A Tale of Two Planning Projects: The Frontiers of Science and Robotics

SCUP 2022 Annual Conference

July 26, 2022

Carnegie Mellon University

GBBN

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The Society for College and University Planning

Introductions, Agenda, and Objectives

Introductions

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Agenda & Outcomes

Today's Agenda

5 min	Introductions & Objectives
10 min	CMU's Challenges & Goals
5 min	Poll and Discussion
10 min	Visioning and Programming
10 min	Site Strategy and Design
10 min	Lessons Learned & Q&A

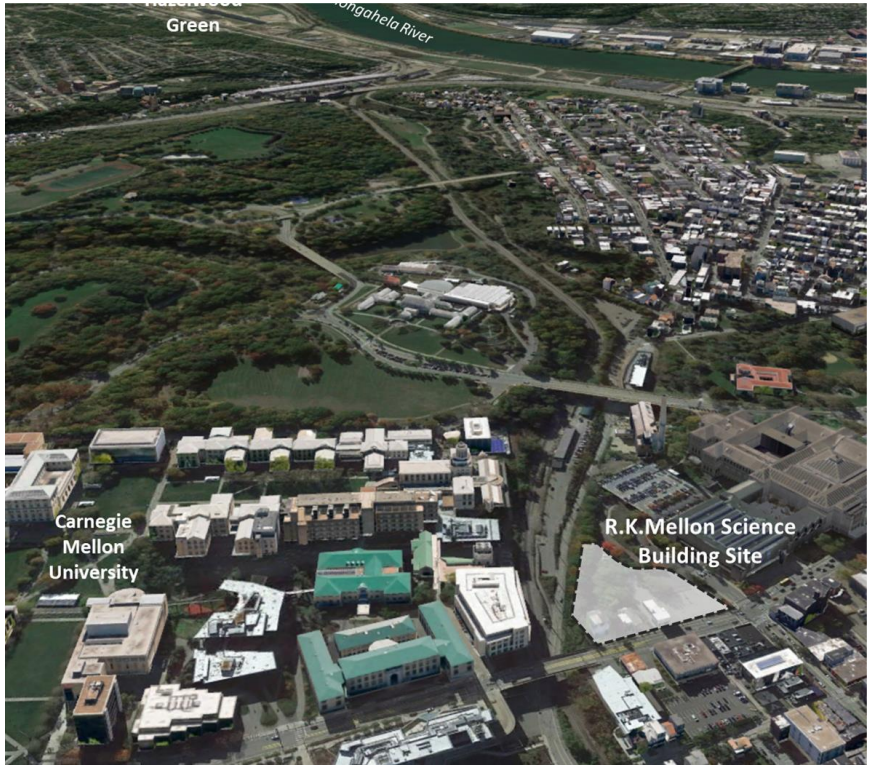
Learning Outcomes

1. Free up space on your main campus by exploring planning on the frontiers of your campus
2. Evaluate issues in interdisciplinary planning at your institution
3. Create a flexible programming model to forecast needs for the future
4. Effectively engage faculty in your planning effort

CMU’s Challenges and Goals

Pittsburgh of the Past

A Tale of Two Projects



A Tale of Two Projects

Interdisciplinary Science Center

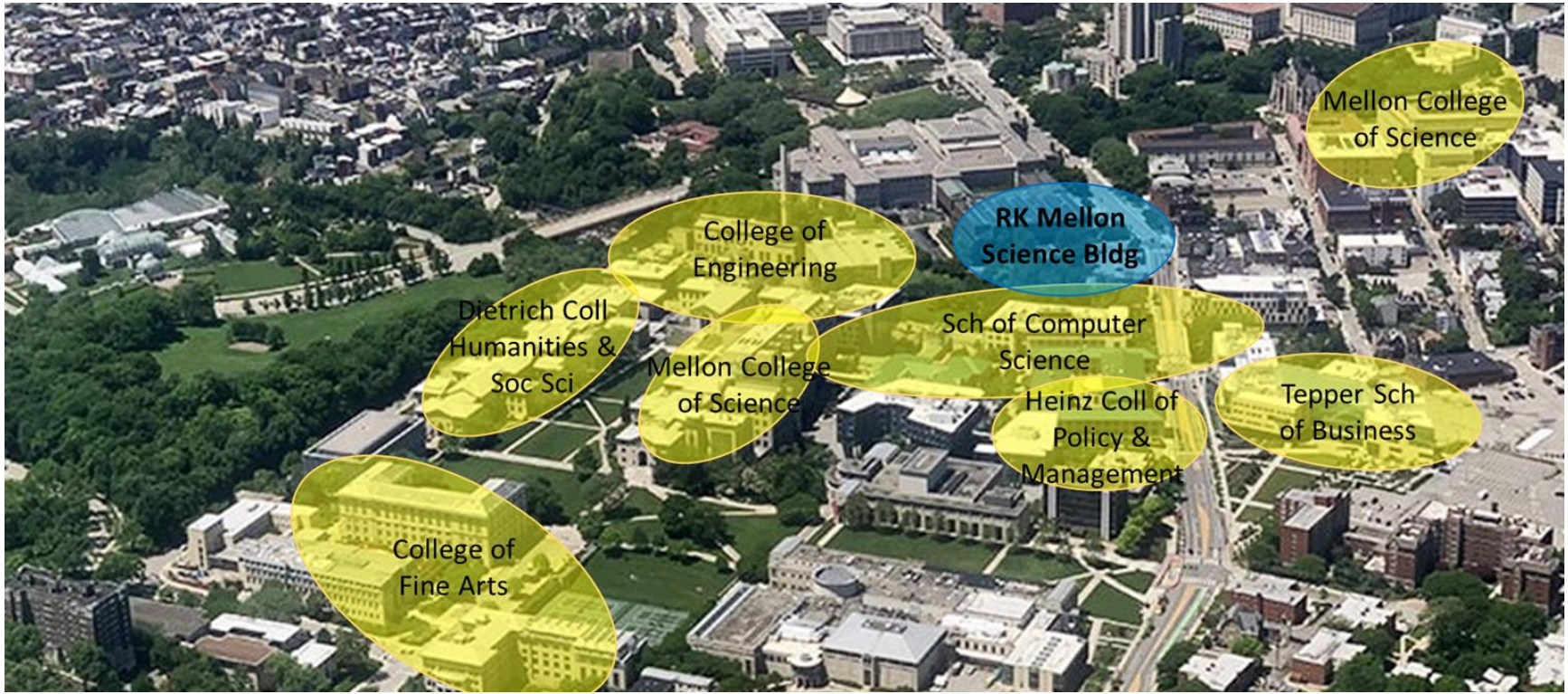
340,000 GSF Complex at edge of campus adjacent to Museum and public library creating research hubs and housing contemporary art institute/gallery.

(w/ RFD Lab Planners)

Robotics Innovation Center

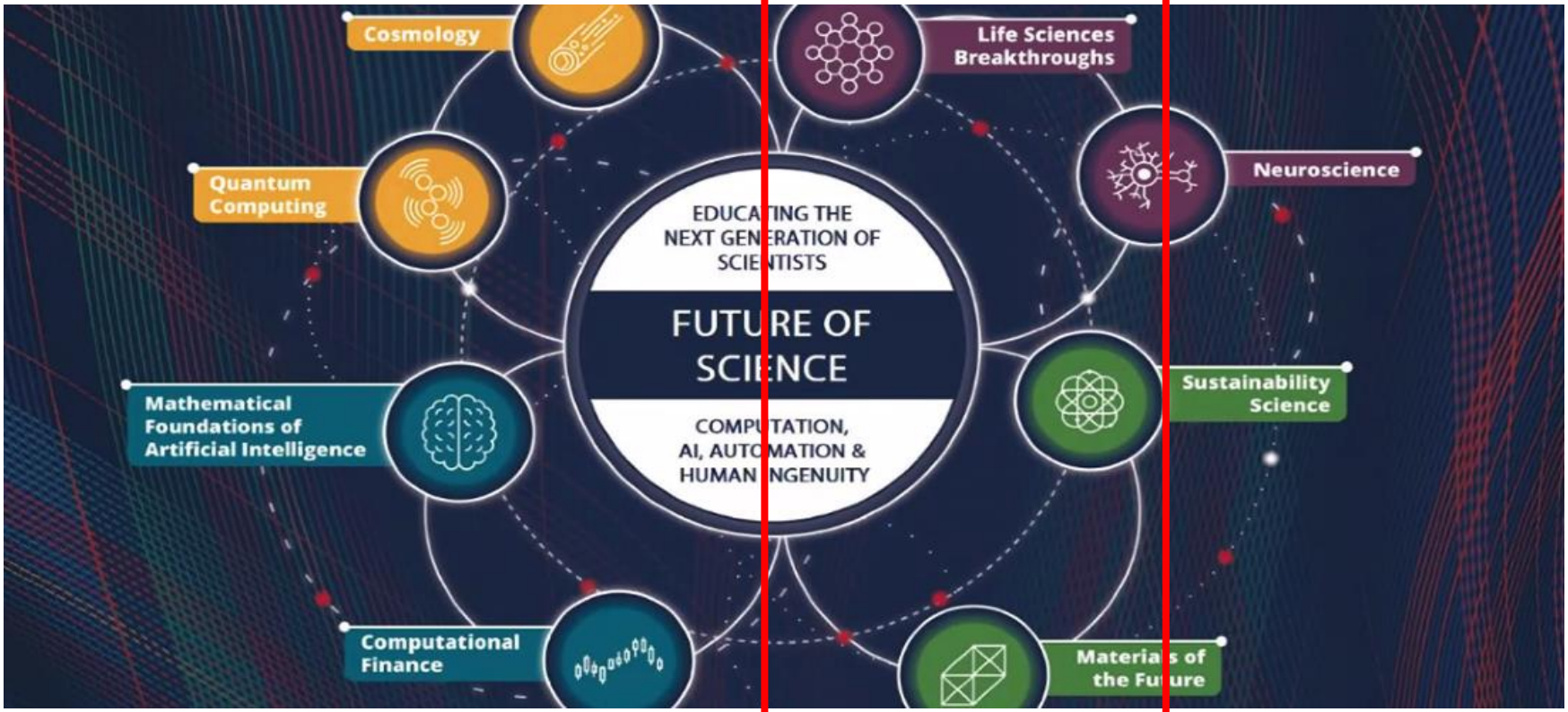
150,000 GSF Off-campus center for robotics bringing together CMU's School of Computer Science, College of Engineering, and Corporate/Government partners.

Interdisciplinary Science Need



Interdisciplinary Science Need

Project Focus



Interdisciplinary Science Vision

The Science Futures Building will be a radically flexible home for Science @ CMU that redefines how science is done.

It will welcome and connect a global community of students, faculty, staff, visitors, and researchers to innovate new pathways for scientific inquiry and discovery.

Powered by the robotics and AI of automated science, the Science Futures Building will foster breakthroughs in life sciences, sustainability, materials, and neuroscience in an inclusive and collaborative environment.

Interdisciplinary Science Principles

Embrace Hubs Across Disciplines	Reduce Dependence on Mellon Institute Building	Expand Collaboration Space	Adopt a Core Facilities Sharing Model
Plan to Contemporary Lab Standards	Promote the Off-site Cloud Lab Facility	Support Teaching and Learning	Avoid Office Duplication

Interdisciplinary Science Goals

Mellon College of Science Goals

Optimize for collaboration, discovery, and creativity

Invite informal connections and community building

Enable hubs to co-locate and evolve

Share core labs and support facilities

Leverage the off-site cloud lab facility

School of Computer Science Goals

Focus on research spaces, fostering collaboration within and beyond SCS

Improve the student experience by expanding

shared study space and classroom spaces

Free up space in other SCS facilities for expansion

College of Fine Arts Goals

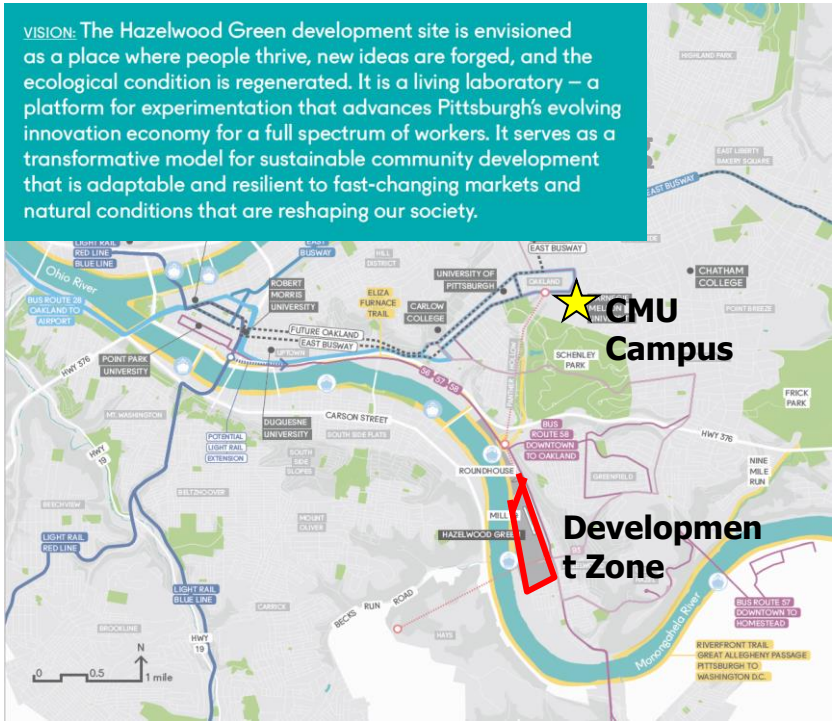
Raise the profile of the arts at CMU

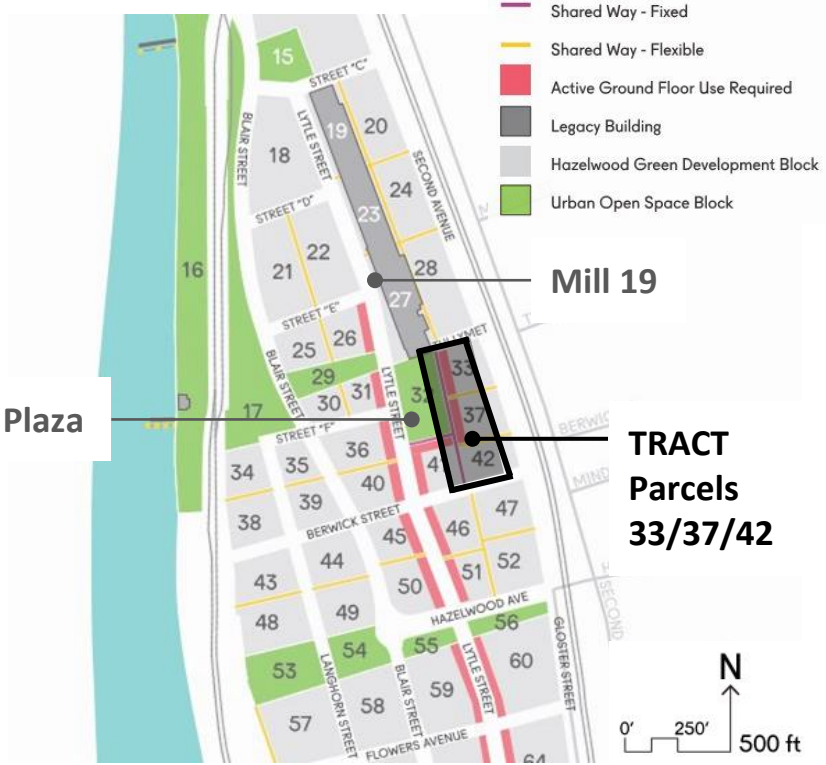
Welcoming the public with a prominent ground floor location adjacent to the Carnegie Museums

Support expanded gallery operations with ample staff space, workshop space and art handling space

Robotics Innovation Center Site

VISION: The Hazelwood Green development site is envisioned as a place where people thrive, new ideas are forged, and the ecological condition is regenerated. It is a living laboratory – a platform for experimentation that advances Pittsburgh's evolving innovation economy for a full spectrum of workers. It serves as a transformative model for sustainable community development that is adaptable and resilient to fast-changing markets and natural conditions that are reshaping our society.





Robotics Innovation Center Vision

The RIC brings together fundamental and applied robotics research in a dynamic and adaptive environment working across traditional disciplinary boundaries to tackle grand challenges of the future.

Robotics Innovation Center Goals

Integrated
Enable researchers to conduct fluid, integrated, translational research and seamlessly field test robots and autonomous systems across indoor, outdoor and virtual environments

Destination
Create a world-class destination for robotics and autonomous systems to attract talent, inspire future generations, build & strengthen partnerships and showcase innovation

Incubator
Provide incubator space and support to pre-seed startups to strengthen and accommodate partnerships in the industry of robotics and autonomous systems

Community
Engage and enhance the local community and create a placemaking destination at Hazelwood Green

Robotics Innovation Center Principles

Flexibility

Design spaces to flex for multiple uses throughout the day or for rotating project teams

Adaptability

Install robust infrastructure to enable long-term changes to spaces

Visibility

Share our research process and outcomes by curating visibility for the public and partners

Community

Create opportunities for meaningful connection with the robotics community, local neighbors, and industry partners

Placemaking

Get people to come here, and help build an identity for Hazelwood Green

Accessibility

Welcome and accommodate users of all levels of ability and experience to engage and contribute

Common Themes: Context, Vision, and Goals

Building upon past studies and internal work	Creating consensus and shared vision	Translating donor agreements into reality
Complementing, not duplicating existing facilities	Enabling expansion in existing facilities	Planning for Uncertainty

Poll and Discussion

What are your 3 biggest challenges planning next gen science and engineering facilities?

Changing to more efficient workspace standards

Moving to a more distributed model (I.e., depts divided)

Shifting to more shared equipment and space

Providing shell space for expansion

Welcoming corporate and government partners

Building consensus across disciplines and departments

Aligning vision, site, program, and budget

Keeping institutional memory across phases of work

Aligning donor and institutional priorities

Planning despite uncertainty from Covid

Visioning and Programming

Programming Approach

Core Users
Mix of users (researchers/ staff/students)

x

Populations
Team size by user type

x

Space Allocation
Area needed by user and team (workspace /support)

+

Shared Facilities
(computing support, storage)

+

Public Space
(lobby, study, retail)

=

Space Program
(57,000 NASF)

Interdisciplinary Science Groups

Biological Sciences Department	Chemistry Department	Neuroscience Institute	Computational Biology Department
Language Technology Institute	Machine Learning Department	Contemporary Art Institute	Science Dean's Office

Interdisciplinary Science Populations

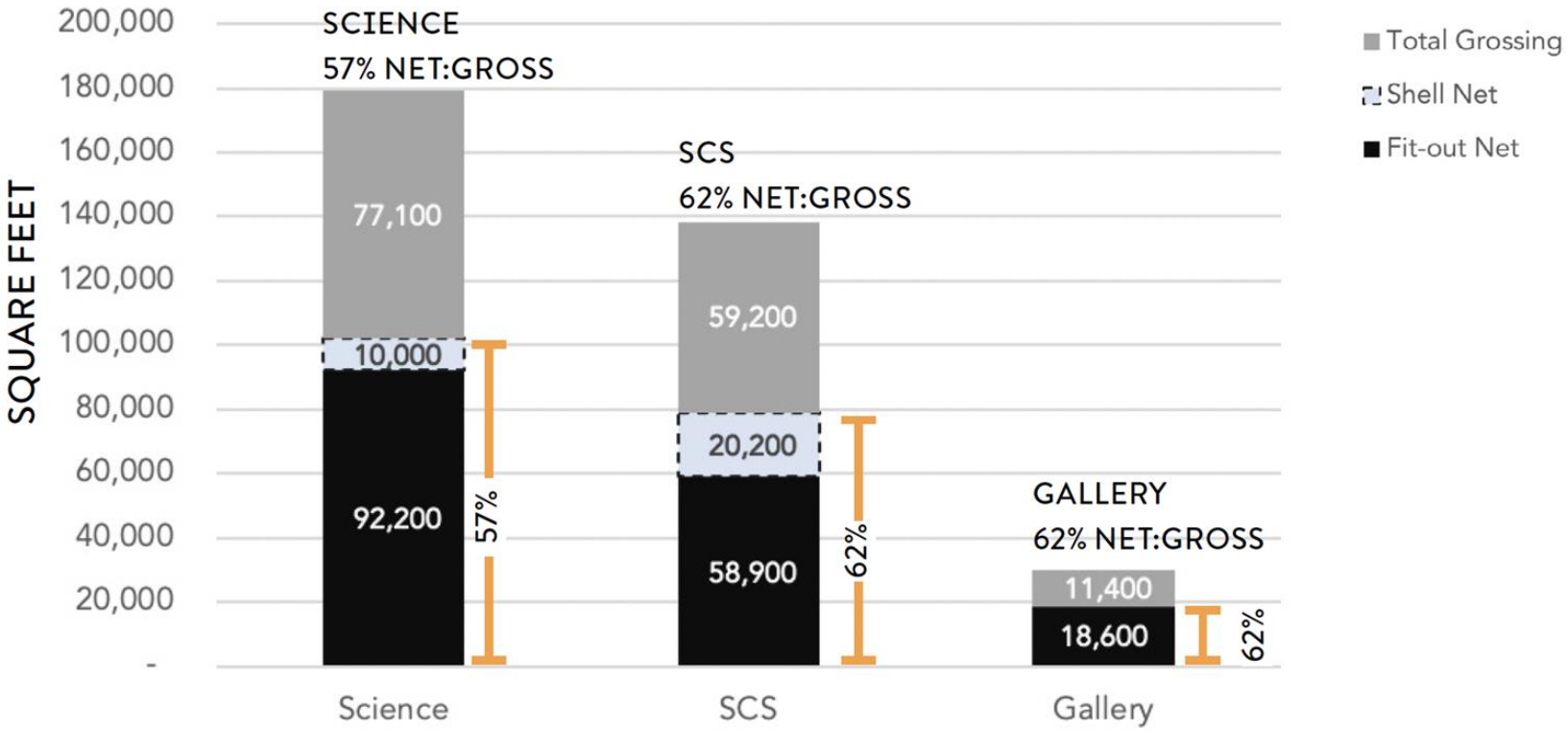
	Science	SCS*	Gallery	Total
Faculty Researchers	44	61	-	**105**
Teaching Faculty	7	7	-	**14**
Research Team Members**	232	311	-	**543**
Undergrad Researchers	41	-	-	**41**
Visiting Researchers	10	12	-	**22**
Students (non-research)	288	302	30	**620**
Est. Daily Gallery Visitors	-	-	165	**165**
Total Staff	42	53	10	**105**
Total Occupants	**664**	**746**	**205**	**1,615**

*** Includes PhD, Post Docs, Research Techs, and Research Masters Students*

Interdisciplinary Science Program

	Science	SCS*	Gallery	Total
Study Space	2,900	5,700	900	**9,500**
Classrooms	2,900	3,300	-	**6,200**
Laboratories	44,300	2,500	-	**46,800**
Workspace	30,300	43,600	900	**74,800**
General Use	6,900	1,800	16,500	**25,200**
Building Support	5,000	1,800	600	**7,400**
TOTAL FIT-OUT NASF	**92,300**	**58,700**	**18,900**	**169,900**
Shell Space	10,000	21,700	-	31,700
TOTAL LONG-TERM NASF	102,300	80,400	18,900	201,600

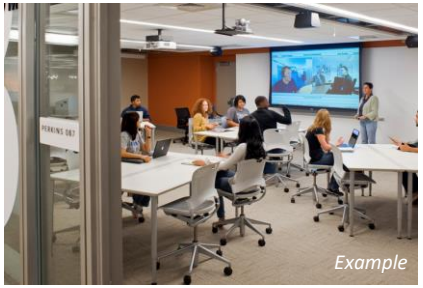
Interdisciplinary Science Program



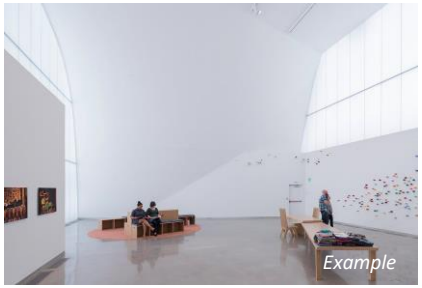
Interdisciplinary Science Public/Learning Spaces

Lobby and Cafe

Bio Teaching Labs



Classrooms



Galleries

Wet Research Labs

Computational Labs

Core Labs

Offices

Robotics Populations

CMU Research Teams

85 total researchers

Faculty and their teams of PhDs, post docs, and other full-time research specialists.

Use Case:
Conducting fundamental to applied research across disciplines and with partners

CMU students

75 total students

Masters and undergraduate students who are involved in robotics or research.

Use Case:
Contributing to CMU research teams and studying for courses

CMU Staff

12 total staff

School support staff, specialist staff, and building managers.

Use Case:
Managing the facilities and supporting day to day research and programming

Incubator Teams

12 total entrepreneurs

CMU students and faculty and staff building start-ups and spin-offs

Use Case:
Developing early-phase start ups into functioning enterprises while leveraging CMU labs and expertise

Government and industry partners

transient/varies

Policy makers and industry partners supporting and advancing CMU research

Use Case:
Visiting the facility to see outcomes of funding and explore next steps

General Public and Neighbors

transient/varies

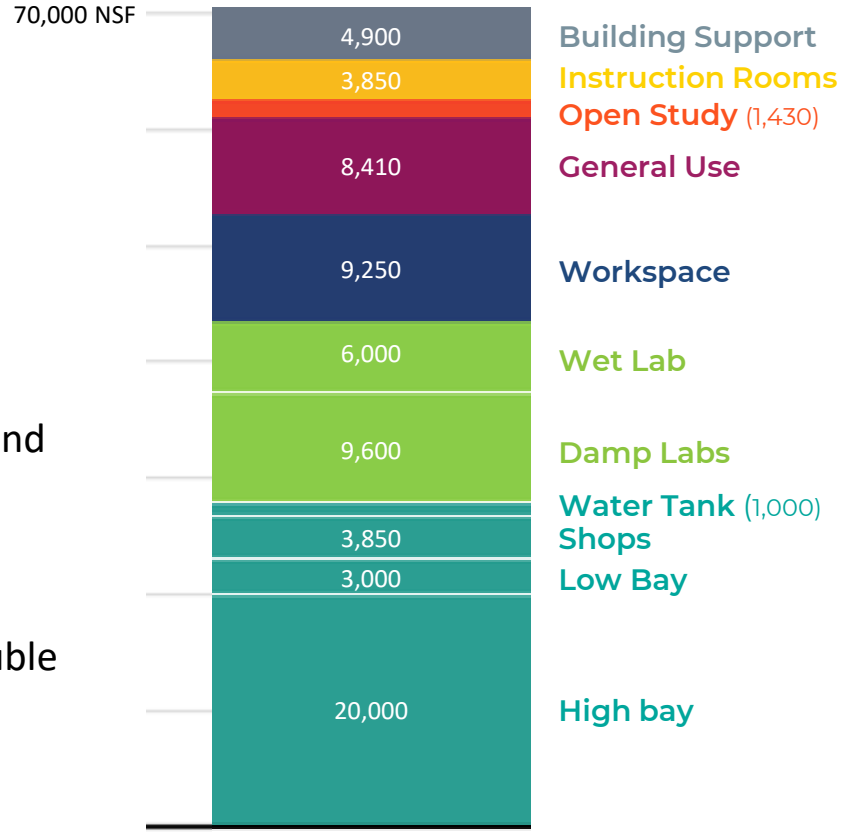
Neighbors and visitors curious about robotics

Use Case:
Visiting exhibits and attending events and trainings

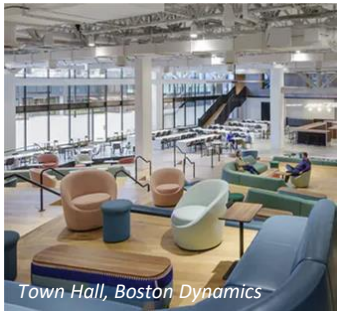
Robotics Program

The new facility provides ~70,000 NASF of space for research, experimentation, working, and public engagement (not incl. 50,000 GSF shell space)

- 17% of the facility for lobby, café, visitor center, childcare, and instruction rooms
- 62% of the facility for high and low bays, shops, and wet and damp labs
- 15% of the facility for workspace and open study
- 7% of the facility for building support spaces; double the standard allocation for a building of this scale



Robotics Instruction, Work, and Study Spaces


Town Hall, Boston Dynamics

Lobby


Pepper Parlor robot cafe, Japan

Cafe


The Exploratorium Museum

Visitors Center


Home Depot childcare center

Childcare


Analytics Classroom, Temple

Instructional Space


Imperial College London

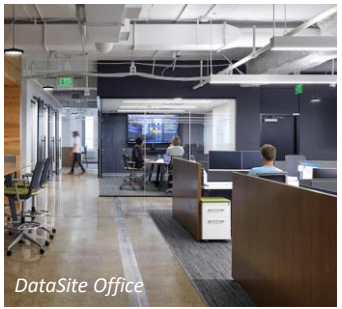
High Bay


Pennovation Center

Low Bay


GRASP Lab, UPenn

Damp Labs


DataSite Office

Workspace


EPIC Space, Boston University

Study Spaces

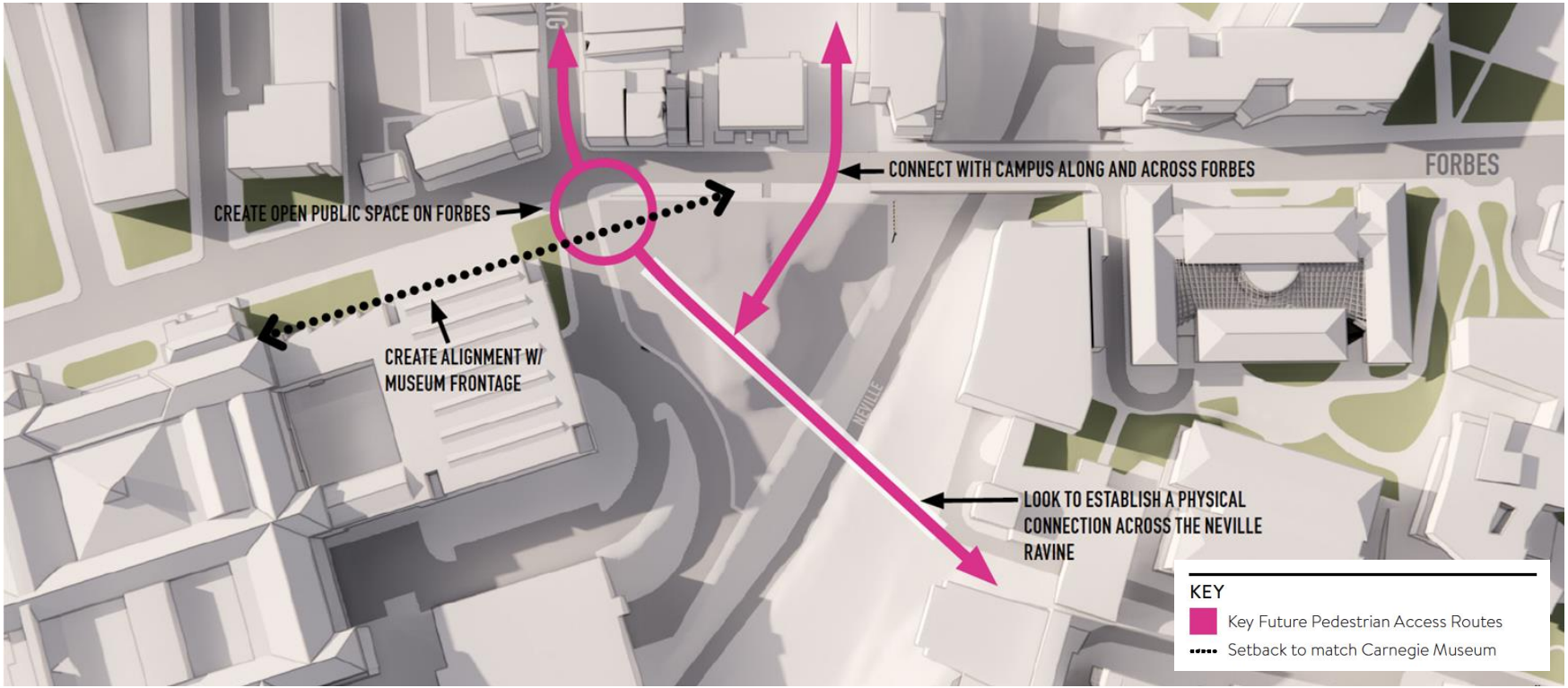
Common Themes: Space Programming & Planning

Shifts to smaller, more shared space standards	Planning for change in science and engineering	Effective digital stakeholder engagement
Moving target for area, net-to-gross, and shell space	Providing just enough detail to make decisions	Delightful to interview faculty on their work and how it's changing

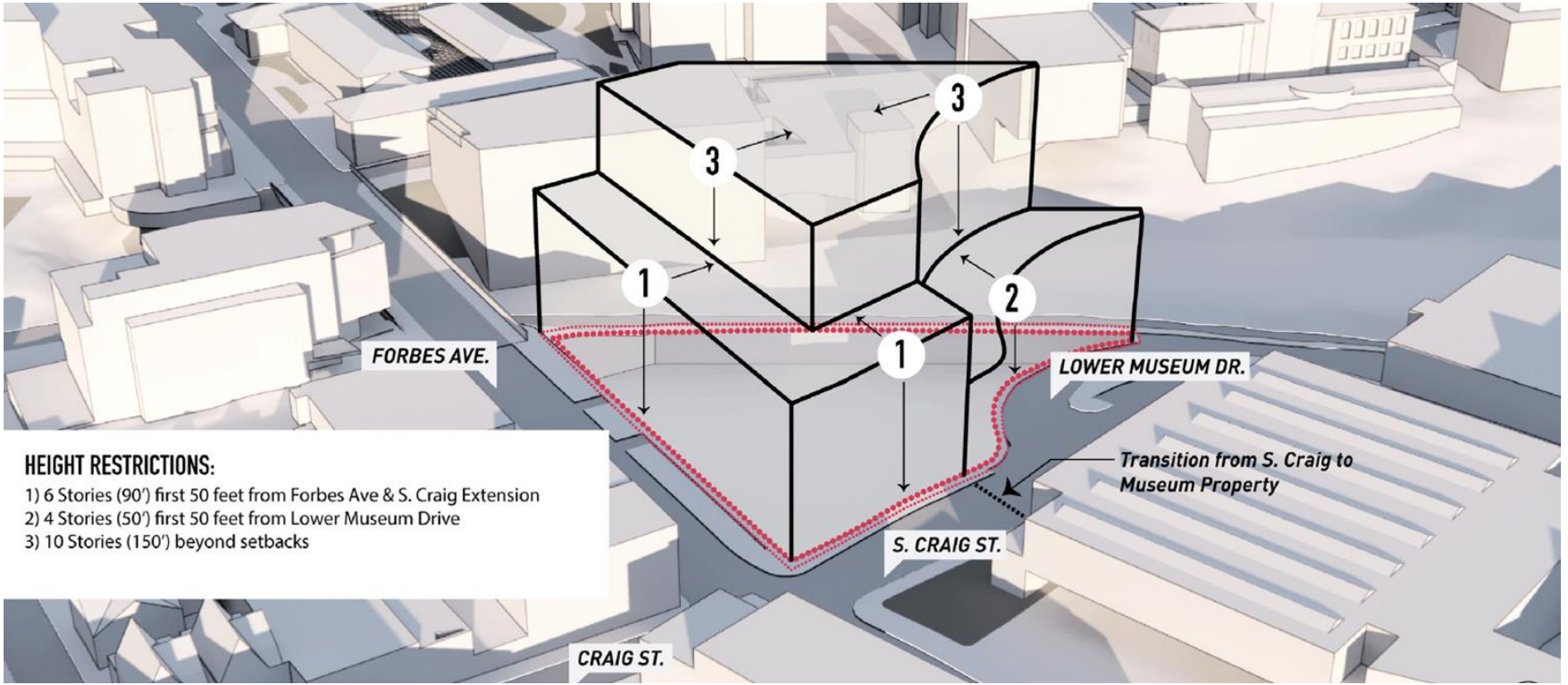
Site Strategy and Design

Interdisciplinary Science Context and Views

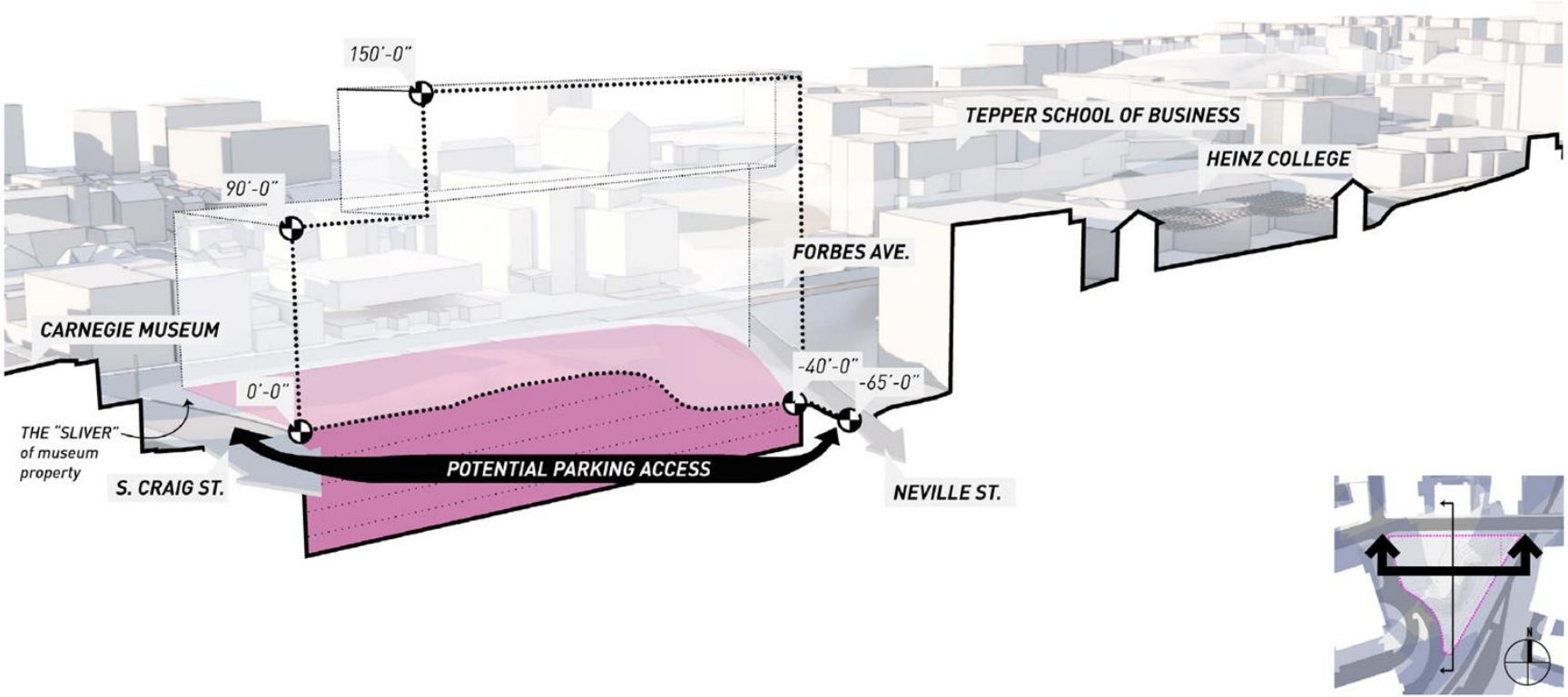
Interdisciplinary Science Masterplan Site Guidelines



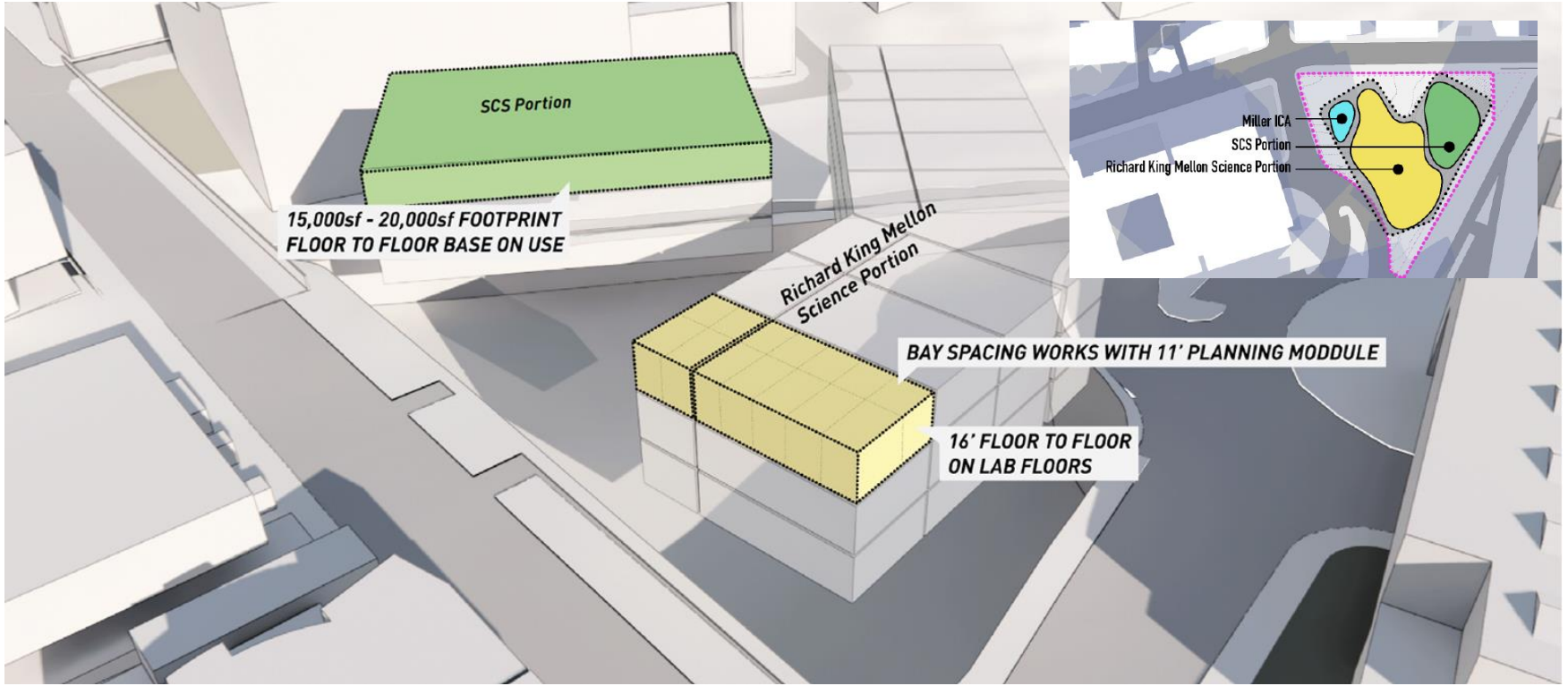
Interdisciplinary Science Zoning and Setbacks



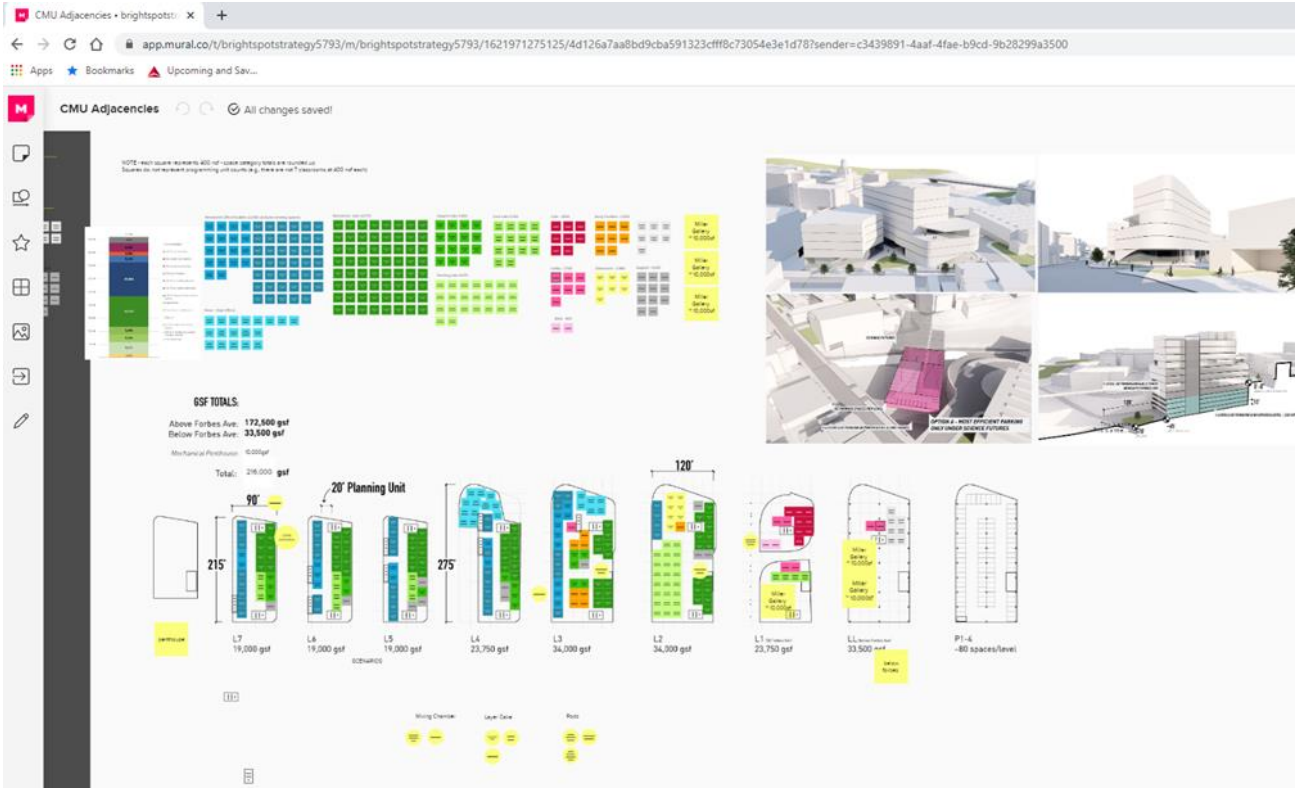
Interdisciplinary Science Site Section

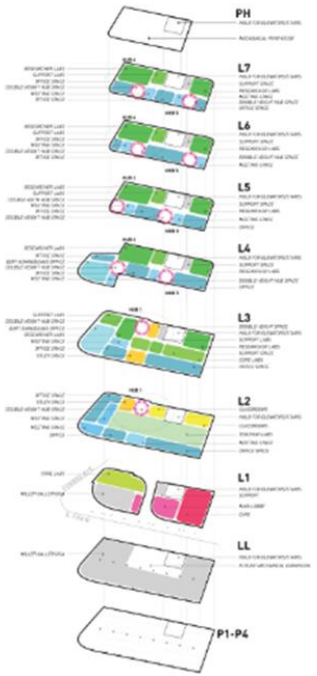


Interdisciplinary Site Strategy



Interdisciplinary Science Massing Concept

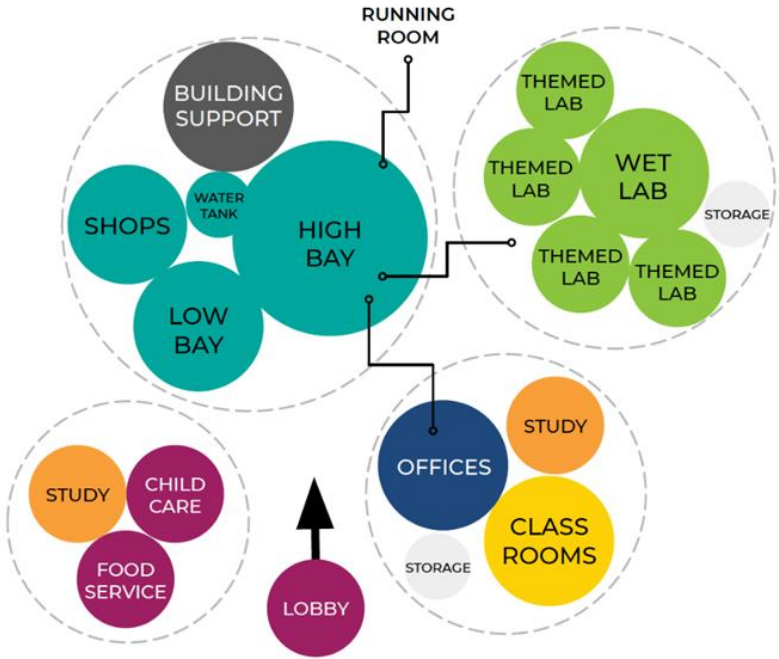




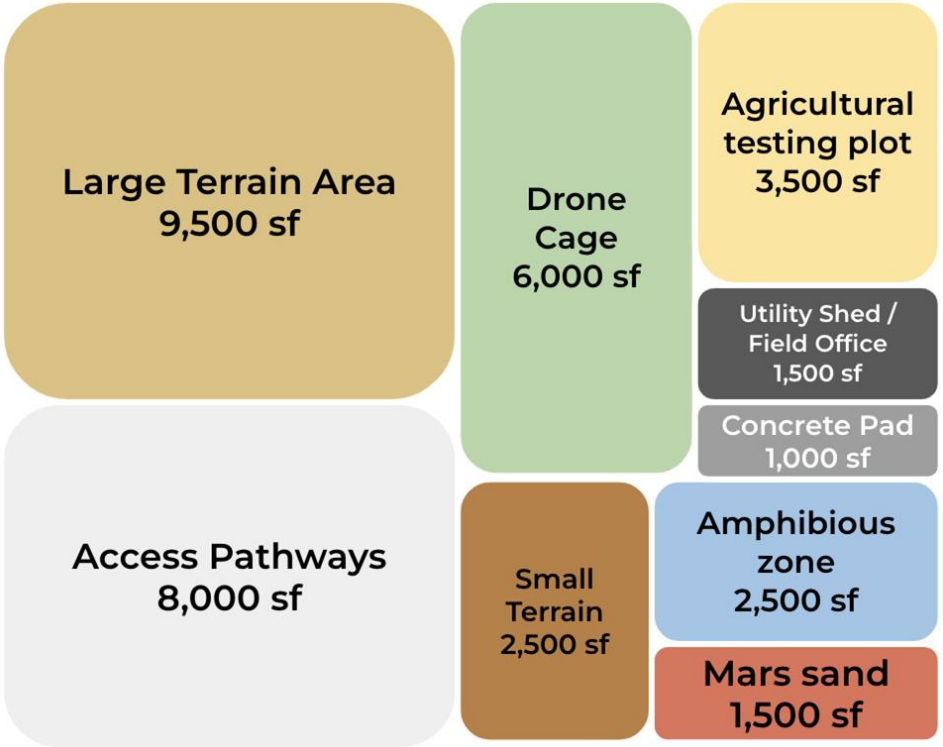
Robotics Adjacencies

Principles

- Facilitate visibility and access to community spaces from the entry and to each other (classrooms, eatery, lobby, etc.)
- Showcase research activities safely for visitors with windows from meeting rooms into the high bay
- Locate shops and makerspaces near classrooms to support K-12 and workforce education programs, if possible.
- Distribute study space for flexibility and seating variety
- Locate restrooms, kitchenettes, and wellness rooms near the research work areas
- Create direct access from high bay to the running room
- Locate low bay adjacent to high bay, with direct access the running room if possible
- Create easy access from shops to the labs and bay spaces
- Locate storage/staging areas near bays and project teams
- Position themed labs adjacent to each other and the bays, and split across vertical levels if ramps / freight elevators can transport large robots



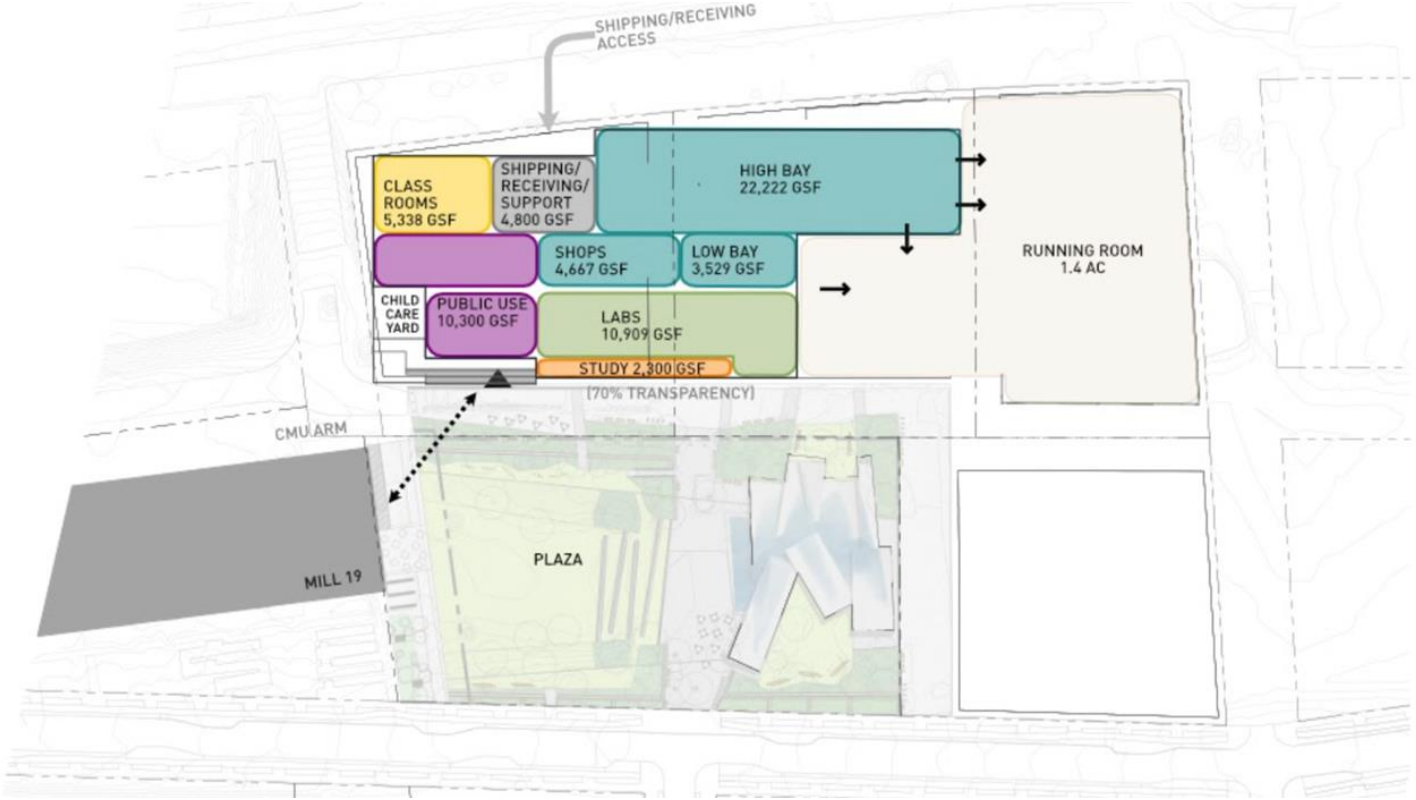
Robotics Outdoor Space



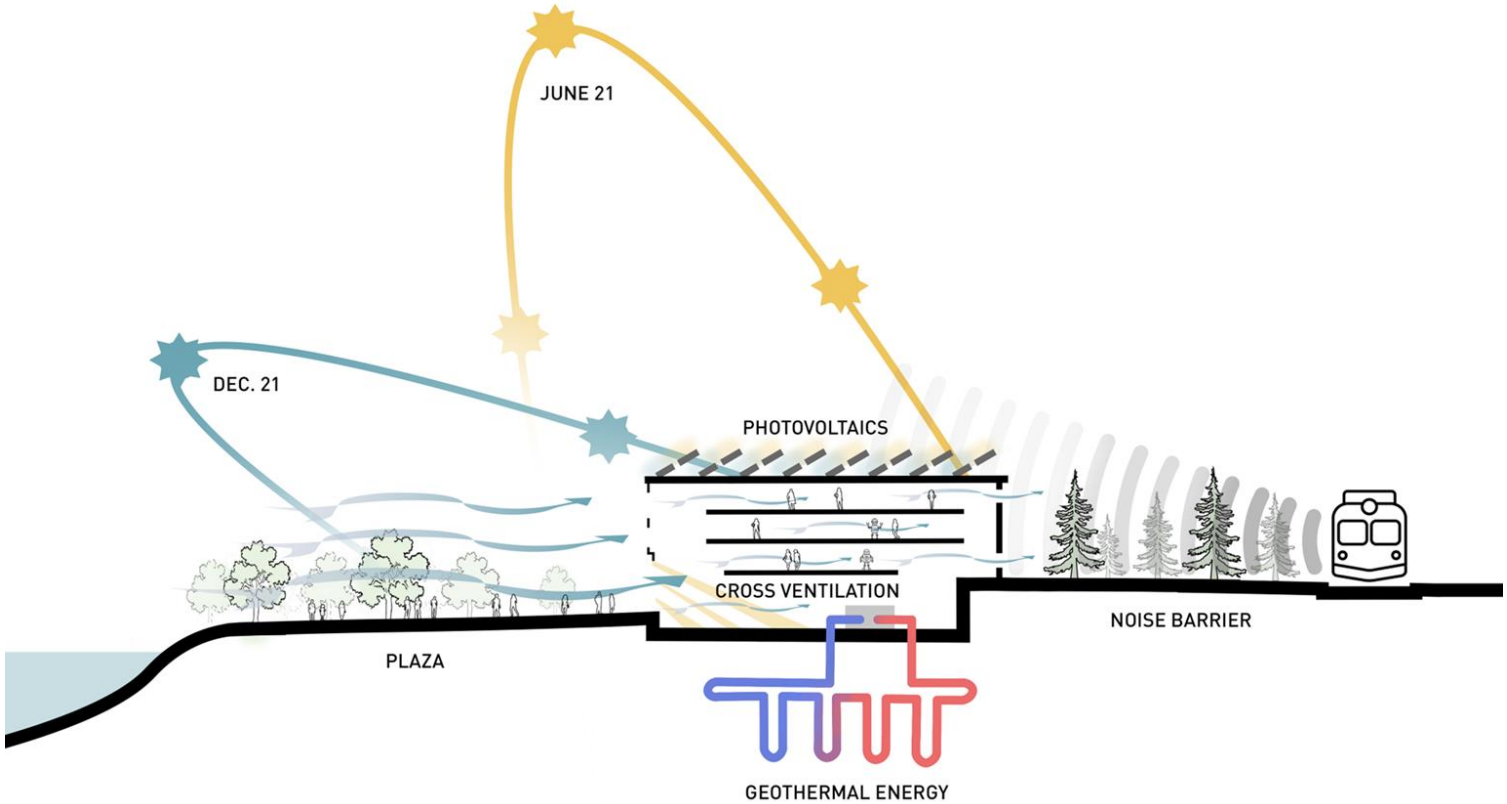
Undefined
project area

5,000 sf per team
25,000 sf total

Robotics Blocking and Stacking



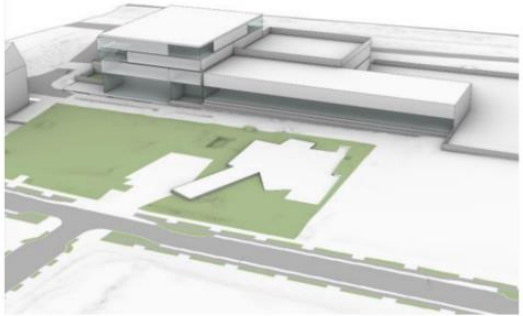
Robotics Environmental Opportunities



Robotics: Exploring Options

- Prominent public location adjacent to Plaza and visible to community of Hazelwood for public access
- Adjacent to ARM and CMU at Mill 19
- Two stories for immediate buildout; opportunity to expand into third floor
- Parcel 41 available for future development or growth of RIC
- Running room of about 1.4 acres
- Will require 70% transparency requirement along plaza frontage and vacating two shared ways

High Bay on Plaza



High Bay on Second Ave

Common Themes: Site Strategy and Design

Maximizing buildable area within site constraints	Access to daylight and views	Identify locations for functional operations: loading, parking, etc.
Creating intuitive locations for high prioriority functions	Providing just enough detail to make decisions	Capitalize on connections to adjacent buildings and the greater campus

Lessons Learned and Q&A

Lessons Learned and Q&A

Virtual engagement enables more participation and more equitable process	Encourage interdisciplinarity through shared labs and “no names on doors”	It takes patience, finesse, and the right info to align views
Address conflicting views as they arise; don’t table it for later when stakes are higher	Need to educate leadership on the value of spending time and money pre-planning	Need a nimble process at the fuzzy front-end, lots of scenarios and options!

Thank you!

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