ARCH633 Environmental Systems I

Assignment 2:
Thermal Climate Documentation Report

Group 3
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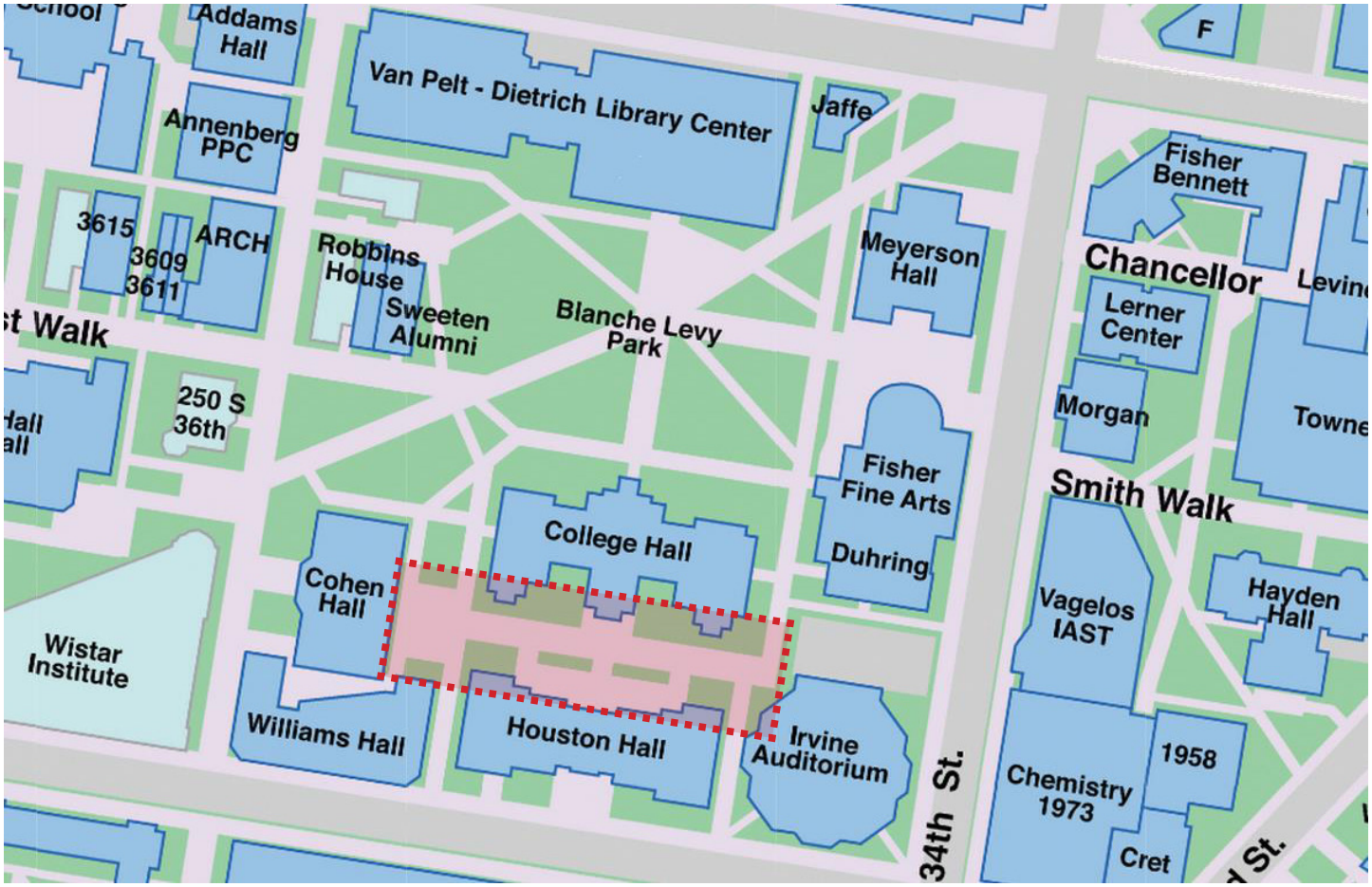
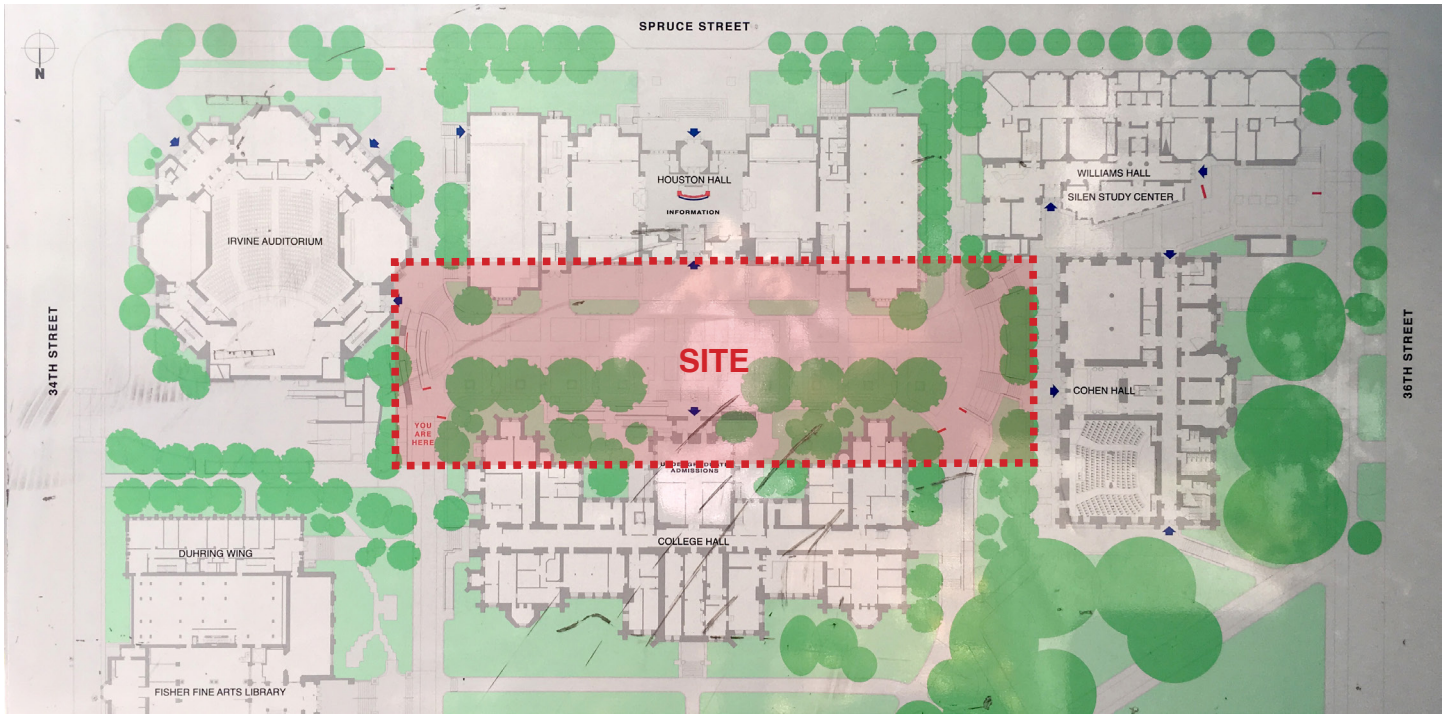
Site Basic Information



Campus Map



Perelman Quadrangle Map

Location:	Perelman Quadrangle, between College Hall & Houston Hall
Area:	20,000 m^2
Documentation Date:	September 10th, 2017
Documentation Times:	10:00 12:00 14:00 16:00
Weather:	Sunny

Site Photos Documentation

Site Condition

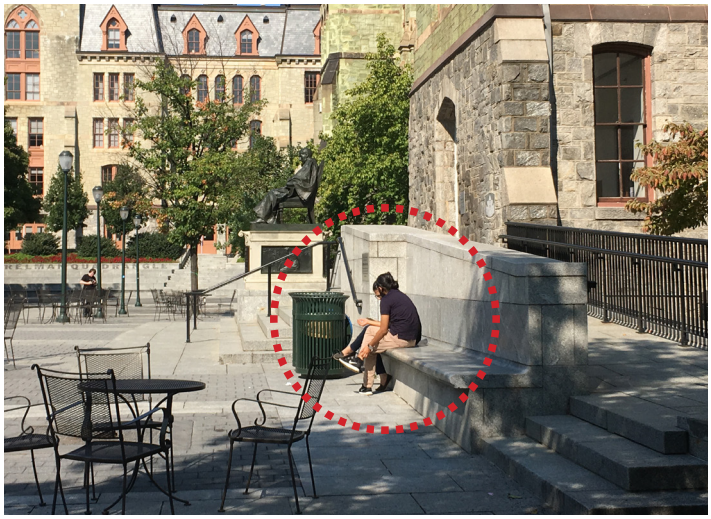
Iron / Masonry Seats

Ground in Sun / Shadow

Time 1: 10:00

	Data from Site	Data from Weather Station
Dry Bulb Air Temperature:	22.7°C	18°C
Wind Speed / Direction:	2.8 m/s (AVG)	4.9 m/s NNE
Feel Like Temperature:		18°C
Relative Humidity:		59%
Surface Temperature:		
(Iron Seats)	25.1°C	
(Masonry Seats)	22.0°C	
(Ground in Sun)	23.2°C	
(Ground in Shadow)	18.2°C	
Comfort Condition:	Comfortable	

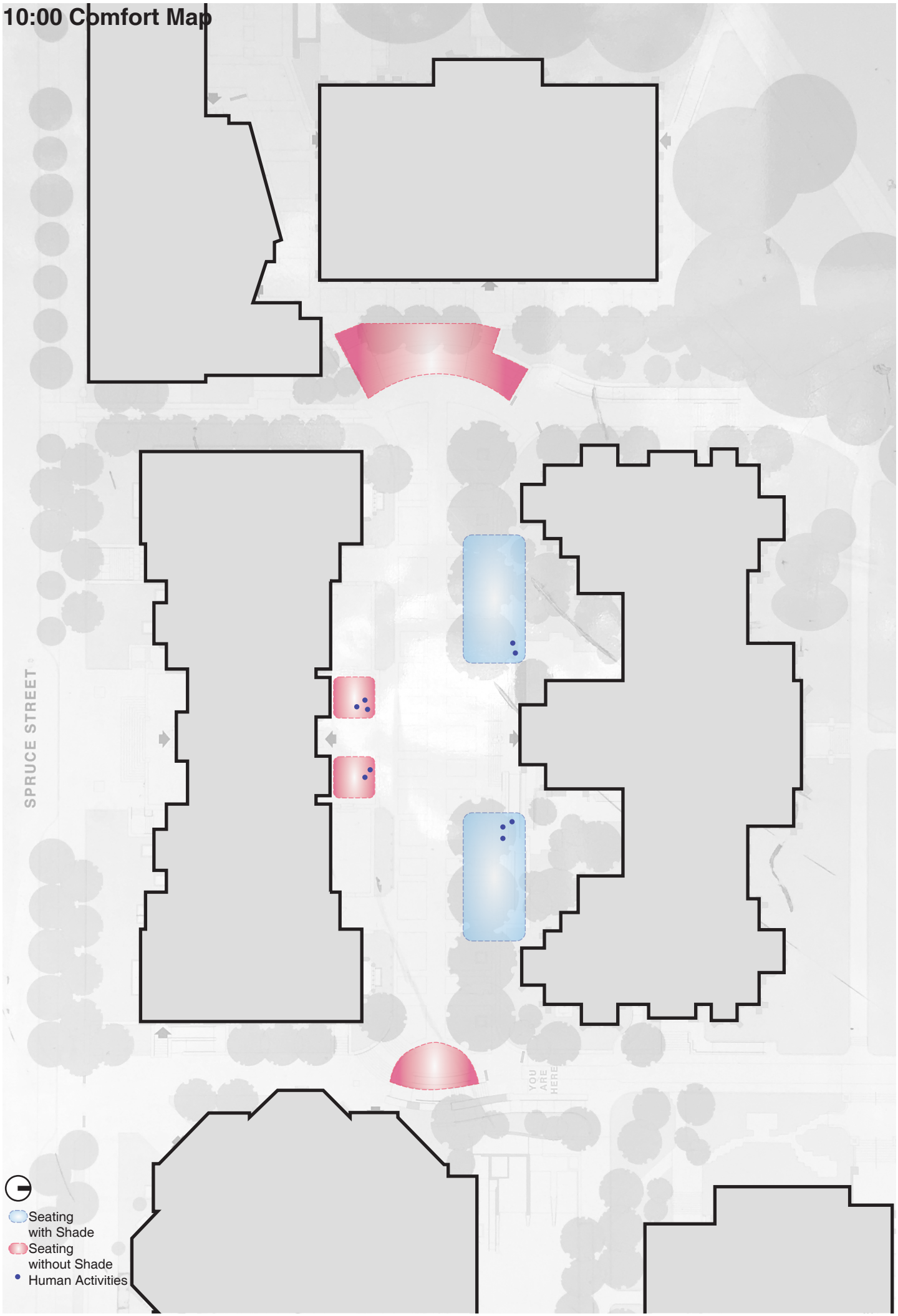
Behavior Photos



Analysis

The temperature is about 22°C at 10:00 am in the morning, which is very comfort without too much direct sunlight. The two different kinds of seating, iron seats and masonry seats, are also in a comfortable temperature. Therefore, people sat very randomly, but it seems that they prefer to talk with each other under the sunshine. Perhaps because it is Sunday morning time for people to enjoy their relaxing weekend.

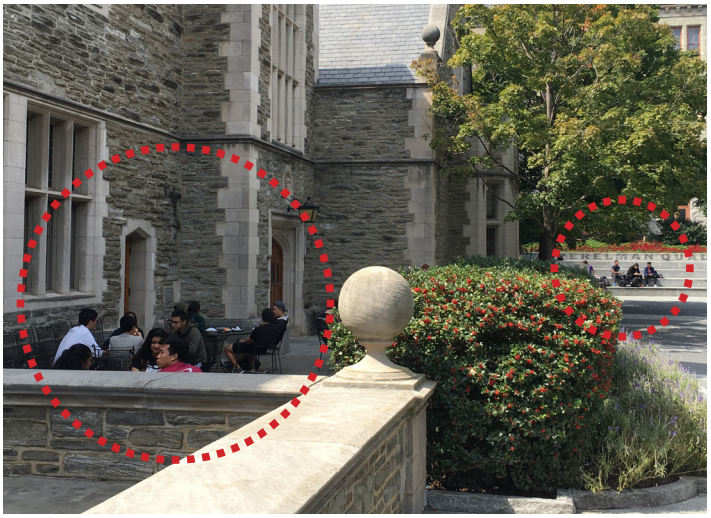
10:00 Comfort Map



Time 2: 12:00

	Data from Site	Data from Weather Station
Dry Bulb Air Temperature:	24.4°C	19°C
Wind Speed / Direction:	1.9 m/s (AVG)	4.4 m/s NNE
Feel Like Temperature:		19°C
Relative Humidity:		55%
Surface Temperature:		
(Iron Seats)	26.3°C	
(Masonry Seats)	27.8°C	
(Ground in Sun)	33.0°C	
(Ground in Shadow)	18.8°C	
Comfort Condition:	Comfortable	

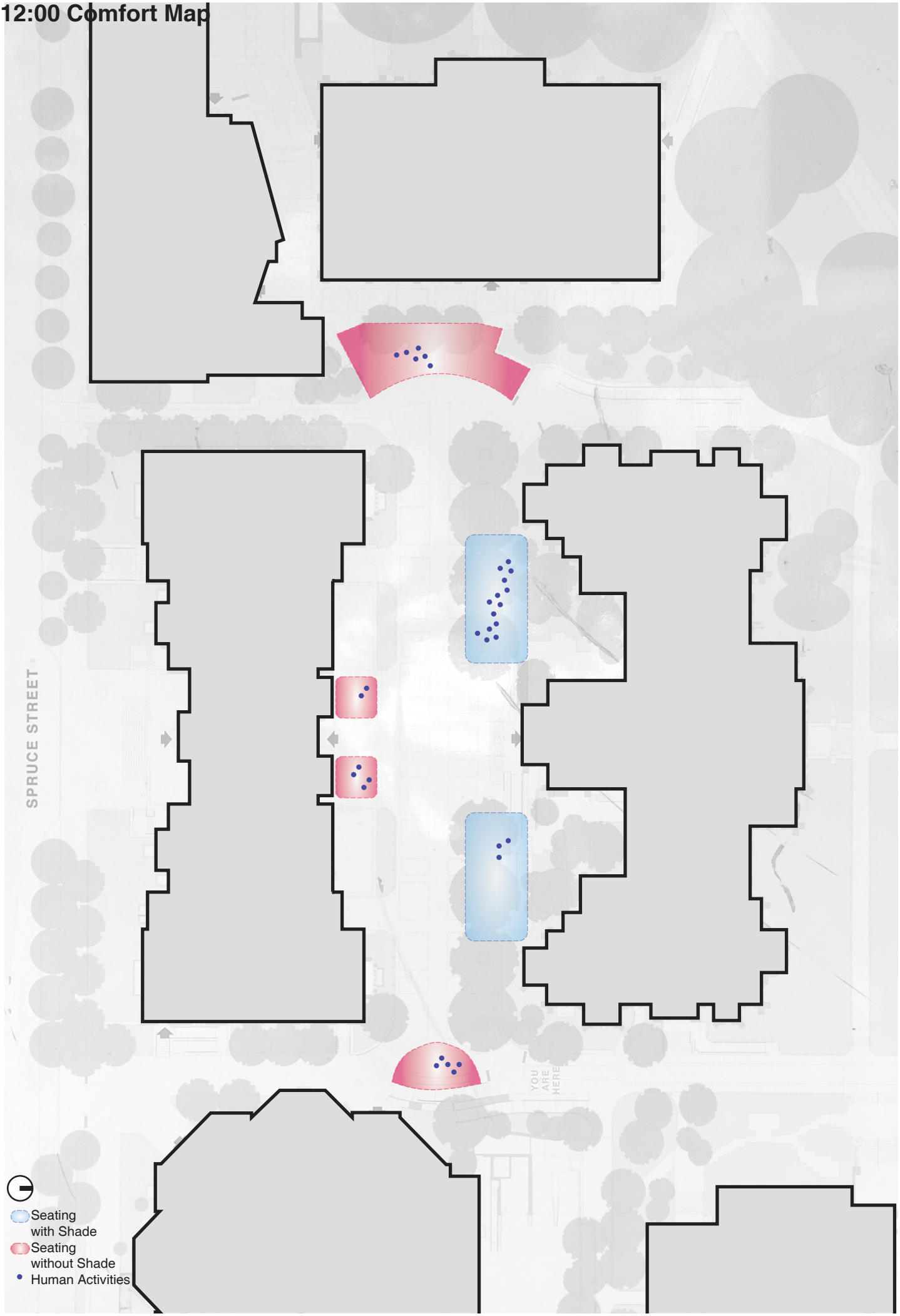
Behavior Photos



Analysis

The temperature is around 24°C according to measurement at noon, which is a little higher than the morning, but still very comfortable for people. Thus more students gathered in the area, talking, eating or studying here in outdoor spaces. Around this time, people chose to sit more randomly, in shadow or sunshine, on iron or masonry seats more according to personal preference. Either of the space or seating area are in moderate feeling temperature, which are comfortable for people.

12:00 Comfort Map



Time 3: 14:00

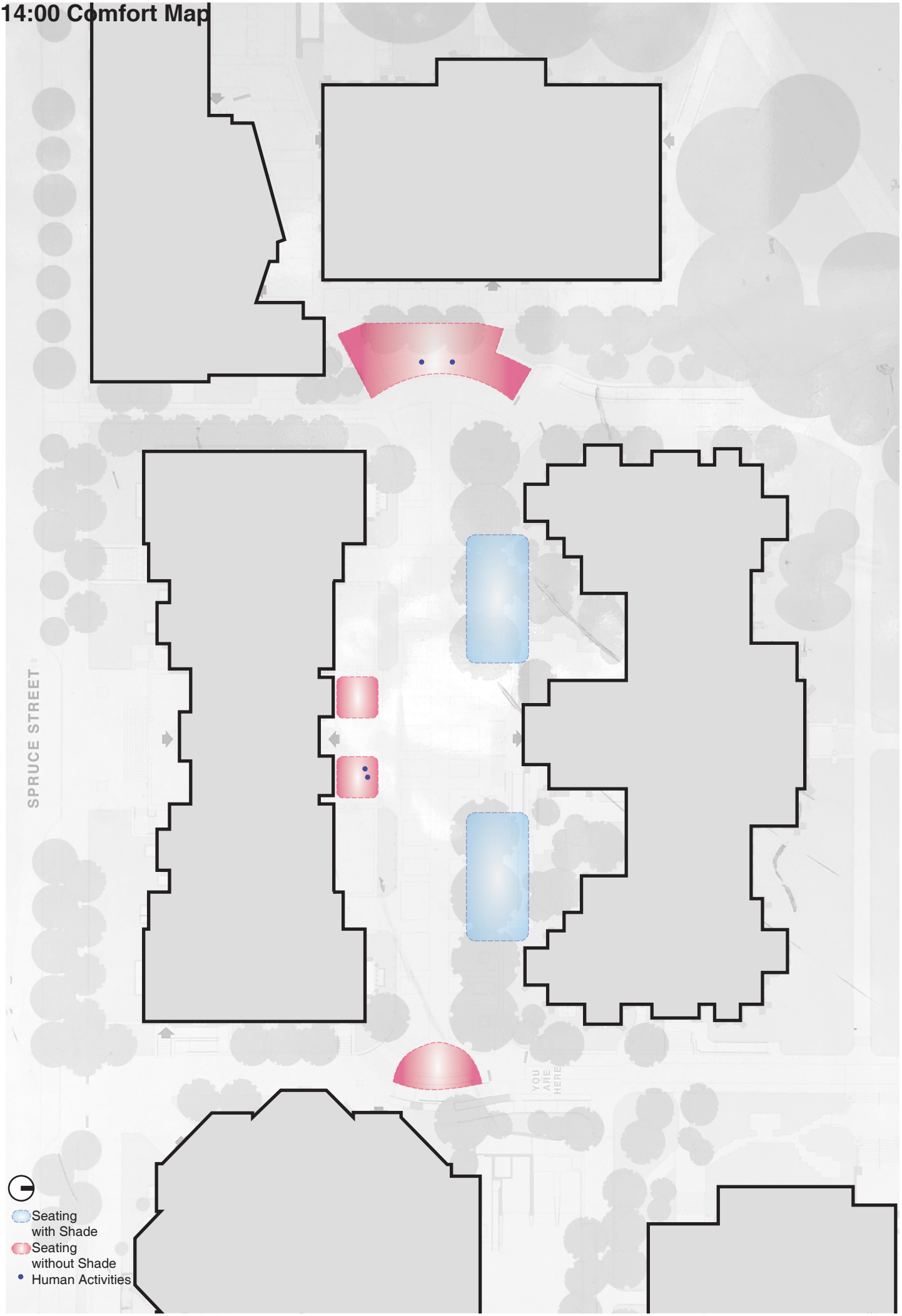
	Data from Site	Data from Weather Station
Dry Bulb Air Temperature:	23.8°C	23°C
Wind Speed / Direction:	2.0 m/s (AVG)	5.4 m/s NNE
Feel Like Temperature:		23°C
Relative Humidity:		44%
Surface Temperature:		
(Iron Seats)	25.7°C	
(Masonry Seats)	28.3°C	
(Ground in Sun)	38.0°C	
(Ground in Shadow)	33.4°C	
Comfort Condition:	Comfortable	

Behavior Photos

Analysis

2:00 pm should be the hottest time during the day, but the temperature is still in a comfortable range, around 23°C. However, there is not many people in the area, especially staying for a while, probably because students usually prefer to stay in indoor space around this time according to our common sense, not due to the climate comfort reason. Actually, the feeling is comfortable and wind is always not too strong during the whole day.

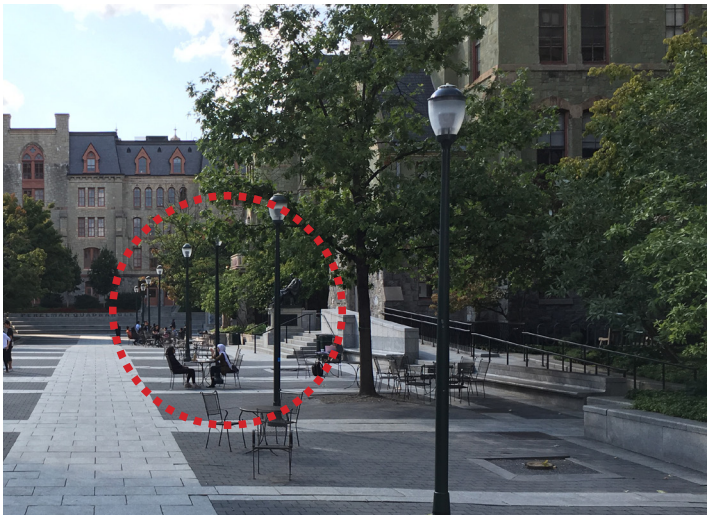
14:00 Comfort Map



Time 4: 16:00

	Data from Site	Data from Weather Station
Dry Bulb Air Temperature:	25.1°C	23°C
Wind Speed / Direction:	1.6 m/s (AVG)	3.1 m/s N
Feel Like Temperature:		23°C
Relative Humidity:		40%
Surface Temperature:		
(Iron Seats)	24.8°C	
(Masonry Seats)	32.4°C	
(Ground in Sun)	33.7°C	
(Ground in Shadow)	30.7°C	
Comfort Condition:	Comfortable	

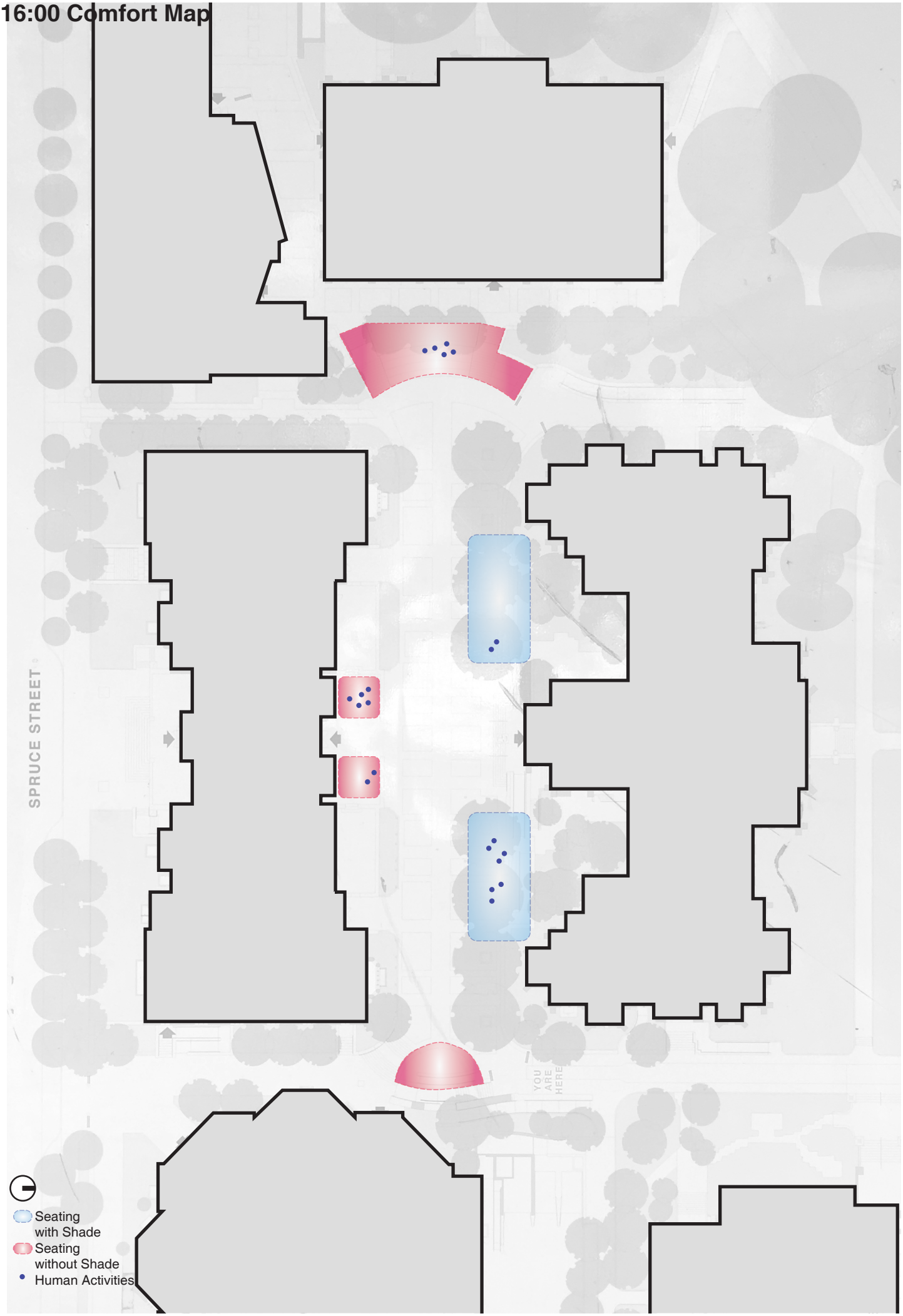
Behavior Photos



Analysis

4:00 pm condition is similar with 12:00, many people come out to sit outside. Actually, most area are in the sunshine now, but sometimes it becomes cloudy not for a long time. This change didn't affect people's behavior, and most students sat in the sunlight area. The temperature, wind and humanity area all very comfortable for people.

16:00 Comfort Map



Question & Answers

1. Relationship between thermal comfort and behavior

Since the temperature in the measurement day is from 22°C to 25°C ; the wind is mild from 1.6m/s to 2.0 m/s; people always feel very comfortable such as sunny day. Therefore, there is not much difference among people's behavior and choices according to thermal comfort. Some people prefer to sit under the sunshine, while some chose to stay in the shadow, maybe according more likely to the personal preference instead of real thermal comfort condition.

2. 2 design proposals to make the space more comfortable for outdoor activities

Because most area in the square is under the sunshine, and there are many iron seats and table around, maybe it is better to put most iron seats under the shadow space. The reason is that in hot summer, iron could absorb much heat and surface temperature could be very high, which is not comfortable for people to sit.

Another proposal maybe could add some water landscape for the area, to moderate the temperature differences in different area of the square's micro-climate.

3. Difference between local weather data, weather file and station weather data

Especially for wind speed, there is much difference between local weather data and weather file. Because station weather data is collected in wider and broader area, such as International Airport for this case, the wind is much stronger compared with in the city. The square measured is surrounded by building in all 4 sides, thus the wind speed were lower. Furthermore, the air temperature still show some difference with the weather data, probably due of the inaccuracy of the measure tool.

4. Based on your observations, predict the comfort map in a summer day and in a winter day

In summer day, people may prefer to sit in shadow space, like under the trees, but they may be more willing to choose some seats more closed to the center of the square because of the wind. However, in the winter, the choices may be on the contrary, students perhaps prefer to sit in the sunshine in the corner or sides of the square, where the feeling temperature is higher than the center but wind speed is lower.