

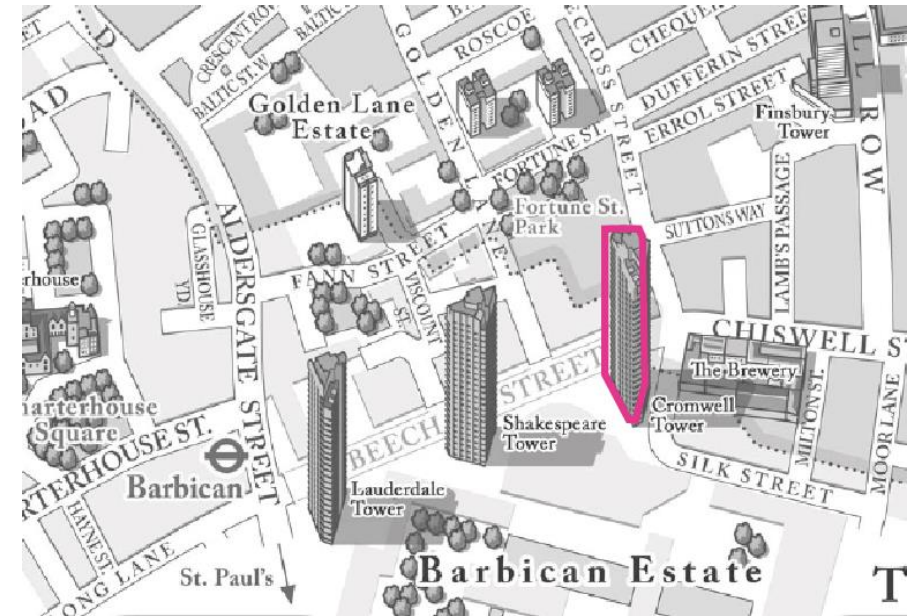
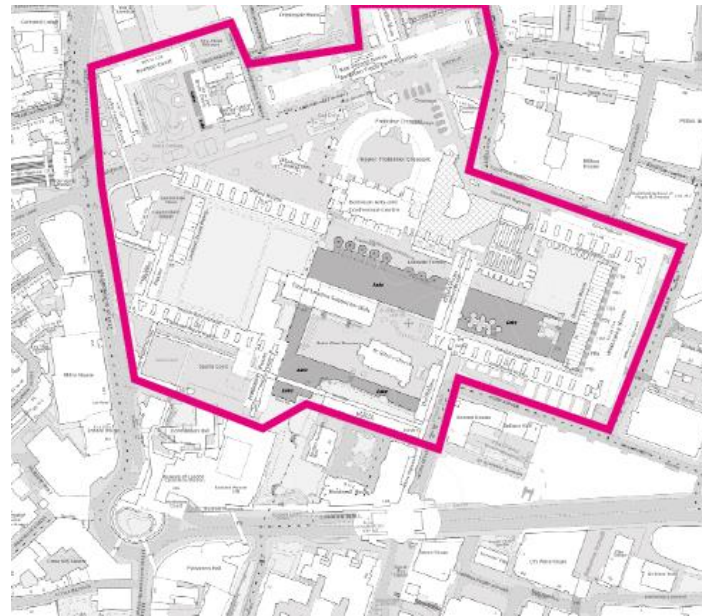
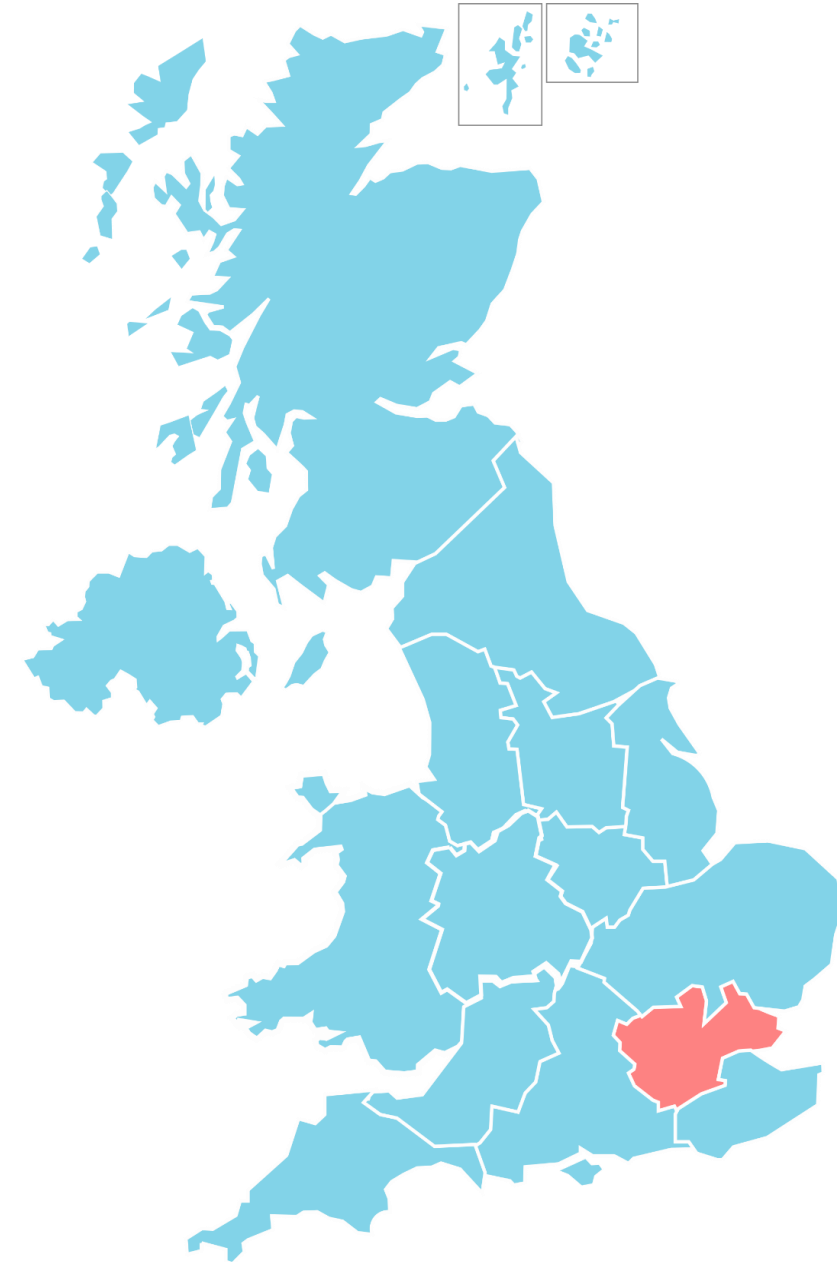
# Barbican

## Environmental & Behavioural Evaluation





# Location

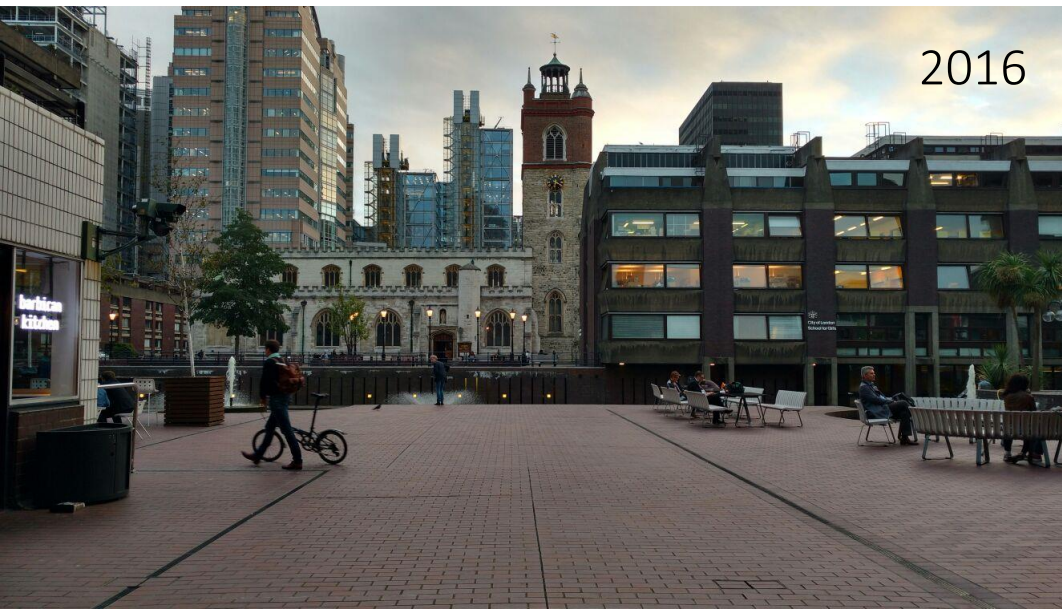




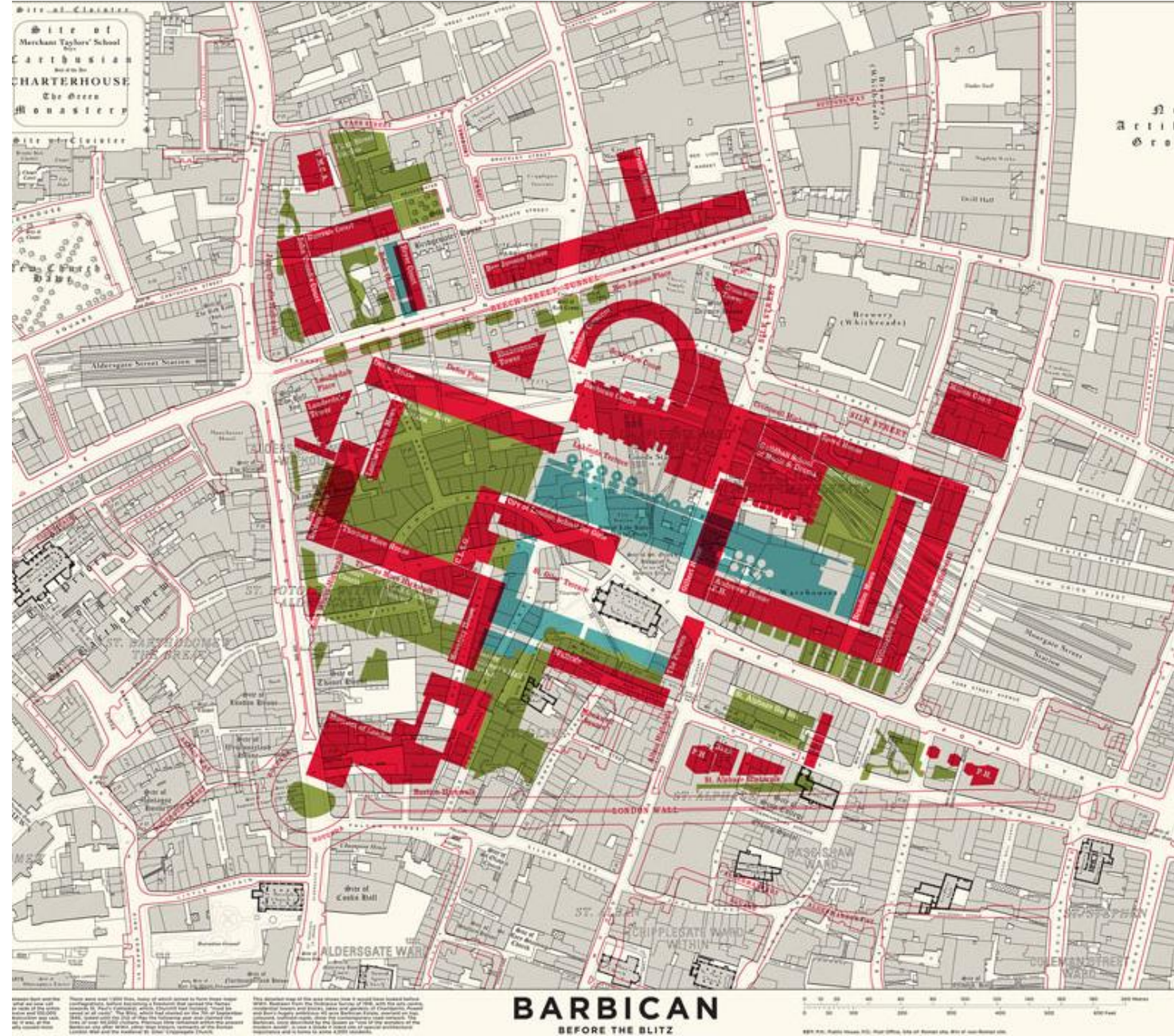
# History



1945

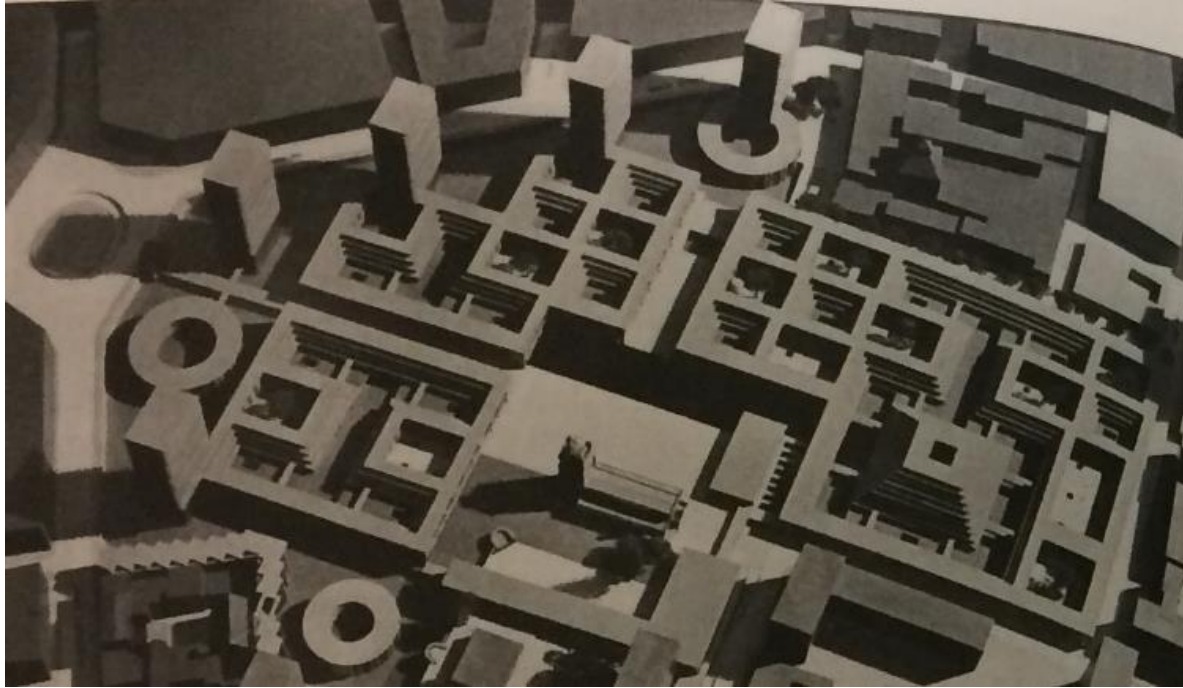


2016

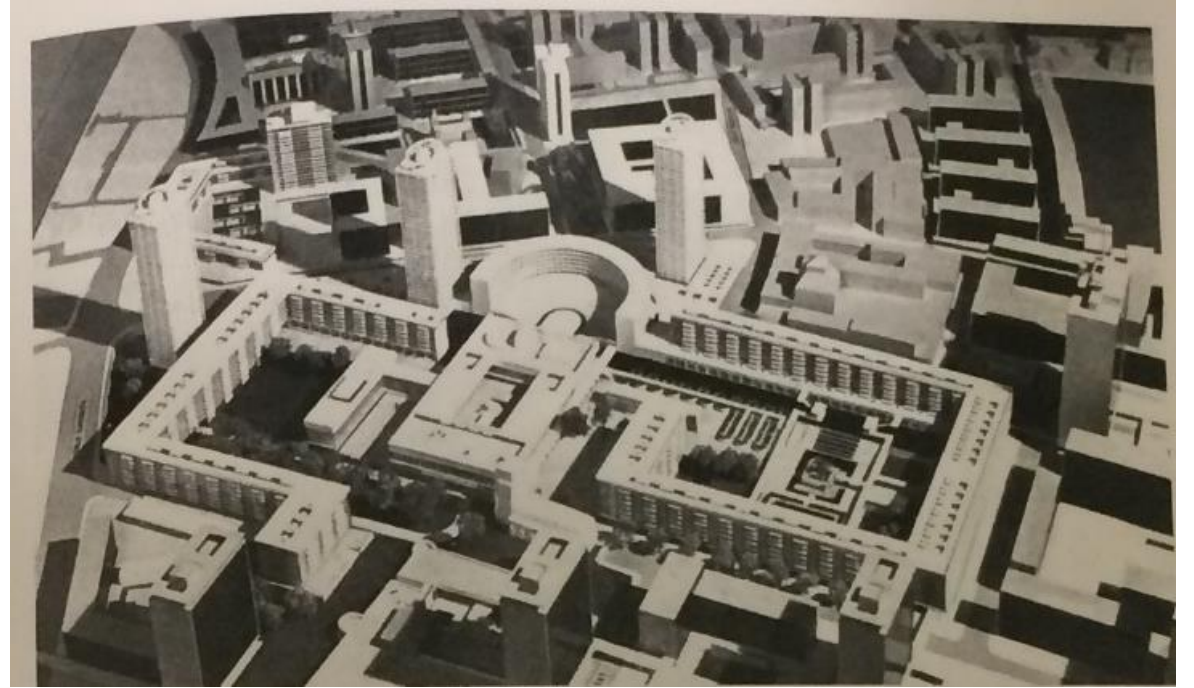




# Development of the scheme



Initial scheme 1955



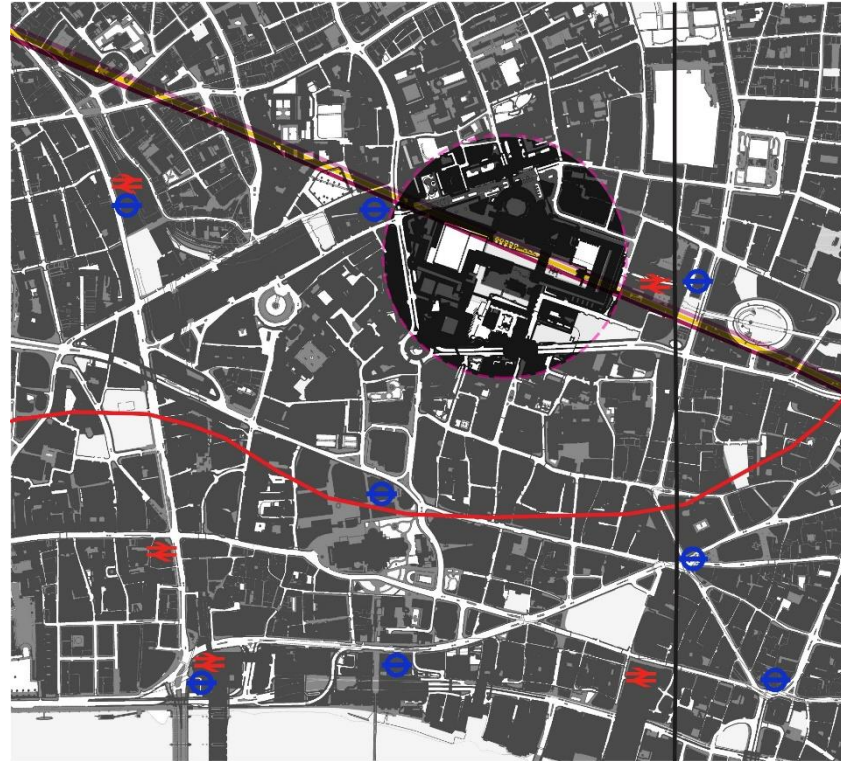
1956 proposal



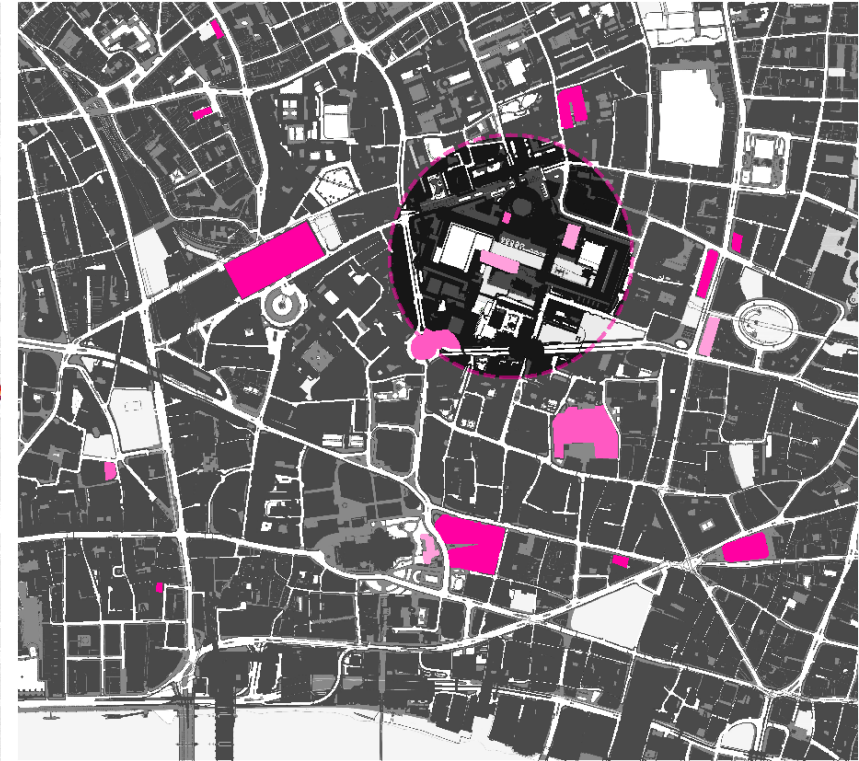
# Urban Context



Green spaces & water features



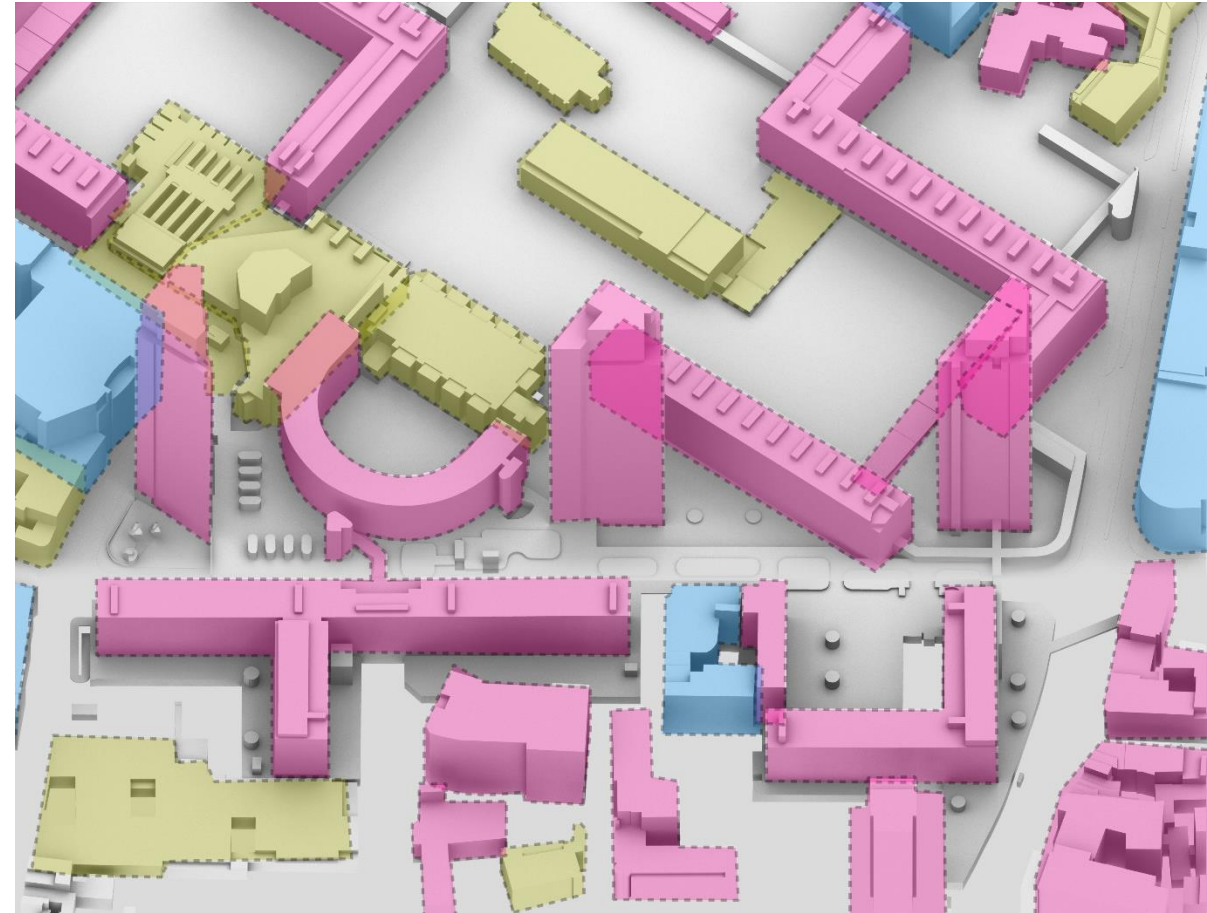
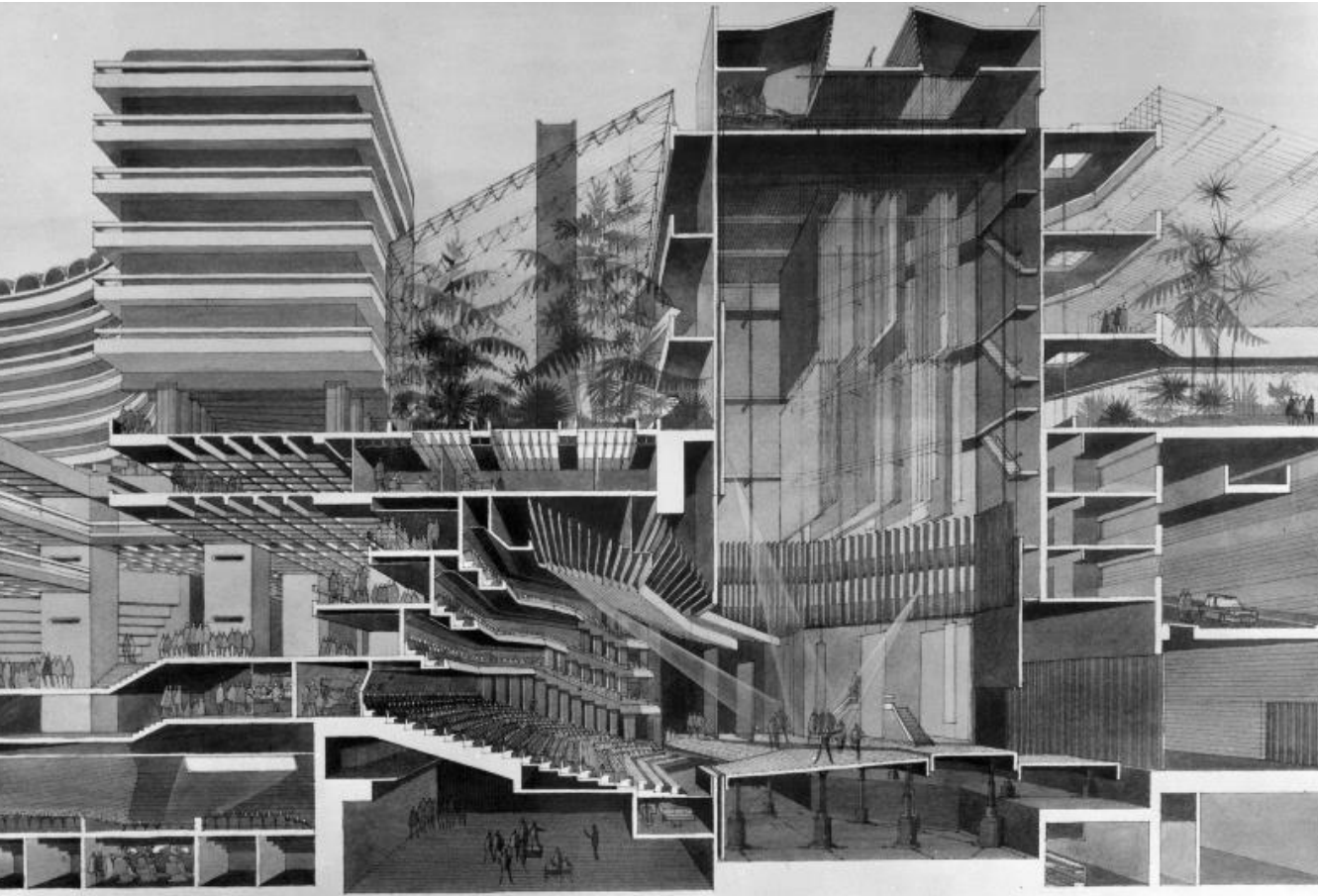
Transport links



Retail & services



# Buildings Use Map



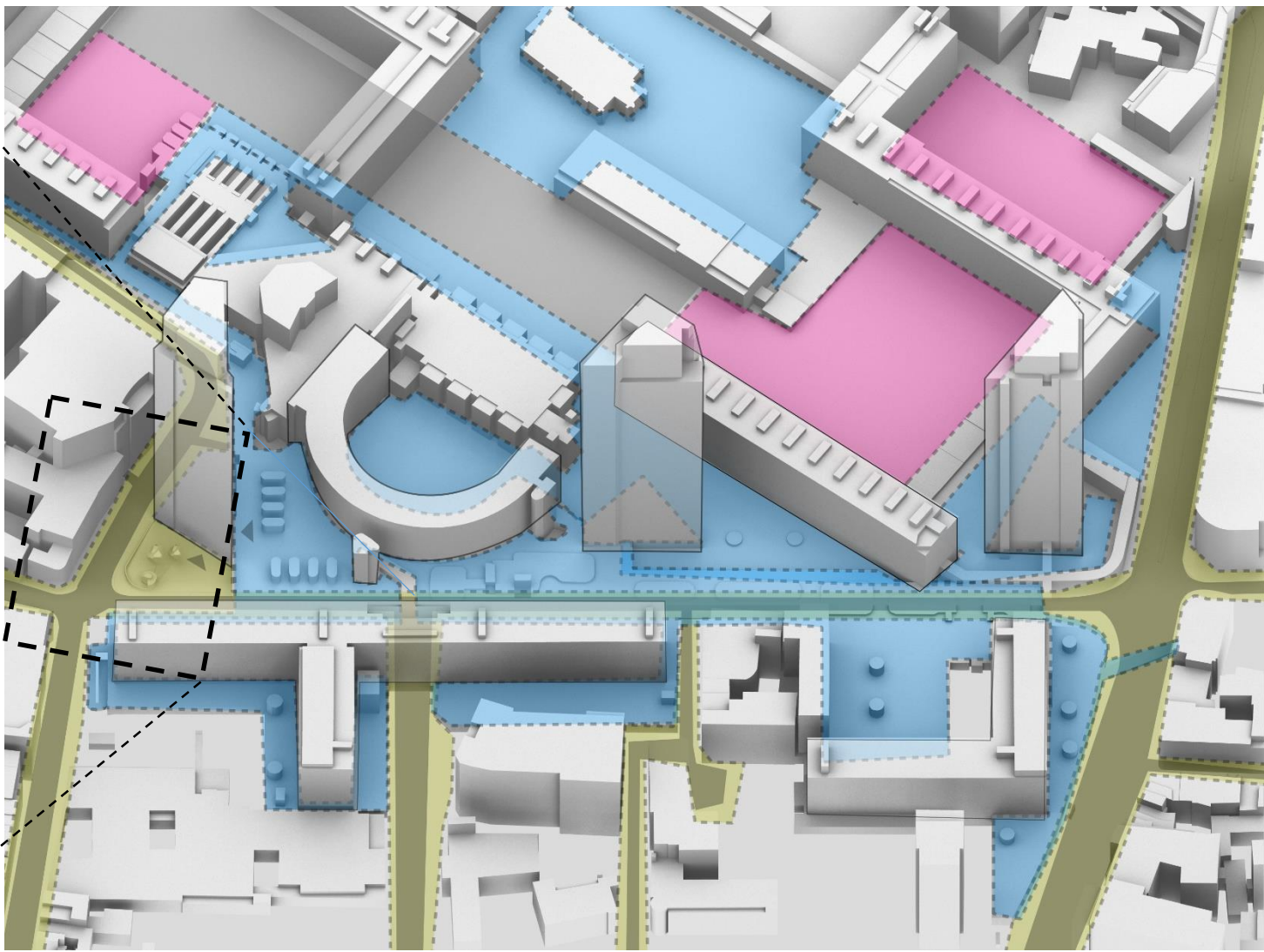
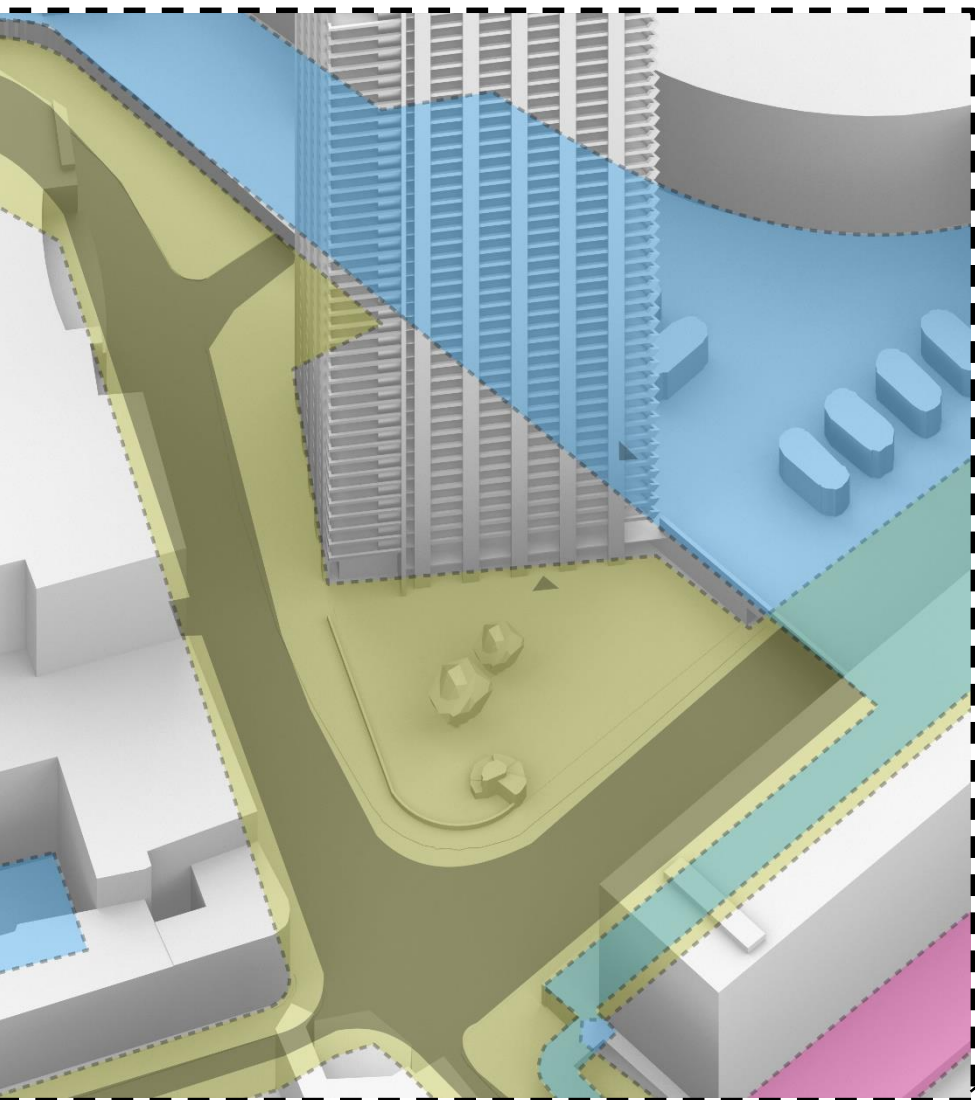
 Services /  
Hospitality

 Commercial

 Residential



# Site Access Map



Public



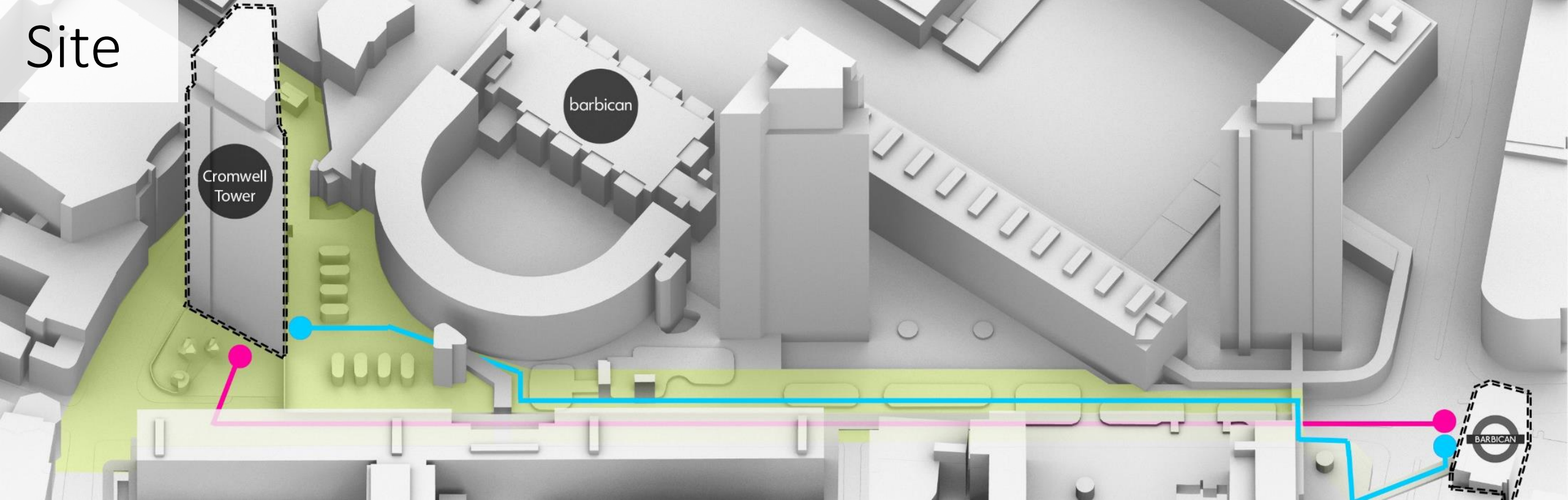
Semi-Public



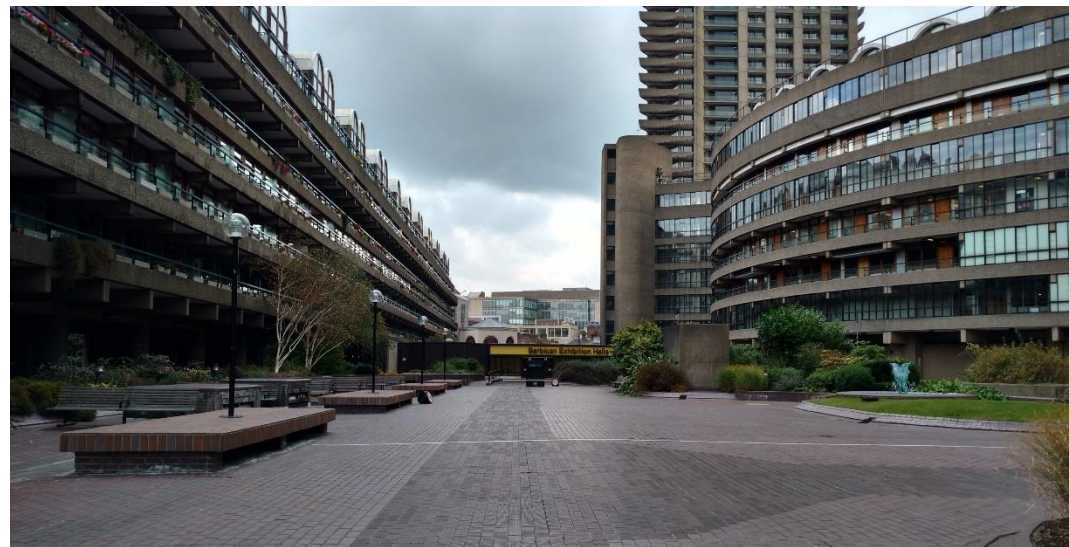
Private



# Site



Transport links



Podium level

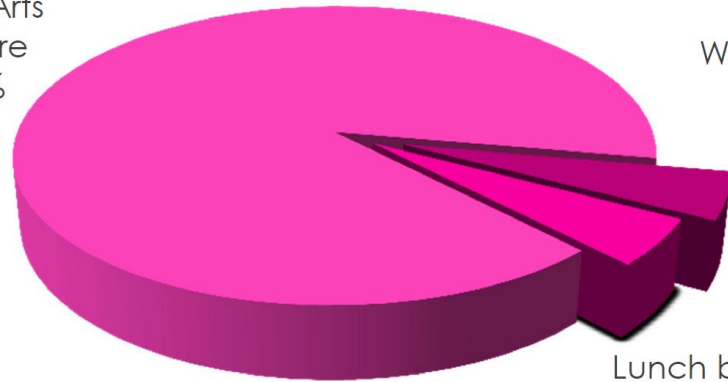


Footbridge from Barbican Tube



# Survey

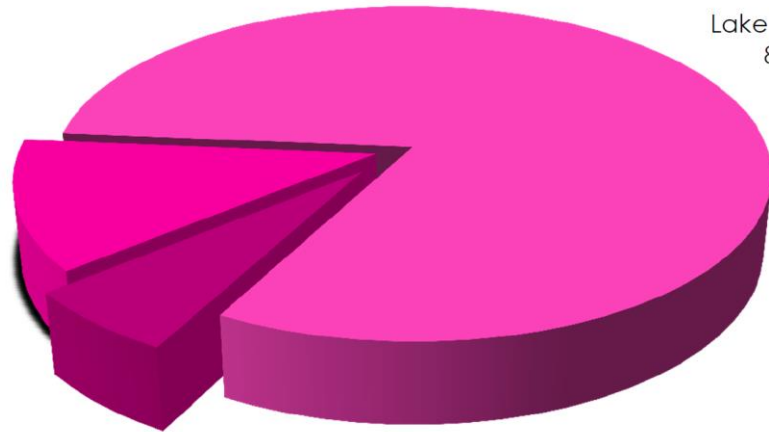
Before or  
after Arts  
Centre  
90%



Walking and  
doing a  
shortcut  
5%

Lunch break  
from work  
5%

Lake terrace  
82%



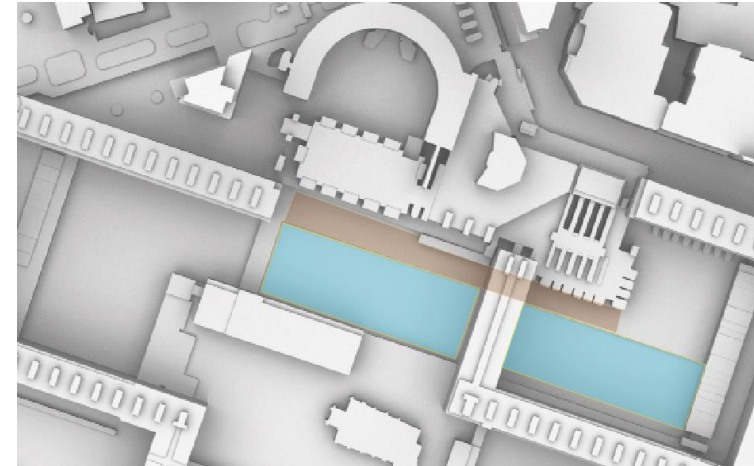
Others  
12%

Frobisher  
Crescent  
surroundings  
6%

## Granary Square by Regent's Canal



## Barbican Centre



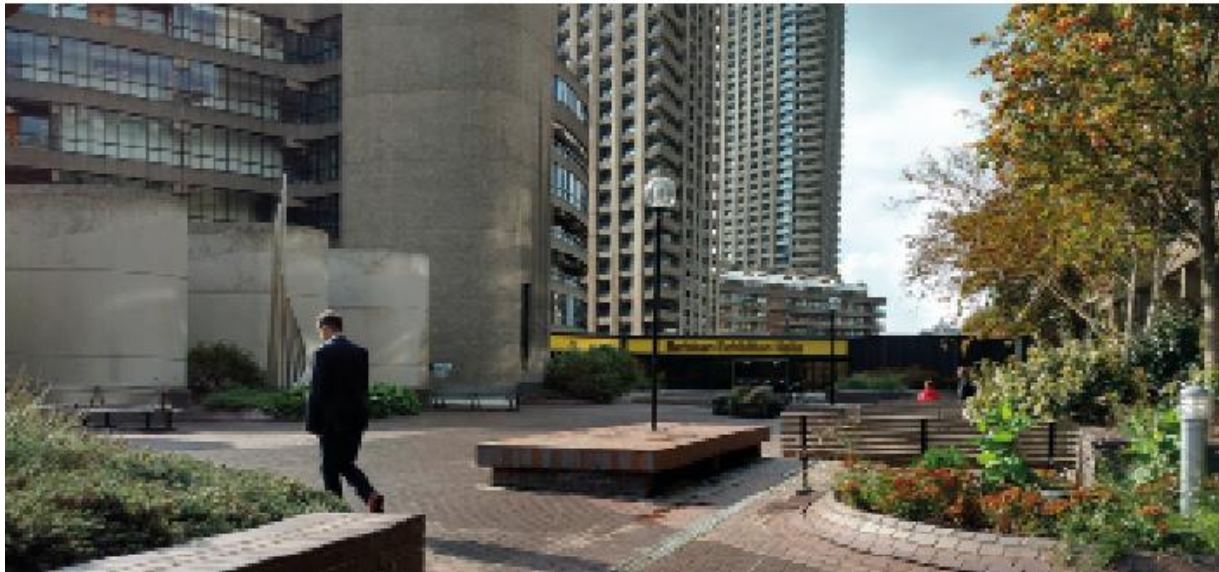


# Outdoor patterns of occupancy

Weekdays

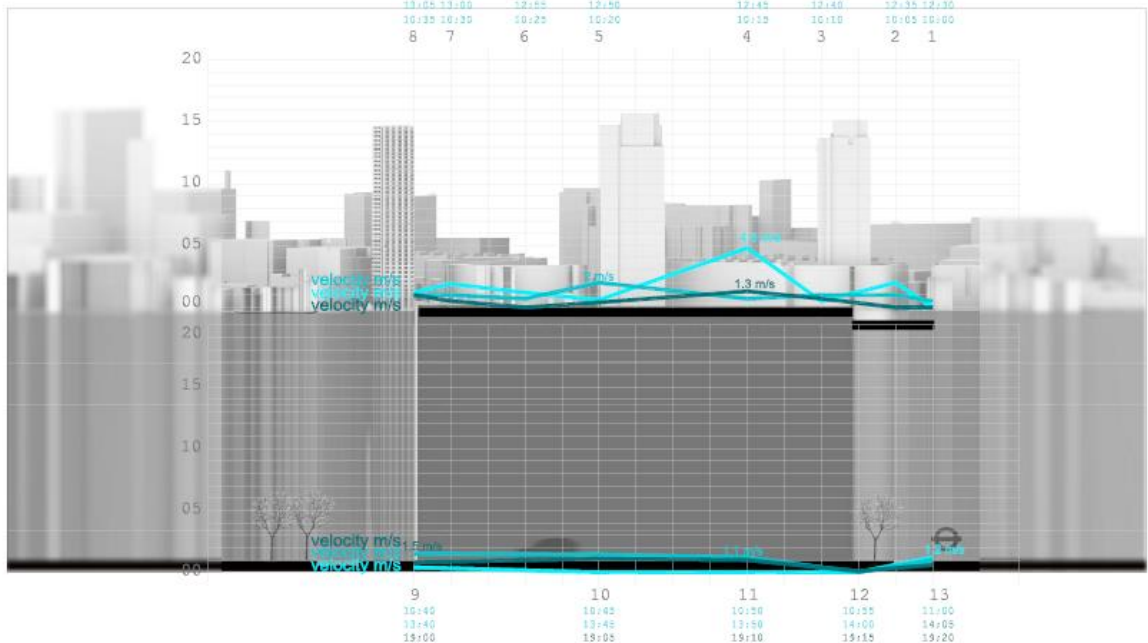
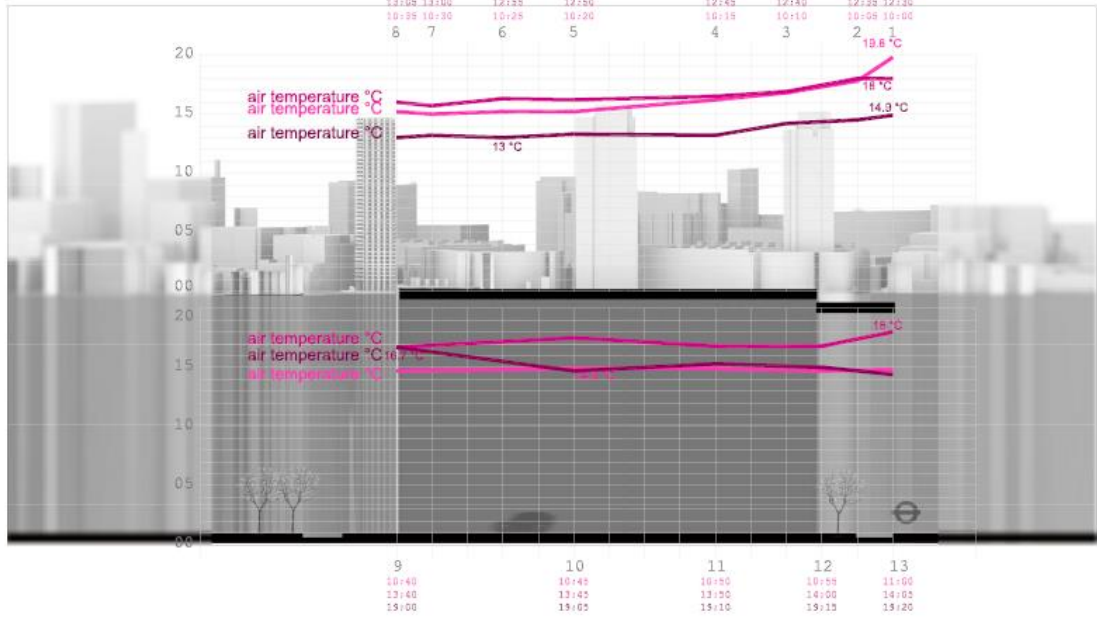
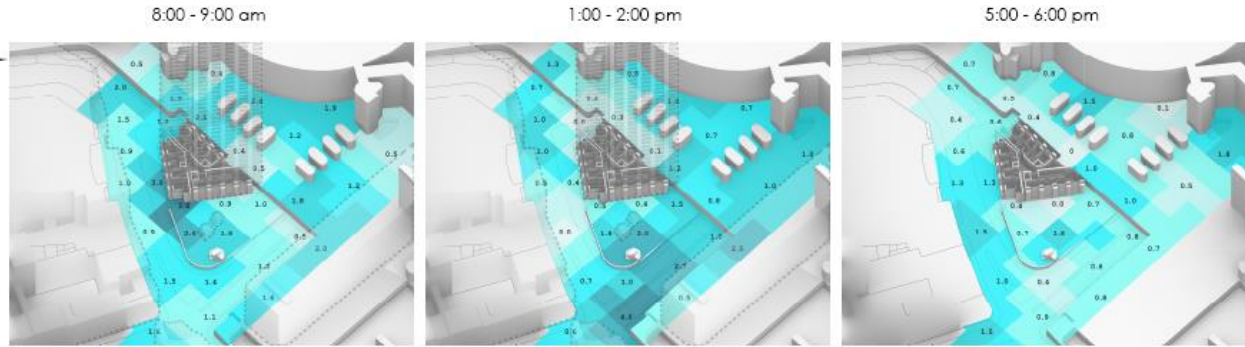
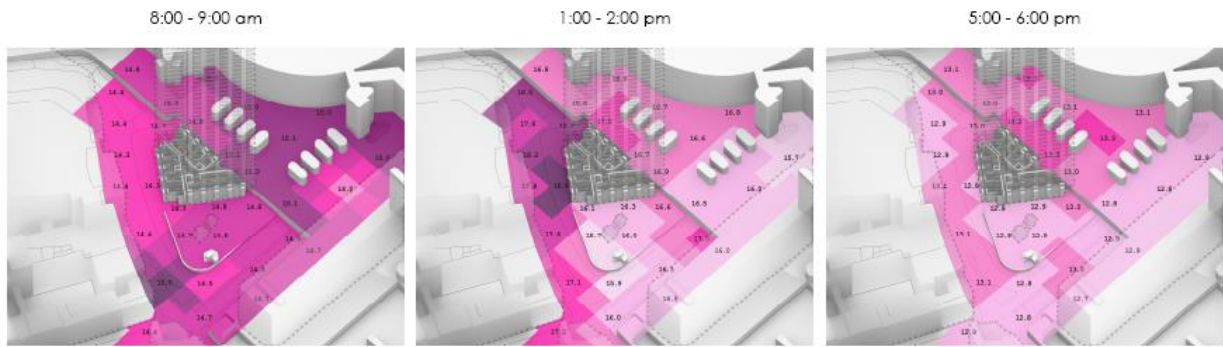


Weekends





# Spot Measurements





# Spot Measurements

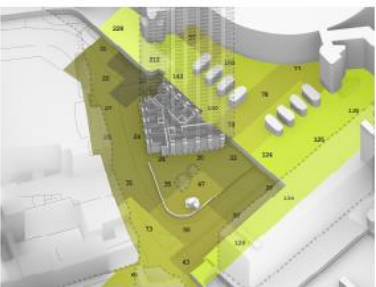


Fig.1 8am - 9am Illuminance [lux]

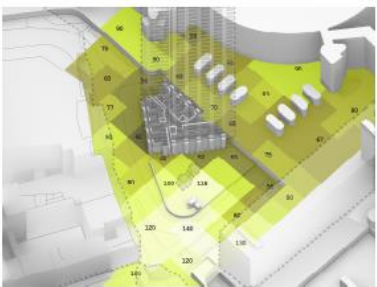


Fig.1 1pm - 2pm Illuminance [lux]

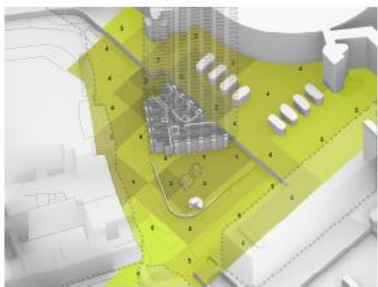


Fig.1 5pm - 6pm Illuminance [lux]

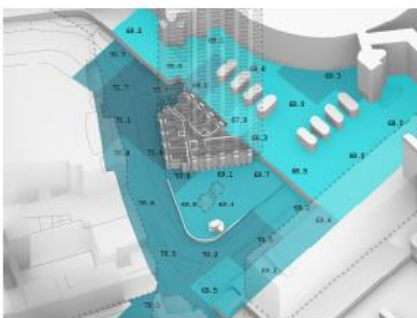
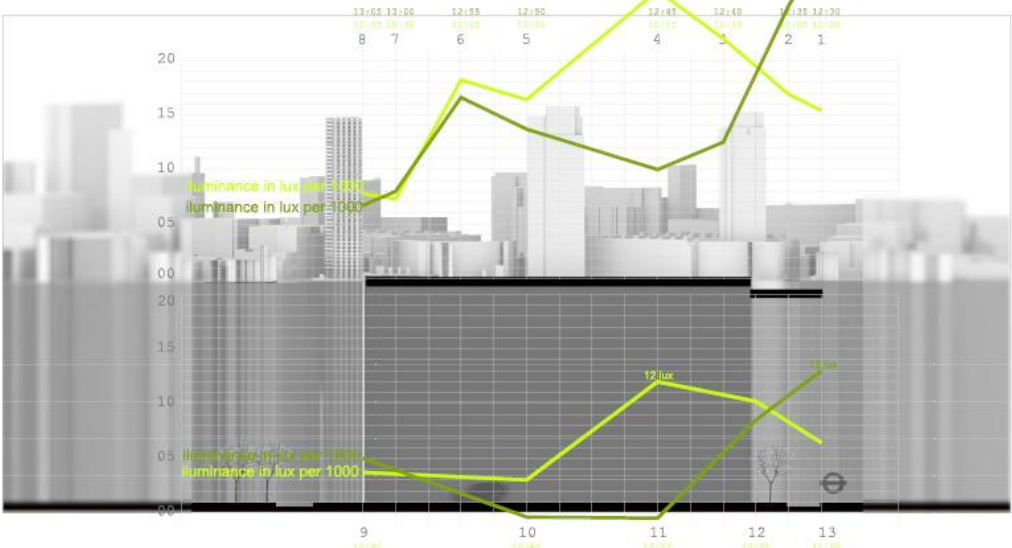


Fig.1 8am - 9am Humidity [%]

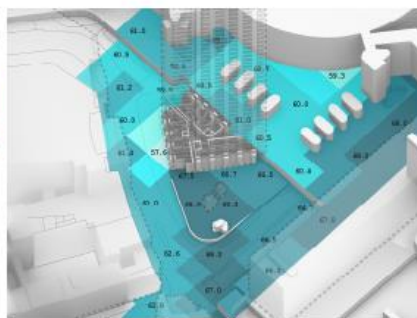


Fig.1 1pm - 2pm Humidity [%]

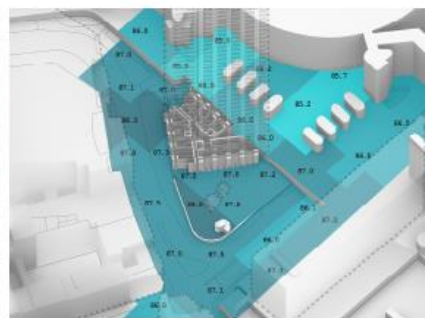
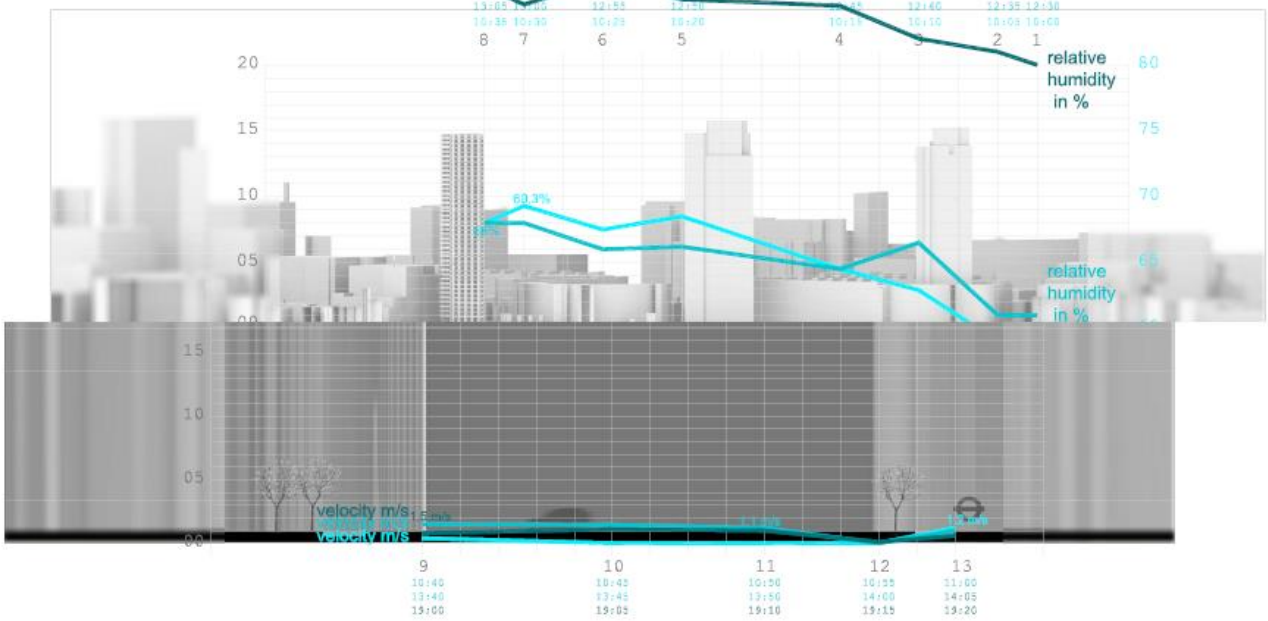


Fig.1 5pm - 6pm Humidity [%]





# “Feel Good” Scale ☺

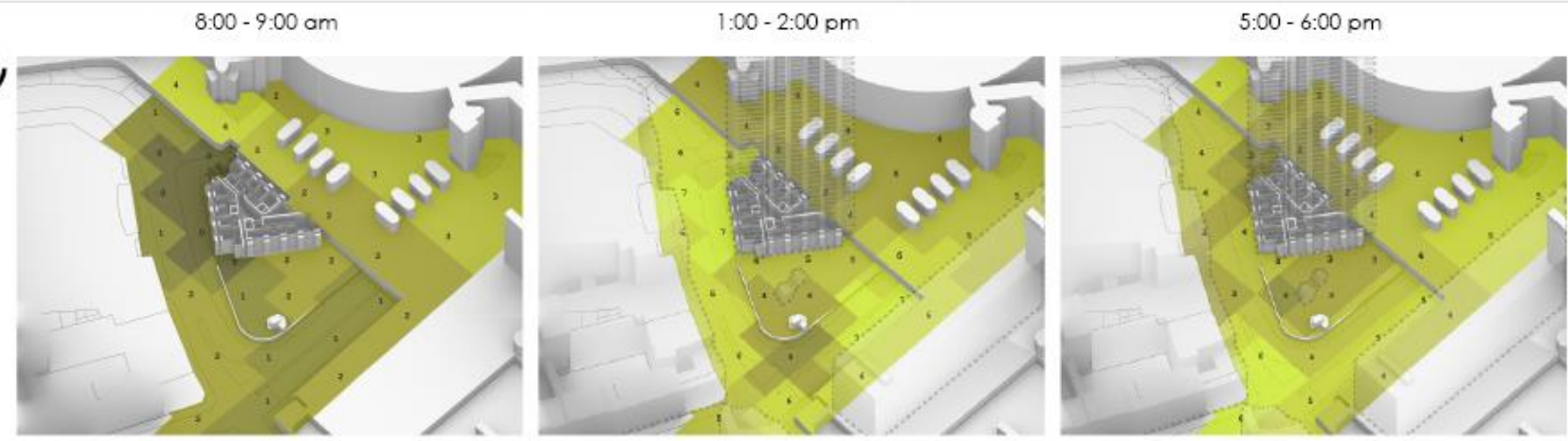
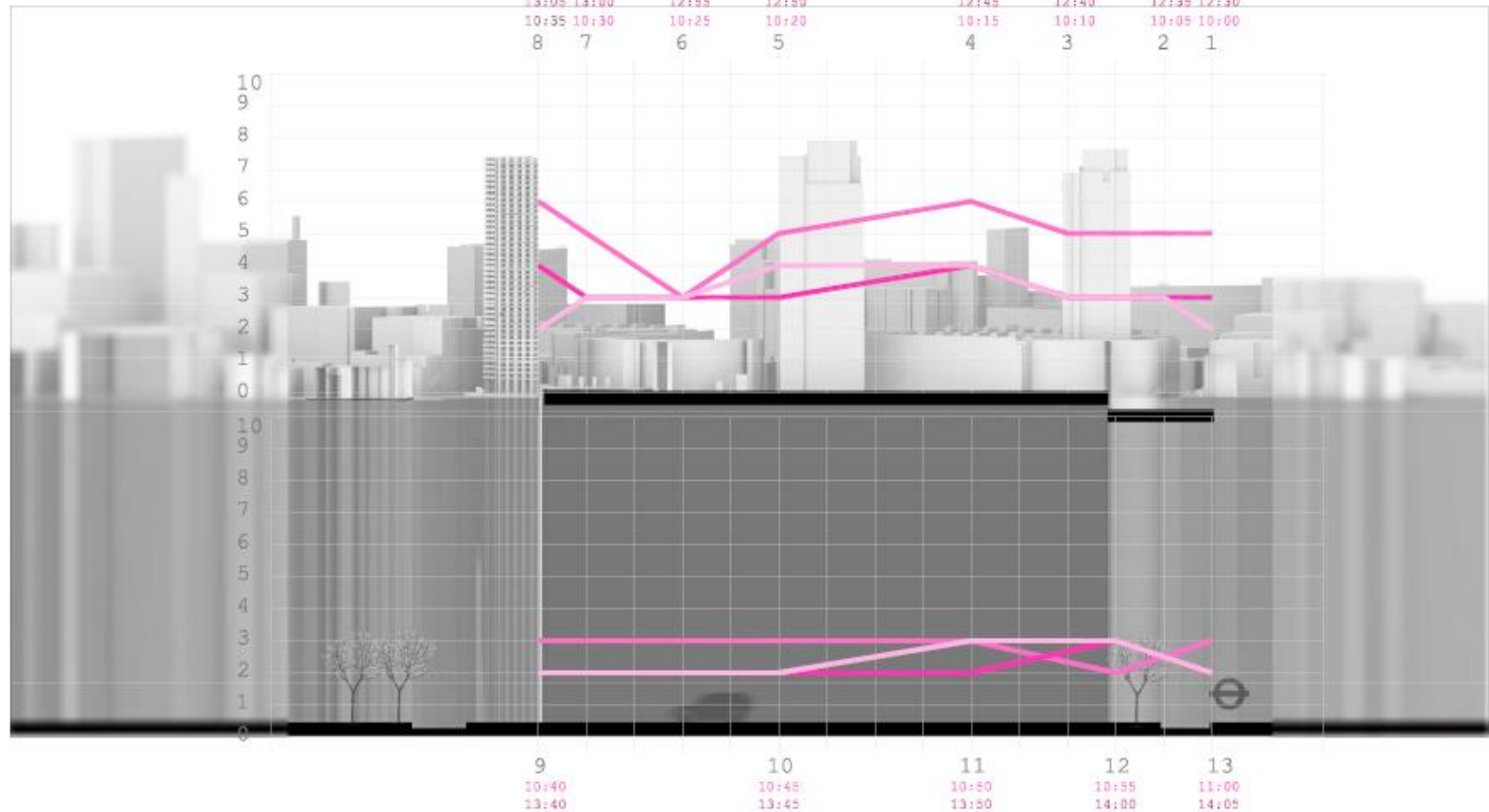


Fig.1 8am - 9am Feel Good Scale [happiness]

Fig.1 1pm - 2pm Feel Good Scale [happiness]



Fig.1 5pm - 6pm Feel Good Scale [happiness]

20:05	20:00	19:50	19:45	19:40	19:35	19:30	19:25
13:05	13:00	12:55	12:50	12:45	12:40	12:35	12:30
10:35	10:30	10:25	10:20	10:15	10:10	10:05	10:00
8	7	6	5	4	3	2	1





# Thermal Comfort

SPOT MEASUREMENTS							SIMULATIONS			
Point of measurement	Date / time	FeelGood Scale 1-10	Dry bulb Temp °C	H %	W m/s	weather	Sun radiation W/m²	Increase by Sun radiation °C 	Decrease by Wind °C 	UTCI results °C
27	13/10/16 1pm	1	14	59	10	sunny (shade)	100	2,7	-16,2	-0,7
					0			2,8	0,0	15,5
30	13/10/16 1pm	4	18	46	6	sunny	550	14,9	-9,5	13,2
					3			14,9	-4,3	18,4
					0			14,9	0,0	22,7
20	13/10/16 1pm	8	16	62	3	sunny	600	16,2	-4,8	17,2
					6			16,2	-10,5	11,5
					0			16,2	0,0	22

REAL

HYPOTHETIC



REAL

HYPOTHETIC

REAL

HYPOTHETIC

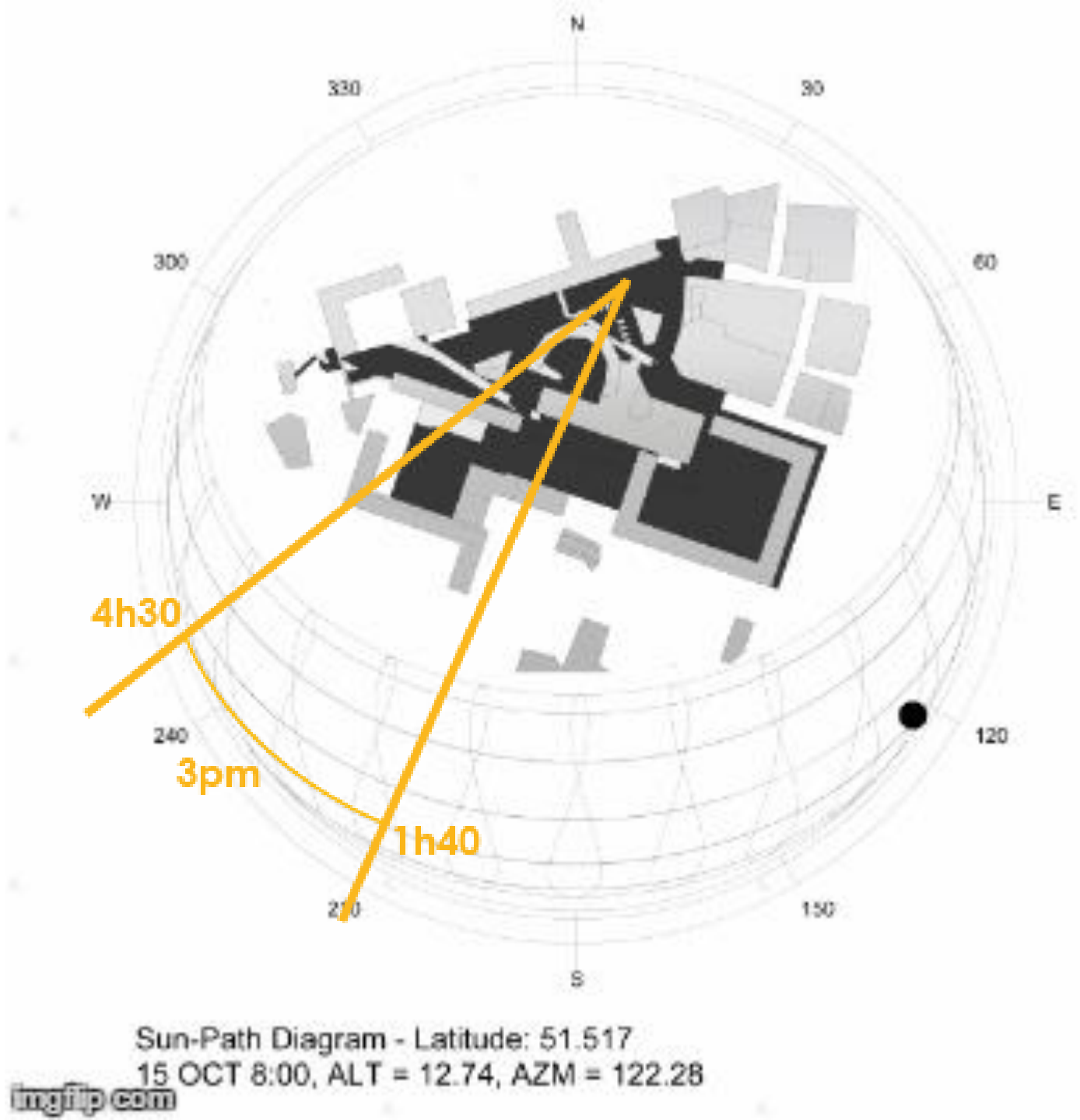
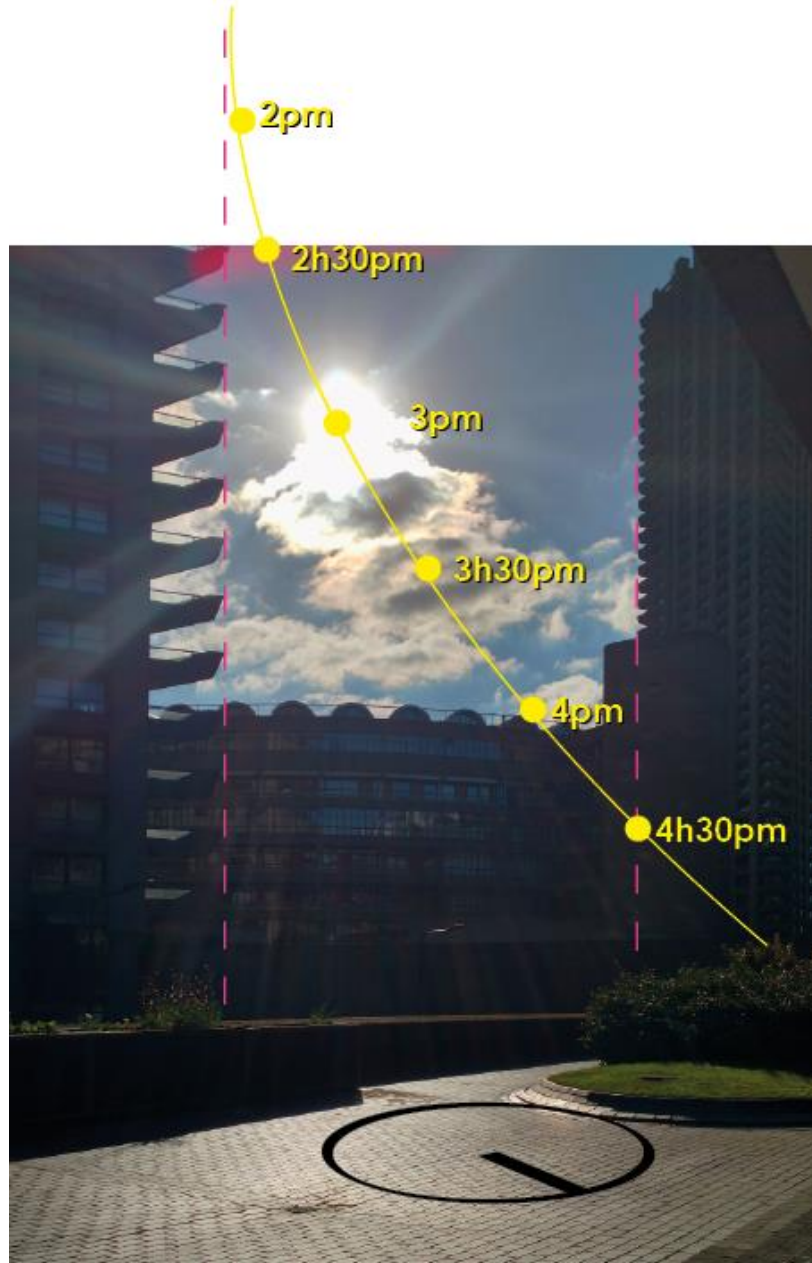
## CALCULATED RELEVANCE OF WEATHER ELEMENTS TO THERMAL COMFORT

Real Temp °C	Perceived Temp °C	Difference °C	FeelGood Scale 1-10		
14,0	-0,7	14,7	1 -	14,29% -	85,71% +
18,0	13,2	4,8	4	61,07%	38,93%
16,0	17,2	1,2	8 +	77,14% +	22,86% -



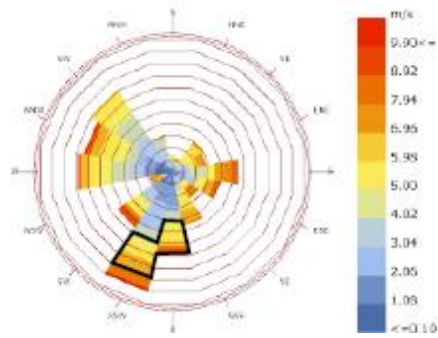


# October – Daylight Hours



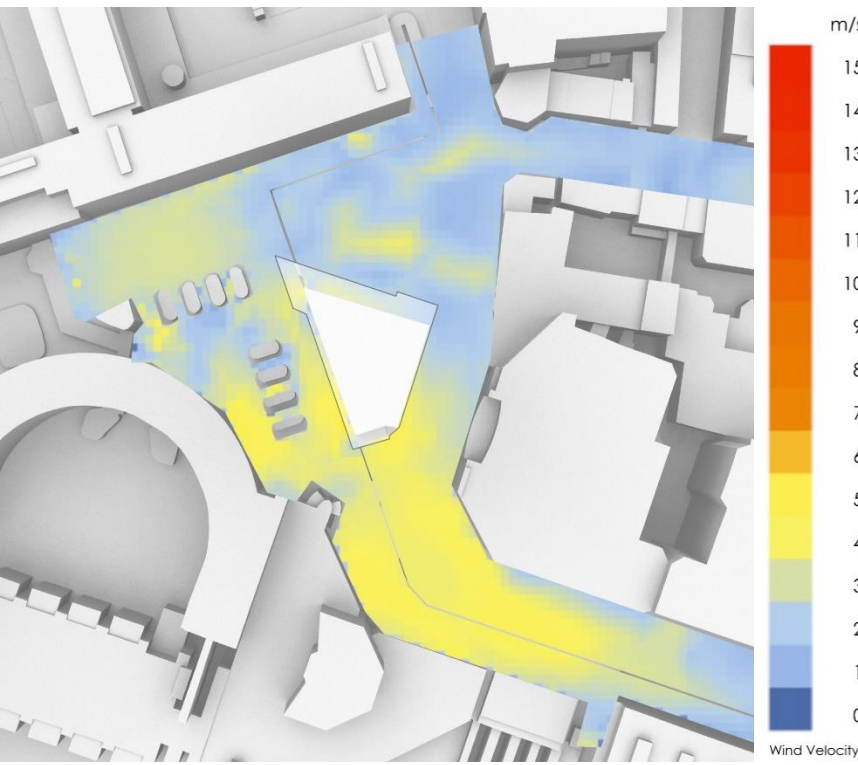


# Universal Thermal Climate Index OCTOBER



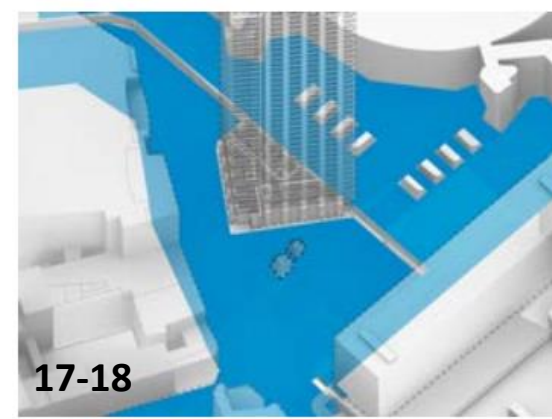
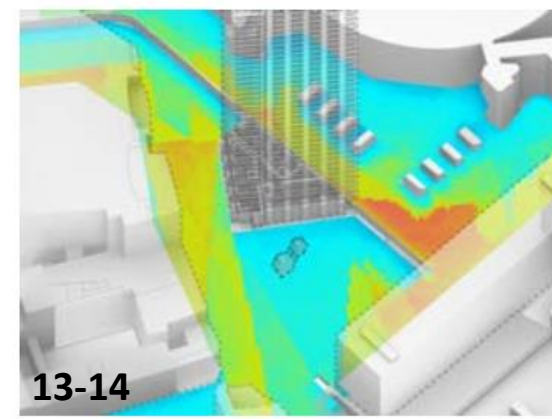
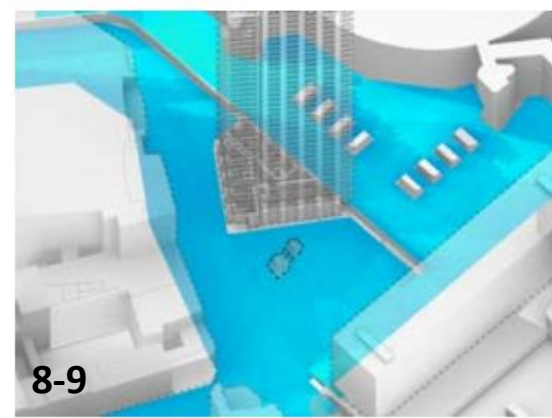
Avg Db = 14.4°C  
Avg RH = 68%

+



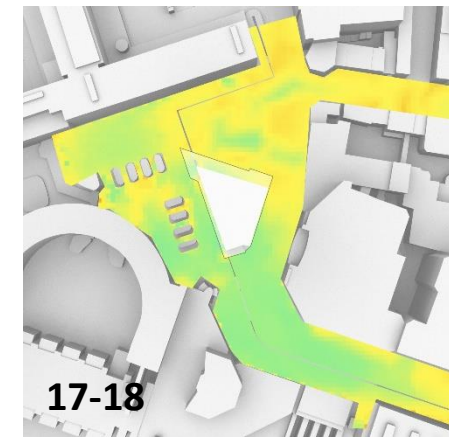
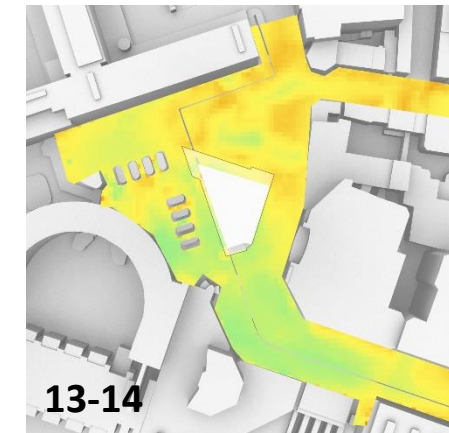
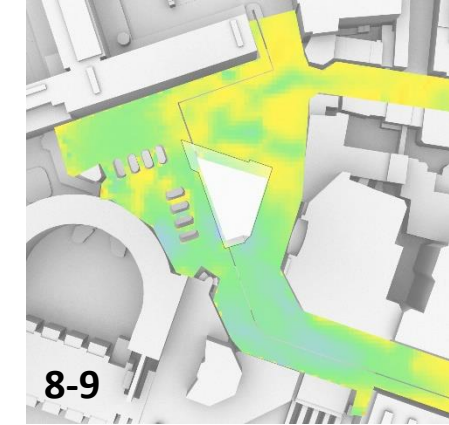
Wind CFD simulation

+

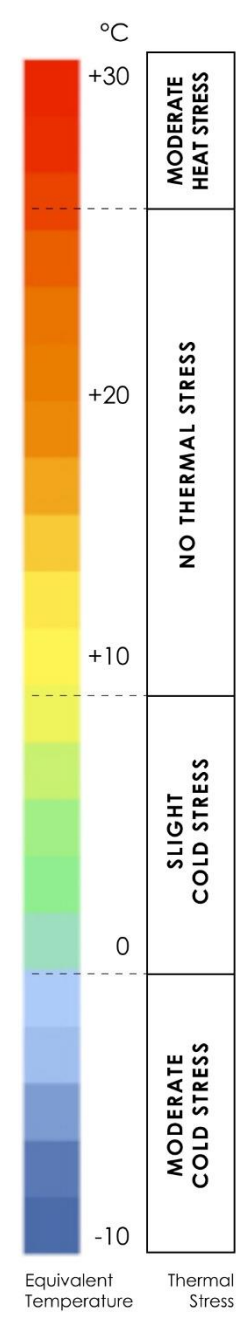


Solar Radiation

=



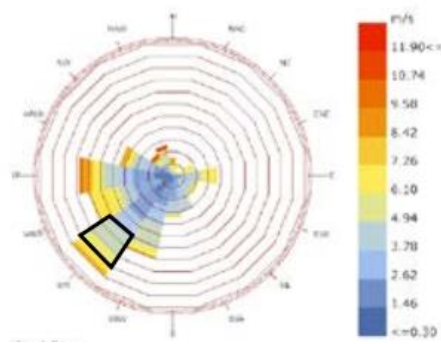
UTCI





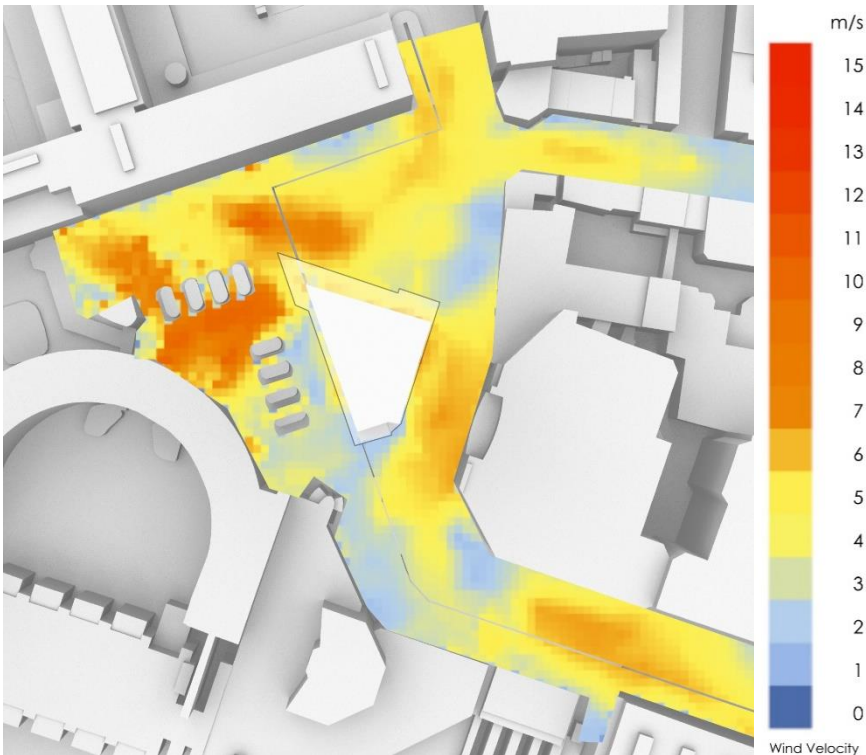
# Universal Thermal Climate Index

## JANUARY



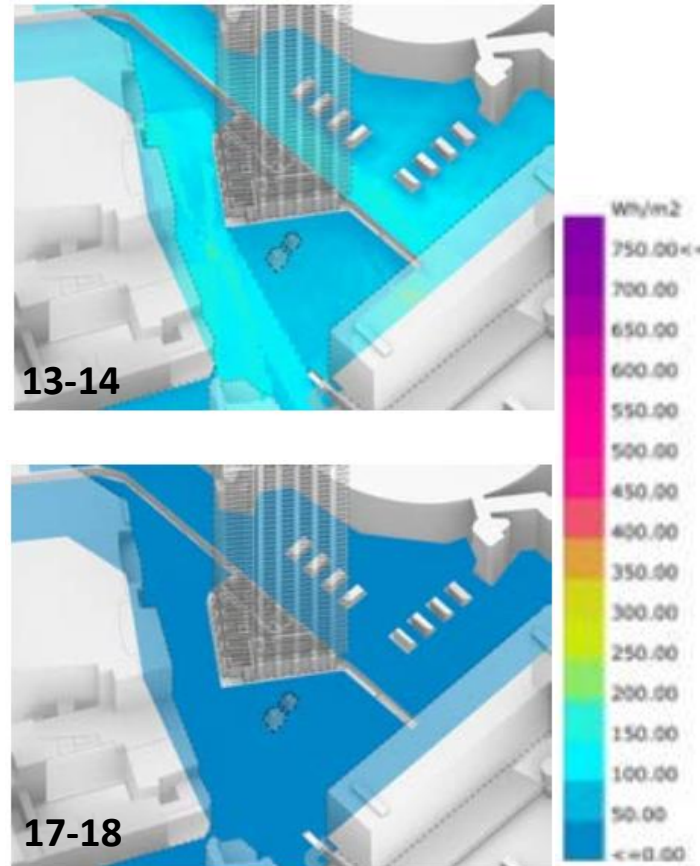
Avg Db = 7.2°C  
Avg RH = 72%

+



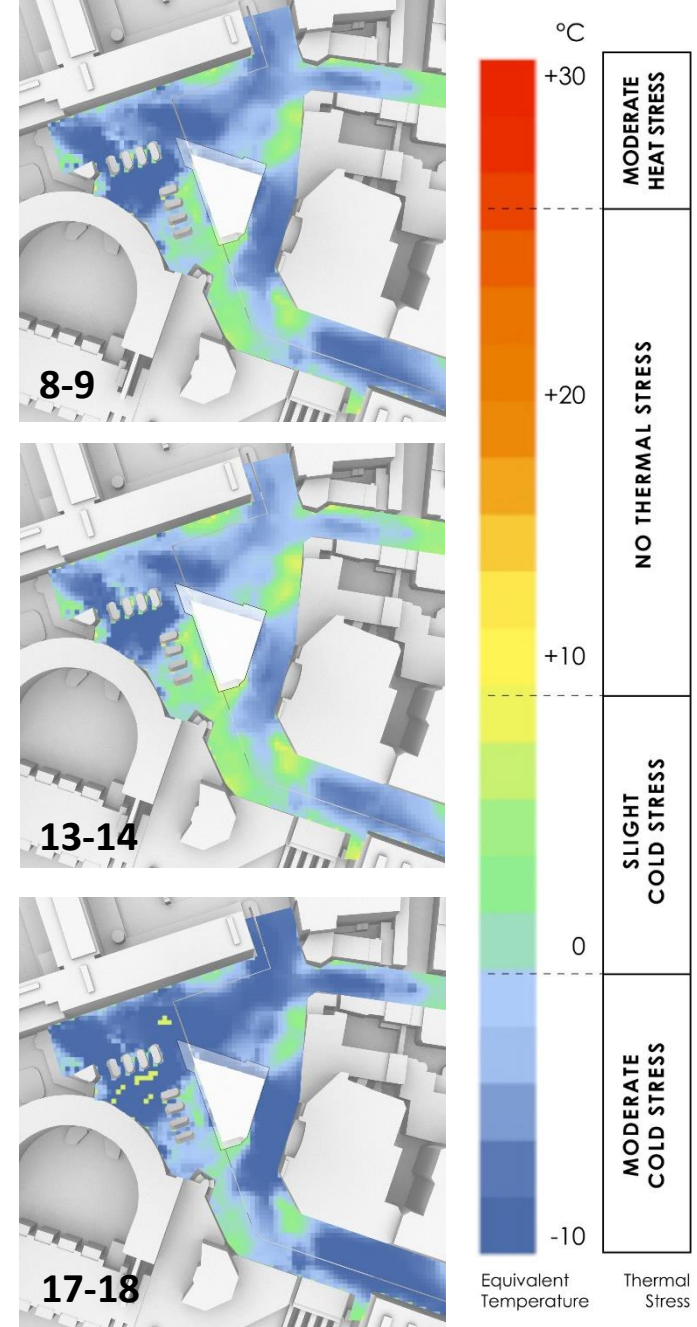
Wind CFD simulation

+



Solar Radiation

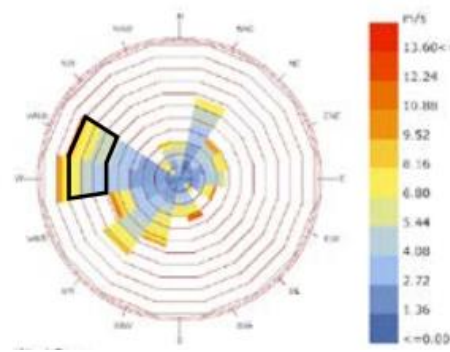
=



UTCI

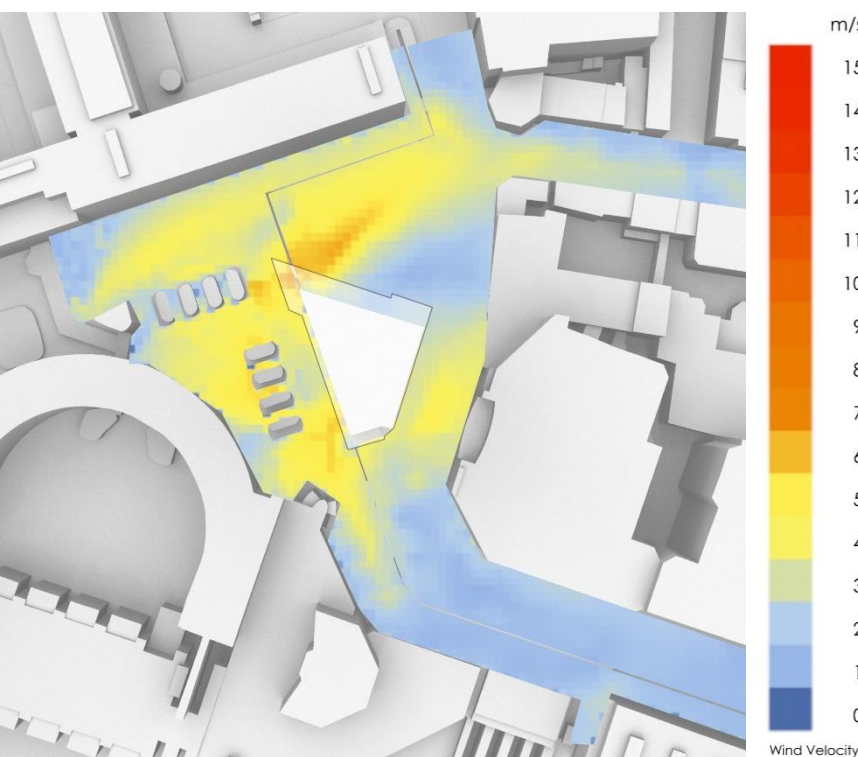


# Universal Thermal Climate Index JULY



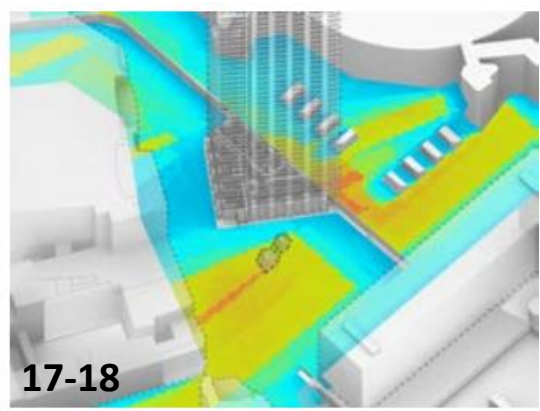
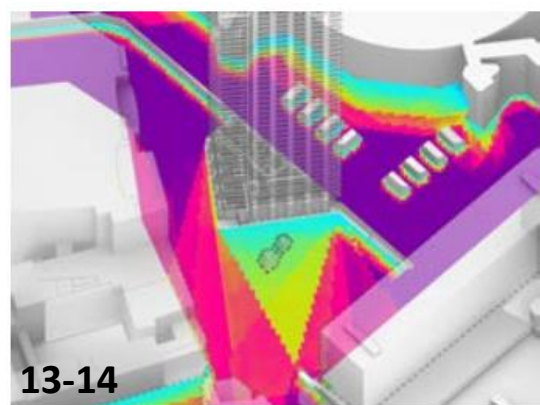
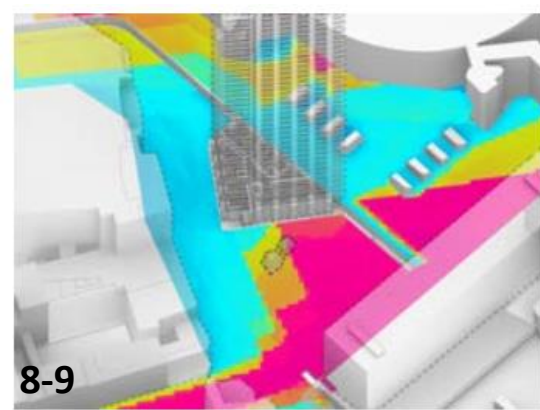
Avg Db = 20.9°C  
Avg RH = 55%

+



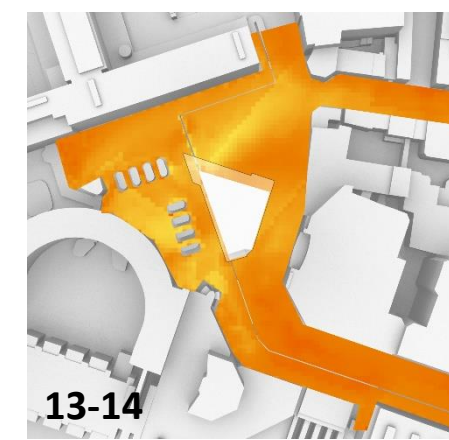
Wind CFD simulation

+

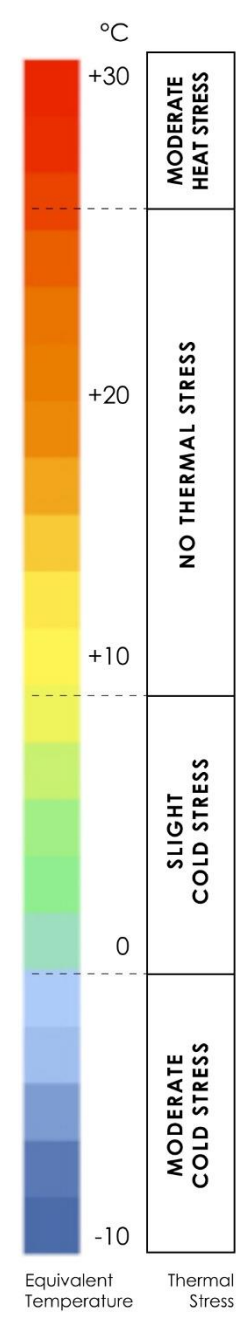


Solar Radiation

=

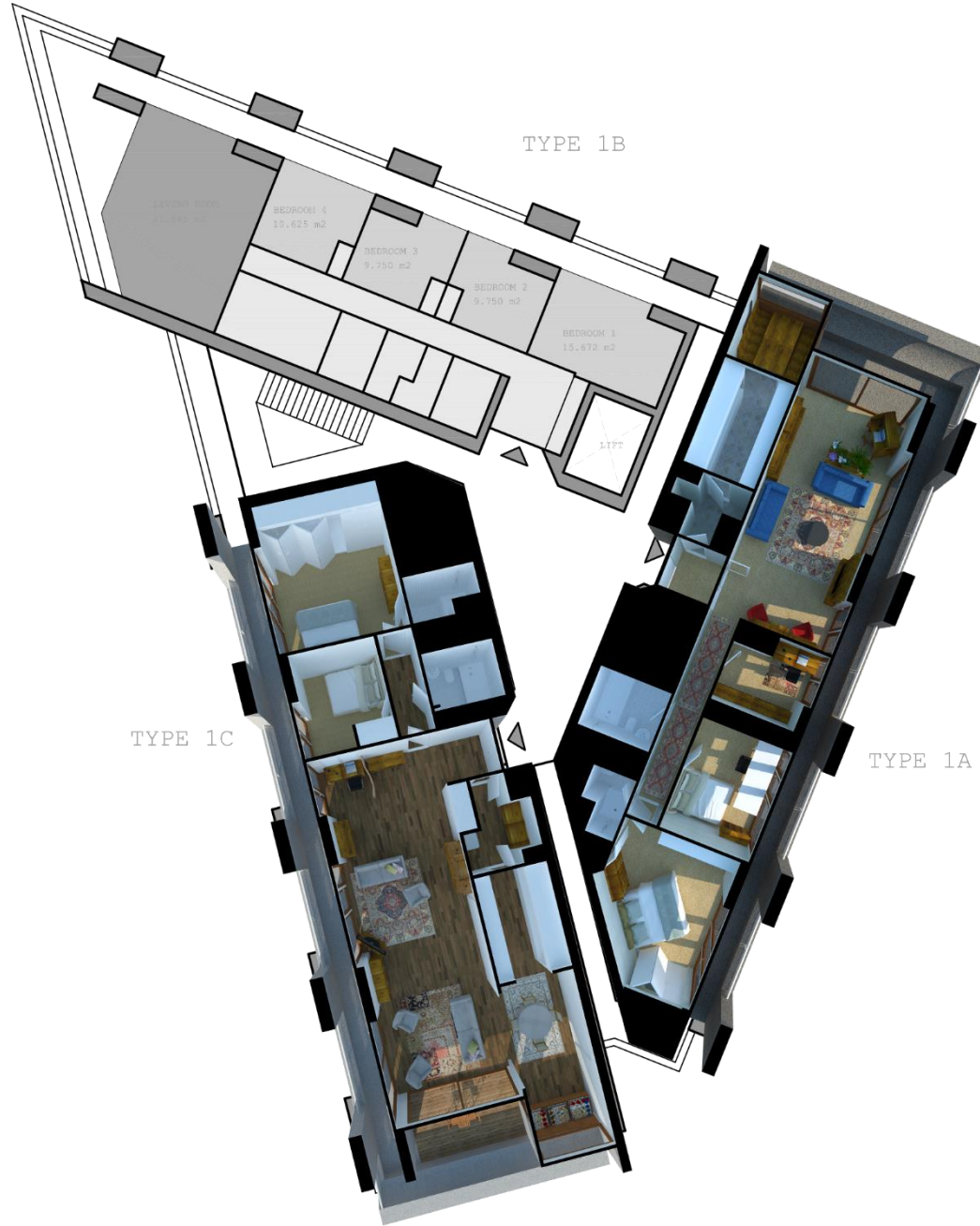


UTCI



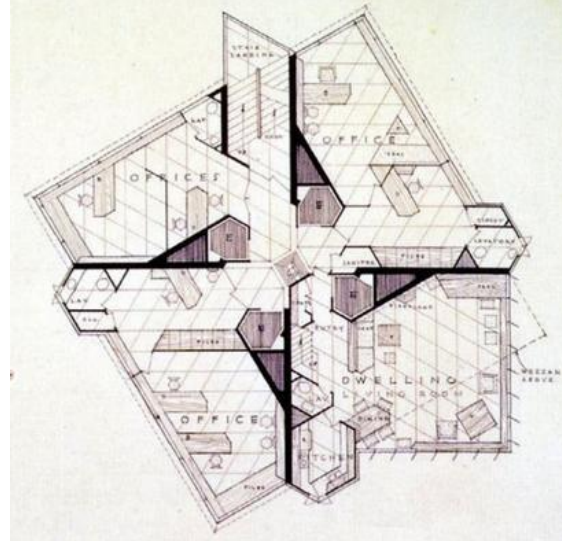


# Cromwell Tower

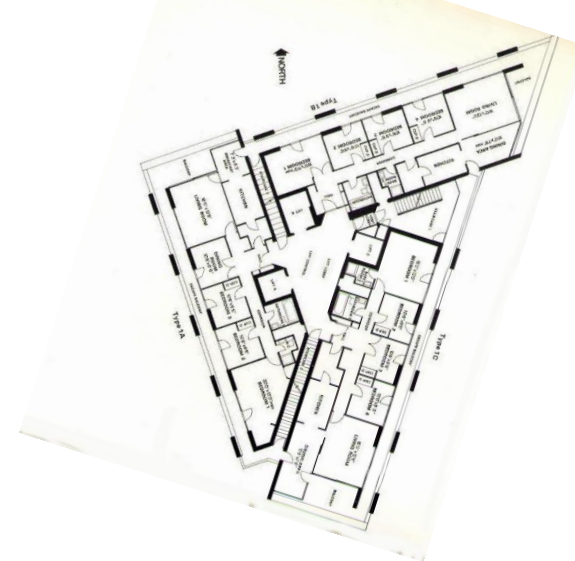




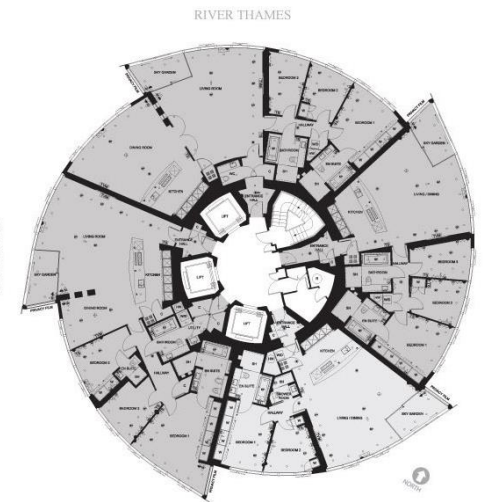
# Architectural Precedence



Price Tower 1955

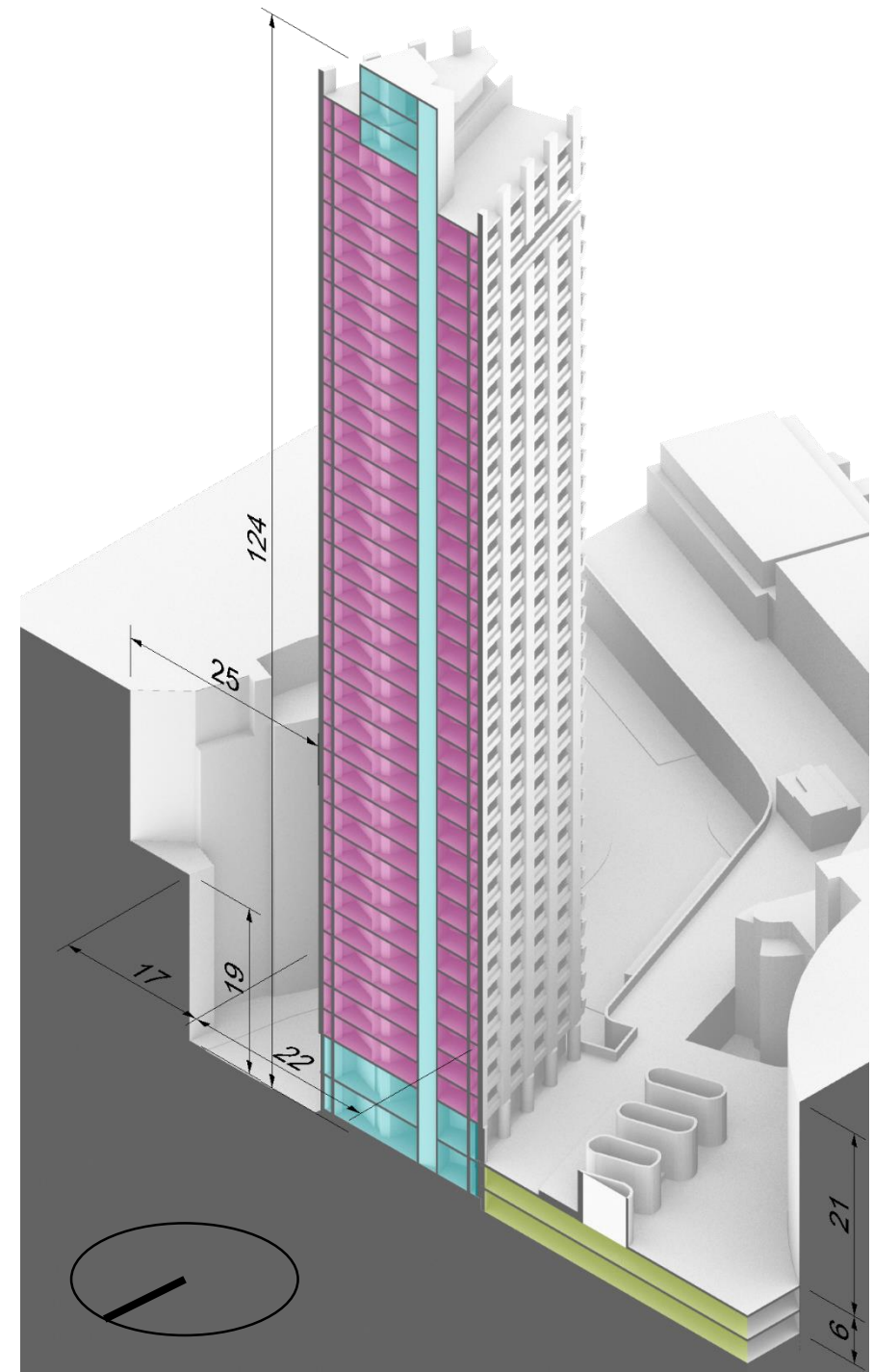


Cromwell Tower 1973



Vauxhall Tower 2014



[illegible]



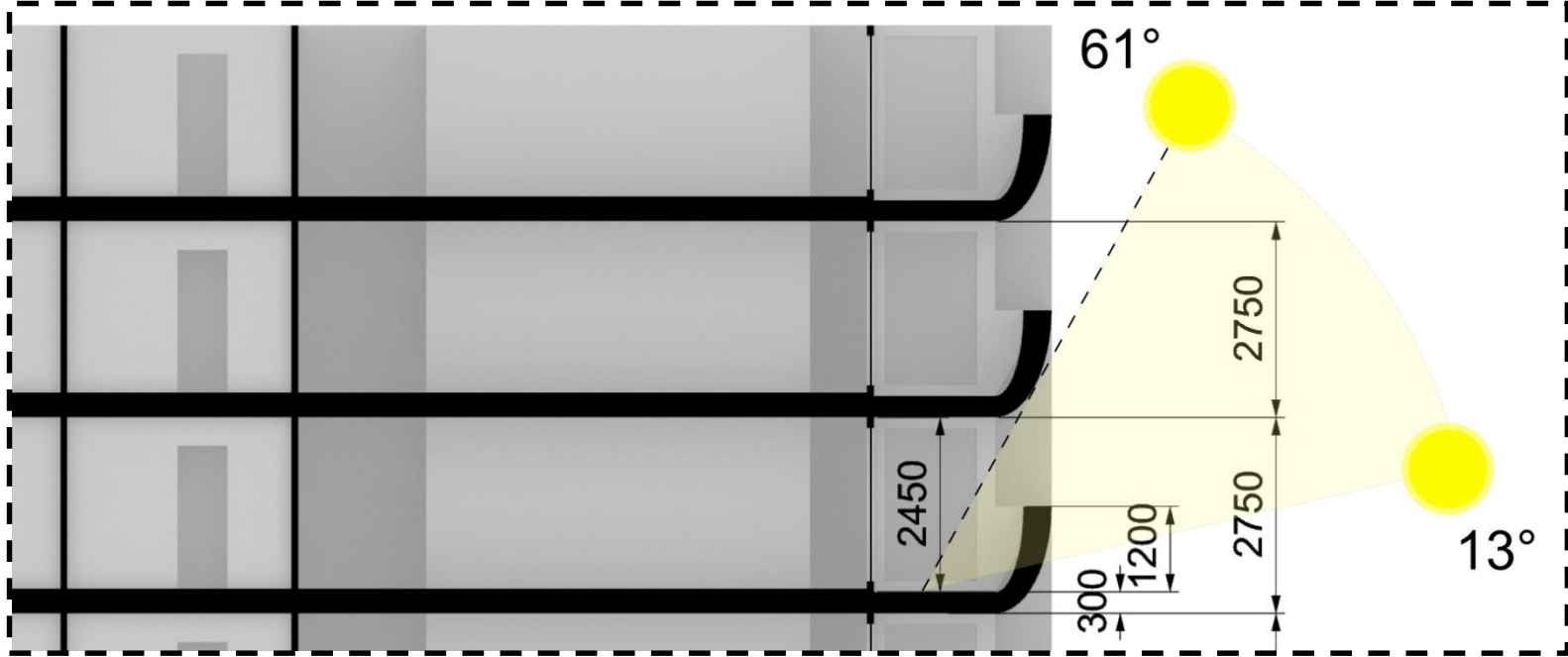
# Cromwell Tower Sections

EXTERNAL FAÇADE:

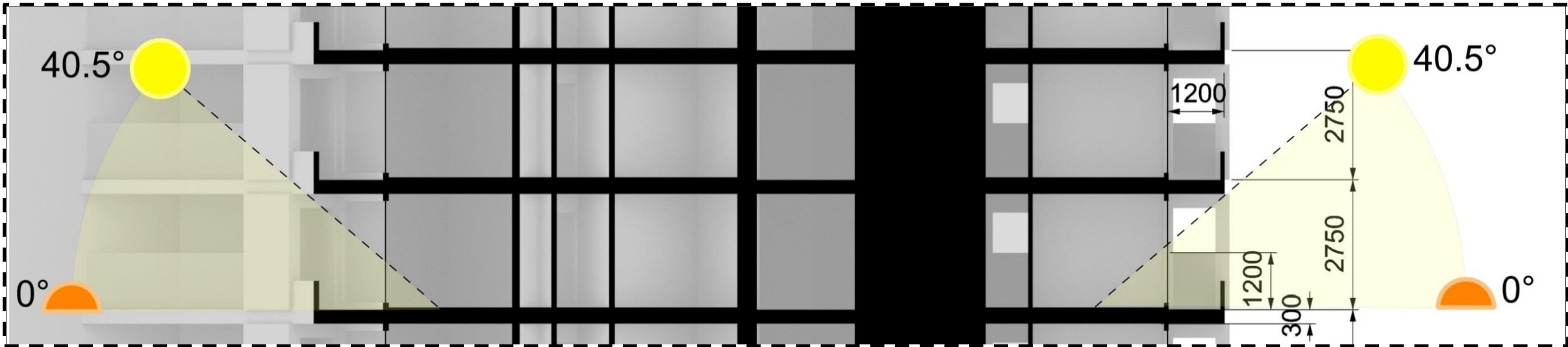
GLAZING/FLOOR RATIO: 35%  
GLAZING RATIO: 51%

300mm CONCRETE WALLS:  $U=3W/m^2K$   
DOUBLE GLAZING:  $U=2.5W/m^2k$

FABRIC HEAT LOSS PER APARTMENT:  
40Kwh/day



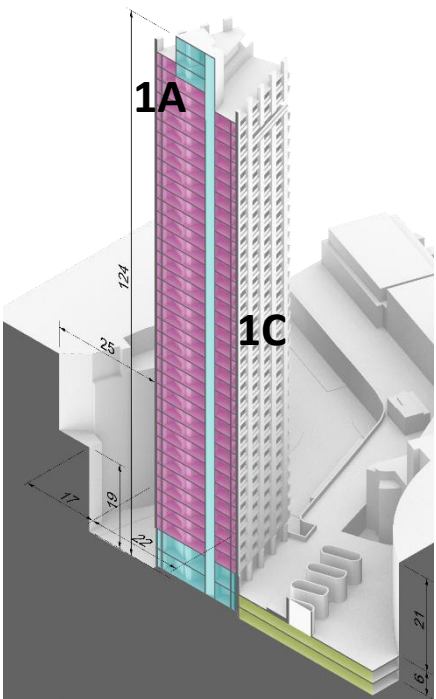
SECTION A-A (NORTH-SOUTH)



SECTION B-B (EAST-WEST)



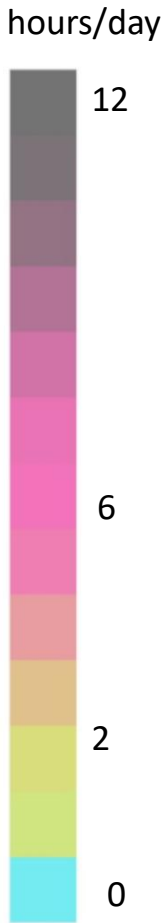
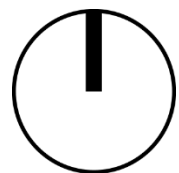
# Cromwell Tower Solar Access



Solar Access Simulation:  
Winter Solstice

**1A** (36<sup>th</sup> floor)

**1C** (15<sup>th</sup> floor)





# Occupancy

7:00-8:30

12:00-13:00

14:00-18:00

18:00-20:00

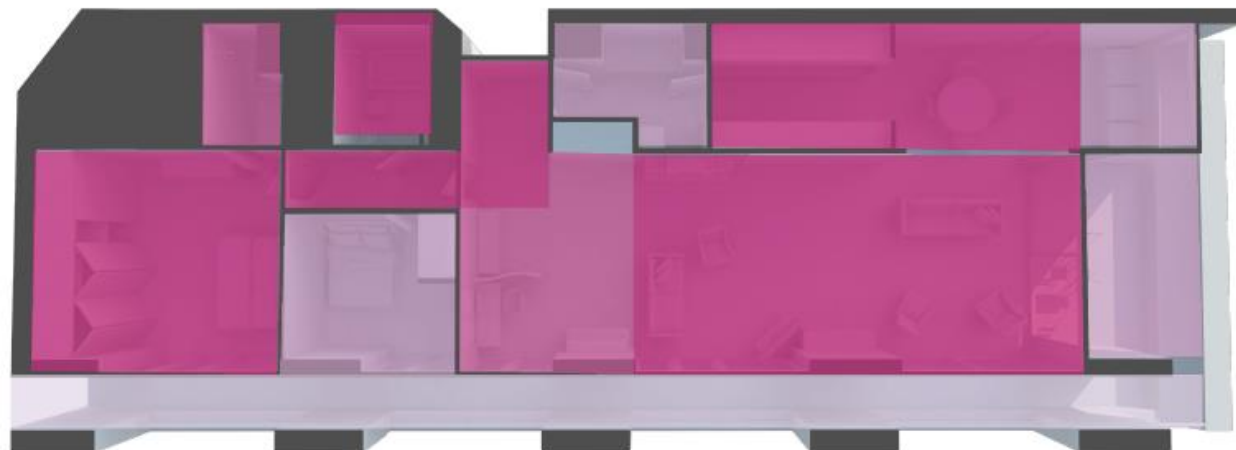
PAYNE:



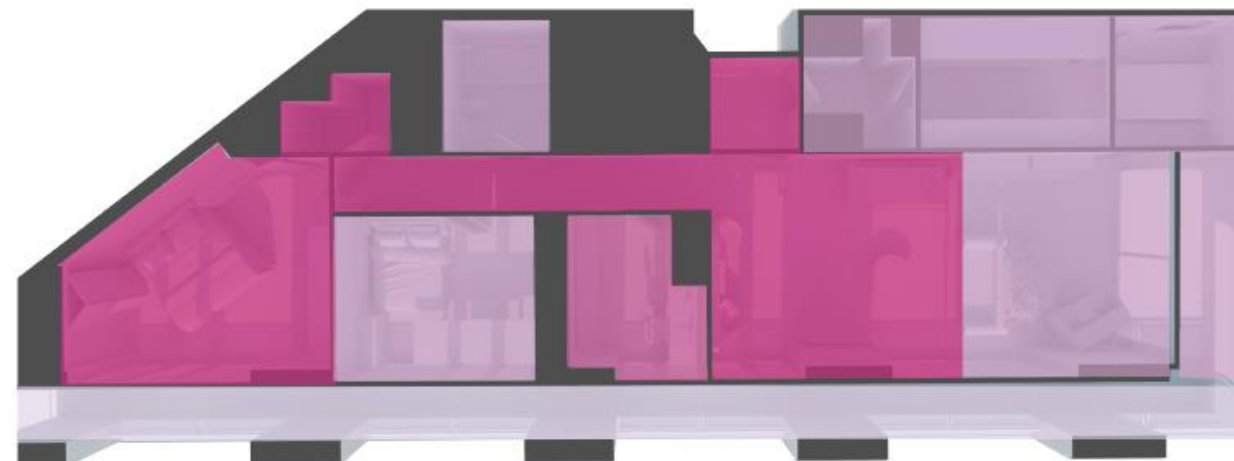
QUINN:



QUINN:

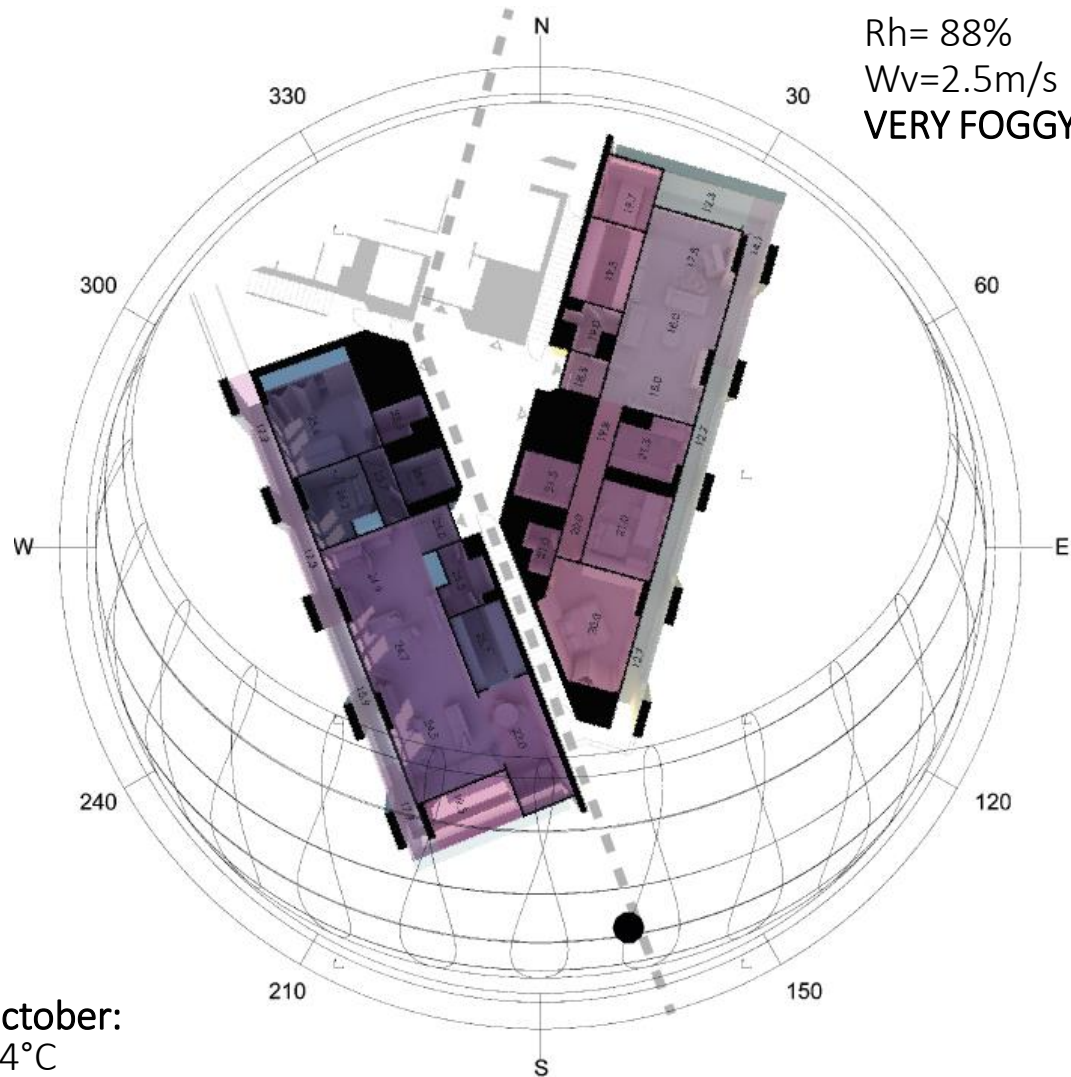


PAYNE:



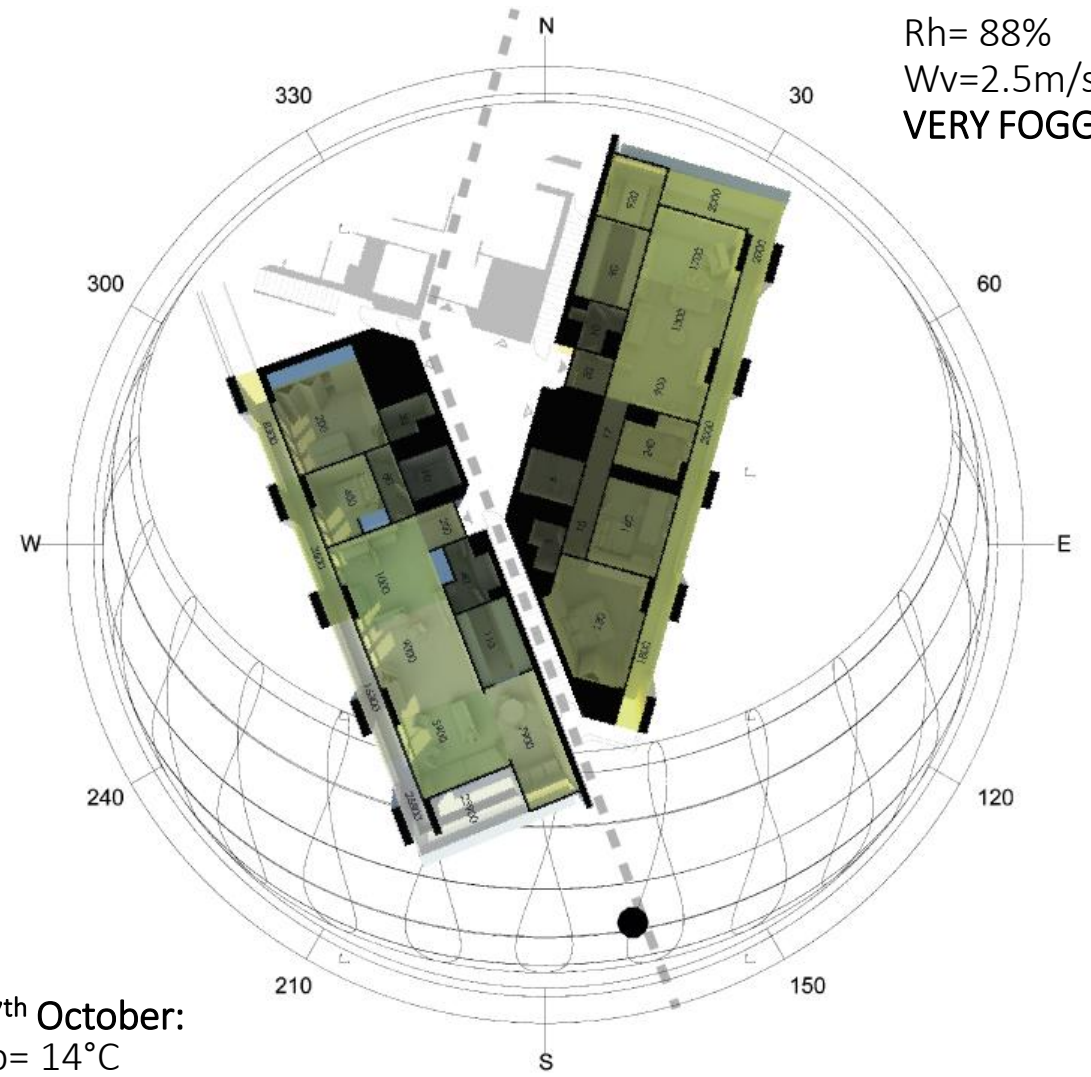


# Measurements



17<sup>th</sup> October:  
Db= 14°C  
Rh= 85%  
Wv=2.7m/s

29<sup>th</sup> October:  
Db= 13°C  
Rh= 88%  
Wv=2.5m/s  
VERY FOGGY



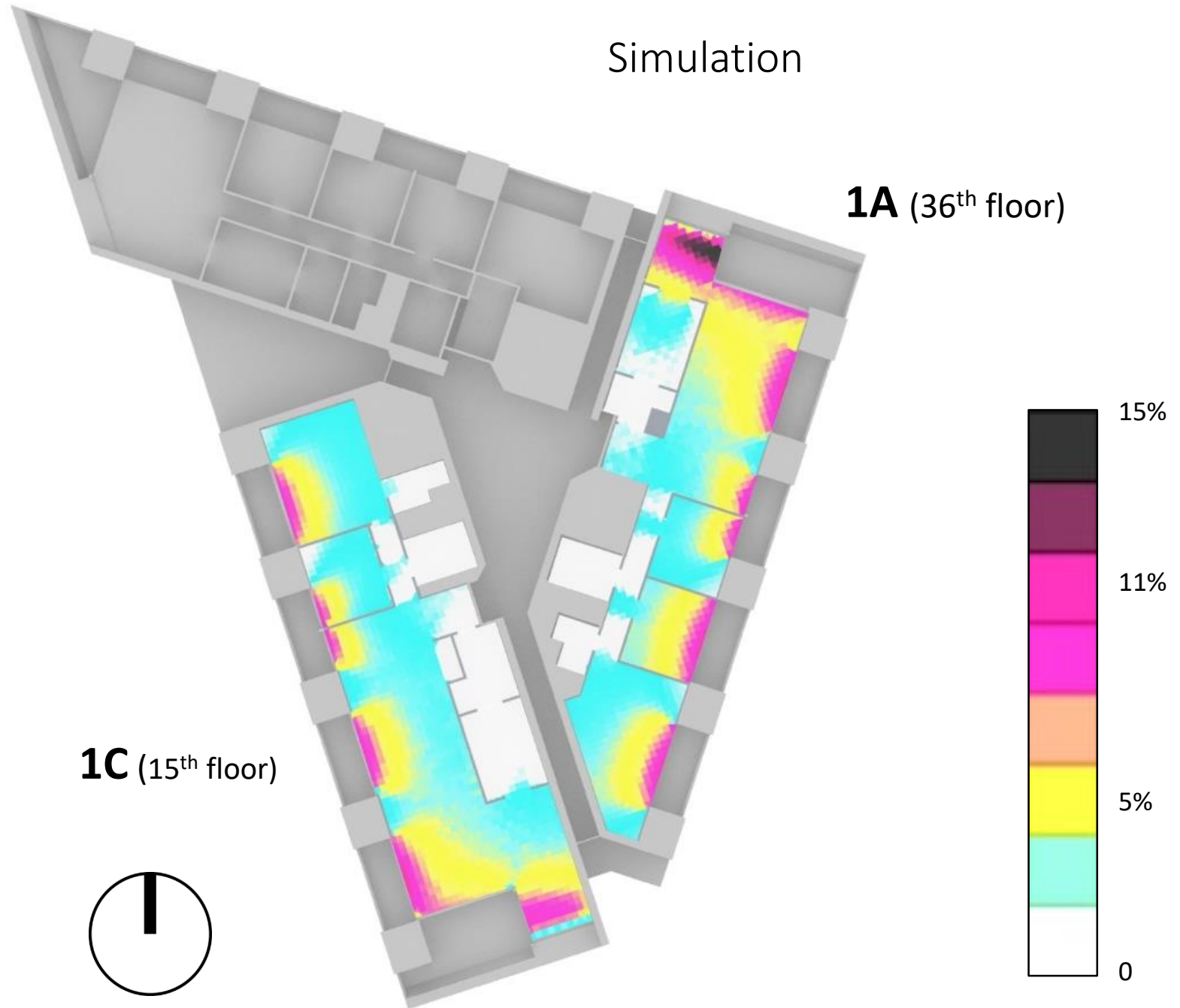
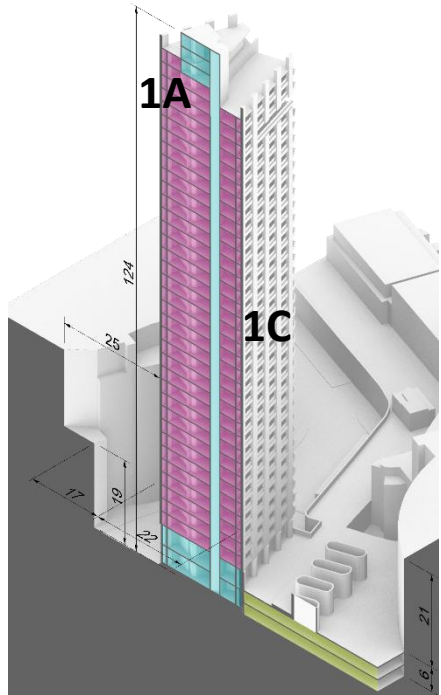
17<sup>th</sup> October:  
Db= 14°C  
Rh= 85%  
Wv=2.7m/s

29<sup>th</sup> October:  
Db= 13°C  
Rh= 88%  
Wv=2.5m/s  
VERY FOGGY



# Cromwell Tower

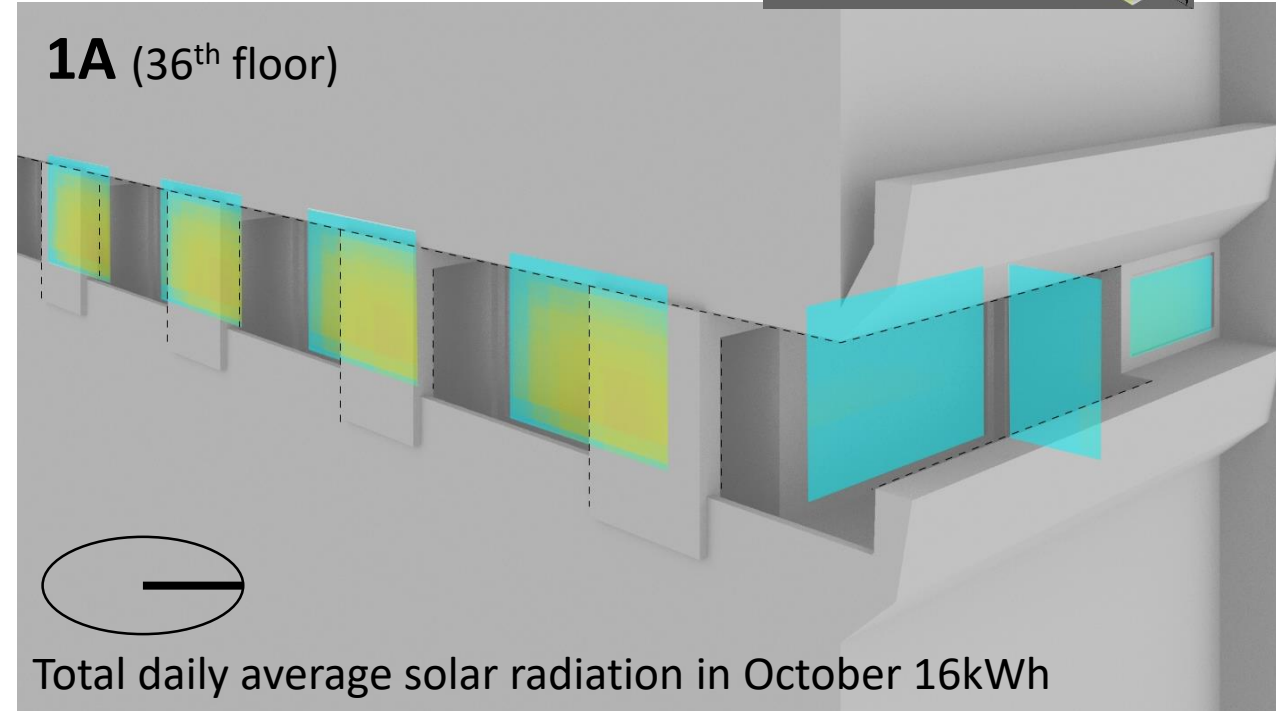
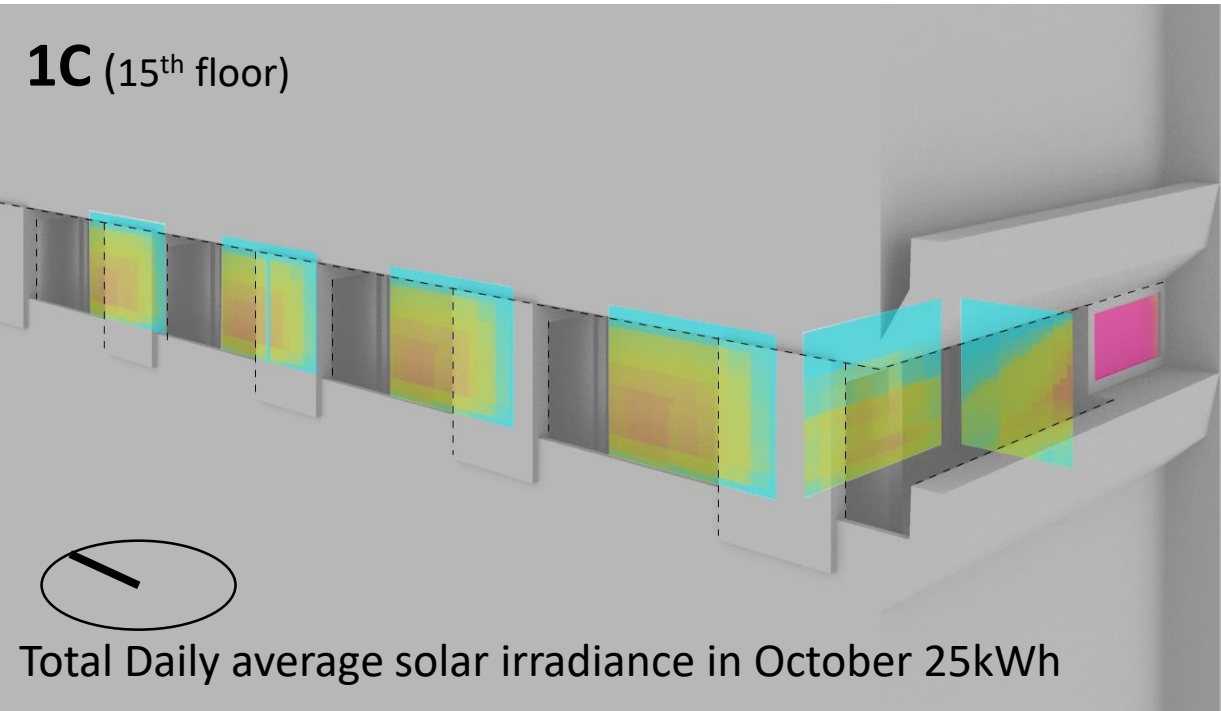
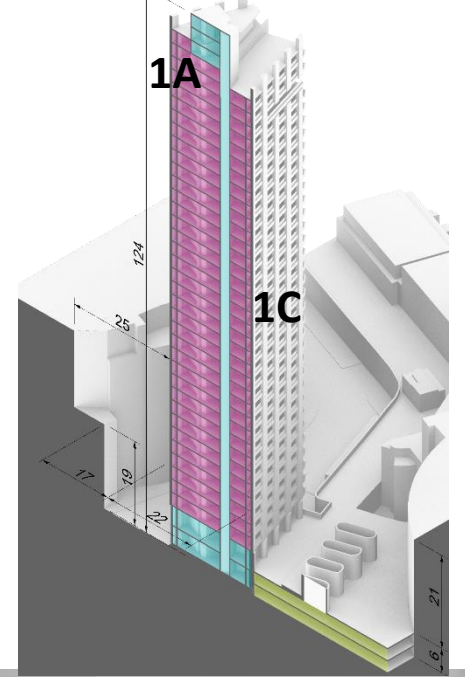
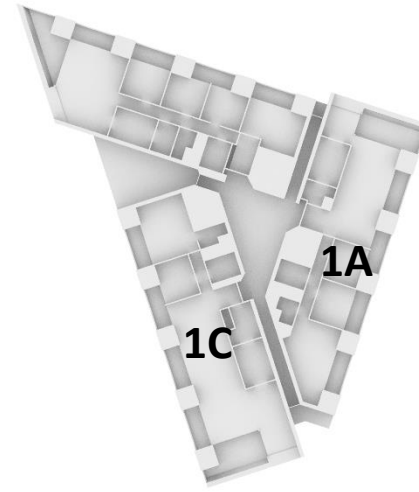
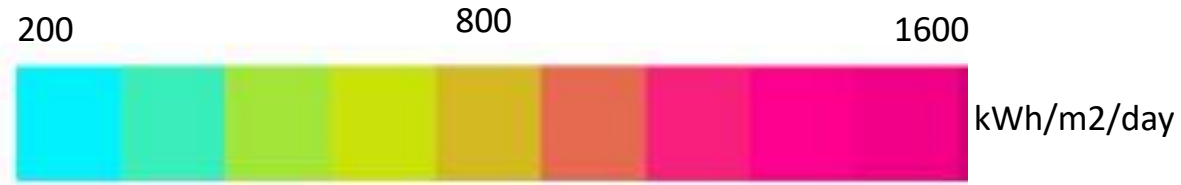
## Day Light Factor





# Cromwell Tower

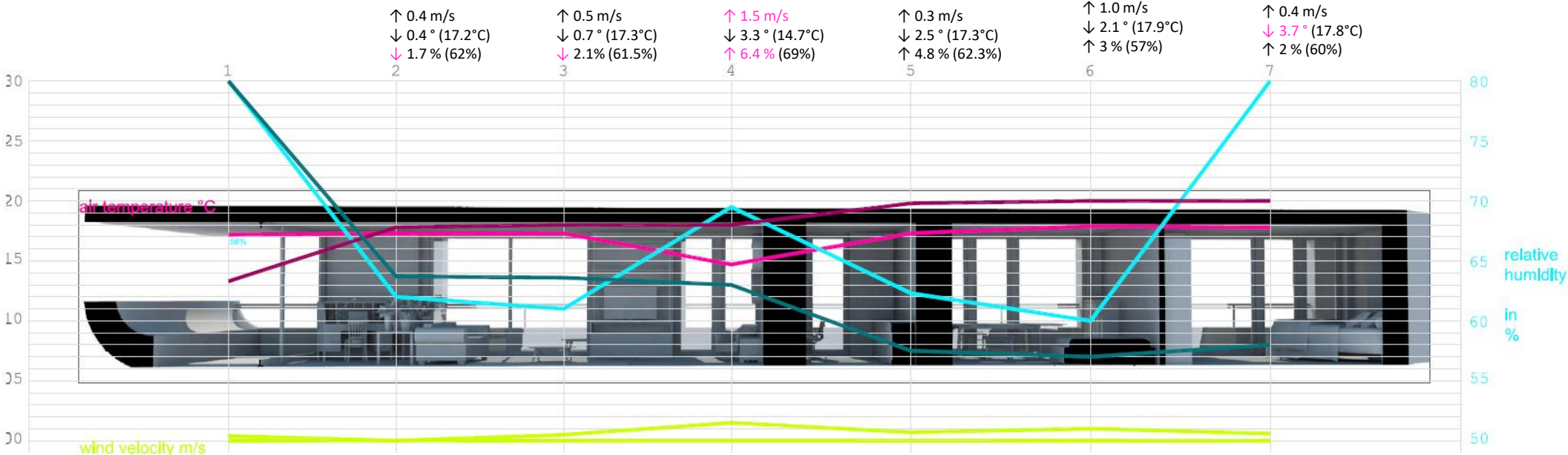
## Daily Solar Radiation



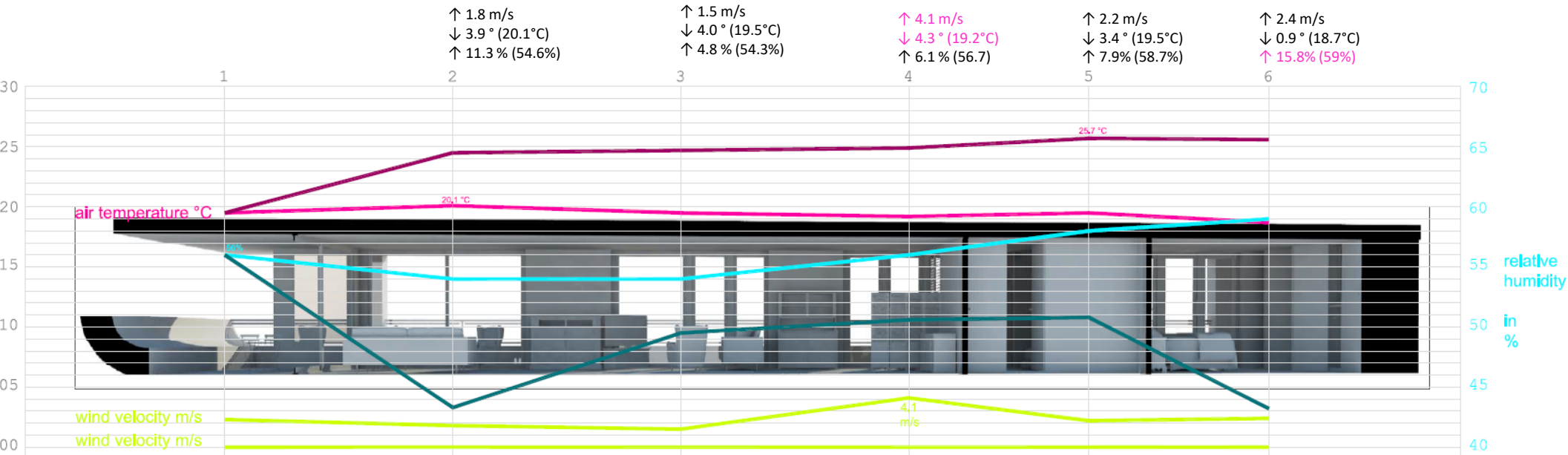


# Wind impact

1A 36<sup>th</sup> floor  
Mr & Mrs  
Payne

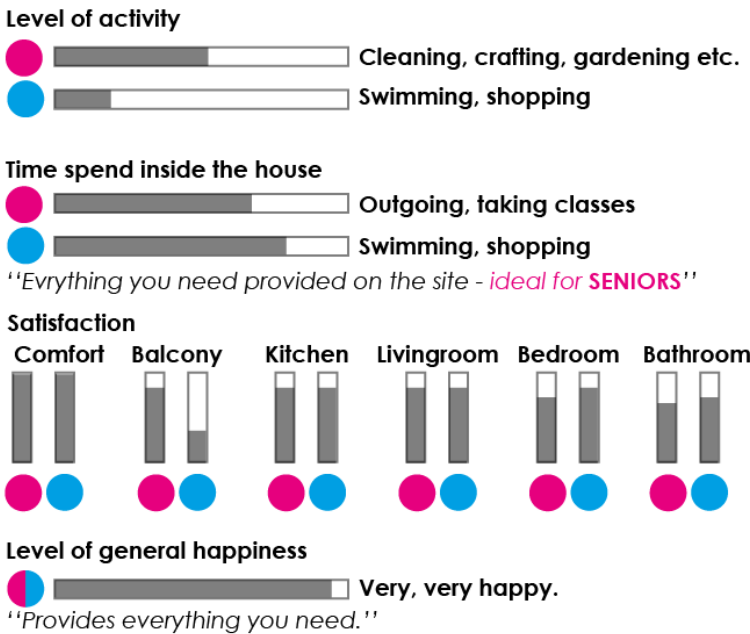
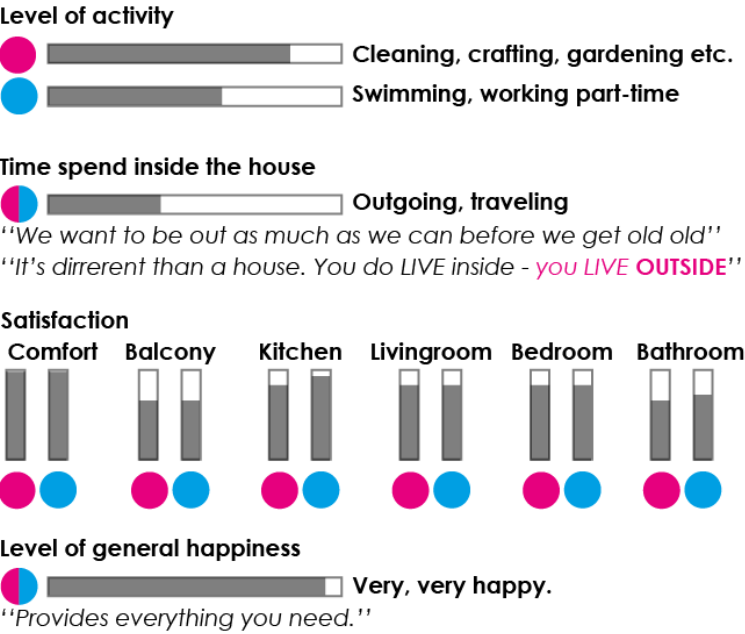


1C 15<sup>th</sup> floor  
Mr & Mrs  
Quinn





# Occupants Perception



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