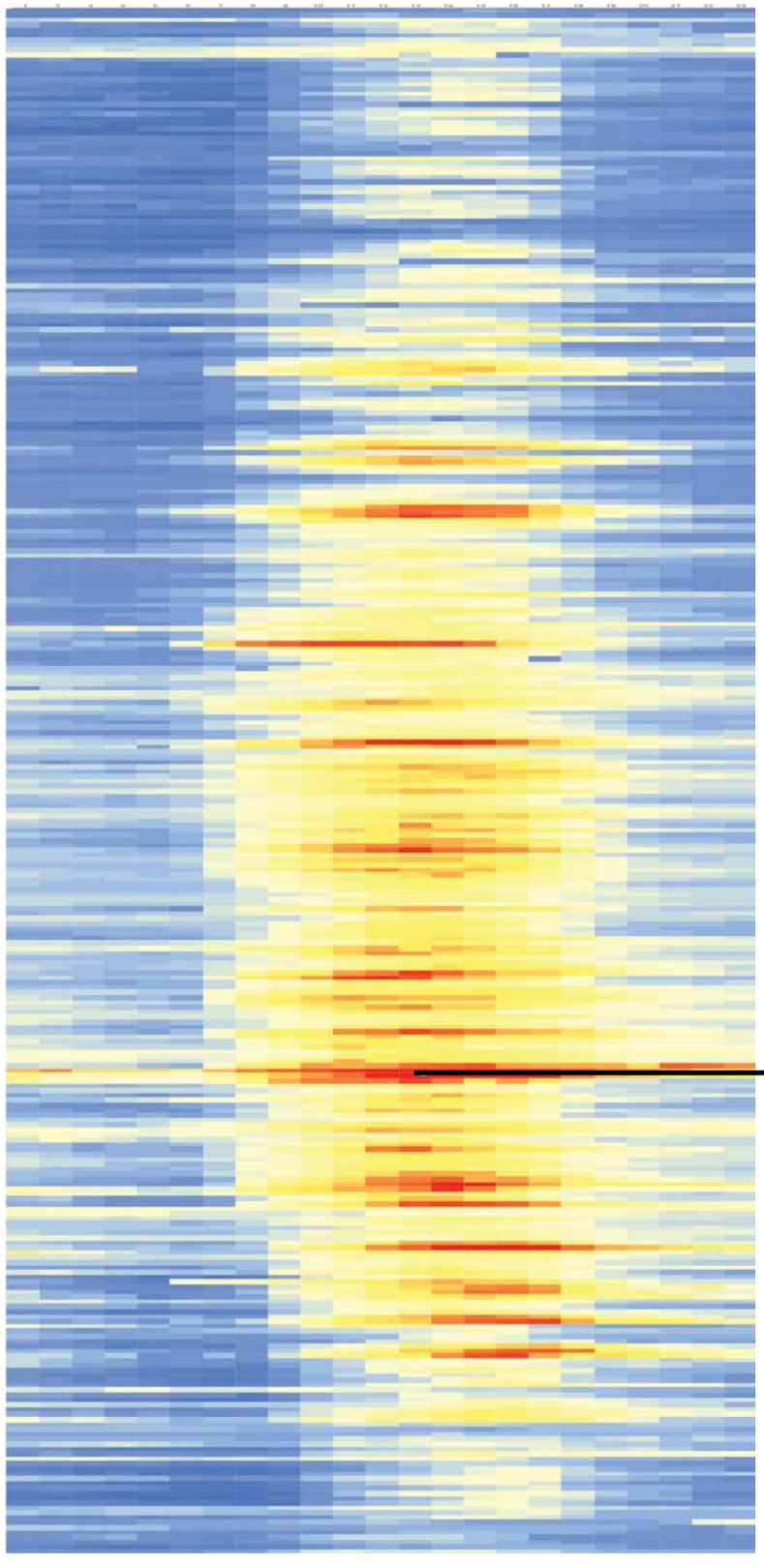
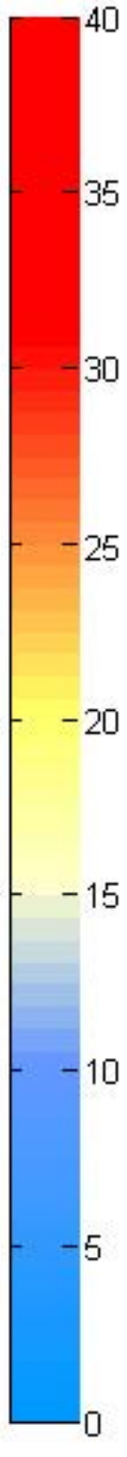
Resilient San Francisco 2080

Cressica Brazier
Fei Hong
Juney Lee
Chris Mackey
Karen Noiva

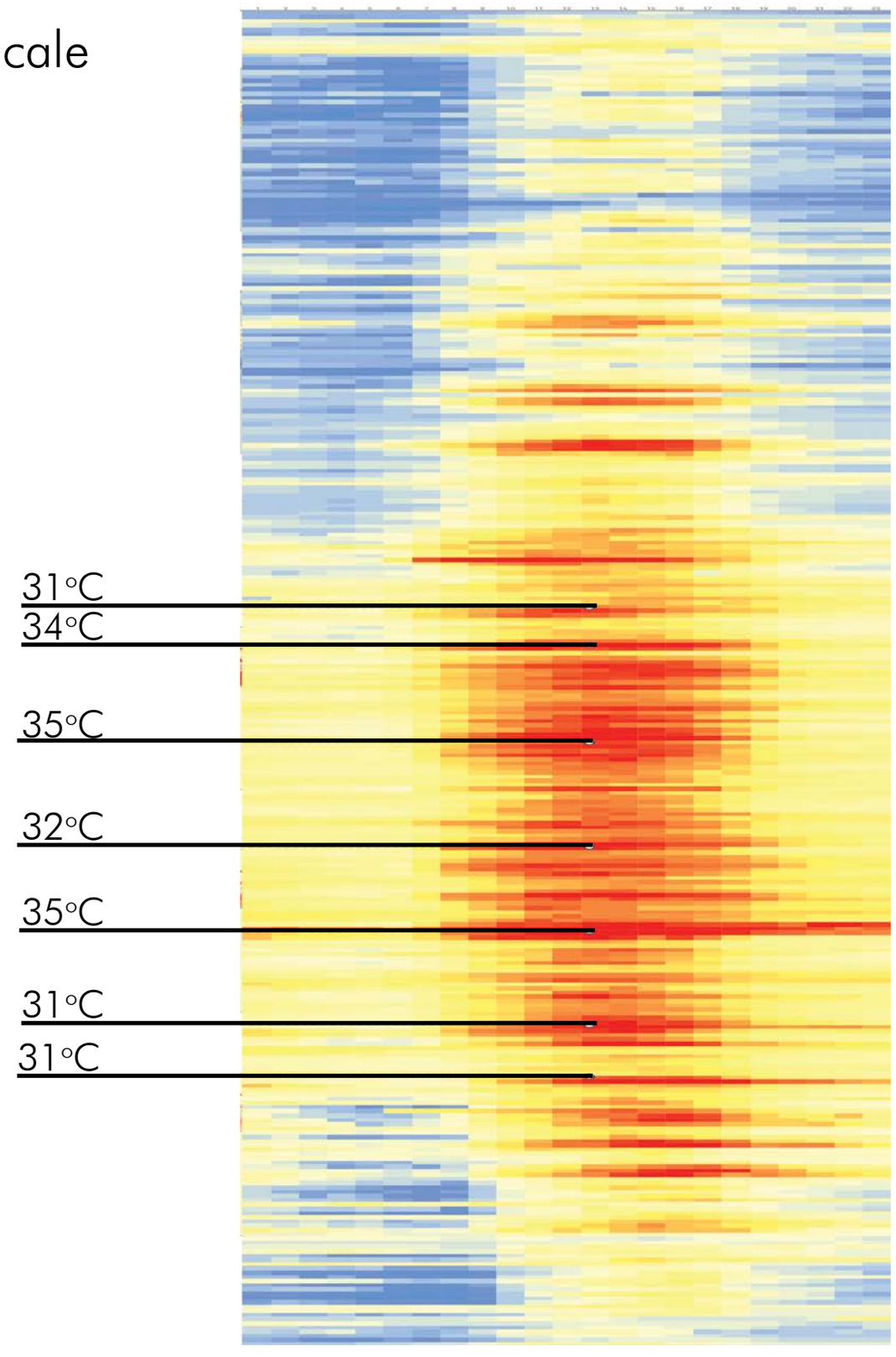
SFClimate 2010



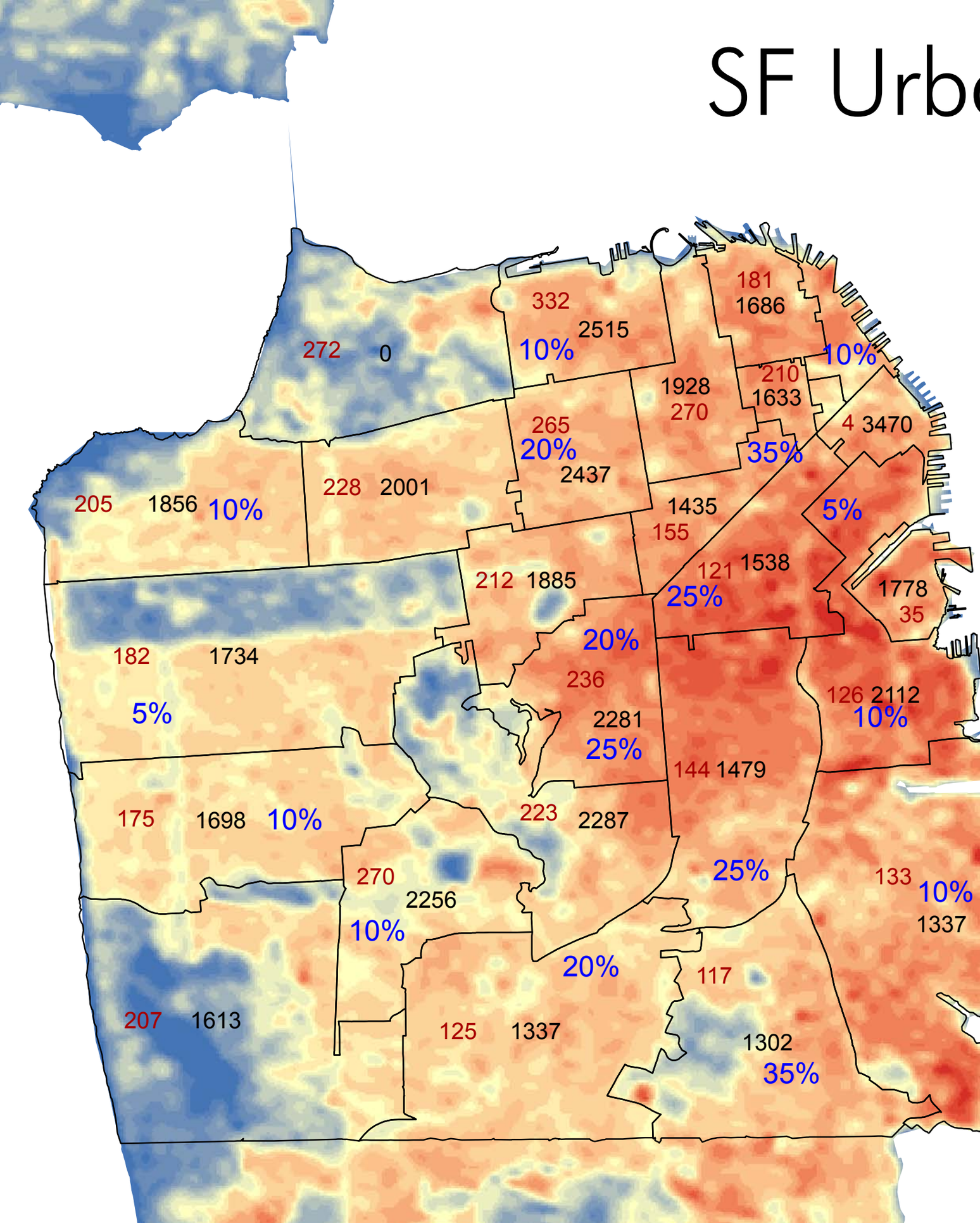
Temperature Scale



SF Climate 2080



SF Urban Heat Island



Surface Temperature Scale

20 25 30 35 40 °C

Natural Gas Use per Capita (Therms)

Annual Electricity Use per Capita (kWhr)

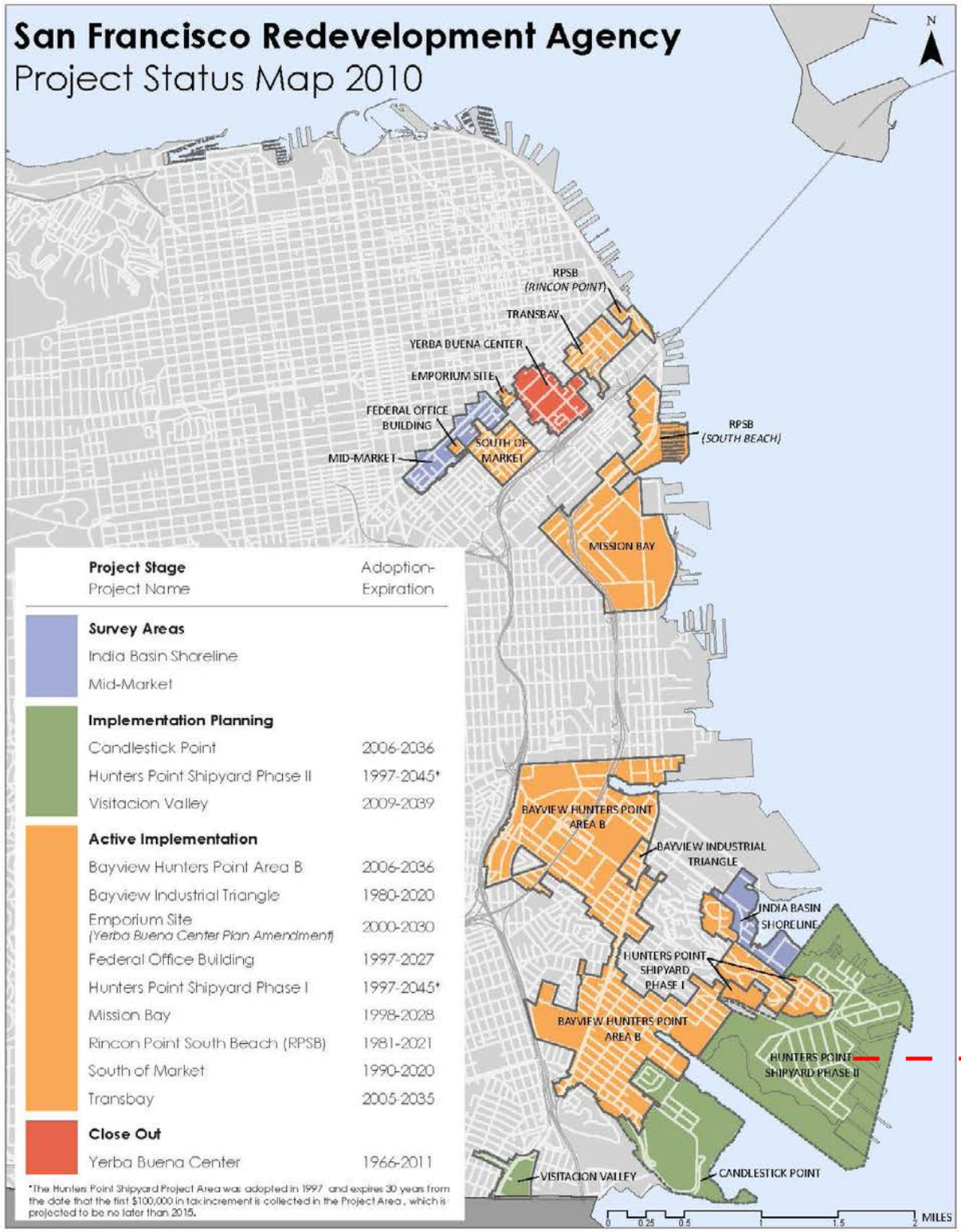
Percentage of Households with Air Conditioning

Our Site

Our Goals:

1) Eliminate the use of gas by using passive solar and heat island.
2) Eliminate air conditioning with cool bay water and night flushing

OUR SITE'S PROJECT STATUS MAP



– – – – We focus on phase 2 in green

EXISTING DOWNTOWN SAN FRANCISCO

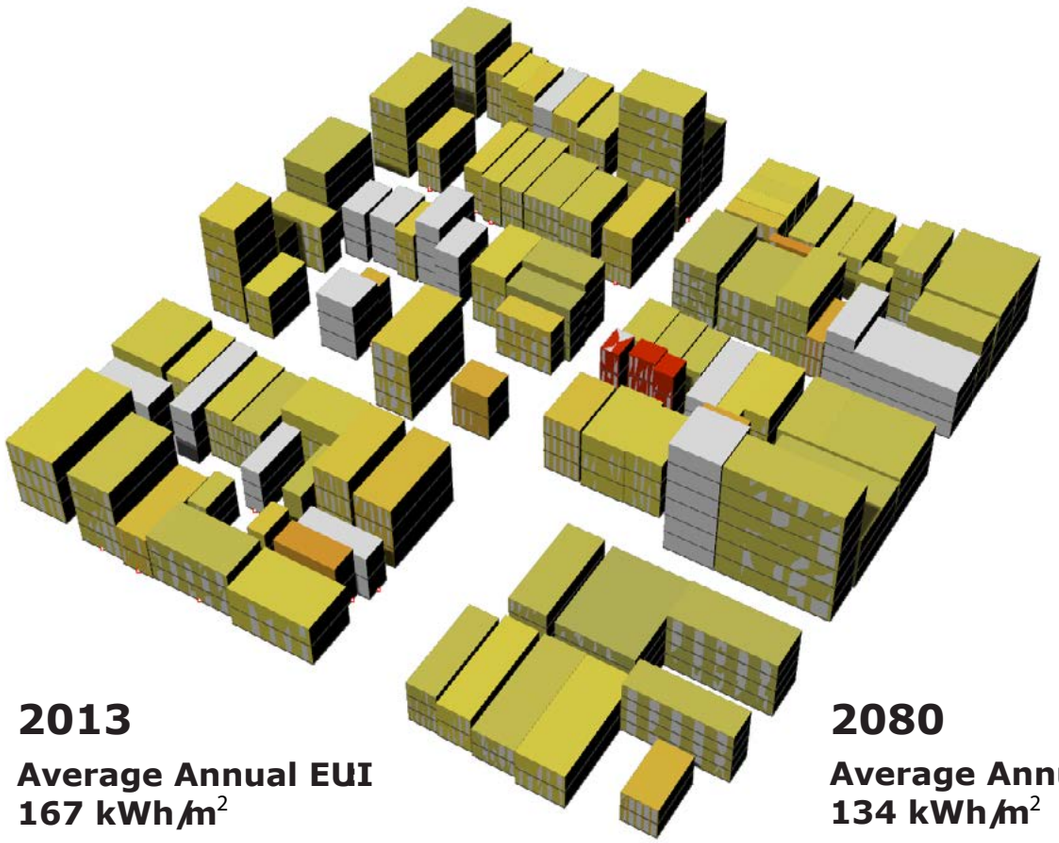
EXISTING Downtown San Francisco
Global Warming Will Reduce Building Energy Use And Outdoor Comfort

2.1-3.9
Density[FAR]

124-167
Energy[kWh/m²]

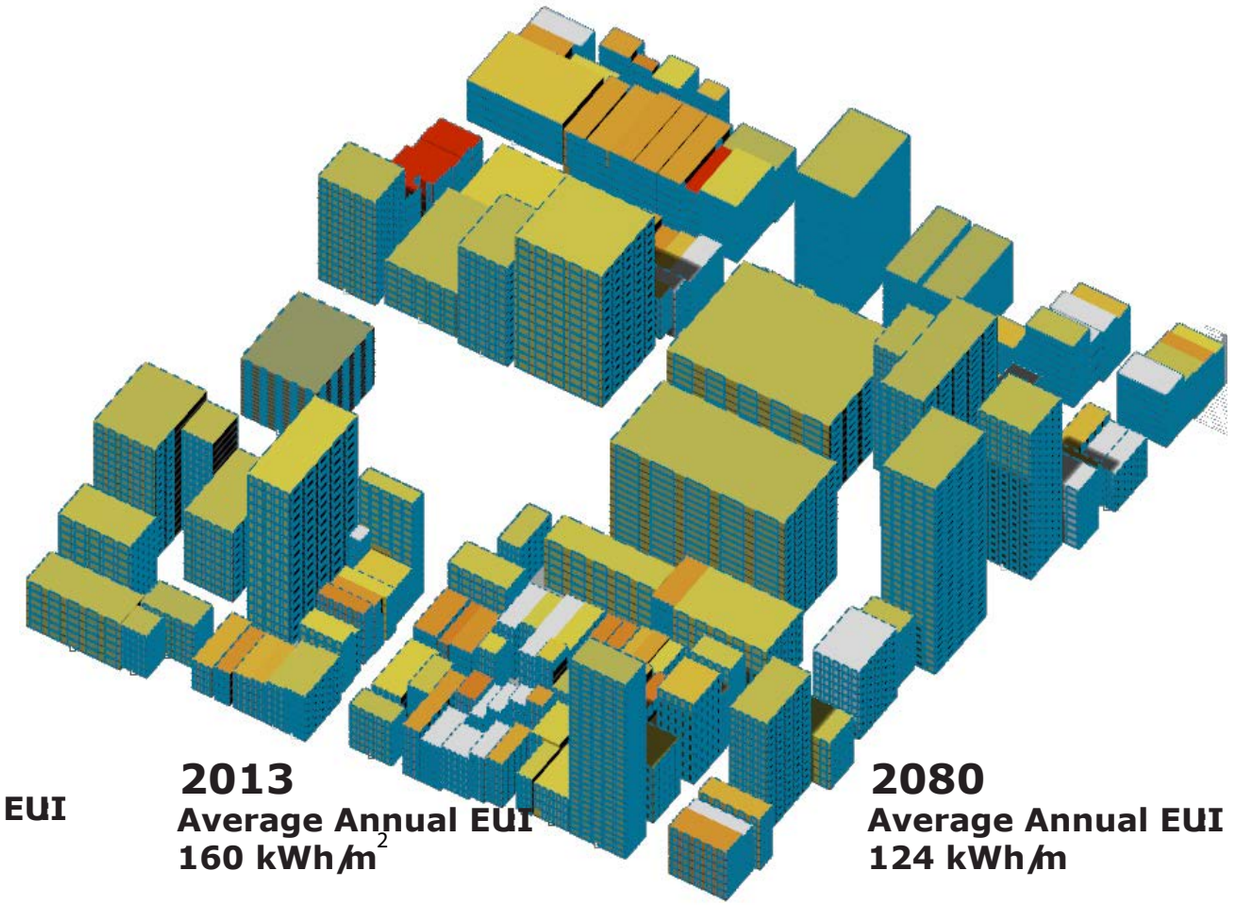
85
Accessibility[%]

Existing Low Density, Predominantly Residential Neighborhood



2013
Average Annual EUI
167 kWh/m^2

2080
Average Annual EUI
134 kWh/m^2



2013
Average Annual EUI
160 kWh/m^2

2080
Average Annual EUI
124 kWh/m

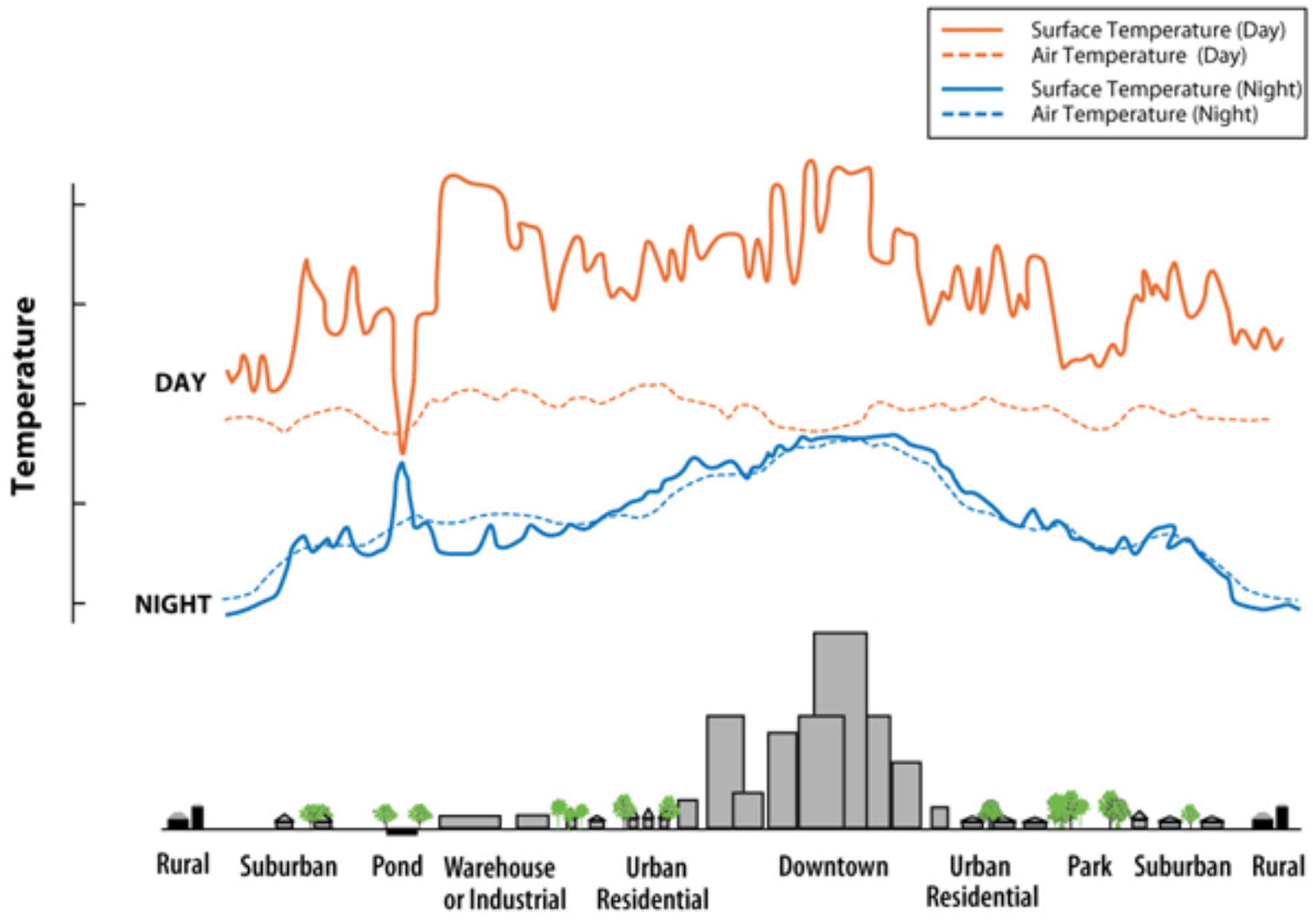
EXISTING Downtown San Francisco
Global Warming Will Reduce Building Energy Use And Outdoor Comfort

2.1-3.9 Density[FAR]

124-167 Energy[kWh/m²]

85 Accessibility[%]

Walkable San Francisco



EXISTING Downtown San Francisco
Global Warming Will Reduce Building Energy Use And Outdoor Comfort

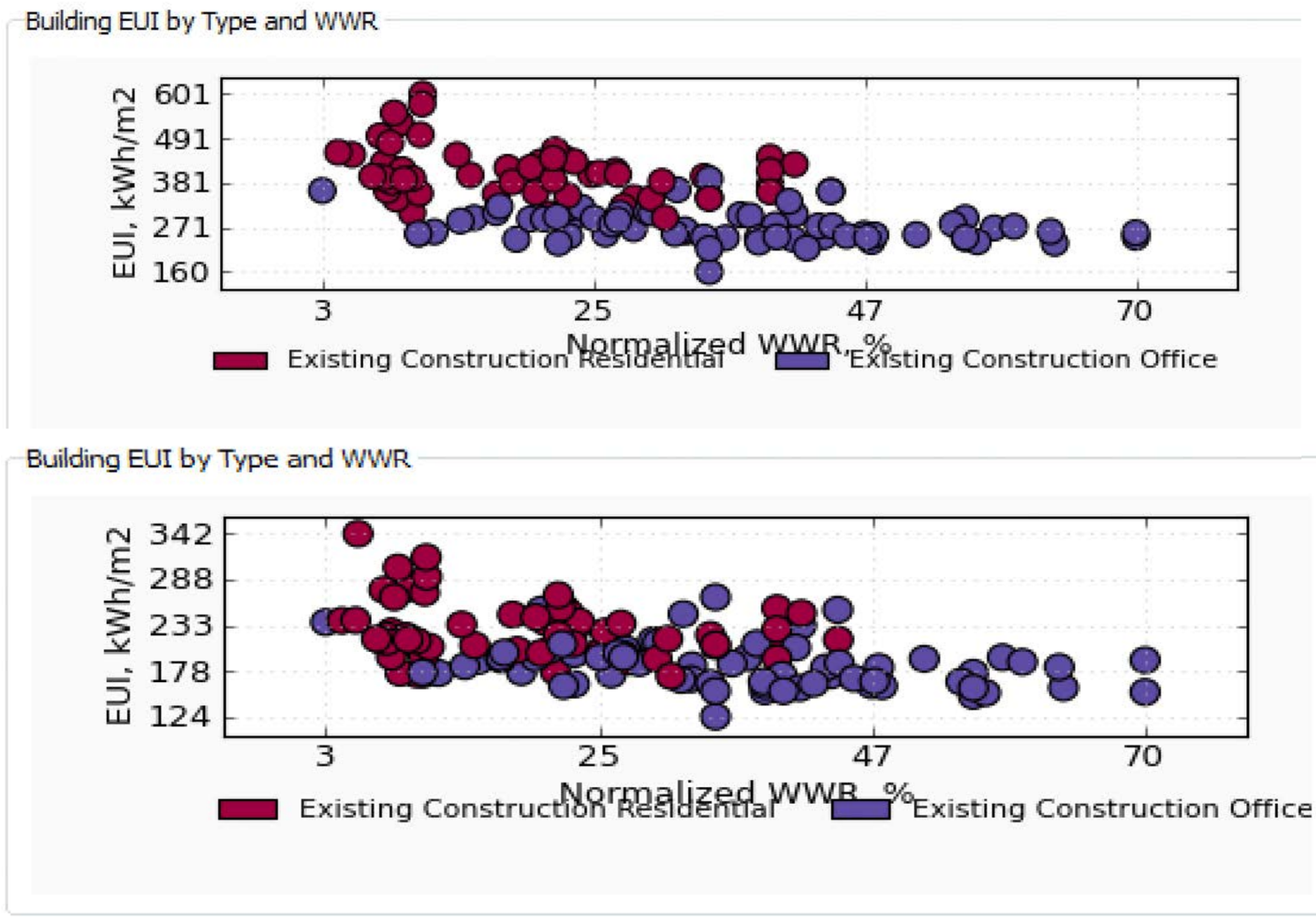
2.1-3.9 Density[FAR]

124-167 Energy[kWh/m²]

85 Accessibility[%]

Urban Heat Island

2013



2080

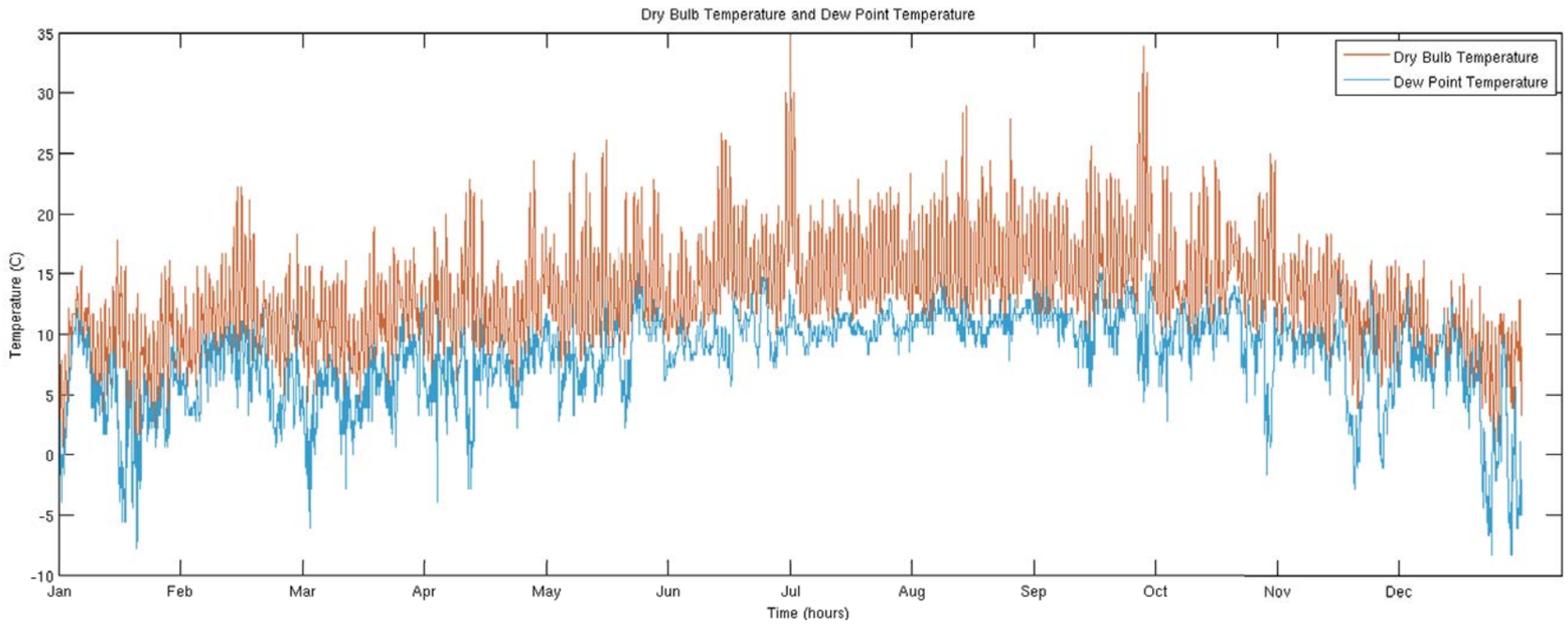
EXISTING Downtown San Francisco
Global Warming Will Reduce Building Energy Use And Outdoor Comfort

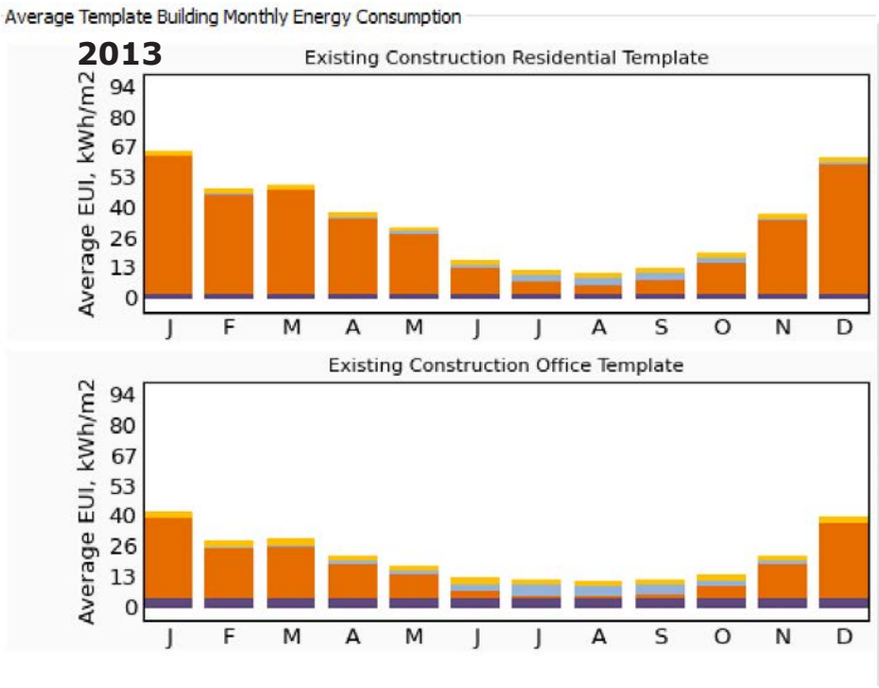
2.1-3.9 Density[FAR]

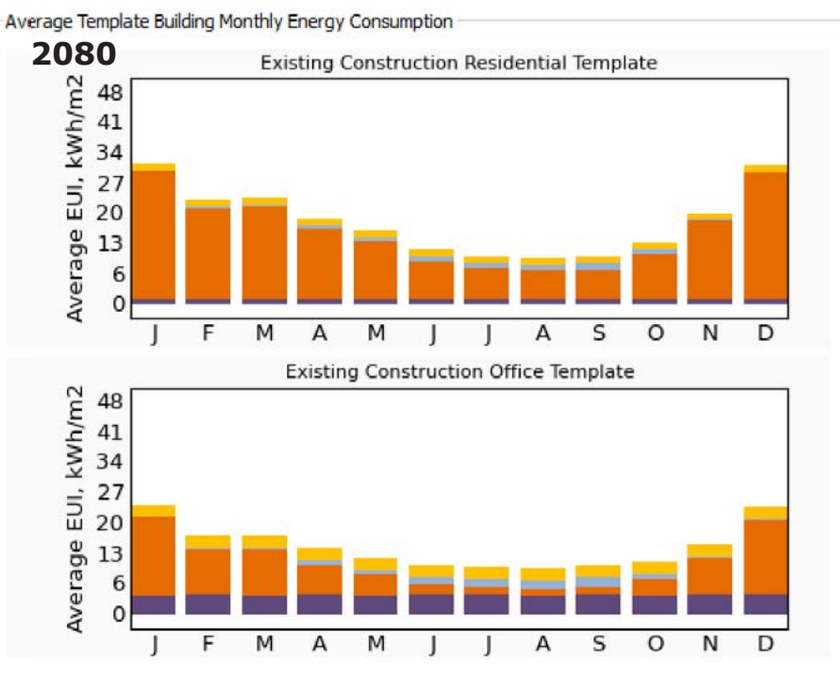
124-167 Energy[kWh/m²]

85 Accessibility[%]

Warmer Weather Reduces Annual Energy Consumption







CURRENT DEVELOPER PROPOSSAL

DEVELOPER Proposal for Hunter's Point

The Currently Proposed Masterplan By The Developer Lennar Urban

0.8 Density[FAR]

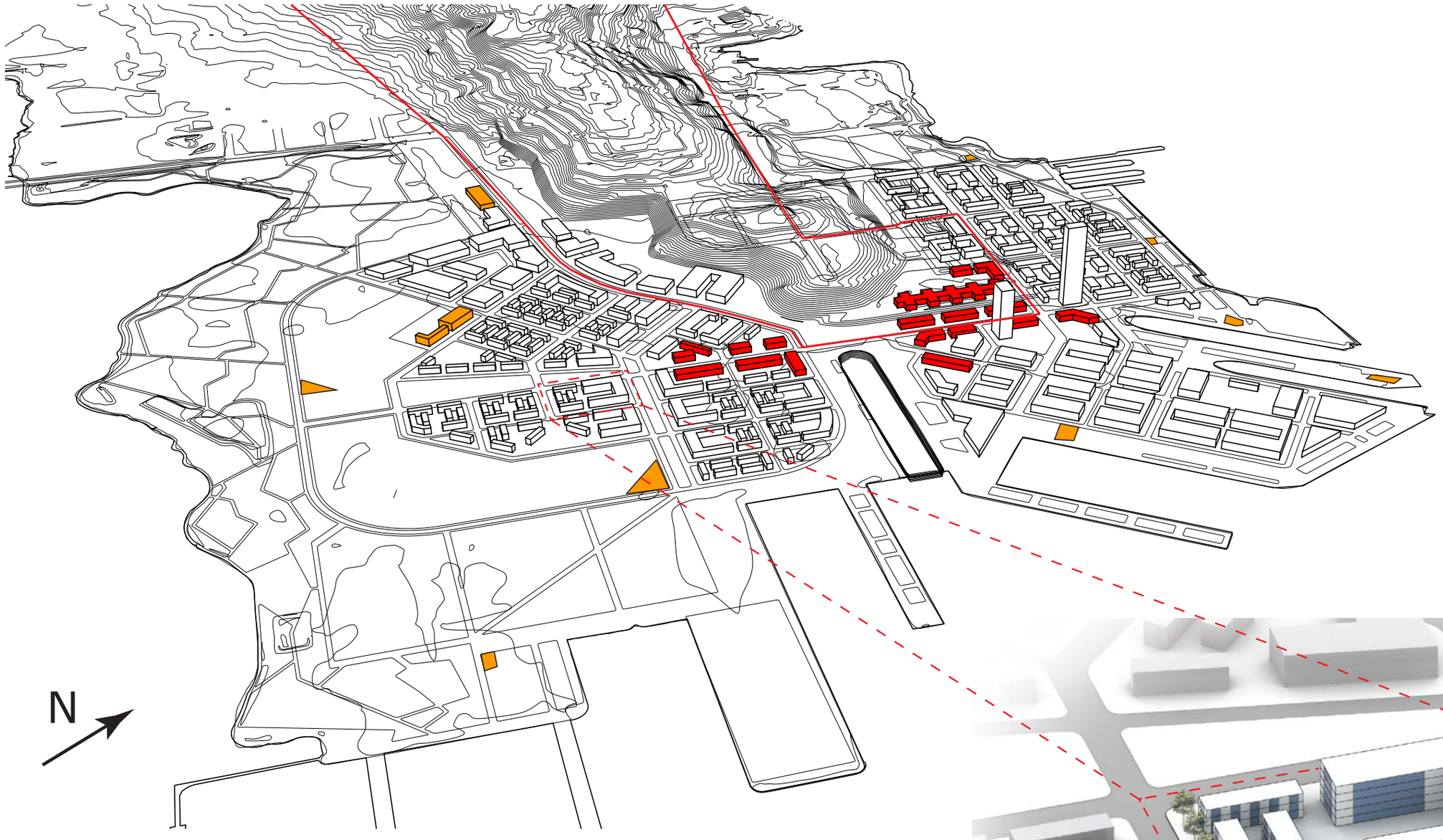
8.2 Finance[CFO/COST]

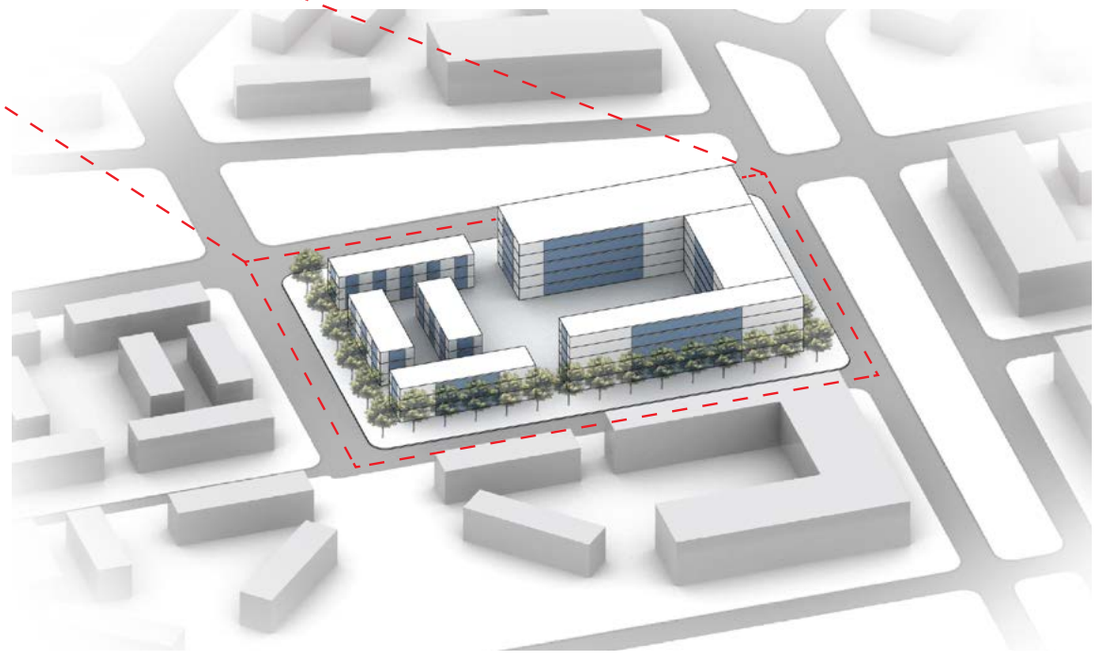
90 Energy[kWh/m2 a]

32 Daylit Area[%]

61 Accessibility[%]

82* Comfort[%]





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Developer Scheme - FAR / Area Summary

Figure 2.1a Illustrative Plan – Non-Stadium Housing Option

Table 2.1a Development Program – Non-Stadium Housing Option

DEVELOPMENT PROGRAM – NON-STADIUM HOUSING OPTION										
	Residential	Commercial (sq ft)							Community Uses (sq ft)	TOTAL Open Space (acres)
	Units	Neighbor-hood Retail	Regional Retail	Office and R&D	Hotel	Arena	Artists Space	TOTAL Commercial		
Shipyard	4,275	125,000	n/a	3,000,000	n/a	n/a	255,000	3,380,000	50,000	221.8
Candlestick	6,225	125,000	635,000	150,000	150,000	75,000	n/a	1,135,000	50,000	104.8
TOTAL	**10,500**	**250,000**	**635,000**	**3,150,000**	**150,000**	**75,000**	**255,000**	**4,515,000**	**100,000**	**326.6**

268 APPENDIX

Total Site Area
500 acres = 21,780,000 ft^2

Total Project Floor Area
17,331,760 ft^2

Total Site FAR
0.80

Typical Block FAR
2

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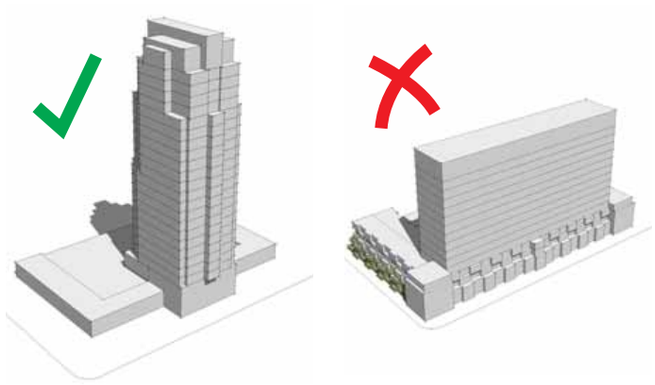
61 Accessibility[%]

82* Comfort[%]

Tower – Form

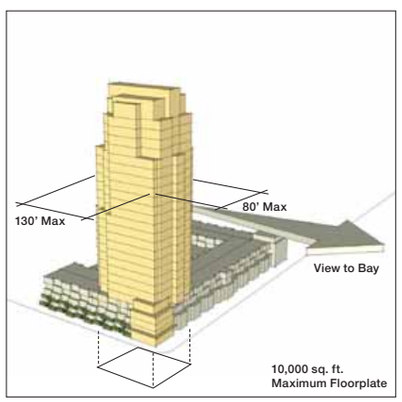
Towers should be slender, maximizing views and limiting visual impact by way of smaller, articulated floorplates and use of light materials and transparency.

- Towers have slim proportioning and a small floorplate area of 8,000-10,000 square feet.
- Massing is articulated to avoid large monolithic blocks
- Employ large degrees of transparency through the use of glass
- Use of distinctive architectural roof treatments
- Sufficient spacing provided between towers to provide light, air and views.
- Towers oriented parallel to view corridors



Towers above the podium, and in all cases above 50 feet, are to be slender in order to protect views to the bay and to accentuate their vertical proportions.

Beyond a maximum of 50 feet above the street, the floor plate must not exceed 80 feet on the dimension facing the bay and 130 feet in the other. The maximum floor plate size must not exceed 10,000 square feet.



Climate – Wind Mitigation

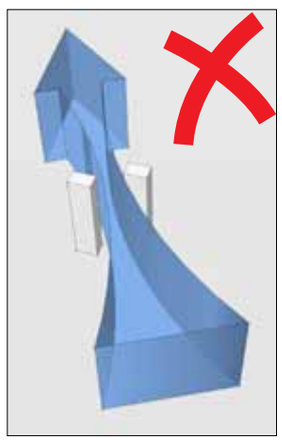
Streets, blocks and buildings should be oriented to minimize the adverse effects of prevailing winds.

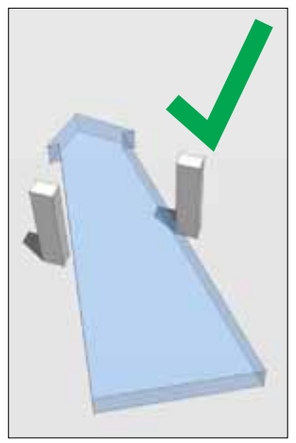
Streets and Blocks

Street and block pattern oriented at 45° to prevailing winds at Candlestick Point

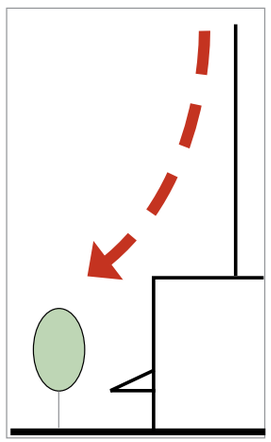
Street and block pattern oriented at 45° to prevailing winds at Hunters Point

Buildings





Minimize wind tunneling with sufficient space between towers



On windward sites set tower back on podium to deflect downdrafts

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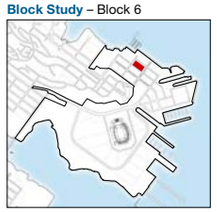
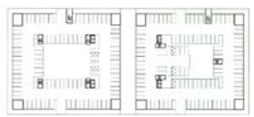
Block Study – Block 6



Typical Upper Floor Plan

Ground Floor Plan

Northwest /Southeast Section



Basement Garage Plan

Northeast /Southwest Section (block 6A)

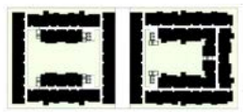
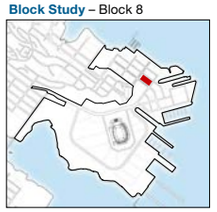
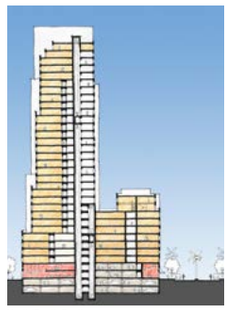


Figure Ground

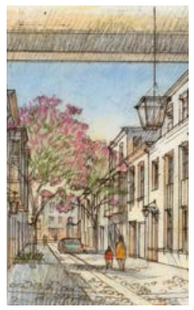
Northeast /Southwest Section (block 6B)

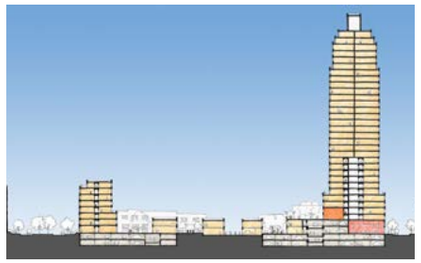
Block Study – Block 8





North/South Section

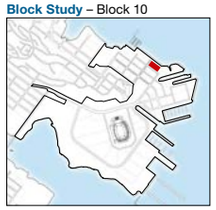


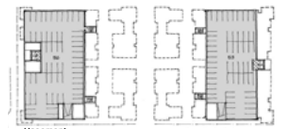


East/West Section

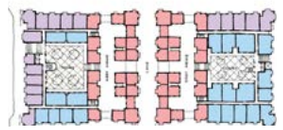
Open Space

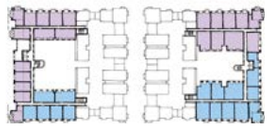
Block Study – Block 10



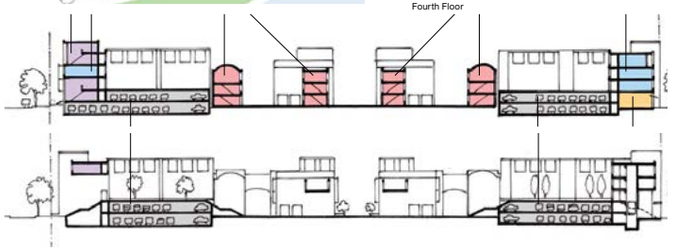


Basement





Fourth Floor



PROPOSED HEAT-RESILIENT HUNTER'S POINT

PROPOSED Heat-Resilient Hunter's Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR]

8.0 Finance[CFO/COST]

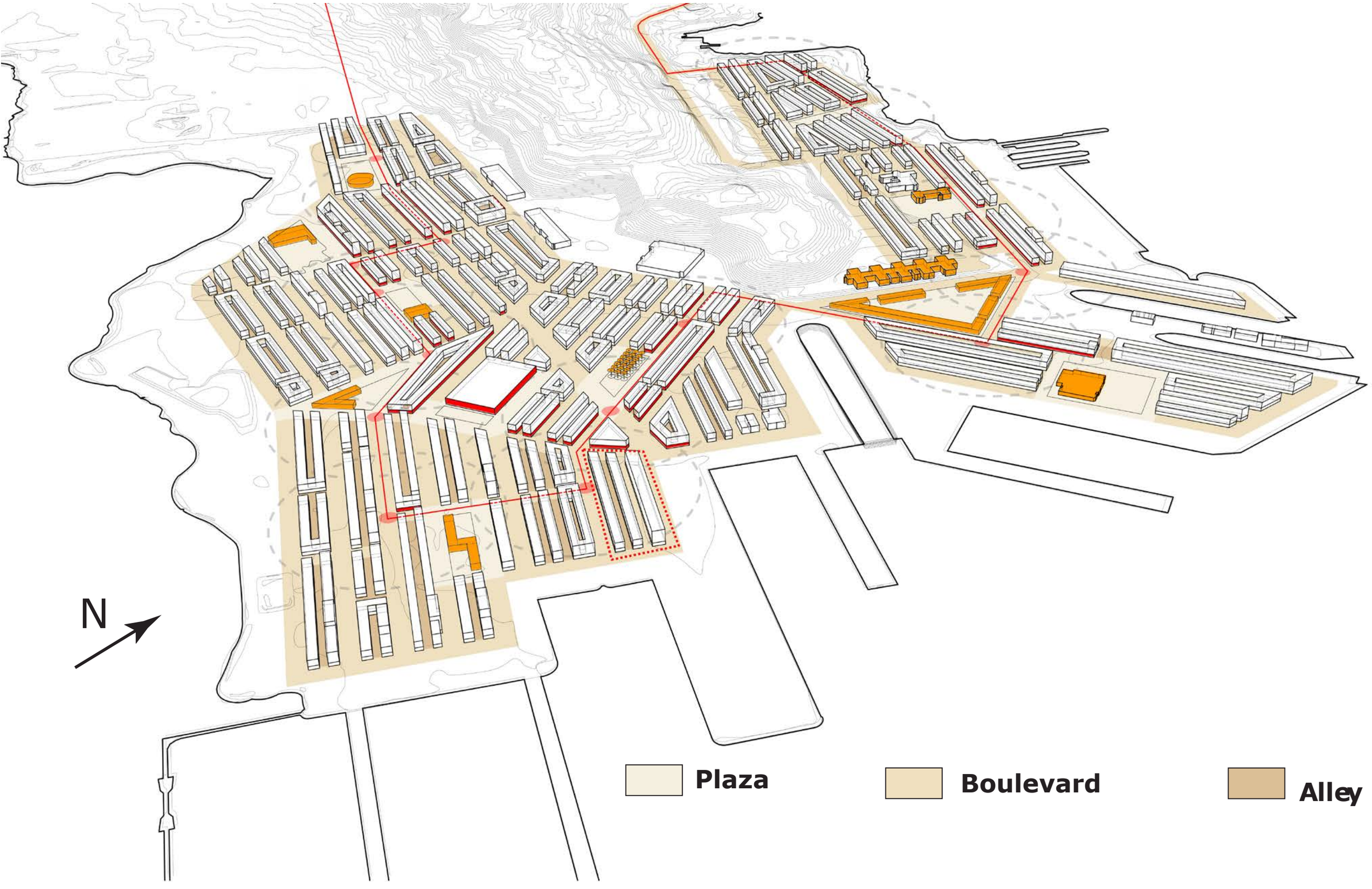
51 Energy[kWh/m2 a]

85 Daylit Area[%]

94 Accessibility[%]

71* Comfort[%]

THREE TYPES OF OUTDOOR SPACES FOR HEAT RESILIENCY



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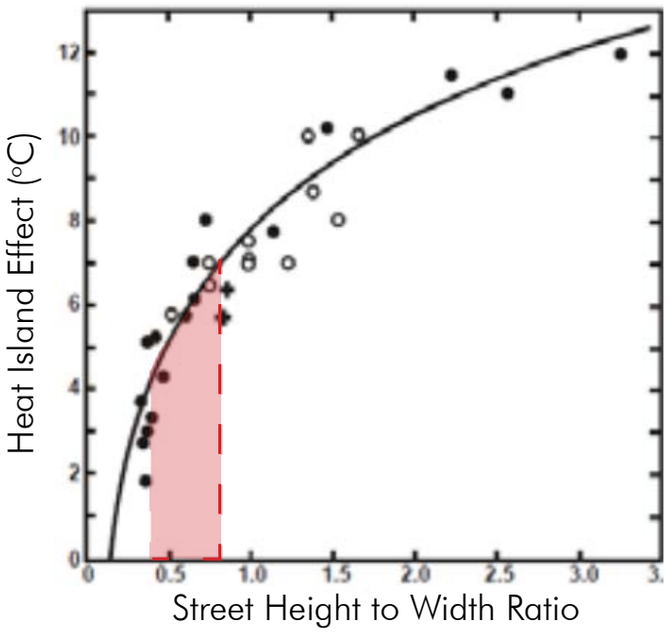
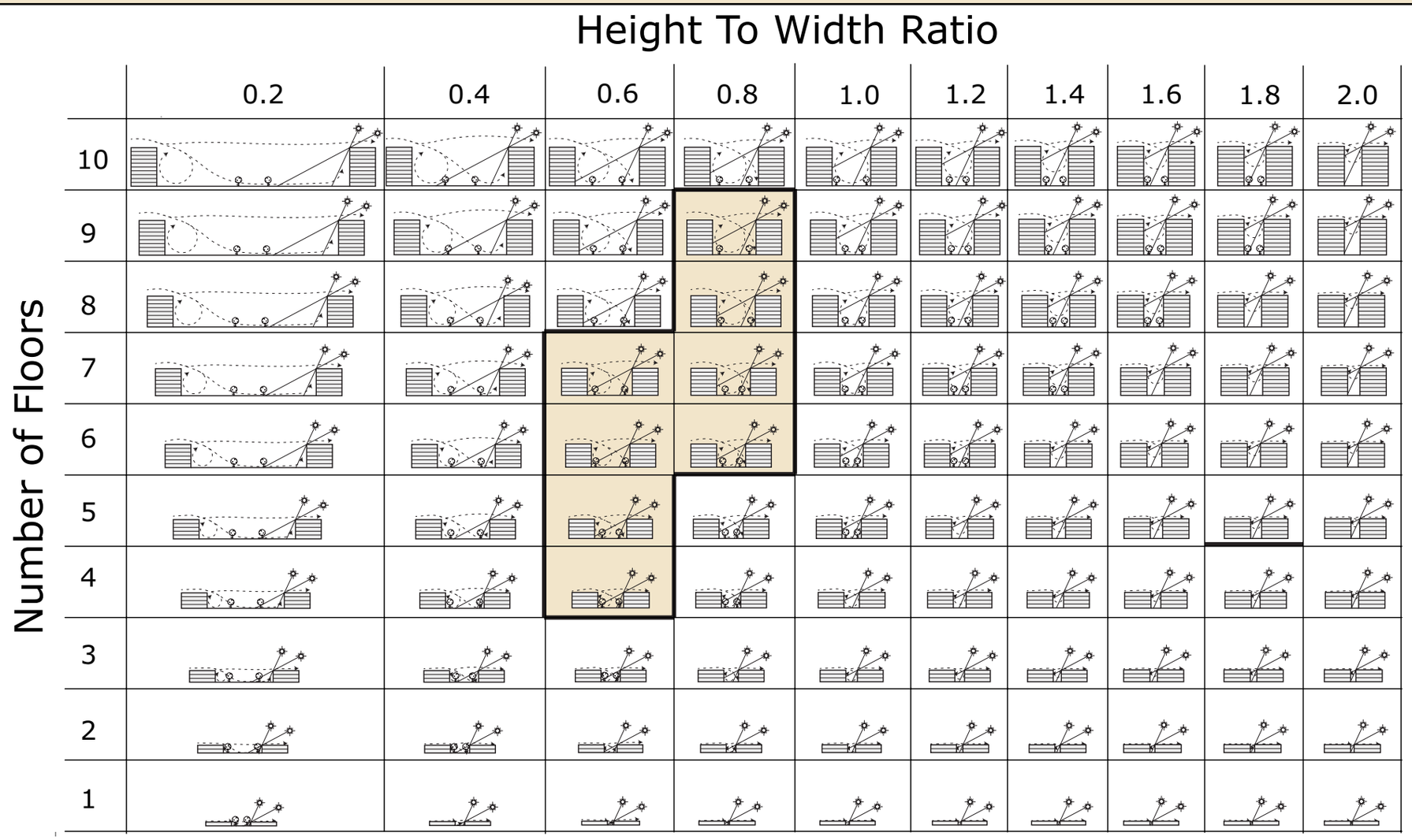
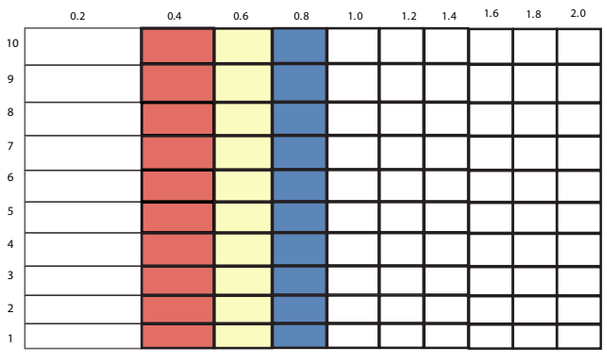
SPACE TYPE 1 - BOULEVARDS



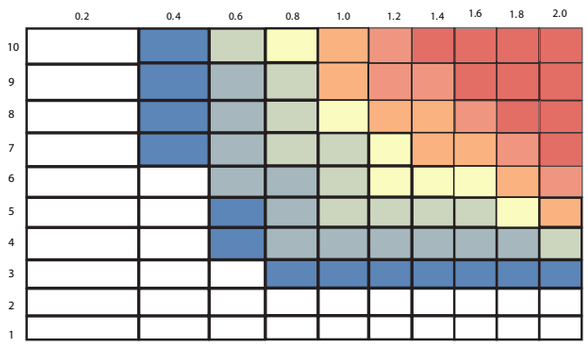
Oke, T.R. 1981: Canyon geometry and the nocturnal urban heat island: Comparison of scale model and field observations. International Journal of Climatology 1, 237-254.



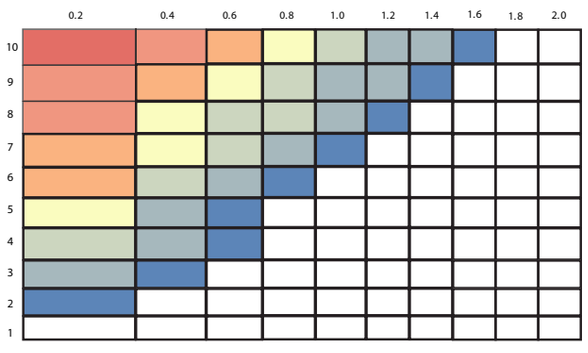
RECOMMENDED H/W FOR LOW HEAT ISLAND



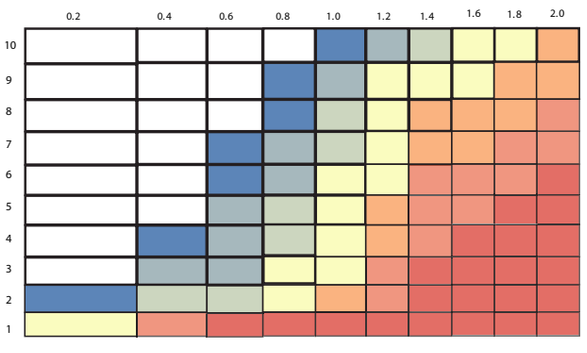
HIGHER DENSITY



TRANSPORTATION REQUIREMNETS



ACROSS-STREET ACCESS



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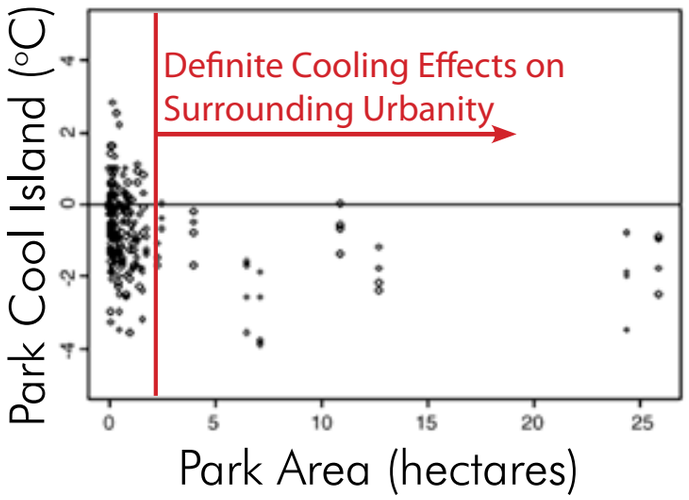
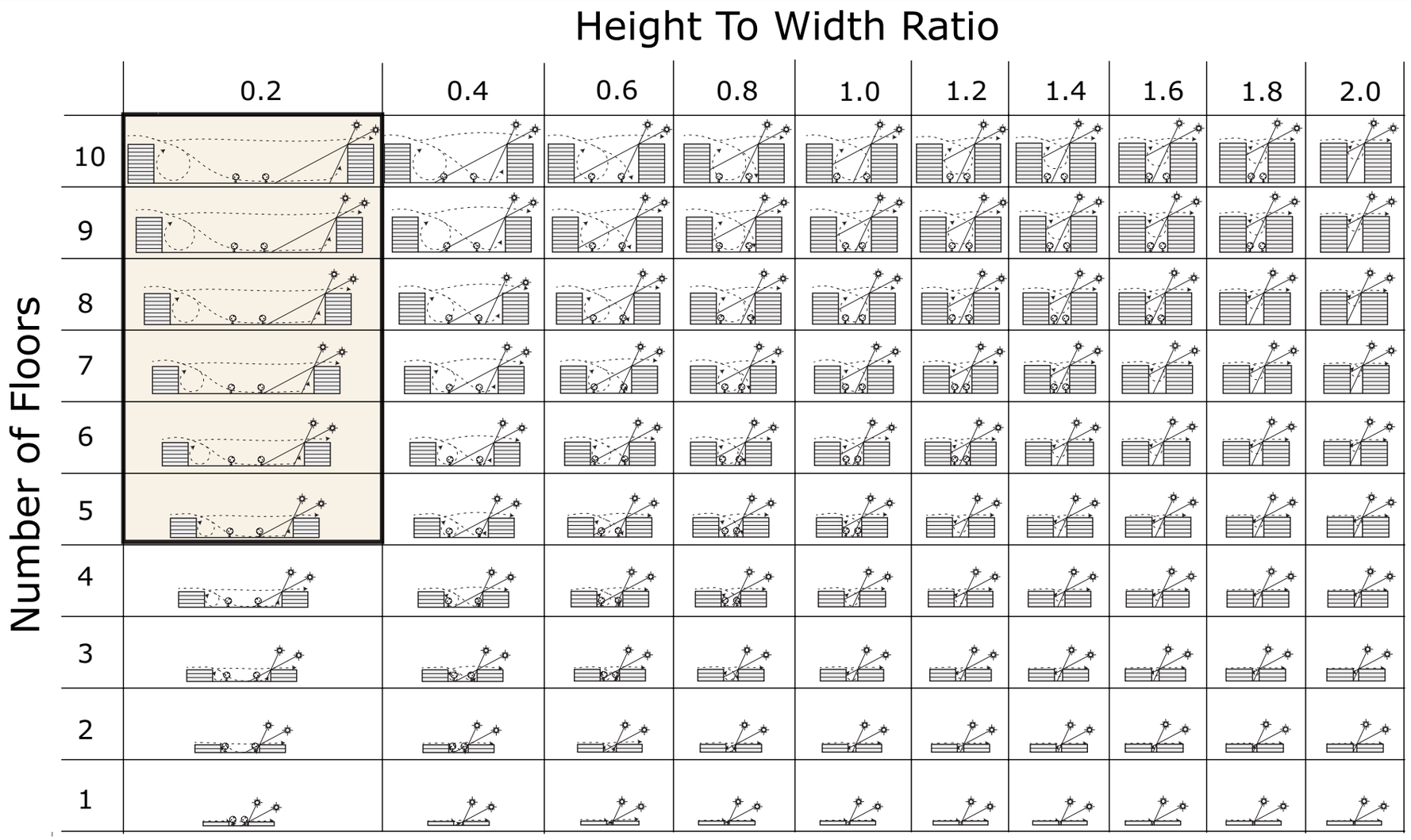
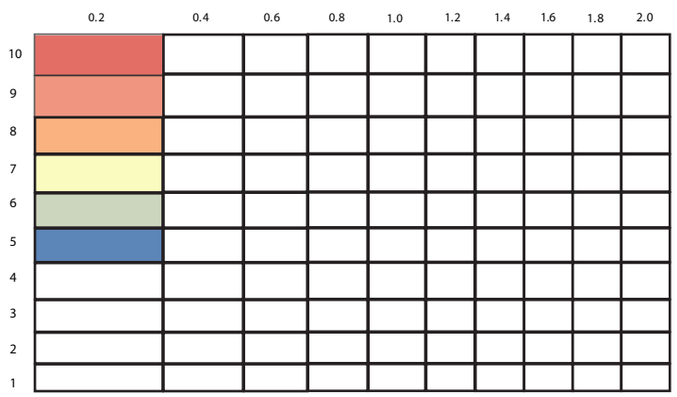
SPACE TYPE 2 - PARKS AND PLAZAS



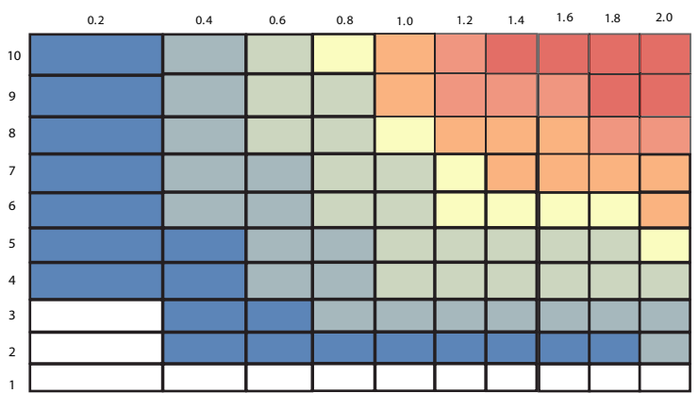
Chang, C R; Li, M H; Chang, S D. (2007). A preliminary study on the local cool-island intensity of Taipei city parks. Landsc. Urban Plan. 80, 386–395



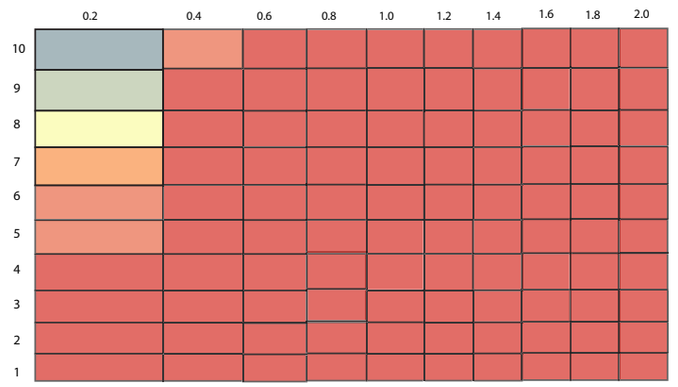
LARGE ENOUGH TO GENERATE PARK COOL ISLAND



HIGHER DENSITY



ACROSS-PARK ACCESS



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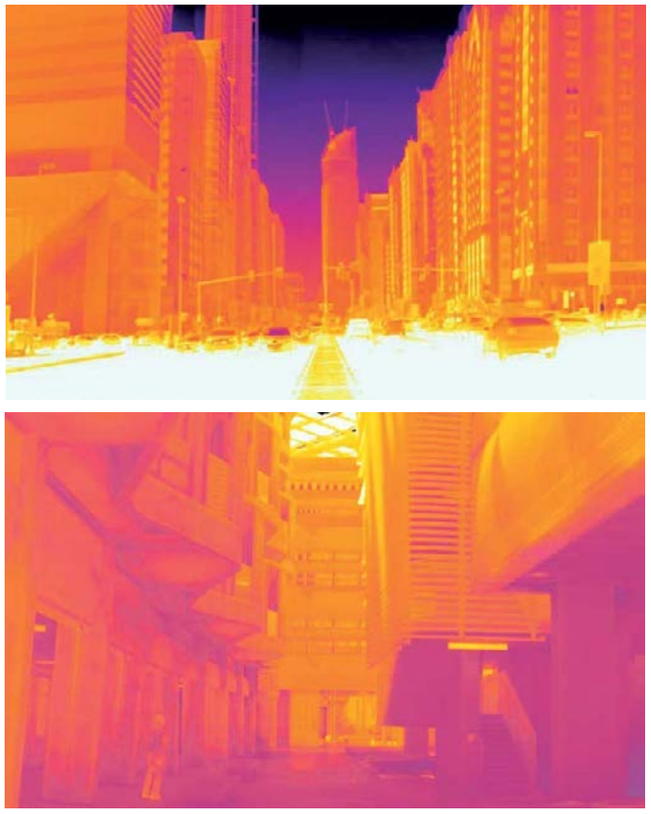
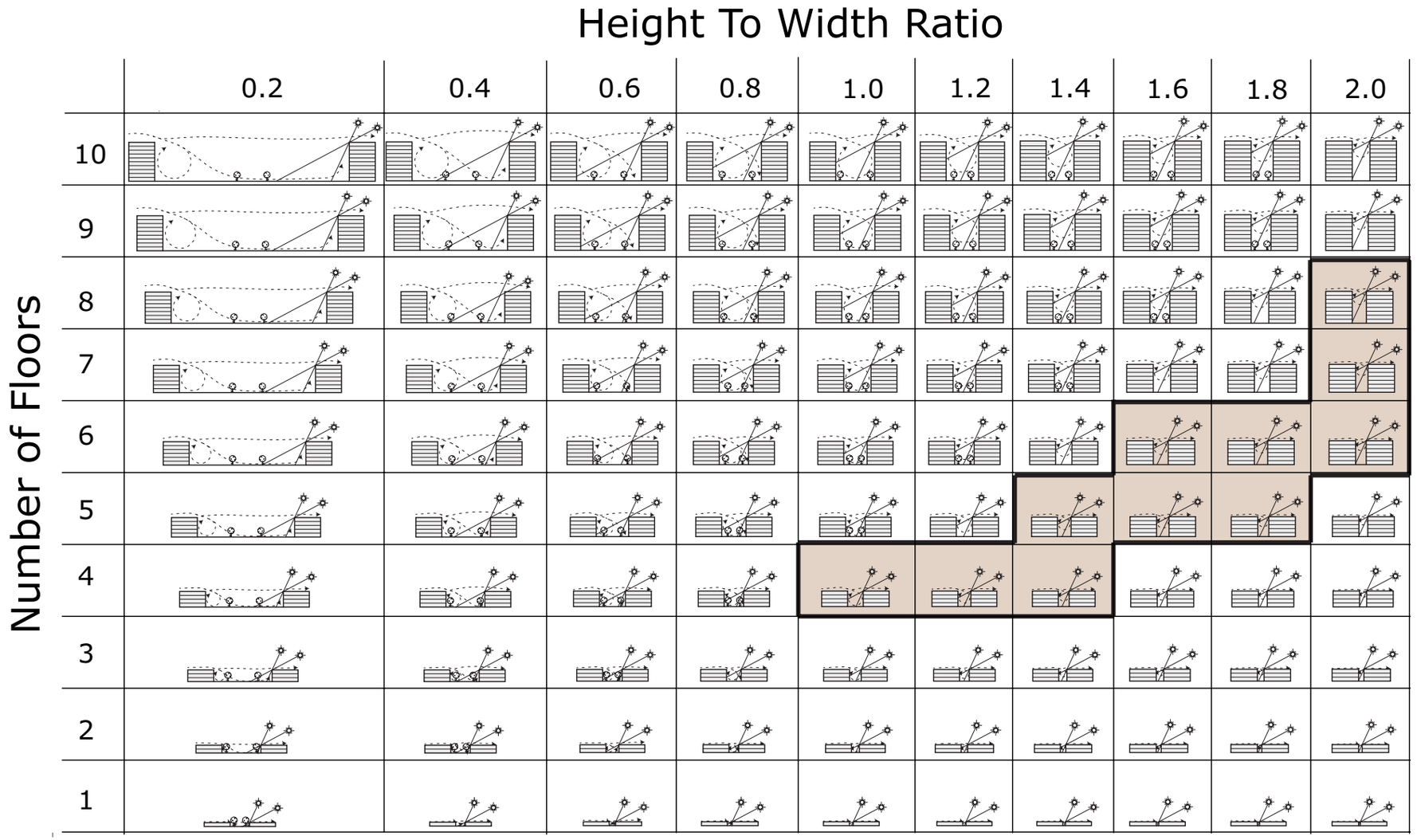
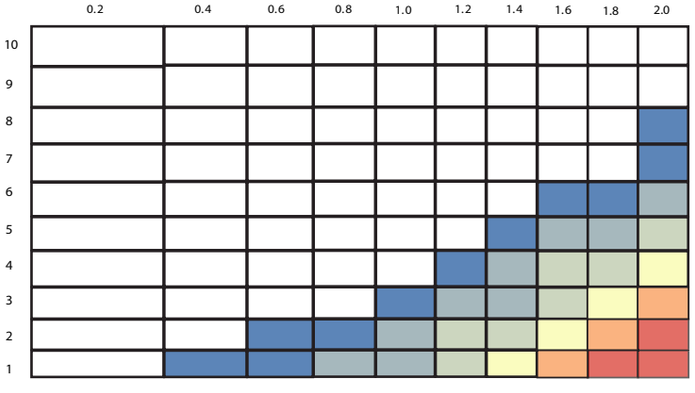
SPACE TYPE 3 - ALLEYS ARCADES AND COURTYARDS



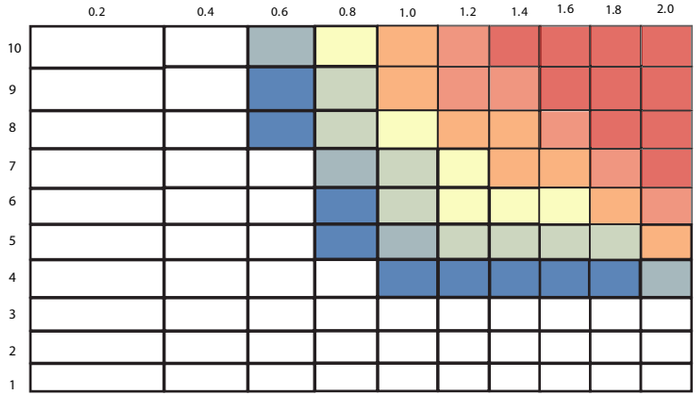
Masdar Development. (2011). Foster + Partners and Transsolar.



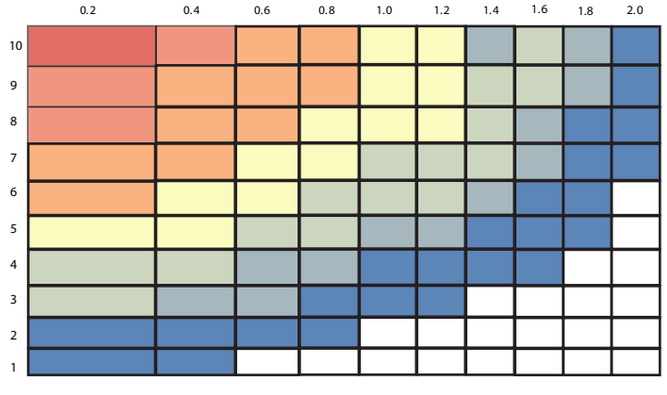
LOW ENOUGH SUMMER HEAT GAINS FOR COOLING W/ WATER OR WIND



HIGHER DENSITY



TRANSPORTATION REQUIREMENTS



PROPOSED Heat-Resilient Hunter's Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR]

8.0 Finance[CFO/COST]

51 Energy[kWh/m2 a]

85 Daylit Area[%]

94 Accessibility[%]

71* Comfort[%]

Plaza **Boulevard** **Alley**

Heat-Resilient Public Space Matrix

Height To Width Ratio

0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0

Nat Vent (ACH) — 2.0 Wind, 1.0 Bouyancy

Number of Floors: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1

	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
Heat Island	+1.5°C	+4.0°C	+6.0°C	+7.0°C	+8.0°C	+8.5°C	+9.0°C	+9.5°C	+10.0°C	+10.5°C
Min Street Daylight	4,600 lux	4,100 lux	3,600 lux	3,200 lux	2,900 lux	2,700 lux	2,400 lux	2,300 lux	2,200 lux	1,900 lux
Density (FAR)	Stories 10 / 5 / 1									
Solar Radiation										

PROPOSED Heat-Resilient Hunter's Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR] | **8.0** Finance[CFO/COST] | **51** Energy[kWh/m2 a] | **85** Daylit Area[%] | **94** Accessibility[%] | **71*** Comfort[%]

Plaza **Boulevard** **Alley**

	Plazas and Squares	Boulevards	Alleys, Arcades + Courtyards
	Density FAR 0.87 Street Width 90.0 m Heat Island +1.5°C Lowest Daytime Light 4,600 lux	Density FAR 1.92 Street Width 30.0 m Heat Island +6.0°C Lowest Daytime Light 3,600 lux	Density FAR 2.62 Street Width 10.7 m Heat Island +9.0°C Lowest Daytime Light 2,400 lux
Winter Day	214 kWh/m/day	69 kWh/m/day	31 kWh/m/day
Winter Night	-212 kWh/m/day	-65 kWh/m/day	-23 kWh/m/day
Summer Day	702 kWh/m/day	261 kWh/m/day	101 kWh/m/day
Summer Night	-698 kWh/m/day	261 kWh/m/day	-90 kWh/m/day

<u>PROPOSED</u> Heat-Resilient Hunter's Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR]
8.0 Finance[CFO/COST]
51 Energy[kWh/m2 a]
85 Daylit Area[%]
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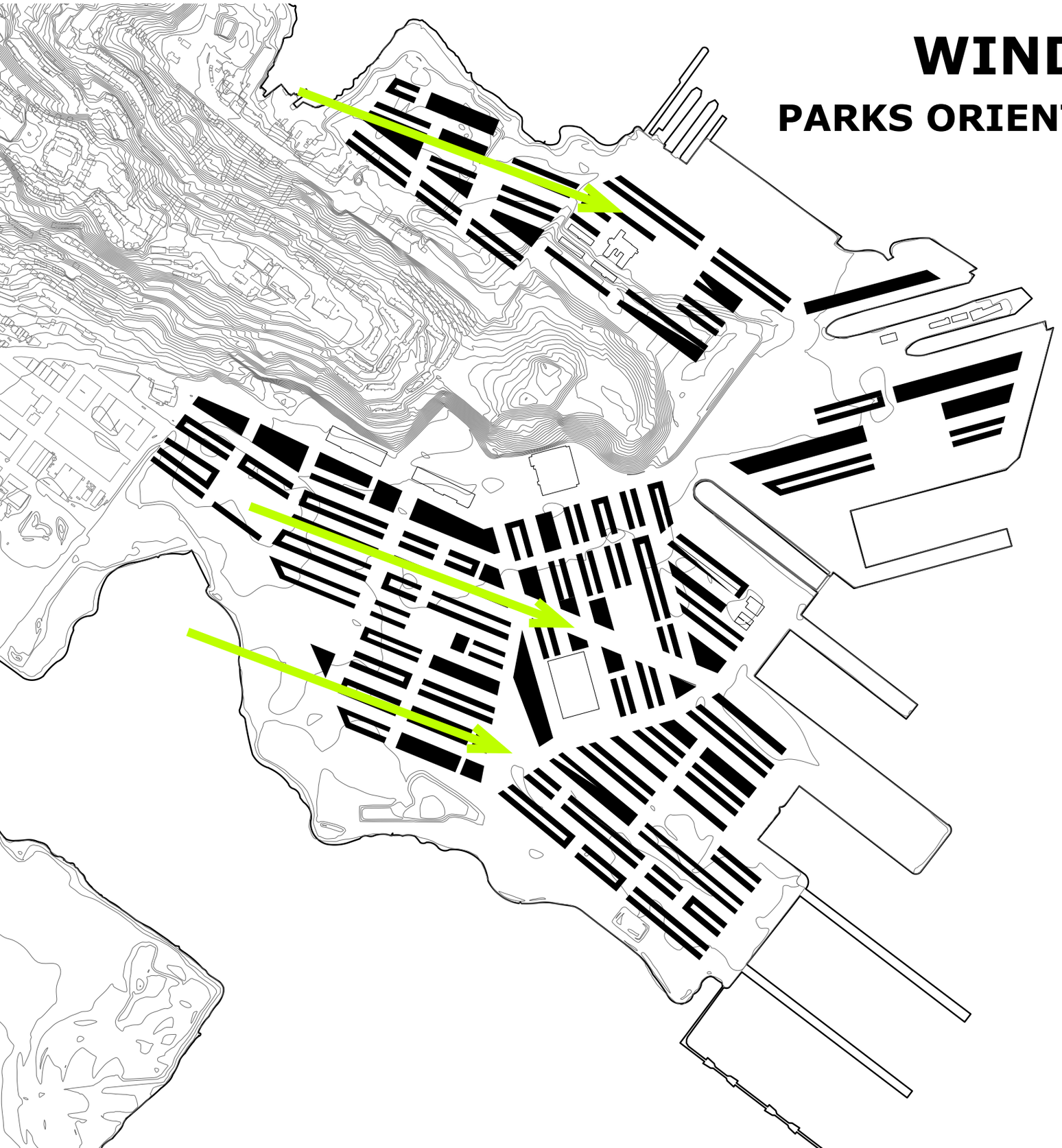
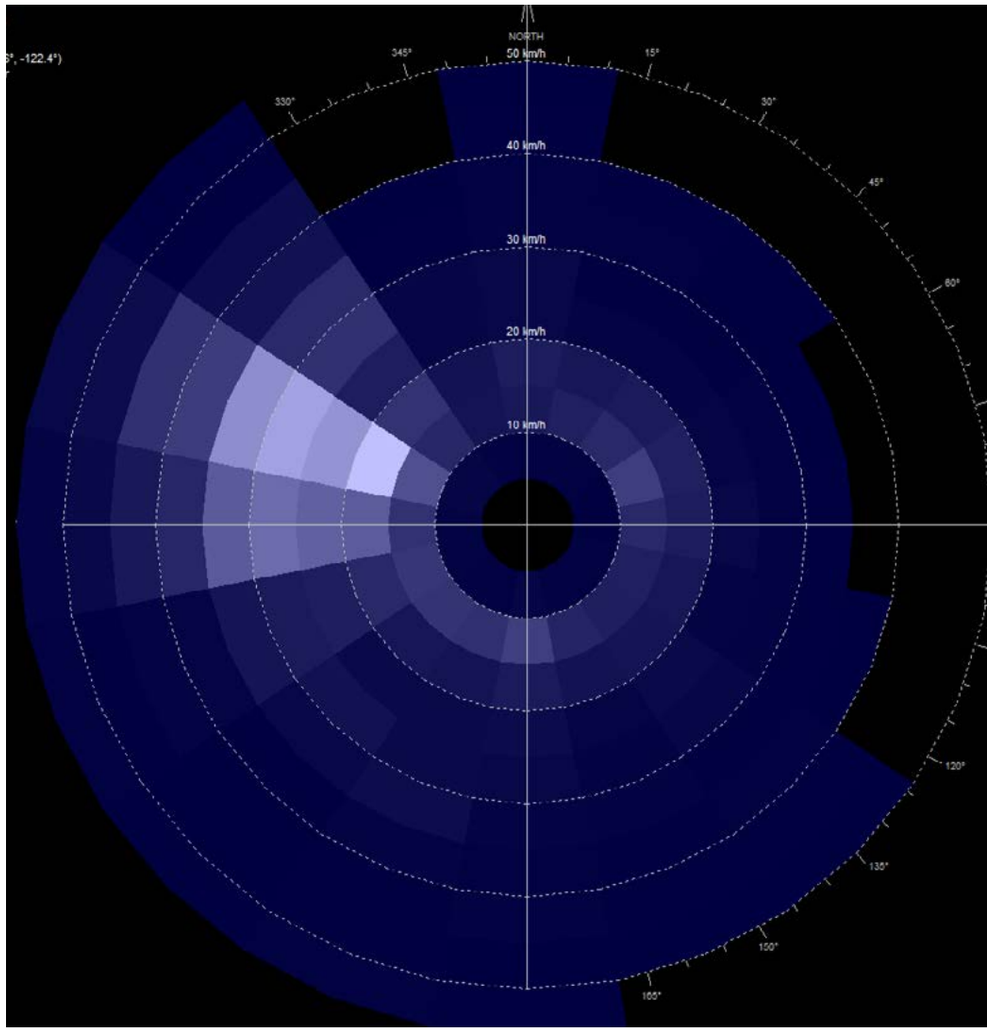
71* Comfort[%]

WIND AND PARK STRATEGY

PARKS ORIENTED TO THE PREVIALING WINDS





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Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

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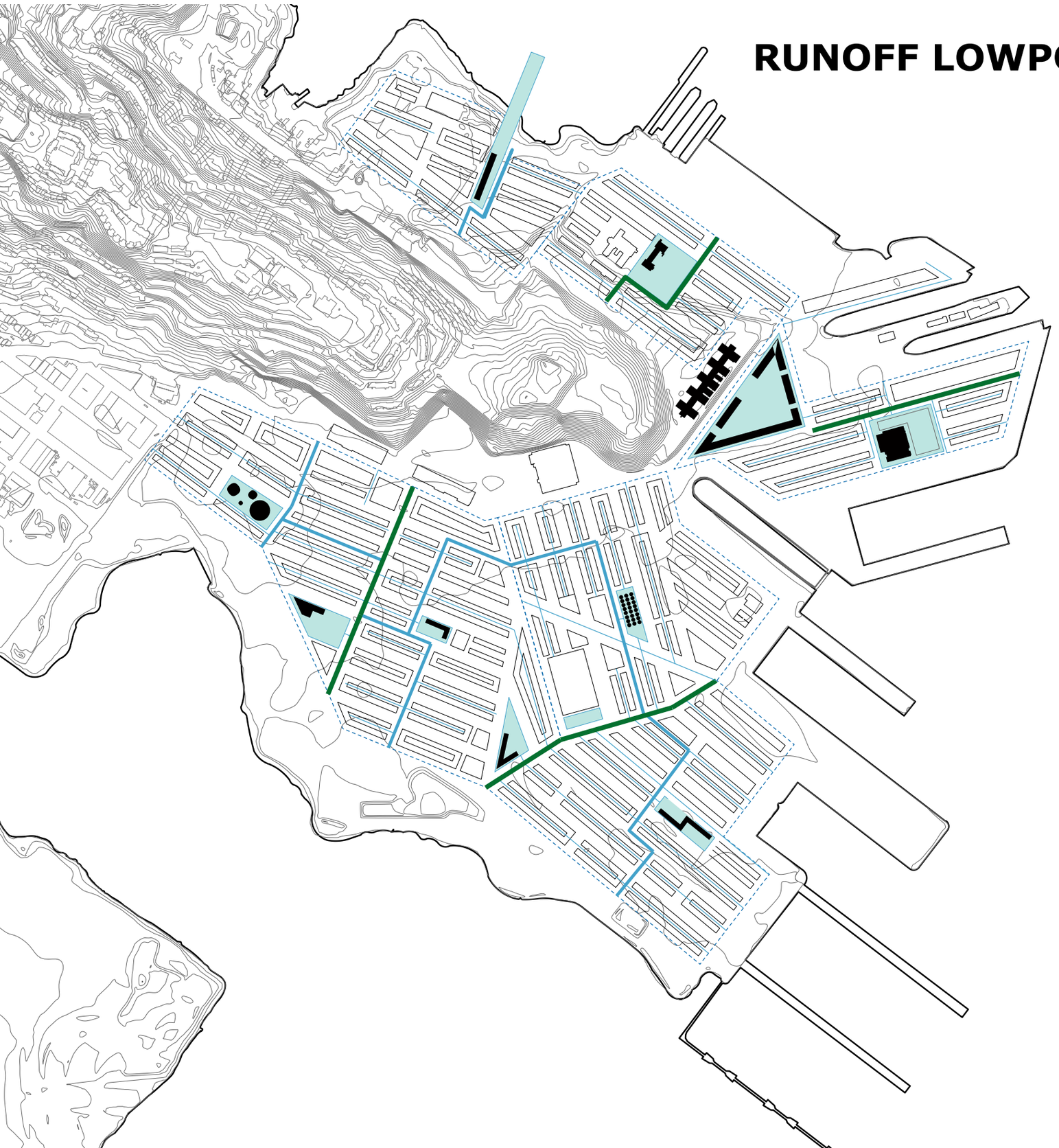
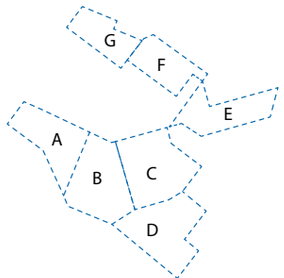
WATER STRATEGY

RUNOFF LOWPOINTS BECOME WATER PLAZAS

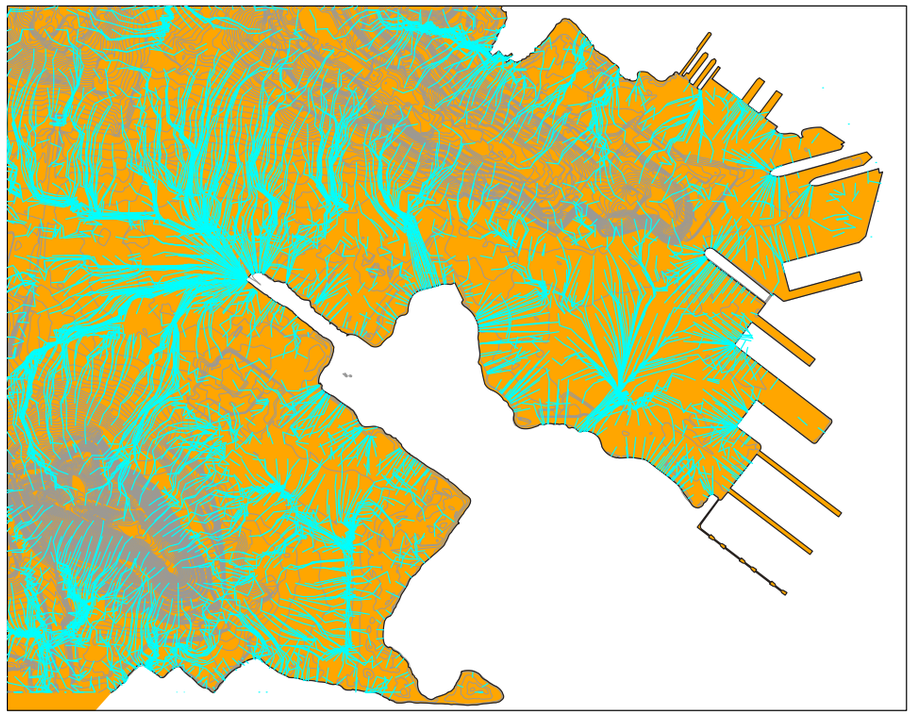


- collection area
- water street
- water square
- street with wetland water clean system



A 147318 m2
B 188071 m2
C 195953 m2
D 190361 m2
E 132337 m2
F 105489 m2
G 97056 m2

RAINWATER RUNOFF
(POINT ANALYSIS USING GRASSHOPPER)



<u>PROPOSED</u> Heat-Resilient Hunter's Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR]

8.0 Finance[CFO/COST]

51 Energy[kWh/m2 a]

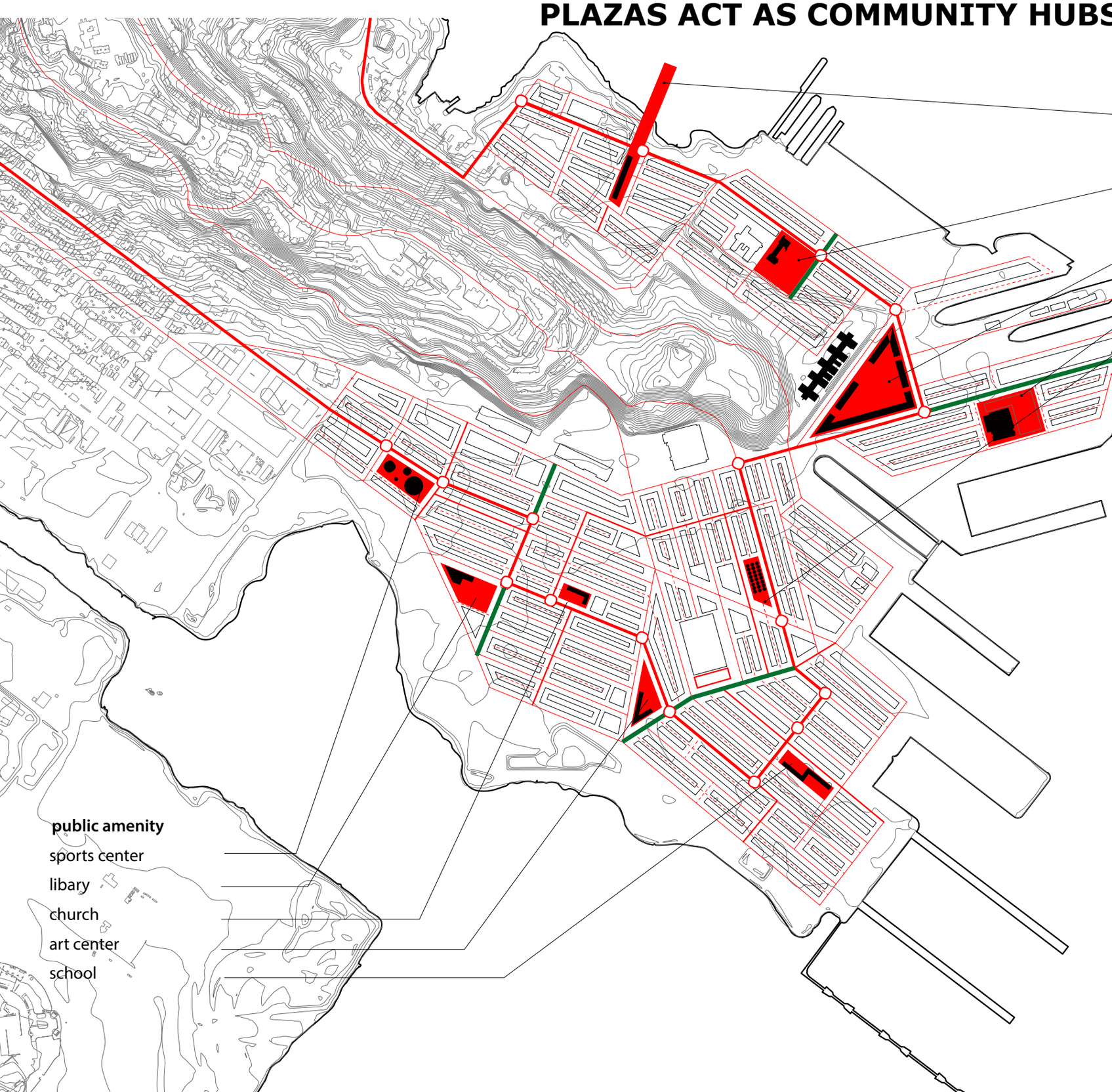
85 Daylit Area[%]

94 Accessibility[%]

71* Comfort[%]

COMMUNITY PUBLIC SPACE STRATEGY

PLAZAS ACT AS COMMUNITY HUBS CONNECTED BY A BUS ROUTE



PROPOSED **Heat-Resilient Hunter's Point**

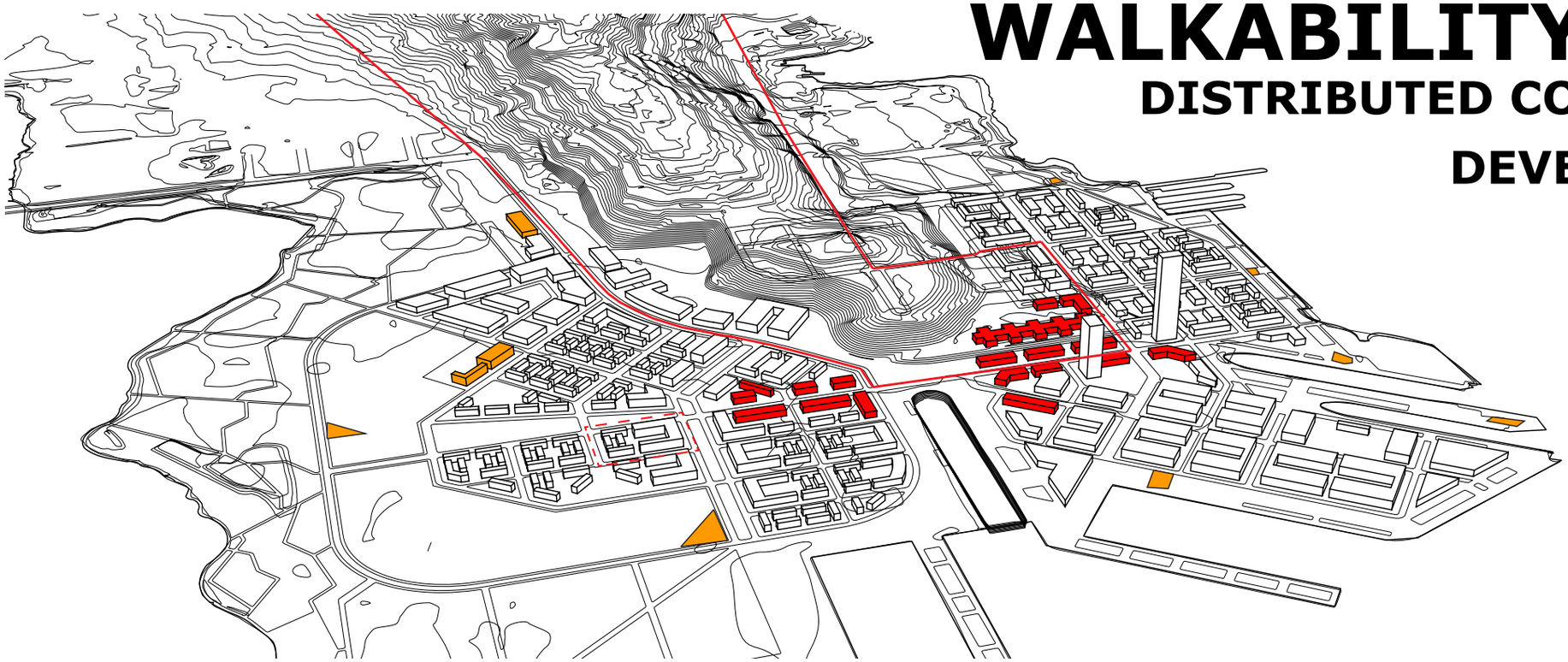
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9	8.0	51	85	94	71*
Density[FAR]	Finance[CFO/COST]	Energy[kWh/m2 a]	Daylit Area[%]	Accessibility[%]	Comfort[%]

WALKABILITY STRATEGY

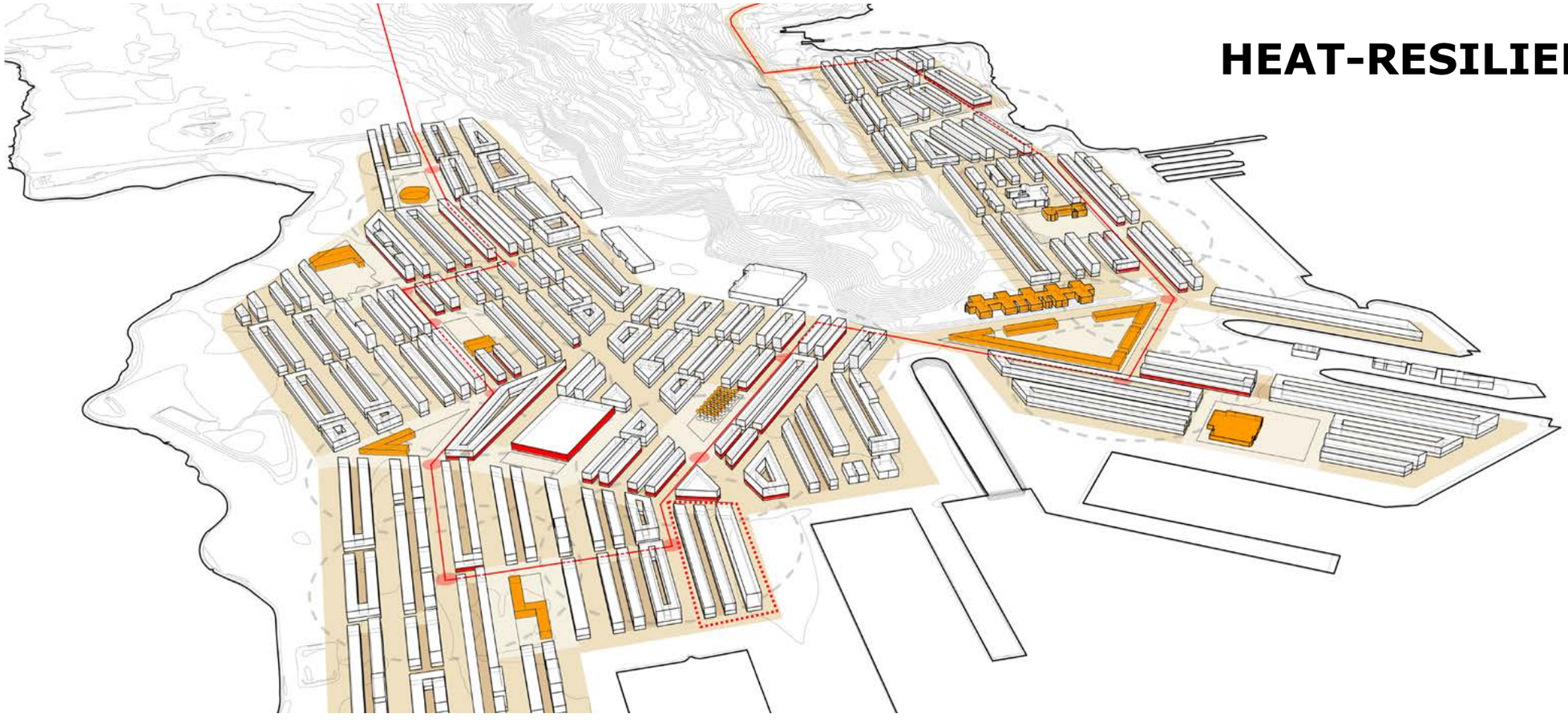
DISTRIBUTED COMMERCIAL CENTER

DEVELOPER PROPOSAL



- Bus Route
- Commercial
- Residential
- Public Amenities

HEAT-RESILIENT PROPOSAL



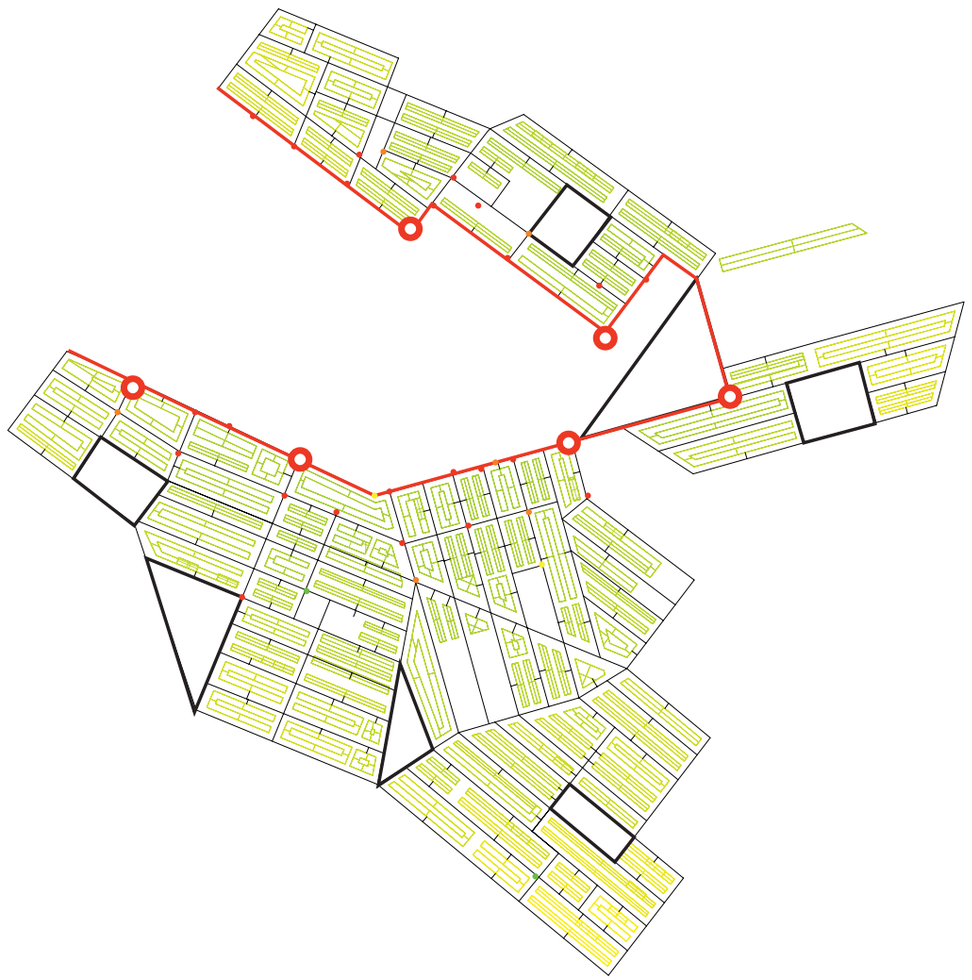
<u>PROPOSED</u> Heat-Resilient Hunter's Point
Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR] | 8.0 Finance[CFO/COST] | 51 Energy[kWh/m2 a] | 85 Daylit Area[%] | 94 Accessibility[%] | 71* Comfort[%]

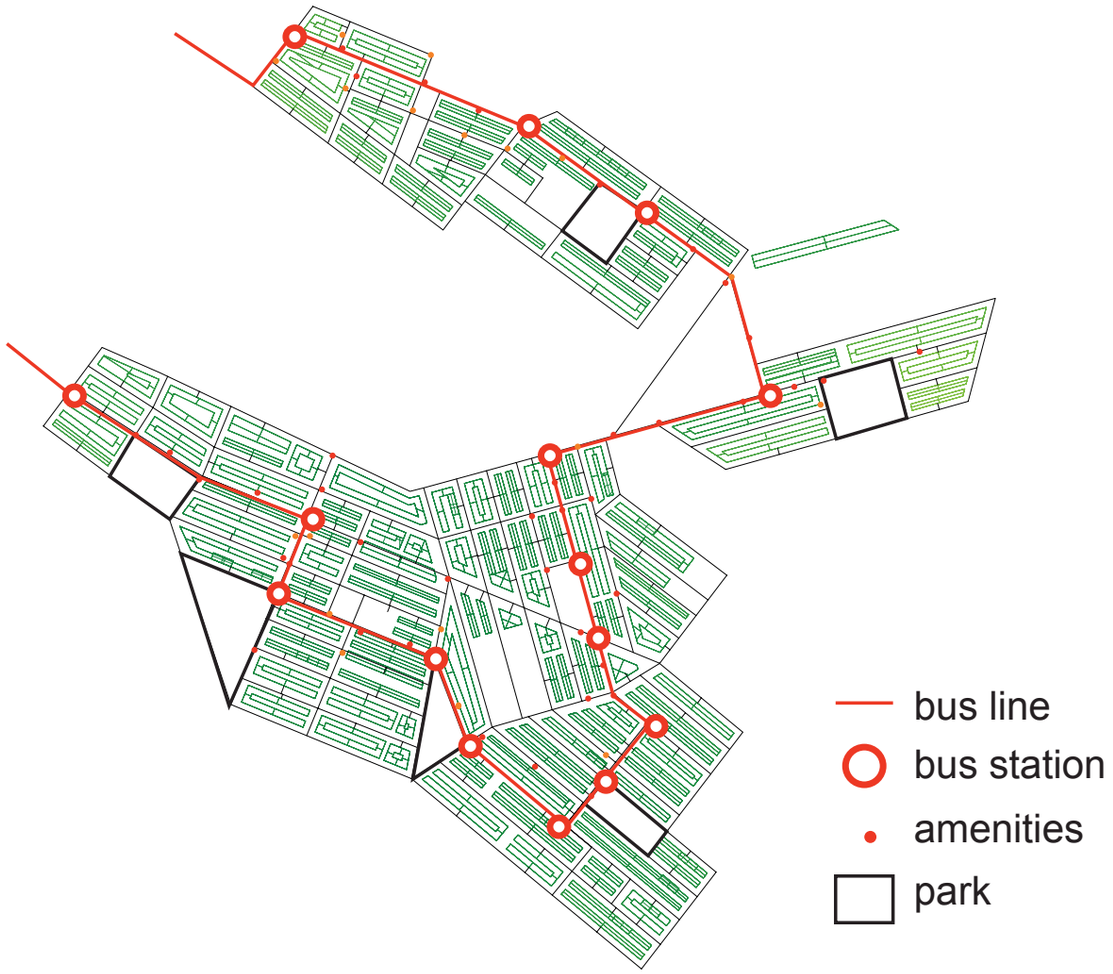
Walkability LOCATION OF MAIN STREET

The new proposed bus route of resilient Hunter's Point places ameninties throughout the site instead of at one point. This increases the walkscore.

DEVELOPER-TYPE BUS ROUTE
61 WALKSCORE



HEAT-RESILIENT BUS ROUTE
94 WALKSCORE



Walk Score

0 — 50 — 100

PROPOSED Heat-Resilient Hunter's Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

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8.0 Finance[CFO/COST]

51 Energy[kWh/m2 a]

85 Daylit Area[%]

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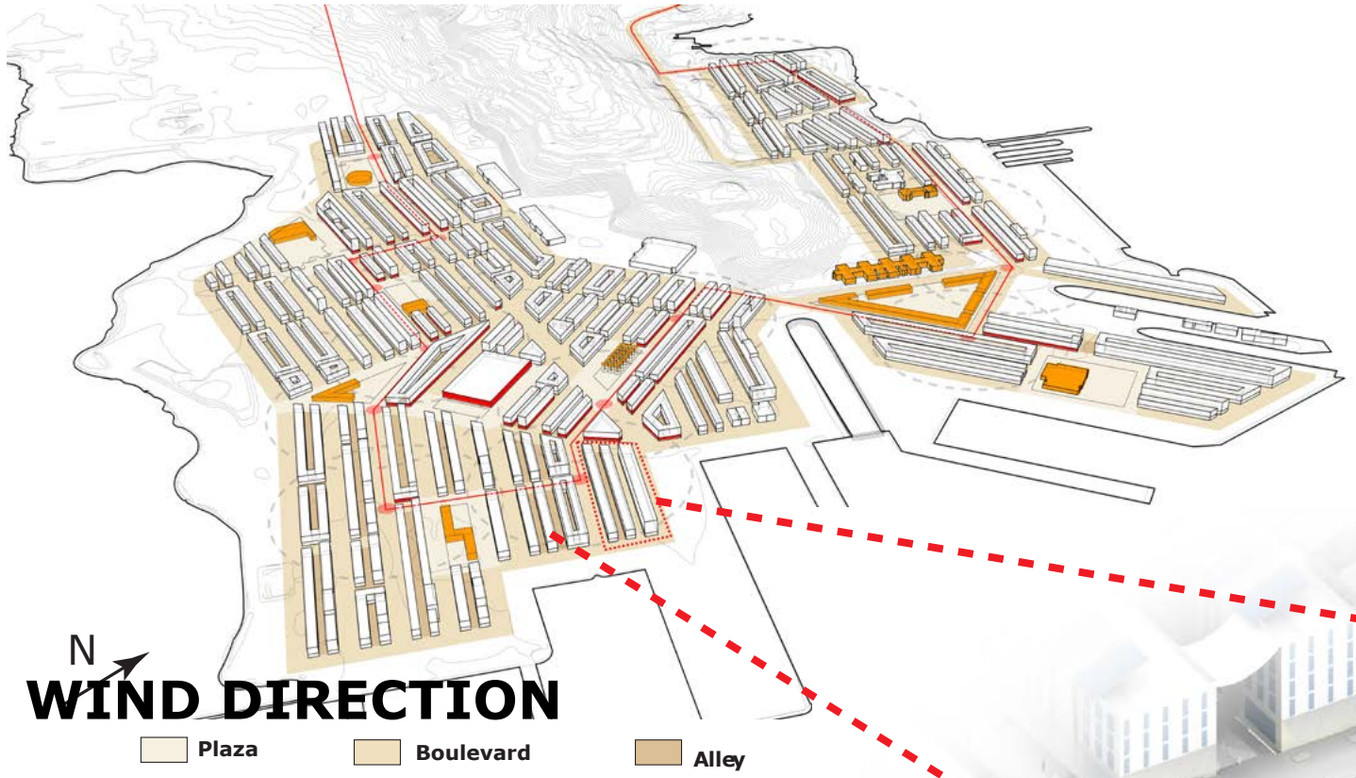
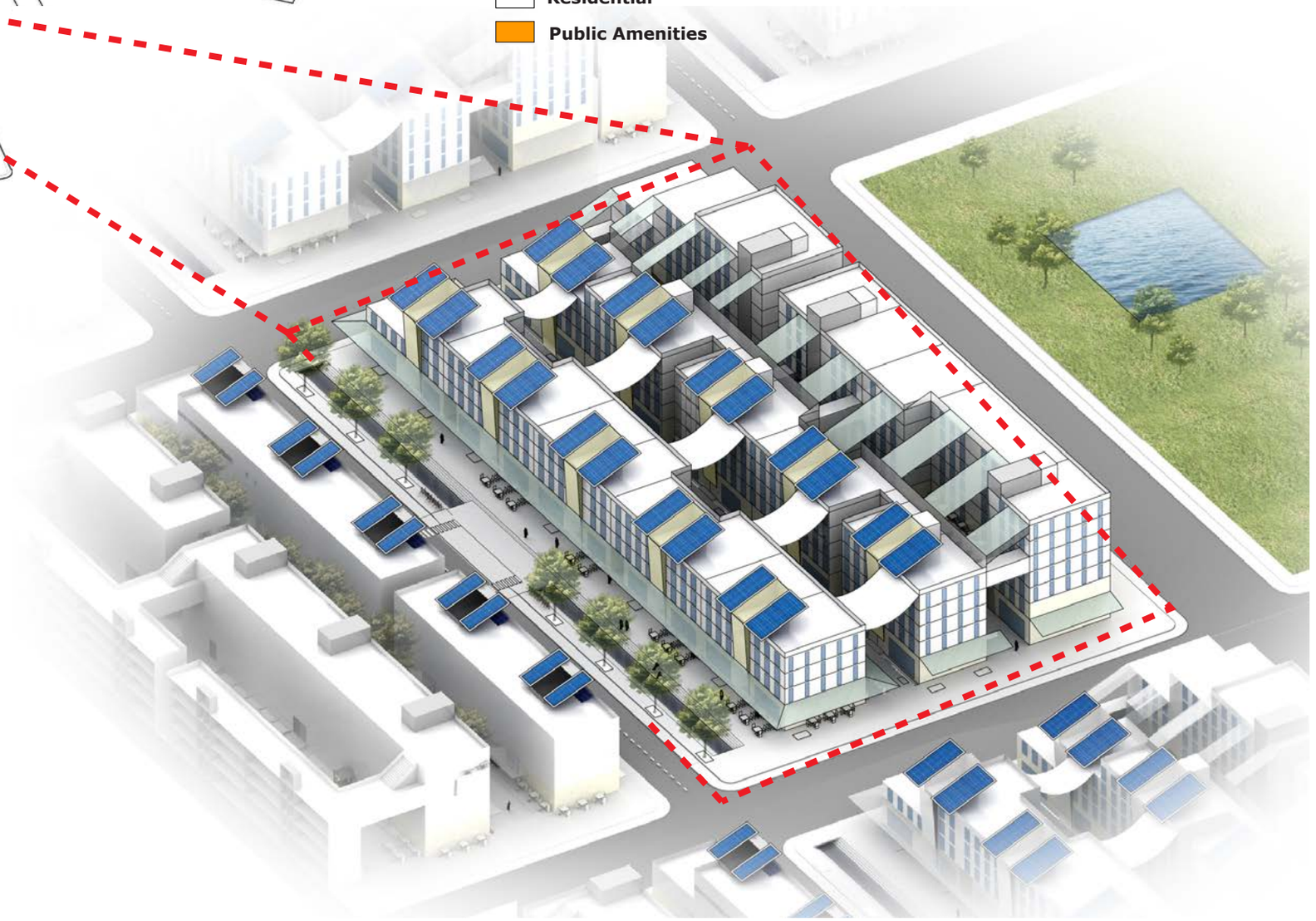
PROTOBLOCK





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Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

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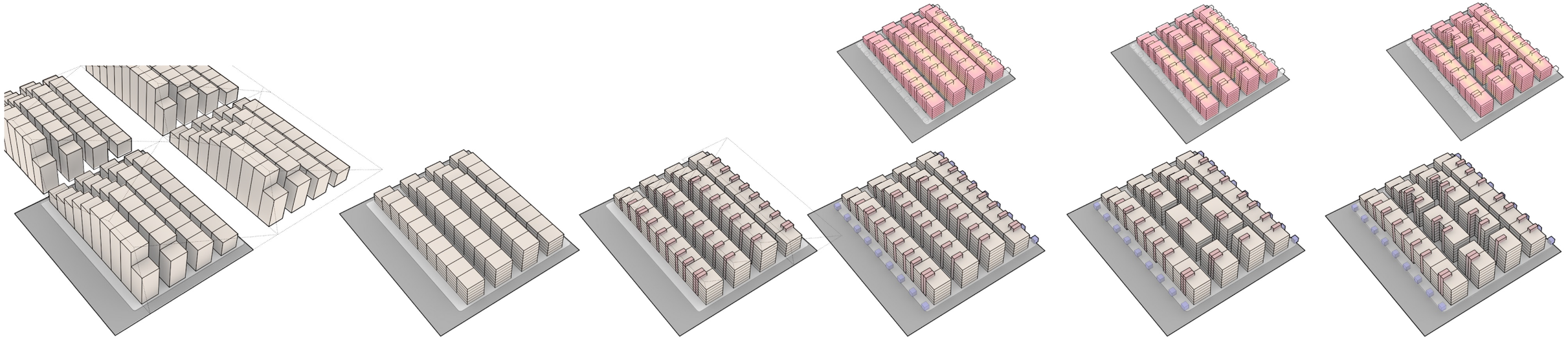

PROPOSED Heat-Resilient Hunter's Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR]

8.0 Finance[CFO/COST]

51 Energy[kWh/m2 a]

85 Daylit Area[%]

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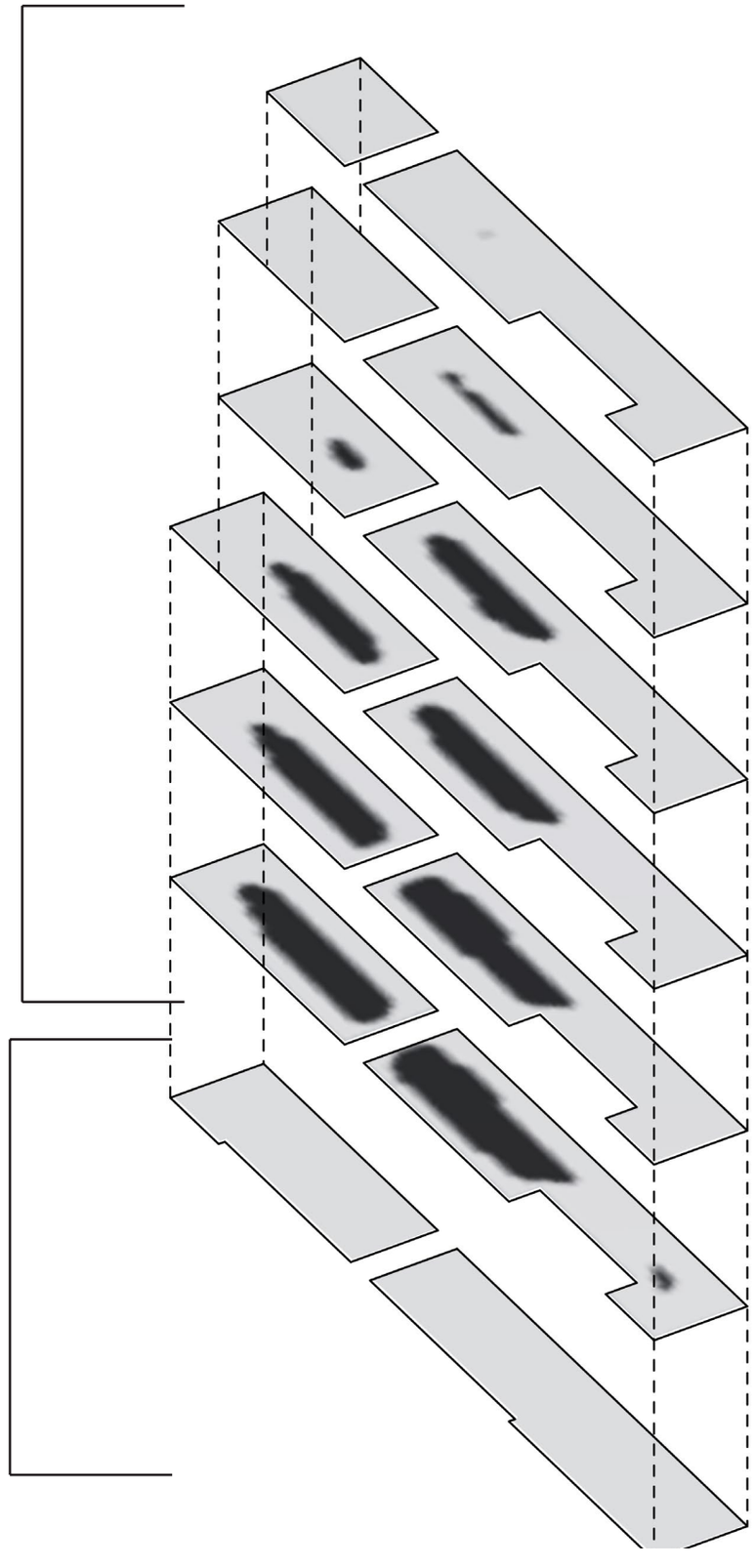
71* Comfort[%]

Adjusting Floor Height For Optimal Daylight

Residential
Floor Height = 3 m
Total Area = 17,643 m^2
Daylit Area = 81%

Commercial
Floor Height = 5 m
Total Area = 4,795 m^2
Daylit Area = 99%



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Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

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TEMPLATE CONSTRUCTION ASSEMBLES

Roof	ASHRAE 90.1 Z5A Asphalt Roof, U-	PassivHaus Standard Roof, U-0.070	Timber and Asphalt Shingle Roof	Asphalt and EPS Roof	Title 24 Metal Building Roof	Title 24 Metal Building Roof	ASHRAE 189.1 Roof with Insulation	ASHRAE 189.1 Roof with Insulation	PassivHaus Standard Roof, U-0.070
Window	ASHRAE 90.1 Z5A	PassivHaus Triple-	SF Existing Single-	SF Existing Single-	Title 24 Window	Title 24 Window	ASHRAE 189.1	ASHRAE 189.1	PassivHaus Triple-
Wall	ASHRAE 90.1 Z5A Wall, U-0.391	PassivHaus Standard Wall, U-0.064	Wood Siding, Wood Studs	Brick Veneer, Steel Studs 2x6@24,	Title 24 Metal Framed Wall U-	Title 24 Metal Framed Wall U-	ASHRAE 189.1 Mass Wall U-0.511	ASHRAE 90.1 Z5A Wall, U-0.391	ASHRAE 189.1 Mass Wall U-0.511
Internal Floor	Internal Slab	Internal Slab	Internal Wood Floor	Internal Slab	Internal Slab	Internal Slab	ASHRAE 189.1 Mass Floor	ASHRAE 189.1 Mass Floor	ASHRAE 189.1 Mass Floor
Floor	ASHRAE 90.1 Z5A Insulated	IECC-2000 Ground Floor, U-	0.1m Uninsulated Concrete	0.1m Uninsulated Concrete	Title 24 Mass Floor	Title 24 Mass Floor	Title 24 Mass Floor	Title 24 Mass Floor	Title 24 Mass Floor
	R	C	R	C	R	C	R	C	R
	Passiv Haus	ASHRAE 90.1	Existing Buildings		Title 24		ASHRAE 189.1		Target

PROPOSED Heat-Resilient Hunter's Point

Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

1.9 Density[FAR]

8.0 Finance[CFO/COST]

51 Energy[kWh/m2 a]

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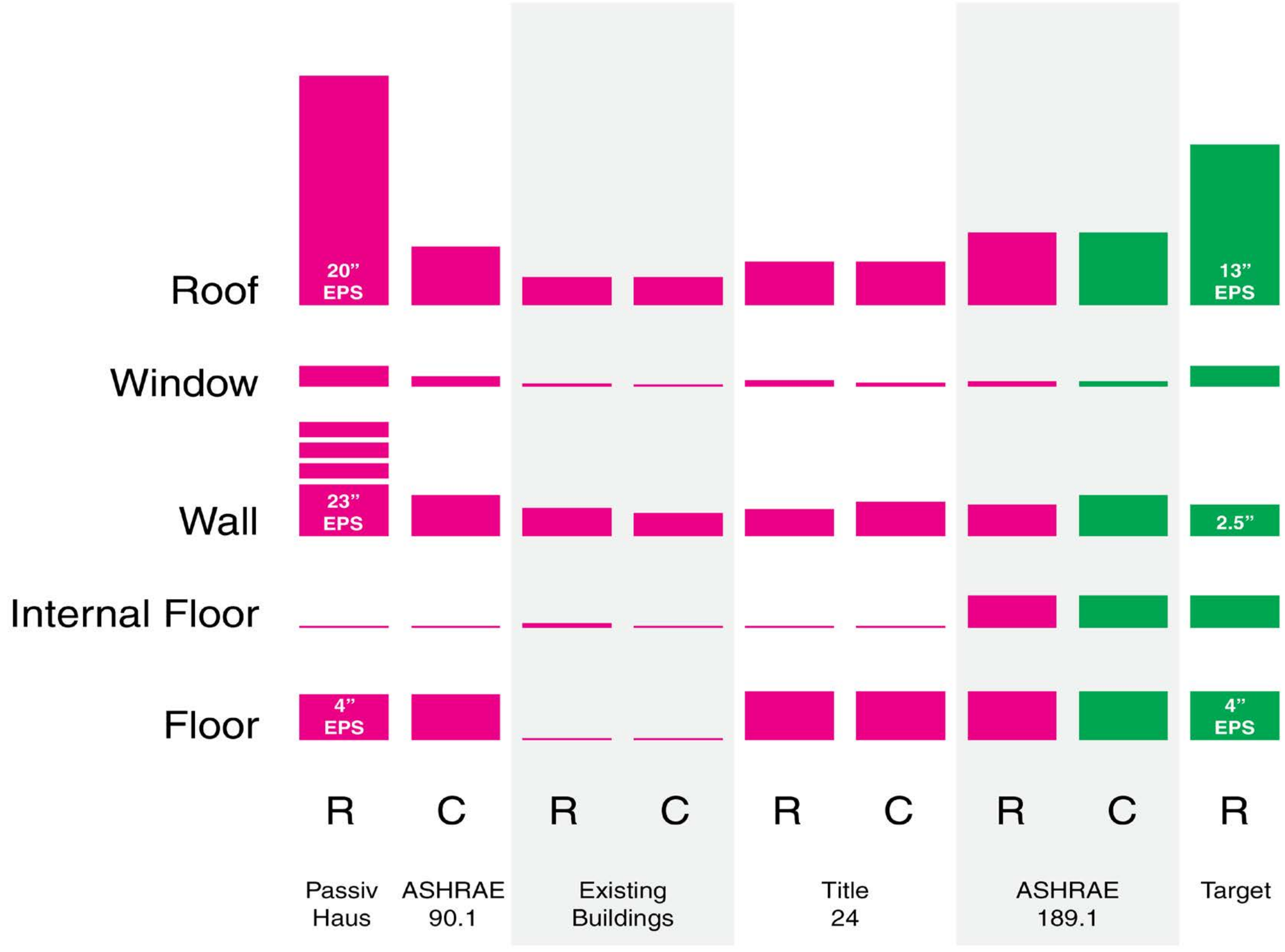
71* Comfort[%]

TEMPLATE U-VALUES



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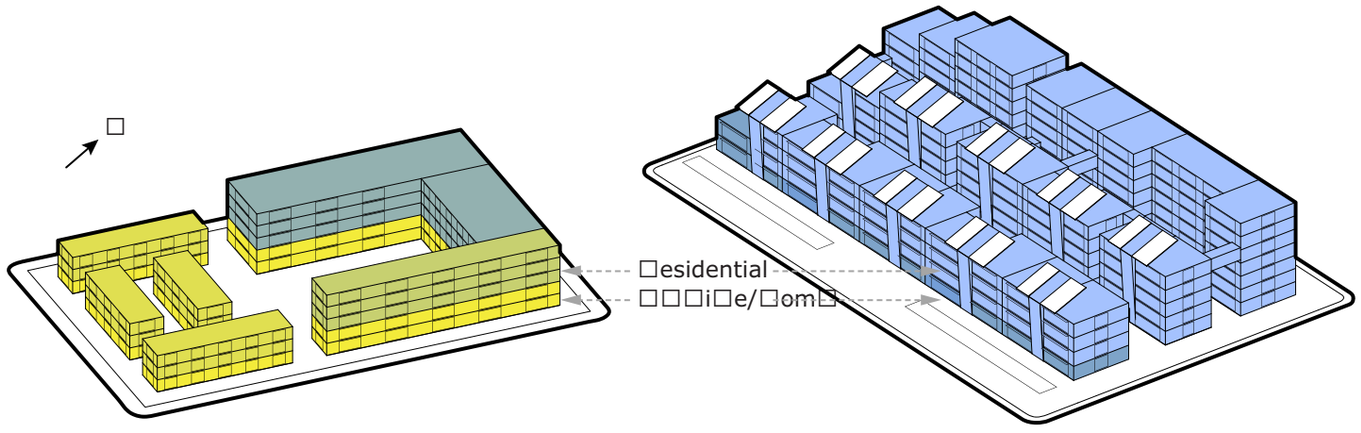
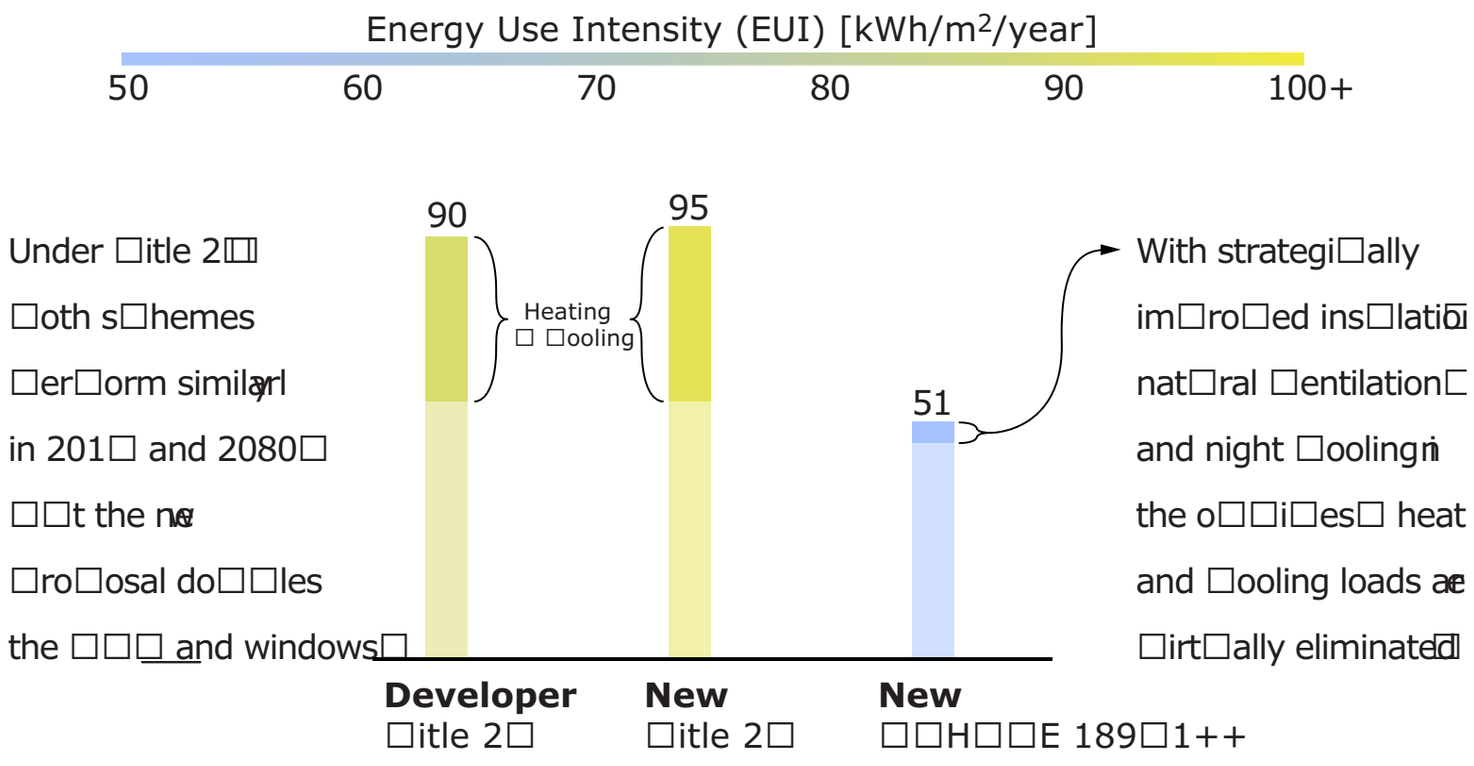
Reducing Energy & Gaining Density

Developer Proposal:
High energy with low density

Heat-Resilient New Proposal:
Low energy with high density





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Balancing Sustainability, Energy Use and Density with Heat Wave Resiliency for 2080

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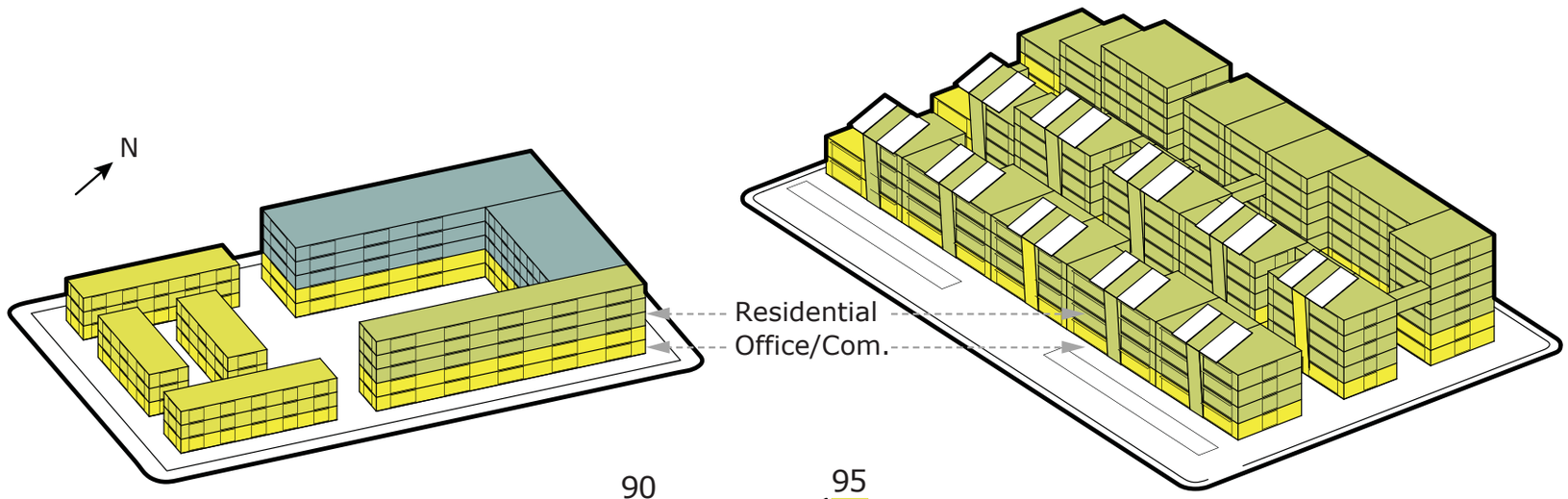
Reducing Energy & Gaining Density

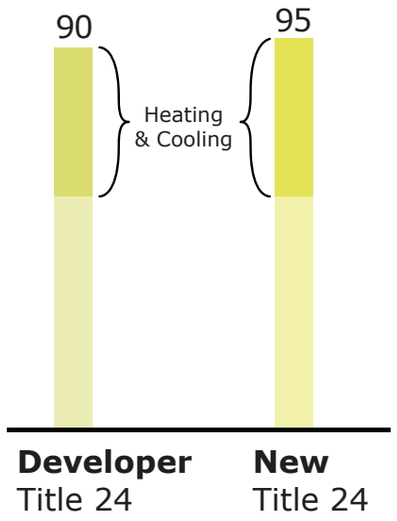
Energy Use Intensity (EUI) [kWh/m^2/year]

50 60 70 80 90 100+

Developer Proposal:
High energy with low density

Heat Resilient Proposal:
Low energy with high density





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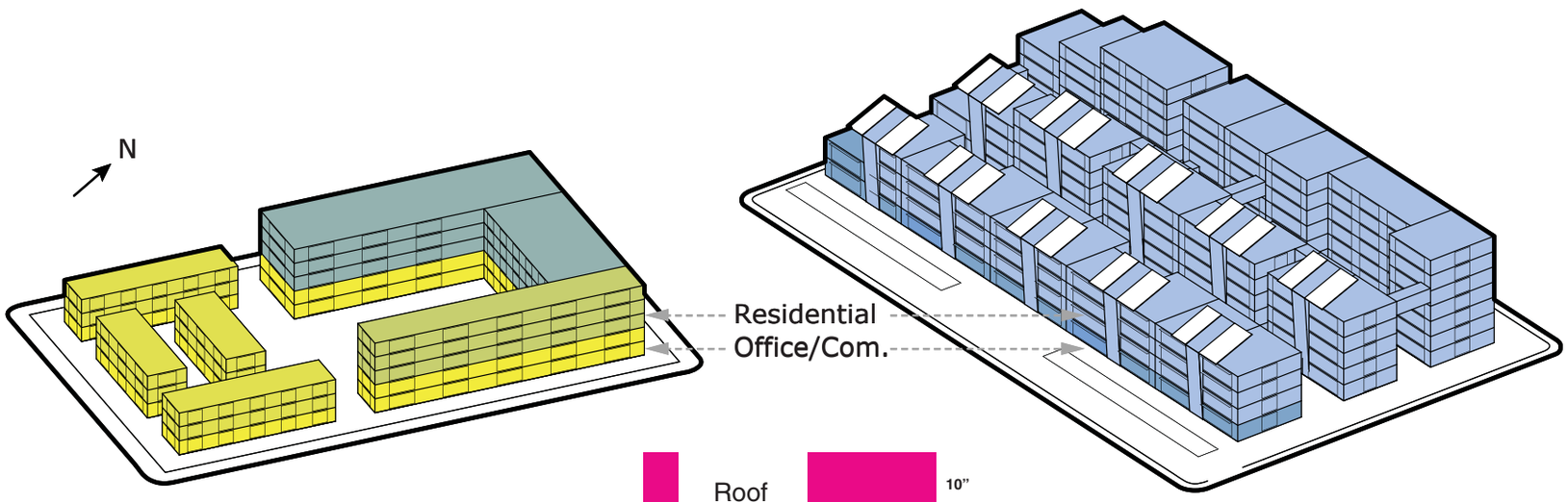

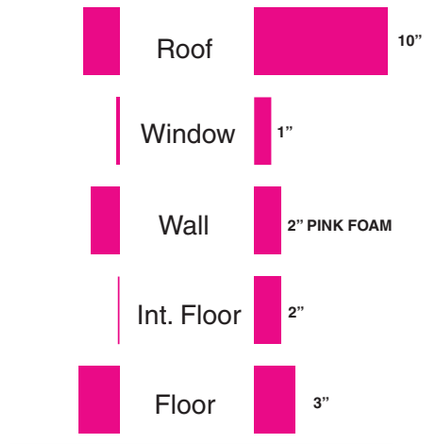

+ Natural ventilation
+ Thermal mass
+ Night cooling

Developer	**New**
Title 24	ASHRAE 189.1++

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Reducing Energy & Gaining Density

Energy Use Intensity (EUI) [kWh/m^2/year]

50 60 70 80 90 100+

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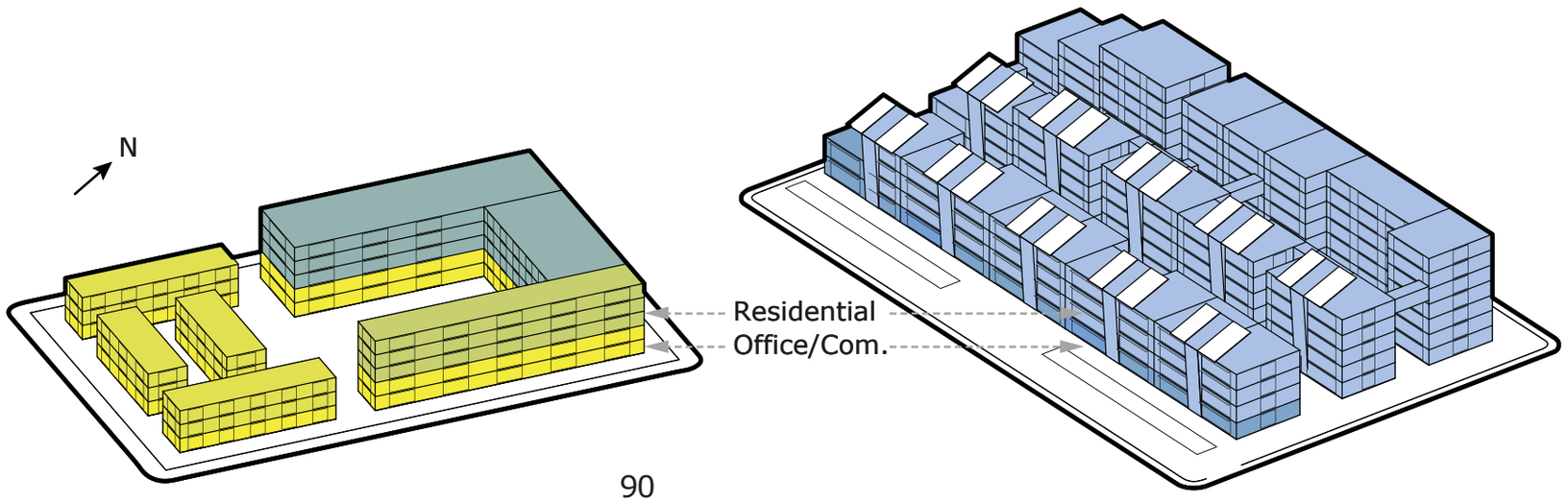

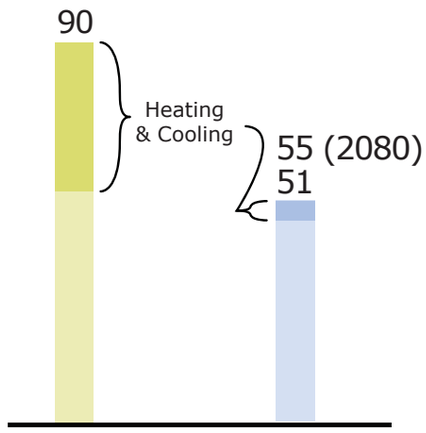

Developer
Title 24

New
ASHRAE
189.1++

+ Natural ventilation
+ Thermal mass
+ Night cooling

82%
Comfort[% Occupied Hours]

71%
Comfort[% Occupied Hours]

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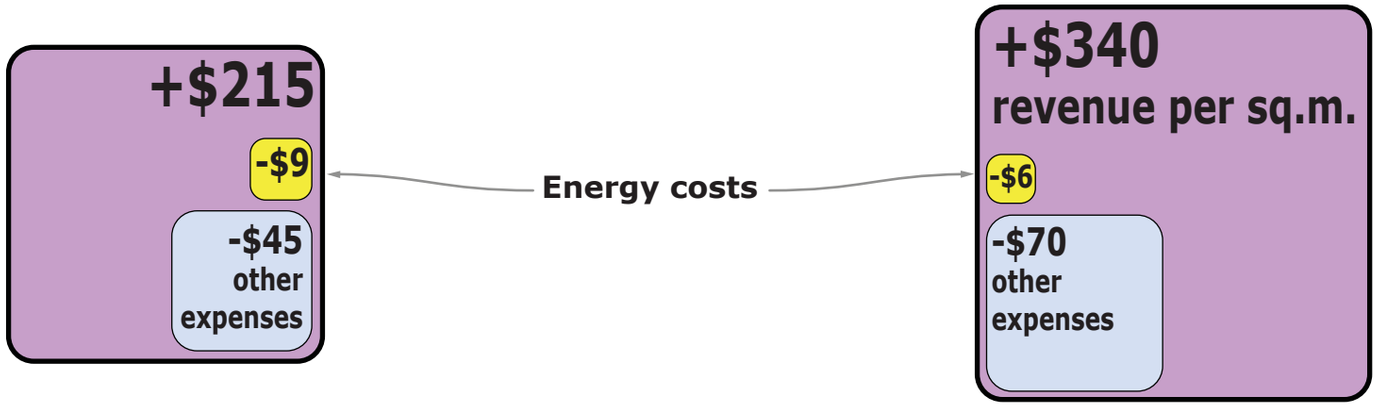
Energy Costs vs. Resilient Value

Developer Proposal:
High energy costs
& lower revenue

Heat Resilient Proposal:
Lower energy costs
& more leasable GFA



$ 8.2
Finanace[CASH/COST]

$ 8.0
Finanace[CASH/COST]

PROPOSED Heat-Resilient Hunter's Point

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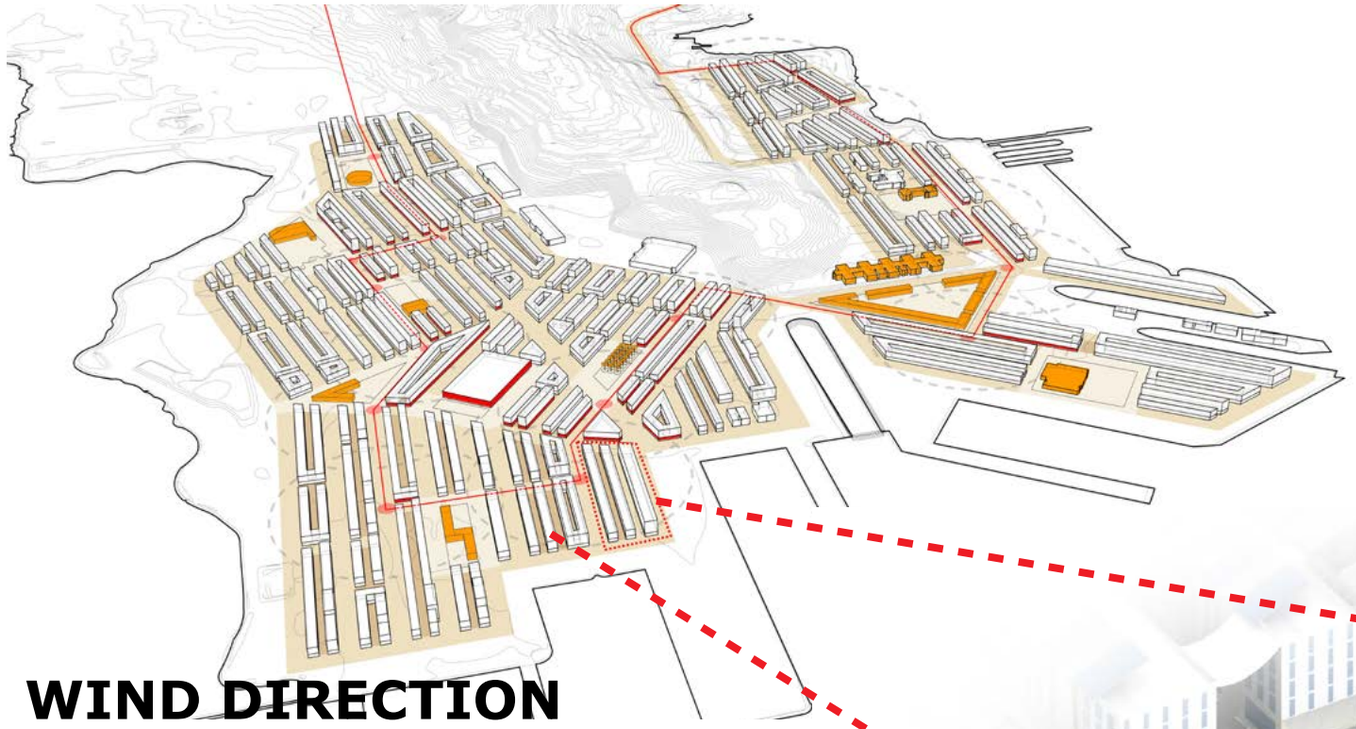

WIND DIRECTION

THANKS!