The Designing of GreenBuild

State College Community Land Trust,

Penn State Race to Zero Design Competition Team, and

Energy Efficient Housing Research (EEHR) Group

DESIGN PROCESS AND COMMUNITY DESIGN CHARRETTES

PUBLIC CHARRETTE DATES:

February 2nd, 2015
March 31st, 2015
May 5th, 2015

Penn State University, State College Pa
Third Floor Mezzanine Space,
Stuckeman Family Building

Charrette (shar-ette) n. // An intensely focused activity intended to build consensus among participants, develop specific design goals and solutions for a project, and motivate participants and stakeholders to be committed to reaching those goals. Participants represent all those who can influence the project design decisions.

New Duplex Design for

1394 University Drive, State College, Pennsylvania

EEHR THE ENERGY EFFICIENT HOUSING RESEARCH GROUP

HAMER CENTER THE HAMER CENTER FOR COMMUNITY DESIGN

PennState College of Arts and Architecture

S·C·C·L·T GreenBuild

Contact Information: SCCLT (director@scclandtrust.org) EEHR (ldi1@psu.edu)

Introduction / Executive Summary

Co-Design

Housing affordability is a rising concern for many Americans, especially those of modest needs. The design and construction of energy and resource-conscious environmentally sustainable homes that are affordable in the short- and long-term are a paramount challenge. A Community Land Trust (CLT) is a private, non-profit organization whose goal is to acquire and hold land for the benefit of the community and to provide secure affordable access to land and housing for community residents. The mission of the State College Community Land Trust (SCCLT) is to "support vibrant neighborhoods by creating and maintaining sustainable housing opportunities for families and individuals who value living in the Borough of State College" (http://www.scclandtrust.org/clt/), a neighborhood with scarce opportunity for affordable, owner-occupied housing. Through a partnership with the Energy Efficient Housing Research group (EEHR), an outreach arm of the Penn State College of Arts and Architecture Hamer Center for Community Design, SCCLT is embarking on their first new building project – a zero energy ready residential duplex on a highly visible site in the property-constrained Borough. The duplex, once completed, will provide homes for two families of modest incomes and will be a demonstration for sustainable, affordable housing in the region. Fueled by challenges posed by the Department of Energy Zero Energy Ready Home program and Race to Zero student design competition, the "co-design" for the SCCLT GreenBuild demonstration project engages a diverse cross-disciplinary student and multiple-faculty team with community housing and construction leaders in discussions related to housing performance and community.

Acknowledgments

This project is the culmination of over two years of work by students, faculty, staff, community members, and local building professionals. This report and project would not have been possible without the continuous help and support provided by the State College Community Land Trust, the Energy Efficient Housing Research Group, the Hamer Center for Community Design, and the 2014-2015 Penn State Race to Zero competition team.

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S·C·C·L·T GreenBuild

HAMER CENTER
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PennState
College of Arts
and Architecture

STUCKEMANSCHOOL

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Triad of Involved Interests

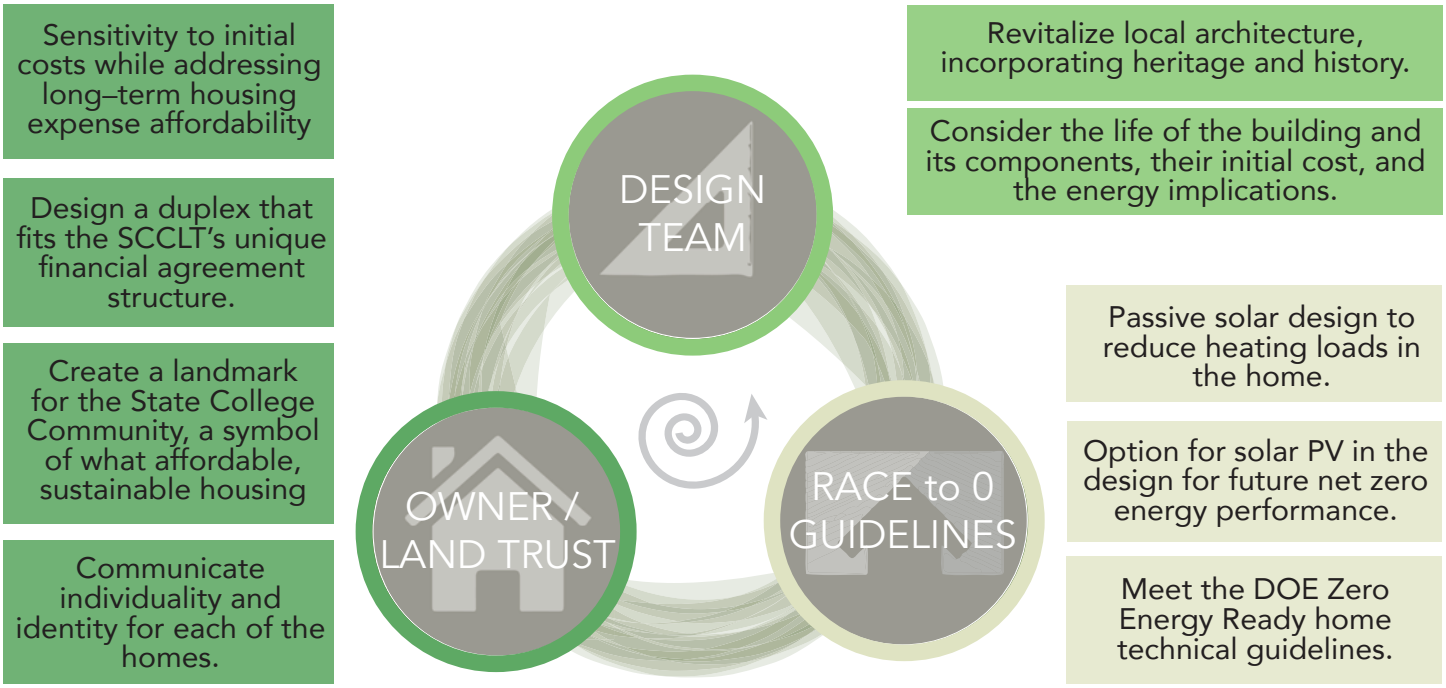


Figure 4: Triad Diagram and related goals (Image Credit: Penn State Race to Zero Team)

[CO] DESIGN FOR A TRIAD OF INTERESTS

A process of interaction between "town and gown" has been central to this project from conception through visualization and will be necessary for successful long-term realization. Three parties were major design drivers: The State College Community Land Trust; the DoE Race to Zero competition guidelines and related DOE Zero Energy Ready Home standards for performance; and the Penn State student and faculty design team and industry advisors.

Heritage Homes: High Performance Homes in Harmony with Community

"Good architecture learns from the past, responds to the present, and inspires the future" (Penn State, 2015). The project concept was informed by the triad in the interest of achieving cost-effective zero-energy homes, intended for a specific client in the community of State College, Pennsylvania, that showcase the expertise of a cross-disciplinary University team (See Figure 4). The project title established by the 2014-2105 Penn State Race to Zero Team, H4, Heritage Homes: high performance living in harmony with community, eludes to the main goals for the project - to foster high performance living in an accessible and affordable way, tying these ideals back to what already makes our region great, all while making the best impact on the community we serve. The design of the SCCLT Greenbuild duplex recalls the local history and traditions of the region's agrarian past through modern interpretations evocative of the iconic Pennsylvania Bank Barn and Farmhouse.

Setting Design Goals & Principles

2015 *Race to Zero* Competition Goals

– Engage college students to become part of a new leadership movement to achieve truly sustainable homes.

– Inspire and develop the next generation of residential design and construction professionals with building science expertise.

– Advance and enhance building science curriculum in universities.

– Complement the experiential learning benefits provided by the U.S. Department of Energy's Solar Decathlon through an additional collegiate competition opportunity.

– Provide the next generation of architects, engineers, construction managers, and entrepreneurs with skills and experience to start careers in clean energy and generate creative solutions to real-world problems.

2015 *Race to Zero* Competition Judging Principles

– Design: An evaluation of the project home design set within its regional context and current market expectations and how well it incorporates features and systems that integrate proven high-performance innovations.

– Cost Effectiveness: The degree to which the competition home is determined to be cost effective, from a buyer's perspective, providing a financial analysis that includes construction and site costs, monthly mortgage payment, insurance, utilities, debt burden, and taxes relative to household income.

– Performance Analysis: Clear and concise documentation of the analysis used to estimate achievement of a DOE Zero Energy Ready Home performance level or better.

– Technical Documentation: Focused and succinct documentation to demonstrate the building science principles and best practice guidelines used in the house design.

SCCLT Goals

– A home that meets the needs of their typical families built for the given budget.

– A home that will be affordable for the long term (durable, minimum maintenance, inexpensive utilities)

– A home that will not bring unwanted attention to the financial conditions of the occupants.

Academic Participants

Penn State Faculty & Staff:

Lisa Iulo; EEHR, Penn State Architecture

Scott Wing; College of Arts & Architecture

Dr. Ali Memari; Penn State Engineering, PHRC Hankin Chair

Sarah Klinetob Lowe; PHRC Staff

Hong Wu; Hamer Center Staff, Landscape Architecture Post-Doc

Tara Mazurczyk; Penn State Landscape Architecture Grad., Hamer Center Staff

Merve Sagiroglu; Penn State Civil Engineering Visiting Post-Doc

Photo: 2014-15 Penn State Race to Zero Team

Student Design Team:

Victoria Brinemugha; Penn State AE student, Mechanical Option

Laura Searles; Penn State Civil Eng. Student

Selby Niumataiwalu; Penn State Architecture Student

Greg Lych; Penn State Architecture Student

Torin Miner; Penn State Architecture Student

Cansu Tari; Penn State M.S. Architecture Student

Negar Ashrafi; Penn State M.S. Architecture Student

Reese Wamsley; Penn State Architectural Engineering Student

Wanxin Huang; Penn State Civil Engineering Student

Yichun Tsai; Penn State Civil Engineering Student

Yamile Rodriguez; Penn State M.S. AE, structures option

Cory Clippinger; Penn State Architecture Student

Dario Vanegas Vargas; Penn State Ph.D Architecture Student

Kyle Macht; Penn State M.Arch Architecture Student

Chauntel Duriez; Penn State Int. BArch/ M.S. Architecture Student

Jonathan Libman; Penn State Architecture Student

Brad Pawelczyk; Penn State Architecture Student

Josh Horenstein; Penn State Architecture Student

Dane DeWire; Penn State Civil Engineering Student

Shivaram Punathambekar; Penn State M.S. Architecture Student

Ehsan Kamel; Penn State Architectural Engineering PhD Candidate

Kassandra Garza; Penn State Architecture Student

Sarah Wooton; Penn State Architecture Exchange Student

Justin Rotella; Penn State Student

Aidan Gilrain-McKenna; Penn State Student

Chris Hazel; Penn State Architecture Student

Travis Creighton; Penn State Architecture Student

Goli Razaghi Kashani; Penn State Student

Issa Ramaji; Penn State Ph.D Engineering Student

Shahrzad Fadaei; Penn State M.S. Architecture Student

Mosope Ismail; Penn State Student

Community Participants

Ron Quinn, SCCLT Exec. Director

Susan Venegoni; SCCLT

Ron Filippelli; SCCLT

Mike Joyce; SCCLT

Polly Dunn; SCCLT

Sue Hiester; SCCLT

Peg Hambrick; SCCLT

Colleen Ritter; SCCLT

SCCLT Homeowners

Todd Alwine; LWA

Joe Cortazzo; SCCLT

Suzanne Bruening; SCCLT

Susan Thomson; SCCLT

Nina Fellin; SCCLT Homeowner

Rachel Fawcett; CCHLT

Michele Halsell; Penn State Sustainable Communities Collaborative

Todd Alwine, Home Builder & sustainable design consultant

Participant list generated from Charrette sign-in, we regret any oversight on the participant list and sincerely appreciate the input provided by all of the the members of our State College Community.

Industry Mentors

Chad Owens; Timber Rock Homes

Peter Vargo, Nu-Tech Energy Solutions

Jason Grottini; Envinity, Inc.

Matt Rooke; Envinity, Inc.

Michelle Palm; The HITE Company

Greg Ballas; YBC

Gary Golaszewski; Penn State Lighting

Richard Mistrick PhD; Penn State AE Lighting/Electrical

Brian Ault; Karpinski Engineering

Anne Messner: Borough of State College

Tom Fountaine; Borough of State College

Scot Chambers; Keller Williams Advantage Realty

Andrew Poerschke; IBACOS

Timeline of Design

Dec. 2014
SCCLT Project
Conceptualization

Aug. 2014
Fall Semester 2014
Arch 431
4th Year Undergraduate Architecture
Design Studio

Spring Semester 2015
Arch 497E Net Zero
Housing elective

Feb. 2015
Design Check Point 1

Feb. 2nd, 2015
Charrette #1
Project Program and Goal Setting

Mar. 2015
Design Check Point 2

Mar, 31st, 2015
Charrette #2
Project Validation - GreenBuild
Committee Meeting

Apr. 2015
Design Check Point 3

Apr. 18th 2015
Race to Zero D.O.E. Competition
Golden, Colorado

May 5th, 2015
Charrette #3
Living and Landscape

Sept. 2015
Design Check Point 4
Stuckeman School Exhibit

Sept. 17th, 2015
SCCLT GreenBuild Committee
On-Site Meeting

Oct. 2015
Design Check Point 5

Nov. 2015
Design Check Point 6

Ongoing project Development &
Realization by SCCLT

Arch 431 studio – Forth Year Architecture

Overview:

During the fall of 2014 a fourth year B.Arch undergraduate design studio took the first steps toward design investigation with the State College Community Land Trust (SCCLT). The work of the studio helped to inform the needs, concerns and intent of the GreenBuild project. The diverse conceptual designs developed by the studetns was a starting point for many more design steps moving forward.

Fall 2014 Arch 431 Student Participants:

Matt Avallone, Valeria Ayala-Cucalon, Chris Cardelli, Lindsey Connelly, Sam Davison, Alyssa Gallina, Nick Gonzalez, Nicole Gioiella, Brittany Hardaway, Nicole Harkins, Katie Johnson, Brian Kerr, Hannah Lasota, Emily Liuzza, Kasey Motley, Elena Nentcheva, Dylan Robinson, Chris Sciulli, David Sellers, Fitore Shllaku, Rob Tirado and Maddie Wagner.

Course Instructors:

Eric Sutherland and Lisa D. Iulo

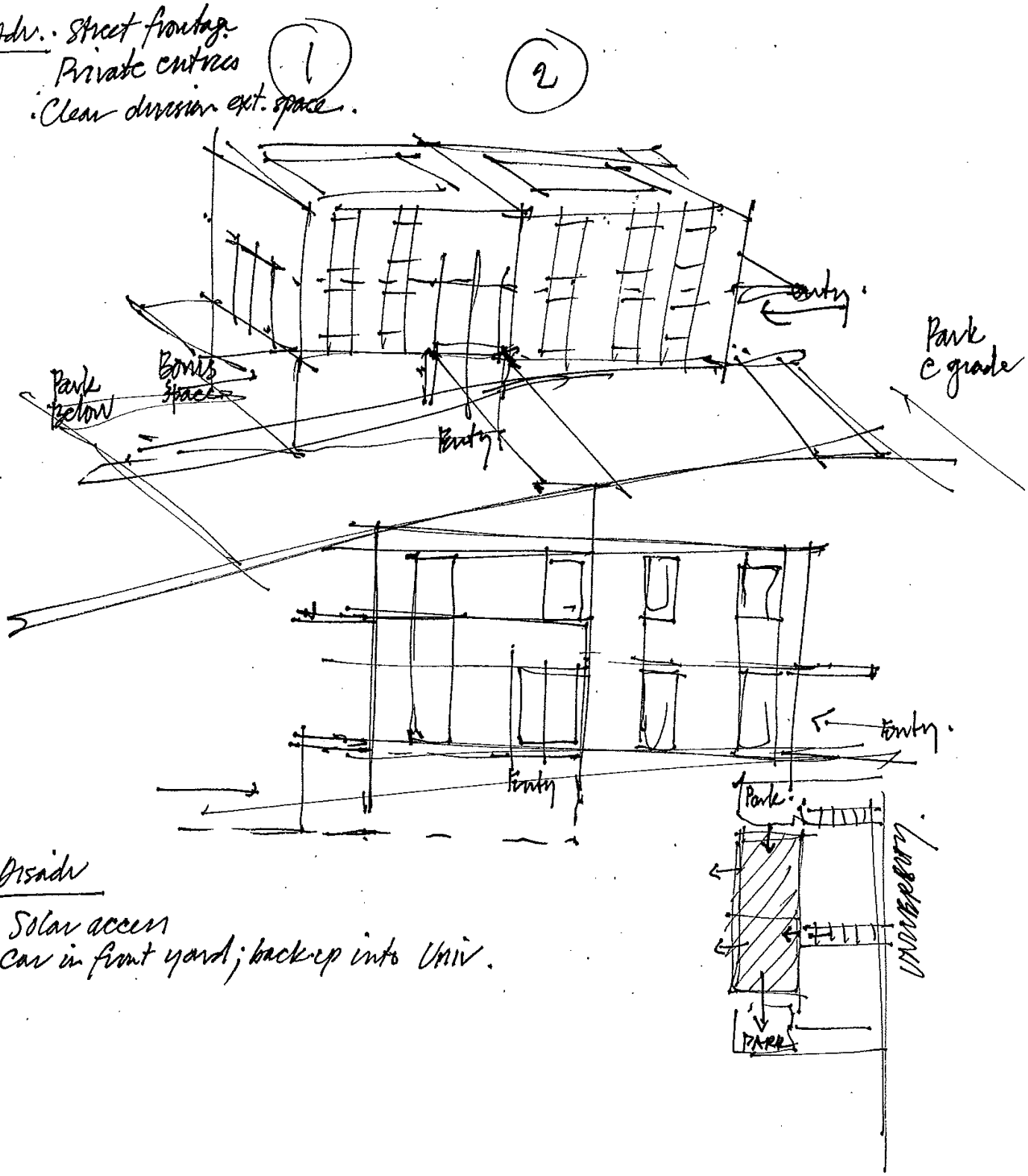
Derivitive Conceptual Sketches

2+ / 2 — face street.

TYPICAL DUPLEX, ENTRY ROTATED

1

Adv.: Street frontage
Private entries
Clear division ext. space.

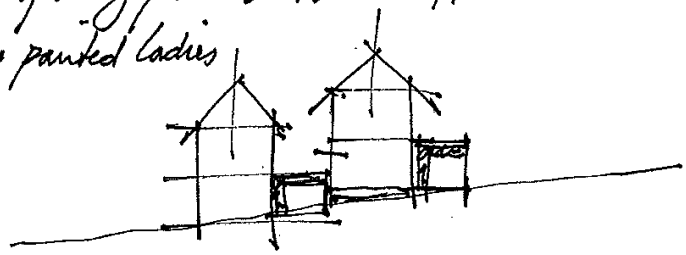


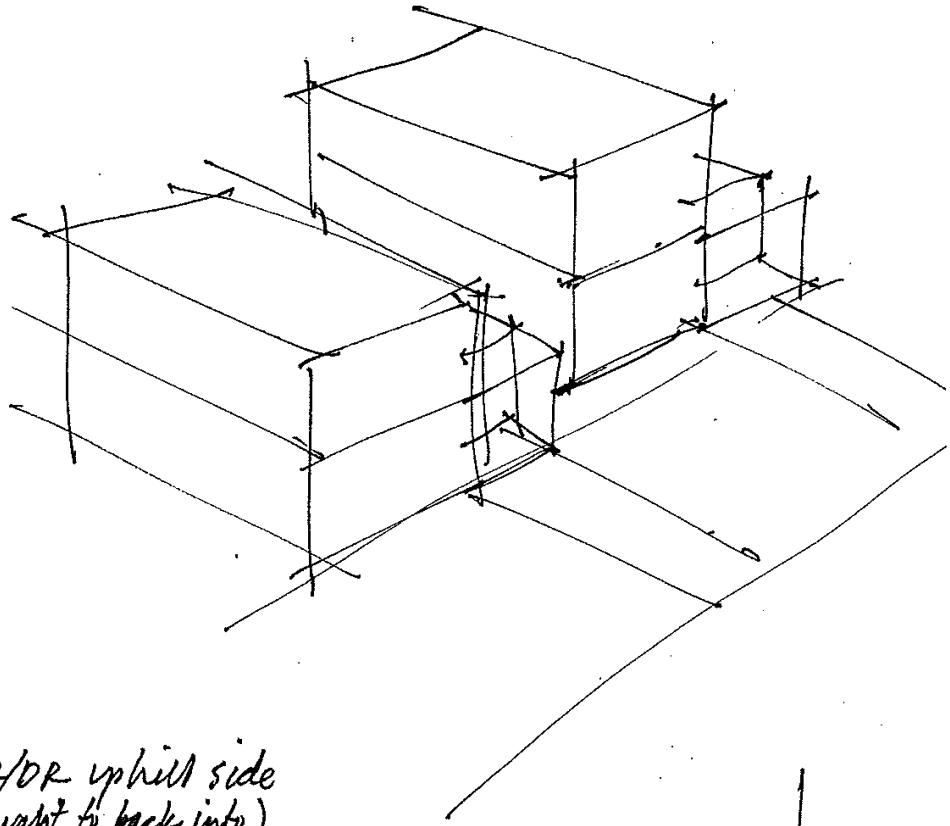
Disadv

- Solar access
- Car in front yard; back-up into Univ.

Rowhouse Typology — Section Shift
— San Francisco painted ladies

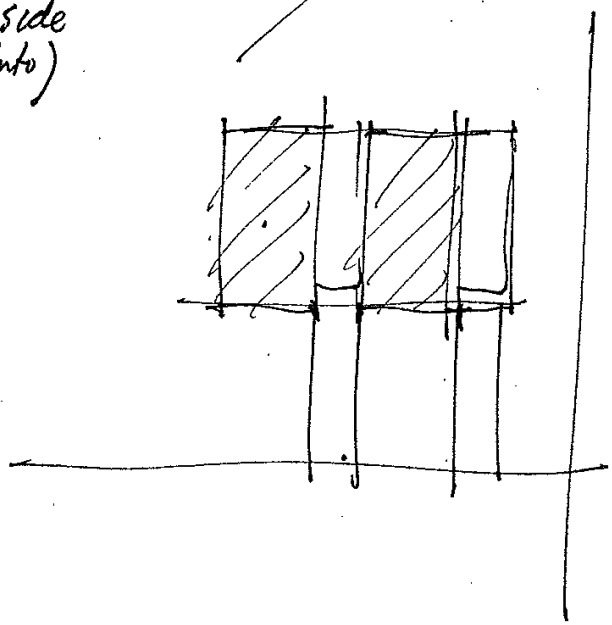
2





Disadv.

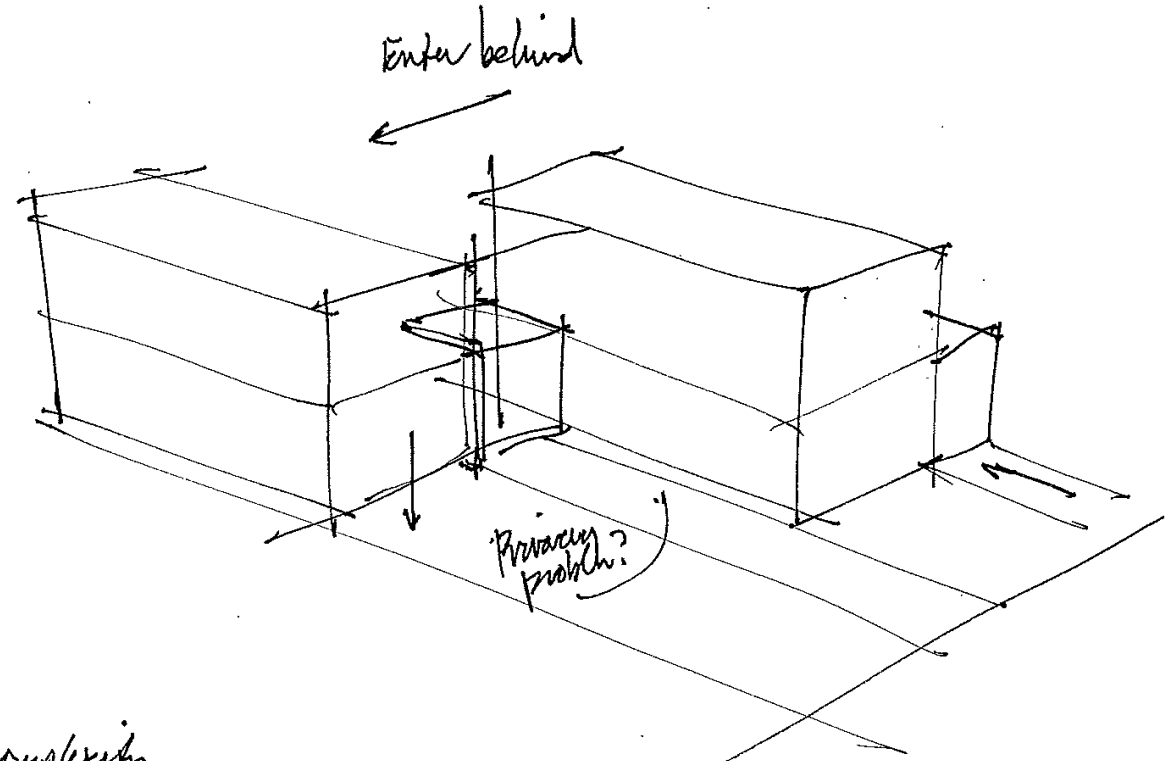
- Limited views for LR/DR uphill side
- No car turnaround (don't want to back into University)
- Solar access compromised.
- Driveway is front yard?



PA Farmhouse - Rotated & Split

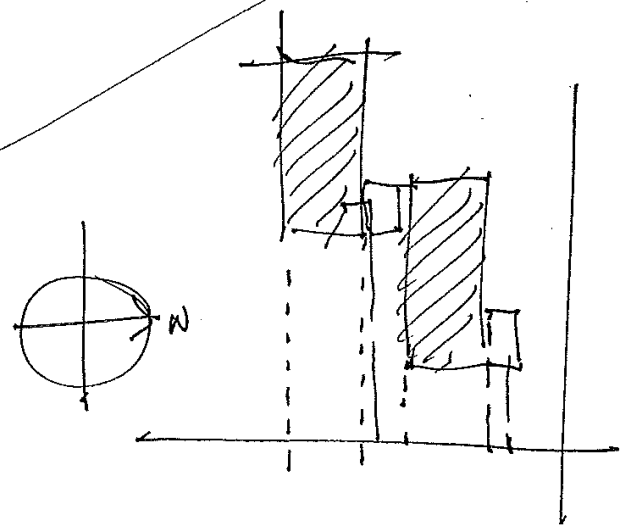
3

- Does not require full story step down... can adjust more to site



Disadv.

- Foundation complexity
- Privacy issues
- more exposed area.
- Back up into Univ. Dr.?
- Driveway is front yard.

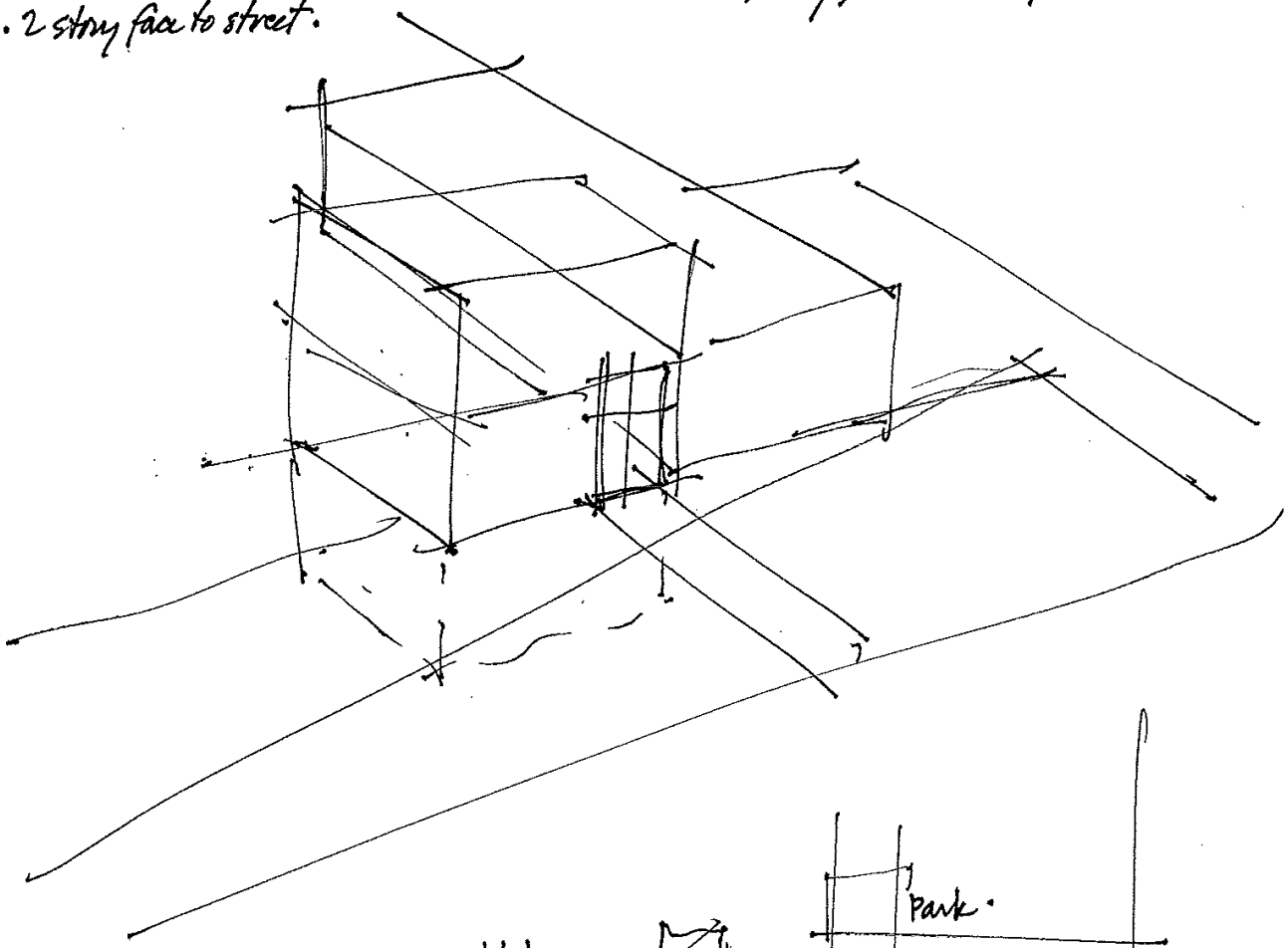


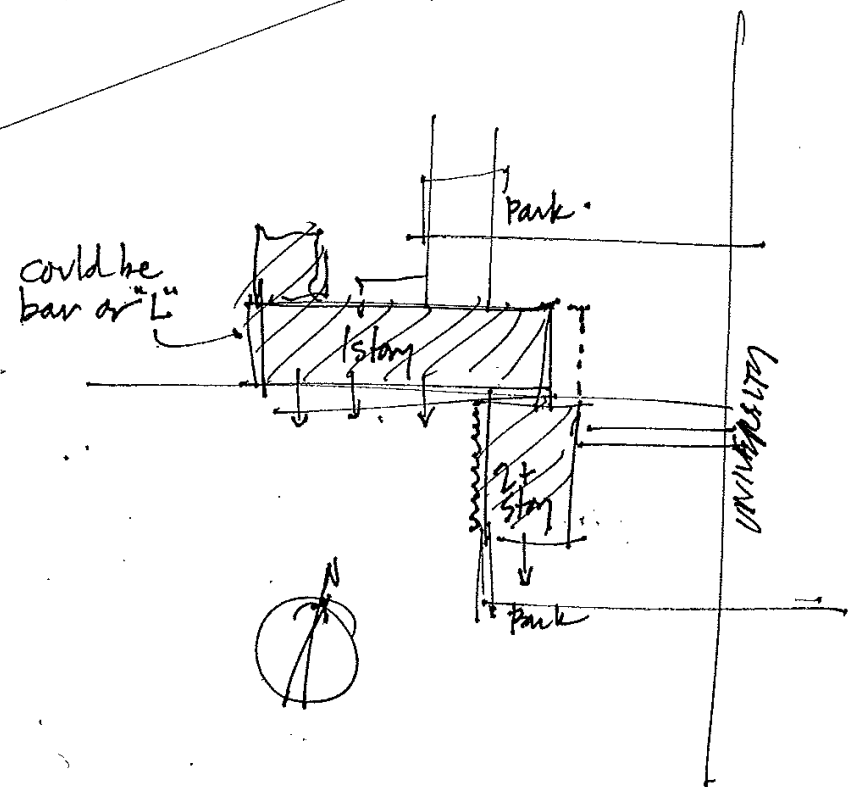
LAUREL & HARDY.

2+ story / 1 story.

4

- contrers stereotype of mirrored image duplex. → unique ID to each
- meets needs of 2 very diff. SCCLT families
- addresses directional conflict betw. street facing & south exposure.
  - 2 story face to street.



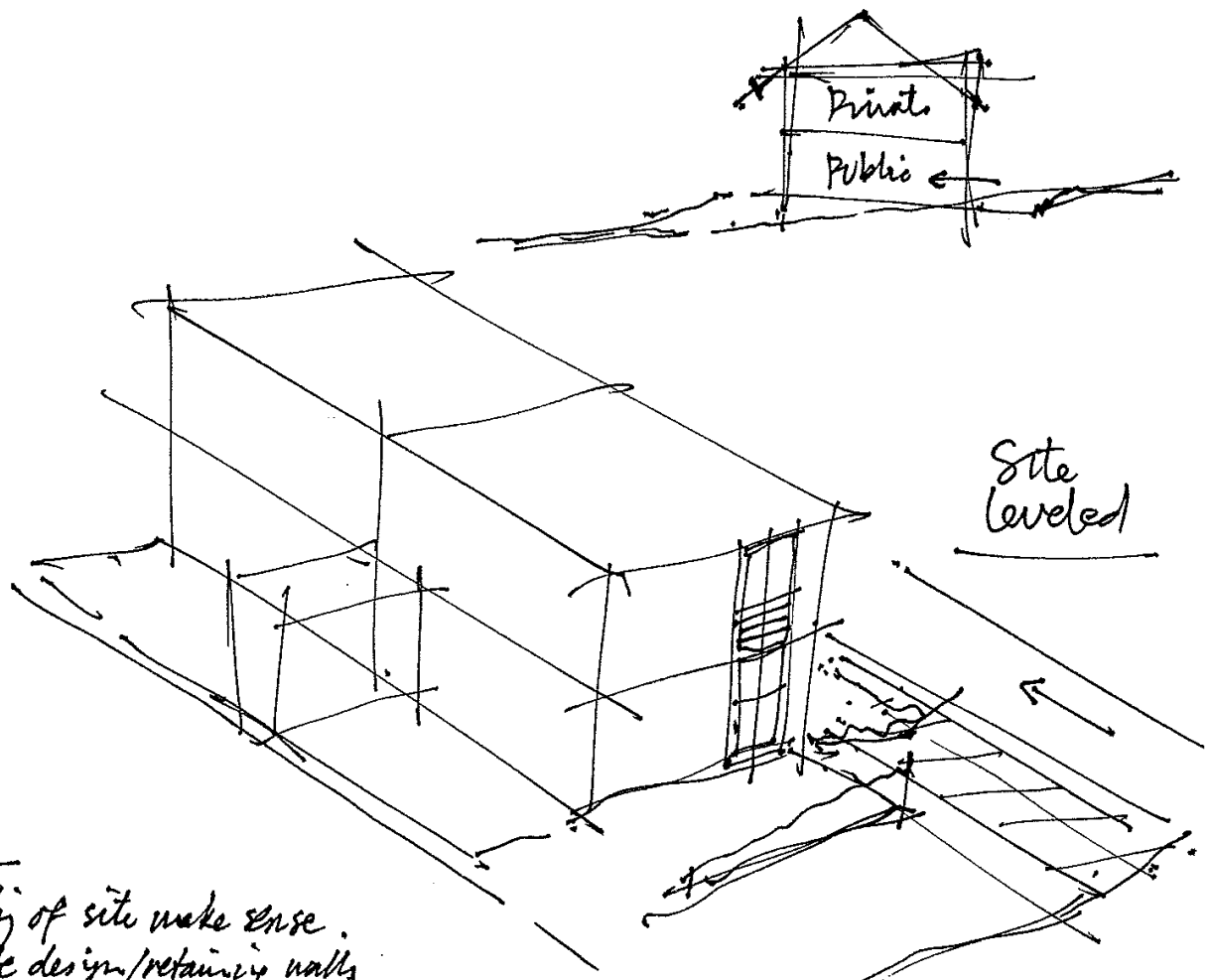


DISADV
- More wall exposure.
- Greater foundation wall length.
- 2 foundation system?

PA Farmhouse – Rotated · - 2 story.

5

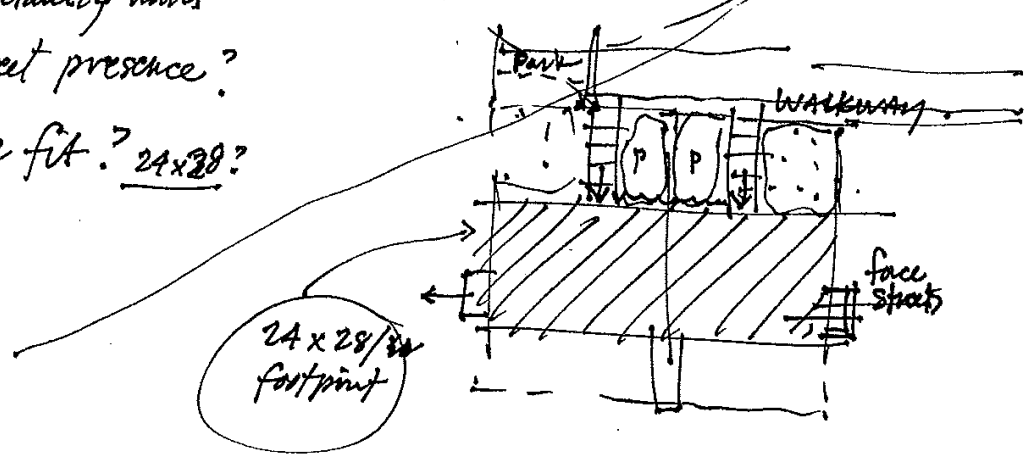
– Familiar PA Horse type - 2 story.



Disadv

- Does levelling of site make sense. Need site design/retaining walls
- Does house have street presence?

Will 1st floor BR fit? 24x28?

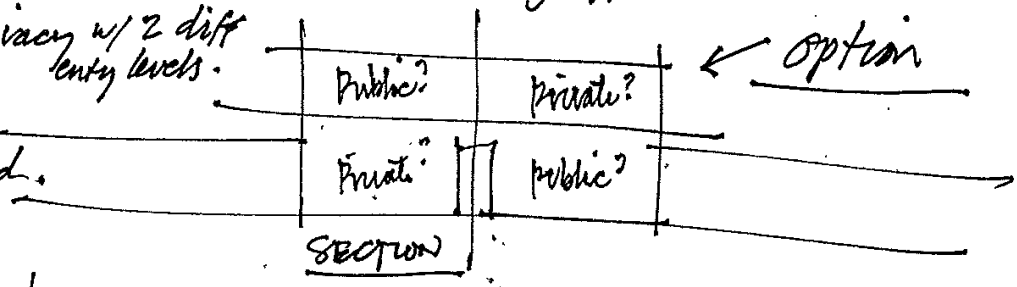


PA FARMHOUSE – BANK BARN.

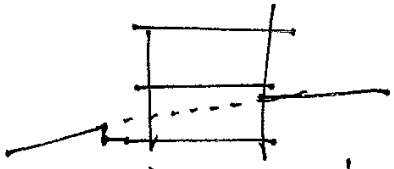
2 / 2 story. (bermed/ground coupled).

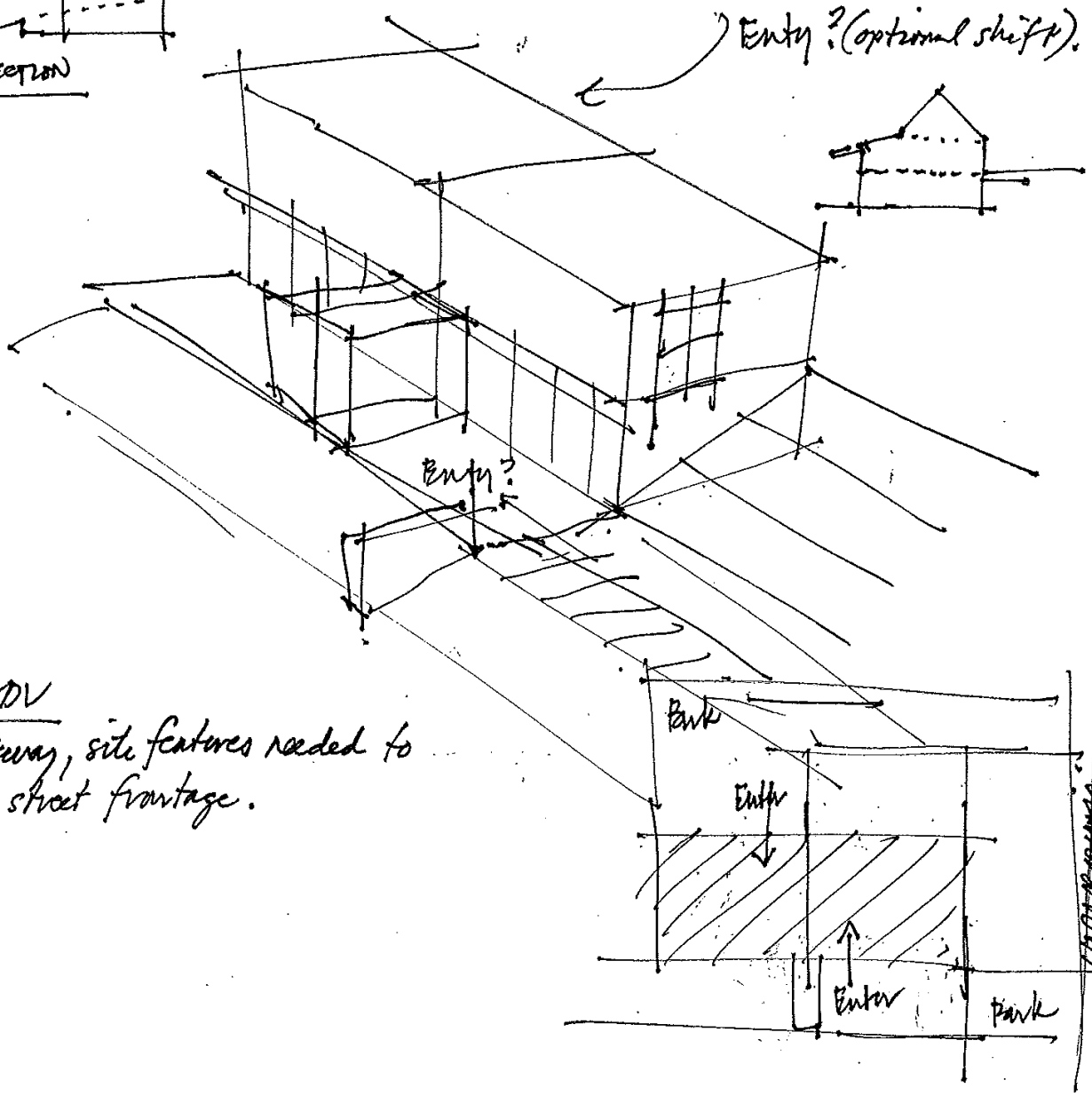
6

- Mash-up of two canonical central PA bldg types
- Twist on privacy w/ 2 diff entry levels.
- Compact.
- Ground-coupled.



← option





DISADV

walkway, site features needed to help street frontage.

Arch 497E – Net Zero Energy Housing

Overview:

A special topics course in Net Zero Energy Housing was offered in the spring semester of 2015 with the intention to conduct research and develop design proposals for the SCCLT GreenBuild duplex. Several upper level architecture students and a couple of students from engineering and related disciplines enrolled in the class. The students in the class were joined by other interested students, comprising the 2014-2015 DOE *Race to Zero* team.

Course Instructors:

Scott Wing and Lisa D. Iulo

Arch 497E – Net Zero Energy Housing

GreenBuild: To build affordable homes for families in opportunity-rich neighborhoods, creating new partnerships and educational platforms to further green housing initiatives and increase long-term sustainability for homeowners.

The Pennsylvania State University — Department of Architecture

The Stuckeman School — College of Arts and Architecture

Arch 497E

Spring Semester 2015

Credits: 3

Meeting time: Tuesdays 6:00 – 9:00 pm

Prerequisites: Interest in affordable, net-zero capable housing and seeing your design work built

Instructors: Scott Wing and Lisa Iulo

Introduction

The objective of this semester-long project is on the design and development of a comprehensive building design for a cost-effective "high-performance" duplex (two attached homes). Expectations are for a thoroughly conceived and detailed building design that is innovative in:

- Selecting building materials and determining assemblies in the interest of re-thinking housing that is highly energy-efficient, sustainable, affordable and able to be duplicated.
- Integrating building science and systems that will result in a zero-net energy ready home.
- Considering the land trust model and investigating the project site in a way that fosters community and neighborhood stability, explores ideas about public and private space, and is considerate of environment and context.

Background

The design of the duplex homes will be in accordance with the needs of our client and community partner, the State College Community Land Trust (SCCLT). A Community Land Trust (CLT) is a private, non-profit organization whose goal is to acquire and hold land for the benefit of the community and to provide secure affordable access to land and housing for community residents. CLTs attempt to meet the needs of those priced out of the housing market by helping to reduce speculation and absentee ownership of land and housing and by preserving the long-term affordability of housing.

The mission of the State College Community Land Trust is to "support vibrant neighborhoods by creating and maintaining sustainable housing opportunities for families and individuals who value living in the Borough of State College" (http://www.scclandtrust.org/clt/).

The State College Community Land Trust (SCCLT), in partnership with State College Borough and the Energy Efficient Housing Research Group - EEHR/Penn State Hamer Center for Community Design, plans to design and build a moderately priced, owner-occupied duplex utilizing advanced and long-term cost-effective "green" technology. This project furthers the Borough's commitment to developing sustainability projects "using best practices to create lasting environmental, economic, community and organizational vitality."

Design Challenge

The design of the duplex homes must take affordability into account, limiting the initial cost of construction and the long-term expenses of home ownership.

SCCLT has the opportunity to purchase a highly visible site on University Drive to embark on their first new build project. The site is approximately 20,000 square feet and is approved for construction of a duplex, which is consistent with the surrounding community fabric. As the pilot project of their new GREENBUILD initiative, it is SCCLT's hope that this project will be a model for the development of future affordable, sustainable housing in State College Borough and the Centre County Region.

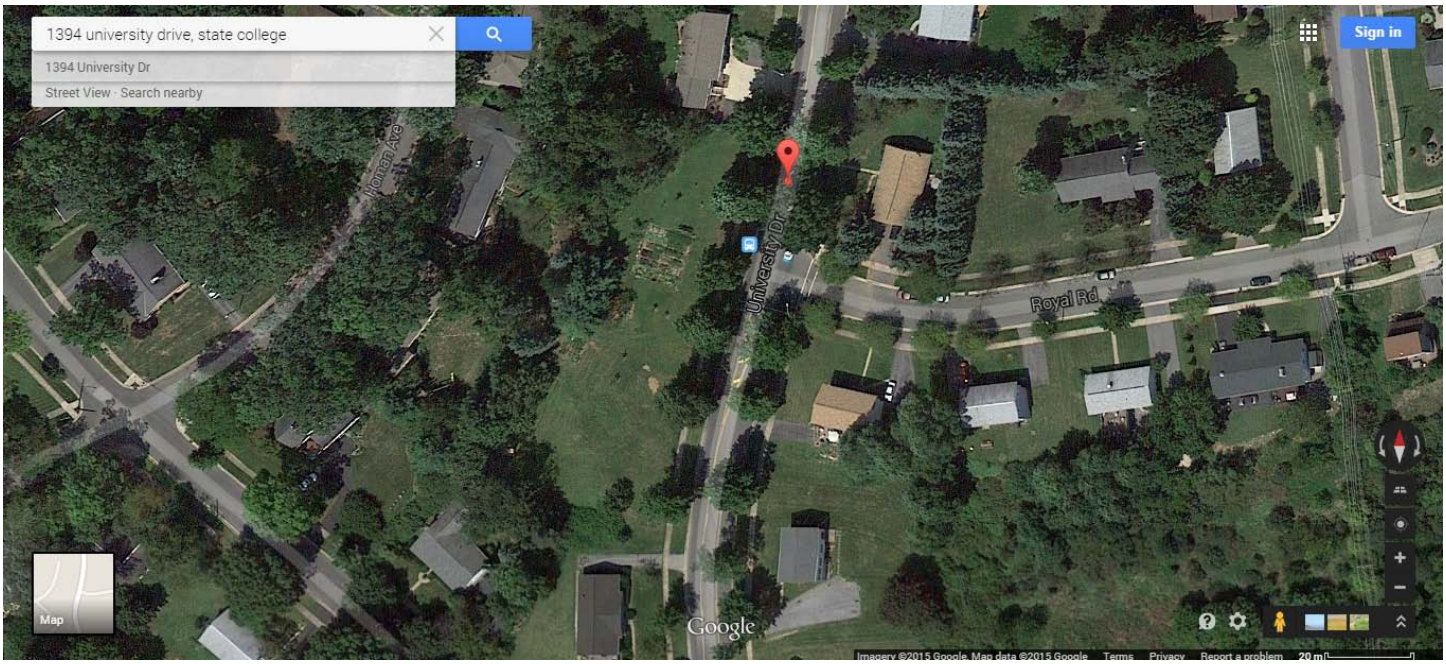
The project has the potential of not only creating additional housing, but creating a broader partnership between PSU, the State College Borough, and the SCCLT. This partnership would enhance the very fabric of SCCLT acquisition and rehab projects and evolve into a collaboartion with PSU that would dramatically influence our knowledge base in green, sustainable, and energy efficiency building and rehab activities. This will influence the success of the SCCLT Greenbuild program and benefits future and current homeowners. SCCLT's goal is to develop homes that are extremely energy efficient and to encourage further development by monitoring the efficiency of these newly developed homes. Through partnership with Penn State the SCCLT hopes to utilize local talent and create a project that is a shared learning experience for the SCCLT board, staff, homeowners and wider State College community of citizens interested in affordable, sustainable and green housing.

Program

The SCCLT is hoping to develop two units of moderate-income homeownership "green" homes that have three (3) bedrooms, 1.5 baths and approximately 1250 square feet of living space in each unit. Each home will provide adequate living, sleeping, cooking and eating space for the residents of an average American family. The design should also be flexible enough to accommodate as many living situations as possible, including aging-in-place.

Site

State College Community Land Trust Greenbuild site is located at 1394 University Drive, State College PA. The site is within a residential area with a strong connection to the fabric of the Borough, including a CATA bus stop on the property. There is a strong landscape component to be factored into the design since the site slopes significantly along University Drive. Because of the unique ownership model of land trust homes, the site for the new duplex can be reconceived to address innovative ideas about community and the design of infill housing. Solar orientation, natural ventilation, and views must be considered in the design of the homes.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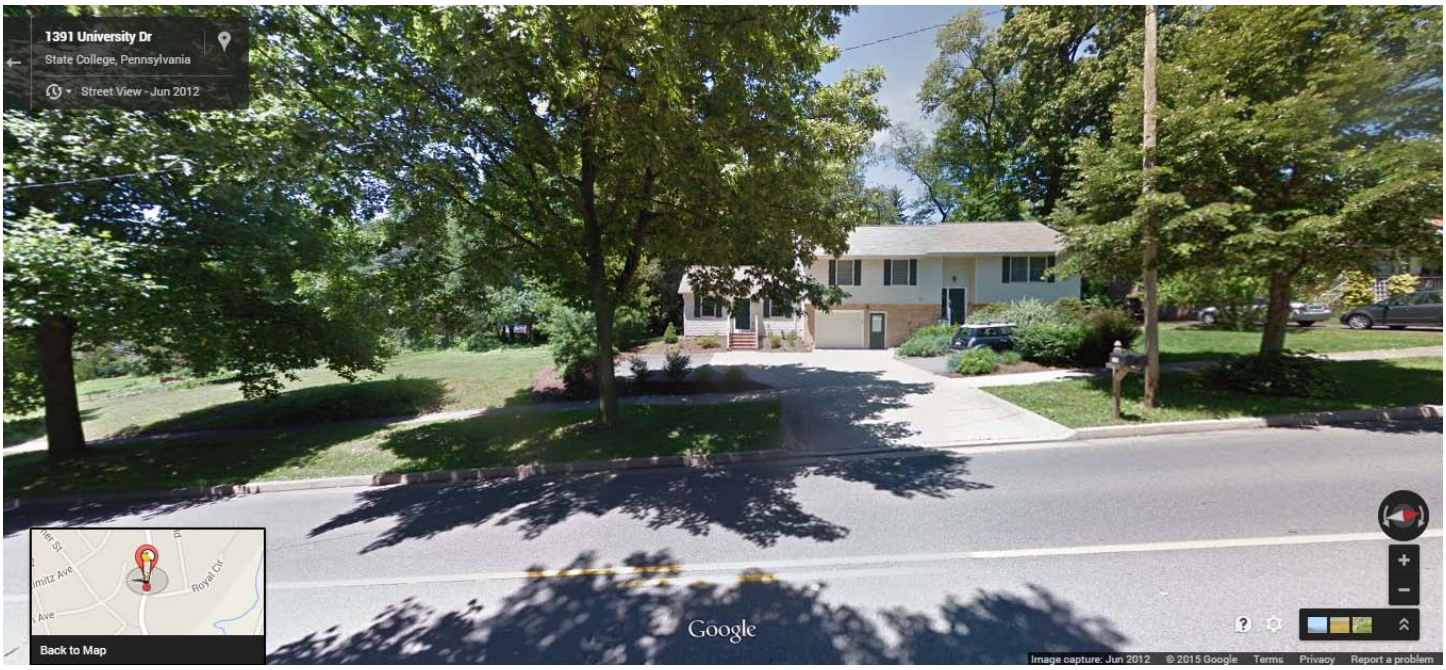
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Zoning and Building Codes

The duplex design must conform to all local and state zoning and building code requirements. Overall accessibility of the dwelling and project site must be addressed, including those related to Universal Design and "Visitability" expectations.

Energy Performance / "sustainability"

The design of the duplex must conform to DOE's definition of a ZERO ENERGY READY HOME (http://www.energy.gov/eere/buildings/zero-energy-ready-home) and exhibit Building America research findings, best practices, and principles of building science for residential buildings (http://energy.gov/eere/buildings/residential-buildings-integration). This benchmark is consistent with the goals for the Race to Zero U.S. Department of Energy 2015 Student Design Competition. Therefore, each student must be familiar with the competition rules and requirements (energy.gov).

Other guidelines/certification systems for sustainability appropriate for the project and context should be considered, including LEED for Homes®, ICC-700 National Green Building Standard®, Passive House, and Living Building Challenge/ Net-Zero-Energy. The design should conform to Architecture 2030 challenge parameters for carbon-neutral design (see Carbon Neutral Affordable Housing: A Guidebook For Providers, Designers And Students of Affordable Housing available at: http://tboake.com/carbon-aia/pdf/CND%20Affordable%20Housing%20Guide-sm.pdf).

Research Topics

Project performance is paramount to home-ownership affordability and the success of this project. Therefore each student is expected to be able to research, understand and apply to the design of the SCCLT GreenBuild Duplex one of the following focus areas:

1.Sustainable Site Design

The duplex should support and enhance goals for community design and planning, including those outlined in the State College Borough Neighborhood Plan (adopted in July 2014). Located on a highly visible site, it should also be a beacon for sustainable design. The project site lends itself very well to sustainable site goals since it is located within the borough in walking and easy biking distance to many community amenities; there is also a CATA bus stop located on the site. The significant slope of the project site is both a challenge and a great opportunity. Finally, inherent to the design of duplex housing are interesting questions about public and private space. These questions are heighted by the unique ownership model of the land trust. The site design team will explore all aspect of community design and sustainable sites including those involving hydrology/pervious surfaces, ground cover, vegetation (with solar/wind implication), site walls/retaining walls, productive gardens (community and/or private).

The site design team will explore all aspect of community design and sustainable sites including those involving hydrology/pervious surfaces, ground cover, vegetation (with solar/wind implication), site walls/retaining walls, productive gardens (community and/or private).

Competition category responsibilities: Design goals, graphics & presentation lead, construction documents (site and landscape elements) 33pts

2. Building Science / Envelope Design and Durability

This team will inform the ultimate appearance and performance of the home. They will take the lead on executing the competition drawings and drawings for estimating and construction (as possible by the end of the semester).

Competition category responsibilities: Design goals, envelope durability, construction documents 48pts.

3. Design for Comfortable and healthy living

- interior materials
- furniture layout
- indoor air and environmental quality
- space Conditioning design and analysis

Competition category responsibilities: Design goals, space conditioning, indoor air quality 45pts.

4. Design for Energy Efficiency and Net-Zero Energy Living

- energy analysis
- renewable energy
- lighting design
- DHW
- Appliance analysis and selection

Competition category responsibilities: Design goals, energy analysis, domestic hot water/appliances 42pts.

5. Living Affordably: Financial Analysis & Marketing

- Market development
- Cost estimating

Competition category responsibilities: Design goals, financial analysis, industry partners 40pts.

The commonly accepted definition of affordable housing is total housing expenses that do not exceed 30% of the area medium income (AMI); this includes costs associated with mortgages, taxes and other annual expenses and all utility costs. "Families who pay more than 30 percent of their income for housing are considered cost-burdened and may have difficulty affording necessities such as food, clothing, transportation, and medical care" (HUD.gov).

Households must be income qualified to participate in a housing purchase with the State College Community Land Trust (http://www.scclandtrust.org/income_guidelines/). The maximum allowable income is based upon 2014 HUD Income Guidelines for State College, PA:

2014 HUD Income Guidelines for State College, PA

Household Size	Minimum Income	Maximum Income
1	$29,460	$39,300
2	$33,660	$44,900
3	$37,860	$50,500
4	$42,060	$56,100
5	$45,480	$60,600
6	$48,480	$65,100

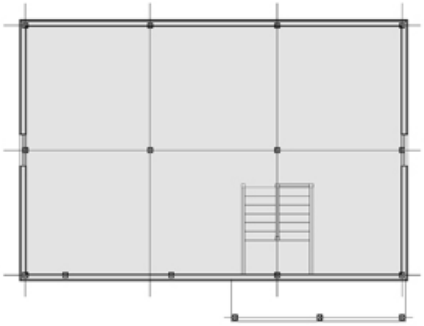
The Race to Zero competition provides resources for understanding the financial implications of siting and construction of a DOE Zero Energy Ready Home. The SCCLT provides a real marketplace for the project and the financial profile of the buyer will be based on a moderate income homebuyer (80 – 120% of the AMI).

Consult the Race to Zero Student Design Competition Guide to Project Preparation and Submittal for additional information and reference materials related to many of the topics above.

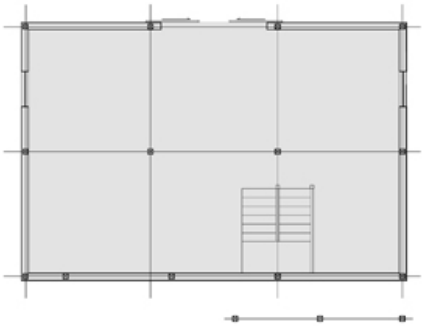
Design Goals and Project Context

Obviously, none of the topics above can be explored in isolation and communication between all students and focus groups will be necessary throughout the semester. All students will be engaged in the design of the SCCLT Greenbuild Duplex engaging in an integrative building design process.

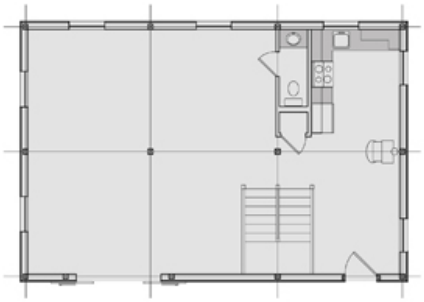
Precedents



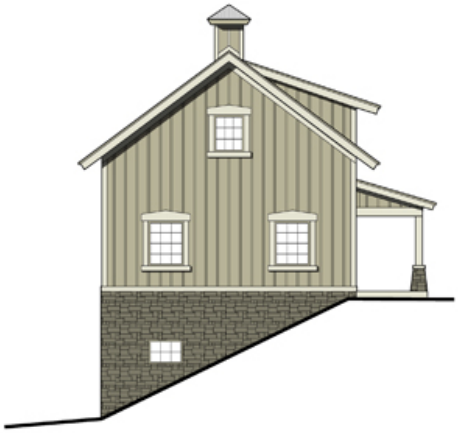
MAIN LEVEL FLOOR PLAN



LOWER LEVEL FLOOR PLAN

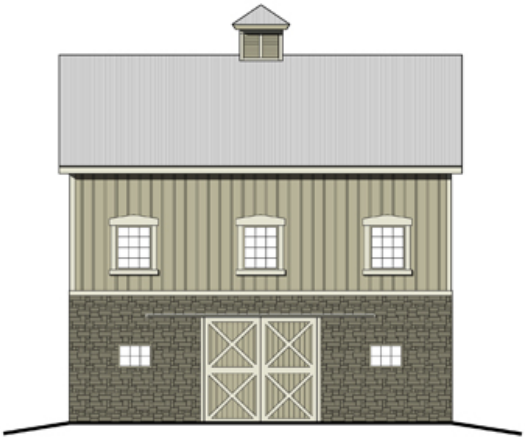


UPPER LEVEL FLOOR PLAN

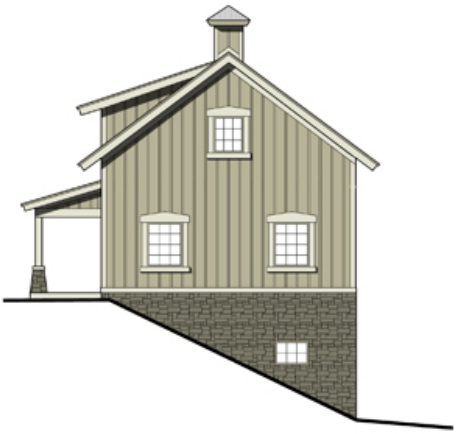


PLAN WEST ELEVATION

PLAN SOUTH ELEVATION



PLAN NORTH ELEVATION

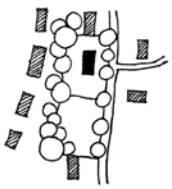


PLAN EAST ELEVATION

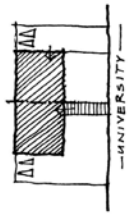
24'x 36' 1828 BANK BARN

Conceptual Sketches

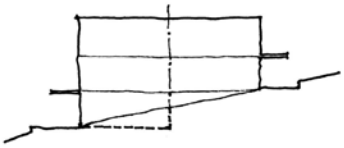
1. PERPENDICULAR DIVIDING WALL - TYPICAL DUPLEX - ENTRY ROTATED



+ Fits into local context
- Unequal solar access
- Solar orientation
- Wind orientation

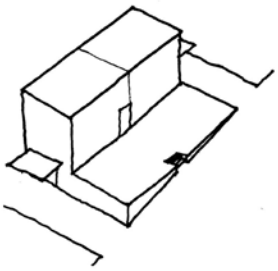


- Car in front yard
- Car backs into busy Univ. Dr.
+ Clear division of ext. space
+ Privacy



+ Bonus space in south unit
- Snow mgmt. (flat roof)

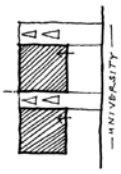
VARIATION: Top floor in south unit could be dropped for better solar access



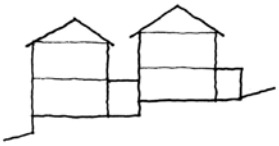
- Unequal views
+ Tight envelope

2. PERPENDICULAR DIVIDING WALL - ROWHOUSE TYPOLOGY - 'SAN FRANCISCO PAINTED LADIES'

+ Fits into local context
- Unequal solar access
- Solar orientation
- Wind orientation

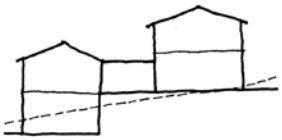


- Car backs into busy Univ. Dr.
- Front yard becomes driveway
+ Clear division of ext. space
+ Privacy

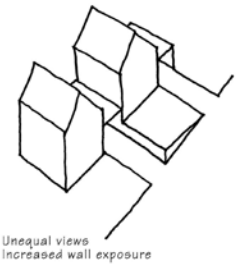


+ Snow mgmt. (pitched roof)

VARIATION: Extra site work could create full level drop for south unit

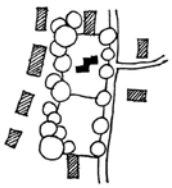


OPTION 2:
+ Berming provides insulation
- Excessive site work?
+ Snow mgmt. (pitched roof)

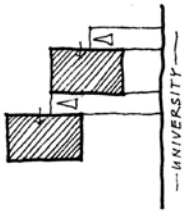


- Unequal views
- Increased wall exposure

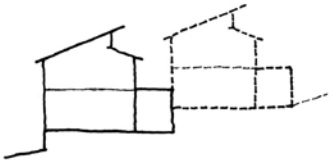
3. PERPENDICULAR DIVIDING WALL - 'PENNSYLVANIA FARMHOUSE '



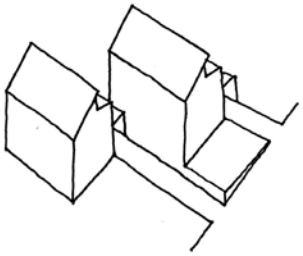
+ Fits into local context
+ Equal solar access
+ Solar orientation
- Wind orientation



- Car backs into busy Univ. Dr.
- Lack of privacy

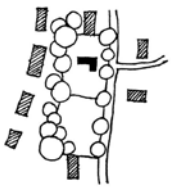


+ Berming provides insulation
- Excessive site work
- Complex substructure
+ Snow mgmt. (pitched roof)

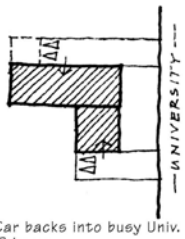


+ Equal access to views
- Increased wall exposure

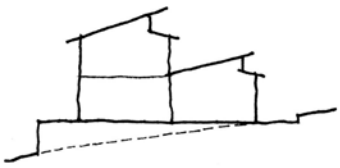
4. PERPENDICULAR DIVIDING WALL - 'LAUREL AND HARDY'



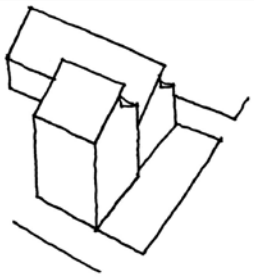
+ Fits into local context
- Unequal solar access
- Mixed solar orientation
- Wind orientation
+ Strikes balance bet. street & solar exposure



- Car backs into busy Univ. Dr.
+ Privacy
+ Can meet needs of two very different families
+ Unique ID to each house

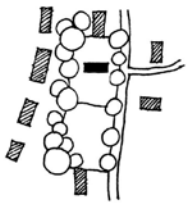


- Greater foundation length
- Two foundation system
+ Snow mgmt. (pitched roof)

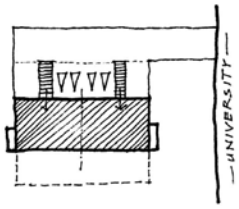


* Access to views neutral
- Increased wall exposure

5. PARALLEL DIVIDING WALL - 'PENNSYLVANIA FARMHOUSE'

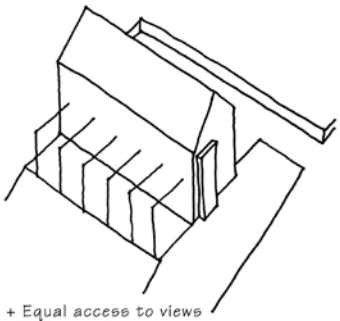


- Against local context
+ Equal solar access
+ Solar orientation
+ Wind orientation
- Low street presence



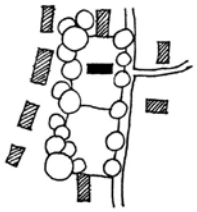
+ Space for car to turn
+ Privacy

- Increased site work?
- Need for retaining walls
+ Snow mgmt. (pitched roof)

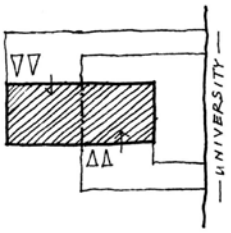


+ Equal access to views
+ Tight envelope

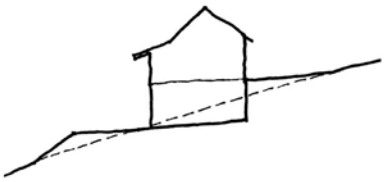
6. PARALLEL DIVIDING WALL - PENNSYLVANIA FARMHOUSE 'BANK BARN'



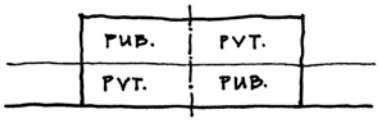
- Against local context
+ Equal solar access
+ Solar orientation
+ Wind orientation
- Low street presence



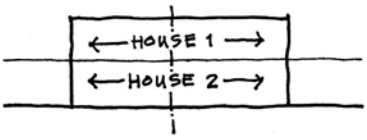
+ Space for car to turn
+ Clear division of ext. space
+ Privacy



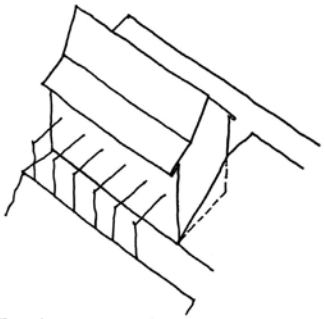
+ Berming provides insulation
+ Snow mgmt. (pitched roof)



+ Interesting variation in privacy created with the two different entry levels



OPTION 2:
Each house could occupy a different level
+ Better privacy
- Higher unit lacks extension to the South



+ Equal access to views
+ Tight envelope

Design Checkpoint 1

Program and Goals:

GreenBuild: To build affordable homes for families in opportunity-rich neighborhoods, creating new partnerships and educational platforms to further green housing initiatives and increase long-term sustainability for homeowners.

Program: Two units of moderate income homeownership "green" homes at 1394 University Drive; each with 3 bedrooms, 1.5 baths and approximately 1250 square feet of living space in each unit.

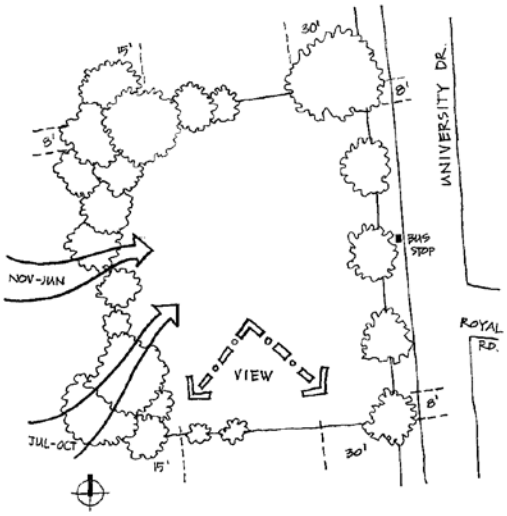
Race to Zero Team Research Topics/Areas:

1. Sustainable Site Design
2. Building Science / Envelope Design and Durability
3. Design for Comfortable and healthy living
4. Design for Energy Efficiency and Net-Zero Energy Living
5. Living Affordably: Financial Analysis & Marketing

Sustainable Sites:

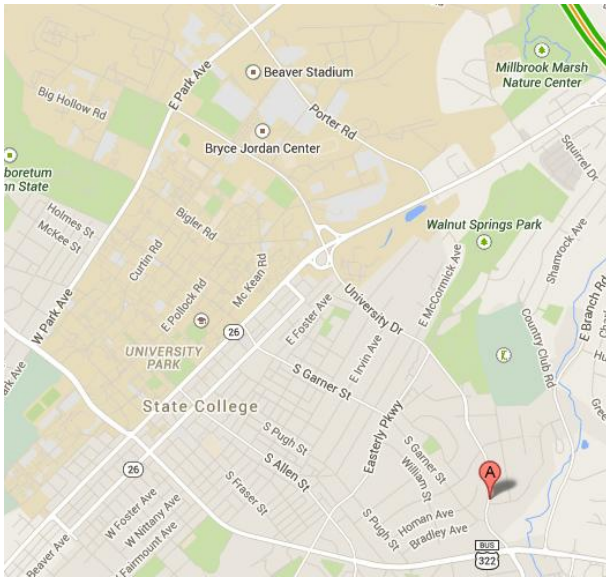
Design for Comfortable and Healthy Living

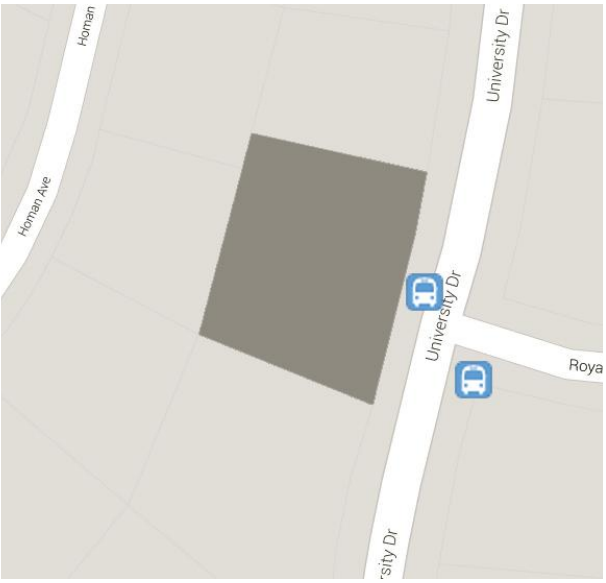
Yamile Rodriguez Asilis
Dario Vanegas-Vargas



Sun/Wind

Views



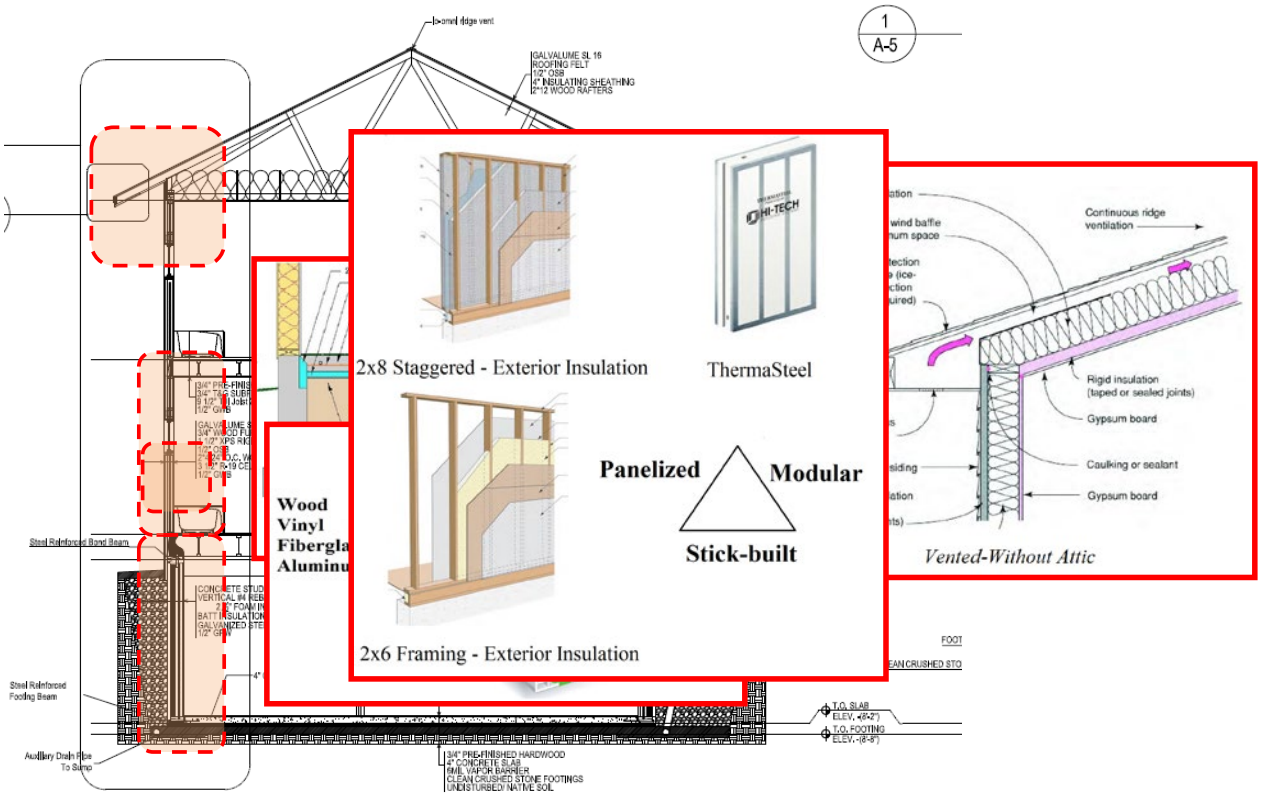


Exterior:

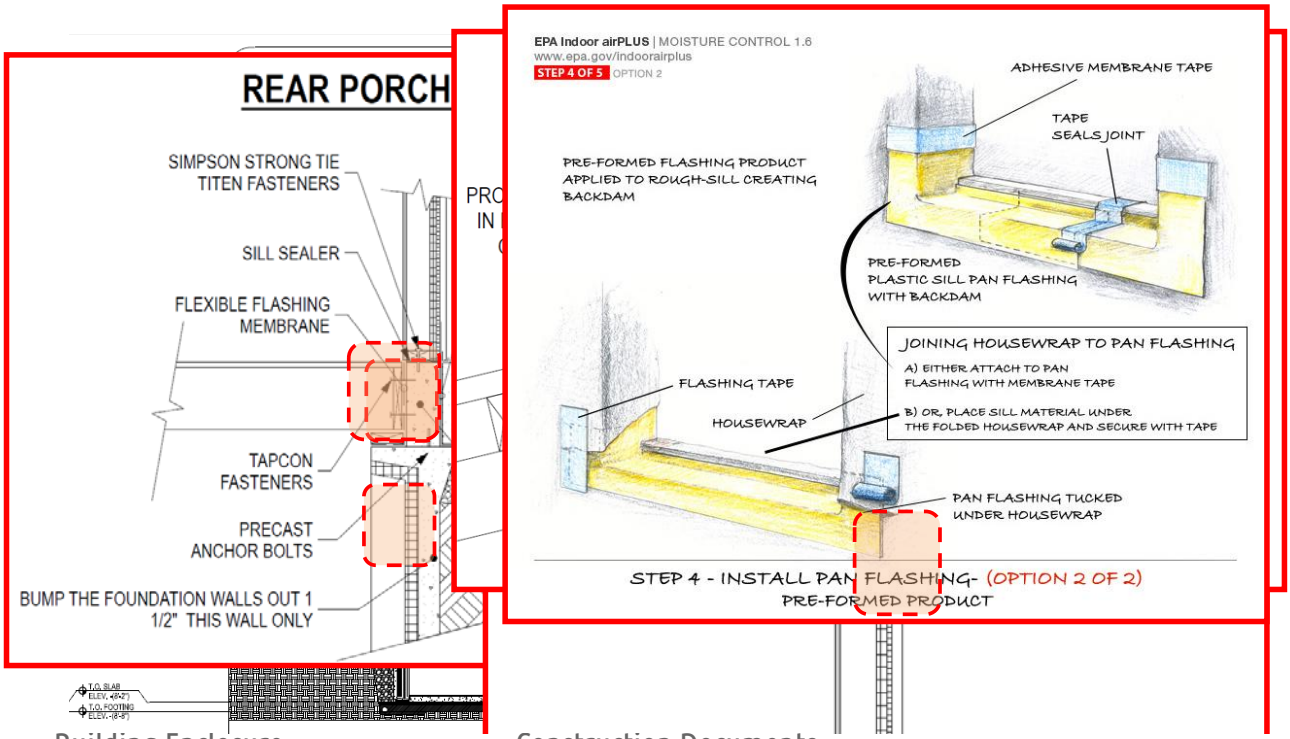
Building Enclosure and Construction Documentation

Jonathan Libman
Brad Pawelczyk
Torin Miner
Greg Lynch
Selby Niumatawalu
Josh Horenstein
Dane DeWire
Shivaram Punathambekar

Envelope Selection



Building Enclosure Details



Building Enclosure Construction Documents Ehsan Kamel

Interior:

Design for Comfortable and Healthy Living

Kassandra Garza
Negar Ashrafi

Interior Design

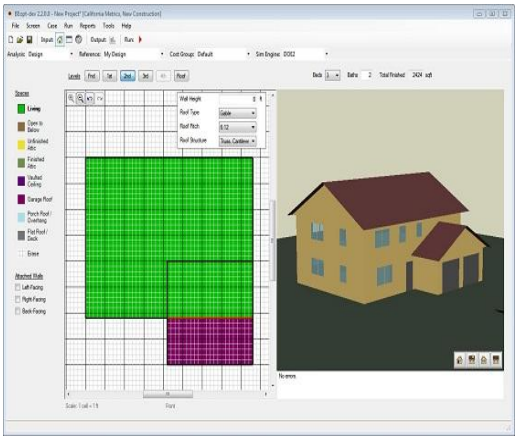
Heating and Cooling

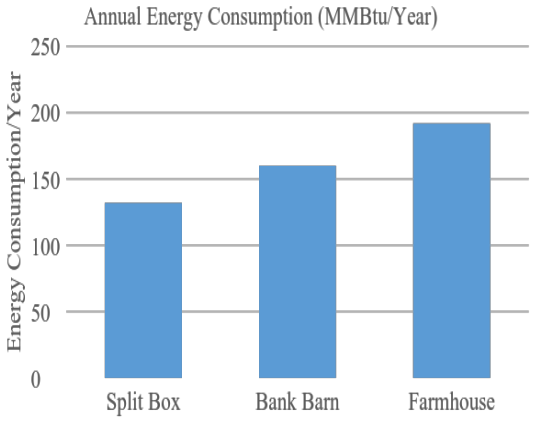
Getting to Net-Zero:

Design for Energy Efficiency and Net-Zero Energy Living

Ehsan Kamel
Sarah Wootton
Cansu Tari

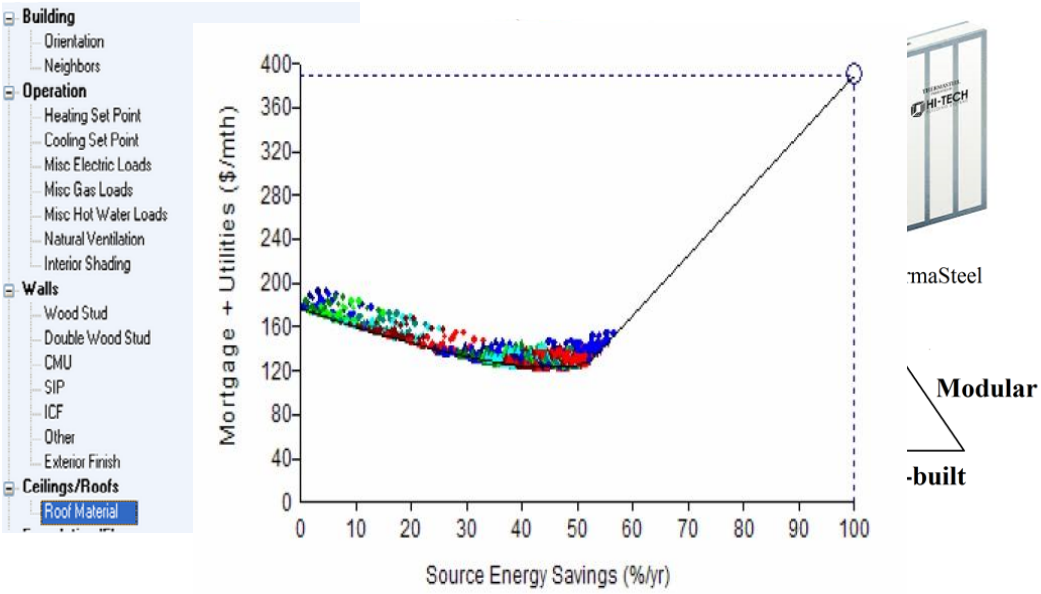
Energy Modeling





Getting to Net-Zero:

Design for Energy Efficiency and Net-Zero Energy Living

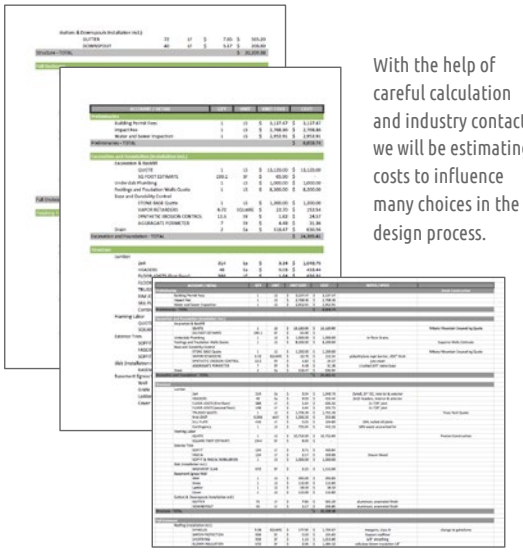


Living Affordably:

Financial Analysis & Marketing

Aidan Gilrain-McKenna
Reese Wamsley
Justin Rotella
Cory Clippinger
Chauntel Duriez

Financial Analysis & Cost Estimating



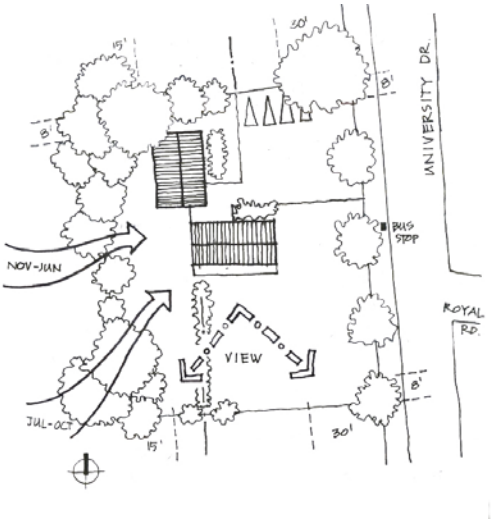
With the help of careful calculation and industry contacts we will be estimating costs to influence many choices in the design process.

Market Development & Presentation Graphics

Our team will also assist with demographic research, marketing and the overall presentation of our design and our story, allowing the project to be visually cohesive and fully communicate our efforts.

Proposed Design Schemes // Initial Design

Split Box
Site Plan

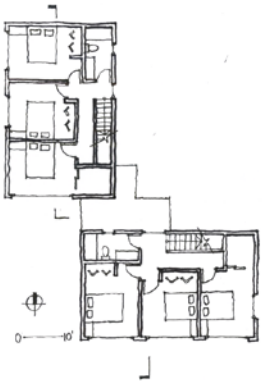


Split Box
3D

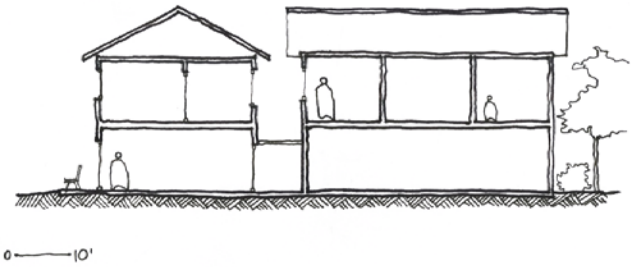
Split Box Gable Roof
3D

Split Box
First Floor Plan

Second Floor Plan

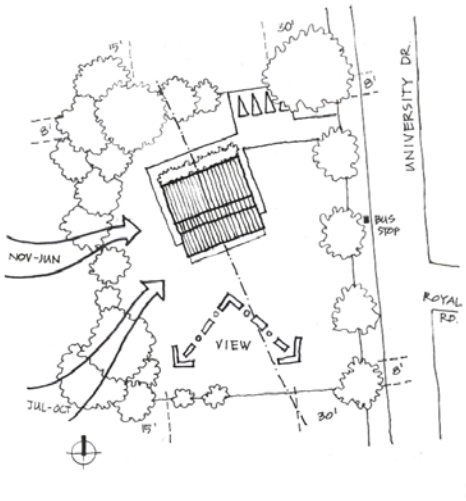


Split Box
Section



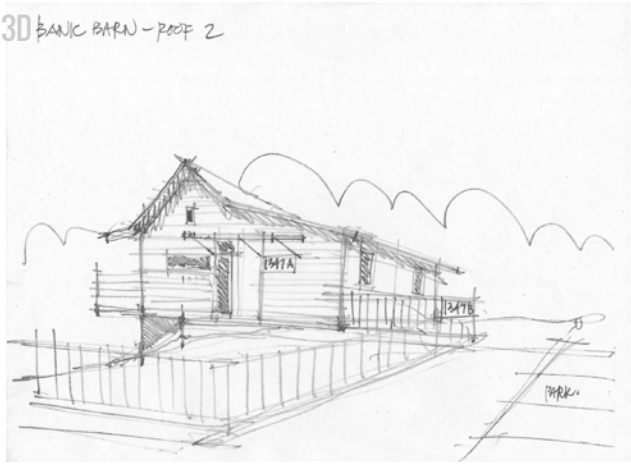
Proposed Design Schemes // Initial Design

Bank Barn
Site Plan



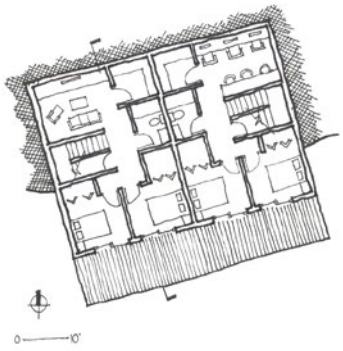
Bank Barn Gable Roof
3D

Bank Barn
3D

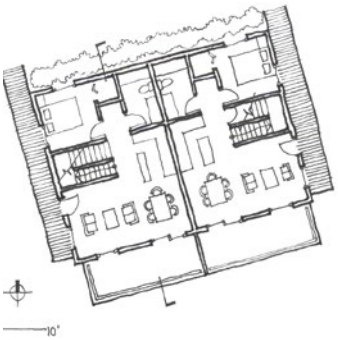


Bank Barn Shed Roof
3D

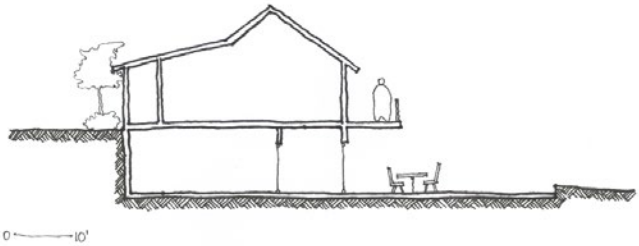
Bank Barn
Basement Plan



First Floor Plan

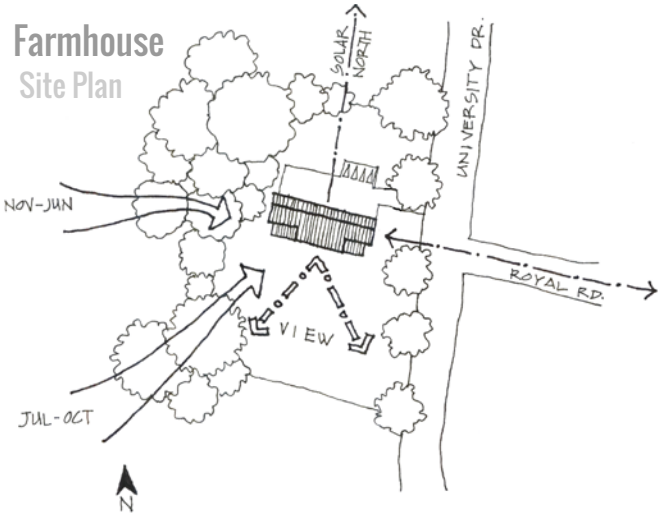


Bank Barn
Section



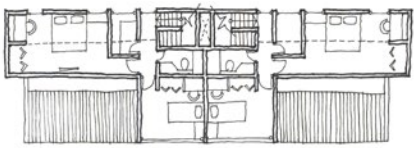
Proposed Design Schemes // Initial Design

Farmhouse
Site Plan



Farmhouse
3D

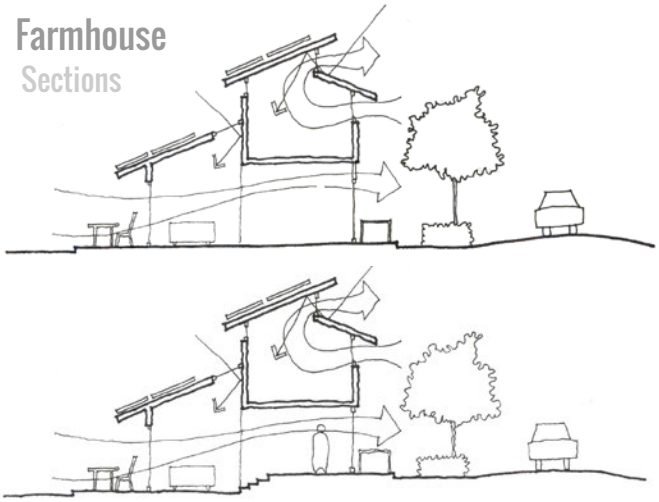
Farmhouse



Second Floor Plan

First Floor Plan

Farmhouse
Sections



Charrette #1 – Project Program and Goal Setting

February 2nd, 2015

Charrette intent:

Address issues of "green building" and schematic design specific to the State College Community Land Trust (SCCLT) GreenBuild Project. This intensely focused discussion and design session will evaluate design strategies appropriate for the new duplex housing at 1394 University Drive in State College, Pennsylvania. The charrette will provide an opportunity for stakeholders and the design team to discuss the basic design moves, and develop an early consensus on the project design priorities. At the end of the workshop an agreement on the project program and design goals will be established.

Schedule:

6:00-6:05 pm Welcome, introduction of participants and Description of Expectations

Describe visual preference survey

6:05-6:45 pm Overview of Project Considerations

Brief presentation by research team members on:

GreenBuild project description and program

Project vision (affordable, model for other housing, educational, environmental)

Race2Zero Competition and sustainability goals

6:45-7:00 pm Break. Light refreshments provided, mingling of attendees

7:00 -8:00 pm Table by table break-out discussions, mixtures of students and

Community and SCCLT members. Facilitators to record conversation.

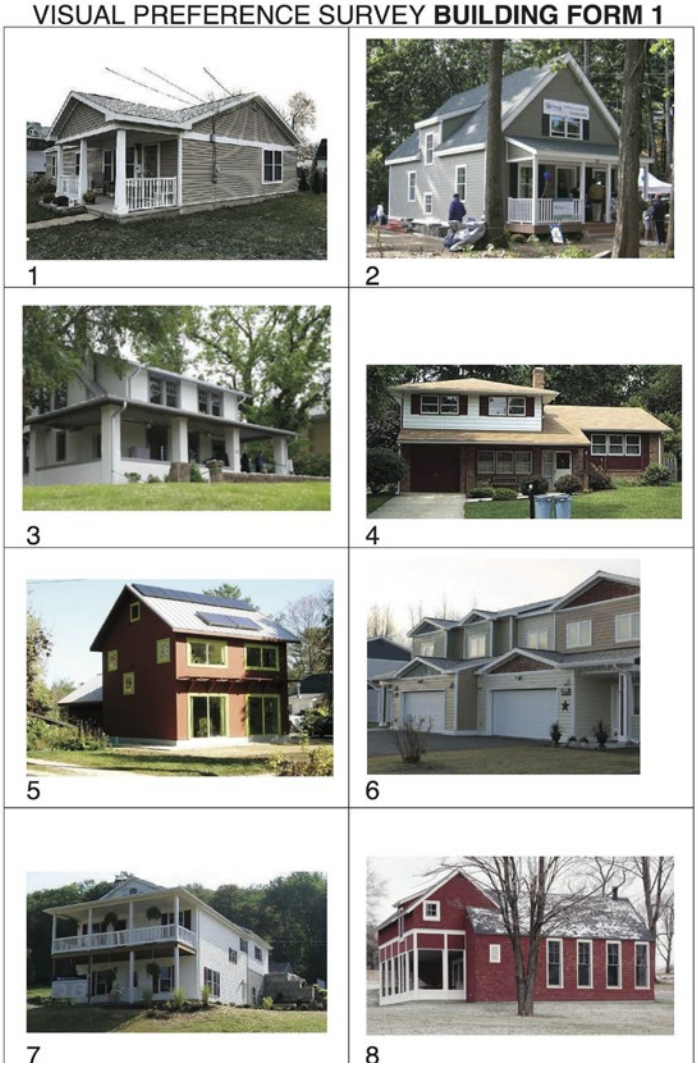
8:00-9:00 pm Recap of break out sessions, recorded and discussed.

Brief:

Following opening remarks the Race to Zero (R20) team presented their team, project organization and their first steps toward design. Findings from a visual preference survey compiled during the workshop are included in the next couple of pages.

Visual Preference Survey

VISUAL PREFERENCE SURVEY **BUILDING FORM 1**



VISUAL PREFERENCE SURVEY **BUILDING FORM 2**

Developed, administered and analyzed by: Jonathan Libman

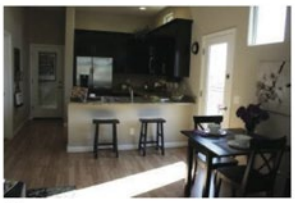
VISUAL PREFERENCE SURVEY **INTERIORS**


1


2


3


4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6


7


8

VISUAL PREFERENCE SURVEY **MATERIALS/ DETALS**


1 HARDIEPANEL


2 WOOD


3 VINYL SIDING


4 SHINGLE SIDING


5 BRICK


6 STUCCO


7 METAL PANELS


8 FIBER CEMENT

Visual Preference Survey // Analysis

Attendees at charrette #1 took part in the visual preference survey compiled by the R20 team. The data from these surveys has been compiled here. The following pages are analysis completed based off this data to show the most preferred and not preferred material and finish options.

Top 5 Choices (Most Preferred)

		Land Trust		Team		Class		Total	
	Rank	Ref #	Pts	Ref #	Pts	Ref #	Pts	Ref #	Pts
Building Form	1	12	39	12	10	12	21	12	70
	2	11	23	8	10	9	19	11	38
	3	2	21	1	8	10	12	9	31
	4	1	14	10	6	8	9	10	31
	5	4	14	11	6	11	9	2	28
Interior	1	7	20	7	10	2	14	2	41
	2	5	18	2	9	6	12	6	37
	3	2	18	6	4	7	7	7	26
Material	1	5	22	8	7	2	18	2	42
	2	2	18	5	6	5	8	5	36
	3	1	14	2	6	4	6	1	18

Bottom 5 Choices (Least Preferred)

		Land Trust		Team		Class		Total	
	Rank	Ref #	Pts	Ref #	Pts	Ref #	Pts	Ref #	Pts
Building Form	12	6	14	6	6	3	9	15	30
	13	7	16	9	8	14	15	7	35
	14	15	19	14	11	7	17	6	36
	15	14	29	15	11	6	16	14	55
	16	4	41	4	12	4	24	4	77
Interior	6	4	14	3	5	8	6	8	25
	7	1	15	8	8	5	8	4	25
	8	3	23	5	9	4	8	3	33
Material	6	8	10	3	6	1	7	6	27
	7	7	18	7	7	3	10	7	30
	8	3	27	6	7	6	12	3	43

OVERALL MOST PREFERRED IMAGES

BUILDING FORMS

1

2

3

4

INTERIORS

1

2

3

MATERIALS

1

2

3

Designed by: Jonathan Libman

Break-out Sessions

After the students presented their work the charrette participants broke off into smaller working groups comprised of students, SCCLT members, professors and community members. Each break-out panel discussed and recorded their thoughts on the topics listed below among others. The feedback was then presented to the entire audience for further discussion. This feedback has been assembled in this section of the report. The opinions and topics informed the team in the next phases of design development.

Discussion

1. Parking
2. Property
3. Orientation
4. Entry
5. 2+, 3, 3+ BR's
6. Shared Systems
7. Reading as one or two homes

Break-out Sessions // Feedback

Collected notes from all groups at the session:

Parking:

-Break out groups explored the pros and cons of detached vs. attached parking. Major factor: detached parking removes the parking from the private living spaces.

-Pros: encourages for possibility for no car = separated parking is fine and access to bus is great. Public space on the site would be ideal, but how would it actually work?

-Cons: coming and going in winter a challenge with detached parking. Potential confusion about property lines; Possible conflict of personalities with a shared driveway.

-Parking is an important issues in many SCCLT homes. However, parking should not dictate the design.

- Parking closer to the unit, even if separate, is ideal.

-Storage space in the shed? Enclosed storage, or storage that is screened from the street is important; Is a garage possible?

-Covered /attached parking makes a great buffer zone between the homes, distinguishing separation.

-Separation between parking is easier to manage.

-Ability to share driveway is preferred, but it must be wide enough for guests/extra parking when needed.

-Driveway can serve as a visual separator between homes.

-Separate carports with storage space.

Bank Barn vs Farmhouse:

-Storage is important; creatively introduce storage.

-Attic space underutilized, trade off with cost.

-Ground floor Bathroom ADA adaptable.

-Open upper floor of the bank barn considered great for the view and solar ++

-Spatial planning and adaptability very successful in the schematic plans.

-Removable wall to accomodate Aging-in-place is a great suggestion, explore further.

-Low bookshelf/built in furniture viewed as positive design feature.

-Options should be considered in regards to simplicity and adaptability for changing families and evolving lifestyles.

-Design of smaller houses and maximizing spaces through flexibility - new concept to be explored.

-Roof configuration important consideration in the exterior "feel" of the house.

-Bank barn shifted along party wall for street visibility to both units is ideal.

-Slight rotation of the bank barn toward University Drive preferred; explore tradeoffs for solar orientation.

-Split box with south unit as bank barn preferred.

-Split box scheme provides visual separation bewteen homes and can have basement; Offset Farmhouse scheme accommodates entries on different walls, also accommodating sense of individual homes.

Break-out Sessions // Feedback

Property Considerations:

-separate yards or shared space?

-Either property should have the opportunity for a garden

-Avoid fences

-How will snow removal with shared driveway be managed?

-Maintenance ownership question, who pays for driveway maintenance.

-Public space in a practical sense would be difficult to determine who governs the area

-Don't give up view or solar access for "better" parking; favor parking to north of the site

-Parking area location: water runoff a concern, consider opportunities for stormwater design between homes/properties or below (south end of site)

-Orientation: optimize views and solar access

-Use trees to screen views from the street

-Materiality of driveway: high permeability

-Property: provide private spaces and common areas

-Clearly defined space is necessary

-More of a private backyard for each unit is needed.

-Okay with less street presence

-need clear demarcation

-separate access to each home.

-Prevention of noise; use landscape to buffer University Dr.

Interior:

-Who is living? Not big families, first time home buyers.

-Prefer all bedrooms downstairs (in 'Bank Barn" scheme); more space for the living room and dining room.

-Option: no dining room but bigger island/kitchen; people living here will be looking for affordable and not very big spaces.

-Flexible furniture for kitchen

-To accommodate ground floor bedroom, consider eliminating dining table and make bigger/flexible island.

-Downstairs design of "Bank Barn" scheme good, the homeowner can decide on how they want to use the rooms depending on preferences and lifestyle.

-Bedrooms: 2+ or 3 or 3+, 3 ideally. Bedrooms downstairs makes sense for slope/site.

-Flex space in basement allows it to be a bedroom or a family space, helping achieve the 2+/3 bedrooms.

-Separate or shared utilities? Pros and Cons?

-Stairway hits right up near the entrance? Is there a better place for it to land?

-Flex space is nice

Break-out Sessions // Feedback

-3 bedrooms

-STORAGE!!

-3 bedrooms +flex space, no basement

-Space serving multiple functions ideal (built in storage?)

-"mud room" possible? (provide space at entry for coats, boots, strollers, etc.)

-Laundry space (next to bathroom)

Kitchen:

-Galley kitchen does not provide enough work space

-Tight entranceway a concern

-Functional counterspace needed

-Cooking into a wall vs. being able to face the living room; face out

-Kitchen is where people congregate & spend time, openness best.

Question:

-Covered entrances with front door ramp possible? what is code?

-Specialized HVAC products break down… then what?

Concerns:

-Driveway too long for shoveling?

-Parking takes up too much street presence; detracts from homes

-Noise from University Drive? Sound buffer?

-Headlights at road intersection? Privacy screen on balcony?

-Jointly owned guest parking/shared property.

-Kitchen Layouts. Too open? Too busy with bar and tables?

-Who will live here: young professionals, young families, moderate income, first time home-buyers, retirees, older professionals. They all want, autonomy, independence, and sense of "my home".

-Need to have storage. Basement or garage. Shed doesn't provide the same or enough room.

-Perception of separation between homes matters

-Solar orientation takes priority

-Must have storage

Break-out Sessions // Feedback

Preferences:

-Open floor plan

-Bedrooms on separate, possibly lower level

-Attached carport is ideal, but is it in budget?

-Turn around in driveway necessary for safety

-Carport storage needed (preferably enclosed)

-Built-in storage on/off deck

-Bring back diversity in community with affordable houses

-Prefer the detached carport!!

-Storage!

-Visual separation, or the perception of, is ideal.

-3 bedrooms. Third can be flex space.

Critical Conclusions

Preferences:

- Cost, durability, health and livability are the most important elements in this design, and they are the constants that we need to measure the rest of our decisions against.
- This project is to bring diversity to a community where it is lacking. Affordable housing is imperative to the strength of a community, yet the connotations of such are less than desirable. It will be in our best interest to choose materials, finishes and design options that promote frugality in the project without sacrificing quality for cost.

Concerns:

- Perception of separation matters for easier marketing to clients. This creates challenges such as common space driveways and property divisions that we intend to solve with applied design.
- The intent of Net-0 energy ready implores us to make solar orientation a priority. We need to maintain the elements that make this project sustainable.
- A home without storage will be unmarketable and unsuccessful to a home owner, it is a very important concern to address.
- It will be impossible to define exactly the type of homeowner who will live here throughout the lifetime of this house and therefore we cannot design to one demographic. Including amenities that are important to all homeowners is important. When trade offs have to be made it could be possible to make the homes not identical in the options we include.

Questions:

- What if specialized HVAC equipment breaks down? Cost is a very important condition as we are attempting to build the most durable, yet cost efficient homes possible.

Kitchen:

- Functionality is key. For livability purposes the kitchen needs to be able ot be the heart of the home.
- Cooking into a wall isn't the best for the health or livability, focusing the energy of the home inward is important.

Interior:

- 3+ bedrooms is ideal
- Flex-space idea is great for maximizing the small foot print of the homes
- Storage is imperative, we need to add every storage possibility.

Parking:

- Discourage car use; Access to the bus stop is important
- Public space achieved through parking and hard-scape would be ideal and contribute to duplex feel without extreme connection between homes.
- Parking is important in Land Trust homes because it is a "shared commodity"
- Parking must be designed to accommodate the lifestyles of any homeowner this includes covered walkways, parking proximity, alternative options, and defined yet shared spaces.

Design Checkpoint 2

Program and Goals:

Design update focusing on all aspects of design and specifically geared to research area exploration and understanding the comments of the SCCLT and their homeowners provided during Charrette 1. Focus was on development of the 'Bank Barn' concept, but alternative sketches with options for more separation between homes are also presented.

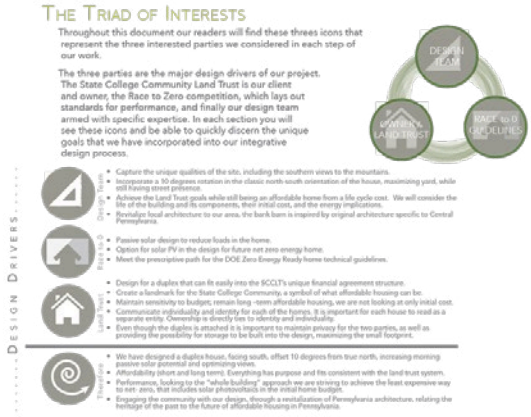
The following images summarize project development and work conducted related to the DOE *Race to Zero* international collegiate competition. The 'Bank Barn' concept was selected for this development.

Tonight's Presentation

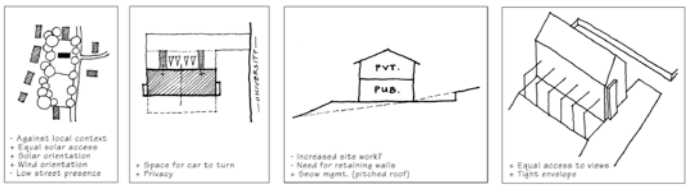
01 // Team Qualifications
02 // Introduction
03 // Design Goals
04 // Envelope Durability
05 // Indoor Air Quality Evaluation
06 // Space Conditioning
07 // Energy Analysis
08 // Financial Analysis
09 // Domestic Hot Water, Lighting & Appliances
10 // Construction Documentation
11 // Industry Partners
- - - Break - - -
12 // Looking Forward
13 // Follow Up Ideas to your Comments

01 // Team Qualifications

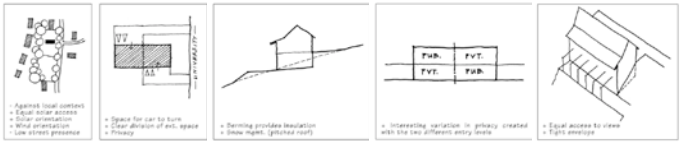
02 // Introduction



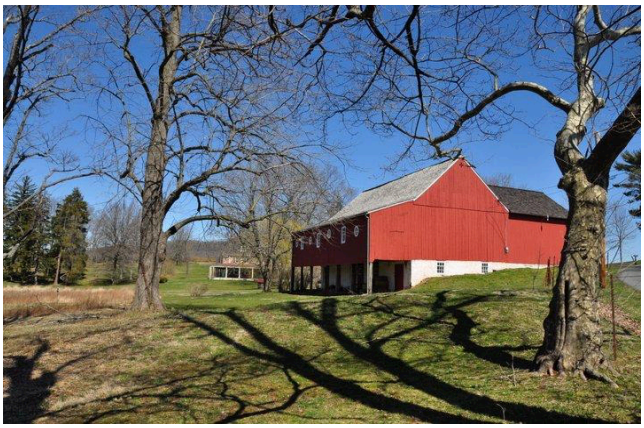
THE 'PENNSYLVANIA FARMHOUSE'



THE 'BANK BARN'



Traditional PA barn from the Historic American Building Survey (HABS), Library of Congress



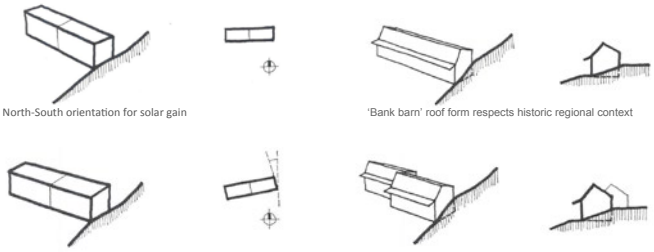
Traditional PA bank barn

VISUAL PREFERENCE SURVEY - MOST PREFERRED CHOICES

Building form

Interiors

Exterior



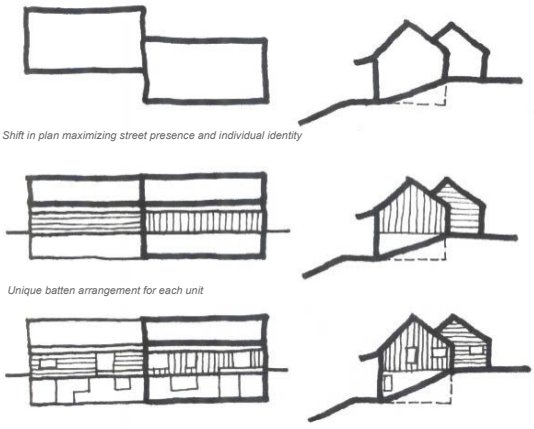
North-South orientation for solar gain

'Bank barn' roof form respects historic regional context

10 degree shift in N-S orientation to maximize street presence

Units staggered for individuality

Building bermed as a response to site topography



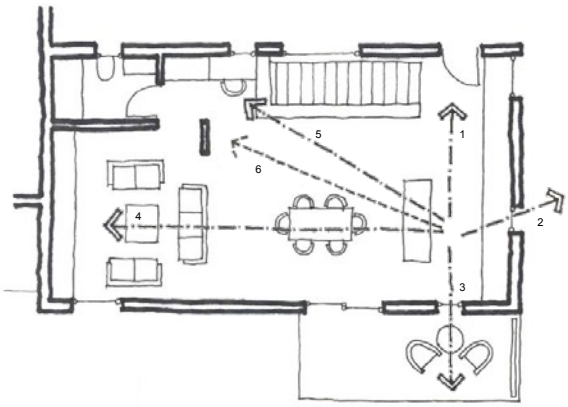
Shift in plan maximizing street presence and individual identity

Unique batten arrangement for each unit

Asymmetrical opening pattern on facade

INDIVIDUALITY FOR UNITS

Design Checkpoint 2

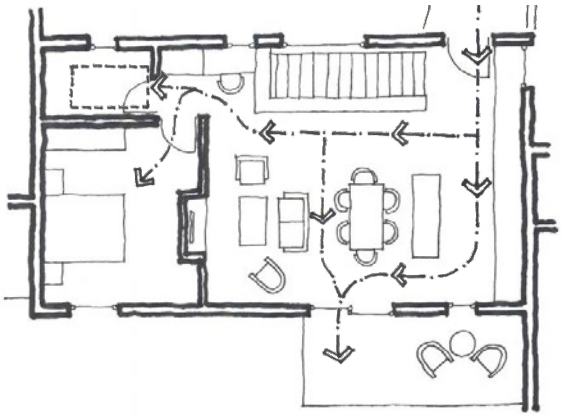


MULTIPLE VIEW SEQUENCES FROM THE KITCHEN
1) Front door, 2) Site entry, 3) Southern view of the Tussey mountains,
4) Living room, 5) Child's study area and 6) Wall panel blocking view to Bathroom door

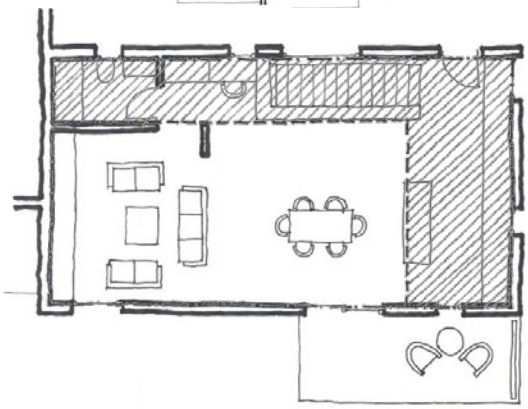
1) Young family, 2016
All living spaces in First floor and all Private spaces in Ground floor

2) Family in 2030
Parents' bedroom in First floor, Family room on Ground floor

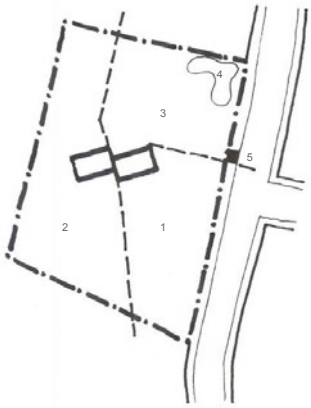
3) Family w. visiting children, 2040
Ground floor Family room reconverted to Bedroom



DRAWING ILLUSTRATING DESIGN FOR VISIBILITY
including no-step entries,circulation widths and bathroom design

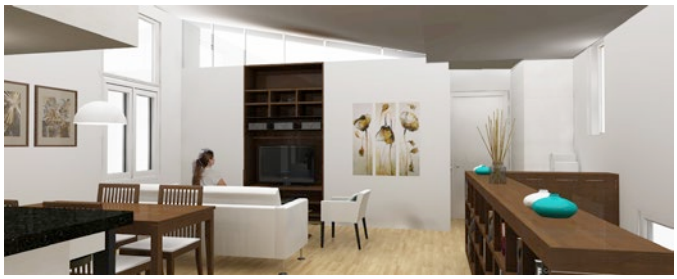


CLEAR SEGREGATION OF 'SERVICE' AND 'LIVING' ZONES
ensures open plan with maximum living space and minimal but interesting circulation patterns



Clear demarcation of land illustrating the public and community space
1 - Unit 1 property,
2 - Unit 2 property,
3 - Public space,
4 - Community 'rain garden',
5 - Bus stop

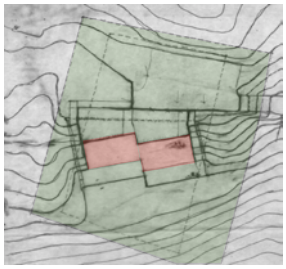
View of kitchen area from study area



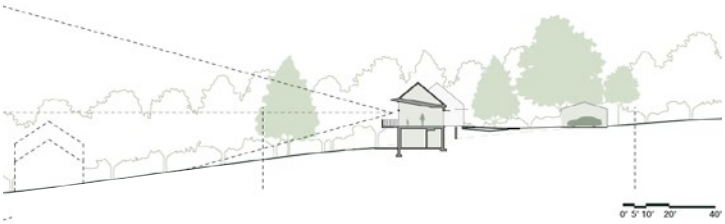
View of living area from entry

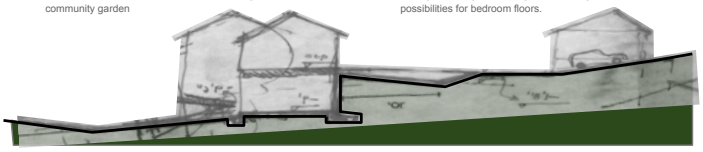
10º of true north
Better street presence for houses
Earlier sun warming for houses
Longer views non interrupted towards mountain's ridge

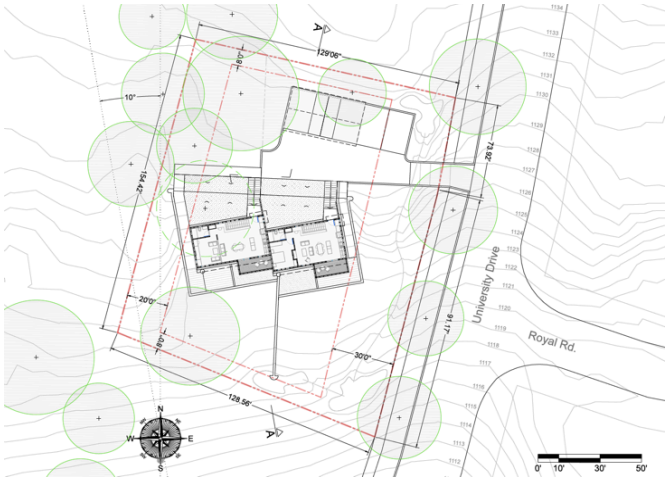
Equitable property areas
Both connected to the shared area for parking and community garden



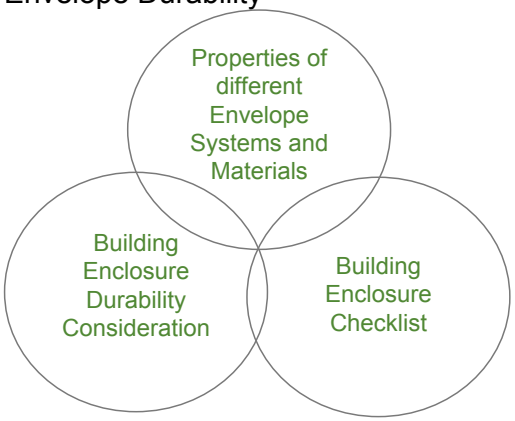
Topography work
Taking advantage of sloping site, berming allows walkout possibilities for bedroom floors.







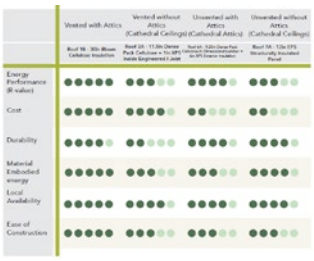
04 // Envelope Durability



04 // Envelope Durability

04.1 Properties of different Envelope Systems and Materials

Insulation



Roof

04 // Envelope Durability

04.1 Properties of different Envelope Systems and Materials

Wall System

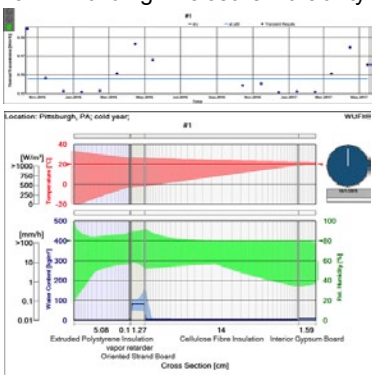
Window

BG Wall System

Cladding

04 // Envelope Durability

04.2 Building Enclosure Durability Consideration



Hygrothermal Analysis

04 // Envelope Durability

04.3 Building Enclosure Checklist

Thermal Control

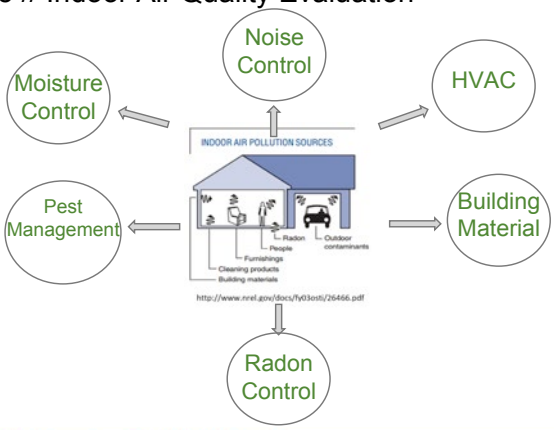
Air Control

Fenestration

Moisture Control

Construction & Architecture

05 // Indoor Air Quality Evaluation



05 // Indoor Air Quality Evaluation

Building Material

- Low VOC paint
- Composite wood materials with low-formaldehyde emissions

Fujitsu ERV

Pest Management

- Wooden frame 6" away from ground
- Termite Barrier
- Insect screen

Noise Control

- Foams surrounding windows
- Low-noise HVAC system

Moisture Control

Radon Control

- Form-A-drains for footings
- HVAC with built-in filters

06 // Space Conditioning

Features: FUJITSU *AOU9RLFC*	
Cooling Min. ~ Max. Cooling *BTU/hW*	3,100 ~ 12,000
Min. ~ Max. Heating *BTU/hW*	3,100 ~ 22,000
SEER *BTU/hW*	33.0
EER *Clg/Htg*	18.0
Moisture Removal PT./H(I/h)	2.6(1.6)
Noise Level dB (A)	42/41
Refrigerant	R410A

Fujitsu *AOU9RLFC*

Fujitsu *AOU9RLS3*

06 // Space Conditioning

Table 1 – Combination of East and West units load calculations

Entire House Average	Heating		Cooling	
Components	Btuh	% of load	Btuh	% of load
Walls	3247	30.225	1095.5	8.95
Glazing	4165.5	38.85	4456.5	36.575
Doors	0	0	0	0
Ceilings	175	7.2	540	4.525
Floors	771	6.8	37	0.325
Infiltration	422	6.675	100	0.8
Ducts	0	0	111	0
Internal Gains	0	0	4620	33.05
Ventilation	1168	10.25	1226	13.775
Total	9948.5	100	7897	100

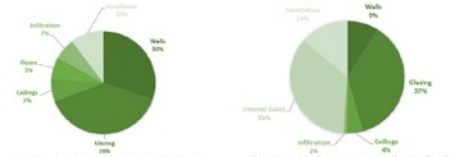
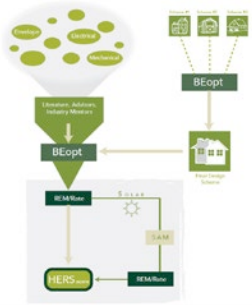


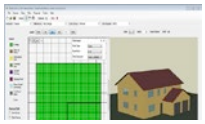
Figure 1 – Entire house average heating % of load

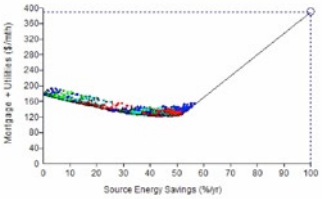
Figure 2 – Entire house average cooling % of load

07 // Energy Analysis

Initial and In-Depth Analysis

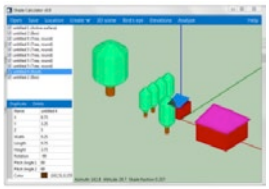


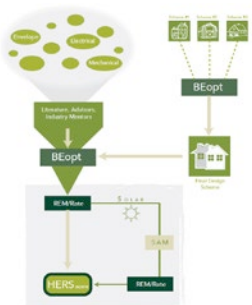




07 // Energy Analysis

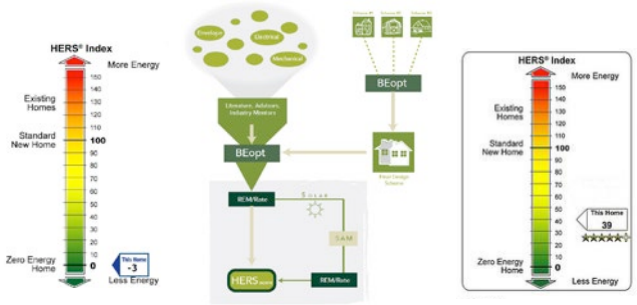
Solar PV Array





07 // Energy Analysis

Final Results and HERS ratings



08 // Financial Analysis

Land Trust Financial Guidelines

	Target Construction Cost	Target Cost per SF
MFI for State College: $66,800	$ 297,000.00	$ 116.00
High End Icome Level: $80,160	$ 380,160.00	$ 148.50
Low End Income Level: $53,440	$ 207,900.00	$ 83.50

08 // Financial Analysis

Competition Guidelines

- Annual payments on the home must be **38%** of annual income
- **4.5%**, **30** year fixed rate
- Down Payment, **20%** of house cost
- Monthly household debt, **0.5%** of annual income

08 // Financial Analysis

Home Sale Breakdown

Total Construction Cost	$154,862.61
Financing Cost	$5,322.17
Marketing Cost	$3,801.55
Sales Commission	$8,363.41
Solar PV Array	$34,326
Finished Lot Cost	$75,000

08 // Financial Analysis

Home Sale Breakdown

Total Construction Cost	$154,862.61
Financing Cost	$5,322.17
Marketing Cost	$3,801.55
Sales Commission	$8,363.41
Solar PV Array	$34,326
Finished Lot Cost	$75,000

08 // Financial Analysis

Home Sale Breakdown

ACCOUNT / DETAIL	COST	%
Site Preperation	$ 28,246.72	11.0%
Foundation	$ 32,803.40	13.2%
Framing	$ 51,527.08	20.8%
Envelope	$ 18,113.23	7.3%
Exterior Finish	$ 18,060.95	7.3%
Interior Finish	$ 57,408.84	23.2%
MEP	$ 41,605.00	16.8%
Subtotal	$ 247,765.22	
Company Expenses		
Overhead and Profit	$ 49,553.04	20.0%
Sales Tax	$ 12,388.26	5.0%
TOTAL COST	**$ 309,706.53**	

08 // Financial Analysis

Home Sale Breakdown

1) House Cost	
Home Value	$206,675.74
Down Payment	$ 41,335.15
Amount Financed	$165,340.59

3) Debt to Income Ratio	
2013 State College MFI	$ 66,800.00
Monthly Income	$ 5,566.67
% Gross Income	27.98%

2) House Financing	
Interest Rate	*4.5%*
Loan Period	*30*
Loan Payment	$ 837.76
Monthly Taxes	$ 321.00
Home Insurance	$ 65.00
Household Debt	$ 334.00
TOTAL PAYMENT	**$ 1,557.76**

08 // Financial Analysis

Financing Solar PV

Solar Payback

Total kW Output of PV Array	$/kWh	Annual Savings	Payback Timeline
7,628	$ 0.122	$ 930.62	30 years

Builder Rebate

	Base Rebate	Savings per kWh	Total Additional Savings	Total Savings
West Home	$ 400.00	$ 0.10	$ 1,587.50	$ 1,987.50
East Home	$ 400.00	$ 0.10	$ 1,619.70	$ 2,019.70

08 // Financial Analysis

Financing Solar PV

Financing Home w/ and w/out PV

		Home Sales Price	Monthly Cost of Home	Monthly Cost of PV (20 yrs)	Annual Cost	% of Income
Cost of Land Included	PV integrated in mortgage	$ 281,675.77	$ 2,040.51	N/A	$ 24,486.12	36.66%
	Home equity loan	$ 247,349.77	$ 1,843.08	$ 314.72	$ 25,893.60	38.76%
Cost of Land Exlcuded	**PV integrated in mortgage**	**$ 206,675.77**	**$ 1,609.15**	**N/A**	**$ 19,309.80**	**28.91%**
	Home equity loan	$ 172,349.77	$ 1,411.72	$ 314.72	$ 20,717.28	31.01%

09 // Domestic Hot Water, Lighting & Appliances

Domestic Hot Water

09 // Domestic Hot Water, Lighting & Appliances

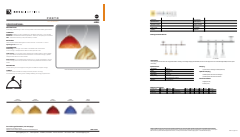
Lighting

Windows placed on the southern facing walls to take advantage of natural light.

Direct lighting with pendants over the kitchen island and dining table.

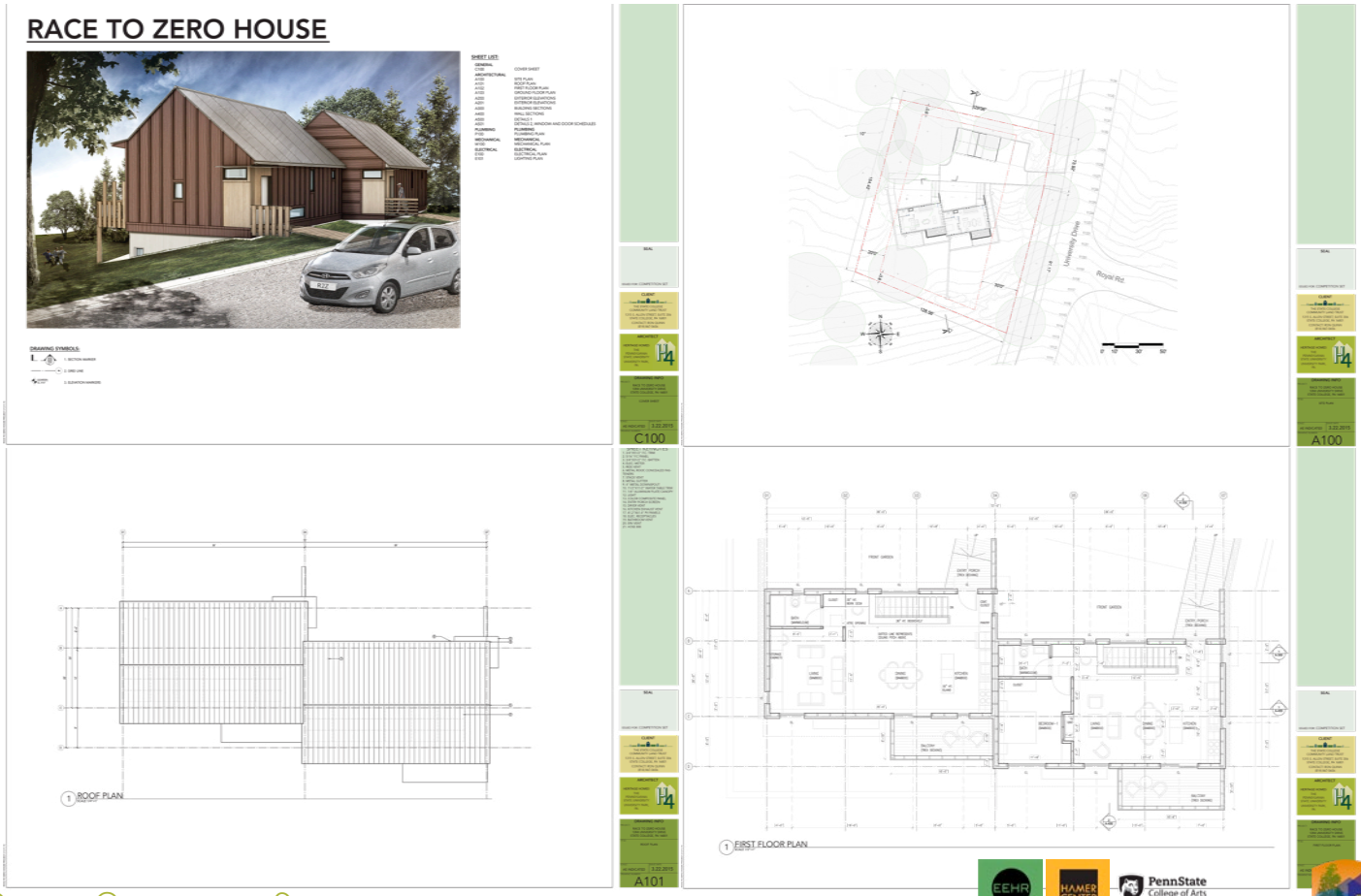
Under cabinet lighting and task lighting in the kitchen and study nook workplaces.

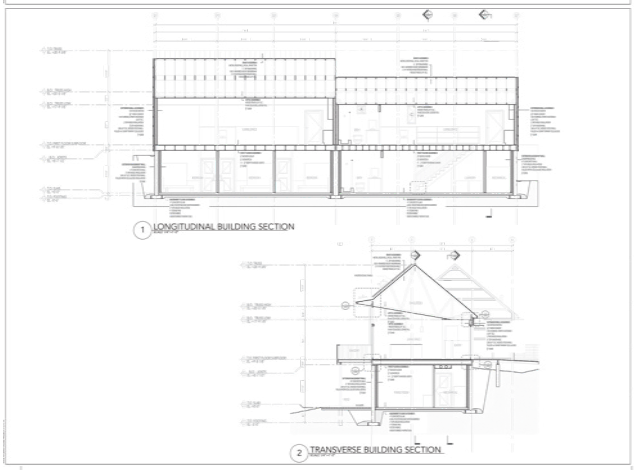
Cove lights in seating areas and master bedroom

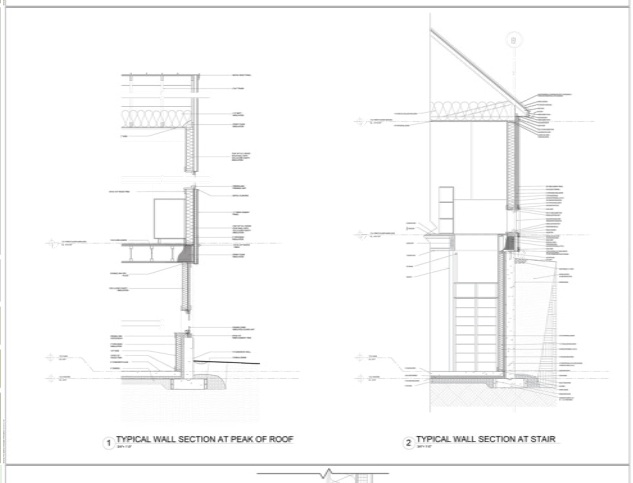


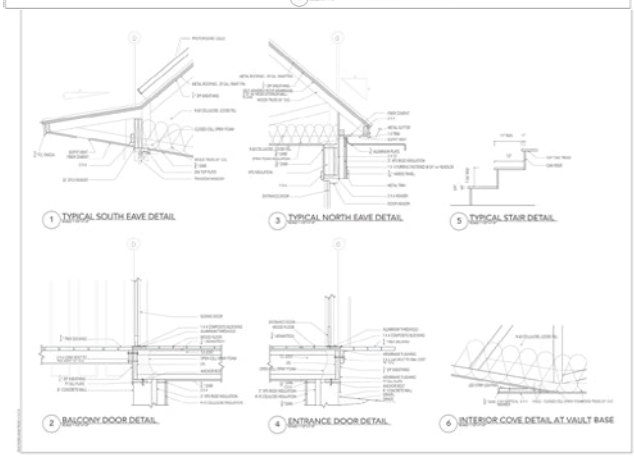
09 // Domestic Hot Water, Lighting & Appliances

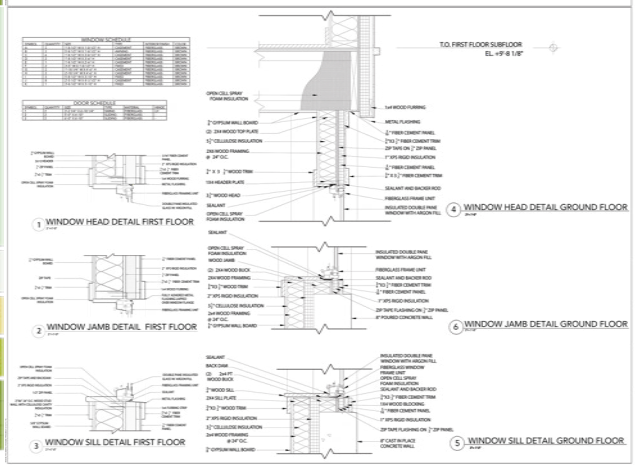
Appliances











11 // Industry Partners

Michelle Pilie
Name of Company: The HITE Company
Title of Contact: Lighting Design Consultant
Credentials: Professional lighting design consultant with more than 10 years of experience, provided the team with cost estimates for light fixtures used in the home.

Chris Ballas
Name of Company: YBC
Title of Contact: Sales Consultant
Credentials: Greg has more than 15 years of experience in sales and aided in cost estimating.

Gary Gouldthwaite
Name of Company: The Pennsylvania State University
Title of Contact: Associate Professor
Credentials: An award winning lighting designer with 12 years of professional experience helped the lighting team with codes and developing electrical plans.

Dr. Richard Mistrick
Name of Company: The Pennsylvania State University
Title of Contact: Instructor
Credentials: With a doctorate in Illuminating Engineering, Dr. Mistrick helped the lighting team with day lighting calculations.

Brian Aust
Name of Company: Kepinski Engineering
Title of Contact: Project Engineer
Credentials: Brian is a Professional Engineer with 7 years of experience as a Mechanical Engineer and is an advisor to the mechanical team.

Anne Messner
Name of Company: Borough of State College
Title of Contact: Senior Planner
Credentials: Anne is the planning and zoning officer for the borough of State College, PA who worked with the State College Community Land Trust and the Penn State team to discuss zoning requirements.

Tom Fountaine
Name of Company: Borough of State College
Title of Contact: Borough Manager
Credentials: As past President of the International Town & Gown Association and current Borough Manager for State College, PA, Tom helped the Penn State team with tax assessments required for the competition report.

Scot Chambers
Name of Company: Keller Williams Advantage Realty
Title of Contact: Realtor
Credentials: Specializing in residential and land sales and purchasing for central Pennsylvania, Scot helped the State College Community Land Trust and the Penn State team with locating an appropriate site for the duplex.

Andrew Poorchee
Name of Company: ESACOS
Title of Contact: Building Performance Specialist
Credentials: Andrew aided in the design and performance of the mechanical system as well as the building envelope of the duplex.

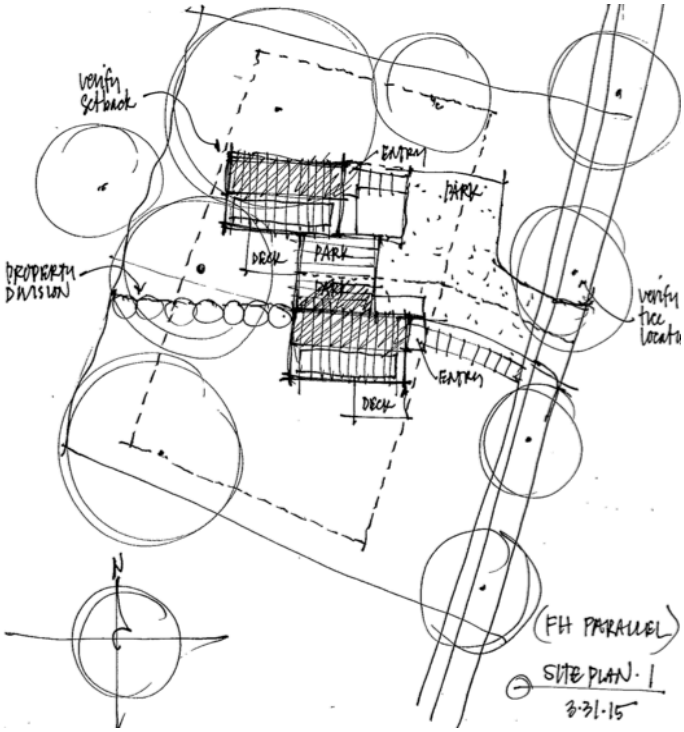
12 // Looking Forward

Conclusions and Continued conversation

- Exterior Space
  - spatial conditions of the exterior.
  - Property division
  - 10 degree rotation, thoughts?
  - Parking: attached? walkway?
  - Solar Perception
- Interior Space
  - Kitchen layout
  - Bedrooms on ground level
  - Storage

Design Checkpoint 2 continued

Simultaneously alternative designs for the duplex configuration, including options for interior and exterior spaces, were developed. See sketches below. This work was presented for SCCLT for their feedback.


verify setback
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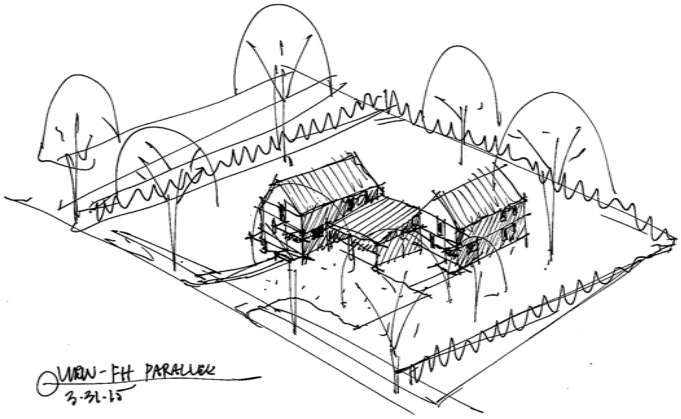
(FH PARALLEL)
SITE PLAN · 1
3·31·15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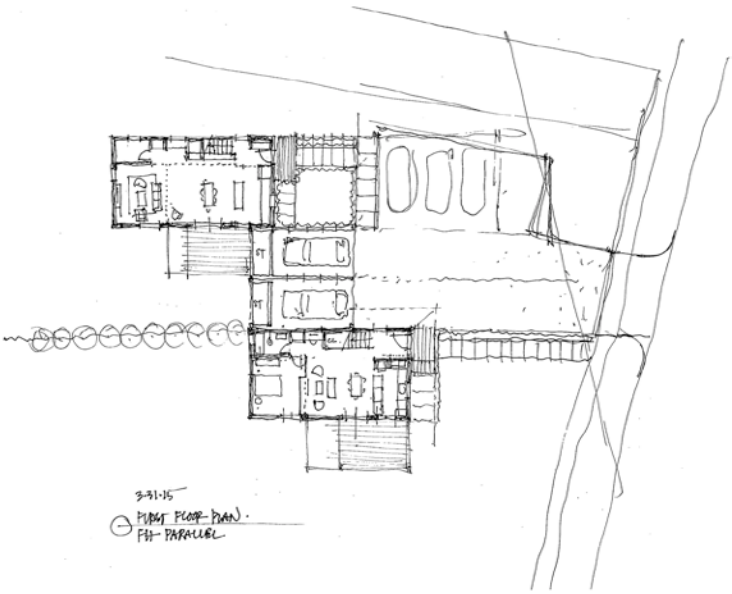
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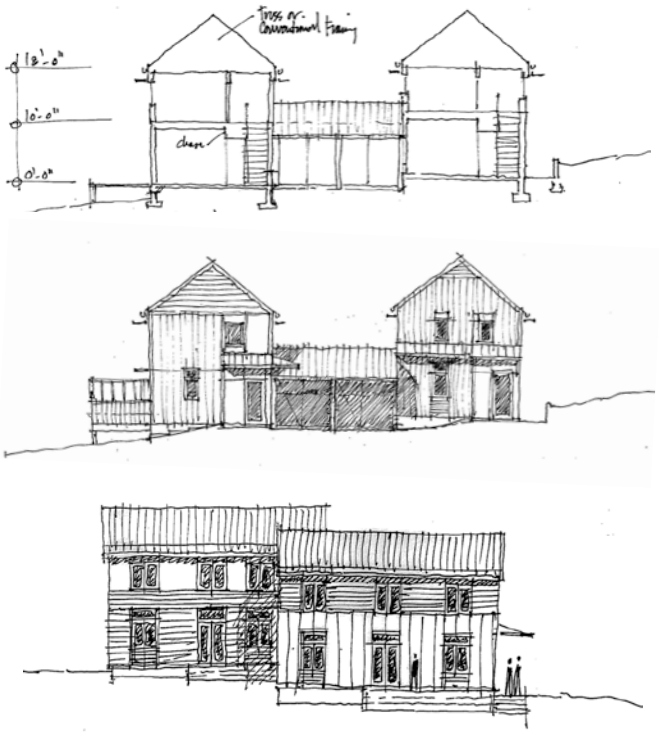
FIRST FLOOR PLAN ·
FH PARALLEL


13'-0"
10'-0"
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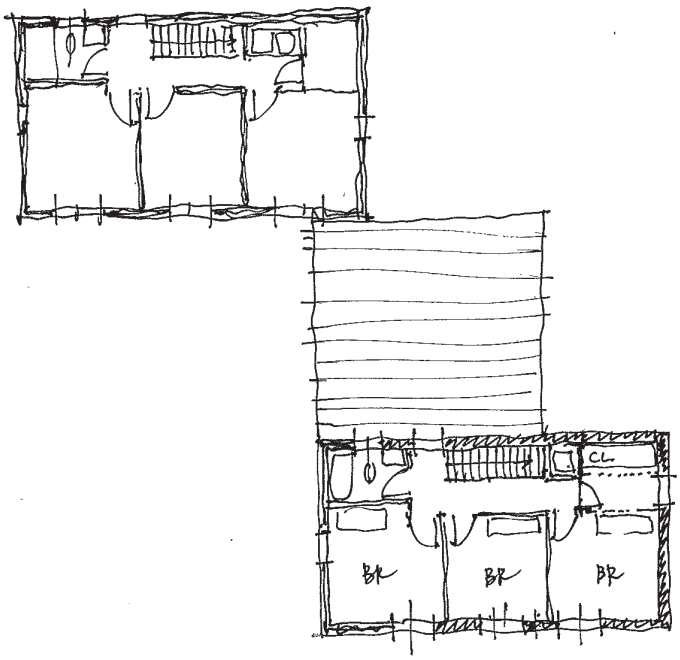
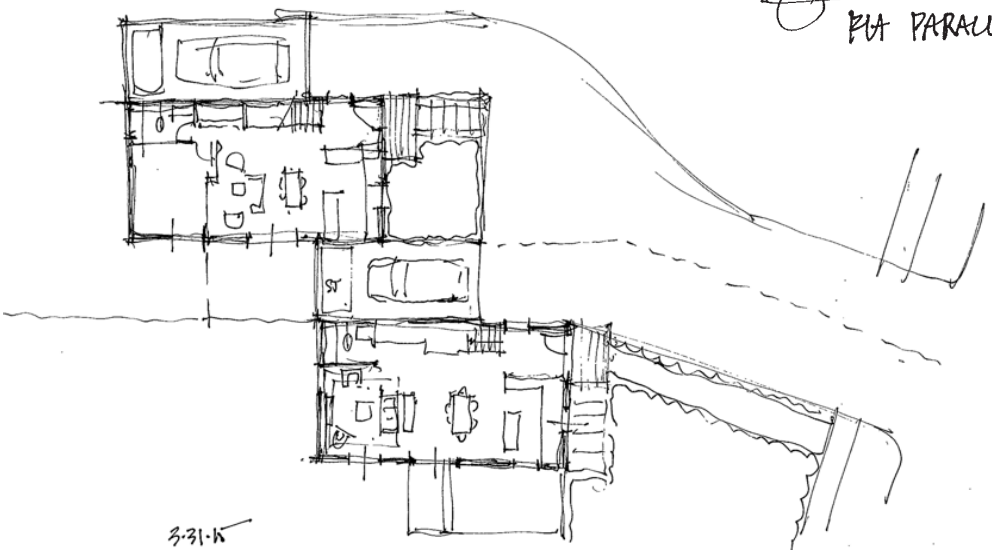
down



3.31.15

SECOND FLOOR PLAN
FLA PARALLEL



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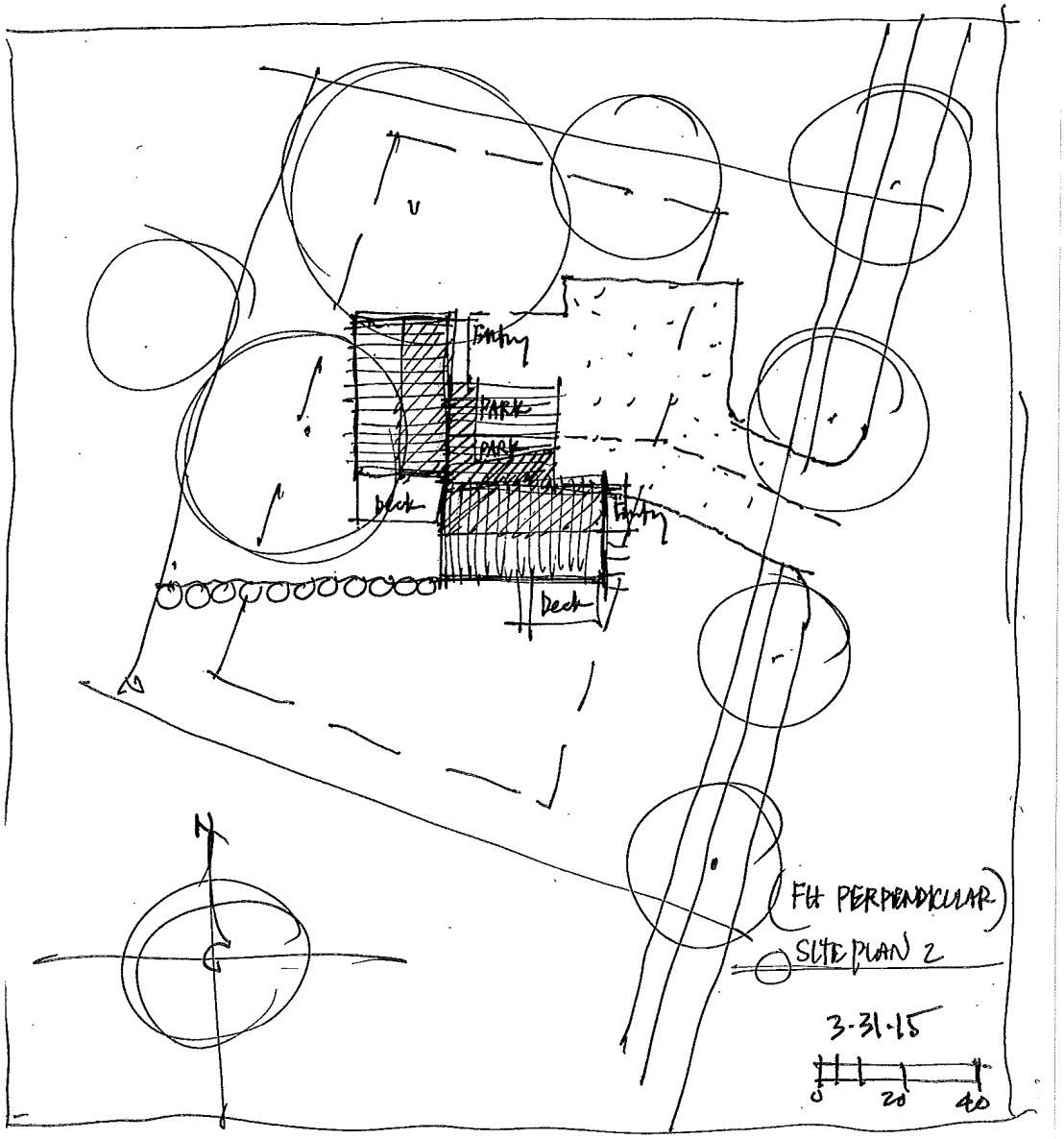
FIRST FLOOR
FLA. PARALLEL: SPLIT PARKING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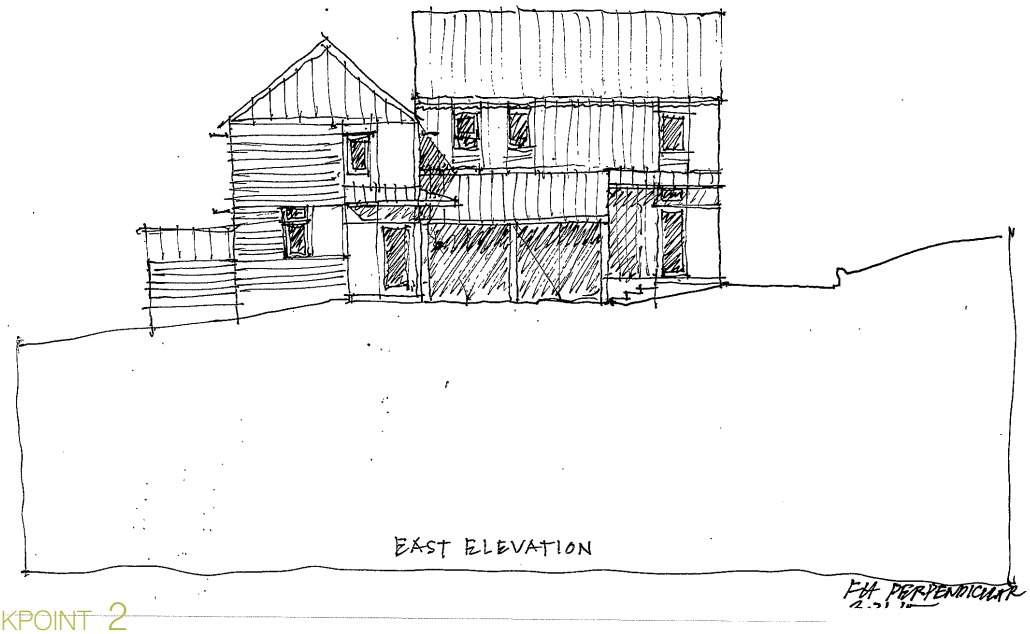
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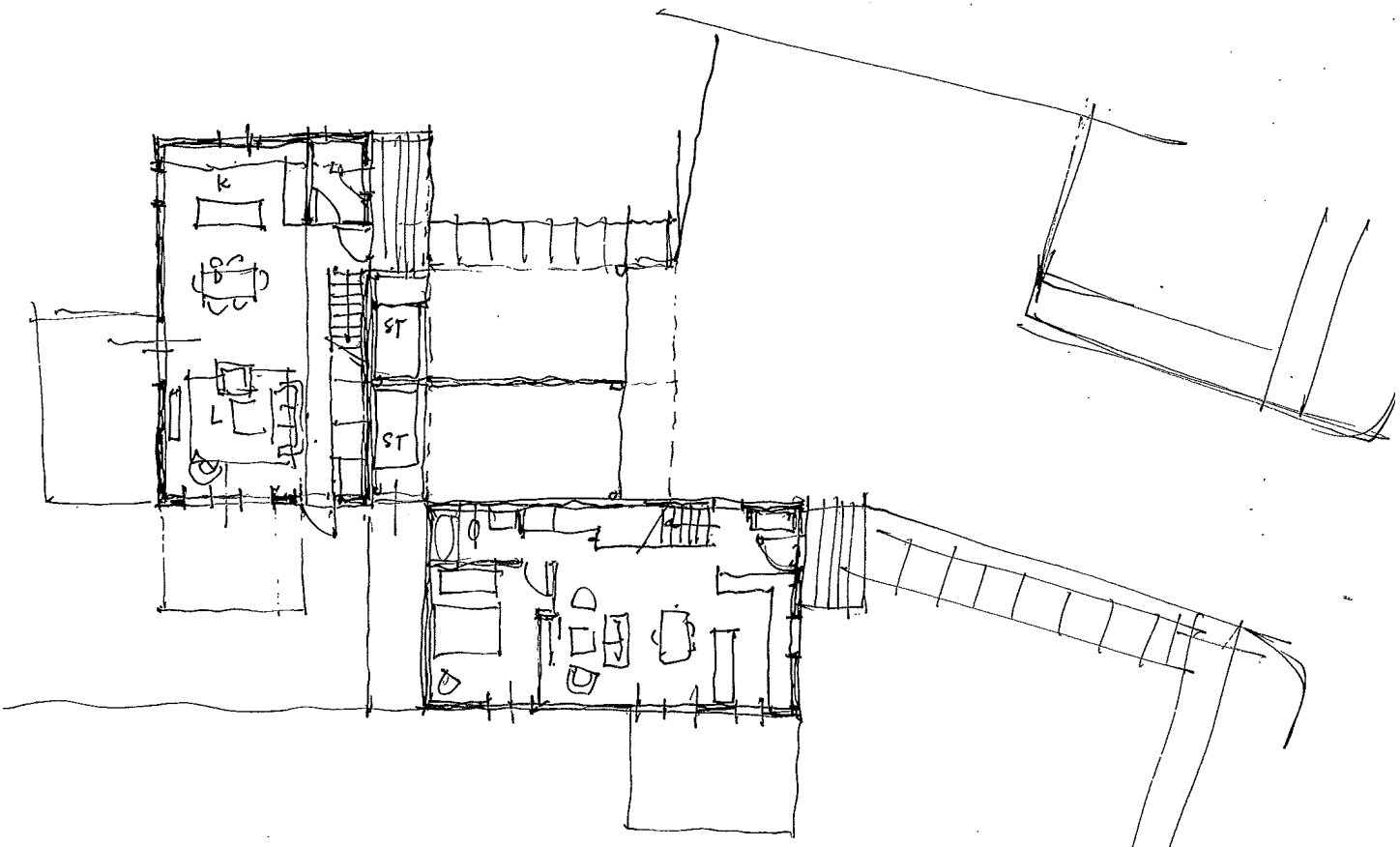

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FIRST FLOOR
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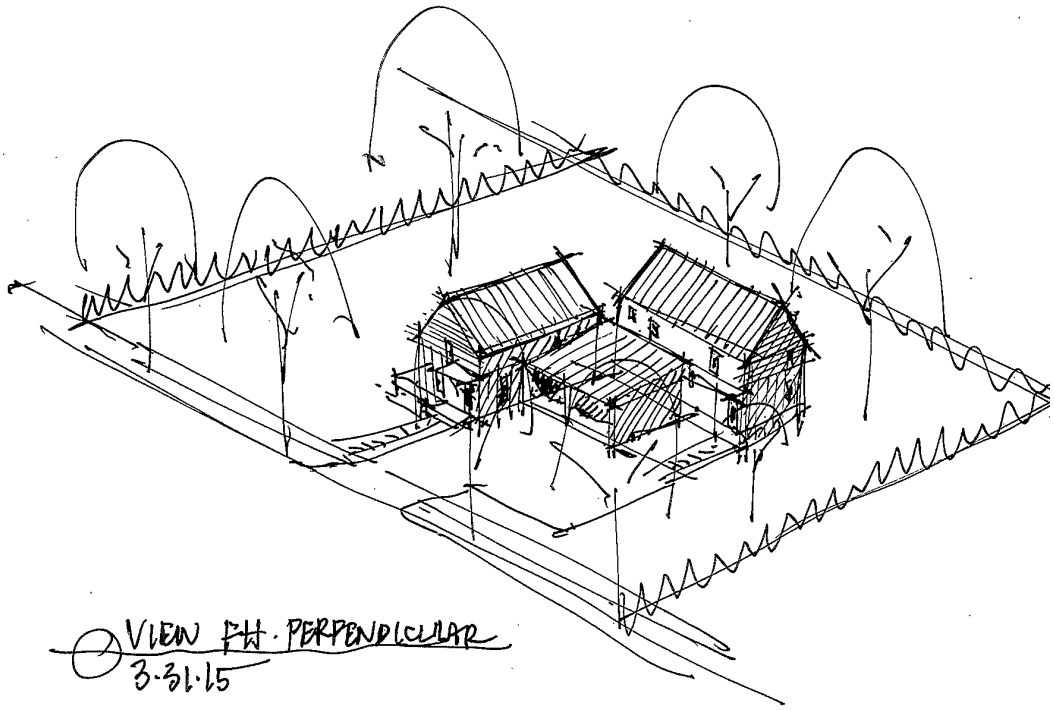

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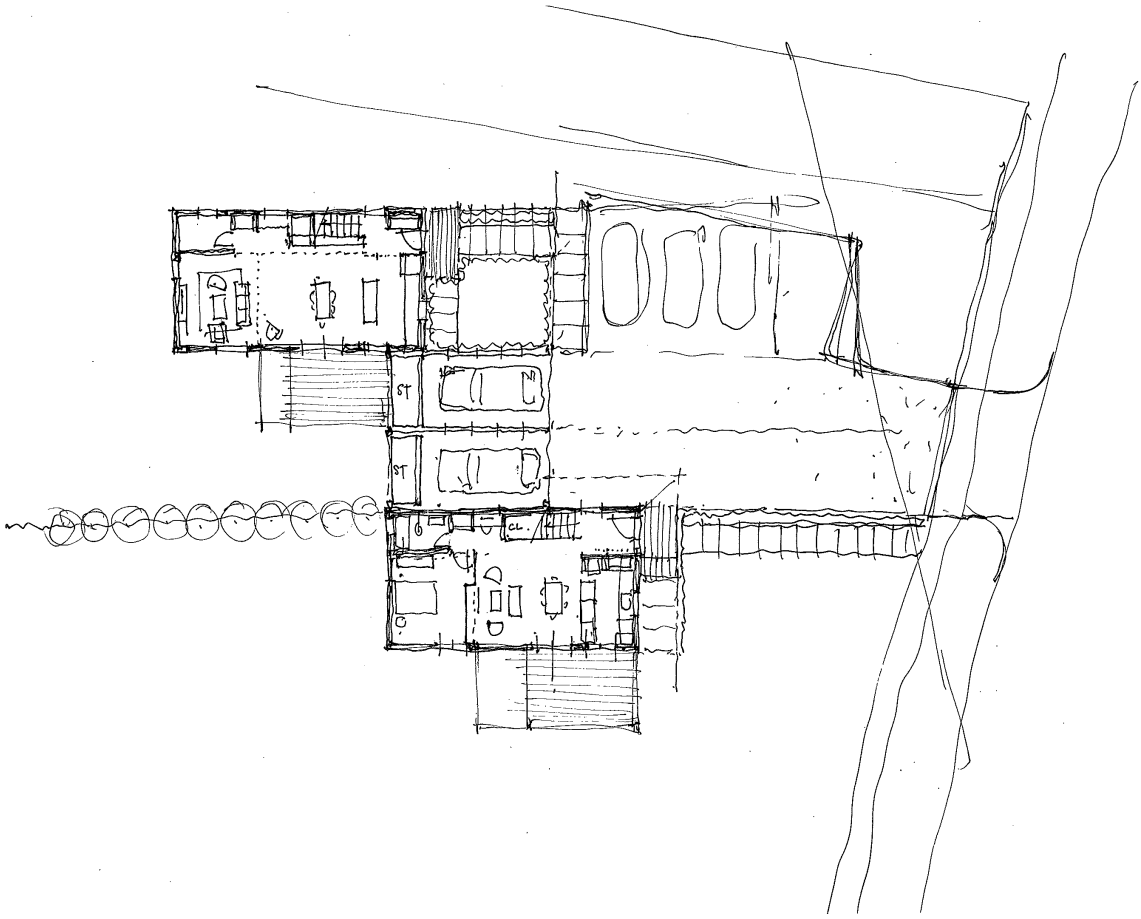
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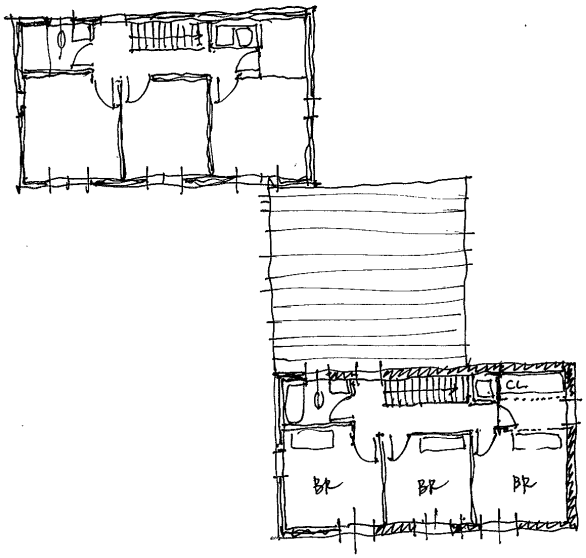
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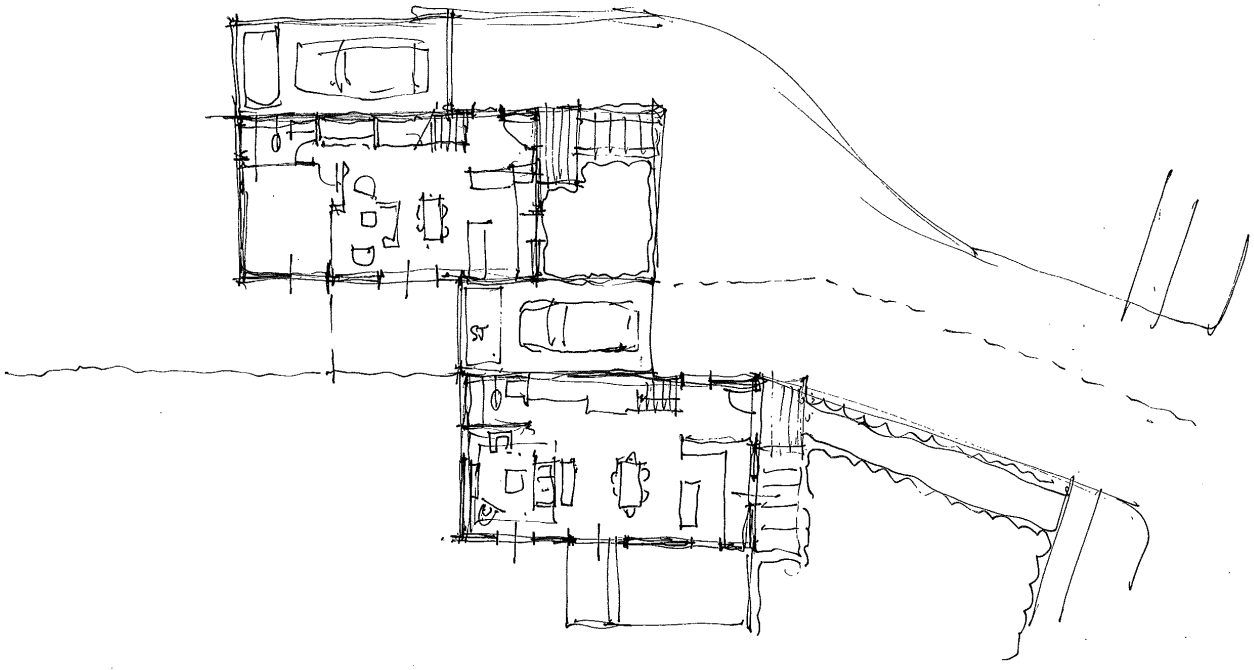

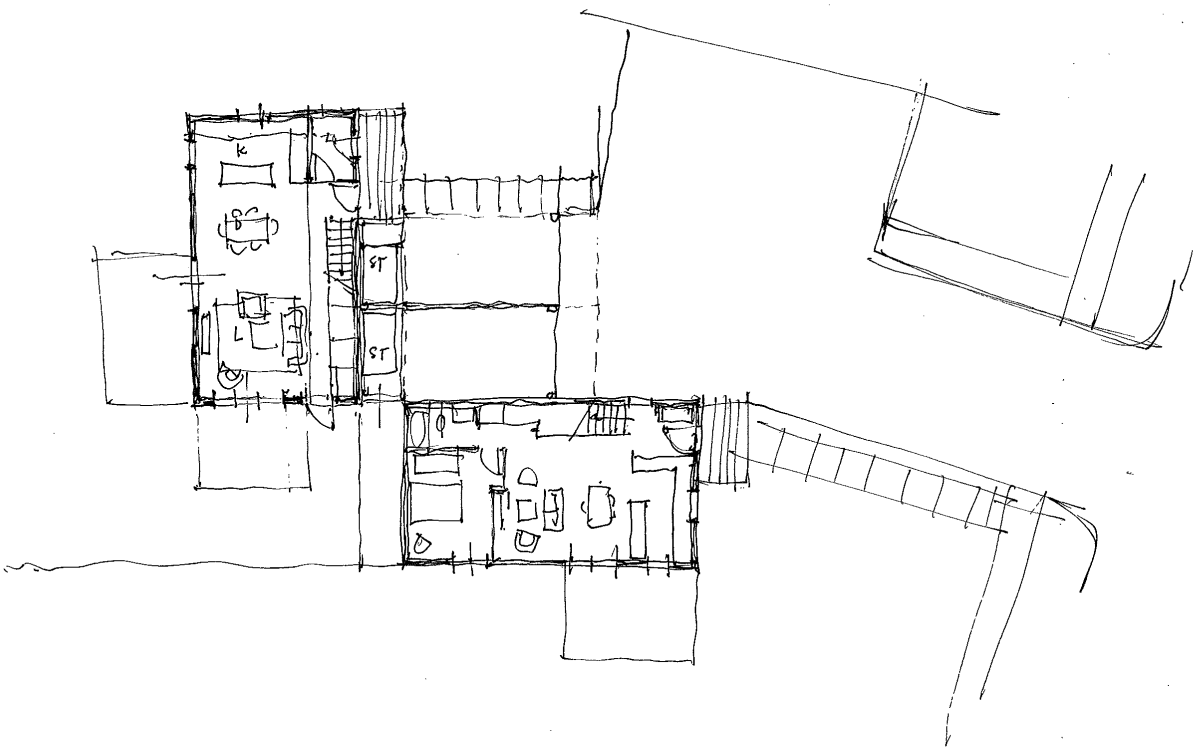

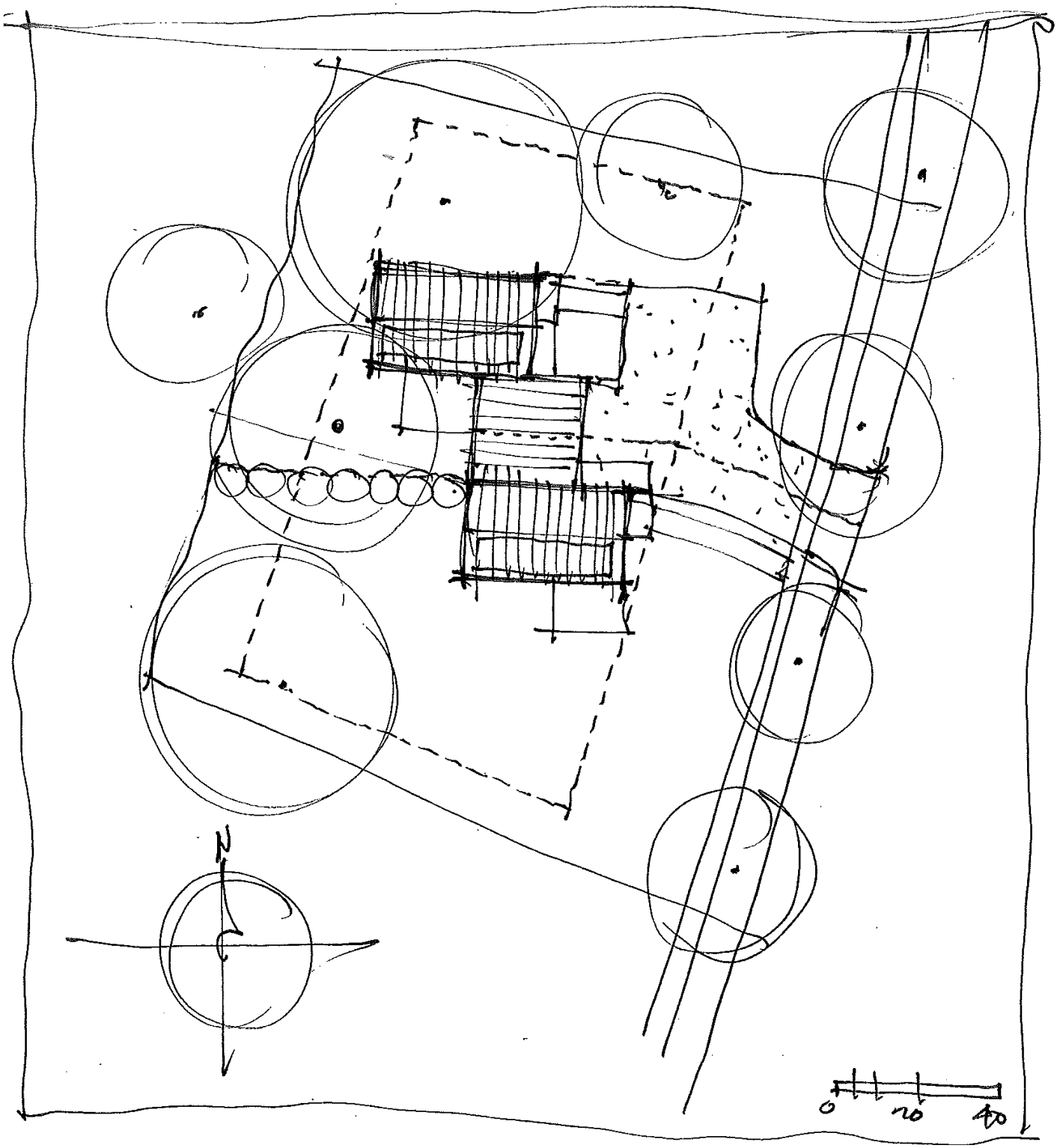
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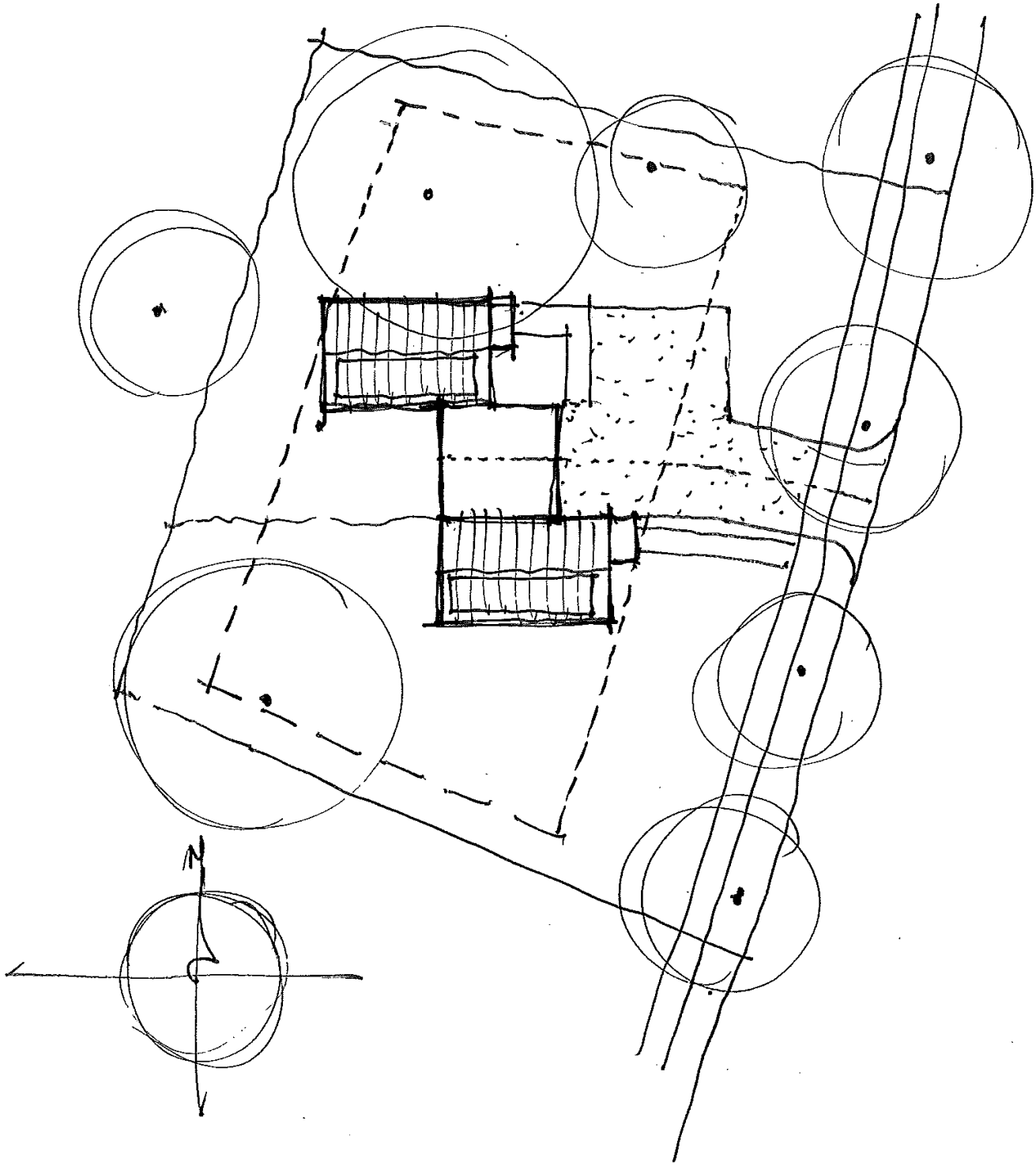
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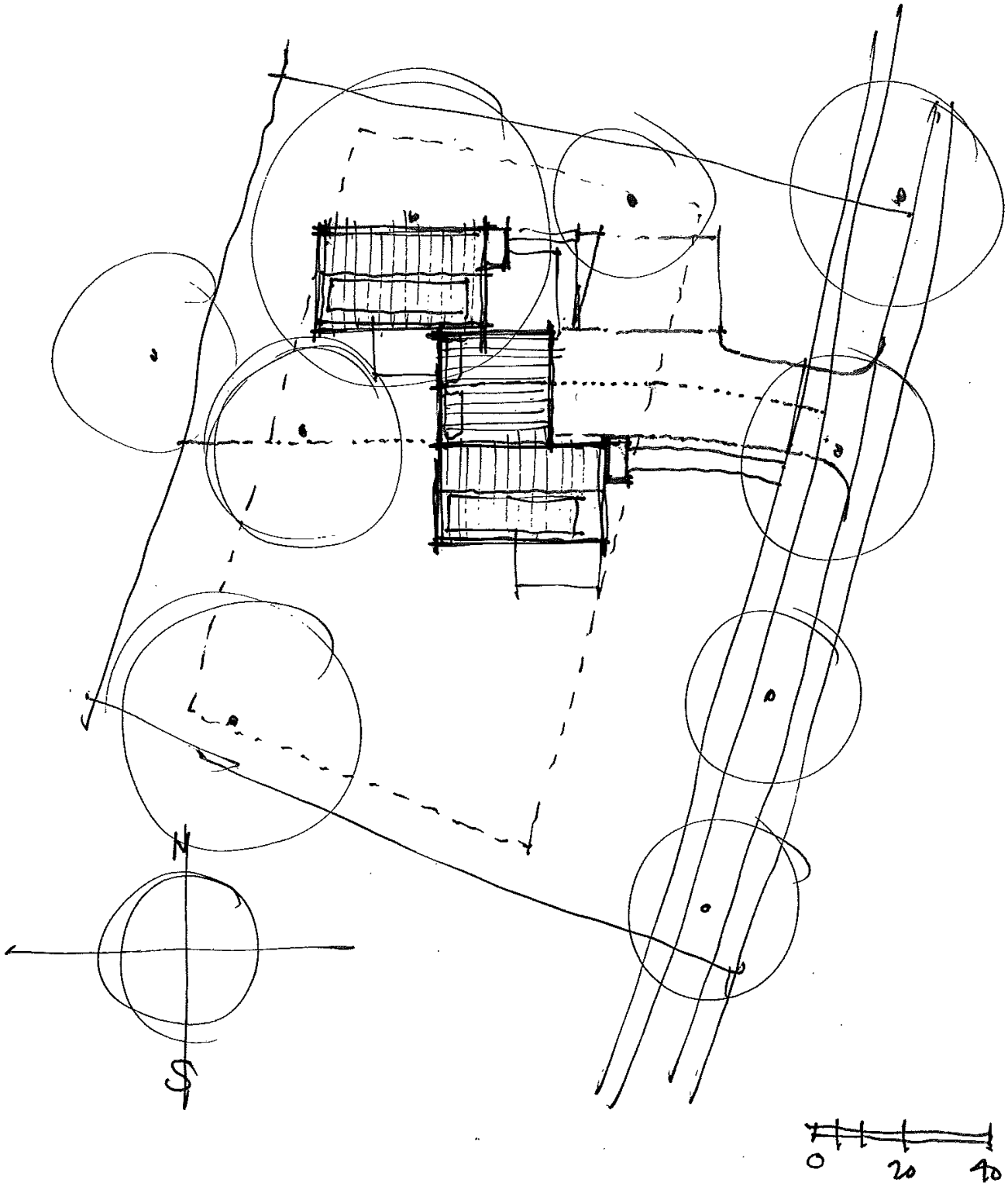
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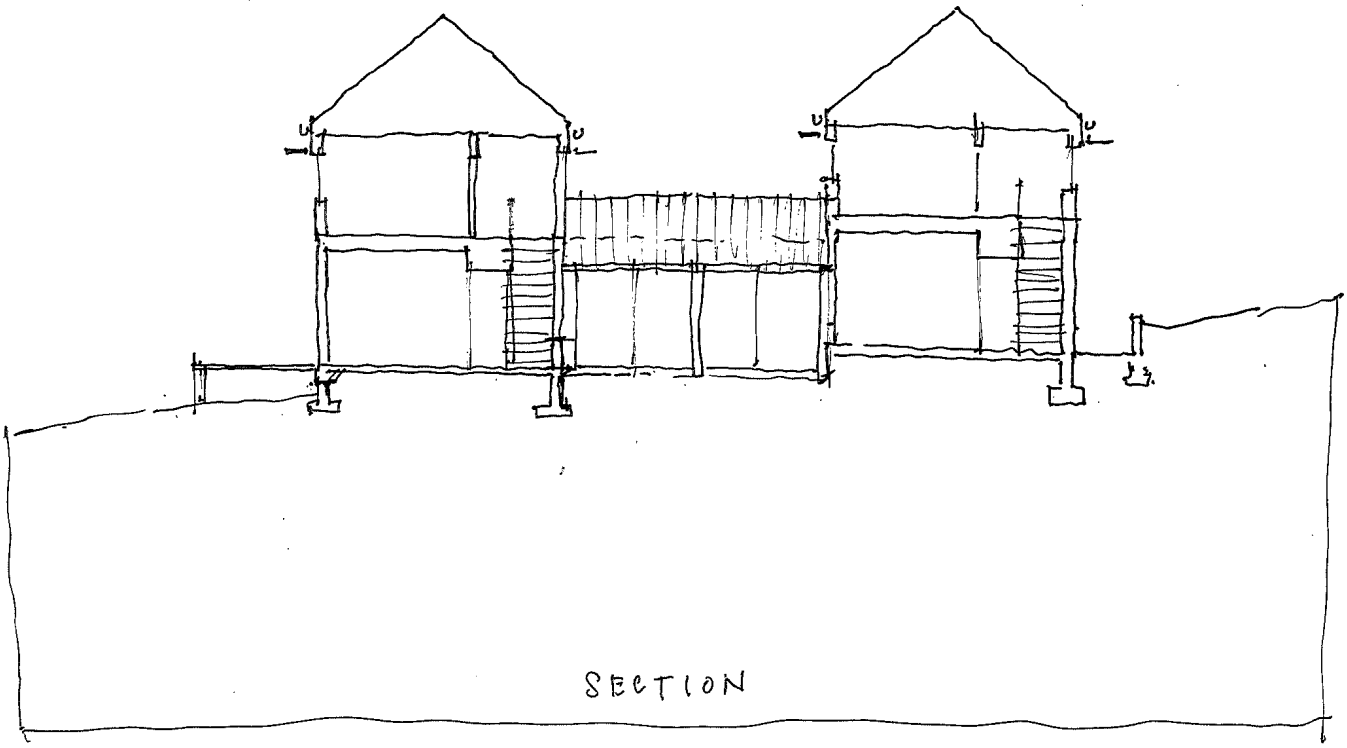
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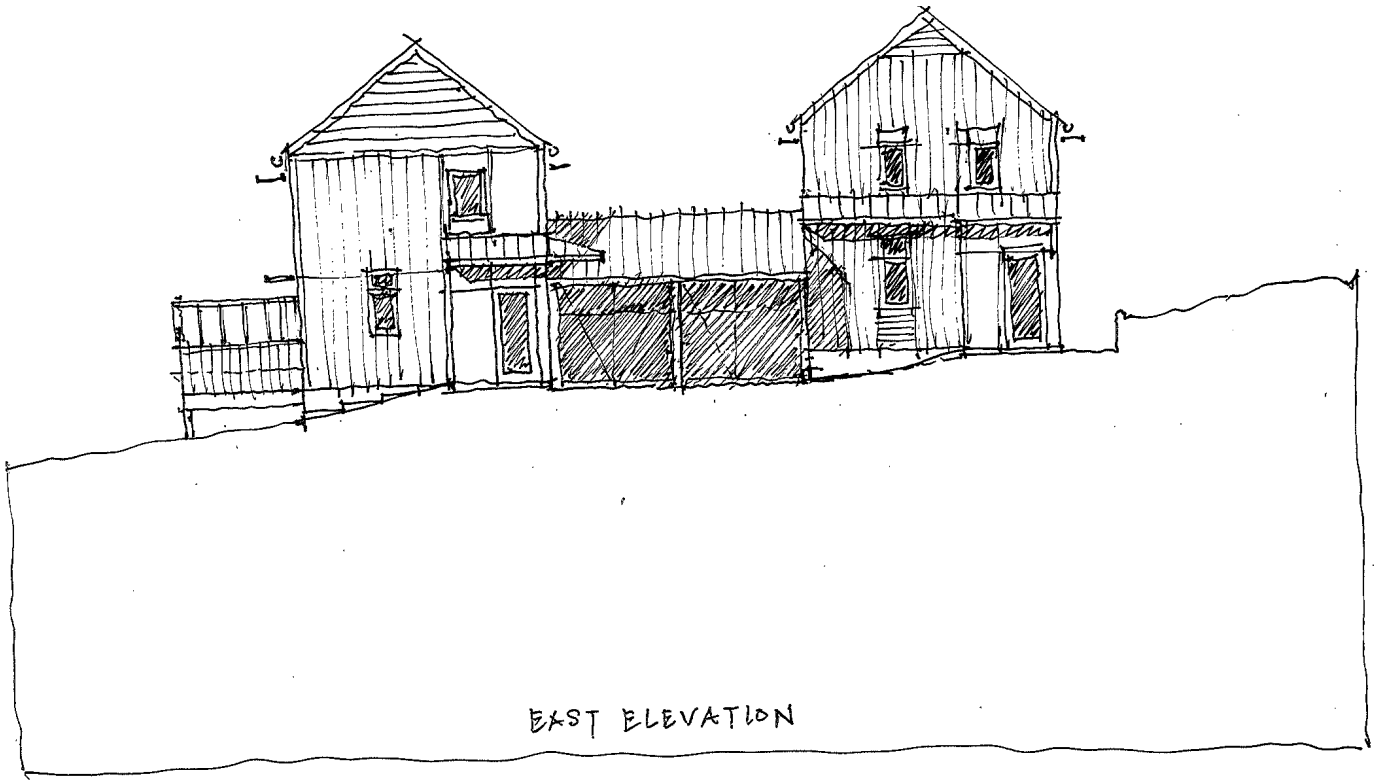
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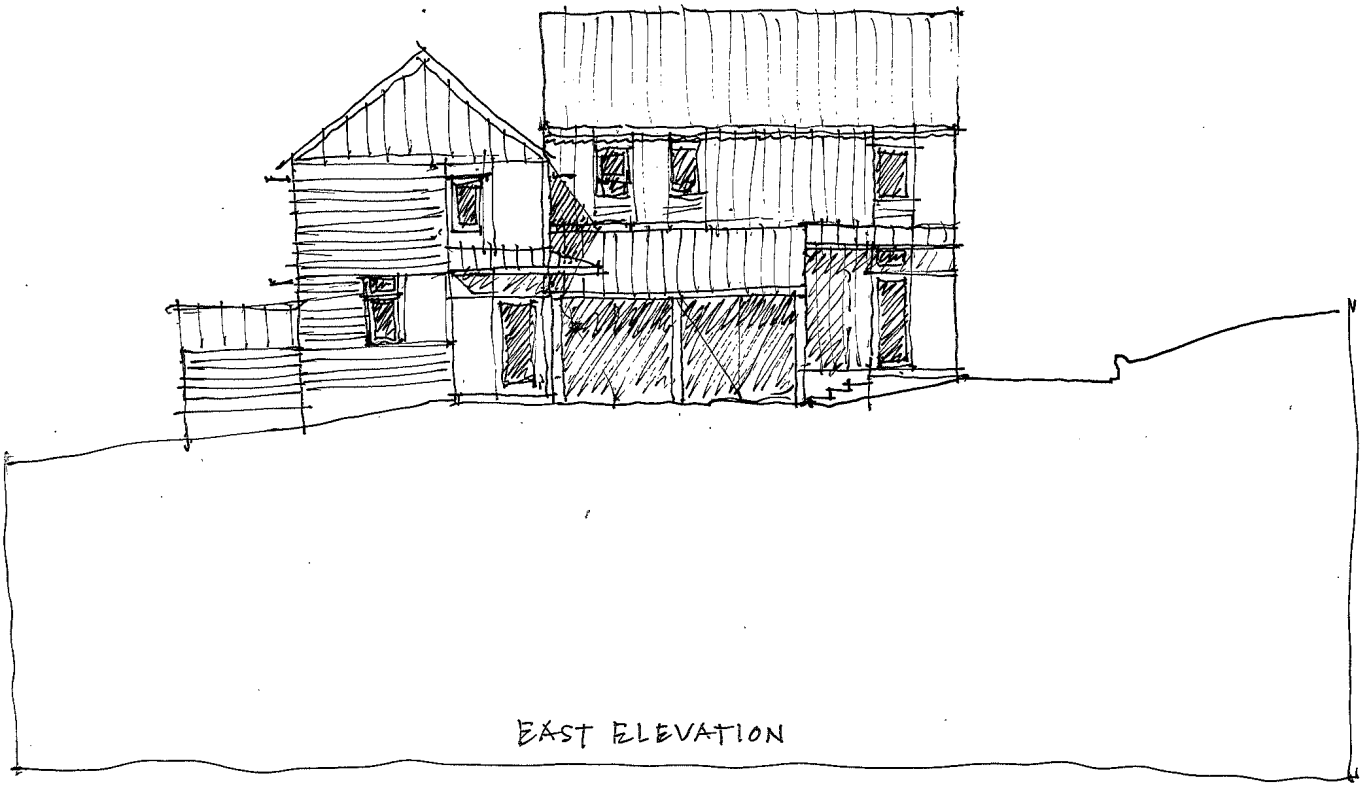
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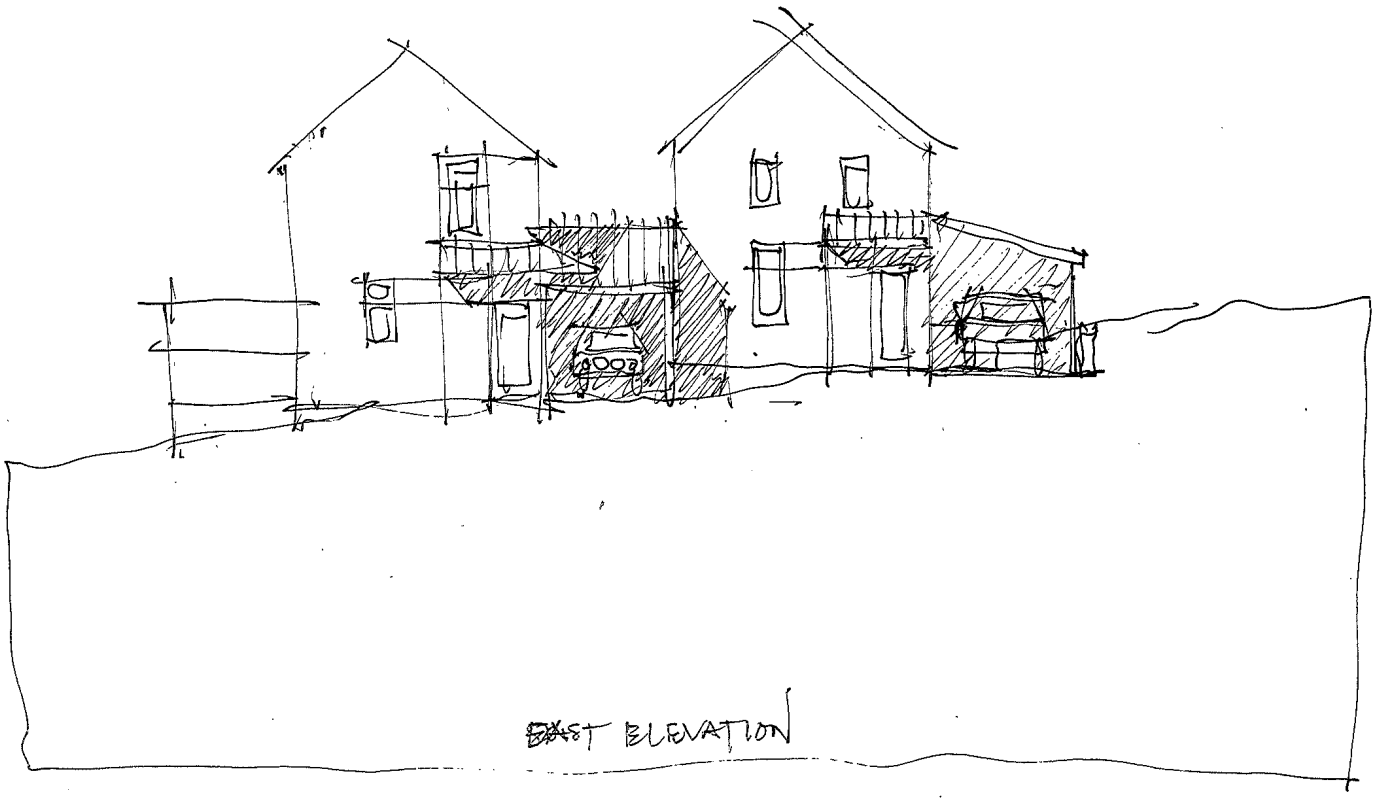
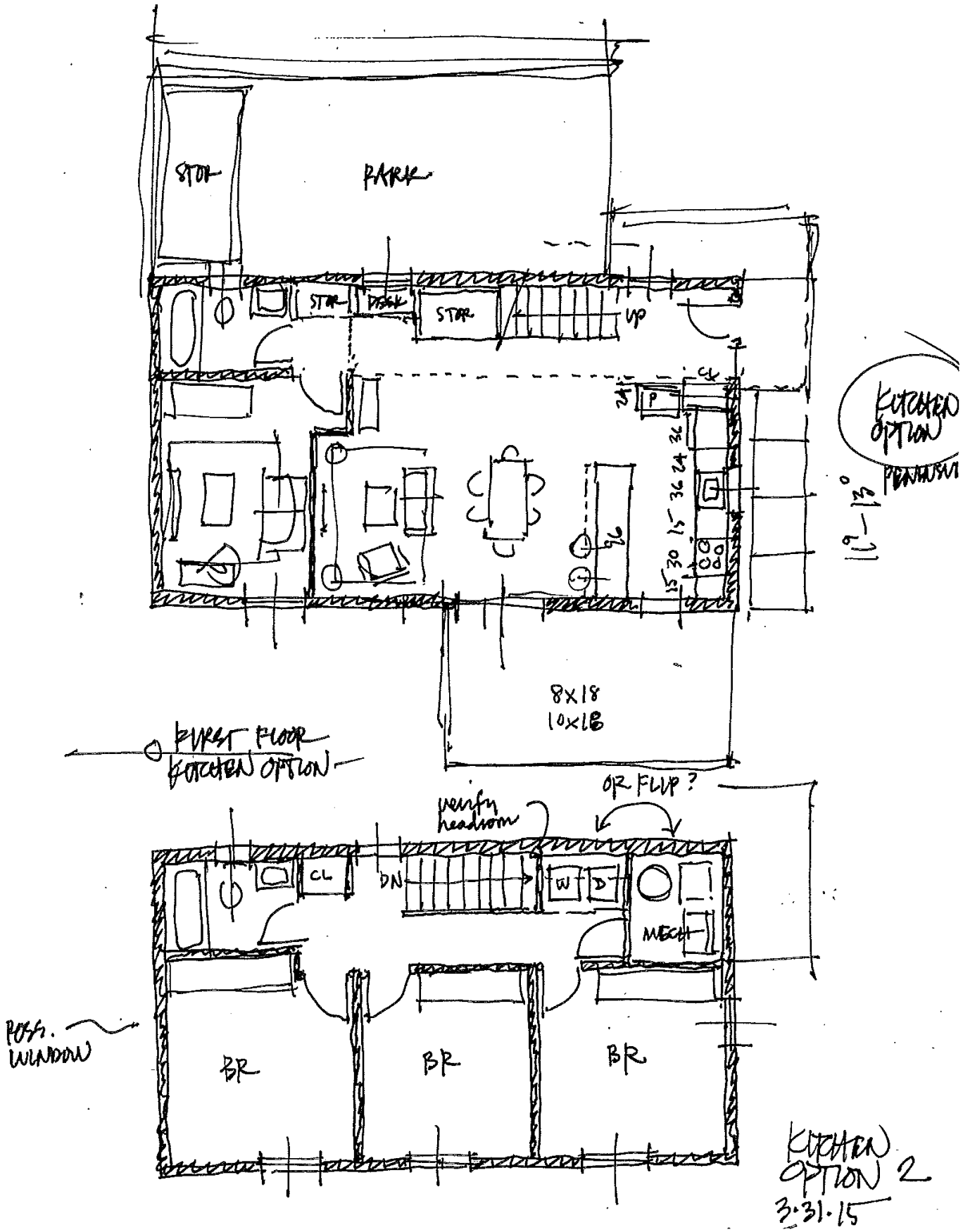

EAST ELEVATION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KITCHEN OPTION
PENTHOUSE
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10x18
FIRST FLOOR KITCHEN OPTION
OR FLIP ?
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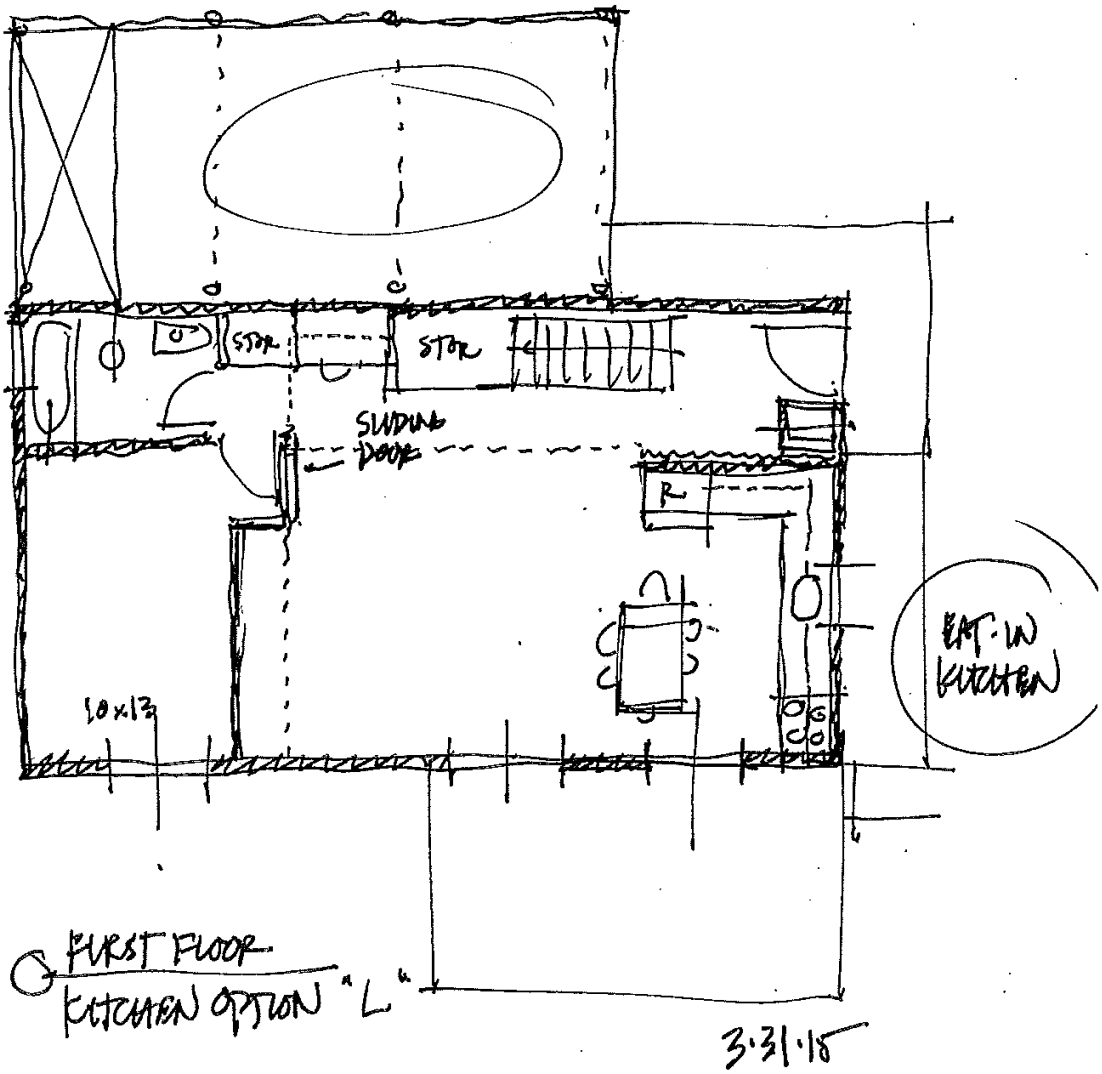
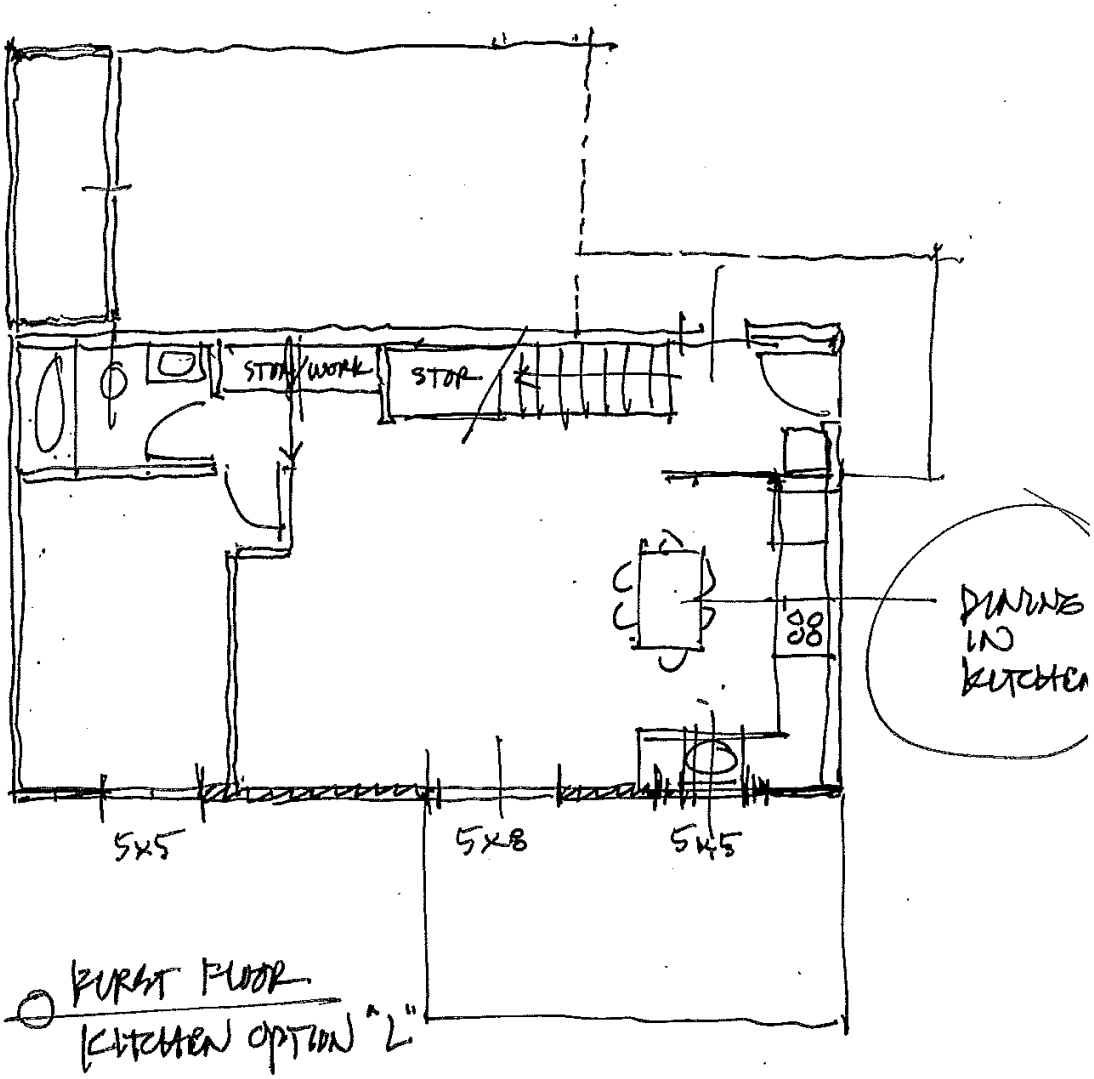
KITCHEN OPTION 2
3.31.15



KITCHEN OPTION 3
3·31·15



KITCHEN
OPTION 4
3·31·15

Charrette #2 – Project Validation– GreenBuild Meeting

March 31st, 2015

Attendance

Scott Wing

Lisa Iulo

Susan Venegoni; SCCLT

Ron Filippelli; SCCLT

Polly Dunn; SCCLT

Sue Hiester; SCCLT

Peg Hambrick; SCCLT

Colleen Ritter; SCCLT

Todd Alwine

Chad Owens

Victoria Brinemugha;

Laura Searles;

Selby Niumataiwalu;

Greg Lych;

Torin Miner;

Cansu Tari;

Negar Ashrafi;

Merve Sagiroglu;

Reese Wamsley;

Michele Hansell;

Wanxin Huang;

Yichun Tsai;

Yamile Rodriguez;

Cory Clippinger;

Dario Vanegas Vargas;

Kyle Macht;

Chauntel Duriez;

List developed from sign-in sheet; apologies for any omissions.

Charrette Intent: To update all parties on our work thus far and discuss the outlook for the future.

Schedule:

6:00 - Welcome!

6:15 - Presentation - A Powerpoint presentation compiled by our team leaders about vital info to talk about, team leaders present, wrap presentation up concluding with "whats next" section and putting our questions in the heads of the audience.

7:00 - Refreshments Break

7:15 - Break out sessions, small tables, white paper and markers. Each table needs to have equal students.

8:15 - Break out session conclusion, one student from each table presents major ideas, start to compile important feedback.

8:45 - Final wrap up, present what conclusions we've come to and open the floor for final comments.

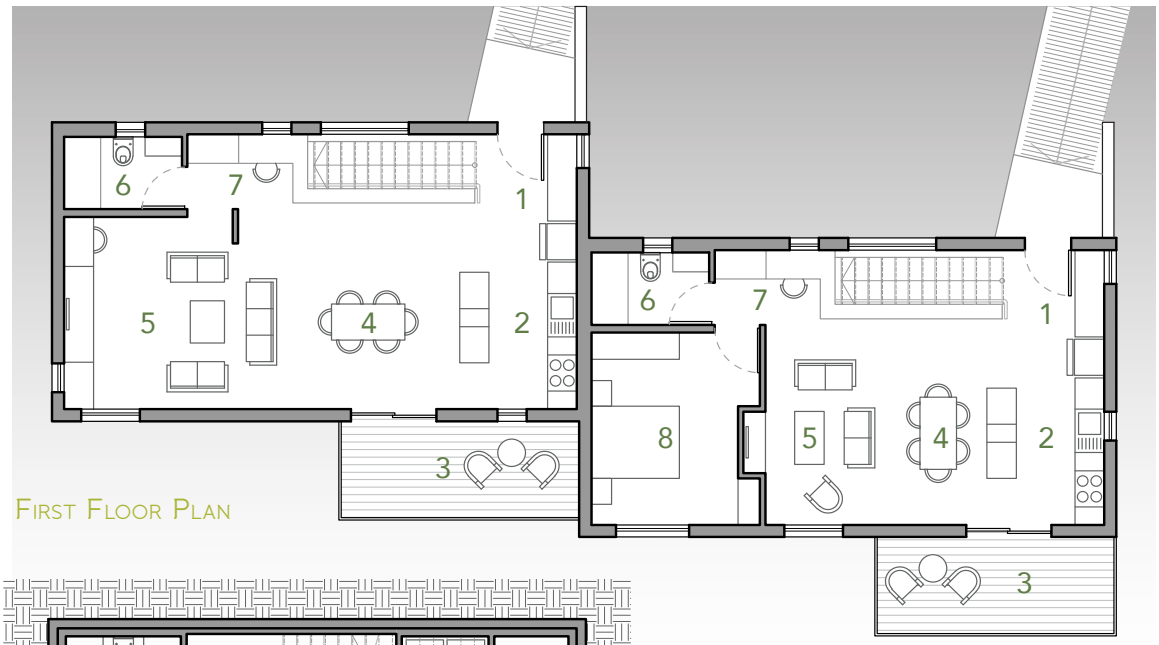
Brief:

To open, the Race to Zero (R20) team presented their progress for the competition thus far. Each research group gave their part of the presentation; after the presenting the information from the competition brief, the design group members then presented the newest updates for design with sketches for each scheme.

A materials library was assembled and on display throughout the charrette to aid discussion and provide participants with a better sense of materials suggested.

Handout:

The following is a copy of a document that was distributed to the meeting attendees. This served as documentation of the current progress in design and a launching point for further critique.

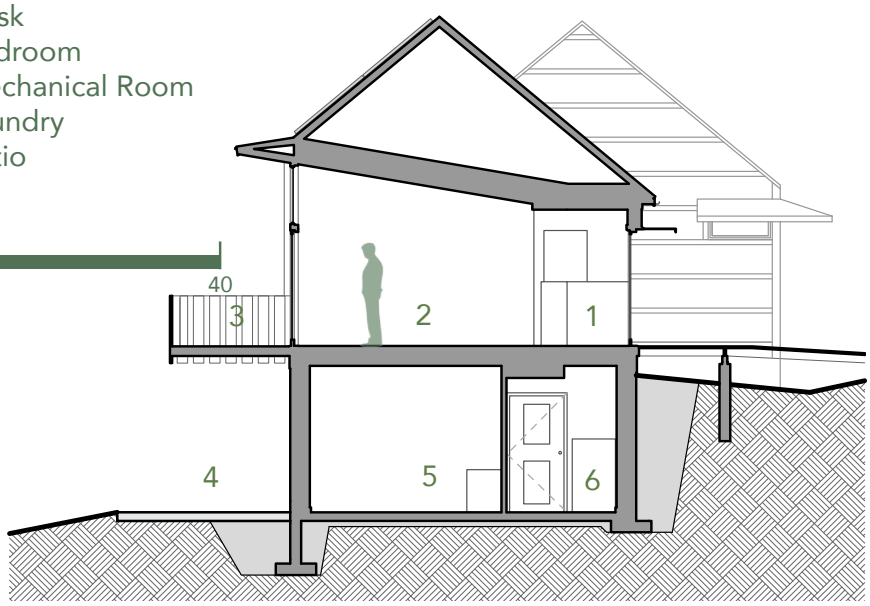


First Floor Plan

Ground Floor Plan

ROOM KEY

1 Entry
2 Kitchen
3 Porch
4 Dining Area
5 Living Room
6 Bathroom
7 Desk
8 Bedroom
9 Mechanical Room
10 Laundry
11 Patio



Transverse Section

Design Overview // March 31st, 2015

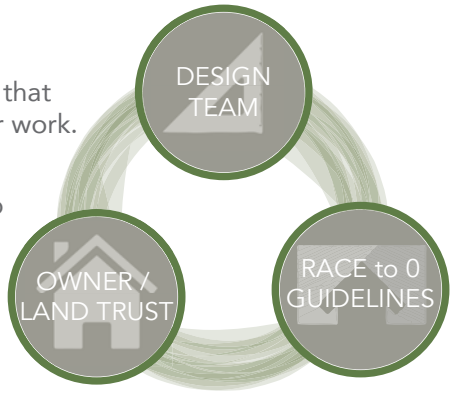
Heritage Homes

H4: High Performance Living in Harmony with Community

The Triad of Interests

Throughout the larger document our readers will find these threes icons that represent the three interested parties we considered in each step of our work.

The three parties are the major design drivers of our project. The State College Community Land Trust is our client and owner, the Race to Zero competition, which lays out standards for performance, and finally our design team armed with specific expertise. In each section these icons will allow readers to be able to quickly discern the unique goals that we have incorporated into our integrative design process. Below are the overall Design Drivers for the project as a whole.



Design Drivers

Design Team

- Capture the unique qualities of the site, including the southern views to the mountains.
- Incorporate a 10 degrees rotation in the classic north-south orientation of the house, maximizing yard, while still having street presence.
- Achieve the Land Trust goals while still being an affordable home from a life cycle cost. We will consider the life of the building and its components, their initial cost, and the energy implications.
- Revitalize local architecture to our area, the bank barn is inspired by original architecture specific to Central Pennsylvania.

Race to 0

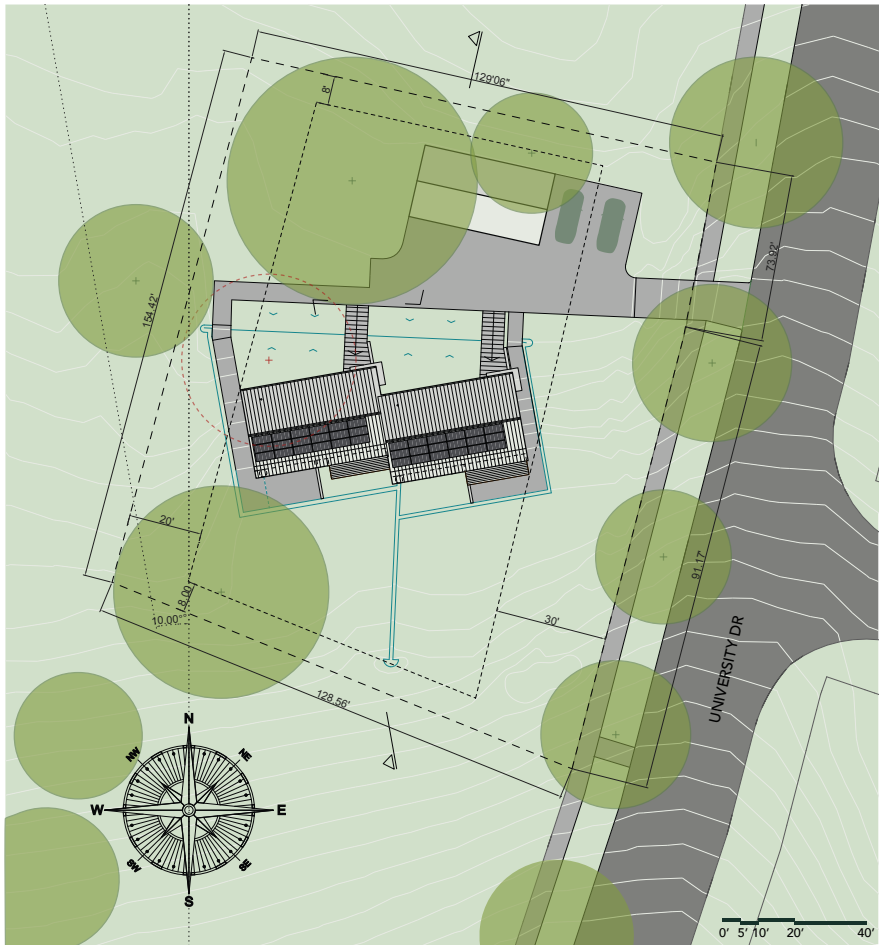
- Passive solar design to reduce loads in the home.
- Option for solar PV in the design for future net zero energy home.
- Meet the prescriptive path for the DOE Zero Energy Ready home technical guidelines.

Land Trust

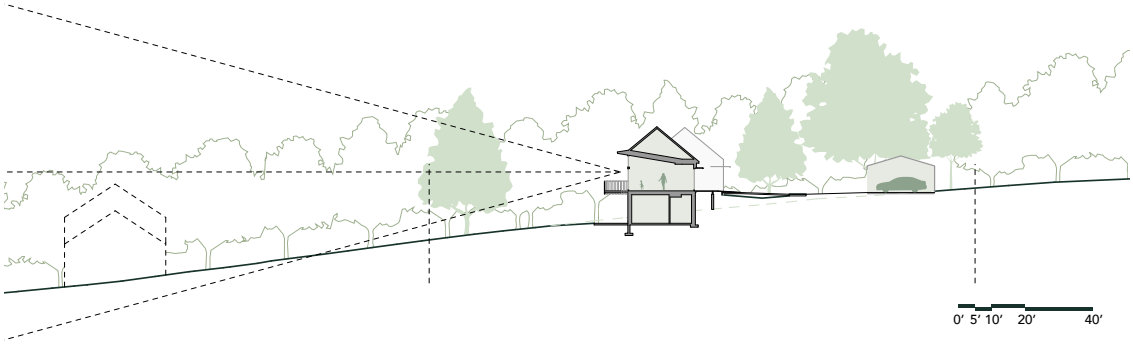
- Design for a duplex that can fit easily into the SCCLT's unique financial agreement structure.
- Create a landmark for the State College Community, a symbol of what affordable housing can be.
- Maintain sensitivity to budget; remain long –term affordable housing, we are not looking at only initial cost.
- Communicate individuality and identity for each of the homes. It is important for each house to read as a separate entity. Ownership is directly ties to identity and individuality.
- Even though the duplex is attached it is important to maintain privacy for the two parties, as well as providing the possibility for storage to be built into the design, maximizing the small footprint.

Therefore

- We have designed a duplex house, facing south, offset 10 degrees from true north, increasing morning passive solar potential and optimizing views.
- Affordability (short and long term). Everything has purpose and fits consistent with the Land Trust system.
- Performance, looking to the "whole building" approach we are striving to achieve the least expensive way to net- zero, that includes solar photovoltaics in the initial home budget.
- Engaging the community with our design, through a revitalization of Pennsylvania architecture, relating the heritage of the past to the future of affordable housing in Pennsylvania.



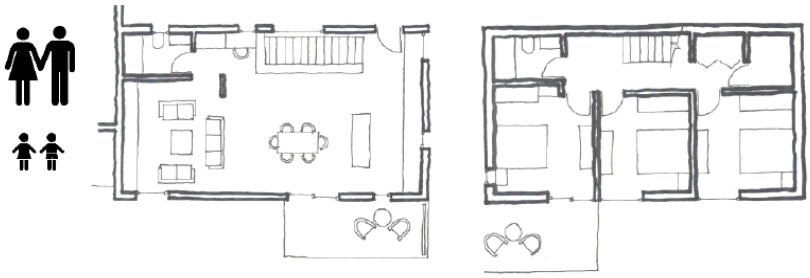
Site Plan



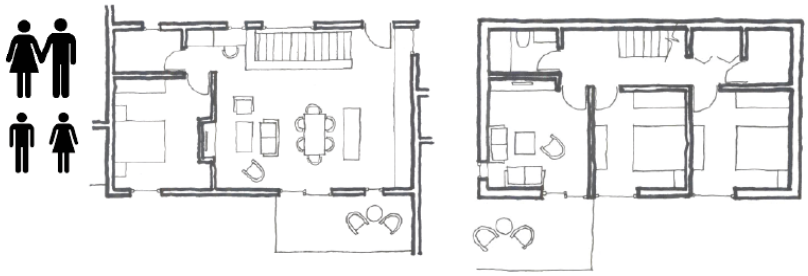
Site Section

Rear View

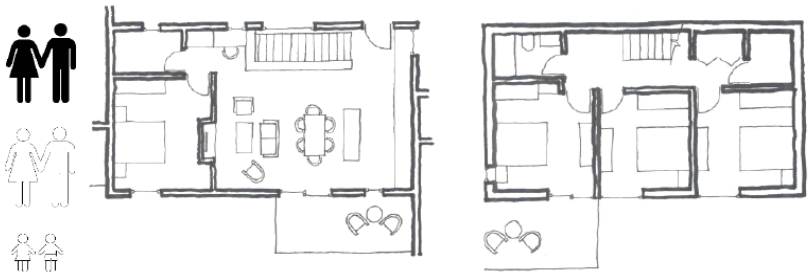
Adaptability in floor plan expressed in different family scenarios



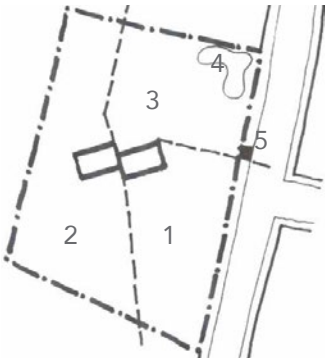
1) Young family, 2016 - All living spaces in First floor and all Private spaces in Ground floor



2) Family in 2030 - Parents' bedroom in First floor, Family room on Ground floor



3) Family with visiting children, 2040 - Ground floor Family room reconverted to Bedroom



^ Clear demarcation of land illustrating the public and community space

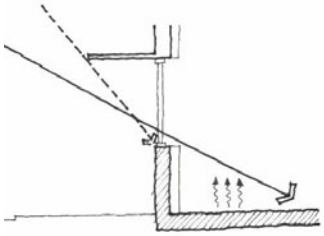
1 - Unit 1 property,

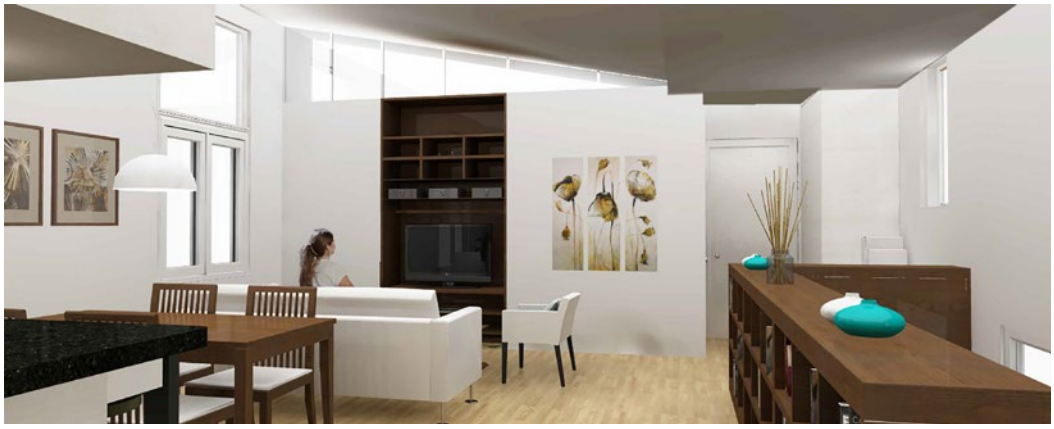
2 - Unit 2 property,

3 - Public space,

4 - Community 'rain garden',

5 - Bus stop





^ Overhangs designed as per shading angles, Concrete floor in Ground floor acts as thermal mass.

Interior Renderings

Break-out Sessions // Feedback

Collected notes from all groups at the session:

Parking:

-Parking attached to home is ideal

-Interior storage in carport! (lawnmower)

-Interior and exterior storage is a must

-Driveway length needs considered. Too long to shovel

-Addressing shared parking? Who does maintenance?

-Driveway turn around important for safety

-Bus stop is a benefit, discouraging car use

-Public space near parking is nice (but would it work?)

-Governance of the commons needs to be established

-Distance from carport to house is important, not too far

-Carport in middle makes parking the focus, not good.

-Detached carport preferred over both attached; however

-Many participants value attached parking

-Cover over at least on parking space/home is needed

-Parking closer to unit with the division retained is needed.

-If carports are open/connected that means extra outdoor space.

-Consider families when deciding parking.

-Could shelving be incorporated? Additional shed? Storage above the carport? Where will outdoor tools go?

Storage:

-Needed inside and outside (i.e. vacuum and lawnmower)

-attic possible?

-storage on deck, maybe

-built in, creative storage.

-bookshelf is nice by stairs

-Need more storage (attic or garage)

"Carport takes care of car.

Garage takes care of all..."

-Storage for kids' things.

-Walkability= bikes. Where can they be stored?

-Attic, platform above insulation (air movement important)

-Storage is critical to homes.

Break-out Sessions // Feedback

Site:

-Rotated scheme, both homes facing University Drive, is great.

-Consider space and land division

-Don't compromise on views or solar orientation to the south

-Don't use fences. Use soft-scaping and landscape features to define yard space

-Noise concern. Buffer sound from University Drive with landscaping and insulation.

-Headlights from University Drive also an issue; explore trees and landscape as buffer?

-Preference for home entrances to face north

-Possible to do one Farmhouse (slab on grade) and One Bank Barn (basement)?

-Excavation is a worry. Slab would be preferred for cost. Is a walk out basement necessary?

Interior:

-Design for 'Visitability' is a great feature

-Living amenities all on one floor is ideal. Current plan has that except for laundry. Could the laundry be located in the study niche on the ground floor?

-Other participants reported preference for the laundry to be close to (on the same level as) bedrooms

-One appliance for washing and drying? (Determined actually to be inefficient)

-Flex space is awesome.

-Line of sight to bathroom has been dealt with.

-People have STUFF. Storage is important, has caused people to have to leave SCCLT houses in the past.

Kitchen:

-Island with seating preferable

-Desire for people in kitchen to be a part the living space when cooking (open kitchen facing out)

-Too open = too busy; avoid general circulation through the kitchen

-Tight entrance to door, cooking into a wall no fun

-Kitchen as 'heart of the home;' open plan.

- Dining room not necessary would rather have longer kitchen.

-Extend island to make it a serve double-duty as a counter space and kitchen table

-Flexible furniture? Could the island move around the kitchen?

-Eat-in kitchen for affordability is a great idea.

Break-out Sessions // Feedback

Bedrooms:

-Nice to be separate on different level from the living space

-Adaptation is great!

-Options: young families and old families both served by 2+ bedrooms.

-2+ bedrooms for flexibility, growth, specialization (hobby space), storage possibilities

-Hobby space is great for private space if one was to work from home.

Critical Conclusions

Parking and Site:

- This is the most shared part of the design and therefore challenging, however the design is moving in a direction that maximizes individualism while being cost effective in similarities.
- Livability is key in the design of the parking because it is a common space, a space that requires homeowner maintenance, yet has to meet their needs in return.
- One curb cut will be the approach, and materiality of the drive way is a possible way to show division of spaces. Permeable brick is something the Land Trust would like to explore. The entrance at the north of the site is also confirmed to be the best by consensus, the reasons being and easier traffic pattern and softer slope approach.
- Carports are a great alternative to garages if they can still meet the needs of the homeowner. This means storage. Also if a car port is the first thing that you see when approaching the homes, they need to be made beautiful.
- Lot separation is a major topic. It is important that each home have a semi-private space for a yard condition and then some more open "front yard" space. We would like to explore a landscape design that communicates the separation in a graceful and subtle manner. This could be achieved through the use of tree barriers and low maintenance buffer gardens. Fences should be minimized.
- The rotated split box scheme is widely preferred. However, the SCCLT made it clear that they wouldn't want to compromise the view for better solar or better parking.
- Excavation costs and surprises are a worry of the SCCLT, therefore it makes sense to pursue slab construction.

Storage:

- This is a re-occurring topic that we need to be sure we have addressed fully.
- Built in storage, such as the shelving by the stairs is nice, and there should be more of it. "People have STUFF" is a common comment, and we need to anticipate this need.
- Interior storage could be accommodated by accessible attic space.
- Exterior storage space is important as well. Lawnmowers, bikes, toys. Livability demands that we think of these homes for a real family.
- Slab construction is a consensus preferred option because of cost and constructibility. This takes away the option of basement storage, and that storage needs to be recouped elsewhere.

Interior:

- The concept of visitability was well received by the SCCLT and something we should peruse.
- Along the lines of visitability, aging in place is still important to include in at least one of the homes. For example it would be nice to have all the amenities on one floor, including laundry. Alternatively, in one home it might be nice to have the laundry in close proximity to the bedrooms
- On the first floor the open plan is great, however the line of site into the bathroom could be improved.
- Opinions on the kitchen plan are varied, many do see it important to keep the space open and inwardly focused, ie. not cooking into a wall. The island plan was well received and should be considered to be designed as a kitchen table/island to save on space and function.
- Bedrooms all on one level is nice, and the hobby space is nice for work.

Summary of comments from the SCCLT GreenBuild Committee Review:

A. Accessibility and Visitability: Homes do not need to be fully ADA compliant, but should provide features that allow for an individual's limited mobility needs and overall flexibility as needs, such as accommodating guests, and/or change of residents.

Suggestions include a single-step or ramp at the front door, adequate door widths (all doors), and all essential living amenities on one floor – including a full bathroom on that floor.

B. Split Plan or Single Structure: We definitely prefer the split plan (Split Boxes). We like the open front, side-by-side carports. We brainstormed carport options and want to pursue shelving along the back wall of the carport for storage. We suggest locked storage units at the back end of the carports that would be accessible via a door in the carport (perhaps from the backyard side as well), for things like lawn mowers and tools. We wondered if the roofs of the carports could be taller and sloped, allowing for loft or eave space above for additional storage. Also, we want both sides to be as identical as possible (both 2 stories, same finishes, etc.)

C. Curb Cuts: We prefer the parking options shown for the Split Box and prefer one curb cut of double width for the driveway. Permeable paving or brick was suggested for the extra parking (or turnaround) areas shown, with possibly more being used in the center of the driveway to show separation between individual driveways.

D. Bedrooms: We prefer 3 dedicated bedrooms plus the flex-space room that can be modified for individual needs.

E. Floor Plans: We are in favor of an open, bright floor plan, keeping in mind previously discussed concerns about restroom privacy and line of sight into restrooms from other areas.

F. Basement?: The consensus of the group was that we prefer slab construction. We continue to be concerned about excavation costs/issues, and would rather spend the money on the livable space itself and energy efficiency efforts.

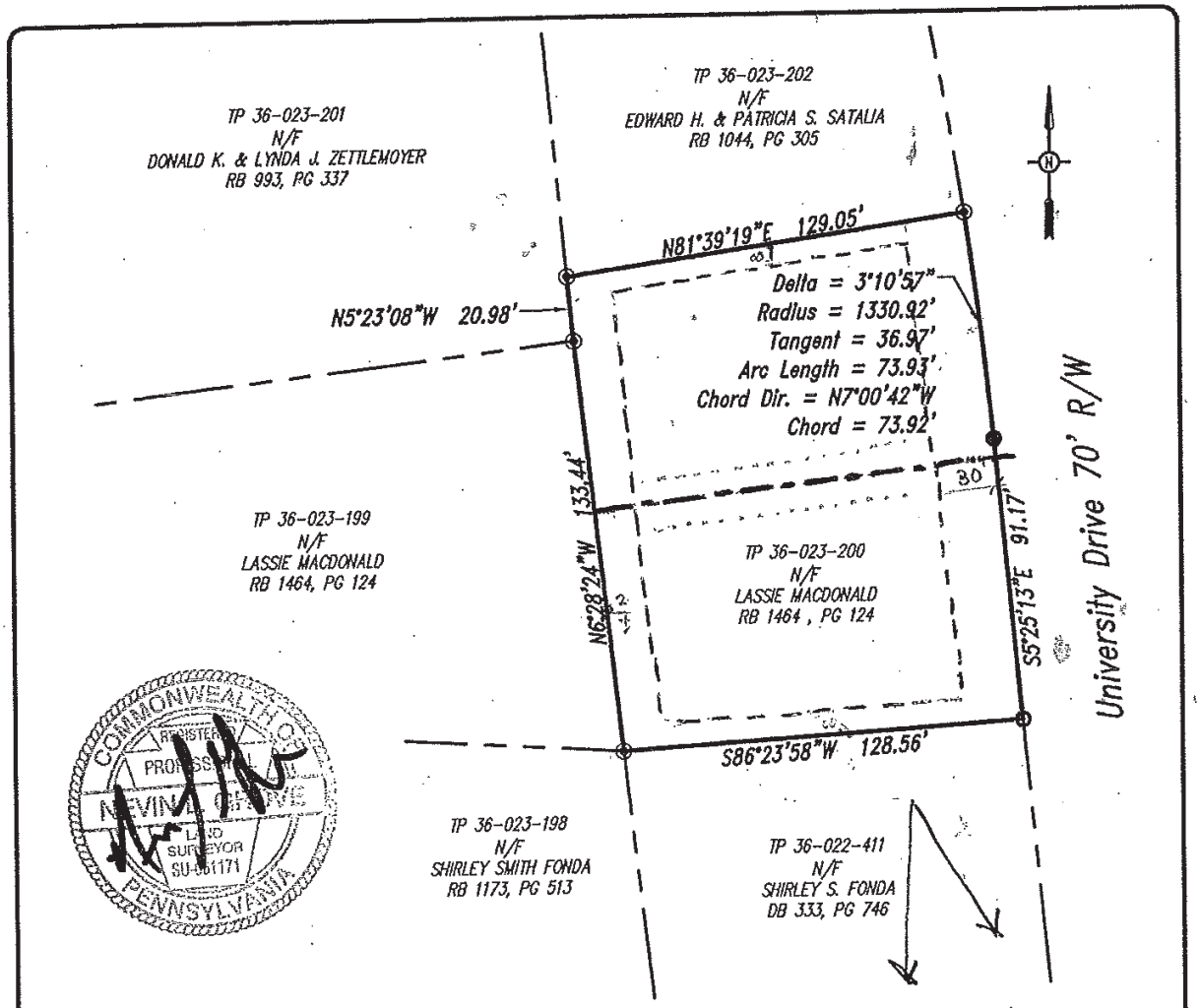
G. Split Box Plan Expansion: We understand the drawings we received 03/17 were preliminary, but we want to talk more about windows and fully utilizing passive solar. Other plans showed larger windows, and we want to get some window elements from other designs into the new design if possible. It was suggested we consider smaller, wider bedroom windows placed higher on the wall, ones that open if possible, to maximize floor space.

H. Lot Separation: We want each owner to feel they control their own space. If both homeowners agree to share common space (example: a garden), we want it to be voluntary and flexible, based on the current residents' needs and relationships. It was suggested we explore a visible division, possibly using trees or bushes in this manner. We do not want 'forced' shared space and prefer to let the residents decide how to use open space.

Design Checkpoint 3

Program and Goals:

Having narrowed down the design to a series of schemes this part of the design process focused mostly on site orientation, site design and parking options. With diagrams, drawings and physical models we were able to explore the various options while showing the SCCLT what impacts each decision would have on the overall outcome of design.



Project Notes:

1. General Site Information:

Owners of Record:	Lassie MacDonald 426 Homan Avenue State College, PA 16801
Tax Parcel No.:	36-23-200
Area:	0.475 Ac. , 20,703 S.F.
Deed Information:	Record Book 1464, Page 124

SURVEY FEATURES LEGEND

- Property Line
- Adjoining Property Line
- I.P. Found
- I.P. Set
- Point Computed
- SETBACKS

PennTerra ENGINEERING INC.
WWW.PENNTERRA.COM

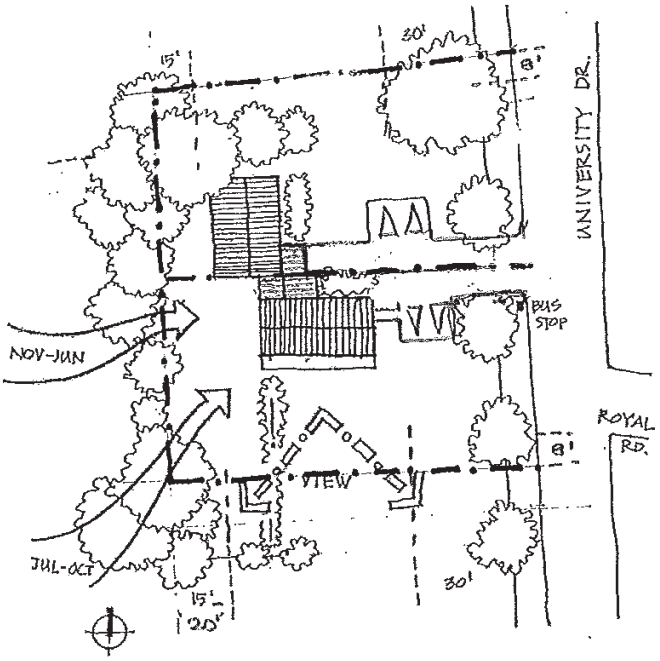
CENTRAL PENNSYLVANIA REGION OFFICE:
3075 ENTERPRISE DRIVE
SUITE 100
STATE COLLEGE, PA 16801
PH: 814-231-8285
Fax: 814-237-2308

TAX PARCEL 36-23-200
SURVEY EXHIBIT

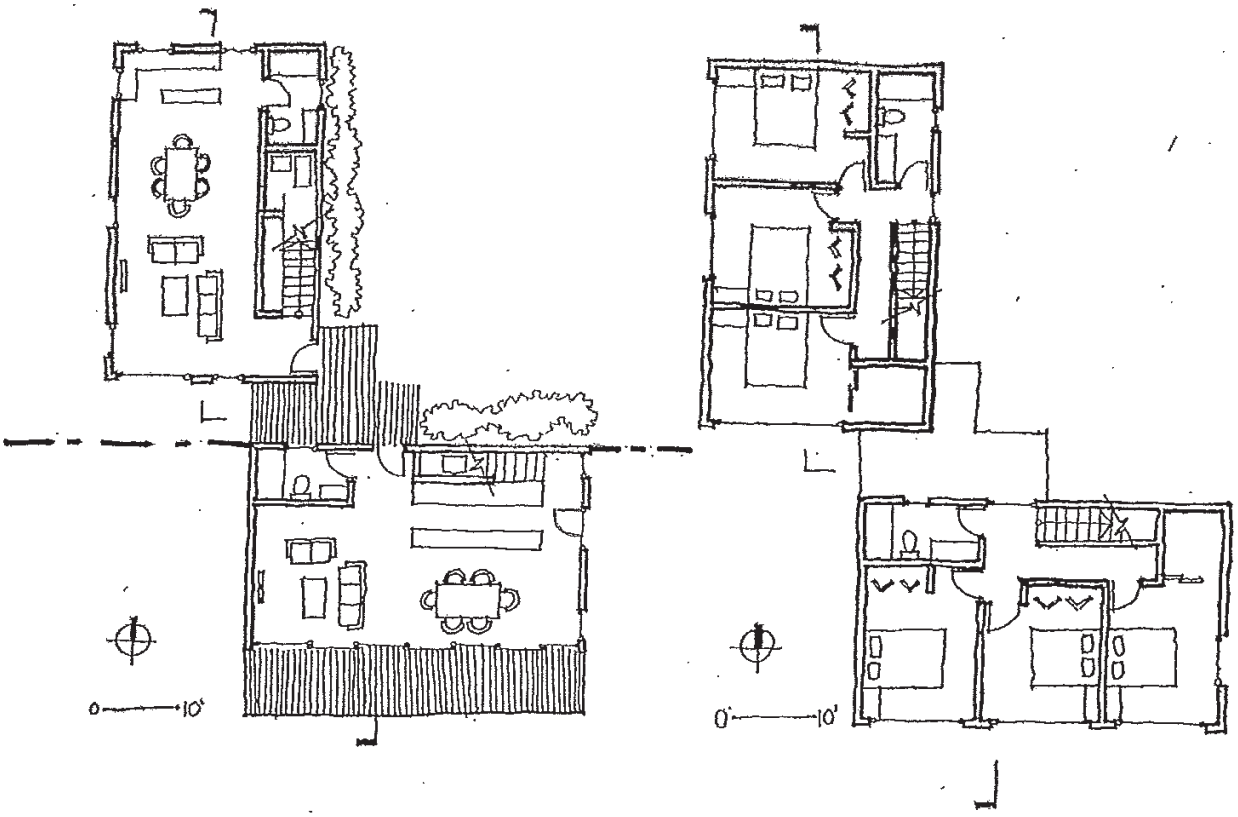
STATE COLLEGE BOROUGH * CENTRE COUNTY * PENNSYLVANIA

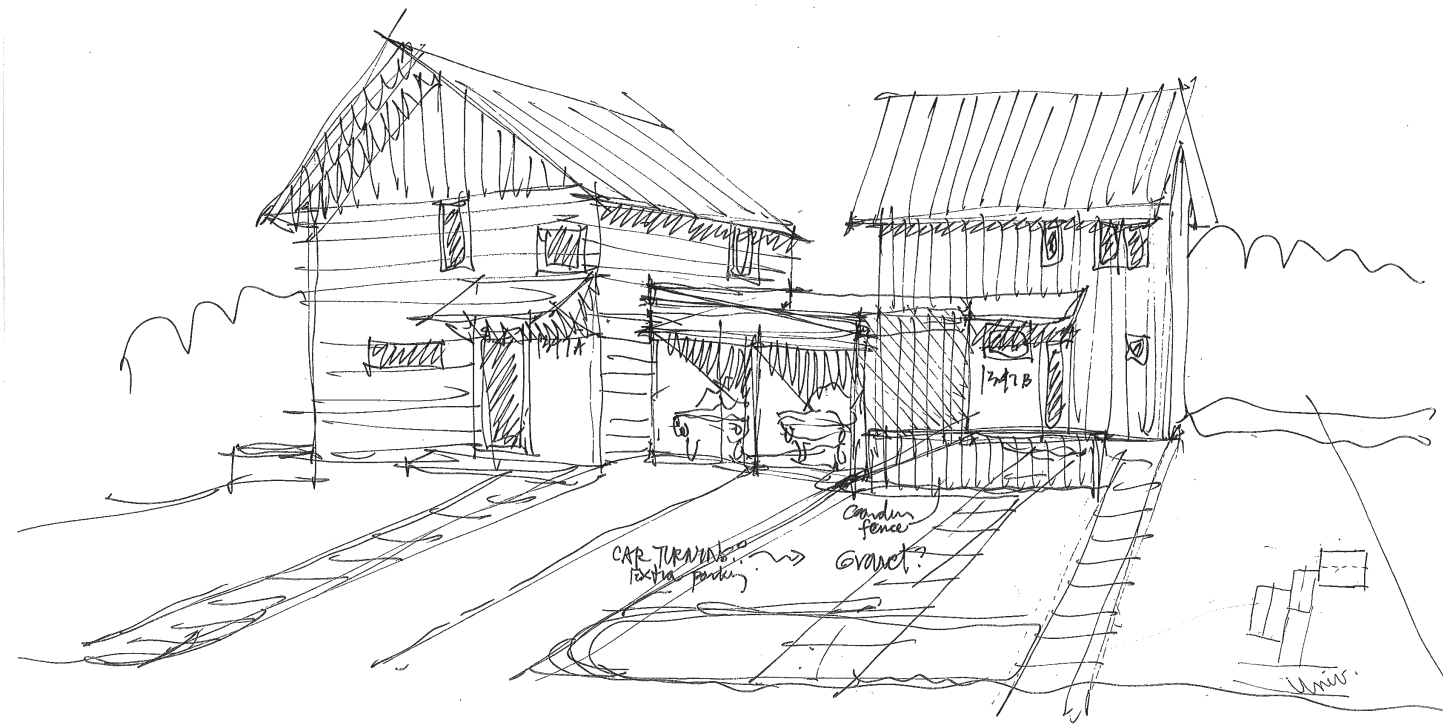
JANUARY 7, 2014

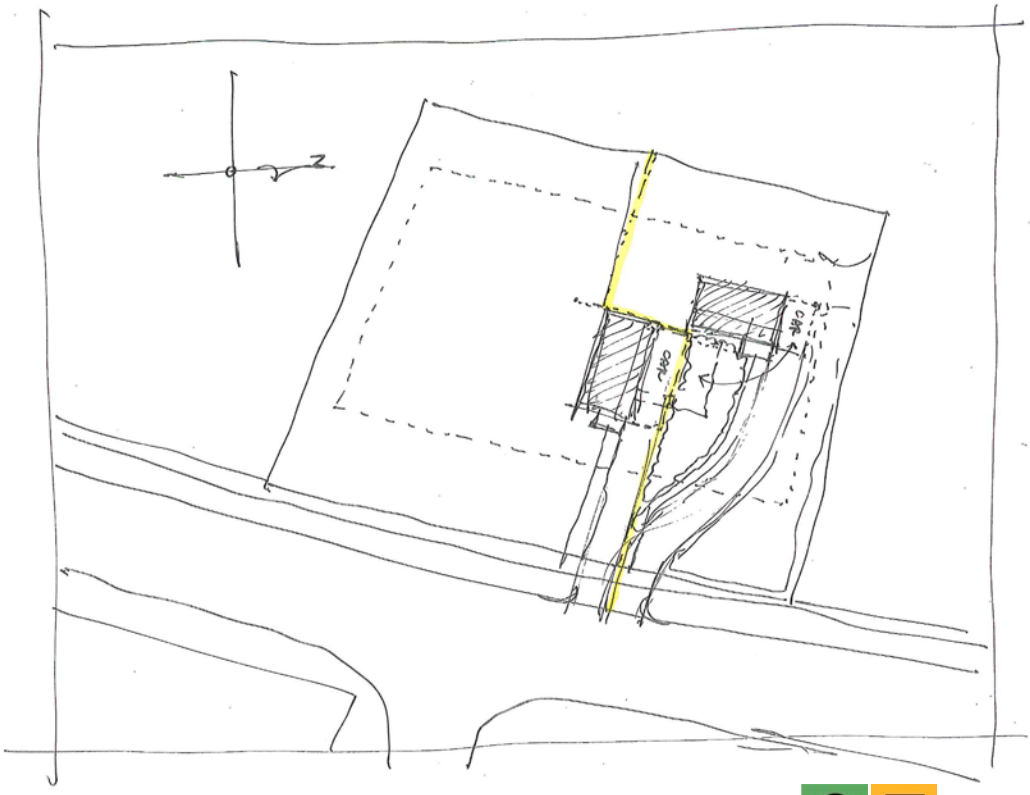
THE SPLIT BOXES

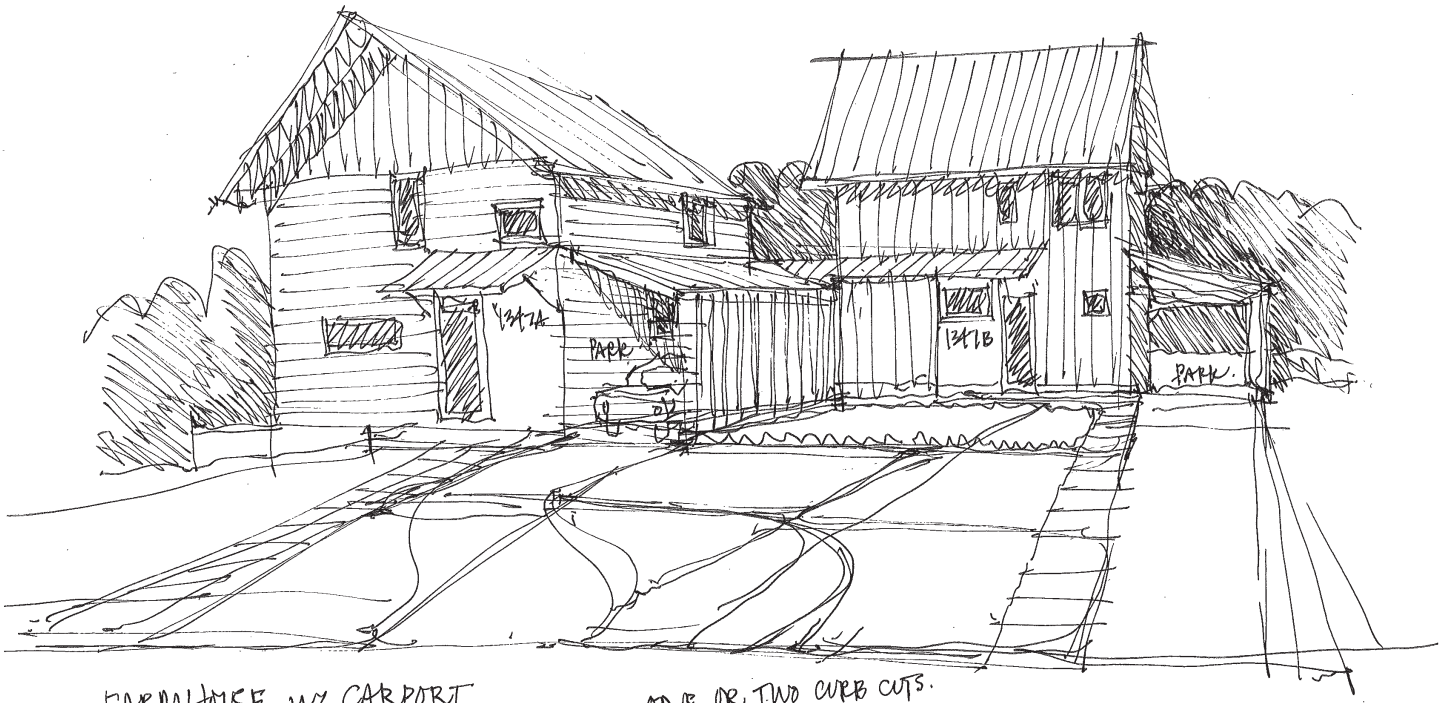


- EAST/WEST DIVISION OF PROPERTY — | to ROAD
- ALLOWS FOR VARIATION IN FLOOR PLANS | HOME LAYOUT, RELATING to TOPOGRAPHY, LIGHT & VIEWS
- SOLAR ORIENTATION & VIEWS OF NORTH UNIT MAY be limited.



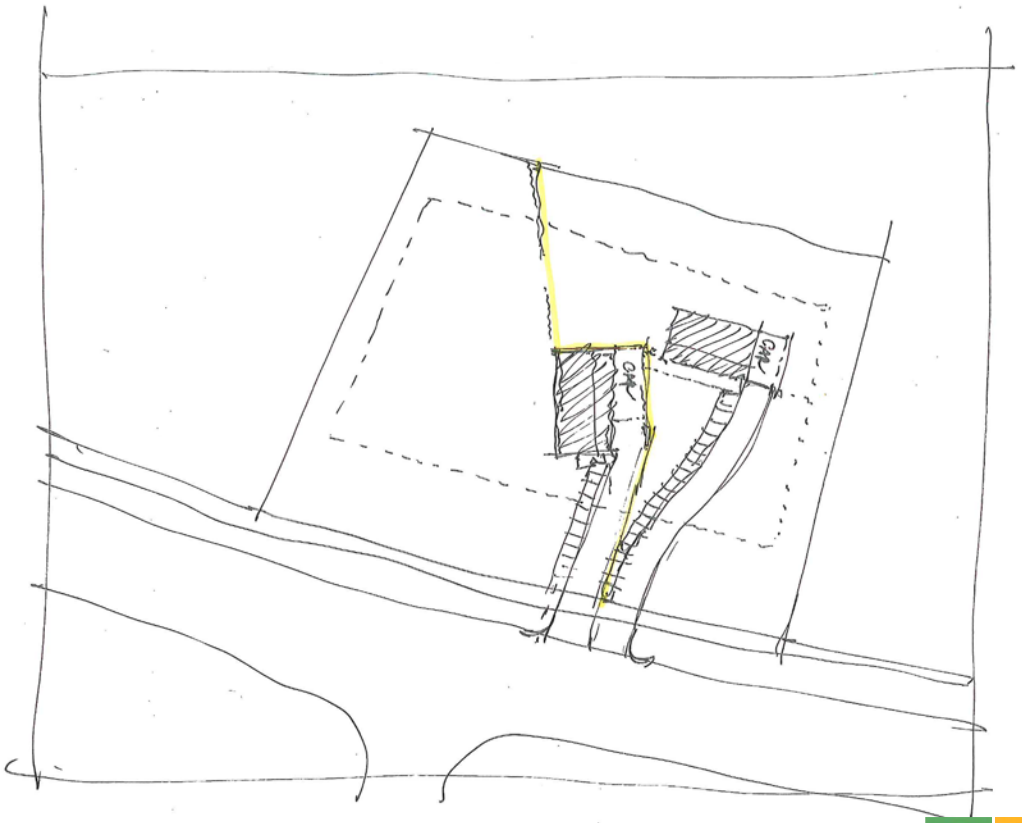

garden fence
gravel?

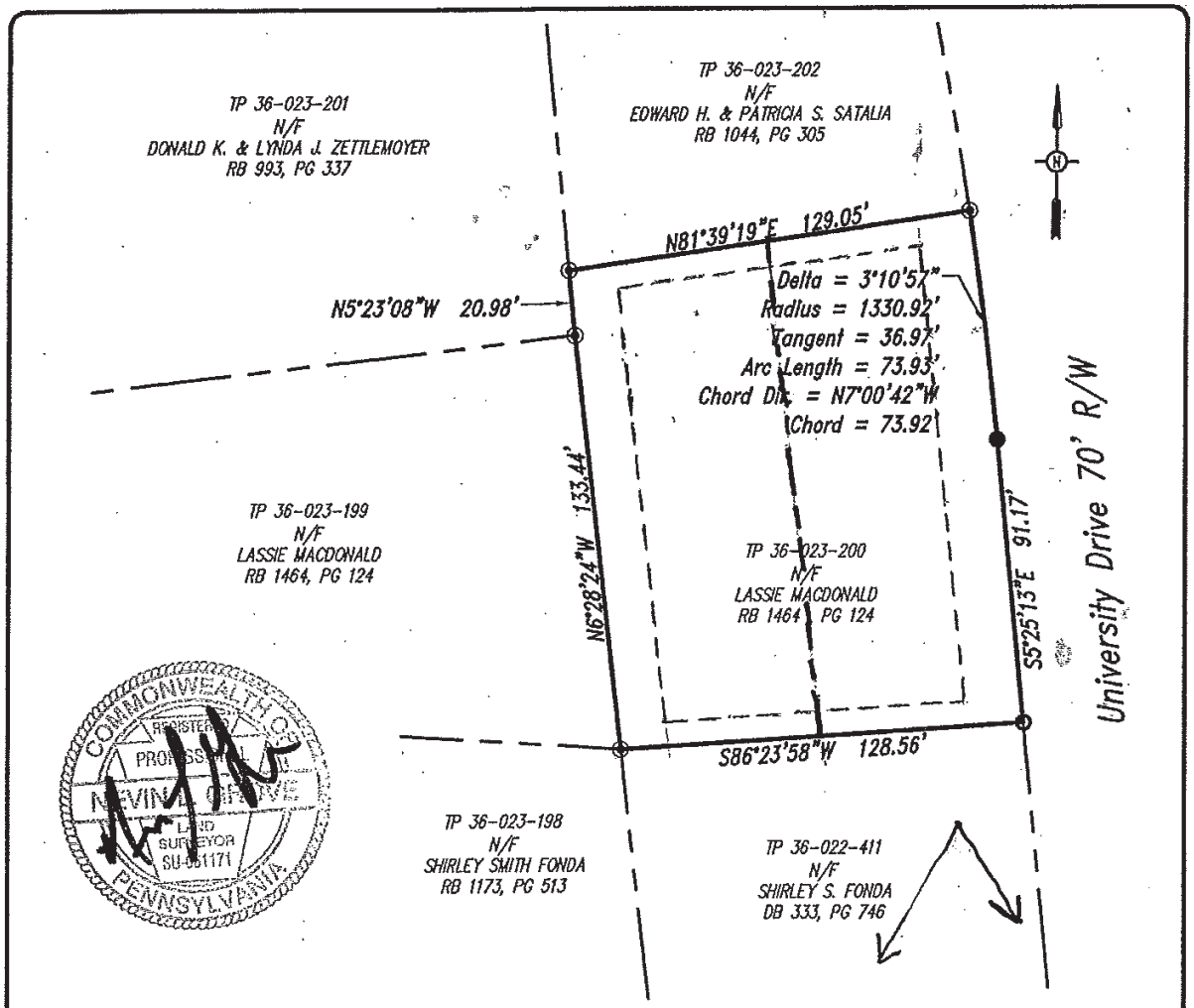




FARMHOUSE W/ CARPORT

ONE OR TWO CURB CUTS.





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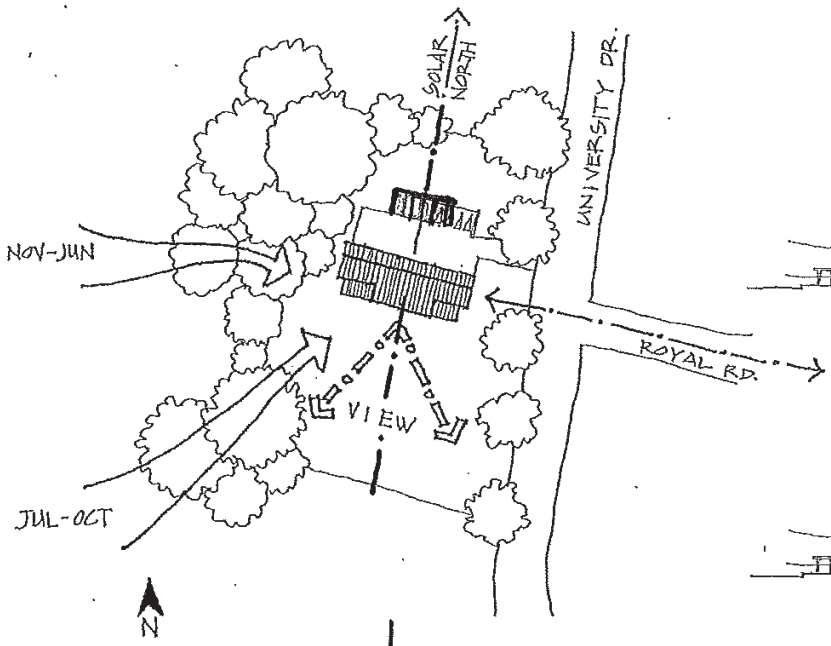
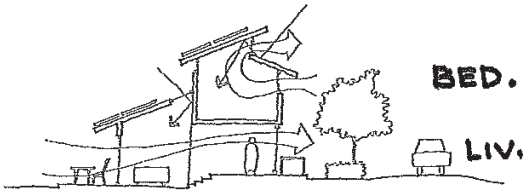
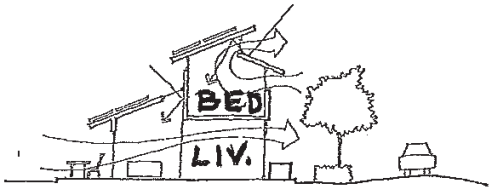
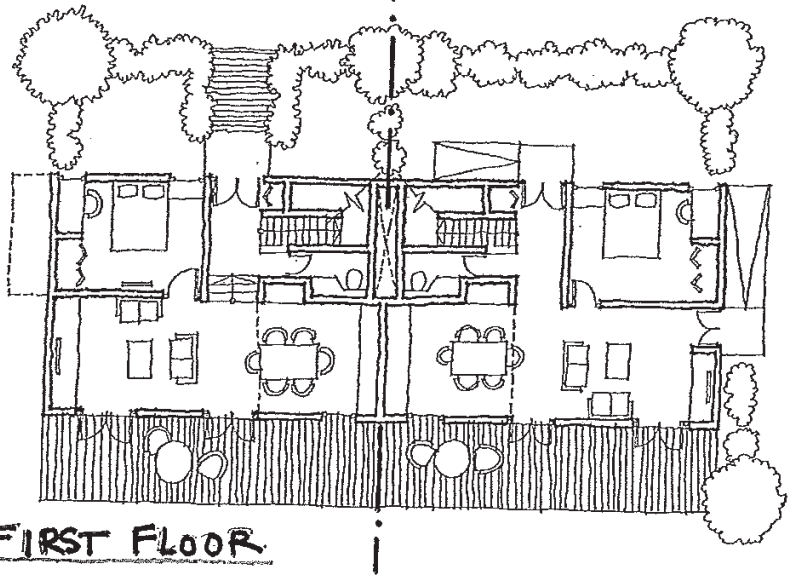
JANUARY 7, 2014

THE FARMHOUSE - 1

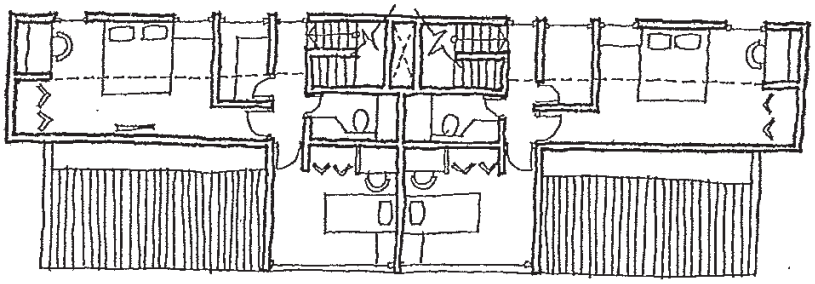








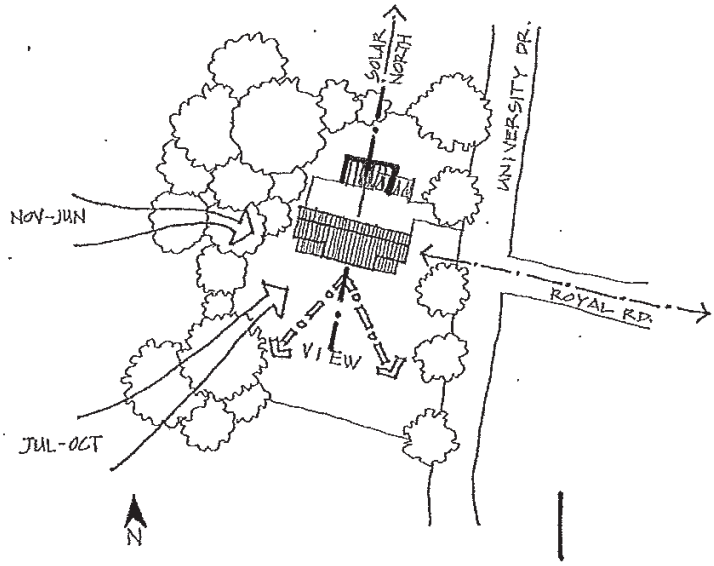
FIRST FLOOR

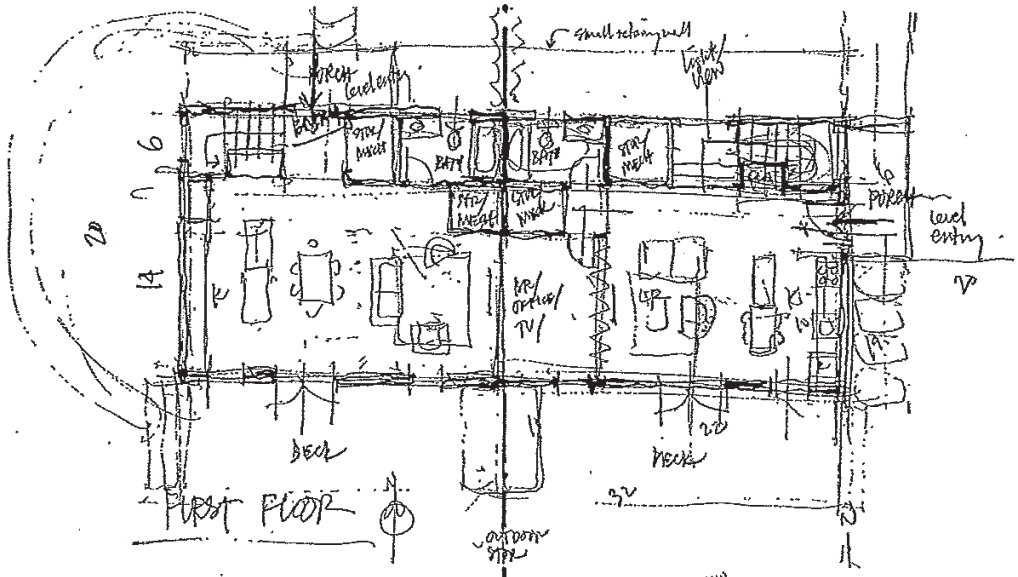


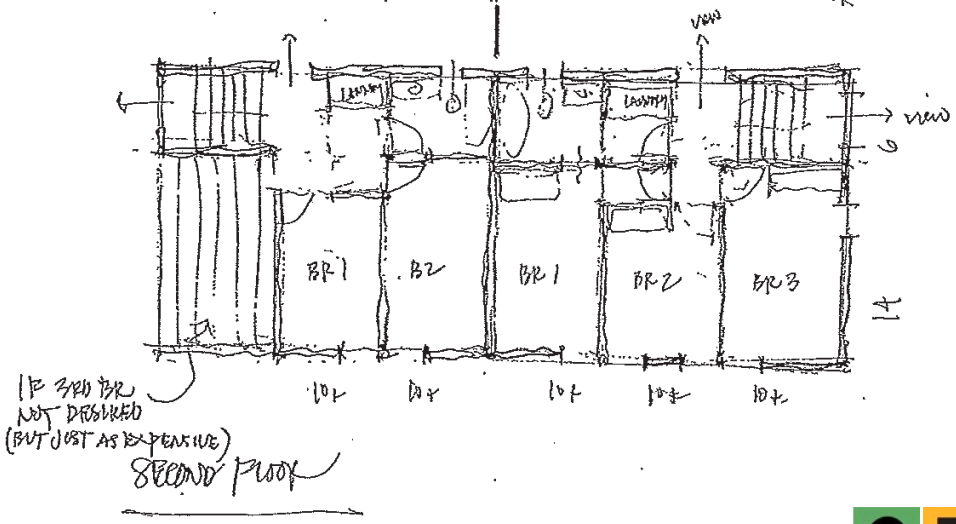
SECOND FLOOR

- NORTH/SOUTH DIVISION OF PROPERTY || to ROAD.
- SIMPLER OVERALL CONSTRUCTION
- MAY REQ. MORE EXTENSIVE SITEWORK
- EQUAL SOLAR orientation IN EACH UNIT

THE FARMHOUSE - 2

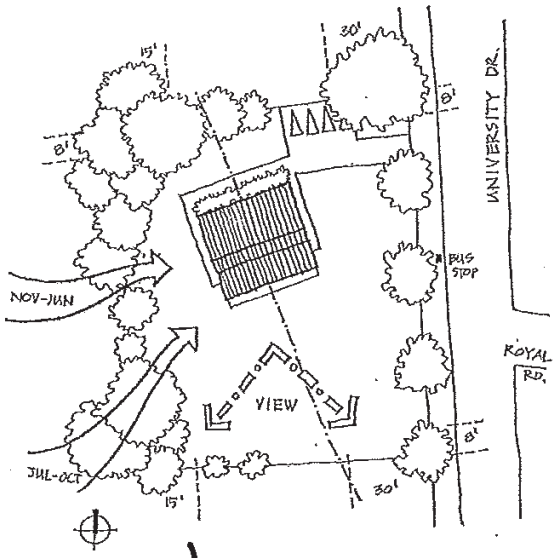


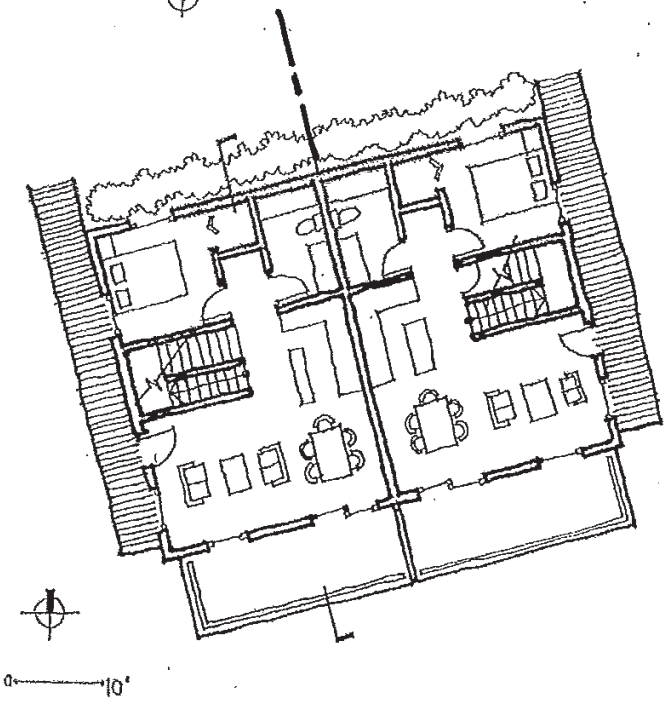


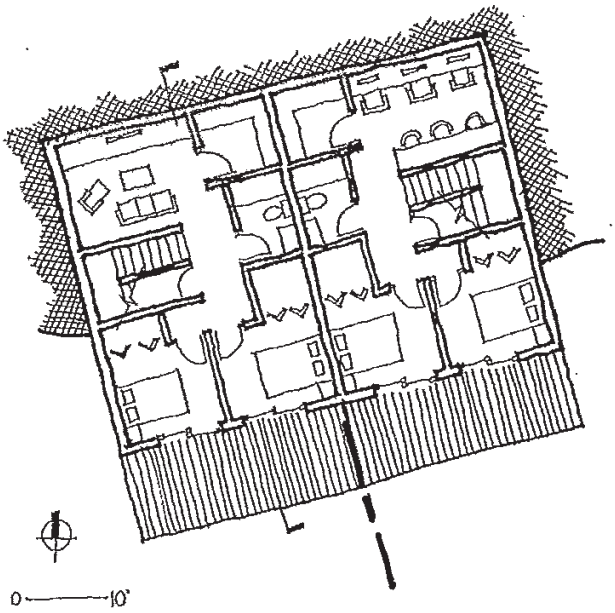


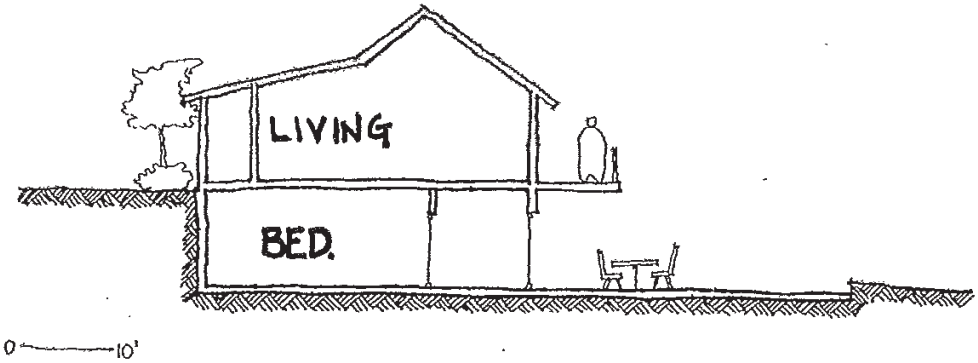
THE BANK BARN

- NORTH/SOUTH PROPERTY DIVISION || TO ROAD
- SHARED DRIVE & PARKING
- LESS EXPENSIVE (ALL FINISHED SPACE IS PROGRAM/LIVED)
- RELIES ON EXTENSIVE EXCAVATION & SUBCONDITION OF SITE.










PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
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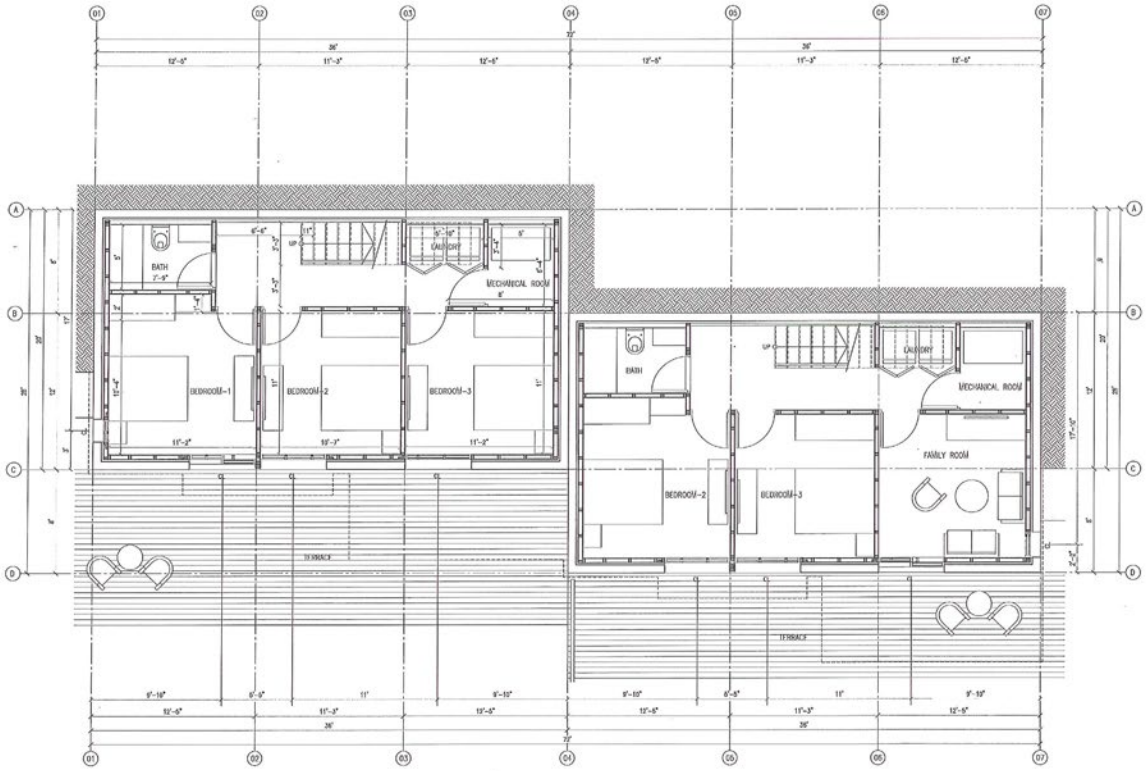
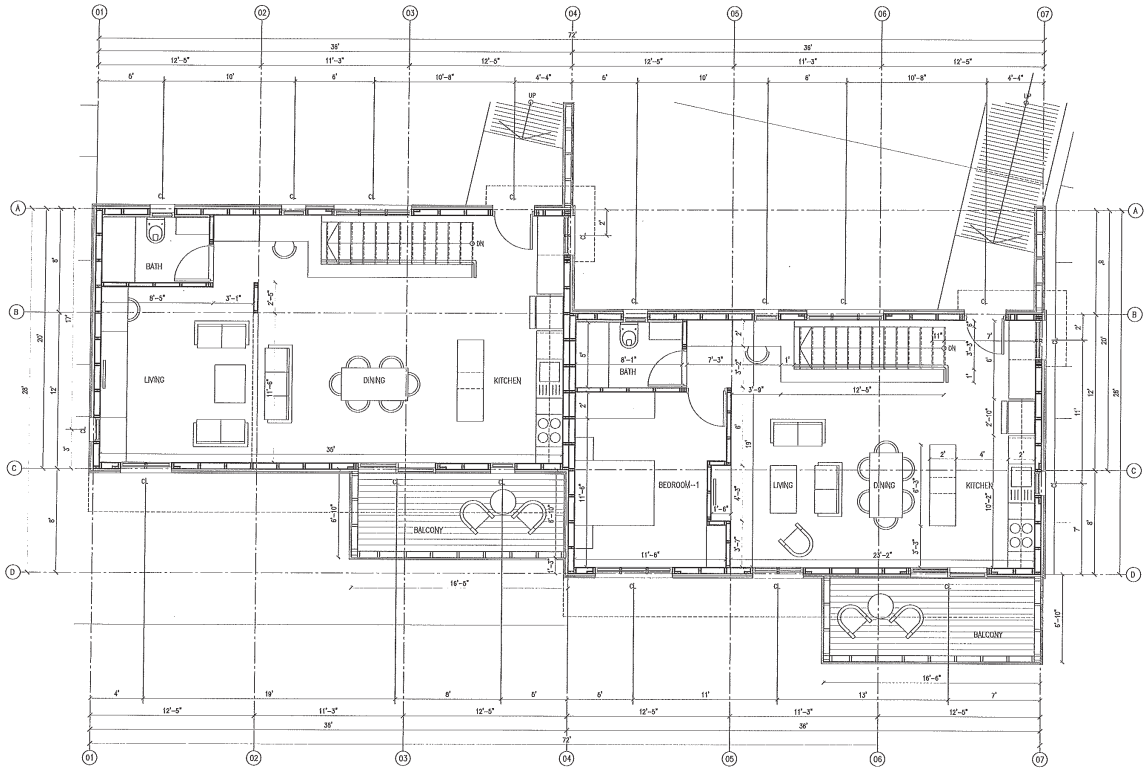

BATH
CALIFORNIA
MECHANICAL ROOM
BEDROOM-1
BEDROOM-2
BEDROOM-3
BATH
CALIFORNIA
MECHANICAL ROOM
FAMILY ROOM
BEDROOM-2
BEDROOM-3
TERRACE
TERRACE


BATH
LIVING
DINING
KITCHEN
BALCONY
BATH
BEDROOM-1
LIVING
DINING
KITCHEN
BALCONY

Tonight's Agenda

7:00 - 7:30	01 // Overview of the DOE Race to Zero Competition
7:30 - 7:50	02 // Design Schemes presentation
7:50 - 8:00	03 // Question and Answer Session
8:00 - 8:30	04 // Pin Up sessions
8:30 - 9:00	05 // Wrap up talk and feedback session

// Tonight's Goals

Design Decisions to choose:

- Parking
- Farmhouse / Bank barn combinations
- Kitchen Layout
- Facade Design
- Laundry Location
- Entry

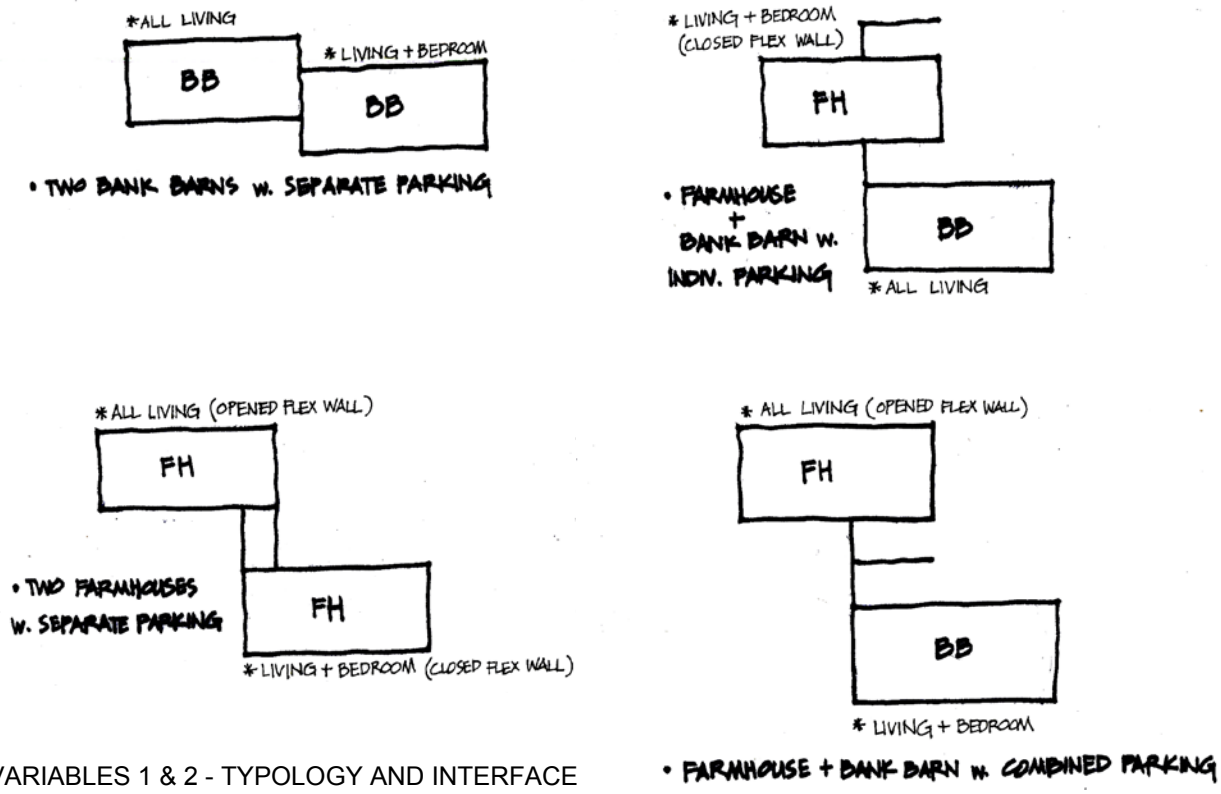
Future Evaluation Tools

tally®

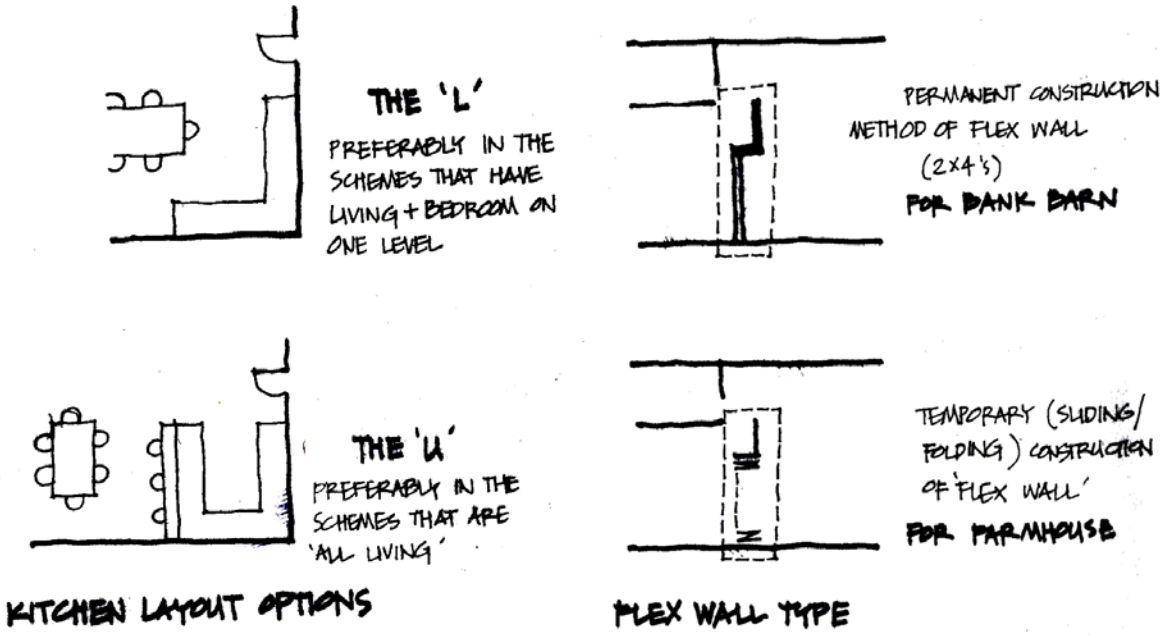
Tally is comprehensive software which can be used in conjunction with the Revit models to calculate the environmental impacts of the building in the form of Life cycle analysis.

Revit

Revit models are being developed for future use. They document detailed information about the construction and design of the duplex.

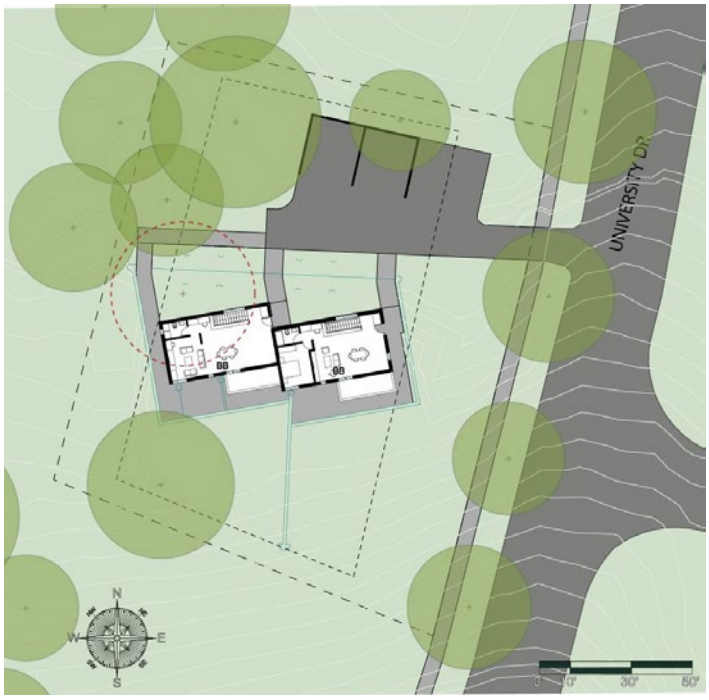


VARIABLES 1 & 2 - TYPOLOGY AND INTERFACE



VARIABLES 3 & 4 - KITCHEN LAYOUTS AND 'FLEX WALL' TYPE

Option 1 Site Plan



> Competition Home // Bankbarn-Bankbarn

Pros:

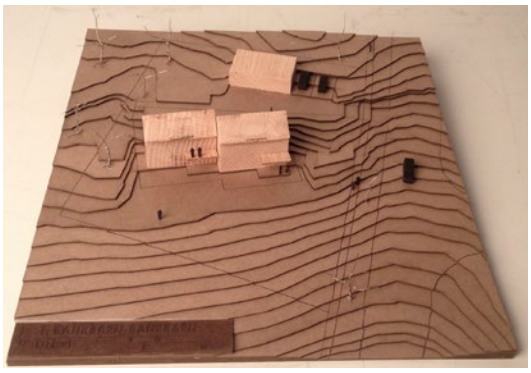
Best view for each home

Best for passive solar

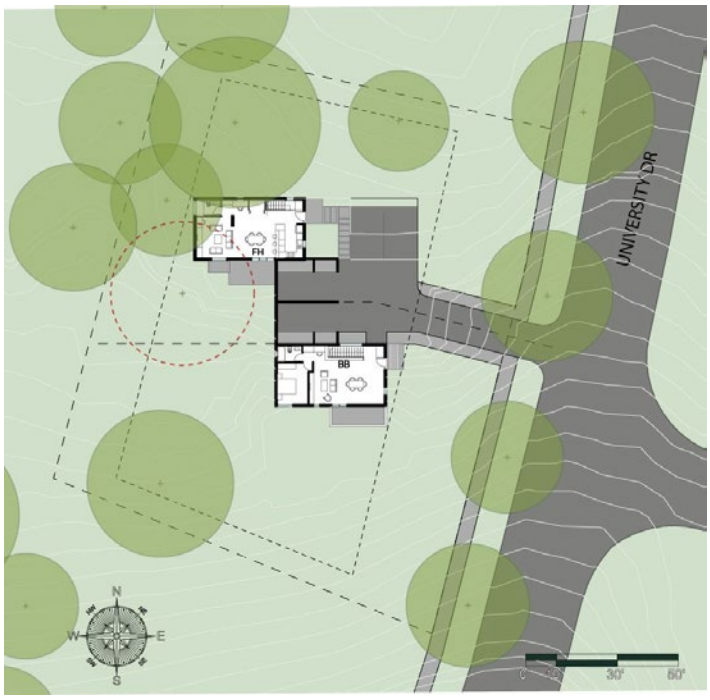
Cons:

No attached parking

West Bankbarn doesn't have a window in the kitchen.



Option 2 Site Plan



> Farmhouse Bankbarn 2 Carport Between

Pros:

Attached parking for each unit

Flexible property division

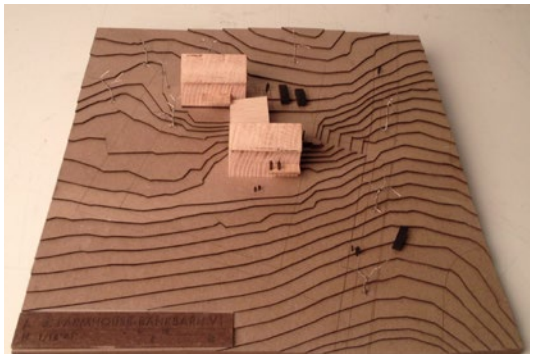
Better street presence for west home

Cons:

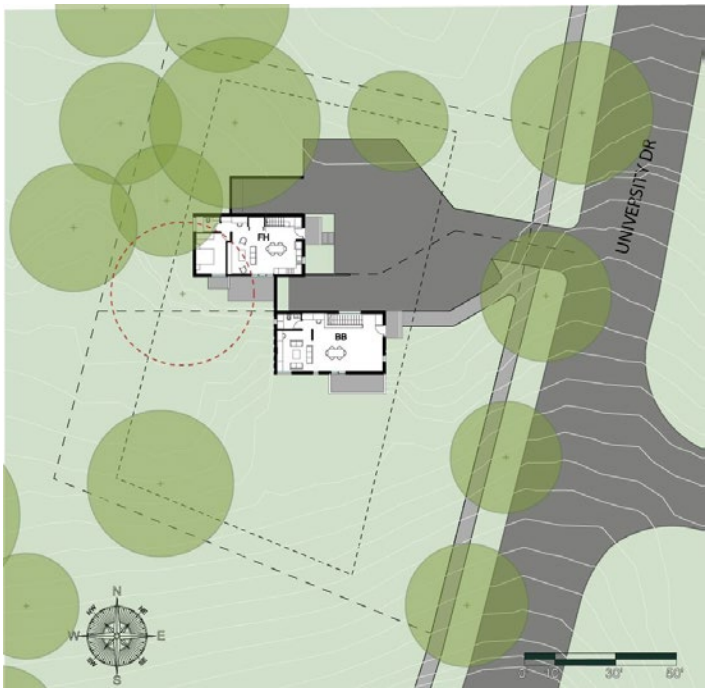
The carport is prominent

Back unit has a reduced view on the first floor

Driveway grading is significant unless the driveway is split into two levels



Option 3 Site Plan



> Farmhouse Bankbarn 1 Carport Between

Pros:

Attached parking for each unit

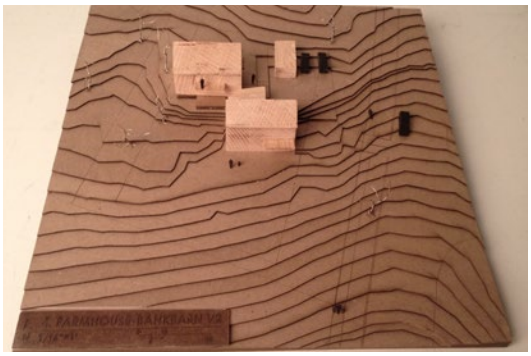
Flexible property division

Better street presence for west home

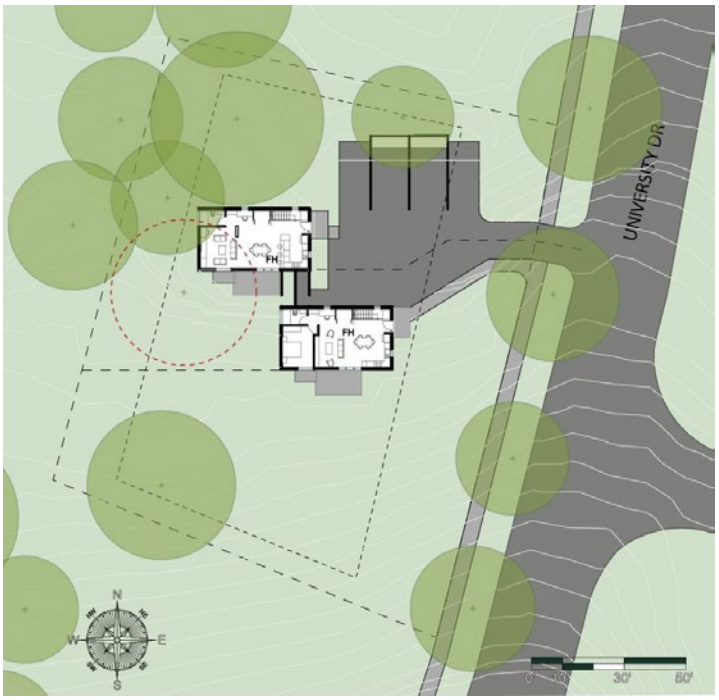
Cons:

Back unit has a reduced view on the first floor

Not as easy for a car to get out



Option 4 Site Plan



> Farmhouse Farmhouse

Pros:

Flexible property division

Slab on grade construction reduces cost

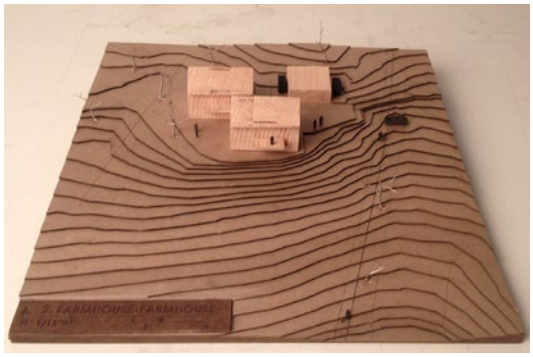
Better street presence for west home

Cons:

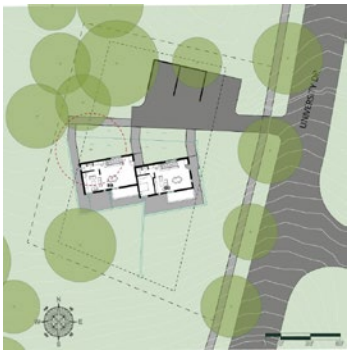
No attached parking

Back unit has a reduced view on the first floor

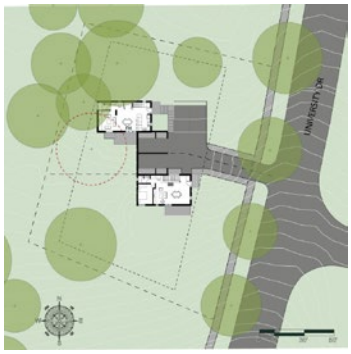
Significant grading



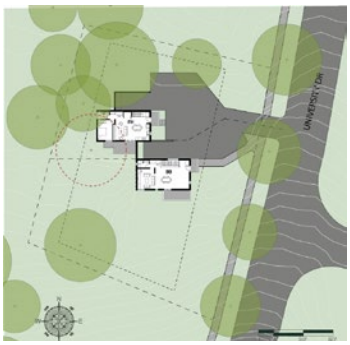
4 Site Plan Options



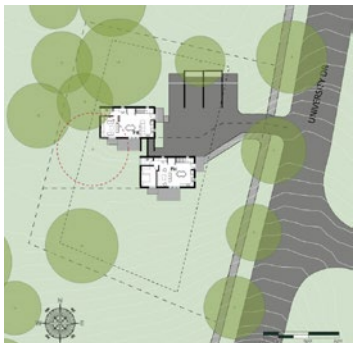
Bank Barn / Bank Barn



Farm House / Bank Barn



Farm House / Bank Barn



Farm House / Farm House

Farmhouse Living Space Interior Schemes

Farmhouse- Living with bedroom interior

Farmhouse- Flex wall living interior

Farmhouse Kitchen Space Interior Schemes

Farmhouse- Kitchen with bedroom interior

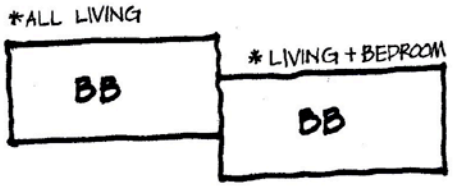
Farmhouse- Kitchen with flex wall interior

Bank Barn Living Space Interior Schemes

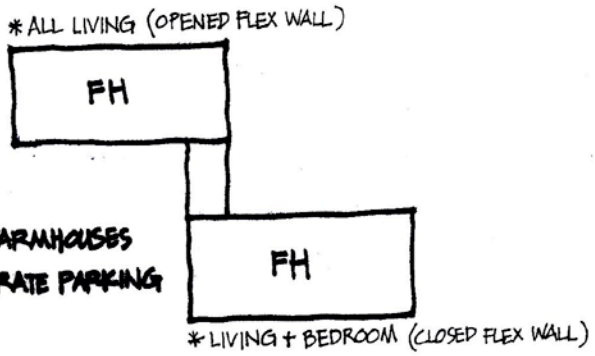
Bank Barn- Kitchen with bedroom interior

Bank Barn- Living with bedroom interior

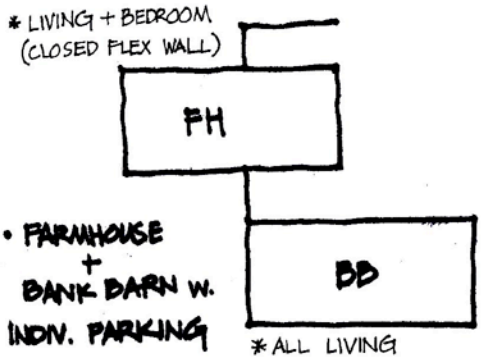
> Schemes Handout



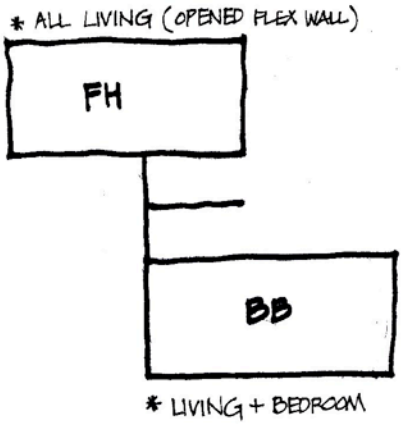
• TWO BANK BARNS W. SEPARATE PARKING



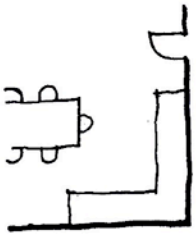
• TWO FARMHOUSES W. SEPARATE PARKING



• FARMHOUSE + BANK BARN W. INDIV. PARKING

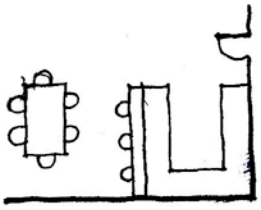


• FARMHOUSE + BANK BARN W. COMBINED PARKING



THE 'L'

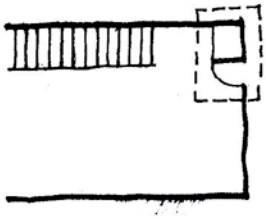
PREFERABLY IN THE SCHEMES THAT HAVE LIVING + BEDROOM ON ONE LEVEL



THE 'U'

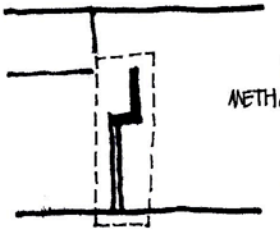
PREFERABLY IN THE SCHEMES THAT ARE 'ALL LIVING'

KITCHEN LAYOUT OPTIONS

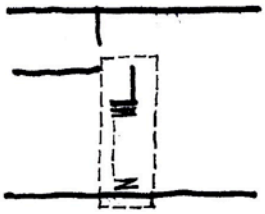


ENTRY + COAT CLOSET LOCATION DOES NOT CHANGE IN ANY OF THE FOUR SCHEMES

ENTRY LOCATION



PERMANENT CONSTRUCTION METHOD OF FLEX WALL (2x4's) FOR BANK BARN



TEMPORARY (SLIDING/FOLDING) CONSTRUCTION OF 'FLEX WALL' FOR FARMHOUSE

FLEX WALL TYPE

Race to Zero D.O.E. Competition

For competition design details please consult Volume I and Volume II of the submission.

Charrette #3 – GreenBuild Committee – Living and Landscape

May 5th, 2015

Attendance

Scott Wing; Penn State Architecture

Lisa Iulo; EEHR – Penn State Architecture

Susan Venegoni; SCCLT

Ron Filippelli; SCCLT

Polly Dunn; SCCLT

Sue Hiester; SCCLT

Peg Hambrick; SCCLT

Colleen Ritter; SCCLT

Kyle Macht; Penn State Architecture Student

Chauntel Duriez; Penn State Architecture Student

Charrette Intent: Moving forward, after the Race-to-Zero competition, the class continued to involve the community and the client, the State College Community Land Trust. At the final design charrette of the semester, the team presented their DOE Race-to Zero Competition presentation along with four schemes for the duplex. These schemes showcased pivotal feedback from previous charrettes and summarized how design decisions affect the homes. With attention paid to each scheme, the group was able to make important choices and find more avenues to explore. Special attention was given to the development of scheme 2 focusing on major concerns including parking, storage, privacy and individuality. Guests were invited to review the teams competition submission booklet, story and future goals and to leave comments in a guest book.

Schedule:

7:00 - Overview of the DOE Race to Zero Competition

7:30 - Design Schemes presentation

7:50 - Question and Answer Session

8:00 - Pin Up Sessions

8:30 - Wrap up and feedback session

This community centered charrette was held after the team had competed in the DOE Race to Zero competition in Golden, Colorado. To begin the meeting the team gave a recap presentation of the competition information. They additionally reported on the results of the competition and what was gained from the experience. These presentations are not pictured in this document. However, the information was reproduced to create an exhibit of the competition and the posters were displayed at this charrette before being placed in a public exhibit in the lobby of the Stuckeman Family building. These posters are included following the charrette overview. The information, although a recap, was important to have available to ensure an informed charrette group and community.

Next the team moved on to presentations regarding four distinct schemes. The presentation that follows cataloged these schemes as well as told the story of how they were derived and what the next steps would be. Labeled 1-4 the team was able to describe each option along with the pros and cons of each option.

After the more formal presentations, the schemes were pinned up on the walls so that individuals could take time to understand and consider each scheme.

After some time was taken to discuss the options in small groups, the cohort came back together to share feedback. The group voiced their opinions about the pros and cons of each. All points were discussed and are recorded in the break-out session notes that follow.

Break-out Sessions // Feedback

General:

-Bank Barn / Farmhouse – one of each combo, provides variation, best of both worlds.

-This approach could cater to various ages, addressing aging in place (south unit) and younger family (north)

-Separation between homes, sectional shift, and options for attached and separate carports provides variation and ways of creating individuality between the two units of the duplex

-The more variables we offer the better we can market the homes to a larger audience

-Preference for Options # 3 and #4 (single carport between the two units) was expressed

Parking :

-Shared driveway with split parking; left or right division

-East/west property division

-2 driveways possible? > No, only one curb cut allowed

-Direct covered access to house from detached carport?

-Two doors unnecessary.

-Proximity of parking important

-Turn-around in driveway important

-"We don't live in the driveway"

-Perception of separation in Scheme #3 is great

-Parking closer makes it a home not student housing.

-Driveway sharing should be minimized.

Comments about Preferred Options:

Scheme #4

-Duplex is obscured by the carport

-Could driveway be gravel instead of paving?

-Green space in front of duplex could ease visual distinction?

-Variation with carport detached?

Scheme #3

-Carport central, common space

-Too much sharing?

- Consider attic for storage

-North / South vs. East / West property divide, can be applied to any scheme.

Break-out Sessions // Images

Critical Conclusions

Preferences:

- Compromises have become a way to offer options. For example incorporating one scheme of both Bank Barn and Farmhouse, and combining the parking layouts of scheme #3 and #4. Providing slight variation between units allows the SCCLT to cater to multiple types of homeowners demographically and in various stages of life.
- The more variables we can offer the better, as we can market to a larger audience.
- Individuality is very important to maintain to fight the stigma of both "duplex"and "affordable housing"

Parking:

- Separation in scheme #3 is great, driveway sharing should be minimized yet it has been said "we don't live in the driveway"
- Since a complete separation (two driveways) is not possible there will be some sharing based on constraints. It is in our best interests to make the shared area as manageable as possible.
- Car maneuverability is important for the driveway as the driveway will back out onto University Drive, quite a busy road. Car turn-a-rounds are ideal and must be carefully considered within the allowable lot coverage on the site.
- Parking closer to the homes gives the look of a home, not student housing. A compromise for some parking close and some further away makes the best compromise.

Design Checkpoint 4 – Exhibit

// Our Client

State College Community Land Trust

> "What is the point of buying your own home, if you cant afford to live in it?"
> –Peg Hambrick Board Member of SCCLT

Private, nonprofit, community-based organization.

Formed in 1996 at the request of State College Borough.

Focus is on buying, rehabilitating, and selling houses.

Over 30 households

Acquires properties through donation or purchase.

Separates ownership of the land from the home.

Images and Information: http://www.scclandtrust.org/our_mission/SCCLT_overview_presentation.pdf

> Program Goals

Design and build a moderately priced, owner-occupied duplex utilizing advanced and long-term cost-effective green technology.

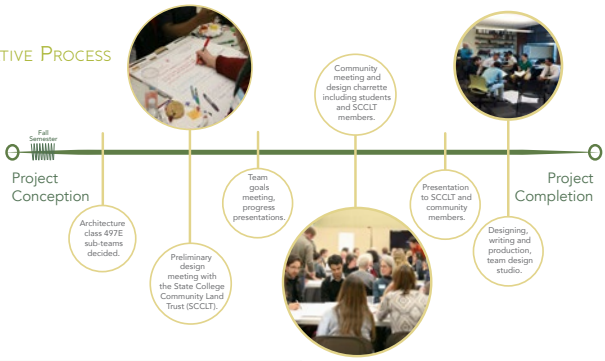
Develop a sustainable project "using best practices to create lasting environmental, economic, community and organizational vitality."

The Duplex:

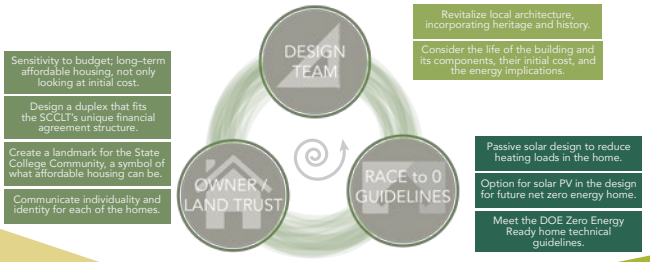
2 Units, 3 Bedrooms, 1.5 baths with approximately 1250 square feet of living space in each unit.

// Our Team

// Our Integrative Process



> "Engage Everybody Early on Everything"



Heritage Homes:

High Performance Living in Harmony with Community

//H4 Design Summary

Project Data

- Location: 1394 University Drive, State College, PA 16801
- Climate Zone: 5
- Square Footage: 1,440 ft2 per duplex (2,880 ft2 total)
- Number of bedrooms: 3 per duplex
- Number of bathrooms: 2 full bathrooms per duplex
- Number of stories: 1 story with full basement per duplex
- Estimated monthly energy cost without PV: $78.96 @ $0.12 per kWh
- Estimated monthly energy cost with PV: - $1.70 @ $0.12 per kWh

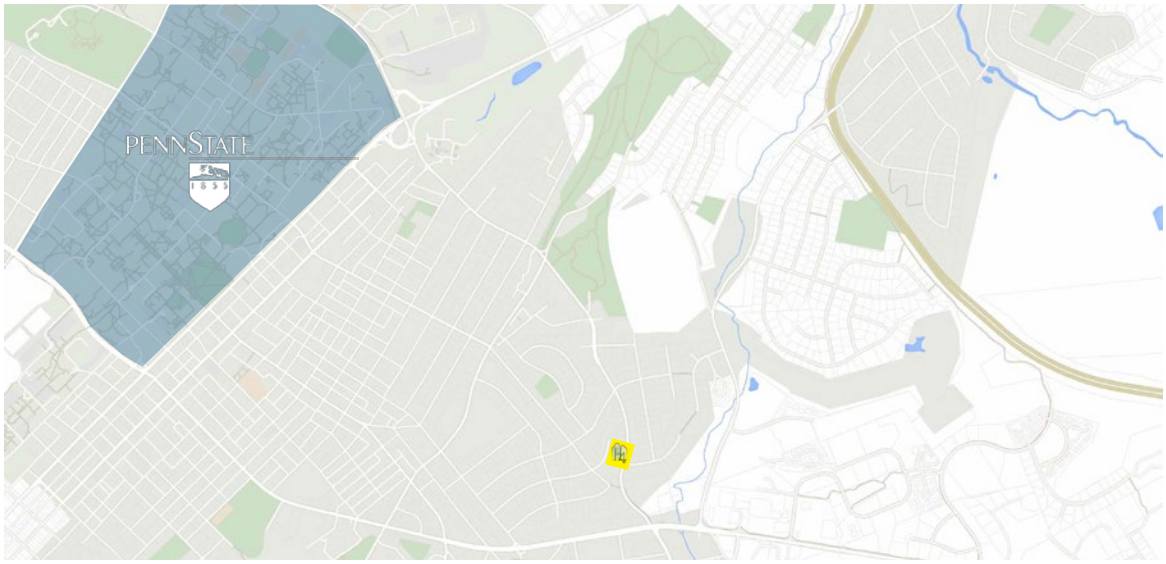
Technical Specifications

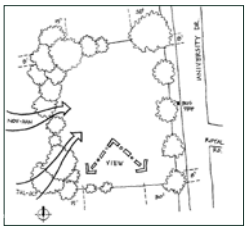
- Wall Effective R-value =29
- Foundation Wall Effective R-Value = 23
- Slab Insulation = R-10
- Roof Insulation = R-60
- Window Performance
  - South & East Windows: U=0.29, SHGC=0.500
  - North & West Windows: U=0.24, SHGC = 0.260
- HVAC specifications
  - Heating/Cooling/Ventilation:
  - Basement and First Floor Bdroom: (1) ¾ ton, 24 SEER, 13 HSPF ducted Mini Split Heat Pump,

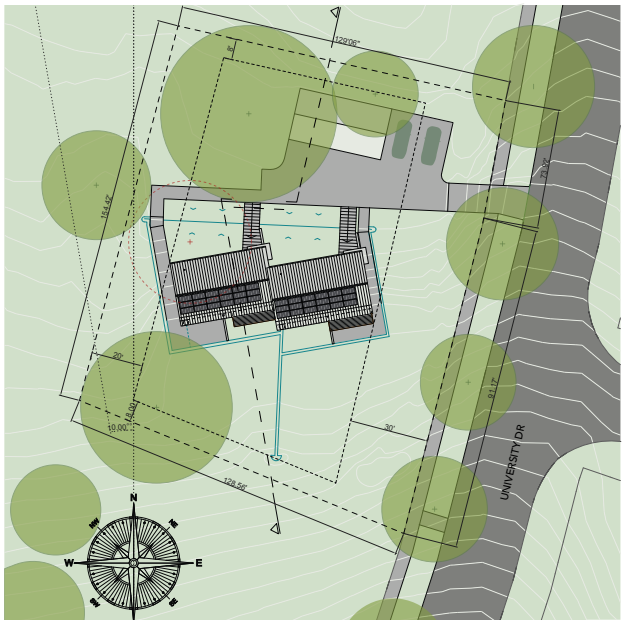
RACE TO ZERO
U.S. DEPARTMENT OF ENERGY
2015 STUDENT DESIGN COMPETITION

// Site Specific

1394 University Drive, State College, PA 16801

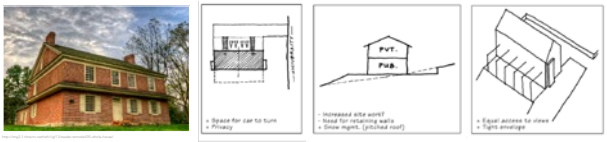






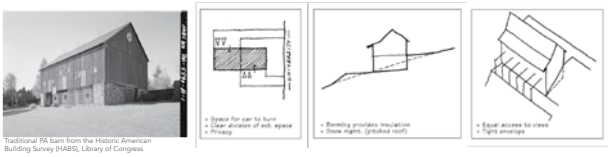
// Heritage Precedents

The "Pennsylvania Farmhouse"



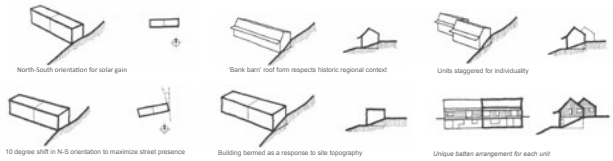
http://cargo.2.1.shares.market.lg7.2/media/remodel/25-sticky-house

The "Bank Barn"



Traditional PA barn from the Historic American Building Survey (HABS), Library of Congress

// Initial Design Moves



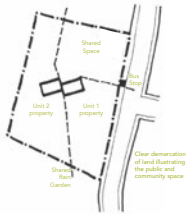
// Visual Preference Survey

Most Preferred Choices

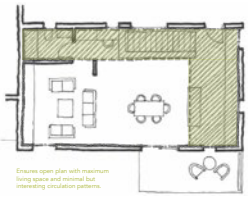
Building form // Bank Barn | Interiors // Rustic Modern | Exterior // Board and Batten

View of duplex from main site entry

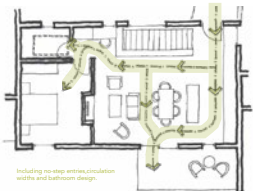
// Competition Design



^ Site

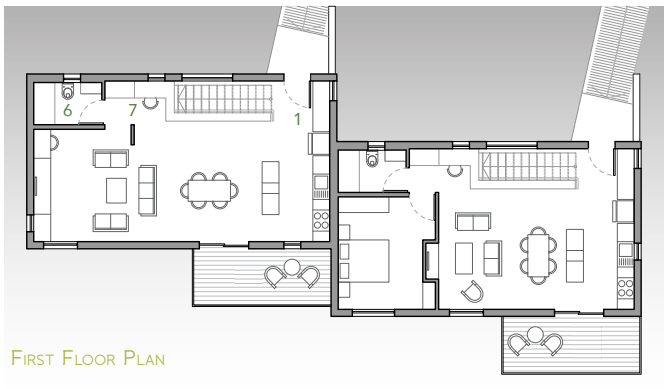


^ Service and Living Zones

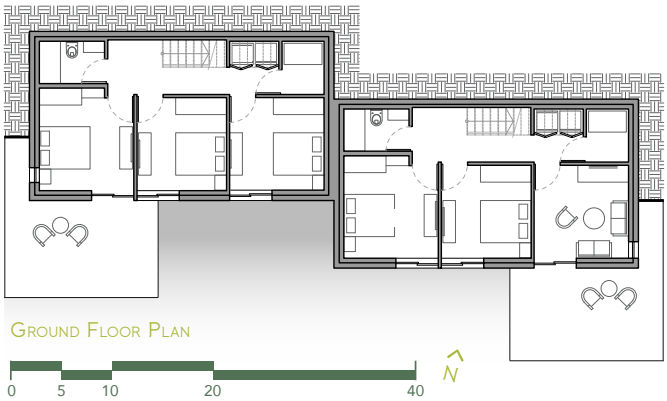


^ Visitability

^ Designed Flexibility

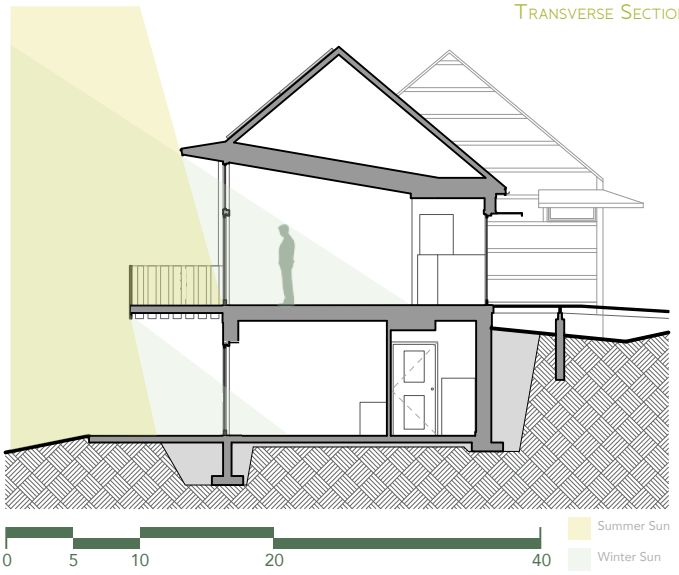


First Floor Plan



Ground Floor Plan

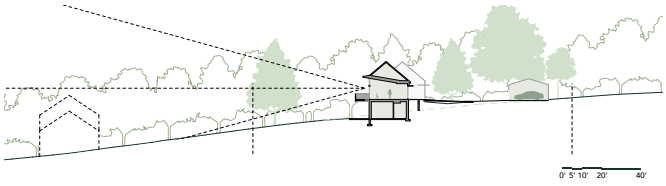
View of duplex from main yard, looking north



Transverse Section

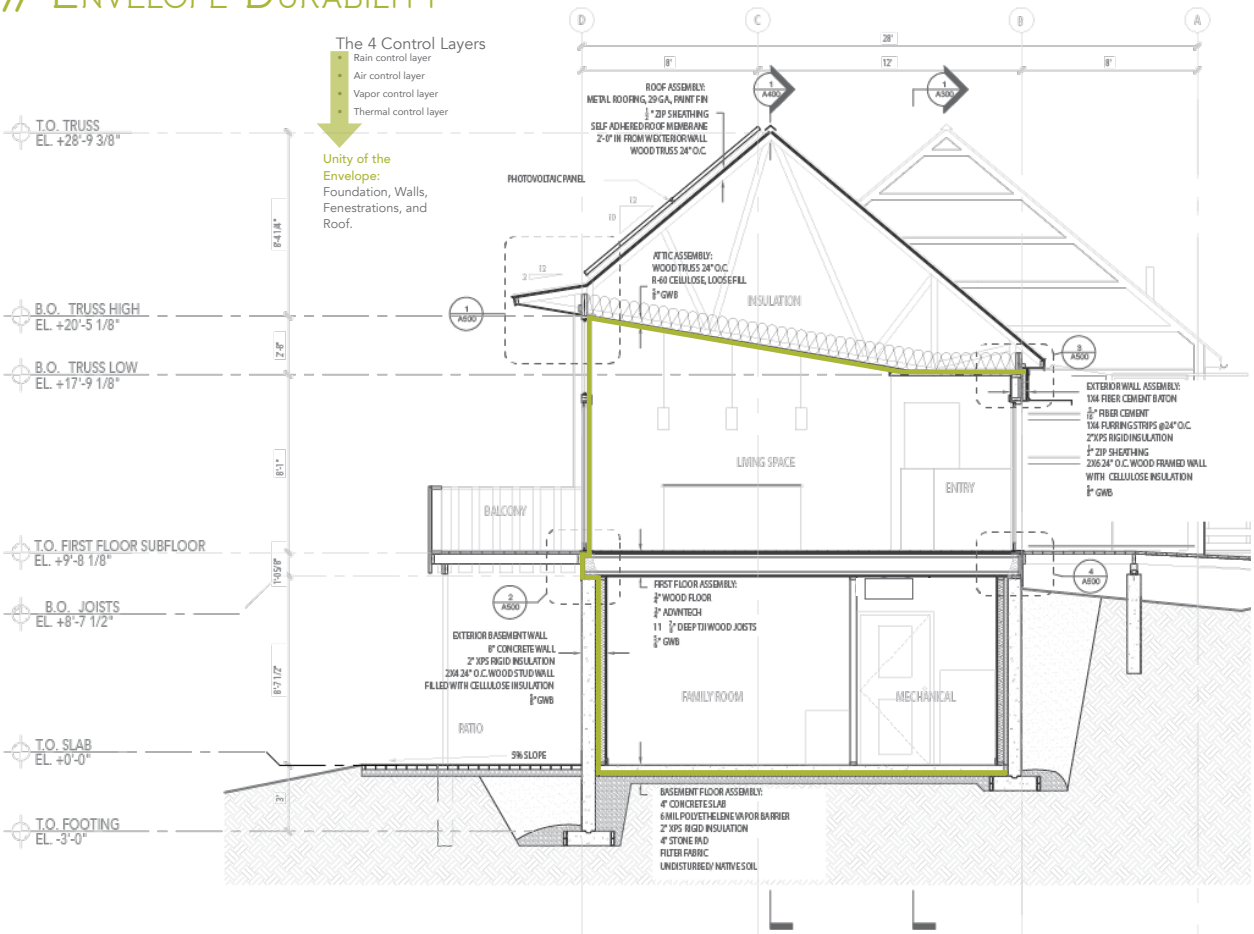
View of living area from entry

View of living area from entry

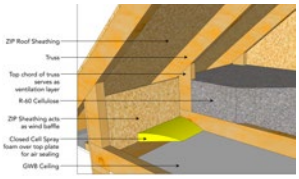


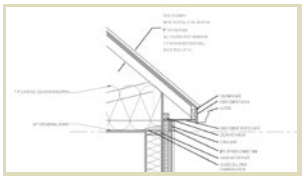
Site Section

// Envelope Durability

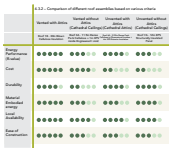


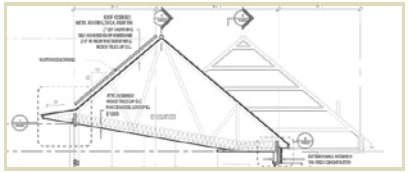
// Roof & Attic





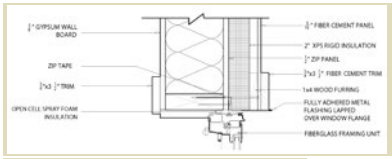
Roof Section Detail 04.4.1



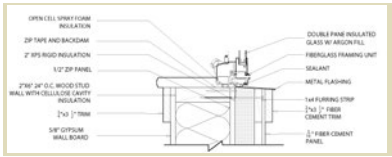


Roof Section Detail 04.4.2

// Fenestration



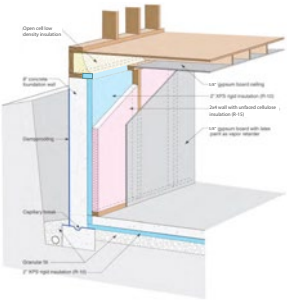
Window Detail 04.3.1



Window Detail 04.3.2

Figure 04.1.2 - WUFI analysis

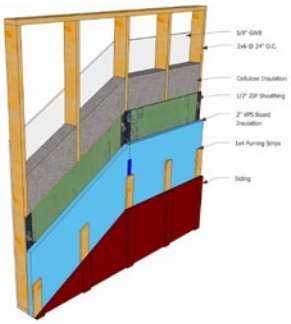
// Foundation

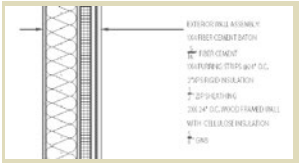


Foundation Section Detail

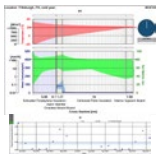
	Cast-In-Place (CIP)	Superior Wall
Energy Performance	●●●●●	●●●●●
Economy	●●●●○	●●●●●
Local Availability	●●●●●	●●●●○
Ease of Construction	●●●●○	●●●●●

// Walls





Wall Section Detail



// Energy Analysis

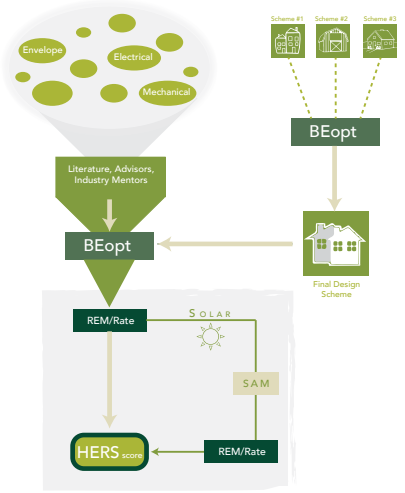
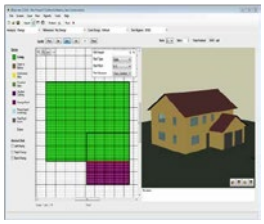
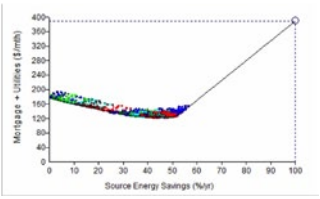


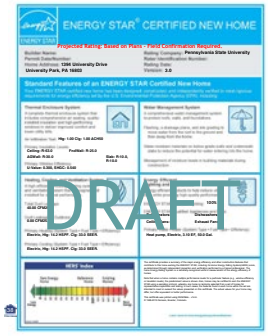
Figure 07.0.1 – Energy analysis process

> BEopt

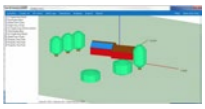


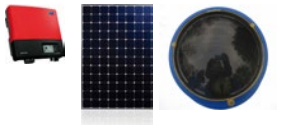


> REM / Rate



> Solar Analysis





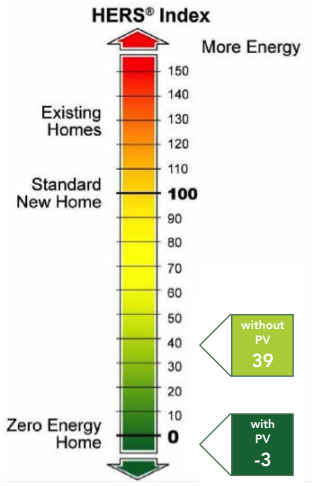
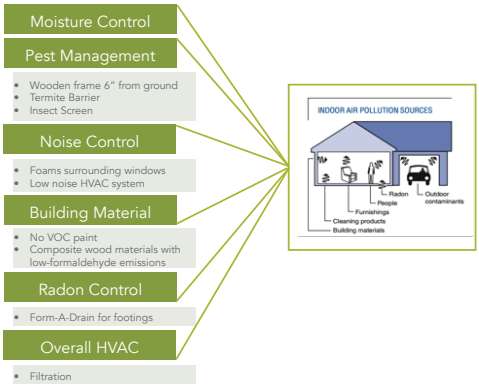


Figure 07.8.2 - HERS index score

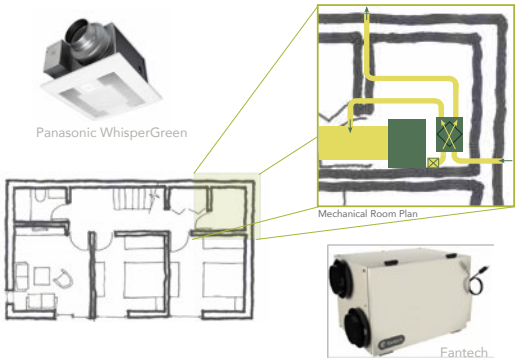
// Indoor Air Quality

Areas of concern



Ventilation System

Panasonic WhisperGreen



// Space Conditioning

Equipment Selection

Fujitsu AOU9RLFC

	Ducted Unit		Wall Mounted Unit	
Model Number	AOU9RLFC		AOU9RLS3	
Cooling Capacity	9000	Btuh	9000	Btuh
Heating Capacity	12000	Btuh	12000	Btuh
SEER	21.5		33	
HSPF	12.2	Btu/hW	14.2	Btu/hW
Sound Pressure Level	49	dB	42	dB

Fujitsu AOU9RLS3

Heating Loads

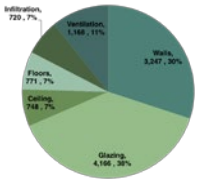


Figure 06.3.2 – Entire house average heating % of load

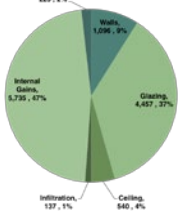


Figure 06.3.3 – Entire house average cooling % of load

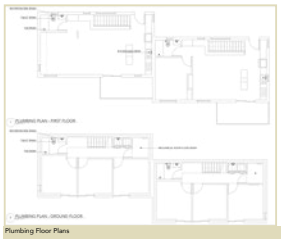
Even though mechanical system may be slightly oversized, the mini splits have variable speed air handler and compressor which can modulate down to the lower required loads.

// Domestic Hot Water

Figure 09.1.1 Domestic Water Heater [1]

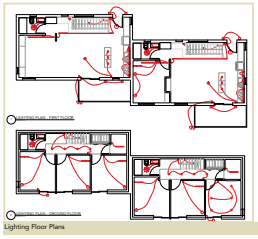
Figure 09.1.2

[1] Figure 09.1.1 - Image: http://www.geappliances.com/ge/heat-pump-hot-water-heater.htm



Plumbing Floor Plans

// Lighting



Lighting Floor Plans

// Appliances

Appliance	Size	ENERGY STAR	Price	Characteristics
Range	30 in	N/A	$ 549.99	GE, Model JBP23SRSS, Stainless Steel
Range Hood	30 in	N/A	$ 199.00	GE Convertible, Model JV367HBB, Black
Microwave	1.1 Cu.Ft.	N/A	$ 139.00	LG Electronics, Model LCS1131ST, Stainless Steel
Dishwasher	24 in	Yes	$ 629.10	LG Electronics, Model LDS5540ST, Stainless Steel
Refrigerator	23.8 Cu.Ft.	Yes	$1,079.00	LG, Model LTC23420ZS, Stainless Steel
Washer	4.3 Cu.Ft.	Yes	$ 719.00	LG, Model WM3170CW, Stackable
Dryer	7.4 Cu.Ft.	Yes	$ 719.00	LG, Model DLE3170W, Stackable

// Financial Analysis

Figure 08.1.3

Competition Guidelines

- Annual payments on the home must be **38%** of annual income
- **4.5%, 30 year** fixed rate
- Down Payment **20%** of house cost
- Monthly household debt **0.5%** of annual income

SCCLT Guidelines

- Mean Family Income (MFI) for State College **$66,800.**

		Target Construction Cost	Target Cost Per Square Foot
MFI for State College:	$66,800	$ 297,000	$ 116
High End Income Level:	$80,160	$ 380,160	$ 149
Low End Income Level:	$53,440	$ 207,900	$ 84

Figure 08.1.1

- Design for Affordable/low income home buyers
- Invest in durability

> Construction Cost Breakdown

ACCOUNT / DETAIL		COST	%
Site Preperation			
	Water and Sewer Inspection	$ 2,672.00	1.1%
	Permits	$ 2,111.72	0.9%
	Utility Fees	$ 7,950.00	3.2%
	Landscaping	$ 15,531.00	6.3%
Total		$ 28,264.72	11%
Foundation			
	Excavation and Backfill	$ 16,000.00	6.5%
	Underslab Plumbing	$ 300.00	0.1%
	Footings and Slab	$ 14,248.00	5.8%
	Insulation and Durability	$ 1,757.00	0.7%
	Drain	$ 498.40	0.2%
Total	Foundation - TOTAL	$ 32,803.40	13.2%
Framing			
	Floor Framing	$ 4,335.64	1.7%
	Roof Framing	$ 7,600.00	3.1%
	Wall Framing	$ 14,197.60	5.7%
	Bracing, blocking and waste	$ 1,000.00	0.4%
	Patio	$ 3,913.84	1.6%
	Framing Labor	$ 20,480.00	8.3%
Total		$ 51,527.08	20.8%
Envelope			
	Sheathing	$ 2,004.00	0.8%
	Insulation	$ 8,320.23	3.4%
	Windows and Exterior Doors	$ 7,514.00	3.0%
	Rental and Disposal Fees	$ 275.00	0.1%
Total		$ 18,113.23	7.3%

ACCOUNT / DETAIL		COST	%
Exterior Finish			
	Roofing	$ 10,899.95	4.4%
	Wall Finishes	$ 6,673.00	2.7%
	Gutters and Downspouts	$ 488.00	0.2%
Total		$ 18,060.95	7.3%
Interior Finish			
	Drywall and Paint	$ 14,196.64	5.7%
	Flooring	$ 8,357.21	3.4%
	Interior Finishes, Doors, and Trim	$ 2,821.20	1.1%
	Lighting Fixtures	$ 10,323.30	4.2%
	Plumbing Fixtures	$ 5,517.40	2.2%
	Cabinetry	$ 8,316.00	3.4%
	Appliances	$ 4,034.09	1.6%
	Interior Labor	$ 3,840.00	1.5%
Total		$ 57,405.84	23.2%
MEP			
	Mechanical	$ 19,605.00	7.9%
	Electrical	$ 13,000.00	5.2%
	Plumbing	$ 9,000.00	3.6%
Total		$ 41,605.00	16.8%
Subtotal		$ 247,780.22	100.0%
Company Expenses			
	Overhead and Profit	$ 49,556.04	20.0%
	Sales Tax	$ 12,389.01	5.0%
		Total Cost $309,725.28	

> Financing Solar PV

Consideration for Future Energy Rates

Total kW Output of PV Array	$/kWh	Annual Savings	Payback Timeline
7,628	$0.122	$930.62	30 years

Figure 08.5.1

Financing the Home With and Without PV

	PV Loan Type	Home Sales Price	Monthly Cost of Home	Monthly Cost of PV (20 yrs)	Annual Cost	% of Income
Cost of Land Included	PV integrated in mortgage	$275,294.74	$ 1,618.35	N/A	$23,428.20	35.07%
	Home equity loan	$247,349.77	$ 1,457.63	$ 294.77	$25,036.80	37.48%
Cost of Land Excluded	PV integrated in mortgage	$200,294.74	$ 1,186.99	N/A	$18,251.88	27.32%
	Home equity loan	$172,349.77	$ 1,026.27	$ 294.77	$19,860.48	29.73%

Figure 08.5.4

Home Sale Breakdown / PV Integrated into the Mortgage

1) House Cost	
Home Value	$200,258.74
Down Payment	$ 40,051.75
Amount Financed	$160,206.99
2) House Financing	
Interest Rate	*4.5%*
Loan Period	*30*
Loan Payment	$ 811.75
Monthly Taxes	$ 310.00
Home Insurance	$ 65.00
Household Debt	$ 334.00
Total Payment	$ 1,520.75
3) Debt to Income Ratio	
2013 State College MFI	$ 66,800.00
Monthly Income	$ 5,566.67
% Gross Income	27.32%

// Industry Partners

Chad Owens
Name of Company: Timber Rock Homes
Title of Contact: Owner
Credentials: Professional Engineer, NAHB Certified Green Professional, and owner of Timber Rock Homes in Bellefonte, Pennsylvania aided in the development of cost estimating.

Peter Vuksic
Name of Company: Nu-Tech Energy Solutions
Title of Contact: President/Owner
Credentials: Building Performance consultant & Energy Rater who has carved out a niche in the affordable housing industry over the last 10 years who consulted with the team on energy modeling and calculations.

Ron Quinn
Name of Company: State College Community Land Trust
Title of Contact: Executive Director
Credentials: With more than 15 years of experience in professional performance with pride and integrity for the State College community, Ron served as the primary contact between the Penn State team and the State College Community Land Trust during the competition.

Jason Grotthe
Name of Company: Enviroity, Inc.
Title of Contact: Director of Operations and Business Development
Credentials: Jason received a Master of Science degree from Penn State University in Environmental Pollution Control Engineering and with years of energy consulting experience helped the team with solar technology cost estimating.

Anne Messner
Name of Company: Borough of State College
Title of Contact: Senior Planner
Credentials: Anne is the planning and zoning officer for the borough of State College, PA who worked with the State College Community Land Trust and the Penn State team to discuss zoning requirements.

Tom Fountaine
Name of Company: Borough of State College
Title of Contact: Borough Manager
Credentials: As past President of the International Town & Gown Association and current Borough Manager for State College, PA, Tom helped the Penn State team with tax assessments required for the competition report.

Matt Rocco
Name of Company: Enviroity, Inc.
Title of Contact: Consulting Engineer
Credentials: As a HVAC Engineer & Building Energy Analyst, he helped the Penn State team develop cost estimates and designs for the mechanical system.

Michelle Paler
Name of Company: The HETE Company
Title of Contact: Lighting Design Consultant
Credentials: Professional lighting design consultant with more than 10 years of experience, provided the team with cost estimates for light fixtures used in the home.

Scot Chambers
Name of Company: Keller Williams Advantage Realty
Title of Contact: Realtor
Credentials: Specializing in residential and land sales and purchasing for central Pennsylvania, Scot helped the State College Community Land Trust and the Penn State team with locating an appropriate site for the duplex.

Andrew Pudenchio
Name of Company: IBACOS
Title of Contact: Building Performance Specialist
Credentials: Andrew aided in the design and performance of the mechanical system as well as the building envelope of the duplex.

Greg Bellas
Name of Company: YBC
Title of Contact: Sales Consultant
Credentials: Greg has more than 15 years of experience in sales and aided in cost estimating.

Gary Gulakowski
Name of Company: The Pennsylvania State University
Title of Contact: Associate Professor
Credentials: An award winning lighting designer with 12 years of professional experience helped the lighting team with codes and developing electrical plans.

Richard Mistrick PhD
Name of Company: The Pennsylvania State University
Title of Contact: Instructor
Credentials: With a doctorate in Illuminating Engineering, Dr. Mistrick helped the lighting team with day lighting calculations.

Brian Aust
Name of Company: Karpinski Engineering
Title of Contact: Project Engineer
Credentials: Brian is a Professional Engineer with 7 years of experience as a Mechanical Engineer and is an advisor to the mechanical team.

// Race to Zero Competition
Golden, Colorado

The Race to Zero is an annual competition, open to students and faculty from any interested collegiate institution. The competition is based upon a real-world scenario where a builder needs to update an existing product line (house plan) to a high-performance house design or is developing a new high performance home product line. College teams are posed with a specific design problem and are asked to either redesign an existing floor plan or create a new house design that satisfies the project requirements.

Since 2008, the U.S. Department of Energy's (DOE) Builders Challenge program has recognized hundreds of leading builders for their achievements in energy efficiency—resulting in over 14,000 energy efficient homes and millions of dollars in energy savings. The DOE Zero Energy Ready Home—formerly DOE Challenge Home—represents a whole new level of home performance, with rigorous requirements that ensure outstanding levels of energy savings, comfort, health, and durability

>What is NREL?

NREL develops clean energy and energy efficiency technologies and practices, advances related science and engineering, and provides knowledge and innovations to integrate energy systems at all scales.

NREL is the only federal laboratory dedicated to the research, development, commercialization, and deployment of renewable energy and energy efficiency technologies.

Energy Efficiency	Renewable Energy	Systems Integration	Market Focus
Residential Buildings	Solar	Grid Infrastructure	Private Industry
Commercial Buildings	Wind	Distributed Energy Interconnection	Federal Agencies
Personal and Commercial Vehicles	Biomass	Battery and Thermal Storage	State and Local Government
	Hydrogen	Transportation	International
	Geothermal		
	Water		

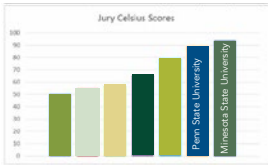
// Competition Results

- Great example of describing the multi-stakeholder, integrated design process.

- Good job taking advantage of the regional architecture, the duplex design, and the flexible layout.

- Good job taking advantage of the south facing views and solar ready roof.

- The sophisticated financial analysis of the integration of PV was commendable.



^ Grading room scores

A special thanks to:
Pennsylvania Housing Research Center
College of Engineering
PHRC

// Competition Group

SCCLT GreenBuild Committee Meeting on Site

September 17th, 2015

Attendance

Scott Wing; Penn State Architecture

Lisa Iulo; EEHR – Penn State Architecture

Susan Venegoni; SCCLT

Ron Filippelli; SCCLT

Polly Dunn; SCCLT

Sue Hiester; SCCLT

Peg Hambrick; SCCLT

Colleen Ritter; SCCLT

Kyle Macht; Penn State Architecture Student

Chauntel Duriez; Penn State Architecture Student

Tara Mazurczyk; Penn State Landscape Architecture Student

Chris Hazel; Penn State Architecture Student

Hong Wu; Penn State Landscape Architecture PhD.

Location: Green Build Site; 1394 University Drive, State College

Purpose: To update all parties on the project development and prompt decisions for the future.

Agenda:

A. Meeting Opening

B. Site Orientation

C. Presentation of design schemes

- With individuality in mind, design update.
- Pros and Cons

D. Re-walking of site with Schemes in mind, Schemes orientation.

E. Discussion

- Design Implications
- Questions for the SCCLT
- Questions from the SCCLT

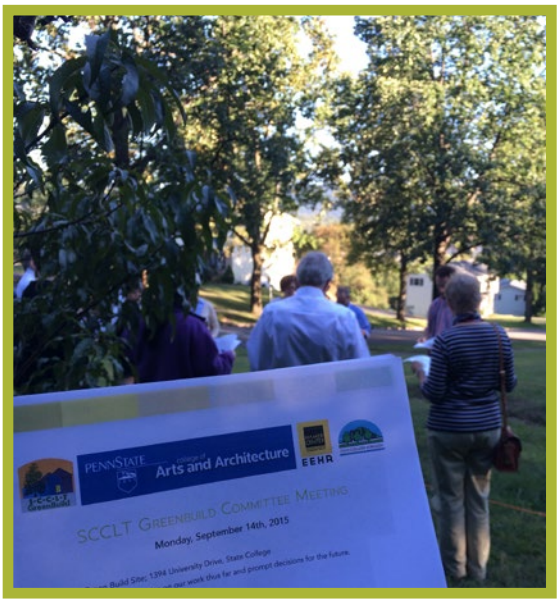
F. Next Steps

- Feedback by Monday, September 21st, 2015
- Moving on toward Design Development: The next phase of the design process. To focus on things like facade design, documentation to take to zoning, material selection and construction documents production.

Brief:

This meeting was held on the site of the future duplex. This location choice was made so that the material presented and the decisions made could be explored in the context of reality more-so than the SCCLT had been able to see before. The meeting was facilitated by way of going through the following information packet and walking the site to explain the intricacies of each design.

Again we framed the possibilities with schemes. However these schemes are very closely related unlike the previous schemes. The choices the design team needed to make at this stage in the project were greatly assisted by the ability to consider the options on the site. The decisions made after this charrette carried the team to the current design..



SCCLT Greenbuild Committee Meeting

Monday, September 14th, 2015

Location: Green Build Site; 1394 University Drive, State College

Purpose: To update all parties on our work thus far and prompt decisions for the future.

Agenda:

A. Meeting Opening

B. Site Orientation

C. Presentation of design schemes

- With individuality in mind, design update.
- Pros and Cons

D. Re-walking of site with Schemes in mind, Schemes orientation.

E. Discussion

- Design Implications
- Questions for the SCCLT
- Questions from the SCCLT

F. Next Steps

- Feedback by Monday, September 21st, 2015
- Moving on toward Design Development: The next phase of the design process. To focus on things like facade design, documentation to take to zoning, material selection and construction documents production.

Site Orientation

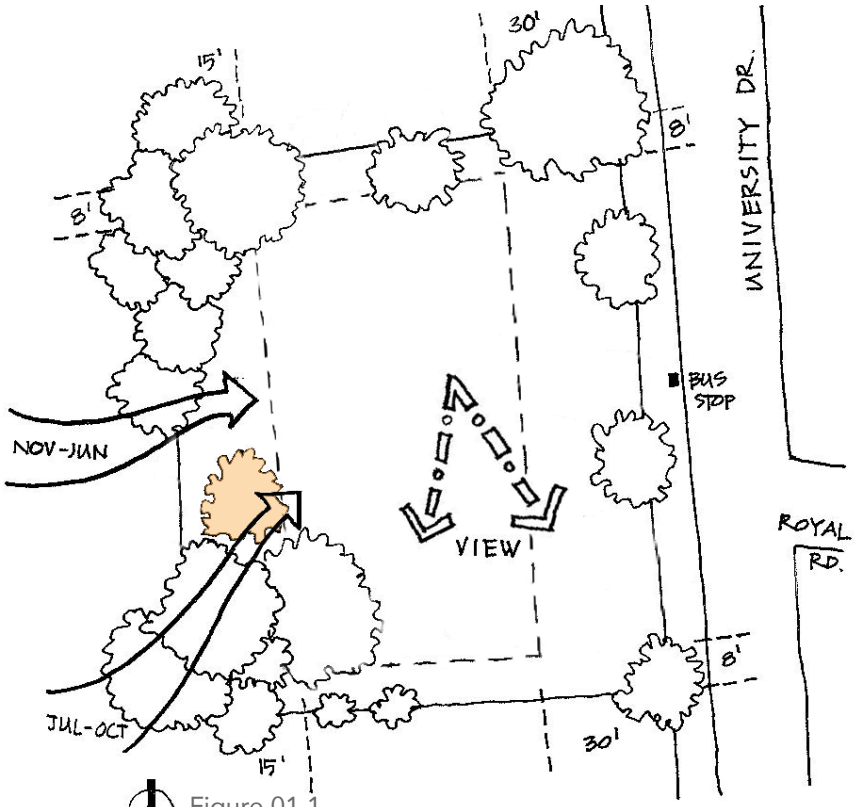


Figure 01.1

Key Points

- Southern views
- Solar Orientation
- Topography Slope
- Tree locations
- Critical Tree

Figure 01.3 - View as seen from diagram 01.1

Figure 01.2 - Panorama View on Site

Figure 01.3 - Detail of highlighted critical tree

Questions for the SCCLT

Please feel free to record your responses and thoughts on the back of this packet.

A) **Several floor plan variations are shown. Do you have a preference? You may provide feedback on the shape (straight vs. u-shaped) and location of the stair; the type and location of the kitchen, the entry door location and other layout considerations.**

B) **How important is the option for "aging in place"?**
Is the option for a ground-floor bedroom a priority?

C) **Do you prefer a Full Bath or a 1/2 Bath on the first floor?**
This relates to aging in place.

D) **What do you see the primary function of the exterior storage area/ covered parking structure to be? Do you prefer a fully-enclosed garage or a would an open carport with secured storage be acceptable? What thoughts do you have about the proximity of the parking to the house and its location on the site?**

E) **How do you perceive the future homeowners will use the property? What wishes do you have for landscaping and site work? We are designing with ecologically responsible design principles in mind, including trying to keep as many trees as possible and minimizing construction impact to the site.**

F) **Do you have other comments about the schemes presented**

Next Steps: What is Design Development

Design Development is the next step in the design process. Over the summer our group has been working in what we call "schematic design." Schematic Design is the beginning phase of design where the goals and requirements for the project are determined. The main design focus is on determining the form and layout of the structure.

Design development is the next step of the design where the design is formalized and materiality is determined. To move onto design development from schematic design the goals, form, and layout should be finalized. During design development we will be elaborating on the facade design, material selection and product research, mechanical, electrical, and plumbing layout to inform the construction and permitting of the future Greenbuild homes (this effort will build upon the work accomplished by the Race to Zero team last semester).

Critical Conclusions

Feedback and Findings:

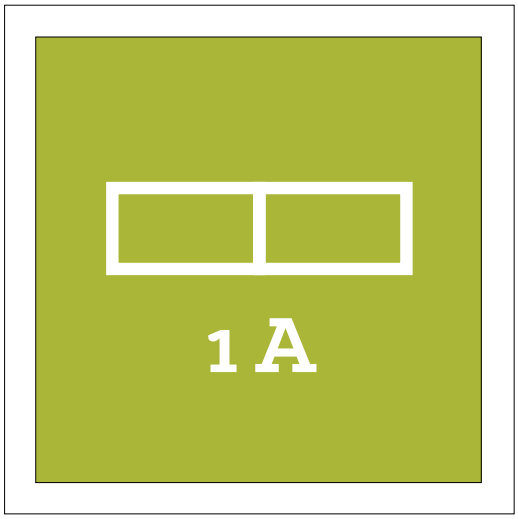
- Being on site was extremely helpful for making decisions related to real dimensions and actual views, size and proximity between homes and their adjacent spaces.
- The footprint of the duplex was staked out to better understand the position on the site, opportunities for views and solar orientation, and impacts on existing trees. It was decided to slide the homes down site to the south slightly more so that the northern most home was less in the shade of the existing trees.
- We also determined just how populated the north west corner of the lot is with existing trees. The SCCLT members were able to see how many trees would need to be taken down and what we think we would be able to save.
- We also addressed that some of the tree cover would be less than ideal for solar panels, yet the decision was made that the majority of the trees aren't worth sacrificing for the feel of the site and that solar could be designed in a way that deals with the existing landscape layout.
- Parking access was able to be envisioned on site by walking from the proposed area for the curb cut and following what would be the driveway.
- The detached carport gained favor as it has the feel of being tucked up into the top of the site. The attached carport was also popular as it contributed to the separate identity of the homes yet it was made clear that gardens, landscape and material choices will play a big role on making sure that the carport isn't the most noticeable element of the site.
- The staked out footprints also allowed SCCLT and design team members to "walk" the floor plans of the homes. Noting where entryways and windows would be as well as taking notice of which rooms would be getting ideal sun light and what spaces may end up being darker due to the sun paths and the existing tree cover. Views to the south were also considered and openings in the north unit were adjusted to maximize view past the south unit. The "walkthrough" allowed visitors "to be in the shoes of the future homeowners" and imagine what spaces would be like as well as the relationship between rooms and inside and outside spaces. These observations were taken into consideration when the floor plan for each unit were refined.
- Yard and site division was discussed and it was determined that it would be best to divide the space using natural barriers such as subtle tree lines, the driveway and implied common gardens. The yard and feel of the south unit is different than that of the north. The south has a much more public face and less private outdoor space while the northern unit has a secluded side and back yard , and a semi private front facing yard that it shares with a facade of the south unit. The feel of these spaces encouraged the team to further think of these homes as individuals rather than Siamese twins. Imparting options into each unit, such as one with attached perking and one without makes sense when the individuality is considered as well as what the needs of the future homeowners might be.
- Many of the characteristics we had been considering in the siting of the duplex throughout the design process, such as the view of the mountain, the downward flow of the site and the importance of the shift, were all things that we could confirm the validity of on site. The visit gave the SCCLT and the design team a better picture of what the GreenBuild would look like.

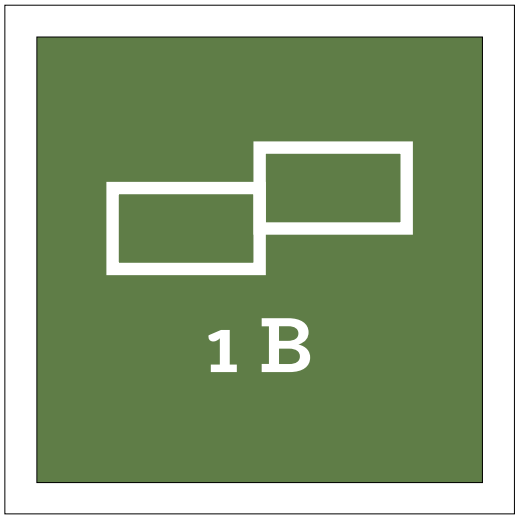
Handouts:

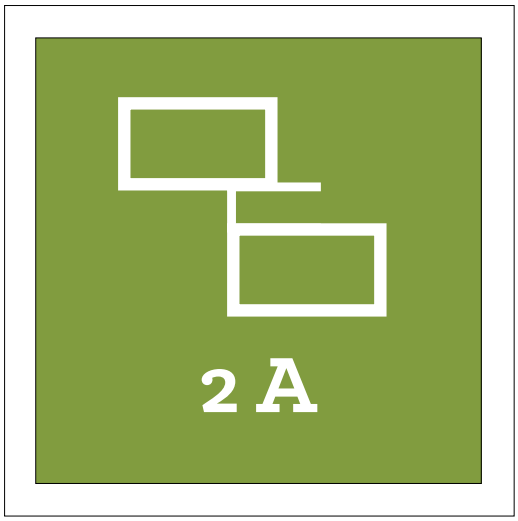
The following are the handouts considered during the site visit.

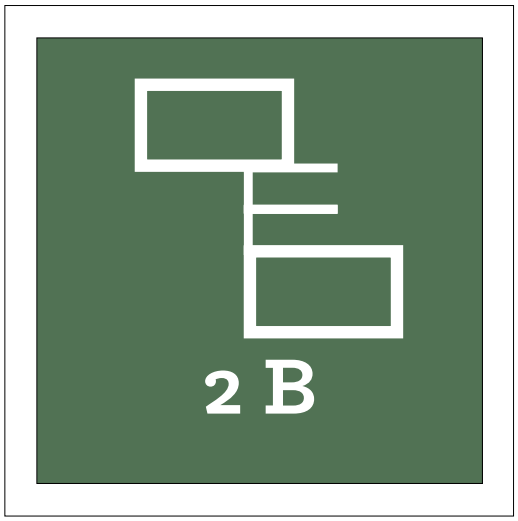
Design Checkpoint 5

Design Schemes







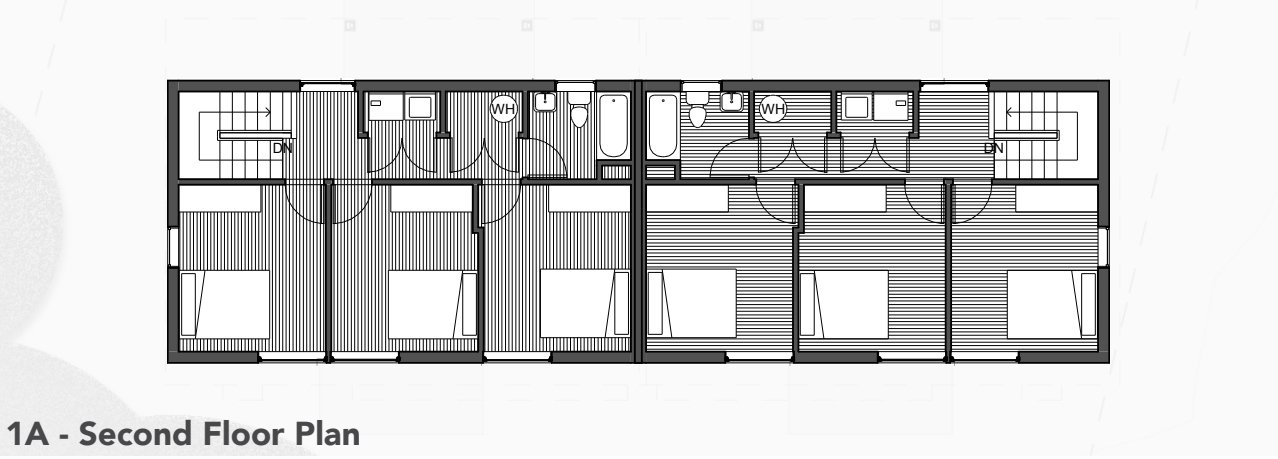


1A

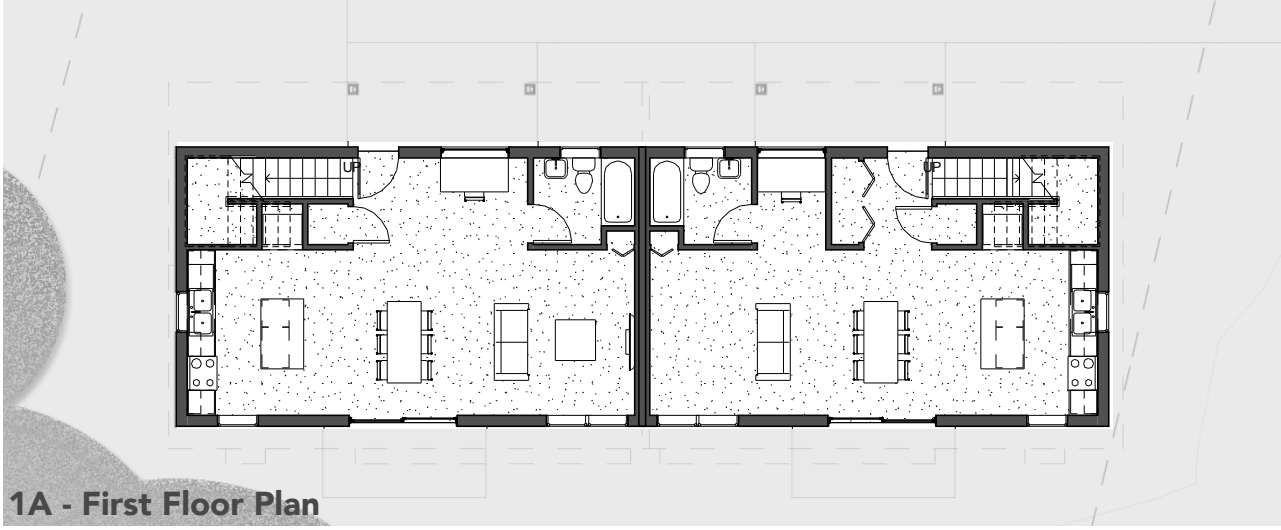
Scheme 1A

1A - Site Plan

Scheme 1A



1A - Second Floor Plan



1A - First Floor Plan

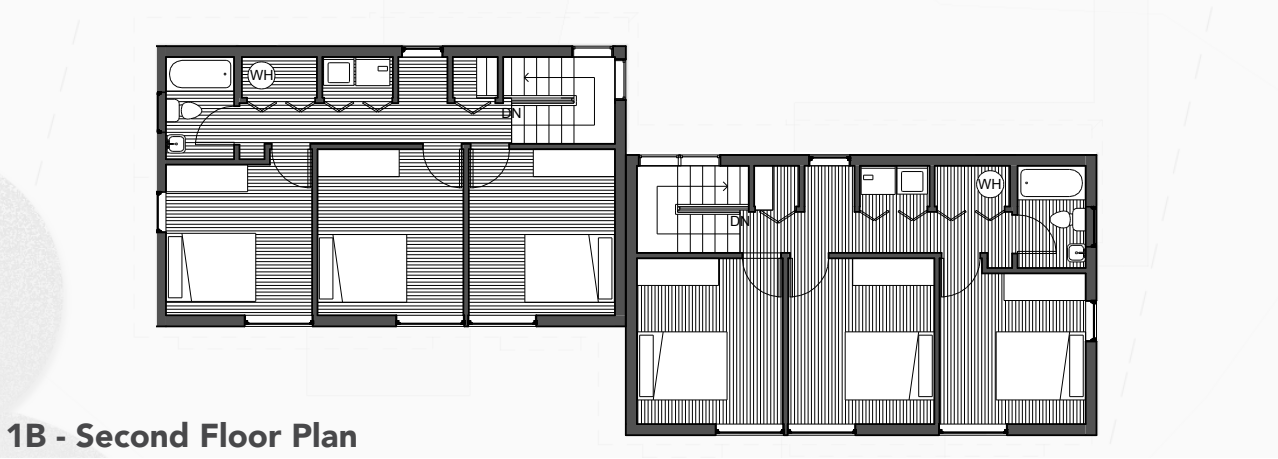
1A - View from driveway

1 B

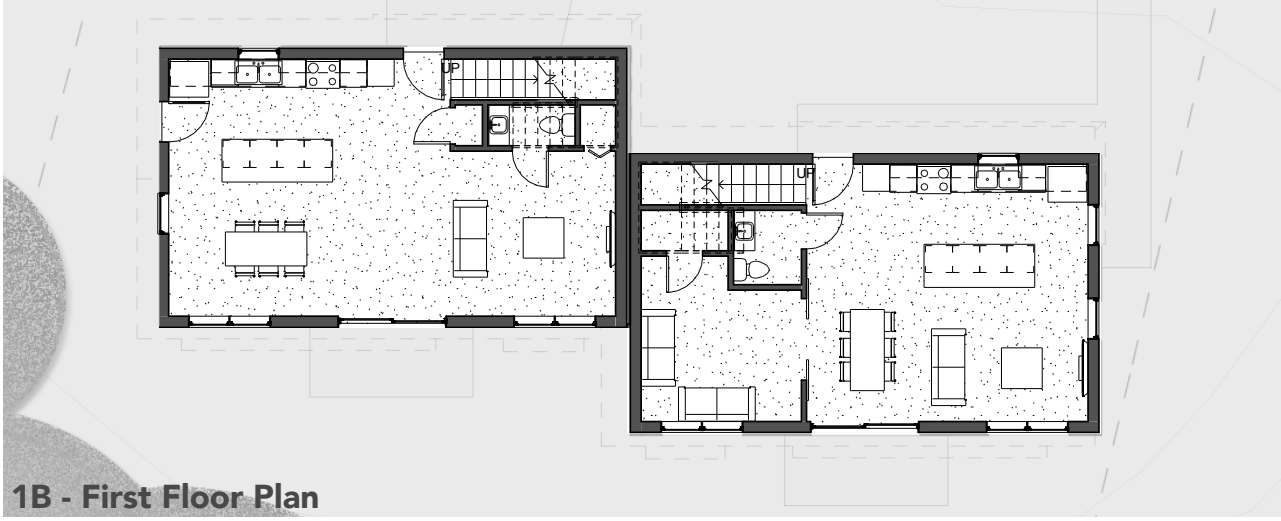
Scheme 1B

1B - Site Plan

Scheme 1B



1B - Second Floor Plan

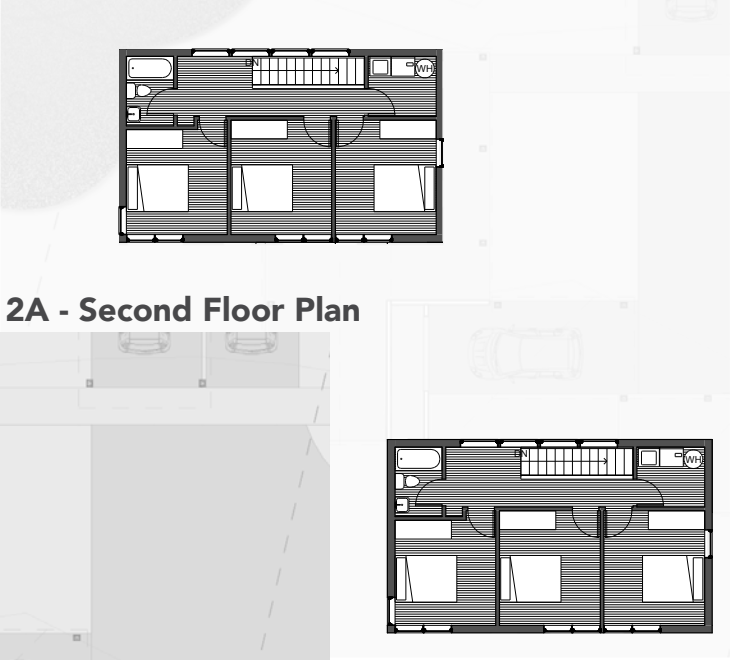


1B - First Floor Plan

Scheme 2A

2A - Site Plan

Scheme 2A

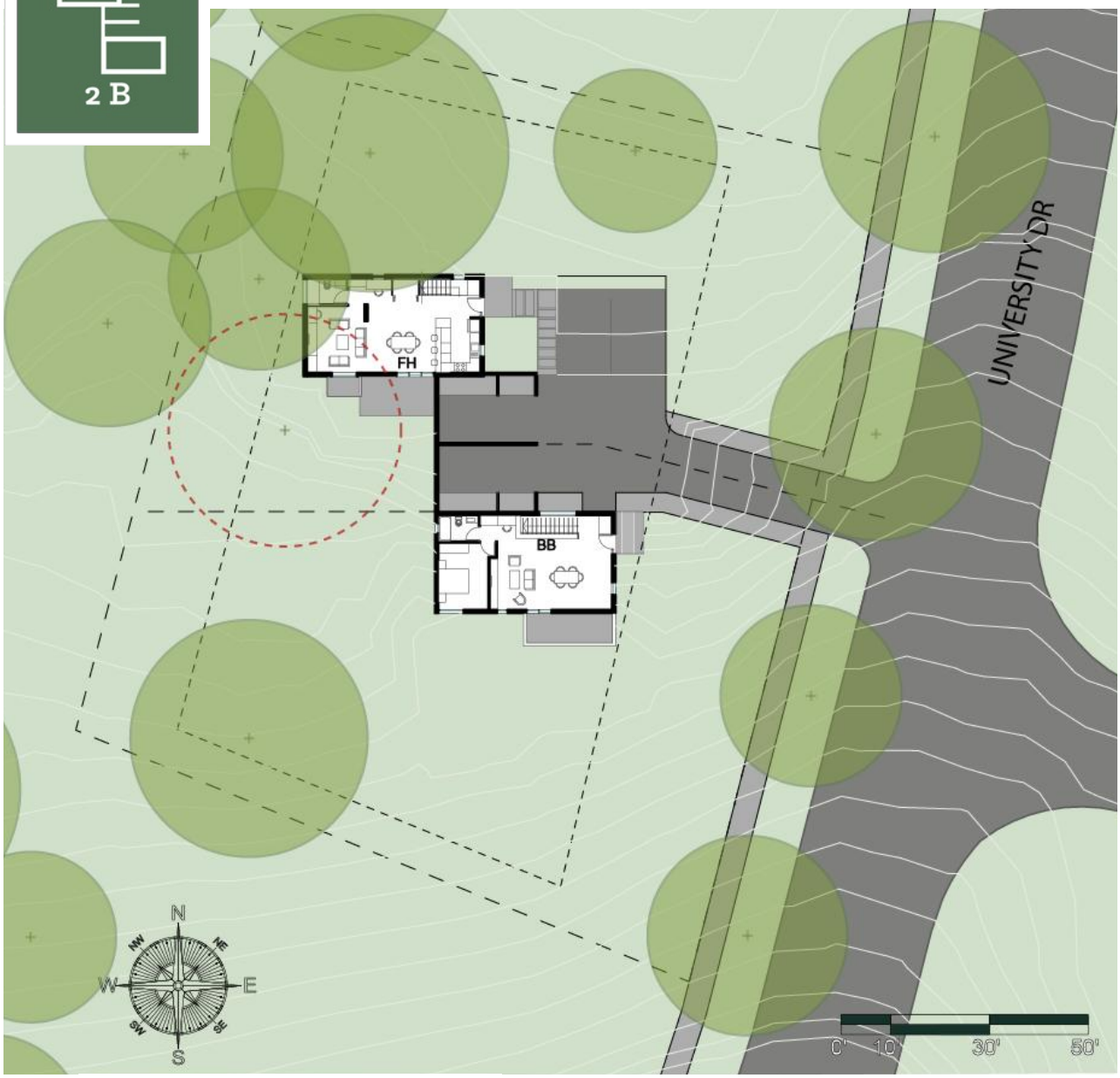


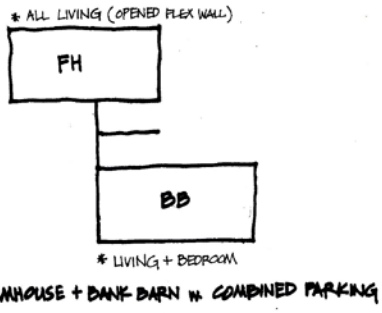
2A - Second Floor Plan

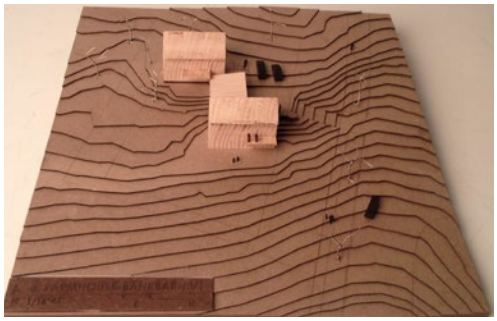
2A - First Floor Plan

2A - View from driveway

Scheme 2B


2 B
FH
BB
UNIVERSITY DR
N
NE
E
SE
S
SW
W
NW
0'
10'
30'
50'


* ALL LIVING (OPENED FLEX WALL)
FH
BB
* LIVING + BEDROOM
• FARMHOUSE + BANK BARN W. COMBINED PARKING



Pros and Cons of Schemes

1A Straight Bar

Site

+ Simple structure = simpler construction therefore may be less expensive;

+ Separate parking structure = flexible orientation and proximity to site; optional in initial pricing of homes; perceived as "healthier" and "safer" (less of a fire hazard).

- Only a north entry works

- Less differentiation in the architecture of the homes (some individuality can be achieved with different cladding/ finishes design and with articulation of exterior spaces through landscape).

Plans

+ Offers the most interior storage on the 1st floor

+ Provides for a large full bathroom on the 1st floor

1B Shifted Bar

Site

+ Benefits of detached parking structure (see option 1A); simplest driveway

+ Homes offset to provide view of both home entries from street

- Uncovered walkway from parking to front door (distance limited to a few steps)

- More complex foundation/construction than straight bar

Plans

+ The most open 1st floor with flexible entry location (north façade or street side)

+ Largest kitchen

- Only a half bath provided at ground (1st) floor

2A Split Box w/ 1 Car Between

Site

+ Most differentiation between architecture of homes, including different entry locations with large porches

+ Parking attached/close to the homes

- Most complicated driveway and entry sequence = More expensive due to complicated roof system and segmented parking

- Most complex foundation/construction

Plans

+ The most natural light in the second floor hall

+ Large bathroom on the 1st floor

- Smaller entry closet

- Northeast corner entry location is the only option

2B Split Box w/ 2 Car Between

Site

+ Parking attached to homes; Simple driveway and entry sequence

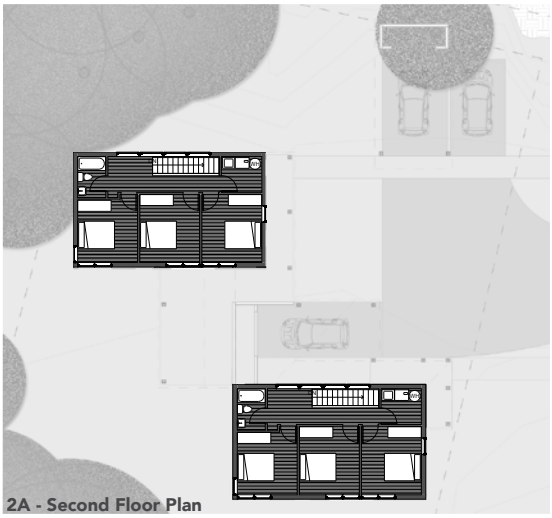
+ Homes each have private yards separated by parking

- Parking is a large focus, detract from the entry sequence of the homes and focus on sustainable development

- The north home gets pushed into the most heavily wooded area of the site and has most limited view to the south.

// Chosen Scheme – Design Development

2A - Site Plan


2A - Second Floor Plan


2A - First Floor Plan

After meeting with the SCCLT on site, the group has come to the consensus to choose scheme 2A- (Split Box with 1 Car Port in-between) to take forward into the Design Development stage. In our next steps we will be elaborating on the facade design, material selection, and product research. Also mechanical, electrical, and plumbing layouts will inform the construction and permitting of the future Greenbuild homes (this effort will build upon the work accomplished by the Race to Zero team last semester).

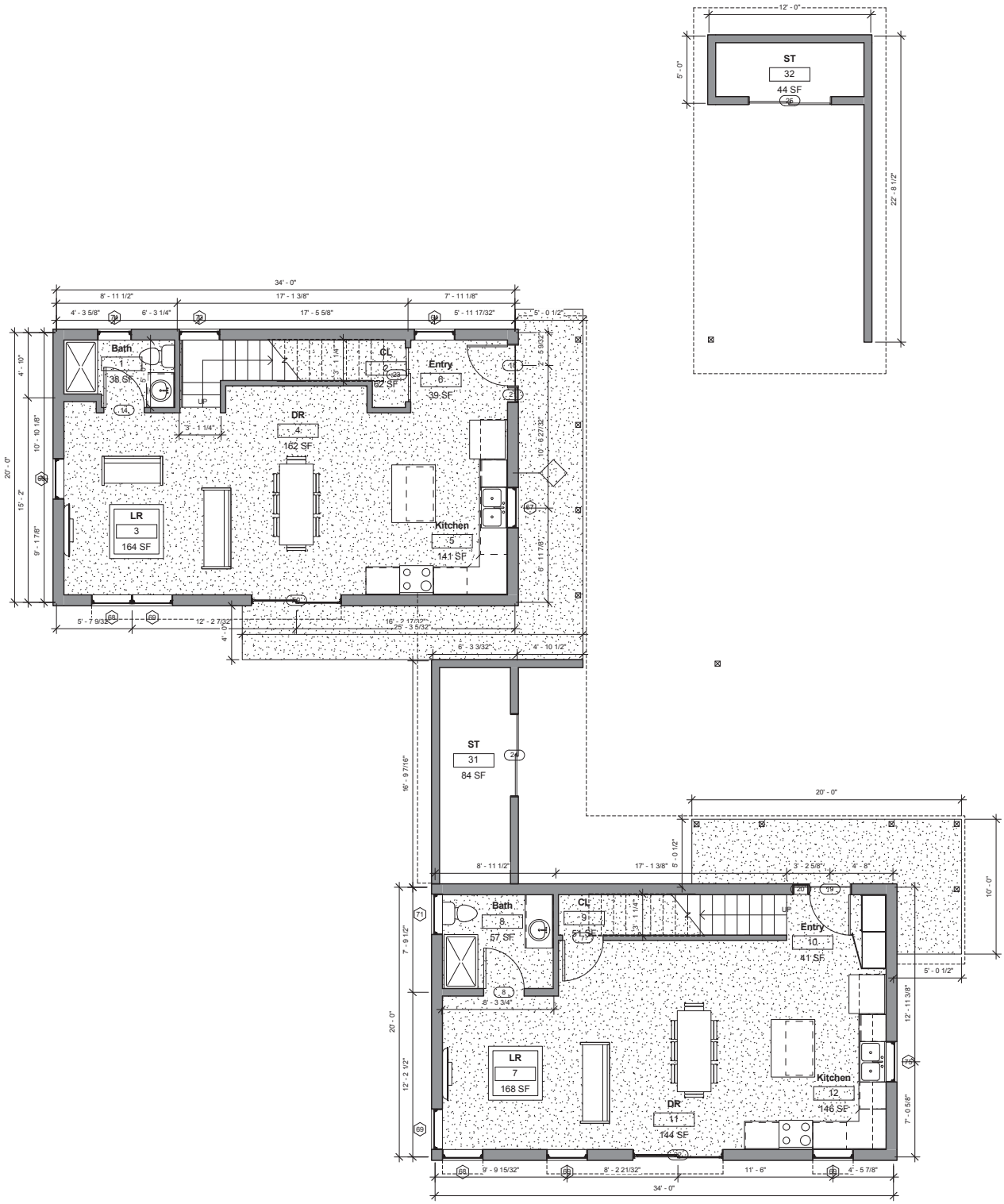

2A - View from driveway

Scheme selection and verification:

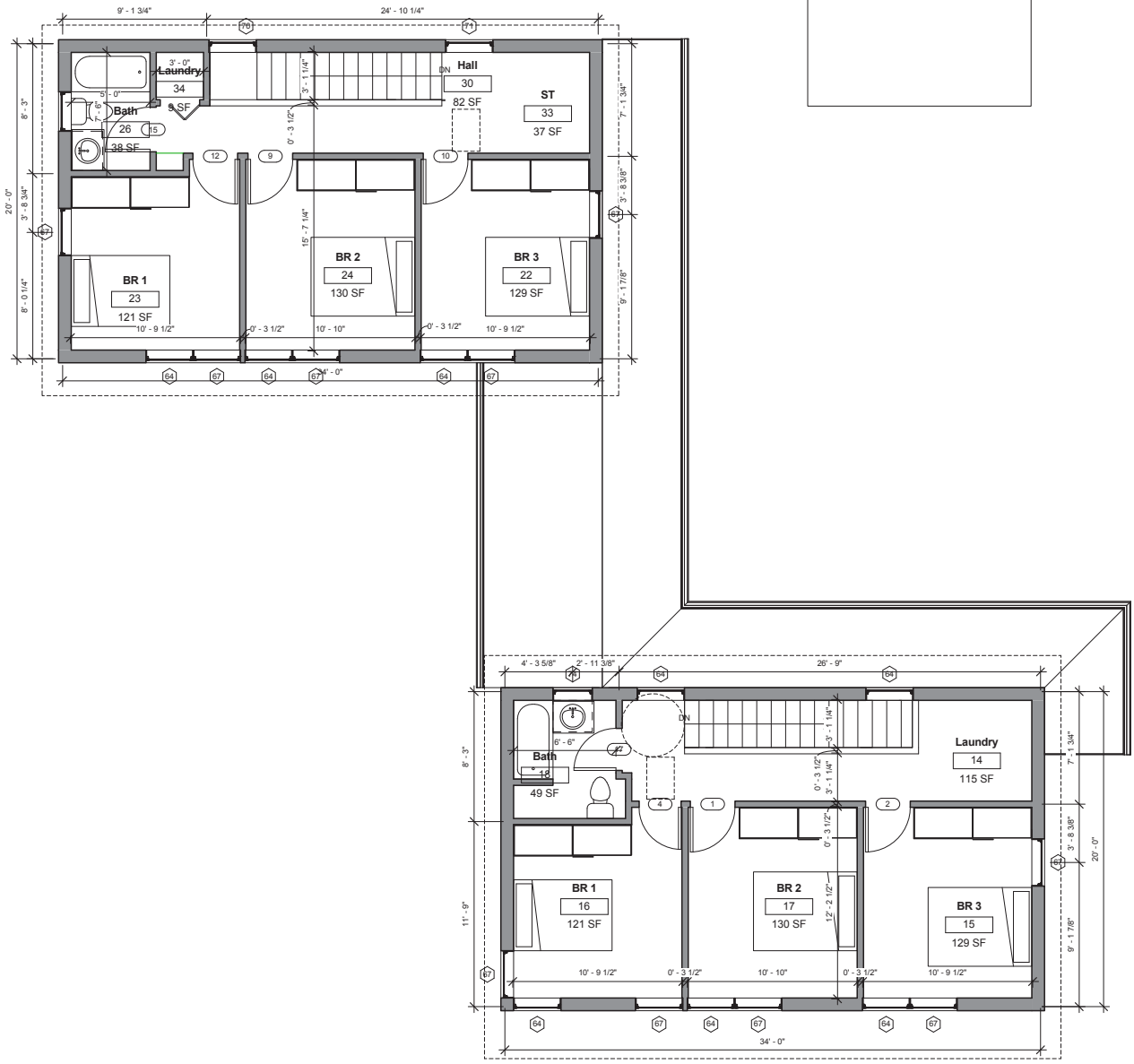
Following the September site visit, the scheme shown on the left was selected for development. A sense of individuality between the units was important to SCCLT. Each unit reflects the character of the Pennsylvania Farmhouse. The continuous lower roof line creates a continuous porch, connecting the units as a duplex.

The following drawings were created and presented to Borough planning and zoning officials to confirm the students design team's understanding of the zoning requirements and assure the team that intentions for a duplex were being maintained in the conceptual design documents.

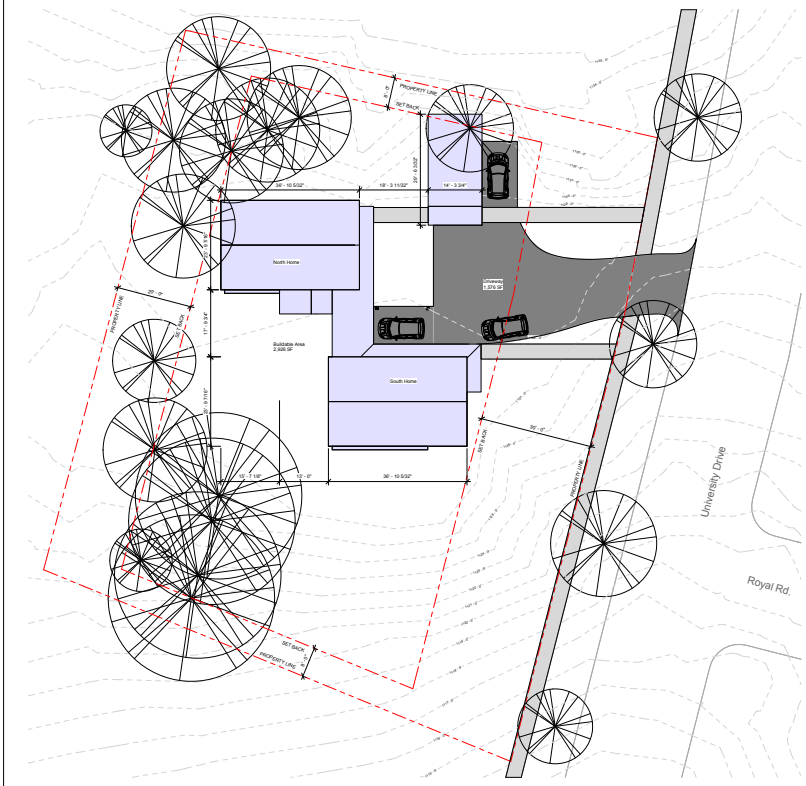
Design Checkpoint 6



First Floor Plan
Scale: 1/8" = 1'-0"
2015.11.10



Second Floor Plan
Scale: 1/8" = 1'-0"



SIDEWALK
DRIVEWAY
BUILT AREA

Site Plan
1/64" = 1'-0"

Setbacks

Front	30 FT	
Side	8 FT	
Rear	20 FT	
Buildable Area	4750 SF	
Driveway	1576 SF	1600 SF Max
Building Height	24' 2"	25 FT Max
Accessory Height	12'	15 FT Max

Site Plan
1" = 10'-0"

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Notes:

Seal:

S·C·C·L·T GreenBuild

THE STATE COLLEGE COMMUNITY LAND TRUST

1315 S. ALLEN STREET
STATE COLLEGE, PA 16801

CONTACT: RON QUINN
(814) 867-0656

EEHR

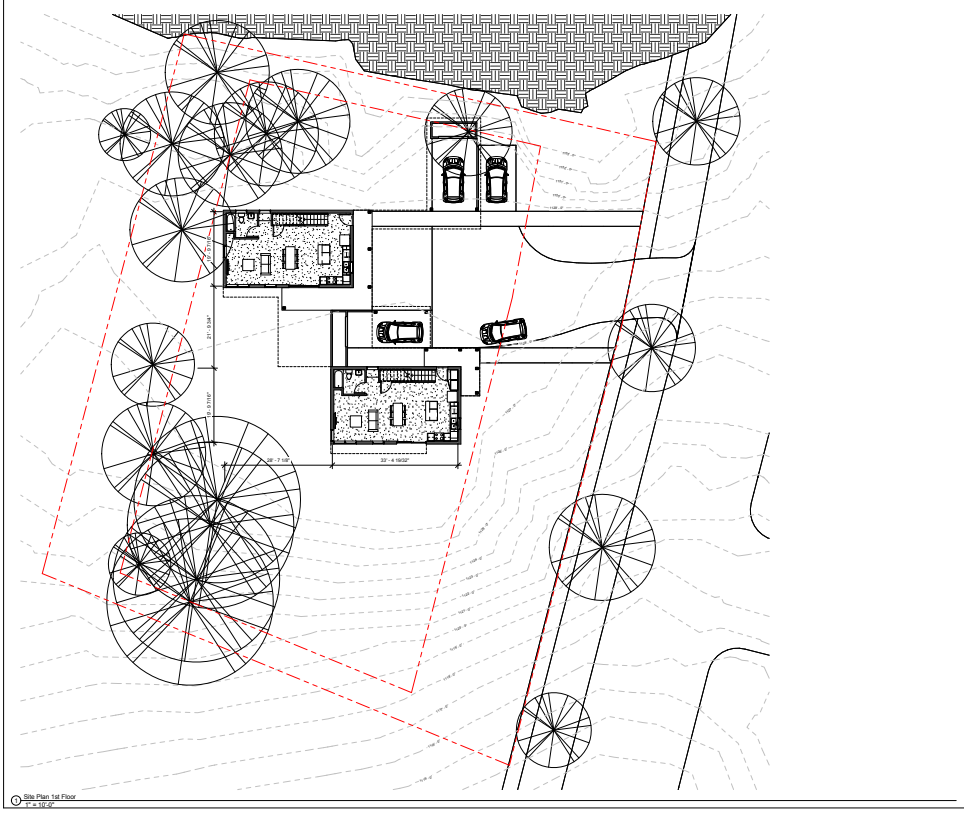
105 STUCKEMAN FAMILY BUILDING

CONTACT: LISA IULO
(814)) 865-

Green Build 1394 University Dr.
State College, PA 16801
A001

Date: Issue Date
Scale: As indicated

A001



Site Plan 1st Floor
1" = 10'-0"

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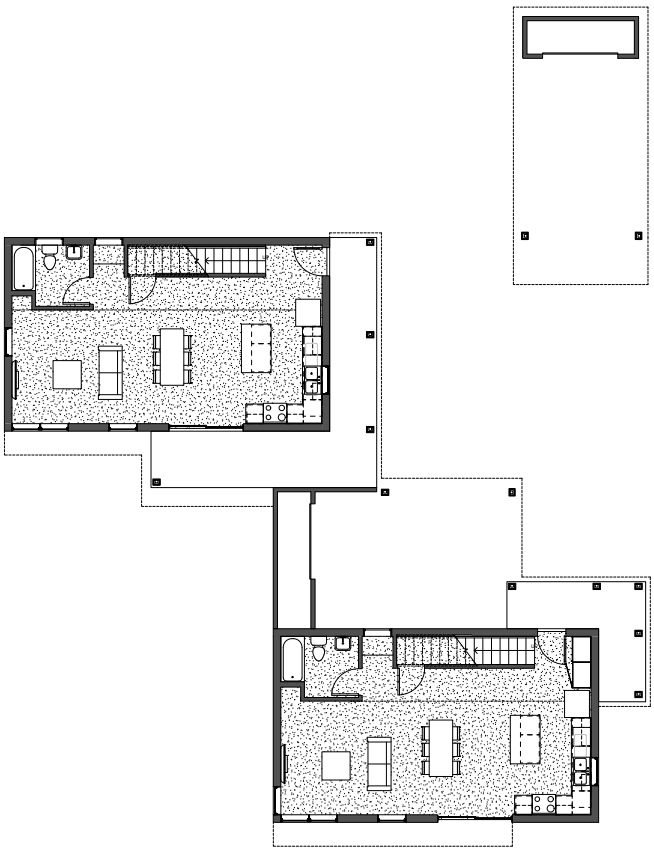

1 1st Floor Plan
1/4" = 1'-0"

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Date: Issue Date
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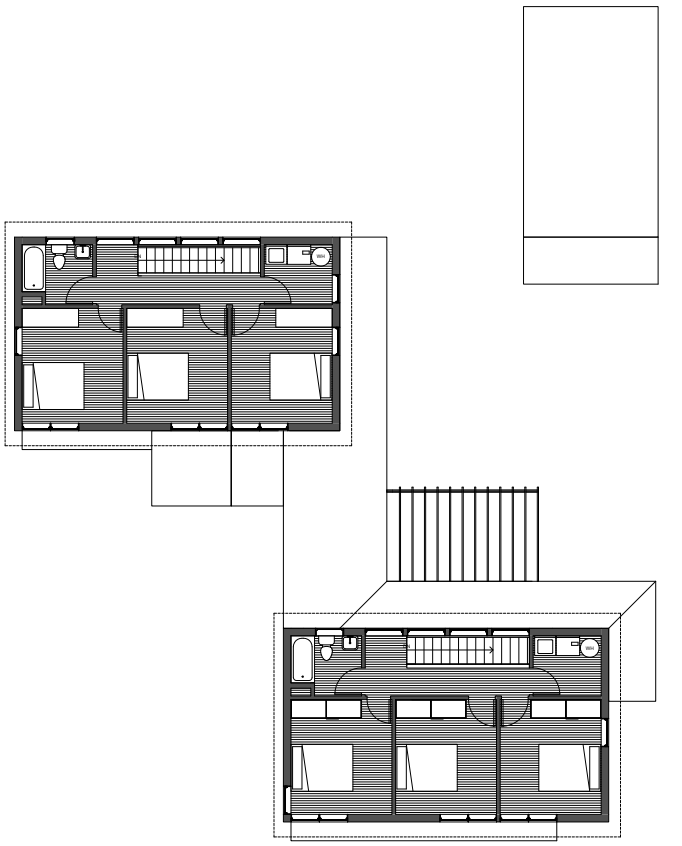

2 2nd Floor Plan
1/4" = 1'-0"

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Notes:

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State College, PA 16801
A103

Date: Issue Date
Scale: 1/4" = 1'-0"

A103

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A201

Date: Issue Date
Scale: 1/4" = 1'-0"

A201

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Notes:

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A900

Date: Issue Date
Scale:

A900

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Notes:

Seal:

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State College, PA 16801
A901

Date: Issue Date

Scale:

A901

Ending notes by Chauntel Duriez:

The manner in which we have conducted this project has depended on the involvement of multiple interested parties each with their own expertise and needs. The design reflects the incubation of all of the ideas and inputs we received throughout the process of this engaged scholarship project. Working closely with the SCCLT has made every design decision carry weight and has encouraged us to strengthen our reasoning behind what we present and support.

After completing the conceptual, schematic and design development stages of this project the team has come to multiple conclusions but most importantly we recognize that there are certain values of design that we hold very high and would like to see valued as the project moves forward. These values are the weight of cost, durability, health and livability for the homeowner. Individually, these topics are important but even more importantly it is how they interact and affect each other that has been a keystone of this project.

In making design decisions we have always held that we would not strive for extremes for the sake of ratings or unnecessary precautions. For example, in suggesting materials such as siding the team strived to balance between durability, efficiency and sustainability, and cost. In short, we have tried to make the most energy efficient, yet durable design possible while keeping a sharp eye on the budget so that we get the most success out of the funds.

We have also considered the health aspects of the design we put forth, considering the project in its full range from the person who installs the materials to the person who lives within the walls built. Applying some of the most advanced building science knowledge has allowed us to ensure that the construction of the home will promote the safe mitigation of moisture, toxins and other air quality troubles. These homes are being designed to last, considering the health of all of those involved with it is just another way to be conscientious about the product put out into our community.

Livability is possibly the biggest factor in the design process, and the one that has been most affected by the proceedings from the charrettes and meetings. We were able to collect information about our client, and our client's client: the homeowner. This feedback was imperative to better meet the needs of the user as well as perfect our design to be suited to this situation. Examples like the long discussions over parking, layout and individuality have shaped what we understood as needs and constraints that the design could react to. Even the more seemingly trivial subjects like storage were brought to the light as incredibly important to homeowners, by the experience of the SCCLT. These experiences and opinions that were shared with us influenced the design to be as realistic and as fitting as possible to the needs of the target audience. Since the beginning as a group we have worked to bring to the State College community a duplex of homes that exemplifies a sustainable product and lifestyle that is not only affordable but desirable to live and thrive in. Anticipating and designing for the ability for anyone to live comfortably in these homes has since become one of the hallmarks of this project but also important for the education and the environmentally friendly encouragement of the community.

This document is a product of the Energy Efficient Housing Research Group (EEHR).
For more information please visit our website at sites.psu.edu/eehr,
or contact our office via email at ldi1@psu.edu. Special thanks to Chauntel Duriez on the development of this document.