



Sophia Academy Roof Garden

Academic Partner:
School of Architecture, Art
and Historic Preservation

Community Partner:
Sophia Academy

Fall 2013



The Roger Williams University Community Partnerships Center

The Roger Williams University (RWU) Community Partnerships Center (CPC) provides project-based assistance to non-profit organizations, government agencies and low- and moderate-income communities in Rhode Island and Southeastern Massachusetts. Our mission is to undertake and complete projects that will benefit the local community while providing RWU students with experience in real-world projects that deepen their academic experiences.

CPC projects draw upon the skills and experience of students and faculty from RWU programs in areas such as:

- American Studies
- Architecture and Urban Design
- Business
- Community Development
- Education
- Engineering and Construction Management
- Environmental Science and Sustainability
- Finance

- Graphic Design
- Historic Preservation
- History
- Justice Studies
- Law
- Marketing and Communications
- Political Science
- Psychology
- Public Administration
- Public Relations
- Sustainable Studies
- Visual Arts and Digital Media
- Writing Studies

Community partnerships broaden and deepen the academic experiences of RWU students by allowing them to work on real-world projects, through curriculum-based and service-learning opportunities collaborating with non-profit and community leaders as they seek to achieve their missions. The services provided by the CPC would normally not be available to these organizations due to their cost and/or diverse needs.

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1. The Project is being undertaken in the public interest.
2. The deliverables generated hereunder are intended to provide conceptual information only to assist design and planning and such are not intended, nor should they be used, for construction or other project implementation. Furthermore, professional and/or other services may be needed to ultimately implement the desired goals of the public in ownership of the project served.
3. The parties understand, agree and acknowledge that the deliverables being provided hereunder are being performed by students who are not licensed and/or otherwise certified as professionals. Neither RWU nor the CPC makes any warranties or guarantees ex-

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Proposed roof garden perspective.
Design by Leslie Hulbert.

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Fall 2013

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ARCH 413 - Advanced Architectural Design Studio | Ginna Johnson, ASLA

CPC Project Managers: Ellen Hassett | Meghan Spratt | Lisa Fasciglione

Introduction

In October 2012, Sophia Academy purchased a former City School building that will be the school's first permanent home. Currently located at the former St. Edward's Grammar School on Branch Avenue in Providence, the new building (located on Elmwood Avenue) would allow for the school to invest in a rooftop garden — something that was once part of the structure.

The addition of a roof garden to the new site would give Sophia Academy science faculty members the opportunity to provide hands-on learning experiences for the students. The garden would serve as a backdrop to the top-floor meeting area, which looks out onto the roof. Additionally, the rooftop garden would serve as a living and vibrant tribute to Sophia Academy's Founder, Mary Reilly, RSM.

In the spring of 2013, Sophia Academy applied to the Community Partnerships Center at Roger Williams University for support in creating potential designs for the rooftop garden. Students enrolled in ARCH 413 — Advanced Architectural Design Studio — in the fall of 2013 were tasked with creating potential design options for the rooftop garden at the new Sophia Academy site. Students looked at possible programmatic uses for the roof garden and explored potential materiality and vegetation options for the site. Students visited other green roofs and roof gardens in the Providence area as part of the precedent analysis for this project.

The work included in this book showcases the results of a semester's worth of work for the students in the design studio.

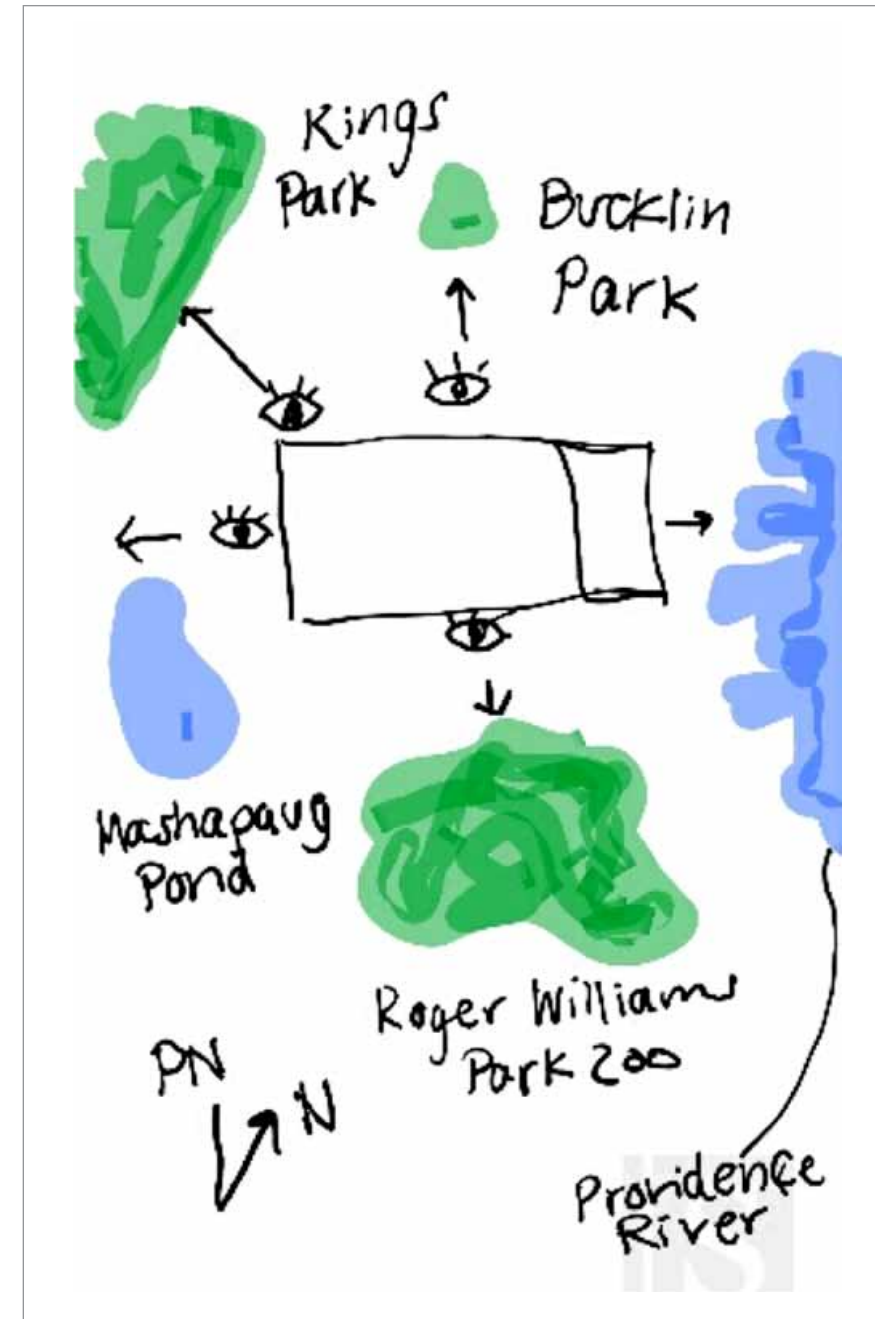


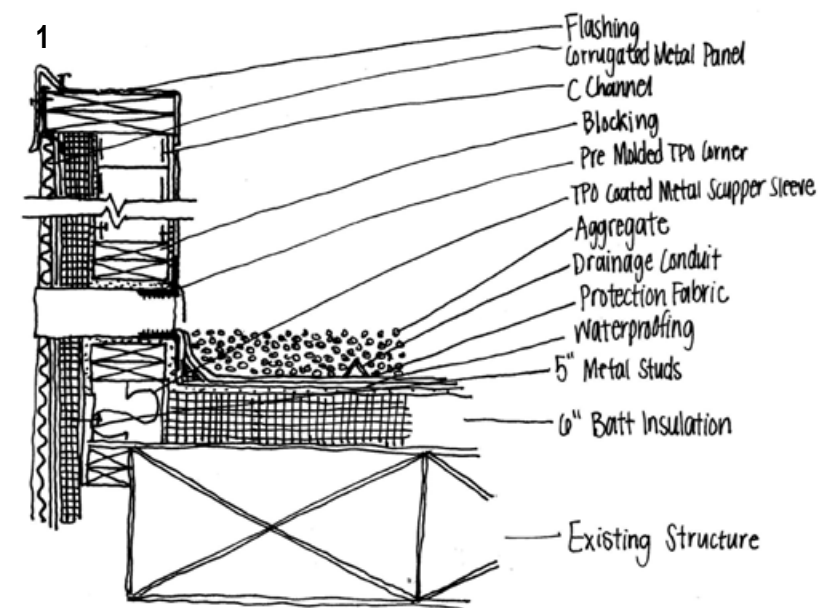
Diagram of city views from the future rooftop garden. Sketch by Chelsea Weibust.

Process

During the fall of 2013, landscape architect Gina Johnson, ASLA, Principal at Esker Company Landscape Architecture in Lexington, MA, served as the faculty mentor for students in the Advanced Architectural Studio, which studied the principles of landscape architecture. As part of one project during the studio, students worked on designing an engaging roof garden for the new Sophia Academy building. Students were tasked with developing possible programmatic uses of the green roof for students and staff, maximizing the services the green roof could provide.

At the beginning of the process, students were asked to conduct an analysis of the building, which once had a green roof as part of its structure, and the surrounding community to help inform their design. Students gained inspiration for their designs from site visits conducted locally at the Granoff Center at Brown University, the Peerless Building and the Save The Bay Education Center. Students studied various types of green roofs and planting systems that could be used on the site in order to inform their designs.

The desired goal for the project was for the staff at Sophia Academy to have a vision of what the transformed roof space could look like on the site and a program for how the space could be utilized. This vision would allow the leaders of Sophia Academy to seek the appropriate funds needed to transform the roof space.



1. Proposed roof parapet detail. Sketch by Cassidhe Griffiths.

2. A sample green roof.

History

"Sophia Academy is a school of abundant opportunity where middle-school girls discover and develop their potential and become confident and compassionate young women prepared to meet the challenges of their world."

- All-girls middle school (5th-8th grade).
- Founded in 2001 by Sister Mary Reilly.
- Fosters intellectual, moral, cultural and social growth for its students.
- Its 60 students are city residents (specifically those facing economic inequities).
- School is supported through private donations, corporate and foundation grants and special events.
- Annual tuition is \$12,500.



1. Founder Sister Mary Reilly in front of Sophia Academy at its Branch Avenue location.
2. A symbolic "ground breaking" ceremony held at the new Elmwood Avenue location.
3. Students of Sophia Academy.
4. The Sophia Academy logo in the floor of the new building.

Site Context

Current Location:

979 Branch Ave, Providence, RI (leasing building)

New Location:

582 Elmwood Ave, Providence RI (move in 2014)

New building:

- Originally built as a branch of Industrial National Bank in 1948.
- Used as a high school and by a construction company as an office.
- Size: 14,000 square feet.
- Site size: 28,000 square feet.
- Two-story building (and basement) masonry building.



1. Aerial view of the new building.

2. Google Map image of the Elmwood Avenue location.

3. Front of the new school, a two-story, masonry structure, which was built in 1948 as a bank.



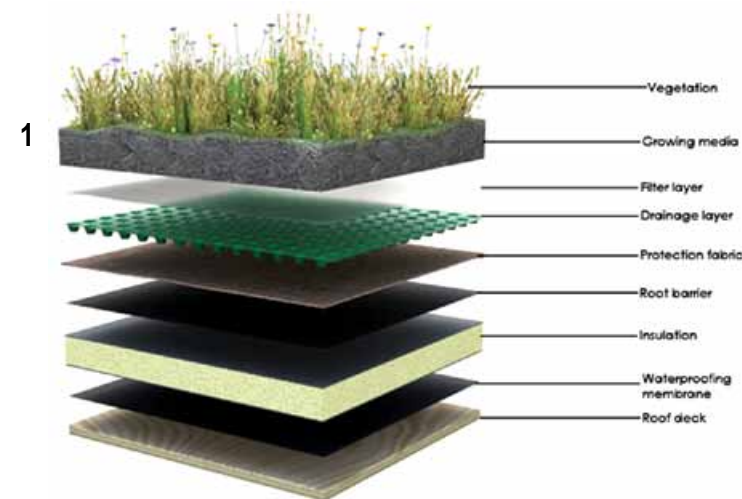


Renderings of new building and site. Adaptive reuse project by Durkee Brown Architects.

Green Roof Study

Environmental Benefits

- Use of roof area as additional space.
- Improves rainwater management.
- Improves thermal performance.
- Reduces sound transmission through roof.
- Visually attractive with a variety of plants and foliage.
- Low maintenance (extensive and brown roofs).
- Little to no artificial irrigation.
- Habitat for wildlife.
- Reduces environmental impact of the building within its surrounding.



1. Diagram of basic green roof requirements:
Image source: www.barrarchitects.net/landscape

2. Green roof HYDROPACK® field in Batavia, NY.
Image source: "Green Roof Design Guide" from Vegetal i.D.

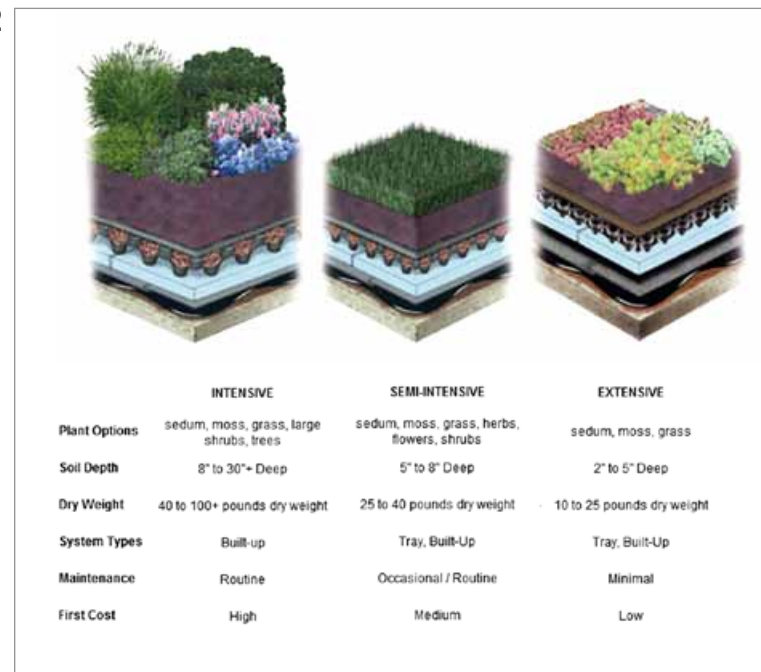
Types of Green Roofs

Intensive Roofs

- Similar management as ground-level gardens.
- Can accommodate virtually any type of plant including grass, moss, shrubs and trees.
- Require artificial irrigation, higher nutrient application and focused maintenance.
- Soil depth ranges from 8" - 30" or more.
- Has greatest impact on structural design.
- Weighs 35-100 pounds per square foot (dry).
- Must pay close attention to waterproofing and roof barrier details.



2



Extensive Roofs

- Low management requirements.
- Cheap to install and maintain.
- Generally made up of a thin layer of soil or other planting medium with shallow-root plants such as sedums, small grasses, herbs and flowers.
- Soil depth ranges from 2" - 5".
- Weighs 10-25 pounds per square foot (dry).
- Tray systems are a viable option.
- Do not require artificial irrigation.

- Plantings are naturalistic and self-sustaining.
- Sedums or hardy wildflower mixtures.
- Habitat for native flora and fauna.

Brown Roofs

- Same benefits and construction methods as intensive/extensive.
- Encourage plant and wildlife biodiversity.
- Utilize local soil and spoil.
- Recycled building rubble and materials (usually 40% or more).
- Range of low-fertility substrate (rubble, sand, rotting timber, etc.).
- Plants tend to establish themselves over a period of time.



1. Example of an intensive roof.

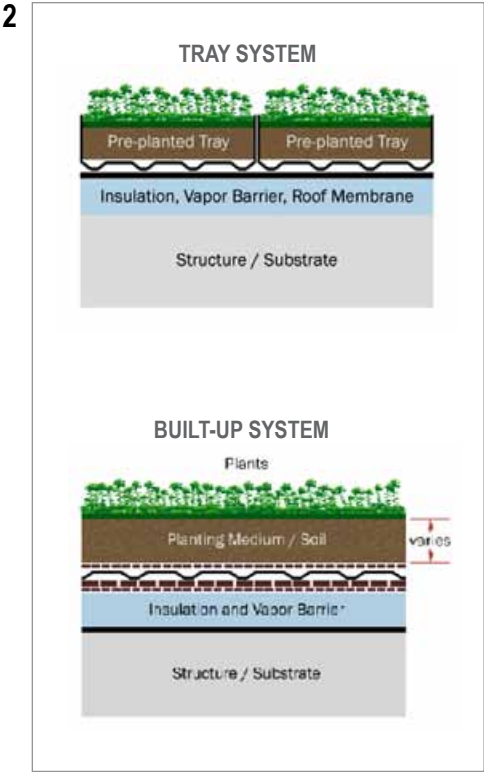
2. Types of green roofs.
Image source: www.barrarchitects.net/landscape

3. Example of a brown roof.
Image source: dustygedge.co.uk

Green Roof Systems

1

| TOPIC | TRAY SYSTEMS | BUILT IN PLACE SYSTEMS |
|--------------------------------------|---|--|
| LEAD TIME | Minimum of 3 months (plants are pre-grown in nurseries) | 2 week lead time (typical extensive systems are planted with cuttings or plugs) |
| MAINTENANCE | Can be initially less maintenance than built-in-place systems. Coverage will decline after installation as conditions are less ideal than in a nursery environment. | Initially more maintenance when established with plugs and cuttings, though similar when established with pre-vegetated mats. |
| COST FOR TYPICAL 4" EXTENSIVE SYSTEM | \$13-20 per sq. ft. tray | \$9-15 per sq. ft. (which includes 8 maintenance visits \$13-20 per sq. ft. tray over 2 years) |
| WATERPROOFING | Covering all areas of the waterproofing material can be more challenging, depending on the dimensions of a roof. In many cases, gaps expose areas of the membrane to the sun/weather which will shorten the life of the roof. | Built-in-place systems cover the entire surface of the waterproofing membrane, therefore preserving it and extending the life of the roof. |
| DESIGN | Less design flexibility (ex. Curves, irregular angles, pitches) | Complete design flexibility |
| LEAK DETECTION | Same requirements | Same requirements |
| RETRO-FIT ROOFS | Plastic (non-biodegradable) tray systems are good for those who wish to have a green roof and will be retro-fitting existing roofs with older waterproofing membranes. Trays have the ability to be moved more easily than a built-in-place system. They are also more convenient for DIY homeowners looking to build their own residential green roof system | Ideally, a built-in-place system would last 40+ years by protecting the waterproofing membrane from UV and temperature fluctuations. Typically recommend this type of installation on a waterproofing membrane that is less than 3 years old to maximize the life of the roof. |
| AESTHETICS | Trays almost always visible, edges do not conform to curved edges or sharp angles. | Continuous vegetation; edges of the roof are continuous, limitless design options with curved spaces, angles, and pitch. |
| PLANT HEALTH | Depending on the type of tray, plant health can be compromised as plants cannot share the resources of water and nutrients as easily. | Time proven complete eco-systems where plants adapt to the microclimate conditions of the roof surface. |
| PRODUCT QUALITY | Many manufacturers will not warranty anything but the module and soil. Modules exposed to the sun on the edges are typically not warranted. | 40-70 years experience in Europe and USA. Fully warranted plants and components as well as single source options. |
| PITCHED ROOFS | Not recommended - tray systems are likely to lose their shape or break apart on pitched roofs. | Can be installed on almost any pitch. |



1. Chart comparing tray systems to built-up systems.

2. Diagrams of green roof systems. Image source: archtoolbox.com

Green Roof Precedents

Granoff Center, Brown University

Providence, Rhode Island

PROJECT YEAR: 2011

BUILDING TYPE: EDUCATION, VISUAL ARTS CENTER

ARCHITECT: DILLER, SCROFIDO + RENFRO

GREEN ROOF SYSTEM: APEX GREEN ROOF



Peerless Building

Providence, Rhode Island

PROJECT YEAR: 2005

BUILDING TYPE: MIXED USE, RESIDENTIAL

DURKEE BROWN VIVEIROS WERENFELS ARCHITECTS



1-3. Building exterior and self-sustaining rooftop garden of the Granoff Center. This roof is not accessible to the public.

4-5. Building exterior and rooftop garden of the Peerless Building. This roof is accessible for use by residents.

Save The Bay

Providence, Rhode Island

PROJECT YEAR: 2004

BUILDING TYPE: EDUCATION

CROXTON COLLABORATIVE ARCHITECTS

GREEN ROOF SYSTEM: SIKA SARNAFIL, INC.



2



Wheeler School

Providence, Rhode Island

PROJECT YEAR: 2009

BUILDING TYPE: EDUCATION, VISUAL ARTS CENTER

ANN BEHA ARCHITECTS

3



1-2. Semi-intensive exterior rooftop garden of the Save The Bay Center. This roof is not accessible to the public.

3-4. Building exterior and tray system rooftop garden at the Wheeler School. This roof is not accessible to the public.

Design Options

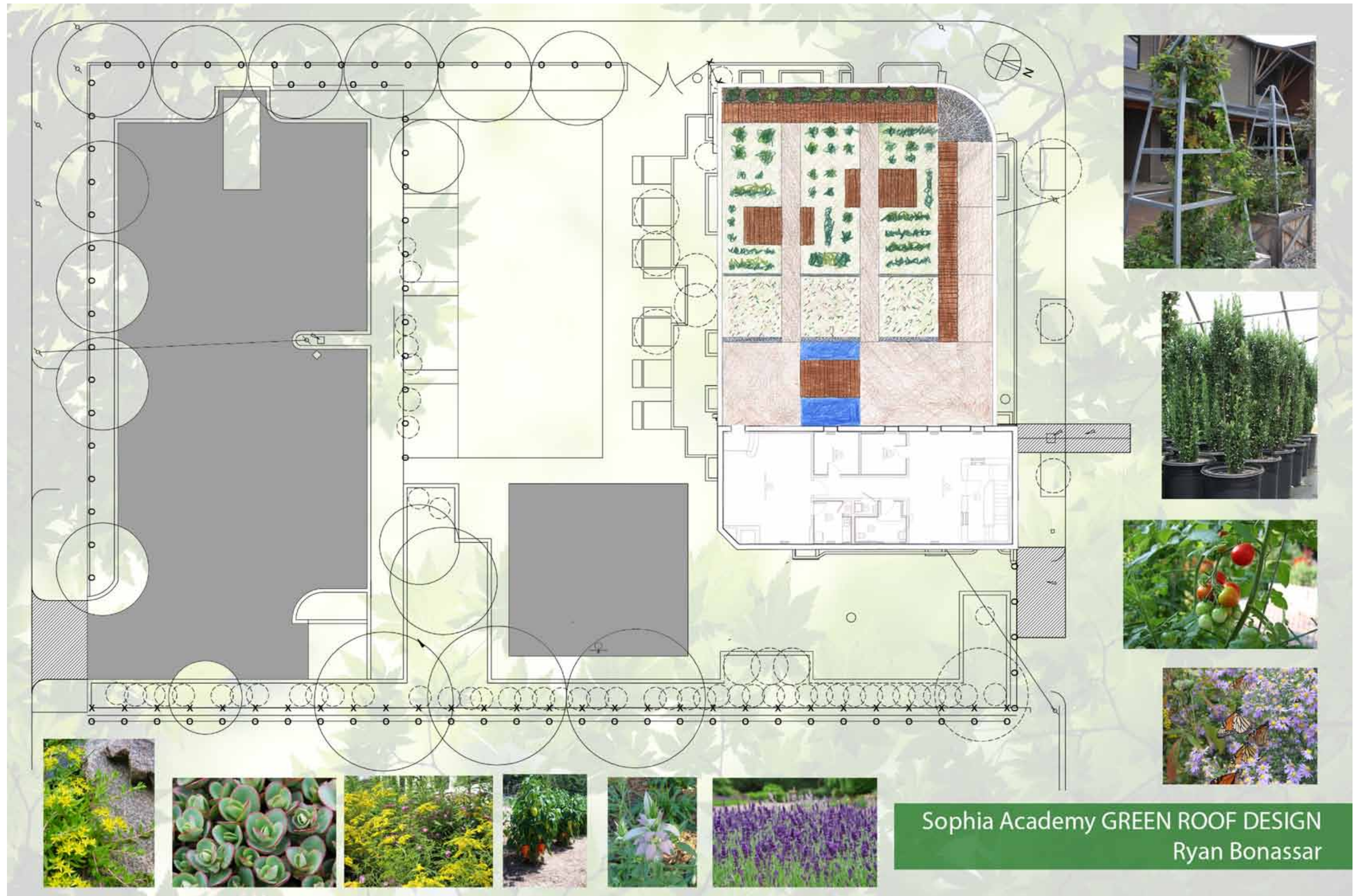
Ryan Bonassar

Concept: Gardening

Geometric pathways divide the roof into smaller garden zones. Plants include both vegetables and flowers. Includes pergola and seating.



1-2. Models of proposed rooftop garden containing vegetable and flower plants.



Design Options

Paul Clark

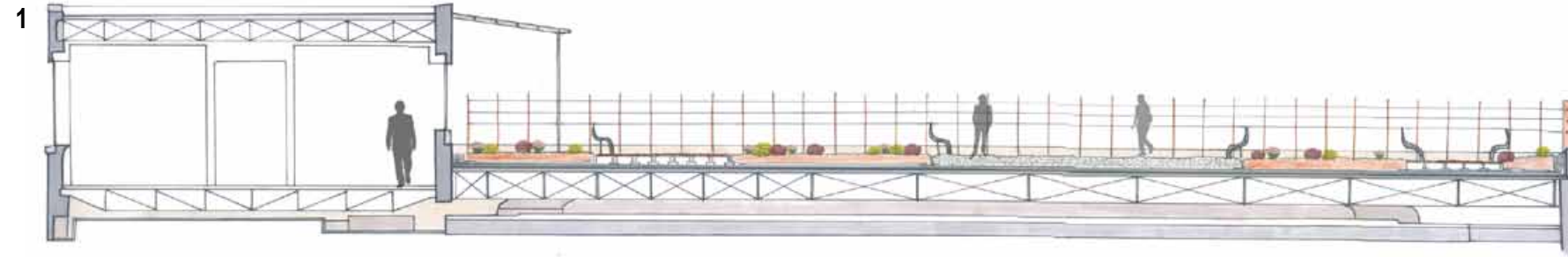
Concept: Quiet Space

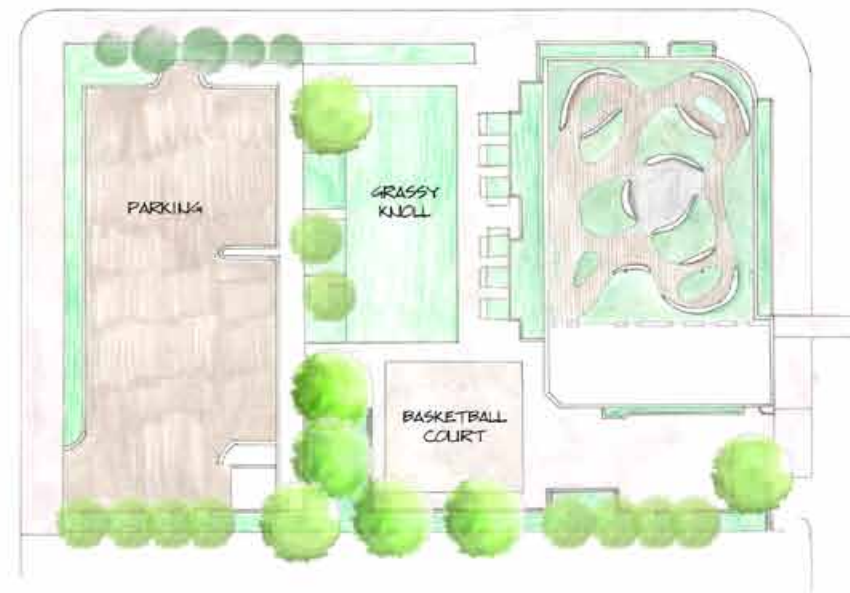
Organic pathway branches off to create multiple intimate gathering zones. Zones have custom steel benches that focus attention inward. Includes pergola, custom railing and addition of windows.



1. Section.

2. Perspective with rooftop view of the Providence skyline.





The Site 1/16" Scale



Sketch Perspective



Railing
From on you can see out but on an angle it creates enclosure



Bench
Built out of curved steel the bench matches the curves of the ground and conforms well to the body.

Selected Plants



Sedum spathulifolium



Sedum showy stonecrop



Sedum dendroideum



Thyme



Sedum grisebachii



Sedum spurium



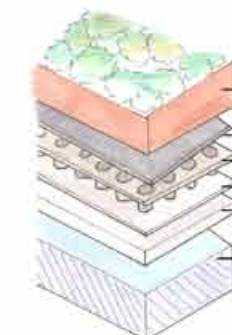
Panicum virgatum



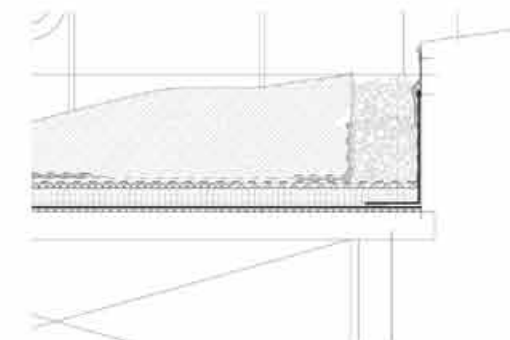
Artemisia frigida



Plan 1/8"th Scale



Plants
Growing Medium
Membrane
Water Collector
Drainage Mat
Water Proofing
Insulation



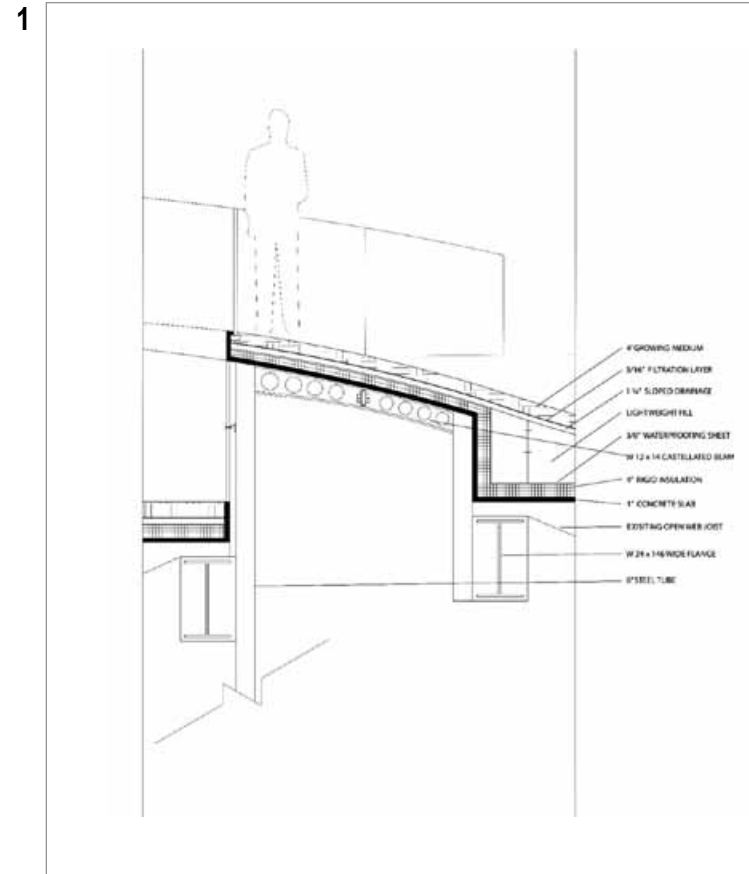
Roof Assembly Detail

Design Options

Robert Clarke

Concept: Interaction with Skylights

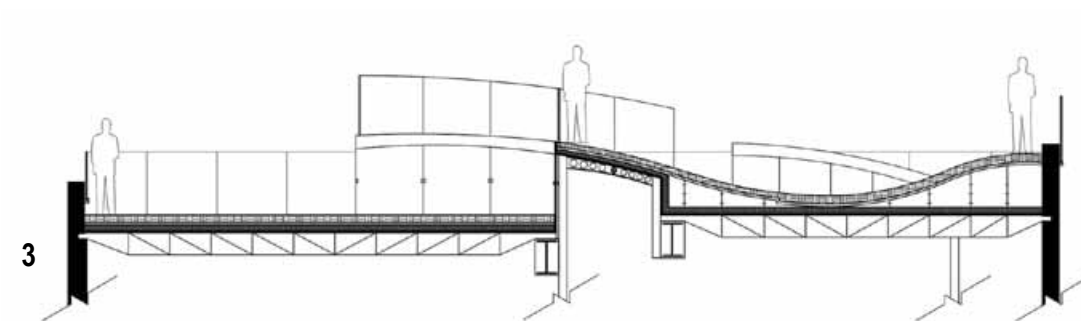
Skylight addition to roof creates change in elevations and improves light in rooms below. Stone pathway leads up to higher sections of roof. Includes gathering space, stone furniture and green space.

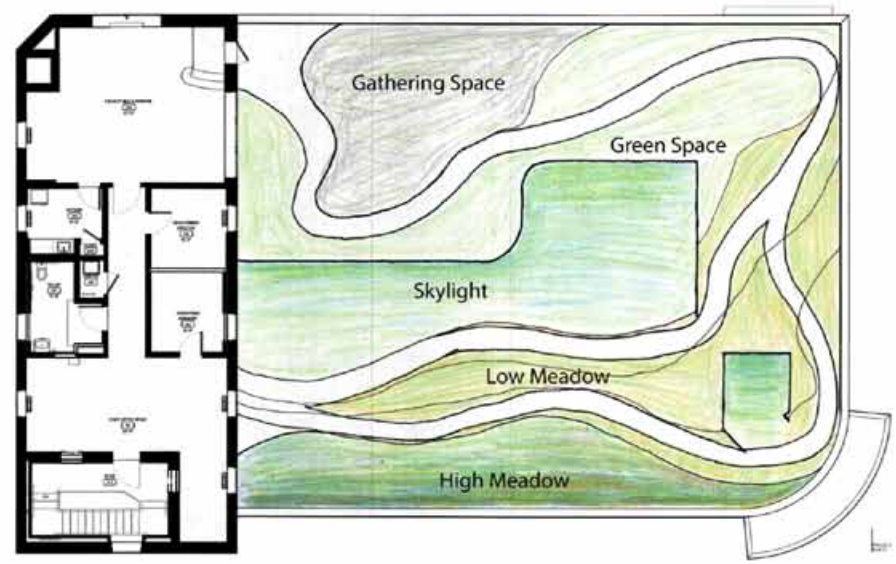
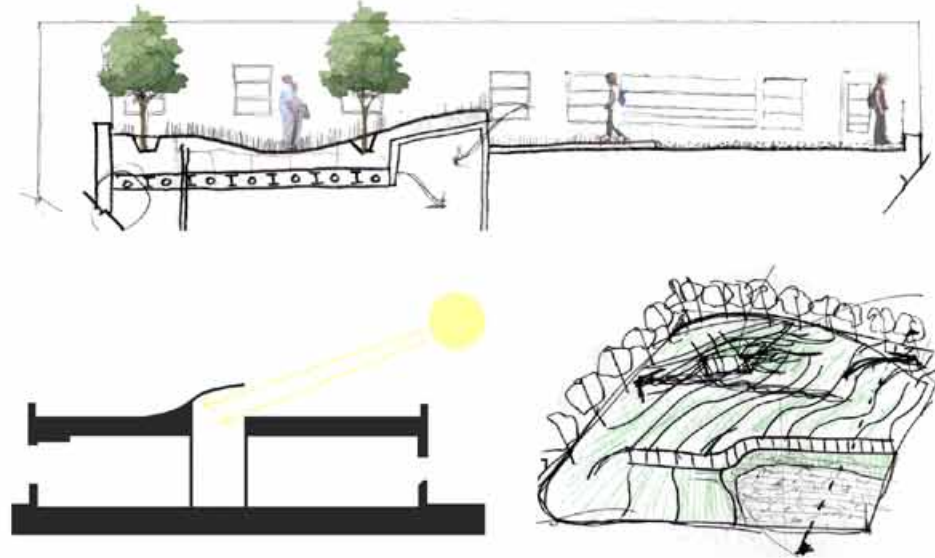
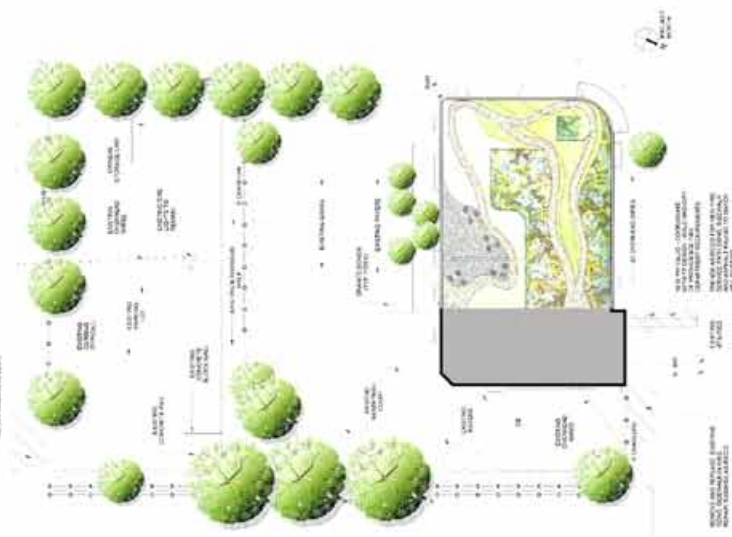


1. Detail of skylight.

2. Perspective.

3. Section.





ROOF PLAN

ROBERT CLARKE



SIDEOATS GRAMA



DWARF LADY'S MANTLE



DESERT BELLS



VIPER BUGLOSS



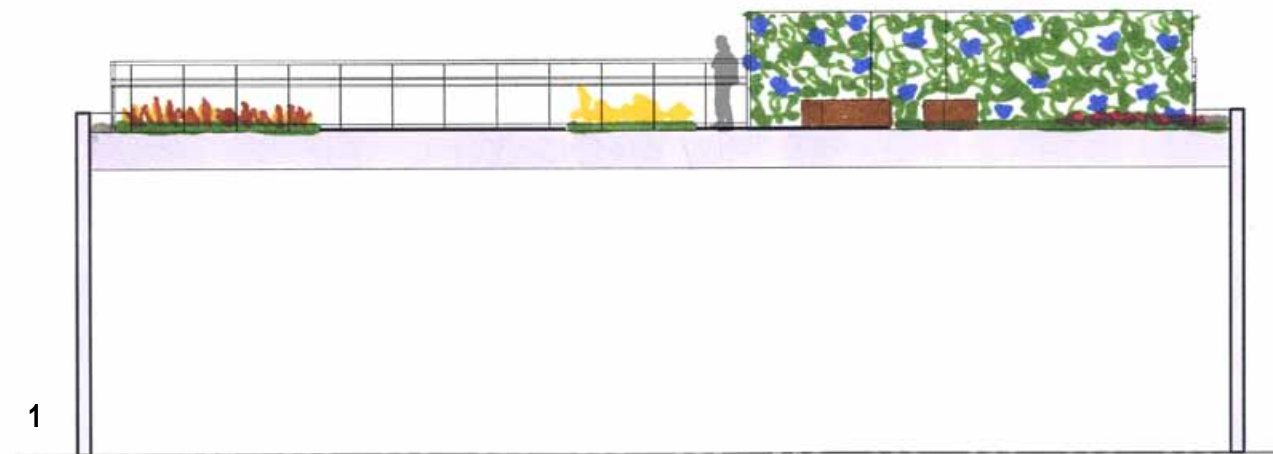
CORAL REEF

Design Options

Lisa Fasciglione

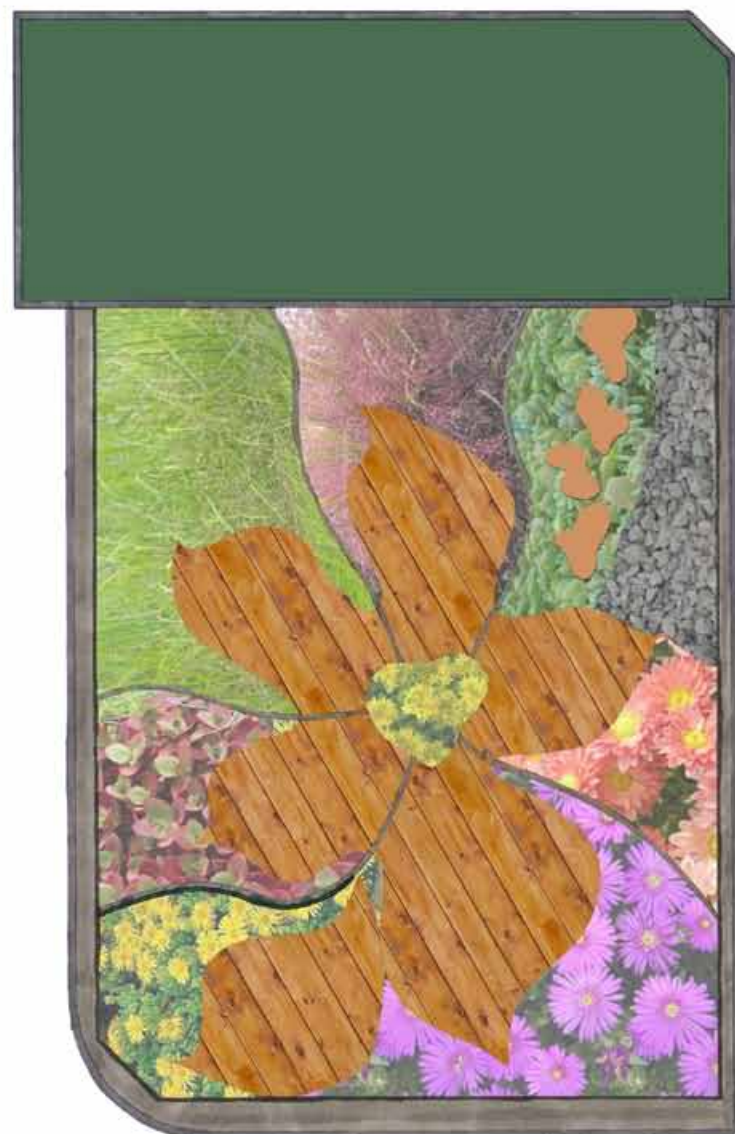
Concept: Feminine Flower

As a girls' school, a feminine feel is emphasized through flower petal-shaped decking and plants of many colors. Includes gathering spaces, privacy screen trellis and an outdoor classroom.

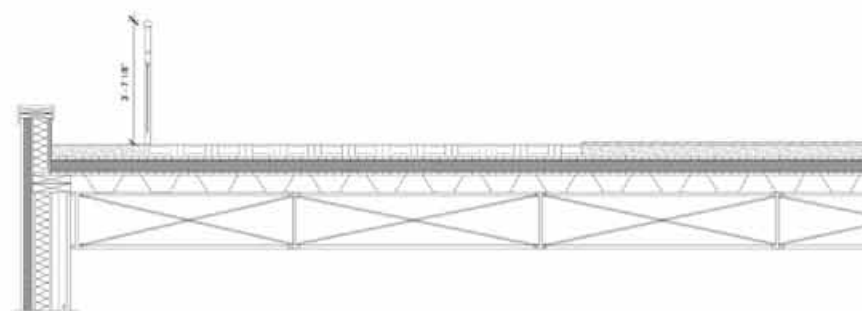


1. Section.

2. Axonometric of the proposed flower petal design.



ROOF PLAN



LISA FASCIGLIONE



DELOSPERMA
DYERI



DELOSPERMA
ECKLONIS



PANICUM
VIRGATUM



DELOSPERMA
CONGESTUM



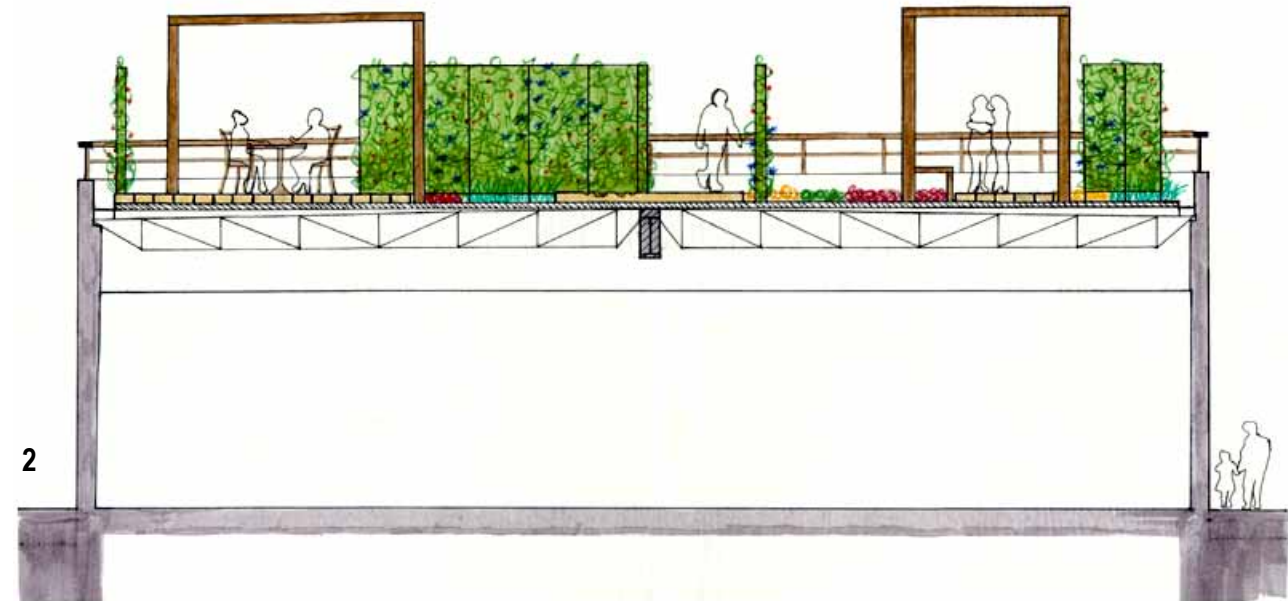
OSBERG

Design Options

April Gaddis

Concept: *Hide and Reveal*

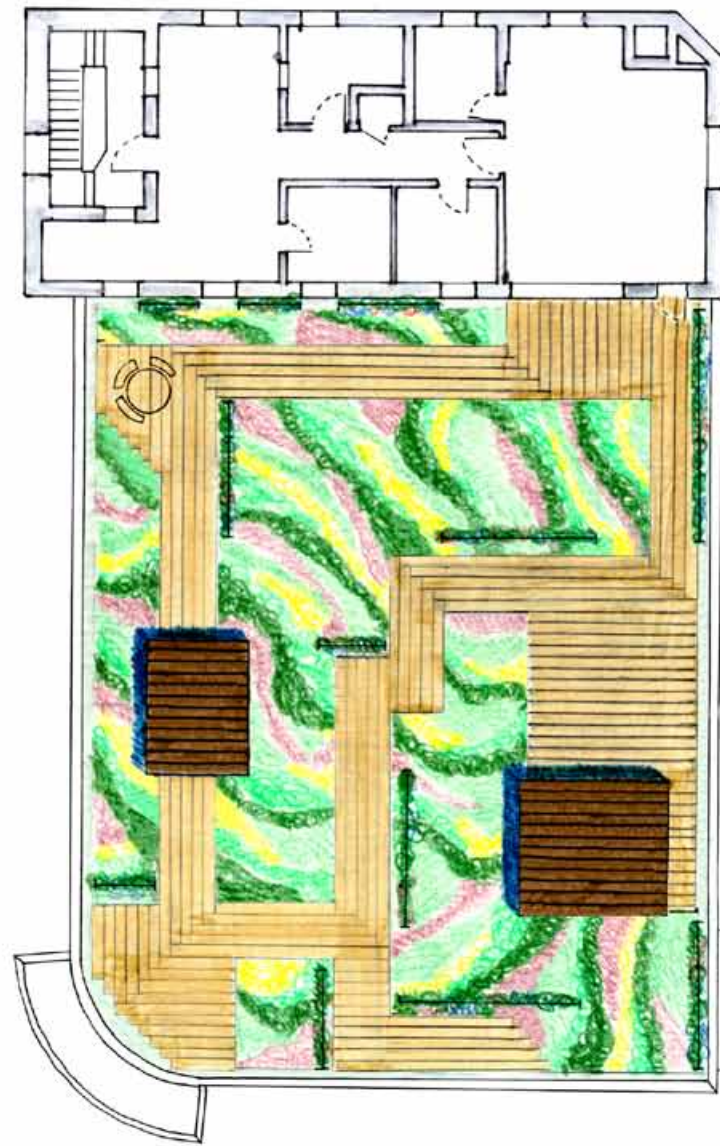
Geometric pathways of teak decking contrast with plants in organic patterns. Green wall screens and wooden elements create privacy and shading. Includes seating and gathering spaces.



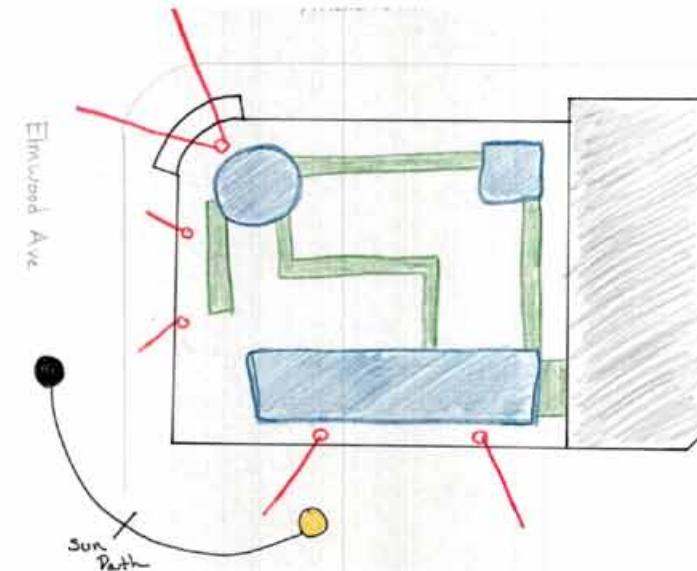
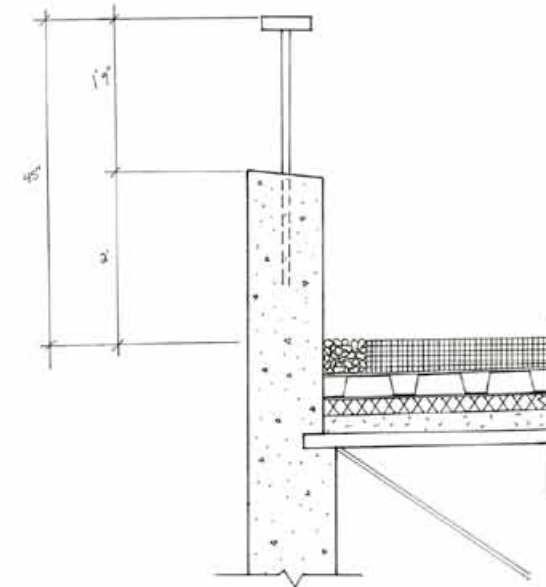
1. Perspective.

2. Section.





ROOF PLAN



APRIL GADDIS



SPURIUM
FULDAGLUT



FESTUCA
IDAHOENSIS



WEIHENSTEPHANER
GOLD



CARDINAL
CLIMBER



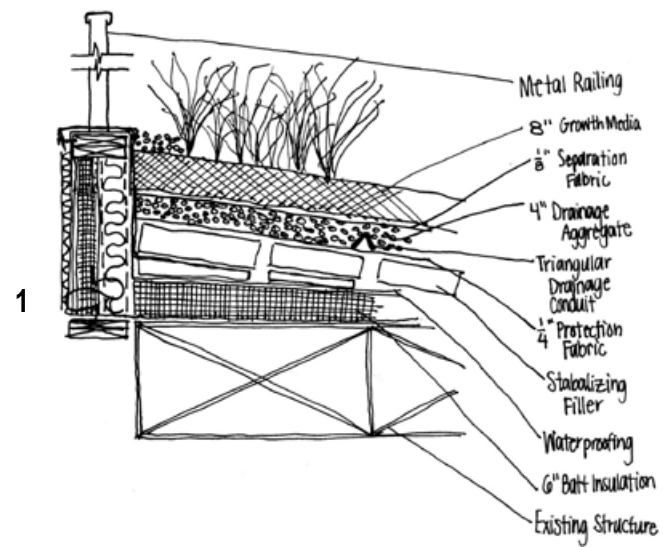
BOUGAINVILLEA

Design Options

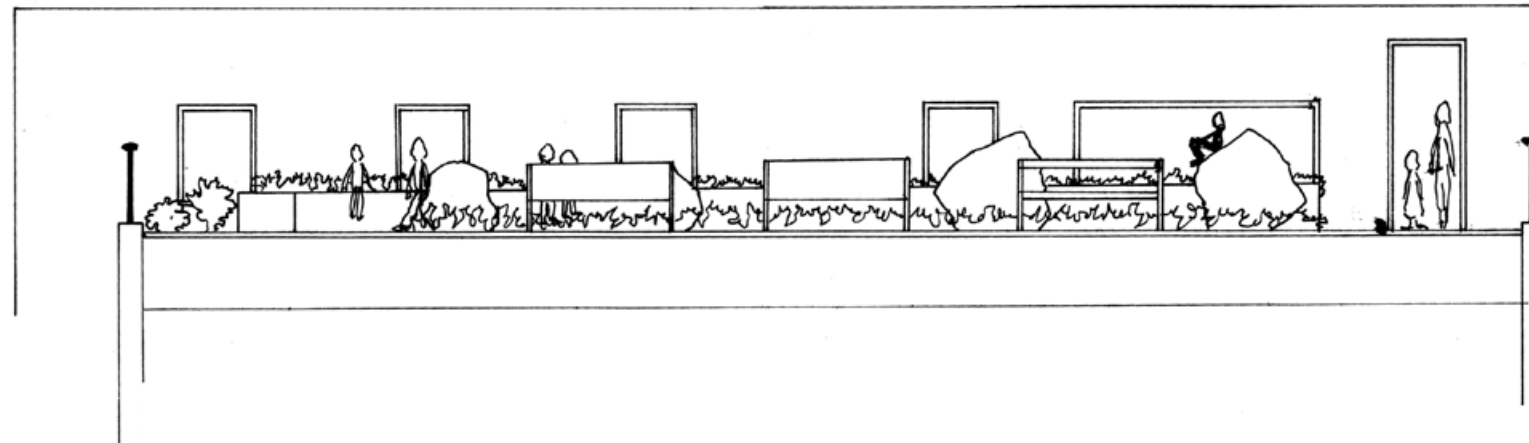
Cassidhe Griffiths

Concept: Natural vs. Built

Geometric design with wood and stone pathways that lead in straight lines. Half of the garden is manicured while half naturally thrives. Includes benches along the pathway for seating.



2



1. Slope detail.

2. Section.

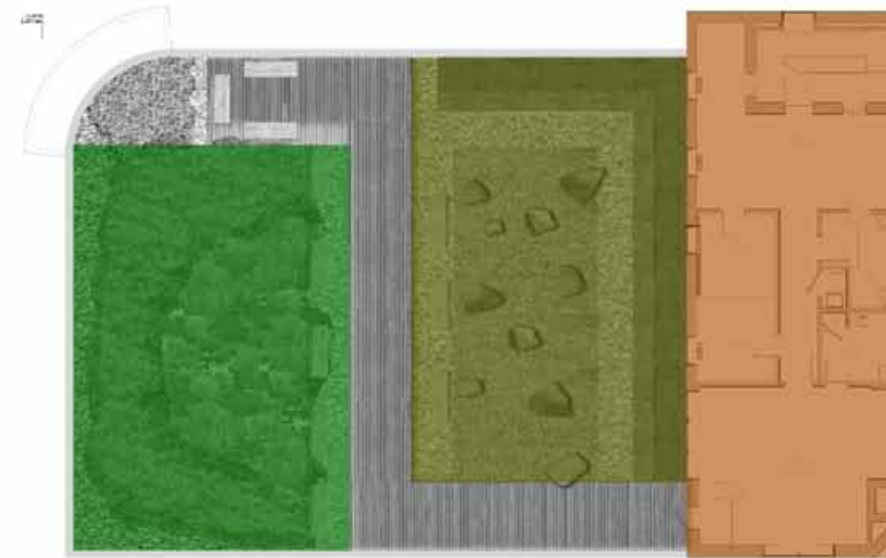
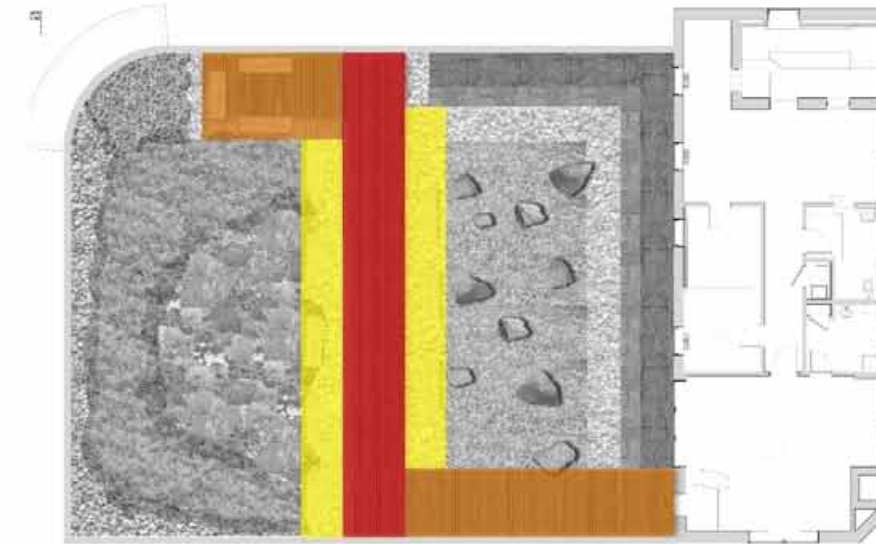
3. Perspective.

3





ROOF PLAN



CASSIDHE GRIFFITHS



ASTER
NOVAEANGLIAE



SEDUM
CAUDICOLA



ALLIUM
SCHOENOPRASUM



ACHILLEA
MILLEFOLIUM



RUDBECKIA
HIRTA

Design Options

Leslie Hulbert

Concept: *The Bay*

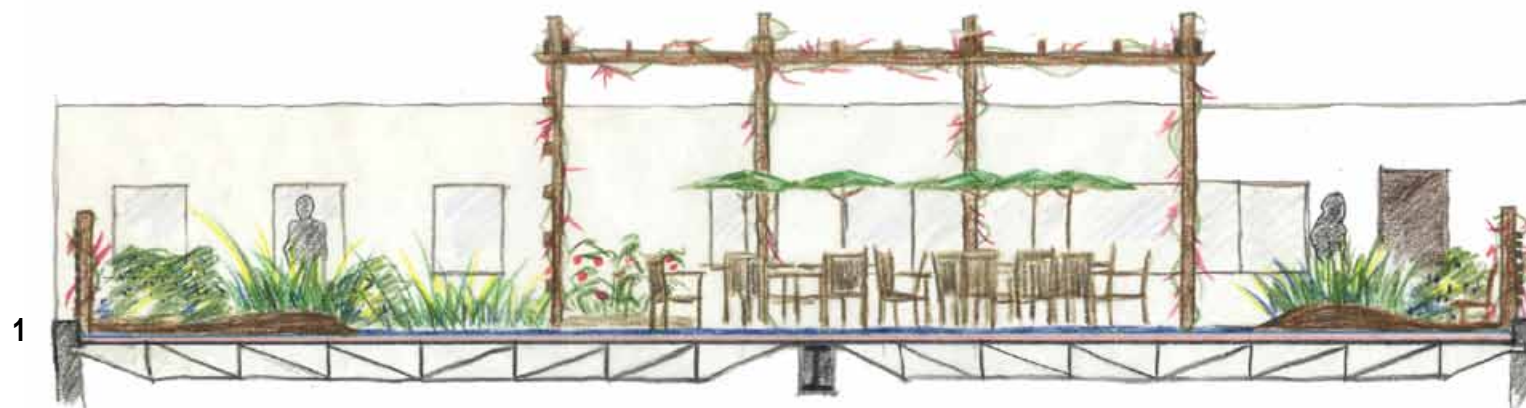
Taking inspiration from the water around Rhode Island, washed wood decking appears as water with the surrounding plants as the shore. Includes pergola, gathering spaces and vegetable garden.

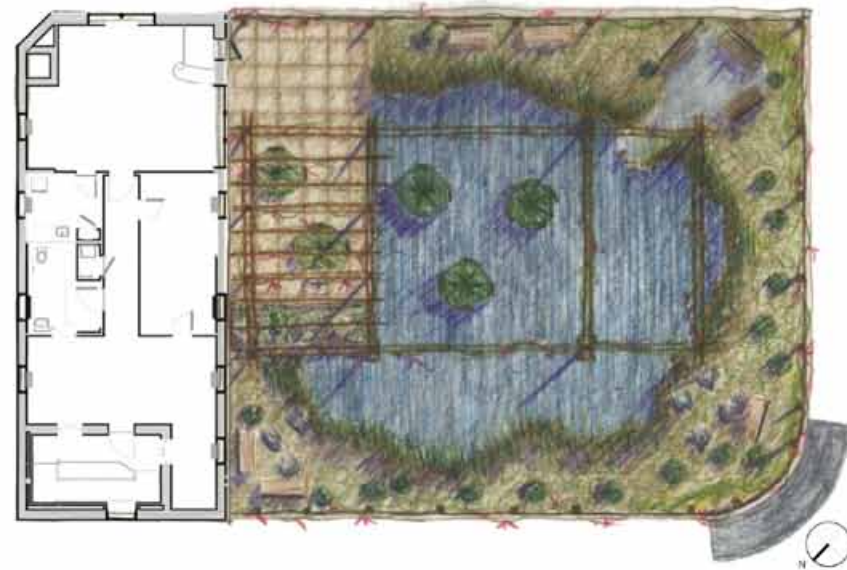
2



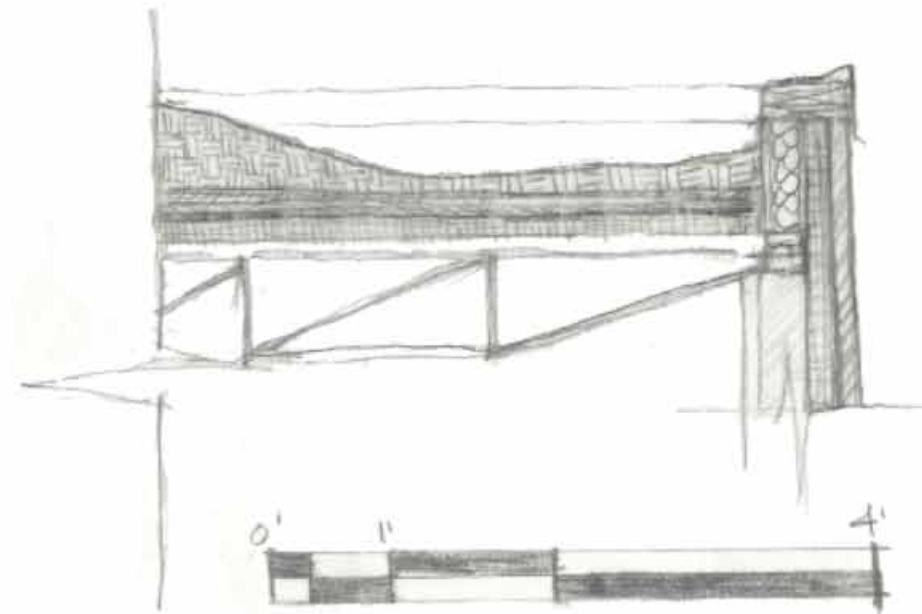
1. Section.

2. Perspective.





ROOF PLAN



0' 1' 2' 4'
6" 2'
SCALE: 1/2" = 1'-0"

LESLIE HULBERT



CAMPSIS
RADICANS



AMMOPHILA
BREVILIGULTA



OCIMUM
BASILICUM



ALLIUM
SATIVUM



LONICERA
SEMPERVIRENS

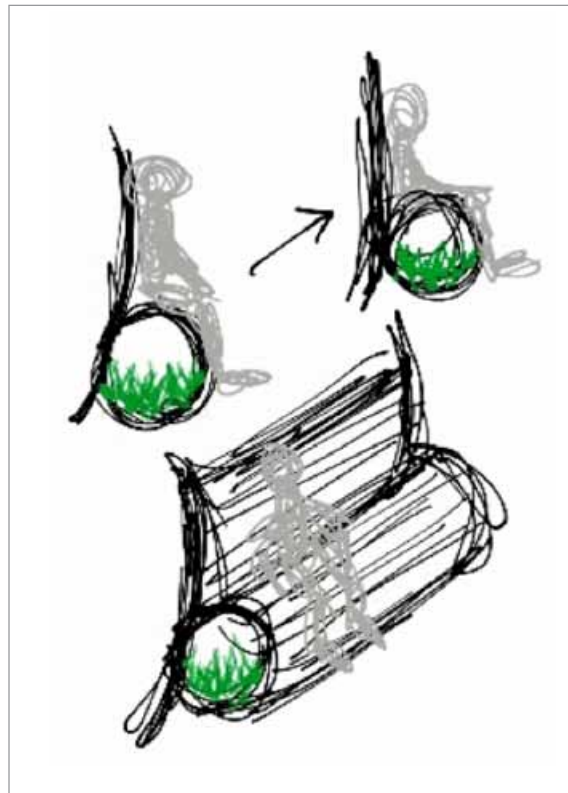
Design Options

Chelsea Weibust

Concept: Urban Nest

Design based off imagery of eggs in a birds nest. Includes outdoor classroom, gathering spaces and custom log benches. Crushed concrete “brown roof” occupies a large portion of the rooftop.

1



2

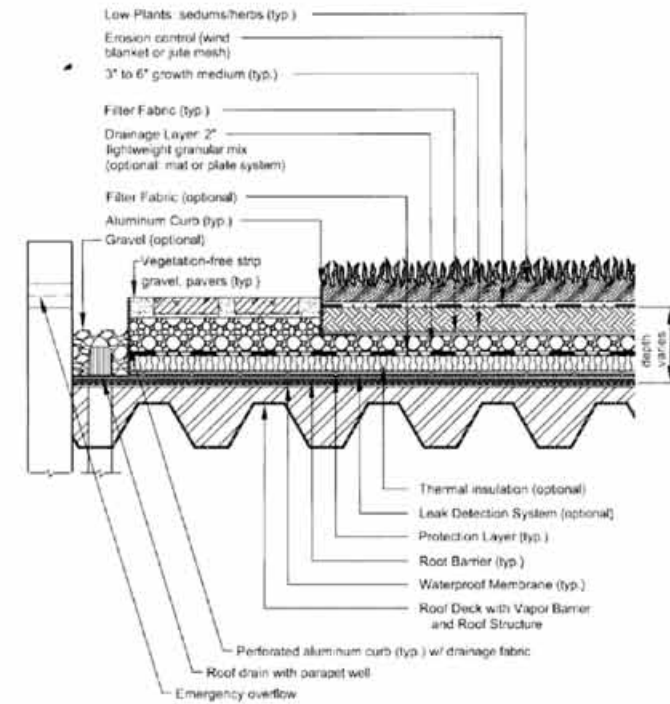


1. Sketch of log-like bench.

2. Axonometric
facing south.



ROOF PLAN



CHELSEA WEIBUST



AQUILEGIA
CANADENSIS



FOAM
FLOWER



YUCCA
ALOIFOLIA



OENOTHERA
MACROCARPA



PANICUM
VIRGATUM



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