

Nanotechnology Sustainability

Lawrence Berkeley National Laboratory Molecular Foundry

Russell Perry, AIA
Vice President,
SmithGroup

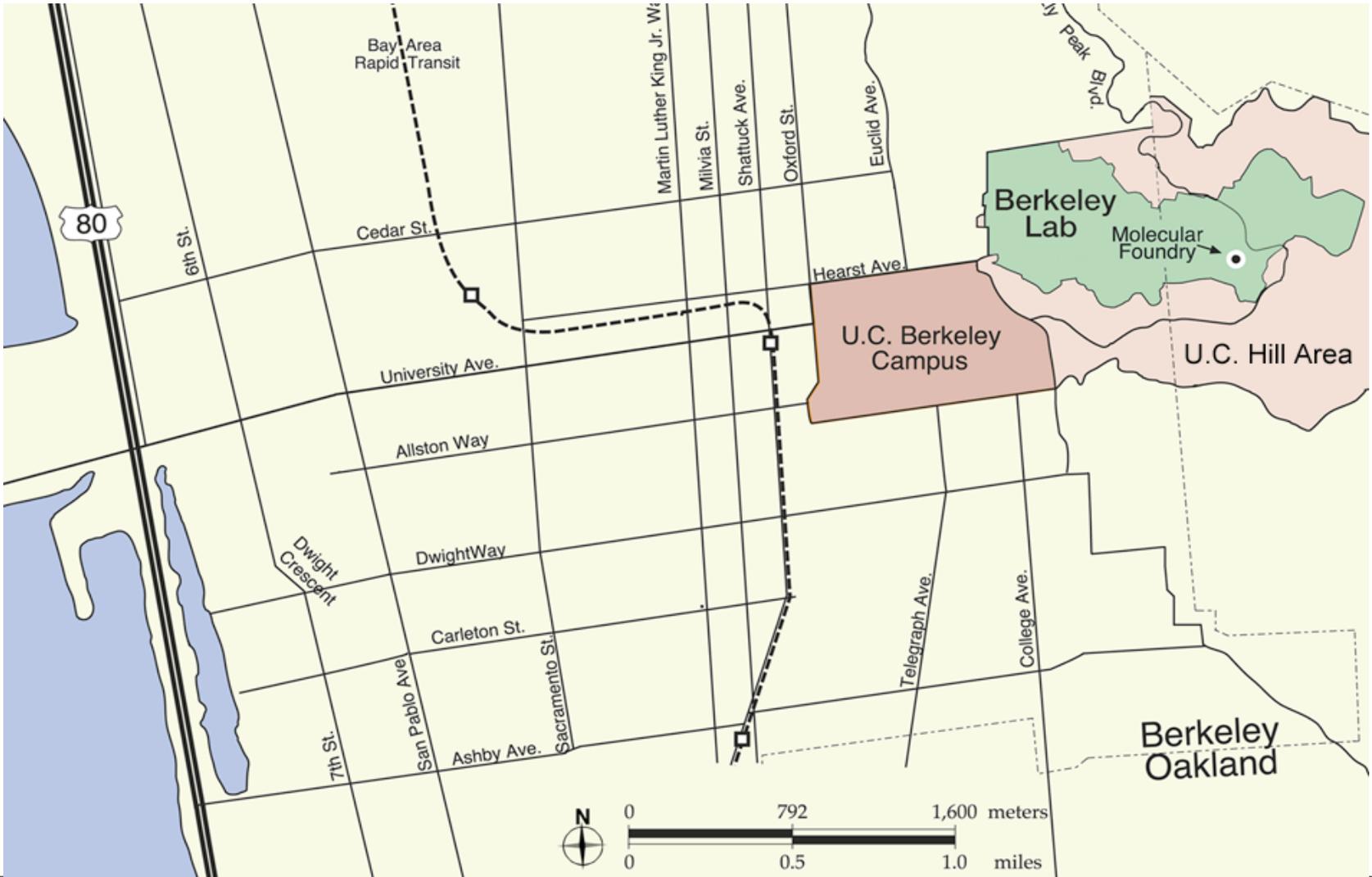


Molecular Foundry

January 14, 2008

SMITHGROUP

Location of Berkeley Lab

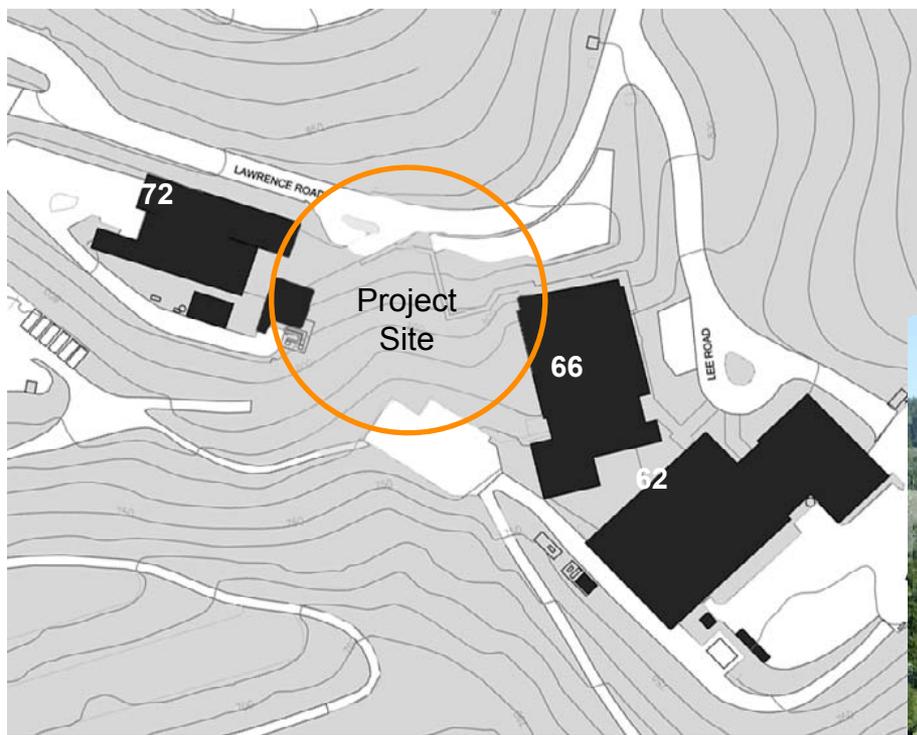


Molecular Foundry

January 14, 2008



Location of Berkeley Lab



Molecular Foundry

January 14, 2008



Building Programming Partially Driven by Site

Imaging (max. on-grade space):
ground floor

Nano-fab (some on-grade space):
2nd floor

Organic (most fume hoods):
top floor

Theory (involvement w/all depts.):
middle floor



Building Programming Partially Driven by Site

Imaging (max. on-grade space):
ground floor

Nano-fab (some on-grade space):
2nd floor

Organic (most fume hoods):
top floor

Theory (involvement w/all depts.):
middle floor



Building Programming Partially Driven by Site



Sustainable Design Process

- Integrated whole building design approach
- Sustainable design goals established at project's inception
- Based on LEED 2.1 Green Building rating system and Labs 21 EPC
- Sustainability guided the project's development from conceptual design to contractor selection



Sustainable Design Process

- Design charrettes to establish sustainable design goals.
- All major project stakeholders participated in the process.

Team works together to identify sustainable design strategies and opportunities



Integrated Design Process

- Building Owner
- Building Users
- Operations & maintenance
- EH&S
- Architect
- Consulting engineers
- Laboratory planners
- Vibration & acoustics specialists
- Energy specialist
- EMI specialists
- Contractor
- Commissioning agent



Sustainable Sites

- Erosion and sedimentation control
- 50% of the total site area restored with native grasses
- An additional 10% of the site was landscaped with drought resistant plantings
- Non-roof areas are shaded or landscaped with light colored pavement



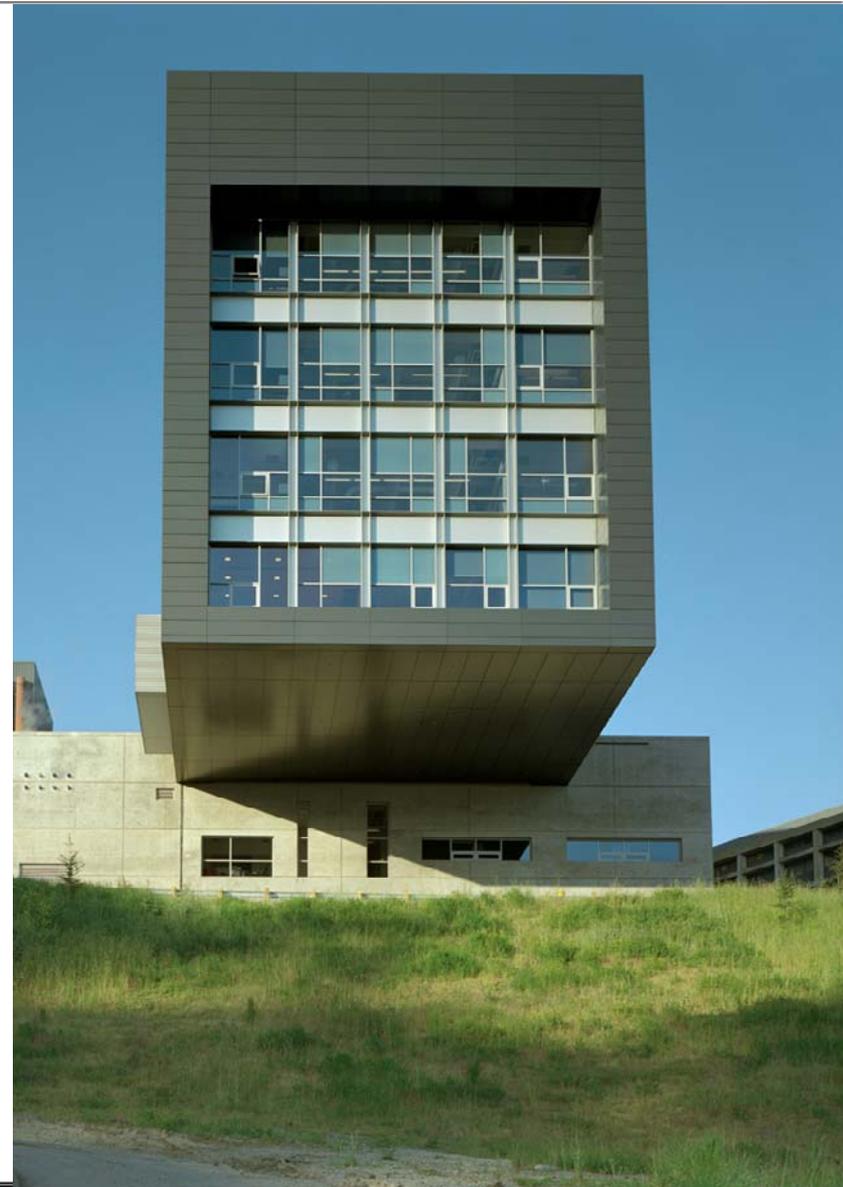
Sustainable Sites

- Increased opportunities for public and alternative means of transportation
- 5 alternative fuel vehicles assigned to building occupants
- Ethanol tank providing alternative fuel for campus shuttles and assigned vehicles is located near the building site
- Building is served by two shuttle lines. connecting to major regional transportation systems



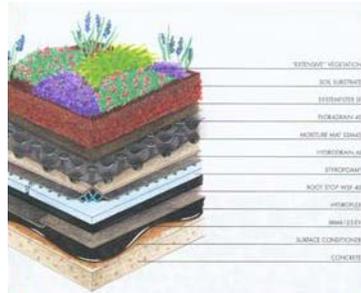
Water Use Reduction

- 32% water use reduction relative to baseline established by the Energy Policy Act of 1992
- 65% in potable water saving by installing a high-efficiency irrigation system
- Landscaped site with native and drought resistant plants requires no irrigation
- Process water savings by installing a closed loop laboratory equipment process cooling system
- Additional process water savings by installing an electromagnetic water treatment system for the cooling tower



Exterior Envelope

- Sunshades on south elevation.
- Low-E coated glass help minimize heating and cooling loads
- Fritted glass on West elevation minimize heat gain
- Landscaped roof over cleanroom and utility plant
- Recycled content
- Operable windows



Indoor Environmental Quality

- Daylighting to increase occupant comfort
- Access to views from most occupied spaces, including the cleanroom
- Operable windows in private offices
- Clerestory windows on interior partitions allow daylight deeper into interior spaces
- Low VOC paints
- Low VOC sealants and urea-formaldehyde free composite woods



Energy & Atmosphere

Reduced energy consumption by 35% compared to ASHRAE 90.1 (1999).

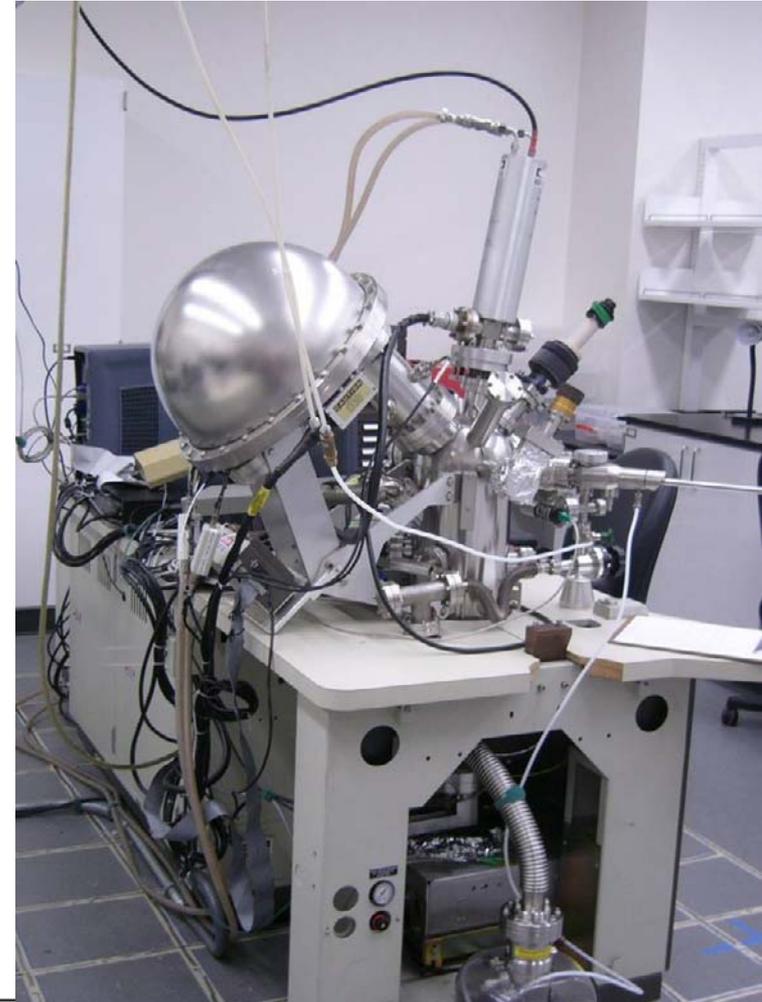
- VAV systems for offices and labs
- Premium efficiency chiller plant
- High efficiency boilers
- Lower air handler filter and coil air flow face velocities
- Electronic (Strion) filters
- Night-time set-backs, VAV hoods, motion sensors and T5 lamps



Energy & Atmosphere

Reduced energy consumption and HVAC first cost by right-sizing equipment loads

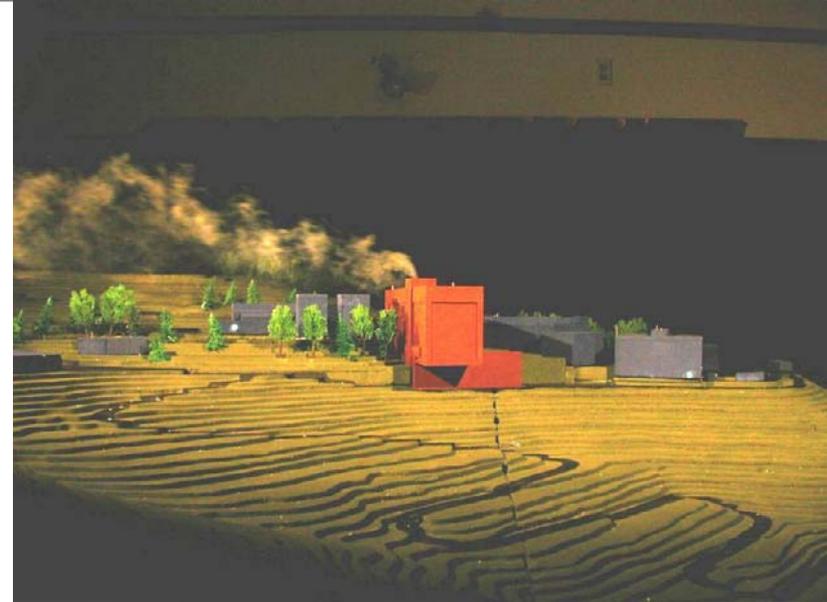
- Air handlers reduced by 35%
- Boilers downsized by 30%
- Chillers reduced by 35%
- Electrical substation reduced by 38%
- Total HVAC first cost savings of \$2.5 Million



Innovation in Design Labs 21

Safety and Risk Management

- Conducted wind tunnel study
- Solvent and Acid waste neutralization and collection in cleanroom
- Raised lips in cup sinks to prevent chemical spills into the sewage system



Innovation in Design Labs 21

Water Efficiency

- Closed loop process water system
- Vacuum system incorporated in lieu of water aspirators

Energy Performance

- Right-sized laboratory equipment loads by measuring actual load usage in similar facilities
- Energy efficient fume hoods
- Fume hood commissioning

