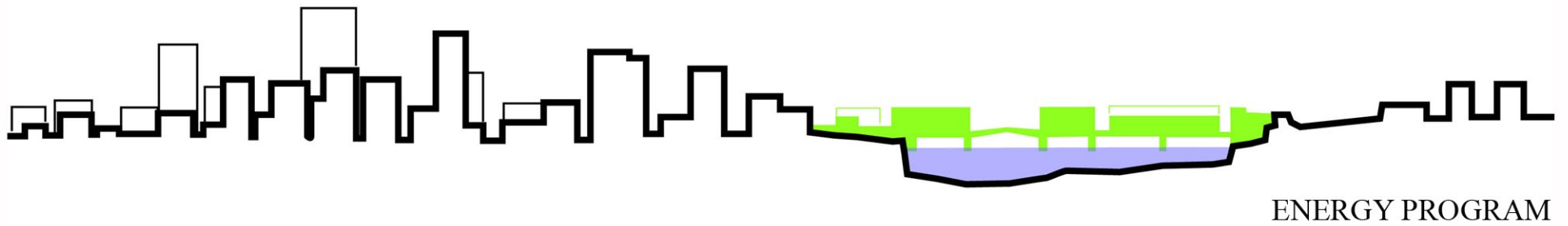


# PDX LIVING BRIDGE



ENERGY PROGRAM

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## PDX LIVING BRIDGE - ENERGY PROGRAM

### Project Thesis Statement:

Portland's Central City is split in two by the Willamette River. No strong pedestrian connection exists. The Living Bridge will provide a true urban connection in the form of buildings, parks and infrastructure, drawing the two parts together.

### Urban/ Environmental Response, Energy Consumption and the Living Bridge:

Portland has a reputation for responsible urban design and environmental response. The Living Bridge is the embodiment of both of these concepts, creating an icon for the city's strongest traits.

The Central City on the west side of the river has achieved the walkable urbanity that is inherently characteristic of great cities worldwide. Districts blend into each other almost naturally. However, the districts on the east side that *are* walkable are unreachable by pedestrian means due to the barriers of the river, the I-5 freeway, and the Industrial Sanctuary. The Living Bridge seeks to reconcile the space in-between and permeate the barriers without destroying the positive qualities that each offers.

Part of responsible urban design is environmental response. The whole point of increasing density in urban areas is to reduce human impact on the environment. The chief way to achieve that is to reduce energy consumption. The Living Bridge is intended to be a net producer of energy through various means described herein.

## Energy Conservation Strategies:

The Living Bridge will use only its annual water and solar budget – the amount of rain and solar energy that lands on the site over the period of one year

The project will employ:

- » Passive solar heating (sunshading and thermal mass)
- » Natural ventilation (operable windows and vents w/ efficient fans)
- » Water reclamation systems (cisterns, bioswales, and greenroofs)
- » Water recycling (gray water systems)
- » Geothermal heating and cooling (coils and pumps)

It will draw energy from:

- » The river (hydroelectric turbines)
- » The sun (photovoltaic cells)
- » The wind (wind turbines)

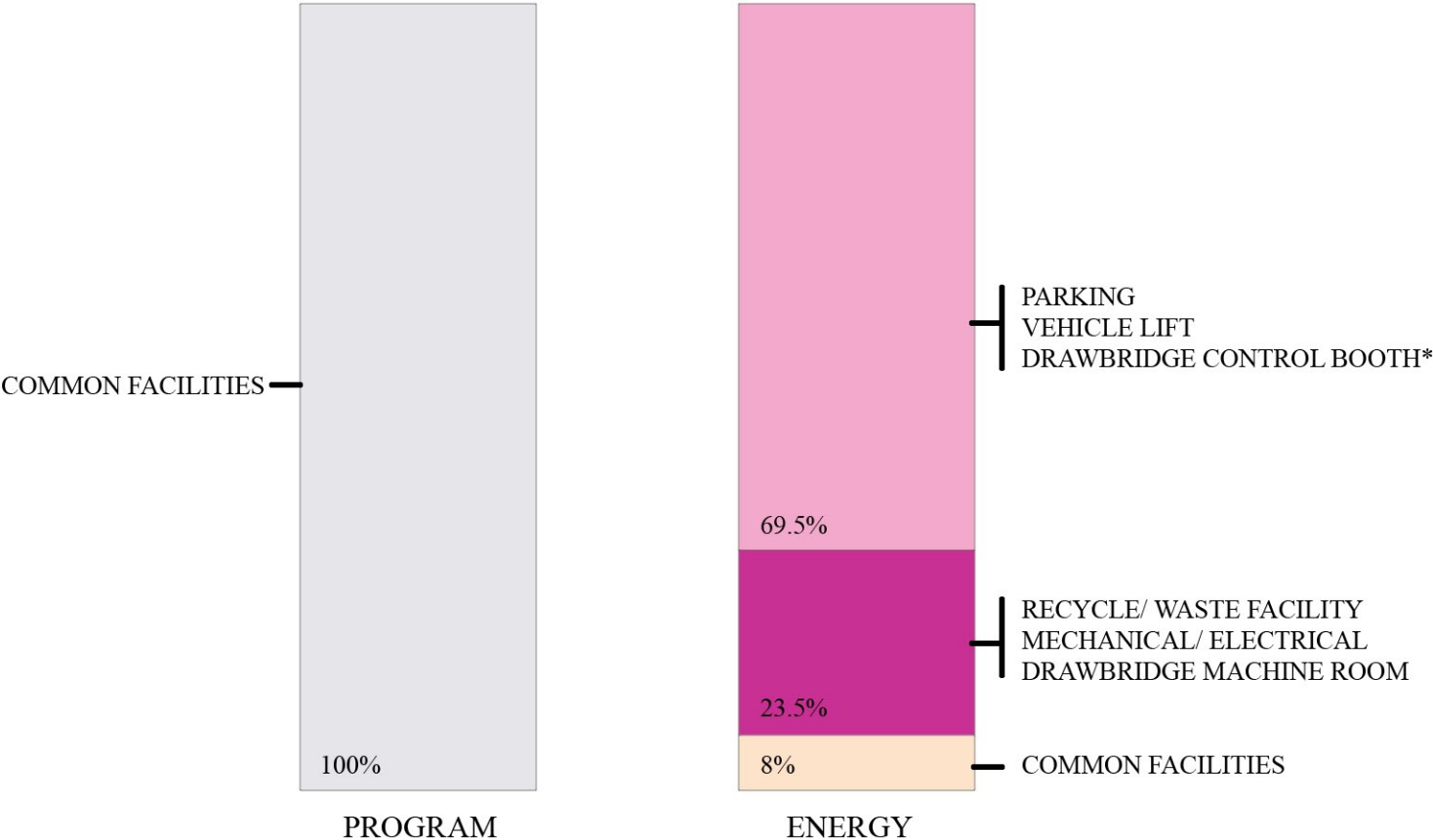
Each of the described strategies will have a direct impact on the form of the buildings on the bridge and hence the overall form of the project. For example the orientation of the bridge is roughly east - west with predominantly north and south exposure. These present opportunities for passive solar heating, daylighting, and natural ventilation. If the buildings on the south are terraced appropriately, the buildings on the north will receive adequate exposure. If the buildings on the north are separated at intervals, the summer winds can be exploited to cool all of the buildings, north and south.

PDX LIVING BRIDGE - ENERGY PROGRAM DATA SHEET

SPACE	FREQUENCY OF USE DAYS/NIGHTS& WEEKENDS	ACTIVITY TYPE	LIGHT LEVELS AMBIENT/TASK (fc)	ALLOWABLE TEMPERATURE RANGE	SPACE DIMENSIONS	SPACE HEIGHT	AREA/SPACE	# OF SPACES	TOTAL AREA	NOTES
<b>COMMON (underside of bridge)*</b>										
Parking, structured	Very Frequent/ Frequent	B / -	5 / -	Large	-	8'-0"	110 spaces	2	220 spaces	1 per residence, 1 per 1000 sf leaseable office
							<b>PARKING TOTAL</b>		73000 sf	36500 sf x 2
Vehicle Lift / Lift Control Booth	Very Frequent/ Frequent	B / -	5 / -	Large	20'-0"x20'-0"	Shaft	400 sf	4	1600 sf	
Recycle/ Waste Management	Rare/ Occasional	- / E	- / 50	Large	33'-0"x100'-0"	16'-0"	3300 sf	2	6600 sf	
Mechanical/ Electrical	Rare/ Rare	- / E	- / 50	Large	75'-0"x100'-0"	16'-0"	7500 sf	2	15000 sf	including (4) geothermal tap lines at each pier
Machine Room for Drawbridge Lift	Rare / Rare	- / E	- / 50	Large	20'-0"x100'-0"	30'-0"	2000 sf	2	4000 sf	locate in pier
Control Booth for Drawbridge Lift	Per US Coast Guard	B / -	5 / -	Large	10'-0"x10'-0"	8'-0"	100 sf	1	100 sf	locate over pier
Storage	Rare / Rare	B / -	5 / -	Large	40'-0"x100'-0"	8'-0"	4000 sf	2	8000 sf	
							<b>GRAND TOTAL</b>		34980 sf	
<b>MIXED-USE RESIDENTIAL (4 BLDGS)</b>										
Lobby (incl. Reception/ Office/ Mailroom)	Very Frequent/ Frequent	B / E	5 / 50	Small	30'-0"x70'-0"	16'-0"	1400 sf	4	5600 sf	
Leasing Office	Very Frequent/ Rare	C / E	10 / 50	Small	10'-0"x15'-0"	10'-0"	150 sf	4	600 sf	
Restroom	Frequent/ Rare	B / -	5 / -	Small	8'-0"x8'-1"	8'-0"	65 sf	4	260 sf	
Janitor's Closet	Rare/ Frequent	B / -	5 / -	Small	7'-6"x10'-0"	8'-0"	75 sf	4	300 sf	
Maintenance Office	Very Frequent/ Rare	C / E	10 / 50	Small	10'-0"x11'-0"	8'-0"	110 sf	4	440 sf	
Retail Lease Space 'A' - Bar/ Restaurant	Rare/ Very Frequent	A / -	2 / -	Small	45'-0"x70'-0"	16'-0"	3000 sf	8	24000 sf	2 units x 4 bldgs
Retail Lease Space 'B' - Shop/ Café / Service	Very Frequent/ Frequent	B / E	5 / 50	Small	30'-0"x70'-0"	16'-0"	1400 sf	20	28000 sf	5 units x 4 bldgs
Dwelling Lease Space 'A' - Studio/ 1-bedrm	Frequent/ Very Frequent	C / E	10 / 50	Small	26'-8"x30'-0"	9'-0"	800 sf	56	44800 sf	14 units x 4 bldgs
Dwelling Lease Space 'B' - 1-bedrm w/ office	Frequent/ Very Frequent	C / E	10 / 50	Small	30'-0"x40'-0"	9'-0"	1200 sf	64	76800 sf	16 units x 4 bldgs
Dwelling Lease Space 'C' - 2-bedrm w/ office	Frequent/ Very Frequent	C / E	10 / 50	Small	30'-0"x66'-8"	9'-0"	2000 sf	36	72000 sf	9 units x 4 bldgs
Common Event Space	Frequent/ Occasional	B, C / -	5, 10 / -	Small	30'-0"x40'-0"	9'-0"	1200 sf	4	4800 sf	
Circulation Space (incl. Elevators & Stairs)	Very Frequent/ Frequent	B / -	5 / -	Large	-	9'-0"	16000 sf	4	64000 sf	4000 sf x 4 floors x 4 bldgs
Electrical/ Data Closet	Rare / Rare	- / E	- / 50	Large	10'-0"x10'-0"	9'-0"	100 sf	16	1600 sf	4 floors x 4 bldgs
Recycle/ Waste	Frequent/ Occasional	- / E	- / 50	Large	10'-0"x 10'-0"	9'-0"	100 sf	16	1600 sf	4 floors x 4 bldgs
Loading Dock	Occasional / Rare	B / -	5 / -	Large	20'-0"x60'-0"	16'-0"	1200 sf	8	9600 sf	2 loading docks x 4 bldgs
Vehicle Lift / Lift Control Booth	Very Frequent/ Frequent	B / -	5 / -	Large	20'-0"x20'-0"	Shaft	400 sf	4	1600 sf	
							<b>GRAND TOTAL</b>		336000 sf	84000 sf x 4 bldgs
<b>MIXED-USE COMMERCIAL (2 BLDGS)</b>										
Lobby (incl. Security)	Very Frequent/ Frequent	B / E	5 / 50	Small	30'-0"x70'-0"	16'-0"	1400 sf	2	2800 sf	
Retail Lease Space 'A' - Bar/ Restaurant	Rare/ Very Frequent	A / -	2 / -	Small	45'-0"x70'-0"	16'-0"	3000 sf	4	12000 sf	2 units x 2 bldgs
Retail Lease Space 'B' - Shop/ Café / Service	Very Frequent/ Frequent	B / E	5 / 50	Small	30'-0"x70'-0"	16'-0"	1400 sf	10	14000 sf	5 units x 2 bldgs
Office Lease Space	Very Frequent/ Occasional	C / E,F	10 / 50,100	Small	-	10'-0"	31040 sf	2	62080 sf	2 floor x 2 bldgs
Circulation Space (incl. Elevators & Stairs)	Very Frequent/ Frequent	B / -	5 / -	Large	-	9'-0"	12000 sf	3	24000 sf	4000 sf x 3 floors x 2 bldgs
Recycle/ Waste	Frequent/ Occasional	- / E	- / 50	Large	10'-0"x 10'-0"	9'-0"	100 sf	6	600 sf	3 floors x 2 bldgs
Electrical/ Data Closet	Rare / Rare	- / E	- / 50	Large	10'-0"x10'-0"	9'-0"	100 sf	6	600 sf	3 floors x 2 bldgs
Restrooms	Frequent/ Rare	B / -	5 / -	Small	11'-0"x20'-0"	8'-0"	2200 sf	2	4400 sf	1100 sf x 2 floors x 2 bldgs (550 sf M, 550 sf W)
Janitor's Closets	Rare/ Frequent	B / -	5 / -	Small	7'-6"x10'-0"	8'-0"	75 sf	4	300 sf	2 floor x 2 bldgs
Maintenance Office	Very Frequent/ Rare	C / E	10 / 50	Small	10'-0"x11'-0"	8'-0"	110 sf	2	220 sf	
Loading Dock	Occasional / Rare	B / -	5 / -	Large	20'-0"x60'-0"	16'-0"	1200 sf	4	4800 sf	2 loading docks x 2 bldgs
Vehicle Lift / Lift Control Booth	Very Frequent/ Frequent	B / -	5 / -	Large	20'-0"x20'-0"	Shaft	400 sf	2	800 sf	
							<b>GRAND TOTAL</b>		126600 sf	63300 sf x 2 bldgs
*serve entire complex of buildings, two separate facilities oriented equally east and west of the drawbridge					FREQUENCY OF USE KEY			ACTIVITY TYPE KEY		
Notes:					Very Frequent = 2-3 times per day to hourly			Ambient Light		
- Mechanical / Electrical space needs are included in all Retail and Dwelling Lease Spaces					Frequent = 2-3 times per week to once daily			A = Public spaces w/ dark surroundings		
- Restroom space needs are included in all Retail and Dwelling Lease Spaces					Occasional = 2-3 times per month to once weekly			B = Simple orientation		
- Internal Gains and Occupant Density for all spaces were low (<23 Btu/hr sf for Internal Gain, <5.5 people/100 sf for Occupant Density)					Rare = 1-2 times per year to once monthly			C = Working spaces, occasional visual task		
								D = Visual task, high contrast of large size		
								Task Light		
								E = Visual tasks, medium contrast of small size		
								F = Visual tasks, low contrast or very small size		

PDX LIVING BRIDGE - ENERGY PROGRAM BAR GRAPH (COMMON FACILITIES TYPICAL OF 2 - LOCATED BELOW SURFACE LEVEL)

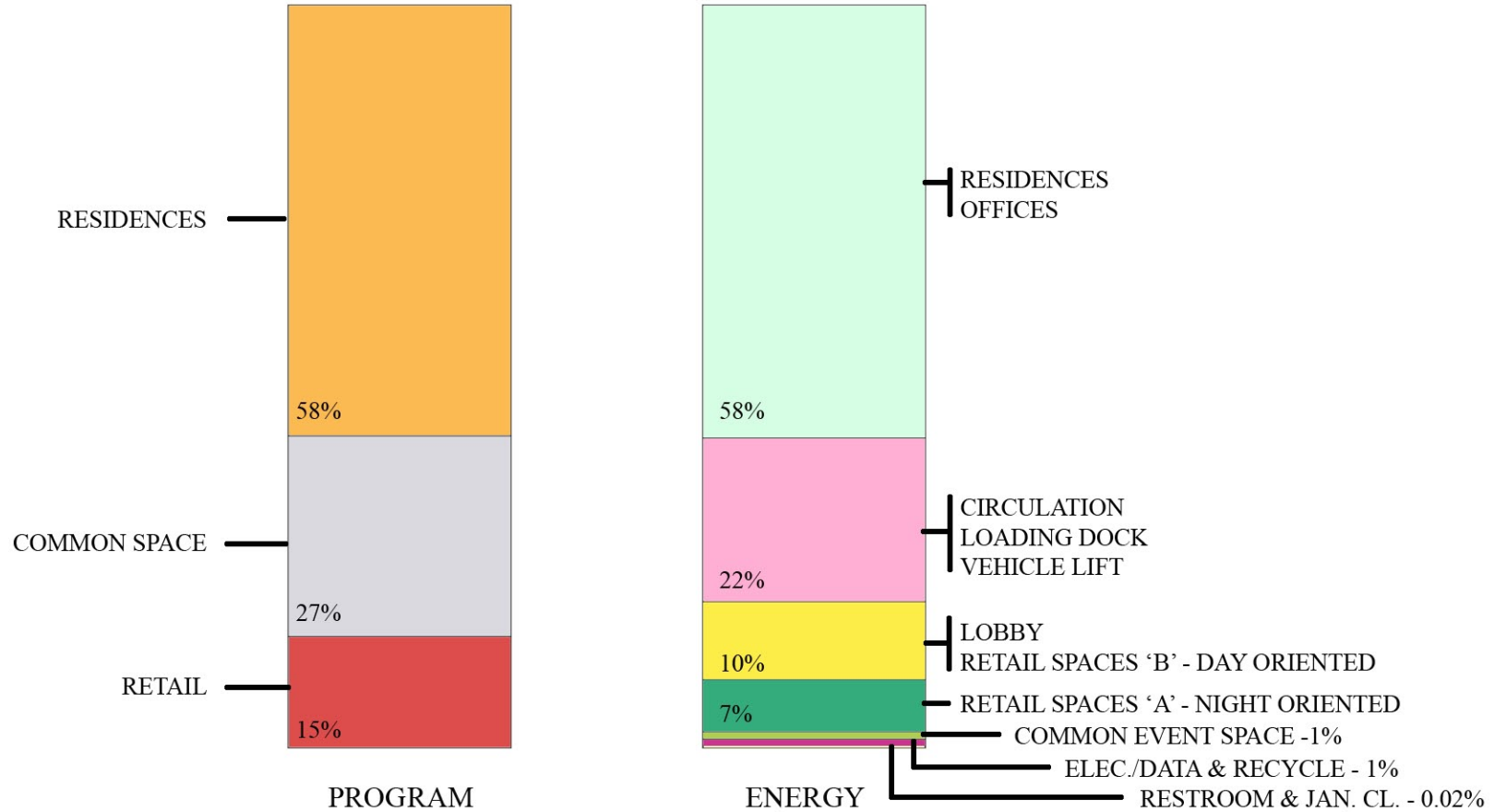
NOTE: COLORS CORRESPOND TO ENERGY PROGRAM DATA SHEET



\*CONTROL BOOTH LOCATED AT SURFACE LEVEL ABOVE WEST PIER ON SOUTH SIDE

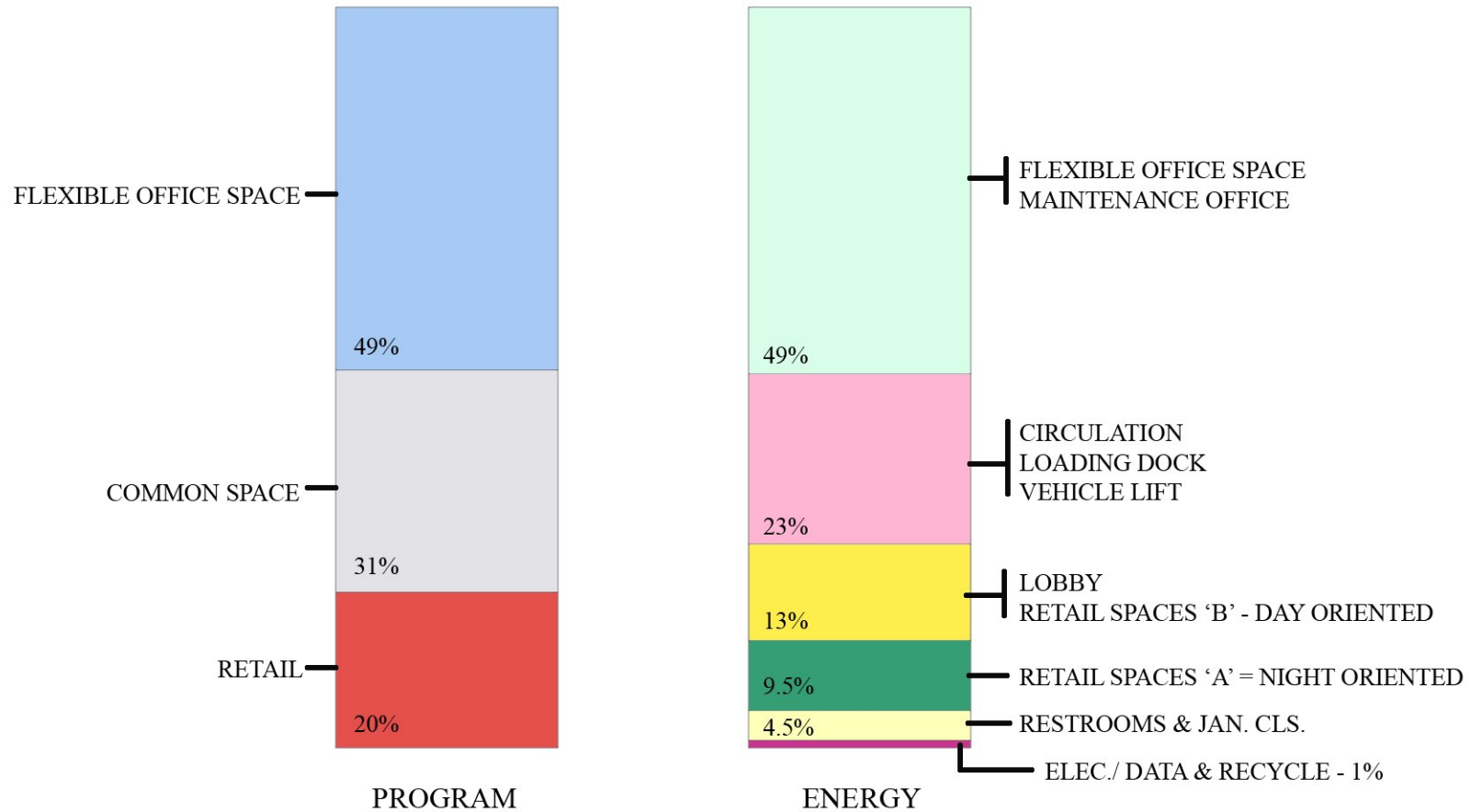
PDX LIVING BRIDGE - ENERGY PROGRAM BAR GRAPH (MIXED-USE RESIDENTIAL, TYPICAL OF 4 BUILDINGS)

NOTE: COLORS CORRESPOND TO ENERGY PROGRAM DATA SHEET



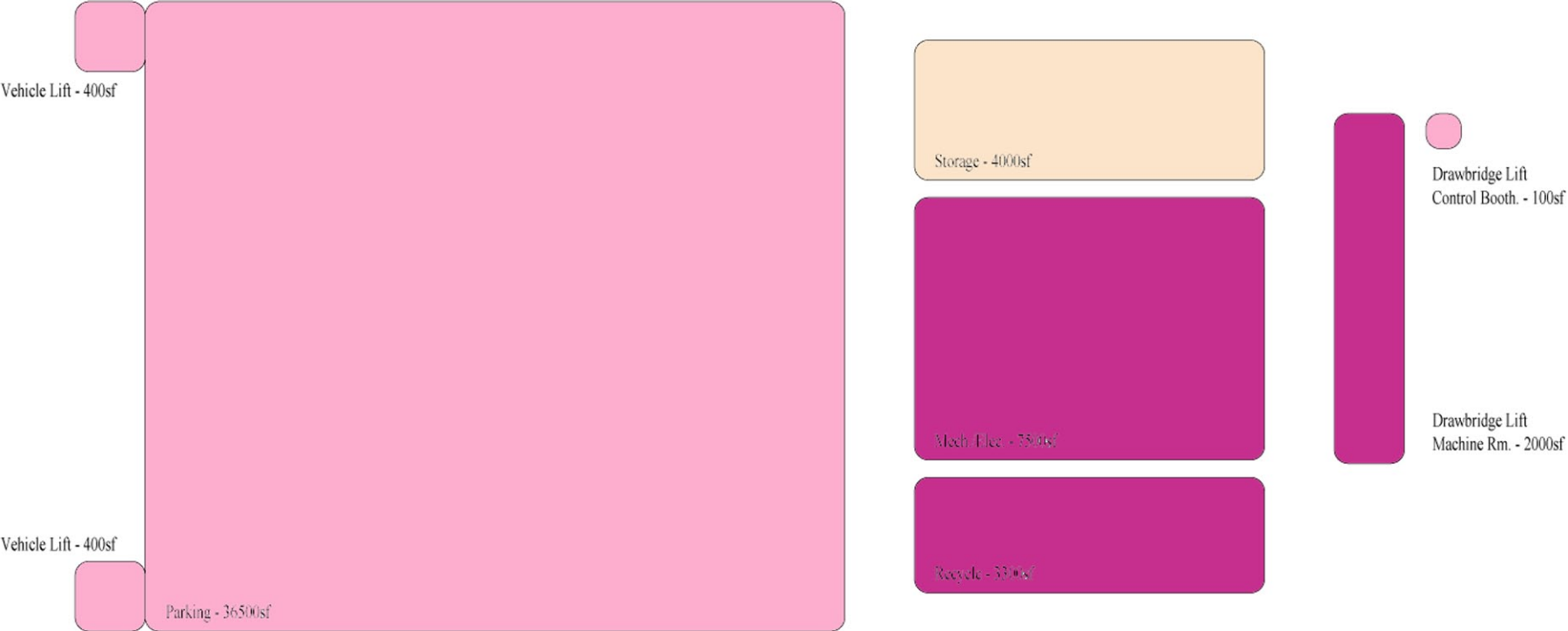
# PDX LIVING BRIDGE - ENERGY PROGRAM BAR GRAPH (MIXED-USE COMMERCIAL, TYPICAL OF 2 BUILDINGS)

NOTE: COLORS CORRESPOND TO ENERGY PROGRAM DATA SHEET



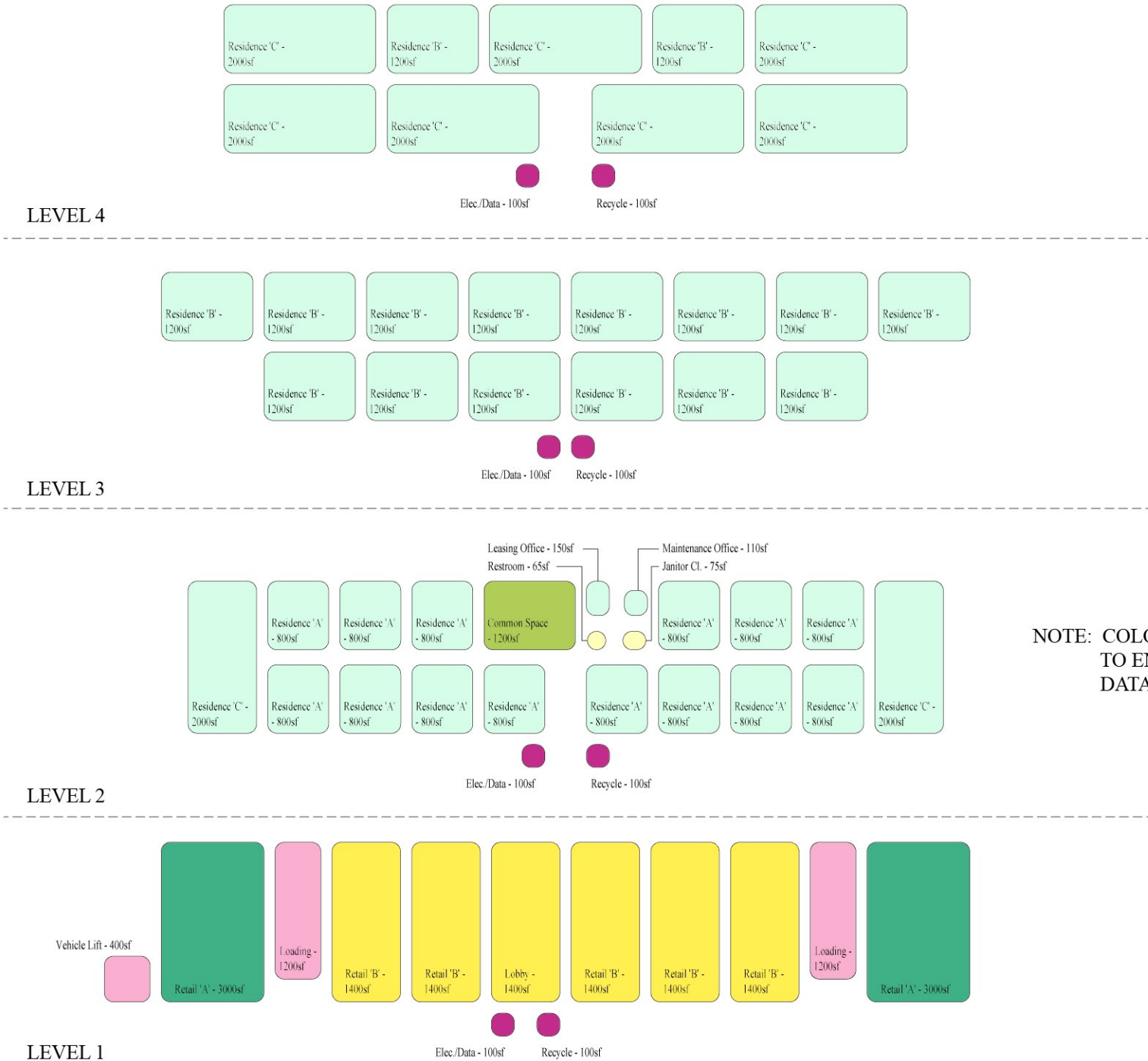


PDX LIVING BRIDGE - ENERGY PROGRAM SPACE DIAGRAM SHOWING ENERGY NEEDS (COMMON FACILITIES, TYP. OF 2)



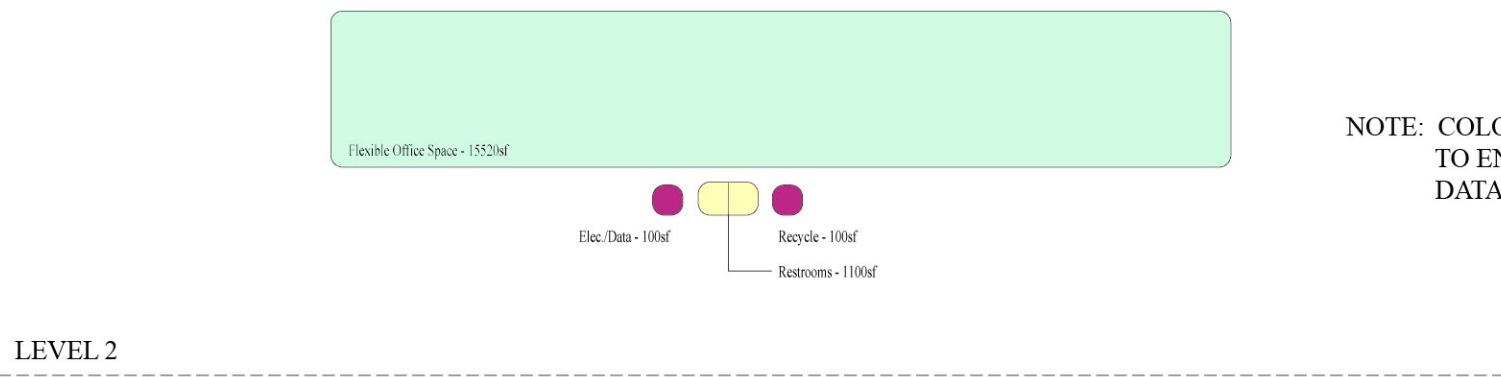
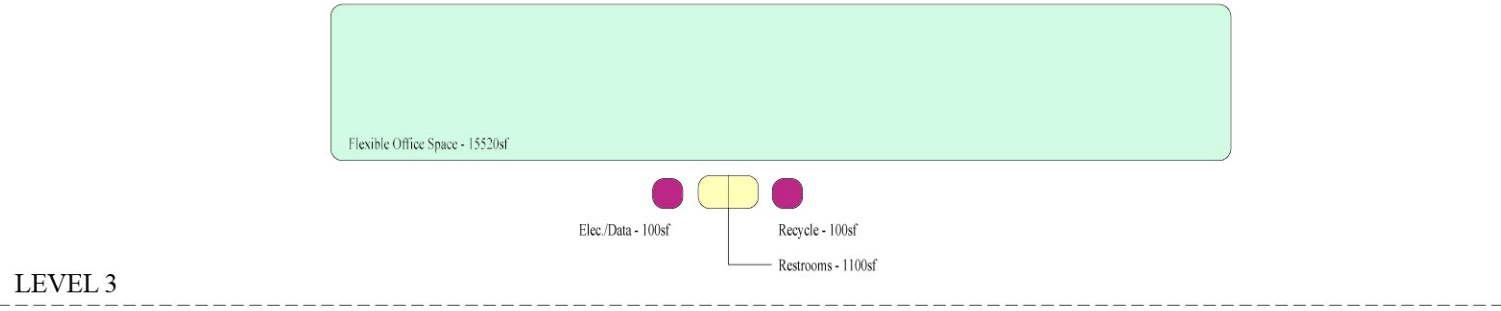
NOTE: COLORS CORRESPOND TO ENERGY PROGRAM DATA SHEET

PDX LIVING BRIDGE - ENERGY PROGRAM SPACE DIAGRAM SHOWING ENERGY NEEDS (MIXED-USE RESIDENTIAL, TYP. OF 4 BLDGS.)



NOTE: COLORS CORRESPOND TO ENERGY PROGRAM DATA SHEET

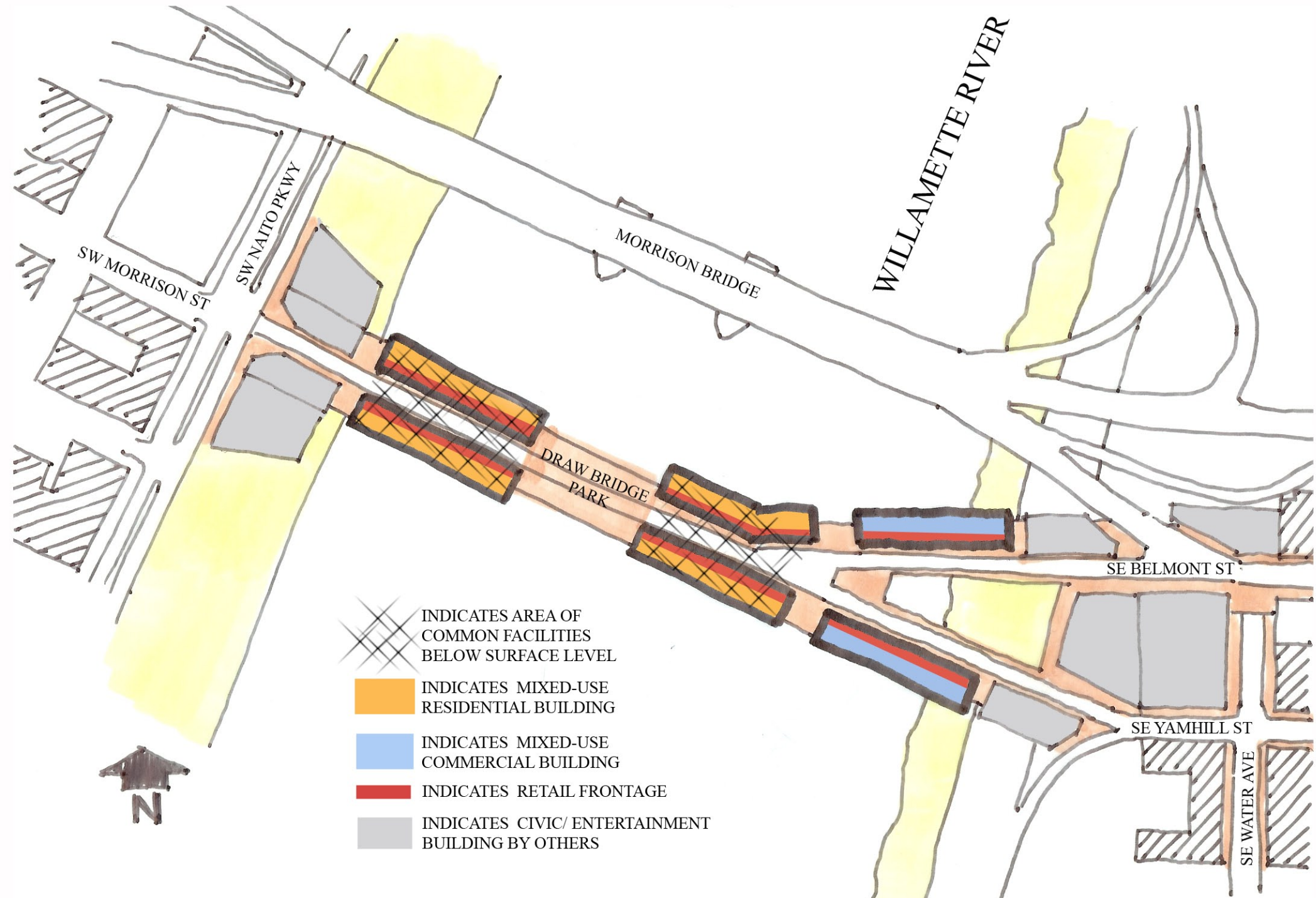
PDX LIVING BRIDGE - ENERGY PROGRAM SPACE DIAGRAM SHOWING ENERGY NEEDS (MIXED-USE COMMERCIAL, TYP. OF 2 BLDGS.)



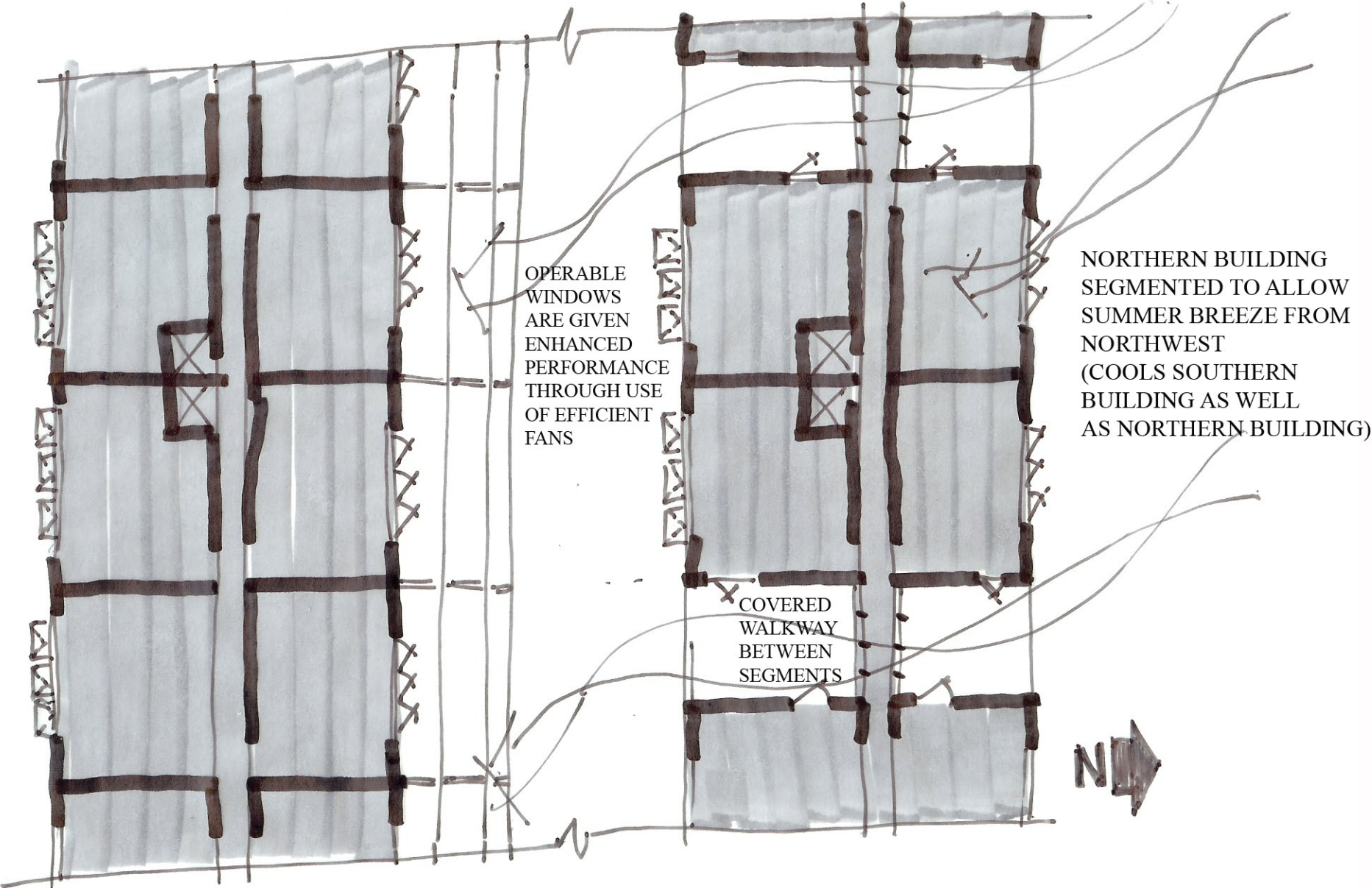
NOTE: COLORS CORRESPOND TO ENERGY PROGRAM DATA SHEET



PDX LIVING BRIDGE - SCHEMATIC SITE PLAN



PDX LIVING BRIDGE - ENERGY PROGRAM ARCHITECTURAL IMPLICATIONS (PLAN AT RESIDENCES)



PDX LIVING BRIDGE - ENERGY PROGRAM ARCHITECTURAL IMPLICATIONS (SECTION AT RESIDENCES FACING WEST)

