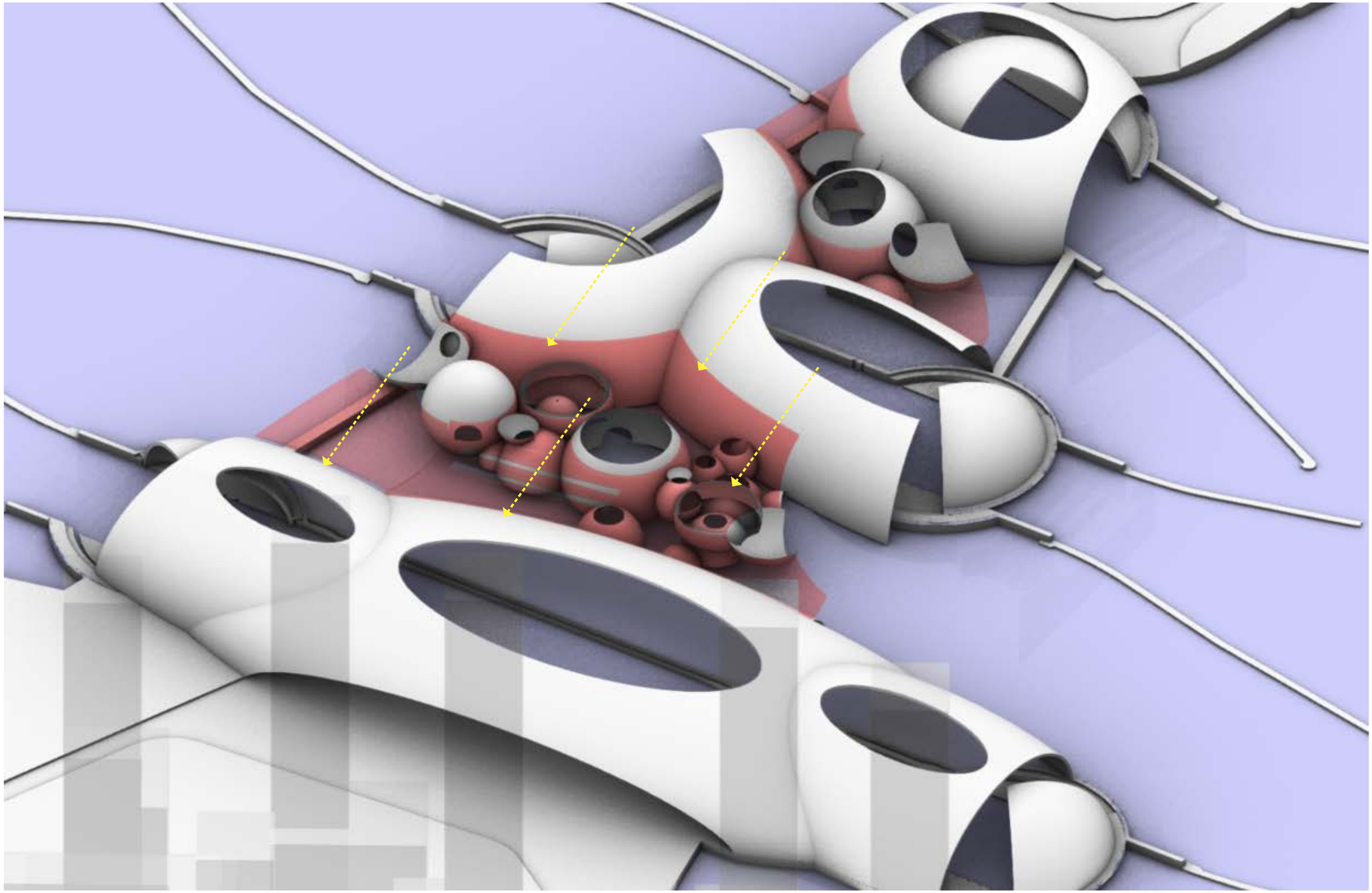


9. Arrange small spherical space for receiving natural light and encourage view connection

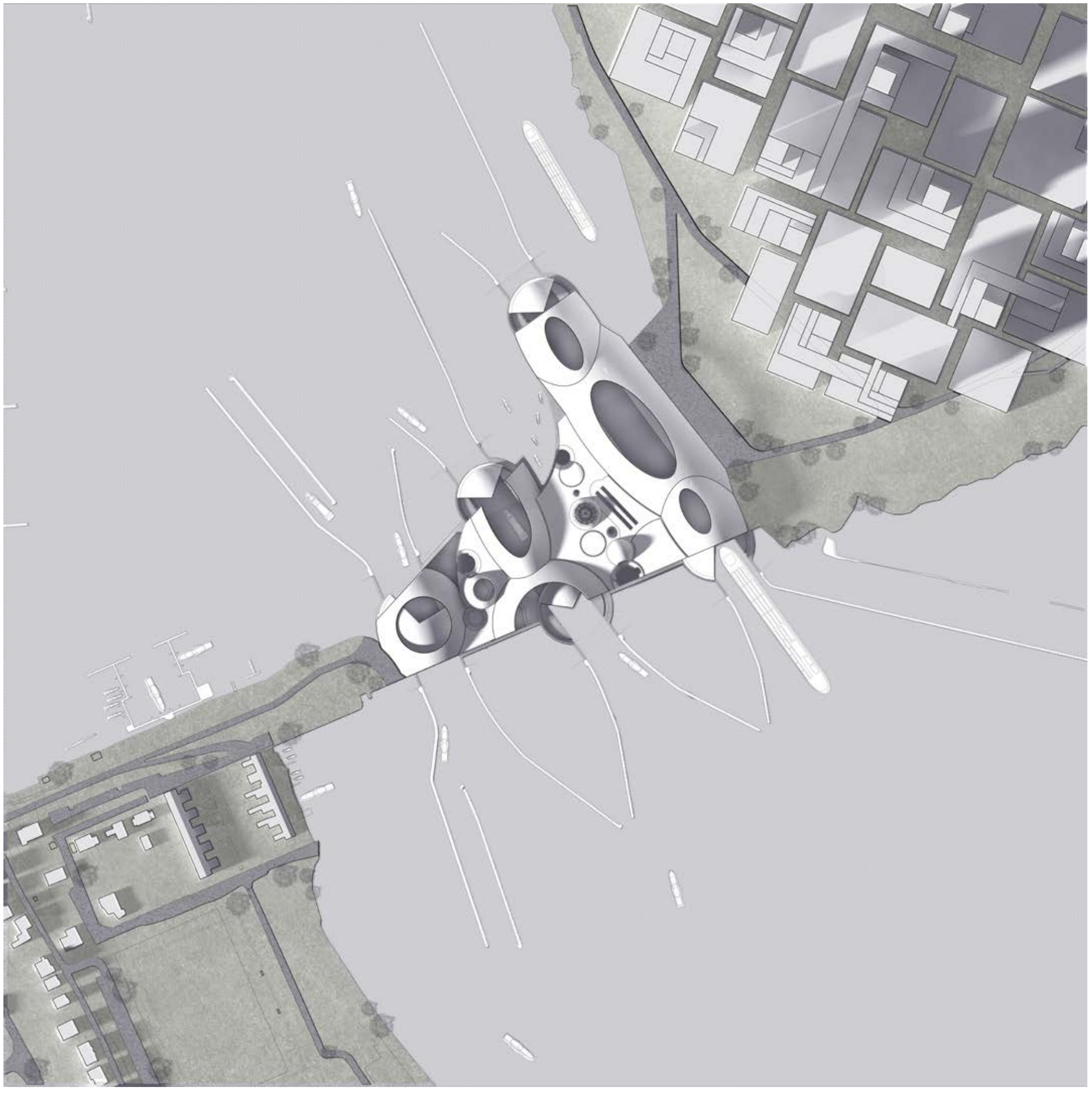


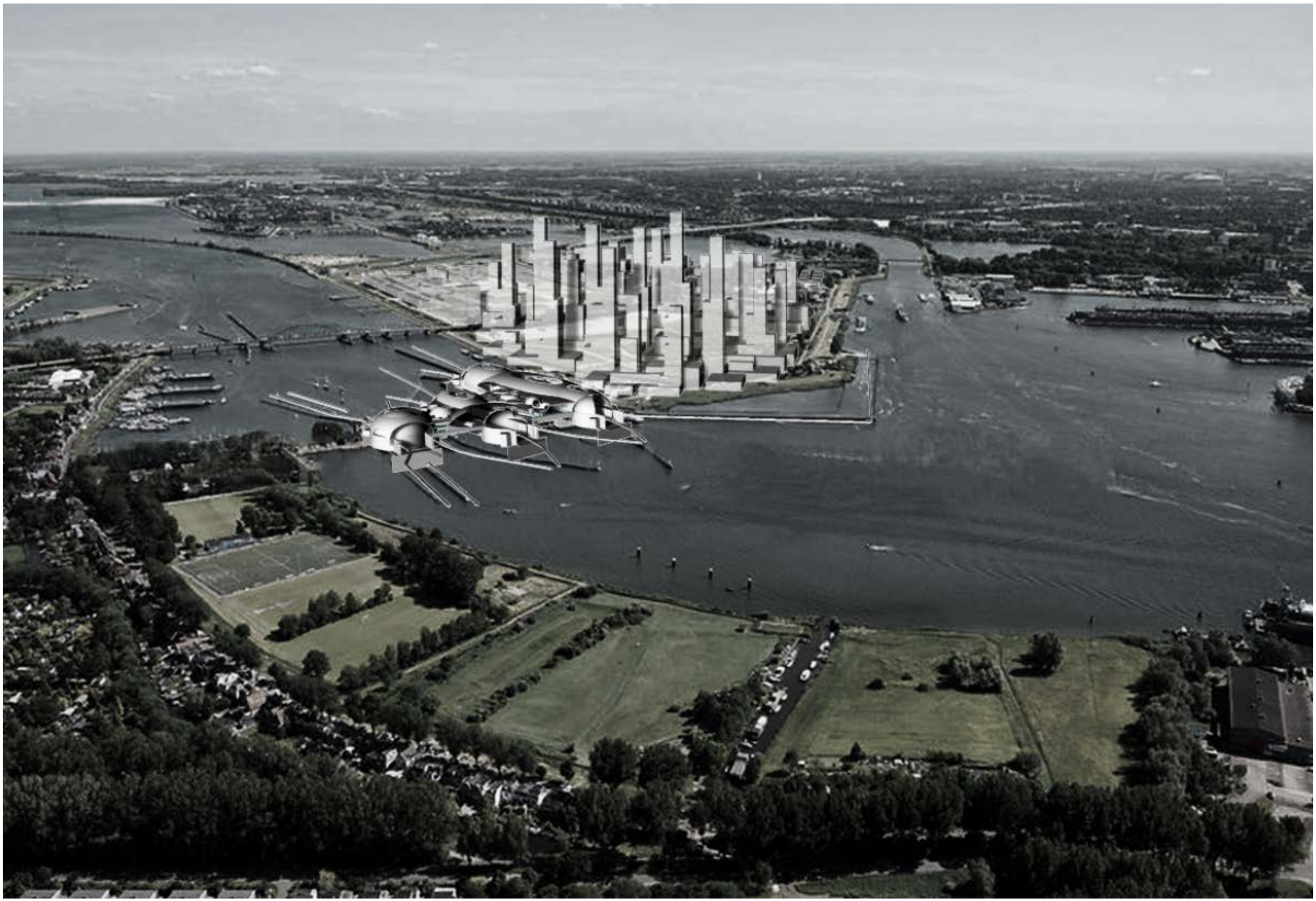


10. Adding glass curtain wall facade and arrage the logistic space

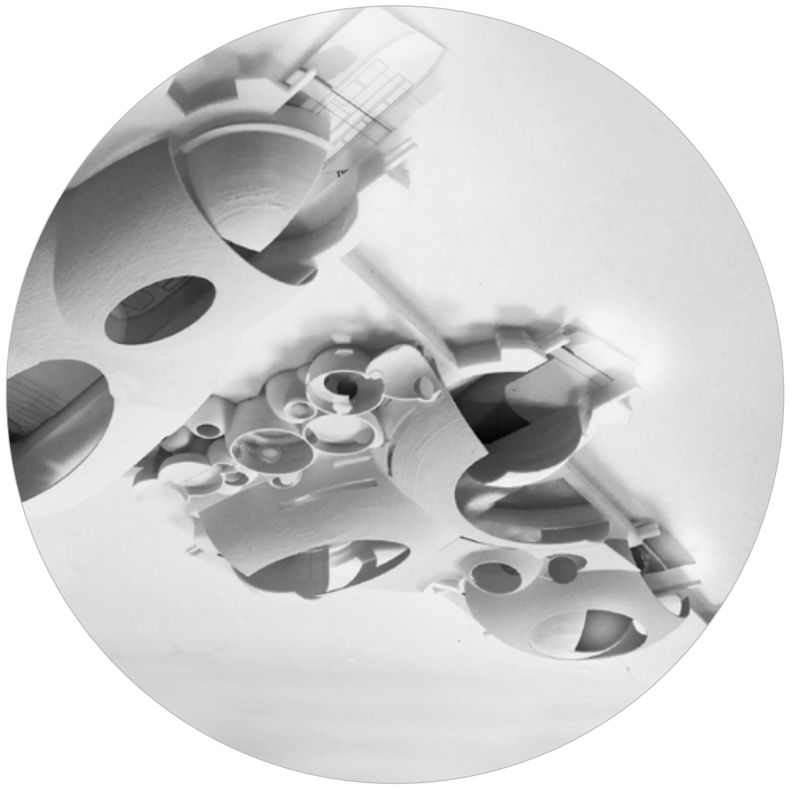


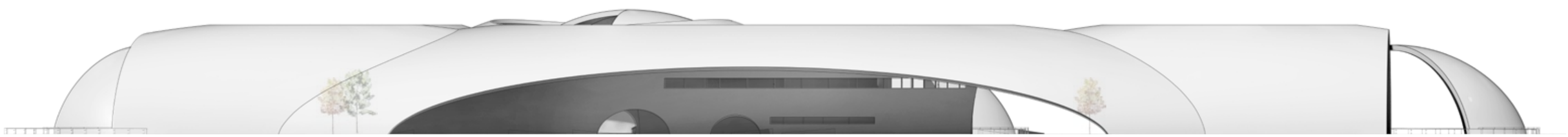
11. Slightly curved roof for receving soft natural light from the gap



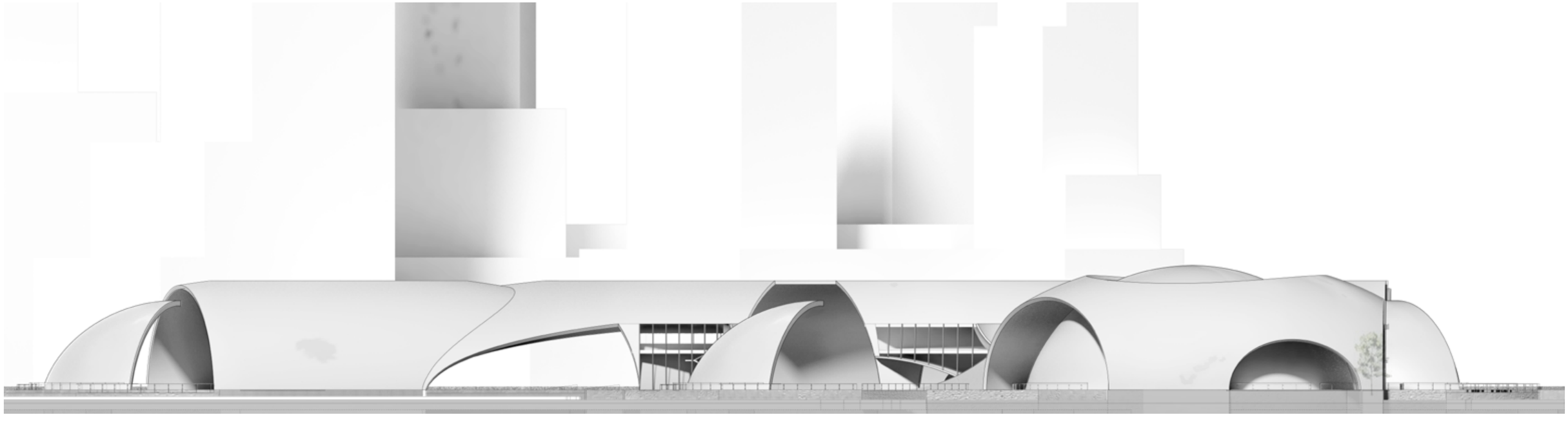


Birdview

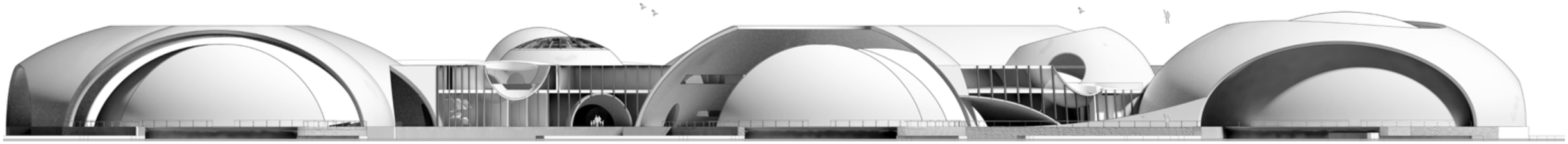




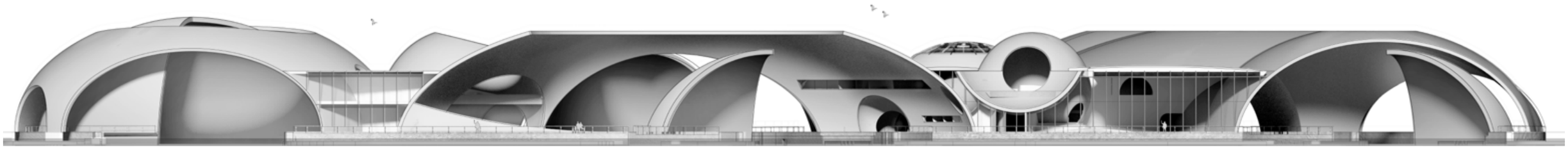
West facade



East facade

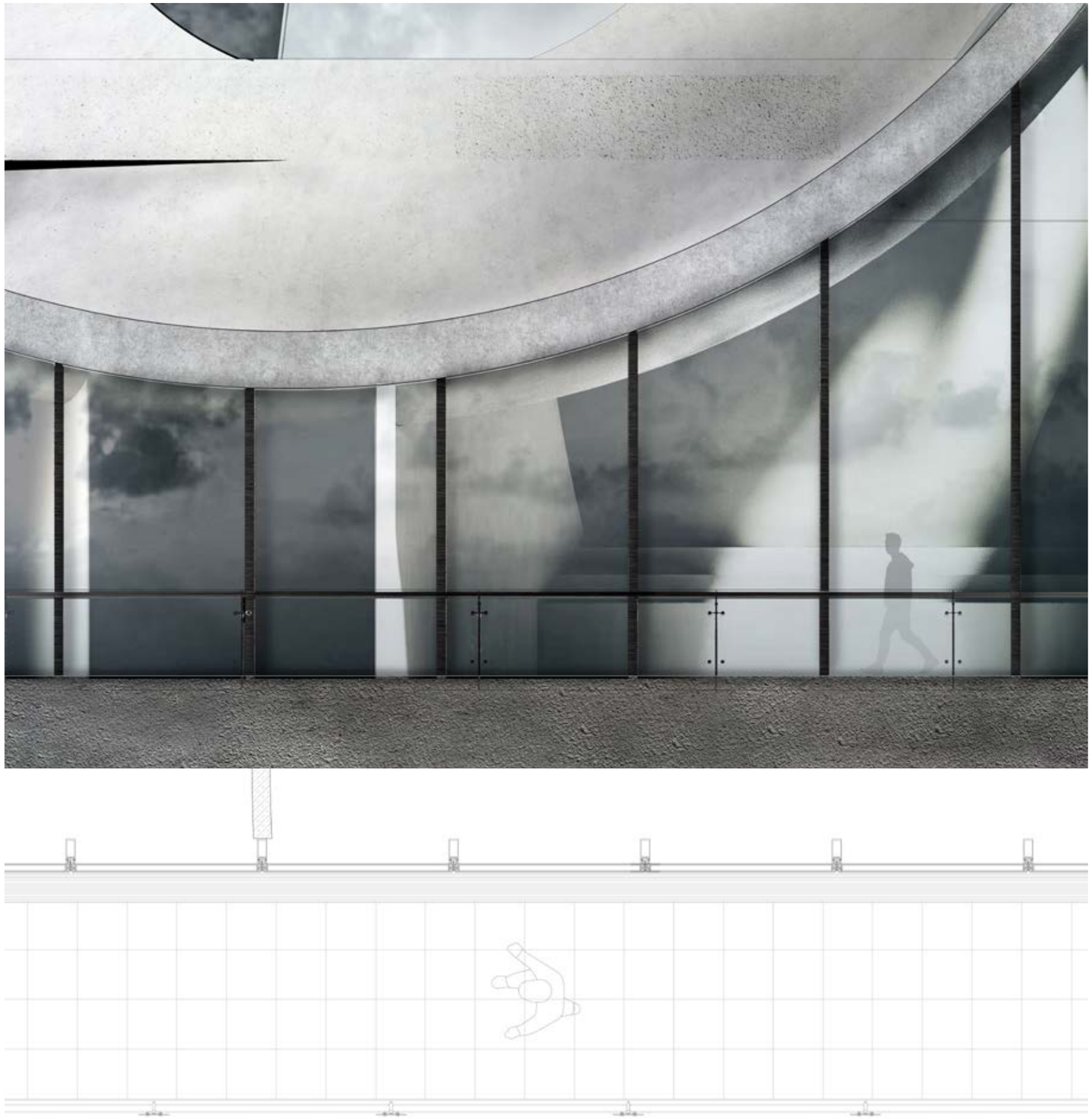


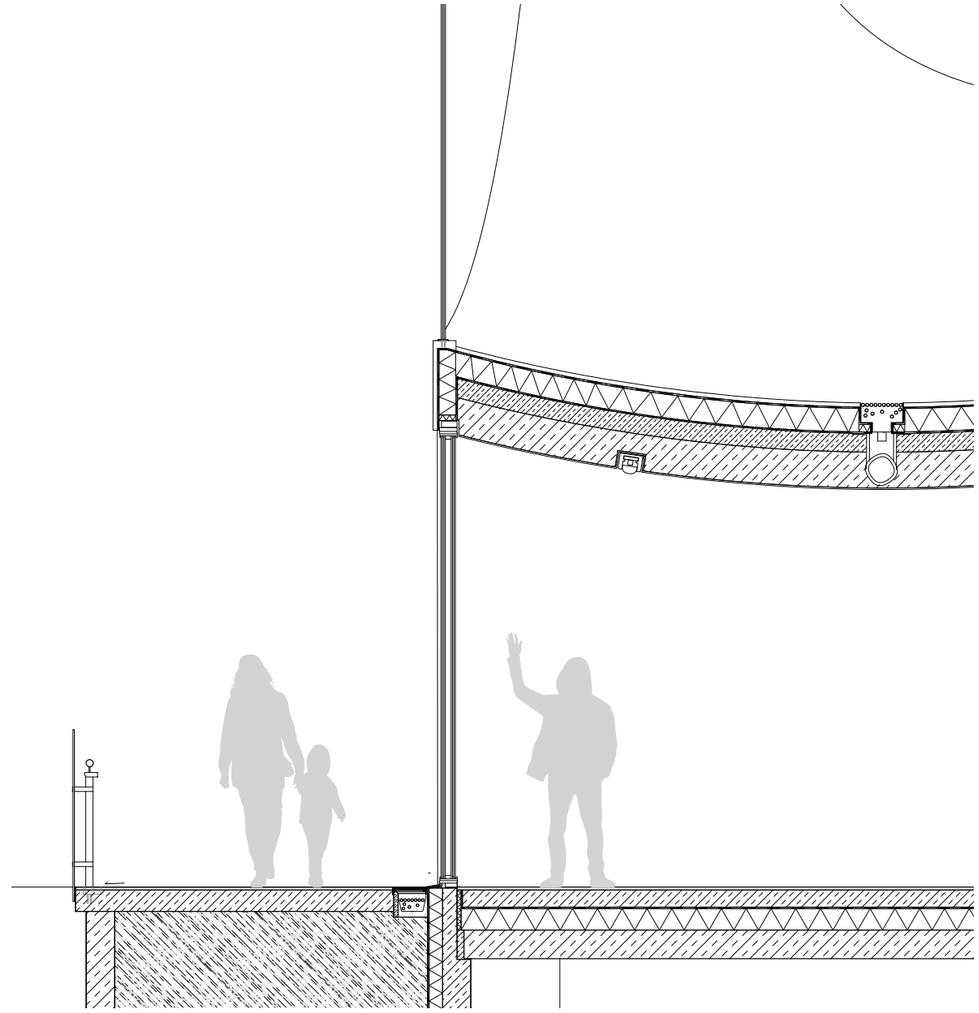
South facade



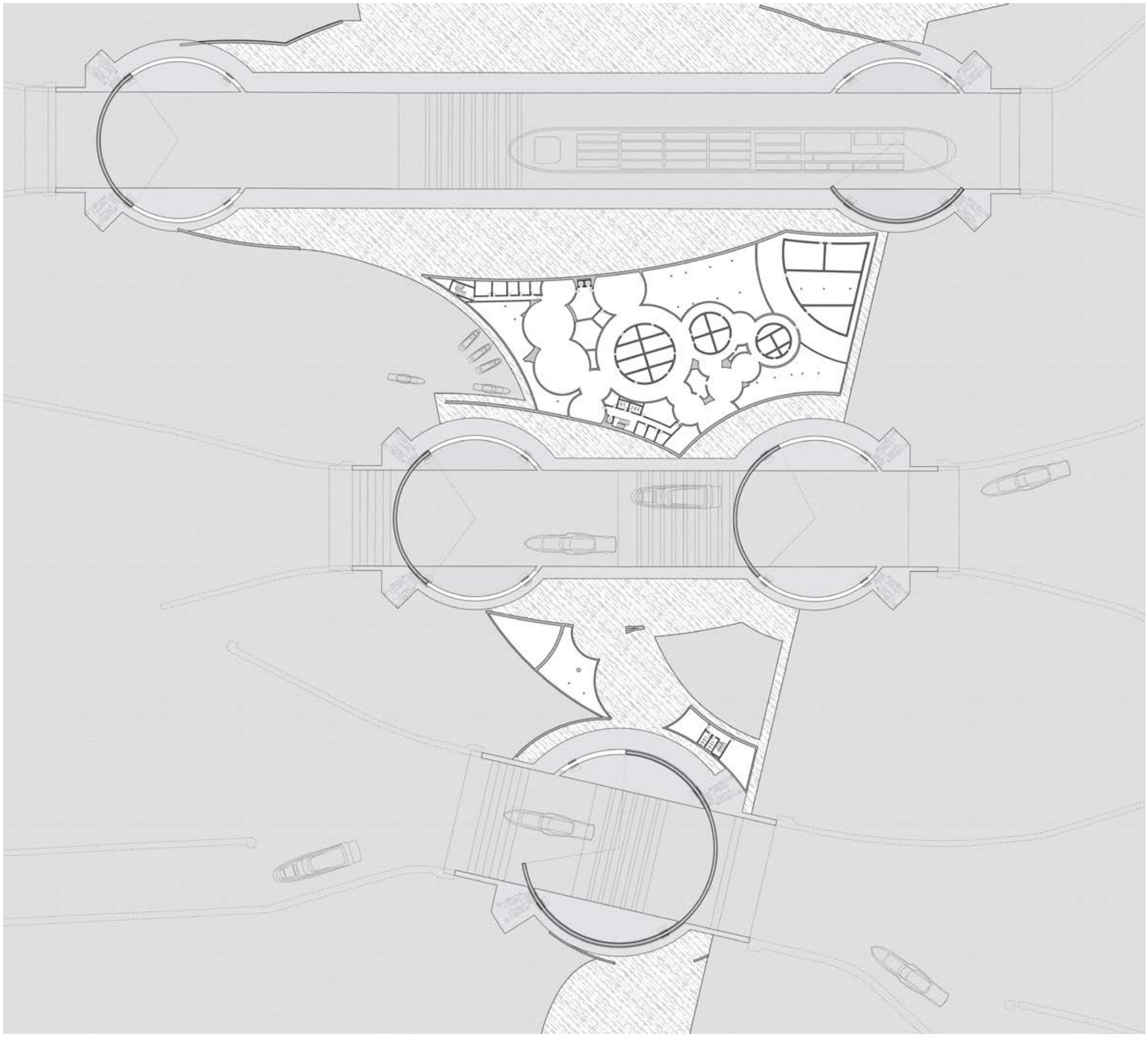
North facade

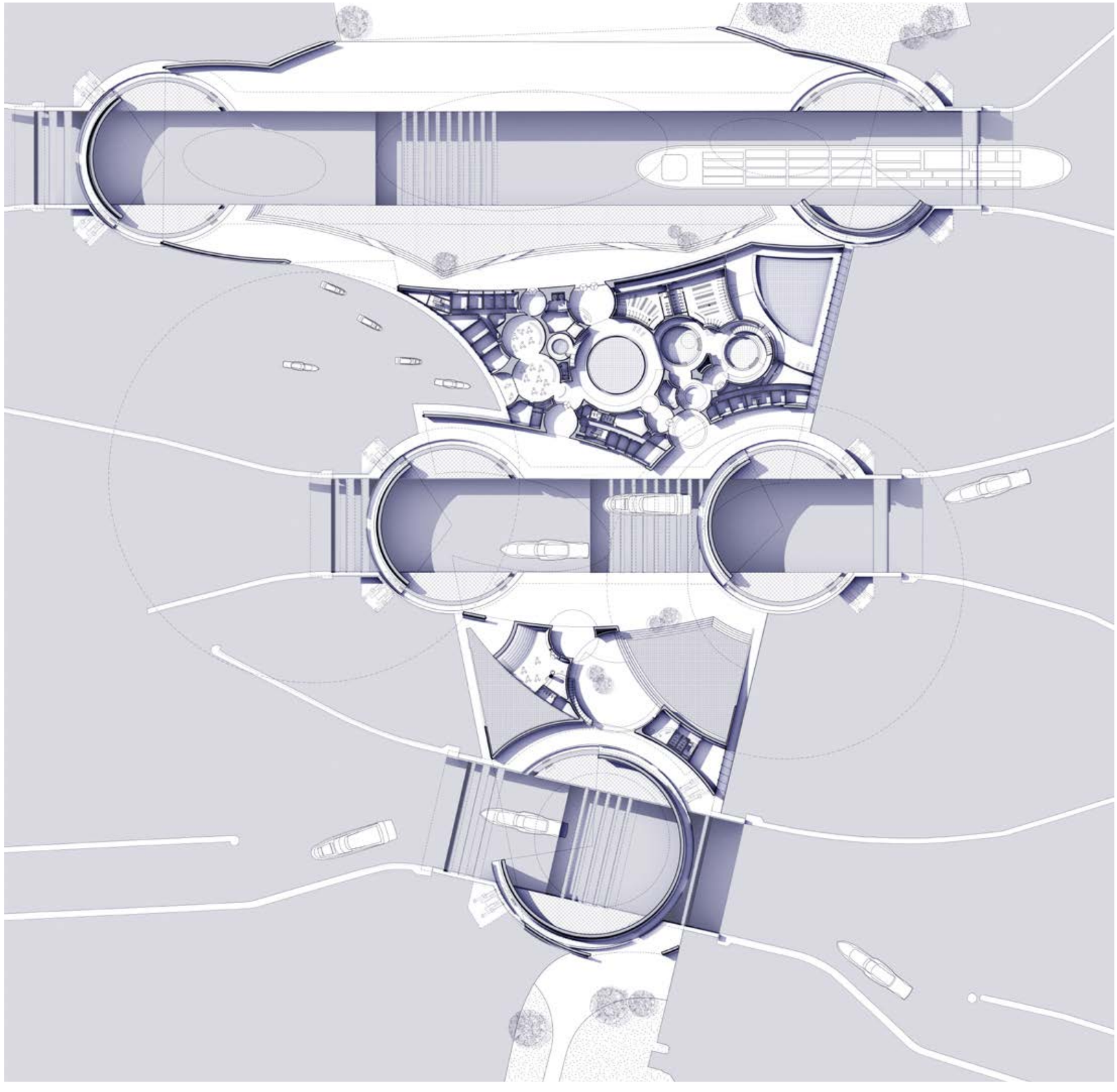
a set of dome rotating above water, light keep changes

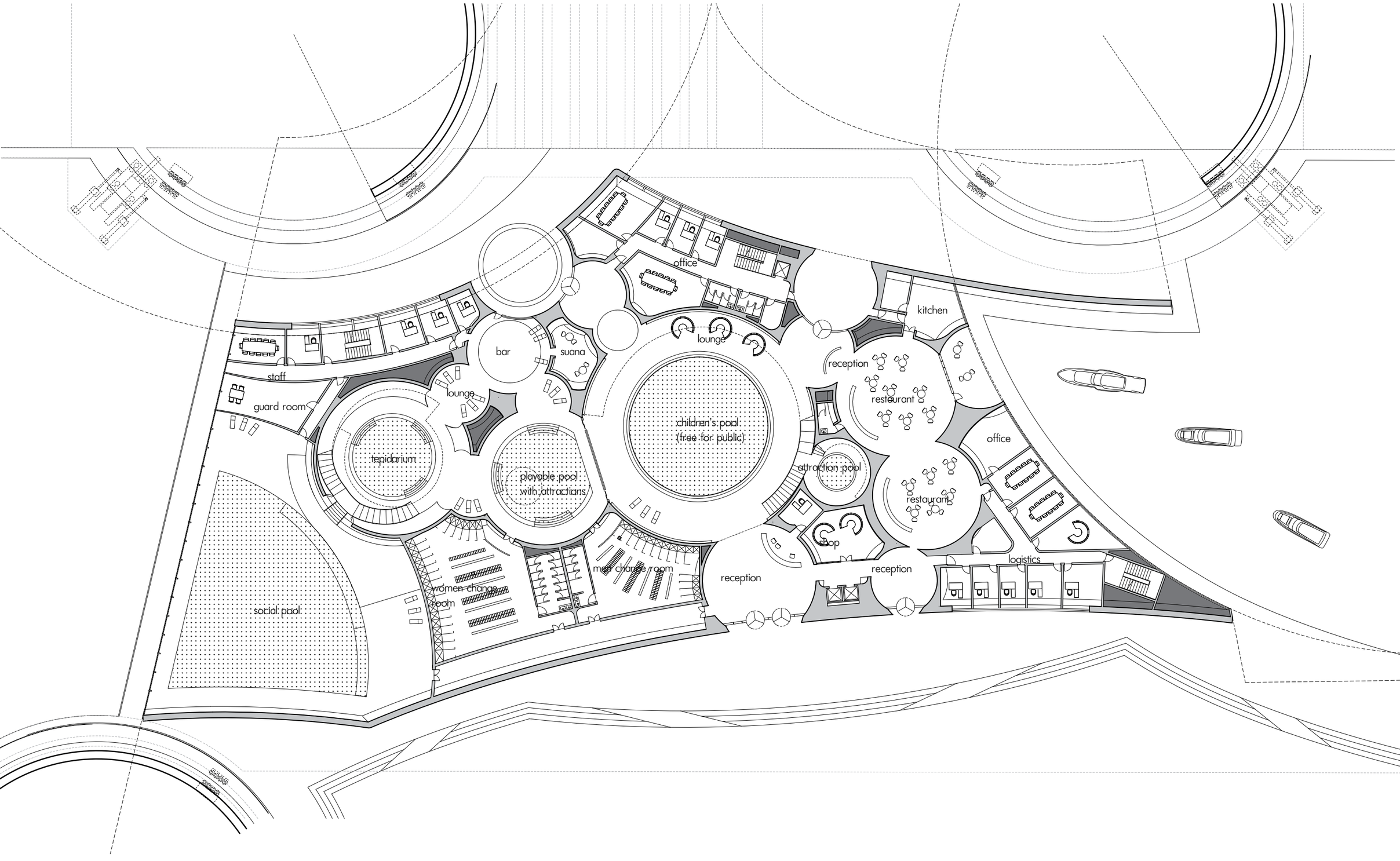




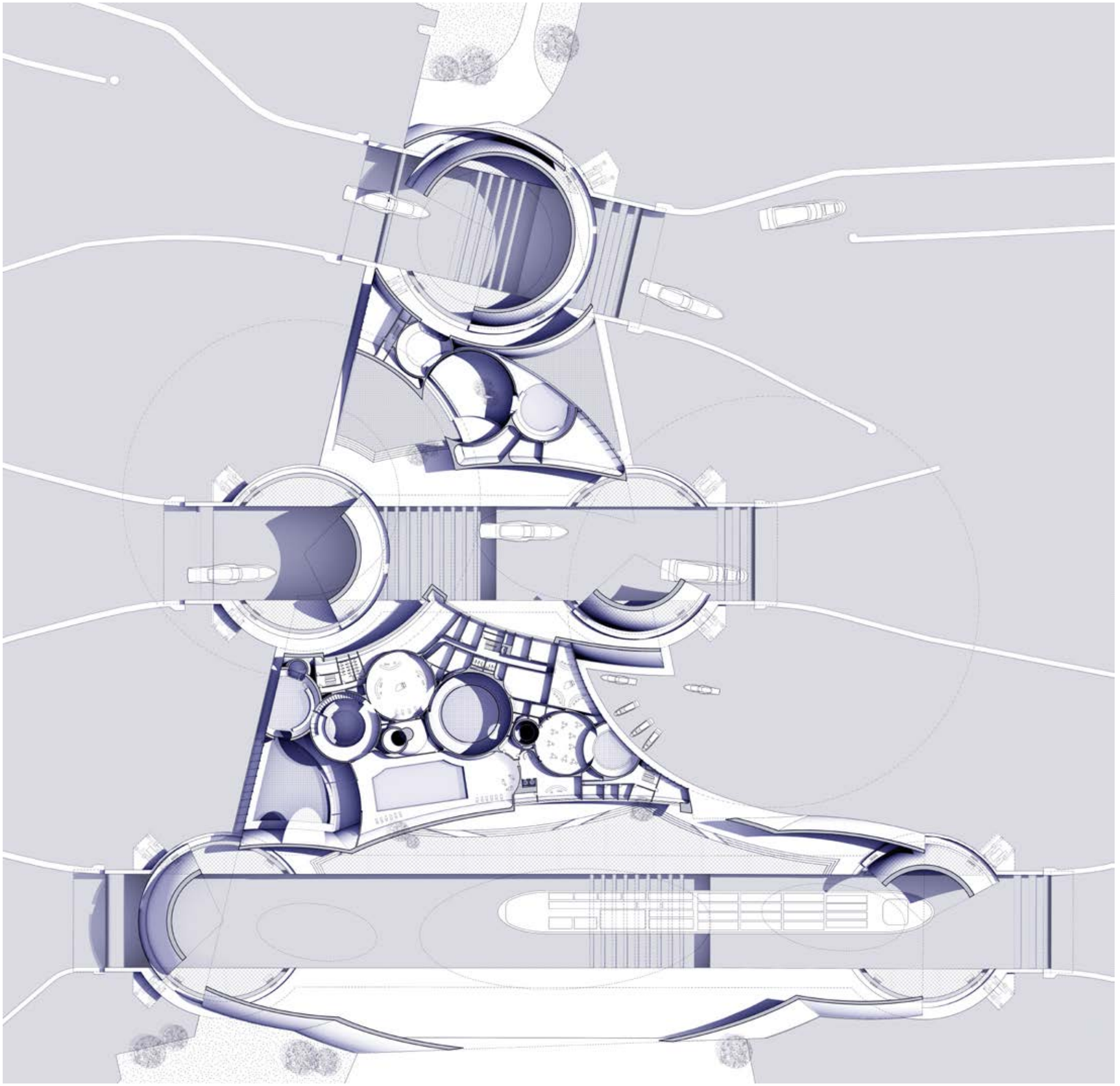
glass curtain wall, light feeling above water, good view towards the River IJ, visual communication with crossing pedestrain





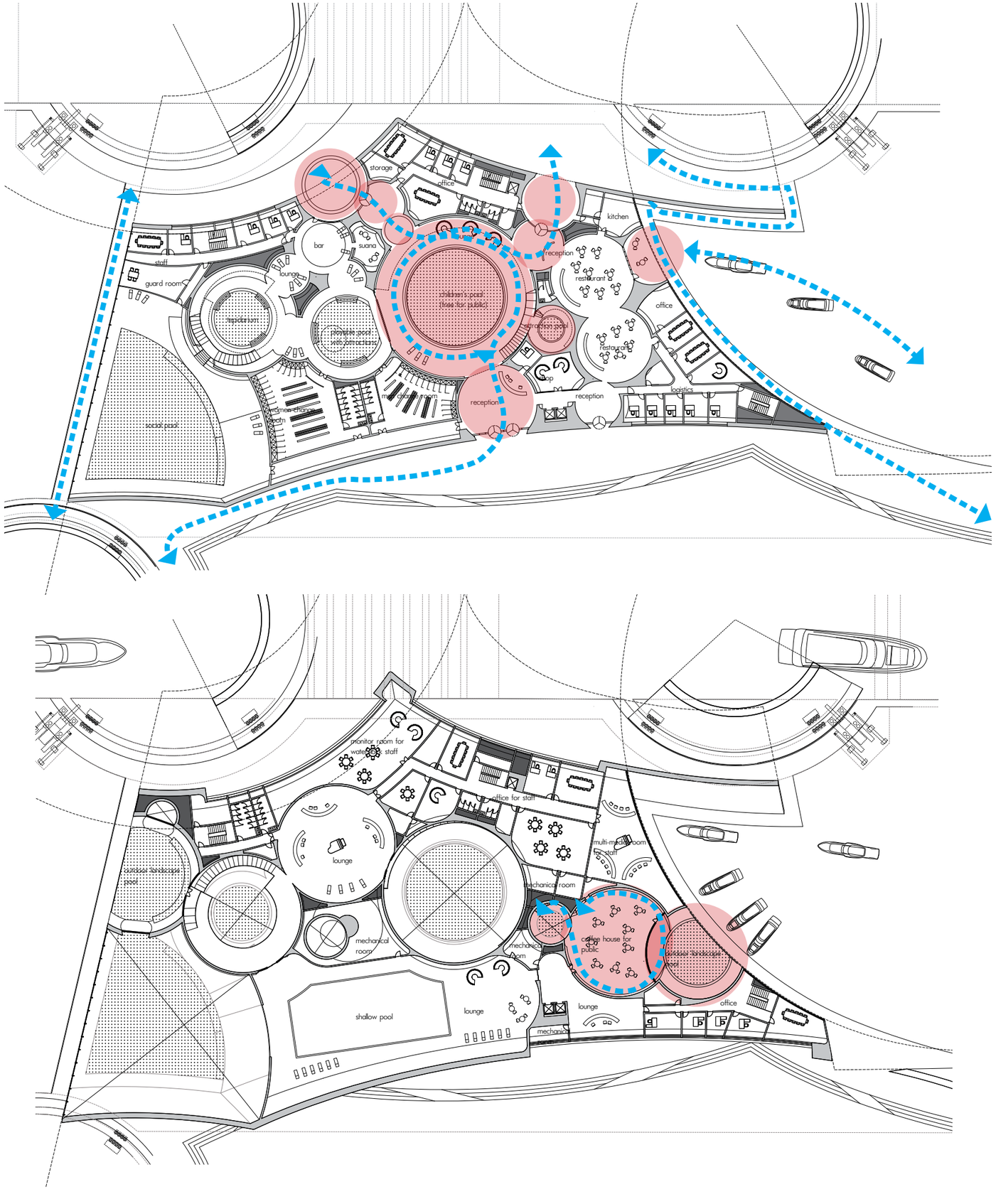

office
kitchen
lounge
bar
suana
staff
guard room
lounge
reception
restaurant
children's pool
(free for public)
office
tepidarium
playable pool
with attractions
attraction pool
restaurant
shop
logistics
men change room
reception
reception
women change
room
social pool

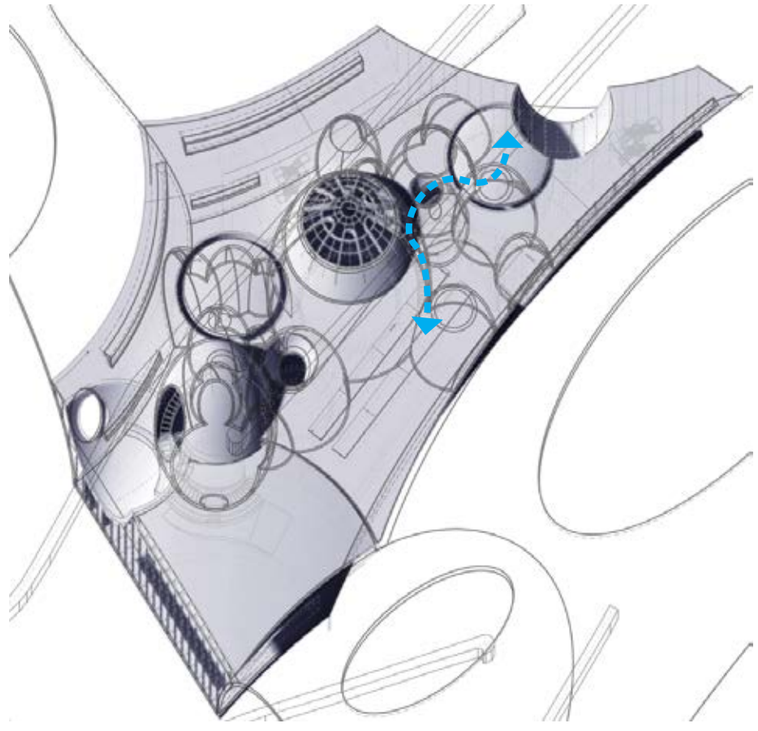

storage
office
kitchen
lounge
bar
suana
staff
guard room
lounge
reception
restaurant
children's pool
(free for public)
office
tepidarium
playable pool
with attractions
attraction pool
restaurant
shop
reception
logistics
reception
women change
room
men change room
social pool
public space
semi-public space



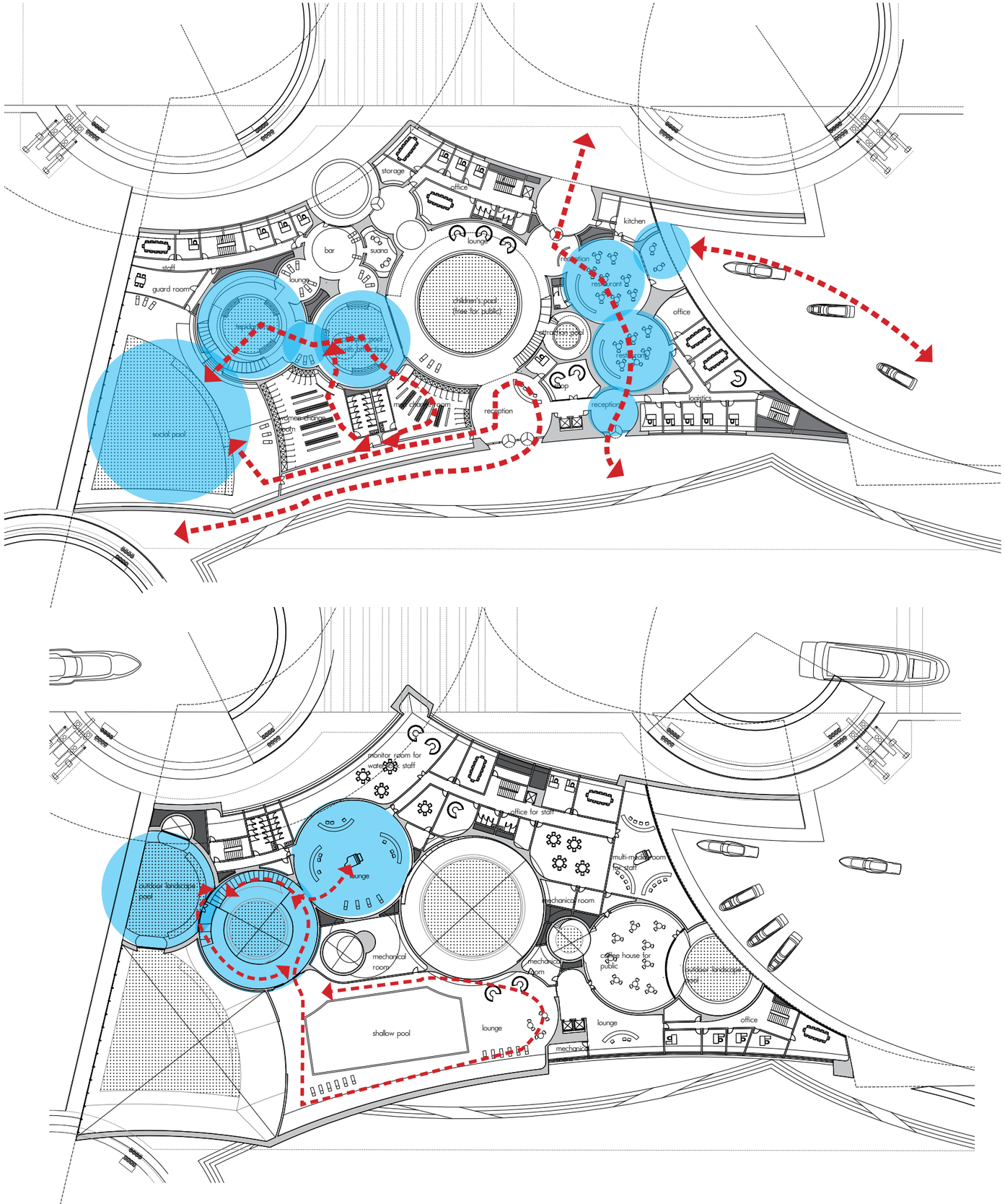

monitor room for water level staff
office for staff
multi-media room for staff
lounge
outdoor landscape pool
mechanical room
mechanical room
mechanical room
coffee house for public
outdoor landscape pool
shallow pool
lounge
lounge
mechanical room
office

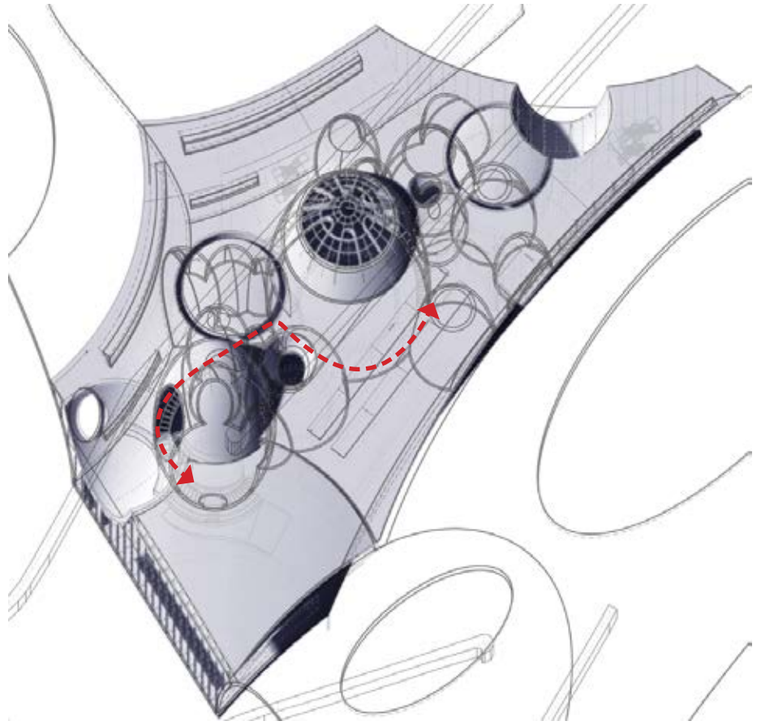

monitor room for wa-
ter lo staff
office for staff
multi-media room
for staff
lounge
outdoor landscape
pool
mechanical room
mechanical
room
coffee house for
public
outdoor landscape
pool
shallow pool
lounge
lounge
mechanical
room
office
public space
semi-public space



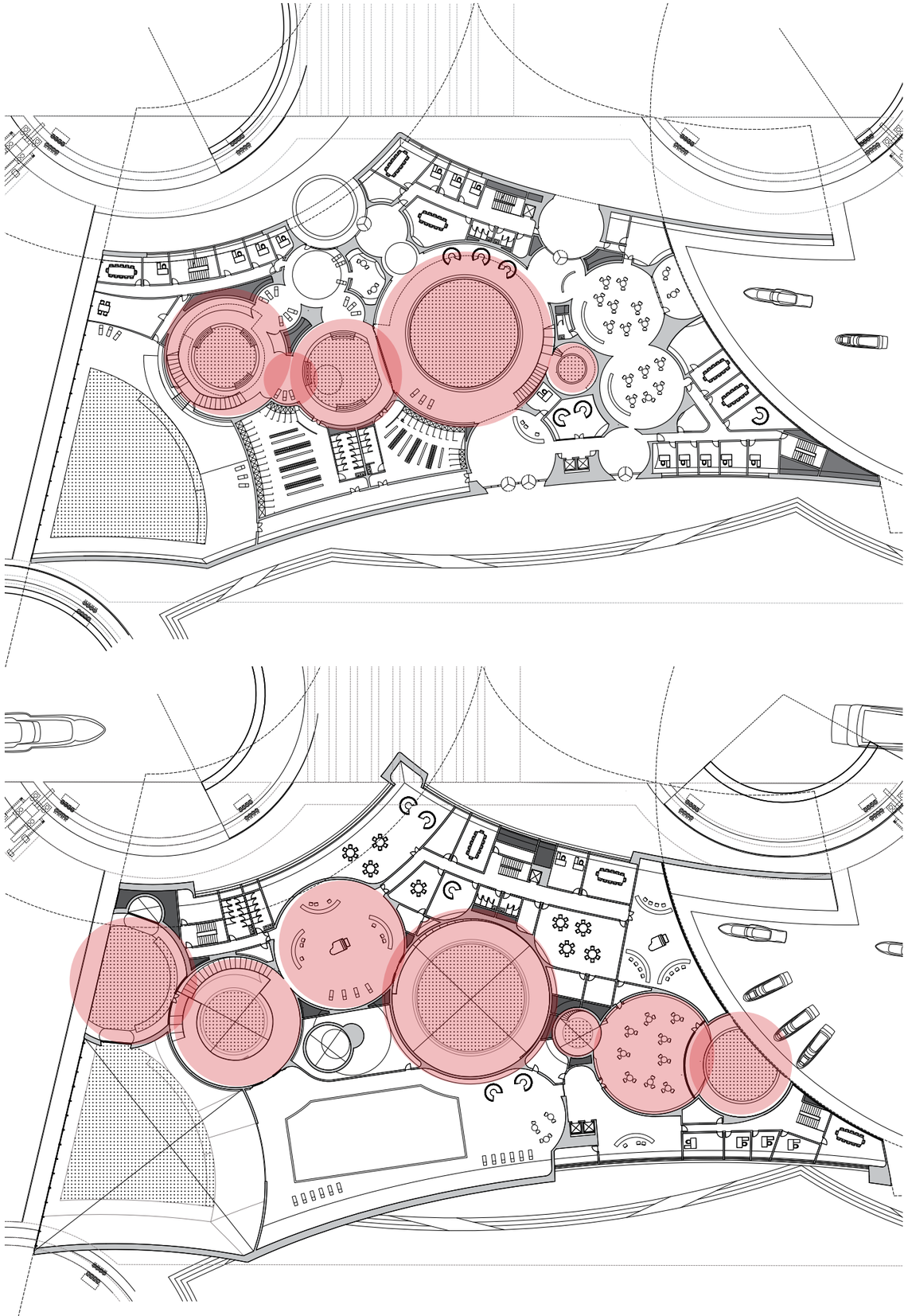


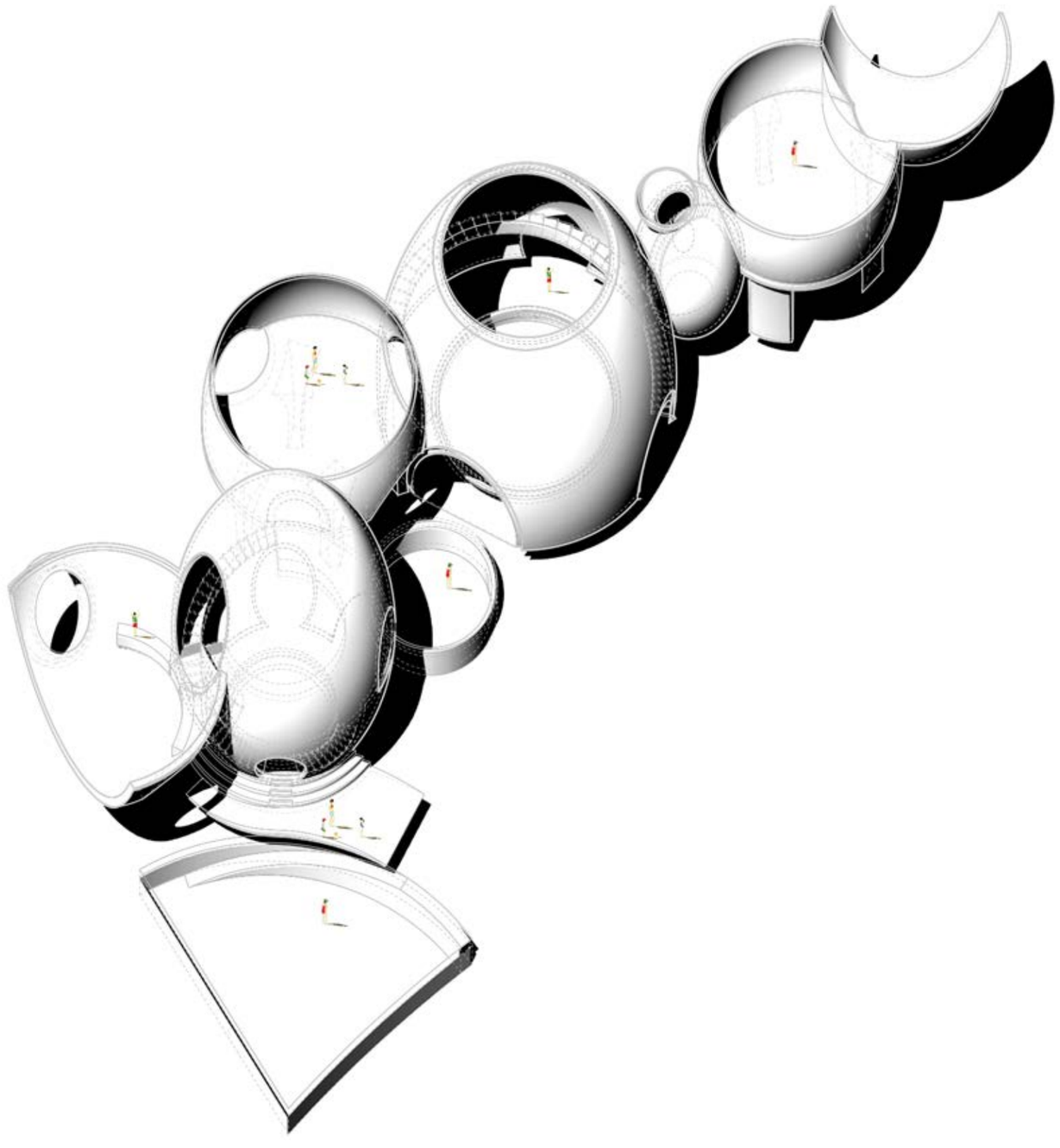
Public route (free)

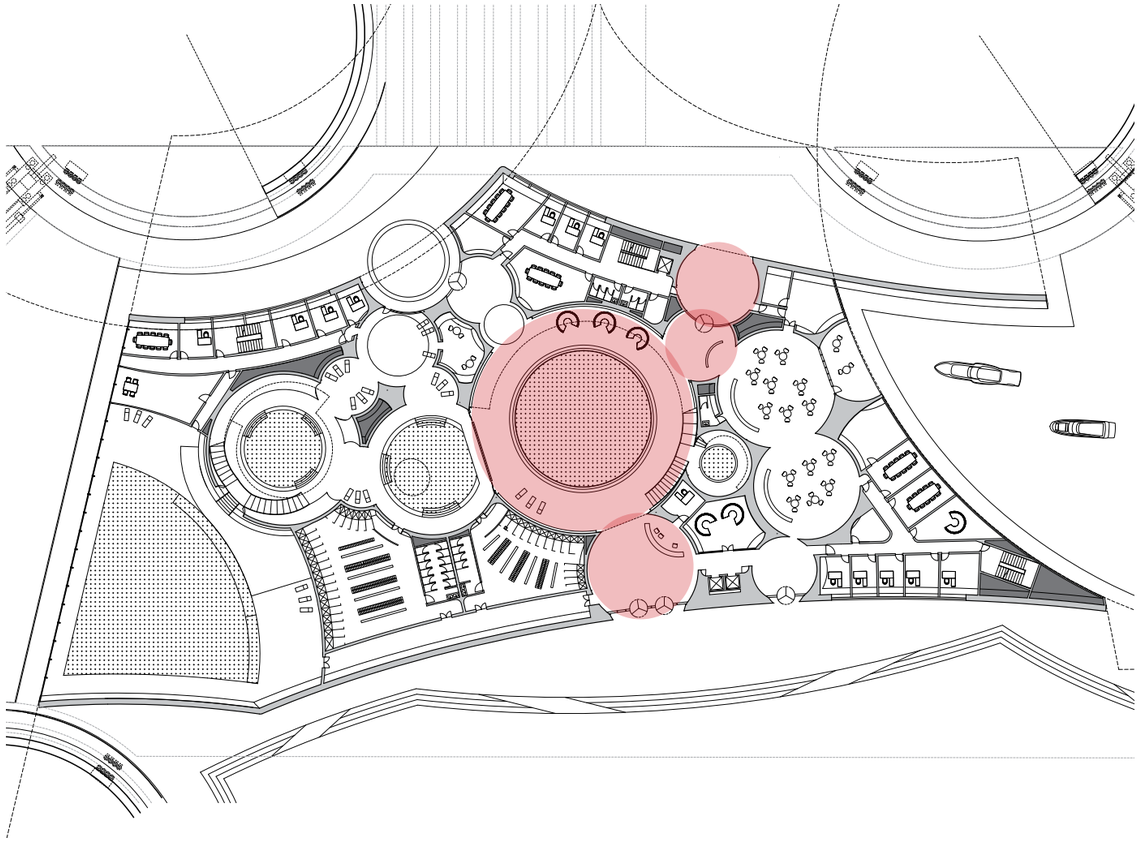


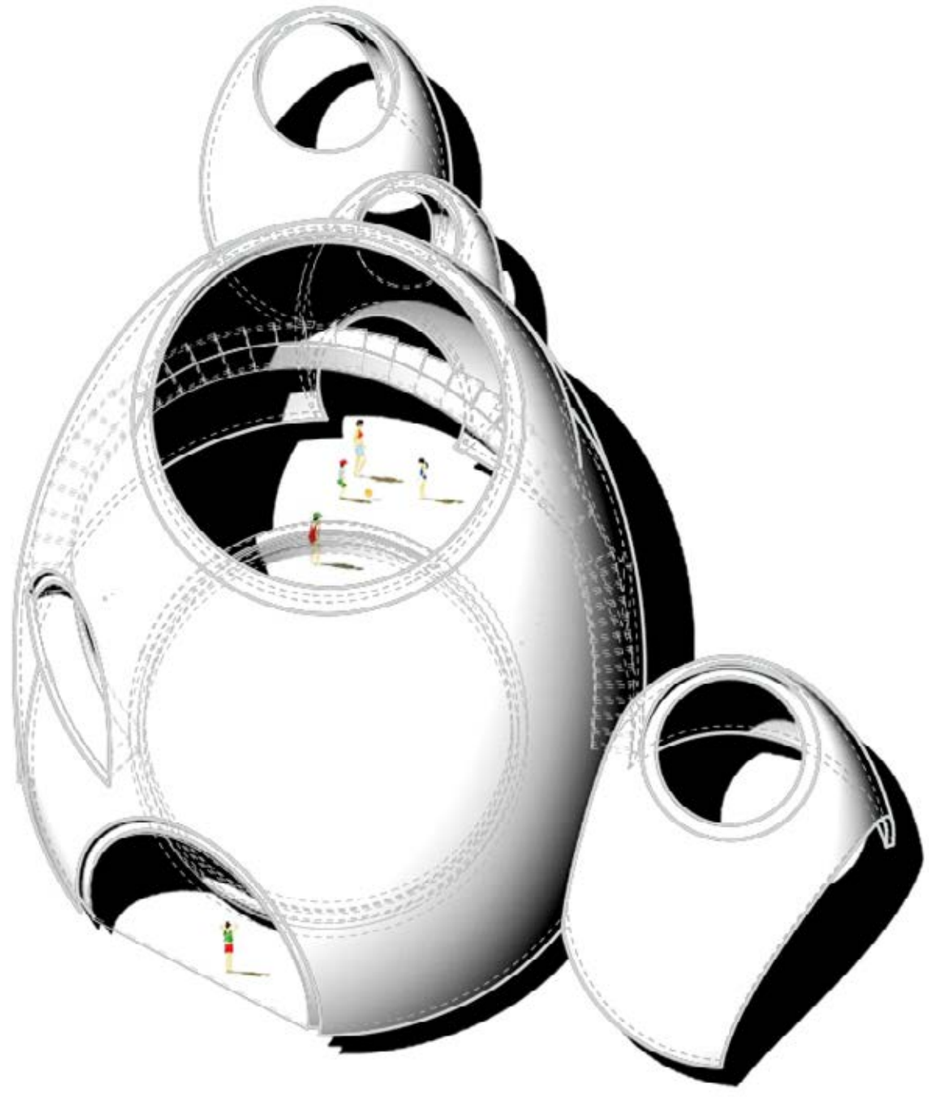


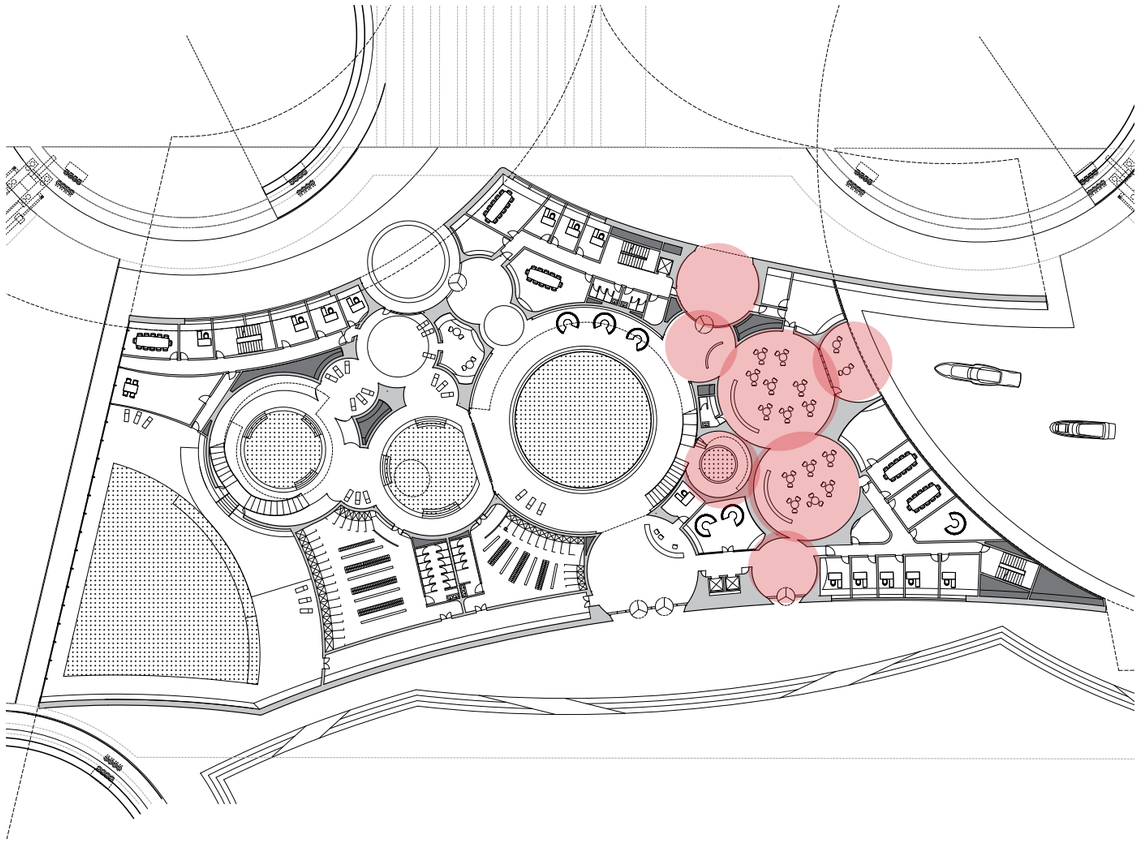
semi-public route (pay)

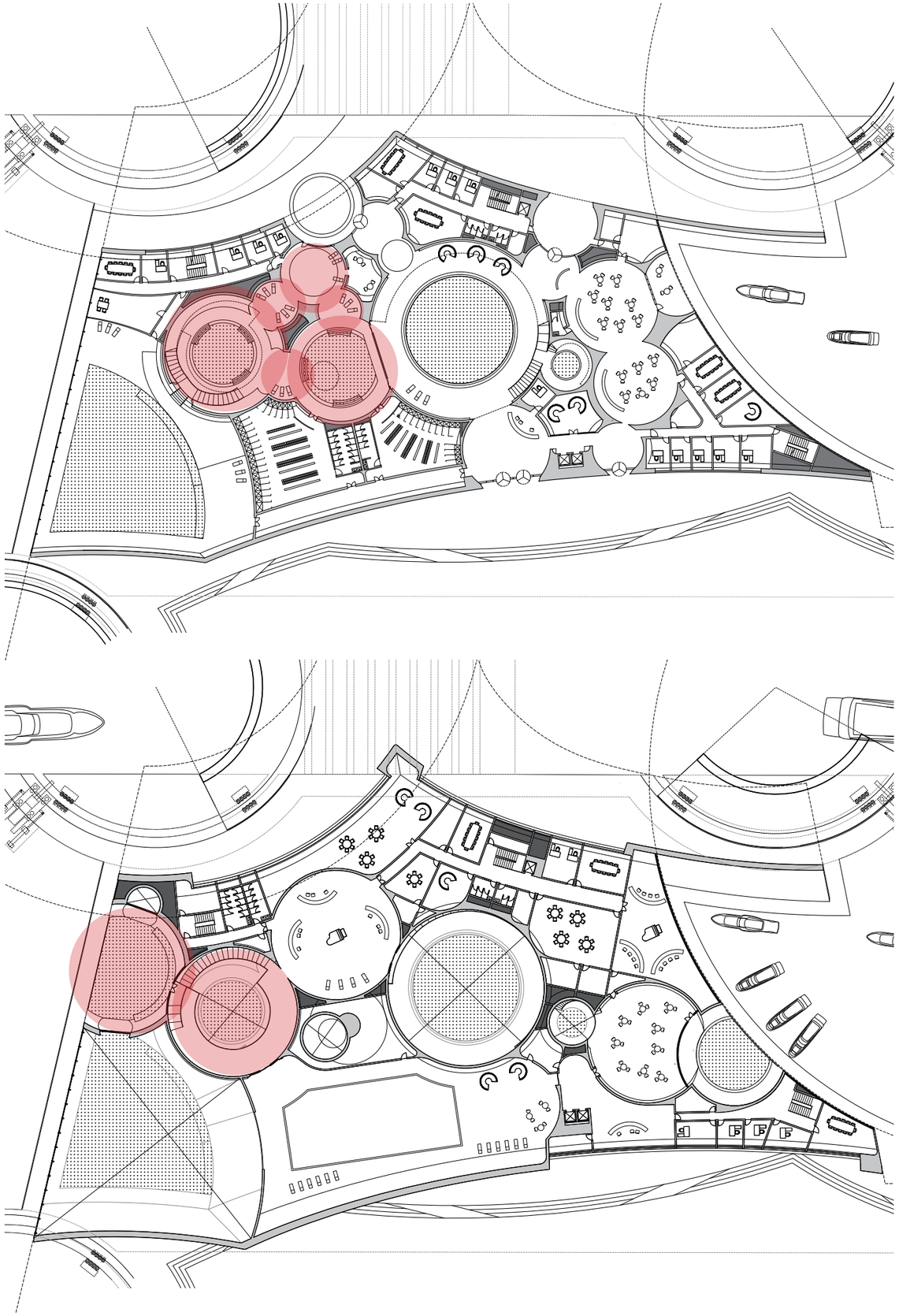


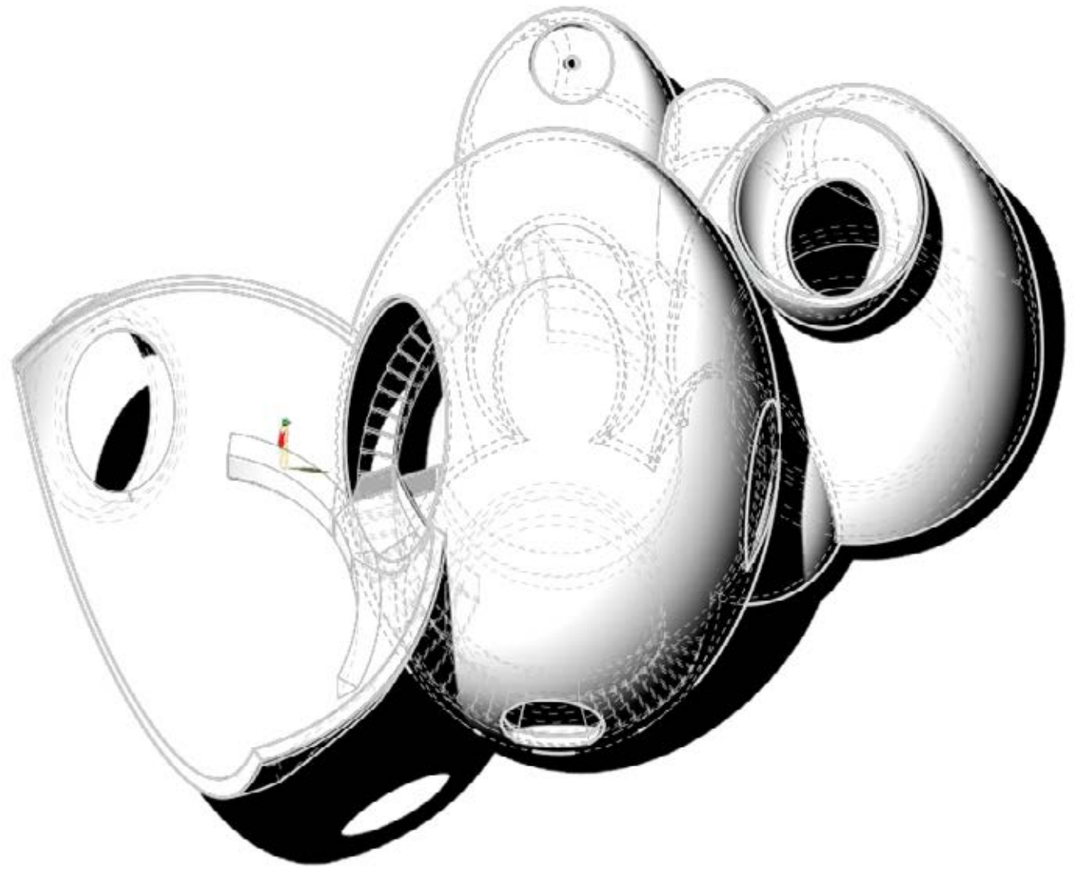


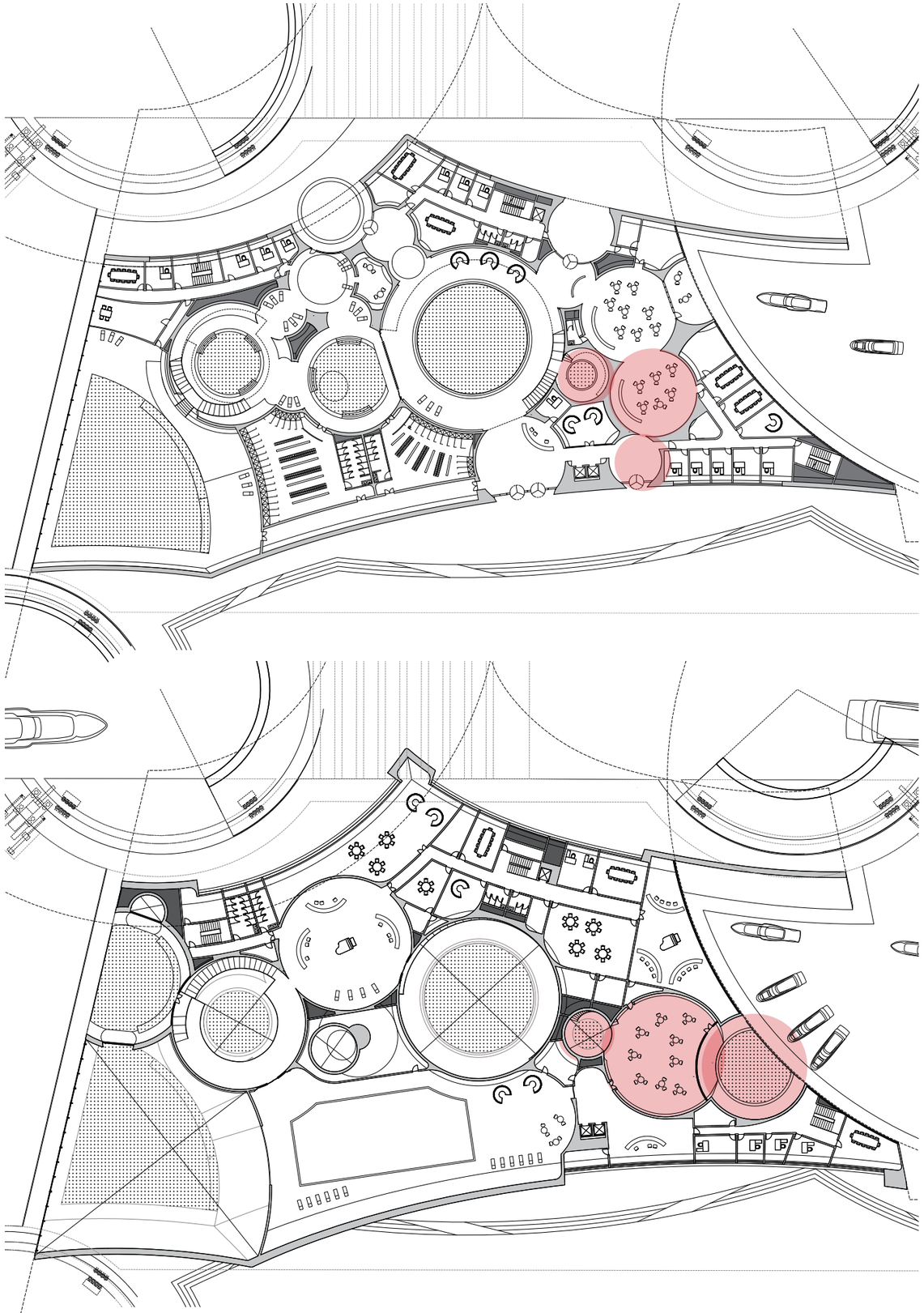


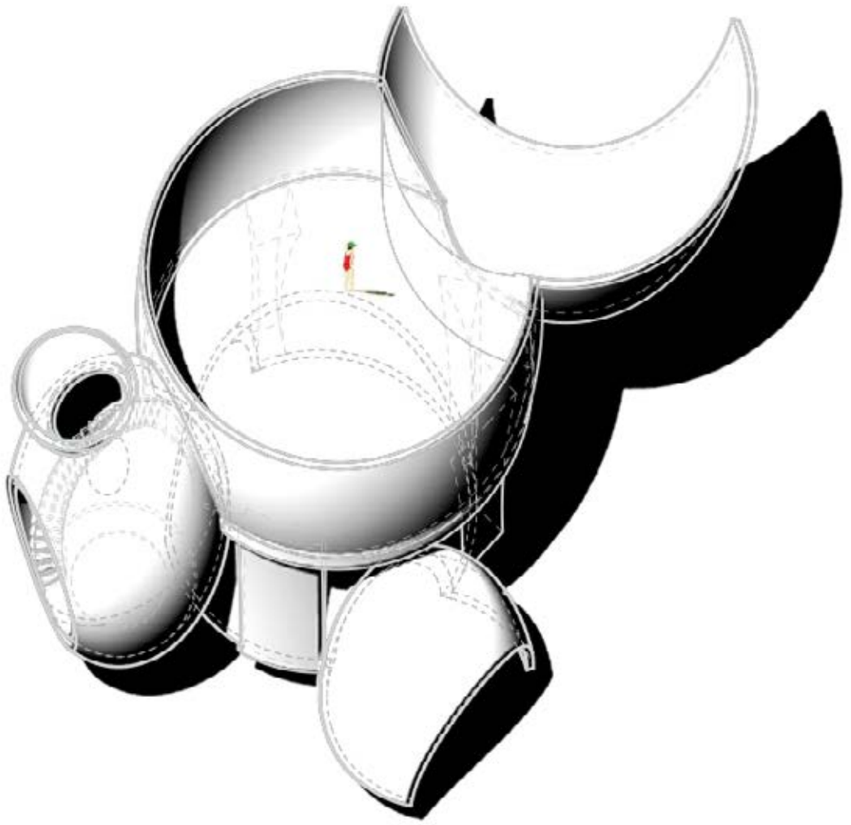


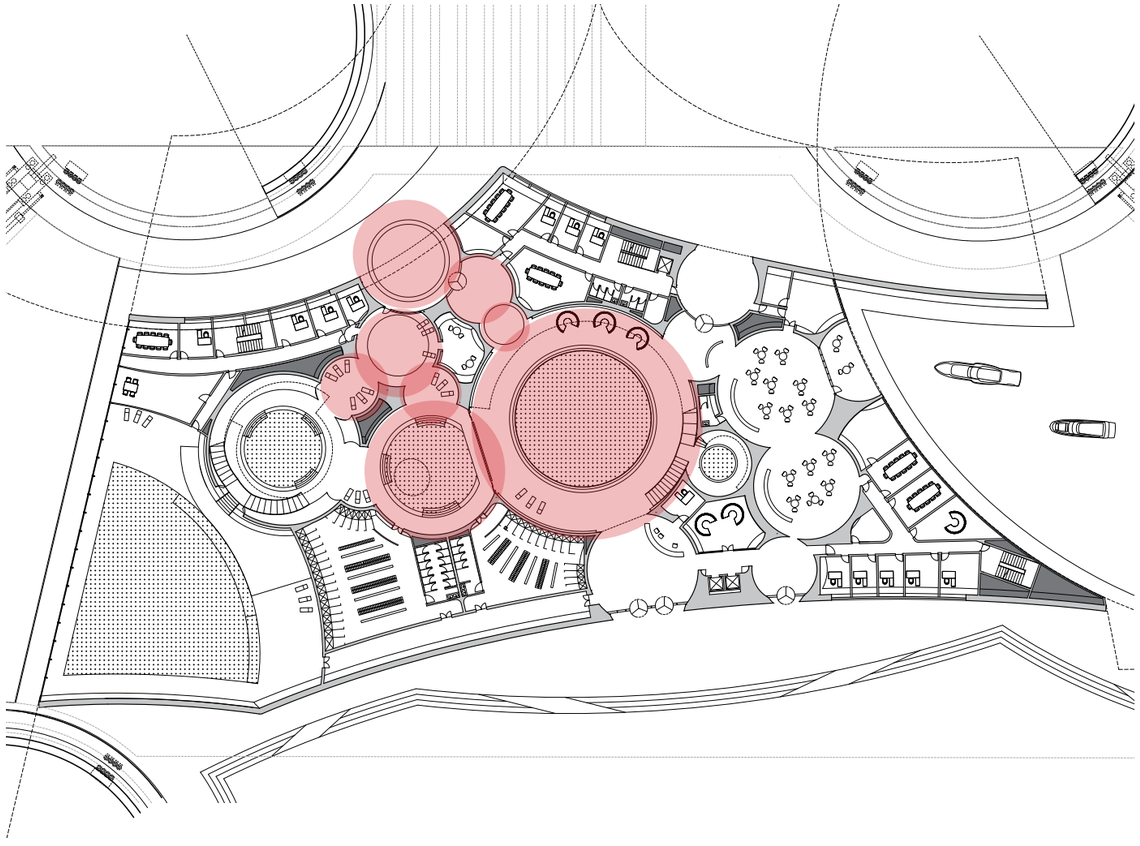


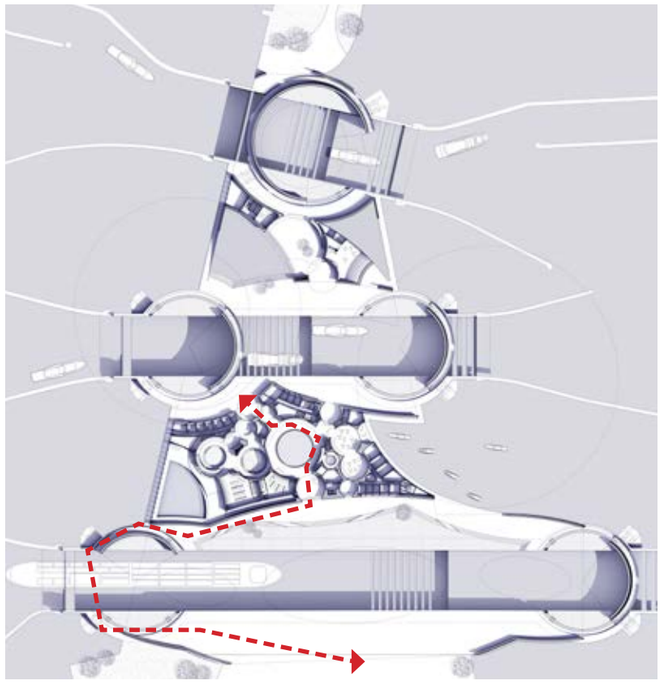




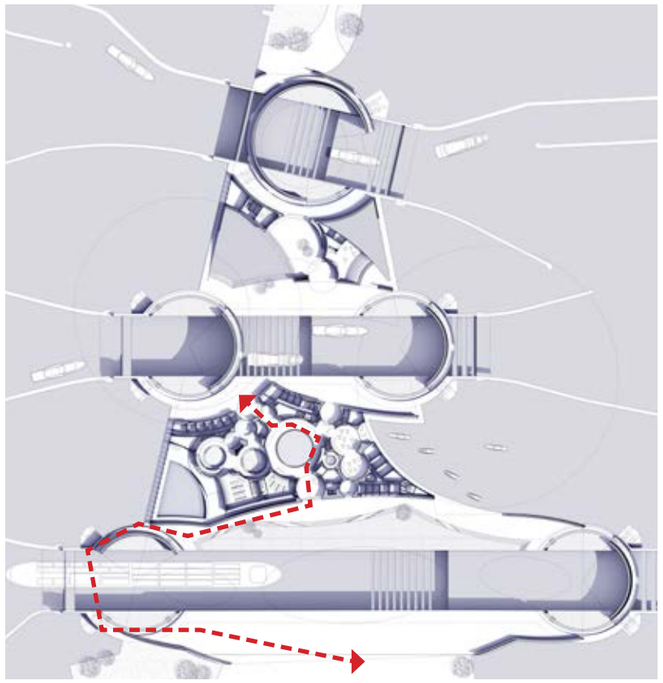


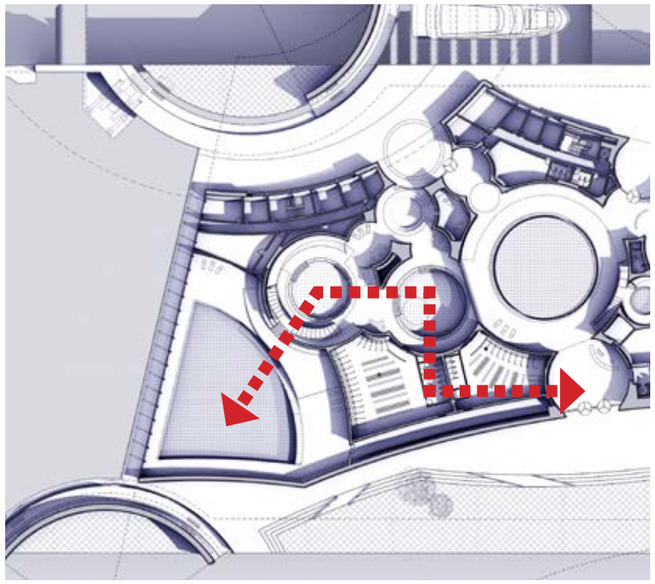


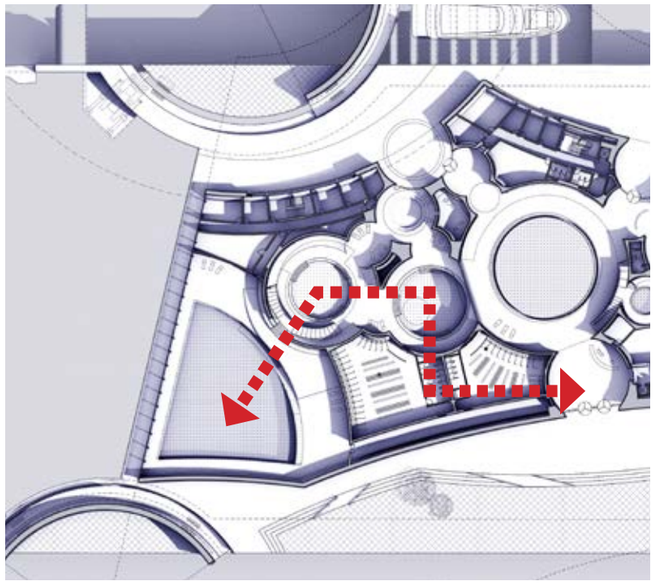


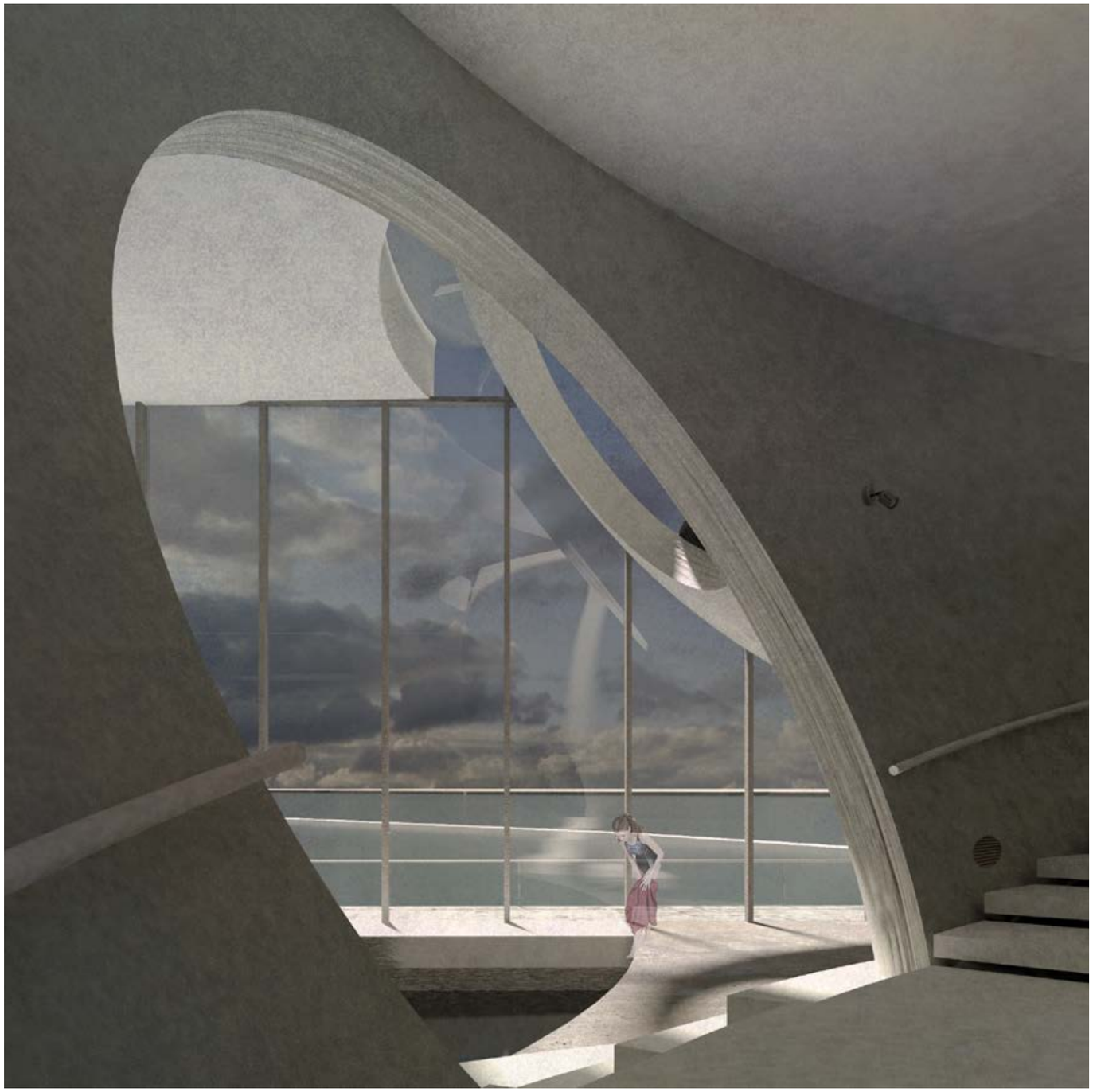


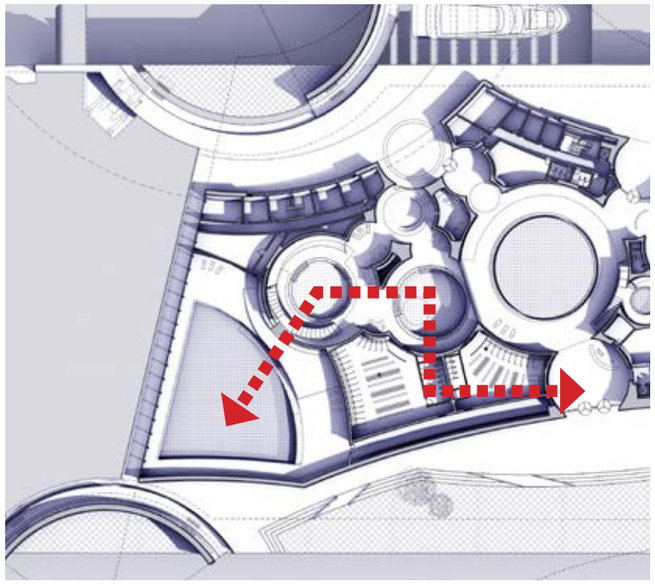

INDIANA HARBOR

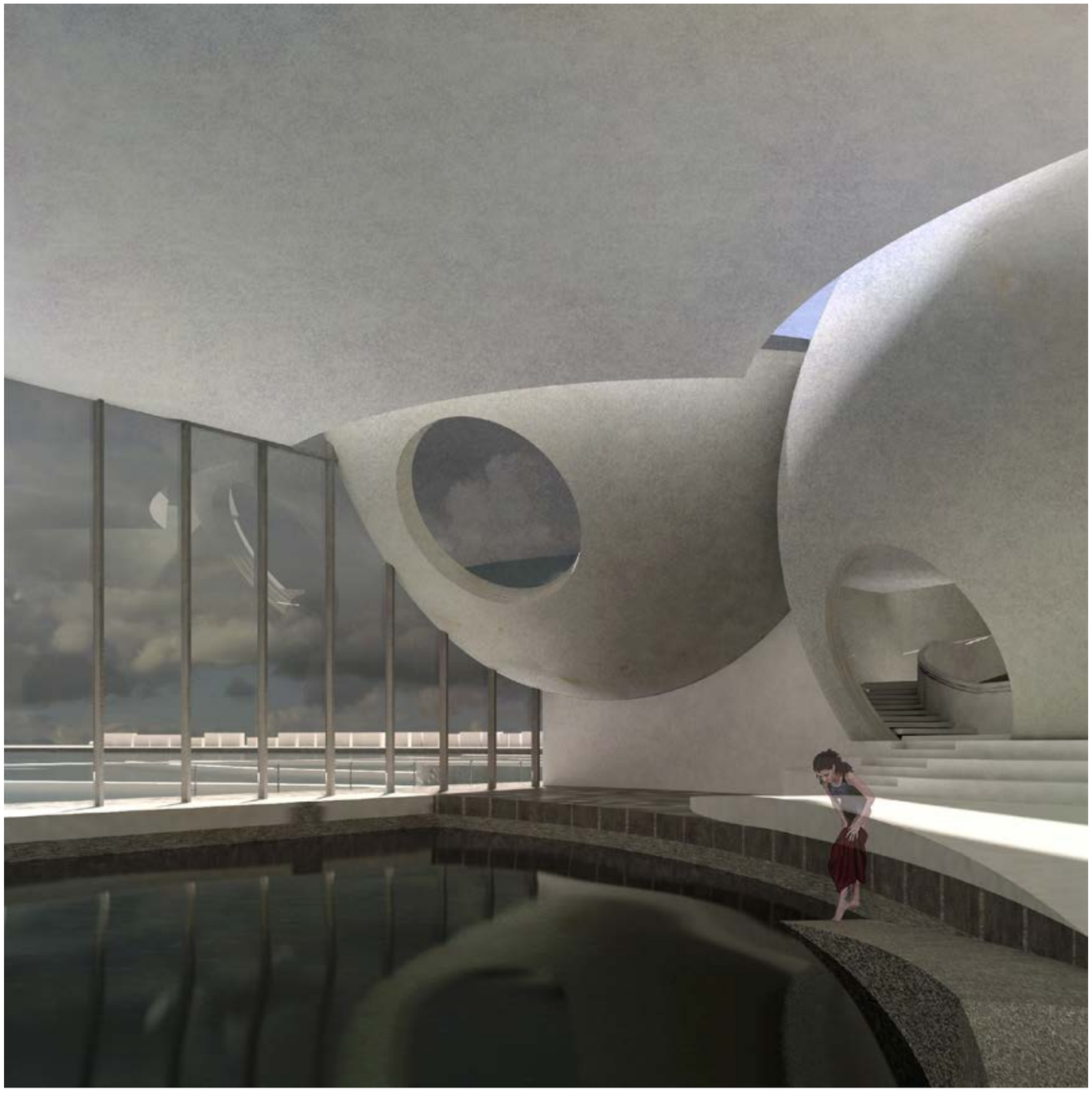


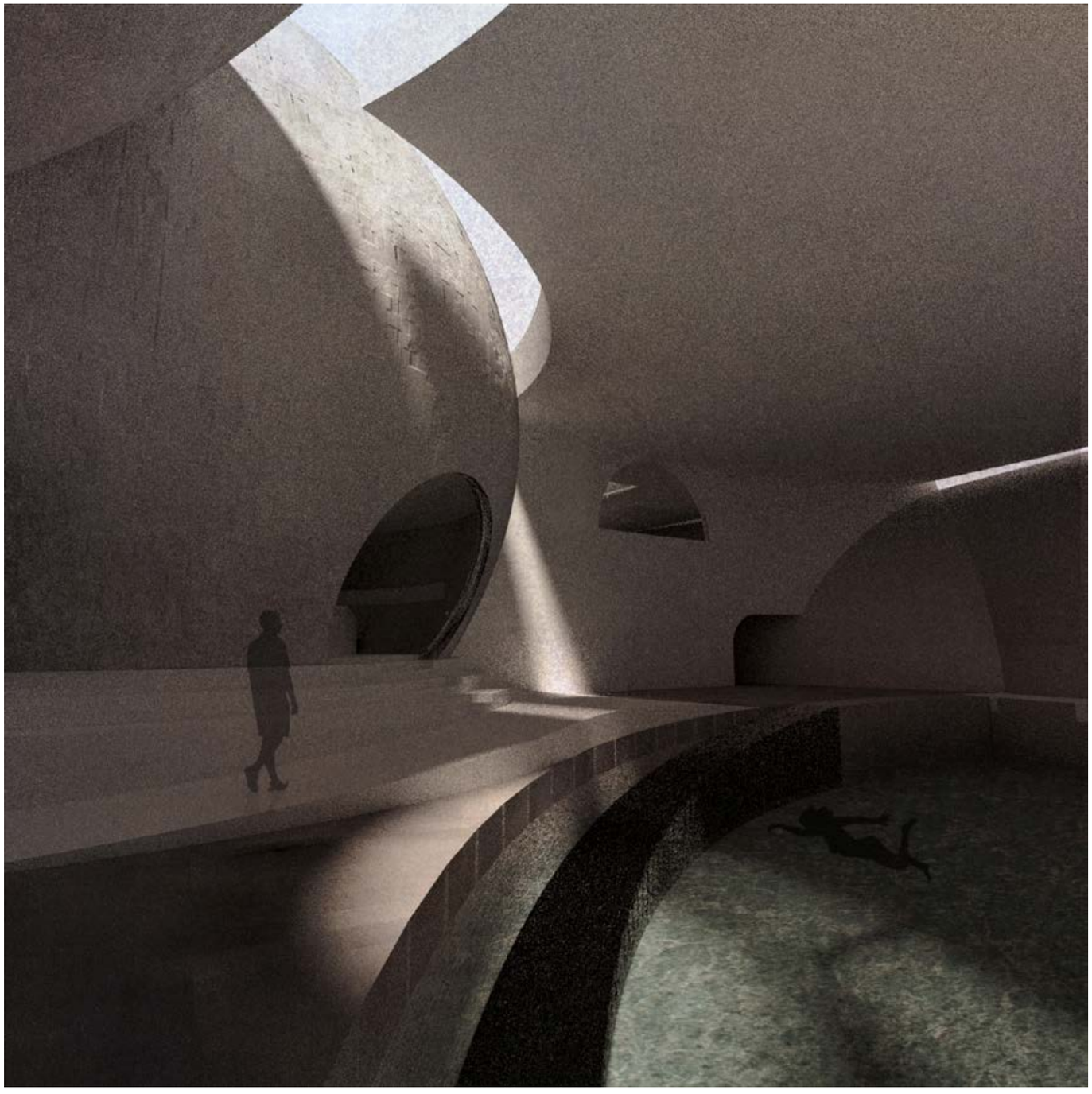


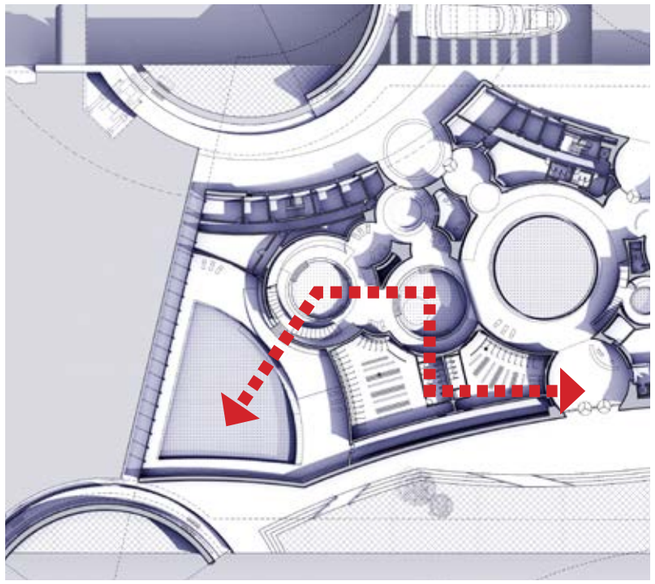


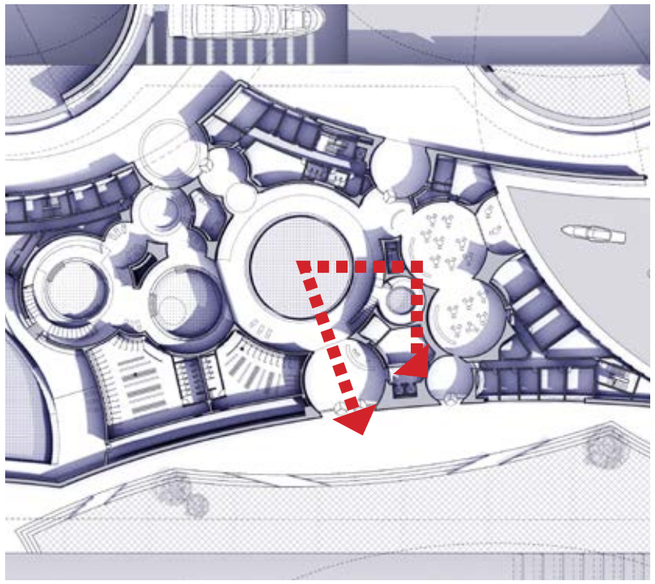


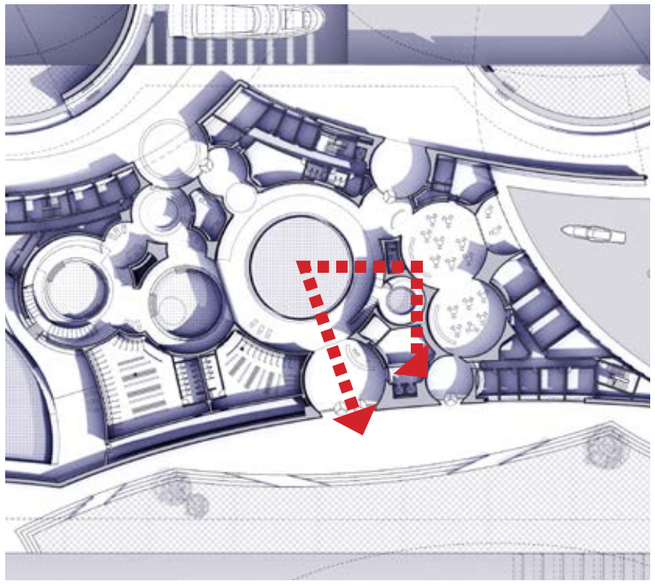


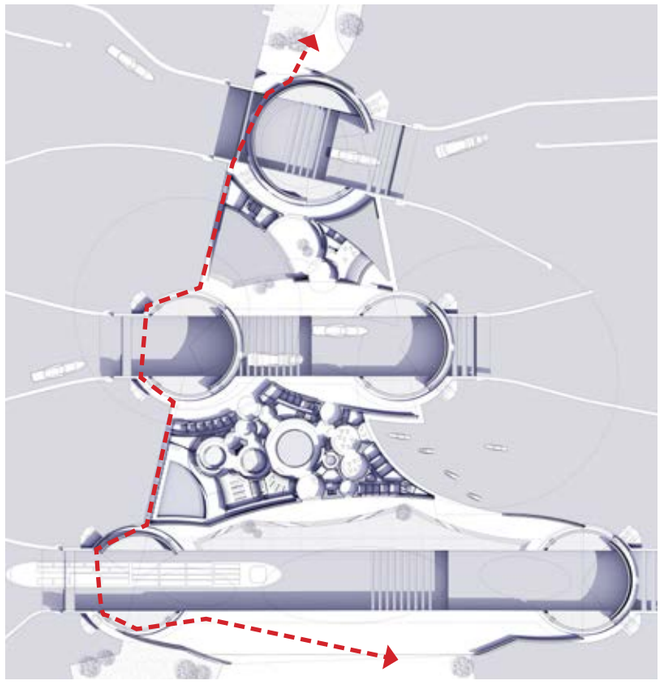


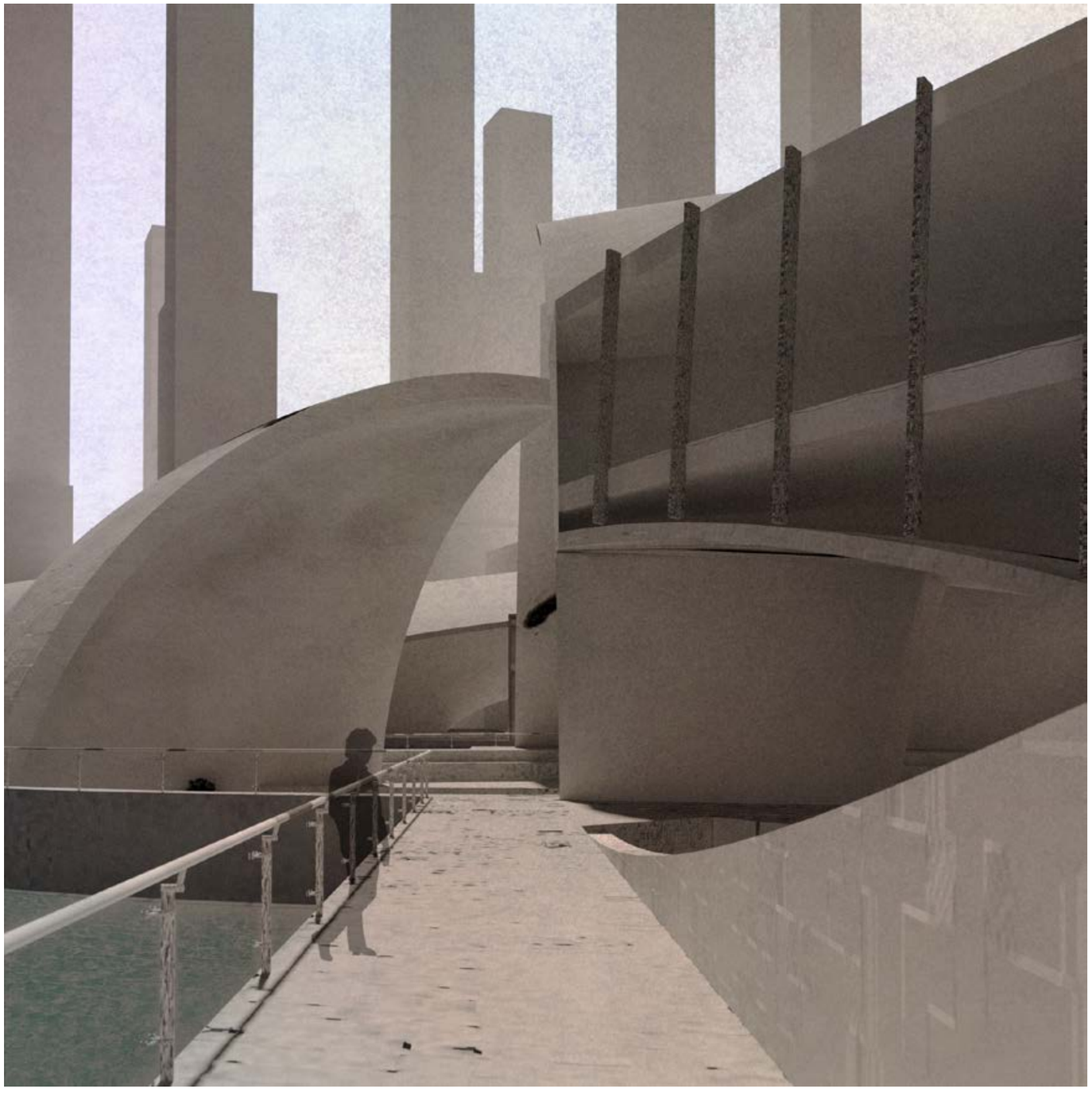


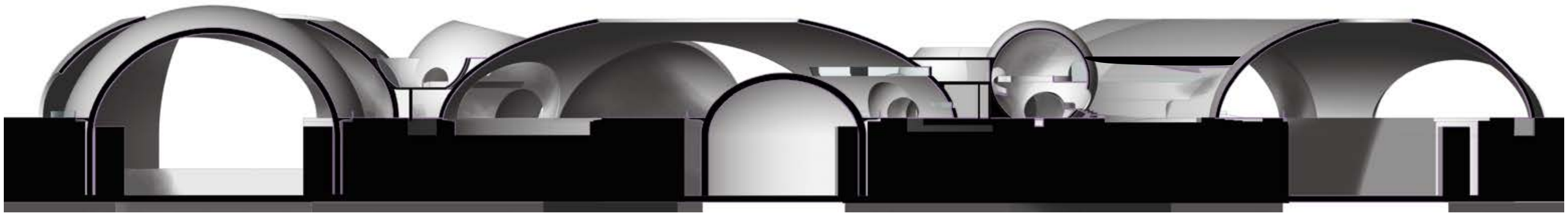


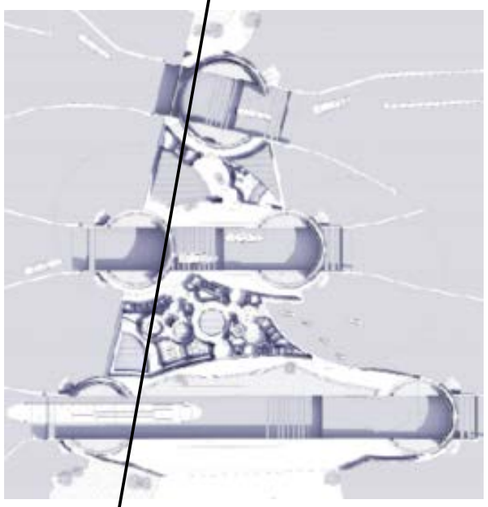






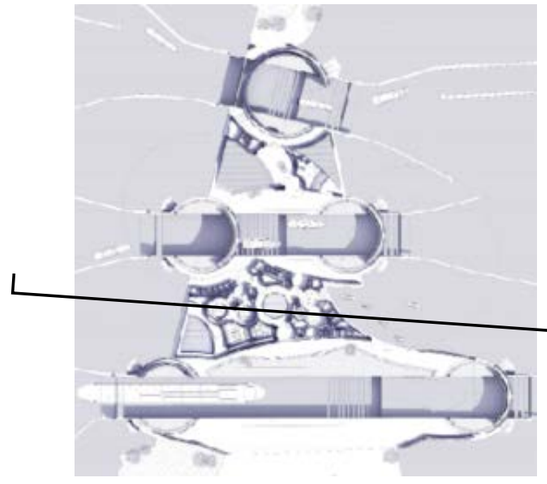




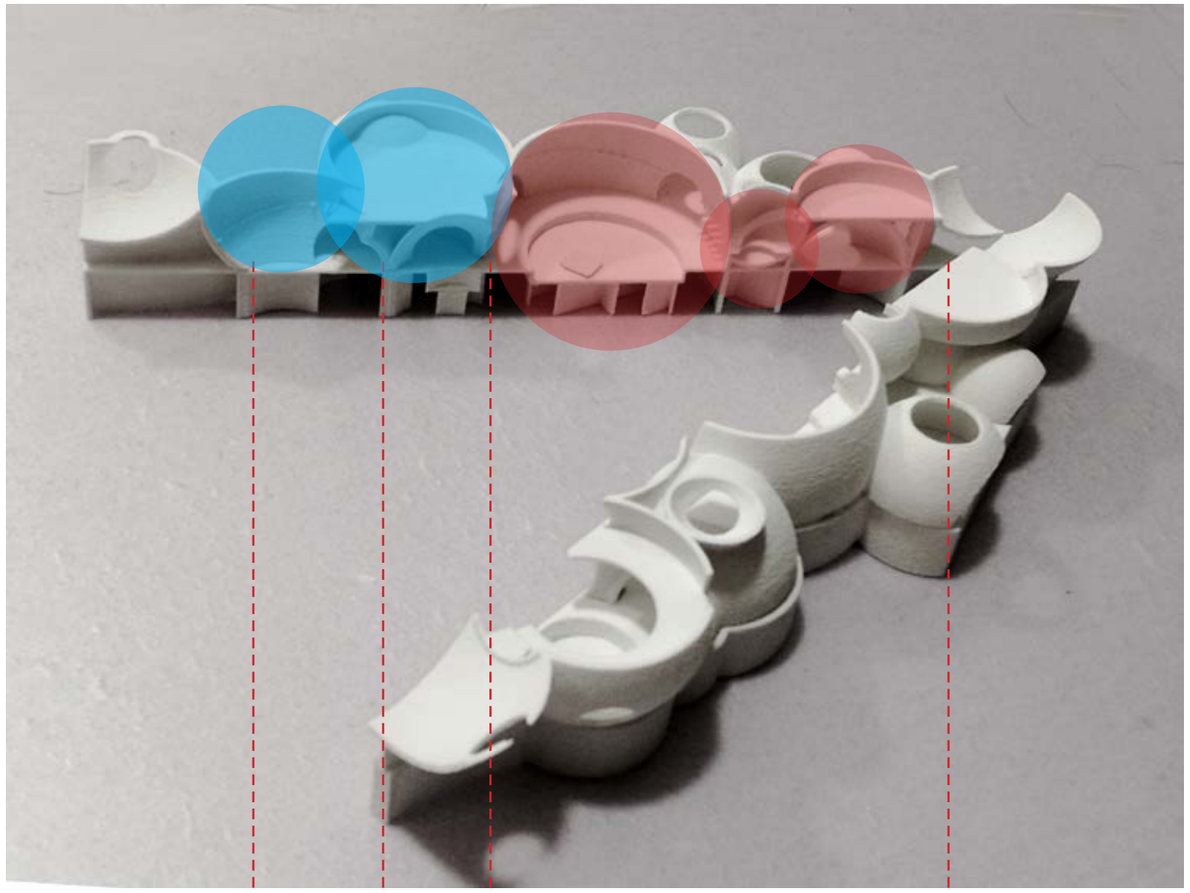


crossing to the other side under a set of dome
space give pedestrain different spatial experience

Developed from the typology of the Roman bath, here, sets of upright and inverted domes, capitalizing on the seemingly serendipitous intersection of these spherical forms, provides or shelter or open-public space. One recognizes the rhythmic and sequential of the space through movement. There is no linear sequence but rather collections of turning moments for discovery.



Main space section 1:200

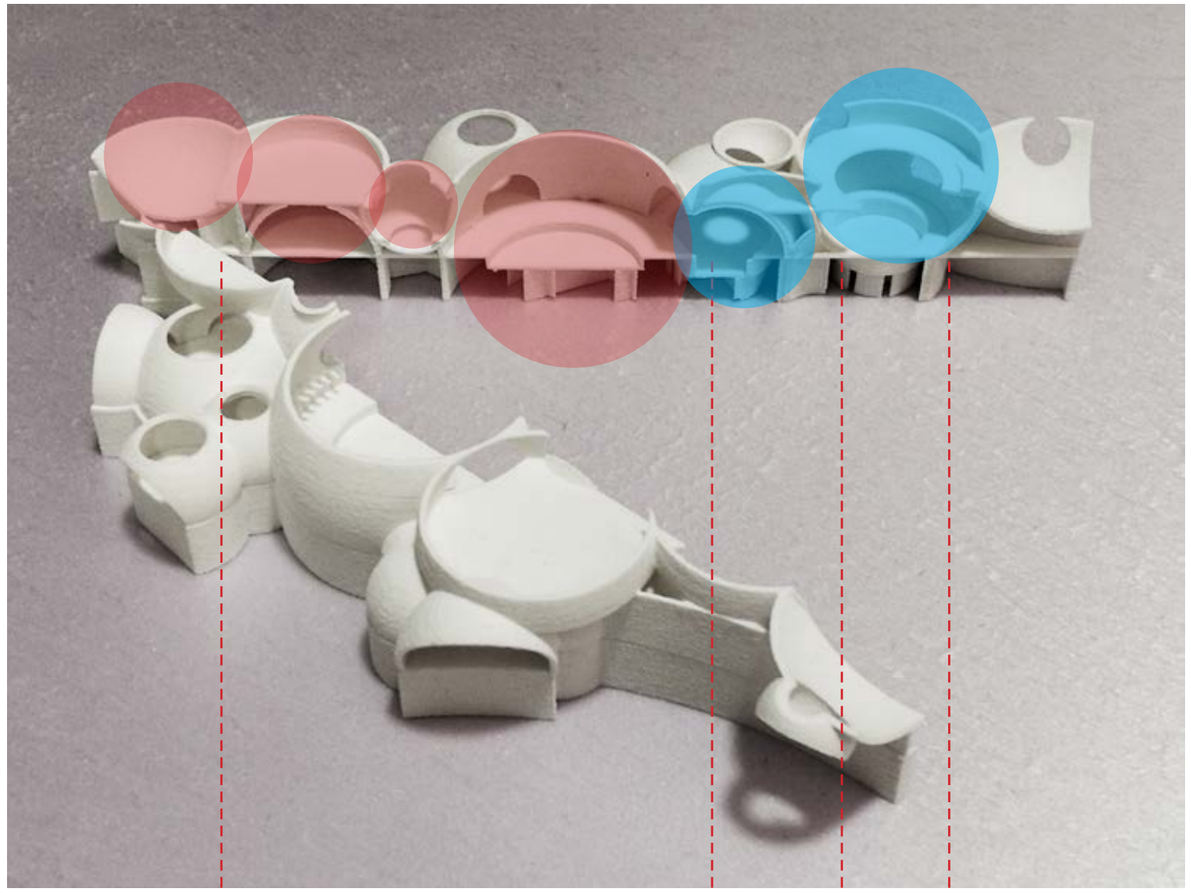


semi-public

static

public

dynamic

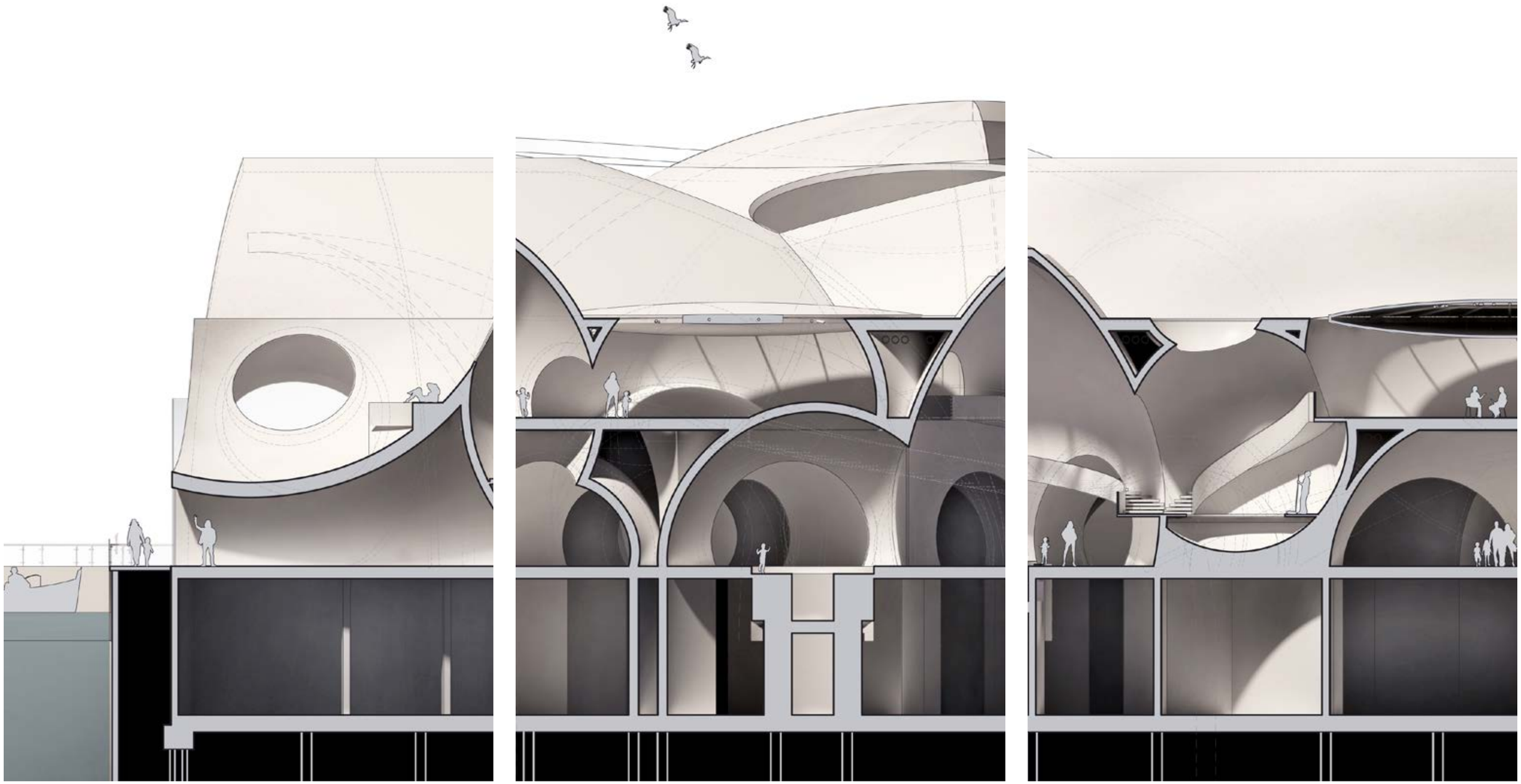


public

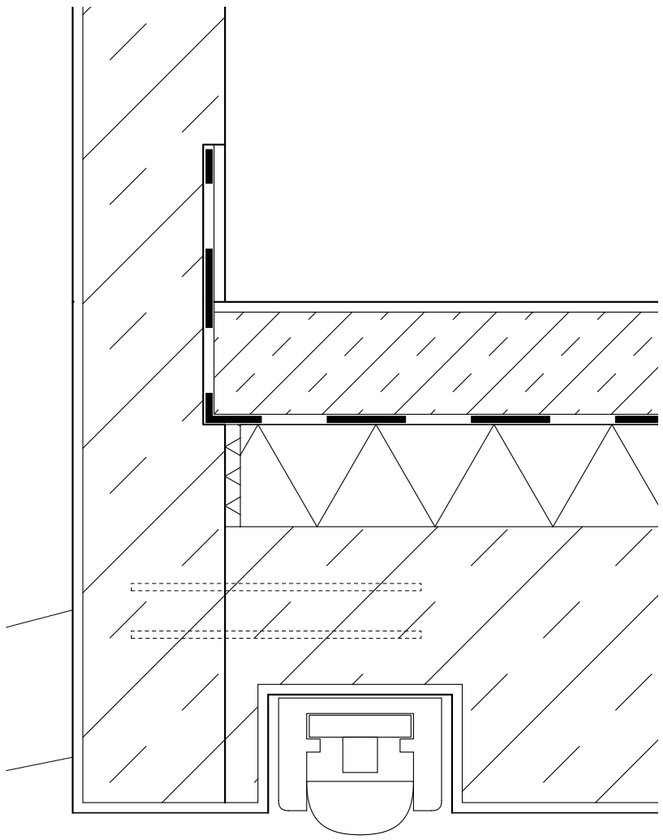
dynamic

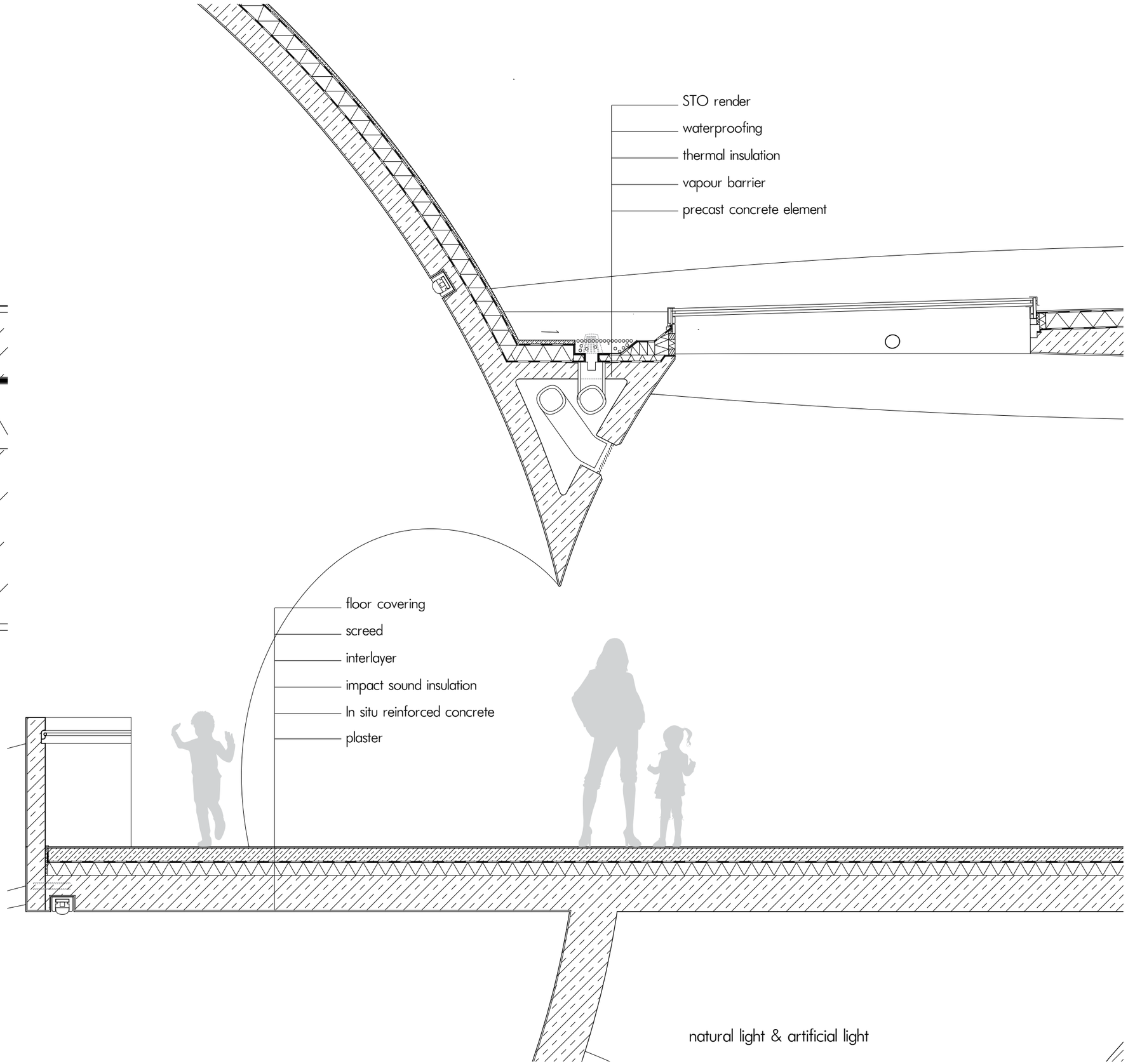
semi-public

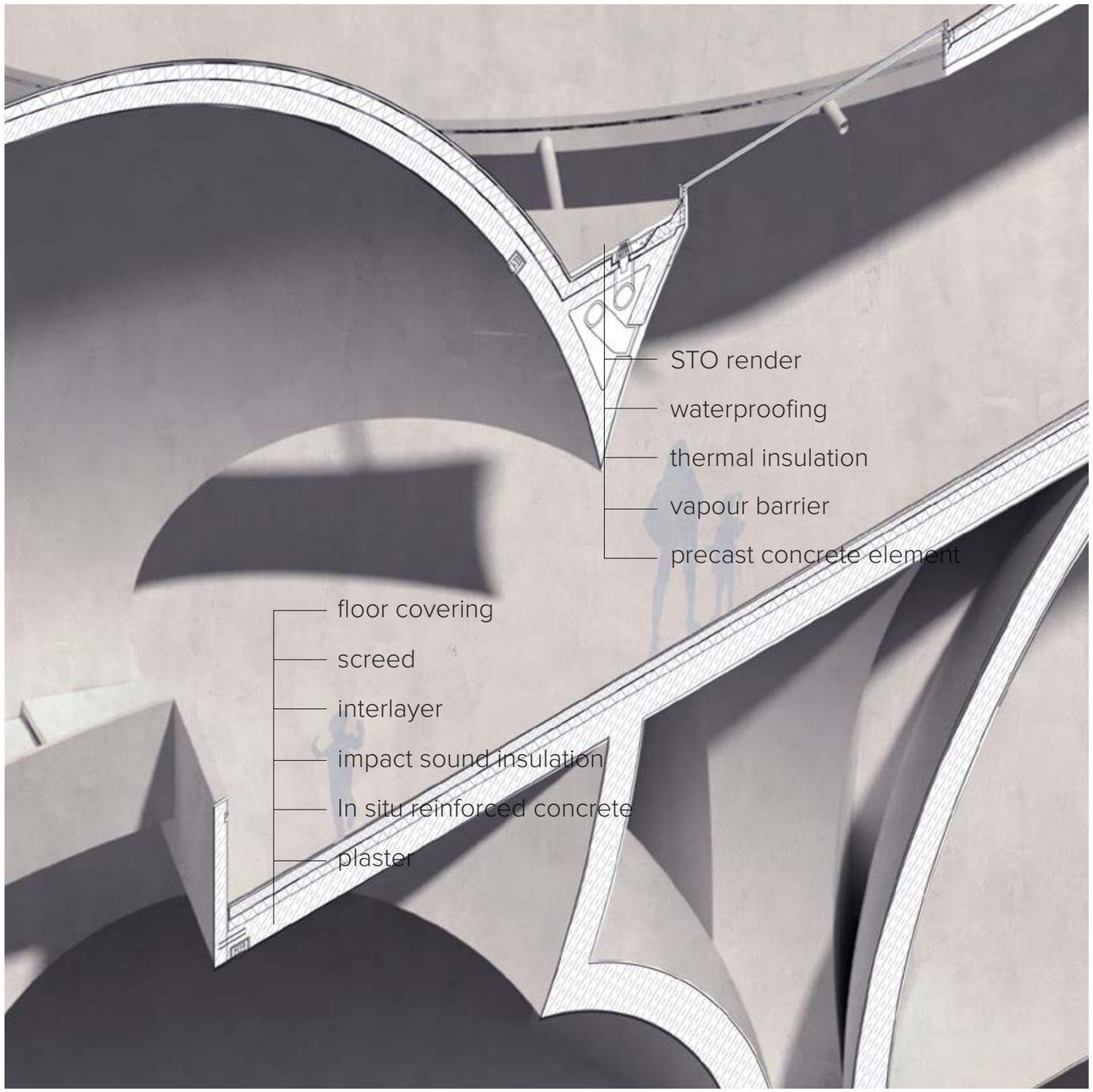
static

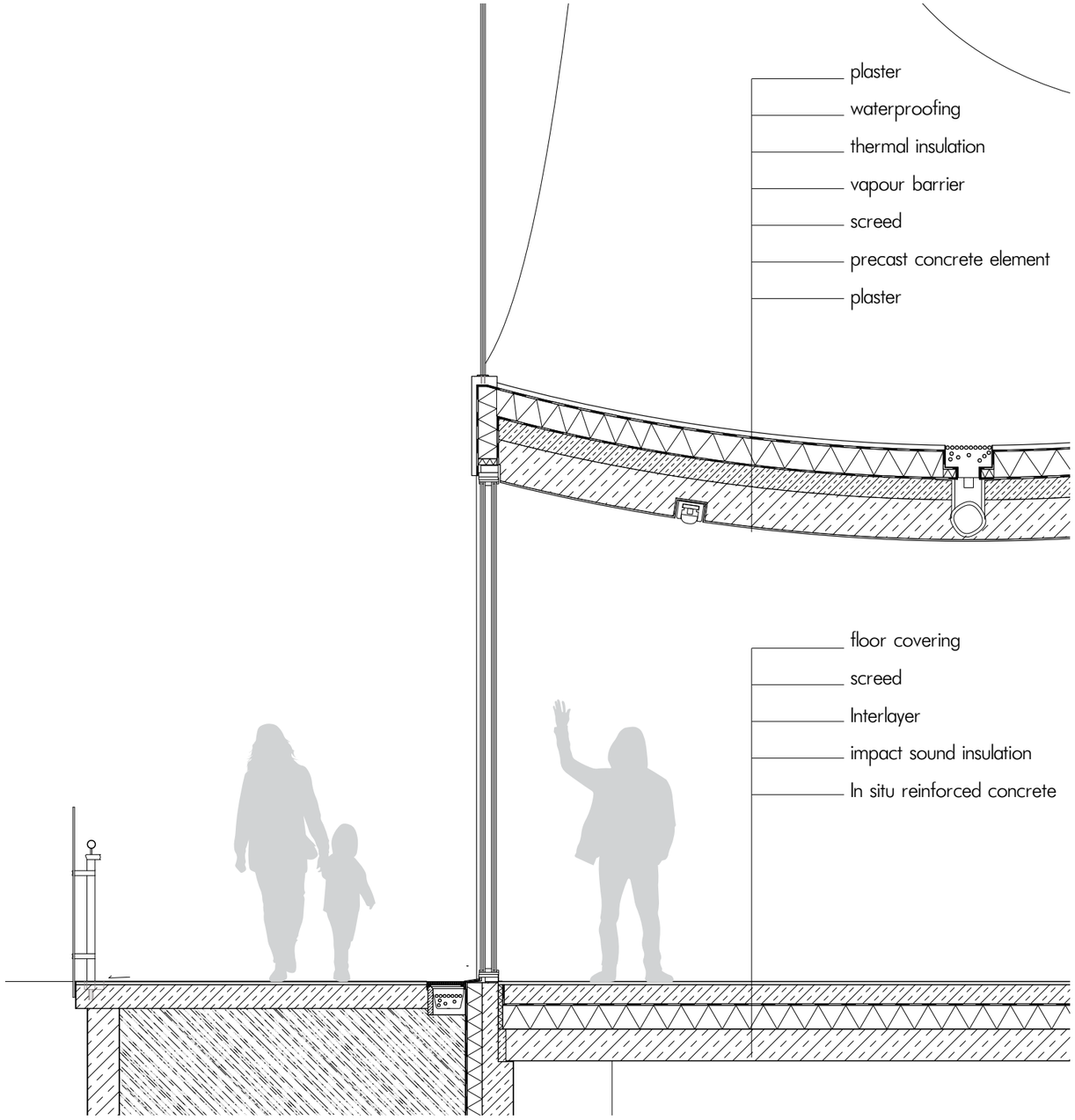


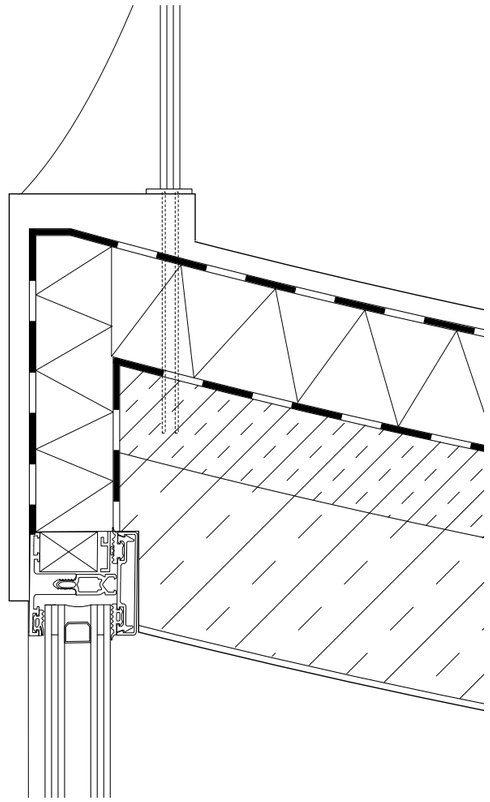
integrating the HVAC system into the in-between ‘blank’ space

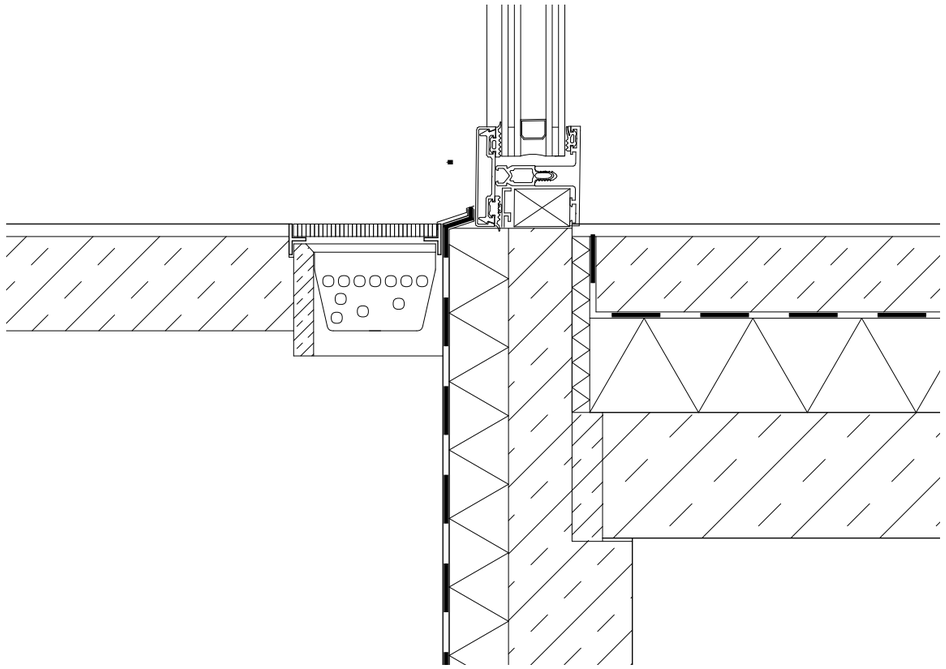


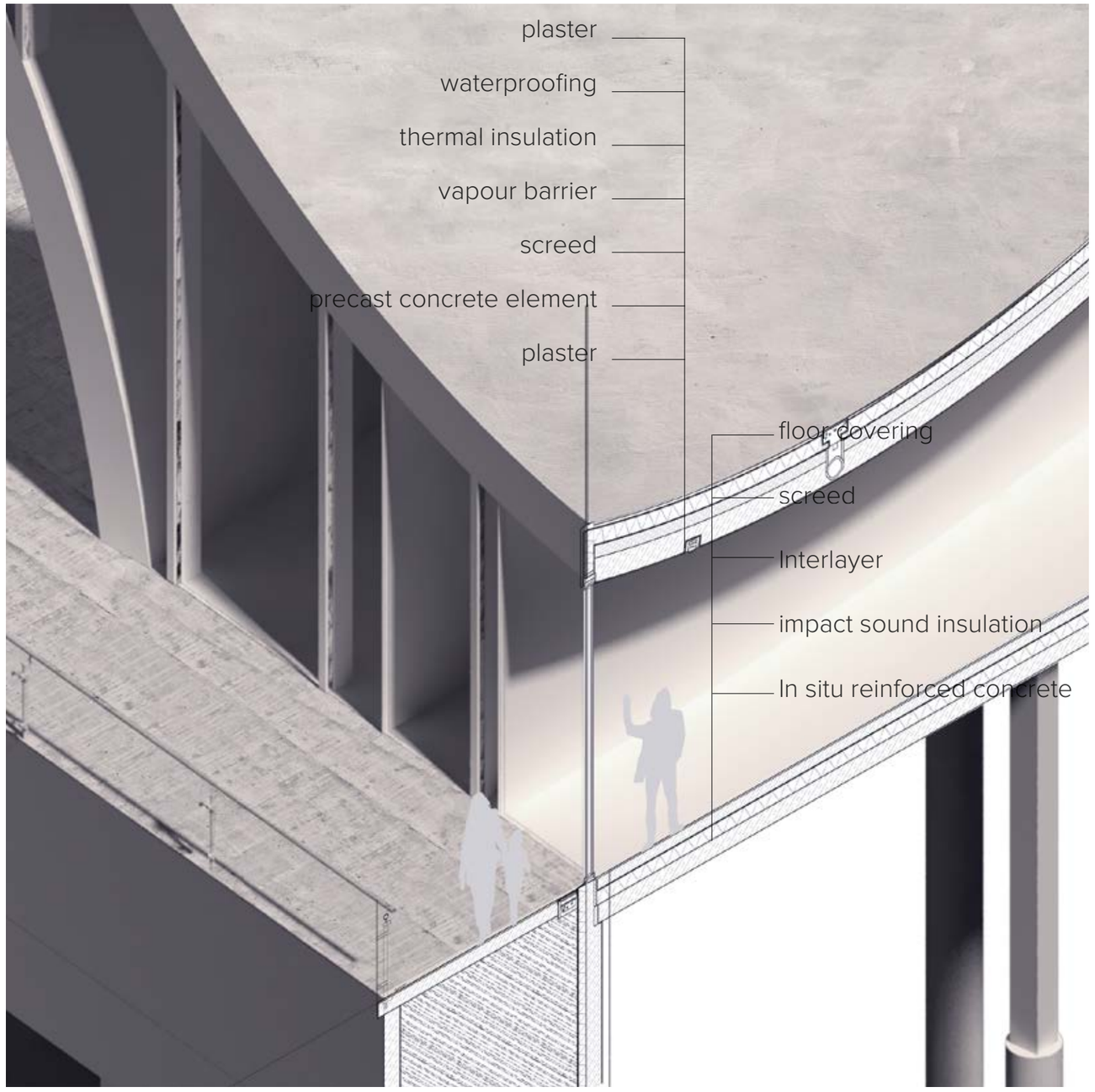

STO render
waterproofing
thermal insulation
vapour barrier
precast concrete element
floor covering
screed
interlayer
impact sound insulation
In situ reinforced concrete
plaster
natural light & artificial light


STO render
waterproofing
thermal insulation
vapour barrier
precast concrete element
floor covering
screed
interlayer
impact sound insulation
In situ reinforced concrete
plaster

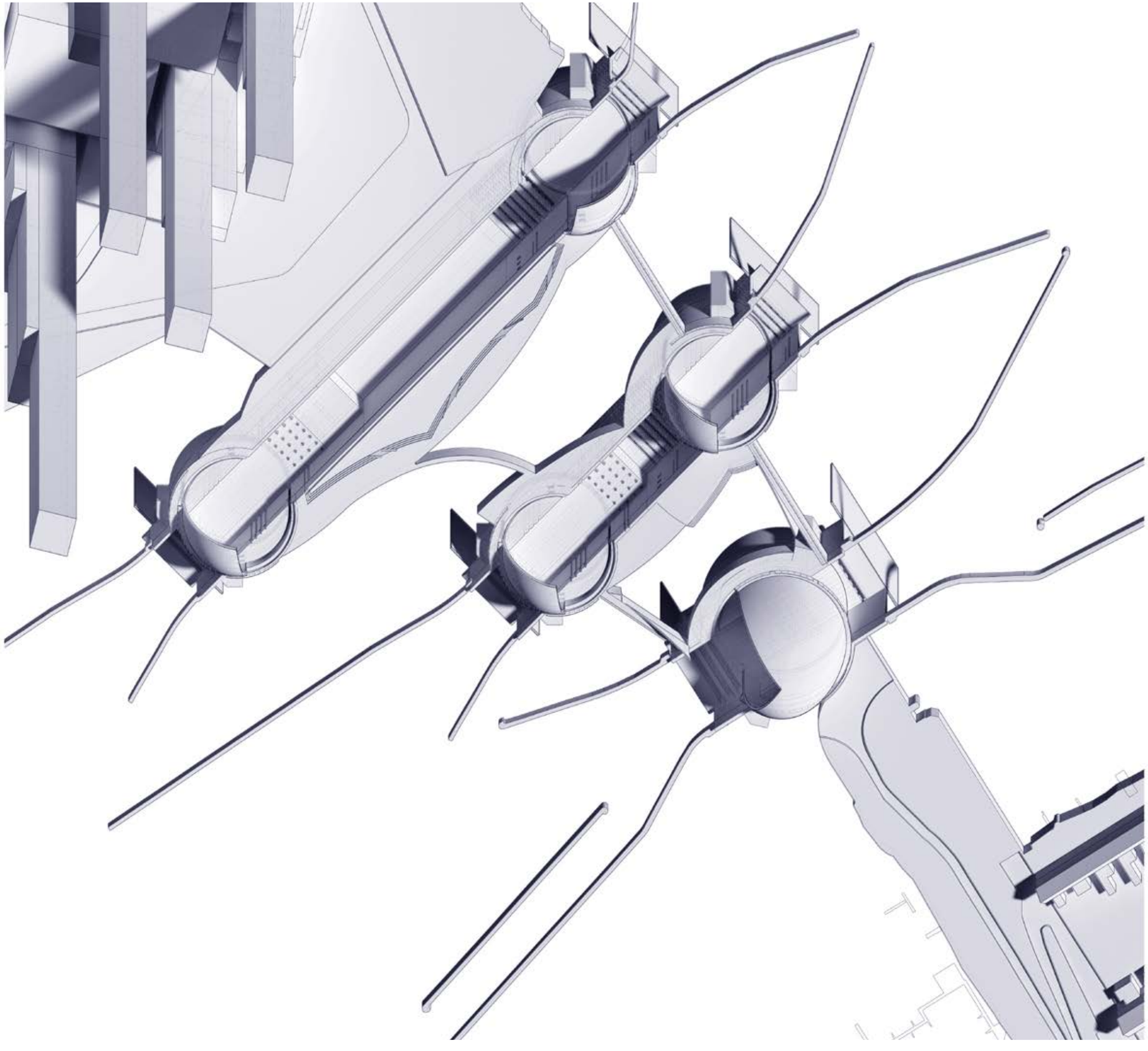

plaster
waterproofing
thermal insulation
vapour barrier
screed
precast concrete element
plaster
floor covering
screed
Interlayer
impact sound insulation
In situ reinforced concrete

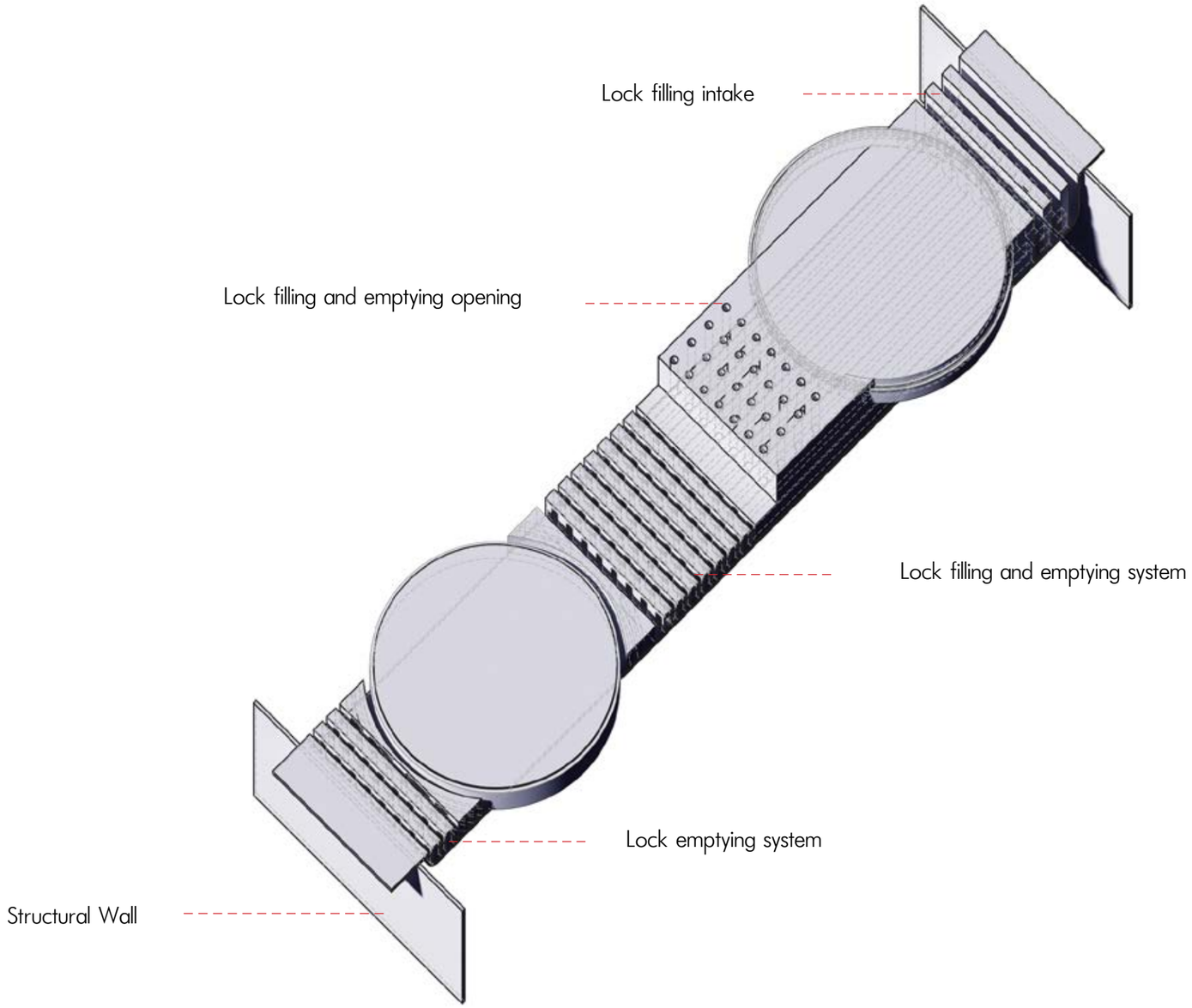


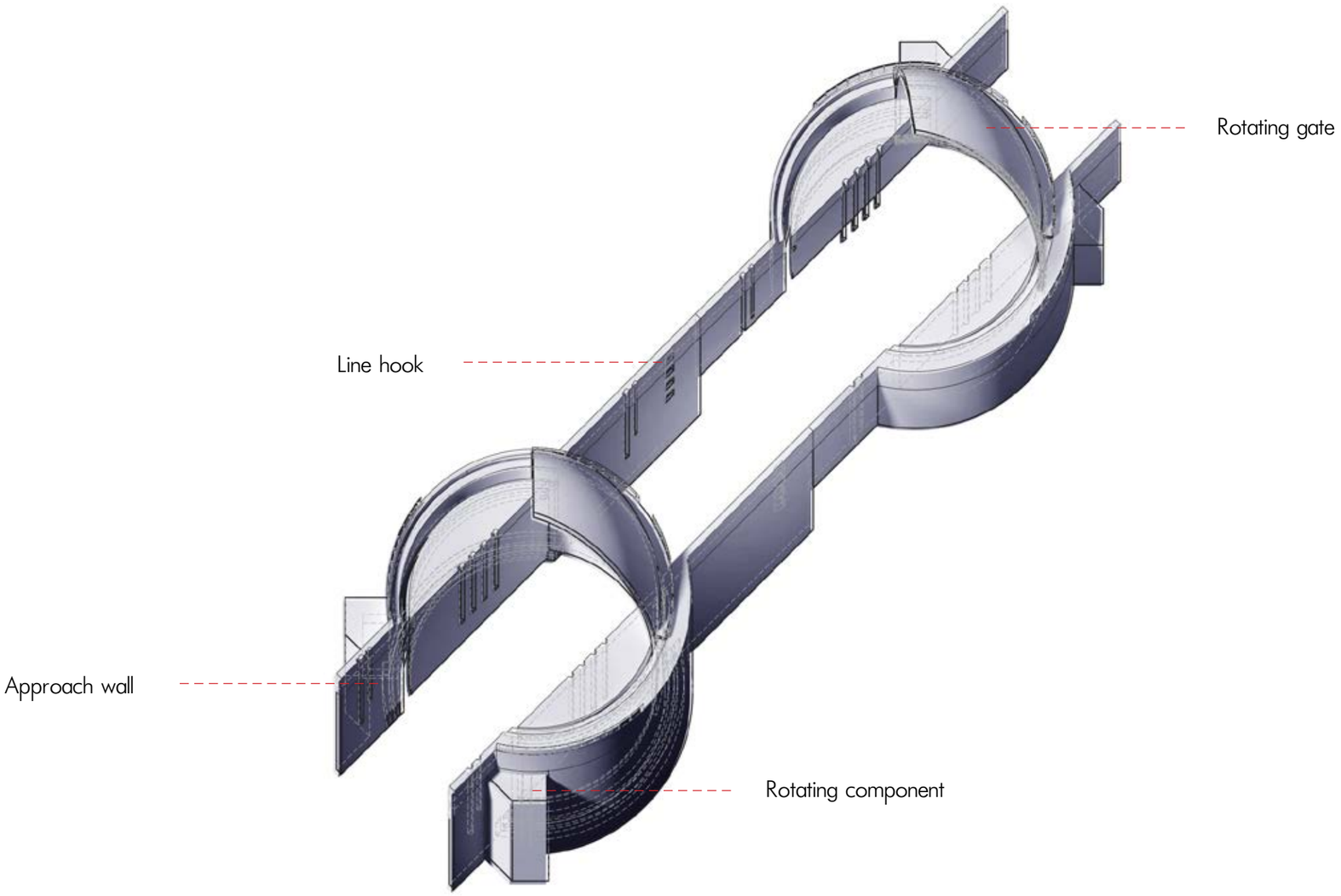



plaster
waterproofing
thermal insulation
vapour barrier
screed
precast concrete element
plaster
floor covering
screed
Interlayer
impact sound insulation
In situ reinforced concrete

Structure and construction




Lock filling intake
Lock filling and emptying opening
Lock filling and emptying system
Lock emptying system
Structural Wall


Rotating gate
Line hook
Approach wall
Rotating component

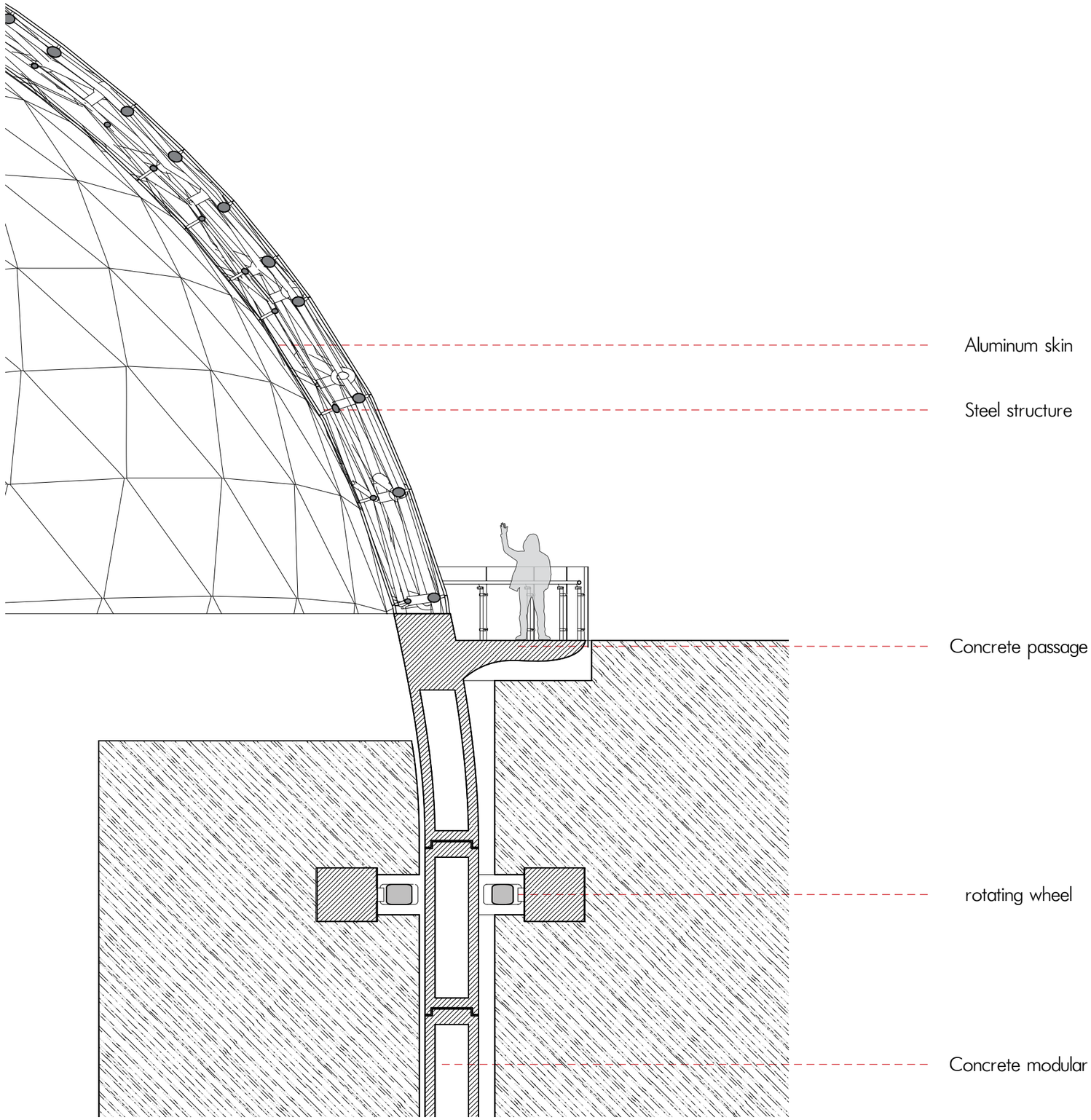
Aluminum skin

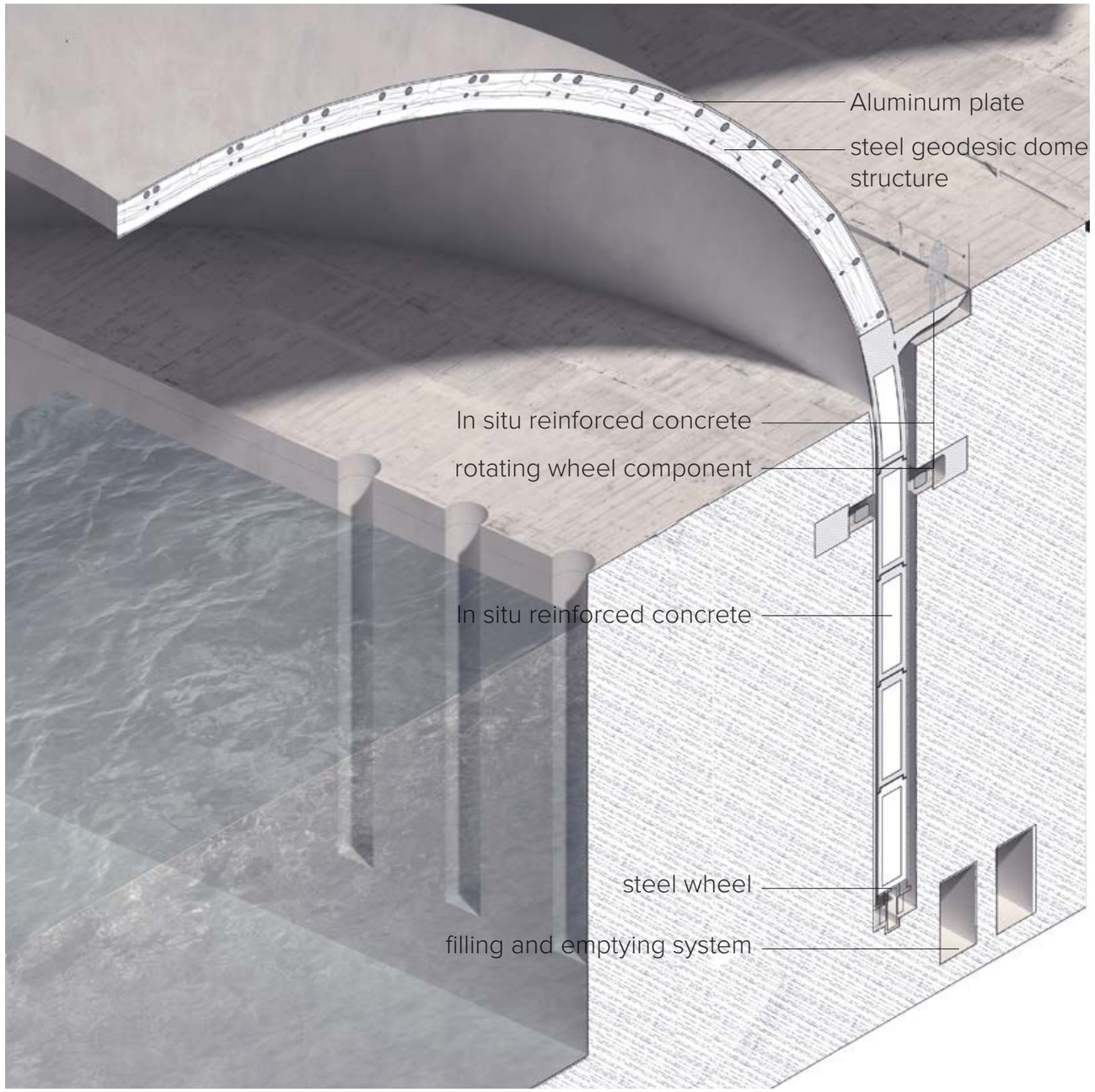
Geodestic dome steel structure

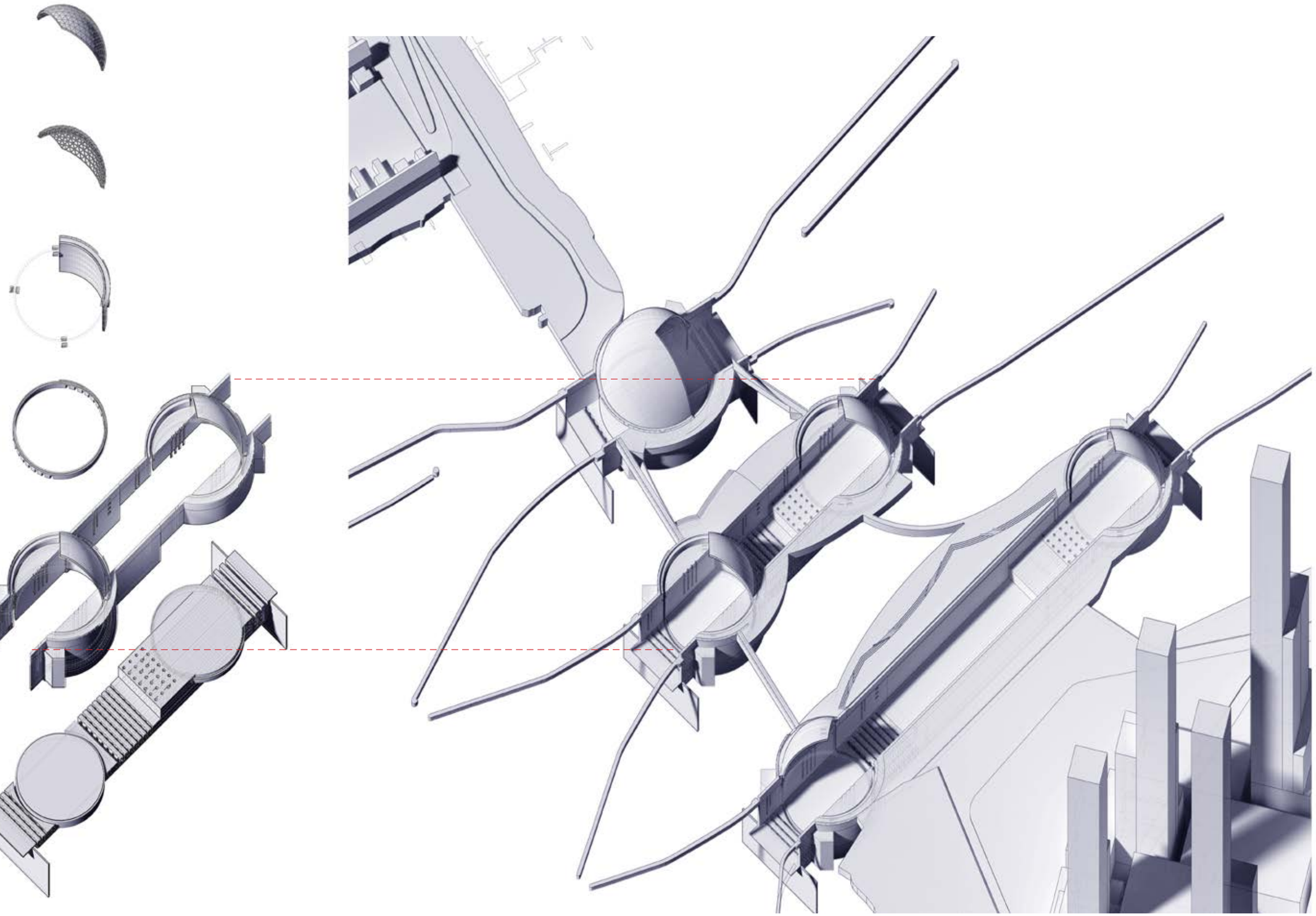
Concrete wall & pedestrain passage

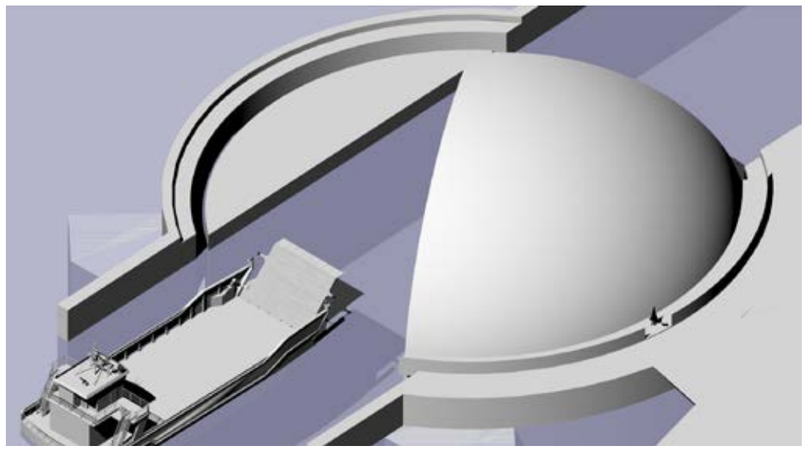
rotating wheel

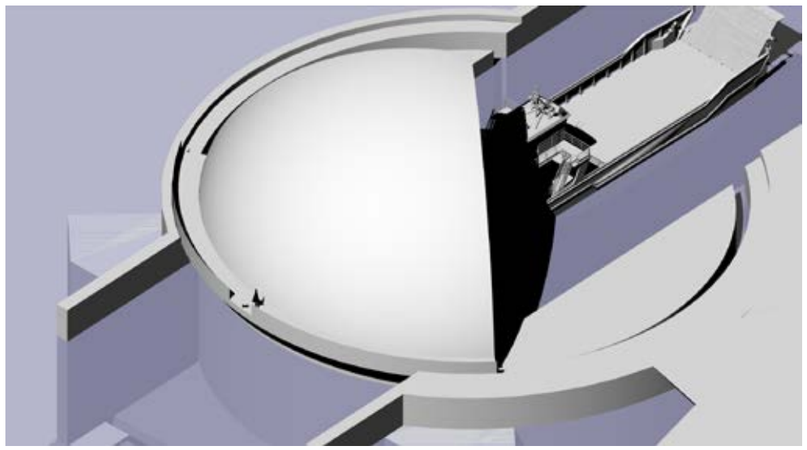
Track for gate's rotating

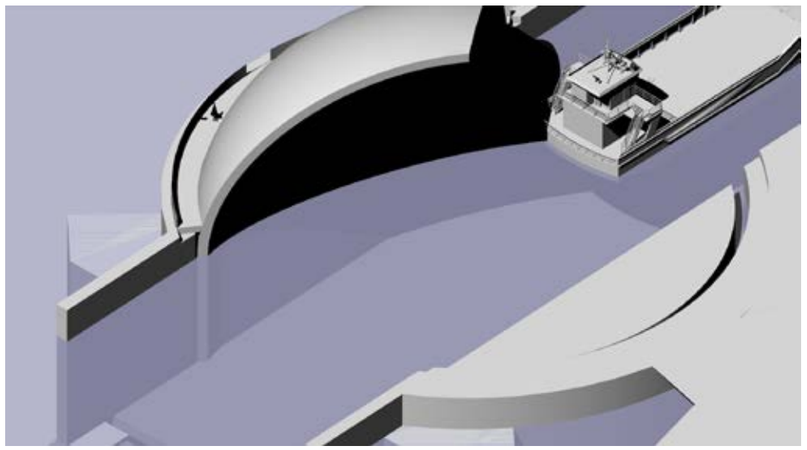

Aluminum skin
Steel structure
Concrete passage
rotating wheel
Concrete modular


Aluminum plate
steel geodesic dome structure
In situ reinforced concrete
rotating wheel component
In situ reinforced concrete
steel wheel
filling and emptying system



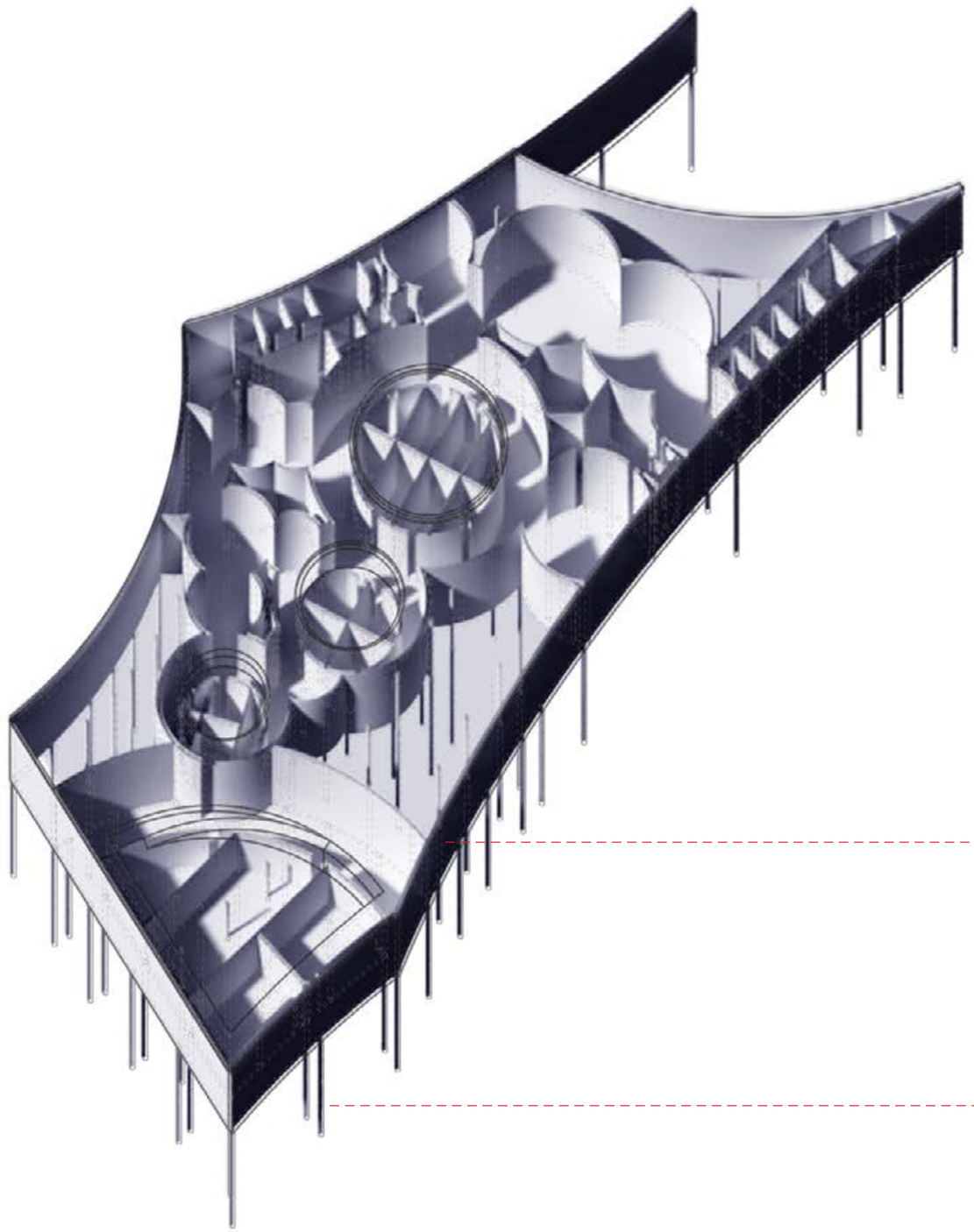






The relationship between boat and people

Concrete wall


Basement wall
Foudation pillar column

slab supported by mushroom column

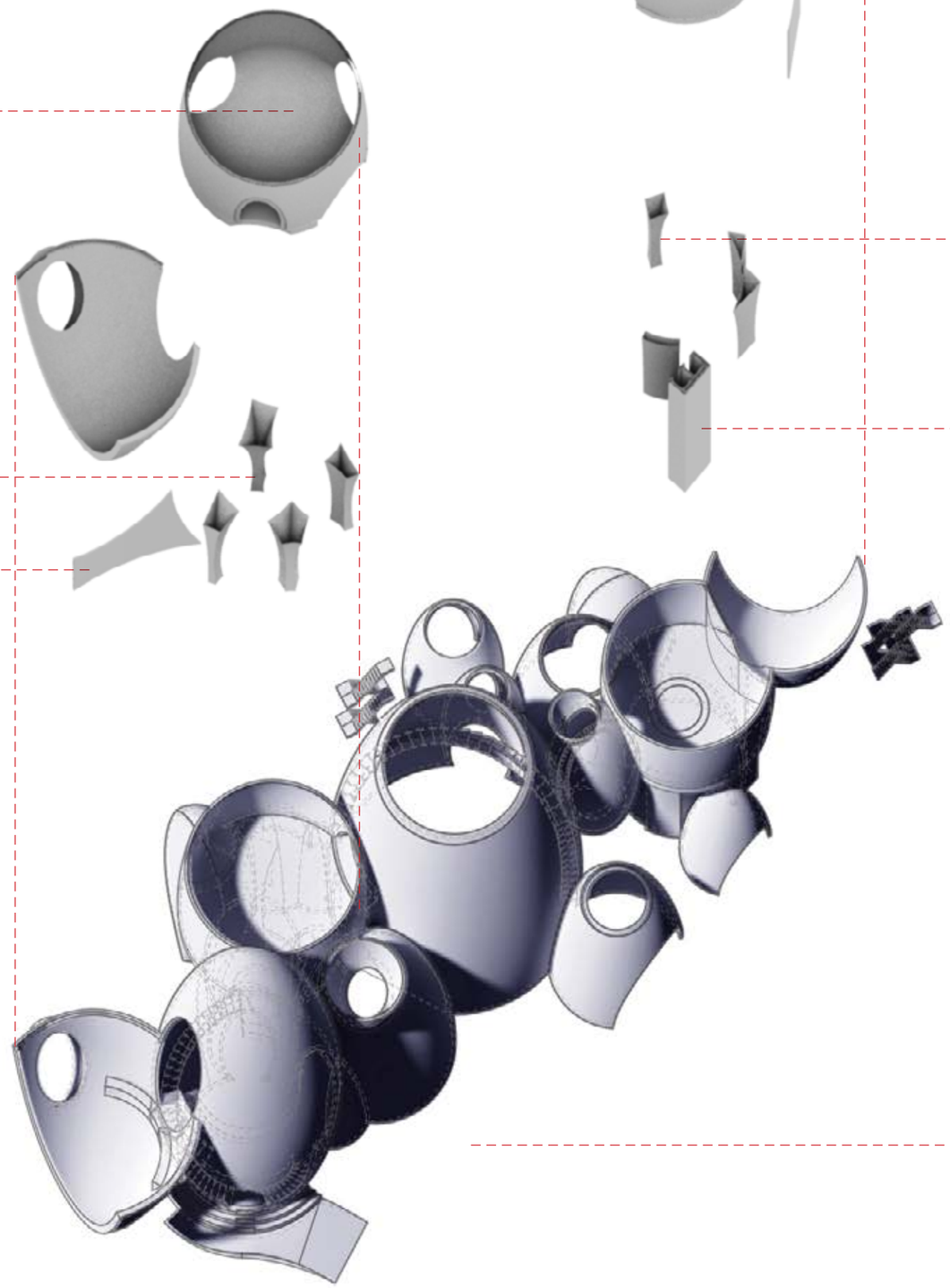
Large mushroom column for supporting addtional bubble

Structure core, elevator

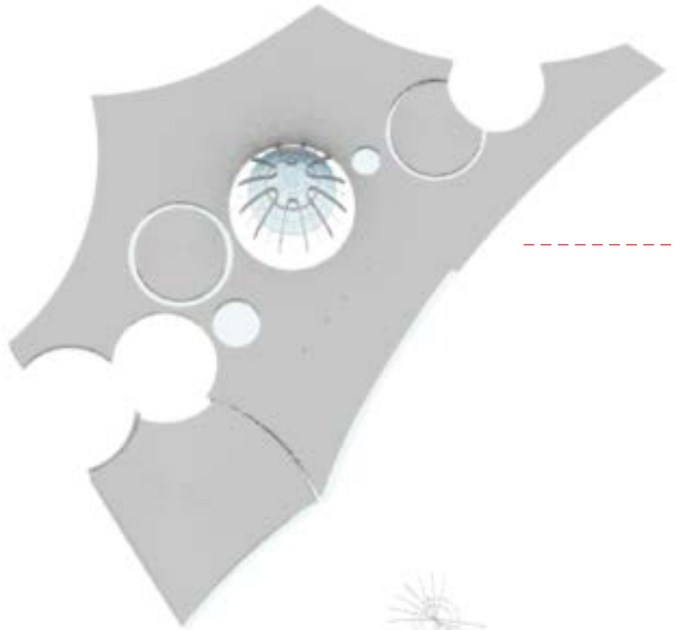
slab supported by mushroom column

Large mushroom column for supporting addtional bubble

structure concrete wall for supporting upper curved wall



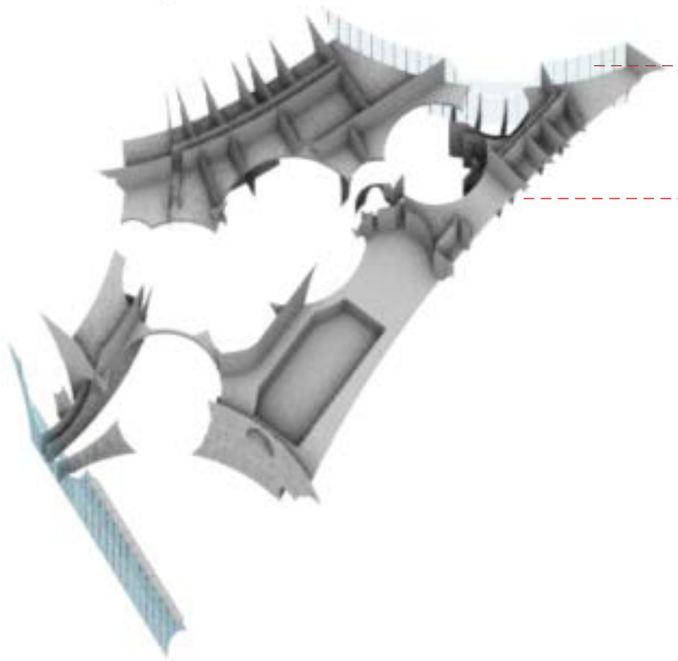
Main bubble space. constructed by concrete



roof

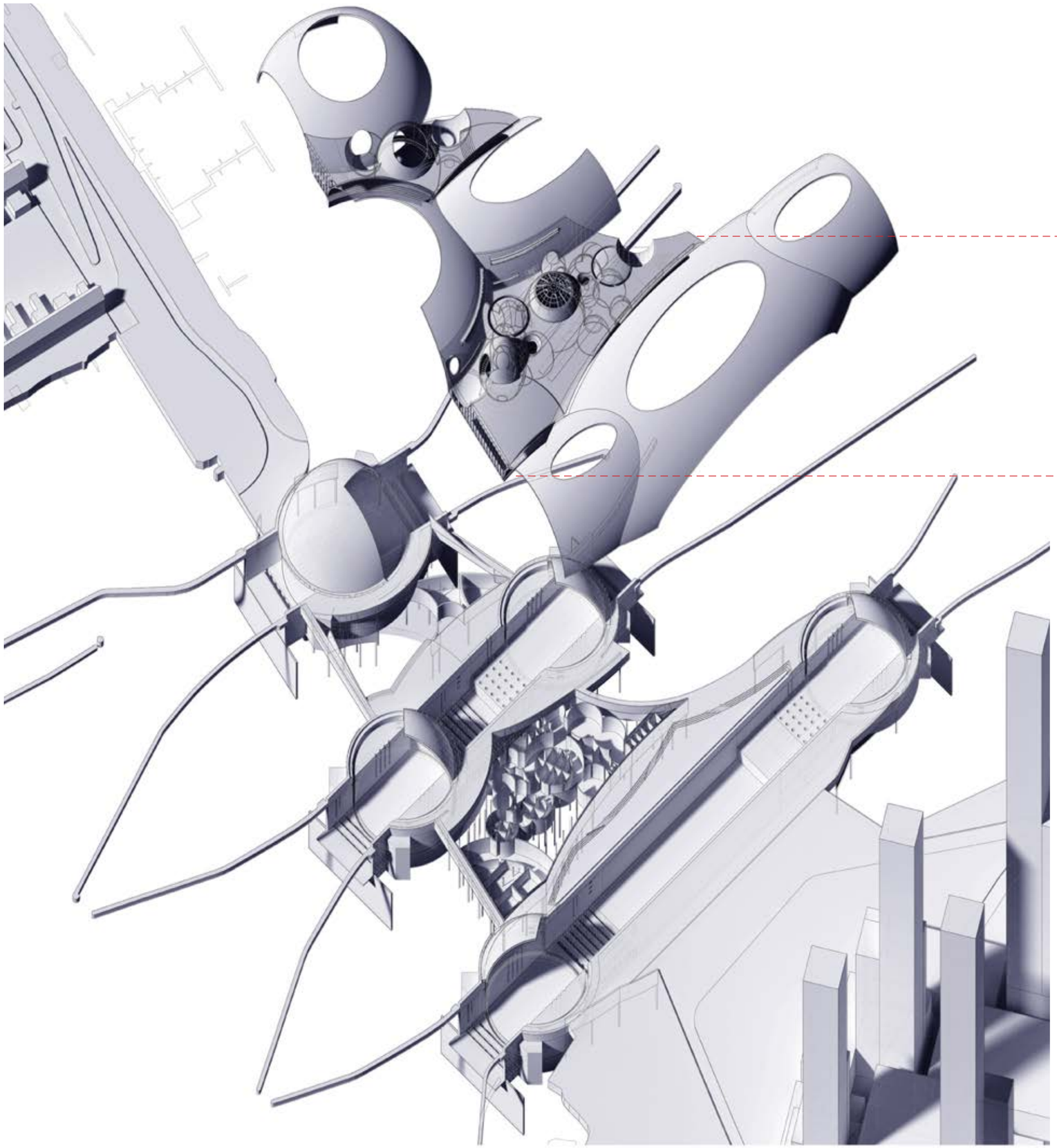
steel cable to support the roof

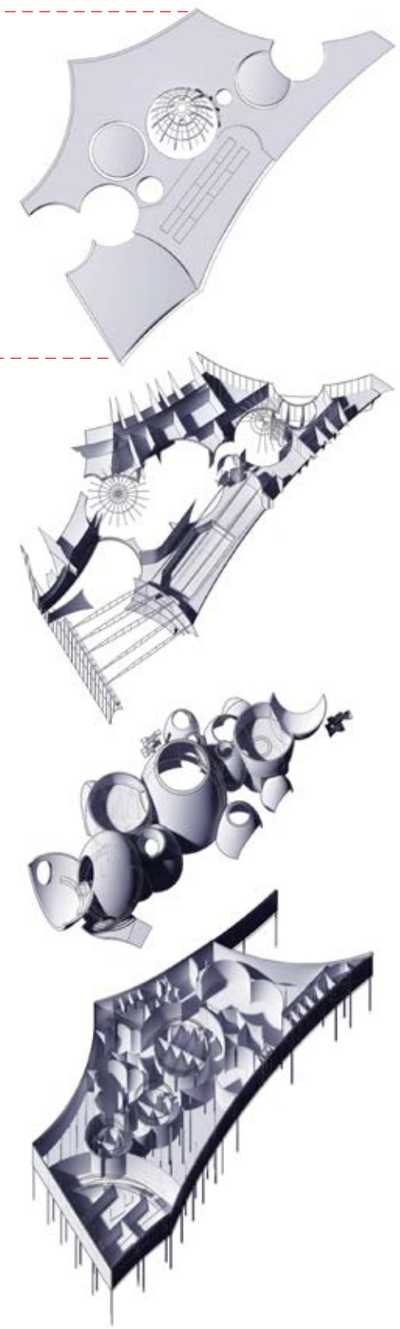
truss structure to support the large roof

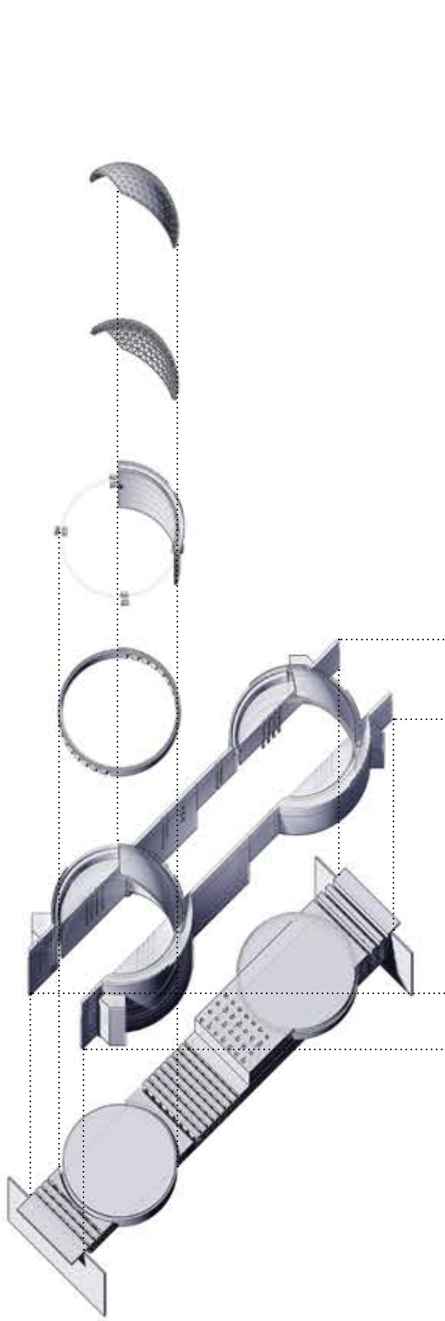


glass curtain wall

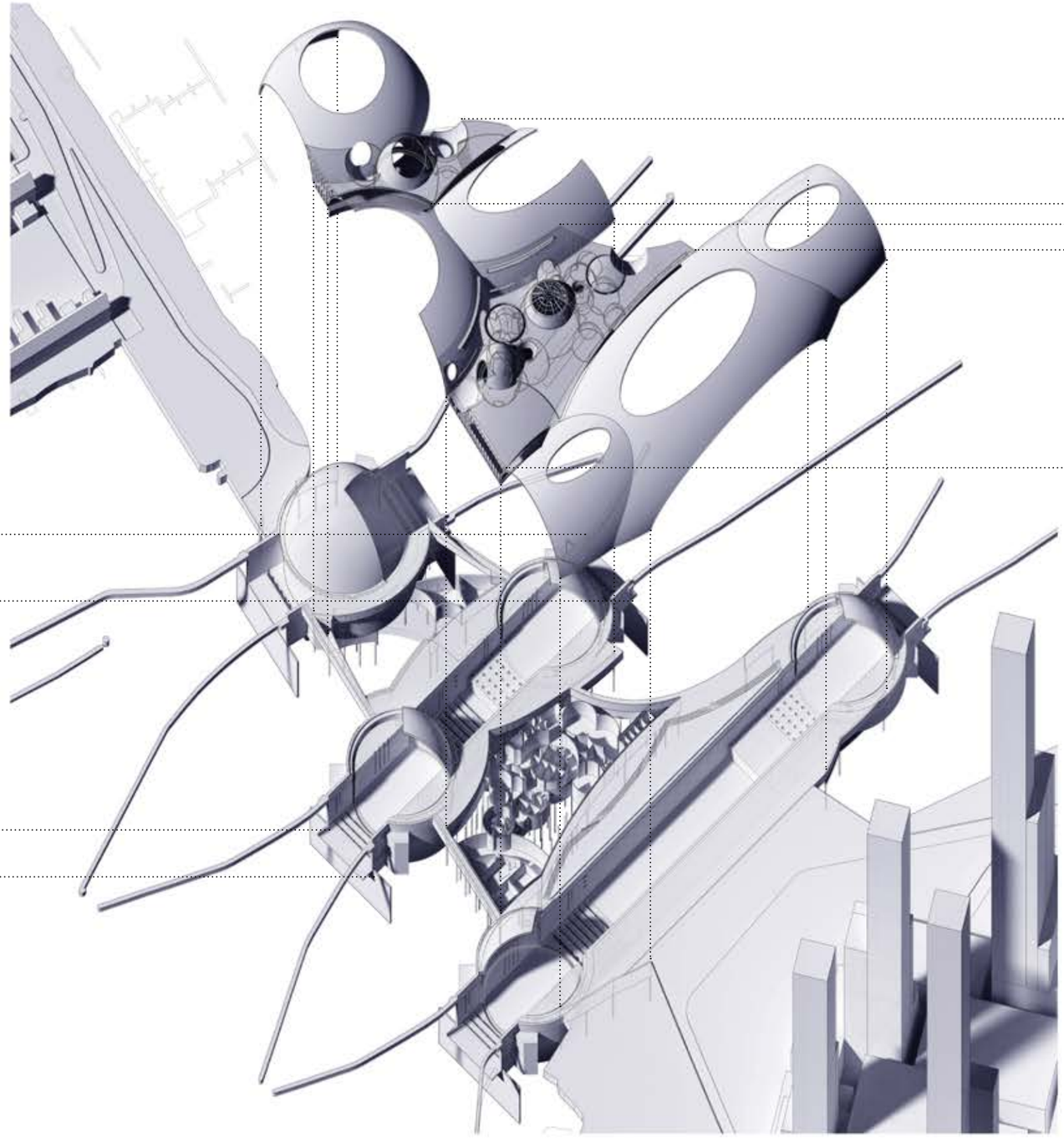
structure inner wall



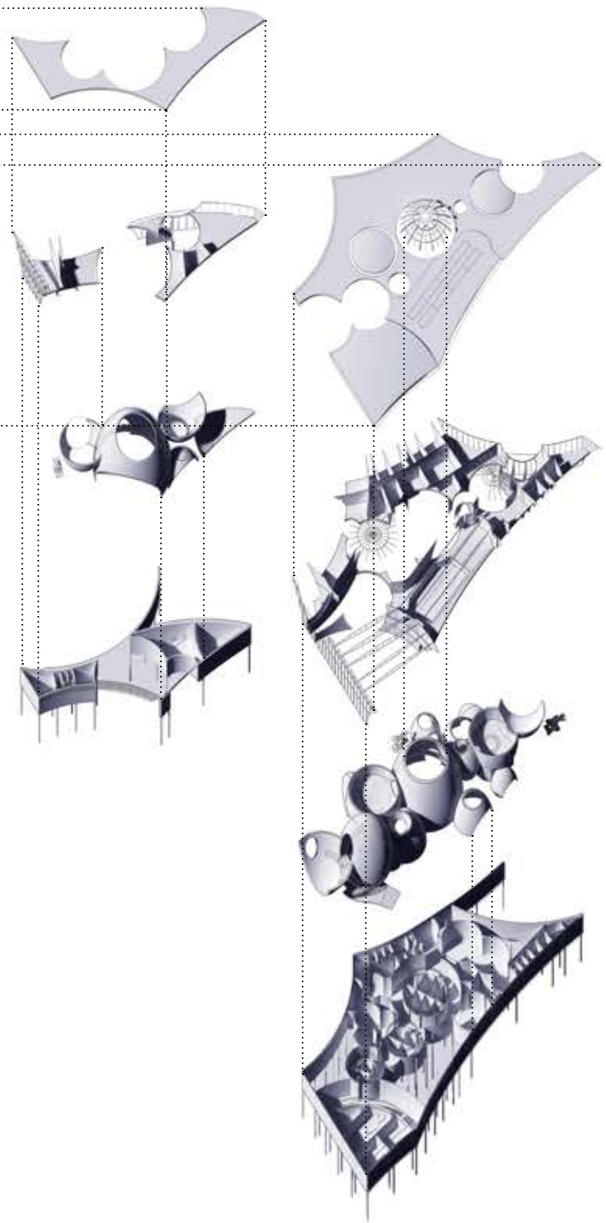




optimized water lock

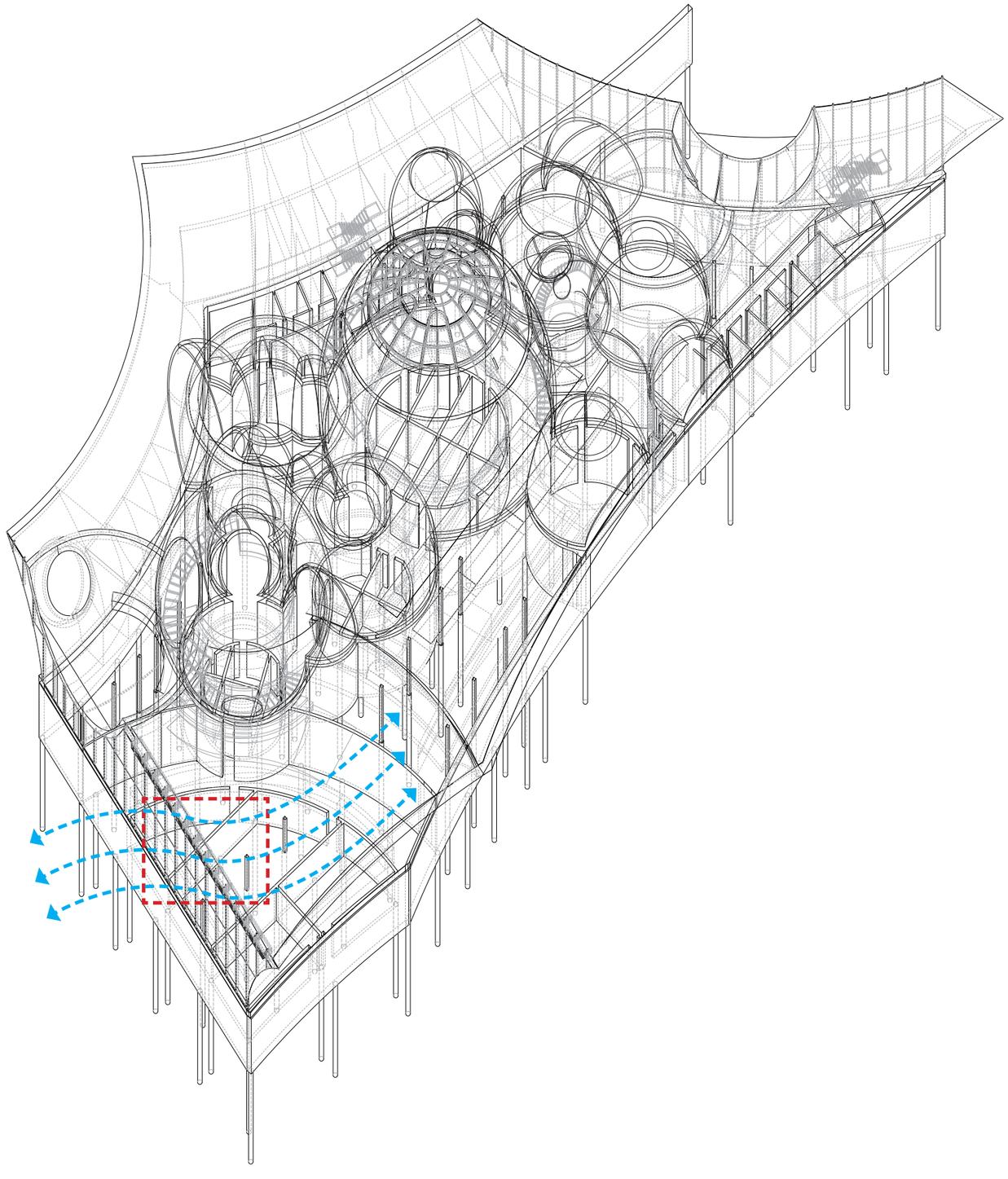


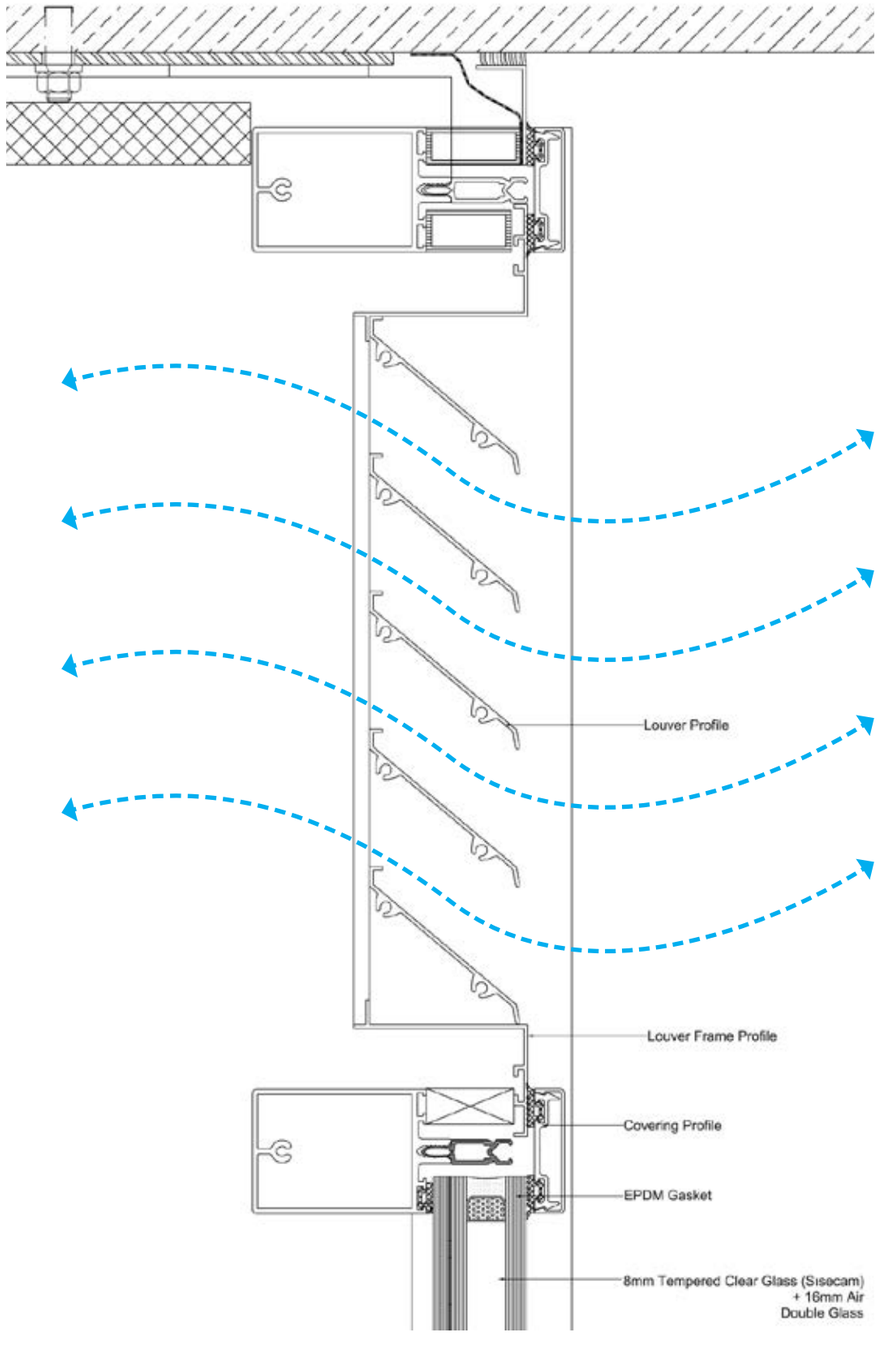
structural axon



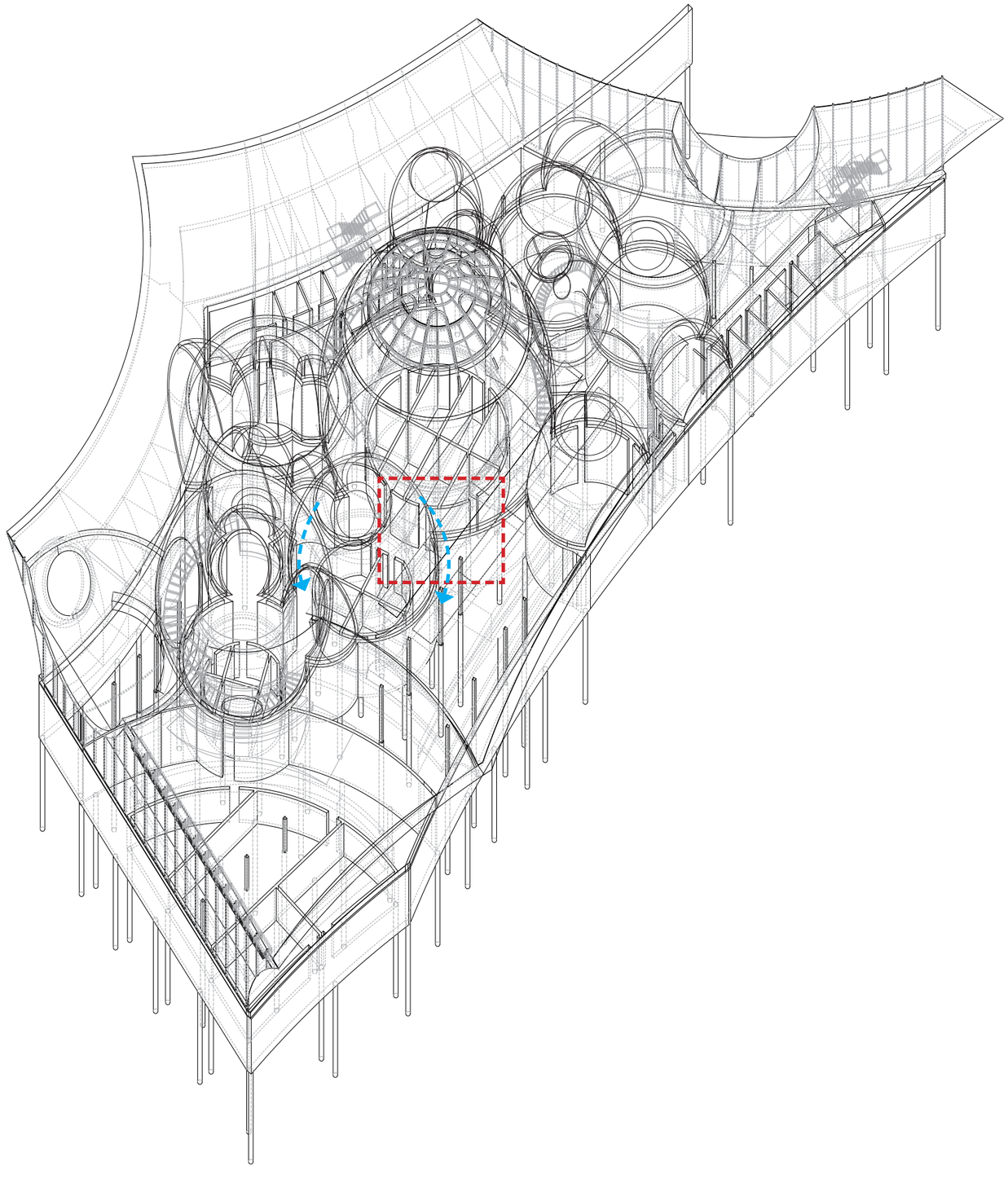
public archtiecture space

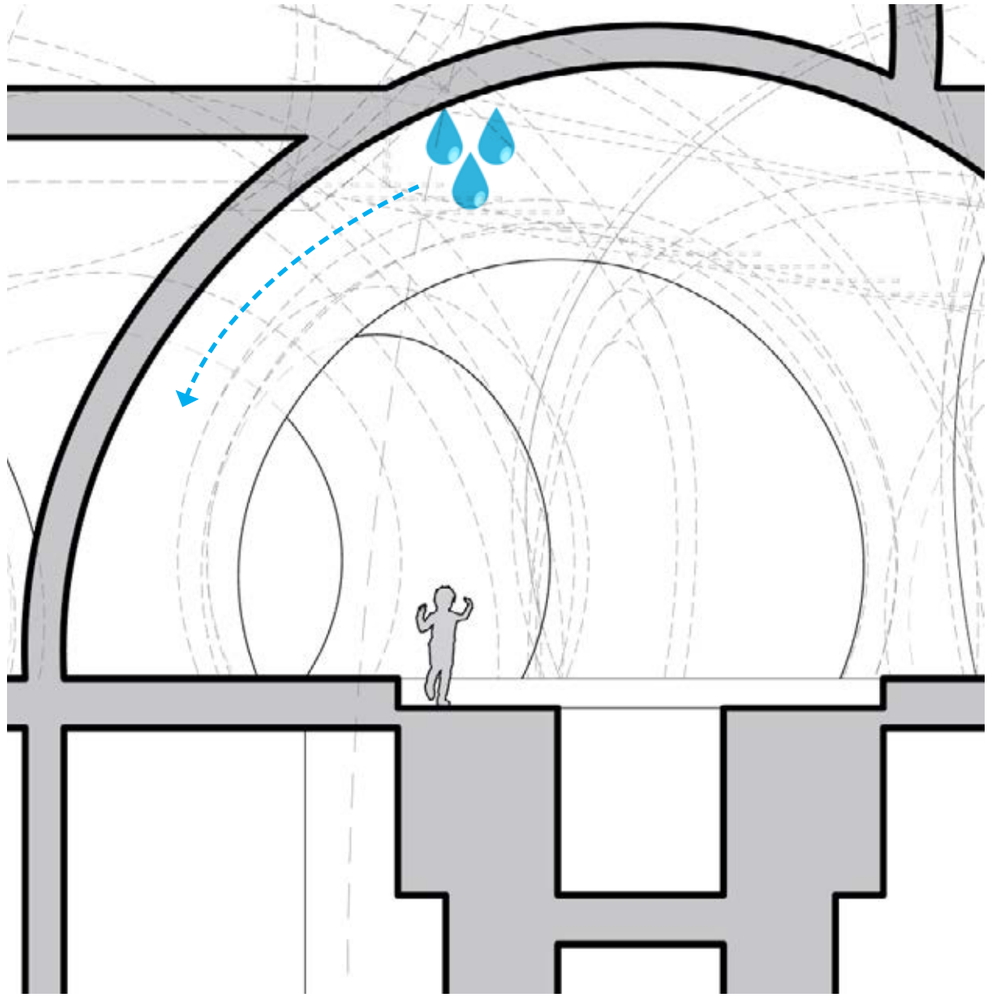
Detail and climate design



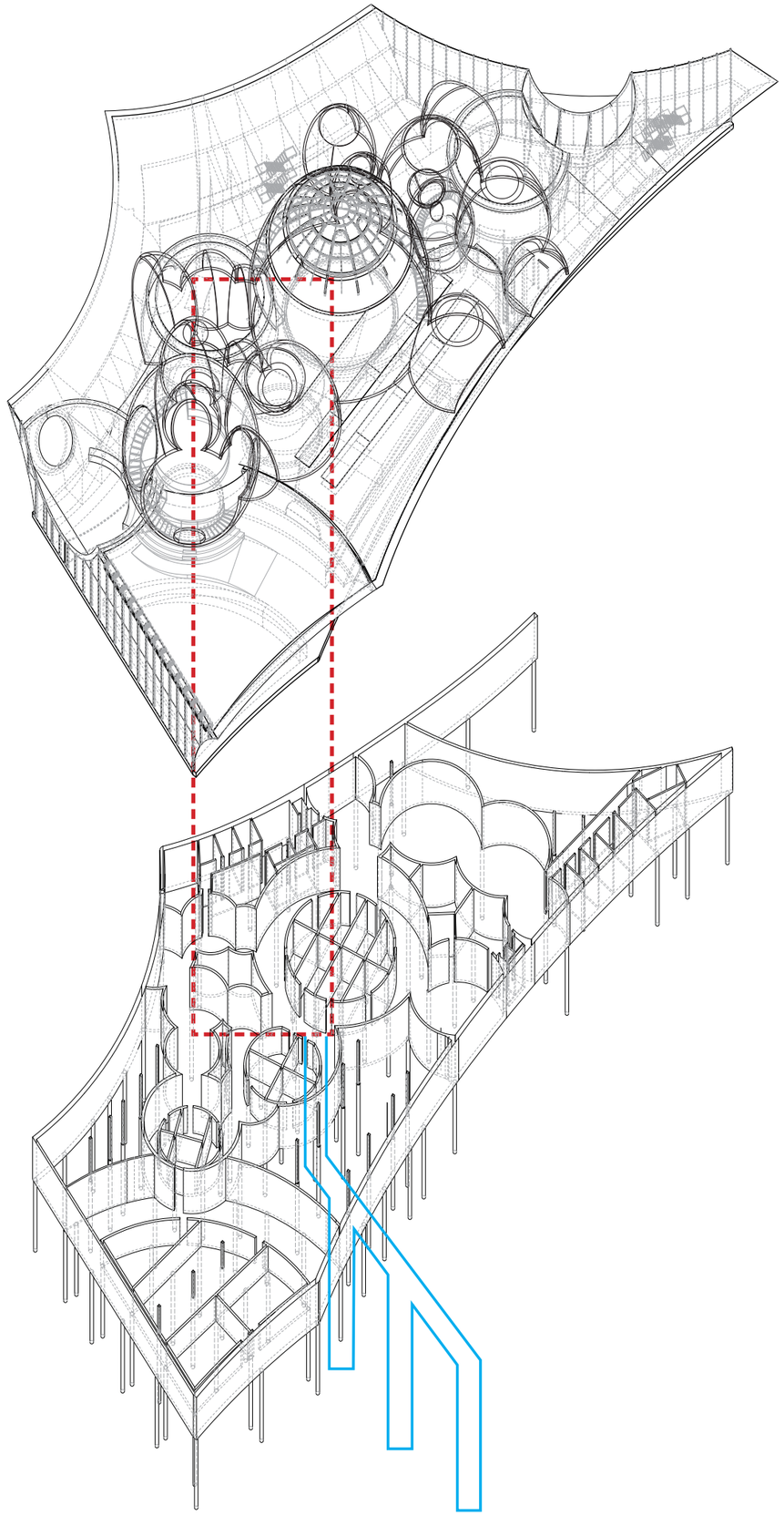


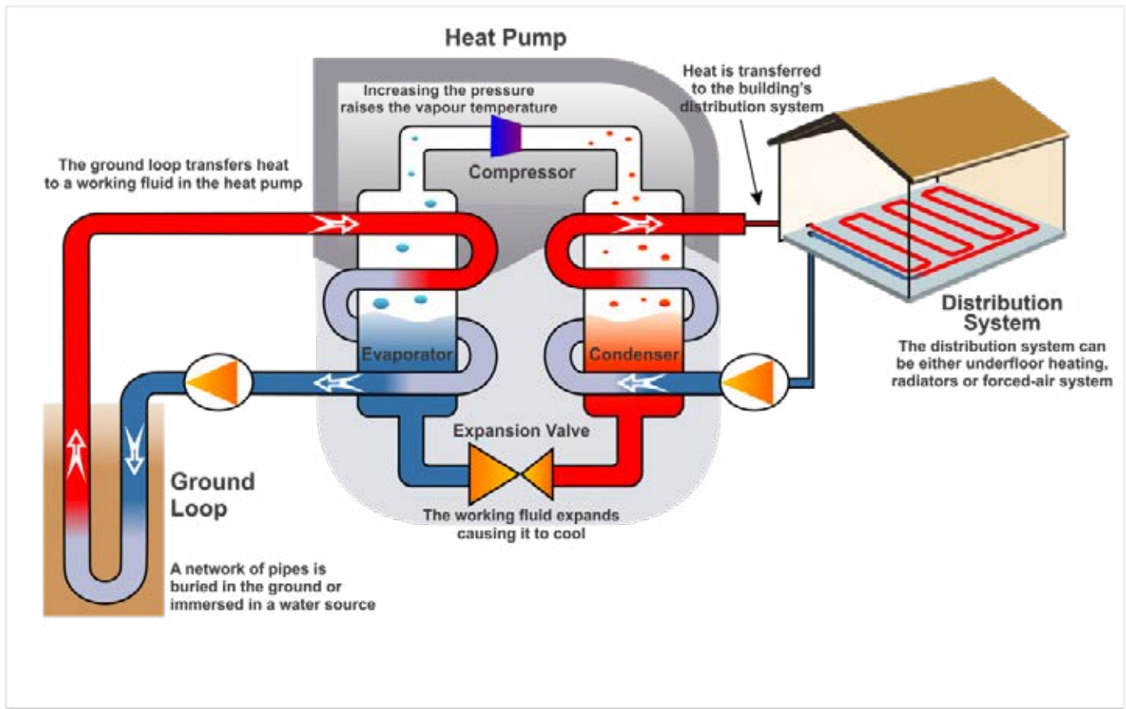
Natural ventilation when summer



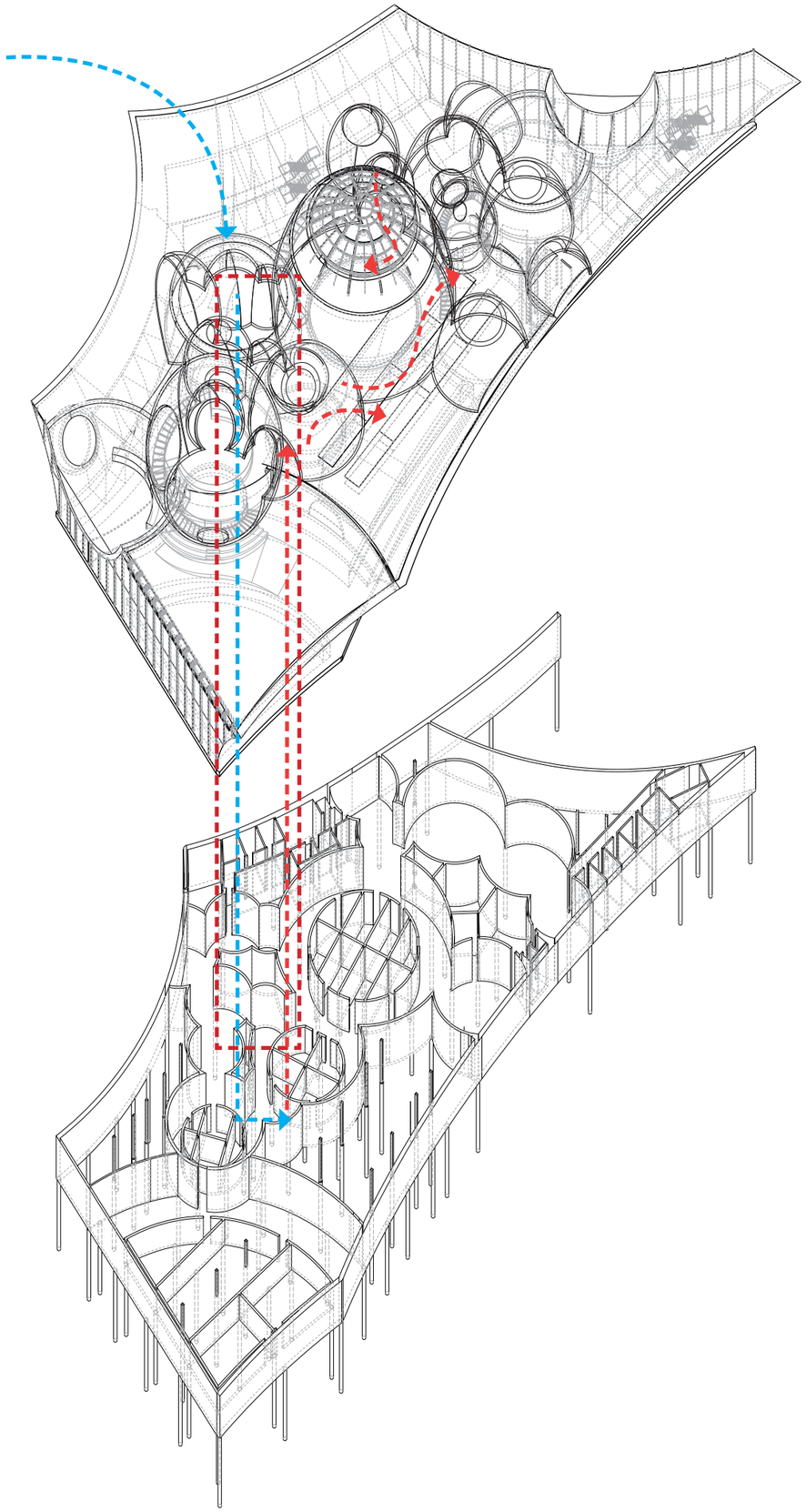


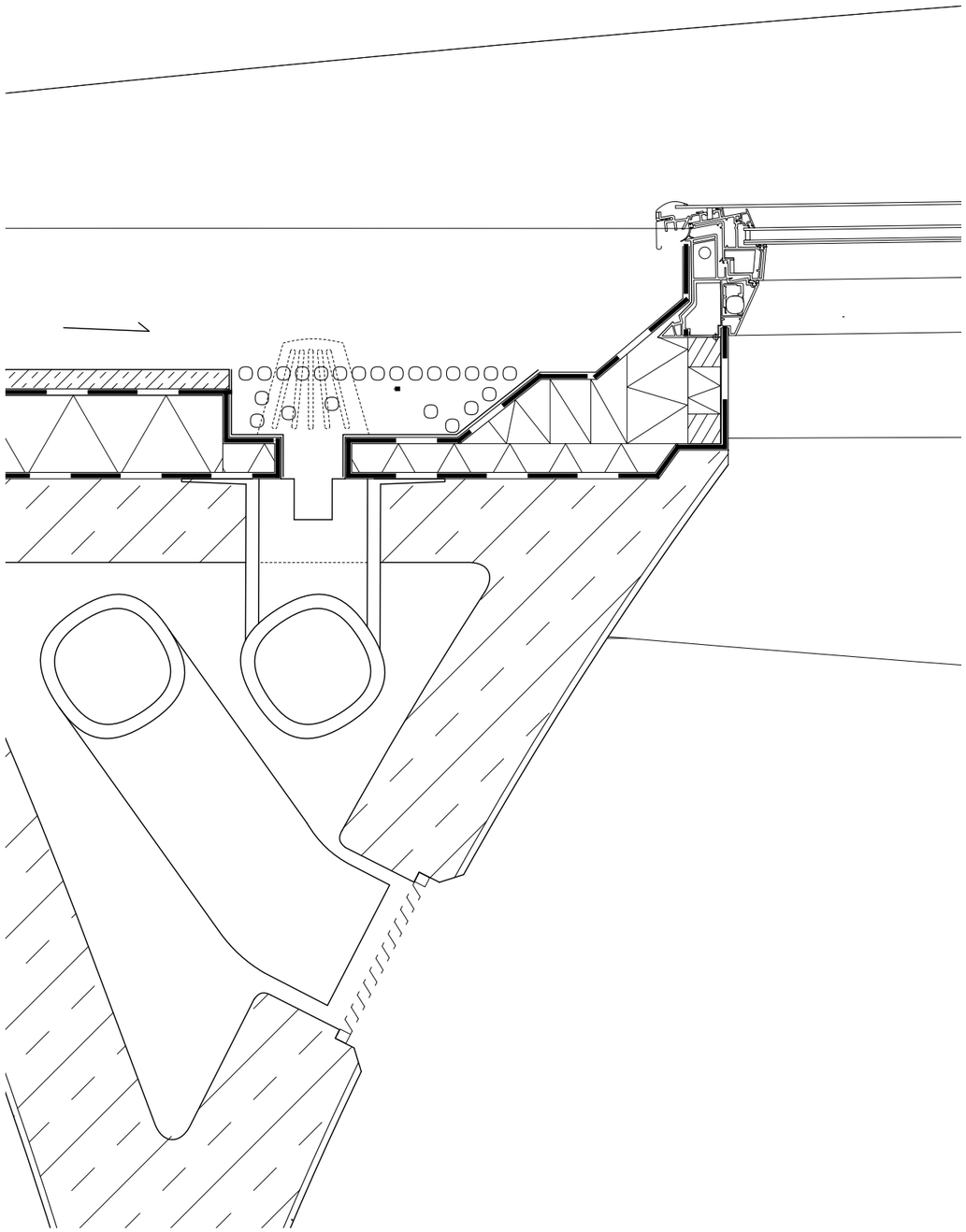
Curved shape will let condensed water slide down naturally and not adhere to the wall surface



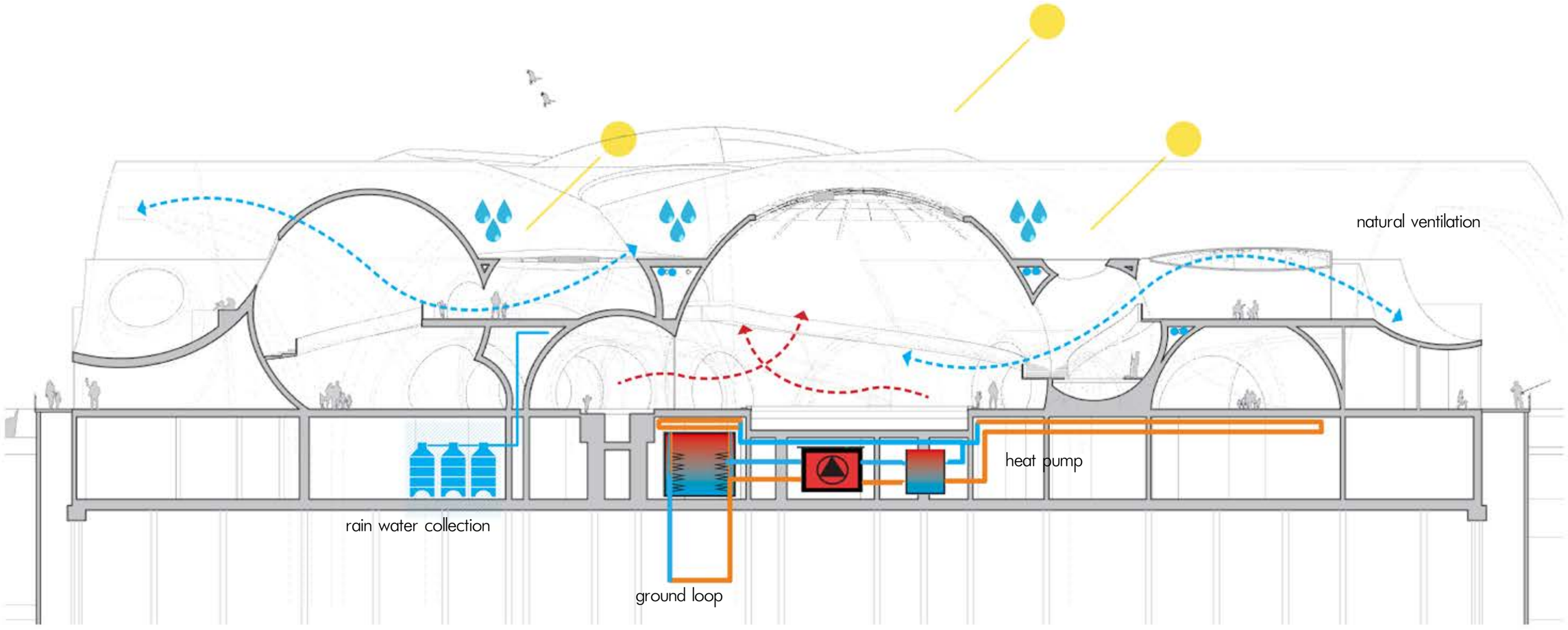


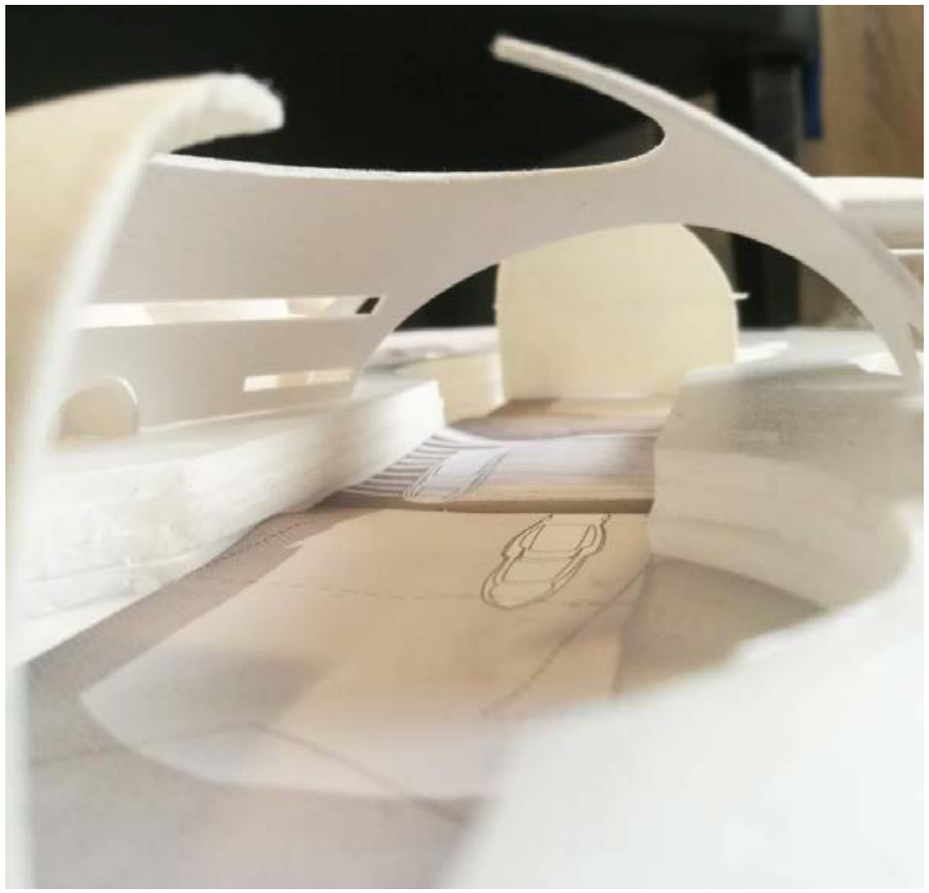
Geothermal heating and cooling, using natrual water resource to heat the pool

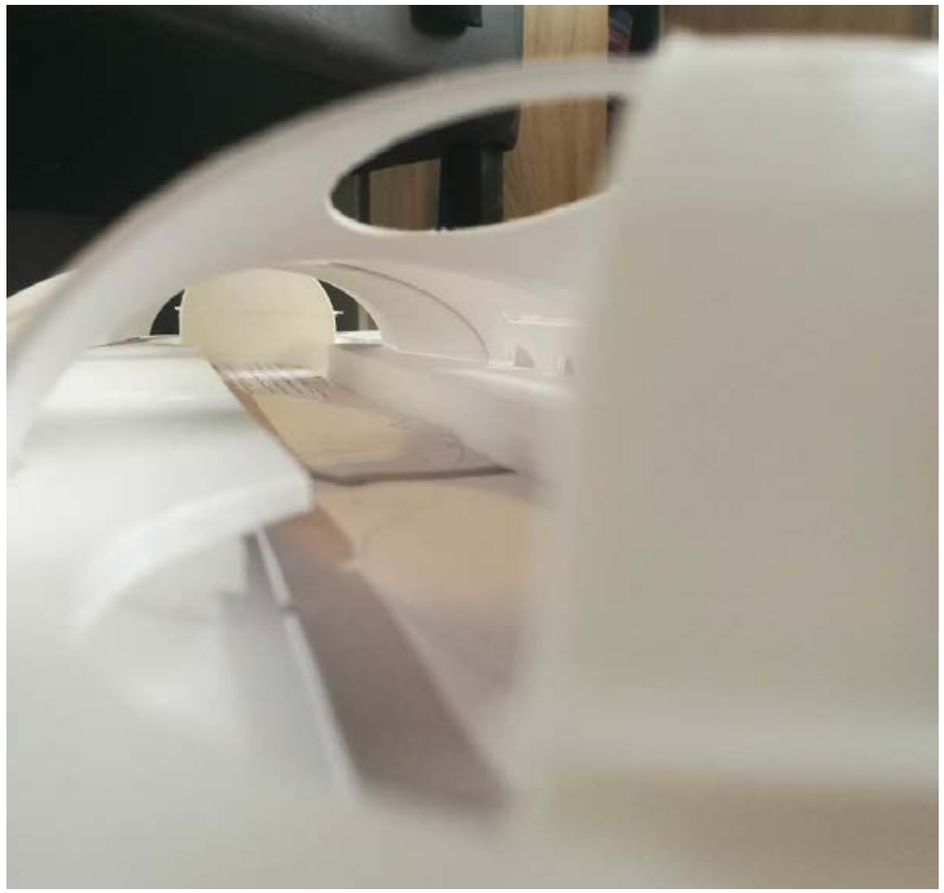


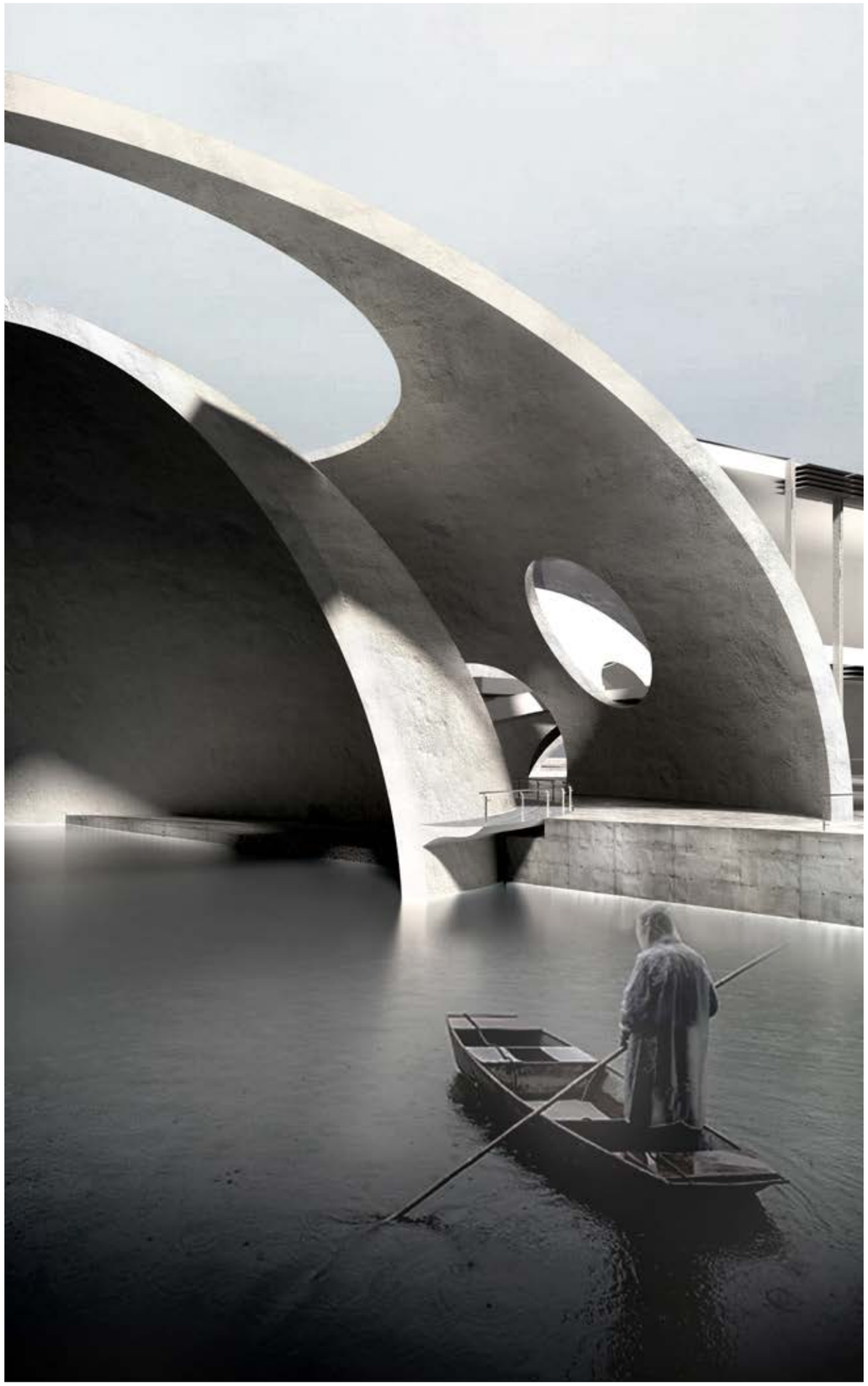


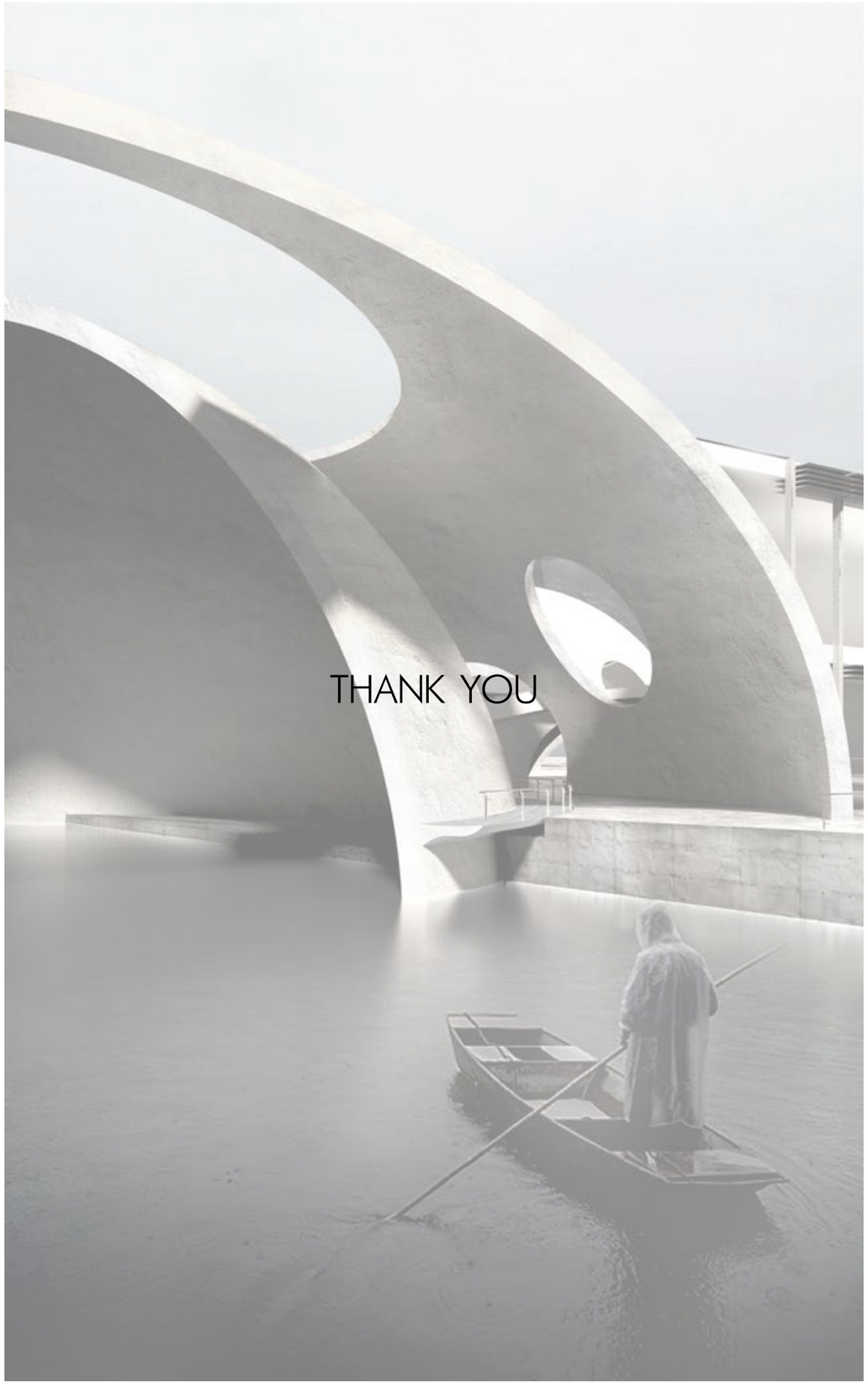
HVAC system is hided in the in-between bubble space


natural ventilation
heat pump
rain water collection
ground loop








THANK YOU