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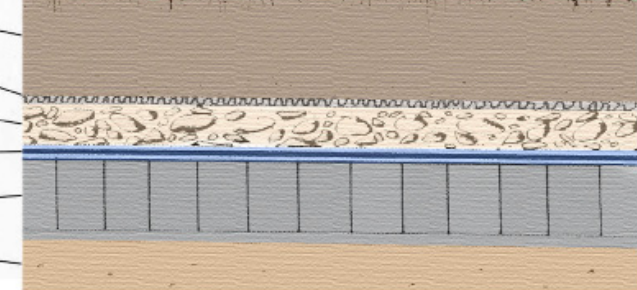
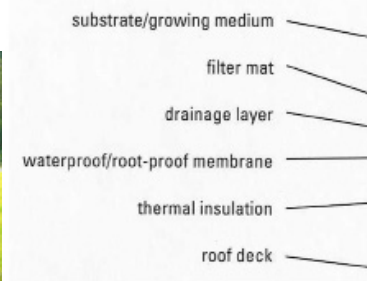
PURPOSE:

INSTALLATION OF GREEN ROOFS ON CAMPUS TO **INSPIRE** AND **EDUCATE** WESTERN STUDENTS AND FACULTY ABOUT THE ENVIRONMENTAL AND ECONOMIC BENEFITS OF SUSTAINABLE GREEN CONSTRUCTION.



WHAT IS A GREEN ROOF?...

A ROOF THAT IS COVERED WITH VEGETATION AND DRAINAGE
PLANTED OVER A WATER PROOF MEMBRANE





EXTENSIVE

VS

INTENSIVE



SHALLOW SUBSTRATE LAYER < 6 IN.

HERBS, GRASSES, MOSSES, DROUGHT
TOLERANT SUCCULENTS-SEDUMS

MINIMAL MAINTENANCE

INSTALLED ON SLOPED ROOFS

NO PUBLIC ACCESS

DEEPER SUBSTRATE LAYER > 4"

SUPPORTS WIDE VARIETY OF PLANTS SPECIES

INTENSE MAINTENANCE

LIMITED TO FLAT ROOFS & STRUCTURE REINFORCING

ACCESSIBLE FOR RECREATION



SEDUM MAT 2"

WATER RETENTION

FLEECE 1/2"

DRAINAGE LAYER 1/2"



PURPOSE

DEFINITION

CASE STUDY

BENEFITS

DESIGN

SITE

POTENTIAL



MICHIGAN STATE UNIVERSITY

GREENROOF RESEARCH PROGRAM



48 RAISED ROOF PLATFORMS

4' x 4' AND 8' x 8'

3500 SF GREEN ROOF

USED XEROFLOR

GRADUATE AND UNDERGRADUATE EDUCATION

ONGOING RESEARCH

INSTALLATION

MONITORING

MAINTENANCE



GREENROOF BENEFITS

ENVIRONMENTAL:

- AIR QUALITY
- WATER MANAGEMENT
- URBAN ECOSYSTEM
- REDUCE HEAT ISLAND EFFECT

ECONOMIC

- LONGER MATERIAL LIFESPAN
- GRANT ELIGIBILITY
- SATISFY REGULATORY REQUIREMENTS

EDUCATIONAL BENEFITS:

- MAJOR DESIGN PRINCIPLES
- ENVIRONMENTAL AND ECOLOGICAL BENEFITS
- CONTINUED STUDIES AND RESEARCH
- INCREASE IN STUDENT AND FACULTY SUPPORT

Seattle Tilth GREEN ROOF

What is a Green Roof?

Green roofs are vegetated roof covers with soil and plants that take the place of shingles or tiles. Also called eco-roofs, living roofs and roof gardens, green roofs are an innovative stormwater management solution that can simultaneously improve the energy performance of buildings, air quality and urban ecology -- all without taking up additional land.

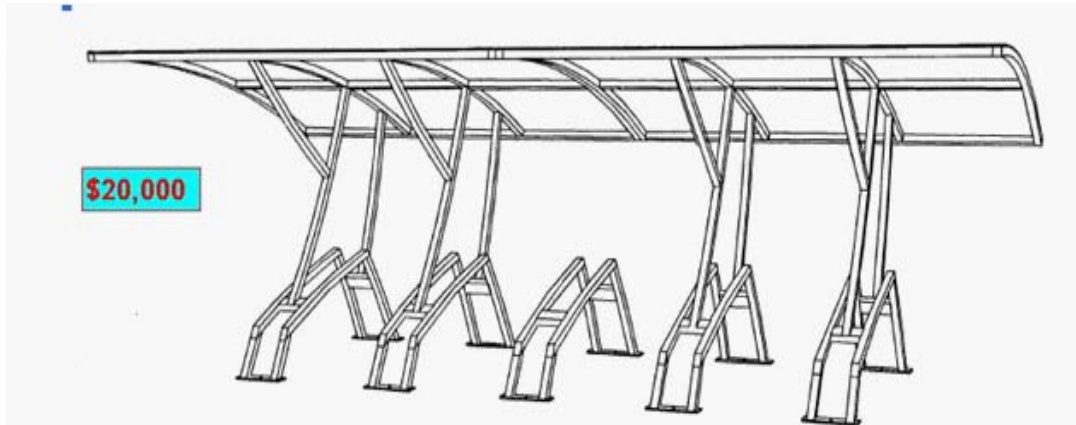
The basic structure of a green roof system involves a waterproof and root repellent membrane, a drainage mat, a lightweight soil mixture, soil filter cloth and plants.

Green Roofs:

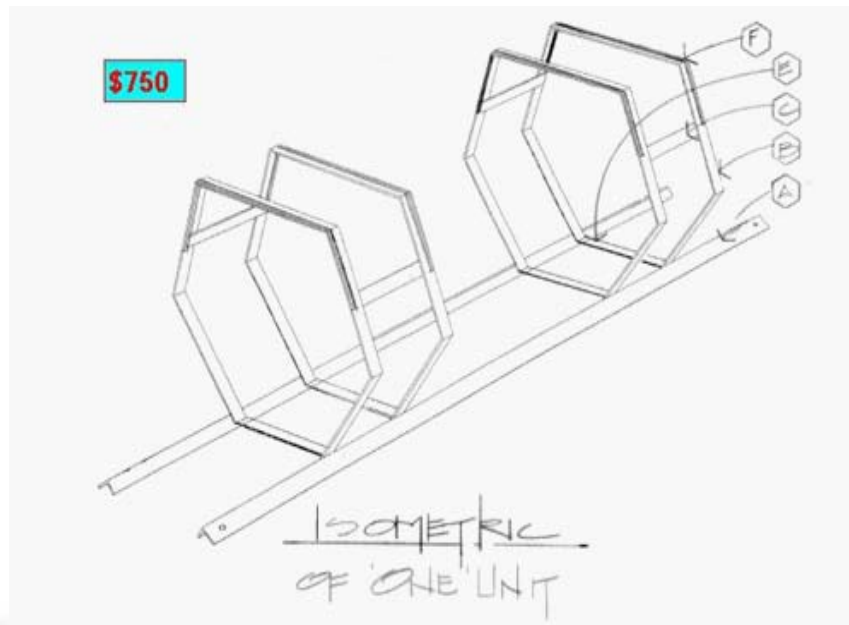
- Reduce the volume of stormwater flowing into streams and drainage channels.
- Decrease toxins that flow into our waterways by absorbing pollutants.
- Provide better insulation. A shaded roof surface helps to cool the building in the summer and acts as a blanket to conserve warmth in winter.
- Reduce the urban "heat island" effect. On warm summer days a city can be 6-8° warmer than surrounding areas due to reflected heat. Green roofs cool the air by reducing solar radiation and also through evapotranspiration, where plants emit water through leaf pores cooling the air in the process.
- Lengthen the existing roof life by 2 to 3 times. The roof deck is better protected from UV rays, weather damage and extreme temperature differences.
- Improve air quality by converting carbon dioxide into oxygen.
- Provide habitat for diverse plant and animal species including beneficial insects and songbirds.
- Add beauty and nature to an urban environment.

This project is funded in part by a King County, Department of Natural Resources and Parks, Water Works grant. Green roof construction, site visit and educational content for sign was provided by The NW Building Club and local design group. Green roof sign design and graphics by The Kingpin.

EXISTING BIKE RACKS & COST



CURRENT COVERED STANDARD	
TOTAL COST	\$20,000
BIKE CAPACITY	10
COST PER BIKE	\$2,000



PREVIOUS UNCOVERED STANDARD	
TOTAL COST	\$750
BIKE CAPACITY	4
COST PER BIKE	\$188

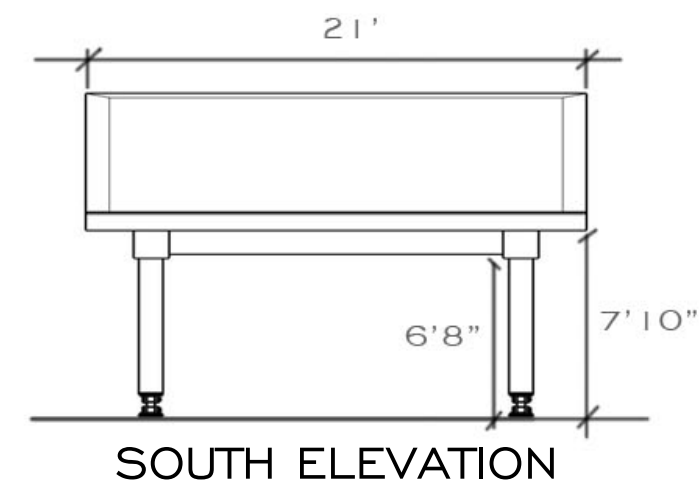
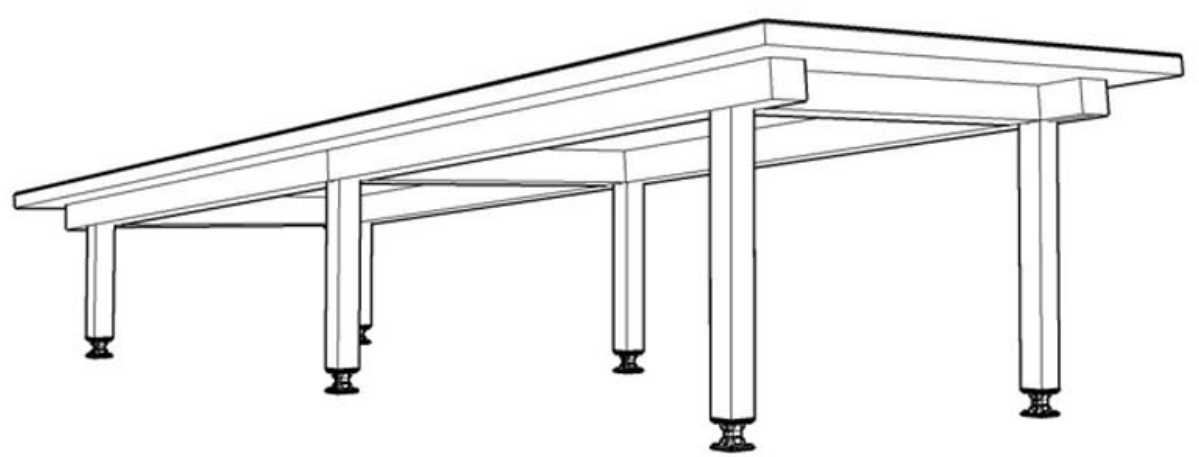
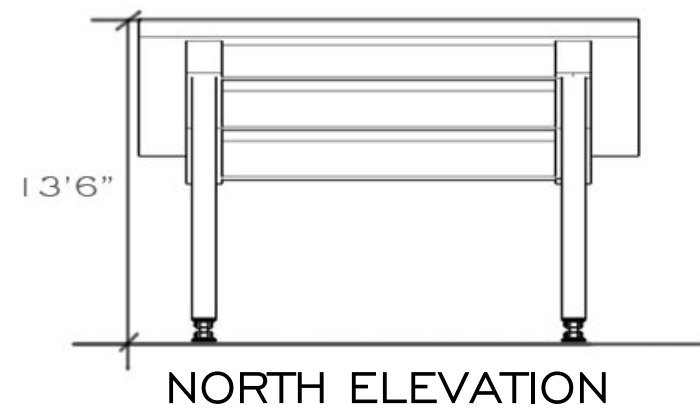
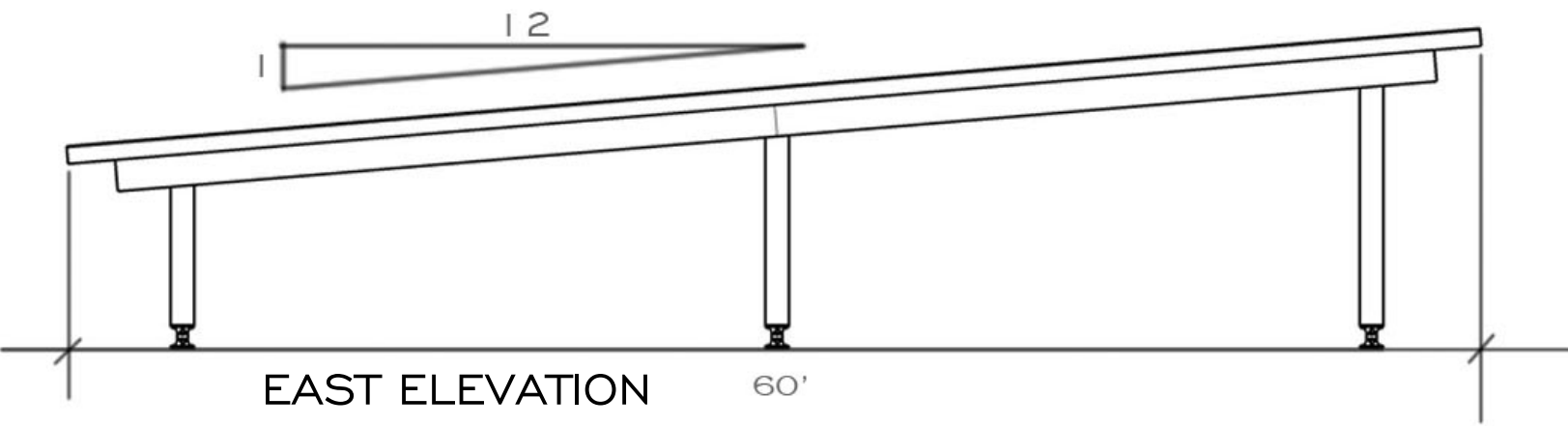


PROPOSED BIKE ROOF COST

MILLER & COMMUNICATIONS LABOR/MATERIALS		\$ 1 00,000
FOOTINGS, POSTS, BEAMS,		
CONCRETE, AND ALL OTHER MATERIALS		
WATERPROOF MEMBRANE		\$ 75,000
GREEN ROOF MATERIALS @ \$8.00 SF		\$ 21,600
TOTAL PROJECT COST ESTIMATE		\$ 196,600
BUS STOP GREEN ROOF INSTALLATION		\$ 11,800
MILLER HALL DESIGN	1 200 SQF	
TOTAL COST		\$92,400
CURRENT BIKE CAPACITY	56	
COST PER BIKE		\$ 1 650
POTENTIAL BIKE CAPACITY	80	
COST POTENTIAL PER BIKE		\$ 1 1 55
COMMUNICATIONS DESIGN	900 SQF	
TOTAL COST		\$92,400
CURRENT BIKE CAPACITY	48	
COST PER BIKE		\$ 1 925
POTENTIAL BIKE CAPACITY	64	
COST POTENTIAL PER BIKE		\$ 1 440

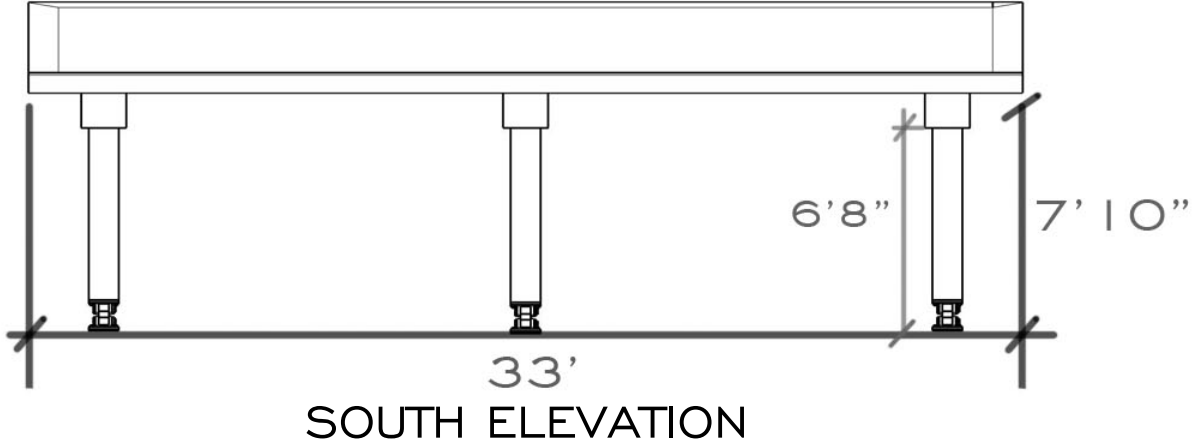
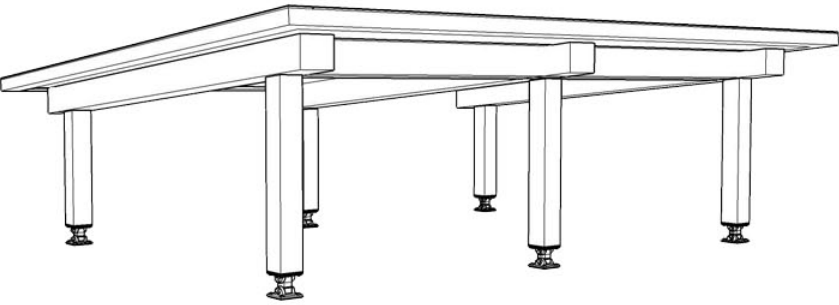
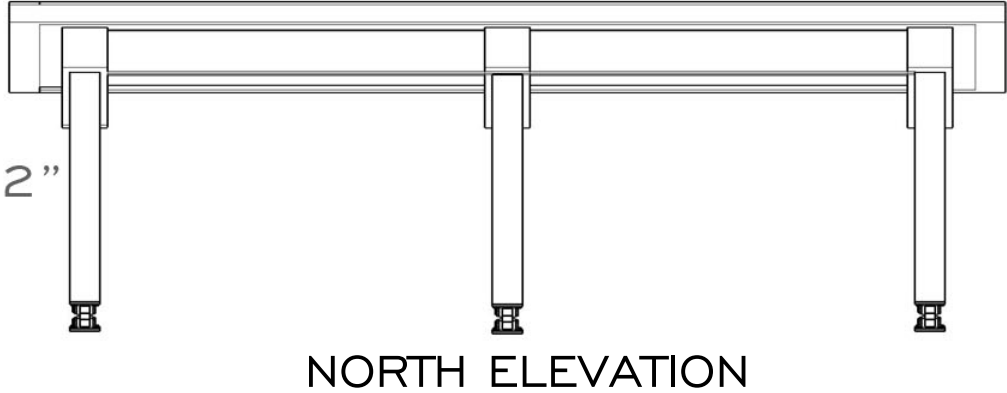
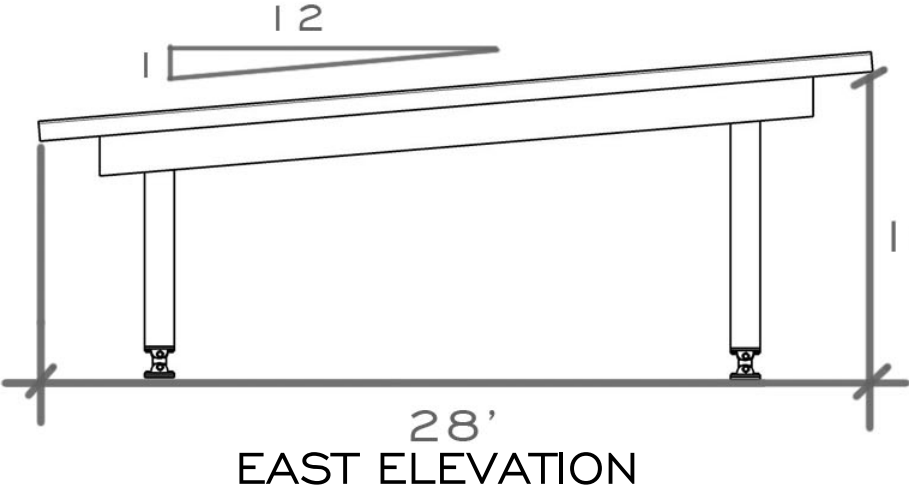


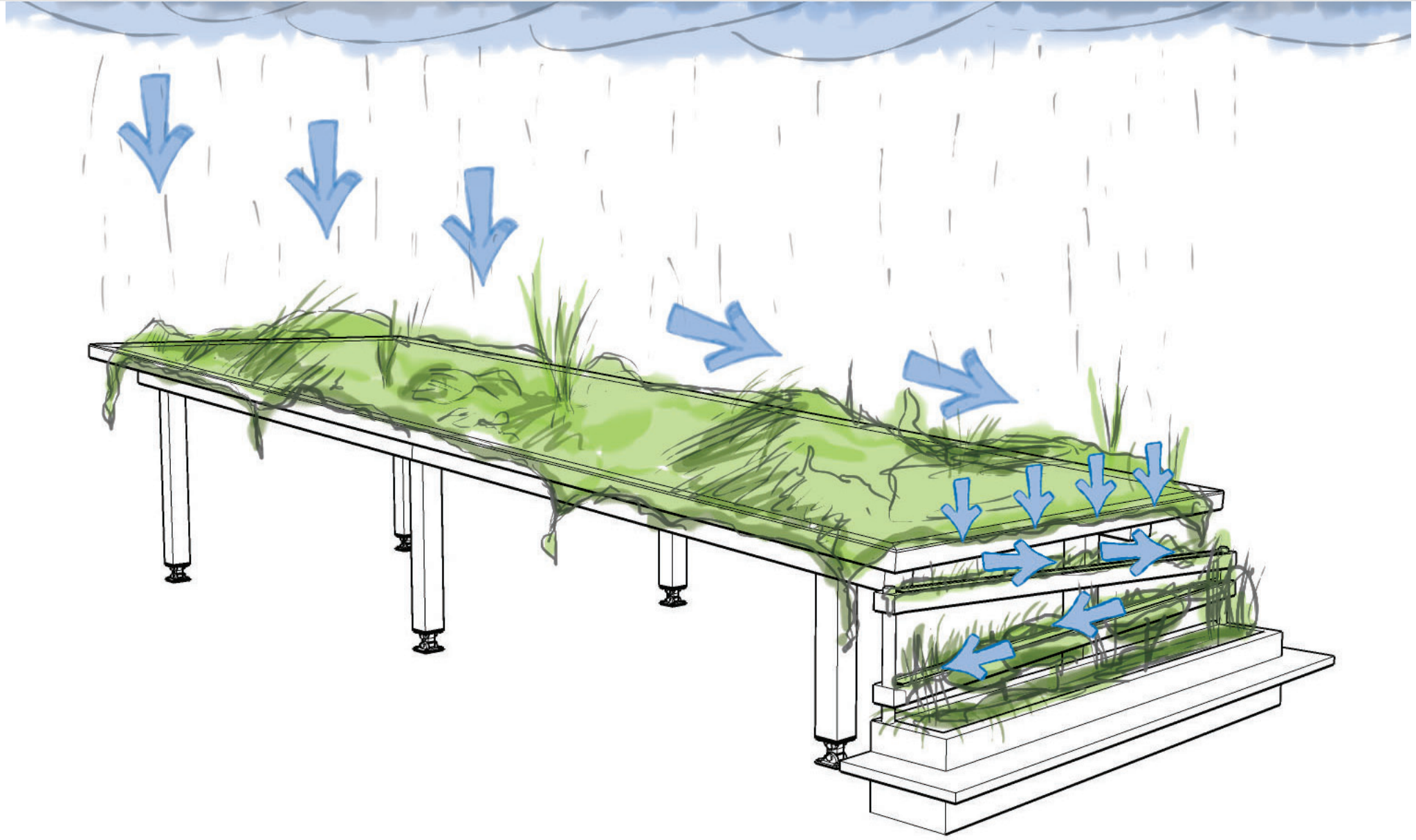
MILLER HALL DESIGN



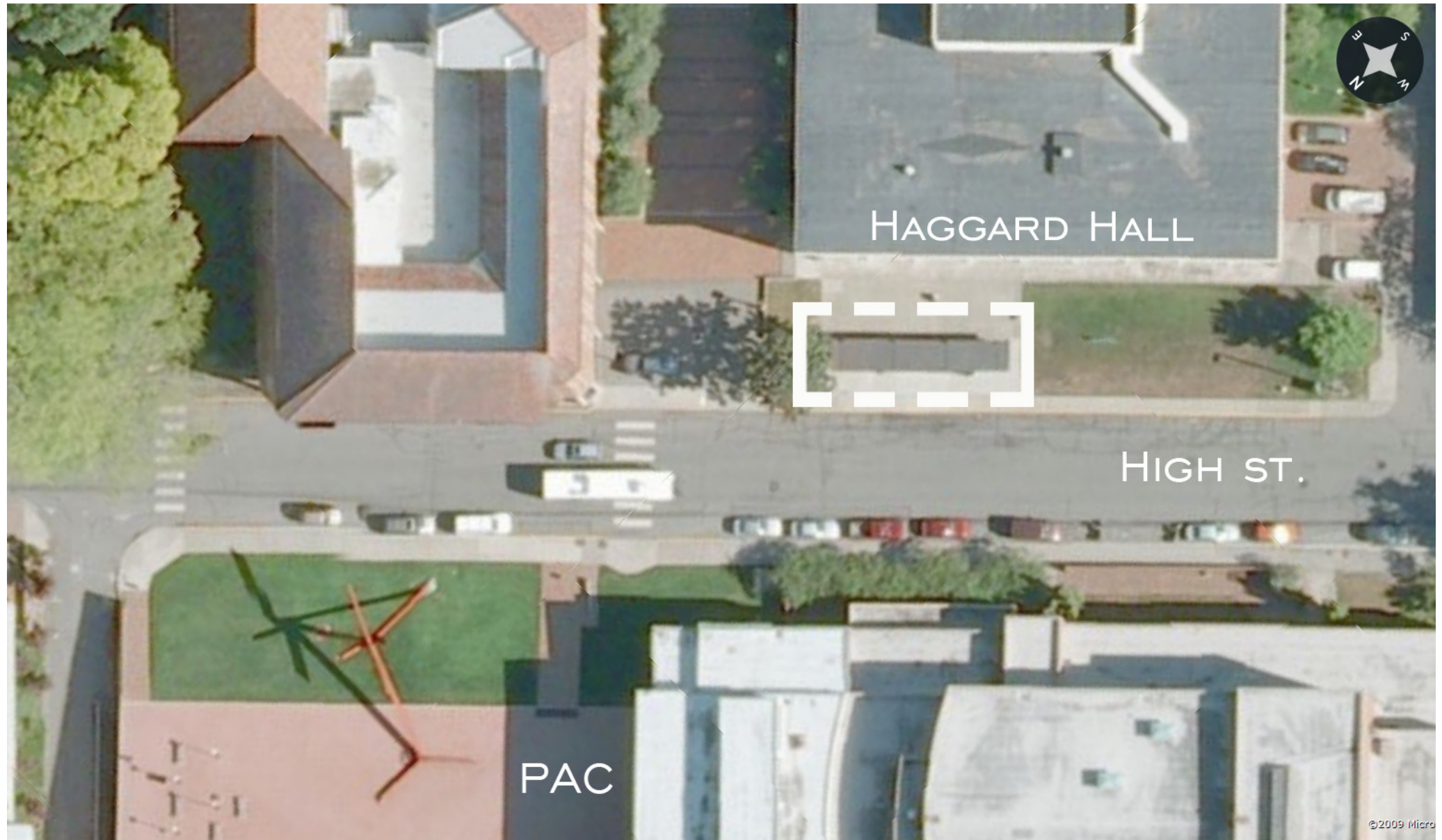


COMMUNICATIONS DESIGN







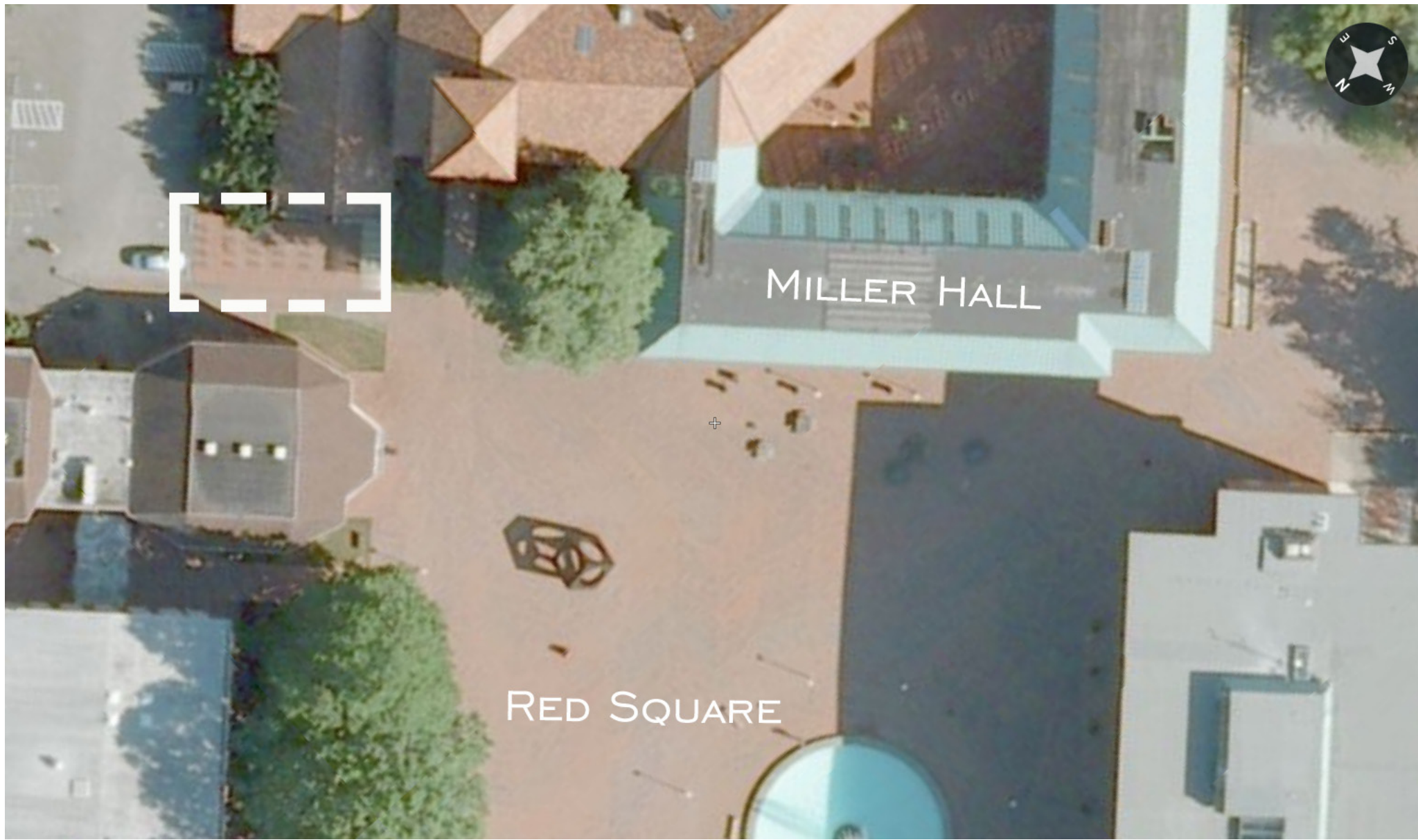




PURPOSE · DEFINITION · CASE STUDY · BENEFITS · DESIGN · **SITE** · POTENTIAL



PURPOSE DEFINITION CASE STUDY BENEFITS DESIGN SITE POTENTIAL





PURPOSE DEFINITION CASE STUDY BENEFITS DESIGN **SITE** POTENTIAL



PURPOSE DEFINITION CASE STUDY BENEFITS DESIGN SITE POTENTIAL





PURPOSE DEFINITION CASE STUDY BENEFITS DESIGN **SITE** POTENTIAL



PURPOSE DEFINITION CASE STUDY BENEFITS DESIGN SITE POTENTIAL



GREEN WALL





PURPOSE DEFINITION CASE STUDY BENEFITS DESIGN SITE POTENTIAL



SPECIAL THANKS TO:

SETH VIDANA PROFESSOR

DAVID WILLETT PROJECT MANAGER FACILITIES MANAGEMENT

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CAROL BERRY SUSTAINABLE TRANSPORTATION COORDINATOR

DAVID GLMORE ETERA GREEN ROOF SPECIALIST

AND PLANNING GRAPHICS STUDIO CLASS

SOURCE LIST:

WWW.AASHE.ORG ASSOCIATION OF THE ADVANCEMENT OF SUSTAINABILITY IN HIGHER EDUCATION

PROJECTS DATABASE GREENROOFS.COM

MILLER HALL RENOVATION INFORMATION PROVIDED BY DAVID WILLETT

PRESENTATION PLANT MEDIA ETERA, NORTHWEST HORTICULTURE

PLANTING GREEN ROOFS AND LIVING WALLS BY NIGEL DUNNETT AND NOËL KINGSBURY

VANWOERT ET AL. (2005) JOURNAL OF ENVIRONMENTAL QUALITY 34(3): 1036-1044

