THE PROBLEM OF THE HOUSE

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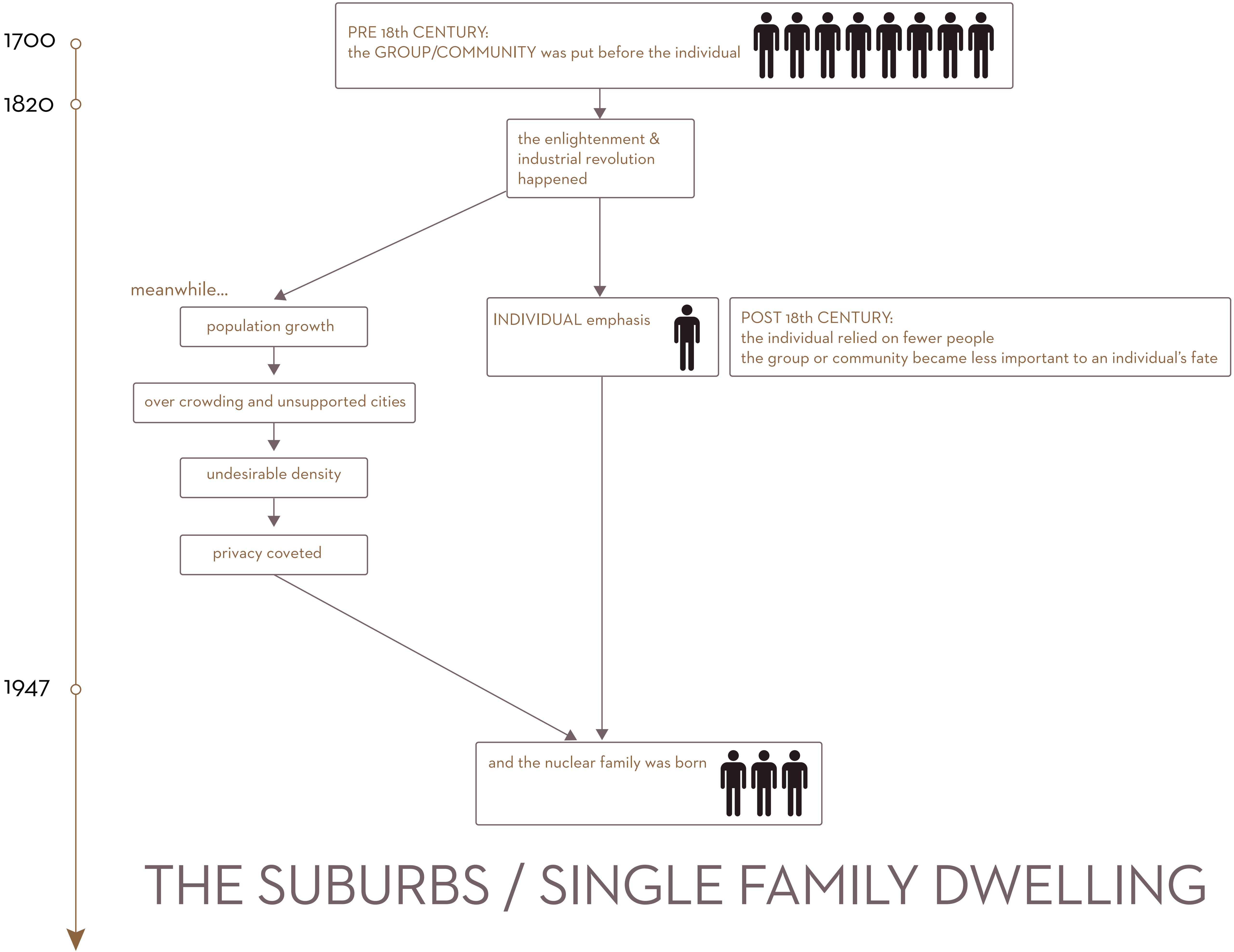
INTRODUCTION

Dating back to the 1700's, a community's success relied on the production and efficiency of the group. With this grew neighborliness and community support. Through times such as the enlightenment and then the industrial revolution, the emphasis switched to the individual. While industry was growing so was the population and city living became overcrowded and polluted. The density of the city became undesirable and privacy was coveted. The individual fortunate enough brought their immediate family outside of the city and into a single family home in the suburbs.

From the initial developments of suburbia, problems arose almost immediately. Although happy to begin the heavily marketed and seemingly idealistic *American Dream* lifestyle in a single family home, including land ownership and upward mobility on the horizon, it was not difficult for residents to quickly notice the mundane qualities of living within neighborhoods where each street and row of homes were difficult to tell apart. With little character and even less to engage one's mind, a popular critique of suburbia was that it was flat out ugly. Sociologically, suburbia took its toll as well. It was a center, a body of inhabitants, wanting to flourish but acting more like an organ haphazardly placed with no blood supply. There were large numbers of people living in these types of communities but the severed outlier created isolation on many scales- from inside the home to the entire detached community relying on the car for outside influence. The suburbs somehow lost all neighborliness and support that made historical communities thrive. It was not until later scientific discovery that a third argument against suburban sprawl was solidified. Eventually scientists urged that the continual land disruption negatively affects all aspects of life. To name a few, suburban sprawl reduces our oxygen producing vegetation, disrupts animal species and their food chain, pollutes air and water, and inefficiently uses the earth's depleting natural resources. Despite the strengthening criticisms of suburbia and the single family home, construction continued. Big builders were making easy profits and indulgent banking allowed for quick sales.

Today these suburban critiques still remain valid but now the country is in a recession. The downturn of the U.S. economy, while troubling, presents an opportunity for people to question their motivations and rationale for living a suburban life. With the unemployment rate up, gas prices up, and foreclosure rates up, for maybe the first time, the suburban lifestyle choices are noticeably illuminated as directly affecting the population's financial distress and it is in unstable economic times that the majority are willing to change.

To attract not only the socially aware and design savvy but to also gain awareness amongst a larger market interested in economically sensible housing in unpredictable times, we have proposed the following in hopes to provide a person or family with a more financially stable life while paying homage to the pre 18th century group-centric community with social connection. The four program elements include a primary dwelling, an accessory dwelling, a neighborhood center, and mixed use on site; together sustainably designed to possibly insulate against failure with square footage applicable towards rental income, work income, or both, while remaining environmentally friendly by cutting energy waste and cost. These program elements plus shared green space also provide social connection, support, and diversity- a neighborhood center to promote camaraderie and a group mentality, varying house size to allow for mixed income, easily accessible commercial space, and denser living to illuminate large area green space instead of wasted individual ornamental yards.


1700
1820
1947
PRE 18th CENTURY:
the GROUP/COMMUNITY was put before the individual
the enlightenment & industrial revolution happened
meanwhile...
population growth
over crowding and unsupported cities
undesirable density
privacy coveted
INDIVIDUAL emphasis
POST 18th CENTURY:
the individual relied on fewer people
the group or community became less important to an individual's fate
and the nuclear family was born
THE SUBURBS / SINGLE FAMILY DWELLING

THE SUBURBS / SINGLE FAMILY DWELLING

1980

Sprawl seemingly continued to prosper because 95% of the 15 million new office jobs created in 1980 were in low density suburbs

present

The current downturn of the U.S. economy, while troubling, presents an opportunity for people to question their motivations and rationale for living a suburban life. **People vote with their wallets.**

THE PROBLEM OF THE HOUSE =

the facts that get people's attention emerge:

- unemployment rate ↑
- gas prices ↑
- foreclosure rate ↑
- age expentancy ↑

+

already well establish concerns:

- isolation
- environmental abuse

SOLUTION *remember the pre-18th century supportive community*

a connected population:

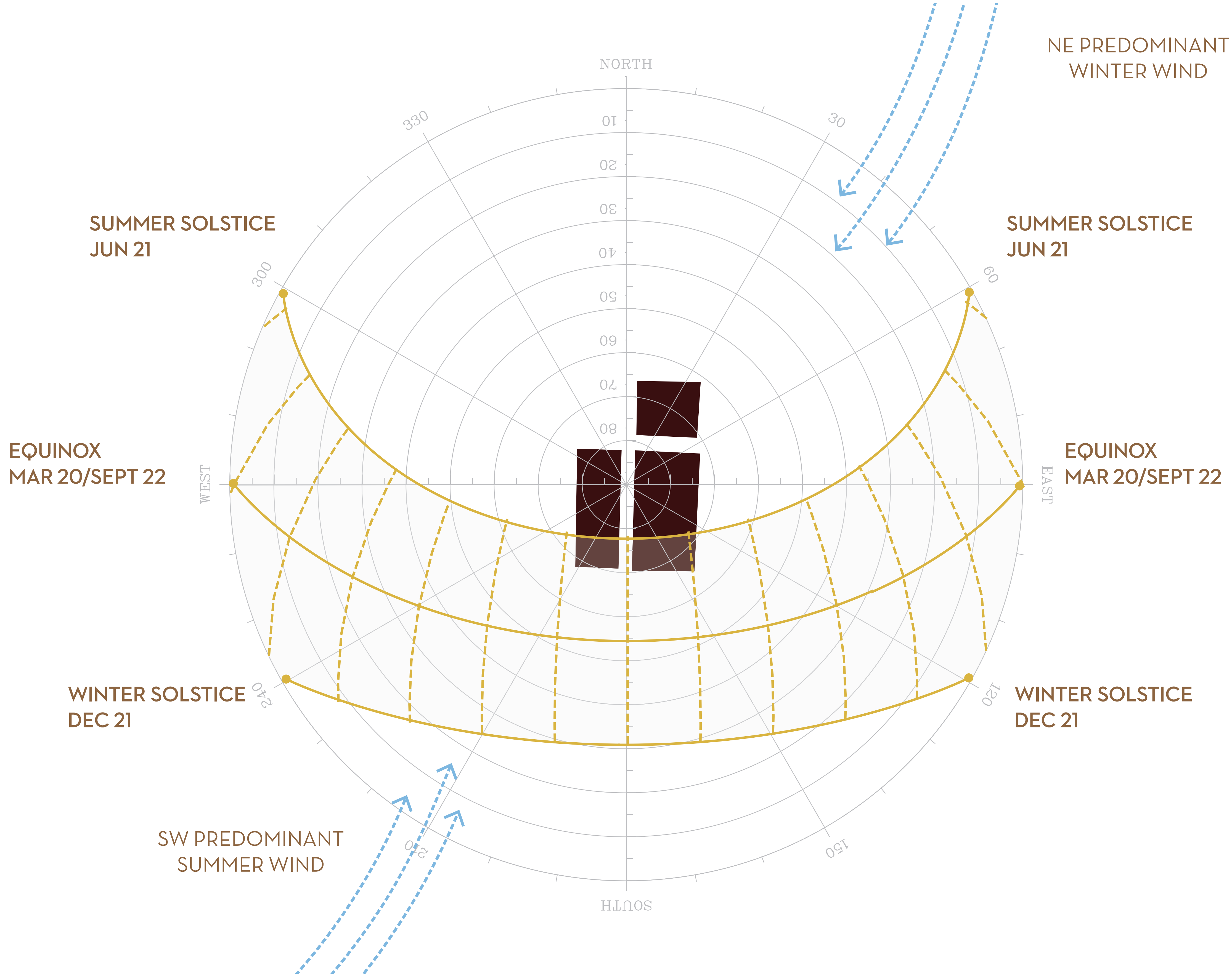
- mixed income
- higher density
- neighborhood center
- public transit

economically sensible housing

	DWELLING single family unit townhouse studio	ACCESSORY DWELLING UNIT	NEIGHBORHOOD CENTER	COMMERCIAL retail restaurant
Ideally..	LIVE +	EXTRA SPACE +	COMMUNITY INVOLVEMENT +	ENTERTAINMENT
You take a pay cut..	LIVE +	DEVELOP SKILL SET +	COMMUNITY SUPPORT +	SELL GOODS
You lose your job...	LIVE +	RENTAL INCOME +	COMMUNITY SUPPORT +	POSSIBLE EMPLOYMENT
Extended unemployment..	RENTAL INCOME +	LIVE +	PICK UP SHIFTS +	POSSIBLE EMPLOYMENT

ROCK BOTTOM

PLACE ANALYSIS
SITE ONE



WIND & SOLAR CONDITIONS

OFFICE & INSTITUTION-1 (O&I-1)

	CODE	OUR PROPOSALS
MAXIMUM DENSITY	15 dwelling units/ acre, or 15-25 units w/ preliminary approval	~20 units / acre
MINIMUM RESIDENTIAL LOT SIZE	5000 sqft	Smaller lots 1800 sqft ADU lots 1200 sqft Bigger lots 2600 sqft
YARD REQUIREMENTS	Side yard 5 ft *(aggregate of 10 ft)* Front yard 30 ft Rear yard 20 ft	Side yard 5 ft *(aggregate of 10 ft)* Front yard 5-30 ft Rear yard 10-50 ft *(depends if there is an ADU or not)*
MAXIMUM HEIGHT	40 feet at the minimum setback line, plus one foot of additional height for every one foot of additional setback	Maximum hight 40 ft *(three stories)*

ALLOWABLE USES WE ARE CONSIDERING

Multifamily and Group Housing Developments, Residential Institutions, Shops, Parks, Office Buildings

BUS STATIONS SCHOOLS & NURSERIES PARKS & PUBLIC SPACES BUS ROUTES LIGHT RAIL

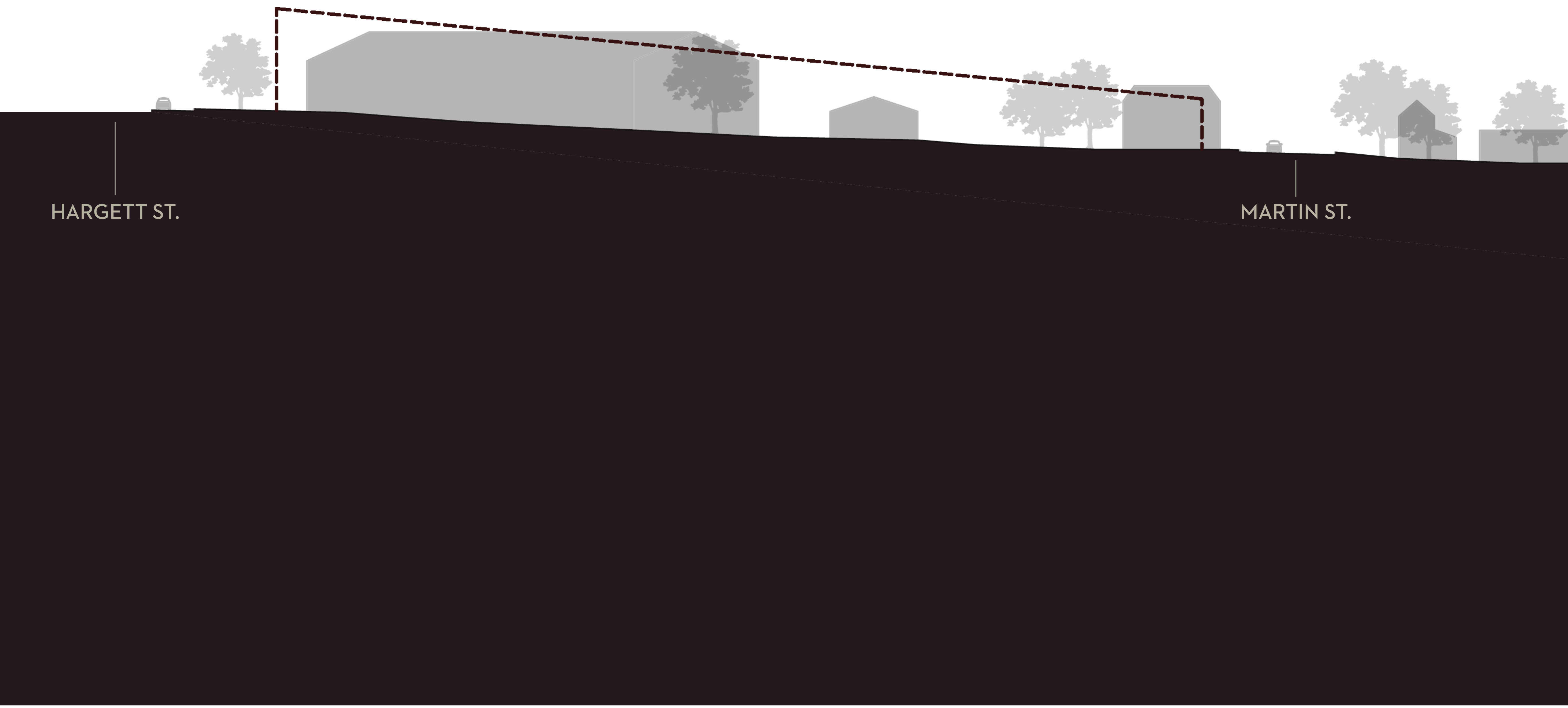
ONE MILE RADIUS OF SITE

AERIAL WITH BROAD CONTEXT

AERIAL WITH IMMEDIATE CONTEXT

AERIAL OF SITE

VIEWS OF SITE



SITE SECTION FACING EAST

SUSTAINABLE DESIGN STRATEGIES

PASSIVE

“Over 75 percent of what makes a building sustainable is contained in its orientation and in its bones – in the materials it is made of. There’s nothing high-tech or unusual about that.”

FRANK HARMON, FAIA

SUSTAINABLE DESIGN STRATEGIES: PASSIVE

Passive Solar & Natural Ventilation

Direct solar gain allows the suns energy to enter the house and heat thermal mass during winter months, and properly designed shading blocks summer solar heating. Cross ventilation provides a flow of cool outside air through a building that removes heat. Building should run east to west to maximize gains on the southern face and to capture as much cross wind as possible. Large amounts of glazing help to increase solar gains, but efforts should be taken to reduce glare and nighttime heat loss. Wind speed and temperature differentials between inside and out (>3 degrees) are critical for ventilation.

ADVANTAGES

Simple low cost techniques that take advantage of renewable energy.

Lifecycle as long as building lifetime.

Cools both occupants (wind speed and temperature) and building surfaces.

Ventilating at night while closing ventilation during the day can be effective even during the summer.

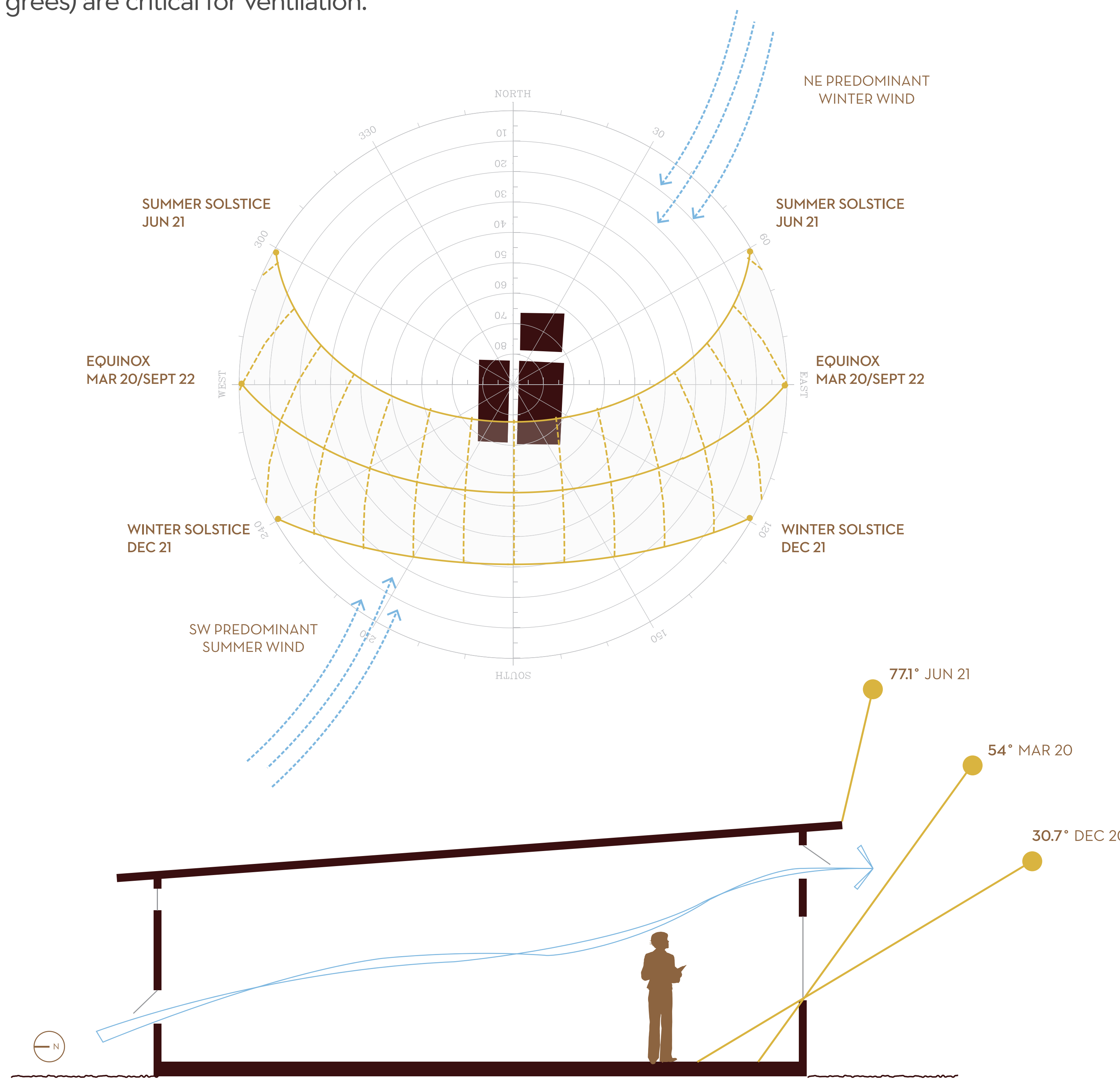
DISADVANTAGES

Overheating is possible on very sunny days.

Not suitable for all site orientations.

Low wind speeds or temperature differentials provide little cooling.

Ventilation can introduced outside noise or air pollutants.



SUSTAINABLE DESIGN STRATEGIES: PASSIVE

Stack Effect & Cooling Tubes

Stack ventilation relies on temperature stratification throughout the height of a building. This passive cooling strategy allows warm air to rise and be ventilated, while cooler air replaces at a lower level. Greater cooling can be expected if combined with air tubes (underground air inlets that precool air). Taller air stacks allow for greater temperature gradients, causing more cooling.

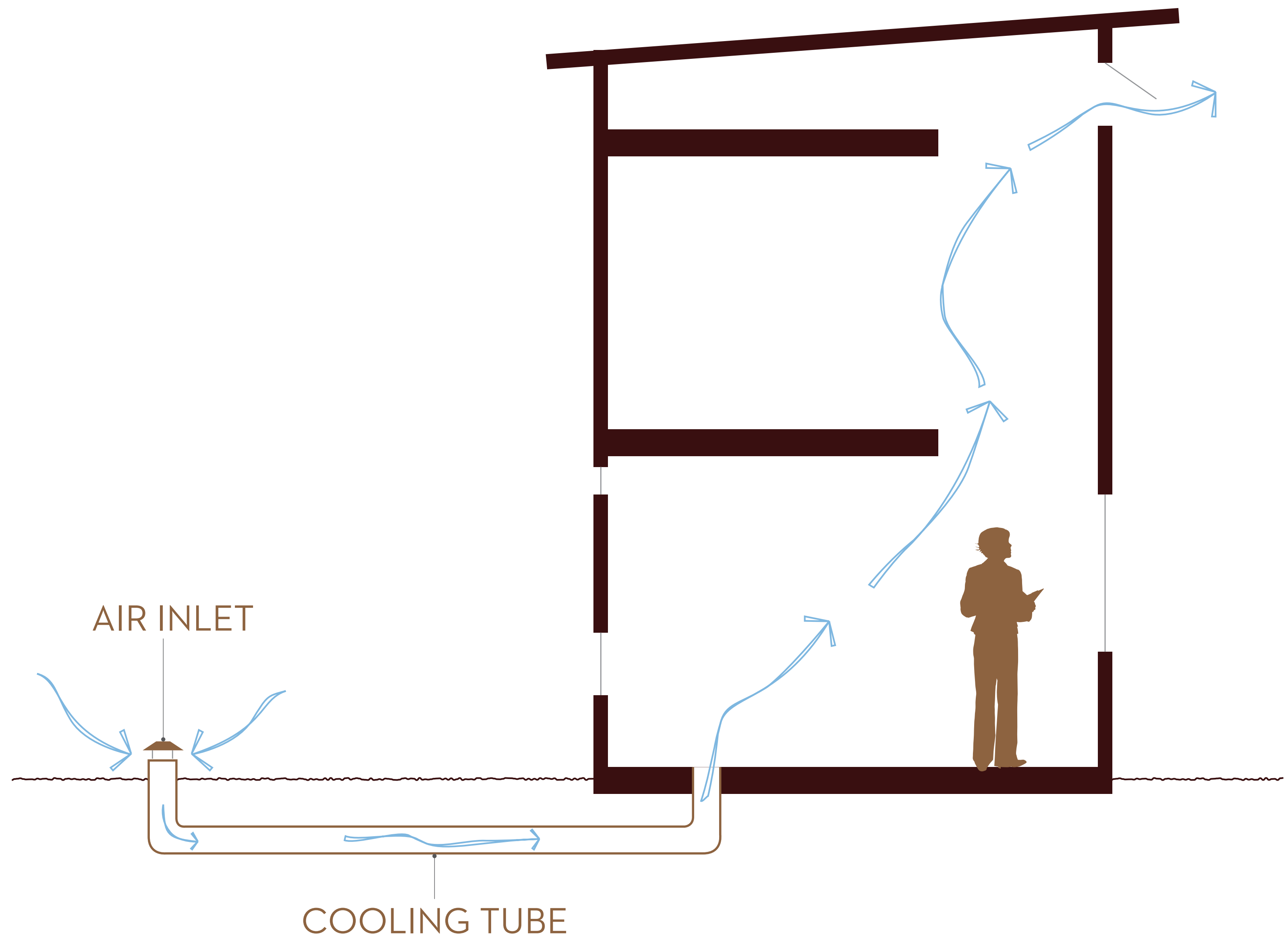
ADVANTAGES

Passive strategies require no energy input.

Improves temperature mixing throughout different levels of the house.

DISADVANTAGES

Only improves comfort if outside air is cooler than inside air.



SUSTAINABLE DESIGN STRATEGIES: PASSIVE

Rainwater Harvesting

Catchment systems collect water from impervious surfaces for irrigation, laundry, or emergency supply. Also known as rainwater harvesting, these systems can improve the hydrological impact of impervious surfaces by decrease storm runoff. Selection roof materials should relate to the expected water quality, metals (stainless steel) provide the cleanest catchment, while asphalt shingles, clay tiles and woods can cause mold or algae growth and contribute chemical contamination.

ADVANTAGES

Excellent way to provide water for luxury uses (watering lawn / washing car)

Improves storm water runoff

Water can be treated to supplement use

DISADVANTAGES

Water contamination possible, especially with incorrect installation or maintenance.

Seasonal variation in amount of collected water.

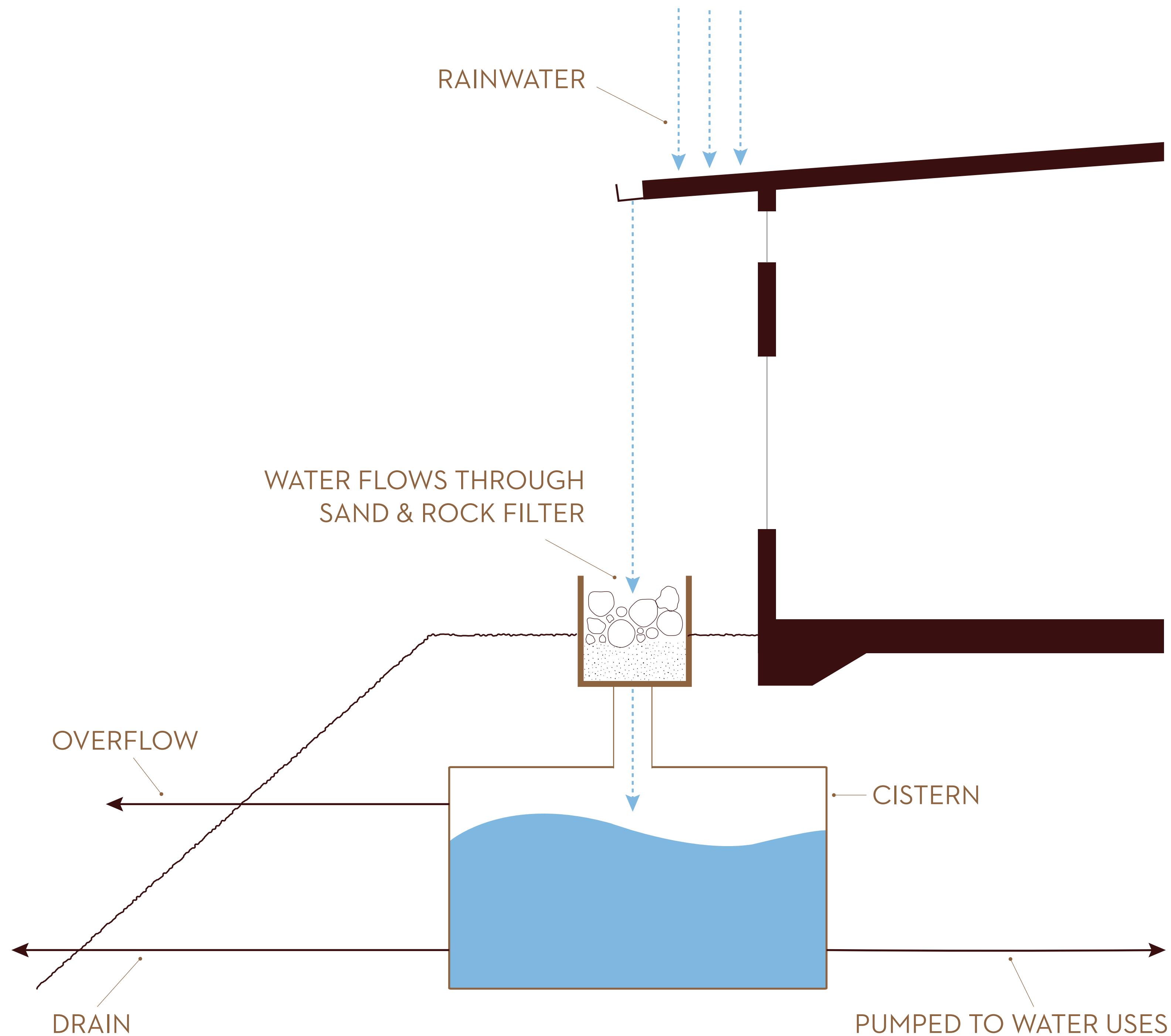
COSTS

Collection and Storage Only: Installation $750-1000

Annual Maintenance: Cleaning tank

Collection, Storage & Treatment: Installation $2000-4000

Annual Maintenance: Cleaning tank, filters, UV light



SUSTAINABLE DESIGN STRATEGIES

ACTIVE

SUSTAINABLE DESIGN STRATEGIES: PASSIVE

Radiant Floor Heating

ADVANTAGES

Quality of air can be much cleaner than forced air.

Works well with thermal mass to improve efficiency.

System could be integrated with chilled water to cool rooms (geothermal).

Long lifecycle (30-45 years)

DISADVANTAGES

Can be difficult to modify or repair, does not work well with renovations.

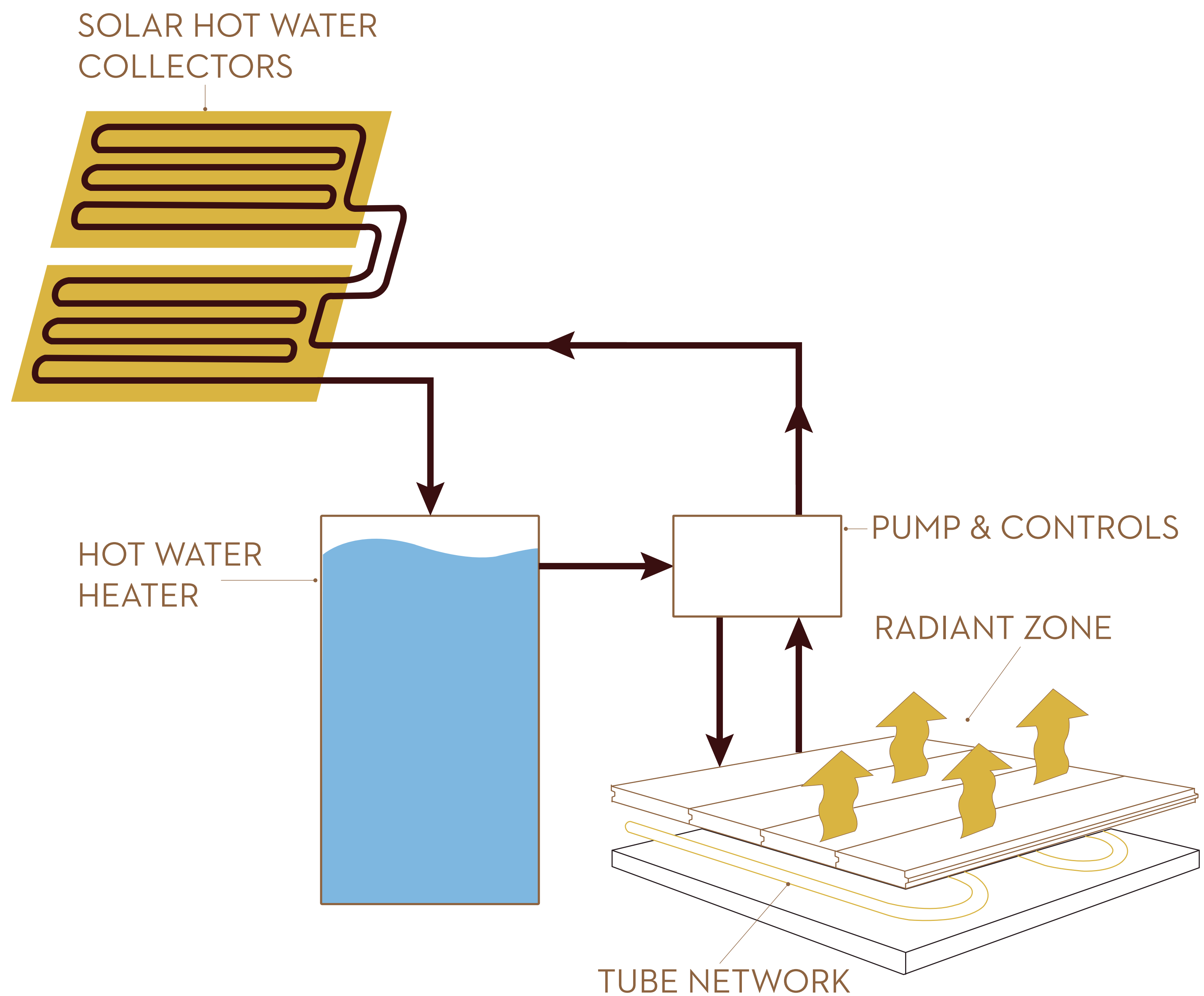
Slow to adjust room temperature.

Limits floor coverings to tile, hardwoods or thin carpets.

COSTS

Installation around 10-25% higher than forced air ($5,000 for 2,000 sqft house)

Radiant heating uses indirect heat exchange to warm a room. There are three types of radiant heat: air, water/glycol, and electric and systems can be located in both the floor or walls. Water/glycol is the most common type, where the system circulates the fluid through a heat exchanger and a network of piping. The pipes can be encased in concrete (wet) or sandwiched between plywood (dry). **System efficiency can be improved with solar hot water or geothermal systems.**



Solar Hot Water

Due to the simplicity of the system and minimal accessories required, solar water heaters are one of the most efficient alternative-energy systems available. Some manufacturers and suppliers state that the payback period from energy savings for a solar hot water collection systems is as little as two years.

ADVANTAGES

Most popular and low cost active solar energy system.

Significantly improve the efficiency of heating water.

Heated water can be used for many applications inside the house.

Large variety of technology options to build to any situation.

Relatively small roof area needed.

Technologies are at a mature stage after many years of development.

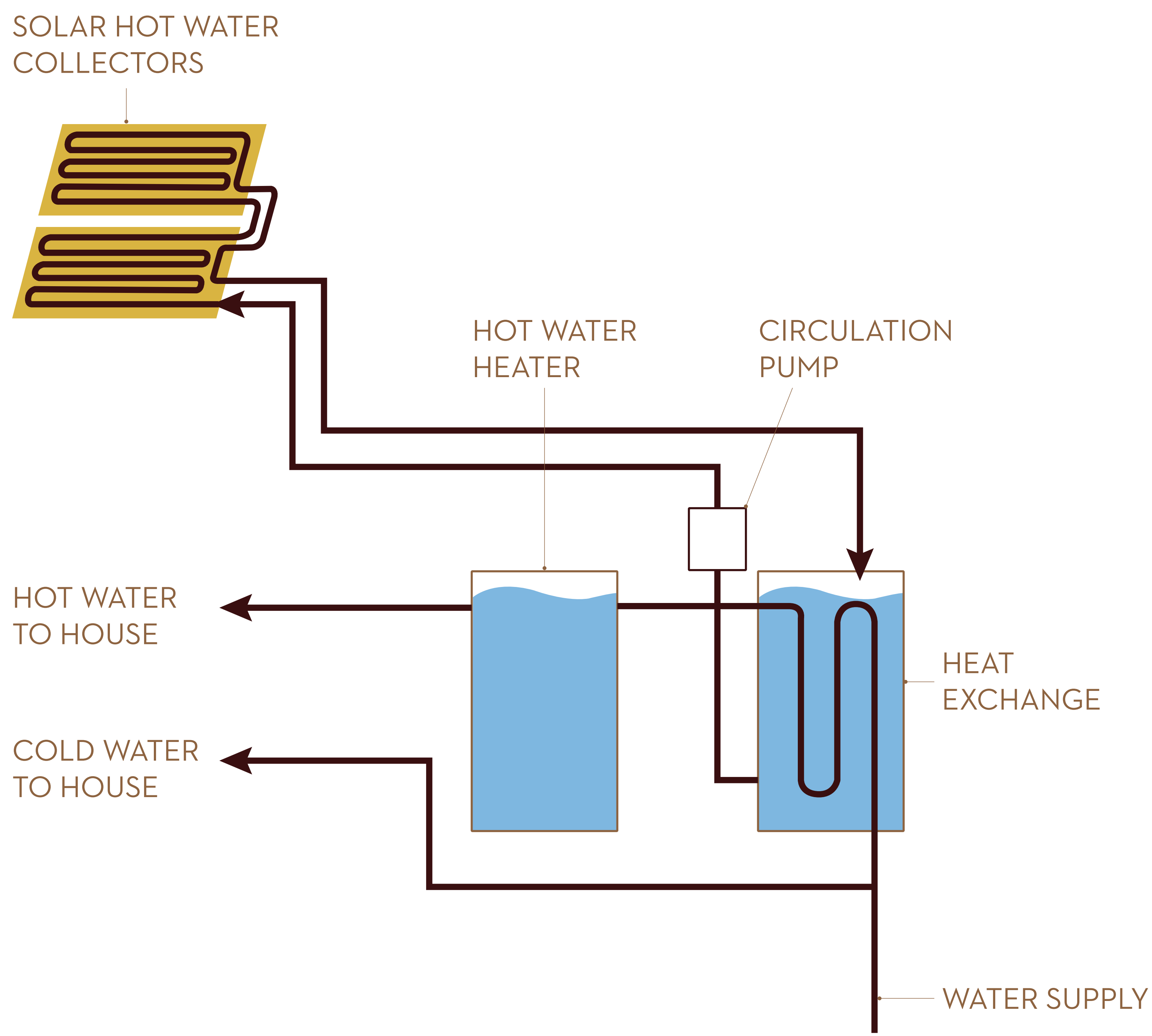
DISADVANTAGES

Freezing conditions can ruin a system, must be planned for.

Pumps create parasitic draw and can fail.

Hard water creates buildup in the system reducing efficiency and can lead to failure.

Leaks are inevitable, routine maintenance is a must.



Geothermal Heating & Cooling

Geothermal heat pumps use the mass of the earth as a more consistent heat sink improving the efficiency of the heat and cooling system. Because the temperature of the ground remains nearly the same year around, savings are realized through the smaller delta temperature between the sink and the compressor system. The ground source loop can use either water, refrigerant, or air as the exchange fluid.

ADVANTAGES

Long system life (35-50 years)

Horizontal arrangement of ground loops decrease the excavation cost

Vertical arrangement of ground loops decrease the system footprint

DISADVANTAGES

Excavation can be expensive

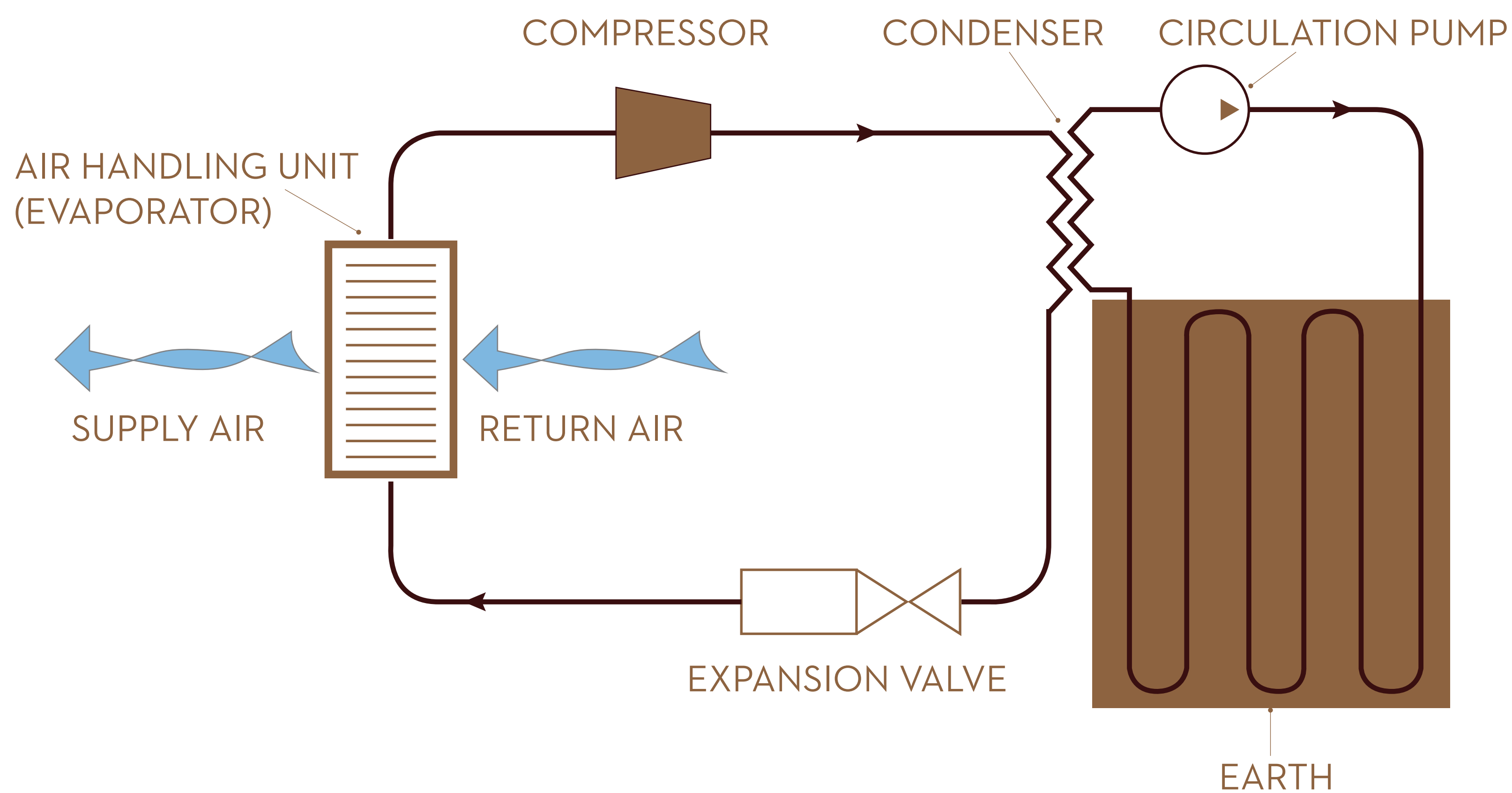
Development on top of ground loops is restricted (parking or landscaping)

COSTS

Installation around $2,500 per ton of capacity.

Reduce electricity consumed by heating and cooling by 25-50%.

Tax rebates of 30% up to $2000 are available.



SUSTAINABLE DESIGN STRATEGIES: ACTIVE

Photovoltaic Panels (PV)

Photovoltaics directly convert the suns energy into DC electricity. The DC output can be converted to AC through an inverter, or used as is. Net metering allows excess production to be “stored” on the grid and for backup supply. The efficiency of the system depends on location, tilt, and orientation, all of which should be optimized during site layout. Weather will also change production, hence the need for backup systems.

ADVANTAGES

Produces energy onsite, reducing utility consumption.

Renewable energy source: Green, Green, Green!

Suitable climate in Raleigh for PV use.

Significant tax credits and market price decreases.

DISADVANTAGES

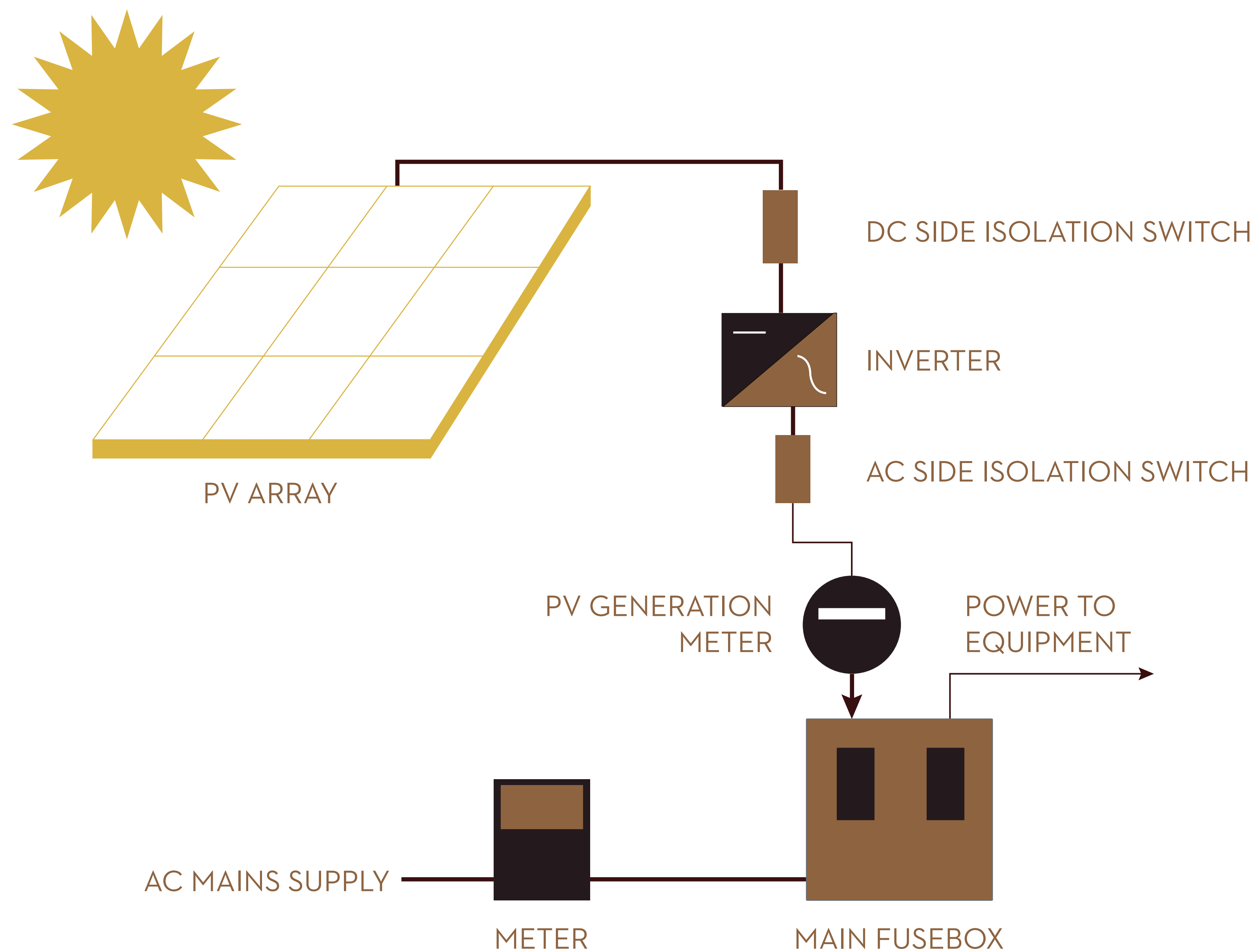
Does not work as well on cloudy days.

High upfront cost.

Can clutter the roofscape.

Damaged panels are difficult to repair.

Significant footprint for moderately sized system.

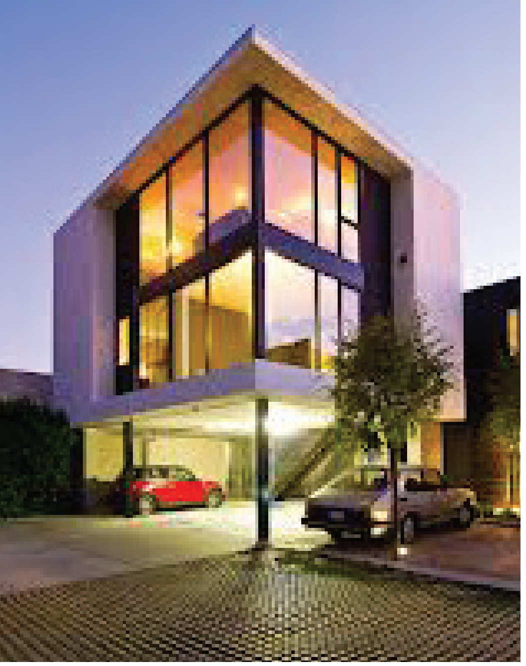


STRATEGY	TYPE	DESCRIPTION	INTERCONNECTIONS	NEEDED RESEARCH / CALCULATIONS
WELL INSULATED	Heating Cooling	Improves efficiency of other systems	All HVAC systems	
PASSIVE VENTILATION	Cooling	Allows ta cool breeze to improve comfort	Stack Effect / Cooling Tubes	
STACK EFFECT / COOLING TUBES	Cooling	Precooling air geothermally, then us-ing convection to move throughout bulidng	Passive Ventilation	Finding similar system that is in use, creating a model to calculate efficiencies
MINI SPLIT	Cooling Heating Humidity	Reducing summertime humidity and providing backup / seasonal conditioning	Efficiency improved by other strategies	Geothermal connections, sizing units
SOLAR GAIN	Heating	Collecting the sun's heat in the building structure	Stack Effect, Site Orientation	Expected winter/summer gains
GEOTHERMAL	Heating Hot Water	Ground heat sink to improve efficiencies	Mini Split, Radiant Floors, Hot Water	Sizing, community scaled options
SOLAR HOT WATER	Heating Hot Water	Solar collection panels decrease needed heating for water	Hot Water, Radiant Floors	Sizing
ELECTRIC HOT WATER HEATER	Hot Water	Provides backup system, improves capacity	Radiant Floors Household Uses	Tying multiple systems together, Sizing
RAINWATER COLLECTION	Water	Collects water for landscaping, toilet flushing		

CONSTRUCTION

	ONSITE BUILDING	PREFABRICATION	HYBRID
COSTS	Lower cost, but more waste	Higher cost but more specialized operations	Savings through installation
SCHEDULING	Site conditions have more impact (weather)	Less float in scheduling	Components could lead to delay
QUALITY OF CONSTRUCTI ON	Allows for craftsman fitting and customiza-tion	Systems with higher tech construction methods	Higher quality components
SUSTAINABILITY	Reduces transportation cost	Lower waste	Takes advantage of prefab specialization and on site customization
EXAMPLES	Stud Walls, Foundations, Site Work, Pumping, Electrical,	PV Cells, SIPS	Rainwater Collection, Radiant Flooring, Interi-or Finishes, Roofing, Mechanical

We think a hybrid approach will be the best direction to pursue for our neighborhood so we can take advantage of the benefits of both construction systems.



THE CHARMER

KETTNER ROW

MUIR COMMONS

CASE STUDIES
NEIGHBORHOODS

CASE STUDIES:NEIGHBORHOODS

The Charmer

DETAILS

Location: San Diego, California, United States

Completed: 2011

Architect: Jonathan Segal Architect

Collaborators: Guillermo Tomaszewski, Matthew Segal

NOTABLE FEATURES

Rental units based on the California courtyard tradition of the 1920's

19 live/work lofts with 5000 square feet of retail below

All units have private individual outdoor spaces

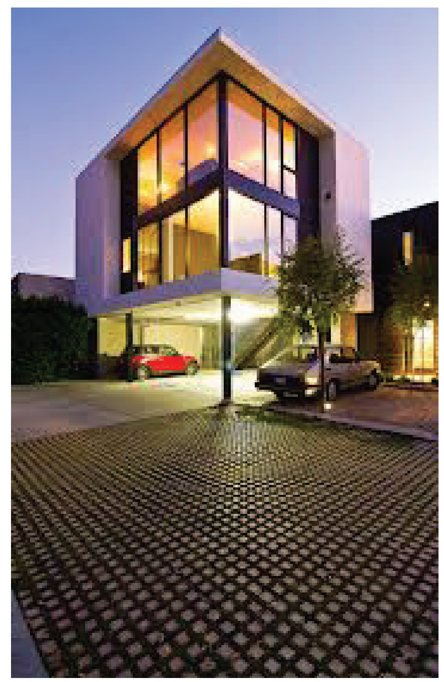
All parking on grade with a portion of the spaces under elevated living units

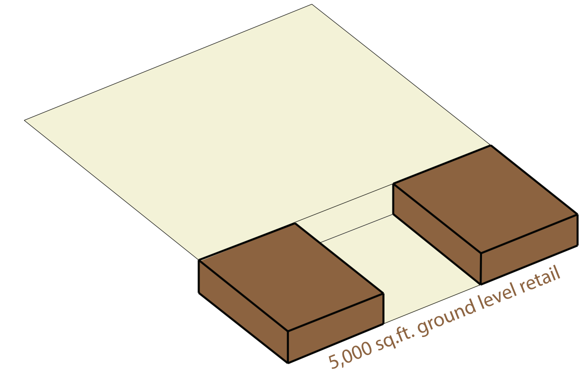
Working with the slope of the site

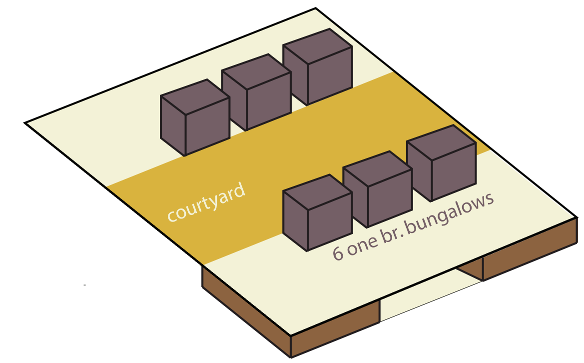
Avoided: underground parking, elevators, & indoor hallways

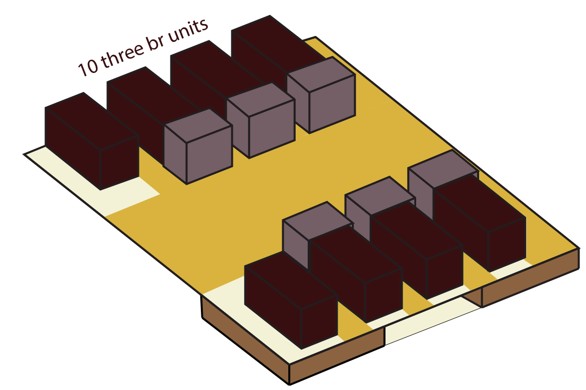
Celebrates the place between the units

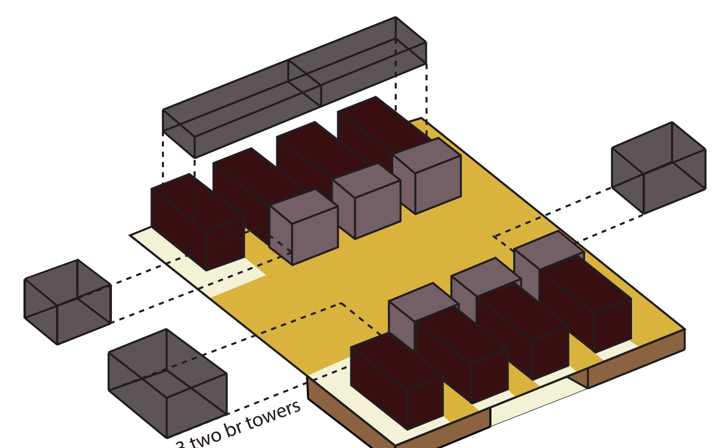
Emphasis placed on the large compositional











CASE STUDIES:NEIGHBORHOODS

Kettner Row

DETAILS

Location: San Diego, California, United States

Architect: Jonathan Segal Architect

NOTABLE FEATURES

The modern row house

16 total primary units

Block contains interior green space

Units have loft/work units behind primary dwelling for

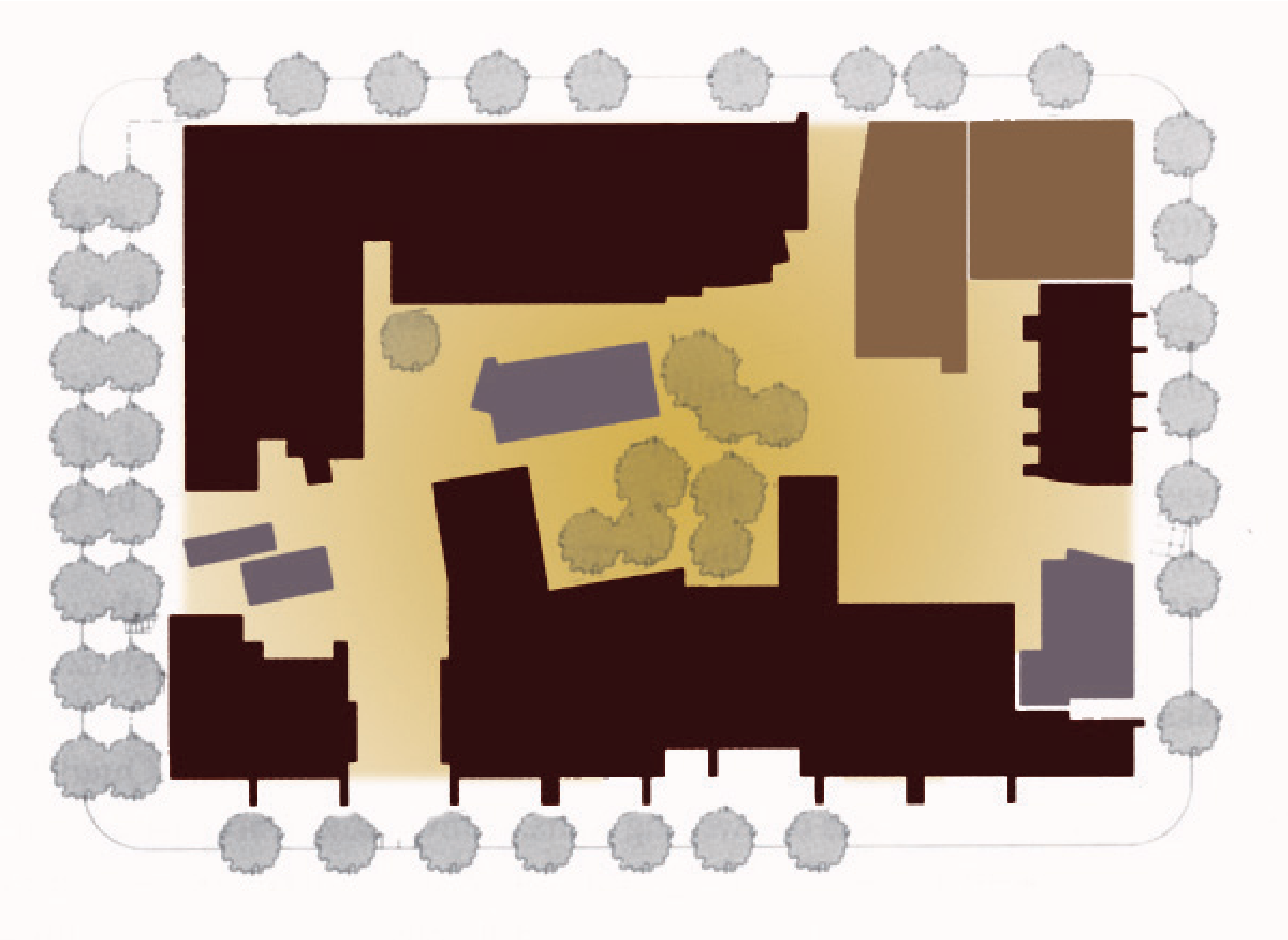
Work, live, or rental income

Commercial space intermingled also

Trolley and public transportation within walking distance

Allows ownership of land that high rise living does not allow

Open floor plans with 25' ceilings



CASE STUDIES:NEIGHBORHOODS

Muir Commons

DETAILS

Location: Davis, California

Muir Commons was the first community newly constructed in the United States modeled after cohousing communities in Denmark

Completed: 1991

SUSTAINABLE DESIGN STRATEGIES

Muir Commons is made up of 26 homes on just under 3 acres

Each individual house includes complete kitchens and private yards

The clustered homes face a central pedestrian pathway while the backyards face the outer edges of the site.

Outdoor features at Muir Commons include a garden, an orchard, children's playground, lawns, and "nodes" to facilitate socializing.

The extensive landscaping includes many drought-tolerant and native species.

Common House is the heart of the community and includes a large kitchen and dining area to accommodate community gatherings including shared meals.

F10 HOUSE

TOKYO HOUSE

ROWE LANE HOUSE

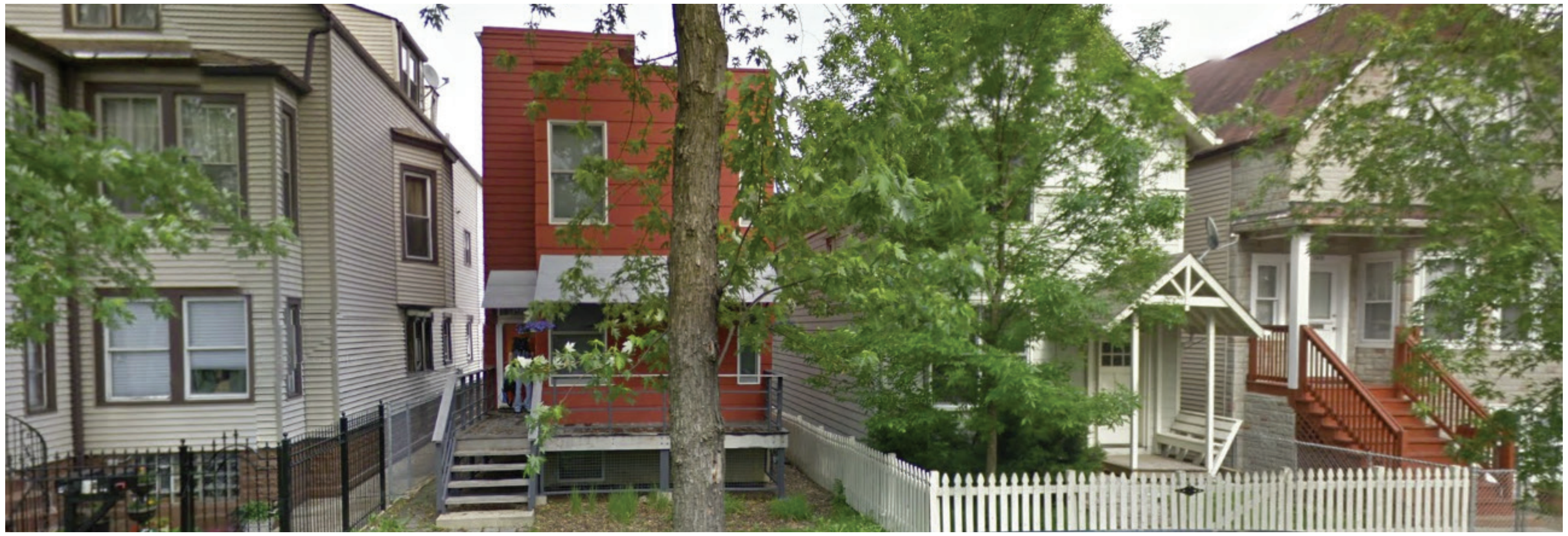
CASE STUDIES
HOUSES

OS HOUSE

FOCUS HOUSE

CASE STUDIES:HOUSES

Factor 10 House



DETAILS

Size: 1,830 sq.-ft.

Location: Chicago, IL

Completed: August 2003

Architect: EHDD, San Francisco, CA

SUSTAINABLE DESIGN STRATEGIES

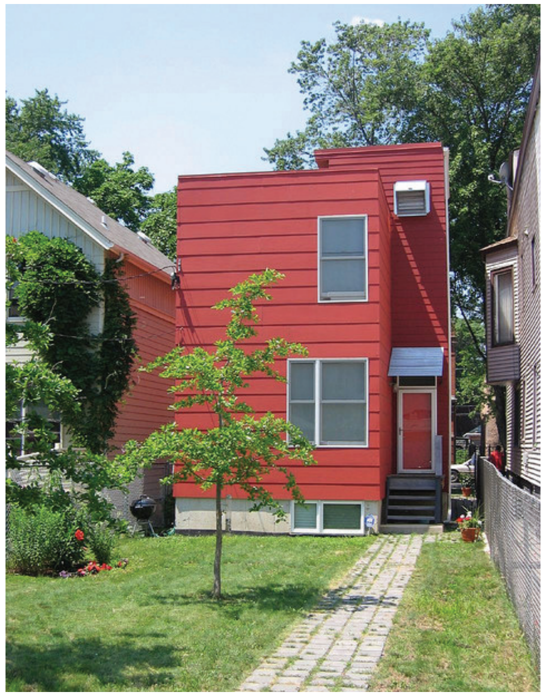
Stack effect: solar chimney exhausts warm air during summer and pushes warm air down during winter

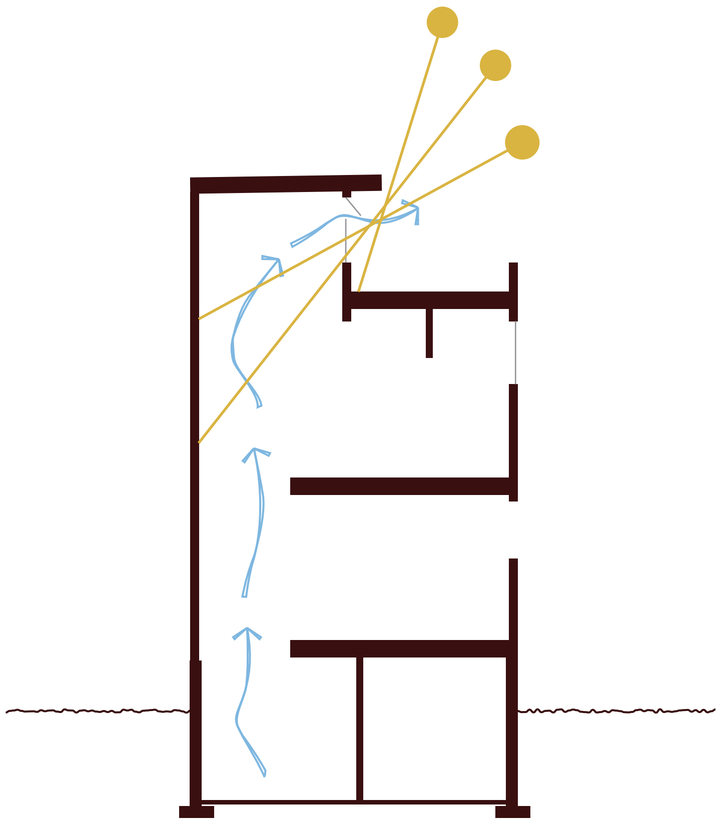
Open plan enhances natural cross ventilation

Windows maximize natural light (clerestory)

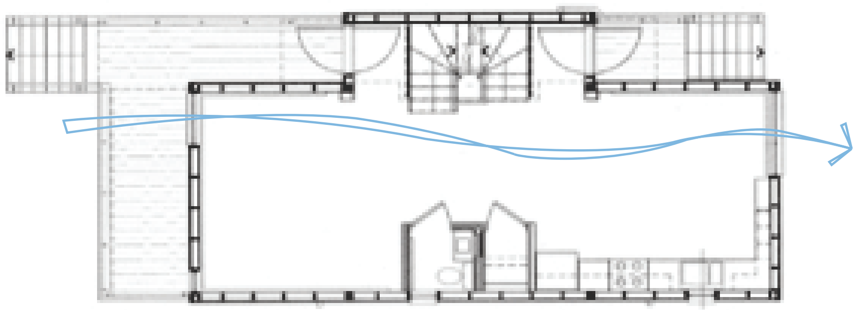
Modularity: house is built on a 2' module to reduce material waste

Neighborhood scale: fits within the built context





STACK EFFECT AND SOLAR SHADING WITH OVERHANGS



NATURAL CROSS VENTILATION

CASE STUDIES:HOUSES

Tokyo House

DETAILS

Size: 640 sq.-ft.

Location: Tokyo, Japan

Completion date: April 2005

Architect: Satoshi Irei Architect & Associates, Tokyo, Japan

SUSTAINABLE DESIGN STRATEGIES

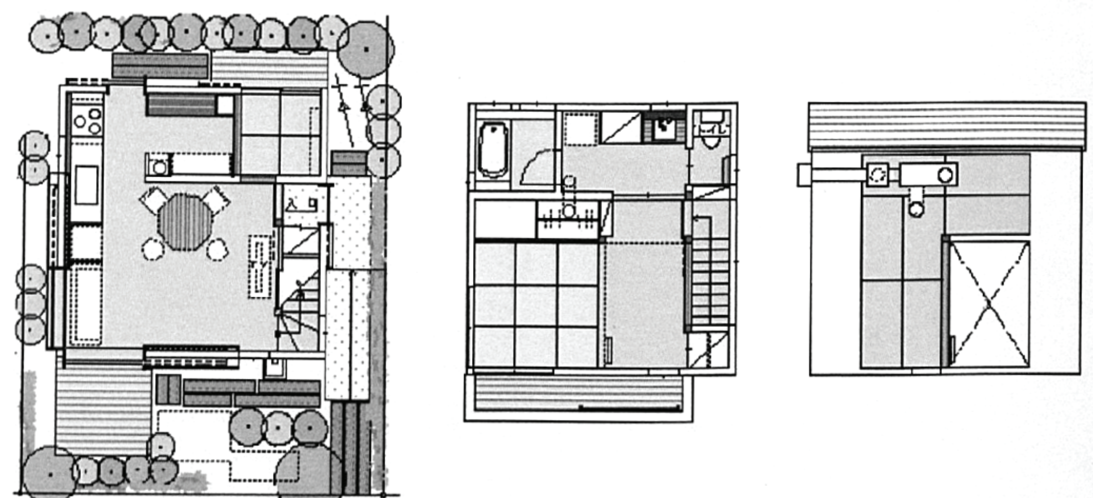
Efficient use of small spaces

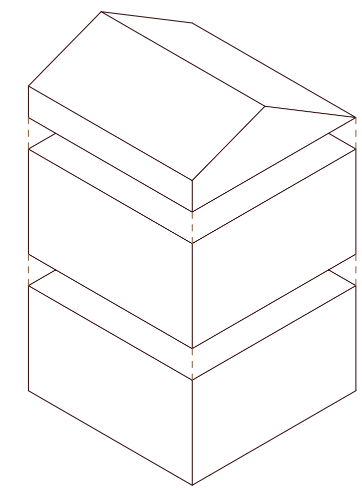
Economy of land usage 320 sq-ft footprint. Three floors allow for a total of 640 sq-ft of living space.

Wood frame construction

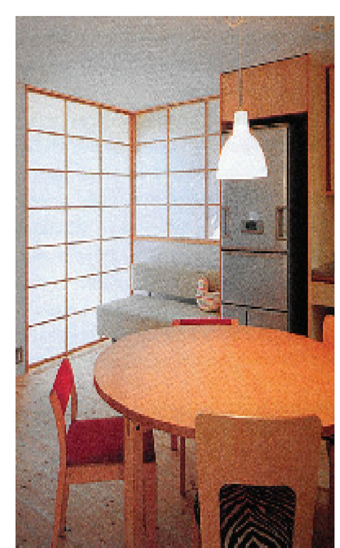
Sectional qualities of the design allow for air movement

Connects the private areas of the house with the public areas of the street. Design encourages interaction with public realm.





VERTICAL MASSING FOR EFFICIENT SITE USAGE



CASE STUDIES:HOUSES

Rowe Lane House

DETAILS

Size: 2690 sq.-ft.

Location: London, UK

Architect: FLACQ Architects, London, UK

SUSTAINABLE DESIGN STRATEGIES

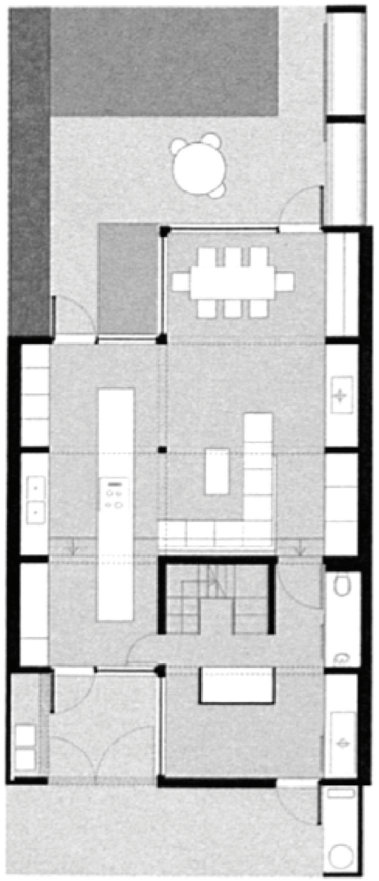
Gluelam timber construction is efficient, economical and renewable

Natural cross ventilation is used for cooling

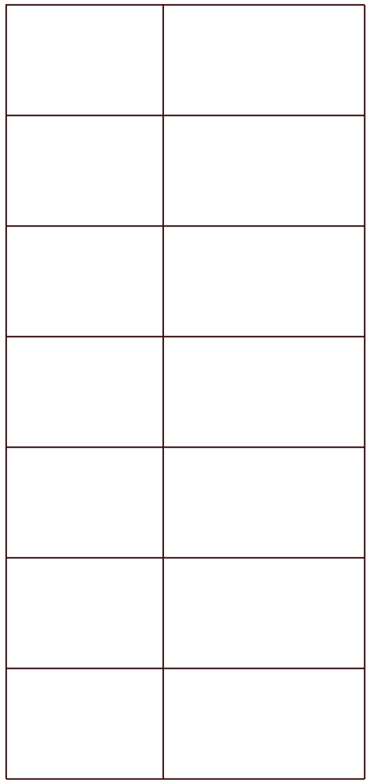
Glazed roof above the kitchen draws in natural light and solar heat during the winter season and in the summer trees partially shade to reduce heat gains.

Modularity: non-load bearing partition walls allow for a reconfigurable floor plan allowing for longevity of the building

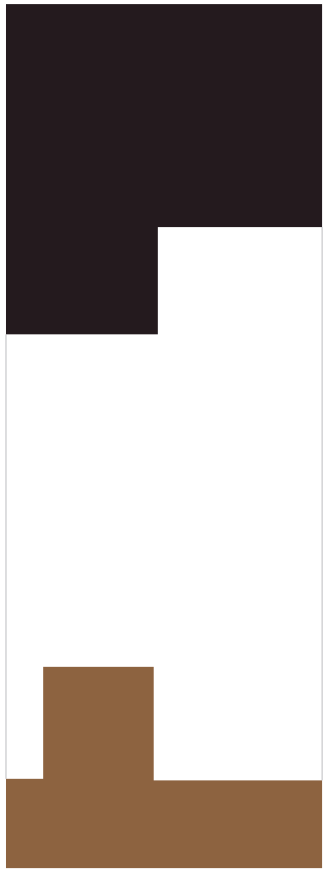
Neighborhood scale: fits within the built context



GROUND FLOOR



MODULARITY/GRID



PUBLIC & PRIVATE ZONES

CASE STUDIES:HOUSES

OS House

DETAILS

Size: 1,940 sq.-ft.

Location: Racine, Wisconsin

Completed: March 2010

Architect: Johnsen Schmaling Architects, Milwaukee, WI

SUSTAINABLE DESIGN STRATEGIES

Solar water heater backed up by a tankless system

Photovoltaics

Geothermal system (ground-source heat pump) for heating and cooling

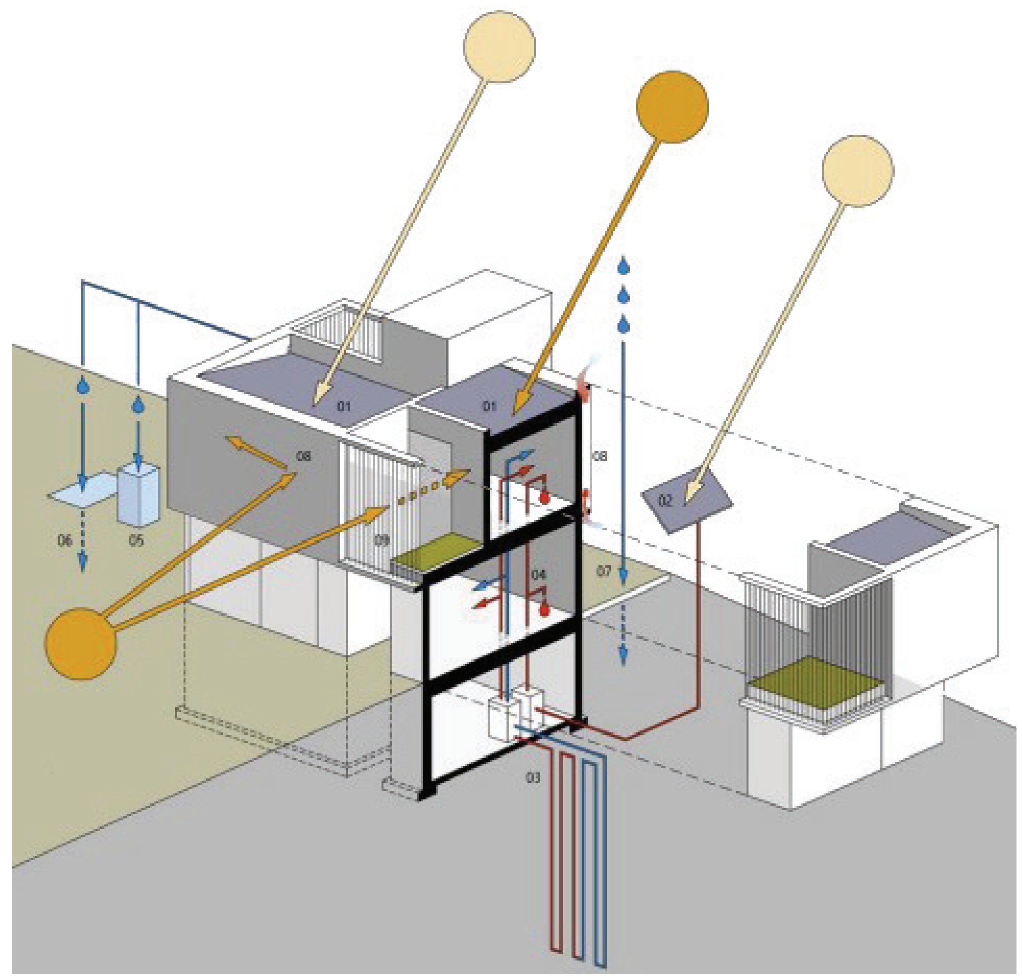
Elongated form enhances natural cross ventilation

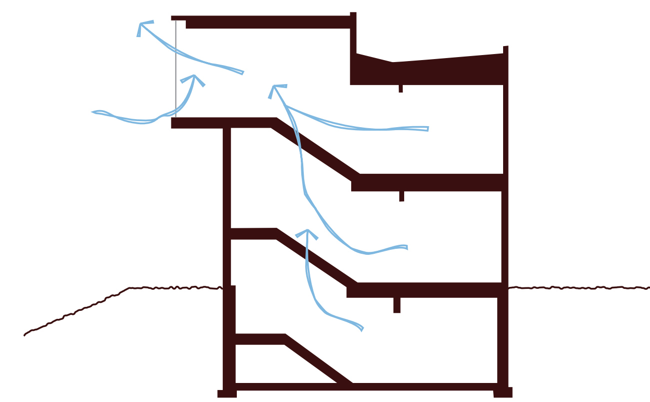
Thermal chimney (stack effect)

Overhangs for passive solar benefits

Low-Water-Use Fixtures & Water-Efficient Appliances

Proximity to restaurants, parks and shops within walking distance and accessible by public transit.





STACK EFFECT

EXPLORATION OF FORMAL CONFIGURATIONS

Focus House

DETAILS

Size: 2690 sq.-ft.

Location: London, UK

Completed: August 2003

Architect: Bere Architects, London, UK

SUSTAINABLE DESIGN STRATEGIES

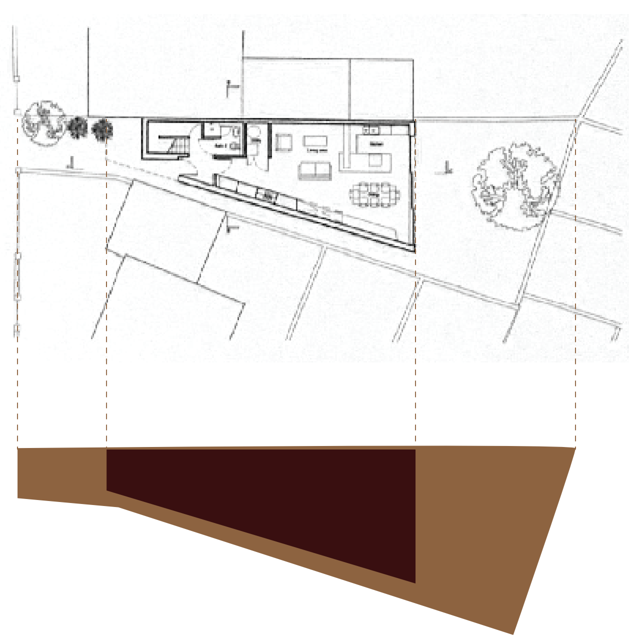
Use of irregular site allows for a spacious dwelling on a small lot providing density to the urban neighborhood

Solar hot water system generates an average of 50-60% of the family's needs

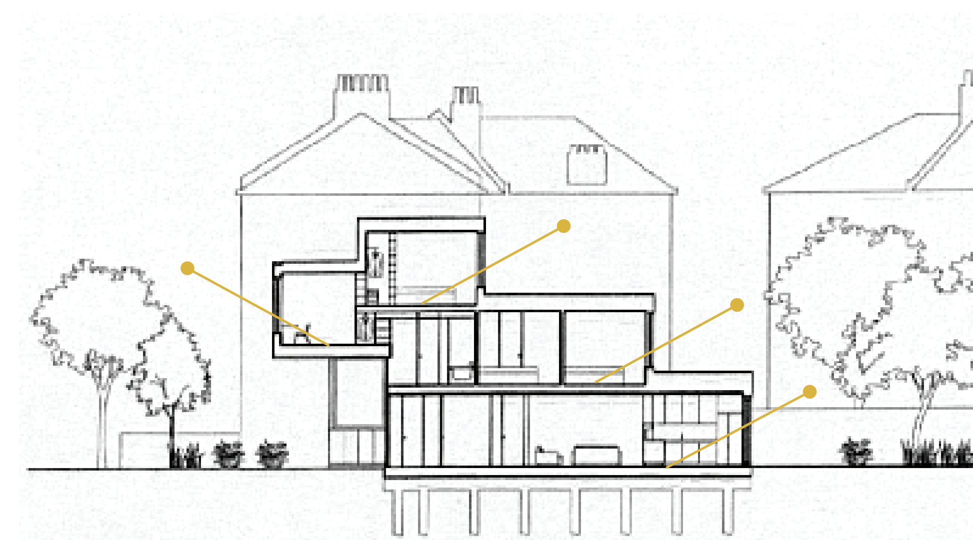
Uses zinc for cladding (which has the lowest embodied energy of any metal and is 100% recyclable)

Timber frame construction (timber acts as a carbon sink)

Staggered formal arrangement allows for additional windows bringing in natural light to each level



EFFICIENT USE OF AN IRREGULAR SITE



MASSING ALLOWS FOR DAYLIGHTING INTO THE SPACES (EAST & WEST)

COMPREHENSIVE DIAGRAM

NEIGHBORHOOD

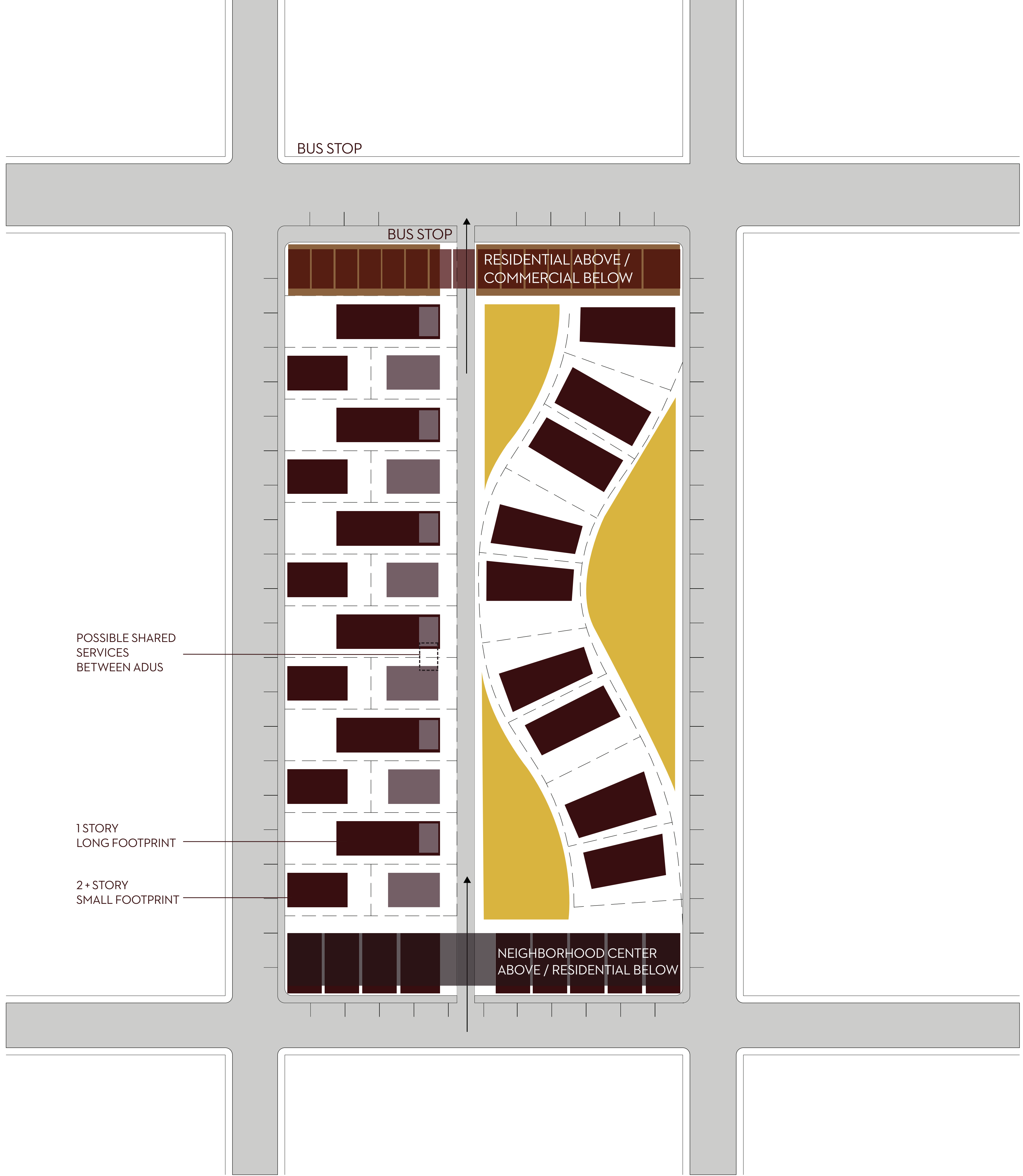
DESIGN STRATEGIES

MIXED USE/ COMMERCIAL/ RETAIL

HOUSES

SHARED SPACES

ADU



COMPREHENSIVE DIAGRAM

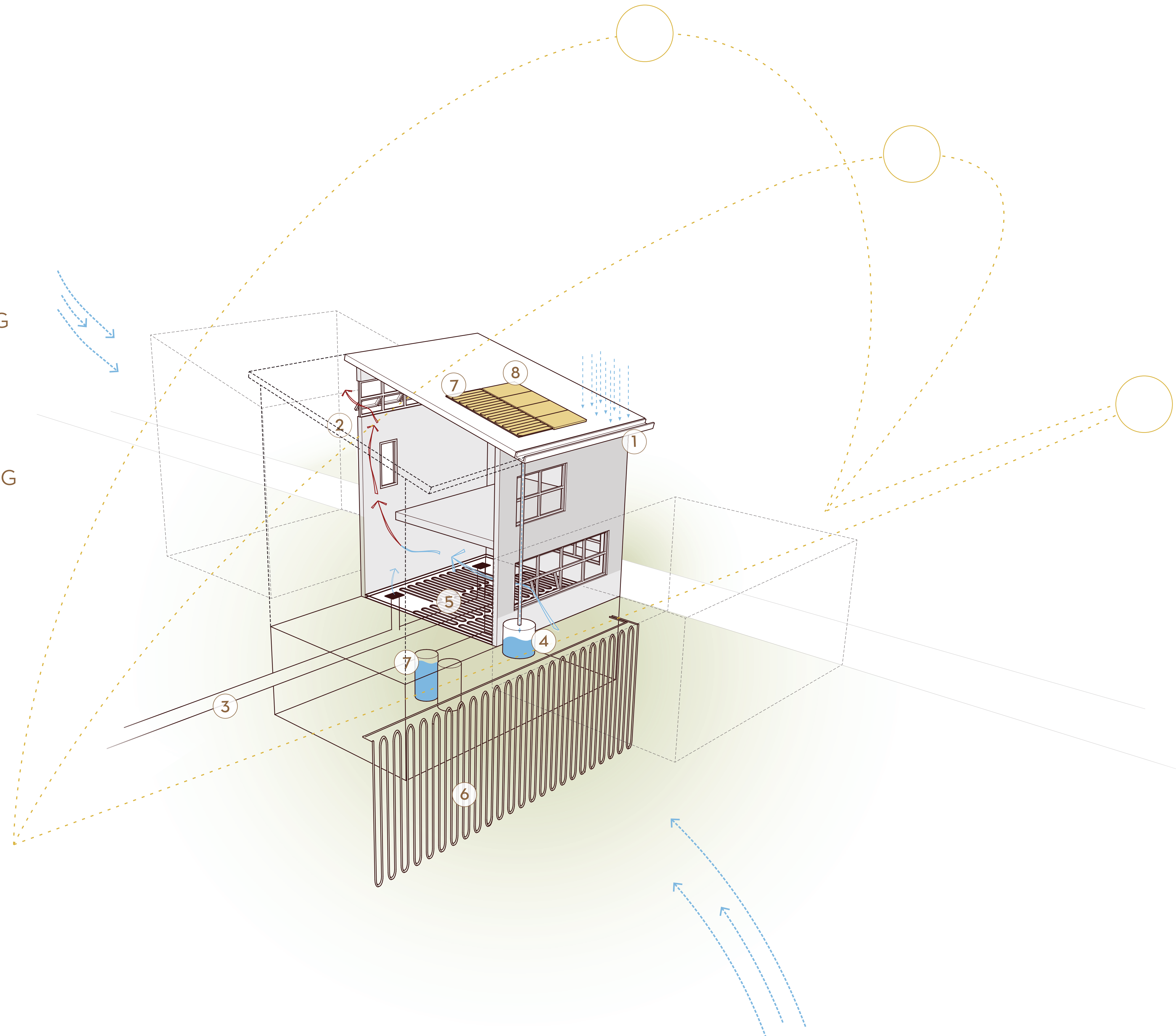
HOUSE

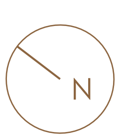
PASSIVE STRATEGIES

1. PASSIVE SOLAR
2. STACK EFFECT
3. COOLING TUBES
4. RAINWATER HARVESTING

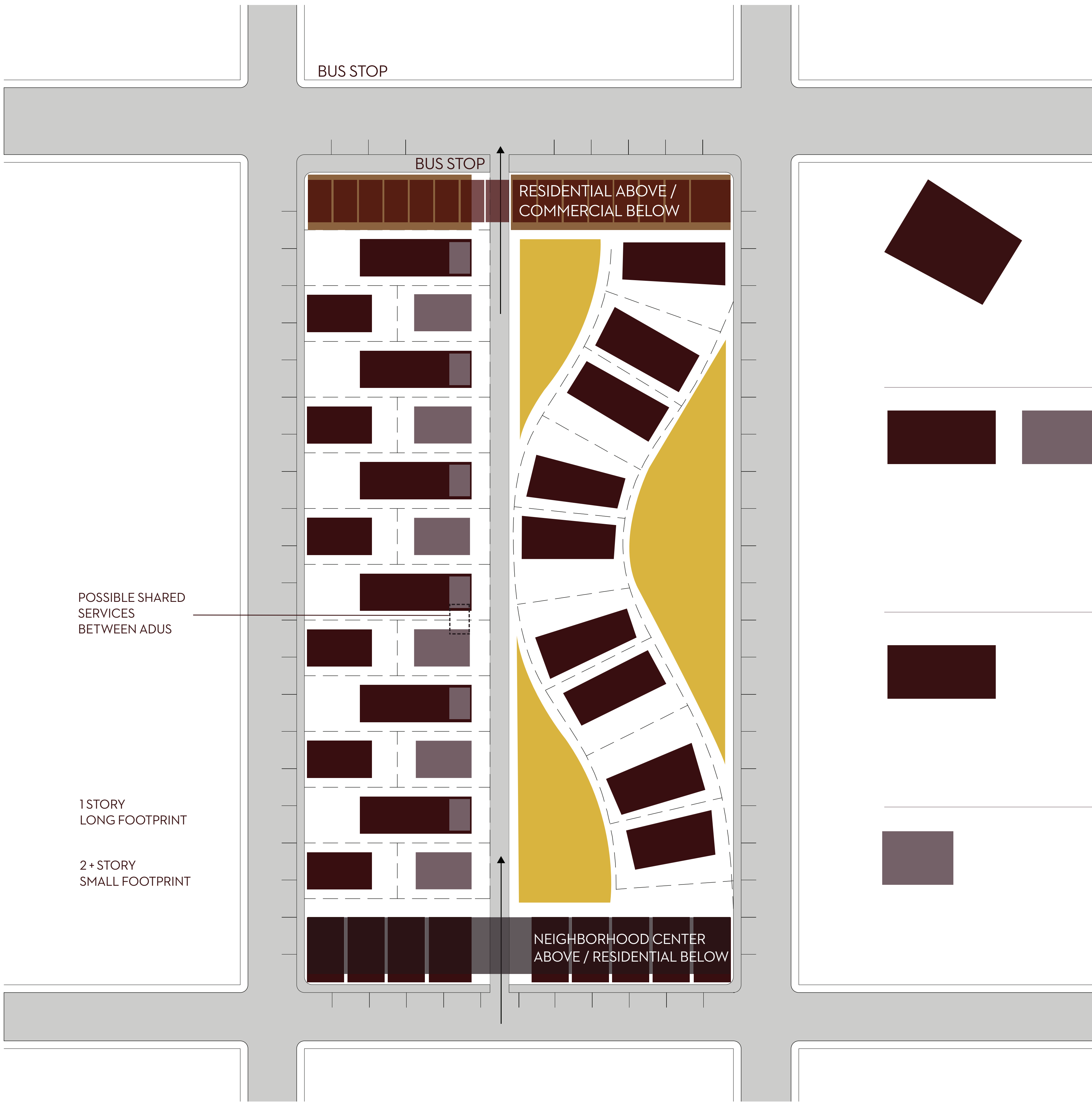
ACTIVE STRATEGIES

5. RADIANT FLOOR HEATING
6. GEOTHERMAL
7. SOLAR HOT WATER
8. PHOTOVOLTAICS





ECONOMIC PLANS



EASTERN LOTS / THE MATURE FAMILY
SHARED GREENSPACE
Average lot size: 0.06 acres
A 2,000 square foot dwelling
At $220 per square foot *(Includes 12% developer profit)*
Priced between $504,000 & $515,000
Approximate mortgage payment per month: $2900

WESTERN LOTS / MIXED INCOME / OPTIONS
PRIMARY DWELLING + ADU
.04 acres + .02 acres
At $170 per square foot *(Includes 12% developer profit)*
Primary dwelling *starting at* 1000 sq.ft. + 500 sq. ft. ADU
Price for dwelling + ADU starting at $344,000
Approximate mortgage payment per month: $2000

PRIMARY DWELLING ONLY
.04 acres
Starting at 1000 sq.ft.
At $170 per square foot *(Includes 12% developer profit)*
Prices *starting at* $223,000
Approximate mortgage payment per month: $1300

SMALL LOT ONLY / ENTRY LEVEL INCOME / SINGLE
.02 acres
500 sq.ft. studio living
At $170 per square foot *(Includes 12% developer profit)*
Priced at $123,000
Approximate mortgage payment per month: $722

ECONOMIC PLAN

THE PROBLEM OF THE HOUSE

HANNA KUIVALAINEN

BRITTANY SPANGLER

DYLAN HORNE

JEREMY ALFORD

ARC 503 SPRING 2013