

The background of the cover is a dark blue, semi-transparent aerial view of a modern building with a complex, geometric structure featuring many windows and balconies. In the center-right of the image, there is a small, dark, circular table with two chairs, and a person is seated at the table, looking down at something in their hands. The overall tone is professional and architectural.

*UNIVERSITY OF VIRGINIA ENGINEERING*

# *INTEGRATED SPACE PLAN*

**2018**







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# **EXECUTIVE SUMMARY**

In 2017, the University of Virginia's School of Engineering and Applied Science commissioned an Integrated Space Plan to align the school's academic plan and strategic goals with the existing space inventory, and ultimately, its future needs stemming from ambitious growth aspirations.

Bringing together the voices of faculty, staff, and students the collaborative planning process played out over the course of a year and was continually refined through numerous on-site workshops and weekly meetings.



By August 2017 a series of goals had been developed specifically related to the ISP. These goals summarized what the consultant team heard and observed spending time on Grounds:

- Provide a **flexible road map** to guide the long-term growth of UVA Engineering – both in terms of infrastructure and people
- Address **aging infrastructure** through strategic renovations or thoughtful replacements
- Create a sense of culture by providing **accessibility and intimacy** to both members of the engineering community and the greater UVA Grounds
- Foster collaborative environments through the creation of a **social heart** – a figurative term given to environments within UVA Engineering where the gathering of people and ideas are celebrated
- Further facilitate the cross pollination of departmental ideas by **breaking down the silos** of existing space allocations, through the reprogramming of existing facilities and the creation of shared resources
- Provide a means for **pedagogical change**, with regards to the education of future engineers through enhanced undergraduate experiences with social and co-curricular spaces to support learning outside the classroom
- Showcase research/educational efforts and advances in the built form and within flexible learning spaces as a means of **“Engineering on Display”** - thus heightening UVA Engineering’s presence on the grounds
- Plan for faculty **growth** and turnover in research, both wet and dry, and have a plan for phased implementation of space needs

In 2015, the University set forth a goal to increase the total sponsored research portfolio. The objective will require an expansion of faculty numbers, research activity, and the PhD student population—all of which have already experienced significant growth.

Following the development of these goals, lab phenotypes and targeted research productivities were established, and demographic growth scenarios along with space planning metrics for students, faculty, and staff were fully scrutinized and confirmed.

With the space needs vetted, the end of 2017 and early part of 2018 were focused on transforming the space data into physical solutions. The planning objectives for the built environment were confirmed and the potential solutions were organized into three types: incremental renovations, transdisciplinary solutions, and redevelopment options. The potential solutions were also divided into high-level phases: short-, mid-, and long-term.

Through a series of diagrams and narratives outlined here within, these solutions can be traced from their initial foundations in early observations to phased solutions that satisfy UVA Engineering’s ambitions and goals.



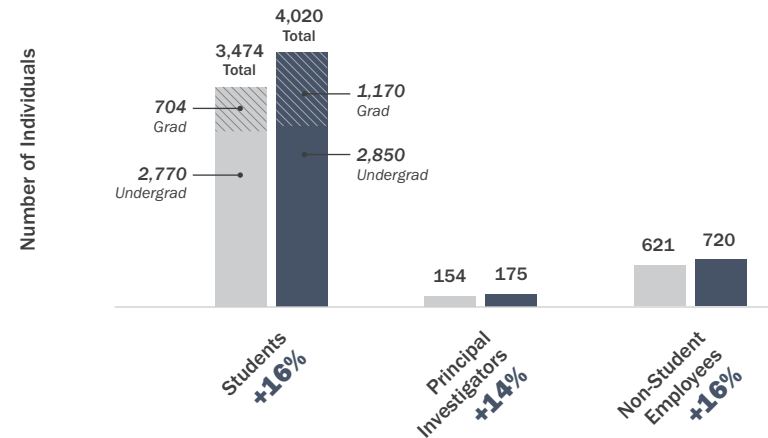
# Phases

- **Short-Term** – An era of time that captures immediate need and growth.
- **Mid-Term** – An era of time that moves past immediate need and allows for projects that begin to satisfy most, if not all of the ISP's goals. This time frame captures anticipated growth.
- **Long-Term** – An era of time that highlights aspirational growth. Physical space solutions are characterized as large in scale and complexity, but will satisfy UVA Engineering's needs both culturally and spatially, and increase the school's ranking.

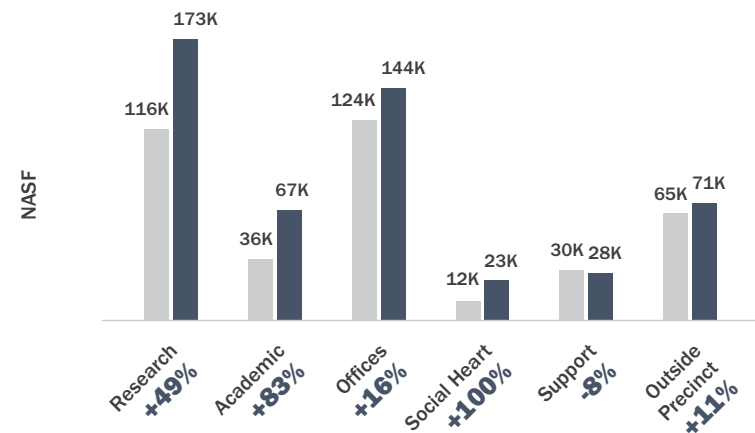
\*NASF - Net Assignable Square Feet

Existing Short-Term Mid-Term Long-Term

## POPULATION GROWTH PROJECTIONS:



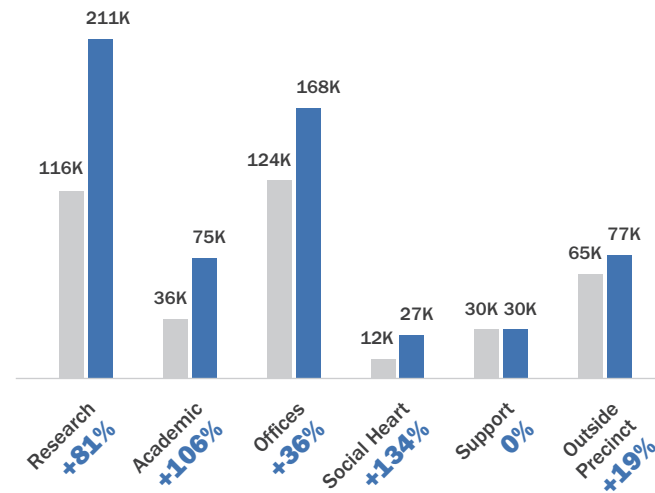
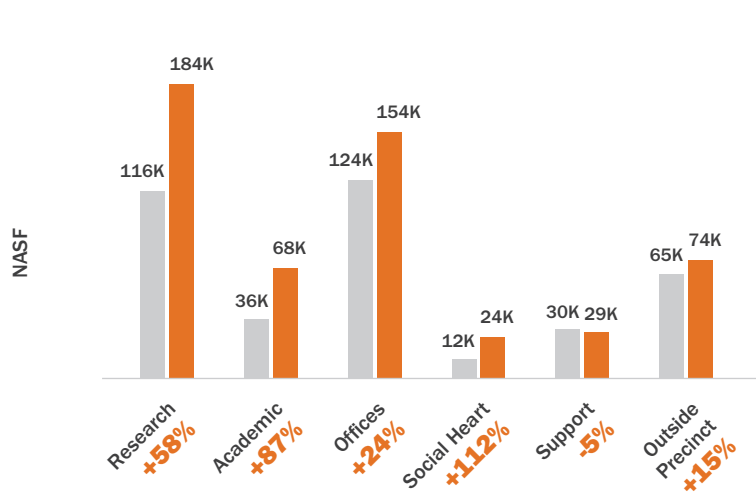
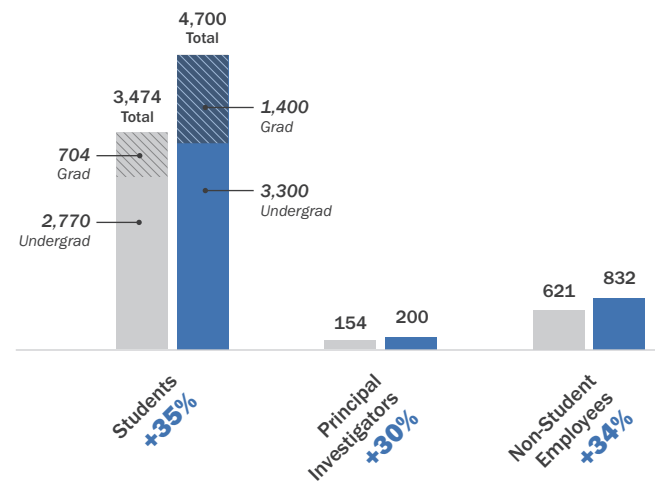
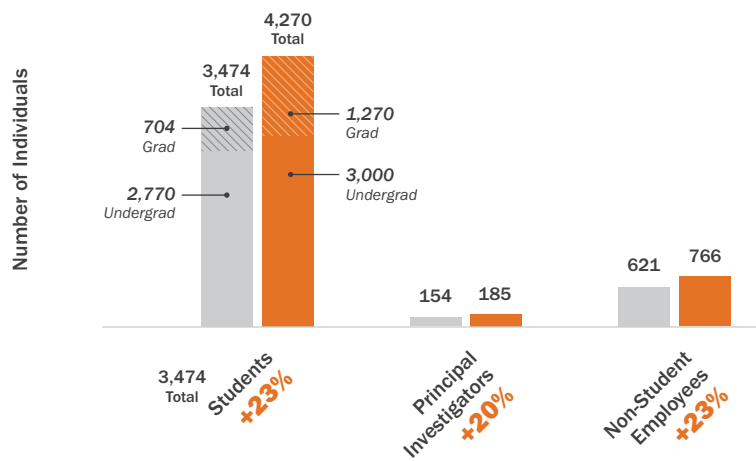
## SPACE NEEDS:



382,700  
NASF EXISTING  
505,800  
TOTAL NASF NEEDED

**+32%**  
**GROWTH**





382,700  
NASF EXISTING  
532,600  
TOTAL NASF NEEDED

**+39%**  
**GROWTH**

382,700  
NASF EXISTING  
587,800  
TOTAL NASF NEEDED

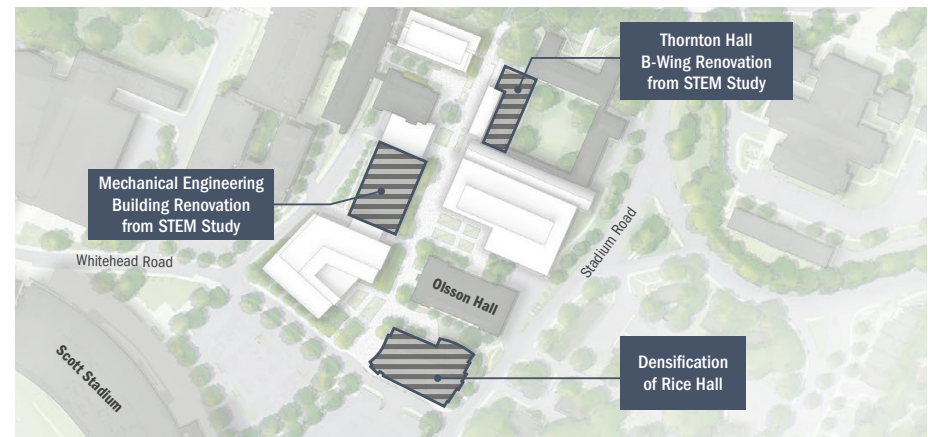
**+53%**  
**GROWTH**



## Solutions

- **Incremental Renovations** – Strategic solutions, designed for short-term needs. Examples include maximizing space efficiencies, reprogramming certain rooms, modifying the size of existing offices to accommodate an increasing population, and developing opportunities for high-bay and industrial space that is lacking in the research space portfolio.
- **Transdisciplinary Solutions** – Capitalizing on opportunities to share space with other schools and using the broader UVA campus landholdings for transdisciplinary research endeavors.
- **Redevelopment Options** – Large scale building opportunities that aim to satisfy all of the goals outlined above but specifically providing adequate space that creates a pedagogical change within UVA Engineering and provides opportunities for a Social Heart and Engineering on Display.

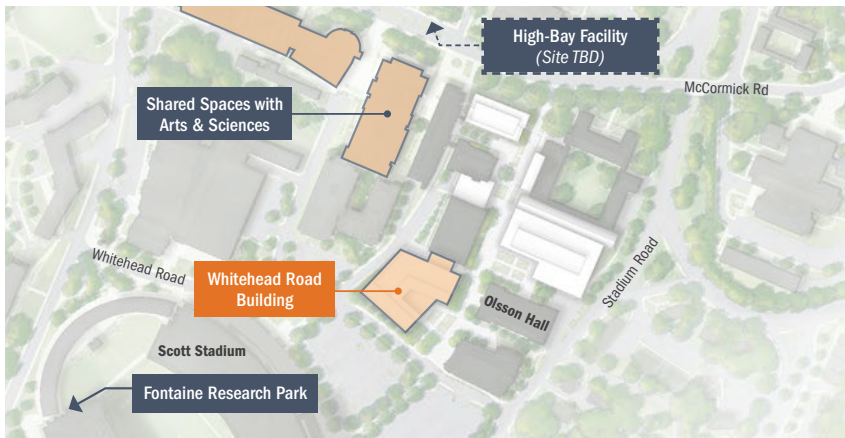
■ Short-Term ■ Mid-Term ■ Long-Term



## Incremental Renovations

- Densification and optimization of existing space (*example: Rice Hall*)
- Mechanical Engineering Building Renovation (*From STEM Study*)  
11,000 NASF
- Thornton Hall B-Wing Renovation (*From STEM Study*)  
12,000 NASF





## Transdisciplinary Solutions

- Shared Spaces with Arts & Sciences  
6,000 NASF
- Whitehead Road Building  
100,000 NASF
- Fontaine Research Park  
25,000 NASF
- High-Bay Facility  
15,000 NASF



## Redevelopment Options

- Chemical Engineering Building Replacement  
35,000 NASF
- Mechanical Engineering Building / Material Science Building Connector  
20,000 NASF
- Thornton B-Wing Addition *(Pending Historical Approval)*  
6,000 NASF
- Thornton D & E-Wing Redevelopment  
112,000 NASF



# *INTRODUCTION*

*OVERVIEW AND PURPOSE*

*PROCESS AND SCHEDULE*

*ENGAGEMENT AND PROJECT TEAM*







# **OVERVIEW AND PURPOSE**

The purpose of UVA Engineering's integrated space plan (ISP) is to align the School's academic plan and strategic goals with the current space inventory and future need. The study identified capital opportunities to address current needs and anticipated future demands. The planning process was purposefully collaborative, involving constituent groups and stakeholders. The ISP process facilitated conversations needed to articulate the vision for realigning the School's functional organization and cultural identity. The ISP identifies critical instructional, research, and support space needs associated with program development. The overarching purpose of the ISP was to develop implementation strategies that respond to emerging programmatic and cultural opportunities and challenges.





*the planning process was **purposefully collaborative***

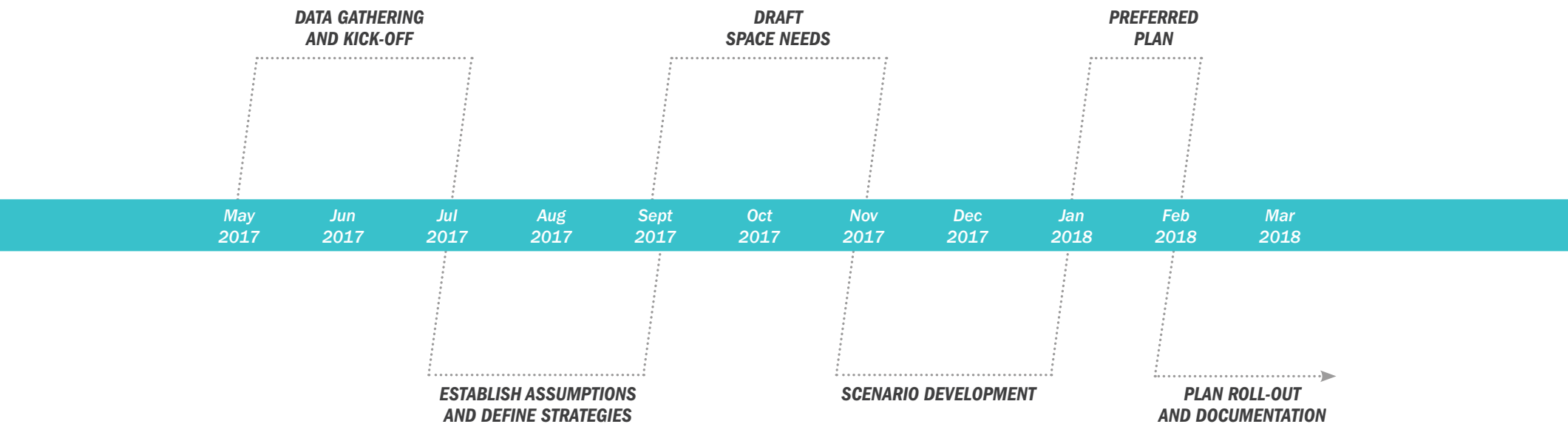


# **PROCESS AND SCHEDULE**

The UVA Engineering ISP was a collaborative process that involved a diverse set of stakeholders. Over the course of almost one year, there were six on-site workshops and over 25 meetings. Between each workshop, the Core Team touched base almost every week to advance the process.









## ***Data Gathering and Kick-Off***

The project started in May 2017 with an introduction of the consultant team including relevant experience gained from past planning endeavors at the University of Virginia, Charlottesville region, and from other higher education projects. Running concurrent to the Engineering ISP process, the consultant team was also working to develop a master plan for Fontaine Research Park. During the first workshop, the consultant team toured the engineering buildings and learned more about the facility condition assessment of those buildings.

More rigorous engagement began in June 2017. The team met and interviewed key stakeholders including the Dean, the Engineering Leadership Team, a Planning Group, a Steering Committee, and various other focus groups. Following the workshop, the consultant team further reviewed base data including building condition summaries, the 2015 STEM master plan, 2008 Whitehead Road Plan, utility plans, and the existing space inventory. The team also reviewed and synthesized programmatic information including interdisciplinary themes, expanding research, innovation, and partnership opportunities. Finally, the team gathered key demographic and productivity metrics such as current and projected student enrollments by FTE, current and projected faculty FTE, research expenditures, and research lab size to provide a baseline understanding of existing conditions.

## ***Establish Assumptions and Define Strategies***

In August 2017, the consultant team shared initial assumptions, both qualitative and quantitative, with the Planning Group and Steering Committee. Overarching goals for UVA Engineering and the quantitative analysis informed the projected space needs. Also in August, more focus group sessions were conducted to engage additional stakeholders, validate the initial assumptions, and help define strategies for physical planning.

## ***Draft Space Needs***

Over the fall of 2017, the consultant team worked closely with the Core Team to advance the space needs analysis through a series of weekly phone calls. During this part of the planning process, growth scenarios and space planning metrics were confirmed. In addition to advancing the space needs, initial physical planning solutions were developed.



***During the ISP process, a concept plan emerged to show how UVA Engineering can evolve to be more interdisciplinary and collaborative.***

## ***Scenario Development***

The November 2017 workshop focused on sharing the key takeaways of the space needs analysis and the initial physical planning solutions with a broader audience. The qualitative assumptions and strategies that were developed earlier in the process were translated into a series of diagrams and a concept plan that articulated the existing functional organization of UVA Engineering and how that can evolve to be more interdisciplinary and collaborative. The feedback received during this workshop was refined over the remainder of the year to form the preferred plan.

## ***Preferred Plan***

With the space needs fully vetted, the end of 2017 and early part of 2018 were focused on refining the physical solutions into a preferred plan. The physical planning objectives were confirmed and the potential solutions were organized into three types: incremental renovations, transdisciplinary solutions, and redevelopment options. The potential solutions were also divided into high-level phases: short-, mid-, and long-term.

During this part of the process, the consultant team worked with the Core Team to develop peer benchmarking to compare the proposed space needs. The consultant team also worked with Michael Vergason Landscape Architects (MVLA) to refine major landscape components related to the preferred plan.

## ***Plan Roll-Out and Documentation***

The last workshop for the ISP was held in early March 2018. The final version of the space needs and physical plan was shared with the Planning Group, Steering Committee, and the broader UVA Engineering community through an open forum. Following the workshop, the Core Team engaged with the Provost and prepared for the ISP to be shared with the Board of Visitors later in the year.



# ENGAGEMENT AND PROJECT TEAM

## *Core Team*

- **Luis Carrazana**, Associate Architect for the University, Office of the Architect for the University
- **Elisa Cooper**, Assistant Campus Planner, Office of the Architect for the University
- **Dick Minturn**, Senior Academic Facility Planner, Office of the Executive Vice President and Provost
- **John Notis**, Director of Planning and Facilities, UVA Engineering

## *Planning Group*

- **Luis Carrazana**, Associate Architect for the University, Office of the Architect for the University
- **Elisa Cooper**, Assistant Campus Planner, Office of the Architect for the University
- **Dick Minturn**, Senior Academic Facility Planner, Office of the Executive Vice President and Provost
- **Julia Monteith**, Senior Land Use/Community Planner, Office of the Architect for the University
- **Chip Morton**, Data Analyst, UVA Engineering
- **John Notis**, Director of Planning and Facilities, UVA Engineering
- **Bill Palmer**, GIS Planner, Office of the Architect for the University
- **Anna Towns**, Director of Space Planning & Management, Arts & Sciences
- **Helen Wilson**, Senior Landscape Architect, Office of the Architect for the University

## *Steering Committee*

- **Craig Benson**, Dean, UVA Engineering
- **Maite Brandt-Pearce**, Executive Associate Dean for Academic Affairs, UVA Engineering
- **Luis Carrazana**, Associate Architect for the University, Office of the Architect for the University
- **Lloyd Harriott**, Associate Dean for Undergraduate Education, UVA Engineering
- **Arthur Lichtenberger**, Research Professor, UVA Engineering
- **Dick Minturn**, Senior Academic Facility Planner, Office of the Executive Vice President and Provost
- **Pam Norris**, Executive Associate Dean for Research, UVA Engineering
- **John Notis**, Director of Planning and Facilities, UVA Engineering
- **Alice Raucher**, University Architect, Office of the Architect for the University
- **Michael Todd**, Associate Dean for Finance & Operations, UVA Engineering



## ***Focus Groups***

- Administrative Units Focus Group
- Core Facilities / Centers Focus Group
- Computational Research Focus Group
- Department Chairs
- Educational / Experimental Learning Group
- Engineering in Medicine Focus Group
- Experimental Research Focus Group
- Instructional / Academic Space Focus Group
- Open Forums
- Student Focus Group
- Student Services Group

## ***Consultant Team***

### **Ayers Saint Gross**

- Alyson Goff
- Luanne Greene
- Lisa Keith
- Angj Kwak
- Tiffany McAllister
- Dana Perzynski
- Angelo Pirali
- Earl Purdue

### **Latimer Health Strategies**

- Scot Latimer

### **Michael Vergason Landscape Architects**

- Beata Corcoran
- Michael Vergason





# OBSERVATIONS AND GOALS

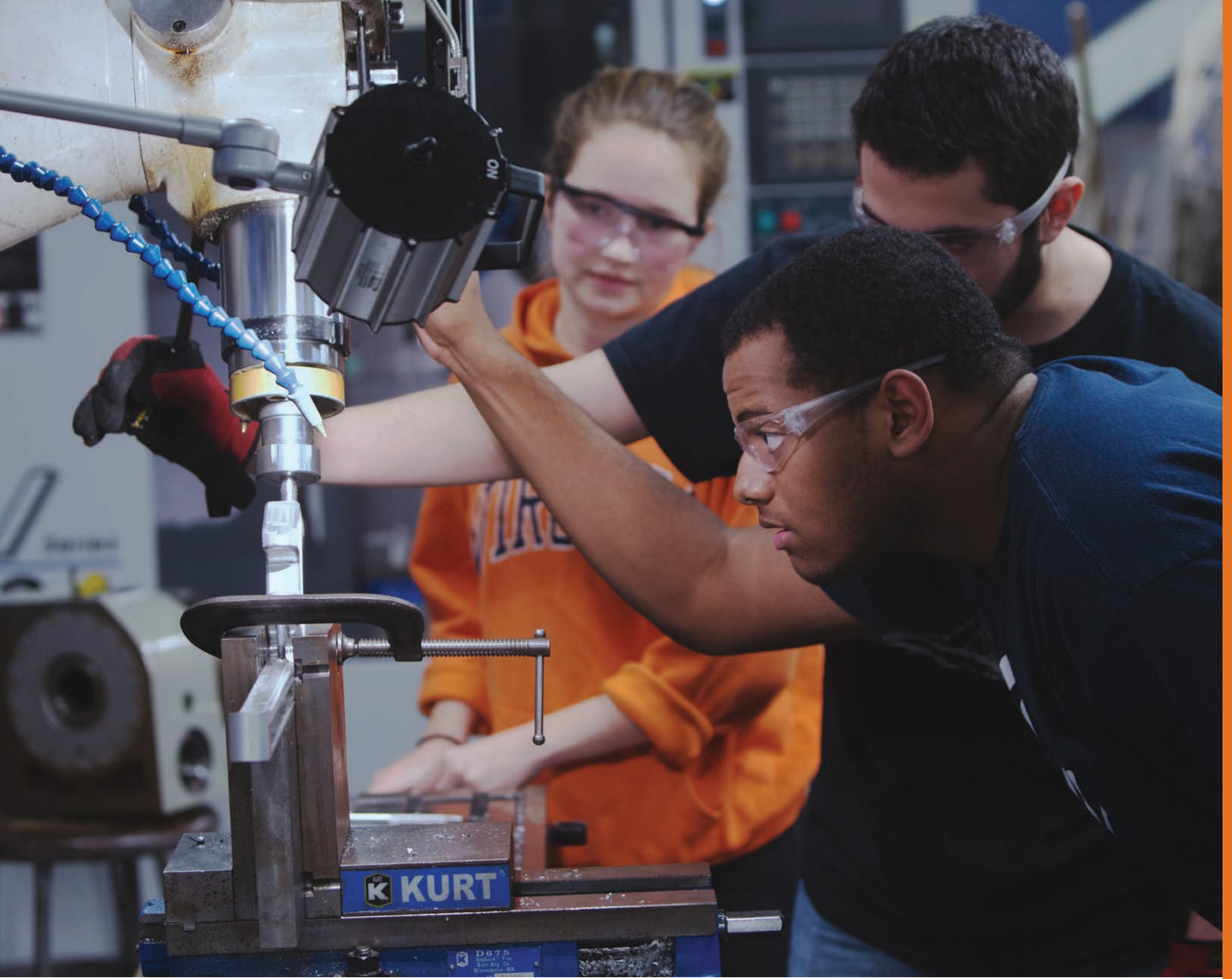
**CONTEXT**

**EXISTING CONDITIONS**

**UVA OVERARCHING GOALS**

**UVA ENGINEERING GOALS**









# CONTEXT

UVA Engineering is situated within West Grounds, bordered by McCormick Road to the north, Stadium Road to the east, and Whitehead Road to the south. The Curry School of Education is to the north and the College and Graduate School of Arts & Sciences is to the north and west. Stadium Road creates a hard edge condition to the east of the School because of topography, the neighborhood, and the road itself.

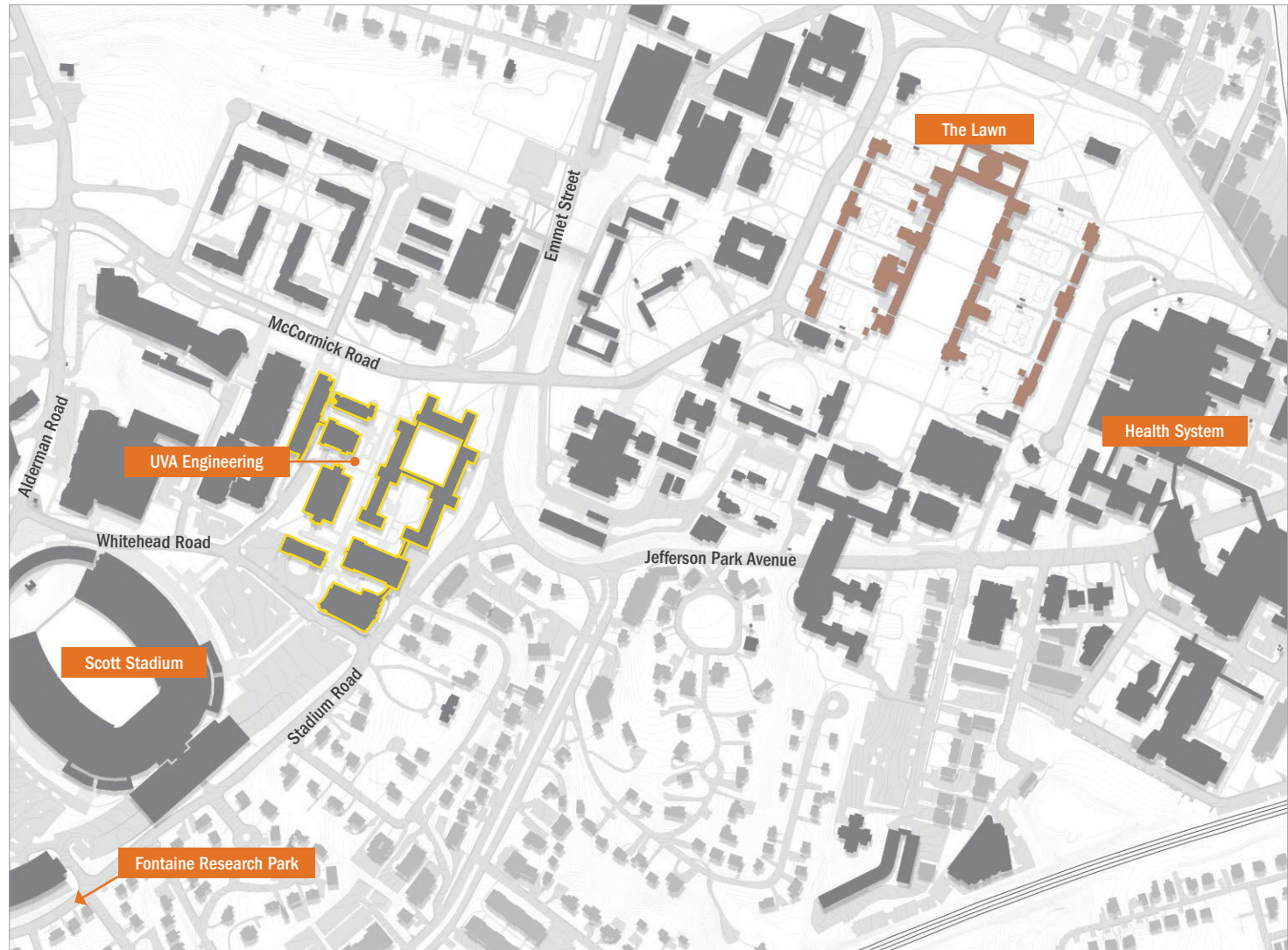
Across Stadium Road via McCormick Road is the Brown Science and Engineering Library. Beyond the library on the other side of the Lawn is the University of Virginia Health System where Biomedical Engineering (BME) is located. BME is primarily housed within the School of Medicine buildings approximately 0.5 miles from UVA Engineering.

Fontaine Research Park, a key component of the UVA Engineering ISP, is located less than a mile southwest of West Grounds. UVA Engineering also uses buildings outside of the immediate West Grounds area, including Lacy Hall, Aerospace Research Laboratory, and Observatory Mountain Engineering Research Facility, located 0.75 miles west on Observatory Mountain.


















BUILDING	GSF	NASF	Year Built
<b>WEST GROUNDS/ENGINEERING PRECINCT</b>			
THORNTON HALL	159,384	94,268	1936
ALBERT H SMALL BUILDING	10,445	6,328	1948
OLSSON HALL	78,002	38,275	1960
MECHANICAL ENGINEERING BUILDING (MEB)	71,088	48,795	1971
MATERIALS SCIENCE BUILDING (MSB)	33,012	17,310	1985
CHEMICAL ENGINEERING RESEARCH BUILDING	24,979	12,926	1992
WILSDORF HALL	97,838	49,871	2006
RICE HALL	104,604	57,078	2011
<b>TOTAL</b>	<b>579,352</b>	<b>324,851</b>	
<b>OUTSIDE WEST GROUNDS/ENGINEERING PRECINCT</b>			
AEROSPACE RESEARCH LABORATORY	12,566	8,886	1948
OBSERVATORY MOUNTAIN ENGINEERING RESEARCH FACILITY	26,486	16,173	1962
MILTON AIR HANGAR	4,368	4,153	1980
AERO RESEARCH TRAILER	600	551	1985
CENTER FOR APPLIED BIOMECHANICS (CAB) @ UVA RESEARCH PARK	25,219	22,630	1996
FLUIDS RESEARCH LABORATORY	2,927	2,424	1996
MR-4/5 (BME ONLY; FLOORS 1 AND 2)	47,000*	27,840	2002
LACY HALL	19,628	12,577	2013
<b>TOTAL</b>	<b>138,794</b>	<b>95,234</b>	
*APPROXIMATE			
<b>GRAND TOTAL</b>	<b>718,146</b>	<b>420,085</b>	

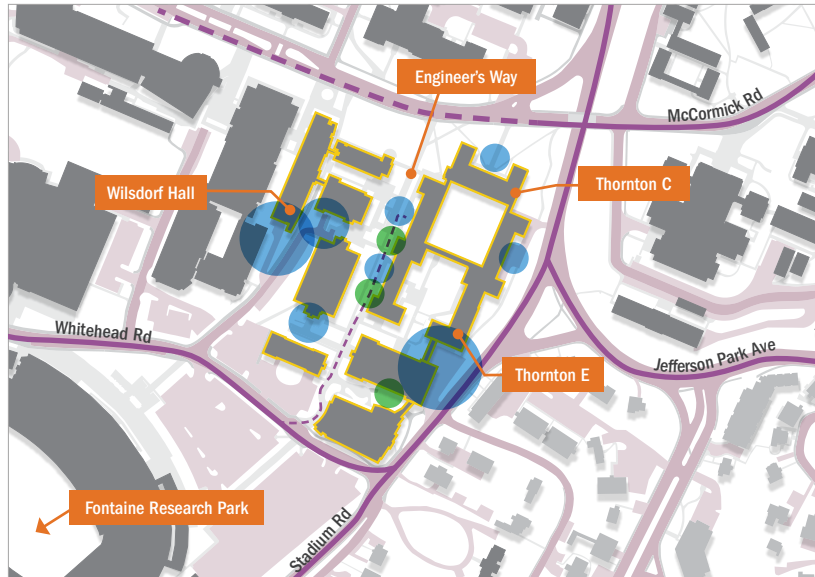
# EXISTING CONDITIONS

The focus of the UVA Engineering ISP is the buildings on West Grounds. Thornton Hall, built in 1936, is the oldest and largest building of the UVA Engineering portfolio. It is considered the “front door” to UVA Engineering as it faces on McCormick Road and is the administrative home for the school. Olsson Hall and Mechanical Engineering Building (MEB) were built in the 1960s and 1970s. Two smaller buildings, Materials Science Building (MSB) and Chemical Engineering, were added in the 1980s and 1990s. The newest buildings, Wilsdorf Hall and Rice Hall, both predominately research buildings, are larger buildings that were built in 2006 and 2011 respectively.

The West Grounds/Engineering Precinct support the mission of UVA Engineering and make up about 30% of the space portfolio.



- UVA Engineering 
- Road 
- Parking 
- Loading 
- Building Service Access 
- Primary Road 
- Limited Access Road 








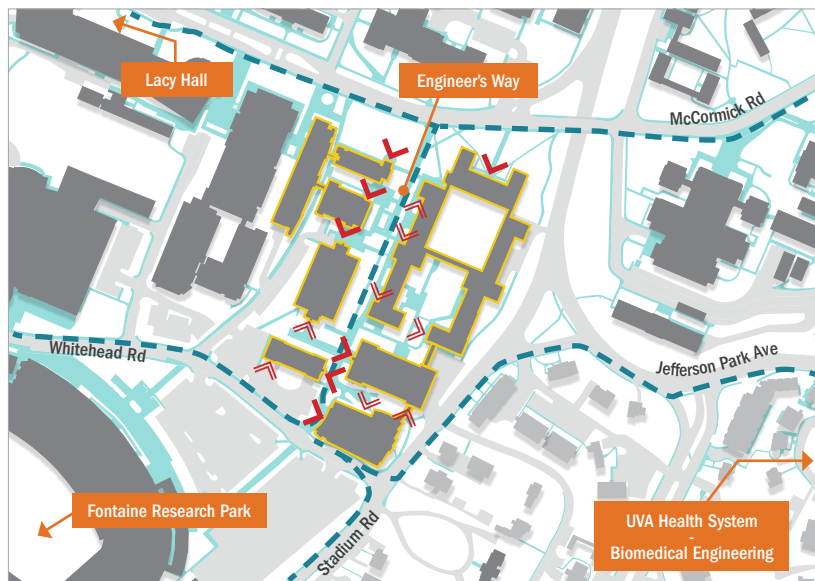
## Vehicular Movement

Daily traffic moves around the eastern and southern edges of UVA Engineering. Two major loading areas for Thornton Hall are accessed via Stadium Road. The southern dock also serves Olsson Hall and Rice Hall. Limited daily traffic runs along McCormick Road to the north.

Additional loading docks are located off Chemistry Drive, a service road accessed via Whitehead Road. Wilsdorf, MSB, and MEB are all serviced from this roadway.

While the majority of loading and service occurs on the edges, smaller loading areas that support Thornton A, B, and D-wings and a secondary dock for MEB are located off Engineer's Way, a main pedestrian thoroughfare.

- UVA Engineering 
- Sidewalk 
- Main Building Entry 
- Secondary Convenient Entry 
- Major Path 



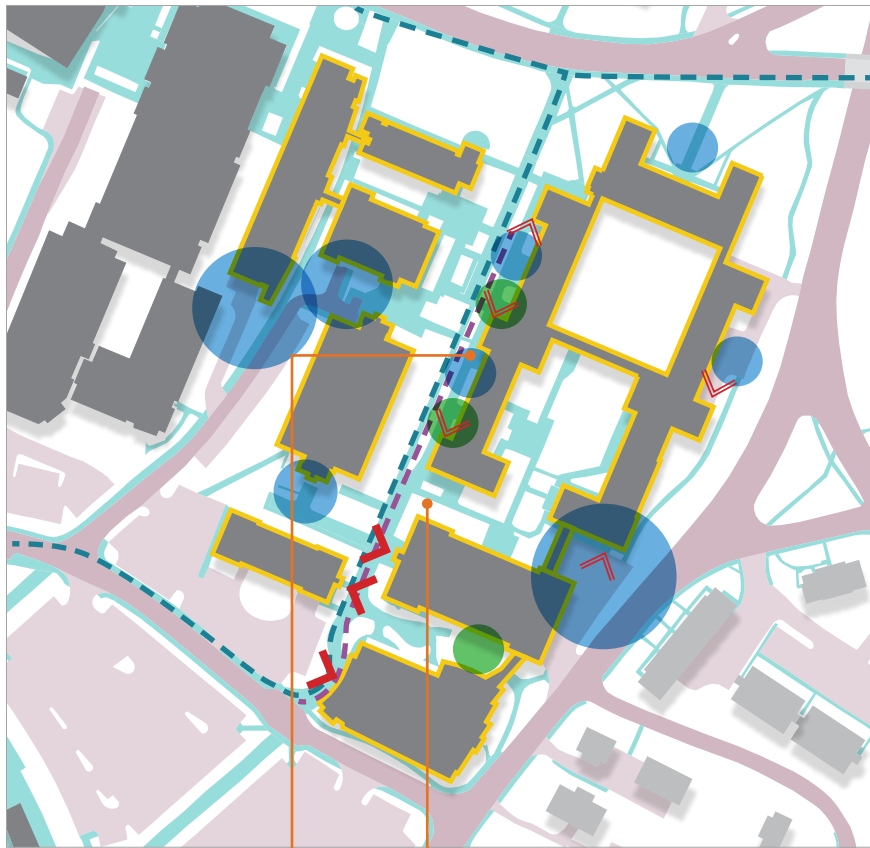
## Pedestrian Movement

Engineer's Way is the primary north/south pedestrian connection for UVA Engineering but is also a main pedestrian link for the broader UVA community, connecting Scott Stadium and its associated parking with McCormick Road and Central Grounds.



## Pedestrian and Vehicular Conflicts

In addition to the loading areas accessed from Engineer's Way, pedestrian and vehicular conflicts are exacerbated by service vehicles parking along this route. Loading docks also double as secondary/convenient entries into buildings by pedestrians.



- UVA Engineering
- Pedestrian Path
- Service Vehicle Path
- Loading
- Building Service Access
- Main Building Entry
- Secondary Convenient Entry



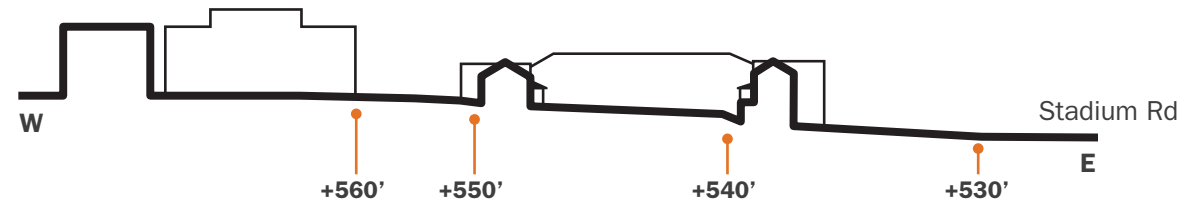
*Engineer's Way—Looking north*



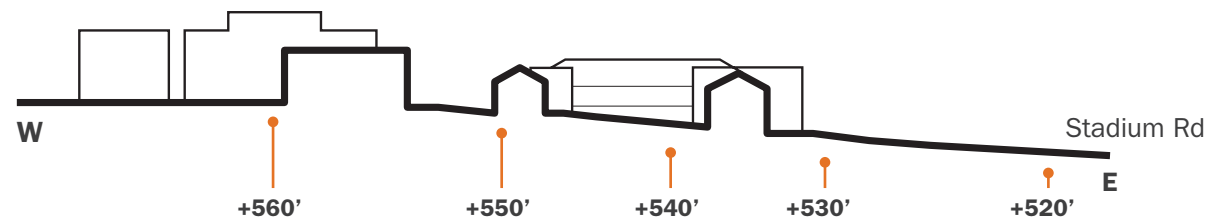
*Engineer's Way—Looking south*



### SECTION A *Wilsdorf Hall to Thornton B & C*



### SECTION B *MEB to Thornton D & E*



## Topography

The site slopes up significantly from east to west (Stadium Road to Engineer's Way). Darden Court, formed by Thornton A, B, and C-wings is relatively flat because Thornton C-Wing acts as a retaining wall separating the Darden Court entrance on the west side from the loading dock on the east side. Thornton E-Wing is less successful as a retaining wall for topography and results in unusable open space between Thornton D & E-wings.

Another area where the topography is noticeable is along Engineer's Way. The site slopes up approximately 10 feet, from east to west, creating accessibility challenges along the route of travel.







# **UVA OVERARCHING GOALS**

Before the ISP process began, the University shared overarching goals for all space planning and physical planning across Grounds. These overarching goals guided the development of specific goals for UVA Engineering.

- 
- **Use existing buildings more efficiently**
  - **Develop individual school space governance models**
  - **Identify opportunities to share space**
  - **Balance reinvestments through renovation with new construction**
  - **Employ highest and best use strategies for each building**
  - **Pool resources and build facilities for multiple schools and departments**
- 

In 2015, the University set forth a goal of increasing the total sponsored research portfolio to \$500M in annual expenditures by 2025, which established a target of \$125M for Engineering, up from \$47M. This objective creates positive impacts across the mission: external funding brings financial diversity and increased revenue, discoveries drive industry and serve society, and thriving laboratories provide the real experiential learning opportunities that modern undergraduate students demand. To meet this objective, the plan is to modestly increase faculty numbers, boost the intensity at which faculty engage in research activity, and ultimately greatly expand the PhD student population, which is a primary driver of research activity and graduate school rankings. School leadership arrived at these plans based on analysis of more research-intensive peer institutions. The plans focus on areas of strength and drive many of the findings of this study. This growth has already begun: From 2015 to 2018, the tenured / tenure-track faculty population increased from 146 to 178, the number of PhD students grew by 48% from 456 to 675, research awards went up 42% from \$54M to \$77M, and research expenditures up 23% from \$47M to \$58M.



# **UVA ENGINEERING GOALS**

Based on interviews with a wide cross-section of stakeholders,  
a series of goals were developed specifically for UVA Engineering.



**Process**  
Flexible Road map



**Facility Condition**  
Aging Infrastructure



**Culture**  
Accessibility and Intimacy



**Collaborative Environments**  
Social Heart



**Thematic Discovery**  
Breaking Down The Silos



**Education**  
Pedagogical Change



**Outward Engagement**  
Engineering On Display



**Growth**  
Phased Implementation





## ***Process***

---

### ***Observations***

While the ISP is a road map, tactical, early-phase solutions are needed to resolve physical silos and immediate space needs.

### ***ISP Goals / Principles***

- Create a flexible / adaptable road map with a long-term planning horizon
- Establish an Engineering space governance model





Test List  
Not for SDK

# Baxter Demo

```
tab { cd ros_ws  
      ./baxter.sh  
      roslaunch baxter_tools
```

## file permissions

gksu nautilus  
:roslab  
mocap2.launch  
Launch2.launch  
use permissions window to edit

```
tab { roscd  
      * -> cd  
      ls  
      roslaunch mocap_optitrack  
      mocap.launch  
      roslaunch  
      mocap_optitrack
```

## first window

```
roslaunch  
mocap_optitrack
```

enabl  
roslaunch baxter\_tools





## ***Facility Condition***

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### ***Observations***

More than a third of Engineering's space is in poor condition, both technically and functionally. Smaller building footprints and building wings cause fragmentation and inefficiencies.

### ***ISP Goals / Principles***

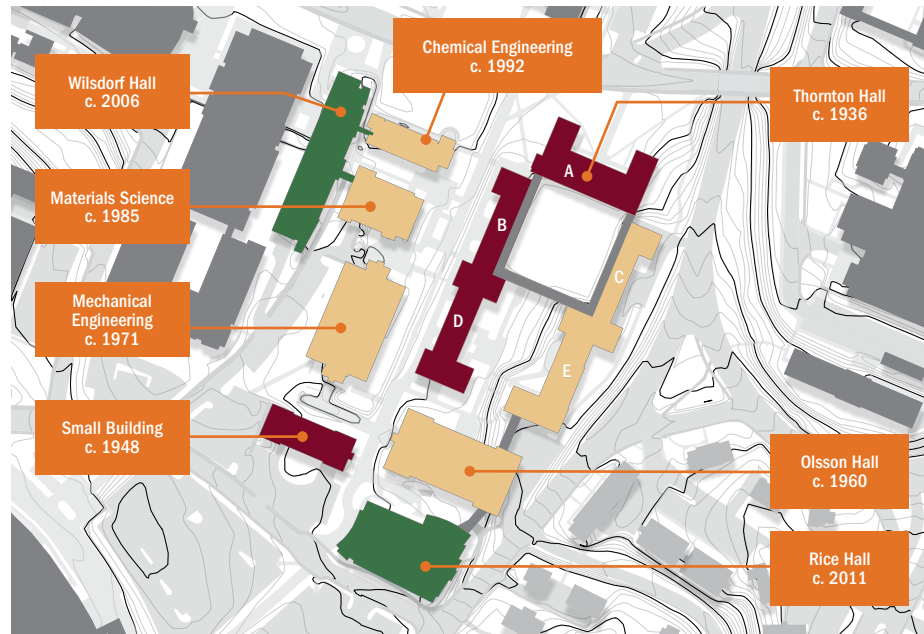
- Address aging infrastructure
- Identify existing space constraints
- Identify solutions to improve space quality



Poor Condition (approximately 33%)

Fair Condition (approximately 33%)

Very Good Condition (approximately 33%)



A

B

C

TECHNICAL

3 2 1

FUNCTIONAL

**Technical Grade** measures the physical condition of a building.

**Functional Grade** measures a building's location and ability to support the program.





## ***Culture***

---

### ***Observations***

The intimacy of the school within the larger University is a strength. UVA Engineering benefits from close proximity to Arts & Sciences and the Health System. However, the perception is that Engineering closes up at off-hours, limiting collaboration. This was observed during summer and breaks when many students were not around, but a significant number of faculty and researchers were still on Grounds.

### ***ISP Goals / Principles***

- Leverage adjacent Arts & Sciences resources, especially Gilmer and Chemistry buildings
- Maintain an intimate, accessible school that fosters community and congeniality beyond 9-5 hours





*The **intimacy** of the school within the larger University is a strength.*





## ***Collaborative Environments***

---

### ***Observations***

The Engineering footprint is compact but the buildings are siloed, which drives operations. Physical silos are reinforced by departmental and cultural silos (and vice versa).

The naming of some of the buildings also reinforces this environment. There is limited space within Engineering for collaboration, both formal and informal.

### ***ISP Goals / Principles***

- Create environments that encourage collaboration









## ***Thematic Discovery***

---

### ***Observations***

UVA Engineering is committed to rethinking departmental structure and reorganizing around scholarly themes. While there will still be departments for administrative and accreditation purposes, research and academic faculty hiring is driven by a thematic focus.

### ***ISP Goals / Principles***

- Move away from department-centric initiatives and more towards an emphasis on interdisciplinary education and research



**THEMES WE HAVE HEARD . . .**

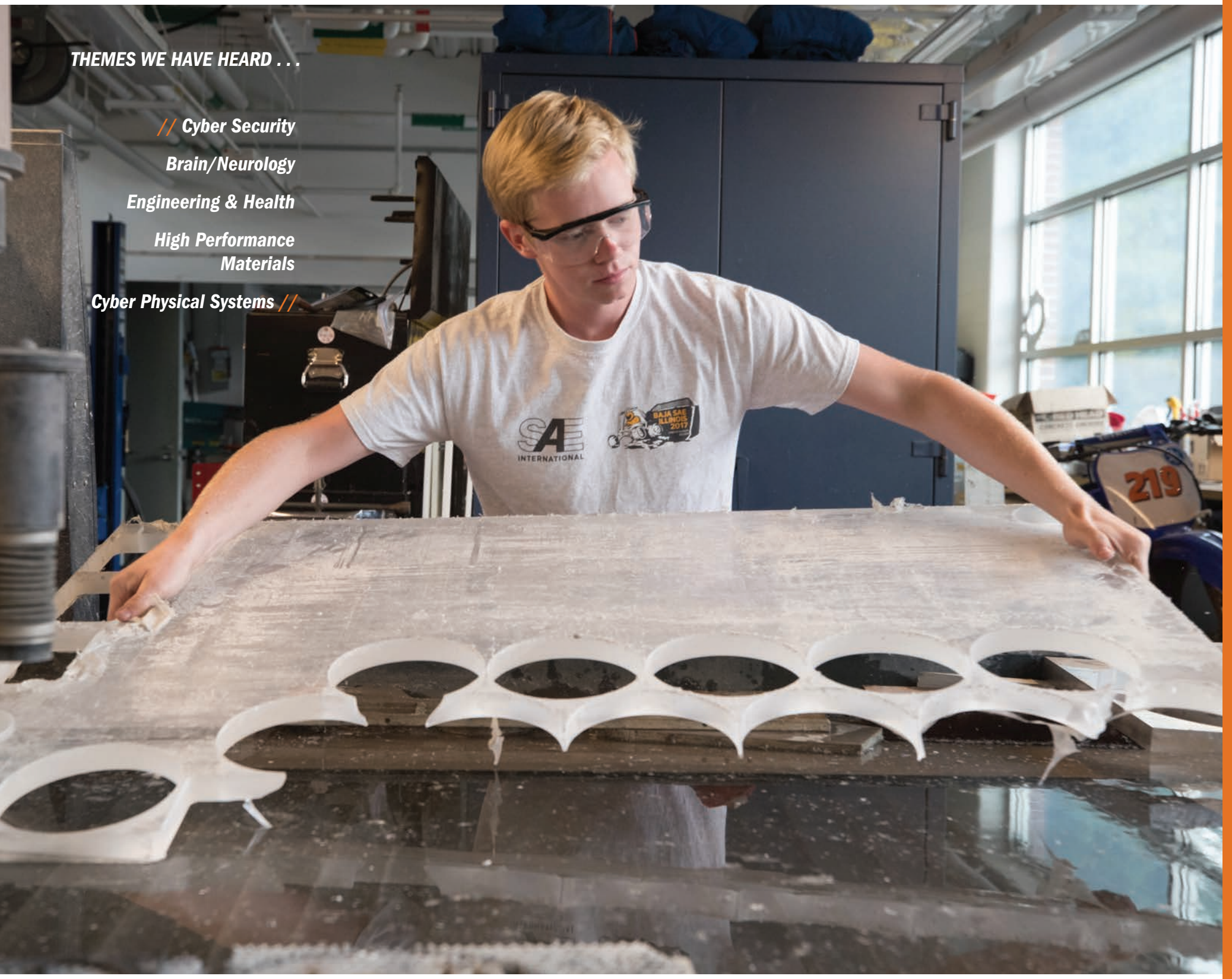
**// Cyber Security**

**Brain/Neurology**

**Engineering & Health**

**High Performance  
Materials**

**Cyber Physical Systems //**







## ***Education***

---

### ***Observations***

Current classroom inventory does not support larger cohort sizes and access to some classrooms is challenged by competition with other Schools for classroom space.

### ***ISP Goals / Principles***

- Enhance the undergraduate experience with social and cocurricular spaces to support learning outside the classroom
- Enable curriculum and pedagogical change, including active learning, with more flexible spaces





```
/* Add node between current cursor and next node */
public void add(LinkedNode<T> node){
    if(this.cursor == null) { // if the list is empty
        this.setFirst(node); // set first to the node
        return;
    }
    if(this.cursor == this.last) { // cursor is last node
        this.last = node;
    }
    // set up
    // ...
}

/* Add node at a particular index location */
public void add(LinkedNode<T> node, int index){
    if(index >= this.count){
        this.setFirst(node);
    }
}
```



```
/* Add node between current cursor and next node */
public void add(LinkedNode<T> node){
    if(this.cursor == null) { // if the list is empty
        this.setFirst(node); // set first to the node
        return;
    }
    if(this.cursor == this.last) { // cursor is last node
        this.last = node;
    }
    // set up
    // ...
}

/* Add node at a particular index location */
public void add(LinkedNode<T> node, int index){
    if(index >= this.count){
        this.setFirst(node);
    }
}
```





## ***Outward Engagement***

---

### ***Observations***

Service and loading mixes with pedestrians, especially along Engineer's Way, detracting from the overall environment. Topography can be a challenge for creating accessible facilities.

### ***ISP Goals / Principles***

- Amplify Engineer's Way as a social heart for UVA  
Engineering attracts the broader UVA community ("Engineering on Display")
- Create a more welcoming and accessible environment
- Provide intentional loading areas to relocate conflicting traffic









## ***Growth***

---

### ***Observations***

UVA Engineering has ambitious growth plans coupled with a period of generational transition due to retirements. However, there is limited space for growth, especially experimental lab space. Lab space has the most unique and challenging space requirements and is not well-suited to small footprint buildings.

### ***ISP Goals / Principles***

- Plan for faculty growth and turnover in research (wet and dry) to support growth plans







# *NEW VISION FOR UVA ENGINEERING*

*EXISTING ORGANIZATION*

*PROPOSED ORGANIZATION*







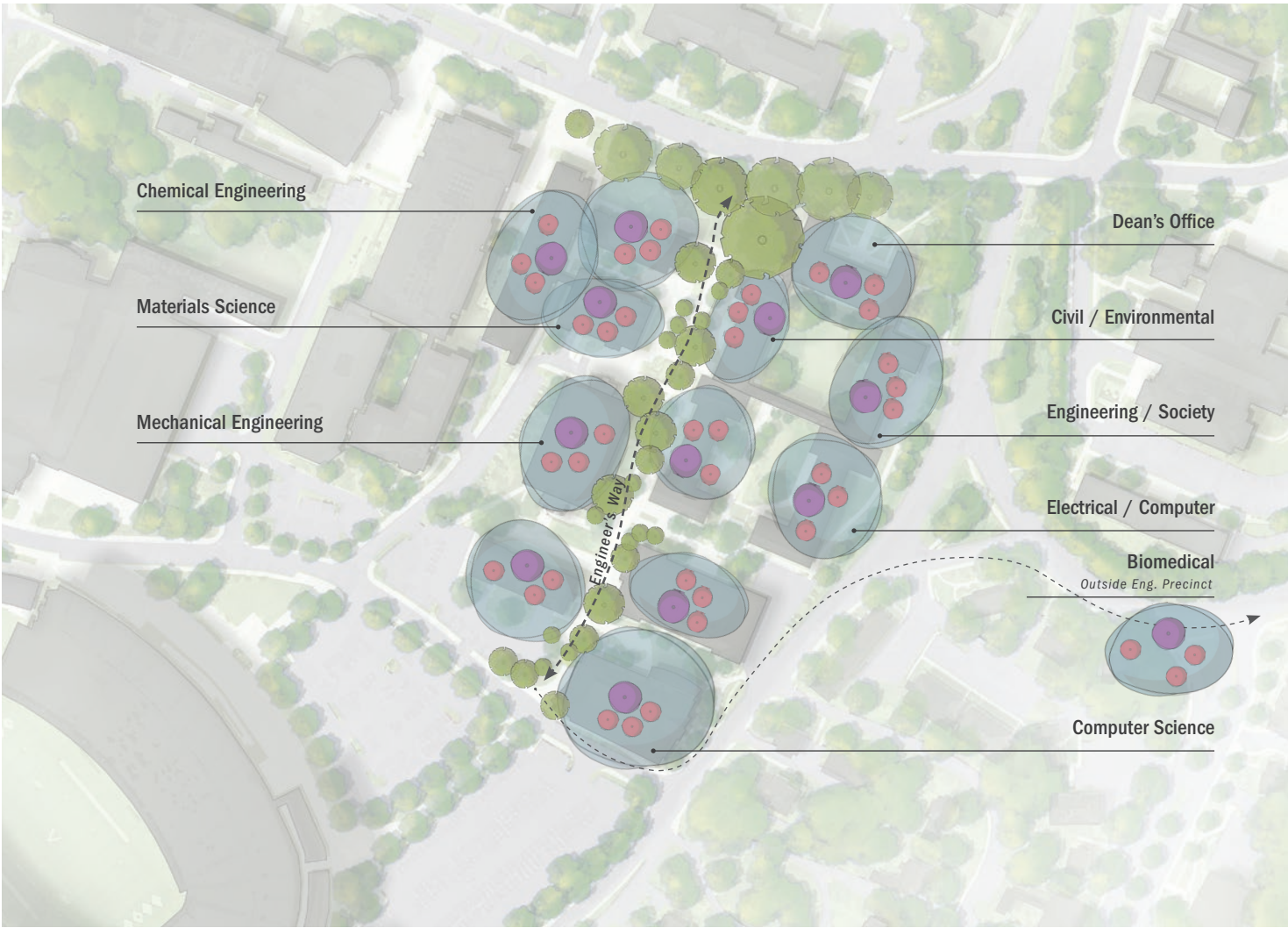
# **EXISTING ORGANIZATION**

UVA Engineering is currently organized, both physically and operationally, by distributed departments. Buildings are typically named after the department in which they house, however some units have found additional space in neighboring buildings. As a result, department chairs and their faculty typically operate in physical silos. There is also limited space for social interactions and collaboration, both formal and informal (usually organized around food and coffee). Engineer's Way is not maximized as a collaborative connector.



**EXISTING ORGANIZATION**

- Department
- Department Head
- Faculty





# **PROPOSED ORGANIZATION**

## ***Migration to Thematic Organization***

UVA Engineering is moving away from departmental organization and migrating towards thematic organization. The broad themes that have been identified include Engineering for Cyber Future, Engineering for Medicine, and Engineering Technologies for a Sustainable and Connected World. The idea is that individuals from different disciplines will come together physically and intellectually to solve complex problems.

## ***Organization by Interdisciplinary Hub***

The new vision for UVA Engineering is to be organized by interdisciplinary hubs. Flexible hubs combine department chairs and faculty from different disciplines in the same physical space. Similar space types will need to be collocated due to the layout of existing buildings.

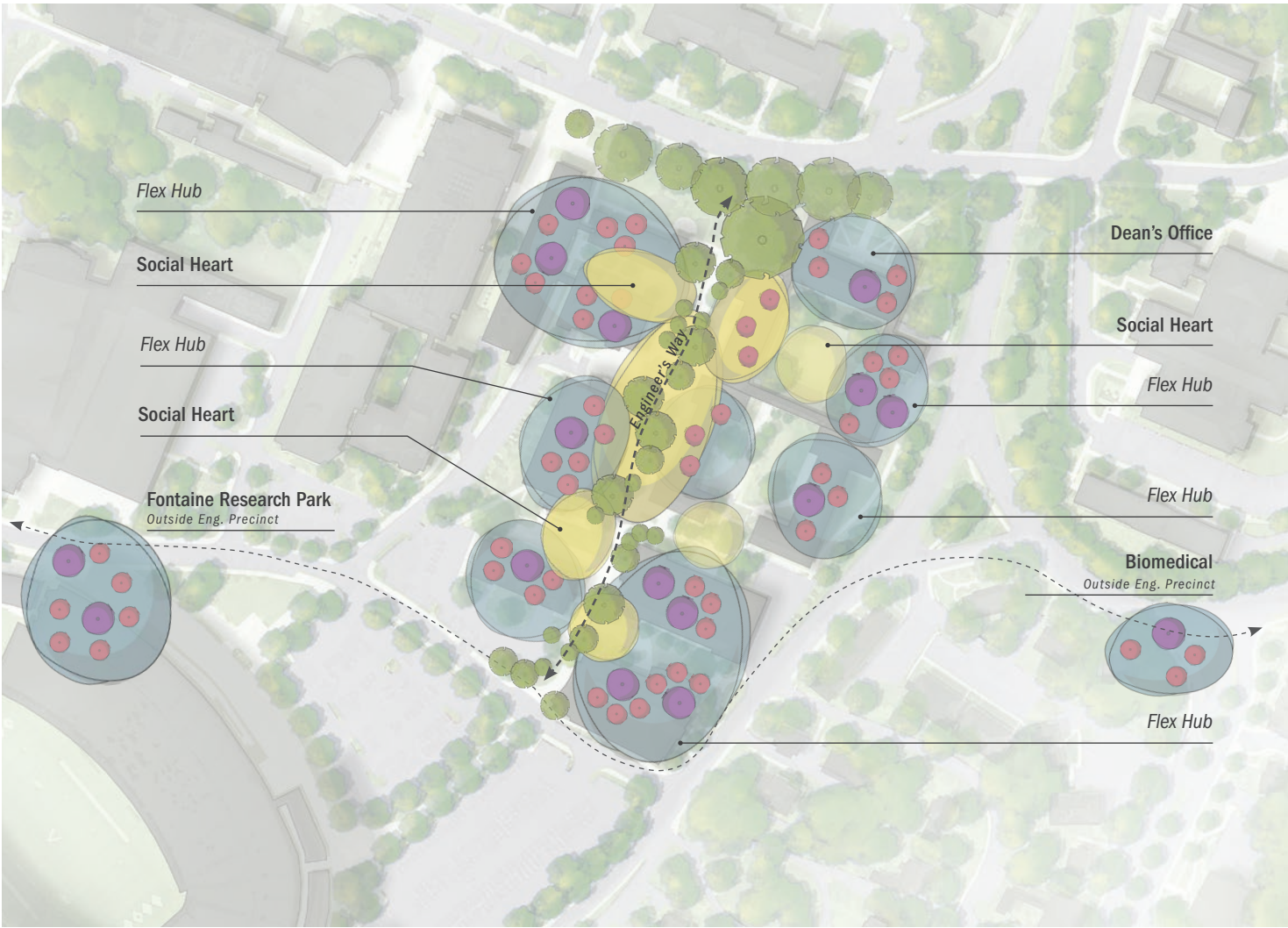
## ***Connected by a Social Heart***

Flexible, interdisciplinary hubs can be connected to other space types and other themed hubs by social spaces. The social heart can be centralized around food and collaboration or decentralized around study spaces and smaller collaboration areas. Engineer's Way can be more pedestrian friendly and inviting while creating an opportunity for engineering on display. The existing landscape will be leveraged to create outdoor spaces that promote interaction. The natural topography will be re-imagined as an educational landscape and reinforce the engineering on display through the promotion of natural process, erosion and sedimentation control etc.



PROPOSED ORGANIZATION

- Flex Hub
- Department Head
- Faculty
- Social Heart: Indoor and Outdoor Collaboration, Food, Study, Etc.





# SPACE NEEDS ANALYSIS

**ANAYLSIS OVERVIEW AND PROCESS**

**DATA COLLECTION AND WORK SESSIONS**

**ASSUMPTIONS**

**EXISTING DISTRIBUTION OF SPACE**

**GROWTH SCENARIOS**

**METRICS**

**SPACE NEEDS SUMMARY**







# ANALYSIS OVERVIEW AND PROCESS

***The needs assessment is an application of metrics based on best practices, which result in a quantitative ideal.***

To guide physical planning for the ISP, the consultant team worked with the Core Team to develop three different planning scenarios. These scenarios were based on varying levels of research productivity and the associated growth in faculty, students, and staff. A space needs assessment was completed to support decision-making and the development of physical plan scenarios. The needs assessment is an application of metrics based on best practices, which result in a quantitative ideal.

Schools of Engineering across the country are experiencing peaks in enrollment for a variety of reasons. More students are exposed to STEM fields earlier in their education and engineering continues to add breadth as a discipline. As a result, Schools of Engineering are increasingly finding the need to cross disciplines, especially regarding research. The University has two unique advantages: a strong comprehensive foundation and close proximity to a medical center. The School is able

to capitalize on these advantages by creating collaborative education and research opportunities. Consequently, as new buildings or major renovations are programmed and designed, efficiencies are likely to be gained. The evolution of pedagogy has transformed the learning environments on campuses across the country. Today's instructional spaces serve a far greater purpose than just the dissemination of content. Modern design provides for more space per person to allow for a variety of teaching methods, particularly hands-on, team-based activities that occur in engineering programs.

The space needs assessment is a quantitative measure informed by the existing quality of space. Quality helps dictate the perceived and true need for space. All space was identified in terms of indoor net assignable square feet (NASF). NASF excluded public corridors, stairwells, mechanical rooms, public restrooms, and structural areas. The needs assessment was developed by space category. The space metrics used to



- 1** *Analyzed existing Engineering space and its distribution*
- 2** *Worked with UVA Engineering's Leadership to project growth scenarios*
- 3** *Engaged UVA Engineering stakeholders to discuss inadequate space types*
- 4** *Verified number of students, existing PIs, and employees*
- 5** *Explored research space needs through different lab phenotypes*
- 6** *Applied best practice metrics for other space types*

generate the analysis were based upon normative metrics applicable to institutions similar to UVA Engineering and drew from the experience of the consultant team.

The process was comprehensive in that it assessed the quantitative and qualitative character of spaces in order to inform metrics reflective of today's pedagogies and modern uses. The needs analysis model factored in the School's shift toward a theme-based approach to education and research. Fall 2016 served as the baseline (existing conditions) for the ISP with three scenarios – short-, mid, and long-term growth. The assessment then compared how much space UVA Engineering had to how much was needed to generate the space overage (surplus) or space need (deficit) for each scenario. The assessment was prepared by space category by planning horizons and identifies current space distributions, utilization, and areas of need.



# **DATA COLLECTION AND WORK SESSIONS**

For UVA Engineering, the space metrics were based on widely used guidelines, benchmarking, and the consultant's experience. The metrics were applied by space category. For class laboratories, the course data was used and the metrics varied by discipline. For office needs and research laboratory needs, the employee database was used. All other space categories used the number of students. The details of the methodology are in the Metrics section later in this report.

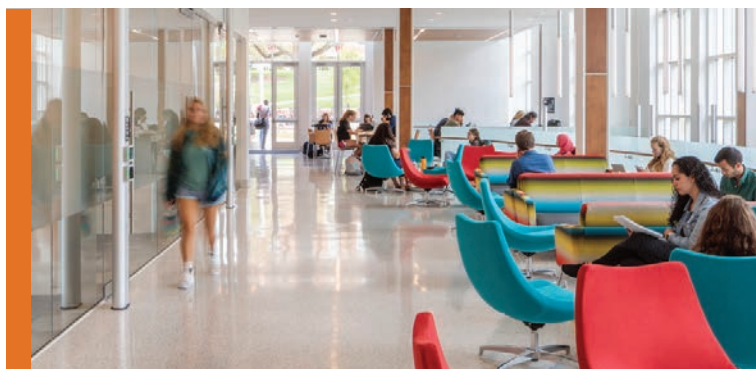
The data required for this analysis was extensive. Building data and a room-by-room inventory file were necessary along with floor plans. Employee data for full-time and part-time faculty and staff was needed as well as research expenditures and course data with student enrollments for Fall 2016. Finally, organizational charts, department names, and coding systems were utilized. A significant amount of time from both the consultant team and the UVA Engineering project team was used to verify the datasets.

The data used in the assessment was provided by the University using Fall 2016 as the snapshot in time. UVA Engineering supplied Fall 2016 course data with enrollments, employee data, R&D expenditures, and the targeted enrollment and research productivity growth goals.

Many of the tables found in this report compare the existing NASF to the proposed NASF generated by the space metric. There is a set of comparative columns for Fall 2016 (baseline year) and three future scenarios modeling needs.

In addition to data collection and analysis, the consultant team held several on-campus work sessions and focus groups with a wide range of UVA Engineering stakeholders to add a qualitative layer to the quantitative analysis. The team also toured UVA Engineering buildings, which provided a more intimate knowledge of the School. These focus groups provided empirical information that helped formulate the needs assessment.





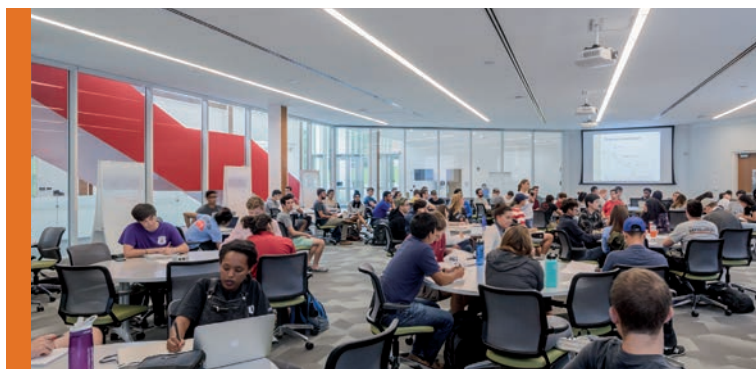
## **Collaborative Environments**

- Conference rooms
- Student lounges
- Campus social heart / commons
- Serendipitous collaboration around food and coffee



## **Thematic Discovery**

- Flexible research space
- Flexible academic space
- Office space
- Shared offices



## **Education**

- Larger, more flexible classrooms
- Study spaces
- Active and project-based learning spaces



# **ASSUMPTIONS**

The space needs assessment included the physical space with UVA Engineering purview. Classrooms were not included as they were not exclusively used by the School. Space within UVA Engineering that was allocated for non-School use (i.e. Facilities Management) was also excluded. The core purpose of the needs assessment was to identify the quantity and distribution of space at the baseline year and provide a comparative view of needs with the application of student and faculty growth over three planning horizons. These growth scenarios were based on immediate, anticipated, and aspirational student enrollment growth.

## ***Enrollments***

Student enrollment projections were provided by UVA Engineering. Additionally, aspirational targets were provided and the data was extrapolated in order to identify enrollments for the short- and mid-term planning scenarios.

## ***Employees***

Growth in faculty, staff, and researchers was developed using the School's approved hiring plan and guided by UVA Engineering leadership. The employee growth reflected in the analysis represents growth in principal investigators with a target goal of 200. Other faculty and staff growth was based on either the PI growth or total growth.

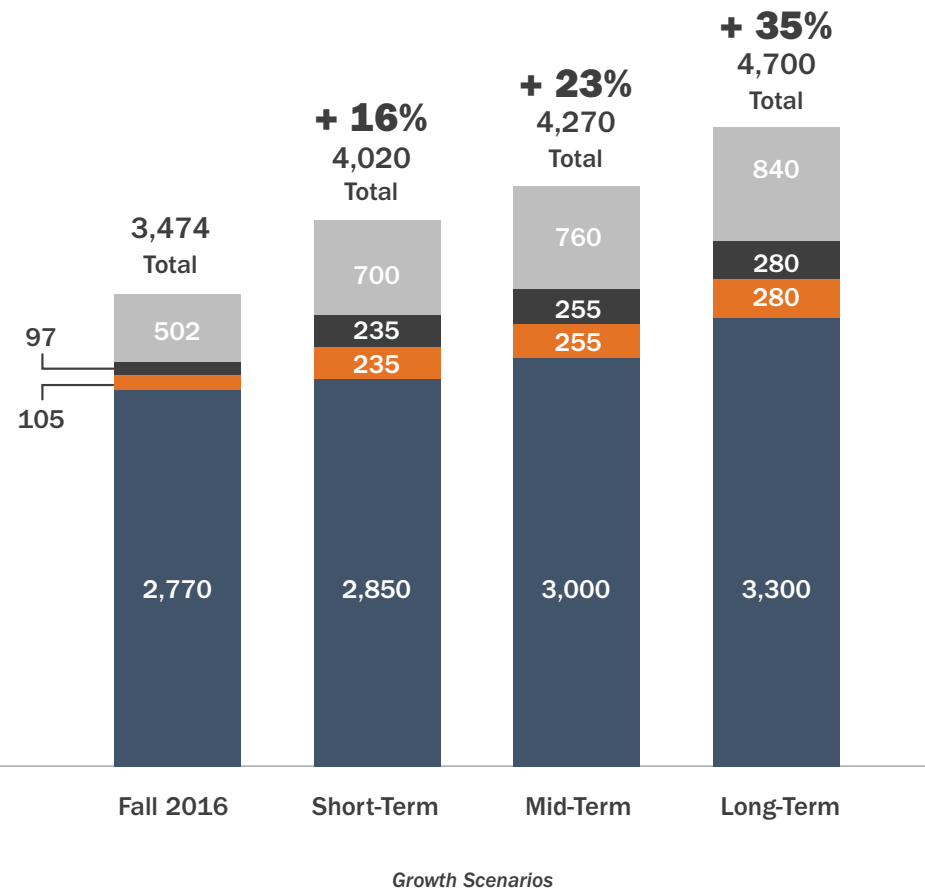
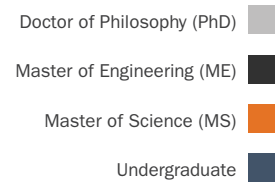
## ***Facilities***

The existing NASF column in many of the tables in this report reflects the space that was in use for Fall 2016 and was expected to remain the space inventory available to UVA Engineering.



## GROWTH PROJECTIONS

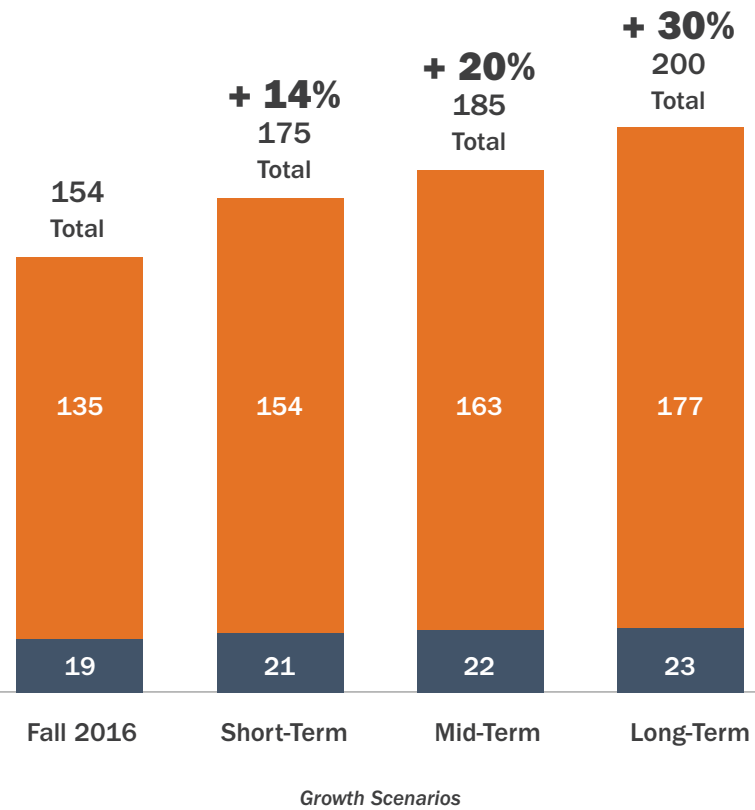
### Student Enrollments





## Principal Investigators

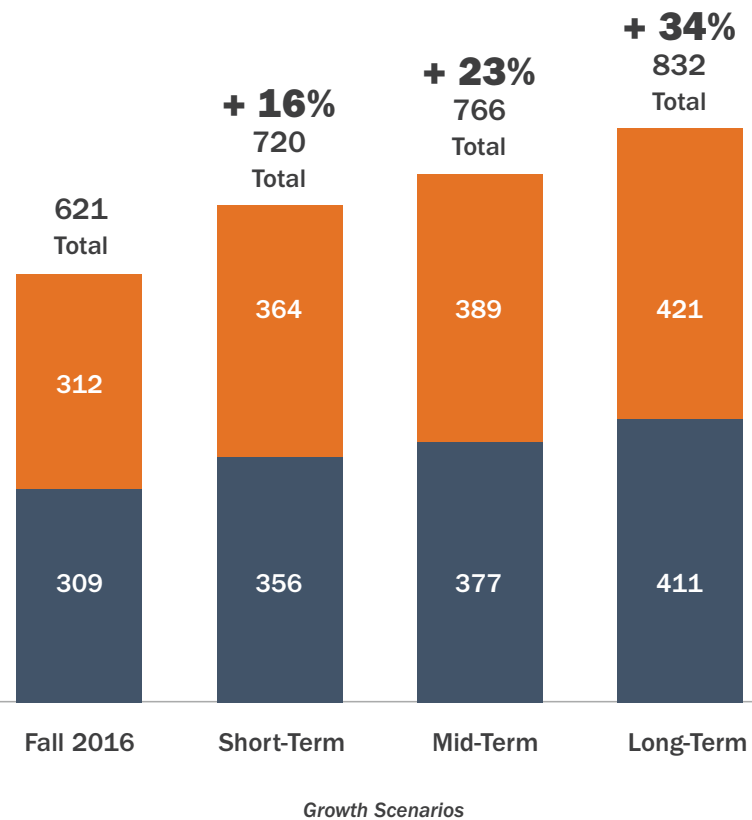
Within UVA Engineering Precinct ■  
Outside UVA Engineering Precinct ■





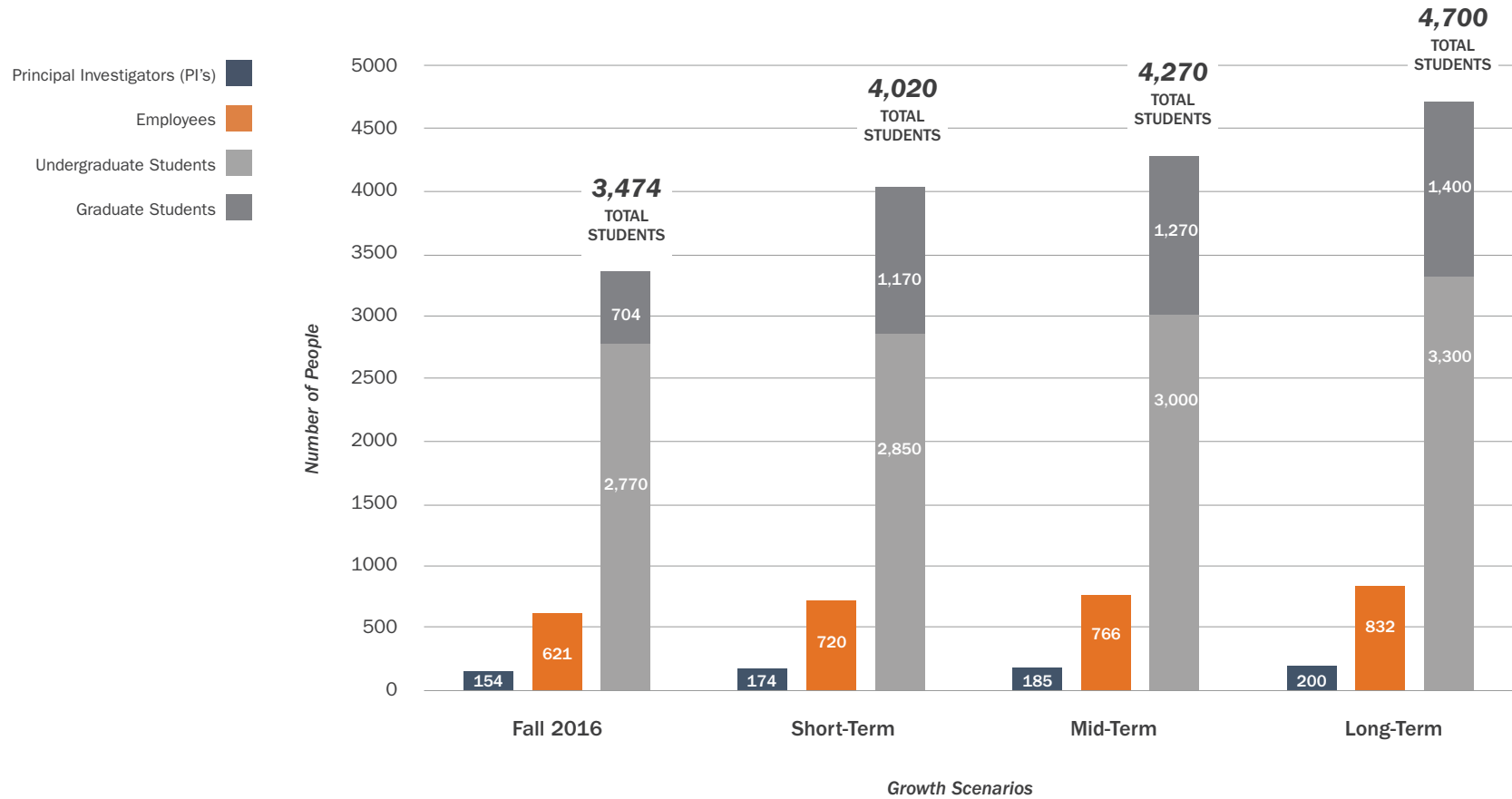
## Non-Student Employees

Staff ■  
Faculty and Other Academic Employees ■

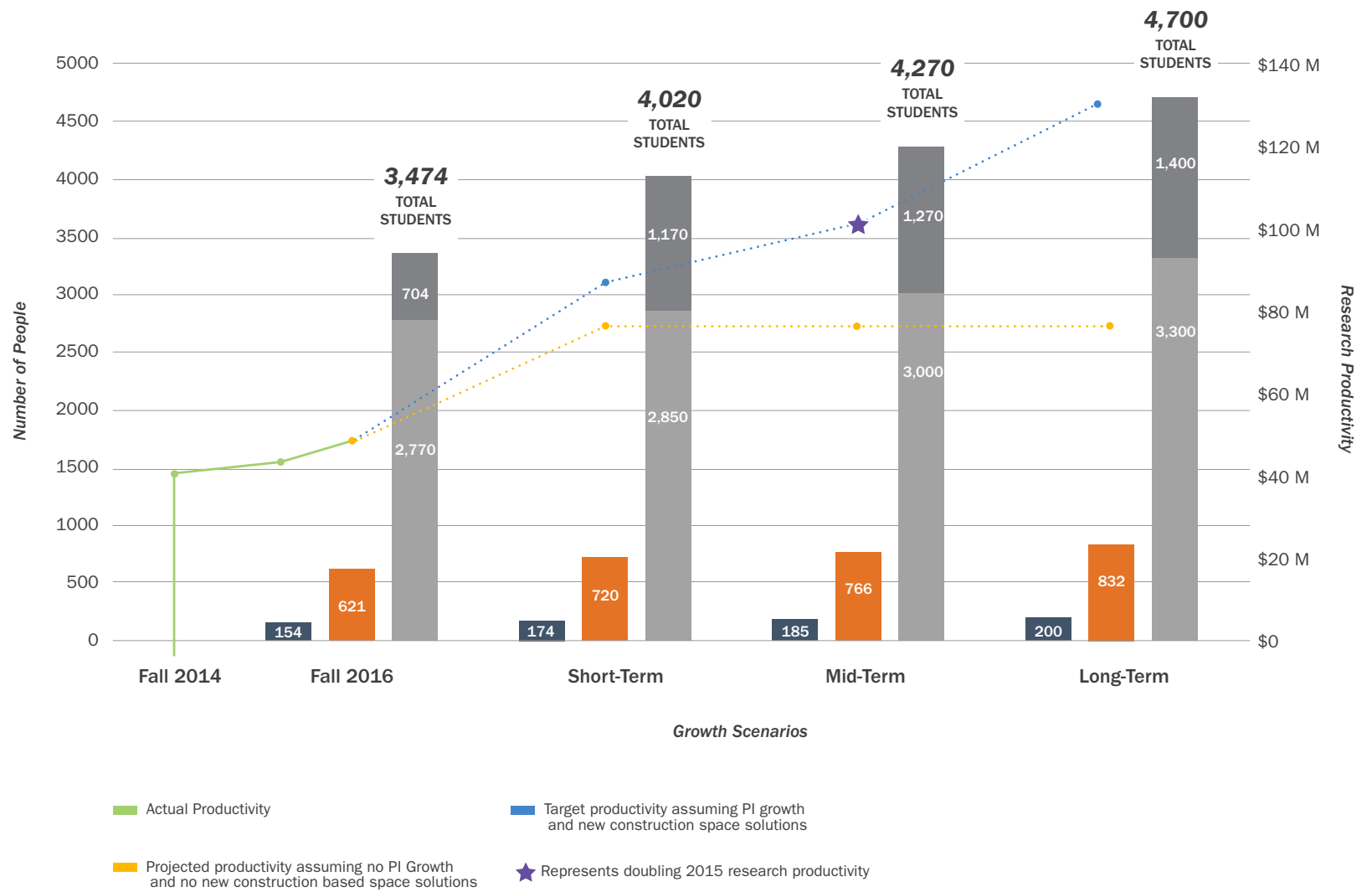




## DEMOGRAPHICS









# ***DATA COLLECTION AND WORK SESSIONS***

Data helps tell a story, so it must be organized so that consumers can easily digest the information. UVA Engineering provided its space inventory, which the consultant team structured into five categories. Space use is assigned based upon primary use, and spaces can serve multiple functions. The outcomes of the space needs analysis are displayed in these major categories in order to quantify deficits and surpluses in a meaningful way to inform the physical plan.



**Research  
Space**



Research Labs  
Core Labs  
Shop Space

**Academic  
and Research  
Offices**



Offices  
Office Service  
Conference / Meeting

**Academic  
Space**



Classroom  

Class Lab

Open Lab

↓

Instructional Labs

**Social Heart**



Lounge / Food Service  
Study  
Collaborative Space

**Support Space**



Support / Admin Offices  
Central / Unit Storage  
Server Space  
Merchandising

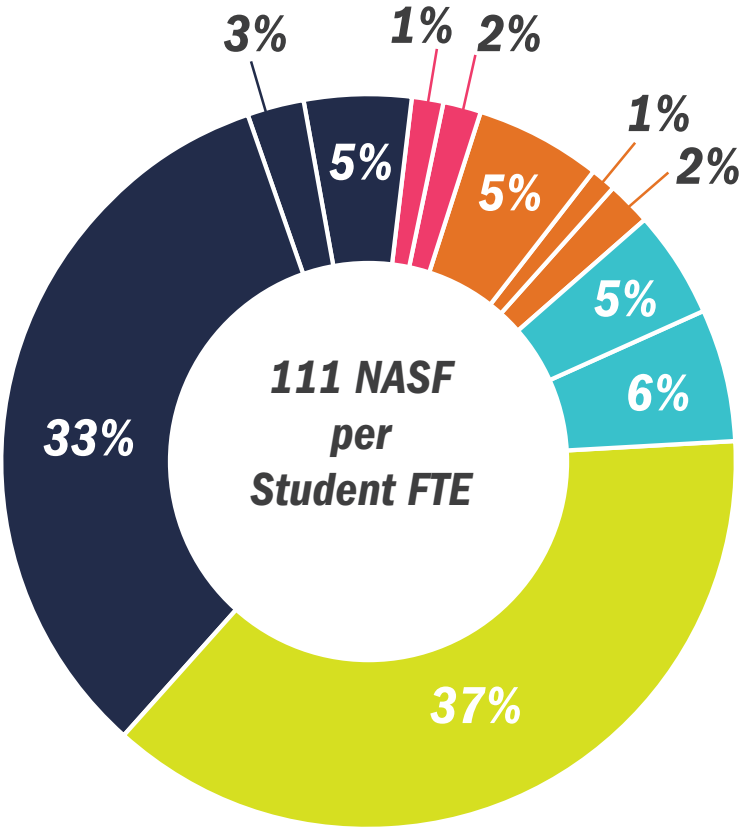


# **EXISTING DISTRIBUTION OF SPACE**

UVA Engineering had approximately 383,000 NASF in its inventory (excluding classrooms and non-School uses) both within and outside of the UVA Engineering precinct. The existing space distribution among the different categories was not unusual. As with most institutions, office space represented the largest distribution of space at 37%. Research space was the second largest distribution, which included labs, cores, and shops. The existing NASF per student (minus exclusions) was 111 NASF per full-time equivalent (FTE) student. This was on the low end of the range for a School like UVA Engineering.



Space Within Entire UVA Engineering Portfolio (NASF)



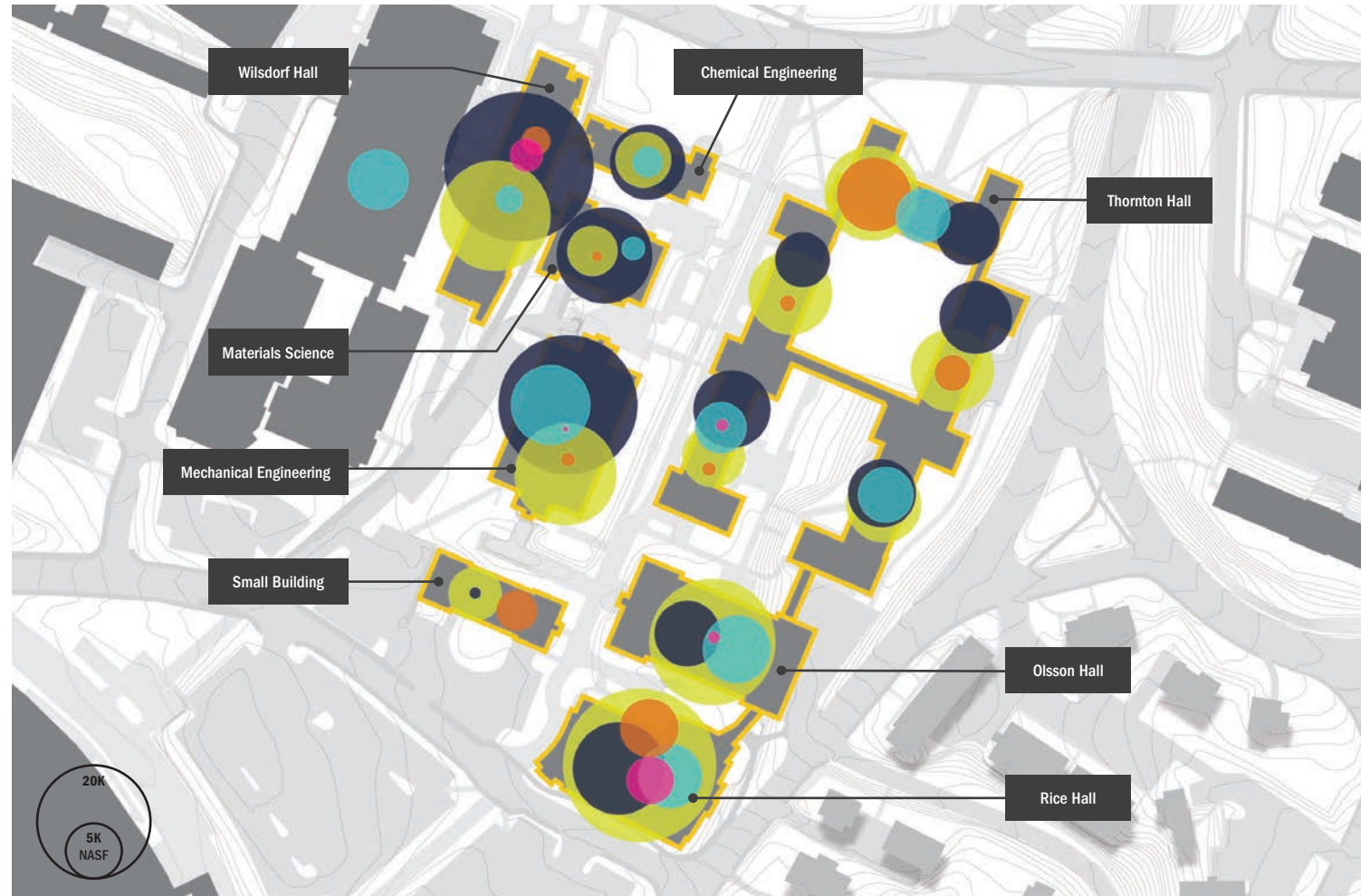
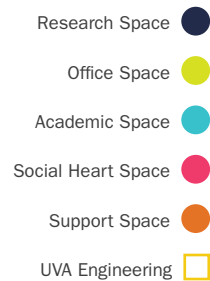
Research Laboratories	126,621
Research Cores	10,394
Shop Space	17,635
Academic and Research Offices	142,496
Class Laboratories	18,591
Open Laboratories	22,816
Collaboration and Community Space	4,805
Food Service and Lounges	7,067
Support Offices	21,238
Other Administrative Space	4,283
Server Space	6,727

TOTAL 382,673



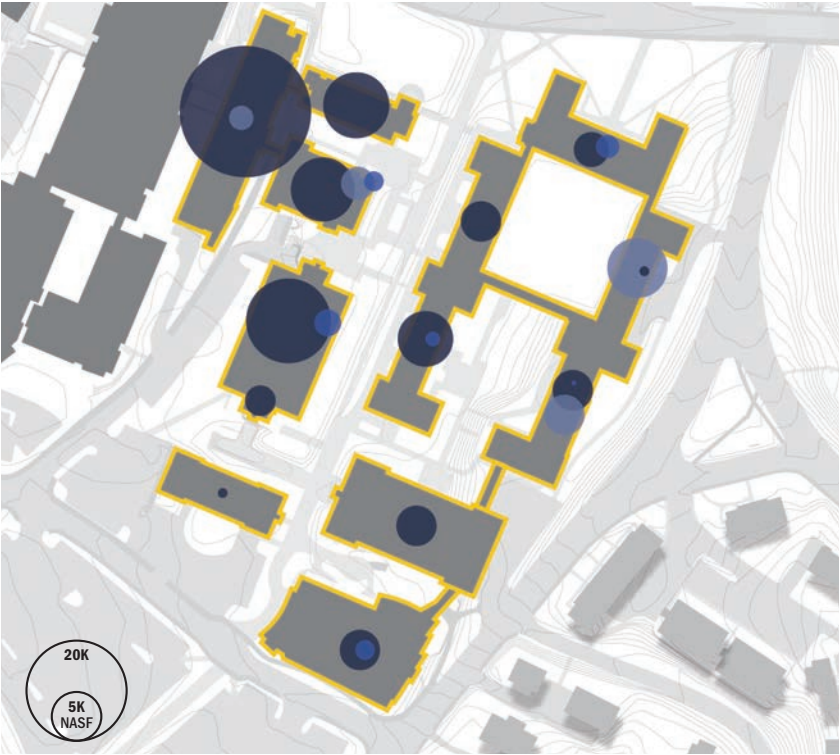
## Space Type Distribution

The following pages diagram the space type distribution specifically within the UVA Engineering precinct on West Grounds. This includes the buildings along Engineer's Way between McCormick Road and Whitehead Road. It does not include buildings outside of the Engineering core.





- Research Labs
- Research Core
- Shops
- UVA Engineering



Research Core	
NASF	BUILDING
6,100	Thornton C
4,000	Thornton E
2,800	Materials Science
1,200	Wilsdorf Hall

Research Labs	
NASF	BUILDING
24,900	Wilsdorf Hall
11,300	Mechanical Engineering
8,700	Materials Science
7,400	Chemical Engineering Research
6,500	Thornton D
4,700	Rice Hall
4,000	Thornton E
3,900	Olsson Hall
3,900	Thornton B
2,700	Thornton A
1,900	Fluids Research Laboratory
200	Albert H Small Building
200	Thornton C

Shops	
NASF	BUILDING
2,600	Mechanical Engineering
1,600	Thornton A
1,100	Materials Science
700	Rice Hall
700	Thornton D
100	Thornton E

\*All NASFs rounded to the nearest 100



Academic and Research Offices ●  
UVA Engineering □



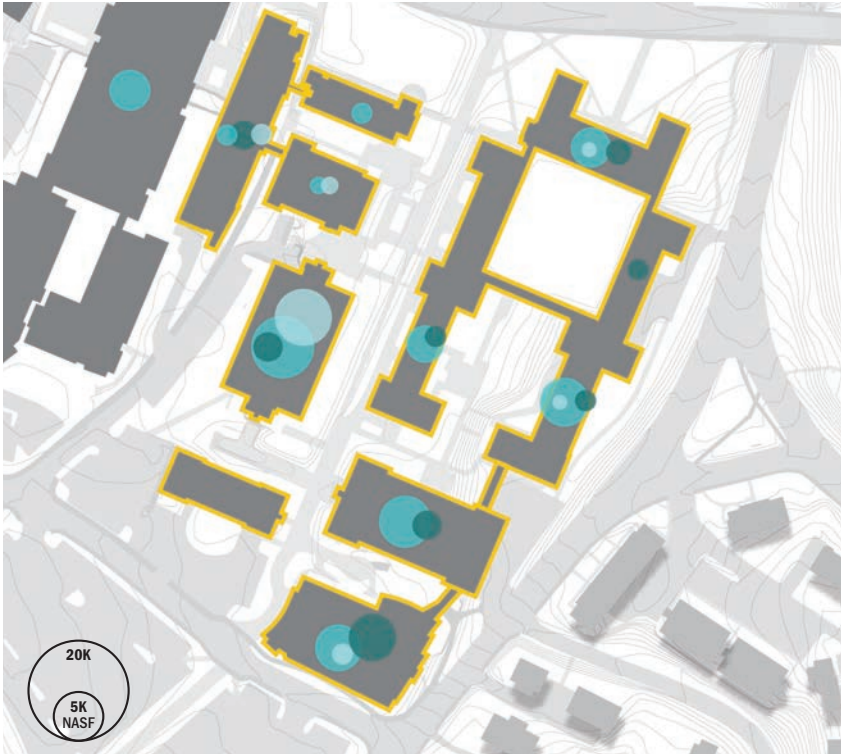
Academic and Research Offices

NASF	BUILDING
27,000	Rice Hall
20,700	Olsson Hall
15,400	Wilsdorf Hall
13,700	Mechanical Engineering
9,100	Thornton B
7,600	Thornton C
7,600	Thornton E
5,200	Thornton D
4,200	Chemical Engineering Research
3,800	Thornton A
3,400	Materials Science
1,400	Albert H Small Building
600	Fluids Research Laboratory

\*All NASFs rounded to the nearest 100



- Classrooms
- Class Labs
- Open Labs
- UVA Engineering



Open Labs	
NASF	BUILDING
7,400	Mechanical Engineering
1,200	Rice Hall
1,000	Wilsdorf Hall
500	Materials Science
200	Thornton E
200	Thornton A

Classrooms	
NASF	BUILDING
8,500	Mechanical Engineering
6,200	Olsson Hall
5,500	Rice Hall
5,000	Chemistry Building
4,100	Thornton E
4,000	Thornton A
3,500	Thornton D
1,200	Chemical Engineering Research
1,000	Wilsdorf Hall
800	Materials Science

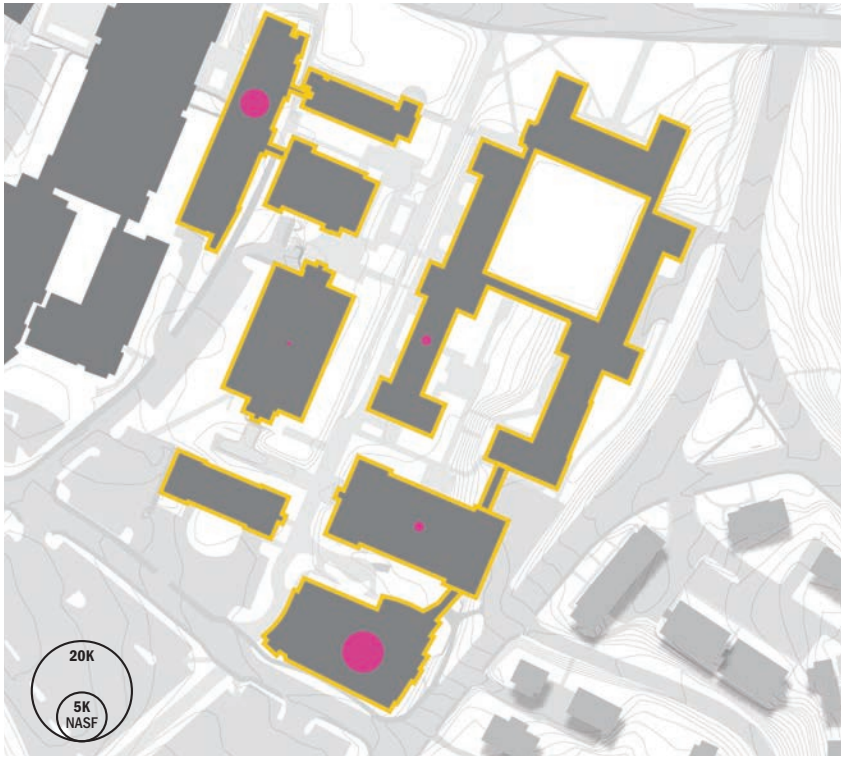
\*The ISP does not quantify classrooms in terms of square footage but rather in terms of inventory mix; for illustrative purposes only

Class Labs	
NASF	BUILDING
3,900	Rice Hall
2,400	Mechanical Engineering
2,300	Thornton A
2,000	Wilsdorf Hall
1,800	Olsson Hall
1,300	Thornton E
1,300	Thornton D
600	Thornton C

\*All NASFs rounded to the nearest 100



Social Heart Space ●  
UVA Engineering □



Social Heart Space	
NASF	BUILDING
4,400	Rice Hall
2,000	Wilsdorf Hall
400	Thornton D
300	Olsson Hall
100	Mechanical Engineering

*\*All NASFs rounded to the nearest 100*



Support Space ●  
UVA Engineering □



Support Space	
NASF	BUILDING
8,100	Thornton A
4,900	Rice Hall
2,500	Albert H Small Building
1,700	Thornton C
1,300	Wilsdorf Hall
400	Thornton B
200	Thornton D
100	Mechanical Engineering
100	Materials Science

\*All NASFs rounded to the nearest 100

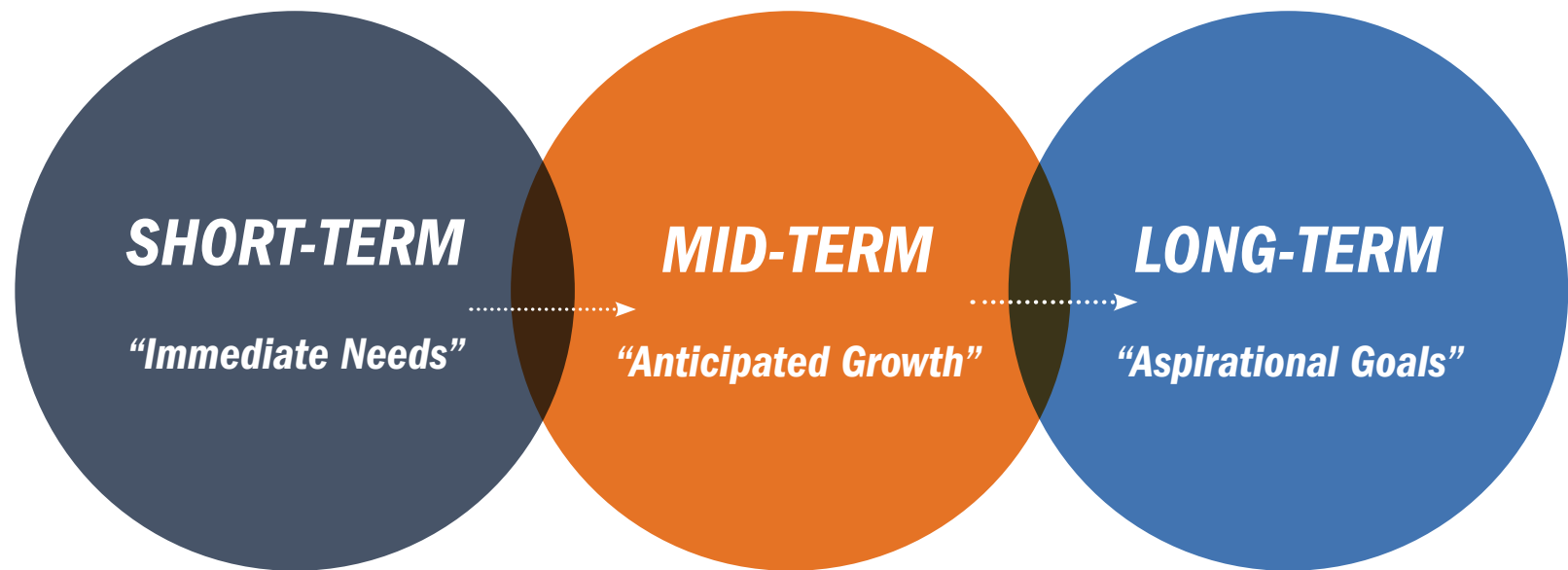


# GROWTH SCENARIOS

The space needs assessment identified needs at the baseline year (existing conditions) as well as projected needs under three different scenarios. These scenarios were developed in conjunction with UVA Engineering leadership, Office of the University Architect, and Office of the Provost. The intent was to quantify needs under different sets of assumptions to develop various physical plan options. Assumptions were driven by the School's goal of dramatically increasing research productivity. To support this target, a massive increase in the graduate student population, supported by moderate increases in principal investigators and increased research team sizes is needed and expected. Additionally, undergraduate student

growth is estimated to increase. Non-PI employee growth was projected by employee type (academic general faculty, professional staff, support staff, lecturers, etc.) based either on the percentage change in PIs, a portion of the student growth, or all student growth. In each scenario, student enrollments, employee growth, and the increase of principal investigators are the factors that drive the space needs. The ISP primarily focuses on the short- and mid-term scenarios as they reflect immediate and agreed upon recruitment goals. The long-term scenario reflects enrollment and research targets to enable the School to increase its national ranking status.









# ***METRICS***

The following section describes the different space metrics used to create the space needs assessment as well as each space category used in the assessment. Space metrics are not space entitlements. These metrics are used to determine magnitude and priority of need for a campus master planning exercise. As construction projects (new or renovation) are developed from this analysis, a lower or higher standard might be used when conducting a detailed program analysis.

The space metrics used in the space needs assessment are customized for UVA Engineering based on its unique characteristics including mission, programs, location, and

culture. These metrics might not be applicable to other Schools of Engineering. The project team's experience in space analytics and instructional space design contributes to the metrics selected. The team does not endorse a one-size-fits-all philosophy about space planning. For most space categories, there is more than one method of applying a space metric. The chosen method was based upon scope of services for the study and the applicability to UVA Engineering.







## Research Space

NASF Needs Summary

SPACE CATEGORY	Fall 2016			Short-Term		Mid-Term		Long-Term	
	EXISTING NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF
Research Labs	90,000	119,500	(29,500)	138,900	(48,900)	147,500	(57,500)	163,700	(73,700)
Research Cores	10,400	18,000	(7,600)	23,000	(12,600)	23,000	(12,600)	31,000	(20,600)
Shop Space	16,000	10,000	6,000	11,200	4,800	13,200	2,800	16,500	(500)
<b>TOTAL</b>	<b>116,400</b>	<b>147,500</b>	<b>(31,100)</b>	<b>173,100</b>	<b>(56,700)</b>	<b>183,700</b>	<b>(67,300)</b>	<b>211,200</b>	<b>(94,800)</b>

\*All Numbers rounded to the nearest 100  
Key: Overage/(Deficit)

## Research Space

The research space category includes research labs, cores, and shops. Four research lab phenotypes were developed to address the space needs of Principal investigators (PI). The phenotypes are: specialty/industrial lab, wet lab, dry lab, and computational lab. To project the space needs for research space, the ISP assumed an average research group size of seven. This includes one PI and six graduate students and/or post-doctoral students (post-docs). Administrative assistants and visiting researchers are also part of the research space discussion. For a research

group size of seven, there are office environment needs and lab environment needs. All four phenotypes are assumed to have similar office environments, including one PI office, workstations for graduate students and post-docs, and a workstation for visiting researchers. Centralized meeting space, administrative assistant space, and office support space are shared outside of the research enterprise so they are included under the Office Space section of the report.



The requirement for each phenotype is different and is focused on the specific research space needs. Modern research lab facilities are based on a 320 NASF module with as much as 100% of the lab module needed for research support and service spaces. However, the variations of this space metric depend on the type of research happening in each lab. To establish space needs for UVA Engineering, the ISP identified what percentage of researchers each department has in that particular lab phenotype. These phenotypes are for high-level planning purposes. Opportunities to share research lab space as well as a shift in the type of research (i.e. wet vs. computational) are expected as UVA Engineering's research portfolio grows and responds to current day needs.

In addition to labs, research cores and shop space are important to the UVA Engineering space portfolio. Research cores are centralized shared resources that provide access to instruments, equipment, technology, and services to support Principal investigators. Examples include a clean room, materials characterization, and imaging/microscopy. No specific metric was used but rather an allocation of additional space was applied to right-size the cores. Core space is currently undersized by almost 8,000 NASF, which increases as the number of researchers increases.

Shop space is used to manufacture, repair, or perform maintenance of equipment to support the research enterprise. A metric of 5-10% of research lab space was used to generate a proposed target for this space type, which generated a surplus for the early planning scenarios, with a slight deficit in the long-term scenario. Given that many shop spaces in the School are in remote and poor-quality facilities, and that shops in the School support academic as well as research demands, this apparent current surplus likely does not exist at a functional level. More detailed space programming will determine the specific needs of the School, which may vary from the generalized metric used to estimate need.



## GROUP SIZE ASSUMPTIONS

**Principal  
Investigator**

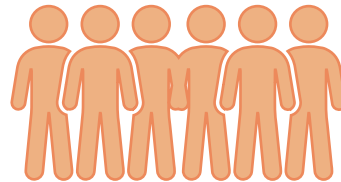
**Grad  
and Post Docs**

**Touchdown  
Space**

**Administrative  
Assistant**



+



+



+



1

6

0\*

0\*

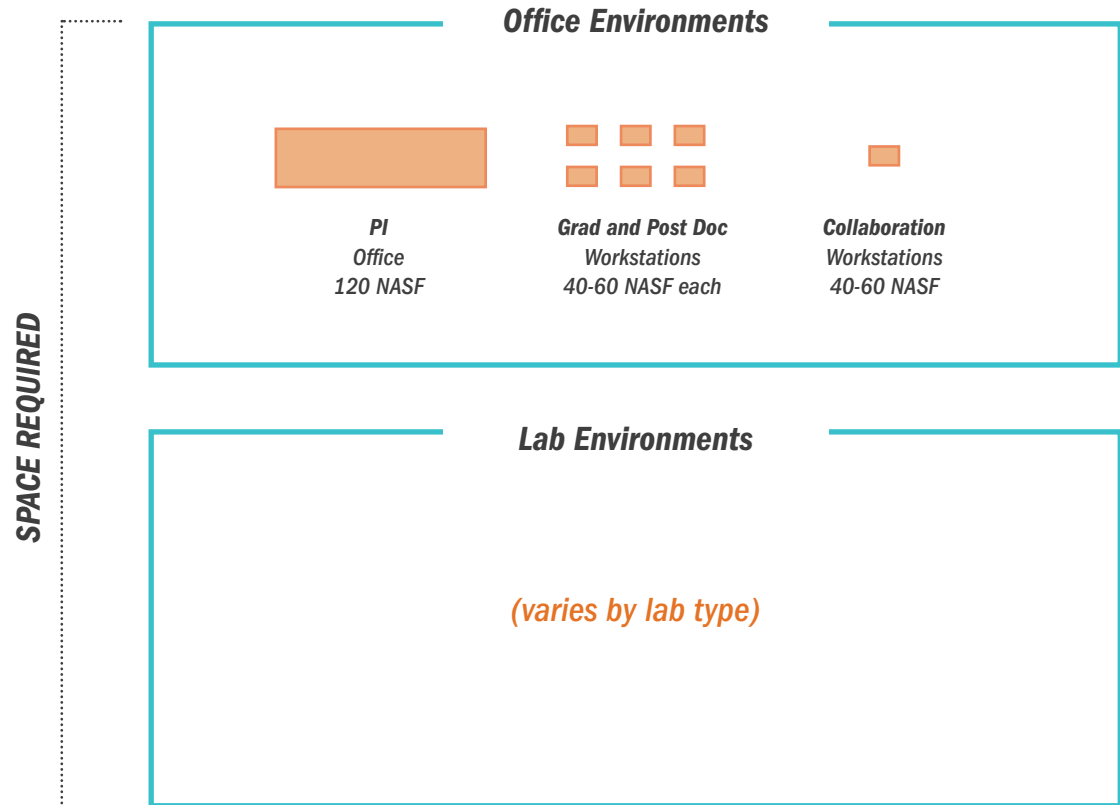
= **7** average group size

\*Research groups would share a conference room, work room, and administrative assistant — all of which reside outside the phenotype



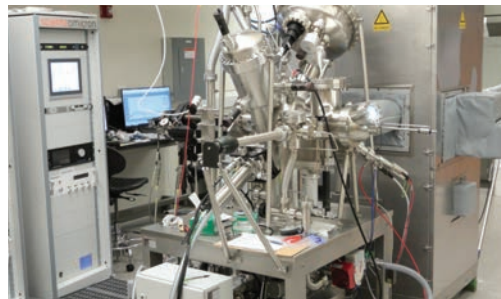


## PI GROUP SPACE REQUIREMENTS





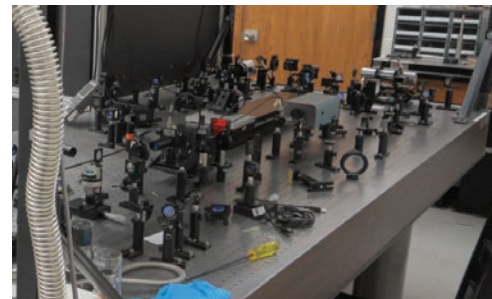
## RESEARCH LAB TYPES



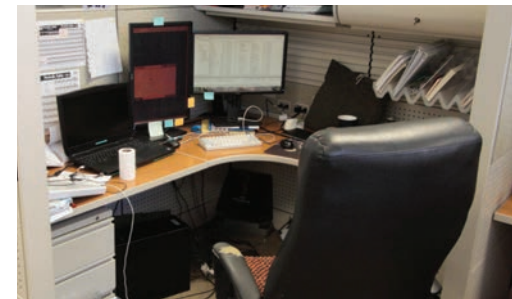
**Specialty / Industrial Lab**



**Wet Lab**



**Dry Lab**



**Computational Lab**

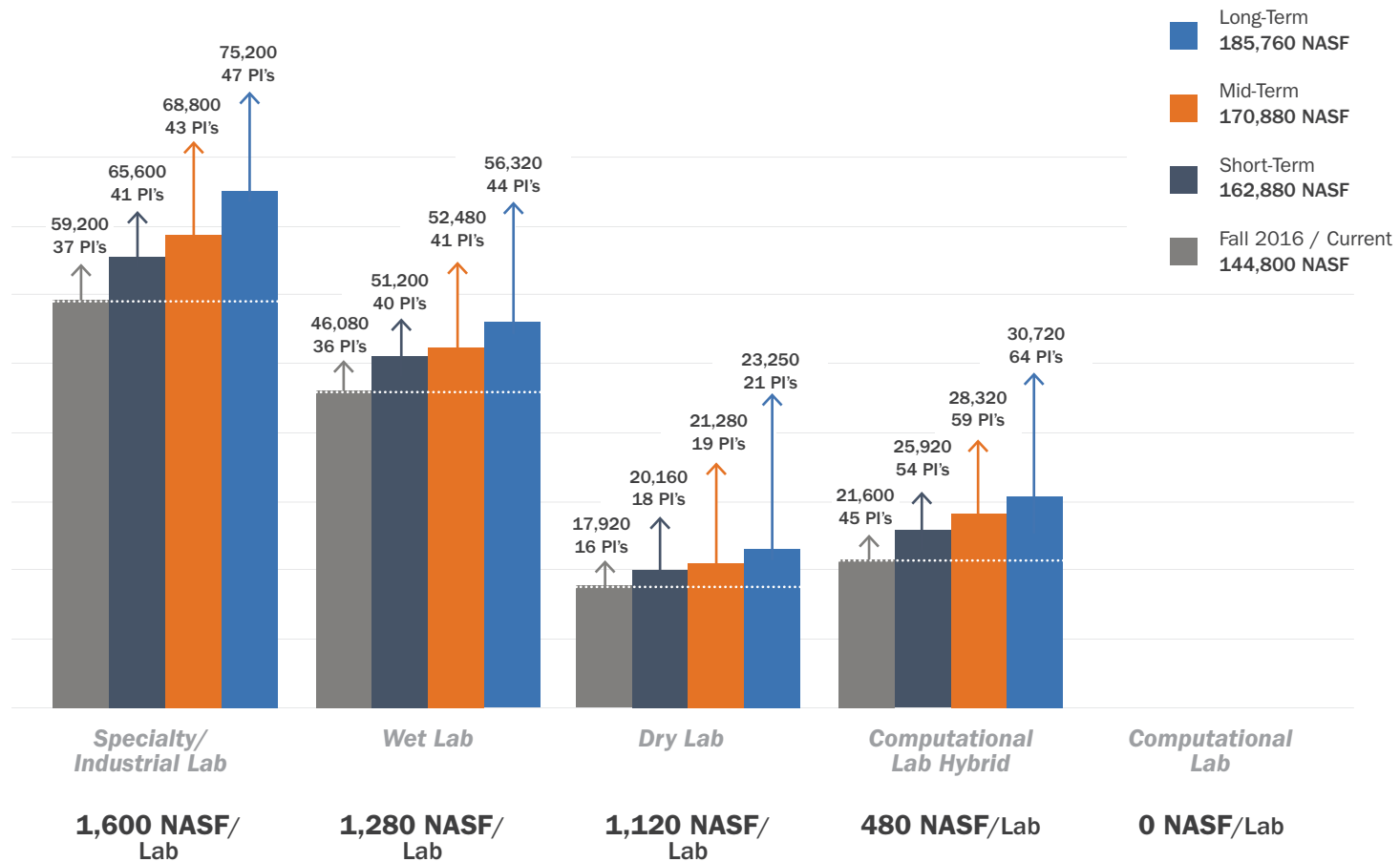
### Net Assignable Space Needs (NASF) by Phenotype

RESEARCH LAB PHENOTYPE	OFFICE ENVIRONMENT	LAB ENVIRONMENT	TOTAL NASF
Specialty / Industrial Lab	460	1,600	2,060
Wet Lab	460	1,280	1,740
Dry Lab	460	1,120	1,580
Computational Lab Hybrid	540	480	1,020
Computational Lab	540	0	540



## Total Net Assignable Space Needs by Phenotype

- The NASF is for research lab space only. Not office environments.
- Computational lab PI numbers include only those allocated research lab space 21 PIs are at zero.





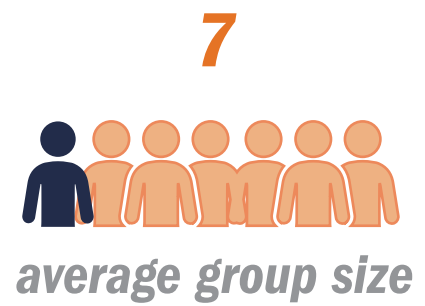


## ***Specialty / Industrial Lab***

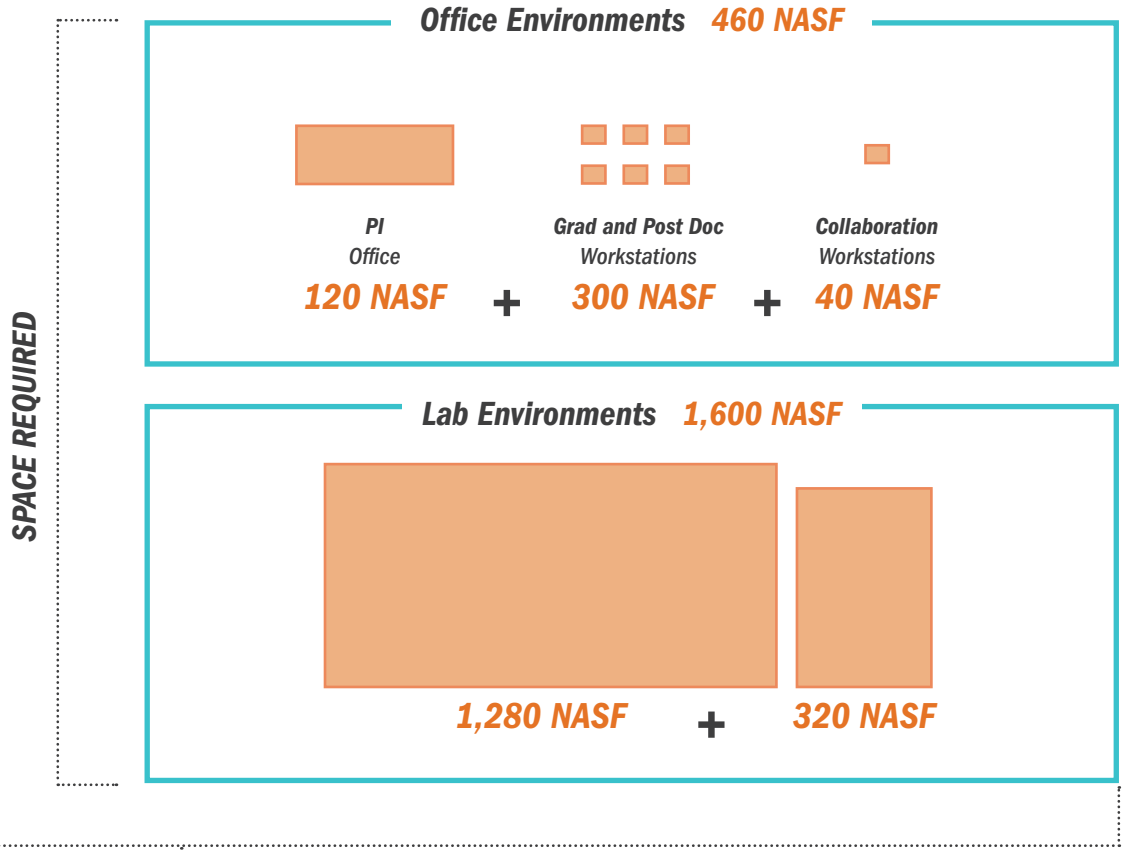
Specialty / Industrial labs encompass a range of disciplines and cover those with specific needs, such as large volumetric requirements, high electrical or other utility needs, high structural load capacity, or vibration sensitivity.

Examples include the **Fluids Lab**, **Fabrication Lab**, **High Bay**, and **Structural Lab**.





USE BY DISCIPLINE	
Civil and Environmental	14%
Electrical and Computer	12%
Material Science	50%
Mechanical and Aerospace	71%
Systems and Information	8%



= 2,060 NASF





## ***Wet Lab***

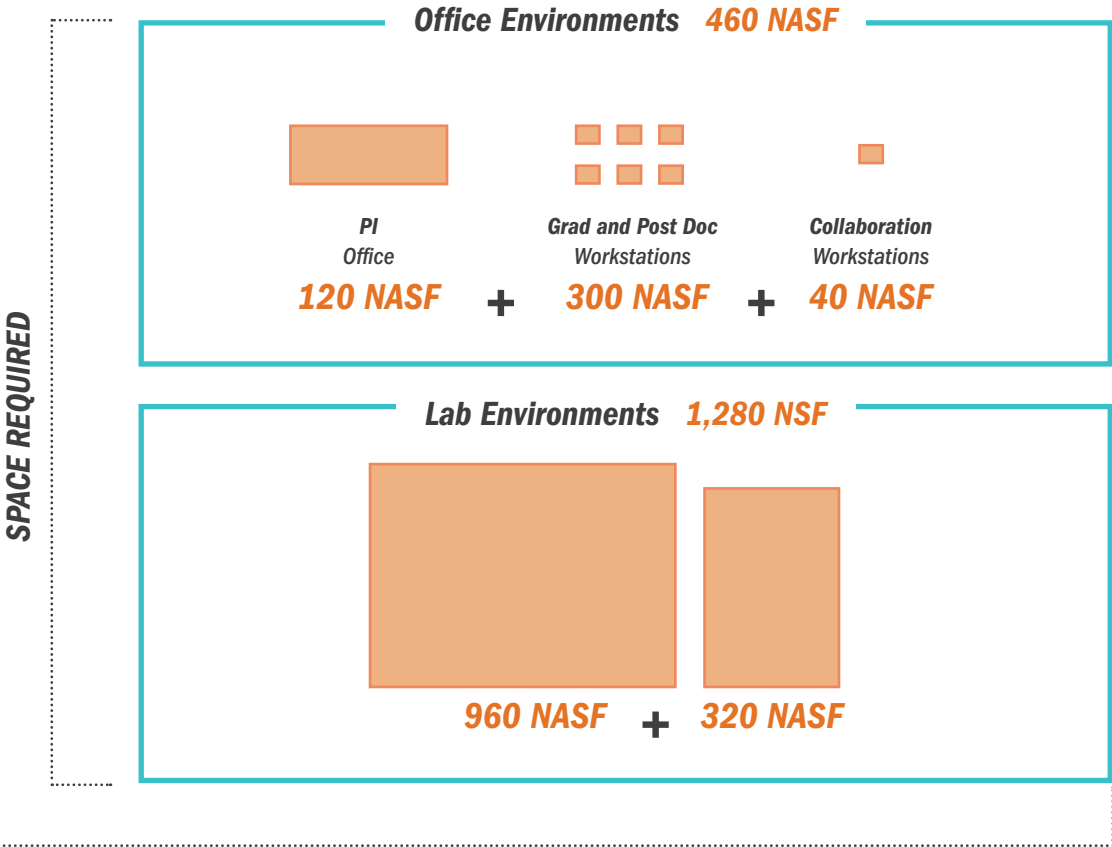
Wet labs include research space with benches and hoods.

Examples include **Biomedical Engineering Labs**, **Materials Labs**, **Chemistry Labs**, and **Chemical Engineering Labs**.





USE BY DISCIPLINE	
Civil and Environmental	21%
Chemical	85%
Material Science	32%
Mechanical & Aerospace	12%
Biomedical	85%
Electrical & Computer	8%



= 1,740 NASF





## ***Dry Lab***

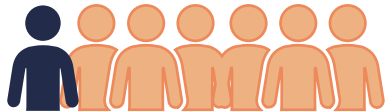
Dry labs include flexible lab spaces to work with dry stored materials, electronics, and/or large instruments. They do not have major requirements like piped services but they may require accurate temperature and humidity control or dust control.

Examples include **Electronics, Computer Engineering, Robotics, Optics, VR/AR Labs, Maker Spaces, and Rapid Prototyping.**



## Dry Lab

7



average group size

### USE BY DISCIPLINE

Civil and Environmental	21%
Computer Science	25%
Electrical & Computer	58%
Engineering & Society	33%
Systems & Information	38%
Biomedical	8%

SPACE REQUIRED

### Office Environments 460 NASF



PI  
Office

120 NASF



Grad and Post Doc  
Workstations

300 NASF



Collaboration  
Workstations

40 NASF

### Lab Environments 1,120 NASF



960 NASF



160 NASF

= 1,580 NASF





## ***Computational Lab***

Computational labs are different than dry labs in that they are typically in an office setting. The type of research in these spaces include computational modeling and data analysis. There are various configurations (private office vs. open office) and may or may not include some experimental/equipment components. For this study, computational hybrid labs are those spaces that include lab space/specialty equipment, while computational labs are those without.



7



average group size

USE BY DISCIPLINE

Biomedical	8%
Electrical & Computer	23%
Computer Science	75%

SPACE REQUIRED

Office Environments 540 NASF



PI  
Office

120 NASF



Grad and Post Doc  
Workstations

360 NASF



Collaboration  
Workstations

60 NASF

Lab Environments 480 NASF



320 NASF




160 NASF

= 1,020 NASF



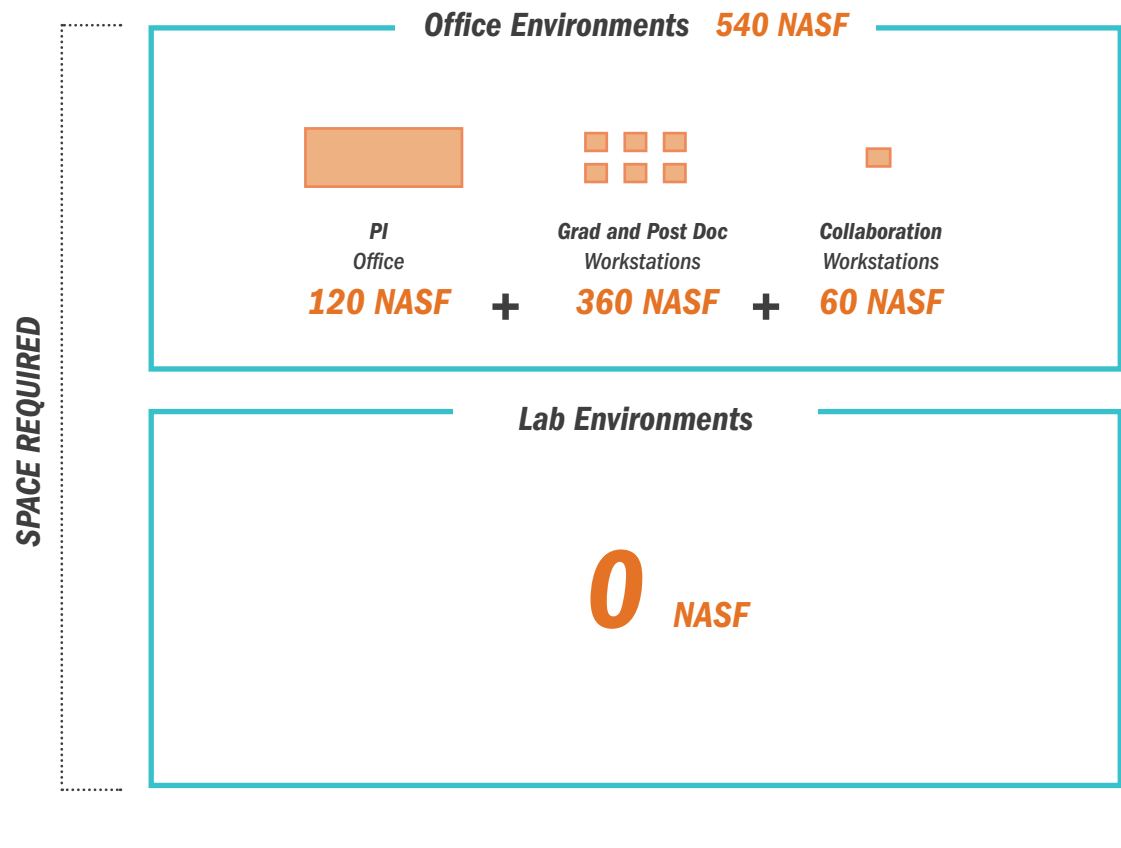
**7**



**average group size**

USE BY DISCIPLINE	
Chemical	15%
Civil & Environmental	43%
Material Science	18%
Mechanical & Aerospace	18%
Systems & Information	54%
Engineering & Society	67%

## Computational Lab without Lab Space



**= 540 NASF**



## Office Space

EMPLOYEE TYPE	NASF PER EMPLOYEE	HEADCOUNT
Dean	300	1
Associate Dean	180	4
T/TT Faculty (FT)*	120-150	182
Research Scientist*	120-150	48
Visiting Faculty	120-150	63
Lecturers (FT)**	120	30
Faculty (PT)	60	20
Research Faculty (PT)	60	7
Emeritus Faculty**	30	39
Professional/Non-Faculty (FT)*	120-150	73
Professional/Non-Faculty (PT)	60	3
Support Staff (FT)	120	92
Support Staff (PT)	60	7
Research Scientist (PT)	60	1
Research Associates	60	45
Equipment Service + Repair Tech	60	6
Graduate Instructor	60	51
Graduate Research Student	60	607
Student Workers (FT)	60	67
Student Workers (PT)	30	22
Student Workers (share with PT)**	0	651
Temp Employee (no office req'd)**	0	48
Non University Employee**	0	23
<b>TOTAL Employees</b>		<b>2,090</b>

SPACE CATEGORY	Fall 2016			Short-Term		Mid-Term		Long-Term	
	EXISTING NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF
<b>Academic and Research Offices</b>	123,600	116,100	7,500	143,900	(20,300)	153,700	(30,100)	167,600	(44,700)

\*All Numbers rounded to the nearest 100  
Key: Overage/(Deficit)

## Academic and Research Offices

Academic and research offices account for office space, service space, and conference rooms. An allocation per employee type was made to generate the required space, which showed an overage at the baseline year. The overage is attributed to legacy buildings that the School occupies, which have an average individual faculty office

size of 173 NASF, well above the 120-150 NASF target allocation that is used today. These legacy buildings were designed with a less flexible column grid and larger, inefficient offices. As the majority of work has transitioned to digital platforms, there is less paper. Office furniture is more modular as well. Overages in office space might be reclaimed through full-scale renovations; however, floor-by-floor renovations are not effective and create minimal return on investment. Also of note, while part-time employees do not generate a permanent need for conference room space, future programming should accommodate huddle rooms. By doing so, this allows for an open-office concept yet provides private breakout space as needed. However, as growth targets are met and more employees are hired, the overage quickly becomes a deficit of over 20,000 NASF in the short-term scenario.

FT - Full Time  
PT - Part Time

In addition, for each eligible employee:  
20 NASF for Office Service Space  
30 NASF for Conference Room Space

For some departments, additional allocations of service or conference space were allotted for suite circulation or additional needs.

\*For future modeling scenarios, a different metric was used for assumed new employees.

\*\*Not eligible for service or conference space allocation.



## Academic Space

NASF Needs Summary

SPACE CATEGORY	Fall 2016			Short-Term		Mid-Term		Long-Term	
	EXISTING NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF
<b>Instructional Labs</b>	36,400	60,600	(24,200)	66,500	(30,100)	67,900	(31,500)	75,100	(38,700)
Class Labs	13,500	20,500	(7,000)	25,500	(11,900)	25,500	(12,000)	27,000	(13,500)
Open Labs	22,900	40,100	(17,200)	41,000	(18,200)	42,400	(19,500)	48,100	(25,200)

\*All Numbers rounded to the nearest 100  
Key: Overage/(Deficit)

## Academic Space

The academic space category includes classrooms, class labs, and open labs. Class labs are defined by the presence of specialized equipment, which excludes use as a general classroom or unrestricted student access. The room is generally not reserved for special term-long experiments or set up to accommodate student projects where students come and go as they have time. These laboratories are also not research laboratories.

The need for additional class labs was developed by applying utilization targets on the existing inventory. Usage accounted for weekly room hours of scheduled use, number of seats filled, and the NASF per seat. Guidelines were applied by discipline. With the exception of Mechanical and Aerospace Engineering, all disciplines have capacity to absorb additional students in all planning scenarios.

Open labs can resemble class laboratories with the exception that they are irregularly scheduled or not scheduled at all.



## Class Laboratory Space Metrics

Use Expectations

DISCIPLINE	WEEKLY ROOM HOURS	SEAT FILL RATE	NASF PER SEAT*
Biomedical Engineering	12	80%	90
Chemical Engineering	12	80%	20
Civil and Environmental Engineering	12	80%	120
Computer and Information Science	20	80%	60
Electrical and Computer Engineering	12	80%	75
Engineering	12	80%	100
Mechanical and Aerospace Engineering	12	80%	75
Research Scientist (PI)	9	80%	60
Systems Information and Engineering	20	80%	60

\*Includes service space

They can include open-access laboratories and might provide equipment to serve the needs of a particular discipline for group instruction or might be used for individual student experimentation, observation, or practice in a particular field of study. The key is that these spaces are typically not scheduled in a formal manner. The analysis identified a need for approximately 17,000 NASF more space, which was driven by the need for more experiential learning, additional maker

spaces, and dedicated, right-sized capstone space for fourth-years. As student enrollment increases, the deficit will increase without additional space.

Classrooms are not quantified in terms of square footage but rather in terms of inventory mix. A classroom demand analysis was performed to determine this required mix. This analysis matches course sections and their actual enrollments with



**Classroom Space**  
Fall 2016 Demand Analysis

CLASSROOM CAPACITY	UVA Engineering Building Classrooms			Projected Classrooms		Need +/-
	# of Registrar Rooms	# of UVA Engineering Rooms	# of Total Existing	Weekly Room Hours	# of Projected Rooms	
0 - 20	1	1	2	113	3	(1)
21 - 30	1		1	18	1	0
31 - 40	3	2	5	74	2	3
41 - 60	4		4	134	4	0
61 - 80	4	1	5	256	7	(2)
81 - 120	5		5	91	3	2
121 - 160	2	1	3	56	2	1
161 - 200				0	0	0
201 - 240				0	0	0
241 - 300				53	2	(2)
301 - 400				8	0	0
401 - And up				14	1	(1)
<b>TOTAL</b>	<b>20</b>	<b>5</b>	<b>25</b>	<b>817</b>	<b>25</b>	<b>0</b>

Key: Overage/(Deficit)

existing classrooms and their current capacities. The School has a need for access to 25 classrooms, for which the quantity need is met. However, the existing classroom mix is not meeting instructional needs effectively. In addition to a need for more flexible learning spaces, UVA Engineering needs access to

additional 80-, 300-, and 500-seat classrooms. Depending upon pedagogy and specific programmatic growth needs, the need for additional classrooms is in the range of six to seven in the long-term planning horizon.



## Social Heart Space

NASF Needs Summary

SPACE CATEGORY	Fall 2016			Short-Term		Mid-Term		Long-Term	
	EXISTING NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF
Collaboration and Community Space	4,400	9,400	(5,000)	10,900	(6,500)	11,600	(7,200)	12,800	(8,400)
Food Service + Lounges	7,100	10,400	(3,300)	12,100	(5,000)	12,800	(5,700)	14,100	(7,000)
<b>TOTAL</b>	<b>11,500</b>	<b>19,800</b>	<b>(8,300)</b>	<b>23,000</b>	<b>(11,500)</b>	<b>24,400</b>	<b>(12,900)</b>	<b>26,900</b>	<b>(15,400)</b>

\*All Numbers rounded to the nearest 100  
Key: Overage/(Deficit)

## Social Heart Space

The social heart space category includes collaboration and community space, food service, and lounges. The School lacks a social heart with space to bring together the UVA Engineering community, provide serendipitous collaborative opportunities, and house various food service options. A typical space metric is based on student enrollment. For this analysis, 3 NASF per Student was used to generate the food service and lounge need, and a metric of 8% of students at 35 NASF per seat was applied. Not surprising, UVA Engineering demonstrates a deficit

in this space category. Due to its current physical constraints, there is no opportunity to meet any of this need in the existing footprints. As new space opportunities are identified, the needs in the category can be met through intentional design to ensure a true social heart is created including improved use of currently disconnected outdoor amenities. While not quantified as part of the space needs analysis, outdoor social heart space is an important element of the plan and provides much needed collaboration and community space.



## Support Space

NASF Needs Summary

SPACE CATEGORY	Fall 2016			Short-Term		Mid-Term		Long-Term	
	EXISTING NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF
Support Offices	21,200	16,200	5,000	18,800	2,400	19,700	1,500	21,300	(100)
Other Admin Space	4,300	4,400	(100)	4,400	(100)	4,400	(100)	4,400	(100)
Server Space	4,800	4,800	0	4,700	100	4,800	0	4,700	100
<b>TOTAL</b>	<b>30,300</b>	<b>25,400</b>	<b>4,900</b>	<b>27,900</b>	<b>2,400</b>	<b>28,900</b>	<b>1,400</b>	<b>30,400</b>	<b>(100)</b>

\*All Numbers rounded to the nearest 100  
Key: Overage/(Deficit)

## Support Space

The support space category includes support offices, other administrative space, and server space. Office and meeting space associated with the Dean's Office and server space used by various academic departments are included in this category.

As with academic and research offices, an allocation per employee type was made to generate need. Other administrative space includes the board room in Rice Hall, the community school group robotics lab, the K12 student project space, and

general storage. An allocation for space was added to support to support the growing online education program.

The School has several server rooms, which present an opportunity to better utilize existing space through better organization and consolidation. Through discussion with end users, it was determined the current amount of space is sufficient for current and future needs.







# SPACE NEEDS SUMMARY

The space needs analysis identified a current deficit of approximately 51,000 NSF, which will require a 13% net increase in the School's existing space inventory. This baseline deficit will increase as UVA Engineering adds researchers, students, and staff.

## Key Takeaways

- *UVA Engineering is having rapid success.*
- *Commitments have been made to faculty, but space is becoming increasingly unavailable.*
- *New faculty do not have space to mature their research teams.*
- *The problem will be exacerbated by planned population growth.*
- *Densification of existing space and identifying sharing opportunities will help mitigate some of the need for new construction.*

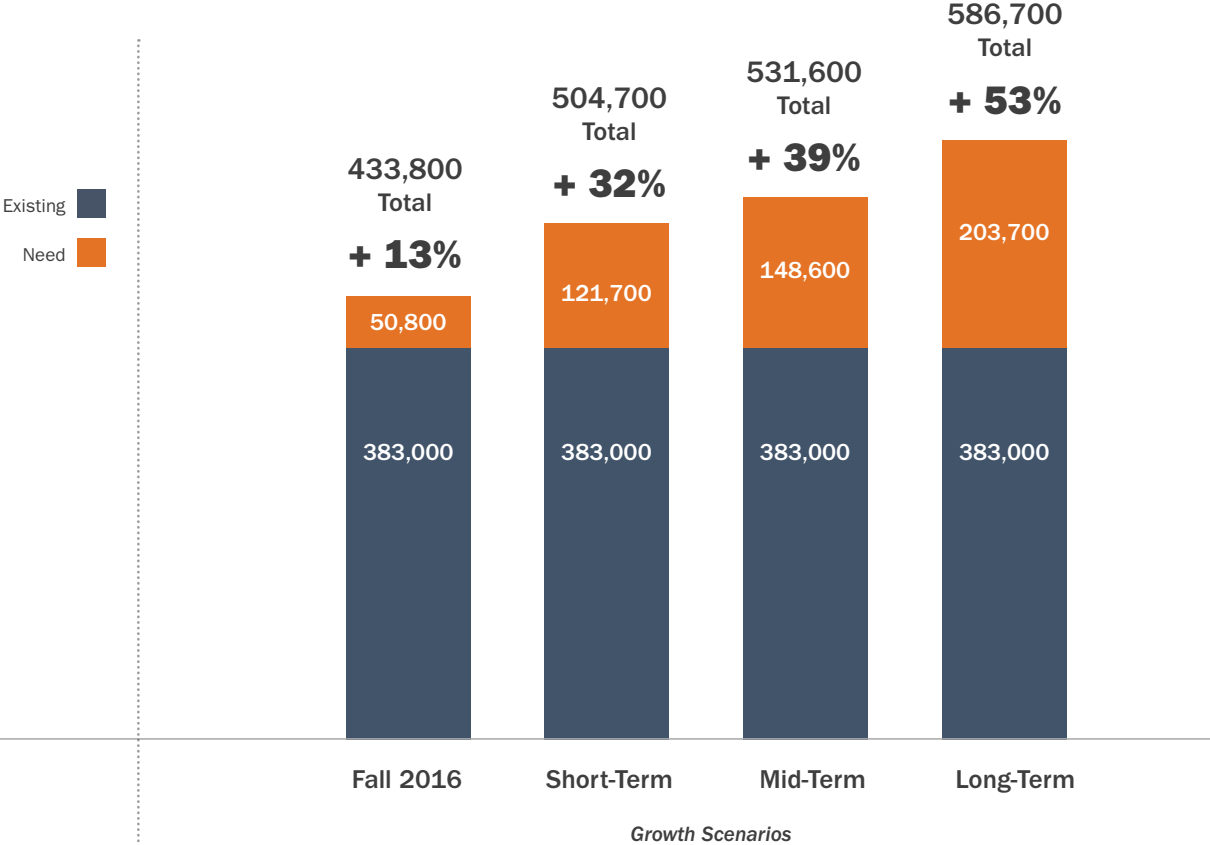




*Rice Hall at 57,000 NASF is comparable in size to the space needs deficit of 51,000 NASF.*



SPACE NEEDS SUMMARY



\*All Numbers are NASF and rounded to the nearest 100



# Space Needs Assessment

## Fall 2016

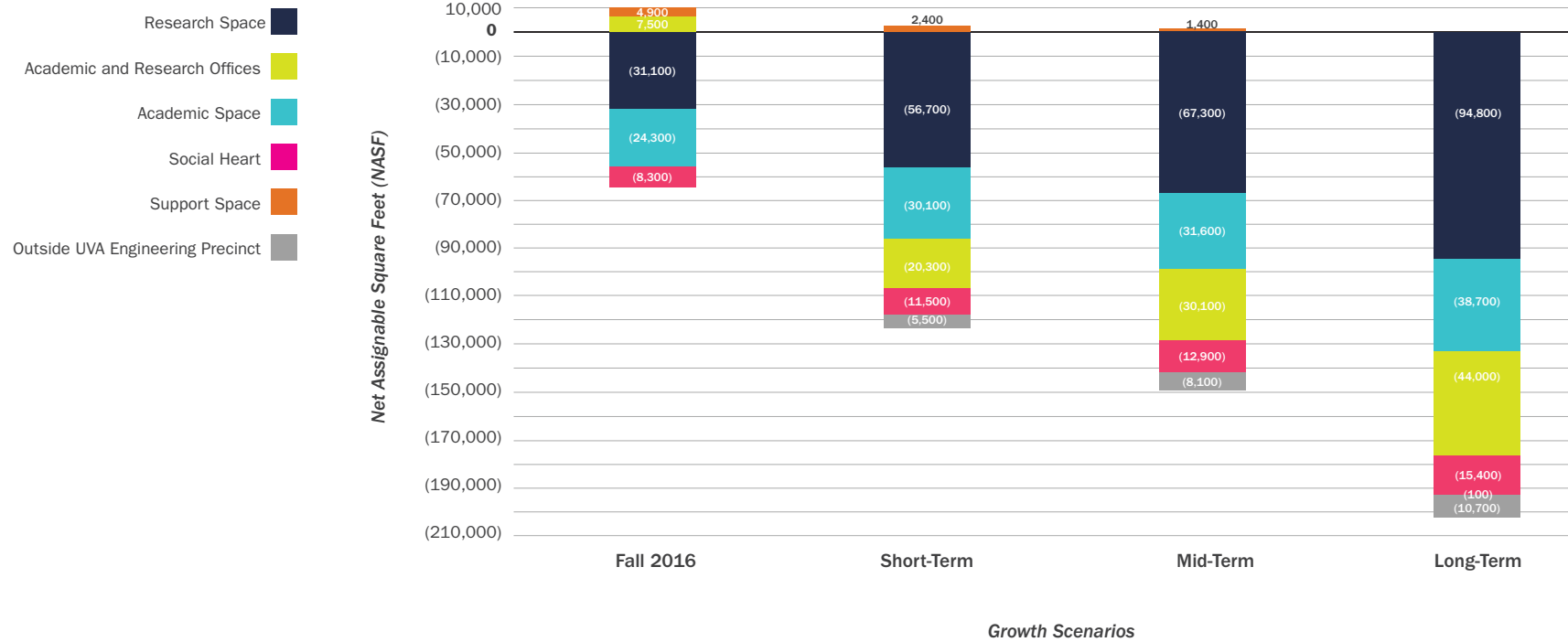
- The need for space is approximately 51,000 NASF at the **baseline year** – a 13% increase from existing space
- The key drivers of need in the baseline year are: research labs, research core space, and open labs
- 33% of UVA Engineering space is within poorly rated buildings – configuration and condition impact the ability to efficiently use existing physical inventory
- Need appropriately sized, dedicated capstone space for fourth-years
- Not enough maker spaces
- Need more experiential learning spaces
- Academic and research office needs are being met
- Need more food service and lounge spaces dispersed throughout UVA Engineering
- Insufficient collaboration and community space, which leads to a lack of a UVA Engineering social heart
- Research labs are undersized, which leads to principal investigators to have to double up and borrow space from other Schools
- Research core space is not adequately sized

## Growth Scenarios

- Baseline deficits will increase as UVA Engineering adds principal investigators and students and as current research teams mature
- In the short- and mid-term scenarios, the need increases by 32% and 39% respectively when compared to existing space (not a cumulative percentage increase)
- Depending upon pedagogy and specific programmatic growth needs, the need for additional classrooms is in the range of six to seven in the long-term planning horizon
- Mechanical and Aerospace Engineering will need additional class lab space
- Need for capstone space and maker space will increase as the student population does
- If aspirational goals are reached, the deficit goes from 51,000 NASF to 204,000 NASF – an increase of 53% over existing – in the long-term scenario



## Space Deficit By Category





## Space Needs Summary

SPACE CATEGORY	Fall 2016			Short-Term		Mid-Term		Long-Term	
	EXISTING NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF	PROPOSED NASF	NEED NASF
Research	116,400	147,500	(31,100)	173,100	(56,700)	183,700	(67,300)	211,200	(94,800)
Academic + Research Offices	123,600	116,100	7,500	143,900	(20,300)	153,700	(30,100)	167,600	(44,000)
Academic	36,400	60,600	(24,200)	66,500	(30,100)	67,900	(31,500)	75,100	(38,700)
Social Heart	11,500	19,800	(8,300)	23,000	(11,500)	24,400	(12,900)	26,900	(15,400)
Support	30,300	25,400	4,900	27,900	2,400	28,900	1,400	30,400	100
Outside UVA Eng Precinct	64,500	64,000	500	71,400	(6,900)	74,000	(9,500)	76,600	(12,100)
Biomedical Engineering	39,300	38,800	500	46,200	(6,900)	48,800	(9,500)	51,400	(12,100)
MAE – CAB	22,500	22,500	0	22,500	0	22,500	0	22,500	0
SCIF Research	2,700	2,700	0	2,700	0	2,700	0	2,700	0
<b>TOTAL</b>	<b>382,700</b>	<b>443,400</b>	<b>*(50,700)</b>	<b>*505,700</b>	<b>*(121,600)</b>	<b>532,600</b>	<b>(148,600)</b>	<b>587,800</b>	<b>*(203,800)</b>

\*All Numbers rounded to the nearest 100 for presentation purposes and may not reflect the sum of their parts (as presented)  
Key: Overage/(Deficit)



# *PHYSICAL SOLUTIONS*

*PLANNING OBJECTIVES*

*KEY COMPONENTS*

*POTENTIAL SOLUTIONS*

*PHASING*







# PLANNING OBJECTIVES

The physical solutions for the ISP reflect the goals, functional organization, and the space needs of UVA Engineering.

The following objectives guided the development of the physical solutions:

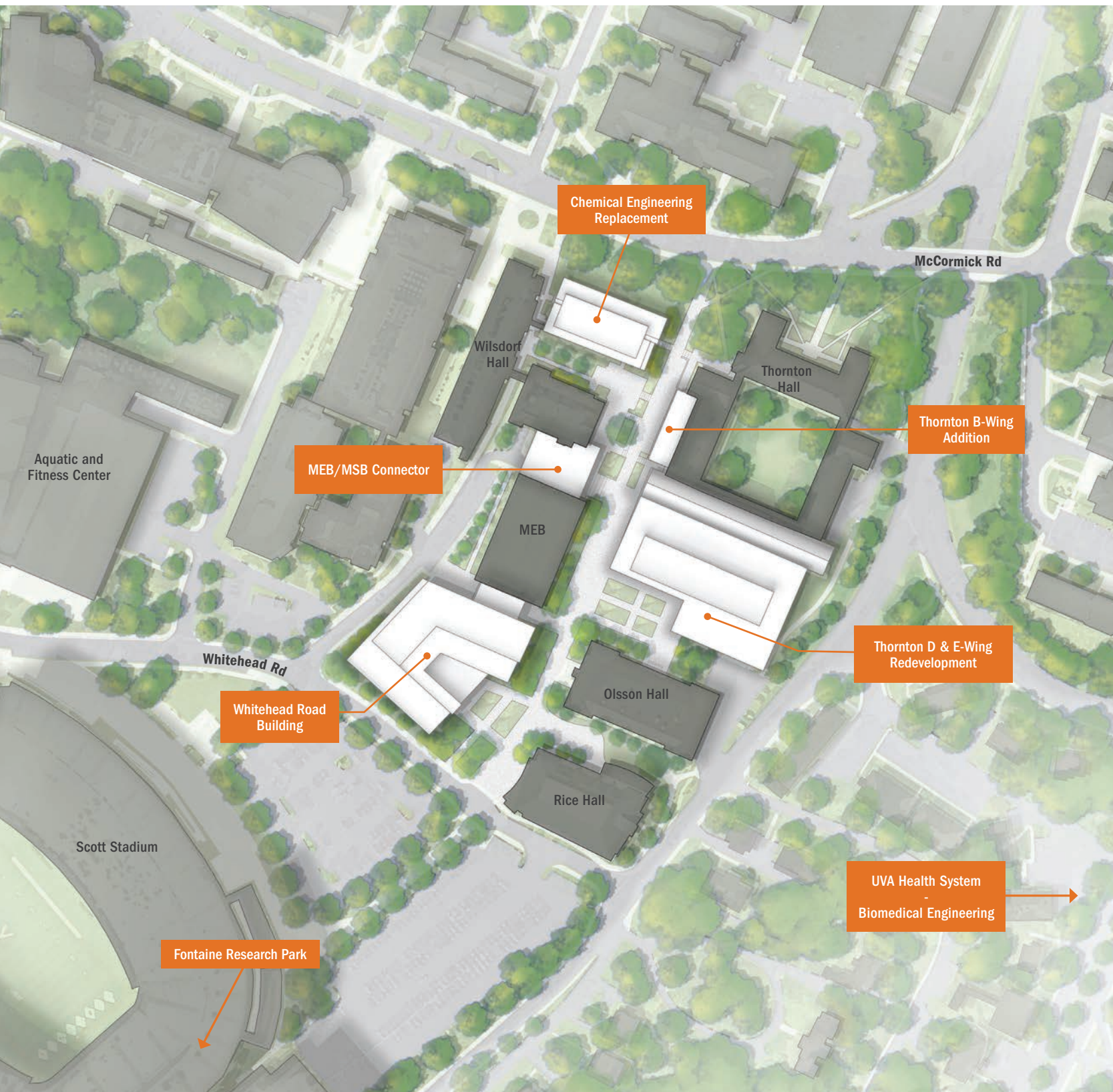
- *Meet UVA Engineering space needs in the long-term and coordinate with University plans*
  - *Create more and better quality space through renovations, additions, and redevelopment*
  - *Enable pedagogical changes and modern, transdisciplinary research through contemporary facilities*
  - *Develop better connected space that supports thematic organization and collaboration*
  - *Create social heart space for people to come together*
  - *Transform Engineer's Way into a welcoming environment with engineering on display*
  - *Improve service and loading, and reduce pedestrian and vehicular conflicts*
- *Improve accessibility into buildings and on site through universal design standards*
  - *Develop an opportunity for high performance buildings and landscapes*
  - *Allow diversity and flexibility of options for solving facility challenges*
  - *Create multiple fundraising opportunities through exciting physical solutions*
  - *Support goals of landscape framework plan*
  - *Reinforce Engineer's Way as a major part of creating a social heart*

Existing Conditions






Existing UVA Building      Existing UVA Engineering





## Proposed Plan Full Build Out

- New UVA Engineering 
- Existing UVA Engineering 
- Existing UVA Building 



# KEY COMPONENTS

The physical solutions needed to satisfy the space needs requirements for UVA Engineering include three new buildings, two smaller additions, and a series of renovations. Outside of West Grounds, the plan proposes investments for interdisciplinary solutions at Fontaine Research Park.

A key component of the physical solutions is using Engineer's Way and the buildings that front it as opportunities to create social heart spaces and allow for engineering on display. The new buildings and additions proposed all front onto Engineer's Way with building entrances perpendicular to the north-south pedestrian movement of Engineers Way. This subtle change to the entry orientation of the buildings will help activate the outdoor spaces. Transparent welcoming facades allow pedestrians to see into the buildings. Teaching and research labs in these new buildings have direct visual connections

to Engineer's Way. Programmable outdoor spaces between buildings provide seating areas for gathering and allow students to show off their work to the broader UVA community.

The new buildings and additions require that loading and service be restricted to the perimeter of the site thereby improving the pedestrian experience along Engineer's Way. Replacing Thornton D & E-wings with a larger building provides service to all buildings along the eastern edge of UVA Engineering in one consolidated loading dock accessed off Stadium Road. An addition connecting MEB and MSB consolidates service and loading for all of the buildings on the west side of Engineer's Way.






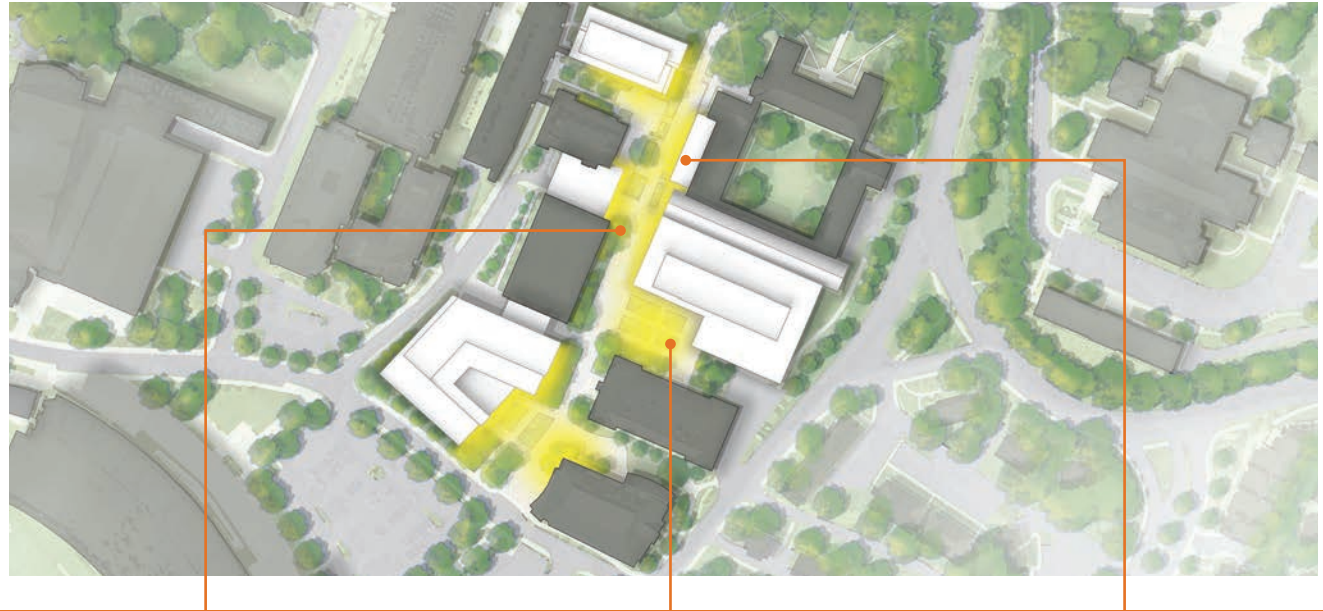
***Outdoor “rooms” create  
direct visual and  
physical connections  
between spaces  
and places.***

The proposed plan takes advantage of the existing topography along Engineer's Way to create outdoor social heart spaces that use the landscape as a way to connect people. These outdoor “rooms” create direct visual and physical connections between spaces and places. Each outdoor room occurs approximately every 200 feet. These spaces signify entry to either Engineer's Way, the crossing of pedestrian thoroughfares, or significant entrances to buildings and spaces. Both the north and south entry of Engineer's Way will be reinforced by large trees and shade. This tree canopy is already mature at the north end of Engineer's Way and the plan proposes introducing a similar experience at the south entry. This landscape strategy is employed elsewhere on Grounds and the re-use of this approach on Engineer's Way supports the goals of landscape framework plan and ties the experience of UVA Engineering to other areas. The proposed outdoor rooms contain smaller trees and low plantings, providing green spaces within the School. The contrast of light and shadow reinforces the presence of the outdoor rooms.



## Social Heart / Engineering on Display

- New UVA Engineering 
- Existing UVA Engineering 
- Landscape Improvements and Engineering on Display 





Circulation - Existing

- Pedestrian
- Vehicular
- Service Access Only

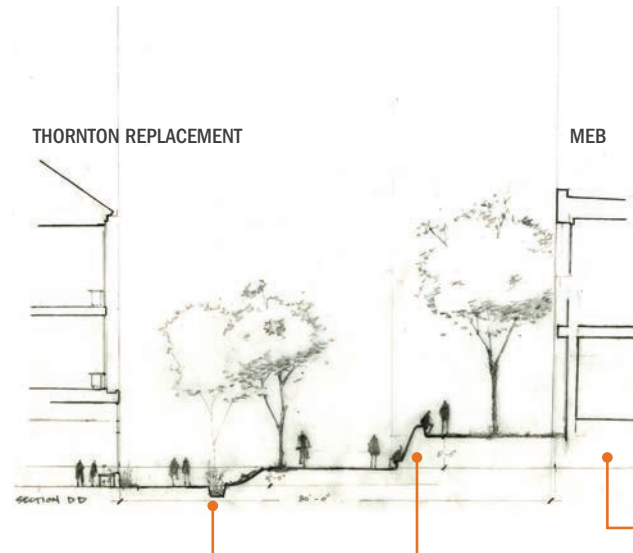
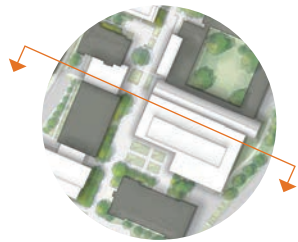


Circulation - Improved





## Engineer's Way - Topography as Social Heart



Steep topography along Engineer's Way creates an opportunity for two-tiered seating while gentle topography creates an opportunity for gathering and lounge spaces. Water features can be integrated into these topographic interventions to take advantage of the existing topography and the potential to showcase natural processes. Elevated catch basins will delay runoff in a rain event, promote greater infiltration of water into the surrounding soils, and tie storm water to the pedestrian experience. In this way, the landscape will be part of a larger theme of engineering on display. The new additions along Engineer's Way help mitigate the challenges of the existing topography by creating accessible entries into existing buildings.



Brighton New Road



Copenhagen Business School

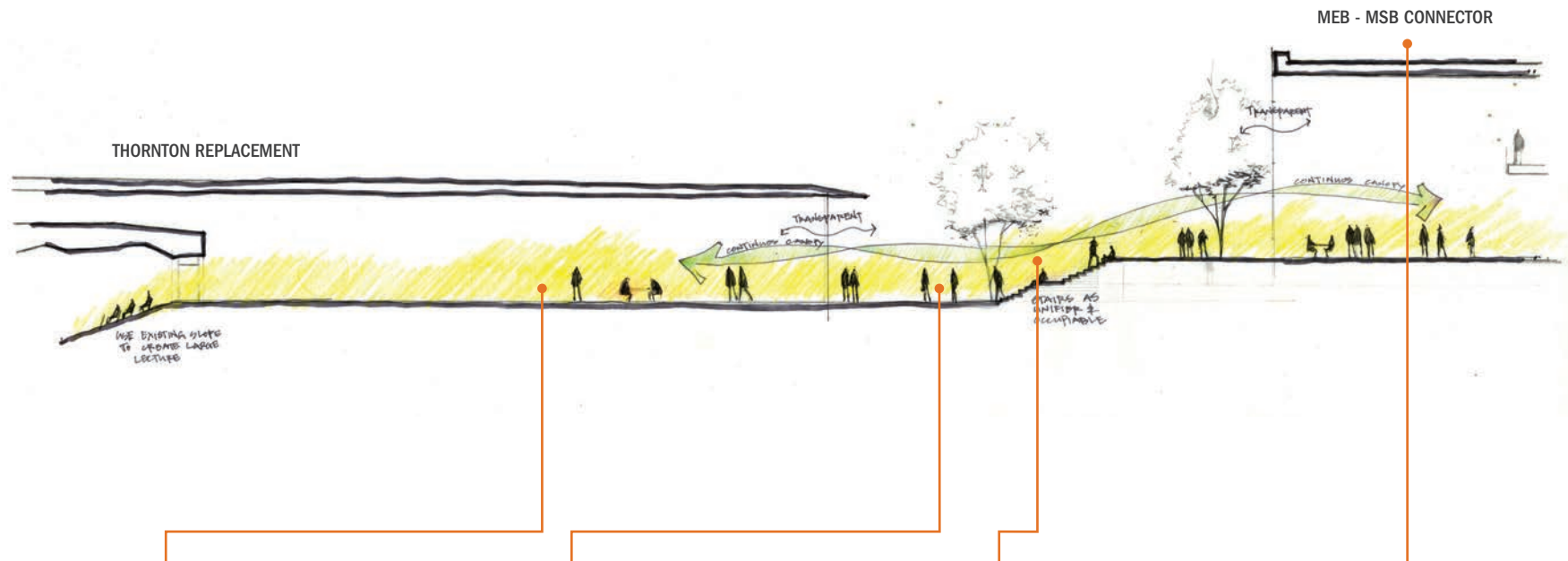


Cam Framis Gardens, Barcelona



University Campus Park UMEA





University of Delaware



Copenhagen Business School



Trinity University Bookstore



# **POTENTIAL SOLUTIONS**

To satisfy space needs requirements and transform UVA Engineering's buildings and Grounds, a series of solutions were developed that can be implemented over time. The solutions were broken down into three separate types.

## ***Incremental Renovations***

These solutions are typically early phase projects to solve immediate space needs.

## ***Transdisciplinary Solutions***

Transdisciplinary opportunities are renovations or new construction that have a significant amount of space shared with another school.

## ***Redevelopment Options***

These solutions include the demolition of outdated facilities to be replaced by new construction.



## Potential Solutions

### Incremental Renovations

- Densification / Optimization (example: Rice Hall)
- Mechanical Engineering Building (MEB)
- Thornton B-Wing

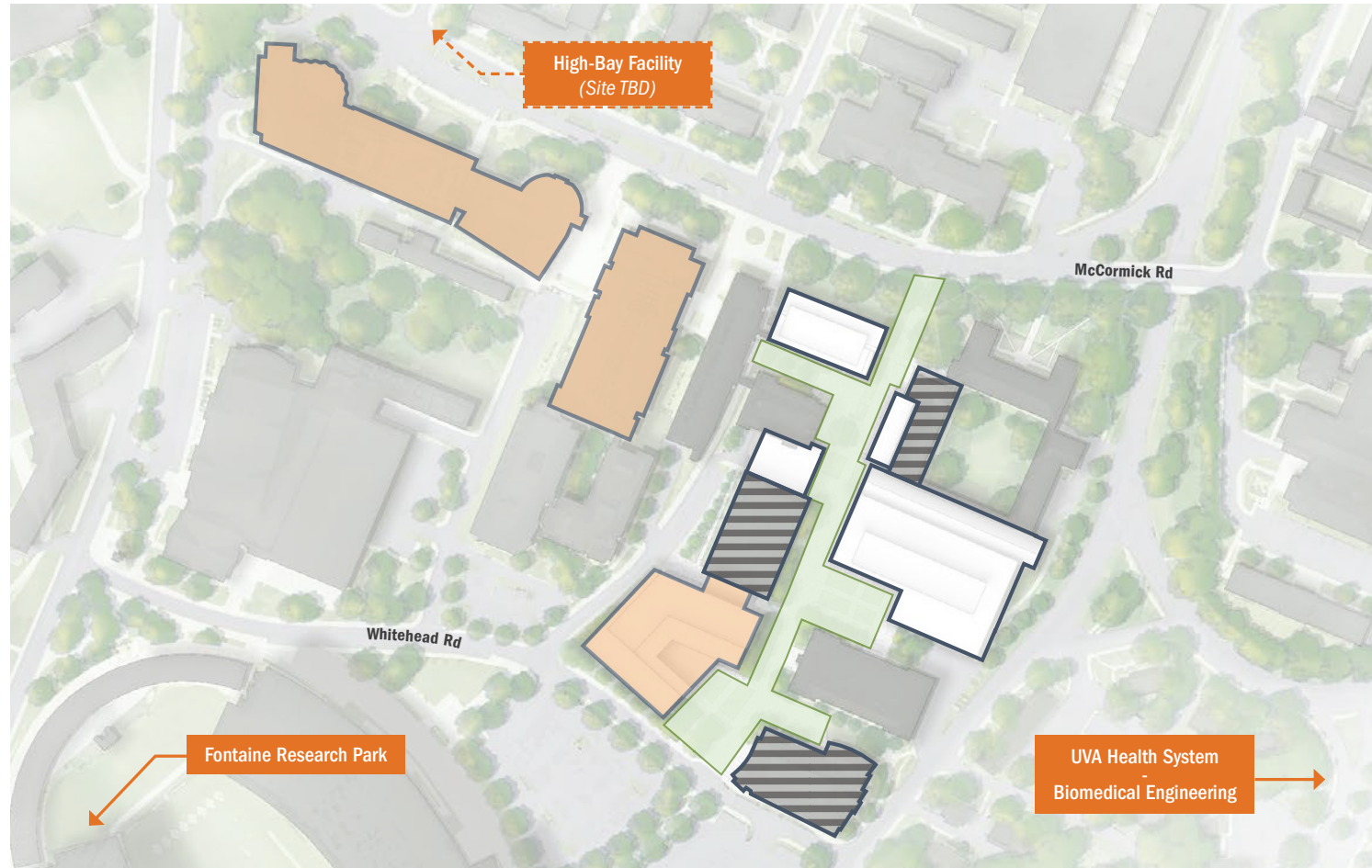
### Transdisciplinary Solutions

- Shared space with A&S
- Whitehead Road Building
- Fontaine Research Park
- BME at UVA Health System
- High-Bay Facility

### Redevelopment Options

- Chemical Engineering
- MEB - MSB Connector
- Thornton B-Wing Addition
- Thornton D & E-Wing Redevelopment
- Whitehead Road Building
- Fontaine Research Park

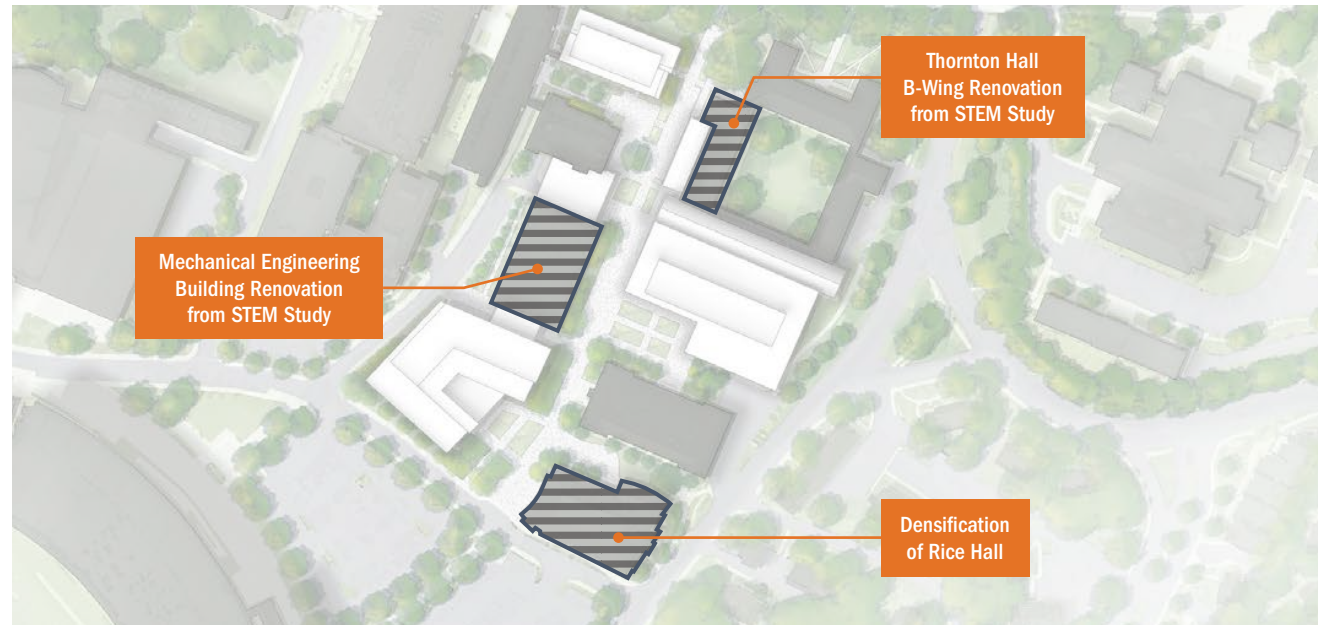
### Landscape Improvements





## INCREMENTAL RENOVATIONS

Incremental Renovations 



### ***Densification and Optimization***

There are some opportunities across UVA Engineering to be more efficient with existing space, including rethinking certain spaces to accommodate more people. One example is Rice Hall, the newest building of UVA Engineering's portfolio. Some ways to increase the density of space use is to optimize the modular desk furniture size and layout. Another option is to adjust the size of office spaces by moving non-structural walls to accommodate more people in an efficient manner.

### ***Mechanical Engineering Building (MEB)***

**11,000 NASF**

In 2015, the University completed a study that identified highest and best use of science and engineering facilities through a conditions assessment of the existing STEM building inventory. With a flat roof, sufficient floor-to-floor height, and the adequate column spacing to support the systems and space requirements of modern teaching and research laboratories, an outcome of that study was the conversion of the Mechanical Engineering Building to a more intensive use. Some classrooms and offices



can be eliminated from the building, especially the top floor, and that space can be converted to lab space. The ISP supports the recommendation of the STEM study.

The increased density of Rice Hall and renovation of the Mechanical Engineering Building does not yield additional new space but by adding more people to the buildings and making the space more efficient, it reduces the overall demand for space. For planning purposes, it is assumed that 11,380 NASF of demand can be reduced through density and optimization.

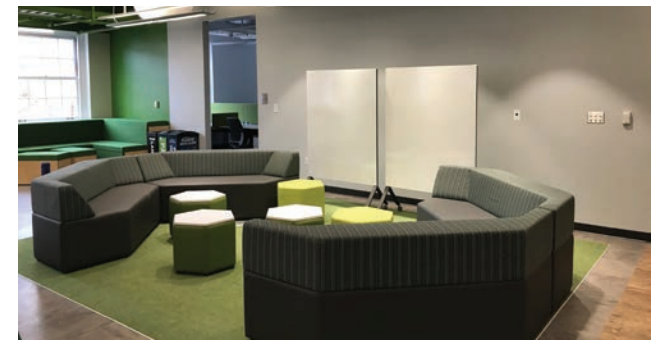
### ***Thornton Hall B-Wing***

***12,000 NASF***

With the Mechanical Engineering Building able to support higher intensity uses, the STEM study recommended renovation and repurposing of Thornton Hall to less intensive uses. This includes classrooms and offices supporting multiple disciplines. Renovation of Thornton Hall also addresses aging infrastructure. The ISP supports the recommendation of the STEM study, however more intensive renovation for B-Wing is recommended because the plan ultimately suggests the demolition of Thornton D-Wing.

A recent example of successful incremental renovation is the Link Lab in the top floor of Olsson Hall. The 17,000 sf space hosts a unique, collaborative cohort of researchers dedicated to


solving the most critical problems at the intersection of the cyber and physical worlds. The Link Lab is committed to research that transcends traditional disciplinary boundaries, is grounded in and applied to real-world problems, fundamentally contributes to technology and engineering, and benefits the greater good. The Link Lab includes informal collaboration space, larger conference rooms and small team rooms, hardware lab, and a mix of open offices and glass-enclosed offices.

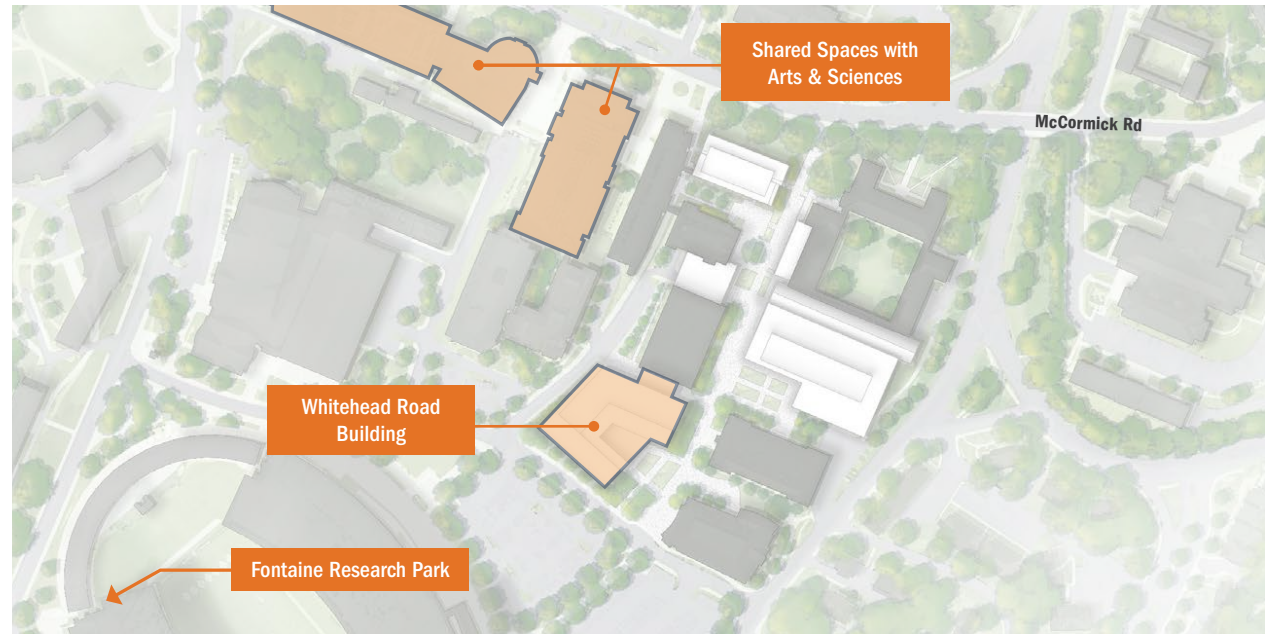


*Link Lab*



## TRANSDISCIPLINARY SOLUTIONS

Transdisciplinary Solutions 



### ***Shared Spaces with Arts & Sciences***

*Approximately 6,000 NASF*

UVA Engineering has programmatic and physical synergies with Arts & Sciences and the ISP suggests there are opportunities to share spaces with the College and Graduate School of Arts & Sciences, especially when the renovations of Gilmer, Chemistry, and Physics are complete.

### ***Whitehead Road Building***

*Approximately 100,000 NASF*

Whitehead Road Building creates an opportunity to replace the Albert H. Small Building (Small Hall) with a much larger, transdisciplinary building. Offering only 6,328 NASF to UVA Engineering, this structure is not the highest and best use of the land and thus this is an ideal site for new construction. The functions currently located in Small Hall will need to be relocated prior to construction. While the ISP does not





UVA ENGINEERING  
ARTS AND SCIENCES

FONTAINE RESEARCH  
PARK

UVA HOSPITAL  
SCHOOL OF MEDICINE  
BIOMEDICAL ENGINEERING



specifically suggest programmatic functions in each building, this site can be used for a blend of wet labs, open labs, and computational labs; offices to support the research enterprise; shared academic space; collaborative/social areas; and shared core space, such as a clean room. Because of its location, it is an ideal site for partnership with the College and Graduate School of Arts & Sciences.

From a physical perspective, the Whitehead Road Building is transformational for UVA Engineering and the broader University. The building creates a strong gateway on the south end of Engineer's Way with opportunities for landscape improvements due to the removal of surface parking on the site. The building can be easily serviced from Chemistry Drive on the west side, maintaining Engineer's Way as a pedestrian spine. The Whitehead Road building is also a key component of phasing for the ISP in part because it is an ideal place for decanting existing buildings for renovation or demolition as part of the of any projected future work. The precedent of Rice Hall as a taller building on the southern edge of the grounds allows for the new

construction to be a large building serving multiple purposes. In this regard, the building presents the first major opportunity for UVA Engineering to be organized around thematic hubs rather than departments.

In 2008, a study of the Whitehead Road area was completed by Michael Van Valkenburgh Associates, titled Science and Engineering Research Initiative Landscape Master Planning. The study suggested that Whitehead Road be removed to allow for a new campus green at the heart of the West Grounds on the Small Building site with future research buildings closer to Scott Stadium. The ISP allows for flexibility, so the Whitehead Road Building can be located on the Small Building site, as shown in the proposed plan, or closer to Scott Stadium depending on future study of Whitehead Road by the University.





## ***High-bay Facility***

*Approximately 15,000 NASF*

The Engineering School has an acute need for flexible high-bay space for large research and instructional uses, including testing and development of autonomous systems, large civil engineering equipment, and large-scale fabrication and testing associated with experiential learning and class labs. Autonomous systems research in particular is an active area of growth and opportunity for the school to differentiate itself among peer institutions. The University has very little space of this type in the academic portfolio, and it would provide many opportunities for shared and collaborative relationships with other University groups.

Existing Engineering programs that would utilize such a facility are housed very poorly and/or remotely, hindering their usefulness and safety. New high-bay space would allow decanting of existing programs and re-allocation for lower-demand uses such as teaching labs and offices, and providing swing space capacity for further renovation and construction.

## ***Fontaine Research Park***



## TRANSDISCIPLINARY SOLUTIONS

- Proposed locations for UVA Engineering functions ■
- Existing ■
- Other Proposed Buildings / Garages ■



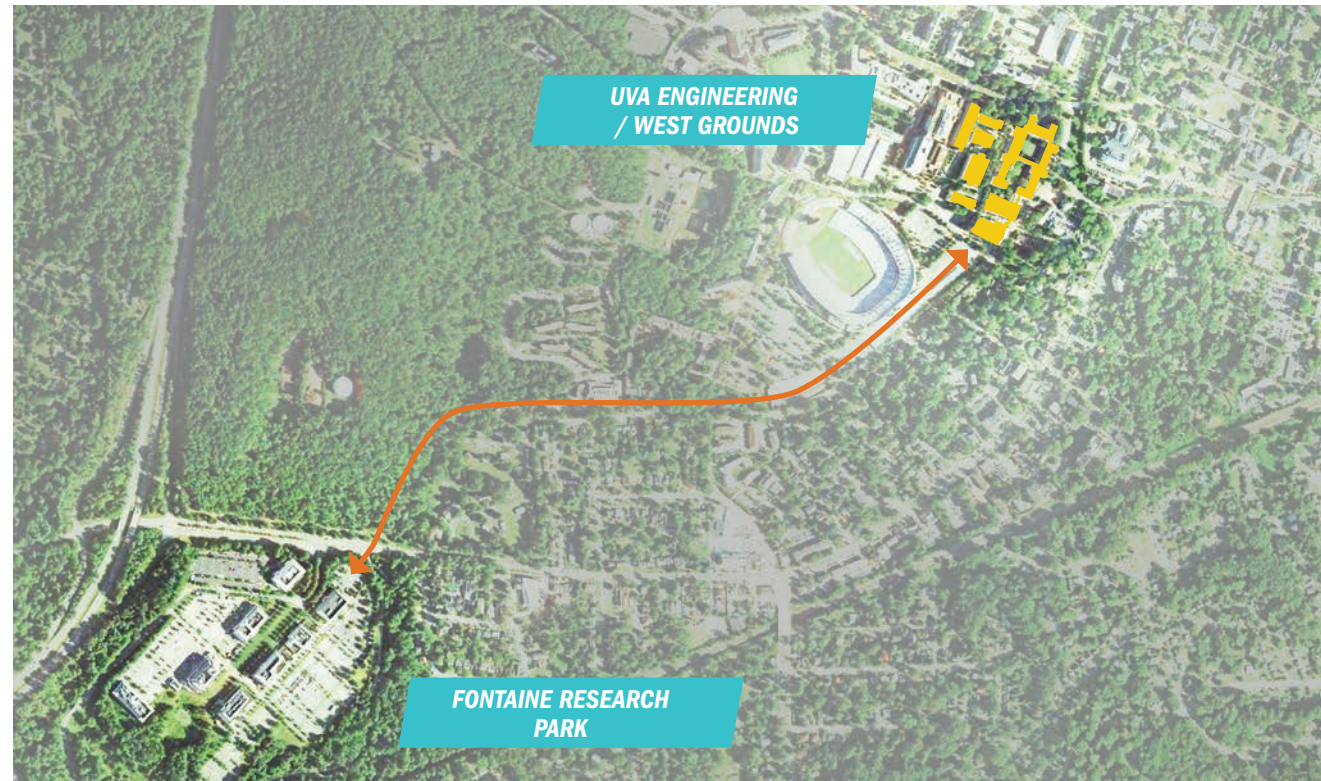
### *Approximately 25,000 NASF*

Fontaine Research Park presents an exciting opportunity for transdisciplinary endeavors – research at the intersections of disciplines. Much thought has been given to the theme of Engineering for Medicine and the potential opportunity for a Brain Institute at Fontaine Research Park. Shared research space at Fontaine builds on UVA Engineering’s areas of strength, creates new knowledge and technologies with other disciplines, and addresses societal challenges with multi-disciplinary expertise.

One of the next new buildings planned for Fontaine Research Park is an interdisciplinary research building with representation from many schools, including UVA Engineering, School of Medicine, Curry School of Education, and the College and Graduate School of Arts & Sciences. The proposed research building is approximately 250,000-300,000 GSF with space for 65-85 principal investigators (PIs). For planning purposes, it is assumed that UVA Engineering will have approximately 15-20 PIs colocated with researchers from other disciplines.

Fontaine Research Park is an ideal place for an interdisciplinary





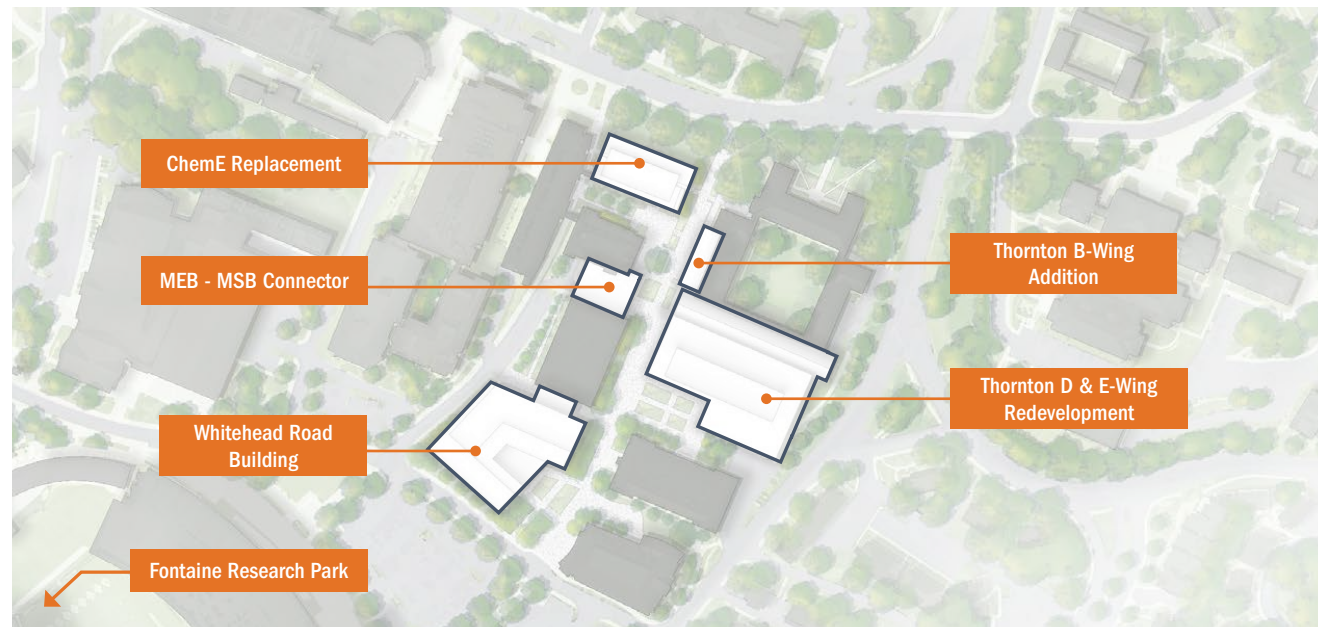
research building because it is an easily accessible, uncongested site with real estate to build a new building. There has been significant investment in core facilities at Fontaine that this new research building can utilize. Fontaine Research

Park also has patient care facilities, which easily facilitates bench to bed connections and transdisciplinary activities.



## REDEVELOPMENT OPTIONS

Redevelopment Options



### **Chemical Engineering Replacement**

*Approximately 35,000 NASF*

The “ChemE” project replaces a small, outdated, and inefficient building footprint on the northern edge of UVA Engineering with larger, more efficient building. The labs currently in this building will need to be relocated, ideally as part of an inter-disciplinary hub. The current Chemical Engineering building footprint is only 6,700 sf with low floor-to-floor heights whereas the proposed replacement building footprint is 11,400 sf with greater flexibility.

The new floor elevations will maintain connections to the upper level of Wilsdorf Hall through a bridge similar to the conditions that currently exist. The existing site elevations must be considered carefully to accommodate this connection. The cohesiveness of the upper level will be further strengthened with a proposed connection to MSB from the ChemE replacement across a new proposed bridge. The creation of an interconnected



upper floor throughout the entire west side of the engineering precinct will provide greater opportunity for collaboration and interaction. Because of the restraints of the floor elevations and the frontage on McCormick Road, which is an academic corridor, the most ideal use for this new building is academic and support space that can be shared with other Schools. The new building will help reinforce Engineer's Way as a major corridor and the ground floor of the building should embrace the notion of engineering on display through building massing and program.

### ***Mechanical Engineering/ Materials Science Connector***

*Approximately 20,000 NASF*

Like the ChemE replacement, the "MEB/MSB" Connector helps to reinforce Engineer's Way. The Connector will provide a front door to the MEB and MSB along Engineer's Way that currently does not exist. The ground floor of the Connector is an ideal place to establish a social heart for UVA Engineering and have engineering on display. The suggested social heart on the ground floor will allow for the MEB and MSB to maintain highly efficient layouts while providing much needed breakout spaces for students and researchers. The entry elevation of the Connector will be carefully considered, as lowering this elevation can create much more convenient accessible entry access to both buildings. The connector will allow for more flexibility of

uses between the two buildings, including shared core facilities, as well as the opportunity for consolidated loading below the entry level on the west side along Chemistry Drive. The ChemE replacement building can also potentially tie into the new loading dock through the basement of MSB.

### ***Thornton B-Wing Addition***

*Approximately 6,000 NASF*

While not of significant size, the Thornton B-Wing renovation and addition will make a big impact on UVA Engineering. As part of the overall the renovation project for the B-Wing, an addition to the west of Thornton Hall creates a northern gateway for UVA Engineering and helps reinforce the importance of Engineer's Way. Acting as a secondary front door to Thornton Hall, the addition provides an accessible entry from Engineer's Way to the proposed renovated spaces. The addition also establishes a stronger connection to Darden Court and social heart space along Engineer's Way. The addition, pending historic approval, will have a fully transparent façade so that the architecture of Thornton Hall can be seen through the space. It is recommended that the program in the addition and renovation is highly active and encourages a high turnover of occupants to take advantage of the highly visible location.



## REDEVELOPMENT OPTIONS

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### ***Thornton D & E-Wing Redevelopment***

*Approximately 112,000 NASF*

The Thornton D & E-Wing Redevelopment creates many opportunities for UVA Engineering. First, the building replaces wings of a structure that are in poor condition and do not function well because of their narrow footprint. Second, it creates an opportunity to consolidate and screen loading and service in one location off Stadium Drive. Third, the building creates a significant opportunity for additional capacity and provides multiple opportunities for social heart space and engineering on display along Engineer's Way. Fourth, along with the MEB-MSB Connector, the Thornton D & E-Wing Redevelopment completes an informal plaza that serves to mark the midway point of Engineer's Way as well as an

important cross axis between the east and west sides of the precinct. This redevelopment also helps to enliven Darden Court and replace the open space south of Darden Court that is not successful today. The ground floor of the new building can open onto both Engineer's Way and Darden Court to help emphasize the connection between both spaces. The Thornton D & E-Wing Redevelopment, pending historic approval of the demolition of the wings, can also help to frame new outdoor spaces that can be used for active learning or casual seating.







*Aerial View Looking North with Rice Hall in the Foreground*

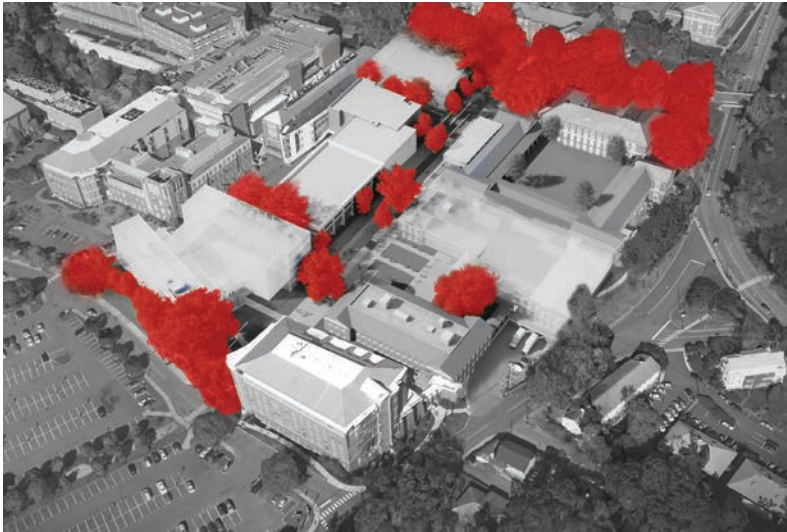


## **PROPOSED**

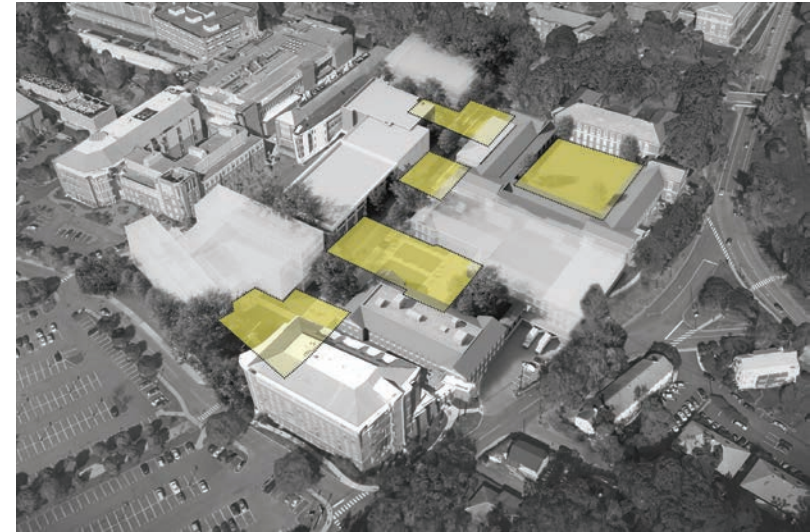
*New buildings, renovations, and landscape/ pedestrian improvements create a strong and cohesive experience for UVA Engineering. Clearings within the clumps of large trees reinforce major intersections and building entry. Ground level transparency and open spaces to work on or display engineering projects create a unique experience in the UVA Engineering precinct. Improvements to and around Darden Court are sympathetic to the rich historic character of Thornton Hall. Proposed buildings on the southern edge of the site provide opportunities for greater density.*



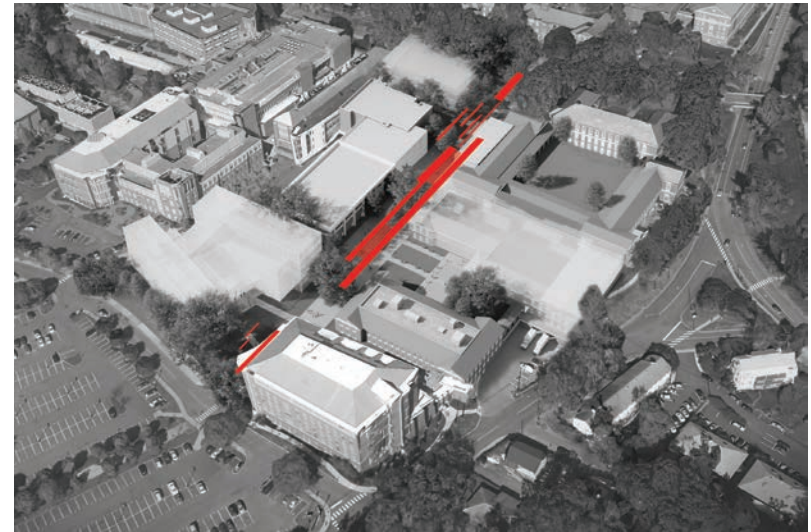
*Large clumps of trees signify entry and define plaza spaces at important intersections between buildings. Dappled light from the trees contrast with the light in the outdoor rooms.*



*Outdoor rooms occur approximately every 200 feet at major intersections between buildings. Building entry occurs perpendicular to the north-south orientation of Engineer's Way. Building entries are transparent to promote views into the buildings.*



*Two-tiered seating and occupiable terrain create opportunity for gathering and lounge spaces in and around the outdoor rooms.*





*View Looking South Along Engineer's Way*

EXISTING





## PROPOSED

*A transparent and porous addition to Thornton Hall B-Wing establishes a vibrant example of engineering on display at the northern entry of Engineer's Way. Landscape improvements include native plantings, visible storm-water management, and abundant site seating to promote a rich and active experience for pedestrians.*





*View Looking North Along Engineer's Way*  
EXISTING





## PROPOSED

*Large canopy trees and the proposed Whitehead Road Building form a new southern entry for Engineer's Way. The space follows the precedent set by the existing conditions at the north entry which has large mature canopy trees on McCormick Road.*





# PHASING

The ISP for UVA Engineering is meant to be a flexible and adaptable road map to guide future renovations and development. In general, implementation priorities follow funding and need, which can change over time. With that in mind, the phasing of this plan is divided into three high-level ranges. The short-term is directly related to immediate space needs. The midterm aims to accommodate anticipated growth within UVA Engineering. The long-term is focused on development for UVA Engineering beyond the 10-year road map of the ISP.

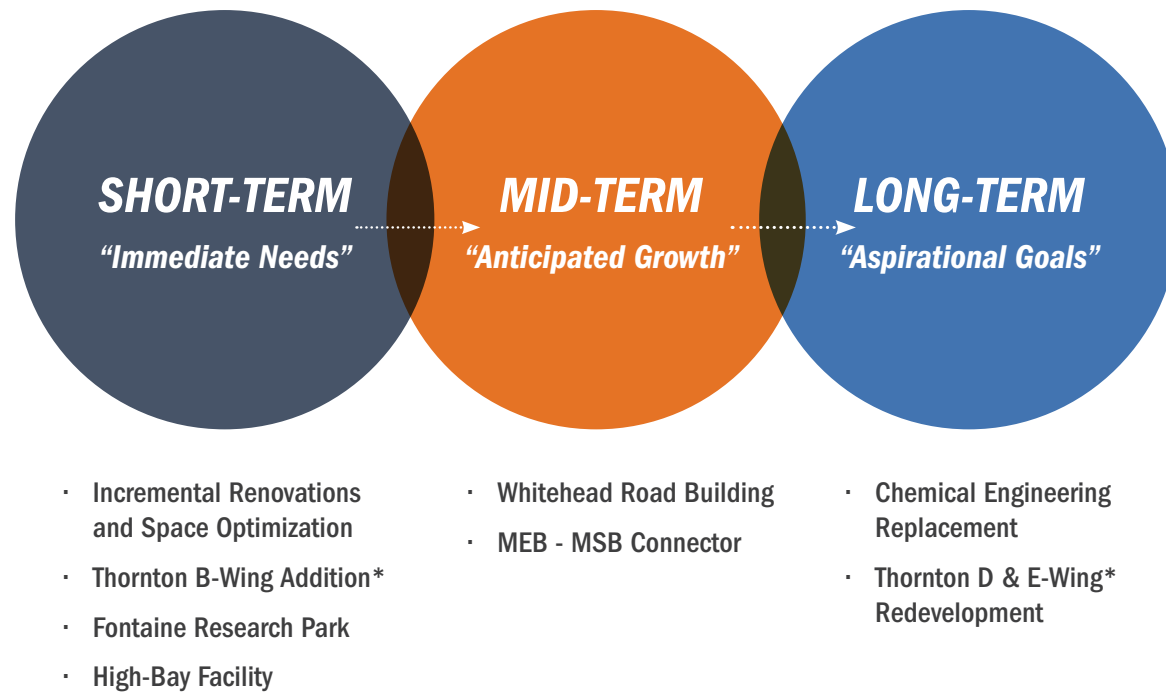
For each phase, specific projects are identified including proposed NASF. For new construction, the NASF noted is the full

capacity of the building. For renovations and shared spaces, assumptions were made in terms of its impact on the space needs. While the ISP does not propose specific program for each project, potential programmatic elements are identified. The goals and objectives of the ISP that each project supports are also articulated.



## Growth Scenarios

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*\*Pending Historical Approval*



## POSSIBLE PHASING

- Short-Term
- Mid-Term
- Long-Term





## **Short-Term** *“Immediate Need”*

Generally, the projects outlined in the short-term phase are smaller in size and are relatively low-cost options that can be implemented quickly to solve immediate space needs for UVA Engineering. Renovation, density, and optimization of existing space solves space needs challenges and help to address aging infrastructure. The addition to Thornton B-Wing enhances the UVA Engineering environment by creating social heart space. Transdisciplinary research at Fontaine Research Park supports the initiative of breaking down the silos. While these short-term phase projects will be transformational for UVA Engineering, together they do not meet the immediate space needs identified in the space needs analysis. Therefore, larger projects in the mid-term phase are critical to meeting that need.

## **Mid-Term** *“Anticipated Growth”*

The two projects identified in the mid-term phase help to meet the space needs of the ISP but also support most of the goals and objectives of UVA Engineering. The Whitehead Road building provides a significant amount of new space, a new front door for UVA Engineering to the south, and collaboration with the College and Graduate School of Arts & Sciences. The MEB/MSB connector solves accessibility and loading challenges but also activates Engineer’s Way. Between these two projects, the immediate space needs and the space needs required to support anticipated growth is met.

## **Long-Term** *“Aspirational Goals”*

The two projects identified in the long-term phase exceed the space needs of the ISP, which provides flexibility for the school in terms of growth. The Chemical Engineering Replacement and the Thornton D & E-Wing Redevelopment not only provide for growth beyond ten years but also address challenges of aging infrastructure and create a more modern environment for teaching and research. These projects also support the goals of creating more social/collaboration space and improving Engineer’s Way as an amenity for UVA Engineering and the broader UVA community.



LEGEND

**ENGINEERING GOALS**

-  Flexible Road Map
-  Facility Condition
-  Culture
-  Collaborative Environments
-  Thematic Discovery
-  Education
-  Outward Engagement
-  Growth

**SPACE CATEGORY**

-  Research Space
-  Academic and Research Offices
-  Academic Space
-  Social Heart
-  Support Space



## POSSIBLE PHASING

**122,000** NASF  
Need

**52,000** NASF  
New

**70,000** NASF  
Deficit Remaining

### Short-Term

#### 1 Density and Optimization MEB Renovation 11,000 NASF



*Increased capacity but  
\*doesn't add new NASF\**



#### 2 Thornton B-Wing Renovation 12,000 NASF



*Addresses aging infrastructure  
but \*doesn't add new NASF\**

#### 3 Thornton B-Wing Addition\* 6,000 NASF



*Glassy addition to introduce  
"Engineering on Display"  
\*Pending historical approval*

#### 4 Shared Spaces with A&S 6,000 NASF



*Estimated 2021 Gilmer/  
Chemistry completion date*

#### 5 Fontaine Research Park 25,000 NASF



*Provides space for 20 PI's; focus  
on transdisciplinary thematic  
discovery on brain research*

#### 6 High-Bay Facility 15,000 NASF



*Addresses need for flexible  
high-bay research space*

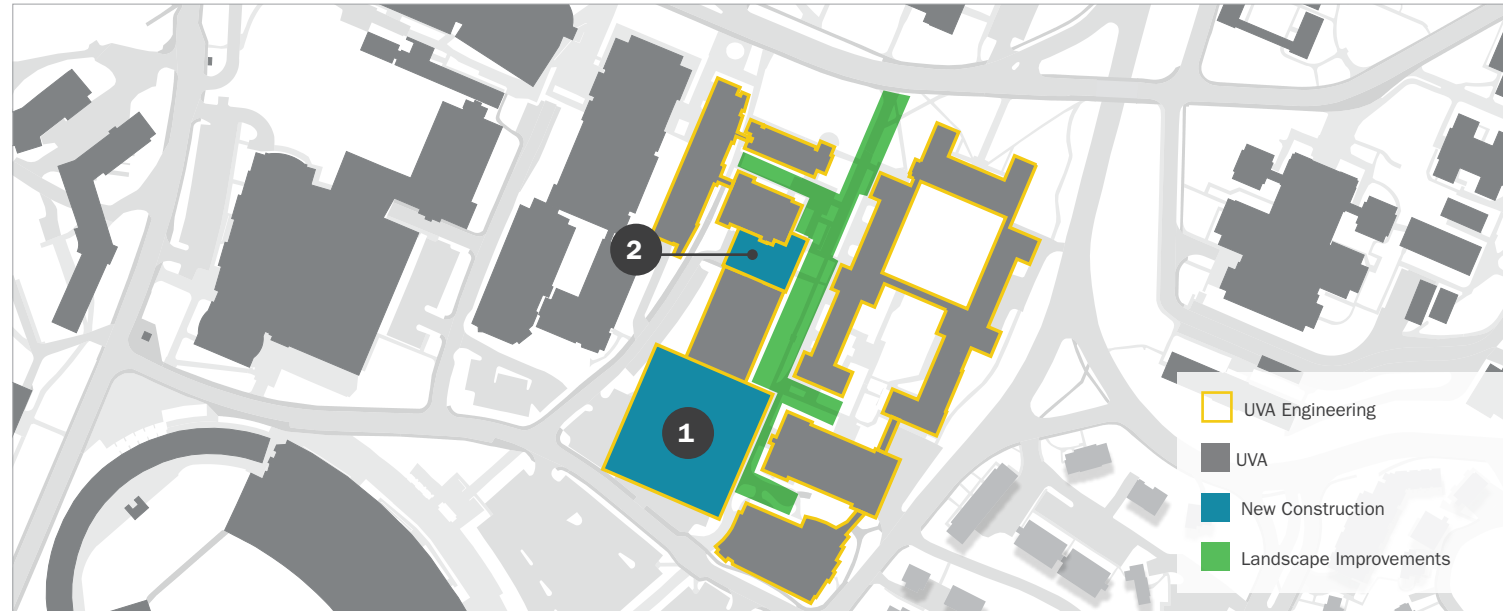


**149,000** NASF  
Need

**172,000** NASF  
New (Cumulative)

**0** NASF  
Deficit Remaining

## Mid-Term



### 1 New Interdisciplinary Research Building at Whitehead Rd 100,000 NASF



*Assumes a net gain of 100K after  
demolition of Small Building  
(6,300 NASF)*

### 2 MEB - MSB Connector 20,000 NASF



*Connects departmental buildings  
and remedies accessibility,  
loading*

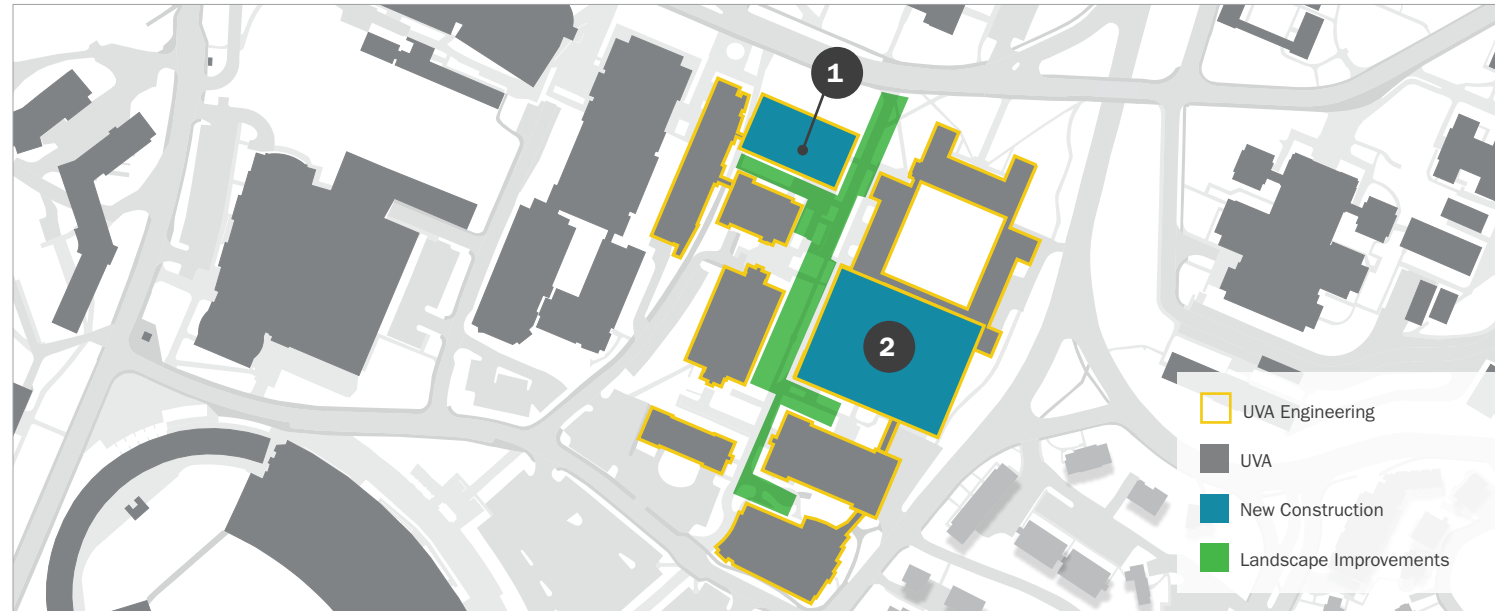


**204,000** NASF  
Need

**319,000** NASF  
New (Cumulative)

**0** NASF  
Deficit Remaining

**Long-Term**



## 1 Chemical Engineering Replacement 35,000 NASF



*Takes advantage of underutilized site on prominent street*

## 2 Thornton D & E-Wing Redevelopment\* 112,000 NASF

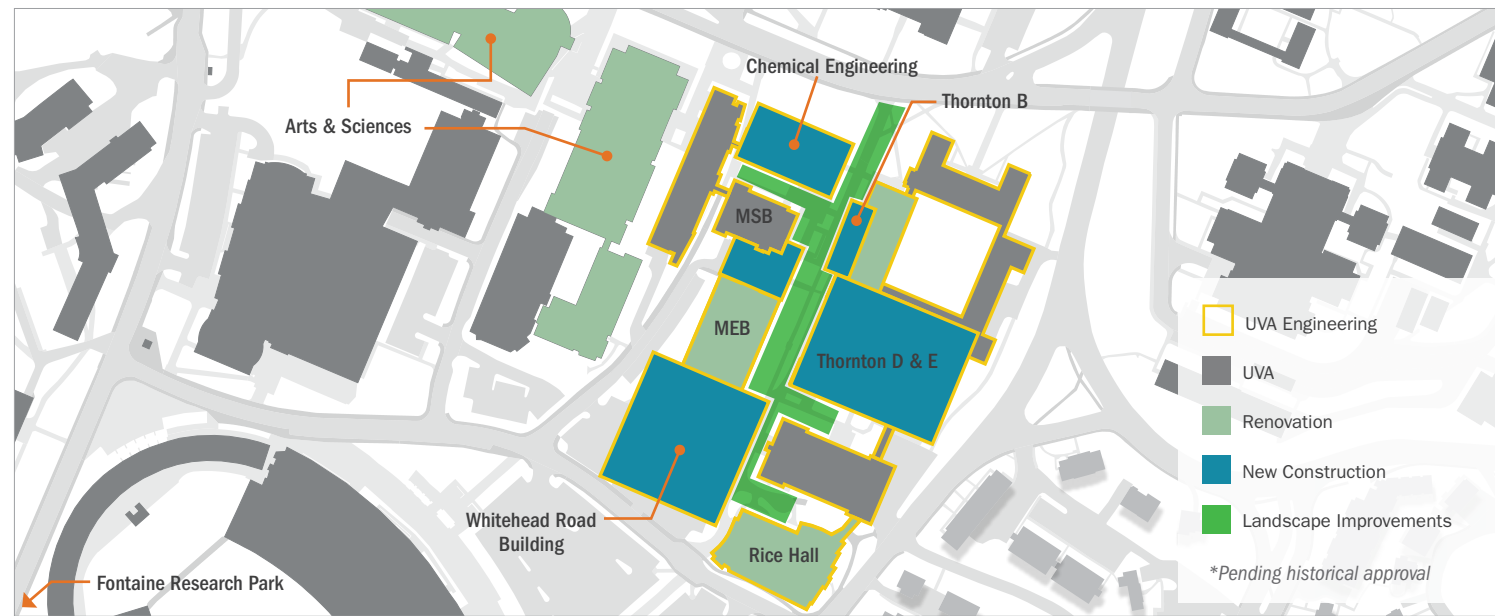


*Central location, ample amount of space. D & E-wings are currently 30K NASF each*

*\*Pending historical approval*



## PHYSICAL OUTCOME



### Short-Term

Densification and Optimization  
MEB Renovation  
11,000 NASF

Thornton B-Wing Renovation  
12,000 NASF

Thornton B-Wing Addition  
6,000 NASF

Shared Spaces with A & S  
6,000 NASF

Fontaine Research Park  
25,000 NASF

High-Bay Facility  
15,000 NASF

### Mid-Term

New Interdisciplinary Research Building  
at Whitehead Road  
100,000 NASF

MEB - MSB Connector  
20,000 NASF

### Long-Term

Chemical Engineering Replacement  
35,000 NASF

Thornton D & E-Wing Redevelopment  
112,000 NASF



SOLUTIONS	NASF		
	DEMOLISHED	NEW	NET
Short-Term Solutions			
Densification and Optimization	0	0	0*
MEB and Thornton B & D-Wing Renovations	0	0	0*
Thornton B-Wing Addition	0	6,000	6,000
Shared Space with Arts and Sciences	0	6,000	6,000
Fontaine Research Park	0	25,000	25,000
High-Bay Facility	0	15,000	15,000
Mid-Term Solutions			
Whitehead Road Building* / Small Building Demolition <small>* Assumes 40-90% UVA Engineering &amp; 10-60% transdisciplinary</small>	6,300	100,000	93,700
MEB - MSB Connector	0	20,000	20,000
Long-Term Solutions			
Chemical Engineering Replacement	13,000	35,000	22,000
Thornton D & E-Wing Redevelopment	36,500	112,000	75,000
<b>TOTAL</b>	<b>55,800</b>	<b>319,000</b>	<b>262,700</b>

\* Increased capacity but \*doesn't add new NASF\*











