FROM PUBLIC HOUSING TO URBAN FARM

ENA SIVCEVIC | MASTERS PROJECT 2010 | DUNHAM-JONES

WITH RISING CONCERN OVER OUR LIMITED RESOURCES AND CLIMATE CHANGE, CIVILIZATION IS AT A DECISIVE TURNING POINT. THE WAY OUR CITIES ARE DESIGNED MAKES ENVIRONMENTAL RESPONSIBILITY INCONVENIENT. IN A PROACTIVE ATTEMPT TO STOP DEGRADATION OF THE ENVIRONMENT AND DEPLETION OF OUR RESOURCES, A NEW AMERICAN DREAM IS INEVITABLE. THE THOMASVILLE URBAN FARM SETS OUT TO MAKE SUSTAINABLE LIFESTYLES A PRIORITY BY MAKING IT PRACTICAL, CONVENIENT AND AFFORDABLE FOR FAMILIES. THE PRIMARY OBJECTIVE OF THE INITIATIVE IS TO REDUCE CARBON EMISSIONS AND CREATE A ONE PLANET COMMUNITY.



PROJECT AGENDA: DWELL | WORK | ENGAGE | REDUCE

The project agenda for the Thomasville Urban Farm is to create a convenient ***sustainable and healthy environment*** for people to live, work and engage in. At heart of the initiative, is the ***production of local organic food, elimination of waste, and on-site electricity generation***. The primary focus of the project is to create an ***alternative, eco-centric lifestyle***, with ***localized*** production. The end goal is to ***reduce the environmental footprint and eliminate of carbon emissions.***

The urban farm will contain on site ***renewable energy production*** to eliminate dependence on non-renewable resources, as well as ***recycling*** and manufacturing facilities to assure ***maximum reuse*** of existing products. The project also advances solutions for ***alternative transport,*** support of ***local*** and ***organic*** materials and goods, ***water conservation, preservation of natural habitats*** and overall ***wellbeing*** and ***happiness***.

A ***design-build*** approach is to be explored using easy to install tounge and groove SIPs, allowing a semi skilled laborer to complete most of the work with minimal supervision of an architect or engineer, thus offsetting labor costs. ***Local laborers***, some experienced while others new to construction, would be hired to assist in the construction of the village through ***organized workshops***, thus ***stimulating the local economy***. A greater initiative of the project is to help ***build knowledge about resilience, sustainable lifestyles and what it takes to achieve carbon neutral living.***

CARBON EMISSIONS

U.S. AVERAGE: **28,56 TONS** PER YR
HOUSING PROJECT: **14.65 TONS** PER YR
URBAN FARM PROJECTION: **5.76 TONS** PER YR

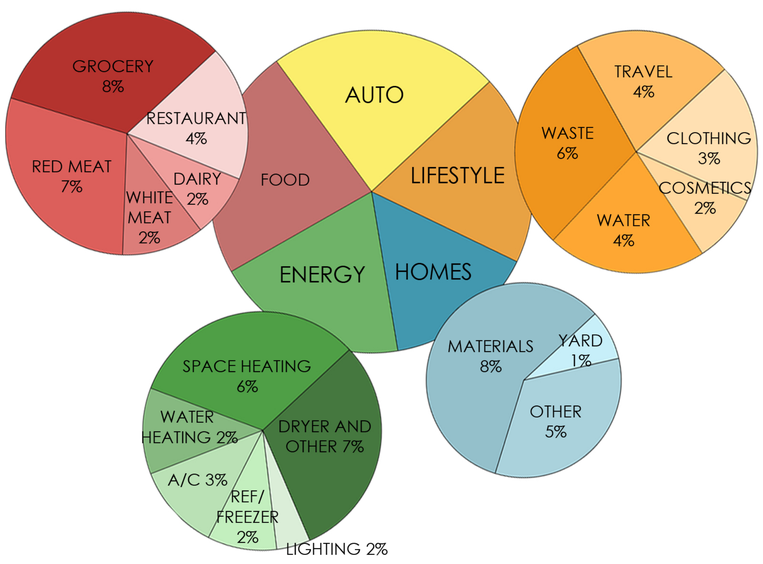
CARBON REDUCTION

SCOPE 1: Natural Gas consumption;
On road vehicle transportation
Off road vehicle and equipment use

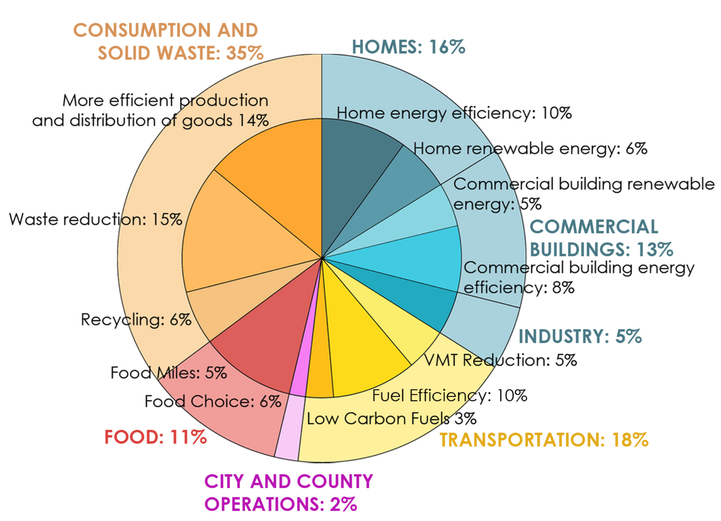
SCOPE 2: Electricity consumption
(consumed electricity)

SCOPE 3: Solid waste; Wastewater treatment;
Product use; Production of purchased goods

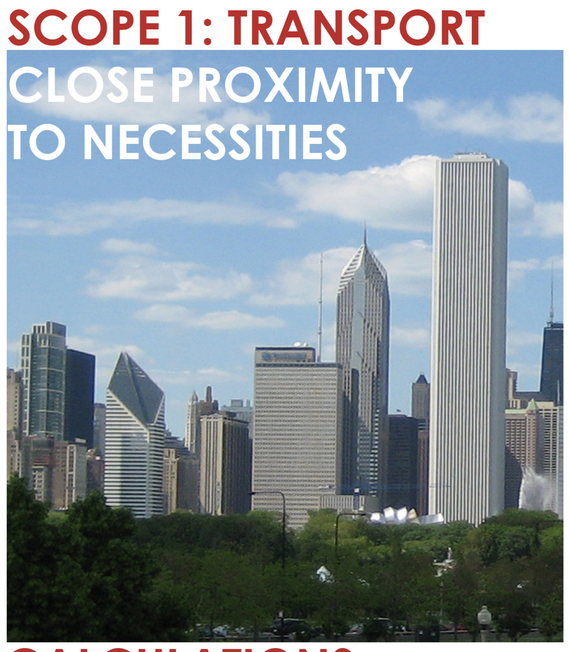
EMISSIONS BREAKDOWN



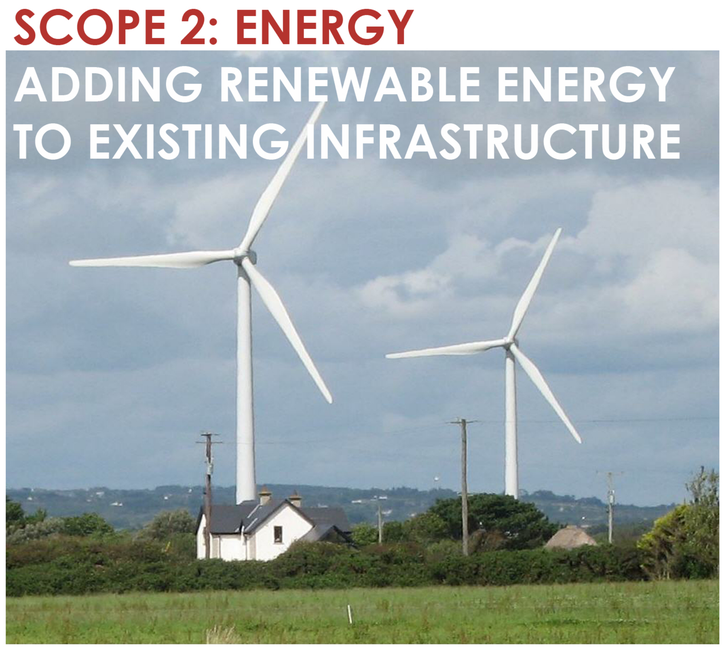
REDUCTION PLAN



SCOPE 1: TRANSPORT



SCOPE 2: ENERGY



SCOPE 3: SUSTAINABLE LIFESTYLE



CALCULATIONS: SOURCE COOLCLIMATE.BERKELEY.EDU

Food, Goods & Services

Data and Sources

Variable	Value	Units	Source
Dollars spent on each category/mo	User Input	$/mo	-
Food			
Meat, fish & protein	1452	gCO_2/$(2006)	EIO-LCA
Cereals & Bakery Products	741	gCO_2/$(2006)	EIO-LCA
Dairy	1911	gCO_2/$(2006)	EIO-LCA
Fruits & Vegetables	1176	gCO_2/$(2006)	EIO-LCA
Eating Out	368	gCO_2/$(2006)	EIO-LCA
Other	467	gCO_2/$(2006)	EIO-LCA
Goods & Services			
Clothing	436	gCO_2/$(2006)	EIO-LCA
Furnishings & household items	459	gCO_2/$(2006)	EIO-LCA
Other goods	338	gCO_2/$(2006)	EIO-LCA
Services	178	gCO_2/$(2006)	EIO-LCA

Calculations

Food emissions [gCO_2/yr] = Sum of food categories (Dollars spent on each category [$/mo] * Emissions for each category [gCO2/$]*12 [mo/yr])

Goods and Services emissions [gCO_2/yr] = Sum of goods and services categories (Dollars spent on each category [$/mo] * Emissions for each category [gCO2/$]*12 [mo/yr])

Driving emissions

Data and sources

Variable	Value	Units	Source
Miles per gallon	User input	mi/gal	-
Miles driven	User input	mi/yr	-
Gasoline emissions (direct)	9,109	gCO_2/gal	WRI Mobile Combustion CO2 Emissions Calculation Tool
Gasoline emissions (indirect)	2,389	gCO_2/gal	Center for Trans. Research, Argonne National Laboratory, GREET 2.8a
Diesel emissions (direct)	10,508	gCO_2/gal	WRI Mobile Combustion CO2 Emissions Calculation Tool
Diesel emissions (indirect)	2,515	gCO_2/gal	Center for Trans. Research, Argonne National Laboratory, GREET 1.8a
Vehicle manufacturing emissions	7,890,776	g GHGs/vehicle	Center for Trans. Research, Argonne National Laboratory, GREET 2.8a Value for a conventional internal combustion engine vehicle made with conventional materials
Assumed vehicle lifetime	160,000	mi/vehicle	Center for Trans. Research, Argonne National Laboratory, GREET 2.8a

Calculations

GHGs/mile [gCO_2/mi] = Vehicle manufacturing emissions [gCO_2/vehicle] / Vehicle lifetime [mi/vehicle]

Miles driven [mi/yr] / Miles per gallon [mi/gal] = Fuel used [gal/yr]

Fuel used [gal/yr] * (direct + indirect fuel emissions [gCO_2/gal]) = Fuel emissions [gCO_2/yr]

Miles driven [mi/yr] * (Vehicle manufacturing emissions [gCO_2/ton] * Vehicle size [ton] / Vehicle lifetime [mi]) = Vehicle manufacturing emissions [gCO_2/yr]

Total driving emissions = Fuel emissions [gCO_2/yr] + Vehicle manufacturing emissions [gCO_2/yr]

Public Transportation emissions

Data and sources

Variable	Value	Units	Source
Miles traveled	User input	mi/yr	-
Public transportation direct emissions	179	gCO_2/mi	Regular average (non-weighted) of public transportation modes: Bus (urban), Bus (intercity), Intercity Rail (Amtrak), Transit Rail (subway, tram), and Commuter Rail. WRI Mobile Combustion CO2 Emissions Calculation Tool [2]
Public transportation indirect emissions multiplication factor	20	%	Center for Trans. Research, Argonne National Laboratory, GREET 1.8a [3]

Calculations

Public transportation emissions [gCO2/yr] = Miles traveled [mi/yr] * (Public transportation emissions (direct) [gCO_2/mi] + Public transportation emissions (direct) * Indirect emissions multiplication factor [%])

Air Travel Emissions

Data and sources

Variable	Value	Units	Source
Total air miles	User input	mi/yr	-
Average emissions per air mile	223	gCO_2/mi	Regular average (non-weighted) of different length air trips (short, medium, long and extended) WRI Mobile Combustion CO2 Emissions Calculation Tool [2]
Number of short trips	User input	trip	-
Emissions per short trip (<400 mi); 300 miles/trip assumed.	254	gCO_2/mi	WRI Mobile Combustion CO2 Emissions Calculation Tool [2]
Number of medium trips	User input	trip	-
Emissions per medium trip (400-1,500 mi); 950 miles/trip assumed.	204	gCO_2/mi	WRI Mobile Combustion CO2 Emissions Calculation Tool [2]
Number of long trips	User input	trip	-
Emissions per long trip (1,500-3,000 mi); 2,250 miles/trip assumed.	181	gCO_2/mi	WRI Mobile Combustion CO2 Emissions Calculation Tool [2]
Number of extended trips	User input	trip	-
Emissions per extended trip (>3,000 mi); 5000 miles/trip assumed.	172	gCO_2/mi	WRI Mobile Combustion CO2 Emissions Calculation Tool [2]

Housing

Data and Sources

Variable	Value	Units	Source
Electricity costs	User Input	$/mo	-
Electricity price	Varies by state	$/kWh	Energy Information Administration Electricity Prices [4] (Value for CA)
Electricity emissions	Varies by state	gCO_2/kWh	eGrid [5] (Value for CA)
Natural gas costs	User Input	$/mo	-
Natural gas price	Varies by state	$/therm	Energy Information Administration Natural Gas Info [6] (Value for CA)
Natural gas emissions	117.080	lbs CO_2/million BTU	Energy Information Administration Energy Coefficients [7]
NG emissions (converted)	5311	gCO_2/therm	Used conversion factors from http://www.onlineconversion.com
Other fuel costs	User Input	$/mo	-
Other fuel emissions	879	GWP/$(2005)	EIO-LCA[9]
Water and sewage costs	User Input	$/mo	-
Water and sewage emissions	4042	GWP/$(2005)	EIO-LCA[9]
Square feet of household	User Input	sqft	-
Household emissions	965	GWP/(sqft*yr)	Quantifying CO2 Emissions of the Typical U.S.A. house, Unpublished study by Roxana, Hernandez, et al. [8] (Value for CA)

Calculations

Household emissions [gCO_2/yr] = Electricity emissions [gCO_2/yr] + Natural gas emissions [gCO_2/yr] + Other fuel emissions [gCO_2/yr] + Water and sewage emissions [gCO_2/yr] + Housing construction emissions [gCO_2/yr]

Electricity emissions [gCO_2/yr] = Electricity costs [$/mo] * 12 mo/yr * Electricity price [$/kWh] * Electricity emissions [gCO_2/kWh]

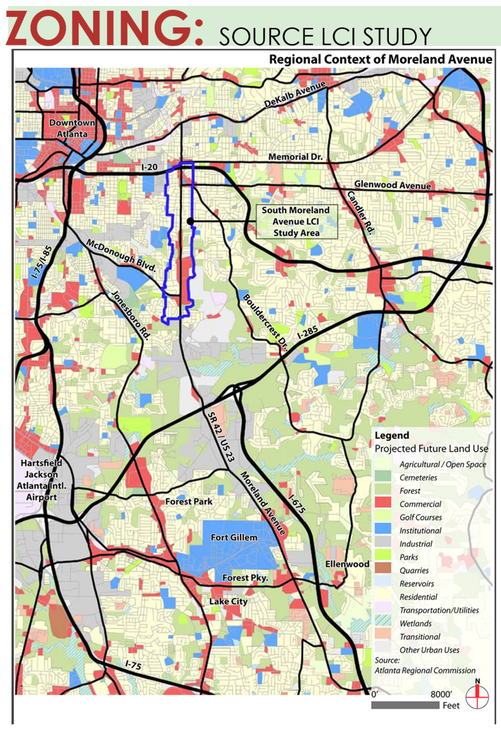
Natural gas emissions [gCO_2/yr] = Natural gas costs [$/mo] * 12 mo/yr * Natural gas price [$/kWh] * Natural gas emissions [gCO_2/kWh]

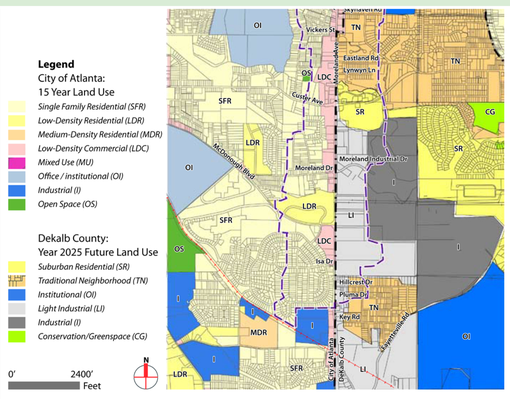
Other fuel emissions [gCO_2/yr] = Other fuel costs [$/mo] * 12 mo/yr * Other fuel emissions [gCO_2/$]

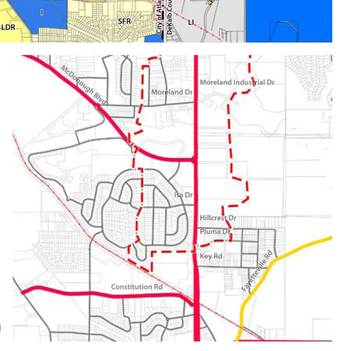
Water and sewage emissions [gCO_2/yr] = Water and sewage costs [$/mo] * 12 mo/yr * Water and sewage emissions [gCO_2/$]

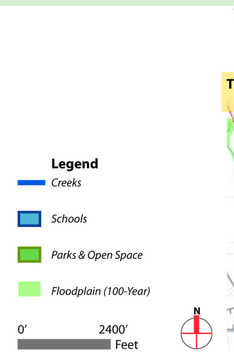
Housing construction emissions [gCO_2/yr] = Square feet of household [sqft] * Housing emissions [gCO_2/(sqft*yr)]

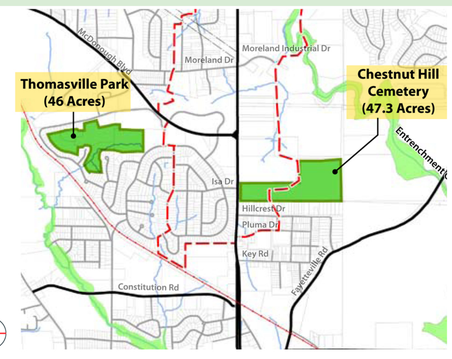
ZONING: SOURCE LCI STUDY



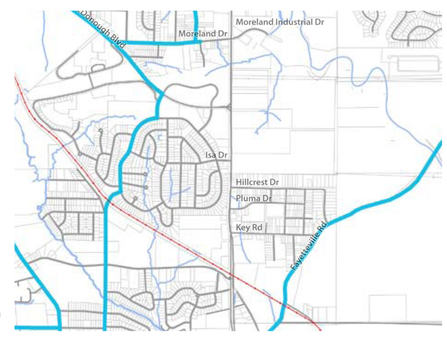




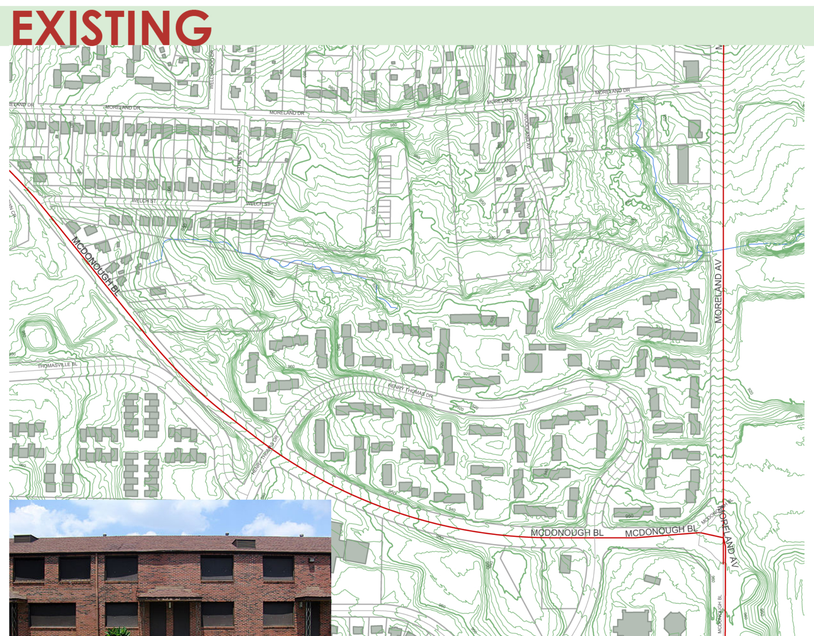




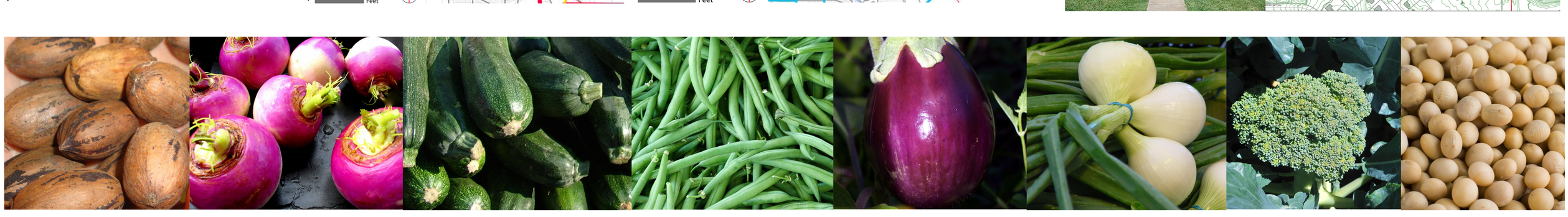




EXISTING







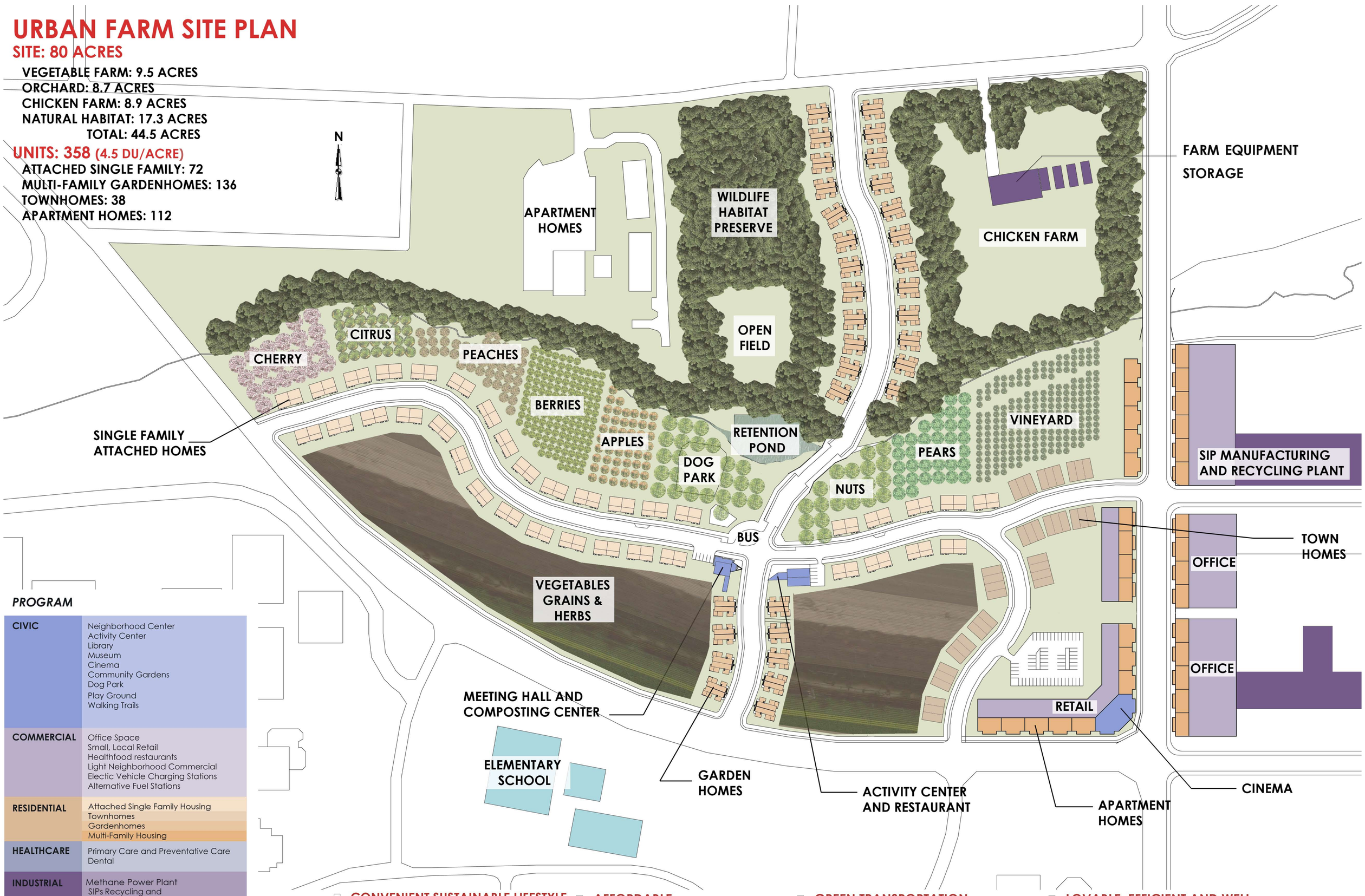
URBAN FARM SITE PLAN

SITE: 80 ACRES

VEGETABLE FARM: 9.5 ACRES
ORCHARD: 8.7 ACRES
CHICKEN FARM: 8.9 ACRES
NATURAL HABITAT: 17.3 ACRES
TOTAL: 44.5 ACRES

UNITS: 358 (4.5 DU/ACRE)

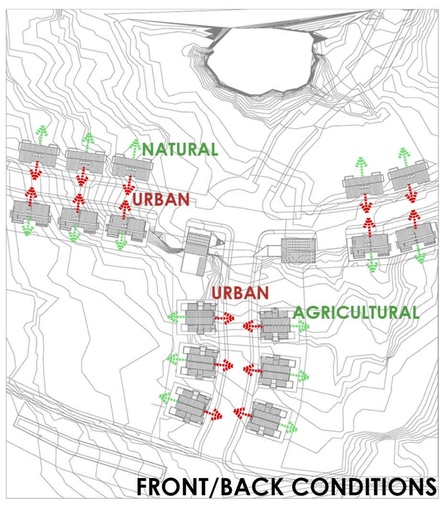
ATTACHED SINGLE FAMILY: 72
MULTI-FAMILY GARDENHOMES: 136
TOWNHOMES: 38
APARTMENT HOMES: 112



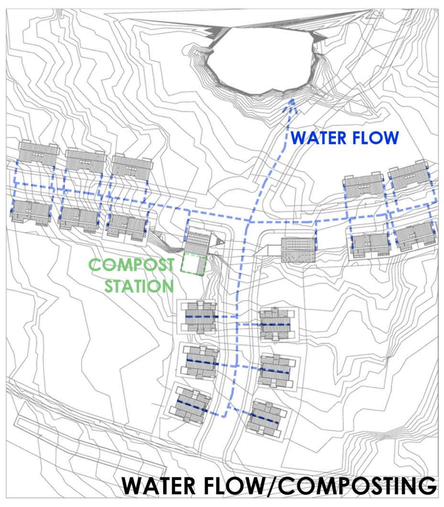
PROGRAM

CIVIC	Neighborhood Center Activity Center Library Museum Cinema Community Gardens Dog Park Play Ground Walking Trails
COMMERCIAL	Office Space Small, Local Retail Healthfood restaurants Light Neighborhood Commercial Electic Vehicle Charging Stations Alternative Fuel Stations
RESIDENTIAL	Attached Single Family Housing Townhomes Gardenhomes Multi-Family Housing
HEALTHCARE	Primary Care and Preventative Care Dental
INDUSTRIAL	Methane Power Plant SIPs Recycling and Manufacturing Plant Chicken Farm
INSTITUTIONAL	Elementary School and Middle School Day Care Center
TRANSPORT	Zip Car Storage Bus Rapid Transit Beltline with in 2 miles

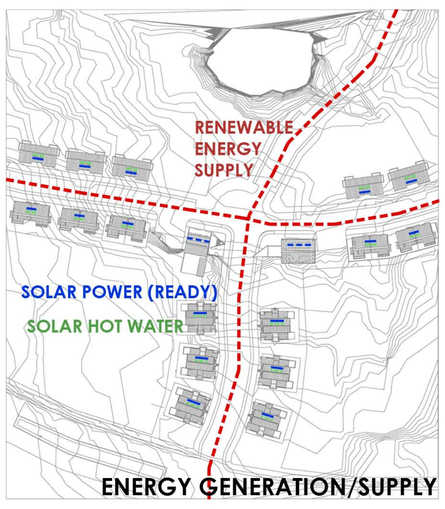
- ☐ **CONVENIENT SUSTAINABLE LIFESTYLE**
  - ☐ Sustainable food production
  - ☐ Water Collection and Retention
  - ☐ Zero Waste / Composting
  - ☐ Pedestrian oriented planning
  - ☐ Sun-rooms
- ☐ **AFFORDABLE**
  - ☐ SIP On Site Production
  - ☐ Local Labor
  - ☐ Solar-generation ready
  - ☐ Low energy bills
- ☐ **GREEN TRANSPORTATION**
  - ☐ Five minute Walkability
  - ☐ Alternative Fuel and Electric Buses
  - ☐ Shared Car System
  - ☐ Designated Biking Lanes and Secured bike storage
- ☐ **LOVABLE, EFFICIENT AND WELL CONSTRUCTED BUILDINGS**
  - ☐ Super insulated walls (SIP), floors & roofs
  - ☐ Maximum use of daylight
  - ☐ Summer solar shading/winter solar gain
  - ☐ Maximum natural ventilation



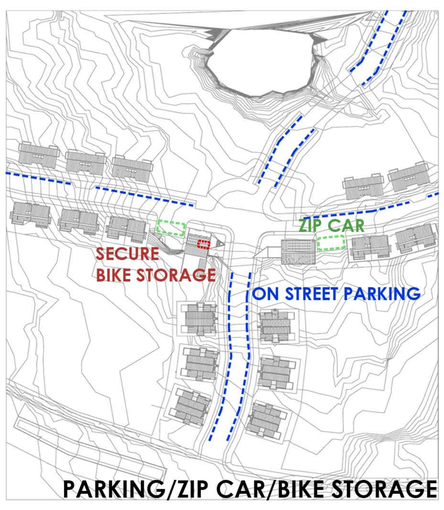
FRONT/BACK CONDITIONS



WATER FLOW/COMPOSTING



ENERGY GENERATION/SUPPLY



PARKING/ZIP CAR/BIKE STORAGE

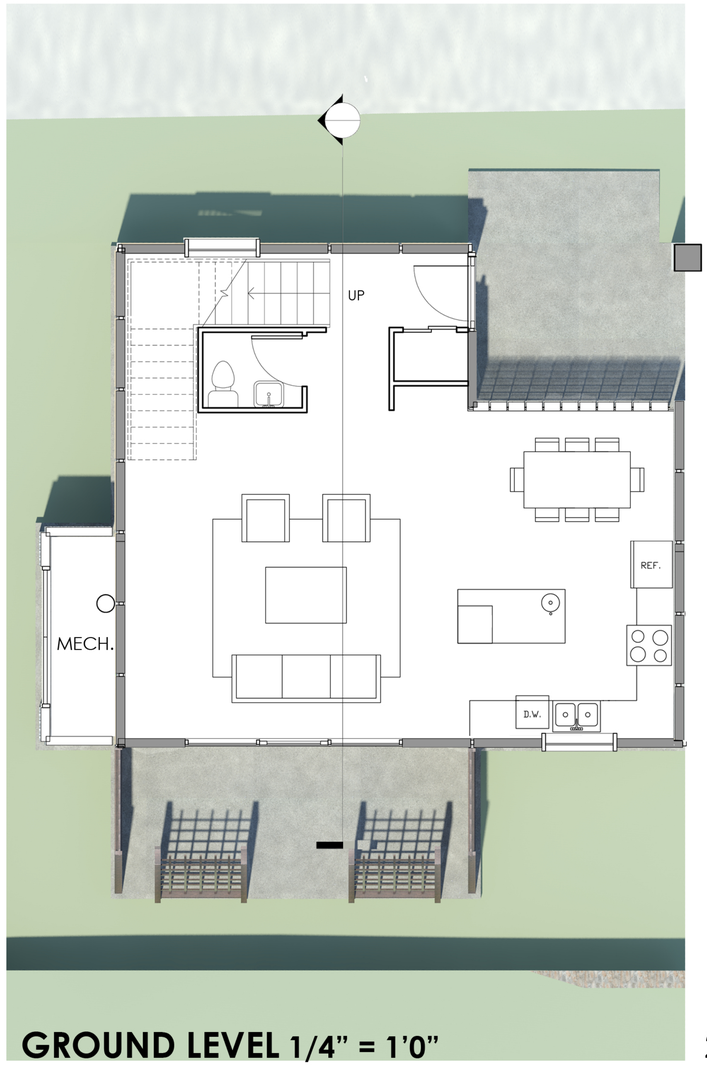
N-S SECTION

E-W SECTION





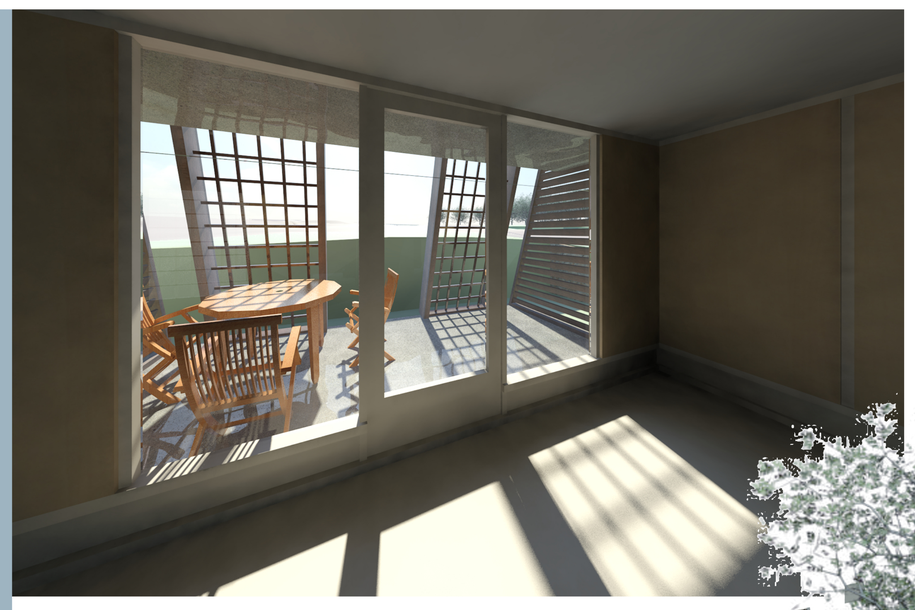
NORTH ENTRY ATTACHED HOME



GROUND LEVEL 1/4” = 1’0”



2ND LEVEL 1/4” = 1’0”





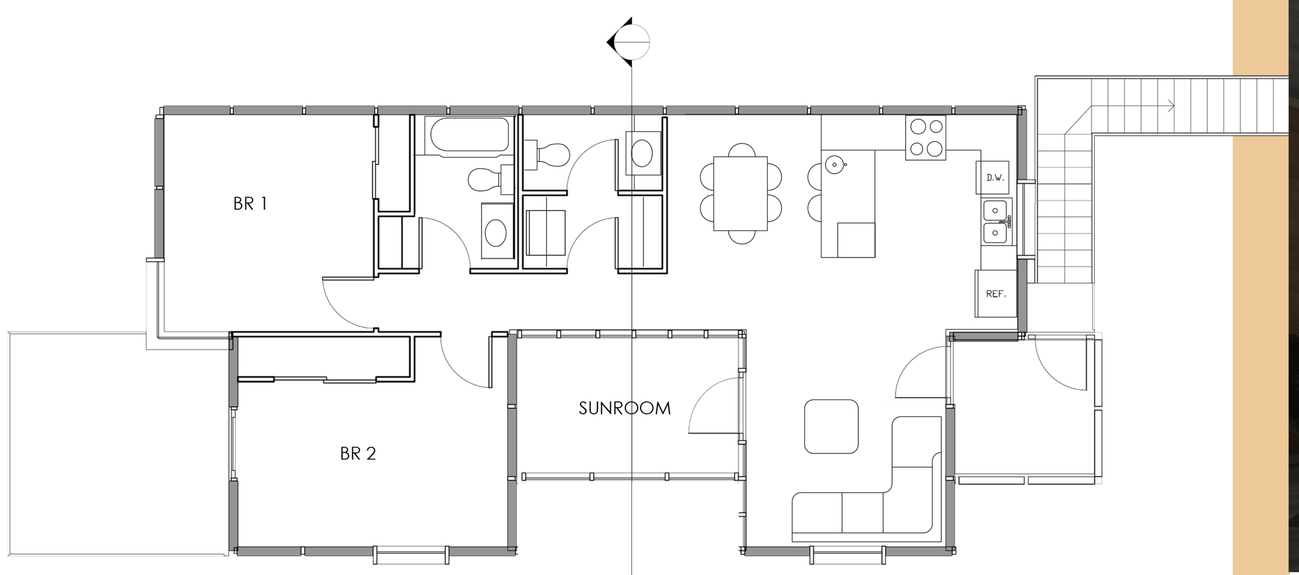


NORTH ELEVATION 1/4” = 1’-0”



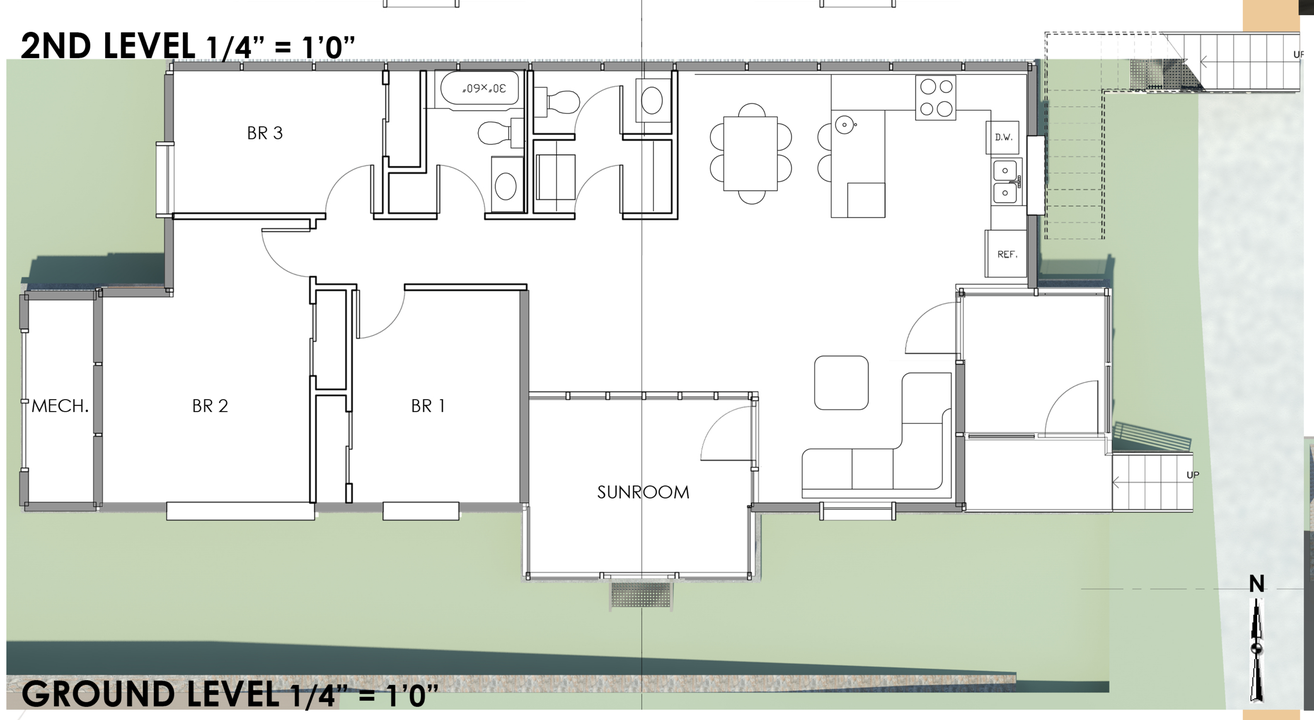
SOUTH ELEVATION 1/4” = 1’-0”

EAST/WEST MULTI FAMILY GARDENHOME

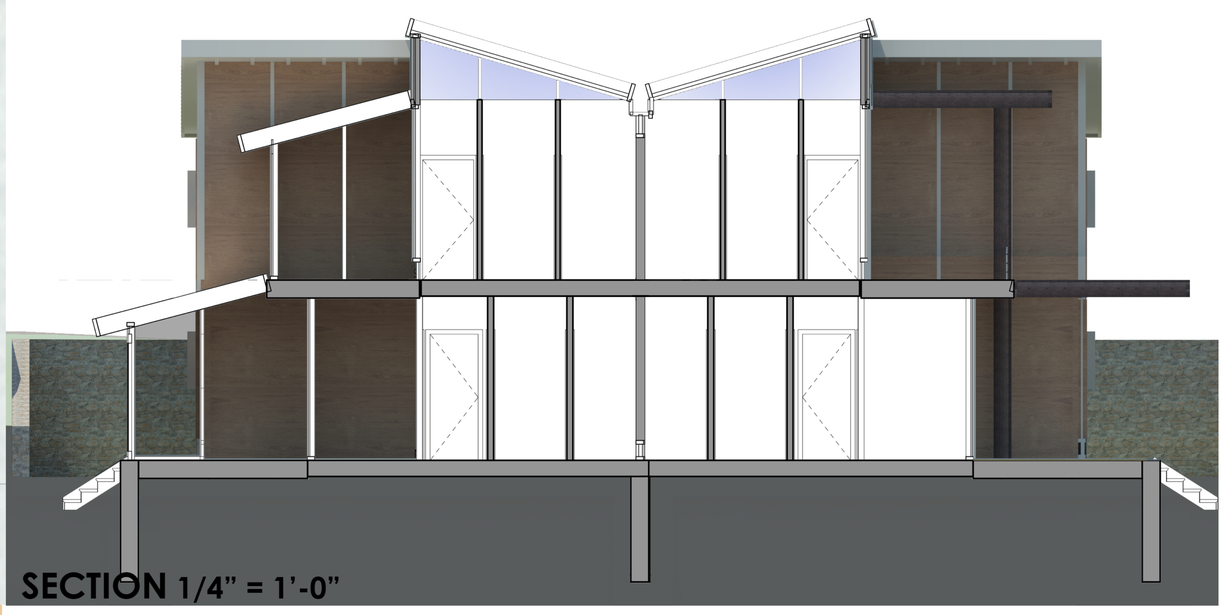


2ND LEVEL 1/4” = 1’0”





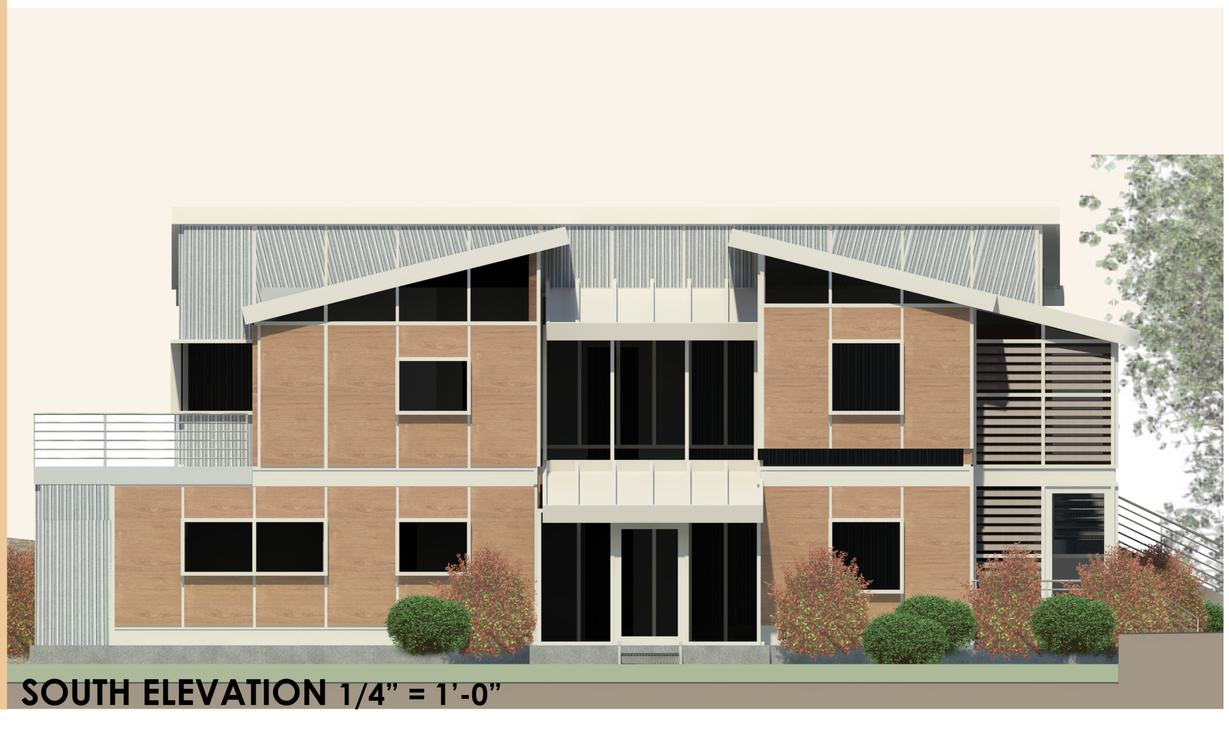
GROUND LEVEL 1/4” = 1’0”



SECTION 1/4” = 1’-0”



EAST/WEST ELEVATION 1/4” = 1’0”



SOUTH ELEVATION 1/4” = 1’-0”

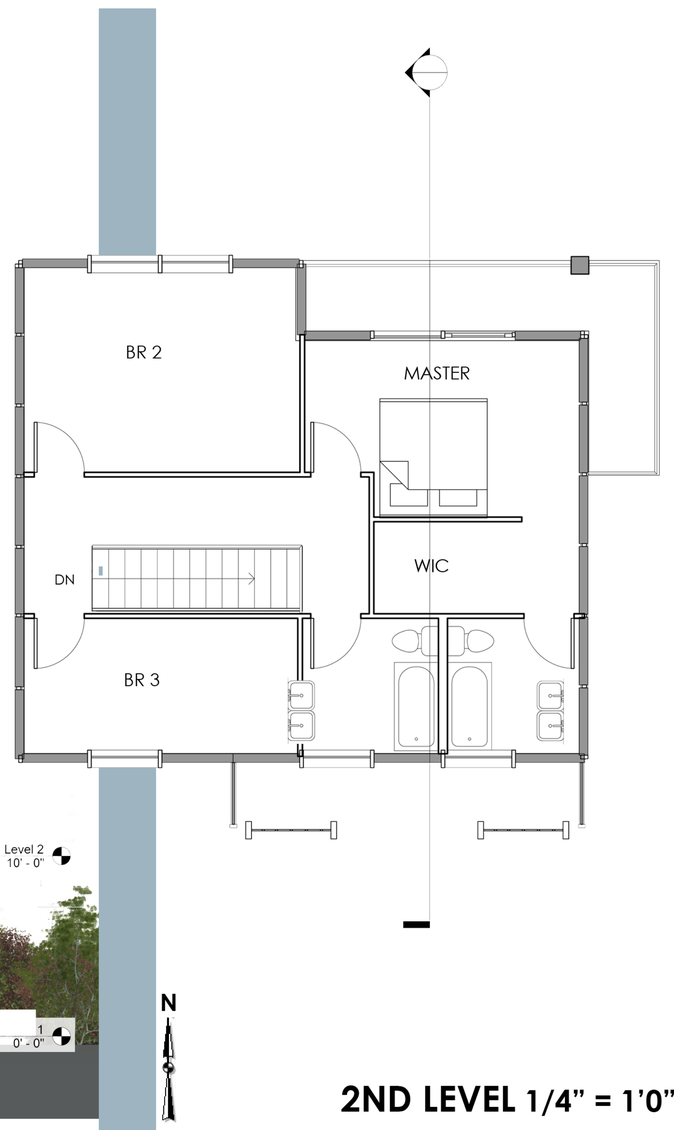


SOUTH ENTRY ATTACHED HOME

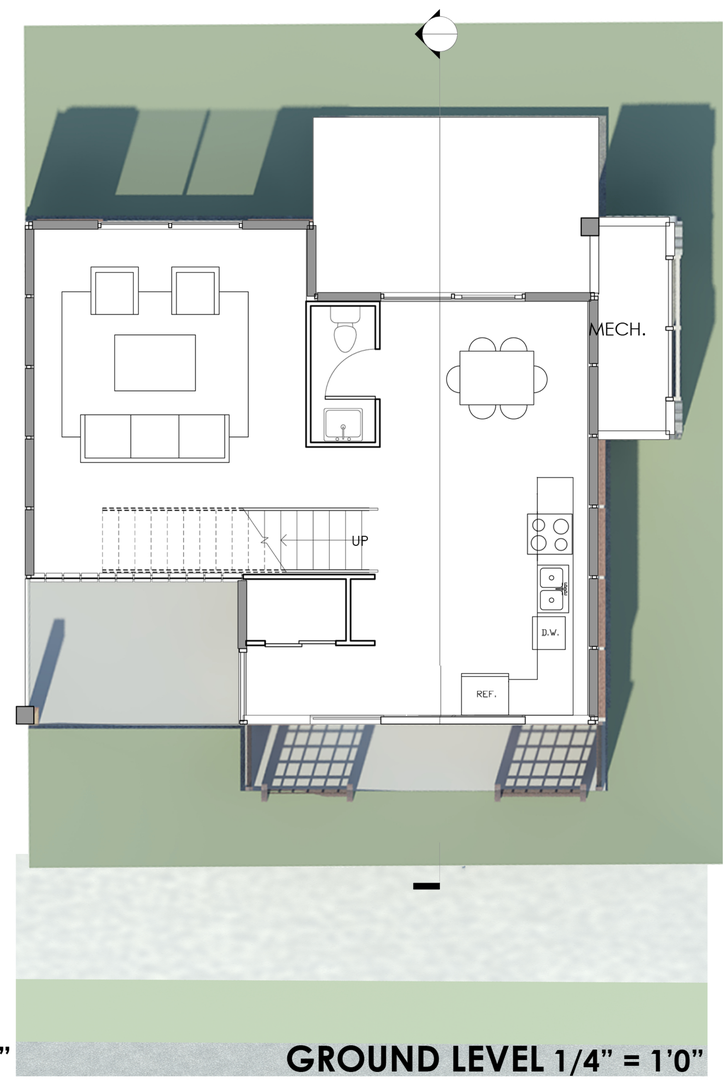




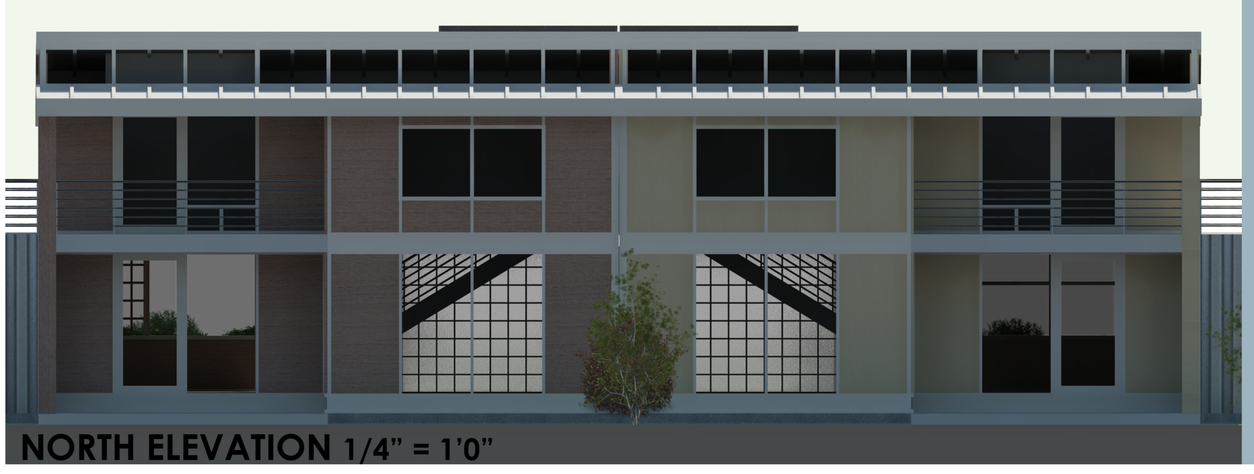
SECTION 1/4" = 1'-0"



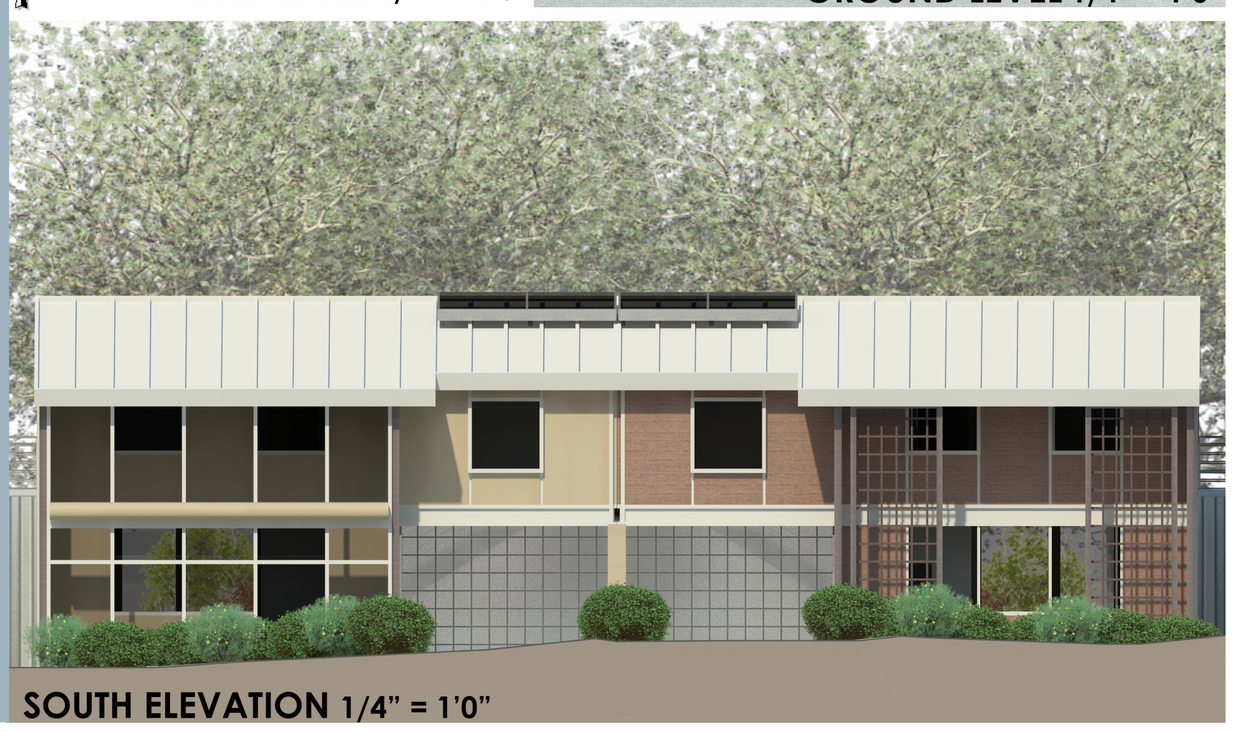
2ND LEVEL 1/4" = 1'0"



GROUND LEVEL 1/4" = 1'0"

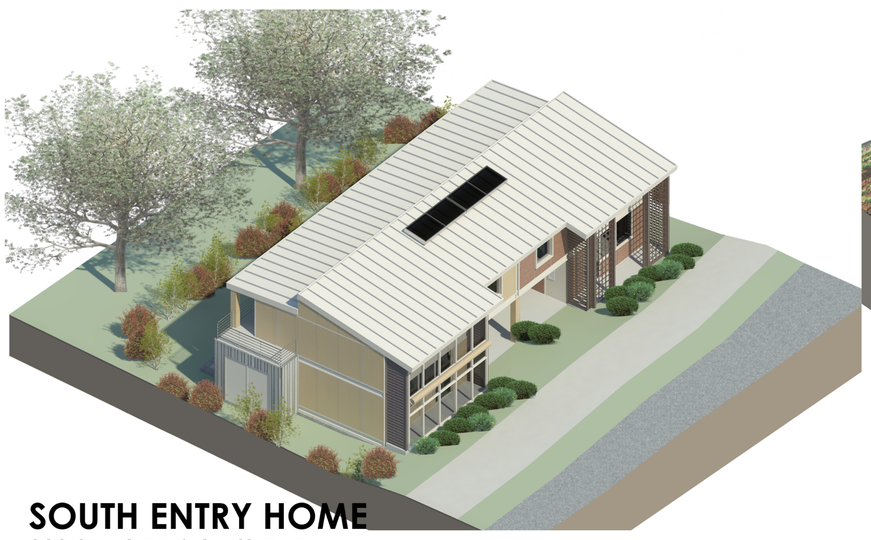


NORTH ELEVATION 1/4" = 1'0"

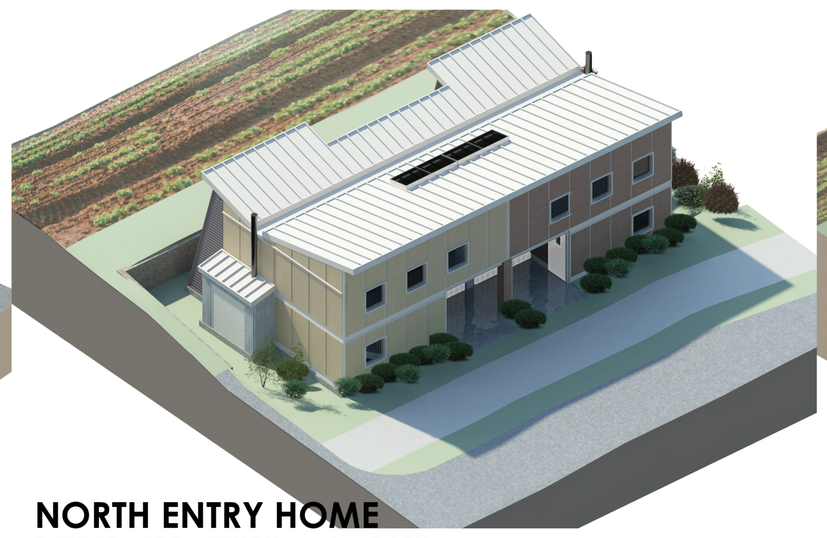


SOUTH ELEVATION 1/4" = 1'0"

CALCULATIONS



SOUTH ENTRY HOME
880 SF - 3 BR | 2 1/2 BATH



NORTH ENTRY HOME
1375 SF - 3BR + STUDY | 2 1/2 BATH



EAST OR WEST ENTRY HOME
GROUND LEVEL: 1055 SF - 3BR | 1 1/2 BATH
2ND LEVEL: 880 SF - 2BR | 1 1/2 BATH

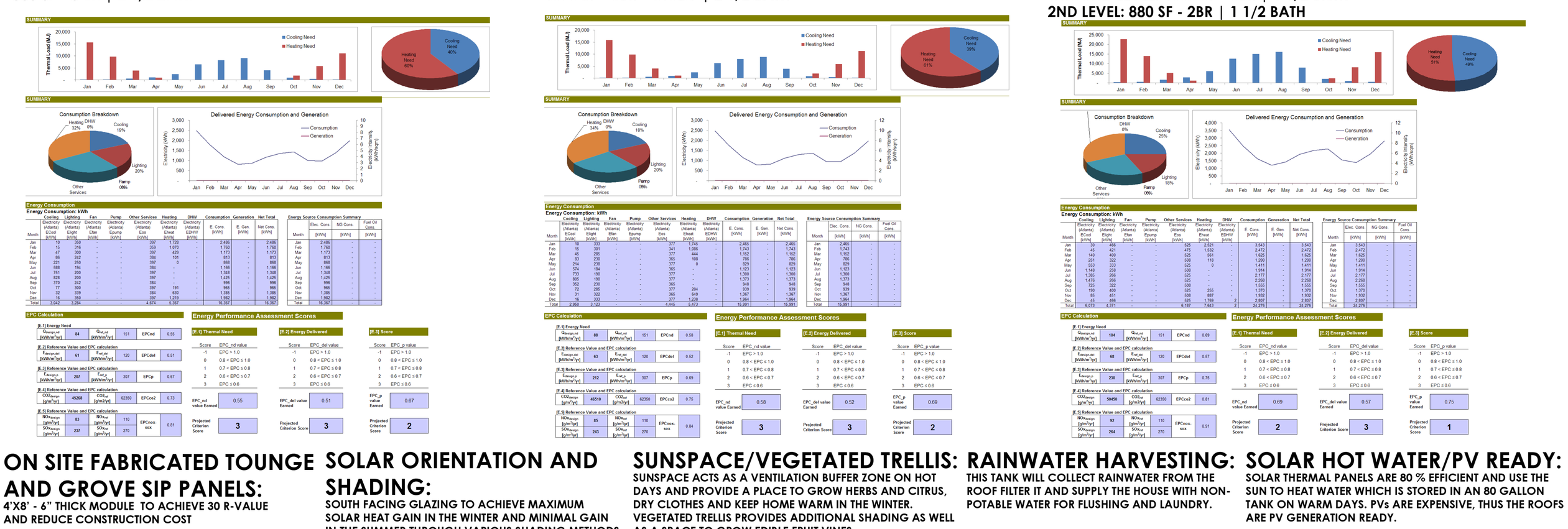
ON SITE FABRICATED TOUNGE AND GROVE SIP PANELS:
4'X8' - 6" THICK MODULE TO ACHIEVE 30 R-VALUE AND REDUCE CONSTRUCTION COST

SOLAR ORIENTATION AND SHADING:
SOUTH FACING GLAZING TO ACHIEVE MAXIMUM SOLAR HEAT GAIN IN THE WINTER AND MINIMAL GAIN IN THE SUMMER THROUGH VARIOUS SHADING METHODS

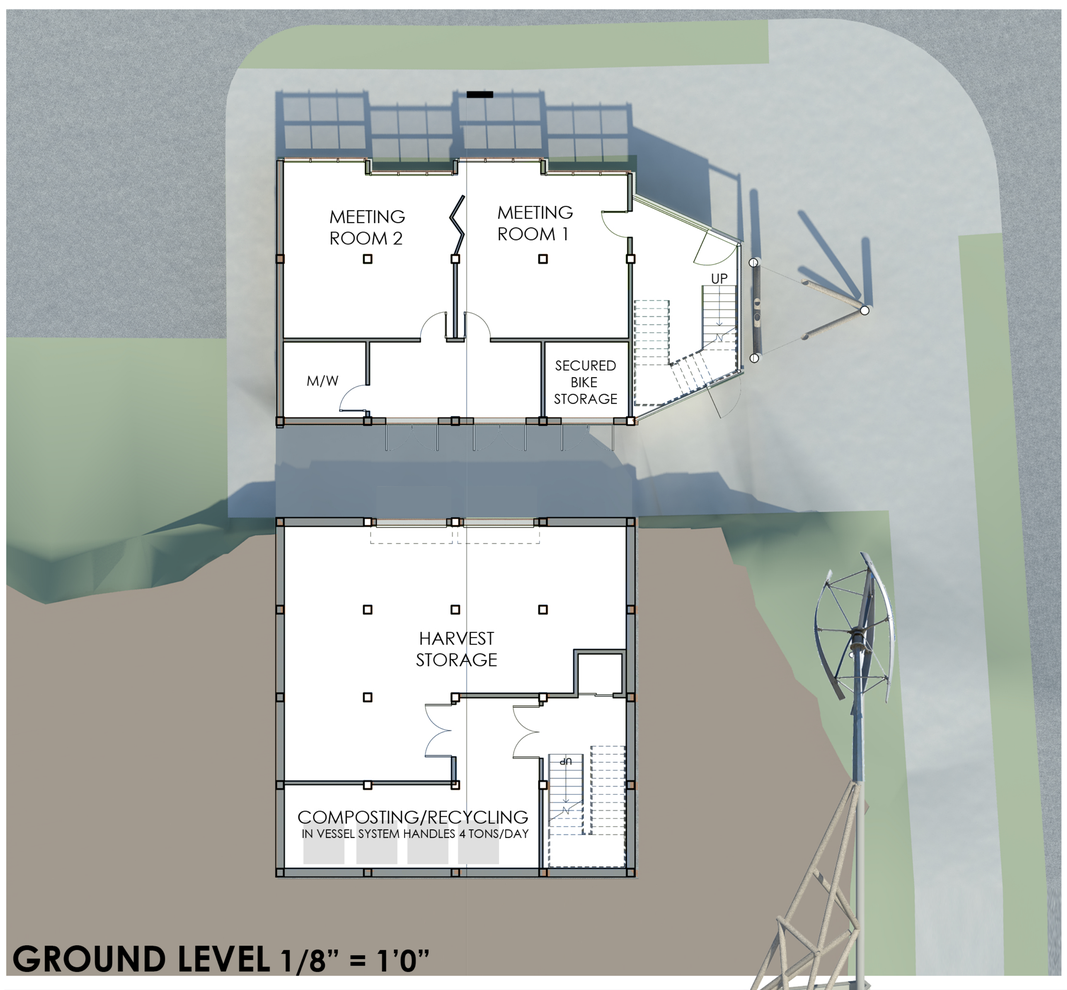
SUNSPACE/VEGETATED TRELLIS:
SUNSPACE ACTS AS A VENTILATION BUFFER ZONE ON HOT DAYS AND PROVIDE A PLACE TO GROW HERBS AND CITRUS, DRY CLOTHES AND KEEP HOME WARM IN THE WINTER. VEGETATED TRELLIS PROVIDES ADDITIONAL SHADING AS WELL AS A SPACE TO GROW EDIBLE FRUIT VINES.

RAINWATER HARVESTING:
THIS TANK WILL COLLECT RAINWATER FROM THE ROOF FILTER IT AND SUPPLY THE HOUSE WITH NON-POTABLE WATER FOR FLUSHING AND LAUNDRY.

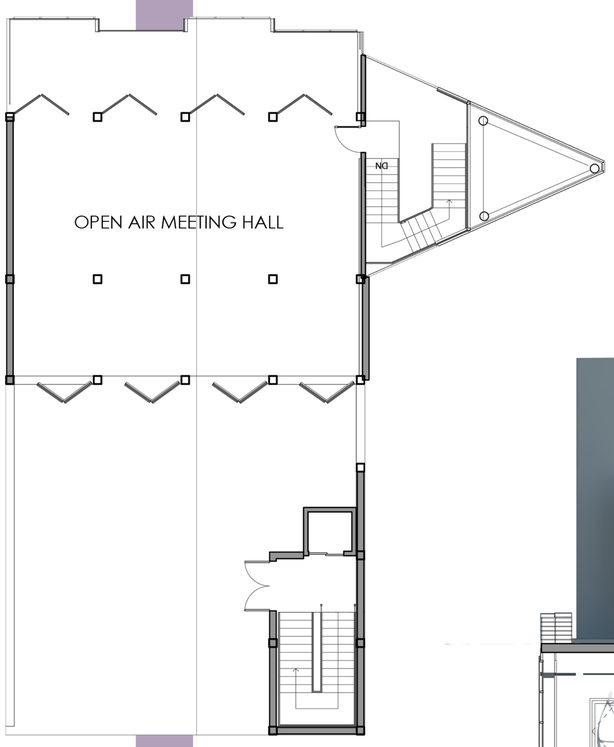
SOLAR HOT WATER/PV READY:
SOLAR THERMAL PANELS ARE 80 % EFFICIENT AND USE THE SUN TO HEAT WATER WHICH IS STORED IN AN 80 GALLON TANK ON WARM DAYS. PVs ARE EXPENSIVE, THUS THE ROOFS ARE PV GENERATION READY.



COMMUNITY MEETING HALL



GROUND LEVEL 1/8” = 1’0”



2ND LEVEL 1/8” = 1’0”



SECTION: SCALE 1/8” = 1’-0”

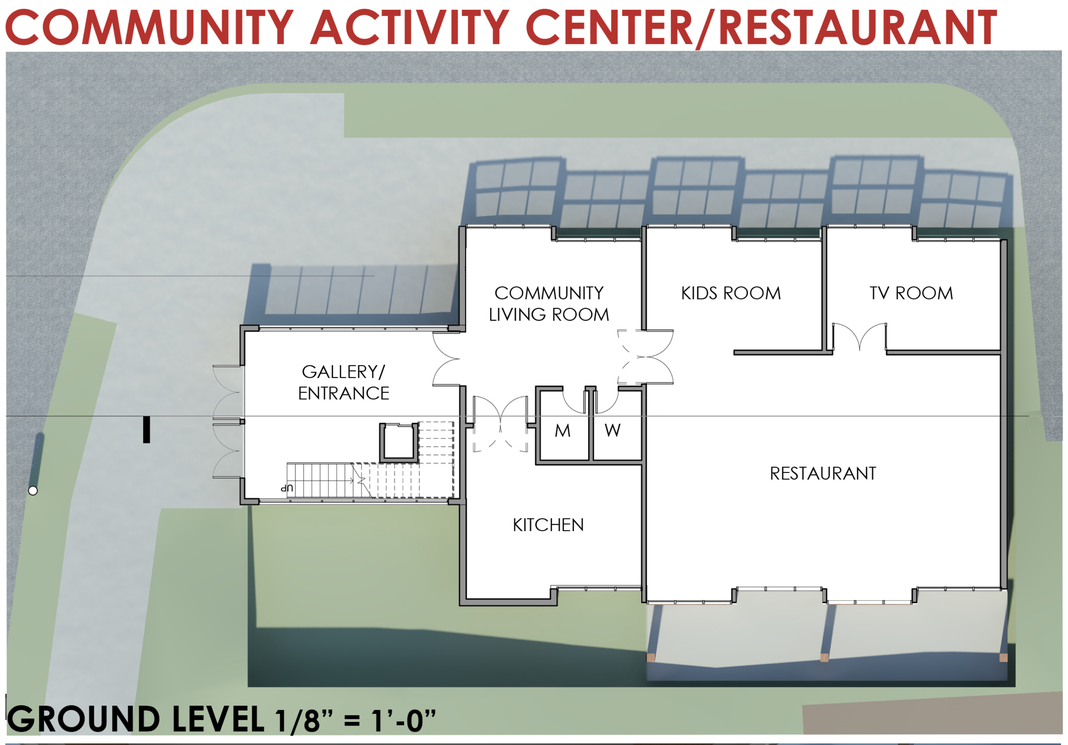


SOUTH-WEST AXON

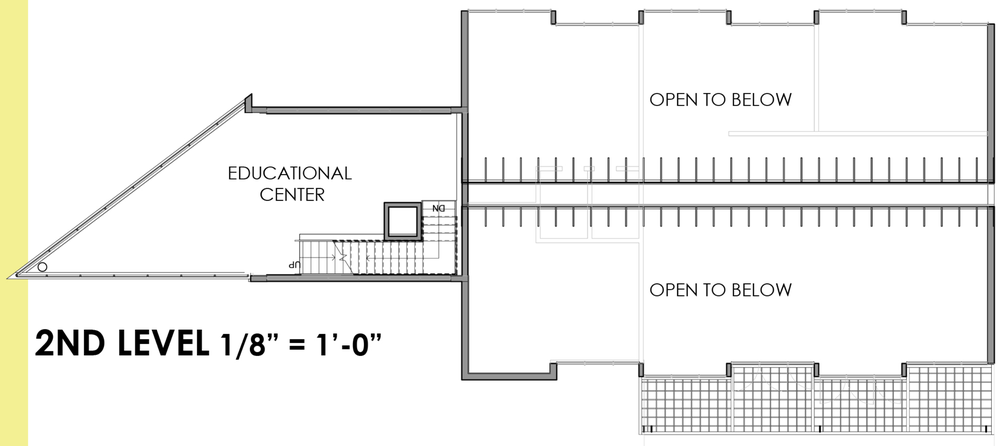


NORTH-EAST AXON

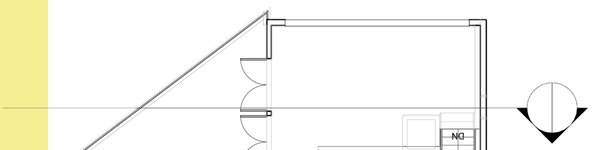
COMMUNITY ACTIVITY CENTER/RESTAURANT



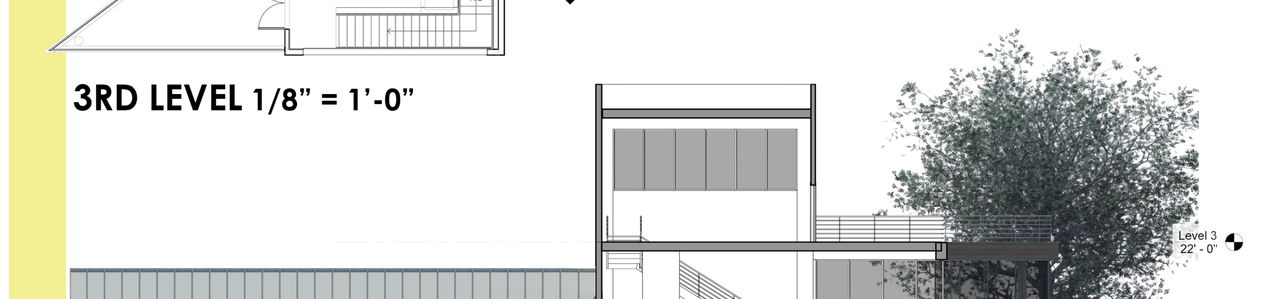
GROUND LEVEL 1/8” = 1’-0”



2ND LEVEL 1/8” = 1’-0”



3RD LEVEL 1/8” = 1’-0”



SECTION 1/8” = 1’-0”



SOUTH-EAST AXON

NORTH-WEST AXON

