COOPER ROBERTSON

UNIVERSITY OF DELAWARE

CAMPUS FRAMEWORK PLAN

Phase 1 - Data Collection Report

8 FEBRUARY 2017

February 8, 2017

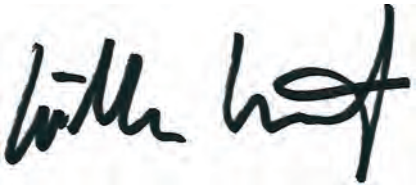
Peter Krawchyk, Interim VP, F.R.E.A.S., University Architect
222 South Chapel Street
General Services Building
Newark, DE 19716

Dear Peter:

A year ago, I made my first visit to the University of Delaware: arriving at the Green at Main Street and seeing the historic architecture, the beautiful lawns, the active street life. This appears to be the quintessential University campus. I wonder why I never discovered this wonderful campus just 45 minutes from where I grew up in Pennsylvania. Through working on this Framework Plan, we explored the campus further and engaged with faculty, staff, and students. We walked the campus from north to south and started to understand the dispersed nature. The masses of students waiting to cross College Avenue is apparent as are the lack of places to gather on the Green. Three different campus characters separated by the railways also became evident. We discovered the natural setting of the North Campus to the walkable small town experience of Central Campus to the amazing resource of the nearby School of Agriculture and Botanic Gardens. Through our analysis and in discussion with stakeholders, the overlapping interests of the City and the University became clear (stormwater, housing, transportation, public safety, utilities, economic development, cultural institutions, and streetscape) with a perceived lack of any partnering. Aside from these urban design issues, what emerged from stakeholders is the poor quality of space and state of disrepair of many buildings on the campus. This is a fundamental challenge to the attraction and retention of faculty, staff, and students. Some contend it is better off to demolish and replace than continue to renovate some structures. These conditions along with an overarching campus design strategy are the biggest issues to be addressed through the Framework Planning effort.

Few universities are the heart of their city. Even fewer have the rich history and associated historic figures as does this University. I recently learned that the founder of the Women's College, Emalea Warner, is my great-great-great grandmother. I am now even prouder to have the chance to work on this campus and look forward to helping the University create an enduring future in Newark.

Sincerely,



William Kenworthey, AIA
Partner

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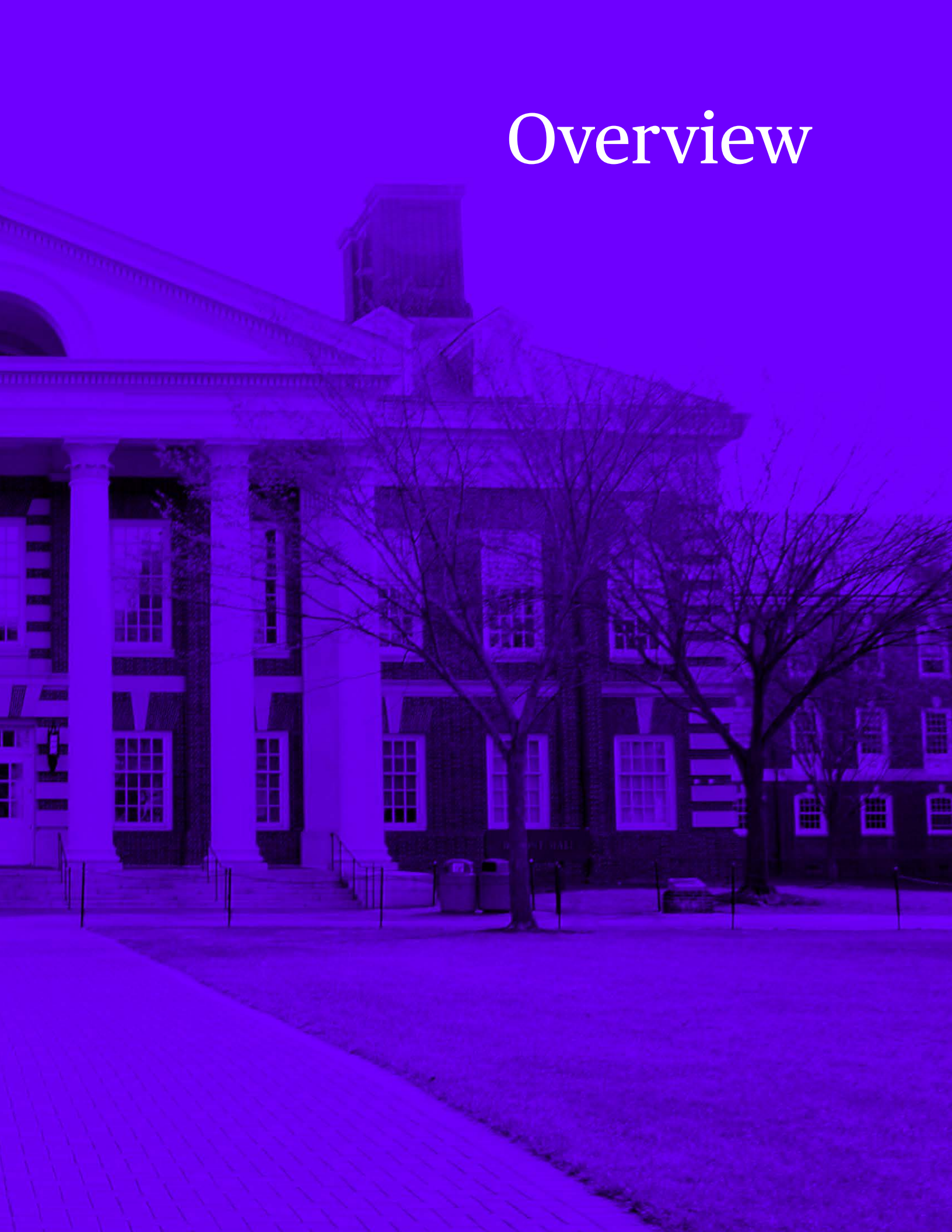
Overview



Goals for Phase One

At the start of 2016, the University of Delaware hired a team led by Cooper Robertson to develop Phase One of a Campus Framework Plan for the Newark Campus. A Framework Plan is precedent to a Master Plan: master plans generally follow the structure and broad vision outlined in a Framework Plan.

In general, a framework plan tries to answer (at least) the following questions:

- What **PROGRAMS** should be emphasized?
- What **PLACES** are necessary to achieve desired cultural outcomes?
- What **ADJACENCIES** will support the success of strategic programs and functions?
- What **CONNECTIONS** should be made or improved?
- What **INFRASTRUCTURE** is necessary to support aspiration ideas?
- What **POLICIES** should be considered for modification or addition?

SCOPE OF THE FRAMEWORK PLAN

The consultant team includes expertise in architecture and campus design, transportation planning, laboratory planning, landscape architecture, infrastructure and sustainability.

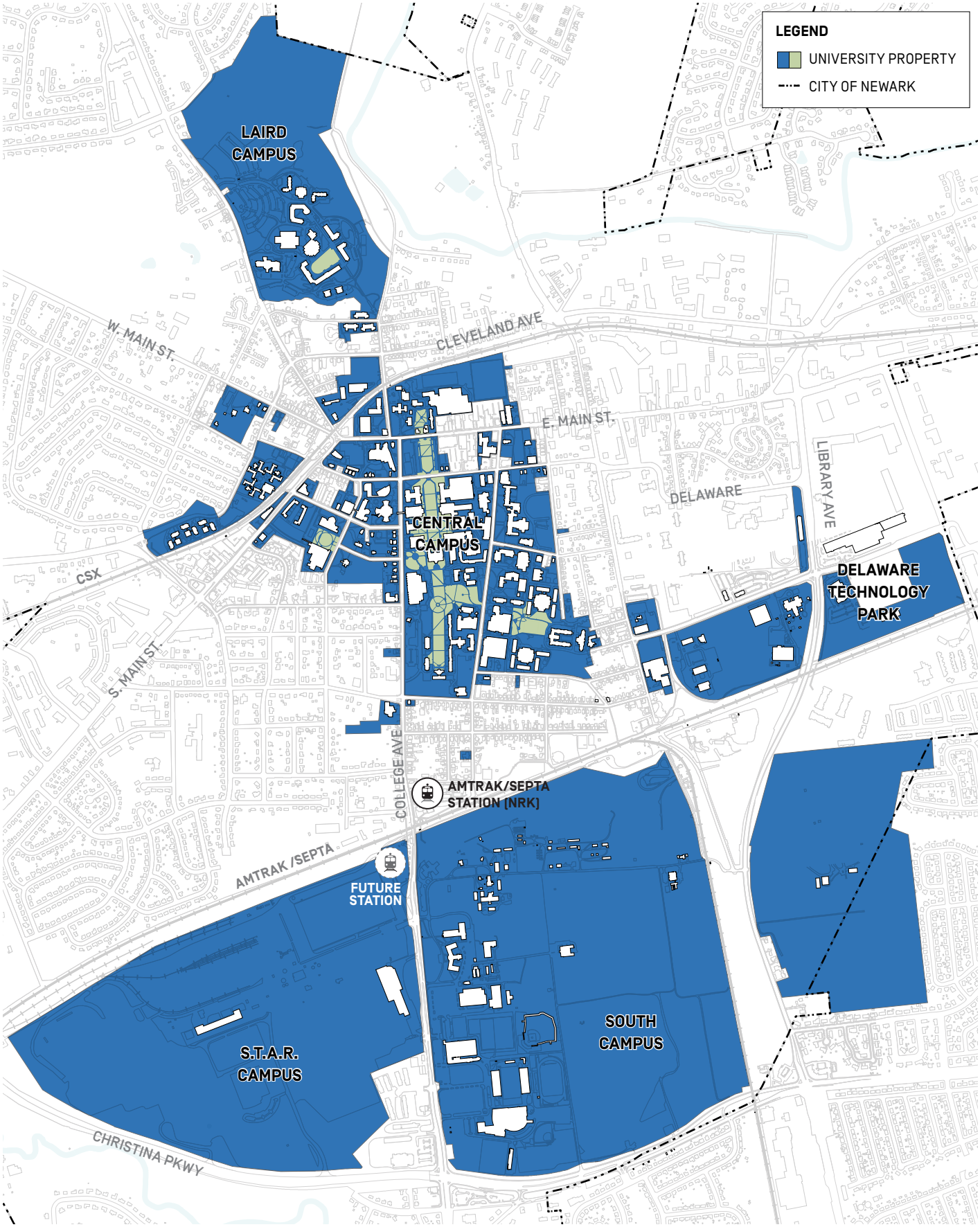
The scope for Phase One of the Campus Framework Plan focuses on the Analysis and Data Collection of existing conditions and practices at the Newark Campus of the University of Delaware based on observation of the campus, stakeholder engagement, findings of previous planning studies, and representation of data provided by the University or researched by the consultant team.

The Phase One assessment documents the influences, emerging themes, and findings of this work, and identifies draft design principles to govern formulation of physical options in later phases of work. The Phase One assessments are not value judgements or proposals about what to do next, which will come with the input of President Assanis and the Board of Trustees in Phase Two of the Framework Plan.

THE GOALS OF PHASE ONE ARE TO:

1. Assess existing conditions and practices
2. Collect information and identify gaps
3. Review relevant past studies
4. Develop benchmarks and criteria
5. Analysis of research lab program
6. Define a set of strategic questions for phase two
7. Prepare draft design principles to guide future work

This overview is intended as an executive briefing for University officials. A more detailed accounting of the Phase One findings and assessments can be found in Section 3: Assessment. The team has also compiled an Appendix of information, notes, and meeting presentations that support the findings and assessments of Phase One as reference for future work.



Scope of Campus Framework Plan

Strategic Plan (2015) "Delaware Will Shine"

The 2015 Strategic Plan needs greater definition and specifics about which programs and initiatives will be emphasized to help the University achieve its strategic goals and desired cultural outcomes.

The University issued its 2015 strategic plan ('Delaware Will Shine') in 2015 after an extensive consensus building process that included a broad coalition of the University community. The document articulates the broad goal of evolving the University into "a pre-eminent learner centered research university."

The plan goes on to suggest that it will focus its mission on addressing the grand challenges facing our society:

- Educating the Global Citizen
- Advancing Cultural Understanding & Creative Expression
- Bridging Opportunity Divides
- Building a Sustainable Economy
- Improving Health & Wellness
- Innovating Energy & Environmental Solutions
- Ensuring Safety & Security

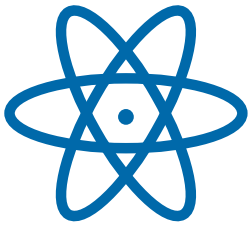
With these Challenges as a framework, 'Delaware Will Shine' identifies five Strategic Initiatives (see opposite page) that the University will implement to achieve its strategic goals and be impactful in addressing the Grand Challenges.

Typically, a strategic plan will clearly identify programs and initiatives that will be emphasized to meet goals, and provides specific metrics and targets against which progress can be measured. The current plan provides some guidance within each of these Strategic Initiatives, but it needs a greater level of specificity necessary to develop a clear understanding of the physical, environmental and financial implications that follow from its implementation. Since a framework plan is meant to coordinate the physical response to a strategic plan, further work is needed by the University to determine what will be the areas of emphasis will be and how their achievement can be measured.

Delaware Will Shine Creating Our Future

A Welcoming and Collaborative Campus

Innovative Education Design



Multidisciplinary Research and Scholarship

Campus Safety and Wellness

Community Engagement

Process

During Phase One, the consultant team reviewed the results of previous studies, conducted research and observation of existing conditions and practices, and facilitated engagements with stakeholders across the campus community. The work performed and the associated results of the analysis and assessment work was organized by a review and guidance framework established at the outset of Phase One that included an Executive Committee, a Steering Committee and eight Stakeholder Working Groups.

EXECUTIVE COMMITTEE

The Executive Committee, comprised of senior administrative officials, was charged with providing the overall strategic direction for the plan. This group received a presentation detailing the scope of work and goals for the project at the outset of Phase One. Peter Krawchyk, who serves on the Executive Committee, is also the Chairperson of the Steering Committee, and has provided regular updates on the progress and direction of the project to the remaining members of the Executive Committee. In addition, members of the Executive Committee have been interviewed as part of the stakeholder engagement process, and were briefed about findings at the conclusion of Phase One.

STEERING COMMITTEE

The Steering Committee, chaired by Peter Krawchyk, is comprised of eight members that represent a cross section of University administrative functions including real estate, finance, facilities, student life, graduate and professional studies, academics and research. They have been charged with providing direction to shape the overall vision and emphasis of the Campus Framework Plan. The Steering Committee has received monthly briefings on findings and the activities of the consultant team. Select members of this Committee have been interviewed based on their roles in the University as part of the Stakeholder engagement process.

STAKEHOLDER WORKING GROUPS

As part of the Campus Framework Planning process, the University convened eight Stakeholder Working Groups. These groups are comprised of 10-15 persons that represent a broad cross section of the campus community and are organized around focus areas articulated by the 2015 Strategic Plan ('Delaware Will Shine').

The Stakeholder working groups were formed to identify critical issues facing the University and to identify information sources and gaps to the consultant team. Over the course of Phase One the Stakeholder working groups were convened for three facilitated discussions during which these critical issues and informational sources were shared with the consultant team.

The eight Stakeholder Working Groups, by topic area, are:

- Academic Spaces and Library
- Research Spaces, Lab, Facilities and Library
- Student and Campus Life
- Community, Diversity and Engagement
- Transportation and Accessibility
- Safety, Security and Wellness
- Infrastructure and Operations
- Sustainability and Environmental Management

Board of Trustees

EXECUTIVE COMMITTEE

Domenico Grasso, Provost, Chair
Alan Brangman, Interim EVP, Treasurer
Franklin Newton, Former Chief of Staff
Peter Krawchyk, Interim VP, F.R.E.A.S., University Architect

STEERING COMMITTEE

Peter Krawchyk, Interim VP, F.R.E.A.S., University Architect
Charles Riordan, Deputy Provost for Research, Scholarship
Lynn Okagaki, Deputy Provost for Academic Affairs
Peggy Bottorff, Associate Provost / Chief of Staff
Matt Robinson, Interim Athletic Director
Dawn Thompson, VP for Student Life
Gregory Oler, VP for Finance and Deputy Treasurer
Shelley Einbinder, Associate University Architect

STAKEHOLDER WORKING GROUPS

ACADEMIC SPACES / LIBRARY
G. Watson / E. Hauenstein

TRANSPORTATION & ACCESSIBILITY
R. Rind / A. Jannarone

RESEARCH & LAB, FACILITIES / LIBRARY
D. Doren / M. Rieger

SAFETY, SECURITY & WELLNESS
S. Homiak / T. Dowling

STUDENT & CAMPUS LIFE
J. Pelesko / K. Kerr

INFRASTRUCTURE & OPERATIONS
P. Dickinson / J. Lapalombara

COMMUNITY, DIVERSITY & ENGAGEMENT
L. Overby / D. Rich

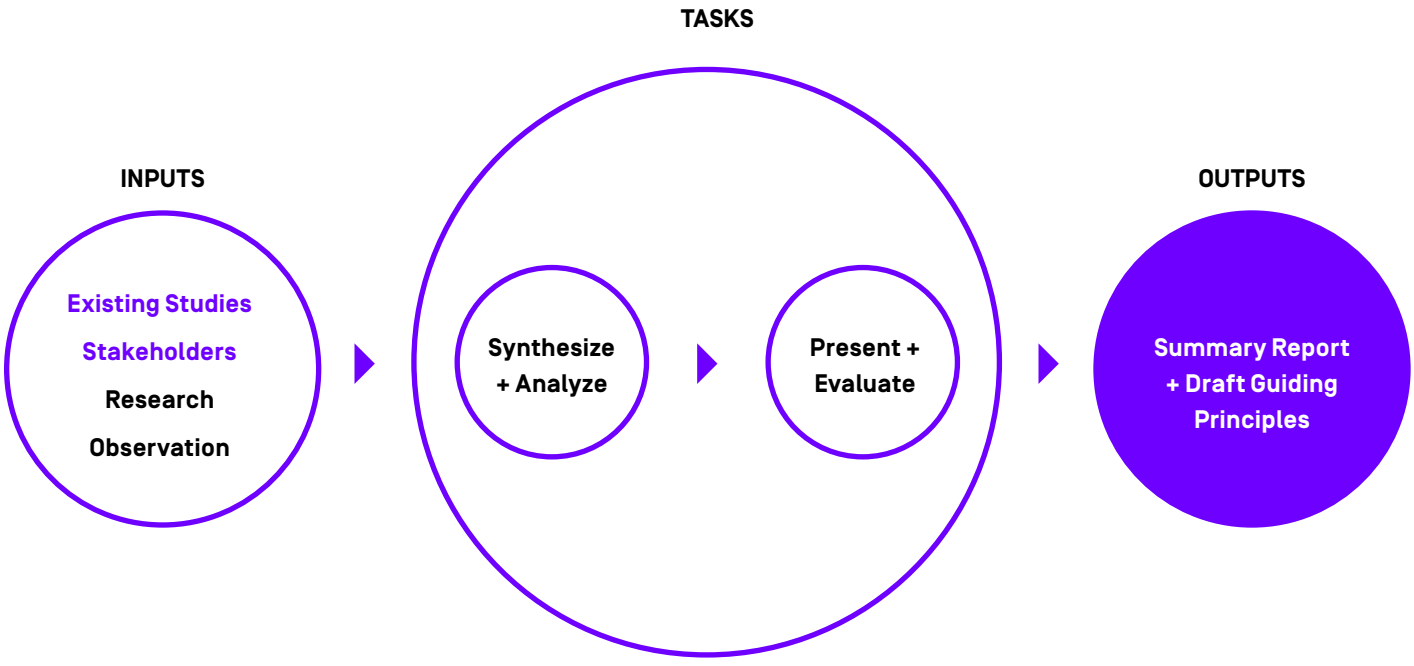
SUSTAINABILITY & ENV. MANAGEMENT
J. Byrne / M. Bennett

Common Emerging Themes

COMMON EMERGING THEMES

Based on the facilitated discussions with the Stakeholder Working Groups, the consultant team identified a set of emerging themes that have some commonality among the different groups. Additional areas of concern that are specific to each Stakeholder Working Group are described in detail in Section 2: Stakeholder Working Groups. The common emerging themes are:

- UD and the City of Newark have overlapping interests in many areas including transportation, utility infrastructure, housing, and safety.
- UD is separated into three zones (Laird Campus, Central Campus, STAR/South Campus) defined by the freight (CSX) and passenger rail (Amtrak - NEC) lines that traverse the City of Newark. As a result, the idea of an interconnected and interactive campus is a challenge.
- College Avenue is the primary spine that connects all three campus zones (Laird Campus, Central, STAR/South Campus). The physical conditions of the College Avenue, however, hinders its role as a campus spine.
- The campus has many front doors, but most lack a sense of arrival and university identity.
- Organizational silos prevent coordination across departments and hinder the University from engaging in integrated decision making.
- In most cases, improving the quality of existing space may be more important than increasing in the quantity of space. Issues related to building age, under-performing building systems, inadequate technology, and configuration of space are some of the highlights.



ADDITIONAL INTERVIEWS

In addition to presentations and discussions with the Executive Committee, Steering Committee and Stakeholder Working Groups, the consultant team conducted interviews with selected administrative officials and other members of the campus community. The purpose of these interviews was to gain a deeper understanding of the needs and priorities associated with academic programs, physical infrastructure, and organizational structure of the University. A complete list of interviewees and selected notes from those interactions are provided in Appendix of this report.

While the information gathered will be of significant value to the University in understanding its current conditions, an overriding of Phase One was to develop a set of draft design principles that can serve as guide posts for the development options to study and the refinement of a preferred plan direction in the subsequent phases of the Campus Framework Planning process.

OUTREACH TO DEANS

College of Agriculture & Natural Resources	Mark Rieger
College of Arts & Sciences	George Watson
College of Engineering	Babatunde Ogunnaike
College of Earth, Ocean, and Environment	Mohsen Badiey
College of Education and Human Development	Carol Vukelich, Dean
College of Health Sciences	Kathleen S. Matt, Ph.D.
Alfred Lerner College of Business and Economics	Bruce Weber

What We Learned:
Opportunities and Constraints

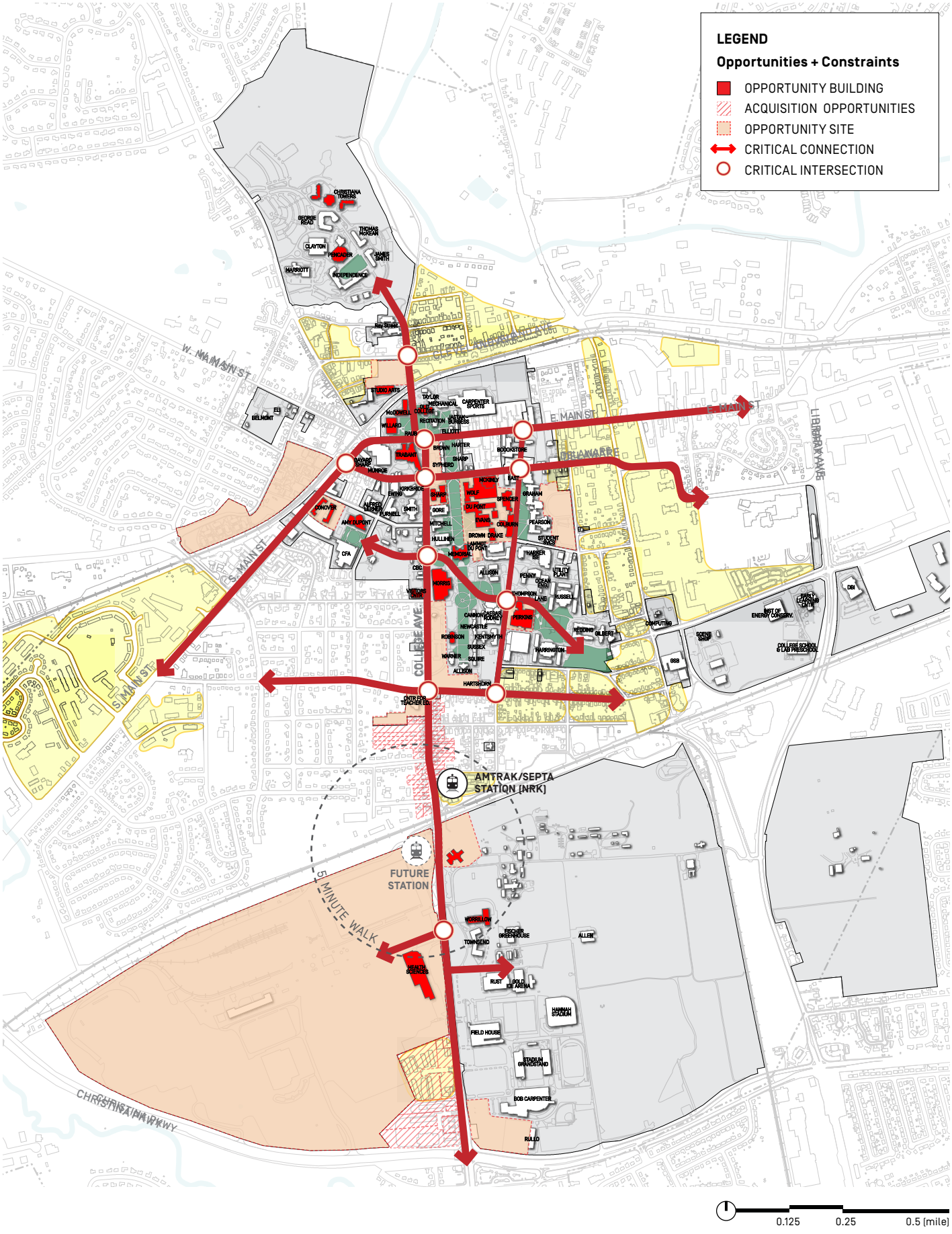
Based on the information gathering, analysis, mapping, stakeholder engagements, and interviews we have identified a core set of opportunities and constraints facing the University.

OPPORTUNITIES

- Prioritize strategic opportunities to **PARTNER WITH THE CITY** on issues and areas of mutual interest.
- **IMPROVE** the quality, functionality, character and safety of **COLLEGE AVENUE**.
- **IMPROVE** visibility and connectivity to **MAIN STREET** and surrounding neighborhoods.
- Improve east-west pedestrian circulation throughout the campus.
- **IMPLEMENT A WAYFINDING SYSTEM** and other strategies to improve campus identity & access.
- **INSTITUTE A SUSTAINABILITY PLAN** with metrics, goals, and milestones.
- **REPURPOSE EXISTING BUILDINGS** in Science and Engineering Precinct.
- **INCREASE UTILIZATION OF** registrar controlled **CLASSROOMS** at early and late times of day for greater use of existing classrooms.
- **CONSIDER** parking lots, undeveloped sites and under utilized buildings as **DEVELOPMENT SITES CLOSE TO CENTRAL CAMPUS.**
- **EVALUATE ACQUISITION OPPORTUNITIES** adjacent to critical connections.

CONSTRAINTS

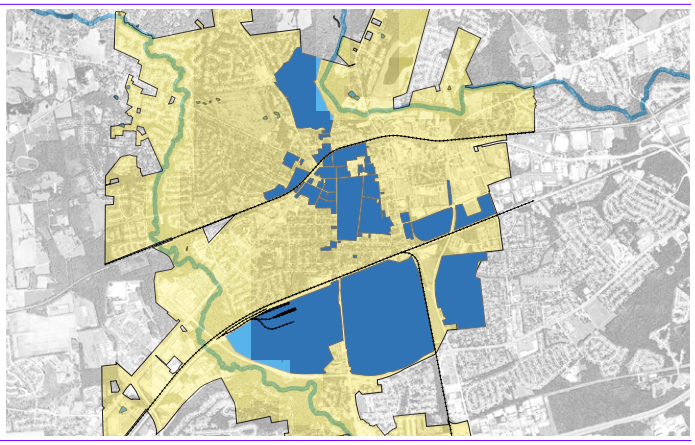
- **CAMPUS LACKS SENSE OF ARRIVAL** at the periphery.
- **RAIL** infrastructure **DIVIDES THE CAMPUS INTO THREE ZONES** and limits circulation to only a few crossing and connections.
- T**RANSPORTATION SYSTEMS** (vehicular, pedestrian, bicycle, transit) **ARE NOT AN INTERCONNECTED NETWORK**.
- **CIRCULATION PATHS** to core campus from adjacent neighborhoods **ARE UNCLEAR**.
- **CAPACITY AND CHARACTER HINDER COLLEGE AVENUE'S** potential as the unifying spine of the University.
- **NO UNIVERSITY-WIDE SPACE MANAGEMENT** function exists to assess space reallocation over time.
- Organizational and budgetary **SILOS PREVENT INTEGRATED DECISION MAKING**.
- **FACILITIES RENEWAL AND DEFERRED MAINTENANCE LACK BUDGETARY PRIORITY.**
- Advancement of research in S**TEM** fields is **LIMITED BY THE QUALITY AND QUANTITY OF LABORATORY FACILITIES**.
- **'THE GREEN' LACKS THE ACTIVATION TO MAKE IT THE HEART OF CAMPUS.**


LEGEND
Opportunities + Constraints
OPPORTUNITY BUILDING
ACQUISITION OPPORTUNITIES
OPPORTUNITY SITE
CRITICAL CONNECTION
CRITICAL INTERSECTION
W. MAIN ST
E. MAIN ST
S. MAIN ST
COLLEGE AVE.
AMTRAK/SEPTA STATION (NRK)
FUTURE STATION
5 MINUTE WALK
CHRISTINA PKWY
0.125
0.25
0.5 (mile)

Guiding Principles

1. Recognize the University as an important part of the City of Newark.

- Address overlapping interests between campus and surrounding neighborhoods.



2. Recognize the Newark Campus as three distinct zones that are tied together by College Avenue.

3. Ensure a welcoming campus and culture.

- Establish clear points of arrival and multiple "front doors" for the University.
- Provide spaces for students to interact and express their identities.

4. Respect historic character while embracing new opportunities to advance the University's goals.

5. Carefully balance new construction with adaptive reuse of existing facilities, open spaces, and infrastructure.

6. Use the space between academic "turf" to encourage interdisciplinary exploration and discovery.

7. Attract a diverse population through supportive University programs and places.

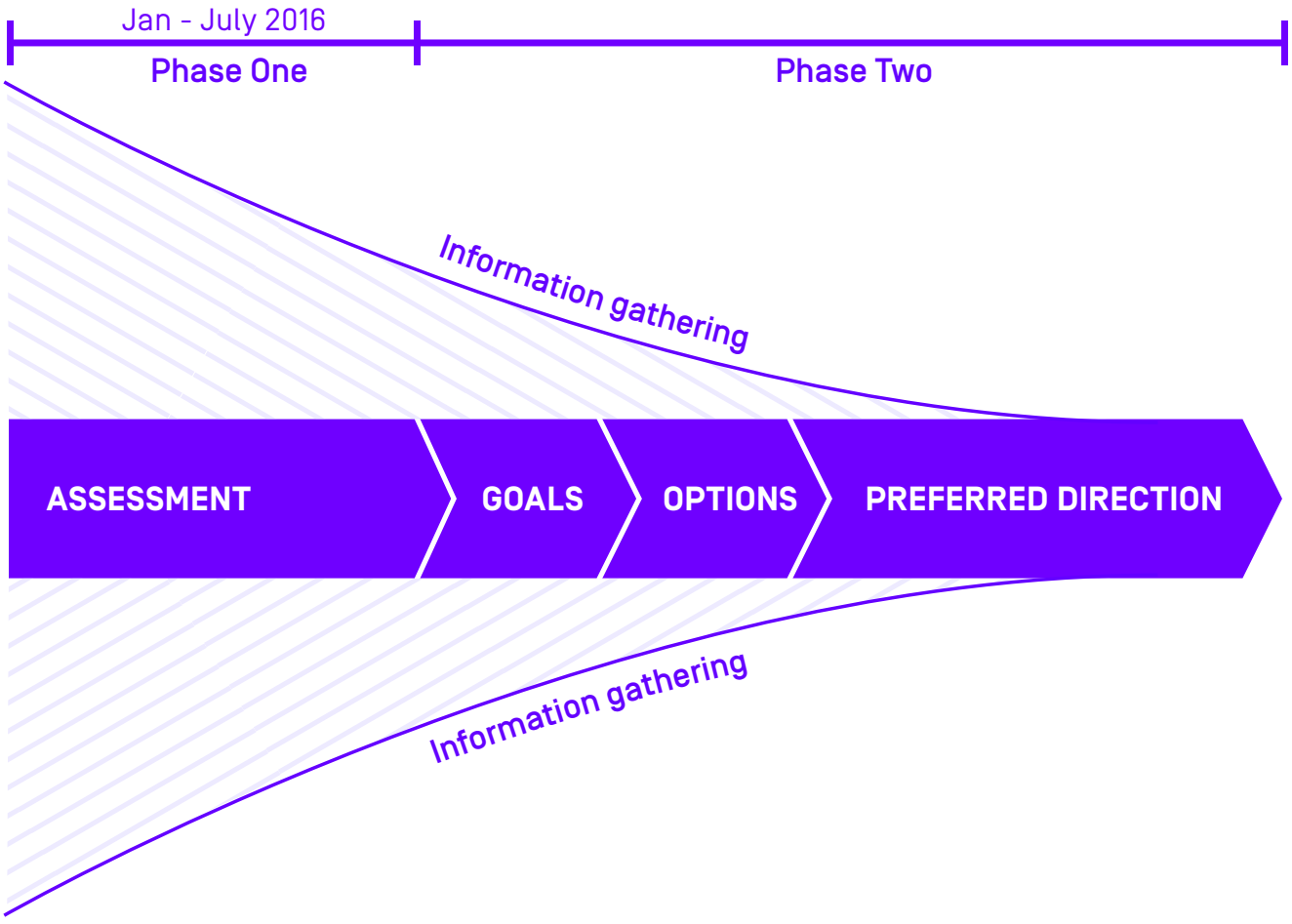
8. Define how sustainability permeates all aspects of the University's culture.

Strategic Questions for Phase Two

1. Should the future Newark Campus be implemented as one brand unifying three distinct areas with their own character?
2. Should the University be a college town or suburban?
3. How big does the University of Delaware want to be in Newark?
4. Which programs should be targeted for growth?
5. What are the best sites for development or redevelopment?
6. What are the sustainability + resiliency goals and policies for the University?
7. What funding levels may be assumed to develop stages for the plan?

Next Steps

- Determine strategic direction and plan priorities.
- Integrate the president's 5 goals into future work.
  - Enhancing the success of our students.
  - Building an environment of inclusive excellence.
  - Investing in our intellectual and physical capital.
  - Strengthening interdisciplinary and global programs.
  - Fostering a spirit of innovation and entrepreneurship.
- Determine nature of interaction between Campus Framework Plan, Academic Plan, and Strategic Planning efforts.
- Plan stakeholder town hall to present findings of Phase One.
- Plan leadership presentation.
- Refine draft design principles.
- Address strategic questions developed in Phase One.
- Authorize Phase Two.



2.

Stakeholder Working Groups

Stakeholder Working Group Process

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- Safety, Security and Wellness
- Infrastructure and Operations
- Sustainability and Environmental Management

Common Themes

EMERGING THEMES
Overlapping interests with the City including transportation, utility infrastructure, housing, and safety.
Separated into three zones (Laird Campus, Central Campus, South Campus/STAR) defined by the Freight and passenger rail lines.
College Avenue is the primary spine that connects all three campus zones. Physical conditions hinders its role as a campus spine.
The campus has many front doors, but most lack a sense of arrival and University identity.
Organizational silos prevent coordination across departments and hinder integrated decision making.
Improving the quality of existing space is more important than increasing in the quantity of space. Building age, under-performing building systems, inadequate technology, and configuration of space are some of the highlights.

Academic Spaces and Library

	DATA/ OBSERVATION	ANECDOTAL	GAP OR DATA NEEDS
FINDINGS			
60% of all registrar controlled **classroom seats** are located to the west of the green.	●		
Location of classroom and residential spaces puts pressure on College Ave.	●	●	
The vast majority of the **laboratory space** on campus is located in the Science and Engineering Precinct, and is dominated by research labs rather than teaching laboratories.	●		
Academic support is being delivered in many places, but has poor visibility.	●	●	Need More Specific Size & Location for Individual Spaces.
Additional classroom capacity is available early mornings/late afternoon time slots.	●	●	
University/Colleges lack clear **policies for the assignment and re-assignment of space**.	●	●	

THEMES
Some additional instruction spaces may be needed, but **improvements to classrooms** (new and existing) should focus on quality, flexibility and technology integration in the classroom.
Circulation space in academic buildings as well as outdoor spaces could be re-purposed to increase study and student collaboration space.
Capital prioritization and financing models of academic buildings do not support coordinated decision making across colleges.
Classroom flexibility and technology can build upon UD's legacy of innovative approaches such as problem based learning.
The **library** requires a comprehensive plan to realize its potential as a hub of campus academic activity.
A more coordinated, visible and accessible **model for academic support** is needed.
There are opportunities for **centralization of certain highly specialized equipment and services** (i.e. core facilities, maker spaces, etc.).

Academic Spaces Stakeholder Working Group Members

George Watson	*Dean*	College of Arts & Science	Co-Chair
Emily Hauenstein	*Sr. Assoc. Dean*	College of Health Sciences/School of Nursing	Co-Chair
Chris Lucier	*Vice President*	Enrollment Management	
Rick Andrews	*Professor*	Lerner College of Business & Economics	
Suzanne Stanley	*Sr. Assoc. Registrar*	Office of the Registrar	
Paul Pusecker	*Sr. Business Officer*	College of Arts & Sciences	
Cheryl Richardson	*Assoc. Dir.*	Office Effectiveness	
T.J. Cournoyer	*Director*	Development Alumni Relations	
Paul Hyde	*Manager*	IT Academic Technology Service	
Shelly McCoy	*Head*	Morris Library - Multimedia Collections and Services	

Research Spaces and Library

	DATA/ OBSERVATION	ANECDOTAL	GAP OR DATA NEEDS
FINDINGS			
The majority of **laboratory space** on campus is located in the Science and Engineering Precinct and is dominated by research labs rather than teaching labs	●		
A significant number of research oriented buildings have been identified as having significant **deferred maintenance or poor condition**, and have been previously proposed for change of use (2013 Space Utilization Study, 2015 FCI Study).	●		
Many buildings have been modified in ad-hoc ways to meet **short term needs**, and are not coordinated within a university-wide construction or facilities renewal process.	●	●	
Many buildings have been adapted to current research activities but are not adequately designed for the level of research they are supporting.	●	●	Laboratory Utilization and Space Needs (in progress)

THEMES
Clear policies are needed for the **assignment (and re-assignment) of laboratory space**.
A comprehensive plan for **building lifecycle management** is needed to assure physical spaces properly support desired research intensity.
A plan is needed to identify the best locations for **new or re-purposed research space**.

Research Spaces Stakeholder Working Group Members

Doug Doren	*Associate Dean*	College of Arts & Science	Co-Chair
Mark Rieger	*Dean*	College of Agriculture & Natural Resources	Co-Chair
Abraham Lenhoff	*Department Chair*	Chemical & Biomolecular Engineering	
Susan Hall	*Deputy Dean*	College of Health & Science	
Sandra Millard	*Interim Director*	Morris Library	
Cordell Overby	*Associate Deputy Provost*	Research Office	
Michael Gladle	*Director*	Environmental Health & Safety	

Student and Campus Life

	DATA/ OBSERVATION	ANECDOTAL	GAP OR DATA NEEDS
FINDINGS			
Connectivity between Laird Campus, Central/East Campus, and South Campus/STAR does not support a sense of campus cohesion	●	●	
45% of all students living on-campus are housed at **Laird Campus** and are dependent on College Avenue to provide connectivity to Central Campus.	●	●	
Certain **off-campus areas** are associated with higher incidence of undesirable student behaviors.		●	Locational data for police response calls (involving UD students).
Spaces associated with high levels of student activity (food, meeting, study, lounge, etc...) are generally clustered around residential areas and located at the periphery of campus.	●	●	Evaluation of available space within existing Academic Space.
There is insufficient meeting space for student activities. They also tend to be of poor quality and have restrictive assignment policies.	●	●	Registered Student Organization (RSO) meeting room booking utilization data.
Campus lacks dedicated **meditation/prayer spaces**.	●	●	
South Campus/STAR campus generally lack food, lounge and other types of student gathering spaces.	●	●	
Outdoor club/intramural recreation fields have been developed over time without in-kind replacement		●	
Space needs for **graduate students** (housing, study, meeting, etc...) are poorly understood and largely absent from campus	●	●	Graduate Student Housing + Space Needs Study
Existing **student centers** (Perkins and Trabant) lack a sense of place and programs that bring people together.		●	Comprehensive Student Center Program Study
Amount of study, lounge and other services provided in **residence halls** vary widely between building and campus area	●	●	

EMERGING THEMES
Focus should be on understanding how to become **a more engaged campus** within the current physical form.
Definition is needed to determine the right mix of **services and activities** in each area of campus to foster a unique sense of place that supports a vibrant campus identity.
Collaborative and shared spaces are essential for students, faculty and staff, and require further study to decisions about next steps. ["How People Work"]
Recreation space are an essential complement to 'work oriented spaces'. ["How People Play"]
A comprehensive **housing plan** that addresses the needs of graduate, undergraduate, faculty and staff is needed to support a vibrant residential environment on- and off-campus. ["Where People Live"]
There are a variety of **Specialized Spaces** that are essential to the cultural life of the university (i.e. assembly, performance, meeting, etc...) but a long term plan is needed to develop and manage them.
Additional space needs should be considered in light of current trends for space components that do not yet exist at UD. ["Spaces of Tomorrow"]

Student and Campus Life Stakeholder Working Group Members

Kathleen Kerr	*Executive Director*	Residence Life & Housing	Co-Chair
John Pelesko	*Associate Dean*	College of Arts & Sciences	Co-Char
Eric Wommack	*Deputy Dean*	College of Agriculture & Natural Resources	
Michael Vaughan	*Associate Dean*	Academic Affairs College of Engineering	
Ann Ardis	*Interim Vice Provost*	Graduate & Professional Education	
Marilyn Prime	*Executive Director*	Student Centers and Student Engagement	
Laura Glass	*Director*	Delaware Center for Teacher Education	
Iain Crawford	*Director*	Office Undergraduate Research & Experiential Learning	
Patricia Fitzgerald	*Director*	Recreation Services	
Michelle Bennett	*Sustainability Manager*	Facilities, Real Estate and Auxiliary Services	
Kyra Kim	*Graduate Student*		
Matt Herman	*Undergraduate Student*		

Community, Diversity and Engagement

	DATA/ OBSERVATION	ANECDOTAL	GAP OR DATA NEEDS
FINDINGS			
UD has very little space specifically designated as **'multicultural'**.	●	●	
Cultural venues and assembly spaces are distributed across campus, but generally have low visibility.	●	●	
Demographic makeup of the University's student body does not reflect the diversity of the state and generally compares poorly against other AAU Public institutions.	●	●	
Historically, the approach to **diversity and inclusion** has been reactionary rather than an integrated part of campus culture.		●	
Academic support and administrative services may not be welcoming to underrepresented, minority and first generation students.		●	Academic Support utilization data
Parking and transportation are important considerations in creating a welcoming and accessible campus.		●	
Agricultural extension is an important component of **community engagement** across the state.	●	●	

EMERGING THEMES
Diversity and inclusion have been long standing challenges for the University, with most change driven by outcry rather than an accountable commitment to improvement.
Community engagement is an important aspect of the University's cultural identity and is critical to cultivating a diverse campus community.
Museum, Arts + Culture are clear points of engagement with the external community, but there is a need to be more welcoming and accessible.
A **commitment to diversity** requires organizational, policy, and human resources that are a complement to visible and welcoming multi-cultural spaces.
Diversity and inclusion should be integrated into all aspects of campus life including **academics, services, student activities and employee recruitment**.

Community, Diversity and Engagement Stakeholder Working Group Members

Lynnette Overby	*Professor*	Department of Theater	Co-Chair
Dan Rich	*Professor*	School of Public Policy & Administration	Co-Chair
Susan Groff	*Director*	Office of Equity & Inclusion	
Cheryl Richardson	*Associate Director*	Center for Teaching & Assessment of Learning	
Carol Henderson	*Vice Provost for Diversity*	Office of the Provost	
Kasandra Moye	*Director*	Center for Black Culture	
Rick Deadwyler	*Director, Government Affairs*	Communications & Public Affairs	
Kim Bothi	*Associate Director*	Institute for Global Studies	
Heather Kelly	*Director*	Office of Institutional Research & Effectiveness	
Kervin Zamora	*Graduate Student*		
Valerie Lane	*Administrative Coordinator*	Community Engagement Initiative	
Kimberly Saunders	*Executive Director*	McNair Scholars Program	

Transportation and Accessibility

	DATA/ OBSERVATION	ANECDOTAL	GAP OR DATA NEEDS
FINDINGS			
There are **significant number of crashes** involving pedestrian and bicycles in the areas surrounding campus.	●		Pedestrian/vehicular/ bicycle traffic counts Vehicular Crash Data
Infrastructure in and around campus does not support a safe environment for biking.	●	●	
Geographical spread of campus and location of activity centers (recreation, residential, academics, research, etc.) create conflicts between pedestrian, bike, and vehicular networks.		●	Pedestrian/vehicular/ bicycle traffic count
Response to **disability services** has been driven by compliance rather than a proactive approach to campus accessibility.		●	Baseline Accessibility Audit
Both UD and City of Newark are looking for ways to improve the **safety and climate of biking** in and around campus.		●	
Movement between different campus zones (Laird, Central, South/STAR) is a challenge for students and faculty with consecutive classes.		●	Bus transit utilization
Accessibility Audit is needed to understand existing accessibility conditions.		●	Baseline Accessibility Audit
There are many 'front doors,' but no **common identify or sense of arrival**.		●	Pedestrian/vehicular/ bicycle traffic count

EMERGING THEMES
Campus needs a more **comprehensive framework for connectivity** that supports all modes of transportation in safe and efficient manner.
Improving the **bike and pedestrian networks** requires policy and physical intervention internally as well as advocacy and engagement with external stakeholders.
A proactive approach is needed to properly respond to the need of **persons with disabilities**.
STAR campus may offer opportunities in space, but may exacerbate challenges around campus connectivity and cohesion.
The campus has many 'front doors' but they lack a **defined sense of arrival and clear campus identity**.
Campus needs a distinct sense of arrival from multiple directions that reinforces a **sense of identity and wayfinding for first time visitors**.

Transportation and Accessibility Stakeholder Working Group Members

Richard Rind	*Director*	Auxiliary Services	Co-Chair
Annie Jannarone	*Director*	Disability Support Services	Co-Chair
Michael Loftus	*Assistant Director*	UD Grounds	
Sue Wyndham	*Landscape Planner*	UD Grounds	
Jenni Sparks	*Manager*	Parking & Transportation Services	
Banlusack Phommachanh	*Supervisor*	Parking & Transportation Services	
Roger Bowman	*Manager*	UD Grounds	
Shearee Barnett	*Manager*	Parking & Transportation Services	
Tim Dowling	*Director*	Student Health Services	
Heather Dunigan	*Principal Planner*	WILMAPCO	
Mark Deshon	*Chair*	Newark Bicycle Committee	
Ethan Robinson	*Planner*	City of Newark	

Safety, Security and Wellness

	DATA/ OBSERVATION	ANECDOTE	GAP OR DATA NEEDS
FINDINGS			
Certain **off-campus areas** have a higher incidence of undesirable behaviors.		●	Locations of Police/ Public Safety Calls
Counseling Services, Health Promotion and Student Health have significant location and space issues.	●	●	
City and campus roadways do not support safe pedestrian or bicycle travel.	●	●	Pedestrian/vehicular traffic counts
Transport of **hazardous waste** is highly constrained due to issues of property contiguity and facility location.	●	●	
There are significant conflicts between **pedestrian circulation and service /loading corridors**.	●	●	Pedestrian/vehicular traffic counts
Campus geography places significant pressure on transportation network and has a reductive effect on connectivity, mobility and campus cohesion.		●	

EMERGING THEMES
Cultivating a more collaborative **relationship with City of Newark** could lead to a more proactive approach to off-campus incidents.
Physical and policy interventions—both internal and external—are needed to support robust and safe biking infrastructure.
A proactive approach to **accessibility and mobility**, especially as populations with identified disabilities are expected to increase in coming years, is needed.
Enhancements to **campus transportation infrastructure** are needed.
Proper training and policies are necessary to support a culture of safety within research and academic units.
Current facilities for addressing wellbeing are insufficient to promote a **culture of wellness** on campus.
Service, hazardous waste transport and loading functions need clear policies and improved routes.

Safety, Security and Wellness Stakeholder Working Group Members

Skip Homiak	*Exec Director*	Campus + Public Safety, Public Policy	Co-Chair
Timothy Dowling	*Director*	Student Health Services	Co-Chair
Charles Beale	*Director*	Center for Counseling & Student Development	
Patrick Ogden	*Chief of Police*	Office of Campus & Public Safety	
C Lombardi	*EMT*	Emergency Care Unit	
Ricky Hernandez	*Student*	Police Cadet Program	
Nancy Chase	*Director*	Student Wellness & Health Promotion	
Brandon Stacy	*Cmte. President*	Student Health Advisory	
Charles Beale	*Director*	Center for Counseling & Student Development	
Kelly Cardner	*Administrative Assistant*	Office of Campus & Public Safety	

Infrastructure and Operations

	DATA/ OBSERVATION	ANECDOTAL	GAP OR DATA NEEDS
FINDINGS			
Meeting **infrastructure needs** is possible in the short term, but the impact of upcoming projects is unknown (i.e. MRI, ISE, Phase IV Housing, etc.).	●		Prioritized space needs projections (5yr, 10yr, etc...)
CHW district is being run in excess of standard needs to meet requirements for small number of buildings and equipment.	●		
Pursuit of **energy efficiency measures** is hampered due to administrative and staffing constraints.		●	Current energy efficiency programs/initiatives
There is available space to increase capacity at both **ECUP (CHW) and Central Utility Plan (steam)**.	●		
Data is being gathered but not being analyzed to support decision making or demand management.	●	●	
Quality of City of Newark power service is not reliable and causes significant issues for efficient physical plant operation.	●		
Significant **stormwater and flooding issues** are present in buildings and landscape spaces on campus.		●	

EMERGING THEMES
Lack of **comprehensive campus plan** drives decentralized decision making and piecemeal approach to building maintenance and modification.
Building maintenance is largely reactionary, and needs a better operational model.
Stormwater compliance is likely to become a significant regulatory issue, necessitating a coordinated framework for the campus.
Dependent **relationship of city and university** is a disincentive to modifying utility usage.
Analysis of available data may offer significant opportunities for identification of efficiencies, demand management and usage reduction.
Building performance standards are needed to prioritize improvements and facilities renewal investments.

Infrastructure and Operations Stakeholder Working Group Members

Paul Dickinson	*Director*	F.R.E.A.S., Maintenance & Operations	Co-Chairs
Joe Lapalombara	*Asst. Director*	F.R.E.A.S., Maintenance & Operations	Co-Chairs
Zach Platsis	*Manager*	F.R.E.A.S., Energy & Engineering	
Tim Becker	*Manager*	Residence Halls Maintenance + Operations	
Melvin Rau	*Manager*	Information Technology	
Michael Gladle	*Director*	Environmental Health & Safety	
Maria Taylor	*Director*	College of Engineering, Facilities Planning	
Krista Murray	*Assistant Director*	Environmental Health & Safety	
Brian Schuster	*Associate Director*	F.R.E.A.S., Maintenance & Operations	
Sue Wyndham	*Landscape Planner*	UD Grounds	
Michael McGuiness	*Maintenance Engineer*	F.R.E.A.S., Energy & Engineering	
Christine Cook	*Senior Business Officer*	College of Engineering	
Tim Filasky	*Deputy Director*	City of Newark, Public Works & Water Resources	

Sustainability and Environmental Management

	DATA/ OBSERVATION	ANECDOTE	GAP OR DATA NEEDS
FINDINGS			
Energy consumption and transportation emissions have greatest potential to reduce GHG emissions.	●	●	
UD has relatively little **organizational infrastructure** (staff, funding) to support sustainability, when compared to other institutions that have made sustainability a priority.	●		
Energy Efficient has not been a driver of change on campus, but significant opportunities exist for low cost/ high impact changes to be implemented.	●		
Stormwater has been addressed in a piecemeal fashion in various areas of campus	●	●	

EMERGING THEMES
Sustainability has historically not been a driver of campus decision making.
A **framework** is needed to facilitate decisions that have social, economic and environmental benefits.
There is tremendous potential for **co-curricular, research and pedagogical overlaps** to advance sustainability at UD.
Stormwater compliance is likely to become a significant regulatory issue, necessitating a coordinated framework for the campus.

Sustainability and Environmental Management Stakeholder Working Group Members

John Byrne	*Director*	Center for Energy & Environment	Co-Chair
Michelle Bennett	*Sustainability Manager*	F.R.E.A.S	Co-Chair
Michael Loftus	*Asst. Director*	UD Grounds	
Sue Wyndham	*Landscape Planner*	UD Grounds	
Jennifer Pyle	*EHS Officer*	Office of Environmental Health & Safety	
Deborah Blanchard	*Manager*	Lerner College of Business & Economics	
Tabitha Groh	*Communications Specialist*	Communications Specialist Res Life & Housing	
Joe Nyangon	*Gradaute Student*	Center for Energy & Environmental Policy	
Zachary Niklaus	*Undergraduate Student*	Center for Energy & Environmental Policy	

3.

[Photo: Alan Levine]

Assessment

The University Today

STAKEHOLDER WORKING GROUP EMERGING THEMES

- The University and the City of Newark have overlapping interests in may areas including transportation, utilities (power, stormwater, etc...), housing policy, and safety.
- The University is separated into three zones (Laird Campus, Central Campus, South Campus/STAR) that are defined by the City's rail infrastructure.
- College Avenue is the vehicular and pedestrian spine that binds the three campus zones together.
- The University has multiple activity centers that are spread across the City of Newark and face challenges of sense of place, identity and connectivity.
- The campus has many front doors, but no clear sense of arrival or orientation.
- **Organizational silos prevent coordination** across departments and colleges and hinders integrated decision making.
- Financing and bonding practices for building construction on campus discourages inter-college collaboration and reinforces organizational silos.
- **Capital prioritization and financing models of academic buildings** do not support coordinated decision making across colleges.
- Focus should be on understanding how to become **a more engaged campus** within the current physical form.
- Definition is needed to determine the right mix of **services and activities** in each area of campus to foster a unique sense of place that supports a vibrant campus identity.
- **Diversity and inclusion** have been long standing challenges for the University, with most change driven by outcry rather than an accountable commitment to improvement.
- **Community engagement** is an important aspect of the University's cultural identity and is critical to cultivating a diverse campus community.
- A **commitment to diversity** requires organizational, policy, and human resources that are a complement to visible and welcoming multi-cultural spaces.
- The campus has many 'front doors' but many of them lack a **defined sense of arrival and clear campus identity**.
- Campus needs a distinct sense of arrival from multiple directions that reinforces a **sense of identity and wayfinding for first time visitors**.
- A Sustainability **framework** is needed to facilitate decisions that have social, economic and environmental benefits.

FINDINGS

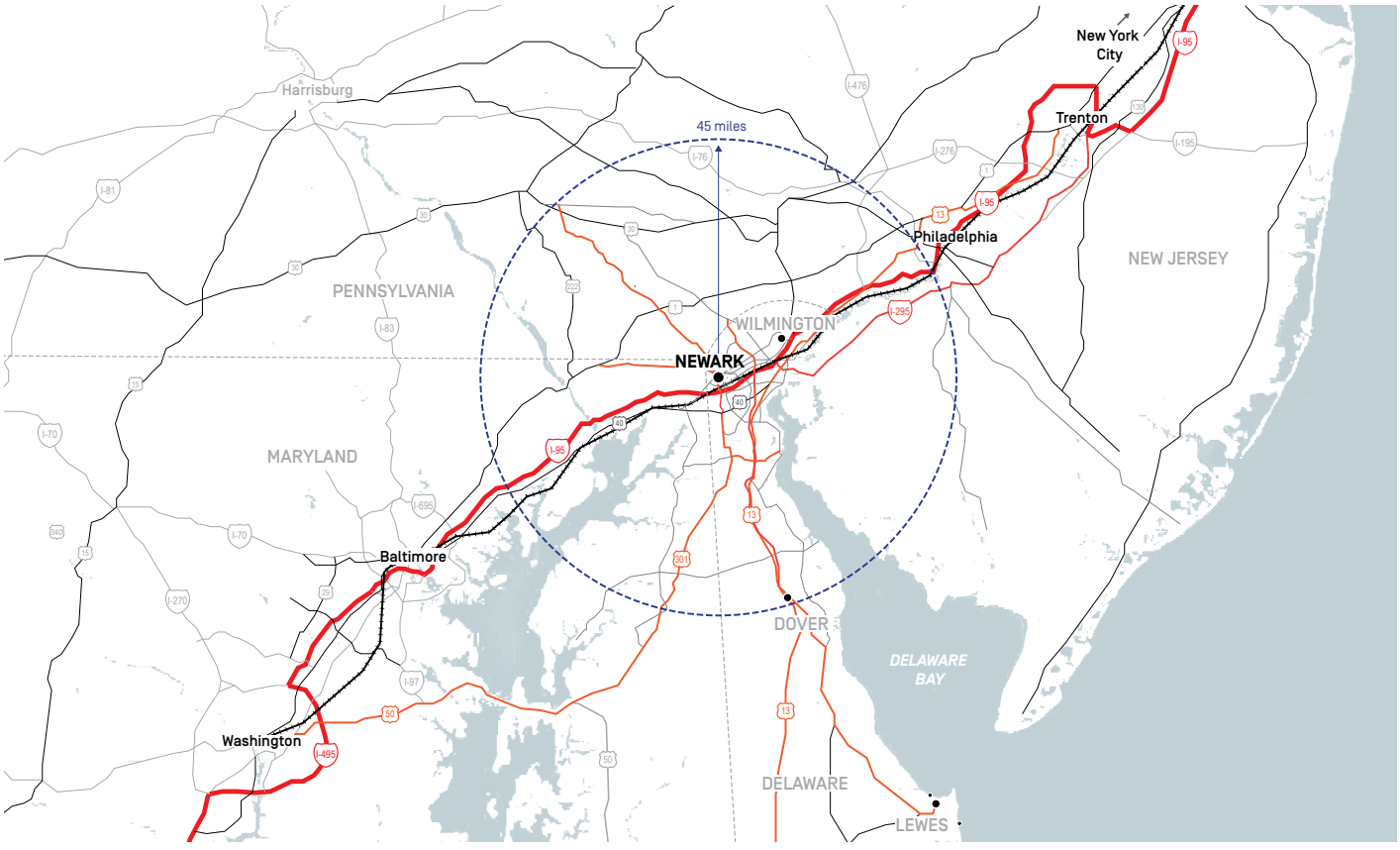
- The University is an economic engine for the region.
- The University and the City have many areas of intersecting interest, including housing, utilities, transportation networks and public safety.
- Many areas around campus are dominated by student occupied rental housing, impacting neighborhood activities and character.
- "All roads lead through Newark." Putting pressure on the vehicular, pedestrian, and bike network for this important downtown.
- The University is divided into three distinct zones by the rail infrastructure. This makes Central Campus like a walled city.
- The three campus zones display different landscape characters including: Natural forest, Formal landscaped spaces, Agricultural fields and Athletics.
- The University has multiple activity centers that are spread across the City of Newark and that face challenges of sense of place, identity and connectivity.
- There are many 'front doors' to campus, but most lack a sense of arrival and clear campus identity.
- College Avenue is the primary thoroughfare that connects the three campus zones.
- "Silo-ing" of academic, operational and financing functions is a barrier towards long-term thinking, collaboration and coordination of capital expenditures.
- Diversity has been a long standing challenge for the University. The current demographics of the University do not reflect the demographic makeup of Delaware and compare poorly when compared to other AAU-Public institutions.
- University of Delaware is in the process of defining which issues are the most important and the extent to which each issue under the umbrella of sustainability will be integrated into the campus.

University of Delaware in the Region

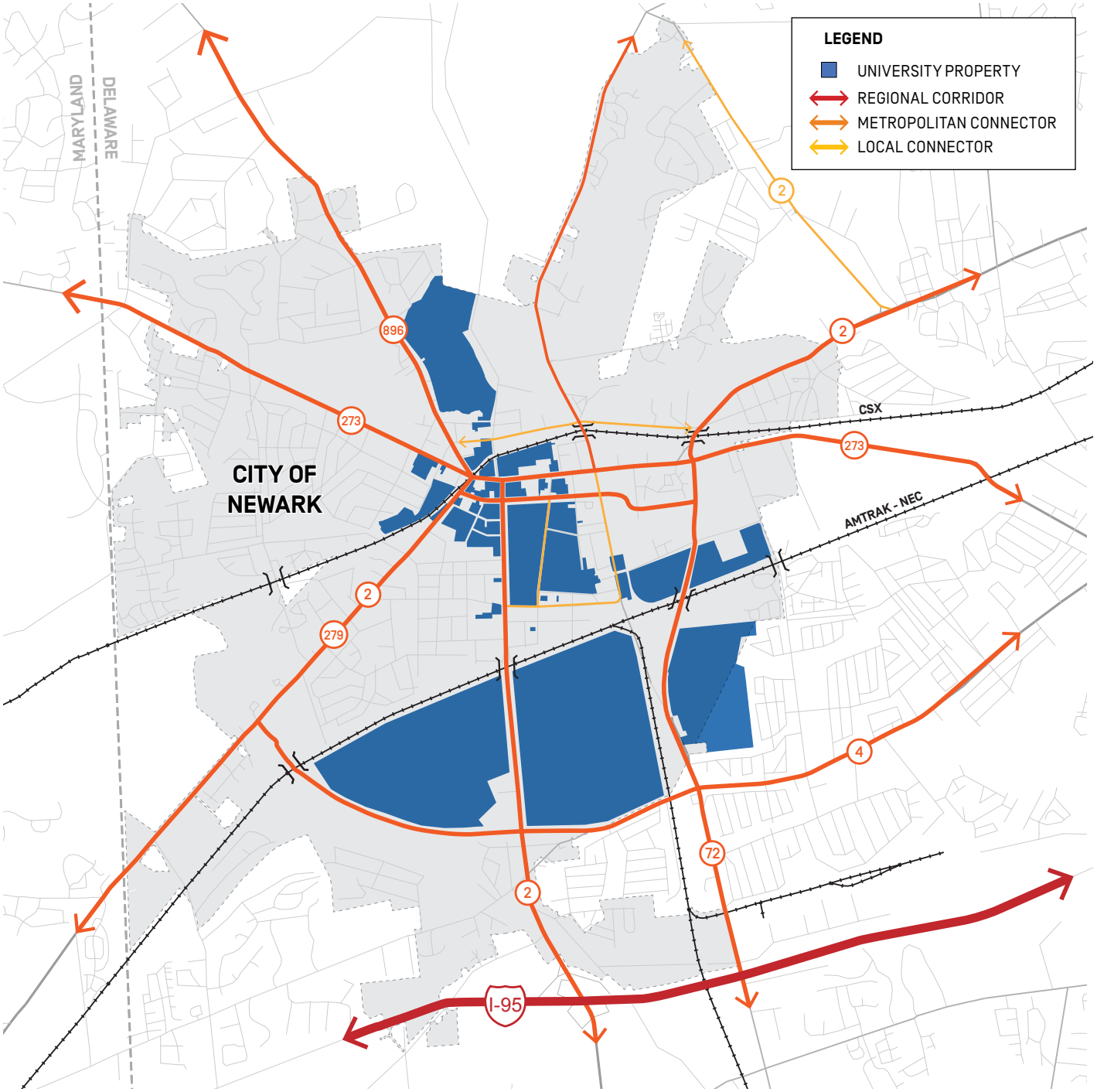
The University is an economic engine for the region.

The University of Delaware is situated at the approximate mid-point of the rail and road corridor that links Washington, DC to New York City. Over its long history it has stood at the crossroads between the north and south, and has influenced (and been influenced by) the economic, industrial and educational characteristics of the region.

Industries such as Agricultural, Chemical, Pharmaceutical and Biotechnology have influenced the development of University of Delaware's academic and research programs. Within the region, the University plays an important research and extension role to supporting industrial farming and agriculture. Similarly, the regional importance of the chemical and pharmaceutical industries have had a direct impact on the growth of the university in terms of physical infrastructure as well as the importance of STEM fields such as chemistry and engineering. More recently, STAR campus and the Delaware Technology Park have increased the ties of the university to the technology, healthcare, and biotech sectors within the state and region.



Newark Regional Context



Newark Road Network Diagram

In addition to the geographic location, the City of Newark and the University have been influenced by regional road and transportation networks. The interstate (I-95) and rail network (Amtrak and CSX) are important regional connectors. However, the metropolitan and local road networks that connect Newark and the University to the larger metropolitan region have defined the physical form of the campus, and in many ways have constrained its development over time. Our analysis of the regional road network shows that all roads lead to downtown Newark. The results of this physical reality have put significant pressure on the existing road network to process a large volume of traffic that has few choices other than to pass through Newark , especially if traveling to local destinations in Maryland, Delaware and Pennsylvania.

Relationship of City and University

The University and the City have many areas of intersecting interest, including housing, utilities, transportation networks and public safety.

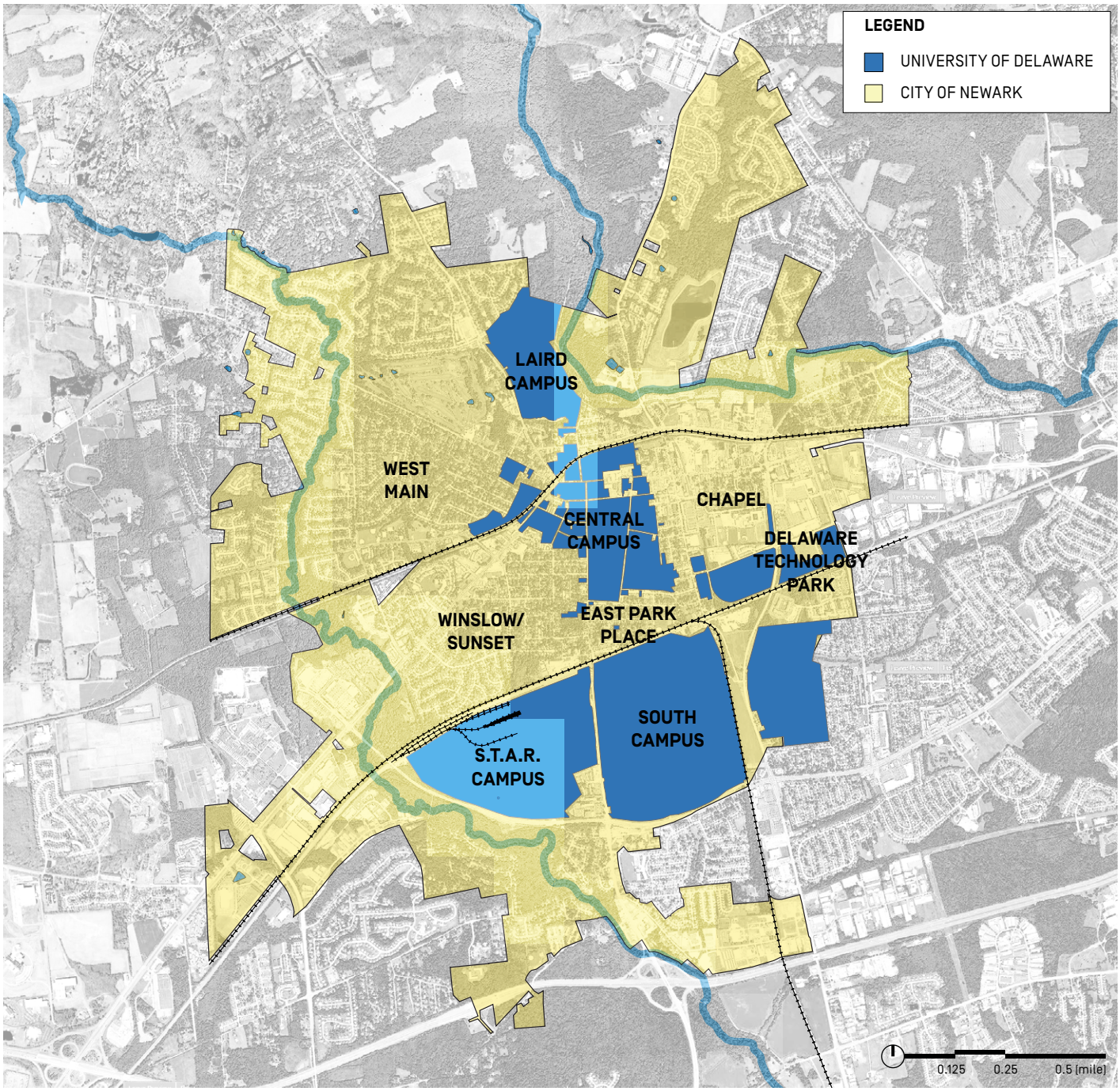
Since its earliest days, the University has grown alongside the City of Newark. Even today, their interdependent relationship influences local economic development, infrastructure, housing, neighborhood character, and community culture. The development of the Main Street commercial corridor and surrounding neighborhoods has been deeply influenced by the growth of the campus over time. As the student, faculty and staff population of the university have grown, the commercial and residential areas surrounding the campus have adapted to support the needs of these populations. Further, the expansion of the university – both in terms of land and buildings – has been enabled by infrastructure and services such as electricity, water and other utilities as well as transportation infrastructure and transit services.

With the University of Delaware occupying approximately 41% of the land area within City of Newark, and a campus population of 21,000 students and 9,000 employees, it comes as little surprise that there is a highly interdependent relationship between the university and the city. As the university has grown, and the city has developed around it, these areas of mutual interest have come to include economic development, housing and neighborhood character, streets and transportation networks, as well as utilities and other infrastructure.

Main Street

For many, the experience of UD's historic core and Central Campus is inseparable from an image and experience of Newark's Main Street and central business district. Many of the businesses on Main Street cater specifically to the university community, and the university has made significant recent investments along the main street corridor including the construction of the UD Bookstore (2014) and several significant leases to support academic and administrative functions. While East Main Street is a state road, it plays an important cultural role in the life of the University and the City – a place where students, faculty, staff and the larger community can come together in a walkable, vibrant, downtown environment.

View of Newark Main Street



University Of Delaware & Newark City Boundary

21,141
UD Student Enrollment

31,454
City Population

0.69
Student / City Population Ratio

1,166
Campus Area (Acres)

5,696
City Area (Acres)

0.41
Campus / City Land Area Ratio

Source: Office of Institutional Research + Effectiveness, Census.Gov

Relationship of City and University

Many areas around campus are dominated by student occupied rental housing, impacting neighborhood activities and character.

Off Campus Student Housing Neighborhoods

The university houses approximately 7,300 undergraduate students on campus, representing approximately 44% of the total undergraduate population. The remaining 56% of undergraduates represents 9,500 students living in off-campus housing.

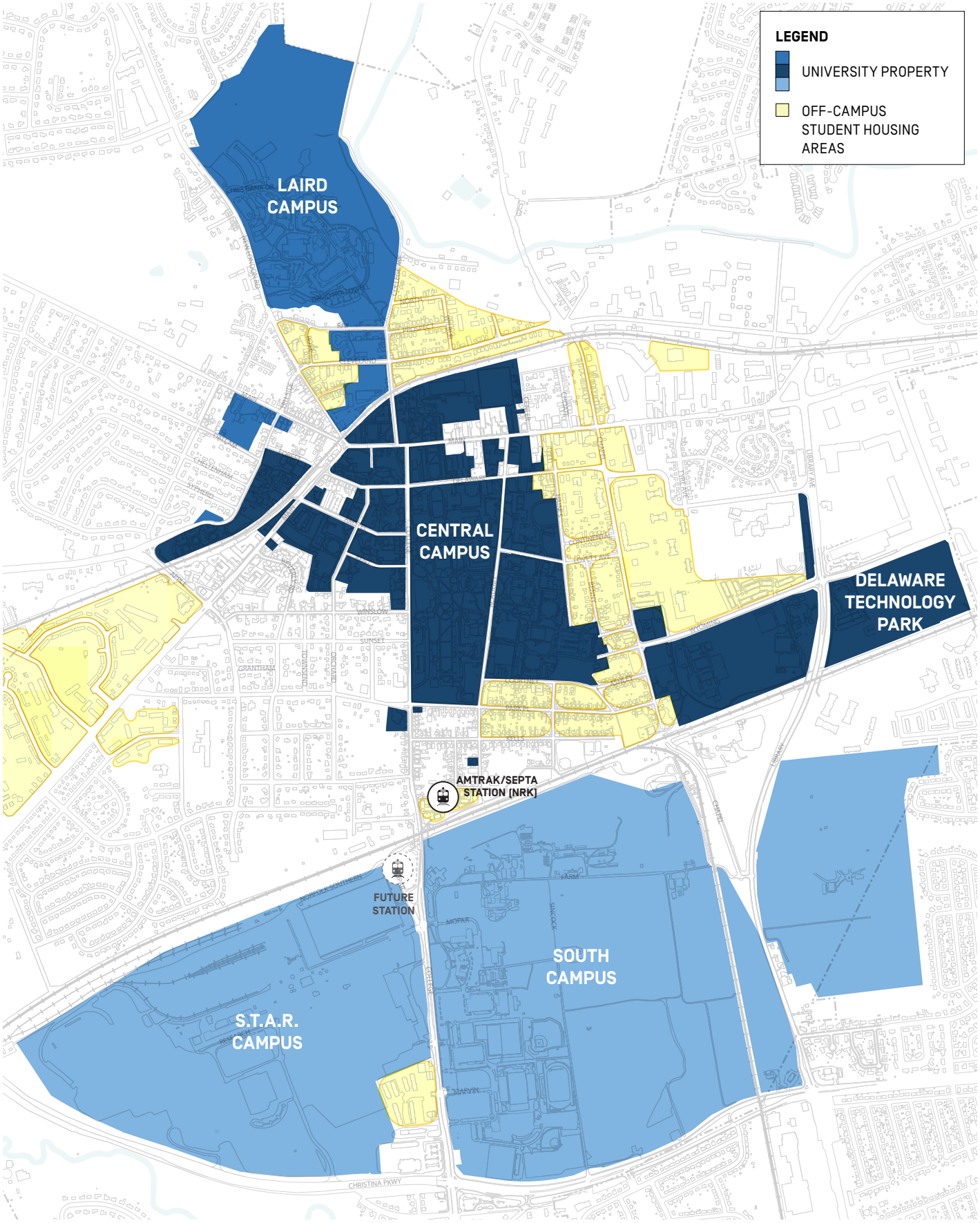
From some perspectives, the residential areas surrounding campus represent a vibrant rental market. However, there is a perception that areas dominated by student rental housing are associated with partying, poor housing conditions and higher incidence of undesirable behaviors.

Both the university and the city have a clear interest in the quality of the residential environment of the areas surrounding campus. The attraction and retention of residents – whether they are associated with the university or not – is an important factor in the economic development of the city as well as the perception of the university by prospective students and their families.

North Chapel Street Off-Campus Residential Area

Campus Crosswalk between Classes

Campus Sidewalk



Areas Of Significant Off-Campus Student Housing

Relationship of City and University

"All roads lead through Newark." Putting pressure on the vehicular, pedestrian, and bike network for this important downtown.

Transportation Networks

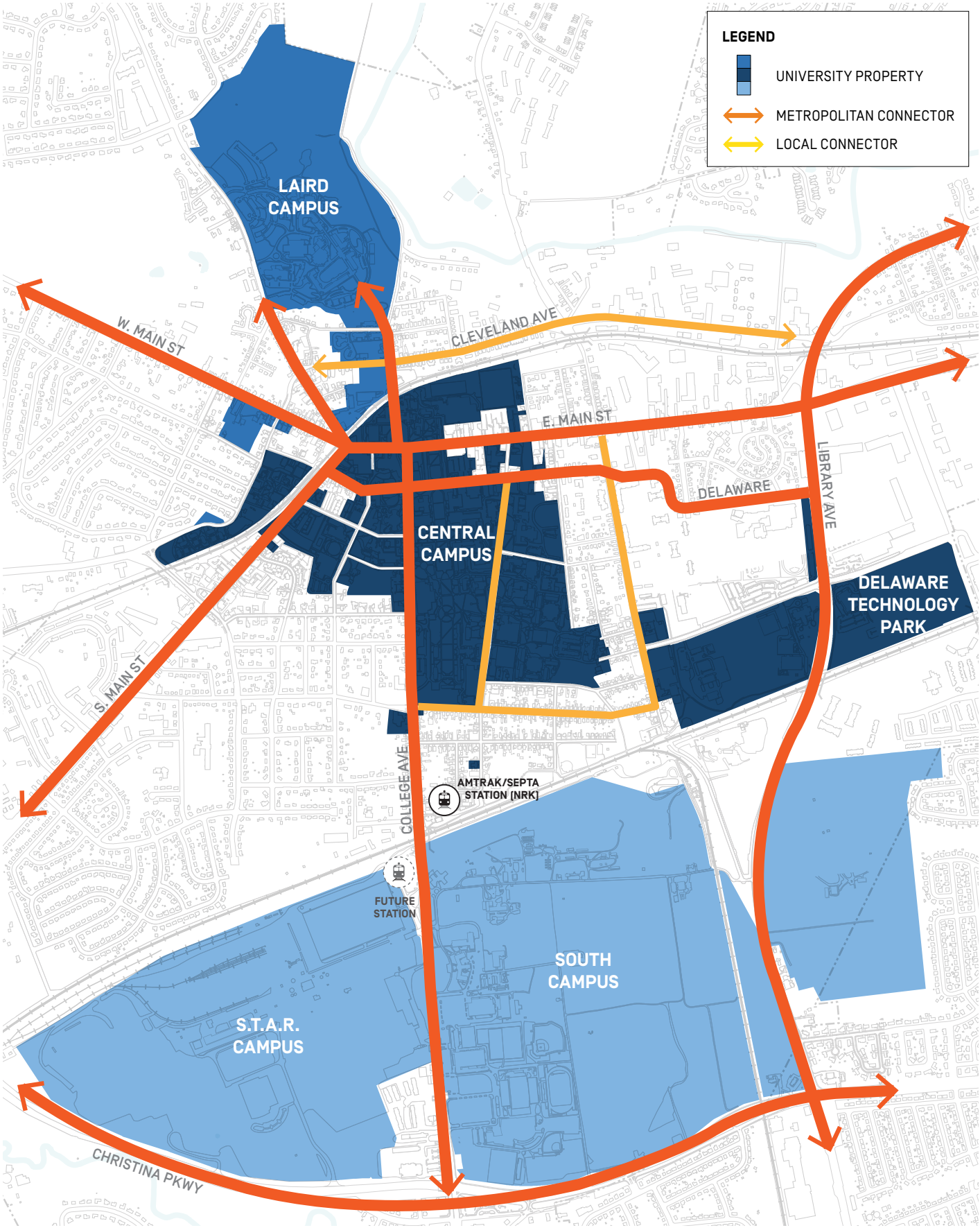
With the university embedded within the City of Newark, the vast majority of campus vehicular, bike and pedestrian traffic relies on the use of city, county or state owned roadways to travel between campus areas. While 'The Green' offers a strong organizing idea for north-south pedestrian travel, the high concentrations of academic and residential uses in peripheral campus areas puts significant pressure on external vehicular roadways. Furthermore, the vast majority of vehicular traffic uses a small number of crossings to enter the central campus and downtown area. Unlike many campuses that have internal roadways, the University relies almost exclusively on external roadways to handle its vehicular traffic.

Since both the university and the City need these roadway networks to meet their transportation needs, there is a significant opportunity for collaborating on strategies for reducing congestion, improving the quality of the pedestrian environment and improving safety for cyclists.

Railroad Crossing

Campus Crosswalk @ College Avenue

Pedestrian and Service Lanes



Metropolitan Road Hierarchy

Three Campus Zones

The University is divided into three distinct zones by the rail infrastructure. This makes Central Campus like a walled city.

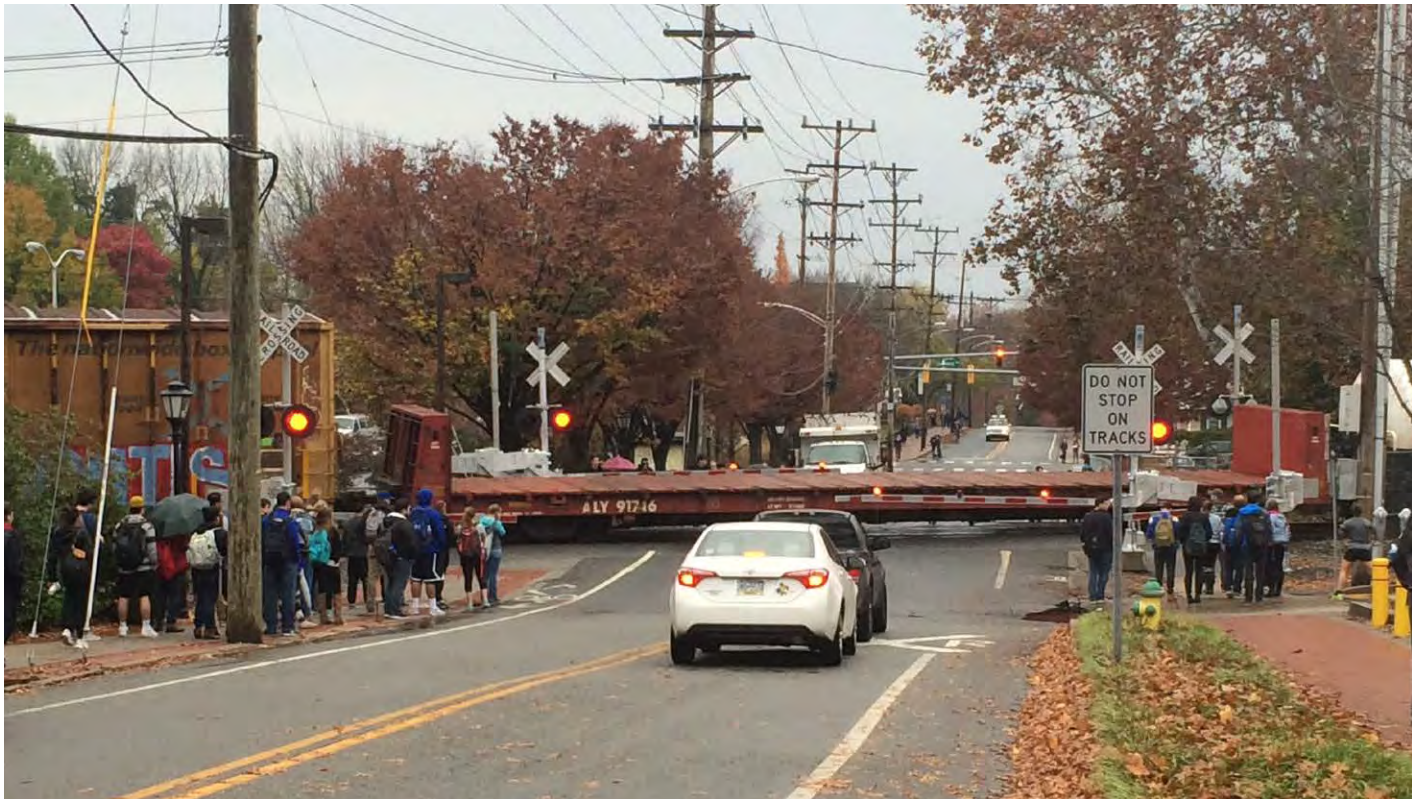
Rail Infrastructure

The campus is divided into three zones by passenger rail to the south (Amtrak NEC) and a freight rail line to the north (CSX). These rail lines have created barriers to programmatic, infrastructural, physical and social integration of the campus that have resulted in a divided campus.

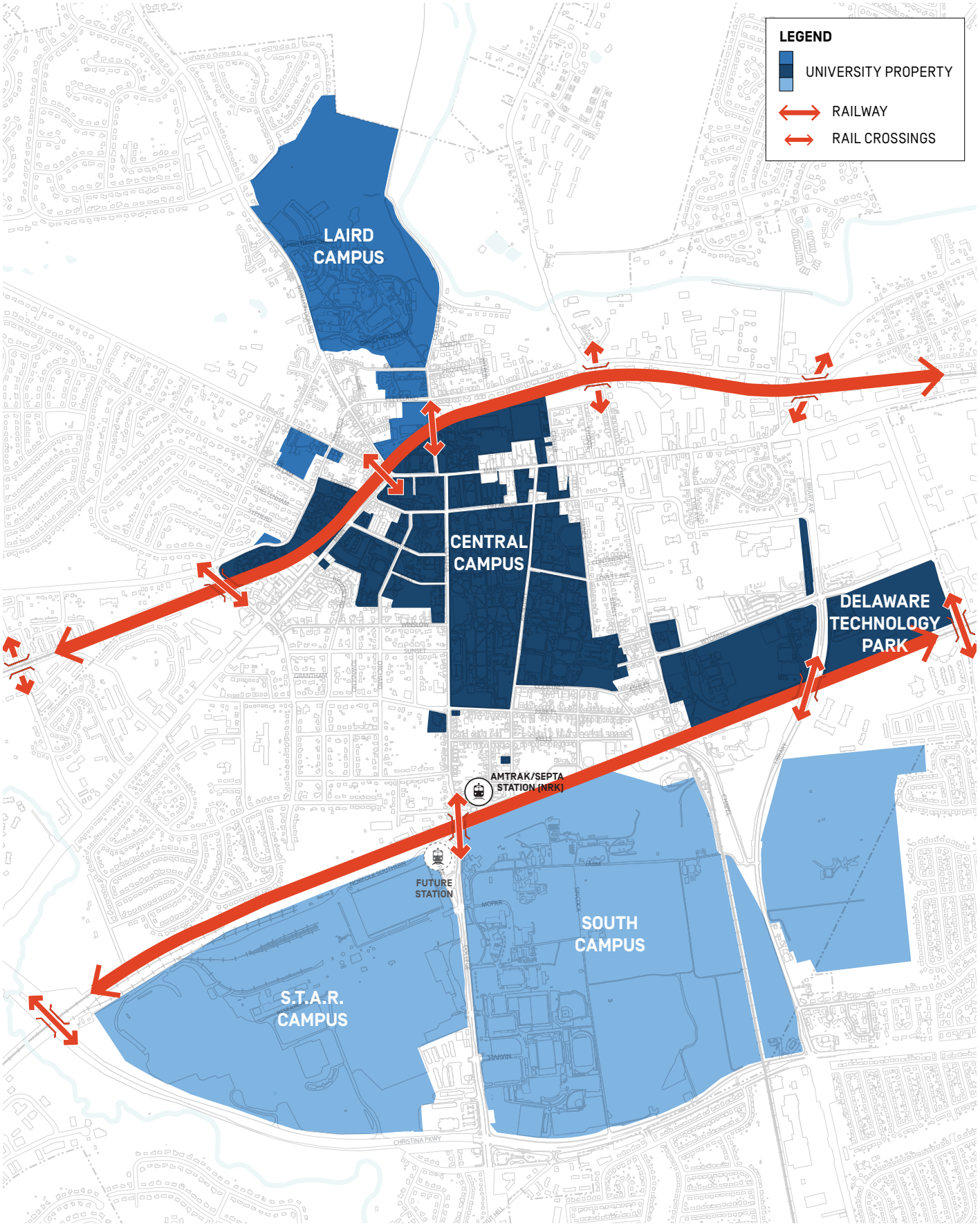
- The northern zone consists of Laird Campus and has a distinct suburban form and is dominated by residential facilities that houses 46% of all undergraduate on-campus residential beds (based on double occupancy). Laird Campus is linked to Central Campus by College Avenue and a pedestrian bridge that serves as the primary pedestrian link over the CSX rail line.

- The Central Zone, which contains Central Campus, East Campus and the Delaware Technology Park is bounded by the CSX freight rail line on the north and the Amtrak NEC passenger rail to the south. This zone contains the academic and administrative core of the University as well as the central business district of the City of Newark. This zone contains the remaining 54% of the total on-campus residential beds (based on double occupancy).

- The southernmost zone is situated south of the CSX freight line and consists of the College of Agricultural and Natural Resources, Newark Farm, athletics precinct and STAR campus. Again, College Avenue provides the primary north-south connection to Central Campus by way of a 2 lane bridge and pedestrian path over the Amtrak NEC rail line. Additional connections are provided at Library Avenue, but this is far east of the campus and is largely a vehicular connection between Main Street, Christina Parkway and the I-95 corridor.



College Avenue at CSX Rail Crossing



Campus Zones Diagram

Three Campus Zones

The three campus zones display different landscape characters including:
Natural forest, Formal landscaped spaces, Agricultural fields and Athletics

In the area around Laird Campus, the landscape character of **North Campus** is defined by steep slopes, ravines, creeks, and natural woodlands. Within the areas that have significant residential facilities there are managed lawns, recreational fields and hardscape areas. However, the residential facilities in this area of campus are almost completely surrounded by natural areas and have direct connections to the local park and trail systems surrounding White Clay Creek.

Central Campus is generally thought of as the historic core of the University, and the landscape is characterized by highly managed and manicured open spaces. In general these types of landscapes are associated with campuses and urban centers. These open spaces are the most formally programed areas of the campus landscape network, often relating to specific buildings with the potential to accommodate large amounts of activity, either planned or informal.

South Campus, which includes the College of Agriculture and Natural Resources, STAR, and the athletics precinct, the primary landscape character is defined by expansive open spaces that accommodate agricultural or athletic programs.

Three Campus Ecological Open Space Zones

A Polycentric Campus

The University has multiple activity centers that are spread across the City of Newark and that face challenges of sense of place, identity and connectivity.

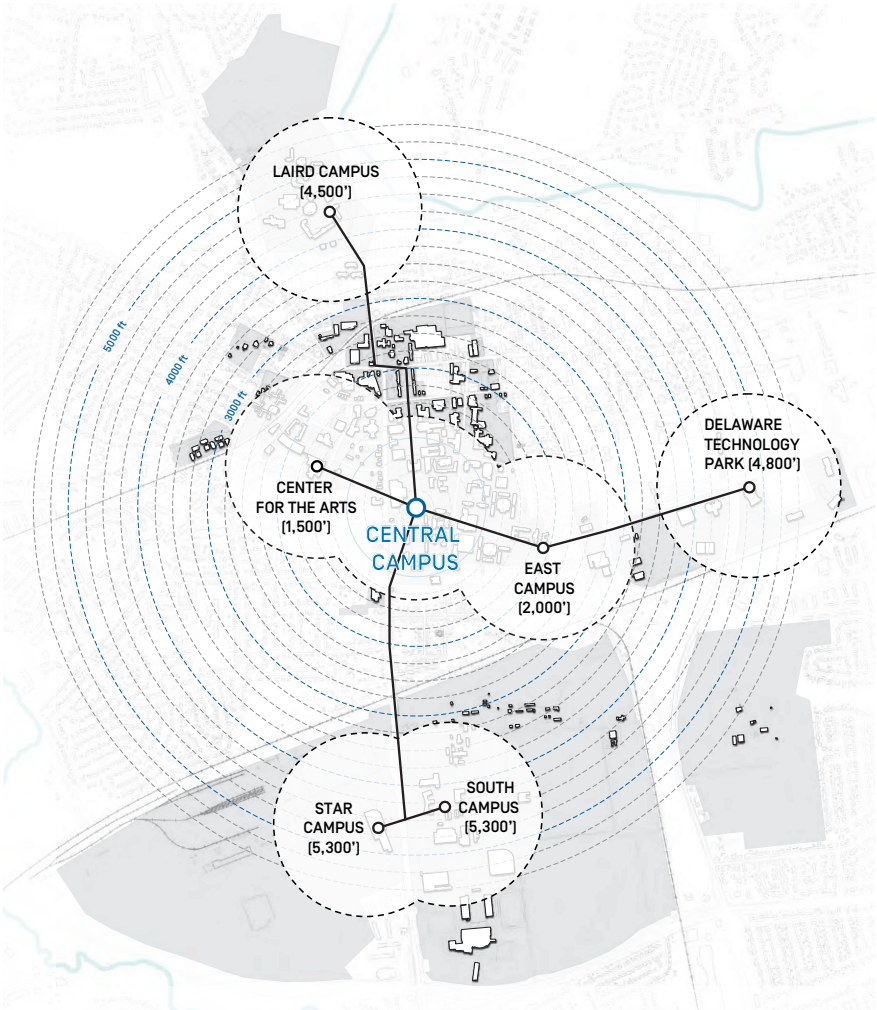
The current form of the university shows the presence of multiple campus centers that have significant distinctions in types and concentration of uses. The highest concentration of academic, campus life, and administrative uses on Central Campus form a clear center of activity that is associated with the commercial and urban core of the City. The high concentration of residential uses at East Campus/ South Green and Laird Campus form distinct residential zones that function as satellites to the academic core of Central Campus. South Campus and STAR Campus represent two additional activity centers that have their own populations and gravity including the Health Sciences complex at STAR campus, the Athletics precinct, and the College of Agriculture and Natural Resources.

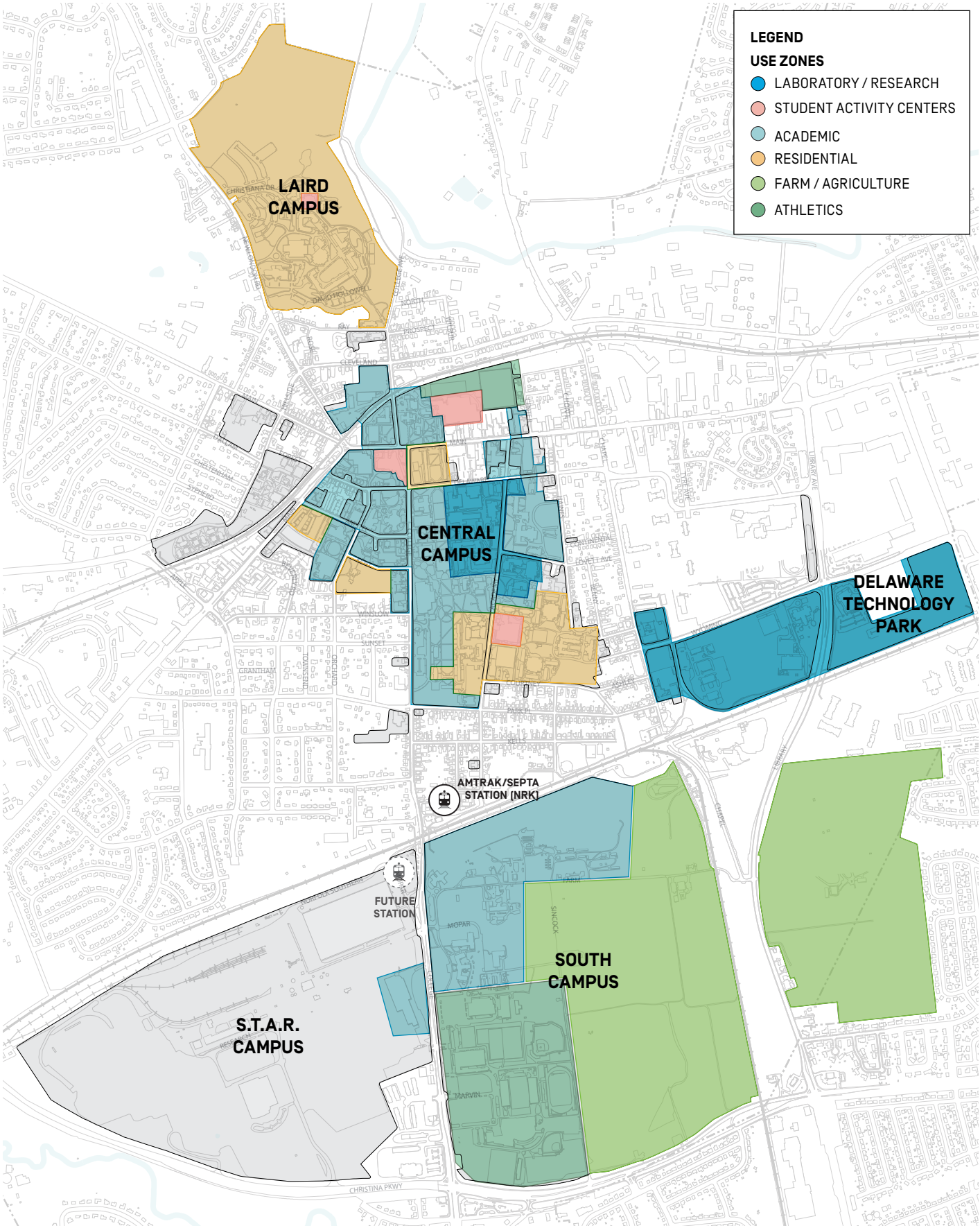
The fact that the University has developed in a poly-centric way partially explains the need for high quality pedestrian and vehicular connections to facilitate movement between multiple areas of campus. The polycentric nature of the campus also highlights the importance of providing the right collection of uses and activities within each area of campus to ensure that each center provides a high quality experience to its users.

Campus Accessibility / Connections

	Distance From Central Campus (feet)	Walk Time* (Minutes)
West Campus	1,600	6
Center for the Arts	1,500	6
East Campus	2,000	8
Laird Campus	4,500	17
Delaware Tech. Park	4,800	18
South Campus	5,300	20
STAR Campus	5,300	20

5 Min. Walking (Radius)
* 1/4 mile = 5 minute walk distance





Campus Use Zones And Centers

Sense of Arrival, Campus Gateways and Identity

There are many 'front doors' to campus, but most lack a sense of arrival and clear campus identity.

The visual identity of the campus is an important aspect that the framework plan can address. Clearly, the historic core of the campus evokes a sense of organization and has a clear visual identity. However, the cohesion and organization of campus buildings and open spaces becomes less clear as distance from the historic center increases. Of particular note is the effect that sprawling growth of the university and the city has had on the sense of arrival, quality of campus gateways, and the physical identity of campus.

Our analysis identified at least five 'front doors' to the campus that each have a distinct character and context. However, most of them lack a clear sense of arrival, identity or connection to a larger concept of campus. Several of these gateways are meant to provide a sense of arrival by vehicular means, but there are also those that are meant to provide a pedestrian level experience that is safe, welcoming and clearly defines the boundaries of the University.

In all cases, there are significant opportunities for improving the visual presence and identity of the University as well as the pedestrian and vehicular environment.

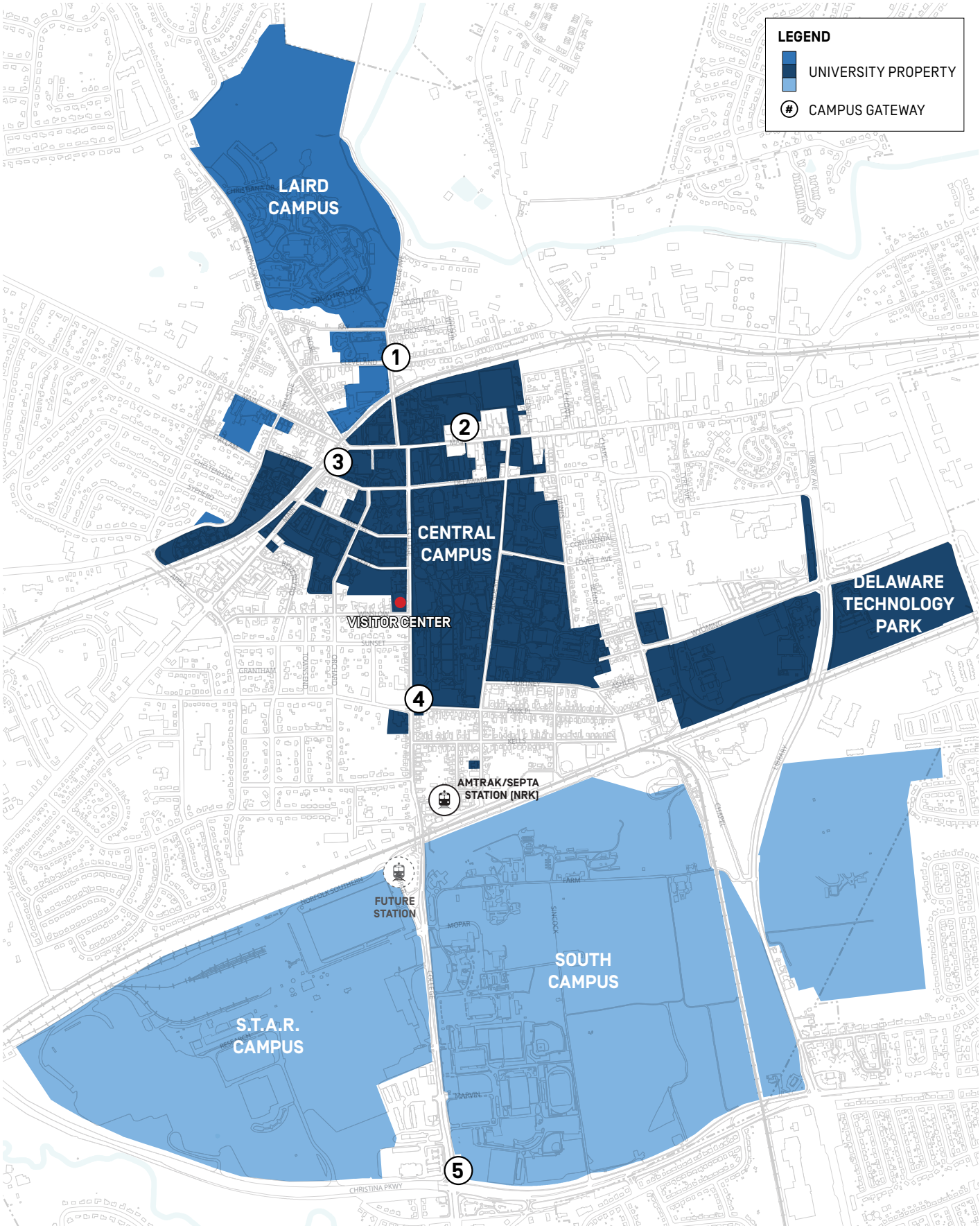
1. North College Ave at CSX Rail Crossing

2. East Main St. at 'The Green'

3. West Main Street at CSX Rail Crossing

4. South College Ave at Park Place

5. South College Ave at Christina Parkway



Important Points of Arrival and Campus Gateways

College Avenue as Campus Spine

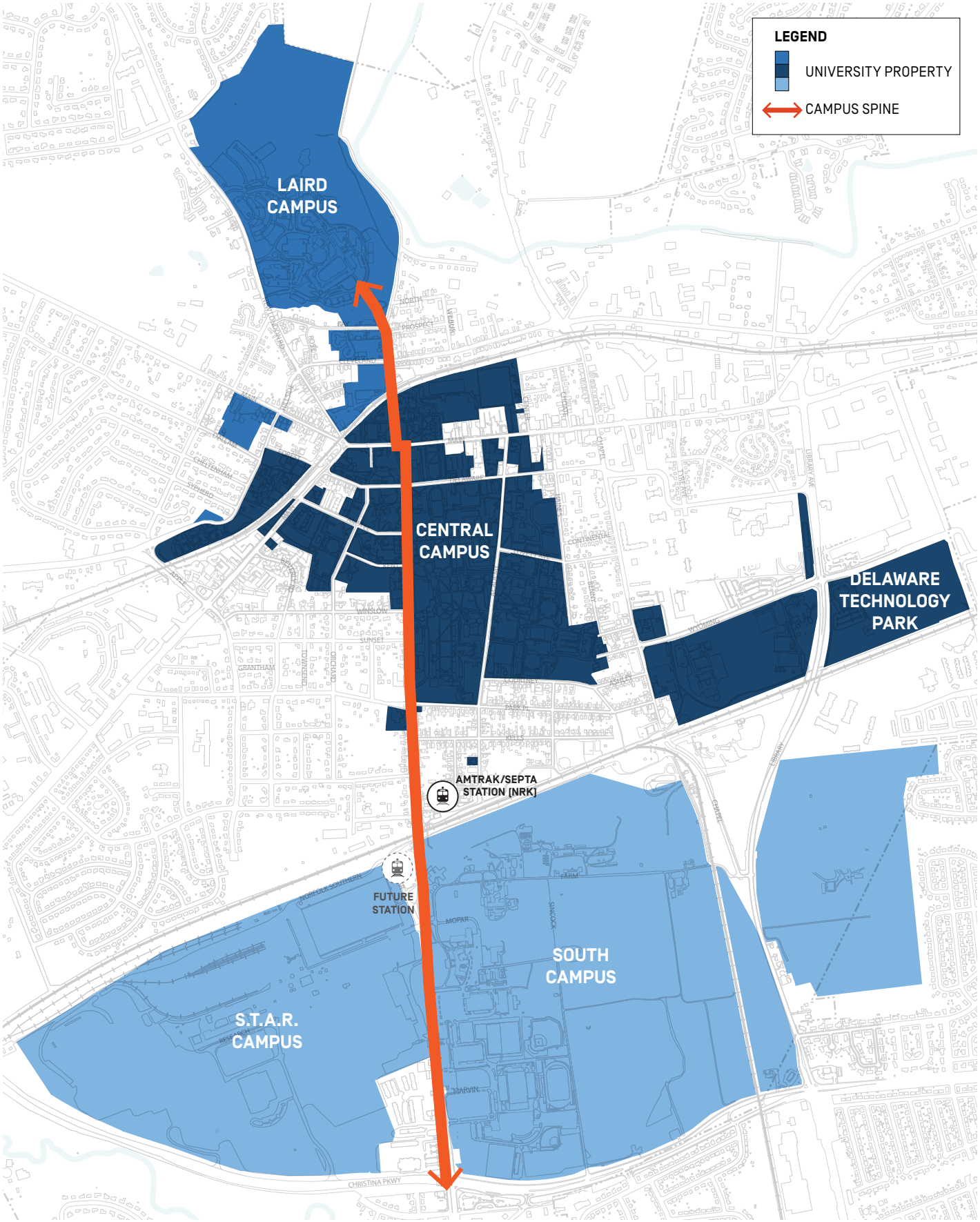
College Avenue is the primary thoroughfare that connects the three campus zones.

With the campus divided into three zones by the Amtrak NEC and CSX rail lines, it is clear that College Avenue is the primary pedestrian and vehicular spine that binds the campus together and connects it to the region via the I-95 corridor. From the South Campus gateway at Christina Parkway to the northern extreme of Laird Campus, College Avenue provides the only continuous road frontage that connects the three zones of the university. However, there are numerous influences and challenges that prevent College Ave from realizing its potential as a spine that truly unifies the multiple campus zones.

Some of the **physical challenges** facing College Avenue are:

1. Highly constrained crossings at the CSX and Amtrak NEC rail lines.
2. High volumes of east-west pedestrian traffic puts significant pressure on a critical intersections adjacent to Central Campus.
3. Lack of infrastructure to support cycling and pedestrian safety.
4. Limited capacity for modification of road bed to accommodate a complete streets model.
5. Many 'back doors' and walls facing College Ave. create an inconsistent and unwelcoming image of the university.

College Avenue from Gore-Smith Pedestrian Bridge



College Avenue as Campus Spine

College Avenue as Campus Spine

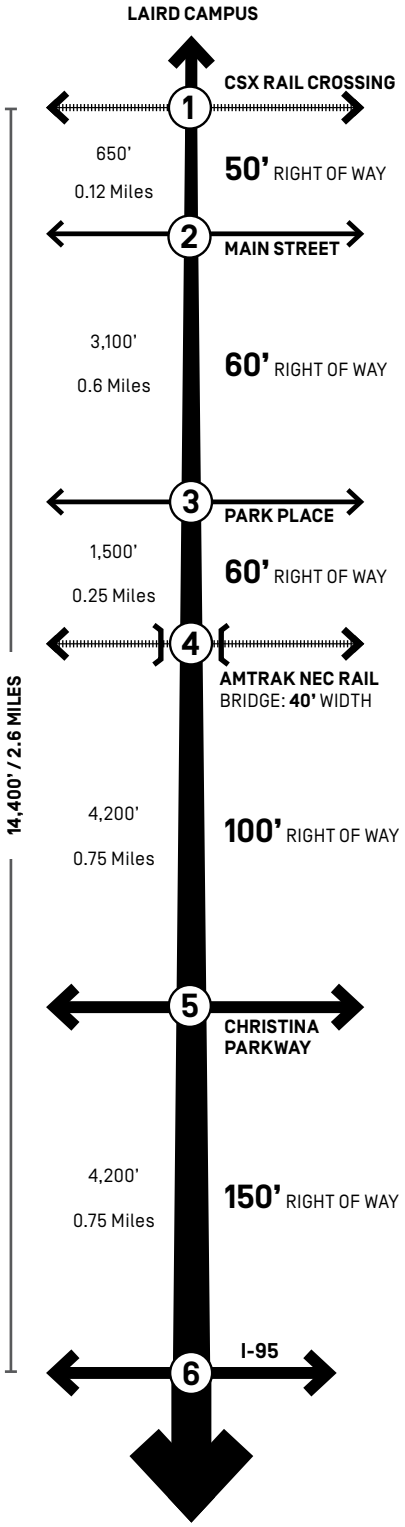
The visual character and pedestrian experiences are challenges to be addressed.

COLLEGE AVE. CROSSINGS

1. N. College Ave at CSX Rail Crossing

3. S. College Ave at Park Pl.

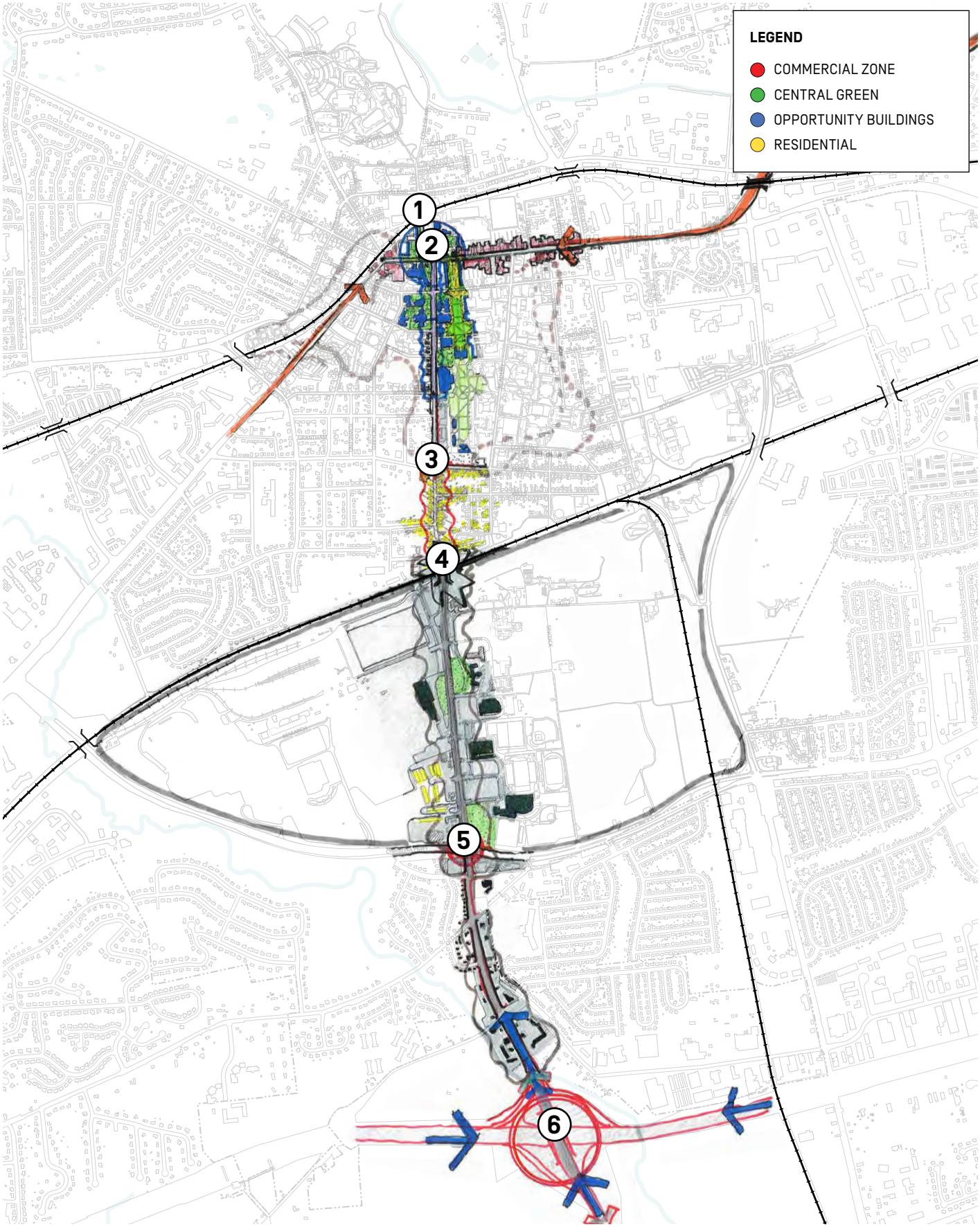
5. S. College Ave at Christina Pkwy.



2. South College Ave. at Main St.

4. S. College Ave at Amtrak NEC

6. South College Ave at I-95


LEGEND
COMMERCIAL ZONE
CENTRAL GREEN
OPPORTUNITY BUILDINGS
RESIDENTIAL
1
2
3
4
5
6

Campus Culture

"Silo-ing" of academic, operational and financing functions is a barrier towards long-term thinking, collaboration and coordination of capital expenditures.

"SILOS"

In the course of many stakeholder conversations during Phase One, there was a clear theme related to the barriers that prevent coordinated decision making and the formation of organizational 'silos' over time.

Some stakeholders attributed the formation of these silos to the Responsibility Based Budget System, and others attributed them to operational factors such as the lack of a campus-wide space management function on campus. Regardless of the reasons, there was general agreement that an integrated and coordinate method of decision making and planning was a desired outcome of the current change in administration that has significant potential impact on the facility and space response of the university.

On the academic side, the colleges operating predominantly on their own may provide quality within their fields but may not be able to discover, define and seize the synergistic opportunities and interdisciplinary frontiers in research and student learning that mark AAU-level institutions. In fact, UD's "burden" is heavier than many other public institutions: in states with multiple branches of the state university , each institution (e.g., Stony Brook) can play to its academic strengths, on the reasonable assumption that others will cover its lesser fields, to the benefit of all the state's residents. UD, however, is the flagship University of Delaware, and so an argument can be made that it has a responsibility to be solid in all major academic areas.

"Silos"

Campus Policies

An integrated 5 to 10 year university -wide capital budget is needed

BONDING + FINANCING PATTERNS

Every Board of Trustees (properly) guards its university's credit rating, to avoid both stigma and higher interest costs, and as one step to that end carefully limits its capital spending/bonding to a sum that will not shake the rating agencies. The agencies are usually clear about the limits they find tolerable, and offer advance warnings. Thereby limited in spending, most universities prepare an integrated university-wide capital budget, often for five or ten years, and update it each year at budget approval time. From a financial viewpoint, existing space should be fully used as a first priority, then existing under-utilized space be renovated/repurposed as a second priority (provided the space is structurally sound and renovation costs appreciably less than new construction per square foot); and new construction should only be undertaken as a last resort: in its lifetime triage, a wet lab can become a dry lab, then become a classroom, then become offices, then be used for storage.

Diversity and Inclusion

Diversity has been a long standing challenge for the University. The current demographics of the University do not reflect the demographic makeup of Delaware and compare poorly when compared to other AAU-Public institutions.

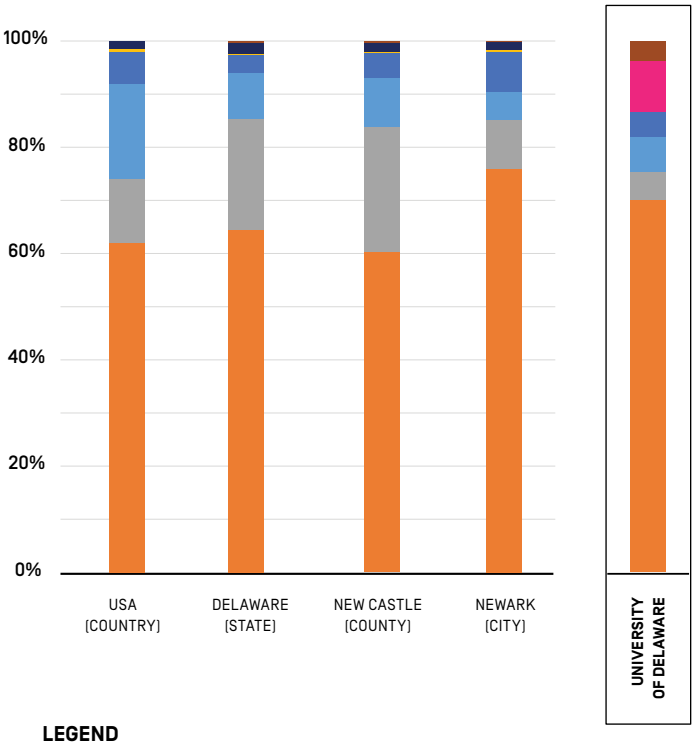
From the perspective of race and ethnicity, diversity has been a long standing challenge for the University of Delaware. Direct comparison of demographic data shows the University is neither in line with regional or state wide demographics. Similarly, demographic comparison shows that the University is significantly less diverse than many of the AAU (public) institutions for which demographic benchmarking was performed.

In the course of our stakeholder conversations, it was expressed that the University response and approach to improving diversity and campus climate have been inconsistent and subject to shifting priorities as administrations have change. As a point of reference, it was suggested that in the 30 years since the publication of the Scarpitti Report, little actual progress has been made. Additionally, there was significant attention paid to the idea that there has been an overemphasis on the provision of so-called 'multi-cultural' space as a panacea for the diversity issues facing the university. It was further suggested that a holistic approach to diversity across multiple levels of the university is needed that considers, organizational, human resource, policy and physical parameters.

Recently, the release of 'Inclusive Excellence: An Action Plan for Diversity at UD' has given renewed attention to diversity issues at the University.

Geographic Demographic Comparisons

AS % OF TOTAL POPULATION



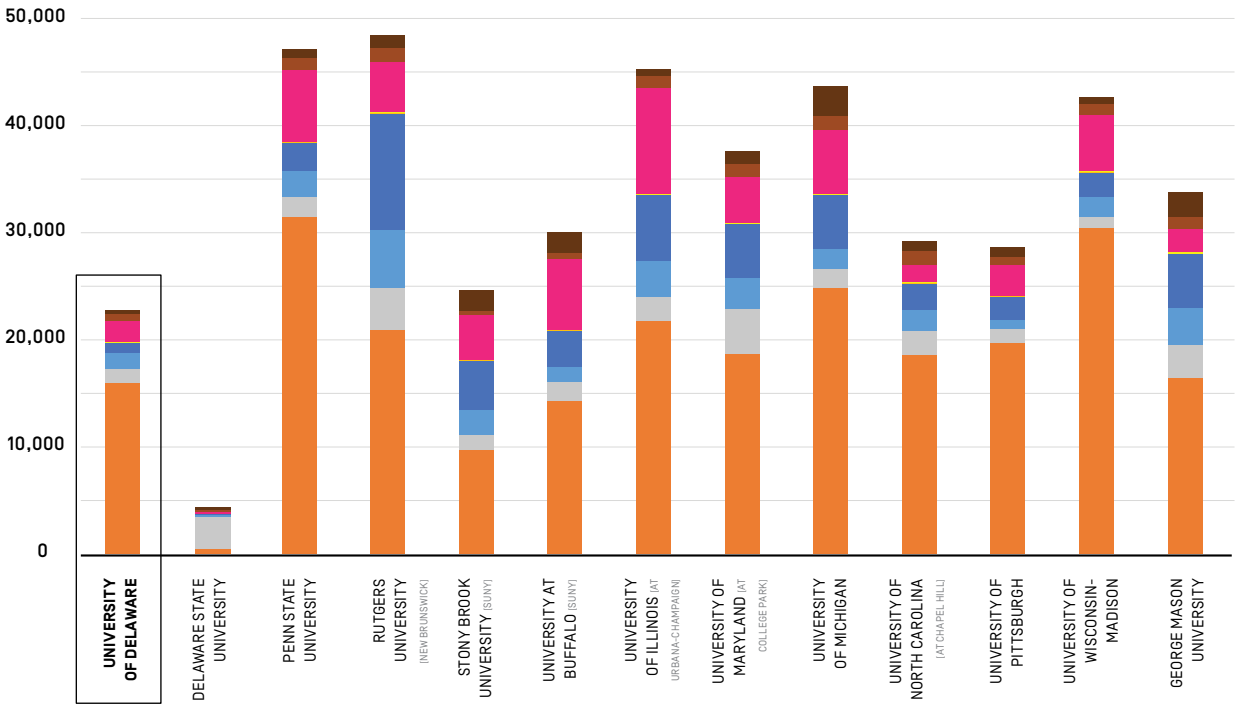
LEGEND

- UNKNOWN
- OTHER
- MULTI-RACIAL
- INTERNATIONAL
- AMERICAN-INDIAN
- NATIVE-HAWAIIAN
- ASIAN
- HISPANIC
- BLACK
- WHITE

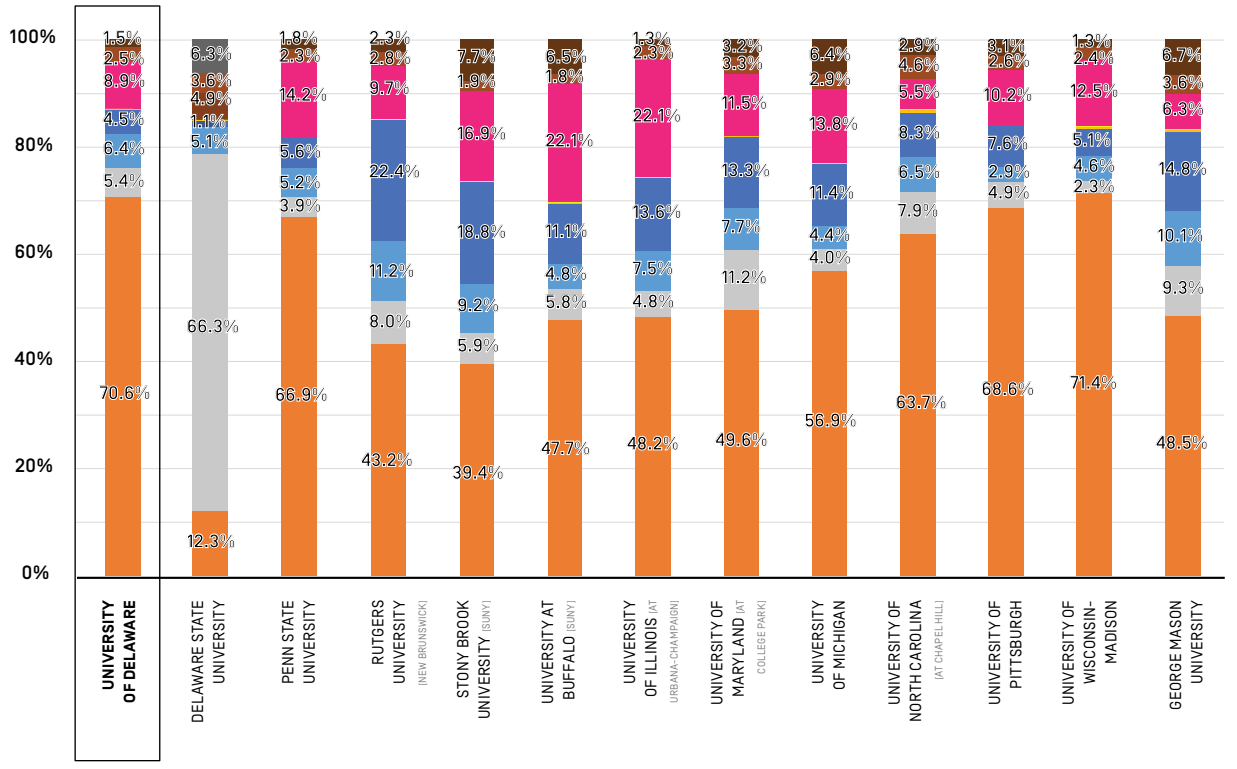
SOURCE: iPEDS DATA CENTER (http://nces.ed.gov/ipeds/datacenter)

Peer School Comparison : Student Population By Race

BY TOTAL STUDENT POPULATION



AS % OF TOTAL STUDENT POPULATION



Sustainability

University of Delaware is in the process of defining which issues are the most important and the extent to which each issue under the umbrella of sustainability will be integrated into the campus.

UD CAMPUS SUSTAINABILITY INITIATIVES

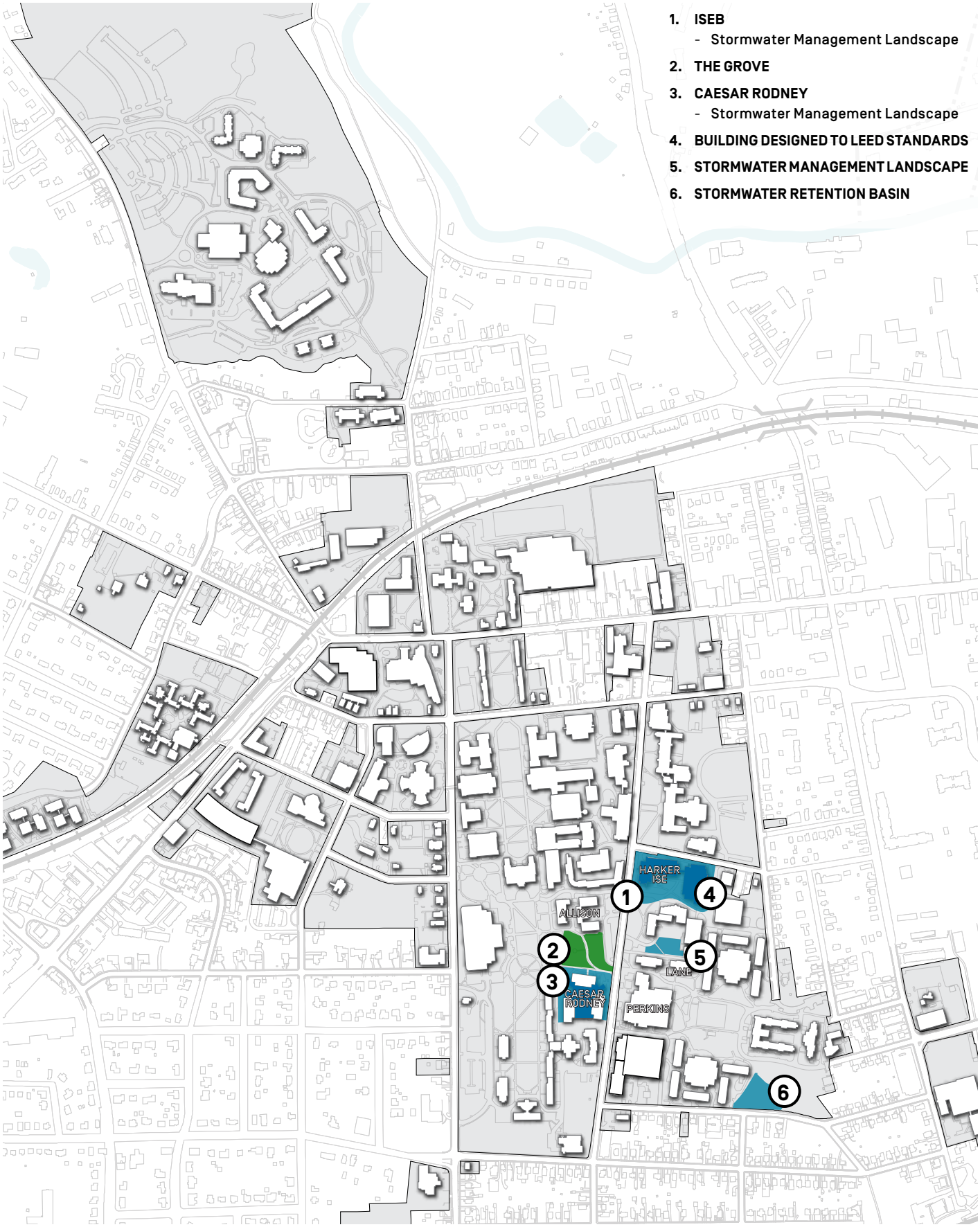
University of Delaware has been tracking greenhouse gas (GHG) emissions since 2008, but in the last year a more comprehensive approach to sustainability has truly begun. With the creation and hiring of a Sustainability Manager, the University has started to integrate sustainability concepts into the physical and operational aspects of the campus. Students and some faculty bring the enthusiasm for the social and environmental issues needed to steer the direction of the campus toward a more sustainable future.

Organizational Capacity and Existing Sustainability Documents

The Office of Sustainability at UD was created in 2015 and is currently staffed with a single position of Sustainability Manager. The office and the role serve as a primary point of contact for all topics of sustainability on campus, but do not have a dedicated staffing or resourcing budget to implement projects directly. As a champion of sustainability on campus, the Sustainability Manager serves as a liaison with nearly all departments to coordinate and advocate for more sustainable practices on all aspects of sustainability. With such a broad remit and limited resources progress has been limited, but some accomplishments can be seen.

The Office of Sustainability has been improving and expanding the content on the university's sustainability website. The website is a major portal for advocacy and information for students and faculty eager to contribute to sustainability programs on campus. The process of applying to the AASHE STARS program, a university sustainability benchmarking and certification program, has recently commenced and should be completed within the year. Numerous student activities and outreach events have been conducted in the past year. And a formal survey of sustainability awareness has been integrated into annual entry and exit surveys from students.

The most recent formal document publicly published specifically on a sustainability issue was the Climate Action Plan from 2009 and the subsequent annual GHG Emissions Inventory documents. The Office of Sustainability aspires to develop a Sustainability Report within the next year to document a broader range of baseline conditions related to sustainability on campus. Following the baseline-setting exercise the Office of Sustainability aspires to create the university's first Sustainability Plan. Sustainability Plans are common documents for AAU-level universities and institutions to publicly state and define their goals and aspirations for sustainability. Following the Sustainability Plan it is common to create an Annual Sustainability Report to track progress toward goals and to publicize accomplishments.


1. ISEB
- Stormwater Management Landscape
2. THE GROVE
3. CAESAR RODNEY
- Stormwater Management Landscape
4. BUILDING DESIGNED TO LEED STANDARDS
5. STORMWATER MANAGEMENT LANDSCAPE
6. STORMWATER RETENTION BASIN
HARKER ISE
ALLISON
LANE
CAESAR RODNEY
PERKINS
1
2
3
4
5
6
0.125
0.25 (mile)

Sustainability (Cont.)

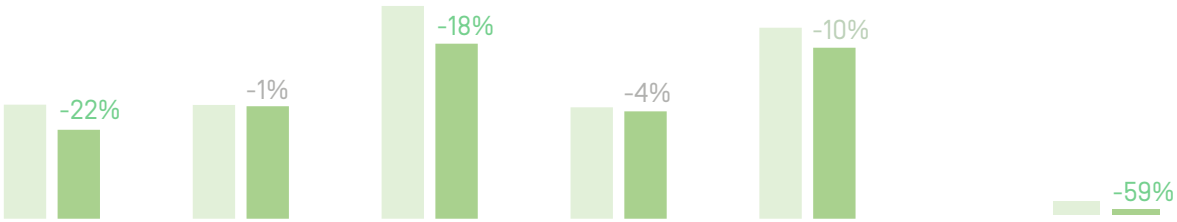
Key Sustainability Issues at UD

The concept of sustainability means different things to different people and organizations. University of Delaware is still in the process of defining which issues are the most important and the extent to which each issue within the sustainability umbrella will be integrated into the campus. The top sustainability issues identified during the existing conditions assessment process were identified to be:

- GHG reduction
- Stormwater management
- Bicycle mobility and alternative transportation
- Waste reduction and recycling
- Organic landscape maintenance
- Preservation of historic trees and landscape
- Sourcing of local, organic food products

University of Delaware can be benchmarked to a broader list of sustainability issues common in peer institutions' sustainability plans, as in the table (below).

	University of Delaware	Lehigh	Carnegie Mellon	Cornell	Stony Brook	Boston University
Target	20% below 1990 by 2020	no set target	no set target	20% below 2005 by 2012; 50% by 2025; neutral by 2035	25% below 2008 by 2020; 30% by 2030; neutral by 2050	25% below 2006 by 2020
Year Set	-	-	-	2008	2008	2006
Baseline Year	1990	2007	2004-2005	2004-2005	2007-2008	2005-2006
Baseline GHG Emissions		57,800	102,089	250,702	276,875	166,285
Latest Measured Year		2013	2012-2013	2013-2014	2013-2014	2014-2015
Measured Year GHG Emissions		52,715	163,821	182,663	239,524	127,823
% Difference	2%	-9%	+60%	-27%	-13%	-23%
Scopes Tracked	1, 2, & some 3	1 & 2	1, 2, & some 3	1, 2, & some 3	1, 2, & some 3	1 & 2
Tracking Tool		Clean Air Cool Planet	Clean Air Cool Planet	Clean Air Cool Planet	Clean Air Cool Planet	Clean Air Cool Planet
2016 GFA (SF)		4,566,228	4,864,661	15,745,567	11,972,529	14,843,003
2016 FTE		9,722	16,080	32,440	24,143	34,642
RECs purchased?	no	no	yes	no		?



UMD - College Park	UVA	Penn State	Georgia Tech	UNC - Chapel Hill	Rutgers	Middlebury
15% below 2008 by 2012; 25% by 2015; 50% by 2020; 60% by 2025	25% below 2009 levels by 2020	17.5% below 2006 by 2013; 35% by 2020	7% below 2008 by 2035; 50% by 2050	20% below 2007 by 2020; 30 by 2030; neutral by 2050	-	Carbon neutral by 2016
2008	2009	2008	2009	2009		2007
2005	2000	2006	2008	2007		2006
332,807	331,875	620,515	325,066	557,076	-	31,200
2013-2014	2014-2015	2013	2014	2013		2014
259309	328,198	510,566	313,093	498,838	-	12,729
-22%	-1%	-18%	-4%	-10%	-	-59%
1, 2, & some 3	1, 2, & some 3	1, 2, & some 3	1, 2, & some 3	1, 2, & some 3		1 & 2
-	Clean Air Cool Planet	Clean Air-Cool Planet	Clean Air-Cool Planet	Custom tool	Custom tool	Custom tool
13236841	16,560,000	20,490,517	11,361,000	17,500,000	17,278,136	2,366,886
31726	43,779	66,443	25,034	28,895	58,062	4,327
no		yes	no	no		Yes

History & Development

STAKEHOLDER MAIN GROUP EMERGING THEMES

- **Additional space needs** should be considered in light of current trends for space components that do not yet exist at UD. ("Spaces of Tomorrow")

FINDINGS

- **The original landscape and master plans of the University served as a strong framework to guide development until the post war era when the university entered a period of sprawling growth at the periphery of campus.**

- **For nearly 80 years, the University remained concentrated around the area of Old College at the intersection of Main Street and College Avenue.**

- **The establishment of two single sex colleges within the University established a University with two activity centers linked by a linear green space that forms the primary landscape framework around which Central Campus was developed.**

- **The post-war era saw the largest expansion of the university both in terms of geography and student population.**

- **The expansion of the university, particular in terms of land area continues, with much of the new development happening at the periphery of campus.**

- **Strong correlation between the University's & City's population growth over time.**

Historical Development Analysis

The original landscape and master plans of the University served as a strong framework to guide development until the post war era when the university entered a period of sprawling growth at the periphery of campus.

While the social and academic contributions of the University are an important aspect of its history, our analysis focuses on the physical development of the campus over time. Specifically, the analysis is focused on the impact that the expanding physical program has had on the identity of the university and its physical cohesion across different eras. As such we have divided the development progression into 4 time periods that coincide with the construction or acquisition of buildings, properties, and open spaces to support the academic, administrative and residential program of the institution.

These time periods are:

1834–1913 Newark College to World War I

1914–1945 World War I to World War II

1946–1970 Post War Era

1971–2015 Contemporary Development

UD Historical Timeline

1743 Free School Opened by Rev. Dr. Francis Allison in New London, PA

1765 Free School relocates to Newark Delaware

1769 Charter granted to school, renamed Academy of Newark

1834 Newark College established

1843 Newark College is renamed Delaware College

1859 Delaware College Closes

1869 Delaware College separated from Academy of Newark

1870 Delaware College reopens as Delaware's Land Grand College

1872 Coeducation established

1885 Coeducation discontinued

1914 Women's College established

1921 University of Delaware is established, with two colleges Delaware College and the Women's College

1945 Delaware College and Women's College merge, reestablishing coeducation

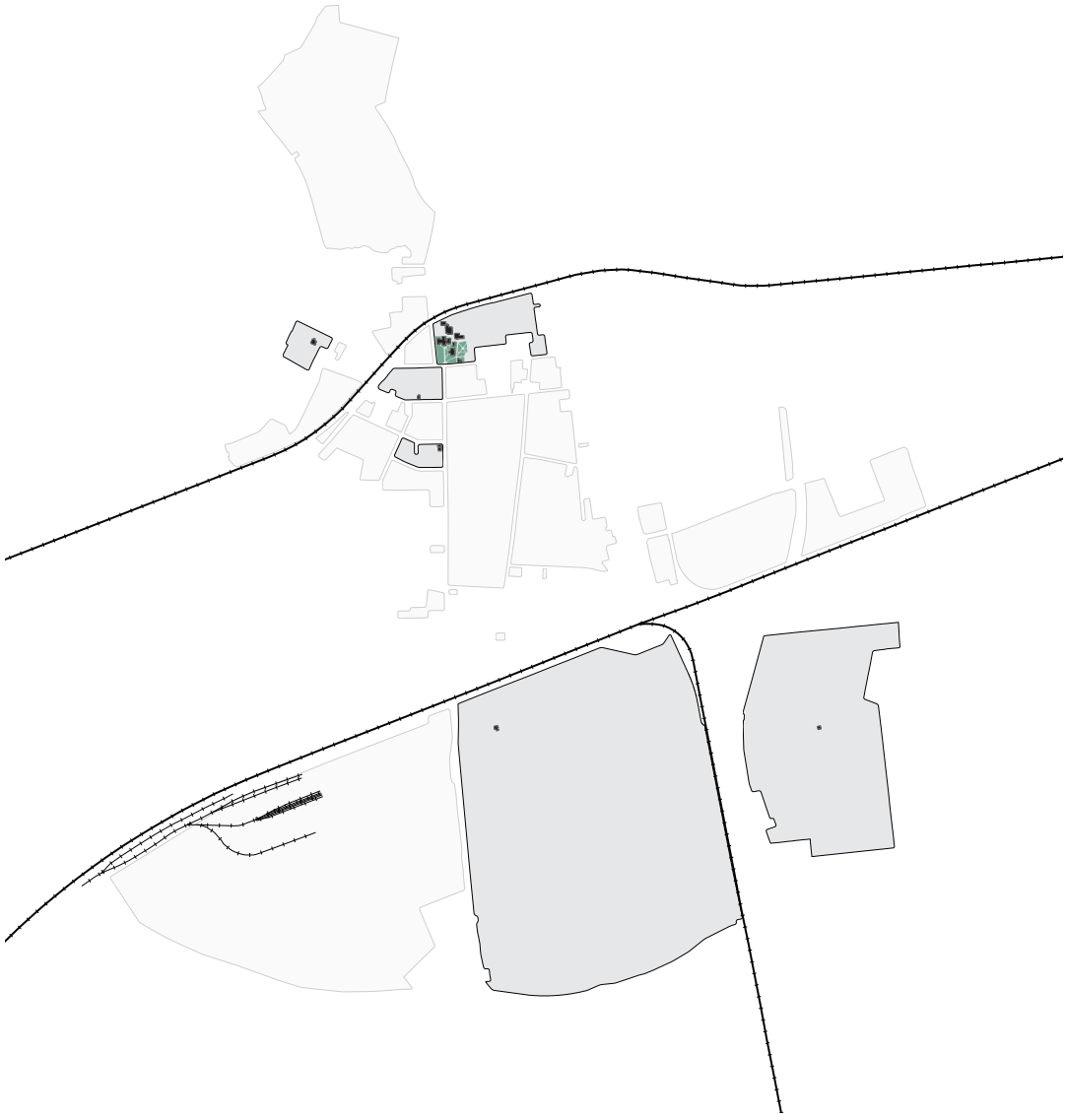
1950 Racial segregation ended

1834–1913: Newark College to World War I

For nearly 80 years, the University remained concentrated around the area of Old College at the intersection of Main Street and College Avenue.

During this time period the operations and physical plant of the University were centered on the building now known as Old College. Through this time period, the primary approach to the institution was via College Avenue. At the time, this provided a clear sense of arrival with College Avenue terminating at a landscaped lawn and a set of monumental steps that announced the presence of the University to all who arrived.

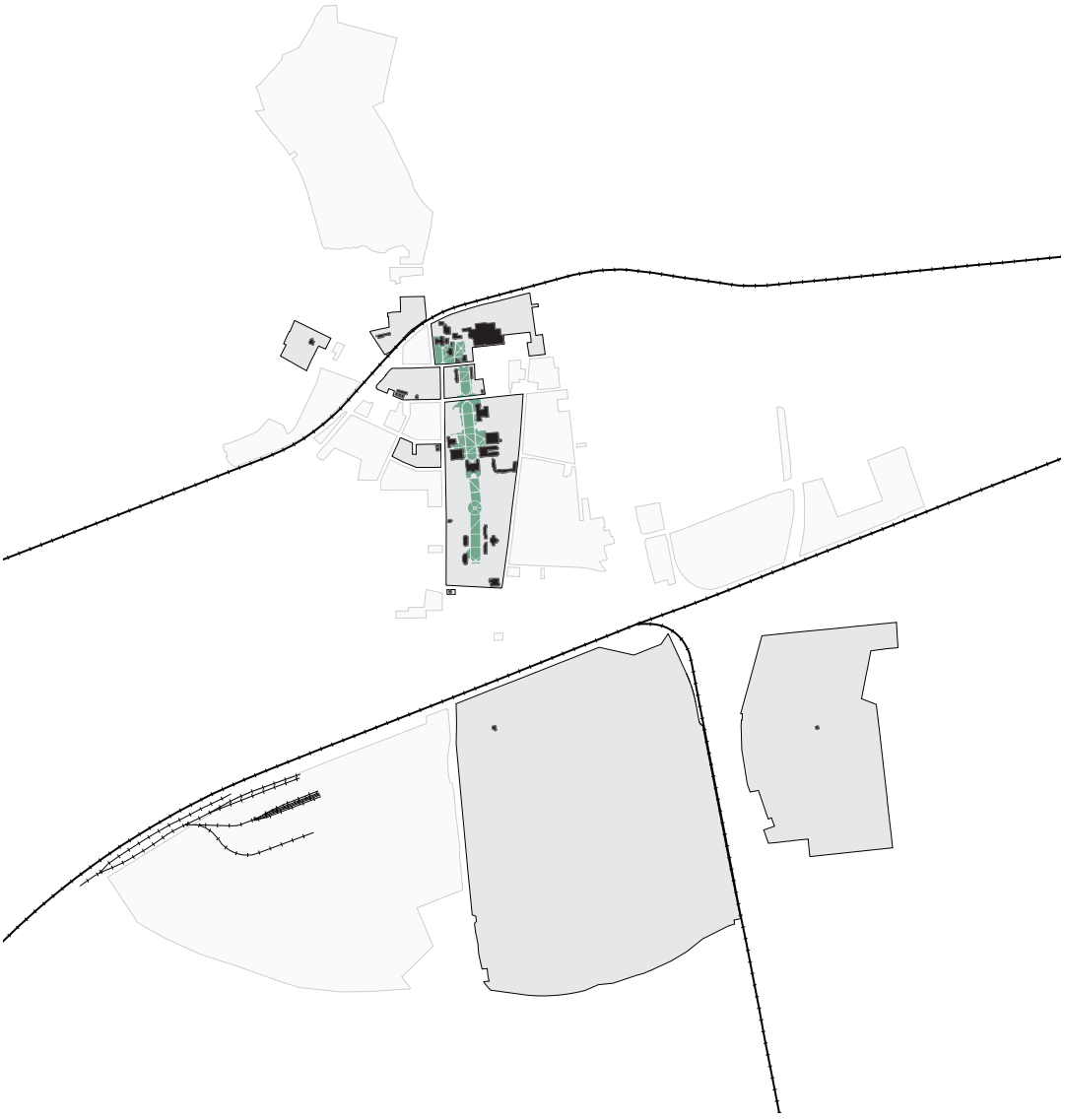
While there was extant commercial and residential areas adjacent to the university, the surrounding areas were largely agricultural farmland. Also during this time, the multiple train lines that still define much of the university were constructed by the Philadelphia, Wilmington and Baltimore Railroad with multiple connecting services provided to the lower areas of the Delaware peninsula and southeastern Pennsylvania.



1914-1945: WORLD WAR II TO WORLD WAR II

The establishment of two single sex colleges within the University established a University with two activity centers linked by a linear green space that forms the primary landscape framework around which Central Campus was developed.

During this era, the establishment of two single-sex colleges established a landscape framework that has influenced and guided the college's identity and growth for nearly a century. The 1917 Day and Klauder established 'The Green' as the primary landscape open space around which both colleges could develop. This is the first time that the center of gravity for the University shifts from Old College to a campus organized around a linear green space flanked by the buildings of the Men's College at the north end and the Women's College at the south end of 'The Green'. This plan also included the siting of Memorial Hall at the midpoint of 'The Green' to serve the academic activities of both colleges. In conjunction with a landscape plan developed by Marian Kaufman in 1918, the physical form and identity of Central Campus has largely been dictated by the framework set in motion during this time. Significant growth of the university occurred during this period, with the majority of new University buildings fronting on 'The Green' in accordance with the extant campus and landscape plans.



1946 – 1970: POST-WAR ERA

The post-war era saw the largest expansion of the university both in terms of geography and student population.

This period represents the most significant period of growth for the university in terms of built space and geographic area. The advent of the GI Bill (1944) and the need to educate the growing middle class in the post-war era necessitated significant expansion of the academic and residential program of Universities across the country – and the University of Delaware was no exception.

While there is significant growth of science and engineering buildings on 'The Green', this period also saw the first significant development in peripheral areas of campus including East Campus as a residential precinct, classroom buildings on the west side of College Avenue (Smith Hall), and the addition of significant academic space on South Campus (Townsend Hall) to support the College of Agriculture and Natural Resources.

1971 - 2015 : CONTEMPORARY ERA

The expansion of the university, particular in terms of land area continues, with much of the new development happening at the periphery of campus.

This contemporary era continued the trend of rapid growth for the University. While several buildings during this time were developed on 'The Green', the greatest areas of expansion are in peripheral areas on the west side of College Avenue, Laird Campus, and South Campus (including STAR campus), and the Delaware Technology Park.

While the growth during this time period is not the greatest in terms of floor area, it does represent the era with the most significant geographic expansion, putting significant pressure on the transportation networks the connect the city and the University – an issue that has been highlighted repeatedly as a major constraint facing the University today.

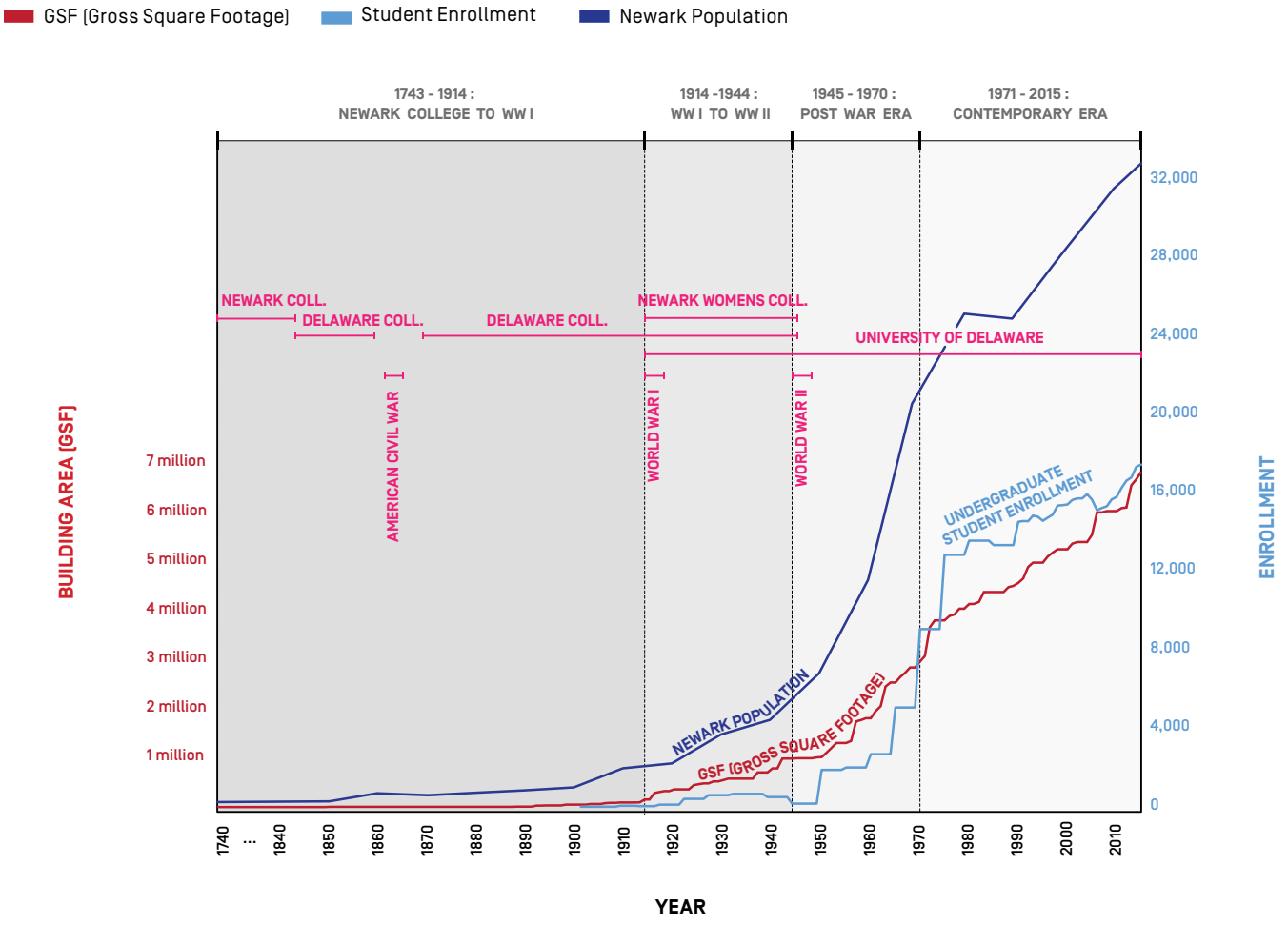
Growth of the University

Strong correlation between the University's & City's population growth over time.

In addition to examining the effect that campus development has had on the sense of campus over time, we performed a parallel analysis on the growth of the university in terms of building area over time. While the available data does not include demolition or disposition of legacy structures, it does give a good estimate of the growth of the physical plant of the university of over time. Similarly, the construction or acquisition dates of some structures are unknown, but they represent less than 6% of the total square footage of the university, and would have a negligible effect on the overall growth trendline. The graph below shows both the historic growth of the university in terms of gross square footage (left/red axis) and undergraduate enrollment (right/blue axis). The overlay also shows how the growth of the university tracks with the analysis time periods used in our locational/geographic analysis.

As the graph shows, the fastest rate of growth in terms of total building area and student population (based on slope of the trend line) are during the post war era followed by the contemporary era. This finding tracks closely with the finding that these two eras also saw the greatest levels of geographic expansion, with new development both north and south of the rail lines that traverse the campus.

Historic Development Graph



Campus

STAKEHOLDER MAIN GROUP EMERGING THEMES

- Some additional instruction spaces may be needed, but **improvements to classrooms** (new and existing) should focus on quality, flexibility and technology integration in the classroom.
- **Classroom flexibility and technology** can build upon UD's legacy of innovative approaches such as problem based learning.
- The **library** requires a comprehensive plan to realize its potential as a hub of campus academic activity.
- A more coordinated, visible and accessible **model for academic support** is needed.
- There are opportunities for **centralization of certain highly specialized equipment and services** (i.e. core facilities, maker spaces, etc.).
- Clear policies are needed for the **assignment (and re-assignment) of laboratory space**.
- A comprehensive plan for **building lifecycle management** is needed to assure physical spaces properly support desired research intensity.
- A plan is needed to identify the best locations for **new or re-purposed research space**.
- **Collaborative and shared spaces** are essential for students, faculty and staff, and require further study to decisions about next steps. ("How People Work")
- A comprehensive **housing plan** that addresses the needs of graduate, undergraduate, faculty and staff is needed to support a vibrant residential environment on- and off-campus. ("Where People Live")
- There are a variety of **Specialized Spaces** that are essential to the cultural life of the university (i.e. assembly, performance, meeting, etc...) but a long term plan is needed to develop and manage them.
- **Additional space needs** should be considered in light of current trends for space components that do not yet exist at UD. ("Spaces of Tomorrow")
- **Museum, Arts + Culture** are clear points of engagement with the external community, but there is a need to be more welcoming and accessible to all.
- Diversity and inclusion should be integrated into all aspects of campus life including **academics, services, student activities and employee recruitment**.
- Cultivating a more collaborative **relationship with City of Newark** could lead to a more proactive approach to off-campus incidents.
- **Proper training and policies** are necessary to support a culture of safety within research and academic units.
- Current facilities for addressing wellbeing are insufficient to promote a **culture of wellness** on campus.
- **Sustainability** has historically not been a driver of campus decision making.
- There is tremendous potential for **co-curricular, research and pedagogical overlaps** to advance sustainability at UD.

FINDINGS

- Campus uses tend to be segregated, with residential, student life, and classroom facilities concentrated at the periphery while laboratory and office spaces are concentrated at the core.
- 62% of classroom seats are located west of 'The Green', leading to pedestrian traffic at key intersections on South College Ave.
- Academic support services are located in many different buildings across campus and could benefit from greater visibility and coordination.
- Morris Library has undergone piecemeal renovations to keep up with national trends in libraries, but a comprehensive plan is needed to achieve its full potential.
- 58% of all laboratory space is located east of 'The Green' in the Science and Engineering precinct, 3/4 of which is research laboratory.
- Most student and campus life spaces are located at the periphery of campus, or clustered within on-campus residential areas.
- The majority of on-campus residents live on Laird Campus and East Campus who must use public streets as their primary connection to Central Campus.
- High concentrations of students live in areas directly adjacent to campus, which impacts: The local rental housing market, Neighborhood character, Perceptions about public safety
- The University has many cultural facilities that are open to the public. There is significant opportunity for these facilities to be more visible and accessible to the University community and to the public
- The oldest buildings tend to be concentrated in the area of Old College and the north end of 'The Green'
- A 2008 Master Plan Study was halted before completion and made several programmatic recommendations that were implemented, but not in the context of a prioritized campus master plan.
- Space needs are more a question of quality rather than quantity. There is additional capacity within existing facilities that should be used more effectively before building new facilities.
- The greatest concentration of buildings in "Poor" condition are located at the north end of 'The Green' and include a significant number of laboratory buildings in the Science and Engineering Precinct.

Space Use Density Analysis

Campus uses tend to be segregated, with residential, student life, and classroom facilities concentrated at the periphery while laboratory and office spaces are concentrated at the core.

Using the Facilities Inventory and Classification Manual (FICM) space inventory provided by the University, our team conducted a building level analysis of the distribution of uses across the Newark Campus.

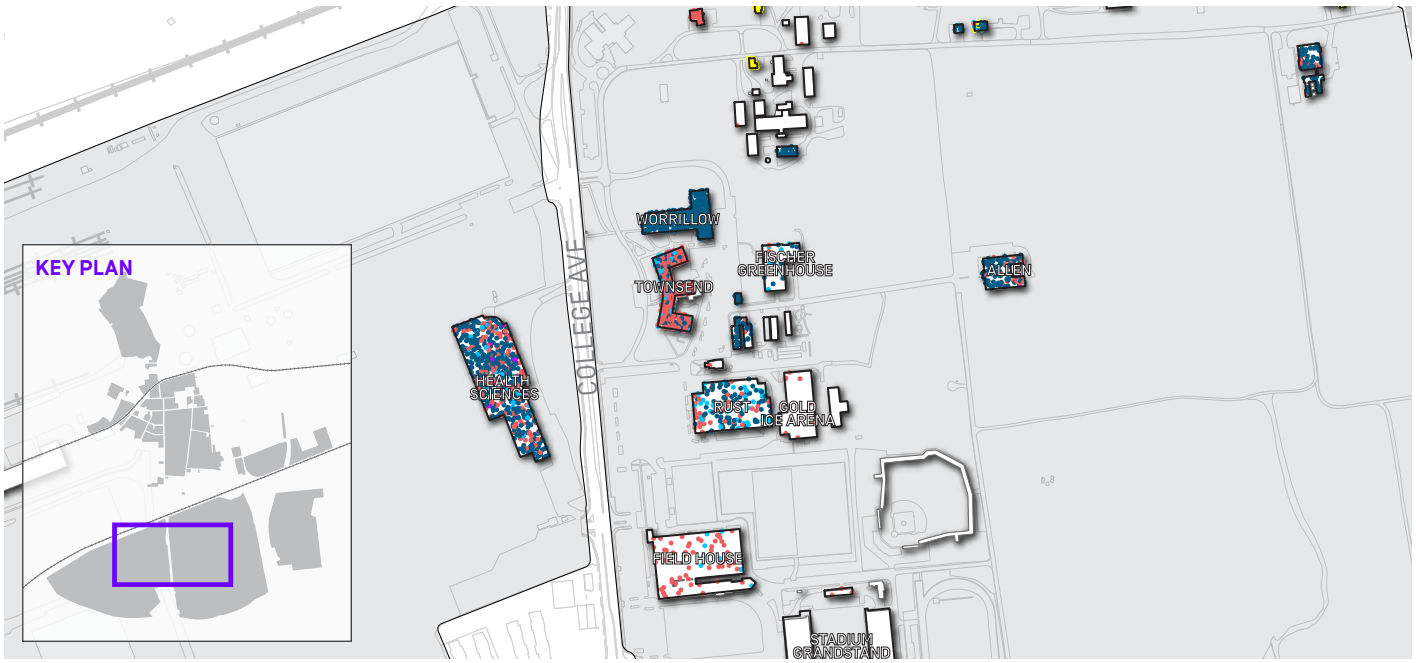
FICM codes classify assignable floor area(ASF) according to its primary use. For this analysis, FICM codes for Classroom (100 series), Laboratory (200 series), Office (300 series), Study (400 series), and Residential (900 series) were aggregated by building and mapped using a dot density to visualize the concentrations of uses within each building.

The resultant color coded map indicates the concentration of uses for each mapped FICM series. Buildings that are single use are indicated by fewer colors, and buildings with a mixture of uses are indicated with multiple colors.

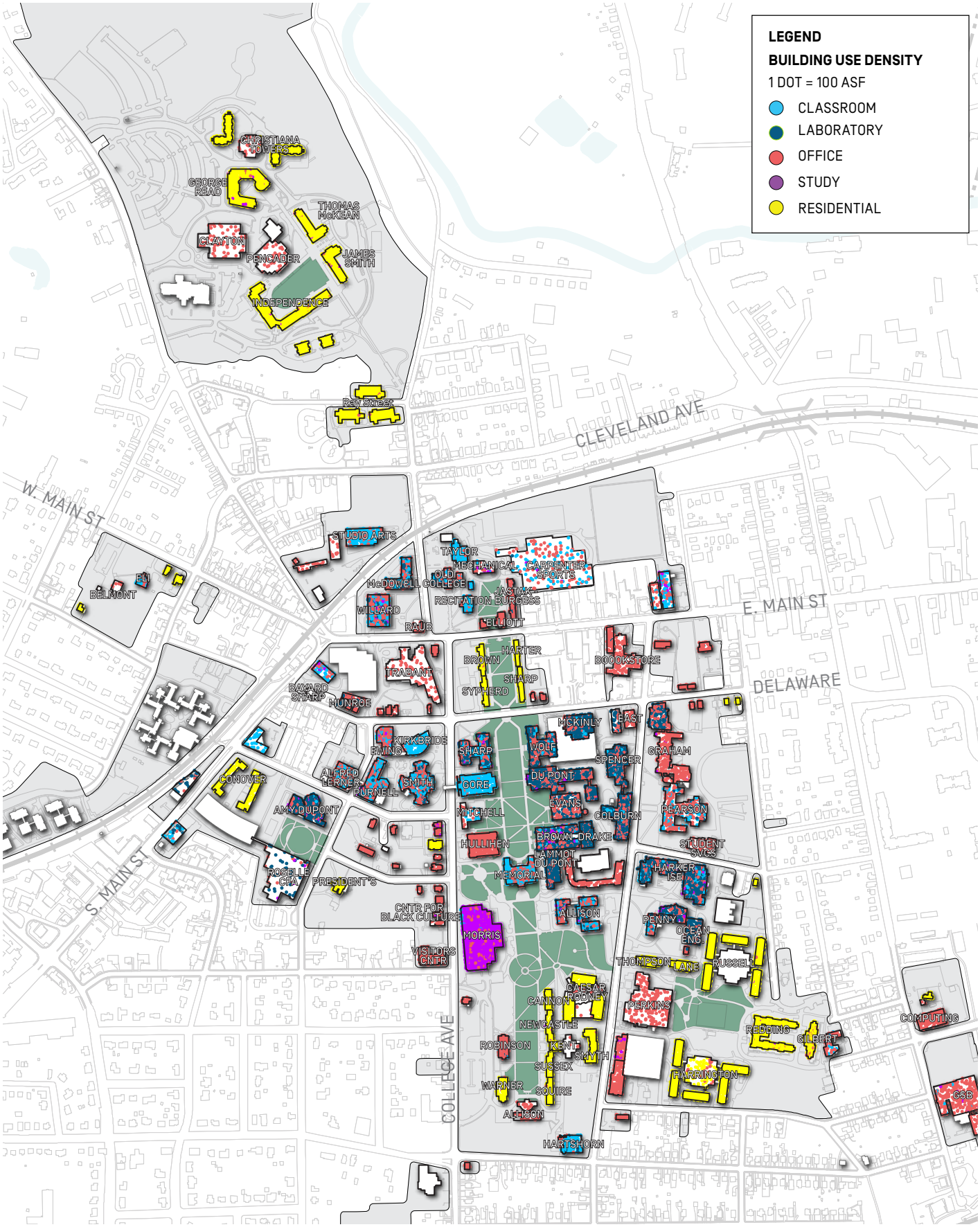
Based on this exercise, several trends and findings were identified:

- On-campus residential facilities are clustered in 3 primary areas: Laird Campus, East Campus/South Green, and North Green
- Classroom Facilities (100 series) are distributed across central Campus, but the highest concentration exists to the west of 'The Green', specifically within Gore, Kirkbride, and Smith Halls. A secondary concentration of classroom space exists in the area north of Main Street that includes in the Old College, Education, Health Sciences and Studio Arts precincts.
- Laboratory Facilities (200 series) on Central Campus are highly concentrated within the Science and Engineering, Primarily located along the northeast side of 'The Green'.
- Study space (400 series) is highly concentrated in Morris Library, with no significant concentrations indicated by the data.

Based on the trends noted in this preliminary analysis, secondary investigations of classroom, residential, student life, and laboratory facilities were performed and appear in subsequent sections of this report.



Space Inventory Use Density - S.T.A.R. + South Campus



Space Inventory Use Density - Central Campus

Classroom Location + Distribution

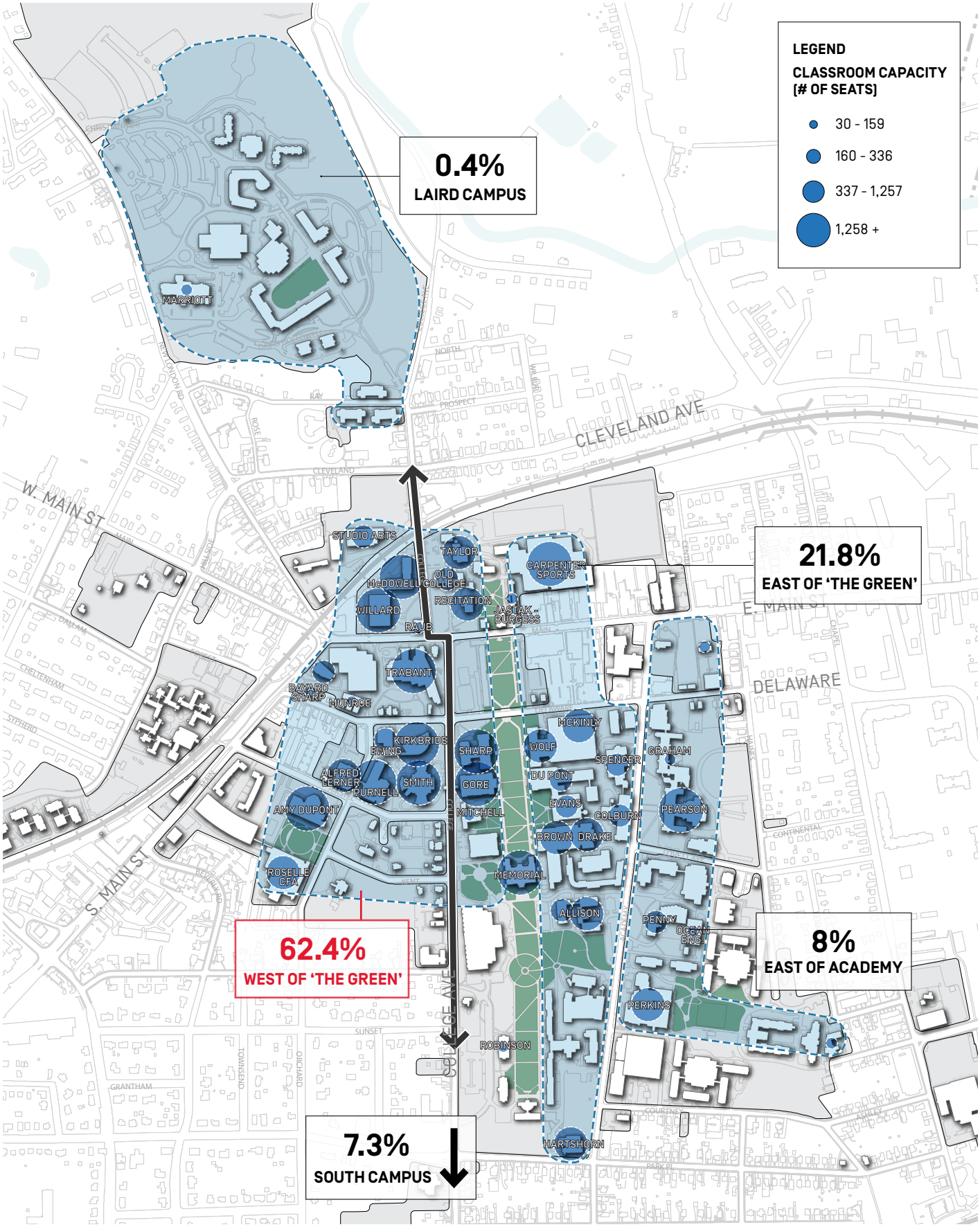
62% of classroom seats are located west of 'The Green', leading to pedestrian traffic at key intersections on South College Ave.

Using an inventory of registrar controlled classrooms provided by the University, the location and concentrations of classroom capacity (# of seats) was mapped by building. For each building, the number of registrar controlled classroom seats were aggregated and mapped by proportional symbols. The proportional symbols represent the quartiles of total classroom capacity, where the largest circle represents the top 25% of registrar controlled seats, and the smallest circle representing the bottom 25% of registrar controlled seats.

Based on the mapped data there is a clear pattern that identified a significant concentration of registrar controlled seat located west of 'The Green'. A secondary analysis of the data that aggregated the registrar controlled seats by the regions indicated on the map showed 62% of all registrar classroom seats are located west of 'The Green' and nearly 22% located east of 'The Green'.

This finding is significant because the location of registrar controlled seats suggests where the highest levels of student activity is concentrated during weekday class hours. This finding at least partially explains the observed high levels of east-west pedestrian circulation at peak class times that puts pressure on College Avenue to perform as the primary connective spine of the campus.

College Ave at Amstel Ave during Class Change



Classroom Capacity and Locational Distribution - Central Campus

Academic Support

Academic support services are located in many different buildings across campus and could benefit from greater visibility and coordination.

In the course of our stakeholder conversations, there was a recurring theme related to the presence and organization of academic support and enrichment services. It was noted that the current state of academic support services at UD is fragmented and has poor visibility for students who may need assistance in their coursework. It was stated on several occasions by the Academic Spaces working group that there is an expectation that the need for academic support services is expected to grow in the coming years as students arrive less well prepared for the challenges of higher education. Based on research conducted, we identified and mapped the locations of all university level academic support services on campus.

While the adequacy of these services are not part of this specific analysis, the map and inventory shows academic support is operating on a disbursed model. Many colleges and universities have aggregated academic support services either within libraries, or in separate buildings generally termed as 'academic success centers' to provide a clear entry point for students seeking assistance in their coursework.

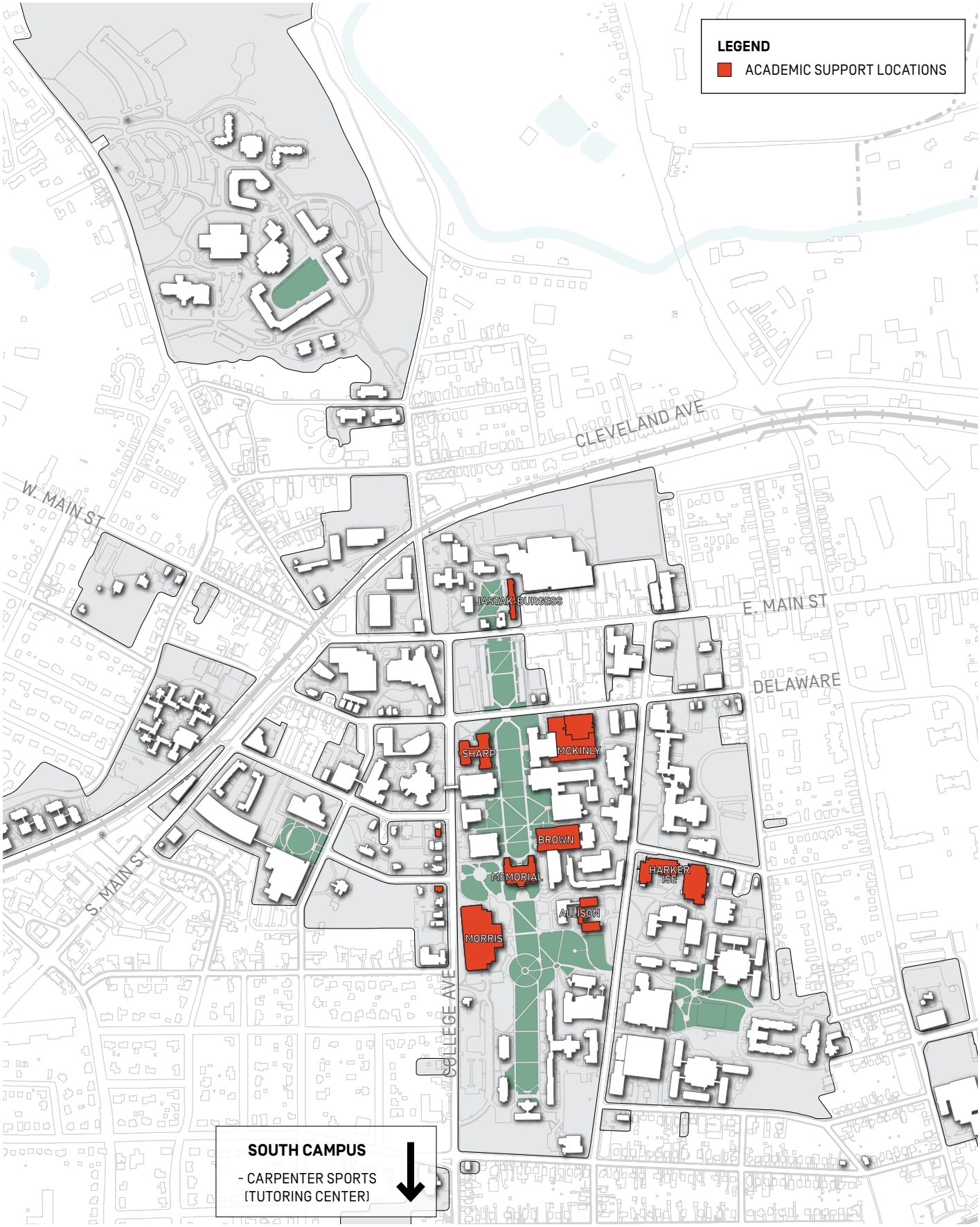
UNIVERSITY ACADEMIC SUPPORT SERVICES

- The University Writing Center (16 Memorial Hall)
- Mathematical Sciences Learning Laboratory, MSLL (053 McKinly Lab)
- Physics Help Center (114 Sharp)
- ISLL Learning Center (314 ISE)
- The Foreign Language & Literatures Language Proficiency Center (006 Jastak-Burgess)
- The Multilingual Student Communication Center (108 E. Main Street)
- Disability Support Services (Alison Hall)
- Morris Library

COLLEGE ACADEMIC SUPPORT

- Agriculture & Natural Resources (#104 Townsend Hall)
- Art & Sciences (#109 Mitchell Hall)
- Associate in Arts (77 E. Main street, #103)
- Business & Economics (#102 Purnell Hall)
- Earth, Ocean & Environment (#111 Robinson Hall)
- Education & Human Development (#106 Alison Hall West)
- Engineering (#141 P.S. DuPont Hall)
- Health Sciences (#343 McDowell Hall)

Mathematical Sciences Learning Laboratory(MSLL) in McKinly Lab



Academic Support Locations - Central Campus

Morris Library

Morris Library has undergone piecemeal renovations to keep up with national trends in libraries, but a comprehensive plan is needed to achieve its full potential.

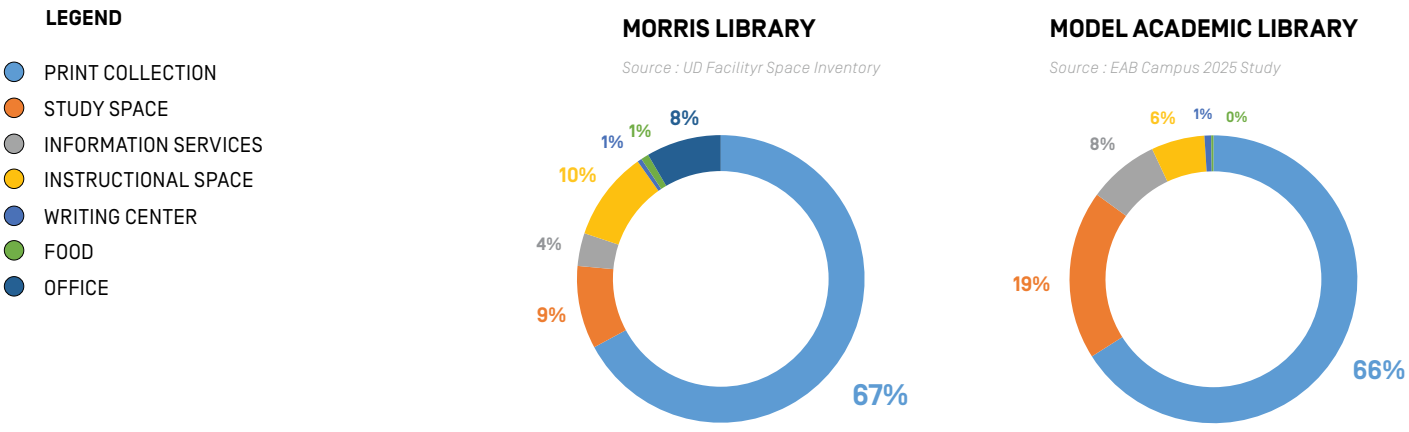
Academic libraries are critical aspect of the life of any university. The essential functions they provide for research and study cut across all disciplines. Over the past decades, academic libraries have also taken on a role as central academic support and social spaces. The advent of digital media and electronic journals have also reduced the need for physical stack space, which has facilitated this transition. Accordingly, libraries have been transitioning from static book repositories into dynamic social and academic centers that provide a much wider range of services to students and faculty.

The administration of the University and the library have tried to keep pace with this trend by significantly reducing the amount of stack space in favor of open study areas, academic support, group work spaces, assembly space, and social spaces. Much of this spatial reorganization has been funded through small UniDel grants that have only allowed the library to be renovated and re-purposed in a piecemeal fashion. While the results have been largely favorable, and have allowed the library to provide greater levels of academic support and customer service, there is a distinct need for the function and functionality of the library to be studied in a comprehensive fashion.

Additionally, as the library has renovated its meeting and study spaces, there has also been a need to improve the quantity and quality of the spaces devoted to Special Collections. The need for improvement is so acute, that there is a specific note in the 2015 strategic plan that identifies Special Collections as a priority for the University. During several tours of Morris Library, it was noted that resources within the special collections are not stored in accordance with standard practices. For example, the primary storage areas for the special collections lack basic temperature and humidity controls to protect the documents from deterioration over time.

There is also a strong desire from library staff to make special collections material more visible and accessible to students and faculty for use in their scholarship. This will require a significant increase in both the quantity and quality of gallery spaces used to display resources continued by the special collections.

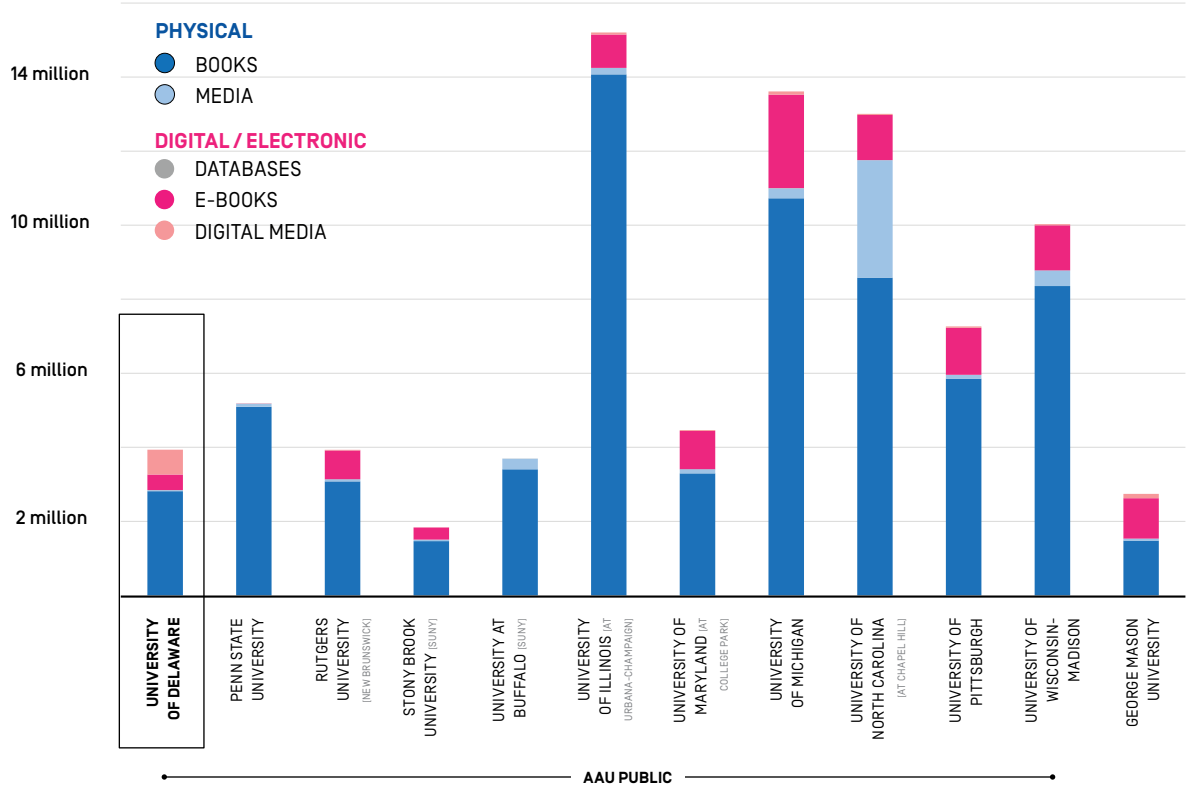
Morris Library Analysis and Comparison



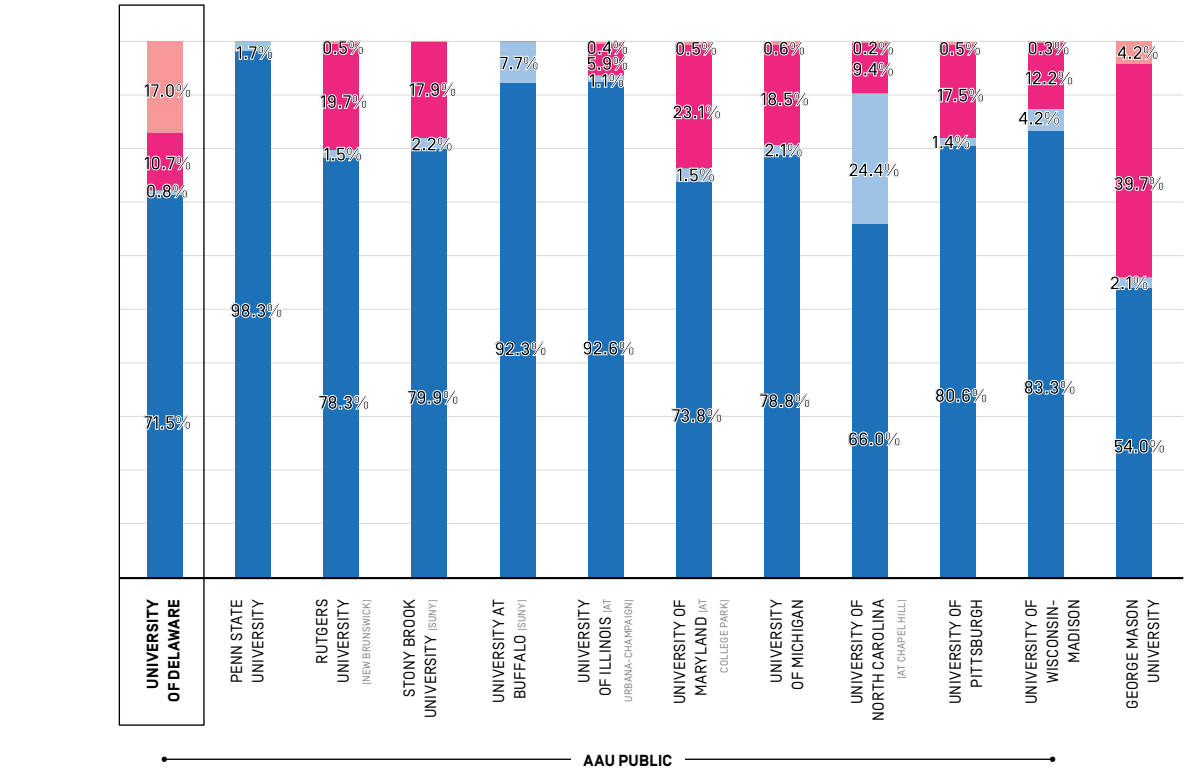
Peer School Comparison: Academic Library Collections

Source : IPEDS DATA CENTER (http://nces.ed.gov/ipeds/datacenter)

BY TOTAL
OF VOLUMES



BY % OF TOTAL
OF VOLUMES



Laboratory Space Distribution

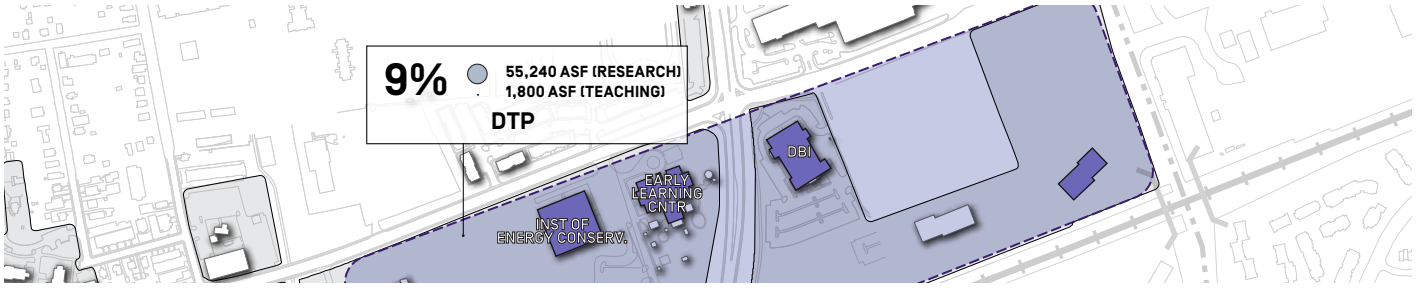
58% of all laboratory space is located east of 'The Green' in the Science and Engineering precinct, 3/4 of which is research laboratory.

Analysis of research space examined locations concentrations, and distribution of teaching vs. research laboratories. A detailed assessment of research laboratory utilization and space projections is included in Section 3: Research Spaces portion of this report.

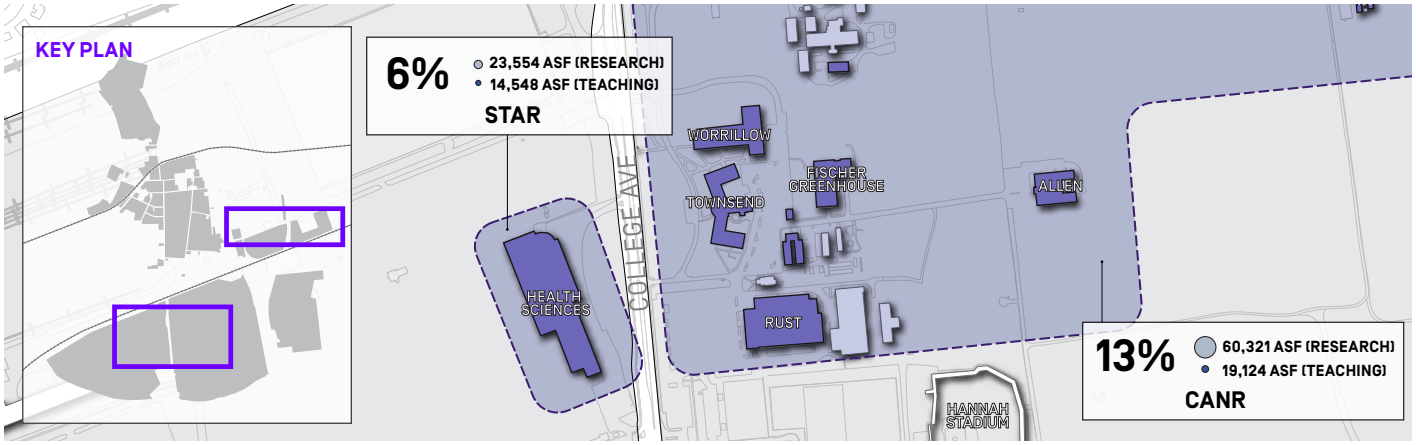
Using the Facilities Inventory and Classification Manual (FICM) space inventory provided by the University, our team conducted a building level analysis of the distribution of laboratory space (200 series) across the Newark Campus. For this analysis laboratory space was sub divided according to Classroom Laboratory Space (FICM 210, 215) and Research Laboratory Space (FICM 250, 255). Room level data for each laboratory type was aggregated to the building level and mapped according to location.

Based on this mapping exercise several observations were apparent:

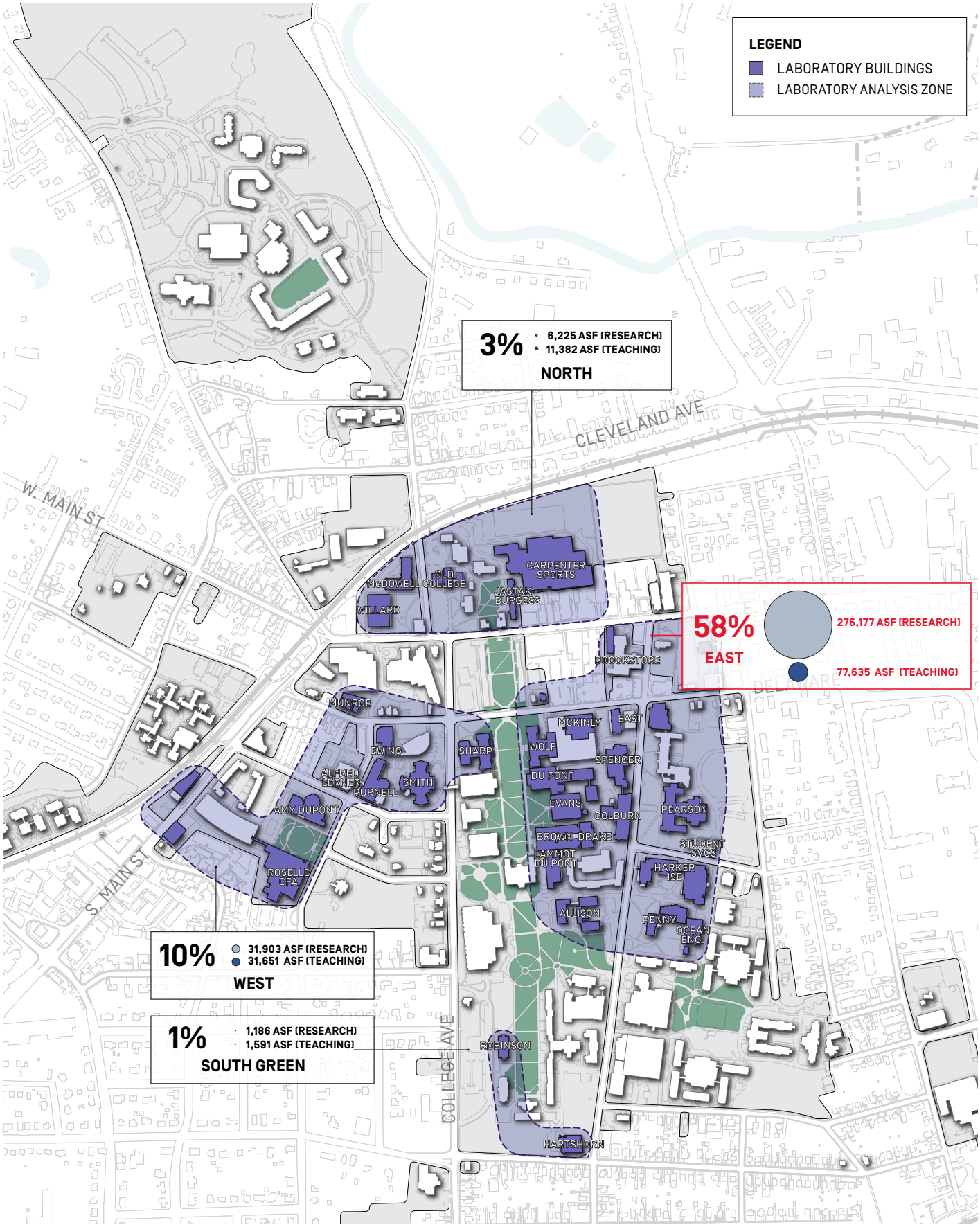
- 58% of all laboratory space is located east of 'The Green' in the general area of the science and engineering precinct.
- Of the laboratory space located east of 'The Green', approximately 72% of that space is dedicated to research laboratory, with the remainder (28%) dedicated to teaching laboratory
- The next highest concentration of laboratory space exists on South Campus largely within the College of Agriculture and Natural Resources, and comprises only 13% of total laboratory space on campus.
- Again, the laboratory space on South Campus is dominated by research laboratories, which occupies approximately 76% of all research space within this campus precinct, and the remaining 24% allocated to teaching laboratories.



Research and Teaching Lab - Delaware Technology Park



Research and Teaching Lab - S.T.A.R & College of Agriculture and Natural Resources



Research and Teaching Lab Concentrations - Central Campus

0.125 0.25 (mile)

Student and Campus Life Spaces

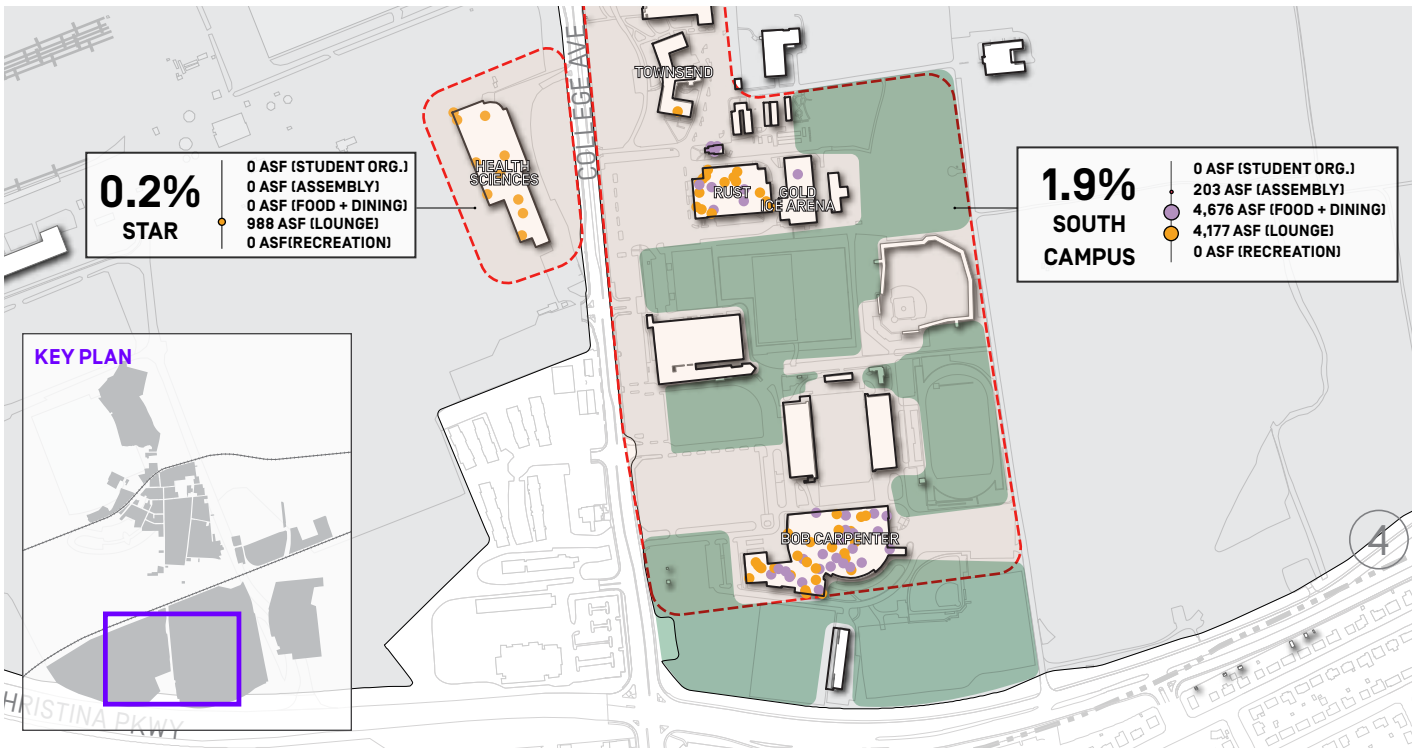
Most student and campus life spaces are located at the periphery of campus, or clustered within on-campus residential areas.

The analysis of student life spaces included in this section examines the concentration and distribution of various types of spaces geared toward enriching the academic, residential and extracurricular experience of students.

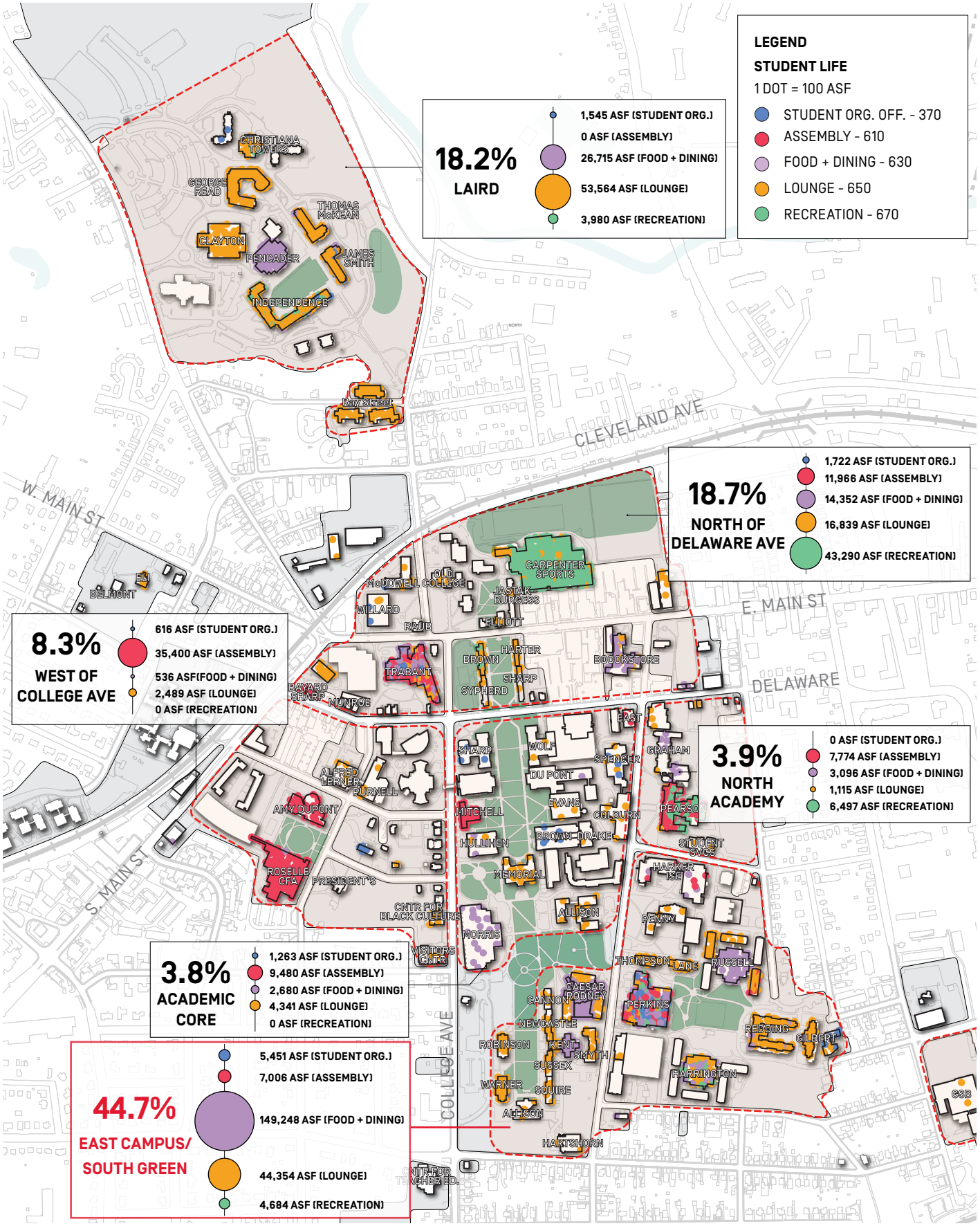
Using the Facilities Inventory and Classification Manual (FICM) space inventory provided by the University, our team conducted a building level analysis of the distribution of student life spaces across the Newark Campus. This analysis includes Assembly Spaces (FICM 610). Food + Dining facilities (FICM 630), Lounge spaces (FICM 650), Recreation spaces (670), and RSO Office spaces (FICM 370). Room level data was aggregated by building and mapped according to location.

Based on this mapping exercise several observations were apparent:

- Most student life spaces are concentrated around residential areas, and are generally are located in the peripheral areas of campus. This finding is in accordance with the 2013 UD Space Utilization Study, which also noted the lack of student life spaces located in the campus core
- Lounge and food service facilities are most abundant in residential areas.
- Both Trabant Student Center and Perkins Student Center have a mix of uses, but are dominated by Food + Dining, Assembly, and RSO Office as a percentage of the whole.
- There are many Assembly spaces on campus, but further work is needed to understand the quality of those spaces relative to desired programs.
- There is a notable lack of student life spaces on South Campus, the Athletic Precinct, and STAR campus.



Student + Campus Life Space Density - S.T.A.R. + South Campus



Student + Campus Life Space Density - Central + Laird Campus

0.125 0.25 (mile)

Undergraduate Student Housing

The majority of on-campus residents live on Laird Campus and East Campus who must use public streets as their primary connection to Central Campus.

ON-CAMPUS HOUSING INVENTORY

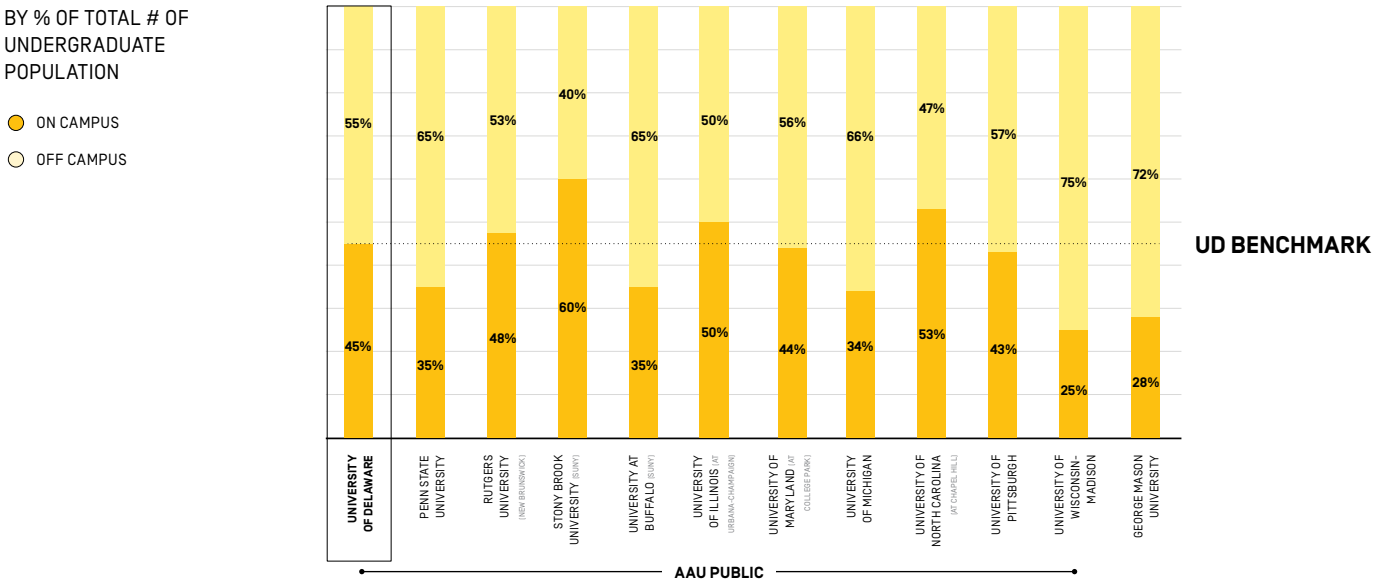
Based on data provided by the office of Residence Life and Housing, the 2015 double occupancy housing capacity at the University is 6,746 beds. Over the past several years, the high enrollment yield of the university combined with the first year on campus housing requirement means that the demand for on-campus housing has outstripped the current supply. In order to meet this demand, the University has employed the use of triple occupancy rooms in some freshman dorms, bringing the total housing capacity to 7,285 beds. The University is also in the process of constructing a new dorm at the intersection of Academy Street and Park Place that will add 521 beds to the on-campus housing inventory (based on double occupancy).

CONCENTRATION OF RESIDENTIAL USES

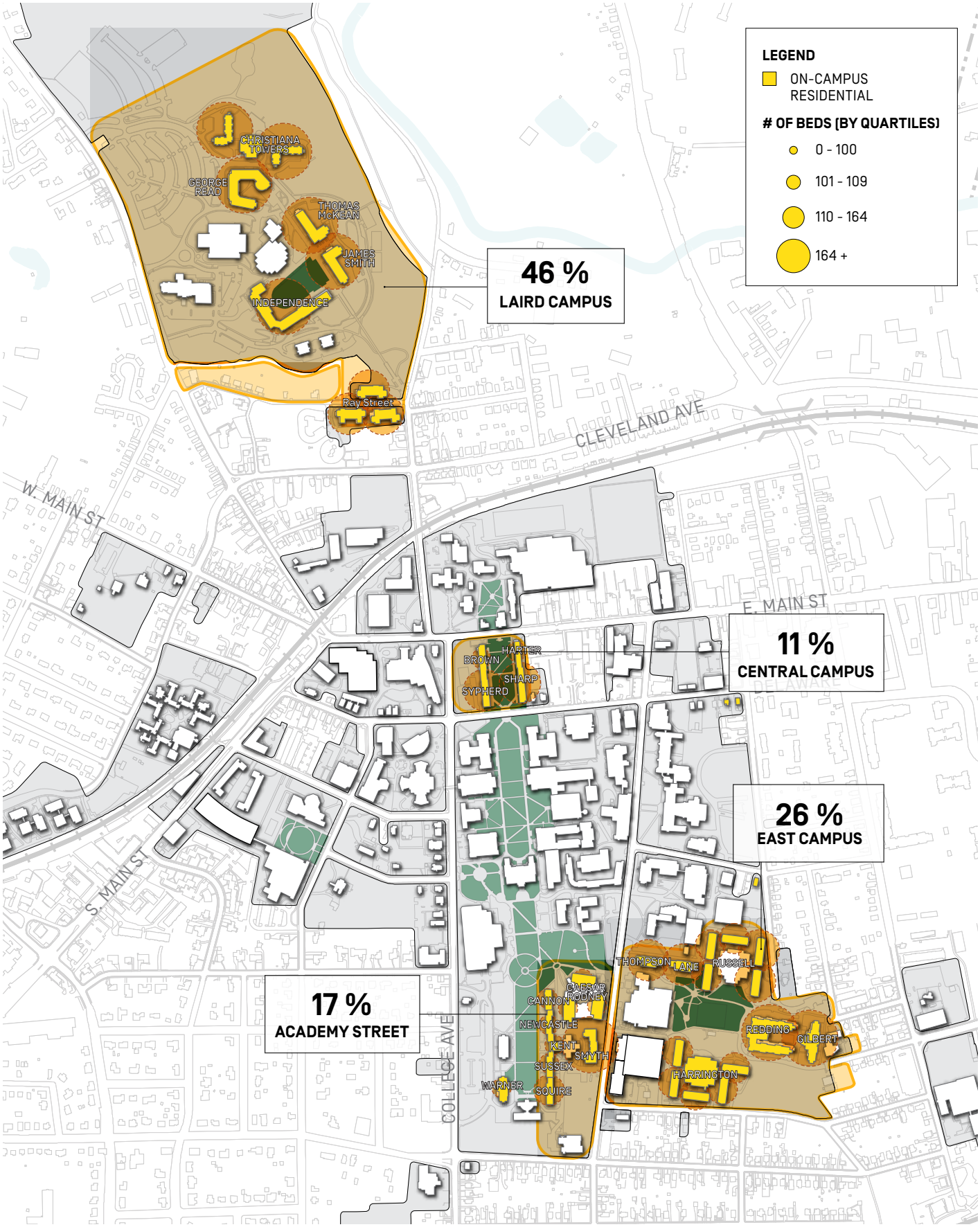
The double-occupancy housing capacity data provided was mapped and aggregated based on geographic area to determine the concentration of on-campus housing capacity. The results of the analysis shows that 46% of all on-campus residential capacity is located at Laird Campus. The additional 54% of on-campus residential capacity is located in the East and Central Campus areas.

The location of this housing capacity is significant because it indicates the most likely origin point for nearly half of the on campus population. Given these origin points, there is a reasonable expectation that the pedestrian routes to and from these areas would come under significant pressure, especially during the peak class times from 10am-4pm. Of specific note are the connections between Laird Campus and Main Street via college avenue, and the campus gateway on Academy Street adjacent to Caesar Rodney and Perkins Student Center. In both cases, our team has observed and heard anecdotal evidence to support the importance of these crossings as students head to and from the academic core of Central Campus.

Peer School Comparison:
On -Campus vs. Off-Campus Housing



SOURCE: US NEWS & WORLD REPORT (http://colleges/usnews.rankingsandreviews.com/best-colleges). NICHE (http://colleges.niche.com)



On-Campus by Total Number of Beds

0.125 0.25 (mile)

Off Campus Housing

High concentrations of students live in areas directly adjacent to campus, which impacts:
The local rental housing market, Neighborhood character, Perceptions about public safety

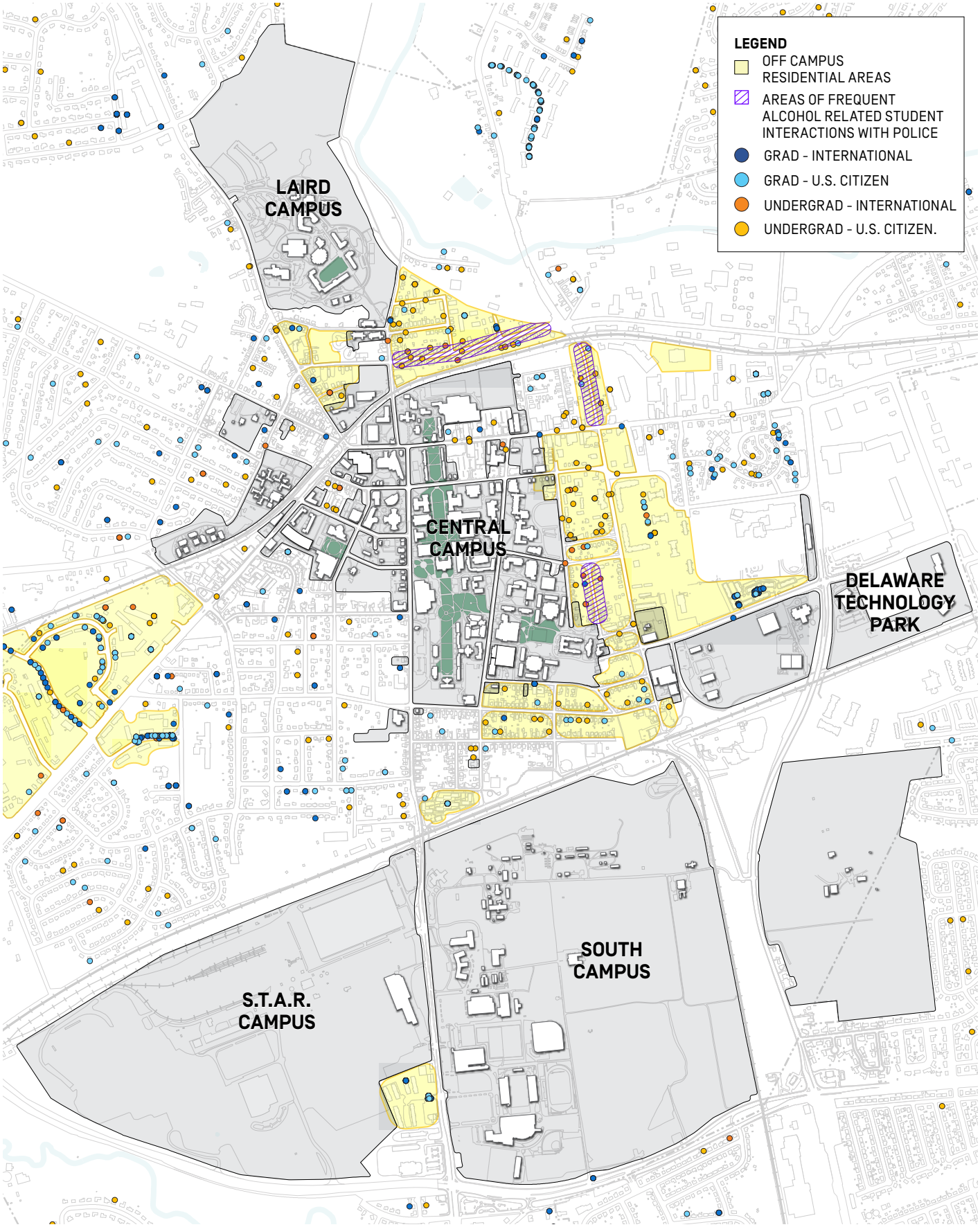
Student address data furnished by the Office of Institutional Research and Effectiveness (OIRE) was mapped to visualize the geographic distribution of off-campus student residents. Since some students do not list their local address, this analysis does not represent a complete record of all off-campus residents. However, the data does provide a picture of where undergraduate and graduate students live in the areas adjacent to central campus and downtown Newark. Furthermore, in many of our stakeholder conversations and interviews anecdotal evidence was provided that indicated areas high concentrations of student housing.

In accordance with observations and what was learned during our stakeholder engagements, the data supported the finding that high concentrations of students are living in the areas directly adjacent to campus. Three areas of significant concentration were highlighted anecdotally, and are supported by the mapped address data:

- East of Chapel Street between Main Street and Park Place
- North of the CSX rail line between New London Rd. and N. Chapel Street
- West of Central Campus between Elkton Rd. and the CSX rail line

The location of off-campus housing is a good indicator of the daily origin point of a significant percentage of the student body. Based on the data, it is likely that off-campus residents are using pedestrian or transit infrastructure to arrive on campus, but are subject to the same constrained intersections that on-campus residents must use. Specifically, the rail crossing at College Ave and Chapel Street, as well as multiple crossings along Academy Street. This data verifies anecdotal evidence and observation that suggest the location of housing is putting significant pressure on specific East-West crossing along College avenue and Academy Street.

Chapel Street Off-Campus Residential Area



Off-Campus Student Housing Address Mapping

Campus Activity Centers + Community Facilities

The University has many cultural facilities that are open to the public. There is significant opportunity for these facilities to be more visible and accessible to the University community and to the public.

Using the facility space inventory and research, Assembly, cultural and community spaces were mapped according to location. This analysis includes locations of spaces and venues within University owned buildings as well as a mapping of external cultural and community resources that may be important contact points with the broader Newark community.

The inventory of on-campus cultural spaces includes buildings that are open to both the university and the public, including:

- Old College Gallery
- Mechanical Hall Gallery
- Mineralogical Museum (Penny Hall)
- Morris Library
- Mitchell Hall
- Trabant Student Center
- Perkins Student Center
- Roselle Center for the Arts
- Center for Black Culture
- UD Athletic Stadiums + Facilities
- UD Creamery
- UD Botanic Gardens
- UD Bookstore
- UD Visitors Center

Additional assembly spaces with fixed seating exist within Pearson but are not currently utilized for public functions.

RELIGIOUS ORGANIZATIONS

The University also has several religious ministries with dedicated buildings that cater to the spiritual needs of the students:

Baptist Student Ministry
Catholic Student Ministry
Presbyterian Student Ministry
UD Hill el / Kristol Center for Jewish Life

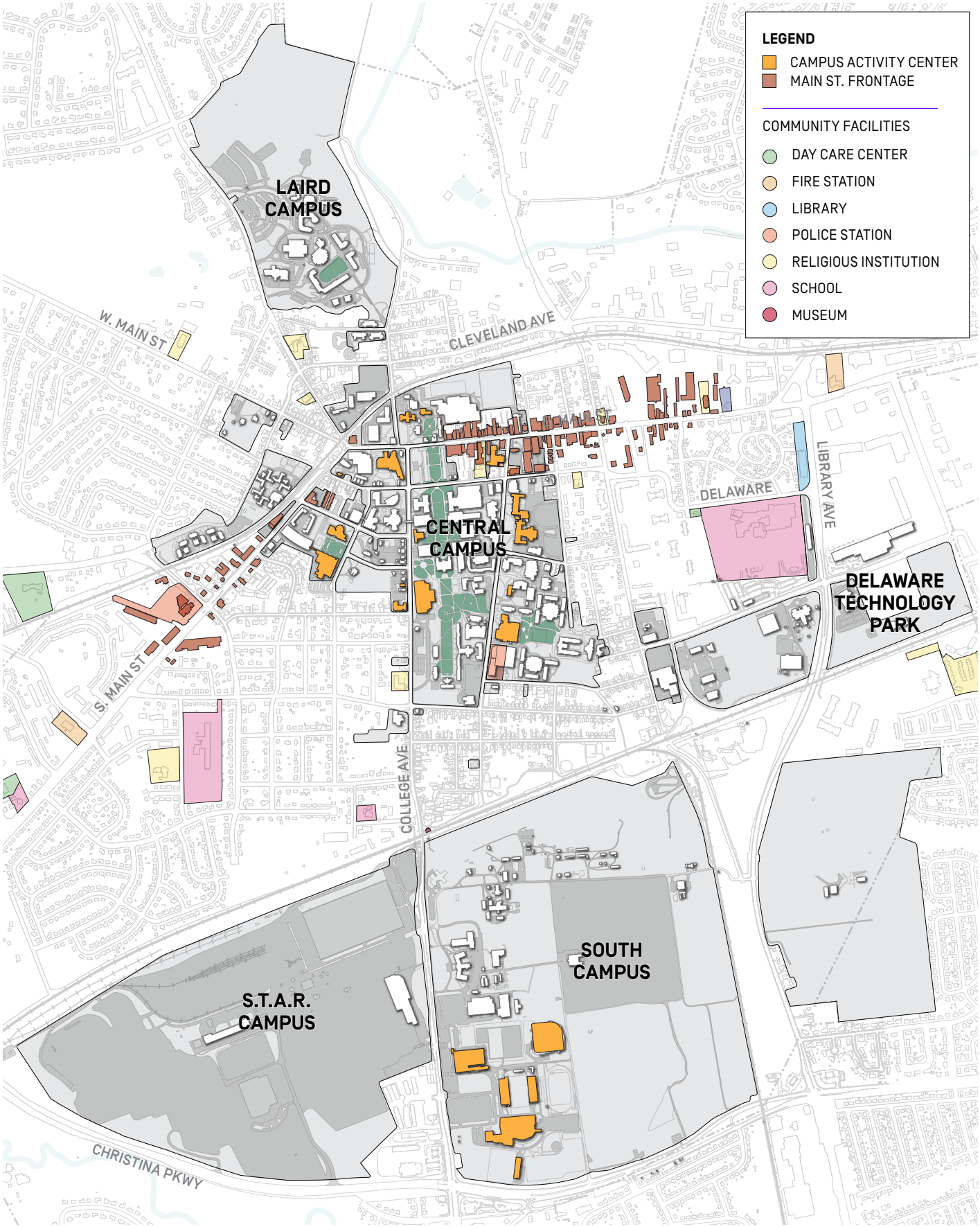
OFF CAMPUS COMMUNITY VENUES AND ORGANIZATIONS

In addition to on-campus cultural and community venues, our team researched the location of religious, civic, cultural and community based organizations throughout the City of Newark. These venues, are not specifically affiliated with UD, but may provide an important link between the university and the broader Newark community.

Mechanical Hall Gallery

Old College Gallery

Mineralogical Museum



Assembly Space and Religious/Libraries/Parks

Building Age

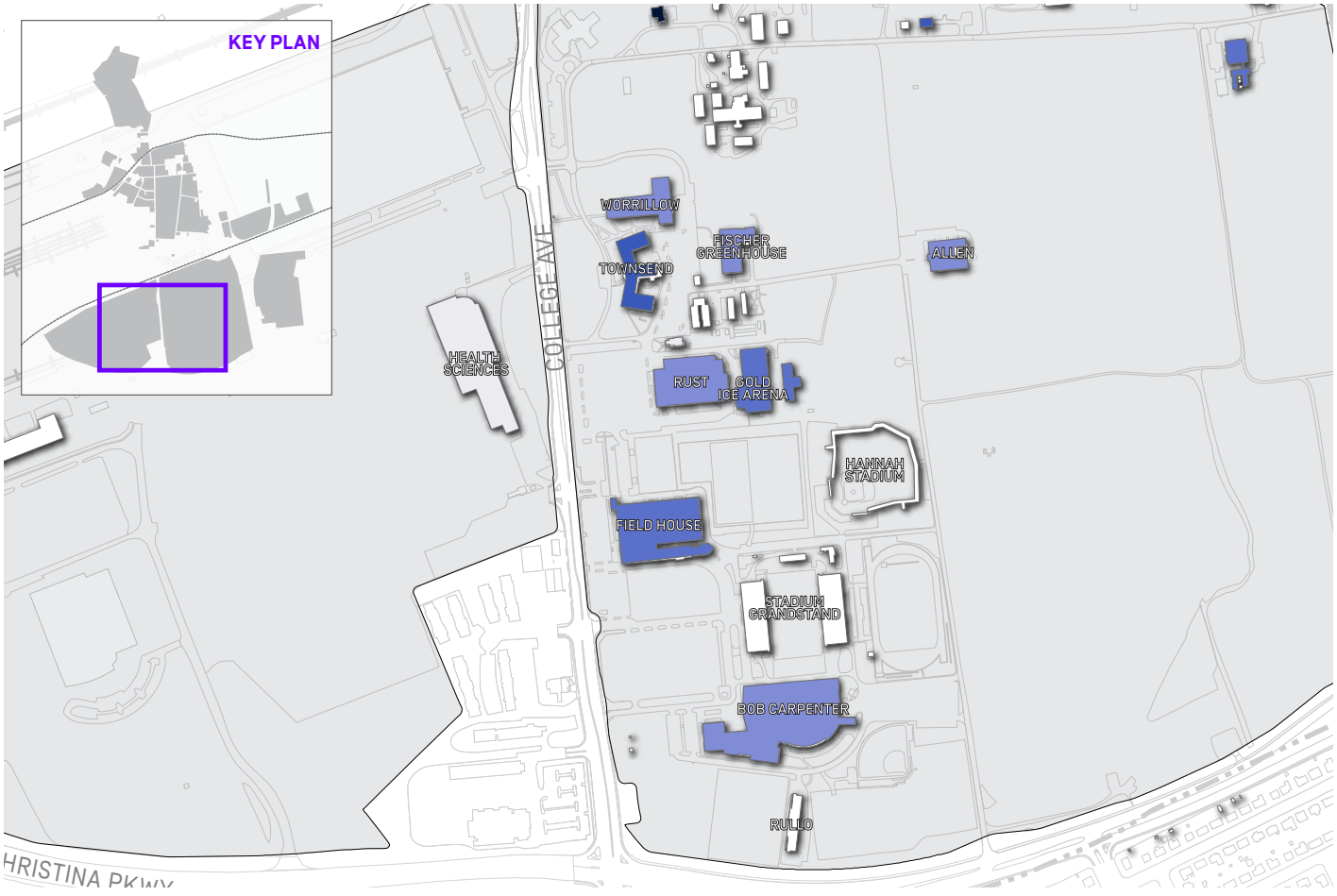
The oldest buildings tend to be concentrated in the area of Old College and the north end of 'The Green'.

Based on data provided by the department of Planning and Project Delivery, the age of each campus building was classified and mapped, with the areas surrounding Old College Hall displaying the highest concentration of buildings built before 1900.

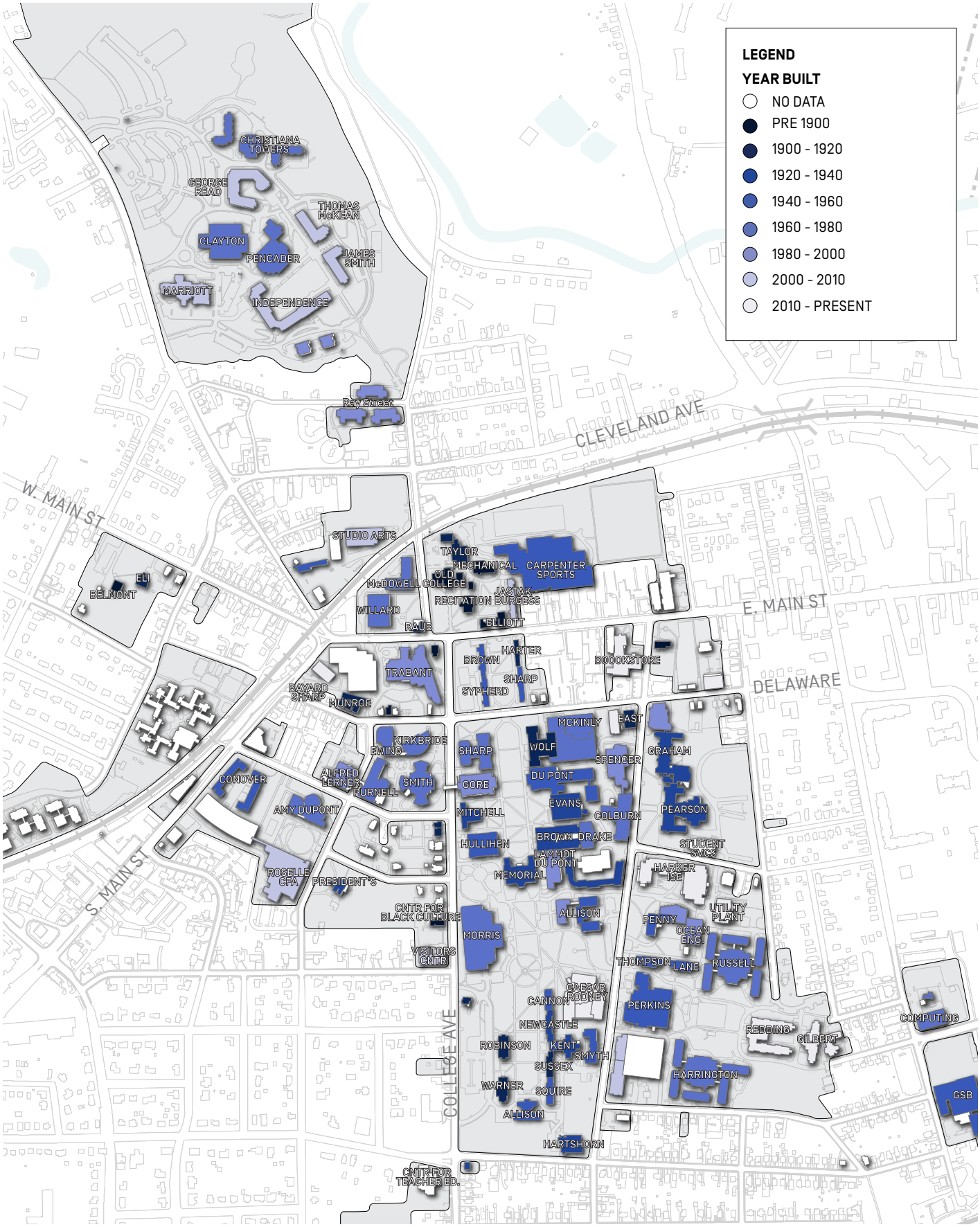
Also as expected, the area surrounding 'The Green' contains a high concentration of older buildings, with the age of buildings generally decreasing as you move away from 'The Green' toward the peripheral areas of campus.

It is interesting to note that a high concentration of buildings built through the 2nd half of the 20th century are often sited in away from the heart of central campus (i.e. 'The Green'), including Laird Campus and South Campus.

These findings are significant to understand the progression of development over the history of the University, particularly when examined in conjunction with assessments of building condition such as the Facilities Condition Index, which demonstrate a significant backlog of deferred maintenance in laboratory buildings built in the latter half of the 20th century -- particularly those in the Science and Engineering Precinct.



Age of Buildings - S.T.A.R. and South Campus



Age of Buildings - Central + Laird Campus

0.125 0.25 (mile)

Campus Capacity Study (2008)

A 2008 Master Plan Study was halted before completion and made several programmatic recommendations that were implemented, but not in the context of a prioritized campus master plan.

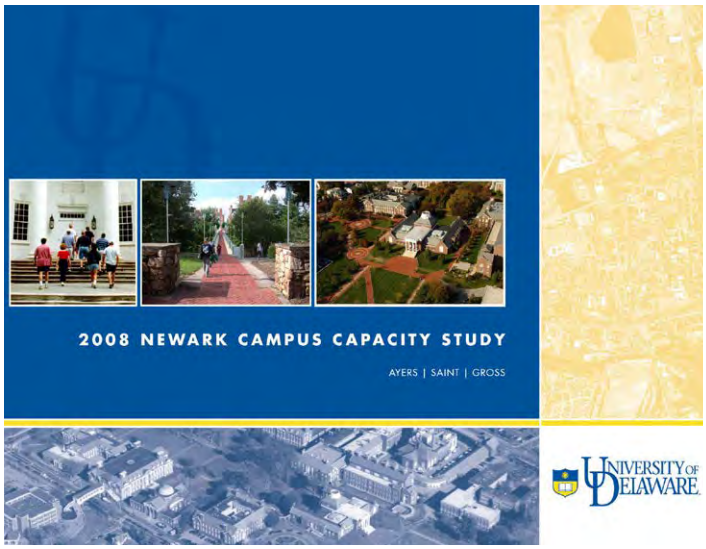
In 2008, the University commissioned a Campus Master Plan that was halted after a study of existing conditions. This study came to be known as the Campus Capacity Study, and included preliminary explorations of the following topics:

- Regional Context
- Building History
- Site Analysis
- Building Use
- Strategic Planning Meetings
- Planning Principles
- Recommendations by Sub-Area

The Campus Capacity Study made a strong recommendation that a comprehensive campus master plan was needed to develop a prioritized suite of initiatives to help the university achieve its strategic goals. It also made several recommendations for planning and building projects that were completed including:

- Interdisciplinary Undergraduate Science Building (ISE Lab)
- Athletics & Recreation Master Plan
- East Campus Residence Halls
    - Caesar Rodney, Redding and Gilbert Residence Halls

The implementation of these projects speaks to the acute need the University had (at the time) for additional laboratory space and residential capacity. However, the lack of a coordinating master plan to guide prioritization and implementation suggests the projects may not have been ideally situated into the context of the larger strategic and physical priorities of the University.



Newark Campus Capacity Study, 2008

University of Delaware Space Utilization Study, 2013

SPACE UTILIZATION STUDY (2013)

Space needs are more a question of quality rather than quantity. There is additional capacity within existing facilities that should be used more effectively before building new facilities.

In 2013, the university commissioned a space utilization study. The key findings of this study were:

- In general, the focus should be on the quality of space rather than creating a significant quantity of new space.
- The University should explore the creation of a university-wide space management function to assess the allocation (and reallocation) of space.
- Non-residential student life spaces are generally in poor condition and are located at the periphery of campus
- It is likely that sufficient office space exists on campus, but may be over-allocated on an individual level and does not facilitate a collaborative environment.
- There is significant inactive circulation spaces within existing buildings that could be easily re-purposed to gathering, study and collaboration space for students.
- Research space is the one type of space that may require the addition of significant new floor area. Specifically the creation of a new cross-disciplinary wet-lab building in the near future.
- Re-investment in existing facilities is a critical need that the university should focus through the management of facilities renewal budget.

In addition, the 2013 Space Utilization Study included assessments of several laboratory buildings. The study ranked buildings based on a color scale of suitable use which is indicated on the accompanying map. The study identified Sharpe Lab, Drake and DuPont Lab as three specific buildings that were no longer capable of supporting the level of research for which they are being used, and suggested they are candidates for changes of use.

Laboratory Assessments: Space Utilization Study (2013) - Central + Laird Campus

Facility Condition Index (FCI)

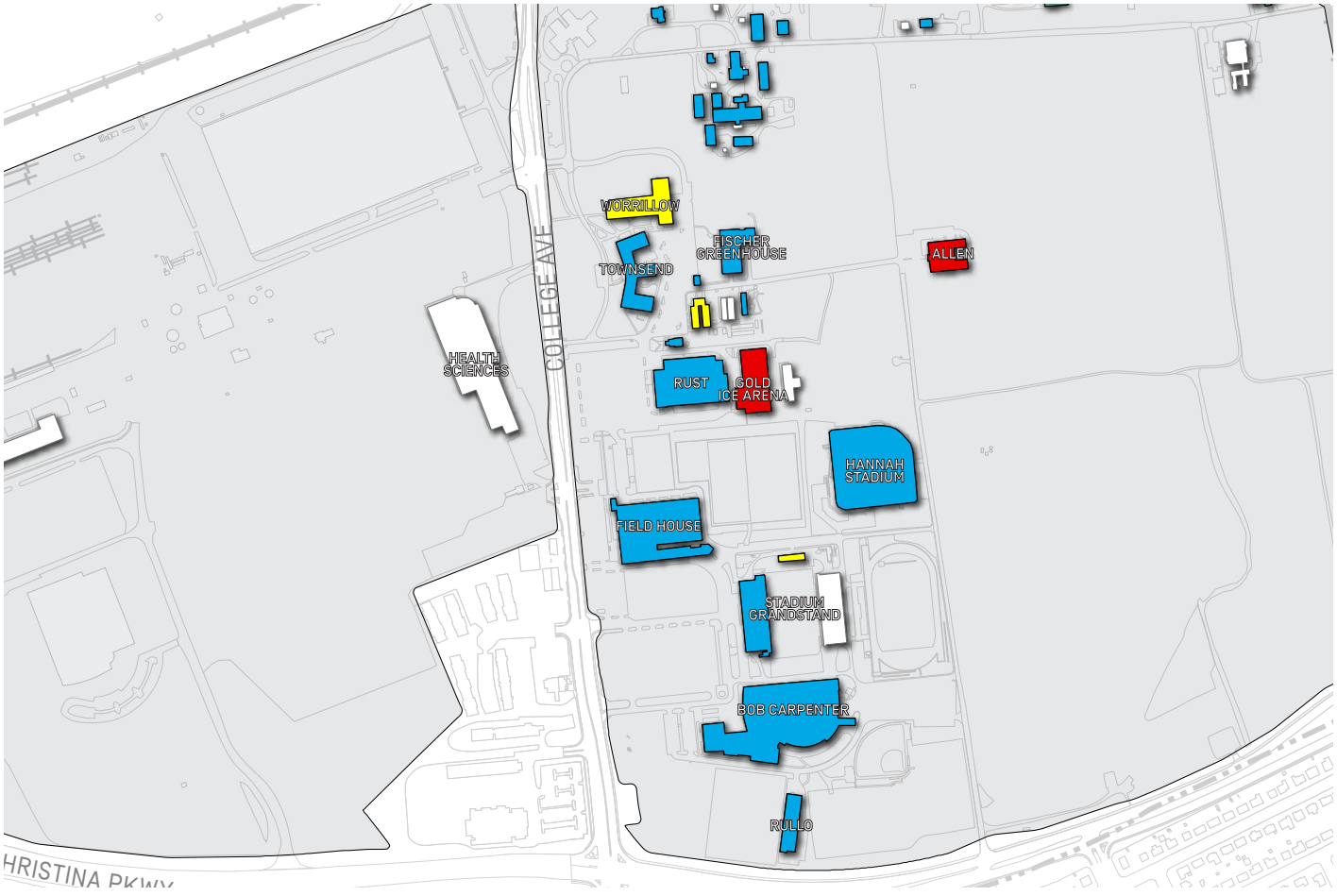
The greatest concentration of buildings in "Poor" condition are located at the north end of 'The Green' and include a significant number of laboratory buildings in the Science and Engineering Precinct.

The University recently commissioned a Facility Condition study to estimate the deferred maintenance, replacement value and Facility Condition Index (FCI) for the Newark campus.

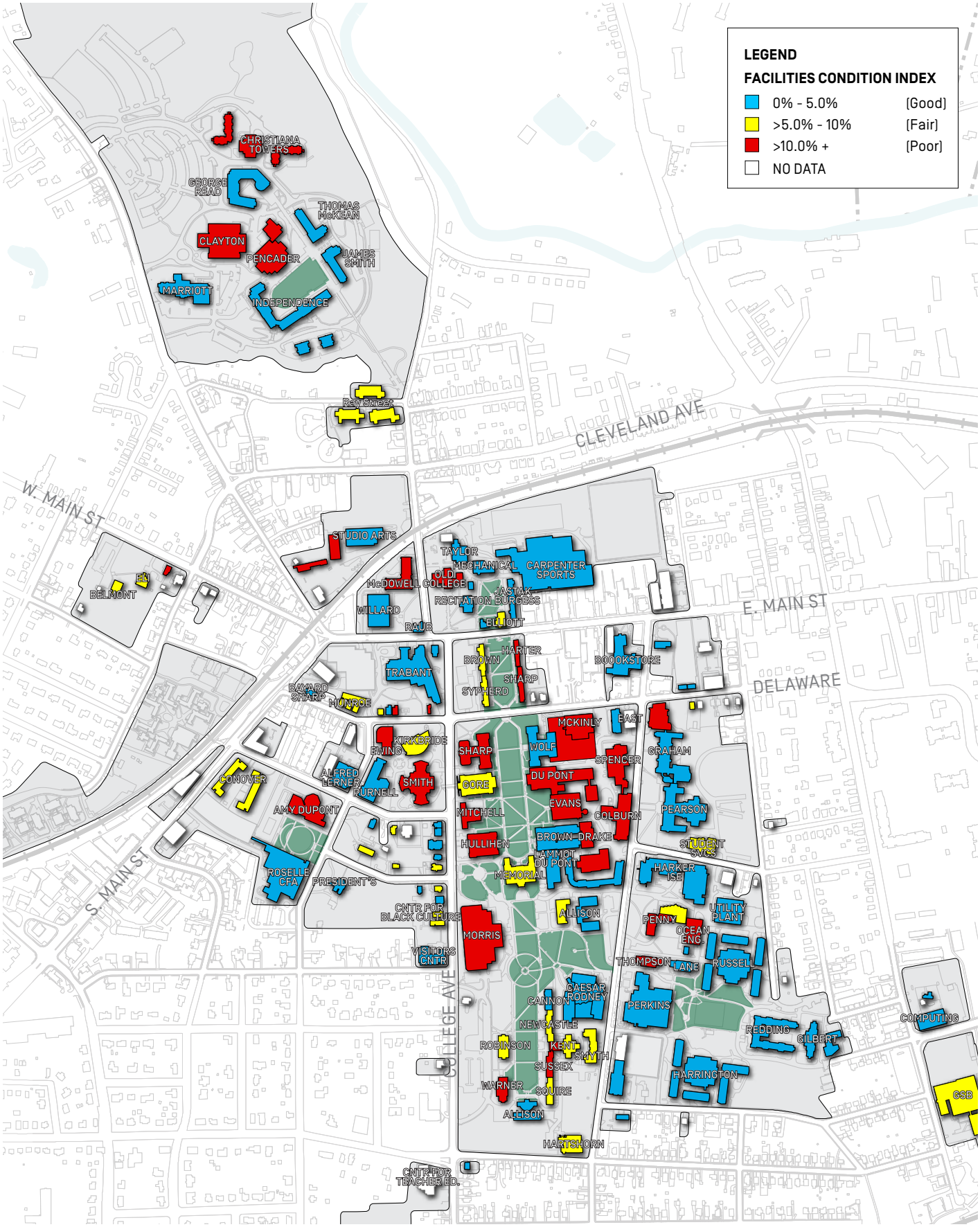
The study found the current replacement value of all buildings on the Newark campus to be slightly more than $4B, with a deferred maintenance value of approximately $110M. The analysis further showed that the overall FCI for the university is 11.7%. According to the study results, a FCI value of >10% indicates a facility that is considered to be in "Poor Condition".

Our analysis mapped the available FCI values for each building according to the scale indicated on the accompanying map.

It is significant to note the high concentration of laboratory buildings in the Science and Engineering Precinct that have an FCI of >10%. These findings align with the findings of the laboratory assessment that was part of the 2013 Space Utilization Study, that recommended a number of use changes for laboratory buildings based on condition and suitability. Additionally the majority of other buildings with an FCI of >10% are located around the north or central areas of 'The Green', with an additional cluster located at Laird Campus. That includes the most significant student life buildings on the North Campus.



Facilities Condition Index Analysis - S.T.A.R. and South Campus



Facilities Condition Index Analysis - Central + Laird Campus

Research

STAKEHOLDER WORKING GROUP EMERGING THEMES

- Clear policies are needed for the **assignment (and re-assignment) of laboratory space**.
- A comprehensive plan for **building lifecycle management** is needed to assure physical spaces properly support desired research intensity.
- A plan is needed to identify the best locations for **new or re-purposed research space.**

FINDINGS

- Goal is to characterize research space utilization. We measured. What to do with these findings is the next step.
- Findings vary by Department.
- UD is generally not operating at or near full occupancy utilization based upon amount of space expressed ASF/FTE units.
- The Facility Condition Index (FCI) needs to be correlated to our occupancy level findings to develop actions.
- At a basic understanding, all space we analyzed is at least habitable up to practical levels.
- Increasing occupancy rates is usually not free of costs. A percentage can be achieved operationally via space management.
- Some facilities will require investment in physical upgrades where building condition suggests a fair to poor standard, or to prepare it for increased occupancy.
- Some facilities may be candidates for demolition or present opportunities for adaptive reuse.
- Other facilities in good condition with room to grow occupancy internally within existing research facility resources need a commitment to take on such an "inhale" and also need some investment to address the impacts.
- $/SF and SF/FTE utilization capacity rates are simple measures that are impacted by complex socio-cultural, political and economic contexts and heavily influenced by historical decision-making. Improvement requires both operational commitments as well as significant investment funding to effect change.
- It's unlikely that the University will agree to sacrifice current conditions to simply increase occupancy density without agreeing that there is a compelling shared urgency, such as: Making room for new recruits, a full shut-down of an existing facility to allow for a shorter renovation period, an emergency shut down due to a mechanical system failure
- Without a compelling reason to change, there is no reason to take on the density.

Measuring Research Space Utilization

Goal is to characterize research space utilization.
We measured. What to do with these findings is the next step.

Findings vary by Department.

- UD is generally not operating at or near full occupancy utilization based upon amount of space expressed ASF/FTE units.
- The Facility Condition Index (FCI) needs to be correlated to our occupancy level findings to develop actions.
- At a basic understanding, all space we analyzed is at least habitable up to practical levels.

"How well are our existing research facilities utilized?"
- Anonymous Board of Trustees members

This is a fair and reasonable question often posed by board members and others in positions of fiduciary responsibility for a portfolio of research facilities. The answer can be an important factor in the decision-making process to authorize, delay, or politely ignore capital funding requests to renovate or construct new facilities.

How can research space utilization be measured?

To assess utilization, two methods can prove useful. They are both based upon the premise that one can reasonably expect a research space portfolio to be generally well occupied, and productive. The first method seeks to understand how fully occupied research space is in straight-forward terms of the number of research faculty and staff assigned. Determining an occupancy rate in an academic research environment requires:

1) Establishing what full, or 100% capacity is,
2) Collecting a census of research space occupants.

Once a census is completed and 100% capacity determined, an occupancy rate (% of capacity occupied), or square foot (SF)/per capita, or SF/FTE can be calculated.

The second method measures how efficient principal investigators (PI) research teams are at generating grant award expenditures within their allotted research space. Dividing annual expenditures by the amount of square feet assigned to a department yields a grant dollar density figure, $/SF. Note that as the average square feet assigned to a department compacts, assuming funding remains the same, the $/SF return-on-asset increases.

Together, these two utilization rates provide good clues that suggest how effective space allocation managers are at using their research space assets to generate a reasonable return-on-investment, or in this case, return-on-asset.

Further clues are needed to fully understand space utilization. The two utilization measures listed here are made irrespective of building systems condition, or capabilities. Considering overall building quality in contextual terms of a matrix of functional and technical systems that may assess architectural condition, building age, time passed since last renovation, structural, mechanical, electrical and plumbing infrastructure condition. A common metric that expresses some of these factors is the Facility Condition Index (FCI). Knowing this offers further clues. For example, aged electrical infrastructure system constraints may limit occupancy assignments.

While it is not difficult to imagine how less desirable habitable space may be intentionally assigned at lower occupancy rates, as a trade-off. Although, consider it a basic assumption that all research space analyzed is minimally habitable at a practical level.

What is a reasonable, practical occupancy rate, or SF/FTE?

"Practical" is a key concept to consider when assessing occupancy levels. Research funding is not achieved as a constant, steady stream. Research space occupancy ebbs and flows along with funding success. Tight management of research space to yield high occupancy, or high $/SF likely requires frequent space adjustments. Recognizing how disruptive and demoralizing this would be to researchers, many space governance policies elect to evaluate three years of research funding before considering space re-allocation. There are benchmarks, or best practice ranges for a "good" to "loose" management approach to research space that remain

achievable and sustainable. The SF/FTE metric is a more universal measure that can be applied more broadly across academic disciplines, independent of research grant funding.

Benchmark and best practice ranges for $/SF vary significantly across research disciplines, especially being dependent upon potential magnitude available for grant funding in particular academic disciplines.

Implementing Tighter Space Management Policy

Increasing occupancy rates is not totally free of financial and emotional costs. Some percent improvement can be achieved through operational moves. Certain facilities will require some degree of financial investment in physical upgrades to be upgraded from poor to good condition and increased occupancy. Some facilities are candidates for demolition, or present opportunities for adaptive reuse.

In addition to a financial commitment, an institution needs a good underpinning rationale before taking on an internal commitment to "inhale."

In practice, before tighter occupancy utilization can be achieved, given a good, rational reason, or urgent need is established; a need well-expressed and clearly understood by those impacted. It's unlikely anyone will agree to sacrifice current conditions to simply increase occupancy density without agreeing that there is a compelling shared urgency, such as making room for new recruits, or a full shut-down of an existing facility to allow for a shorter renovation period; or an emergency shut down due to a mechanical system failure. Without a compelling reason to change, no reasonable person would take on the financial, logistical and emotional hassle. Examples of rationale for increasing occupancy may include: to align an institution's utilization of space resources with their strategic initiatives such as forecasts for recruiting and retention; acknowledging deferred maintenance.

Findings

When reviewing a department's metrics, it's prudent to pursue further investigation of outlier results, especially when indicators suggest unexpectedly low occupancy, or return. There may be mitigating circumstances. Local circumstances need to be considered.

Findings certainly vary by department, and are best evaluated at that scale. In general, the research facilities are not completely full in terms of occupancy. There appear to be some potential to increase experimental research occupancy rates in many of the University's research facilities, assuming functional and technical facility conditions warrant higher occupancy. Without considering building condition, no specific conclusions for action to increase utilization, or inaction can be fully backed up.

Next Steps

Tasks include testing and developing concepts, strategies and scenarios for development that optimize and maximize planning opportunities. The result should address the strengths and weaknesses of campus facilities, including those dedicated to research.

ISE Lab

Measuring Research Space Utilization & Benchmarks

Increasing occupancy rates is usually not free of costs.
A percentage can be achieved operationally via space management.

Increasing Occupancy Rate

- Some facilities will require investment in physical upgrades where building condition suggests a fair to poor standard, or to prepare it for increased occupancy.
- Some facilities may be candidates for demolition or present opportunities for adaptive reuse.
- Other facilities in good condition with room to grow occupancy internally within existing research facility resources need a commitment to take on such an "inhale" and also need some investment to address the impacts.

University Summary Methodology

STEP 1: PEOPLE
Identify assigned research space & perform an occupancy census for a spring 2016 benchmark.

- Research PI count (Selected Faculty Principal Investigators assigned research space)
- Research FTE count (Other Faculty, Professional Staff, Trainees & Students assigned research space)

STEP 2: SPACE
Collect research space data records.
Organize the following space type categories:

- Experimental Research Lab + Lab Support
- Computational Research Space
- Office Space for Research Faculty, Post-Docs, Grad Research Assistant, Teaching Assistant & Undergrads
- Core Labs & Research Workshops

STEP 3: GRANT $
Gather grant expenditures by department.

- Include direct & indirect expenses
- Federal, State & Non-governmental Sources

STEP 4:
Analyze people, space & grant $

- Average PI group size; FTE per PI
- Average occupancy SF per FTE
- Grant $ per SF - Return on asset (ROA)
- Occupancy ratio
- SF demand to supply SF capacity

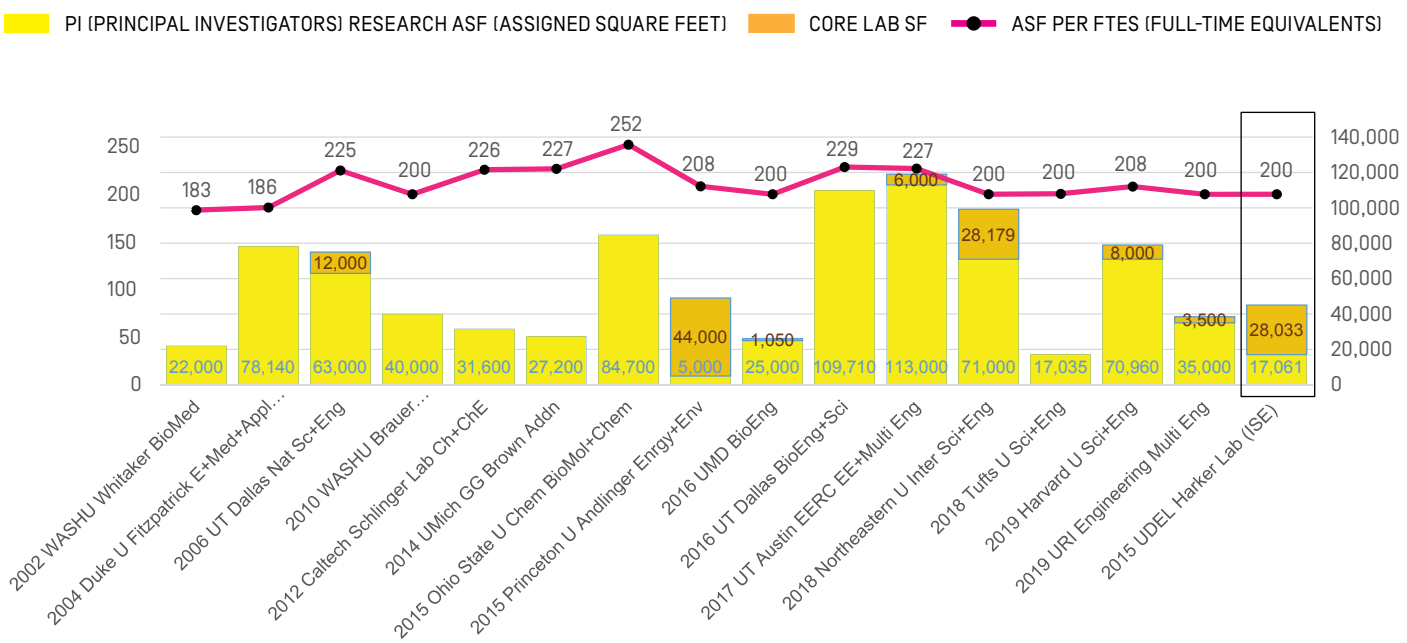
GRANT $ per ASF (directs & indirects):

- $400–$600/ASF lab, lab support, office & shared confirm
- >$600/ASF over-crowded

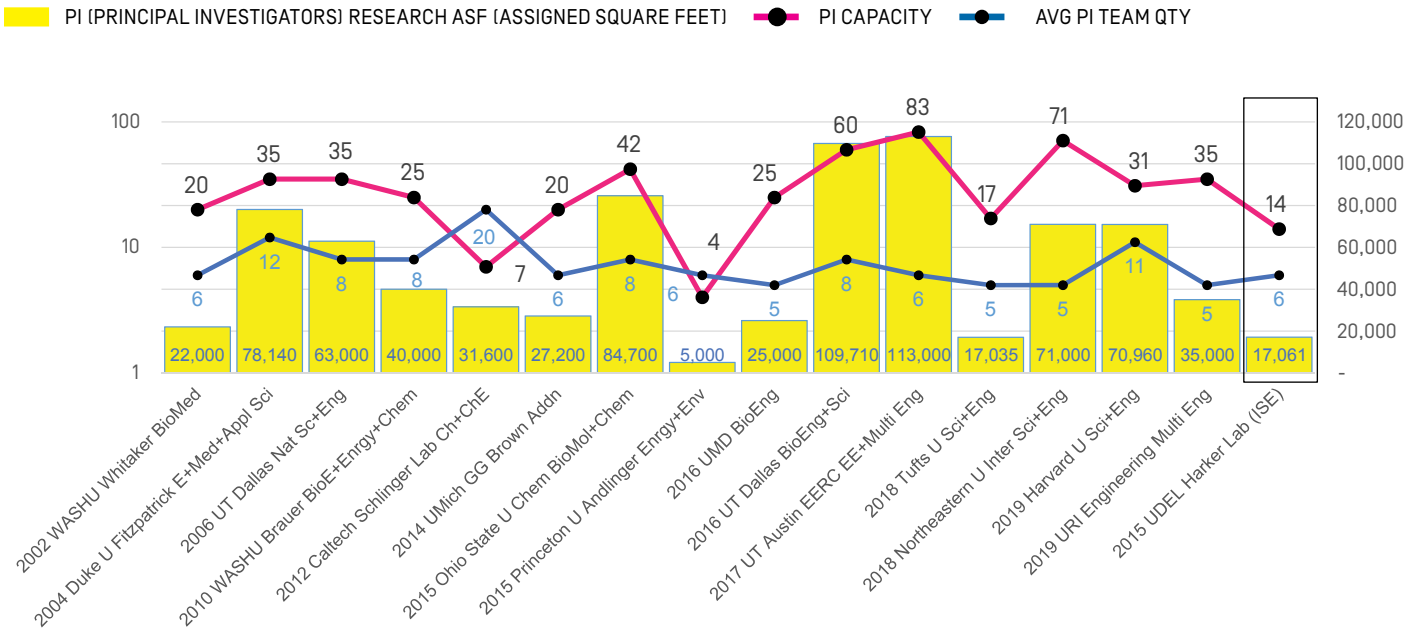
ISE Lab Building

Peer School Comparison :
Research Space Utilization

- ASF per Research FTE with Research ASF



- PI Groups per Research Facility with Average PI Group Size & Research ASF



Research Space Utilization Summary

$/SF and SF/FTE utilization capacity rates are simple measures that are impacted by complex socio-cultural, political and economic contexts and heavily influenced by historical decision-making.
Improvement requires both operational commitments as well as significant investment funding to effect change.

RESEARCHERS

A census of principal investigators (PI) identified 951 tenured or tenure-track, research-active PIs across the seven colleges. Experimentalist researcher counts subtotaled to 404, with 547 computationalists. In addition to the principal investigators, 1,981 research Full-Time Equivalents (FTEs) occupy research space within Newark campus research facilities.

Research FTE include people who are not tenured, nor on tenure-track, professional and technical staff, visiting faculty, post-docs, and paid graduate research assistants, graduate teaching assistants, and undergraduates. Non-research and adjunct professionals, emeriti faculty and administrative staff are intentionally not included.

ASSIGNED PI RESEARCH SPACE

The amount of experimental and computational research facilities in active use combined with their associated research office space for faculty and FTE comprise about 752,000 square feet available across the University.

Research space figures were derived from the room by room facilities space database, classified as non-class laboratory (experimental labs), non-class laboratory support (experimental lab support) and office space.

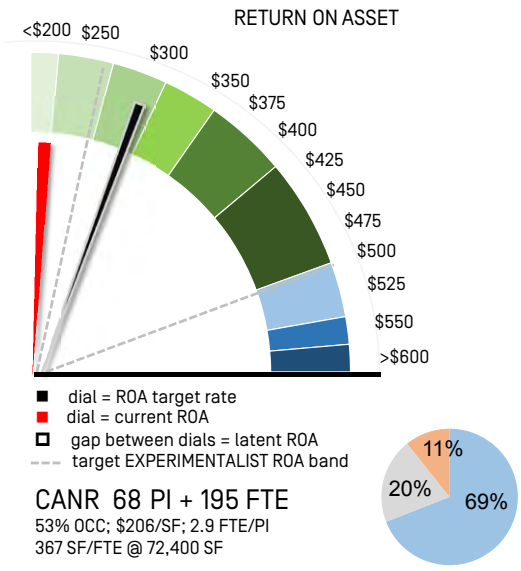
Vivarium space, core labs and other highly specialized labs and research support spaces are sub-totaled separately as they are isolated from the utilization analysis of assigned PI research space. These exceptions comprise about 43,000 additional square feet of research space.

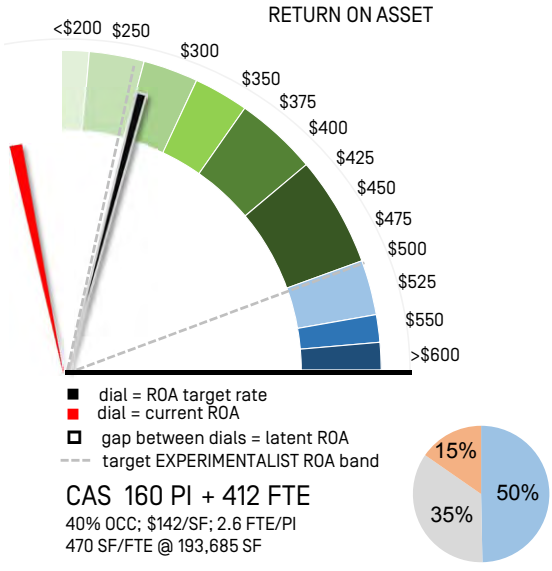
GRANT EXPENDITURES

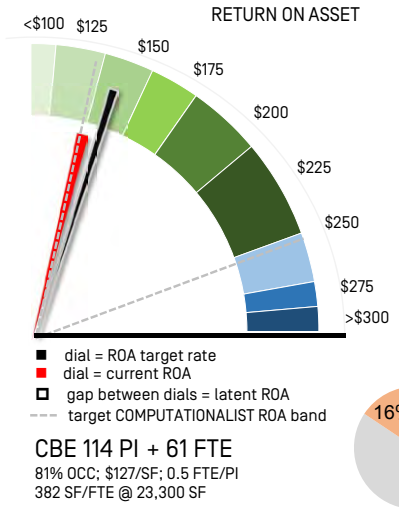
University of Delaware PIs averaged $145,400 of grant expenditures in 2015.

METRICS

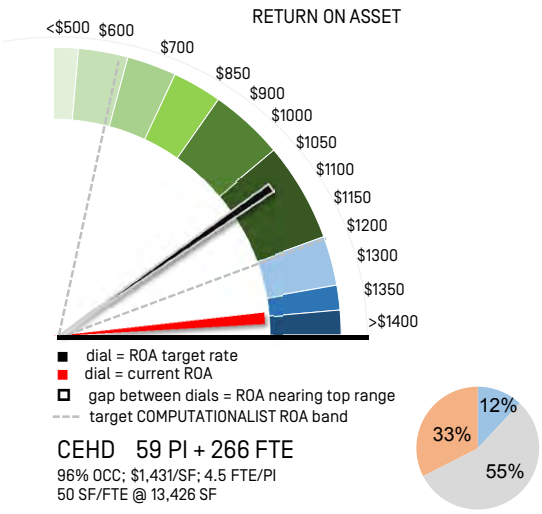
- 1.0:1.36 Experimental to Computational PI
- 2.1 FTE per PI (excludes PI)
- 791 SF per PI and 380 SF per FTE
- $184 grant expenditures per SF of PI assigned research space



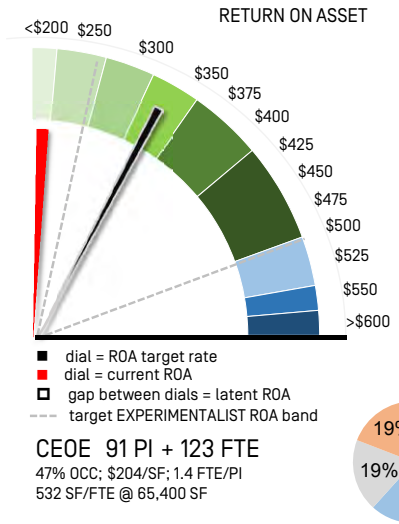




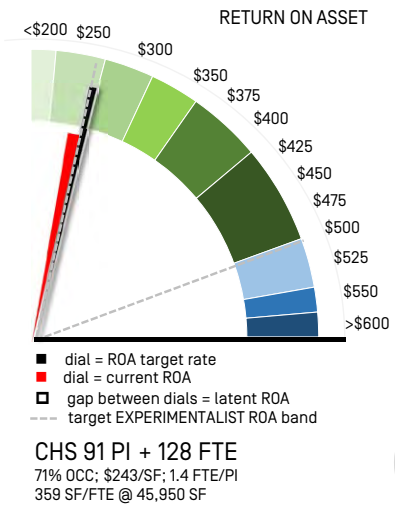
CBE 114 PI + 61 FTE
81% OCC; $127/SF; 0.5 FTE/PI
382 SF/FTE @ 23,300 SF



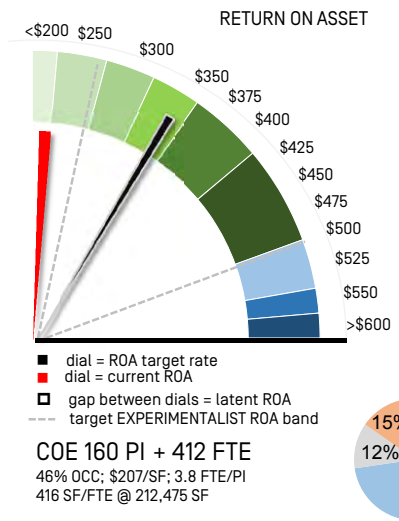
CEHD 59 PI + 266 FTE
96% OCC; $1,431/SF; 4.5 FTE/PI
50 SF/FTE @ 13,426 SF



CEOE 91 PI + 123 FTE
47% OCC; $204/SF; 1.4 FTE/PI
532 SF/FTE @ 65,400 SF



CHS 91 PI + 128 FTE
71% OCC; $243/SF; 1.4 FTE/PI
359 SF/FTE @ 45,950 SF



COE 160 PI + 412 FTE
46% OCC; $207/SF; 3.8 FTE/PI
416 SF/FTE @ 212,475 SF

ACRONYMS

UNIVERSITY OF DELAWARE - COLLEGES

CANR	College of Agriculture and Natural Resources
CAS	College of Arts and Sciences
CBE	Lerner College of Business and Economics
CEOE	College of Earth, Ocean, and Environment
CEHD	College of Education and Human Development
COE	College of Engineering
CHS	College of Health Sciences

LEGEND

- Lab & Lab Support
- Research Office
- Grad & Post Doc Office

Research Space Utilization - Findings by College

Research Space Utilization Summary

It's unlikely that the University will agree to sacrifice current conditions to simply increase occupancy density without agreeing that there is a compelling shared urgency, such as:

- **Making room for new recruits**
- **A full shut-down of an existing facility to allow for a shorter renovation period**
- **An emergency shut down due to a mechanical system failure.**

Without a compelling reason to change, there is no reason to take on the density.

RESEARCH SPACE CAPACITY MODEL
Baseline Capacity Assumptions

PI Office Space Model: 120SF / Principal Investigator

- 120 SF per Faculty

Experimental Research Space Model: 200-220 SF/FTE

- 40-60 SF per FTE prorated share of PI office (varies by average group & PI office size)
- 120 per FTE SF of research space
- 25 SF per FTE for workstation office space
- 15 SF per FTE shared collaborative conference room & break room

Computational Research Space Model: 100-120 SF/FTE

- 40-60 SF per FTE prorated share of PI office (varies by average group & PI office size)
- 20 SF per FTE of dedicated research space per FTE
- 25 SF per FTE for workstation office space
- 15 SF per FTE shared collaborative conference room & break room

Hybrid/Clinical Research Space Model: 150-170 SF/FTE

- 40-60 SF per FTE prorated share of PI office (varies by average group & PI office size)
- 60 SF per FTE of experimental research space
- 25 SF per FTE for workstation office space
- 15 SF per FTE shared collaborative conference room + break room
- 05 SF per FTE of clinical research space

RESEARCH SPACE OCCUPANCY CALCULATION
Calculate "Fit for Purpose" = 100% Occupancy

1. Collect counts of principal investigators, professional, technical, trainee and students who are assigned and occupy research space
2. Collect research space records to calculate how much research space is assigned to each department. Include faculty offices, post-doc and graduate student offices, research laboratory and lab support. Exclude core and highly specialized lab space.
3. Calculate the amount of research space (SF) needed to closely fit the total count of FTE occupants per organizational unit, referred to as "Fit for Purpose" figure. It is a benchmark figure which represents the baseline space assignment needed, without provision for any contingency. If this exact amount of space is provided, "Fit for Purpose" is equal to 100% occupancy, a very tight fit.

- Calculated by multiplying the research FTE count by the amount of research SF/FTE established in the **Research Space Capacity Model** for experimental, computational, and hybrid/clinical research FTEs

Establish Model Occupancy Target Range = 64-85%

4A. A practical expectation for the operational occupancy target rate acknowledges multiple factors that make a 100% target difficult to achieve. Applying a contingency to account for temporarily unoccupied space due to vacancies from the natural churn of principal investigators is a typical strategy. Accounting for differences across a portfolio of research facilities with regard to sizes of faculty lab and office SF is another such factor.

As a reasonable response, a contingency of 10-15% accounts for these and other typical operational factors, establishing an adjusted baseline occupancy target rate of 85%. An occupancy rate of 85% then represents "full occupancy."

4B. An additional research space occupancy factor exists. Recognizing the nature of research funding, there are considerable variations within short periods of time in the amount of grant expenditures and FTE counts. There are also considerable variations over the course of a year in the length of time graduate and undergraduate students who occupy research space, typically peaking in the summer months. To avoid the operational aggravation needed to frequently adjust space assignments, a further contingency factor can be considered. As a target, consider an additional 25% contingency factor to build in considerable space occupancy flexibility. (e.g. a range from 3-4, or 6-8 occupants). Applying this additional contingency factor reduces the 85% target by 75% to a reduced target of 64%. (85% x 75%=64%)

85% occupancy remains the benchmark for "full occupancy." 64% occupancy represents a reasonable bottom rate for an operational occupancy target range. If the measured occupancy is less than 64%, it represents a latent space vacancy. It is feasible for an occupancy rate to be greater than 100%. Sharing workstations, working from home or another office location and other workplace strategies are now being applied to reduce the amount of corporate office space assignments to effectively reduce space needs. When research space occupancy approaches the 100% level, consider it as a signal alert to be further investigated as occupancy conditions are likely compressed.

Calculate Current and Model Occupancy

Calculated by taking the square footage calculated for "Fit to Purpose" and dividing it by either the Current or Model amount of assigned research space. The result is expressed as a ratio (e.g. 85%)

Calculate Current and Model ROA

Calculated by taking the total grant expenditures and dividing it by the Current or Model amount of assigned research space. The result is expressed as a rate per SF (e.g. $250)

Ratio of Lab + Lab Support Space, Research (PI) Office and Grad & Post Doc Office Space

- Lab + Lab Support (FICM 250 + 255)
- Research Office space (FICM 310)
- Grad & Post Doc Office (FICM 380)

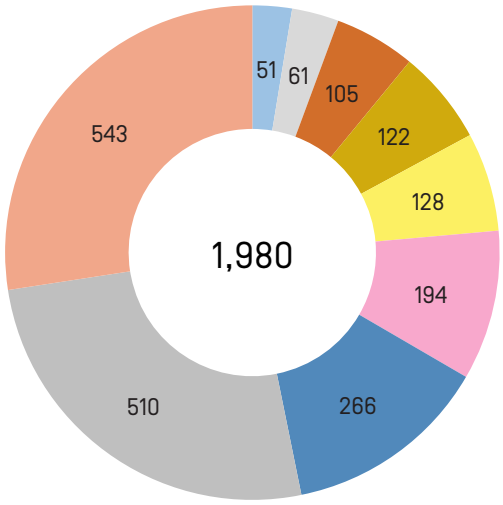
Chemistry & Biochemistry Lab, Drake Hall

Research : People, Space & Grant

950 Principal Investigators (PI) are split roughly 1.0 experimentalist for every 1.39 computationalists.
The average is about 2.1 FTE for each PI.

University Summary - People:
Colleges, Institutes & Centers PIs & FTEs

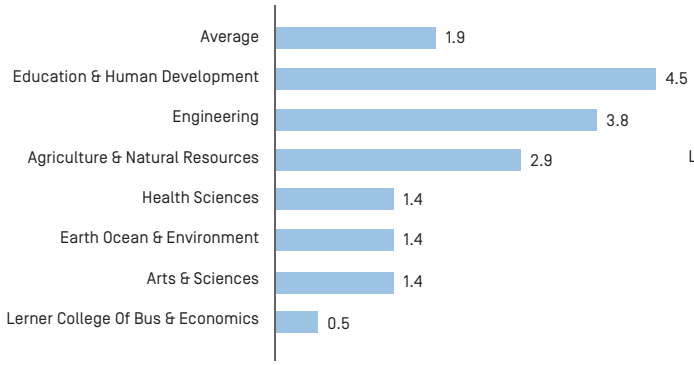
FTE Count (Adjusted)



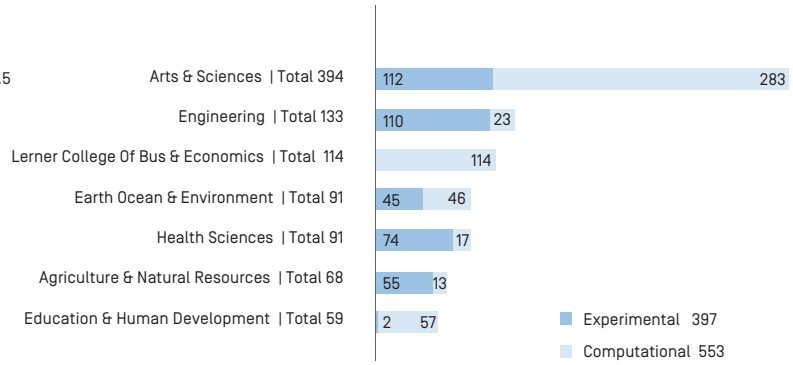
LEGEND

- INTERDISCIPLINARY INSTITUTES & CTRS
- LERNER COLLEGE OF BUSINESS & ECONOMICS
- PLATFORM CORE LABORATORIES
- EARTH OCEAN & ENVIRONMENT
- HEALTH SCIENCES
- AGRICULTURE & NATURAL RESOURCES
- EDUCATION & HUMAN DEVELOPMENT
- ENGINEERING
- ARTS & SCIENCES

Average PI Group Size (FTE-Adjusted)



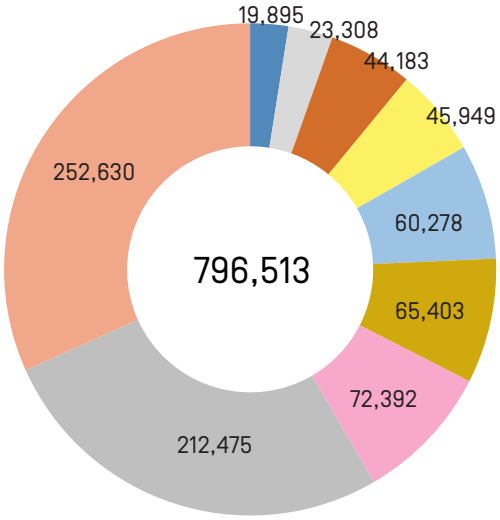
PI Count



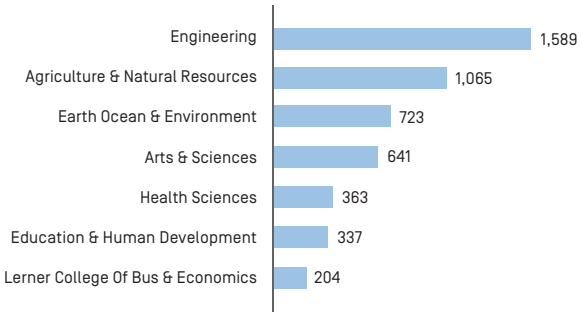
The wide diversity of this bulk College measurement is not as useful for space planning as more granular departmental scale metrics.

University Summary - Space:
Colleges, Institutes & Centers PIs
FICM 250, 255, 310, 380

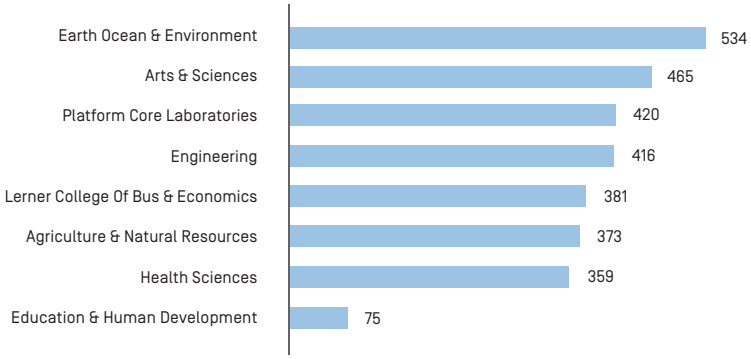
Research Space



Average Research Space Per PI (ASF)



Average Research Space Per FTE (ASF)

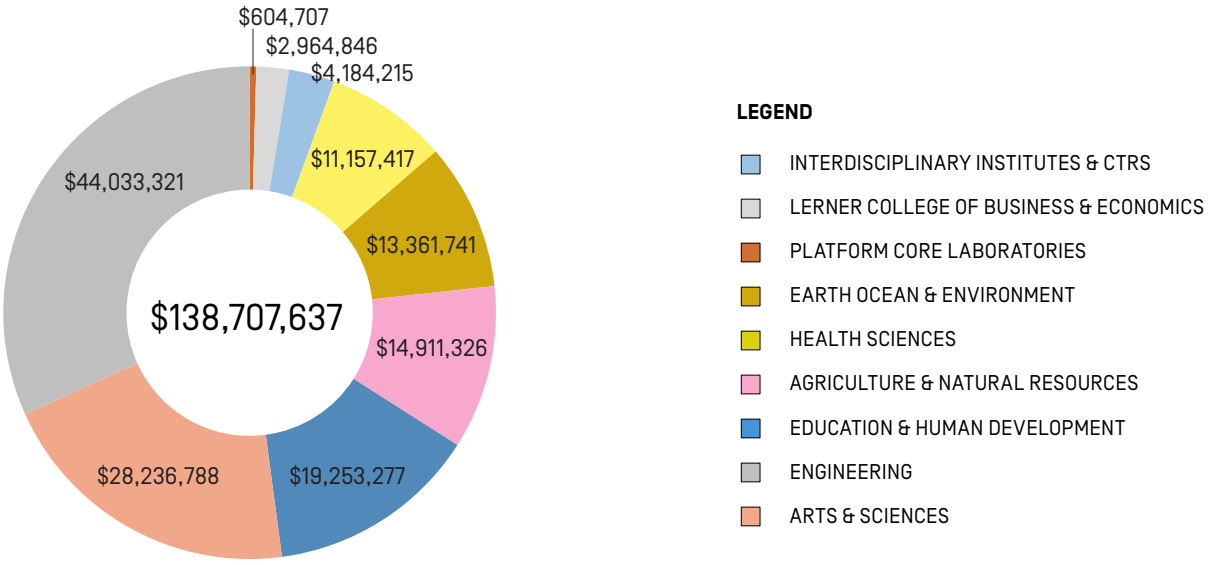


Research : People, Space & Grant

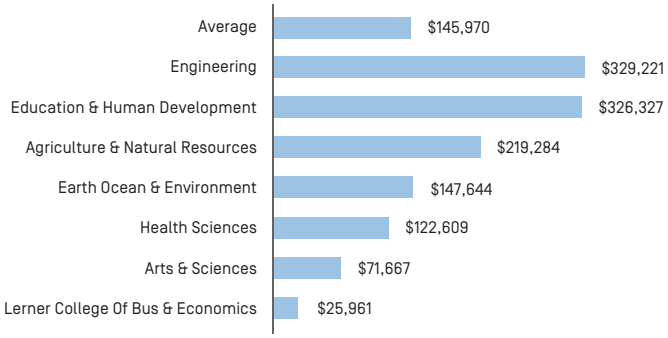
The wide diversity of this bulk College measurement is not as useful for space planning as more granular departmental scale metrics. It does illustrate the vast range in dollar metric values across disciplines.

University Summary - Grant:
Colleges, Institutes & Centers

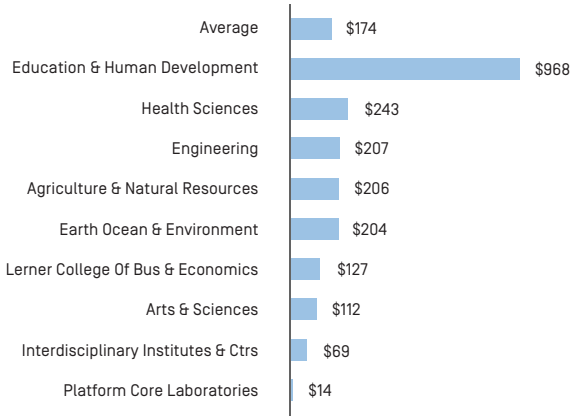
Research Grant Expenditures (2015)



Average Research Space Per PI



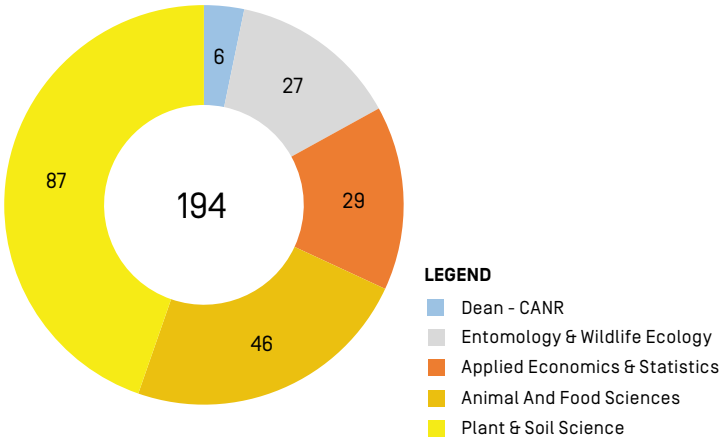
Research Grants Per Assigned Square Feet (ASF) Of Research Space



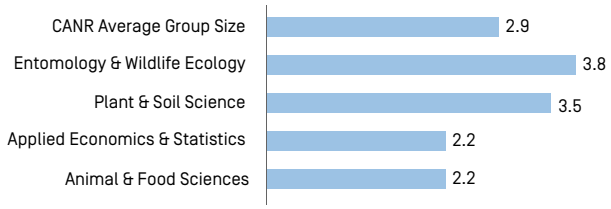
College of Agriculture & Natural Resources (CANR) - People:

PIs & FTEs by Department

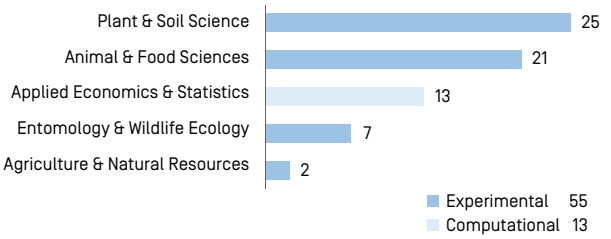
- FTE Count (Adjusted)



- Average PI Group Size (FTE-Adjusted)



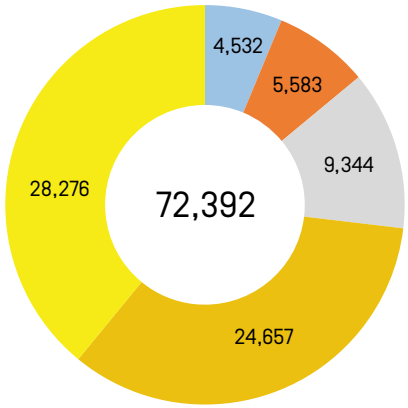
- PI Count



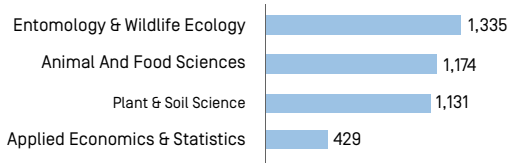
CANR - Space:

Space by Department (FICM 250, 255, 310, 380)

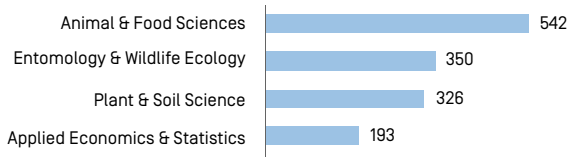
- Research Space



- Average Research Space Per PI (ASF)



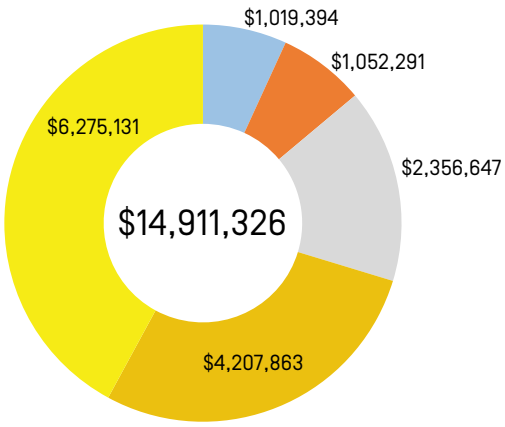
- Average Research Space Per FTE (ASF)



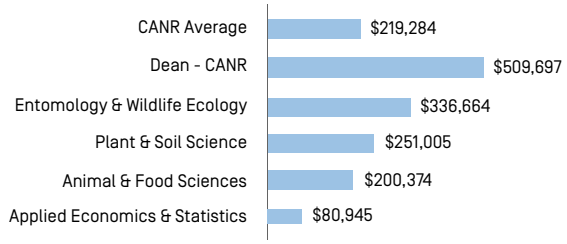
CANR - Grant:

Grant by Department

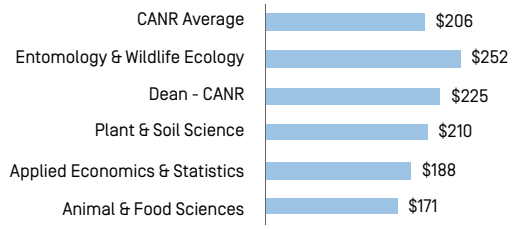
- Research Grant Expenditures (2015)



- Average Research Grants Per PI



- Research Grants Per ASF of Research Space



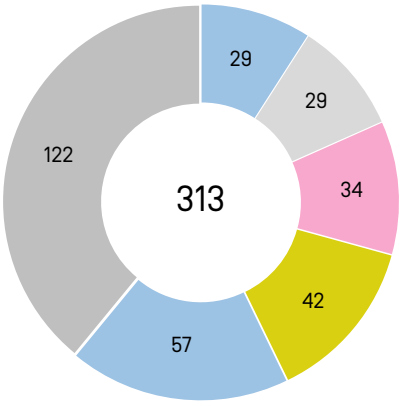
Research : People, Space & Grant

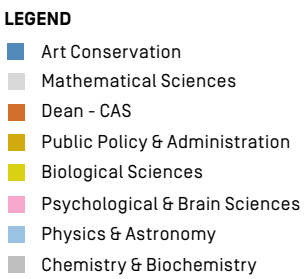
CAS features widely diverse departments. The overall group of CAS departments is split into two groups identified in the caption heading as [Experimentalist] & [Computationalist].

College of Arts & Sciences (CAS-experimentalist)- People:

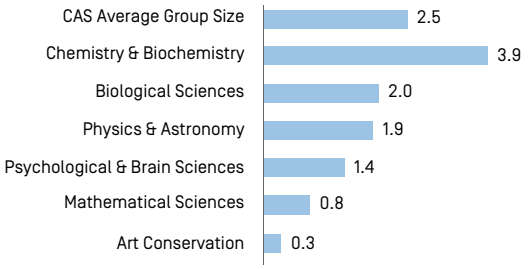
PIs & FTEs by Department

- FTE Count (Adjusted)

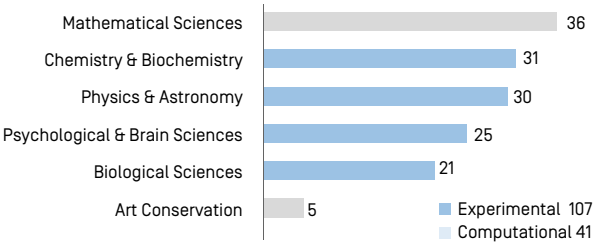




- Average PI Group Size (FTE-Adjusted)



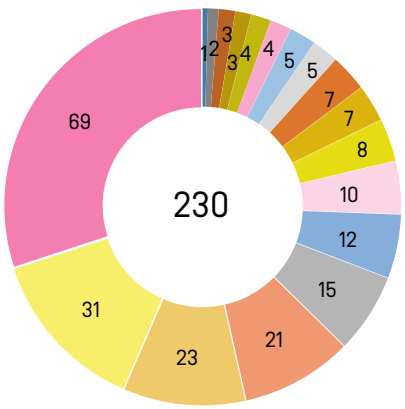
- PI Count

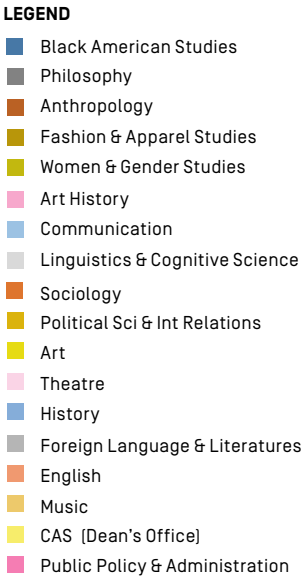


College of Arts & Sciences (CAS-computationalist) - People:

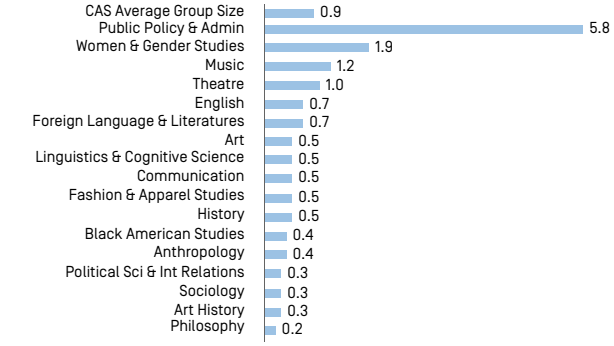
PIs & FTEs by Department

- FTE Count (Adjusted)

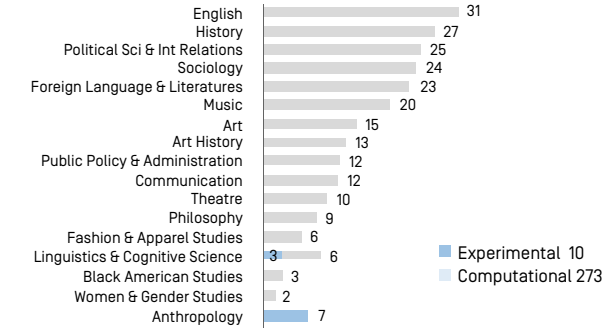




- Average PI Group Size (FTE-Adjusted)



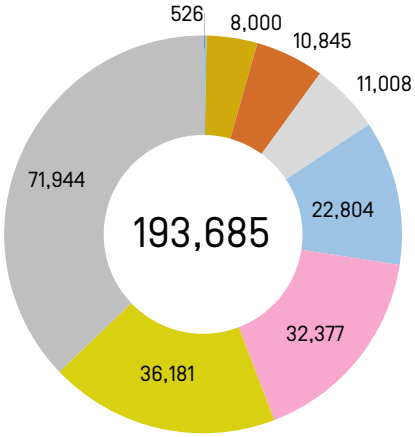
- PI Count



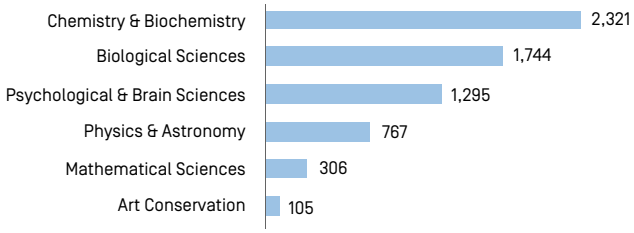
CAS (experimentalist) - Space:

PIs & FTEs by Department

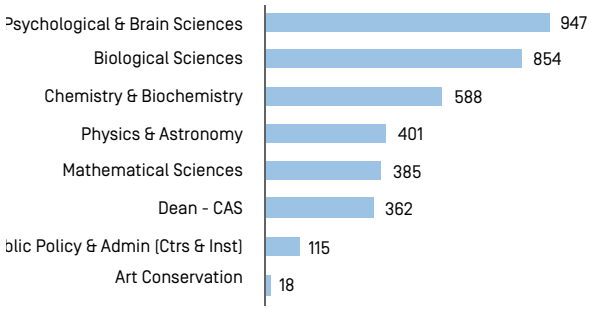
- Research Space



- Average Research Space Per PI (ASF)



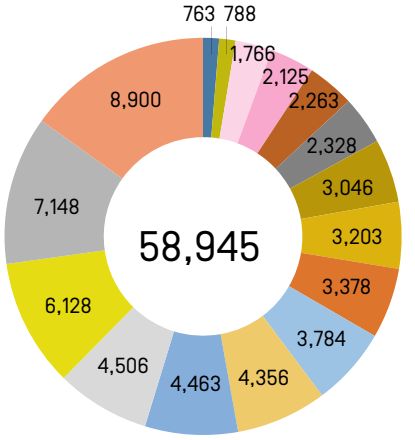
- Average Research Space Per FTE (ASF)



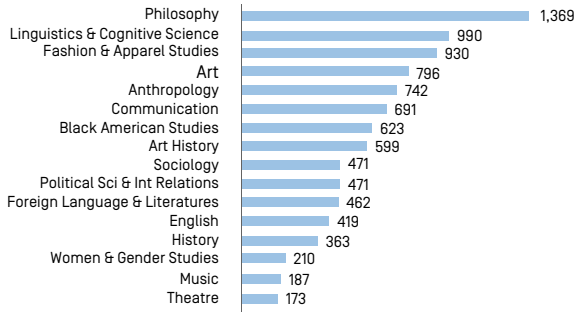
CAS (computationalist) - Space:

Space by Department (FICM 250, 255, 310, 380)

- Research Space



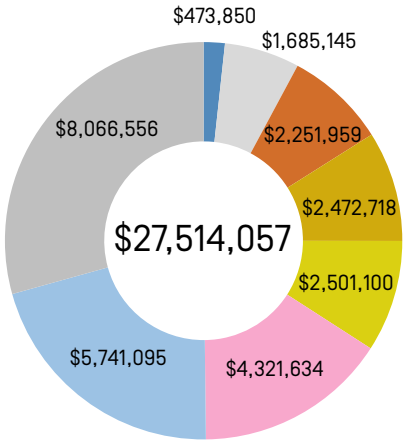
- Average Research Space Per FTE (ASF)



CAS (experimentalist) - Grant:

Grant by Department

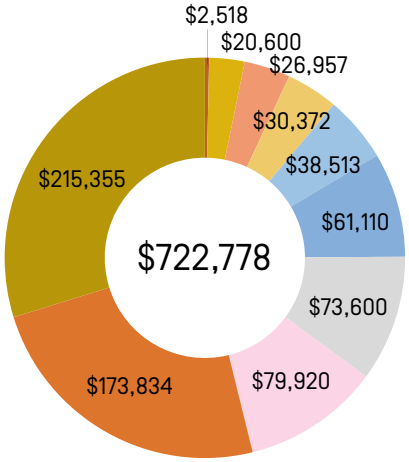
- Research Grant Expenditures (2015)



CAS (computationalist) - Grant:

Grant by Department

- Research Grant Expenditures (2015)



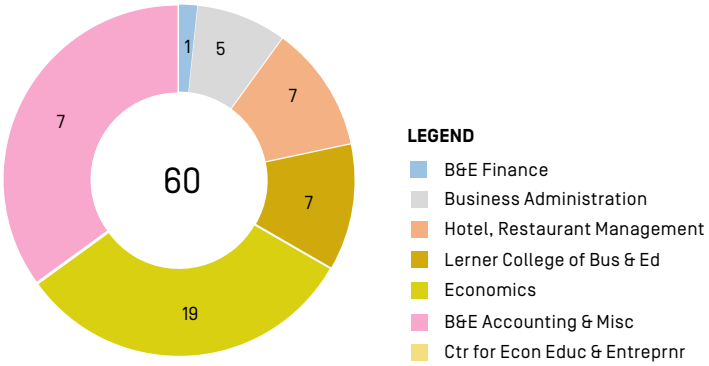
Research : People, Space & Grant

PI group sizes in business are often not large.
Small SF can magnify ratios. Consider the amount of research space.

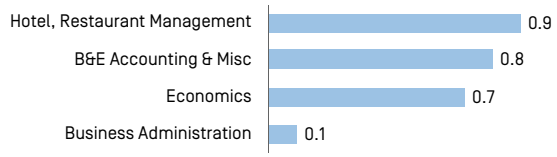
Lerner College of Business & Economics (CBE) - People:

PIs & FTEs by Department

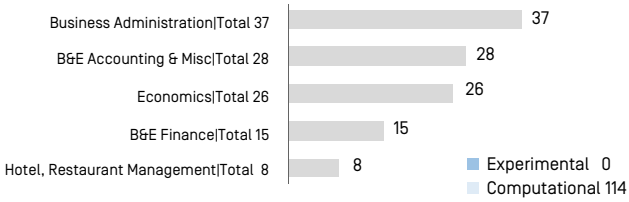
- FTE Count (Adjusted)



- Average PI Group Size (FTE-Adjusted)



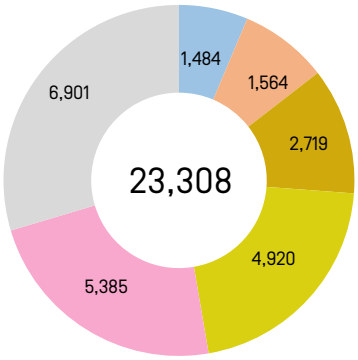
- PI Count



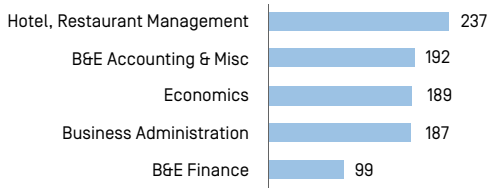
CBE - Space:

Space by Department (FICM 250, 255, 310, 380)

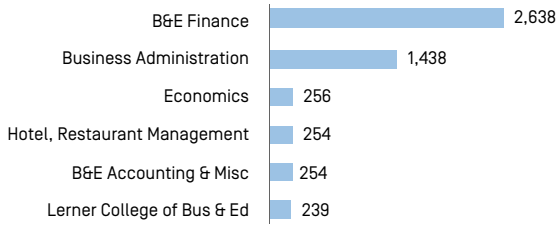
- Research Space



- Average Research Space Per PI (ASF)



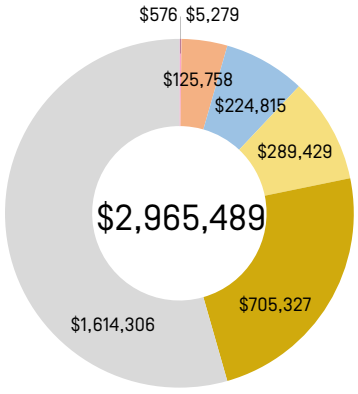
- Average Research Space Per FTE (ASF)



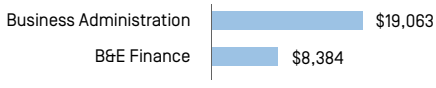
CBE - Grant:

Grant by Department

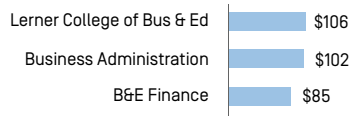
- Research Grant Expenditures (2015)



- Average Research Grants Per PI



- Research Grants Per ASF of Research Space

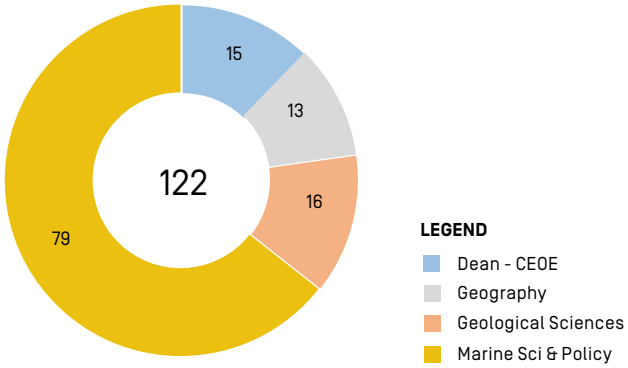


Quite small average group sizes. Investigate and validate outliers - there may be a good justification in terms of equipment-driven space needs. Research funding availability likely plays a role here.

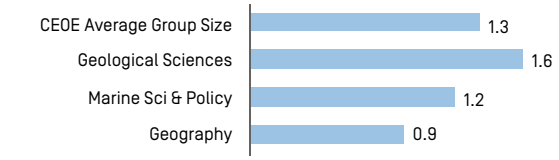
College of Earth, Ocean, & Environment (CEOE) - People:

PIs & FTEs by Department

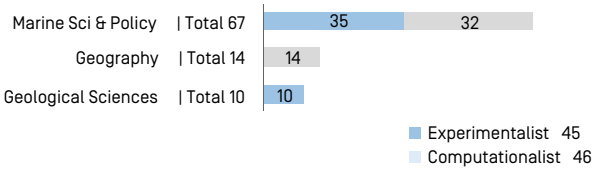
- FTE Count (Adjusted)



- Average PI Group Size (FTE-Adjusted)



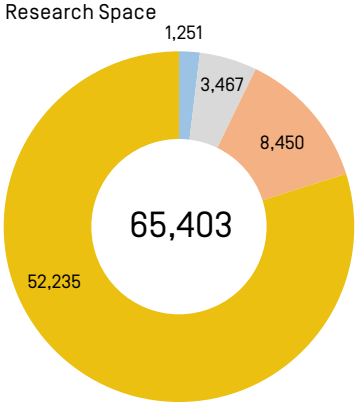
- PI Count



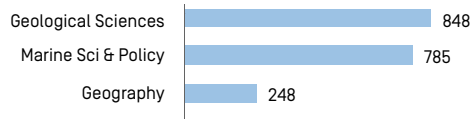
CEOE - Space:

Space by Department (FICM 250, 255, 310, 380)

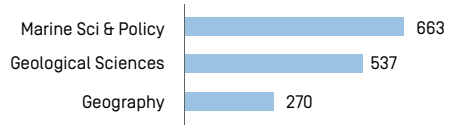
- Research Space



- Average Research Space Per PI (ASF)



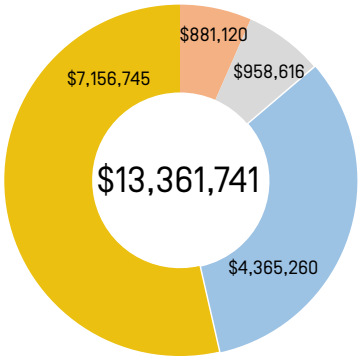
- Average Research Space Per FTE (ASF)



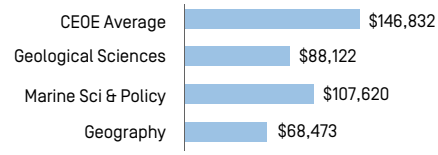
CEOE - Grant:

Grant by Department

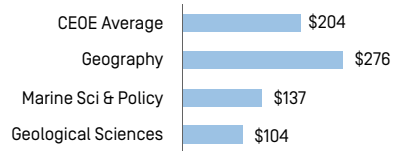
- Research Grant Expenditures (2015)



- Average Research Grants Per PI



- Research Grants Per ASF of Research Space



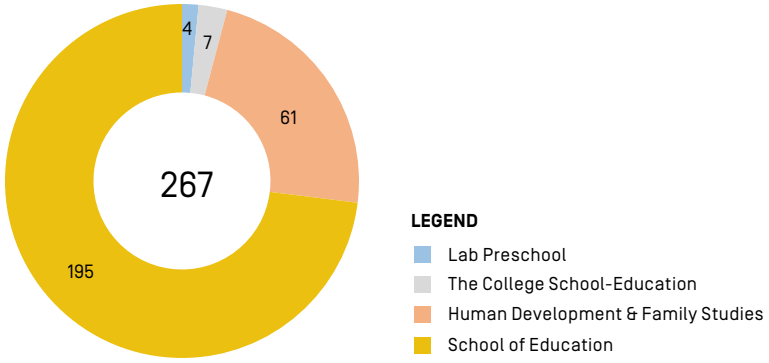
Research : People, Space & Grant

Good average group sizes are likely related to research funding levels.
$/SF are a factor of relatively modest average research space per FTE.

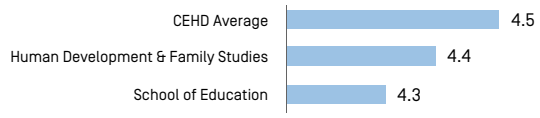
College of Education & Human Development (CEHD) - People:

PIs & FTEs by Department

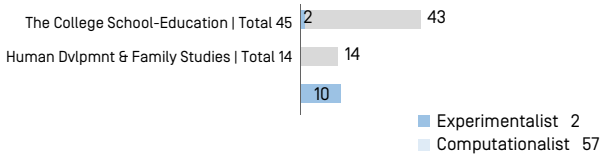
- FTE Count (Adjusted)



- Average PI Group Size (FTE-Adjusted)



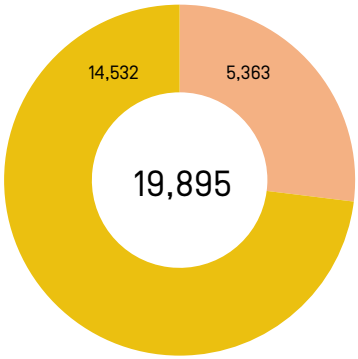
- PI Count



CEHD - Space:

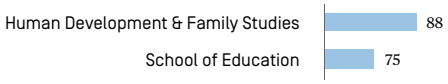
Space by Department (FICM 250, 255, 310, 380)

- Research Space



- Average Research Space Per PI (ASF)

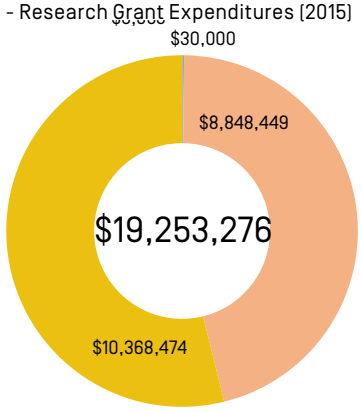
- Average Research Space Per FTE (ASF)



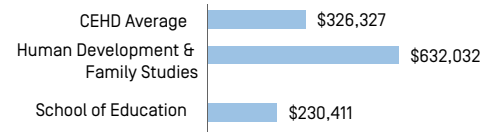
CEHD - Grant:

Grant by Department

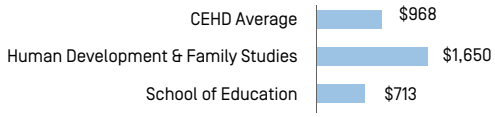
- Research Grant Expenditures (2015)



- Average Research Grants Per PI



- Research Grants Per ASF of Research Space

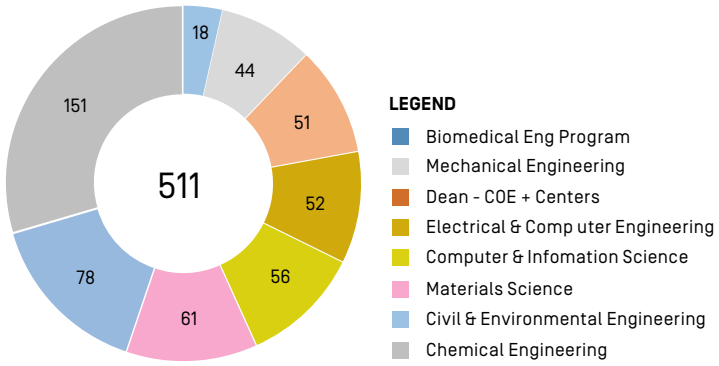


Wide range in diverse engineering disciplines. SF/FTE appear to be somewhat high relative to the average FTE group sizes. Consider other space allocation factors that may influence allocation.
Grants expenditures per PI are generally quite good. Moderate $/SF a factor of relatively high assigned SF.

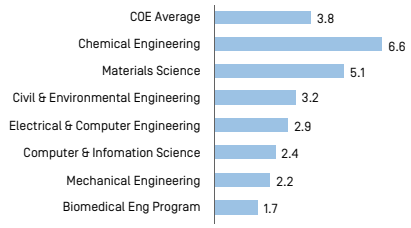
College of Engineering (COE) - People:

PIs & FTEs by Department

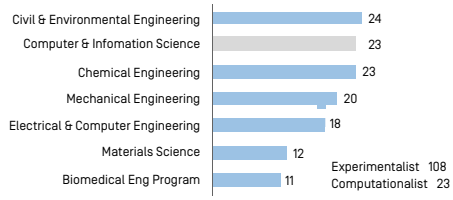
- FTE Count (Adjusted)



- Average PI Group Size (FTE-Adjusted)



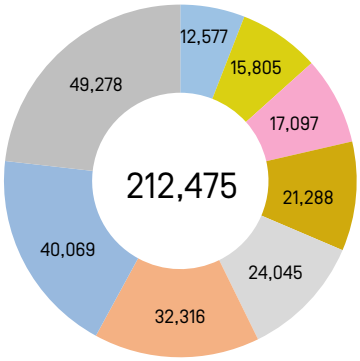
- PI Count



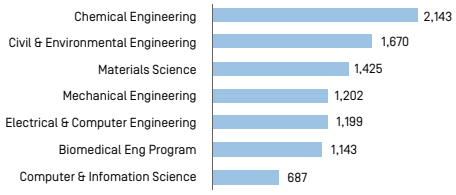
COE - Space:

Space by Department (FICM 250, 255, 310, 380)

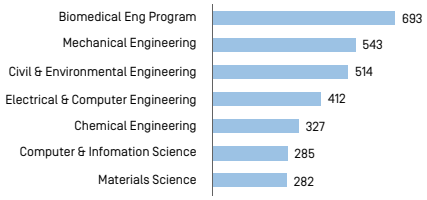
- Research Space



- Average Research Space Per PI (ASF)



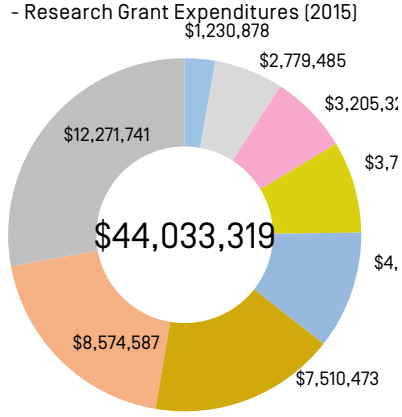
- Average Research Space Per FTE (ASF)



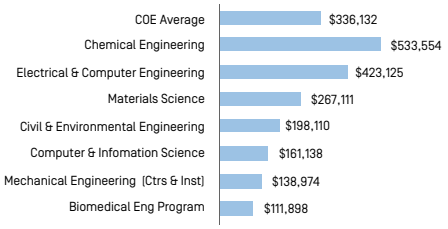
COE - Grant:

Grant by Department

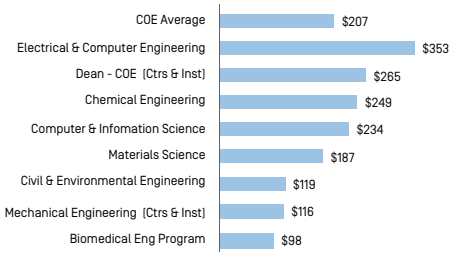
- Research Grant Expenditures (2015)



- Average Research Grants Per PI



- Research Grants Per ASF of Research Space



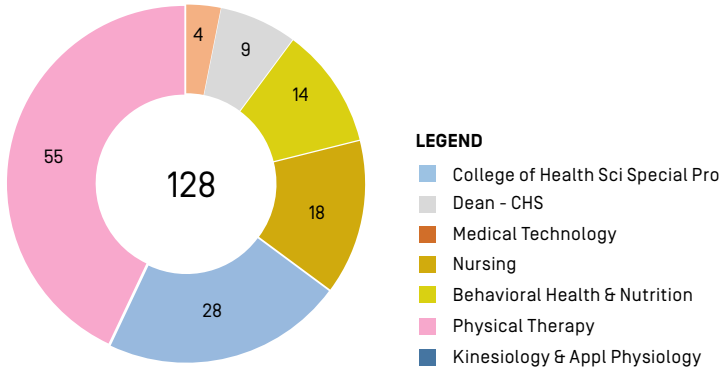
Research : People, Space & Grant

Small average research group sizes, with exception of Physical Therapy. Note relatively intimate scale of research SF. Reasonably moderate return on asset for most with lower rates for Behavioral Health & Nutrition & Med Tech.

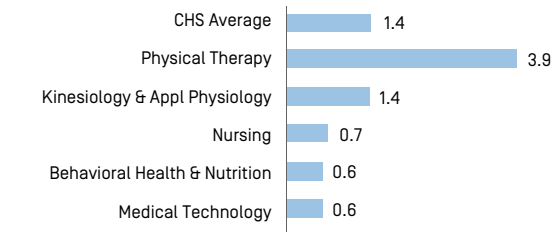
College of Health Sciences (CHS) - People:

PIs & FTEs by Department

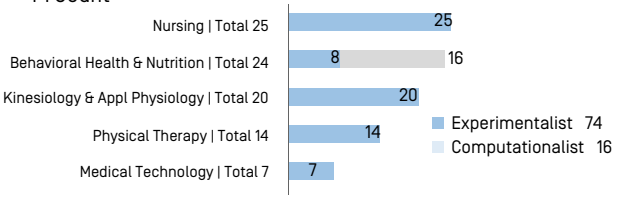
- FTE Count (Adjusted)



- Average PI Group Size (FTE-Adjusted)



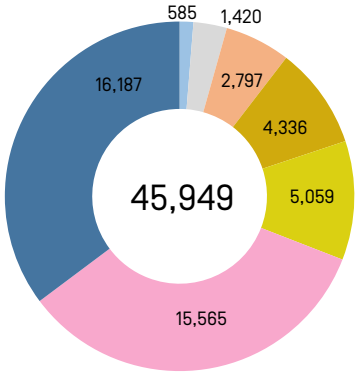
- PI Count



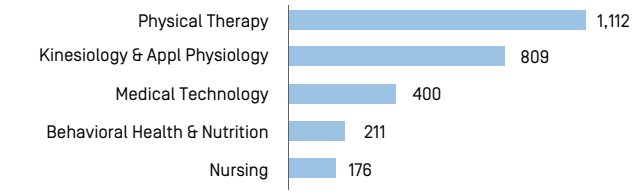
CHS - Space:

Space by Department (FICM 250, 255, 310, 380)

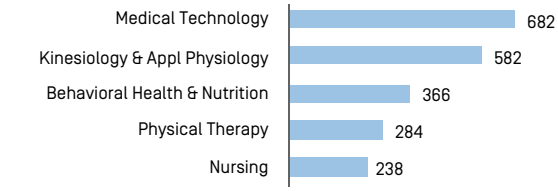
- Research Space



- Average Research Space Per PI (ASF)



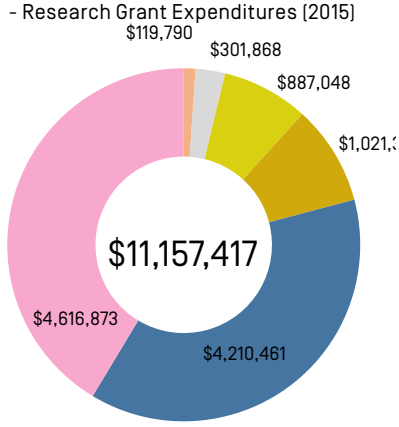
- Average Research Space Per FTE (ASF)



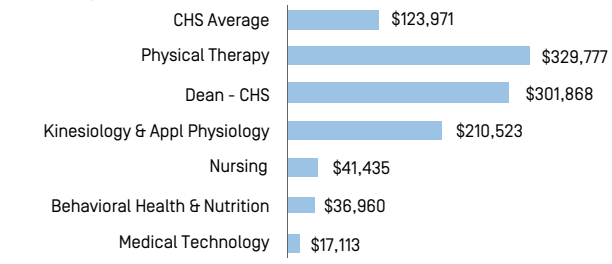
CHS - Grant:

Grant by Department

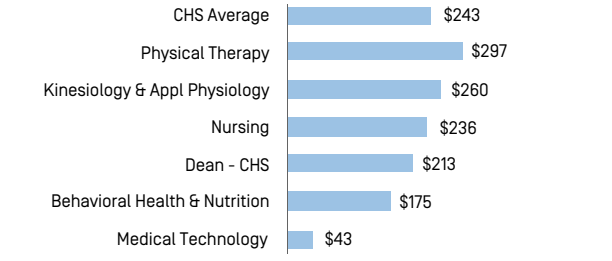
- Research Grant Expenditures (2015)



- Average Research Grants Per PI



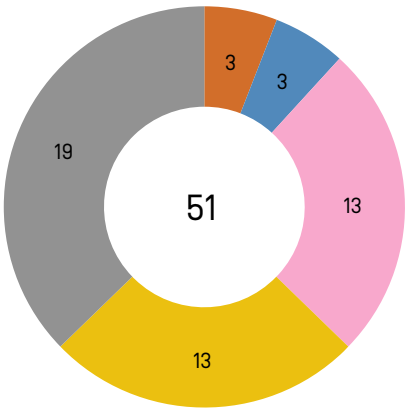
- Research Grants Per ASF of Research Space



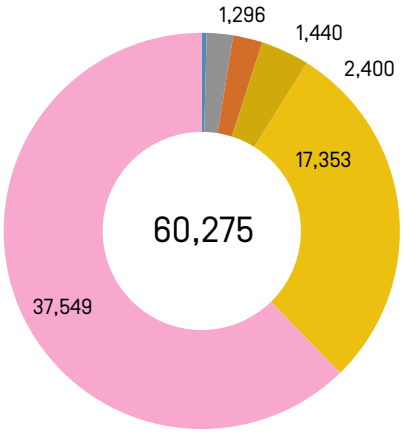
Interdisciplinary:

This classification has no PIs and only a relatively few FTE with a significant amount of space. Investigate to verify whether space research capacity is overstated, our perhaps even double counted. DRI space does appear in individual departments through accounting records. 7.6% of overall PI assigned space of 796,513 SF.

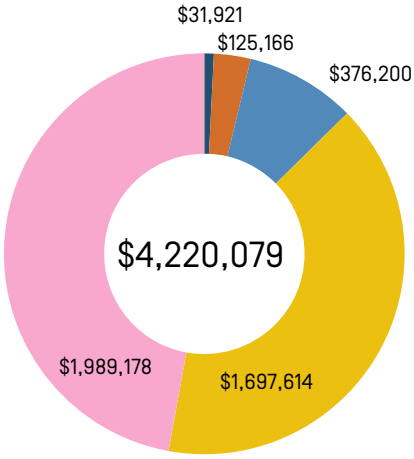
- People - FTE COUNT (ADJUSTED)



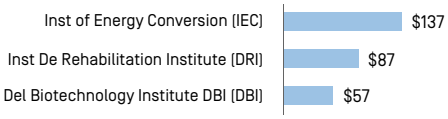
- Space - Research Space



- Grant - Research Grant Expenditure (2015)



- Research Grants Per ASF of Research Space



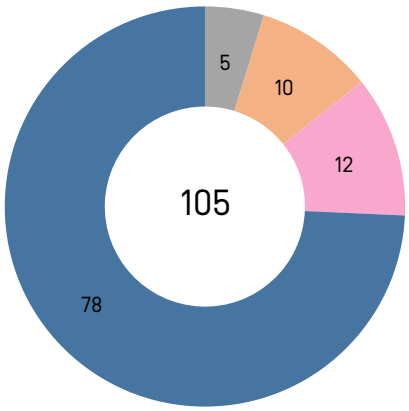
LEGEND

- Inst Sustainable Energy Rsch (ISER)
- Ctr for Energy & Environmental Policy (E&Ep)
- Inst De Rehabilitation Institute (DRI)
- Ctr Bob Carpenter Center
- Inst of Energy Conversion (IEC)
- Del Biotechnology Institute DBI (DBI)
- Ctr Applied Sci & Engr (ASE)

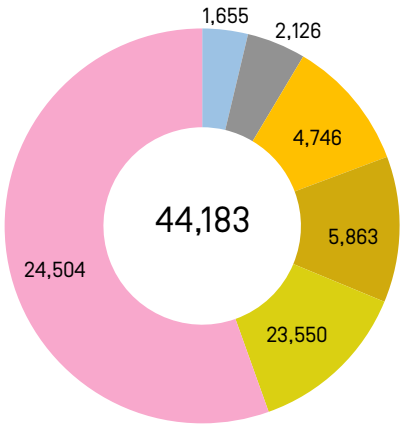
Platform Core & High Spec Labs:

Ratio of Platform Core & Highly Specialized labs are 5.5% of overall 796,513 ASF of Research Space. The future trend is to increase this % upwards by developing more exotic core facilities to approach 8-10%.

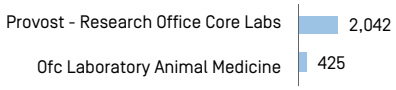
- People - FTE COUNT (ADJUSTED)



- Space - Research Space



- Average Research Space Per PI (ASF)



- COE - CE Core Labs
- Ofc Laboratory Animal Medicine
- Dean - College of Engineering Core Labs
- Entmlgy & Applied Eclgy - BenefInsect Lab
- COE - ECE Core Labs
- Provost Research Office Core Labs
- Agriculture - Newark Farm
- Library

Landscape

STAKEHOLDER WORKING GROUP EMERGING THEMES

- **Circulation space** in academic buildings as well as outdoor spaces could be re-purposed to increase study and student collaboration space.
- **Recreation space** are an essential complement to 'work oriented spaces' ("How People Play")
- **Stormwater compliance** is likely to become a significant regulatory issue, necessitating a coordinated framework for the campus.

FINDINGS

- Over time, the University has developed as multiple centers expanding the Main Green and leaping over the rails to the north and south.
- While 'The Green' offers a strong visual identity for the campus, its length is significantly longer than iconic green spaces on many other campuses. The perception of this scale is slightly broken down by the presence of Memorial Hall, but the half-mile length of 'The Green' has contributed to a perceived lack of activity.
- The University has a diverse range of landscape types with little continuity or transition between spaces because of the lack of an organizing landscape framework to connect the campus.
- Significant stormwater issues result from regional topographical and hydrological systems. Current stormwater management practices lack a comprehensive implementation and prioritization framework.
- The network of pedestrian paths and routes connecting the different campus areas are inconsistent, with the clearest routes existing adjacent to the historic core. In peripheral areas, especially along primary vehicular corridors such as College Avenue, the pedestrian network lacks definition and tends to prioritize vehicular movement over pedestrian movement.
- Both traffic flow and visibility are reduced by the constructed edges - fences, mounds, and walls - which flank many pedestrian pathways on the campus. A richer pedestrian experience can be achieved through streetscape improvements which unite pedestrian pathways and landscape.
- The open spaces network of the University offers many opportunities improved connections and greater levels of programming.

Historical Development

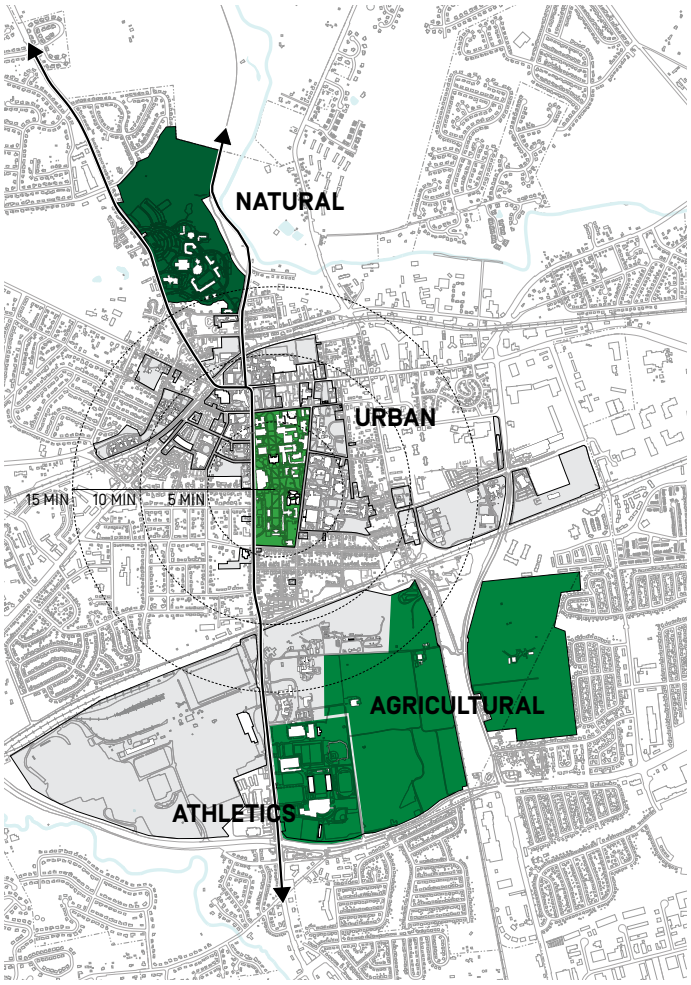
Over time, the University has developed as multiple centers expanding the Main Green and leaping over the rails to the north and south.

The University of Delaware is one of the oldest Universities in the United States with its beginnings tracing to 1743. As the campus has expanded through the years, so has its presence in Newark, Delaware.

Prior to the 1900s the campus was made up of a small number of educational buildings which today is called the 'Old College' area that served as the heart or the center of campus at the time. During the transition into the Twentieth Century, more educational and support buildings started to emerge. The campus began to shift and broaden its reaches to the south, thus creating a larger campus—one with multiple areas where people could walk to and congregate. As the building-landscape relationship continued to evolve, the understanding of a campus center started to break down.

It was not until the 1920s that Marian Coffin, a Landscape Architect, created a campus master plan that tied together north and south campus despite having completely different characteristics due to the north housing the Men's Campus, and the south housing the Women's Campus. Though there was a gender specific campus separation, Marian Coffin felt a strong desire to create a sense of overall place that would carry though the entire University of Delaware. Coffin proposed different plant typologies for the various green spaces to highlight the idea of planting design working to reinforce circulation, provide orientation, display seasonal changes and give identity to various places within the overall campus. Also, with Coffin's design of the Central Oval placed between the two campuses, along with the formalization of the Men's and Women's Central Lawn spaces, a new sense of the campus center was formed, one that was more polycentric in nature. This polycentric campus consisted of 3 perceived centers, those being the Old College, the Men's Lawn, and the Women's Lawn.

Marian's Design sensibilities can be seen today even with the continued growth of the campus; however, this growth has divided the campus into three campuses (Central, Laird, and South Campuses) with the three main campus centers staying in tact within the Central Campus. With the campus sprawl,



Three Campus Regions with Differing Characteristics

a sense of overall campus identity, one that ties together all three campus locations, is currently missing. Creating a stronger campus core, and/or creating campus cores within each of the three areas may be desirable to assist with the overall campus identity and place making.

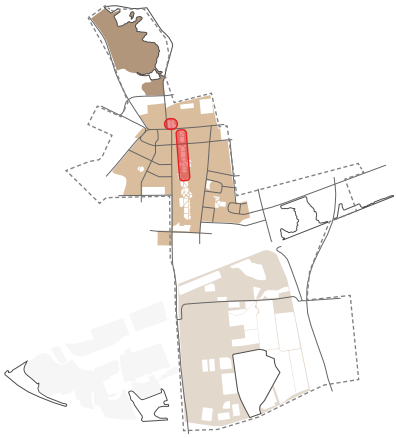
Conclusions:

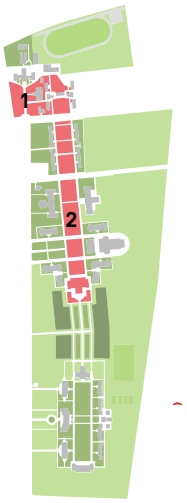
- Campus Core has changed over time, and has evolved into a polycentric campus.
- The college consists of three areas which lack defining centers to orient people.

1917

ONE CENTRAL CAMPUS
FRANK MILES DAY PLAN

TWO CAMPUS CENTERS
1 OLD COLLEGE
2 MEN'S COLLEGE



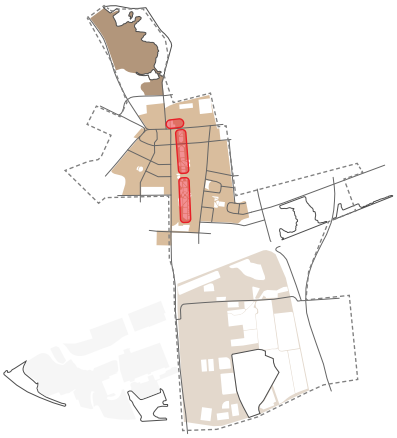


LEGEND
HISTORICAL DEVELOPMENT
- CAMPUS CORE
- LAIRD CAMPUS
- CENTRAL CAMPUS
- SOUTH CAMPUS
- SITE BOUNDARY
- SHRUB + TREES
- CAMPUS GREEN
- ATHLETIC FIELDS
- SITE PERIPHERY

1926

ONE CENTRAL CAMPUS
MARIAN COFFIN PLAN

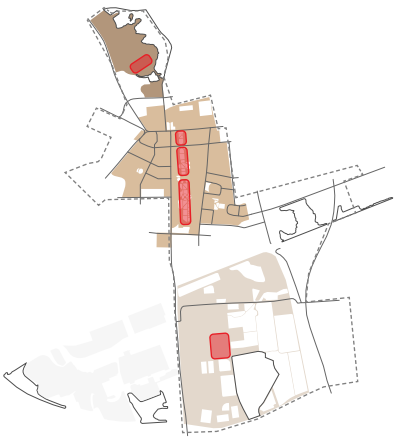
THREE CAMPUS CENTERS
1 OLD COLLEGE
2 MEN'S COLLEGE
3 WOMEN'S COLLEGE

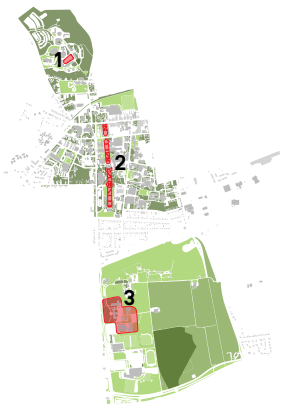


2016

POLYCENTRIC CAMPUS

THREE CAMPUS CORES
1 LAIRD CAMPUS
2 CENTRAL CAMPUS
3 SOUTH CAMPUS





Campus Historical Development

‘ The Green’ Scale Comparisons

While ‘The Green’ offers a strong visual identity for the campus, its length is significantly longer than iconic green spaces on many other campuses. The perception of this scale is slightly broken down by the presence of Memorial Hall, but the half-mile length of ‘The Green’ has contributed to a perceived lack of activity.

The iconic image of ‘The Green’ at UD provides a strong landscape framework upon which the university based much of its growth through its earliest years of development, and it continues to define the visual ‘center’ of campus today. Conceptually, it serves a similar function to the iconic open spaces at many other campuses, but in our comparative analysis we discovered that its length and scale are vastly different from the comparisons we examined. In this analysis we showed that while modest in width, the length of The Green may lend to a sense of the lack of campus core.

***The Green, University of Delaware (19 acres)**, Newark, DE*

***The Diag, Michigan University**,*
Ann Arbor, MI

***The Oval, Ohio State University**,*
Columbus, OH

***Monroe Park, VCU**,*
Richmond, VA

***Mckeldin Mall, University of Maryland**,*
College Park, MD

***The Lawn, University of Virginia**,*
Charlottesville, VA

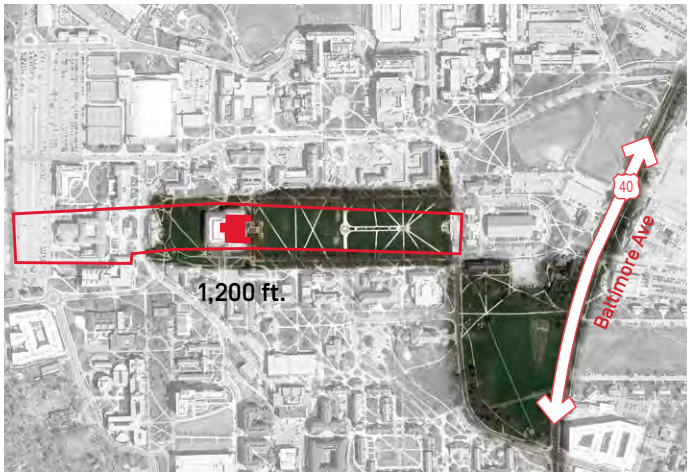
***Old Main Lawn, Penn State University**,*
State College, PA

As seen in the below diagrams, the UD Green differs greatly from many of the comparison Universities we studied. Making these comparisons can assist in understanding how the current Campus Green may or may not be successful in the context of the campus as a whole, and how one might utilize information gathered from the other comparison examples to improve upon current UD conditions.

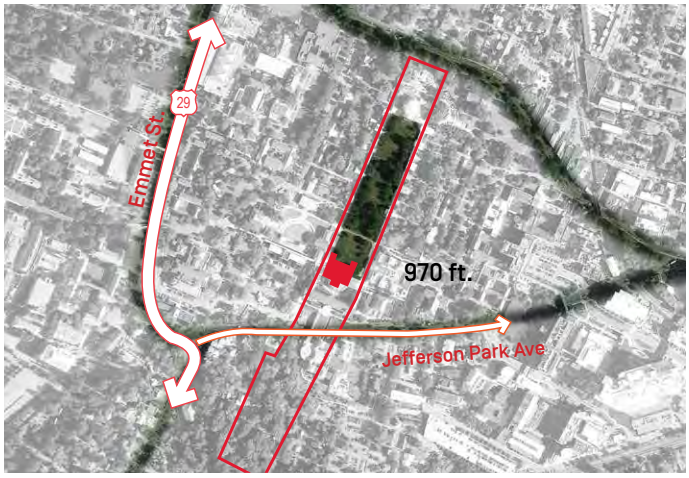
***The Diag, Michigan University (12 acres)**, Ann Arbor, MI*

***The Oval, Ohio State University (16 acres)**, Columbus, OH*

***Monroe Park, VCU (10 acres)**, Richmond, VA*



***Mckeldin Mall, University of Maryland (12 acres)**, College Park, MD*



***The Lawn, University of Virginia (6 acres)**, Charlottesville, VA*

***Old Main Lawn, Penn State University (16 acres)**, State College, PA*

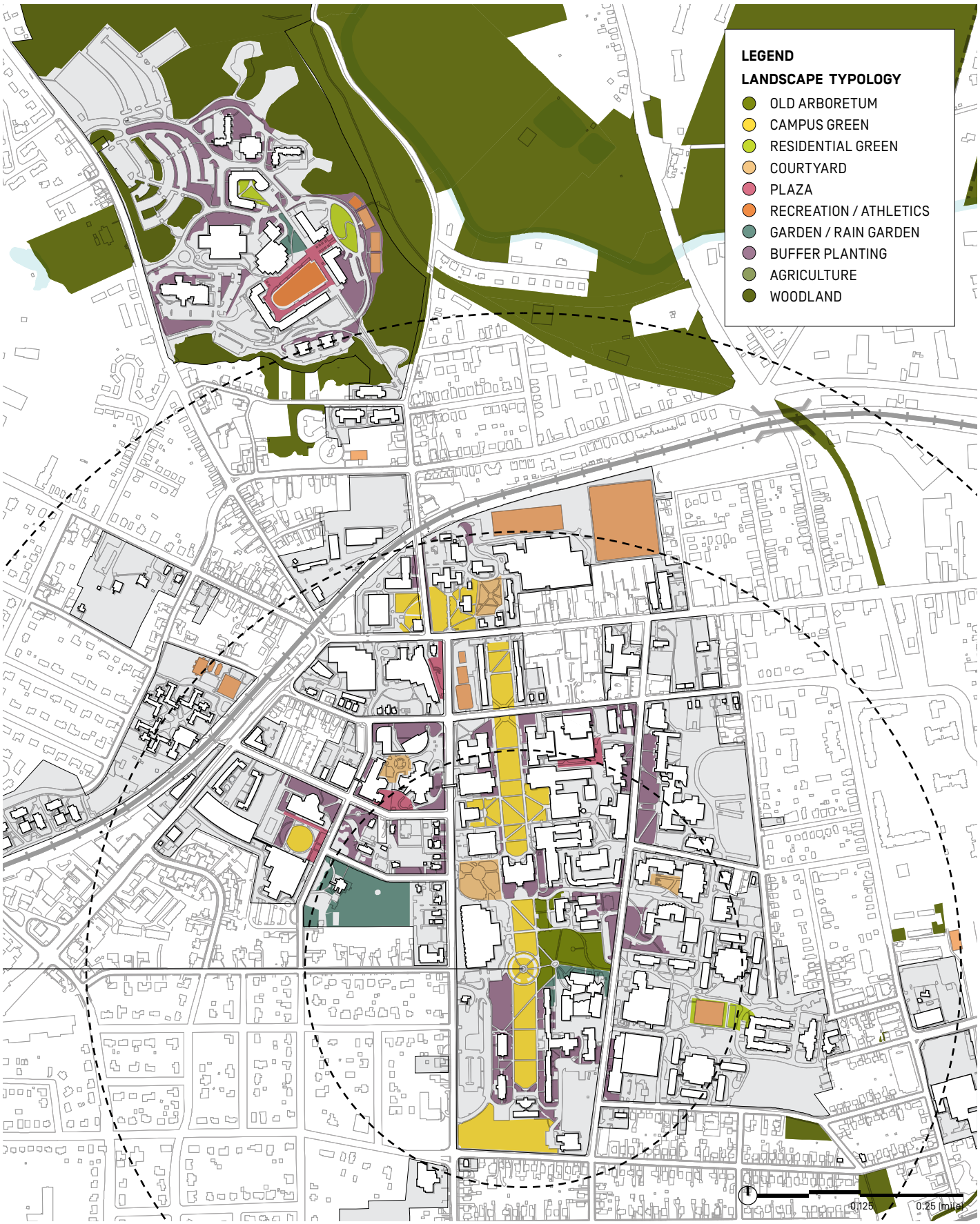
Landscape Typologies

The University has a diverse range of landscape types with little continuity or transition between spaces because of the lack of an organizing landscape framework to connect the campus.

The University of Delaware is comprised of many landscape typologies including lawns, quadrangles, recreational fields, gardens, agricultural lands, wooded areas, and others; all of which work together to form the current University landscape network. This network has evolved through campus development projects that have been phased over the decades without a strategic framework or master plan to guide improvements. This causes deficiencies in the current landscape network due to lack of continuity and/or transition between spaces and typologies.

Also, a lack of appropriately planned landscape amenities and program within the three zones lends itself to under-utilized spaces and the inability to meet the needs of the growing student population. An increase in planning efforts regarding the appropriate location of the various landscape typologies would serve the campus well in utilizing more of the campus areas and also potentially retain students, faculty, and non-university people on the campus for longer periods of time. Extending campus life daily allows for a richer university experience overall.

Landscape Typologies (S.T.A.R. + South campus)



Landscape Typologies (Central and Laird Campus)

The UD Central Campus features a variety of both open lawn and hardscape areas located among the academic and residential buildings. These landscape areas are valuable assets to the overall campus environment, providing potential areas for students and faculty alike to prepare for classes, engage in outdoor learning, relax and de-stress. Additional programming in these spaces will improve their functionality as campus amenities.

CAMPUS GREEN

RESIDENTIAL GREEN

COURTYARD

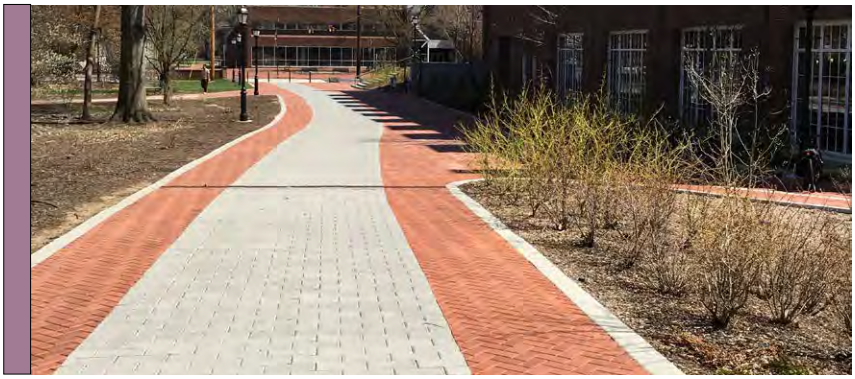
PLAZA

Landscape Typology Site Photos

Landscape typologies at the periphery of the polycentric campus both link UD to the greater landscape network in Newark as well as reinforce the agricultural history of the University. Increased connections to the surrounding woodland areas via trail systems fall in line with the University's health and wellness goals, as well as provide recreation areas beyond those already found on South Campus and Laird Campus.

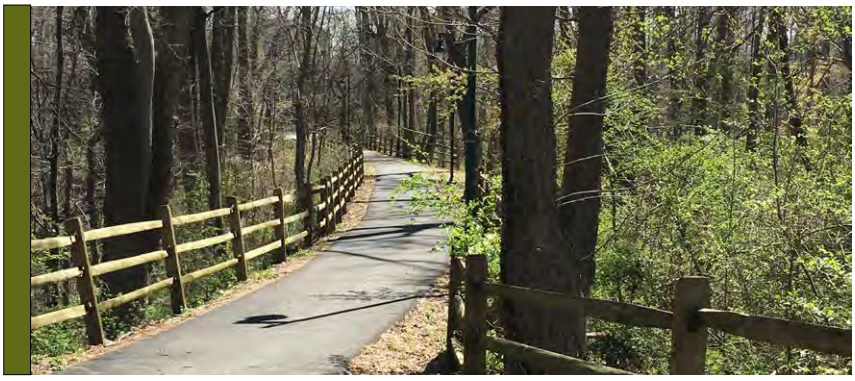
GARDEN / RAIN GARDEN

BUFFER PLANTING



RECREATION / ATHLETICS

WOODLAND



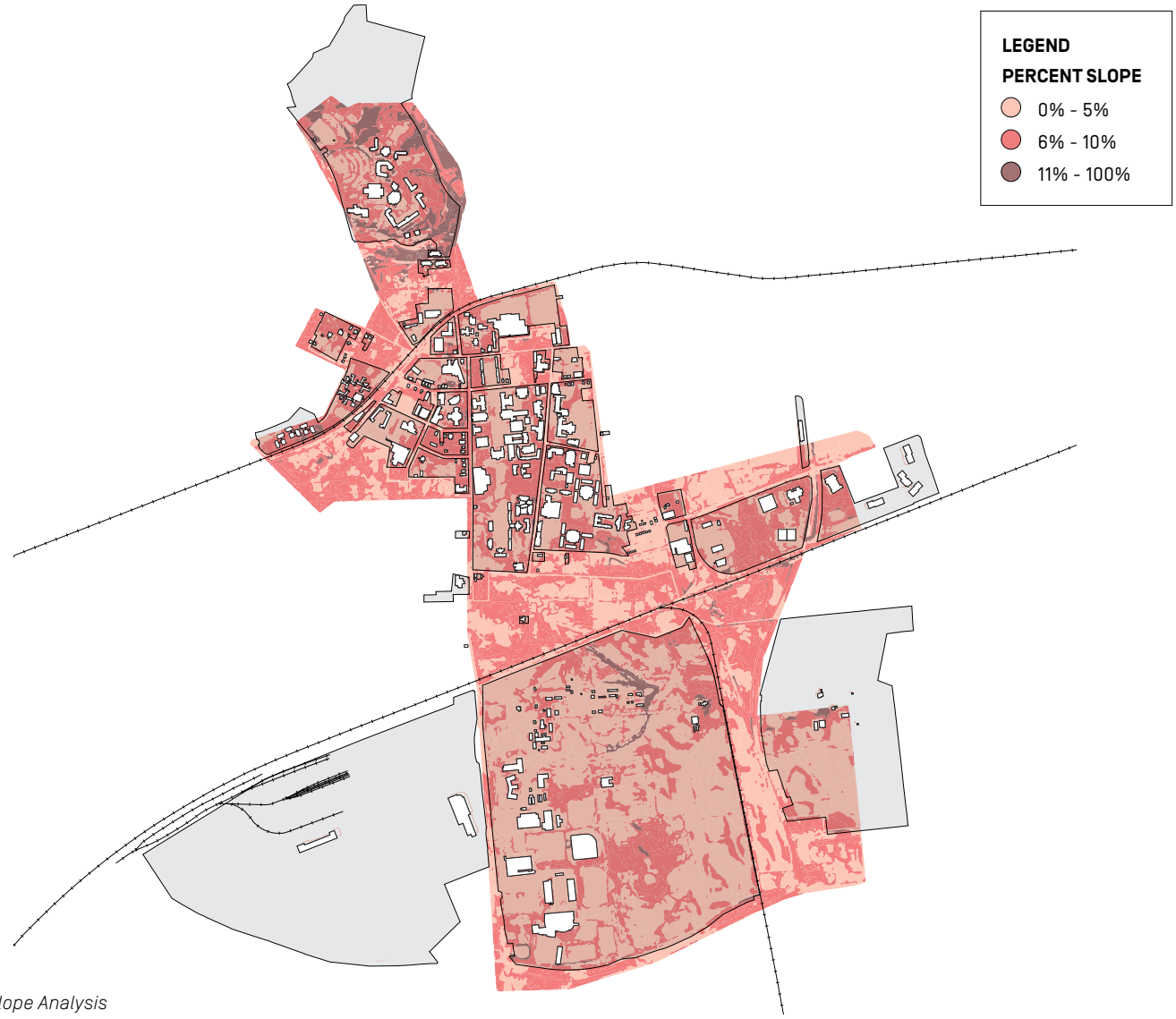
Landscape Typology Site Photos

Landform and Natural Systems

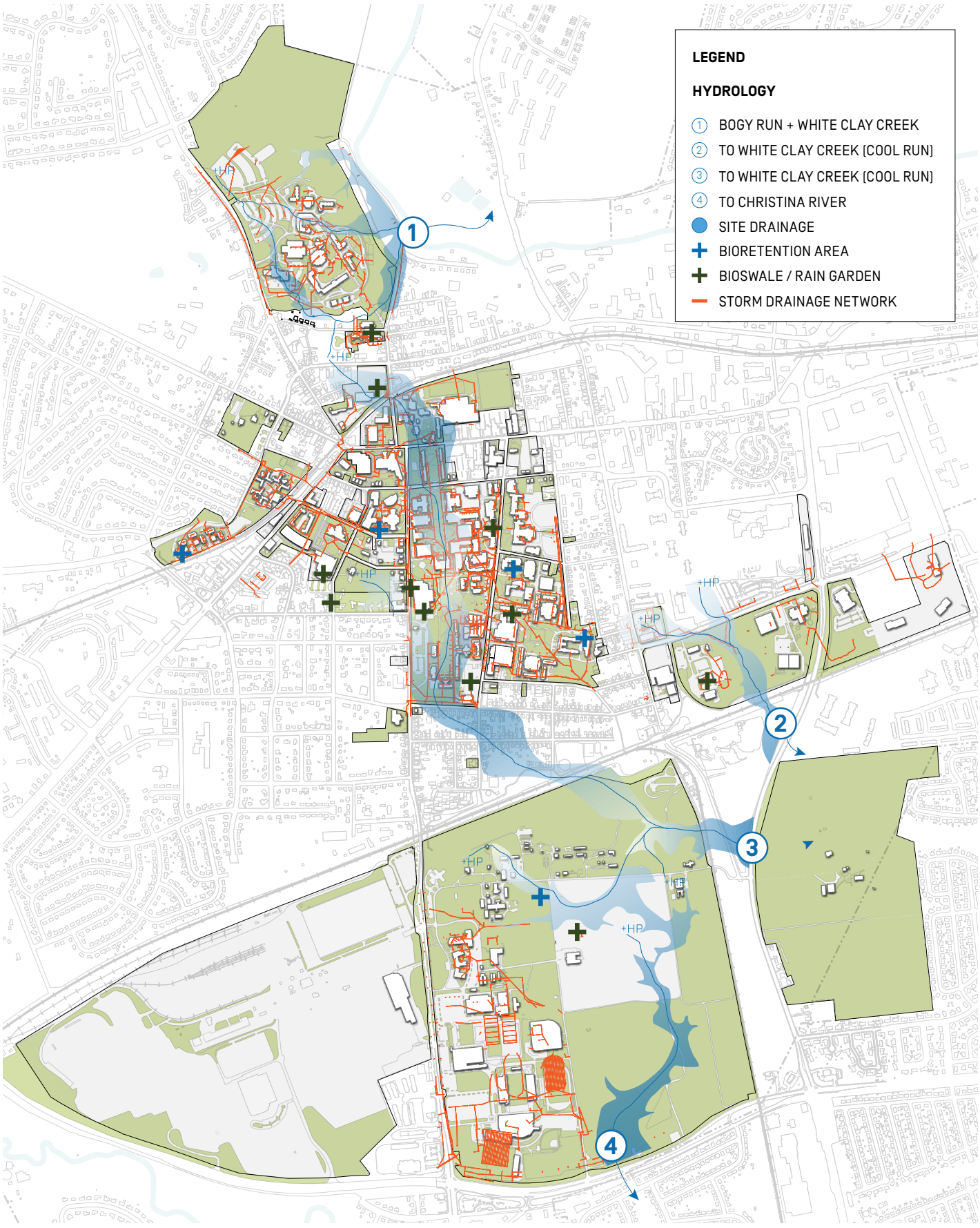
Significant stormwater issues result from regional topographical and hydrological systems.
Current stormwater management practices lack a comprehensive implementation and prioritization framework.

Topography and Hydrology

The University of Delaware is located in the Brandywine and Christina Watersheds with the majority of the stormwater runoff draining into White Clay Creek and the Christina River. As stormwater management is becoming a growing compliance issue, the University will soon be obligated to take actions to ensure proper stormwater systems are in place. The University currently has a number of bioswales & rain gardens in position along with some planned bioretention areas, but an overall stormwater strategy that employs a connected system to reduce pollutants from entering adjacent water bodies is currently needed. This overall system can be utilized in a didactic sense, with students studying rainfall and how stormwater systems can help aid in regional and global sustainability efforts. These topics are interesting to many incoming students and will benefit the recruiting students for years to come.



Campus Slope Analysis



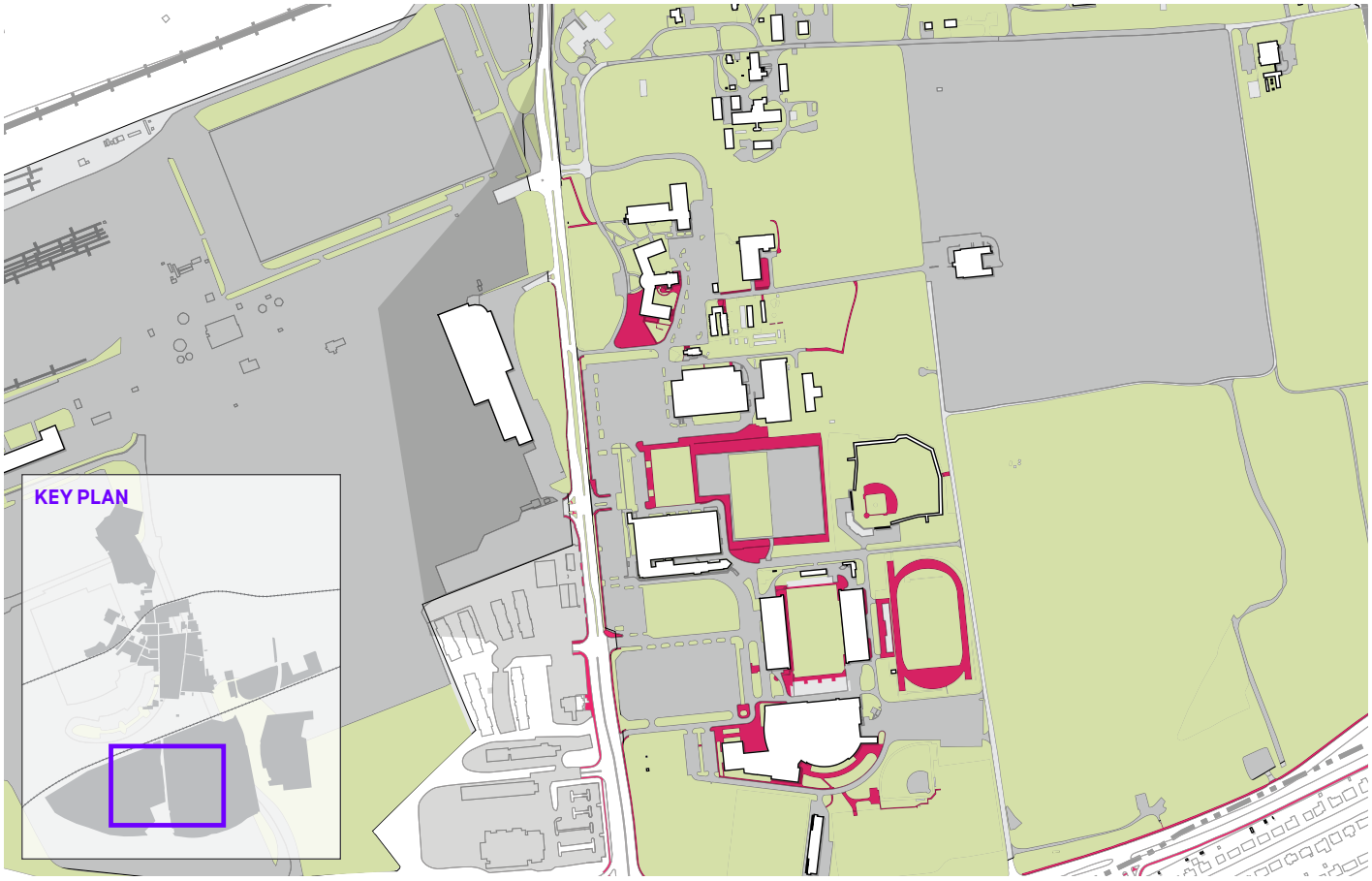
Stormwater and Hydrology Networks

Pedestrian Network and Connectivity

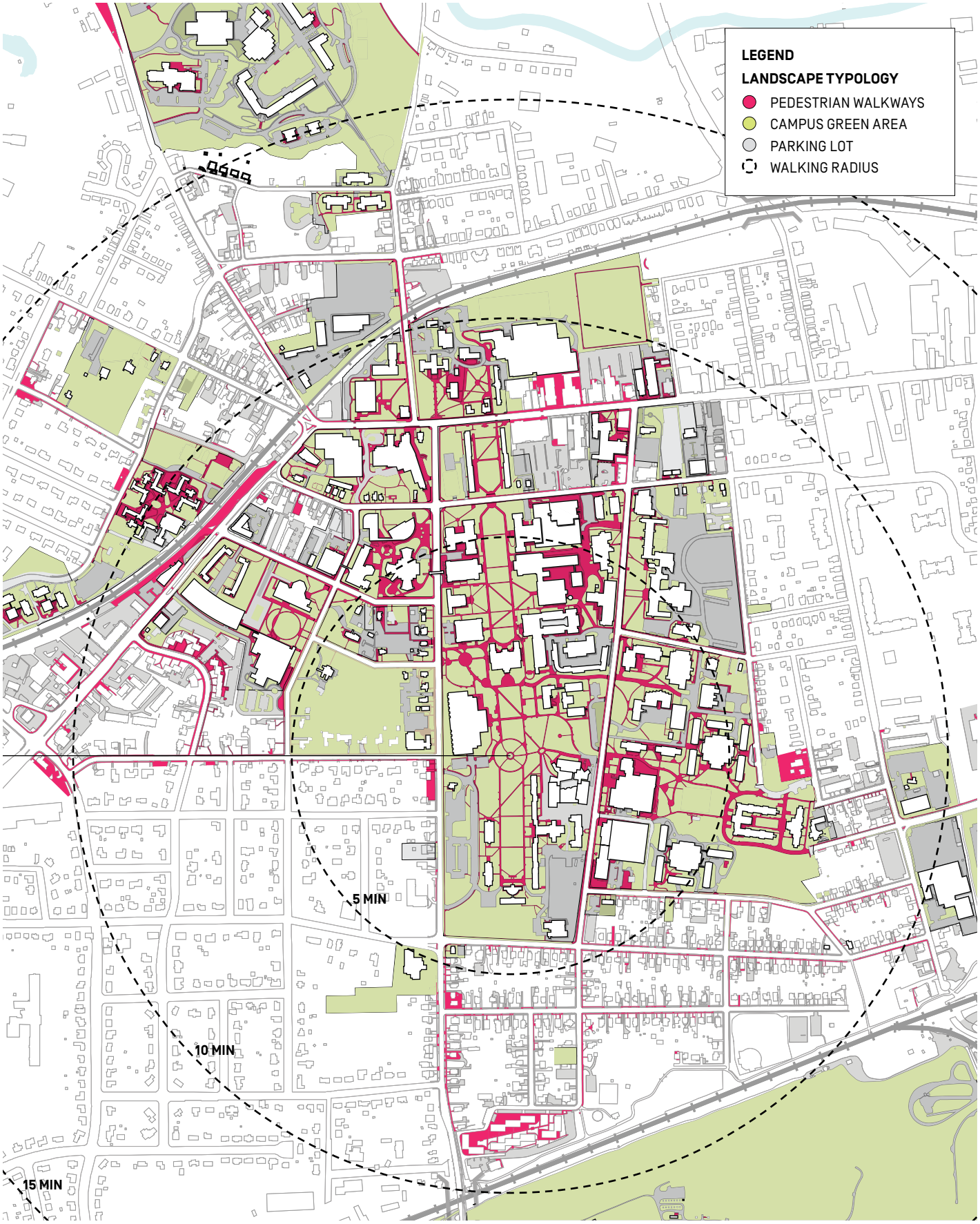
The network of pedestrian paths and routes connecting the different campus areas are inconsistent, with the clearest routes existing adjacent to the historic core. In peripheral areas, especially along primary vehicular corridors such as College Avenue, the pedestrian network lacks definition and tends to prioritize vehicular movement over pedestrian movement.

The greatest pedestrian flows generally have a north south pattern due to the path networks and the barriers created from the edge conditions and road networks. In many instances the vehicular circulation dominates the pedestrian corridors. Massive surges of pedestrian traffic occur across College Avenue and Academy Street as well as other vehicular corridors.

In some cases the pedestrian paths are four to five feet in width creating very uncomfortable conditions in relation to the street network. Additionally, chain fencing prohibits street crossings and funnels pedestrian flows during high pedestrian volume events, which occur daily between classes. Widening these pathways along with some form of traffic calming at a minimum would help achieve a more pedestrian friendly campus and enhance connectivity.



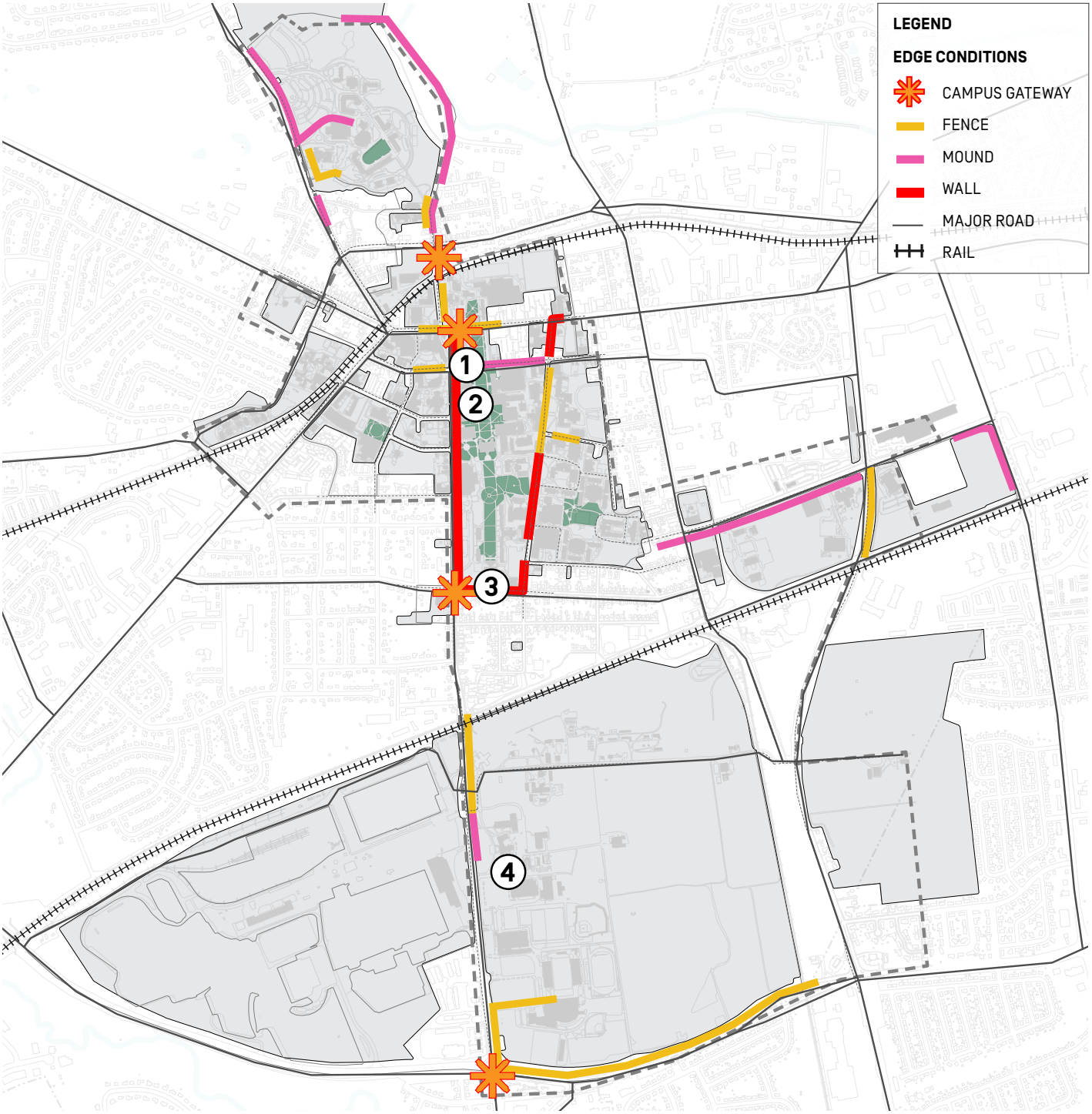
Pedestrian Connectivity (S.T.A.R. + South Campus)



Connectivity Improvement Areas

Campus Edge Conditions

Both traffic flow and visibility are reduced by the constructed edges - fences, mounds, and walls - which flank many pedestrian pathways on the campus. A richer pedestrian experience can be achieved through streetscape improvements which unite pedestrian pathways and landscape.

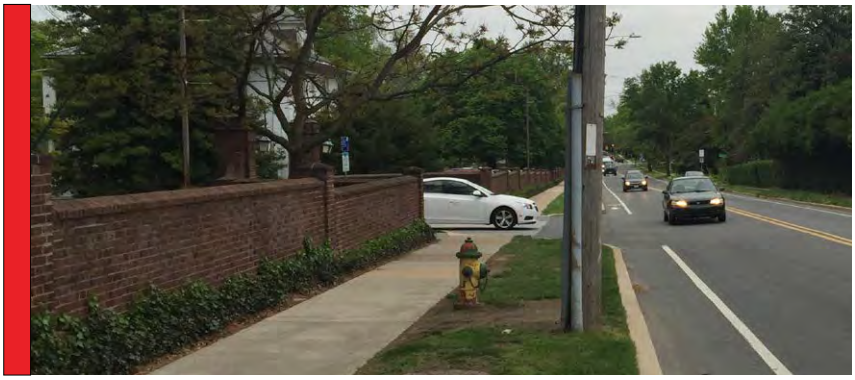


Campus Edge Conditions Diagram

1. RAILROAD

2. FENCE

3. WALL



4. MOUND

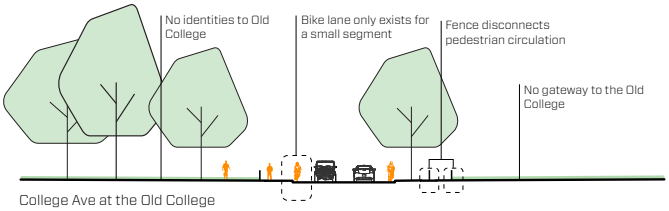
Edge Condition Site Photos

Open Space Opportunity Areas

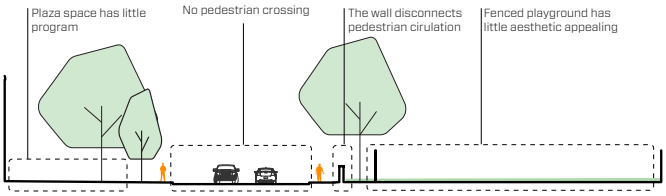
The open spaces network of the University offers many opportunities improved connections and greater levels of programming.

The University of Delaware is a polycentric campus with an ample network of open spaces which serve the varying needs of the university population. These landscape areas, although diverse in character, are generally disconnected from each other and internally focused.

The core campus areas are bounded by major roads; streetscape improvements could help to define and separate circulation routes for pedestrians, bicycles, and vehicles. Enhanced pedestrian connectivity in both the north-south and east-west directions would alleviate concerns over the fragmented network of spaces.

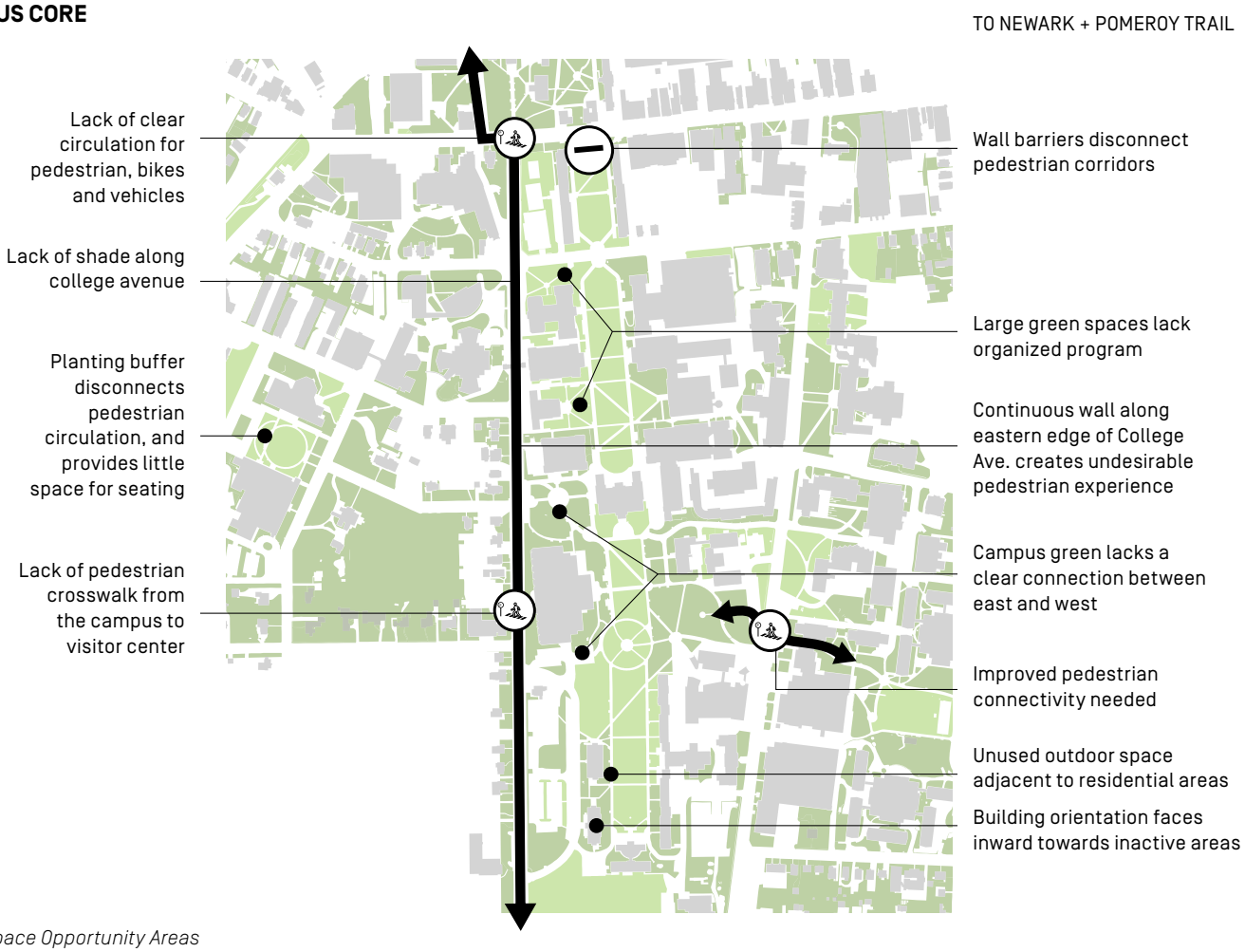


College Ave at the Old College



College Ave at Trabant University Center

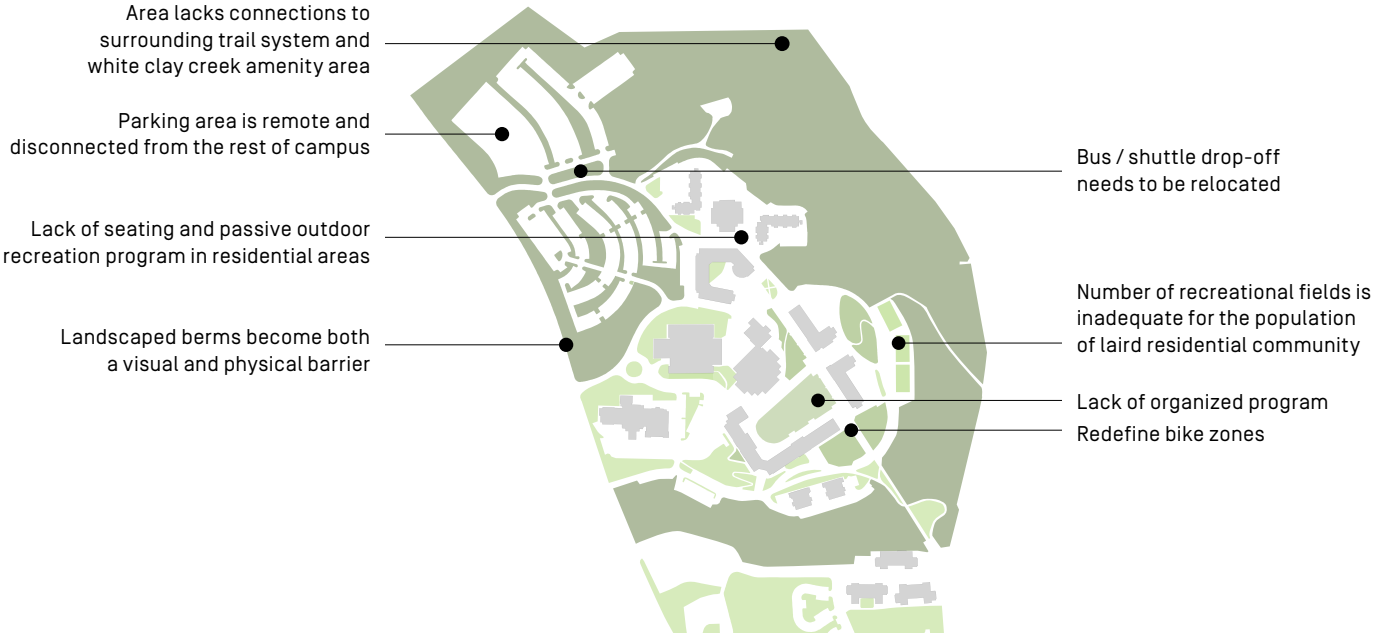
CAMPUS CORE



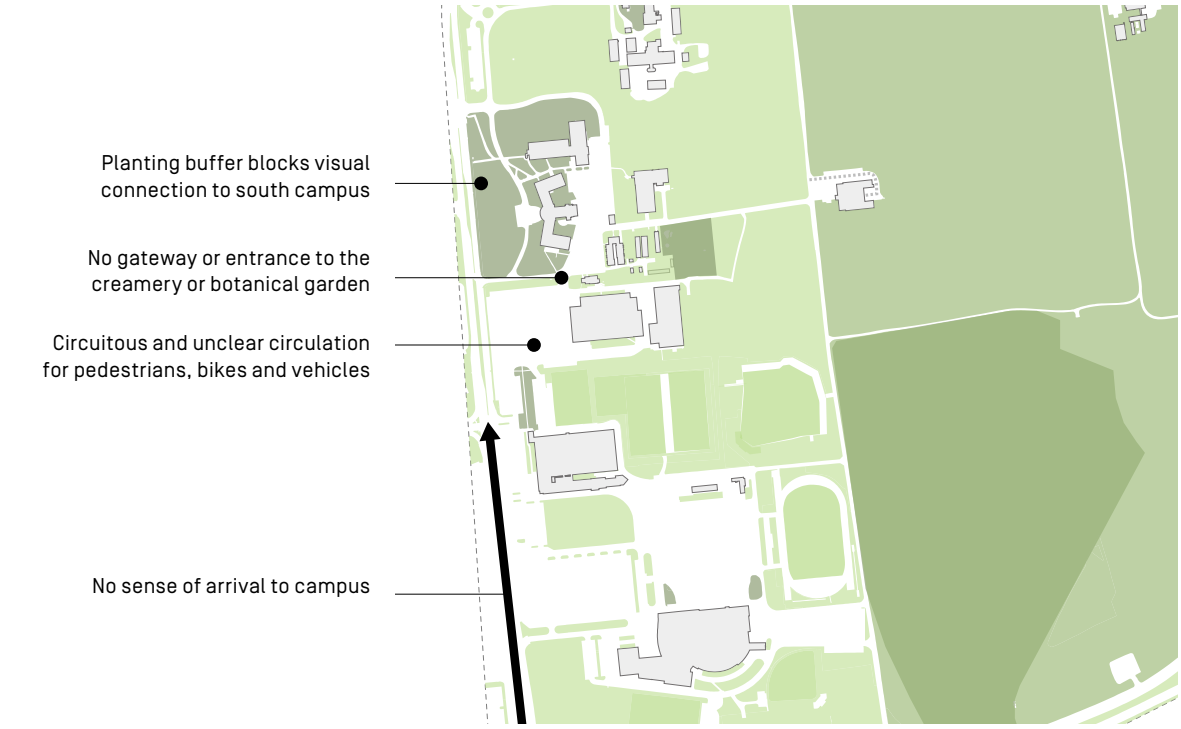
Open Space Opportunity Areas

With improvements to the overall UD circulation network a greater sense of connection to the landscape areas can be achieved in the three campus zones. Organized programming in these areas can highlight them as unique from one another, creating distinct activity destinations for students and faculty. Improvements such as additions of lighting and furniture would help redefine many current landscape areas as usable campus amenities.

LAIRD CAMPUS IMPROVEMENT AREA



SOUTH CAMPUS IMPROVEMENT AREA



Open Space Opportunity Areas

Transportation

STAKEHOLDER WORKING GROUP EMERGING THEMES

- Improving the **bike and pedestrian networks** requires policy and physical intervention internally as well as advocacy and engagement with external stakeholders.
- A proactive approach is needed to properly respond to the need of **persons with disabilities**.
- **STAR campus** may offer opportunities in space, but may exacerbate challenges around campus connectivity and cohesion.
- **Physical and policy interventions**—both internal and external—are needed to support robust and safe biking infrastructure.
- A proactive approach to **accessibility and mobility**, especially as populations with identified disabilities are expected to increase in coming years, is needed.
- Enhancements to **campus transportation infrastructure** are needed.
- **Service, hazardous waste transport and loading functions** need clear policies and improved routes.

FINDINGS

- The University is completely surrounded by streets that are classified as high usage 'major arterial' roads that provide the primary connectivity for the city of Newark to the larger region. This puts significant vehicular traffic on the same public roads that pedestrians and bicycles must use to access different areas of campus.

- Zip code mapping of address data shows the majority of employees live farther than 5 miles from the university. This travel distance likely necessitates the use of a personal vehicle and increases the demand for employee parking close to the campus core

- The University of Delaware requires employees, students, and visitors to obtain a permit to park on campus. Spaces are distributed throughout the campus with those closest to the Green being in high demand (and limited supply) and thus most tightly controlled.

- Loading and service lanes are an essential for the proper functioning of the University. However, the location of these service lanes are often in conflict with pedestrian pathways, and lack clear standards to encourage safe practices by service and delivery vehicles.

- Connections to Laird Campus and South campus are inconsistent and present significant safety and aesthetic concerns. The network does not adequately address east-west connectivity between the East Campus and the academic core west of College Avenue leading to significant conflicts between vehicles and pedestrians at key Intersections.

- The bicycle network around campus lacks the consistency and definition necessary to encourage cycling as a safe and viable form of transportation. On-campus the lack of standards and clear rules leads to improper use of pedestrian paths and conflicts between pedestrians and bicycles

- Available mapping data shows a significant amount of bicycle usage within the city, and available data on bicycle crash data shows significant concentrations of recent incidents along the primary routes to campus.

- Riders are generally satisfied with the routes and destinations of university-run transit but have concerns about overcrowding during peak time. There were significant reports of the traffic along College Avenue affecting the ability of students to travel between central and south campus within class change periods.

Street Hierarchy and Road Network

The University is completely surrounded by streets that are classified as high usage 'major arterial' roads that provide the primary connectivity for the city of Newark to the larger region. This puts significant vehicular traffic on the same public roads that pedestrians and bicycles must use to access different areas of campus.

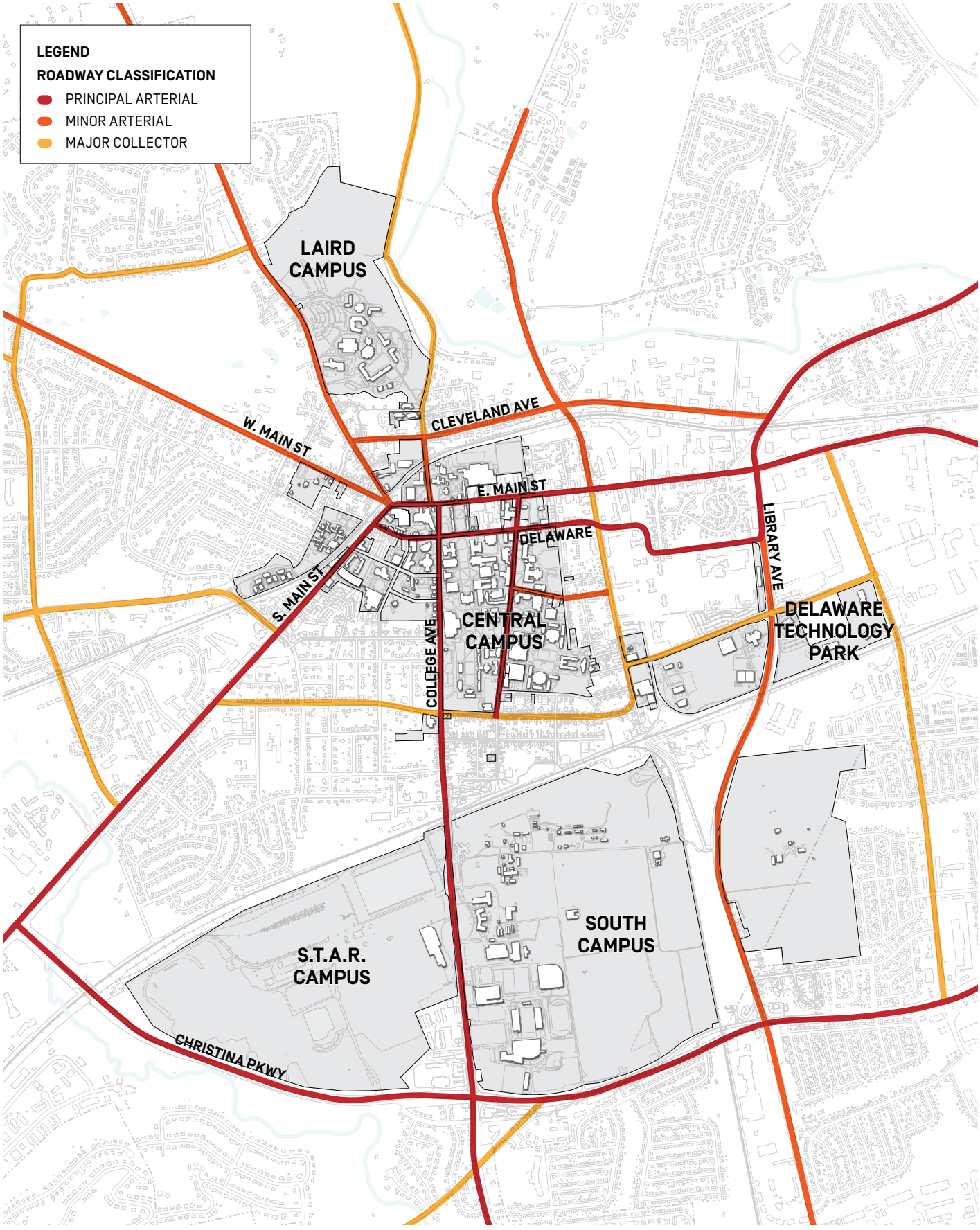
When evaluating the transportation context of the University of Delaware campus, it is important to understand the surrounding street network. The adjacent map indicates the official classification of the roads surrounding the University of Delaware campus and the hierarchy of these travel ways. Data for this map was sourced from the Delaware Department of Transportation (DelDOT) and indicate the federal functional classification.

Of significance is that the campus is surrounded and pierced by a number of routes deemed significant to the regional transportation network.

- E. Main Street, E. Delaware Street, S. Main Street/Elkton Road, and S. College Avenue are considered major arterials by DelDOT.

- New London Road, W. Main Street, Cleveland Avenue, Paper Mill Road, Library Avenue, and South Chapel Street are regarded as minor arterials. These classifications apply to routes of regional significance, where through travel and regional movement are prioritized. Modification of these roads which reduce vehicle capacity would likely be a challenge. Moreover, these roads tend to have high traffic volumes and drivers may be making longer trips, thus be less likely to distinguish the context shift of the university, and thus potentially less aware of the increased pedestrian and bicycle volumes, and slower vehicles.

- Major collectors and non-classified local routes are seen as less regionally-significant, relative to major arterials, and are more likely traveled by those living or working in the area. Also, as they typically have a greater emphasis on access than mobility, represent potential opportunities where the University can affect the roadway cross section and streetscape.



Routes to Campus and Street Hierarchy

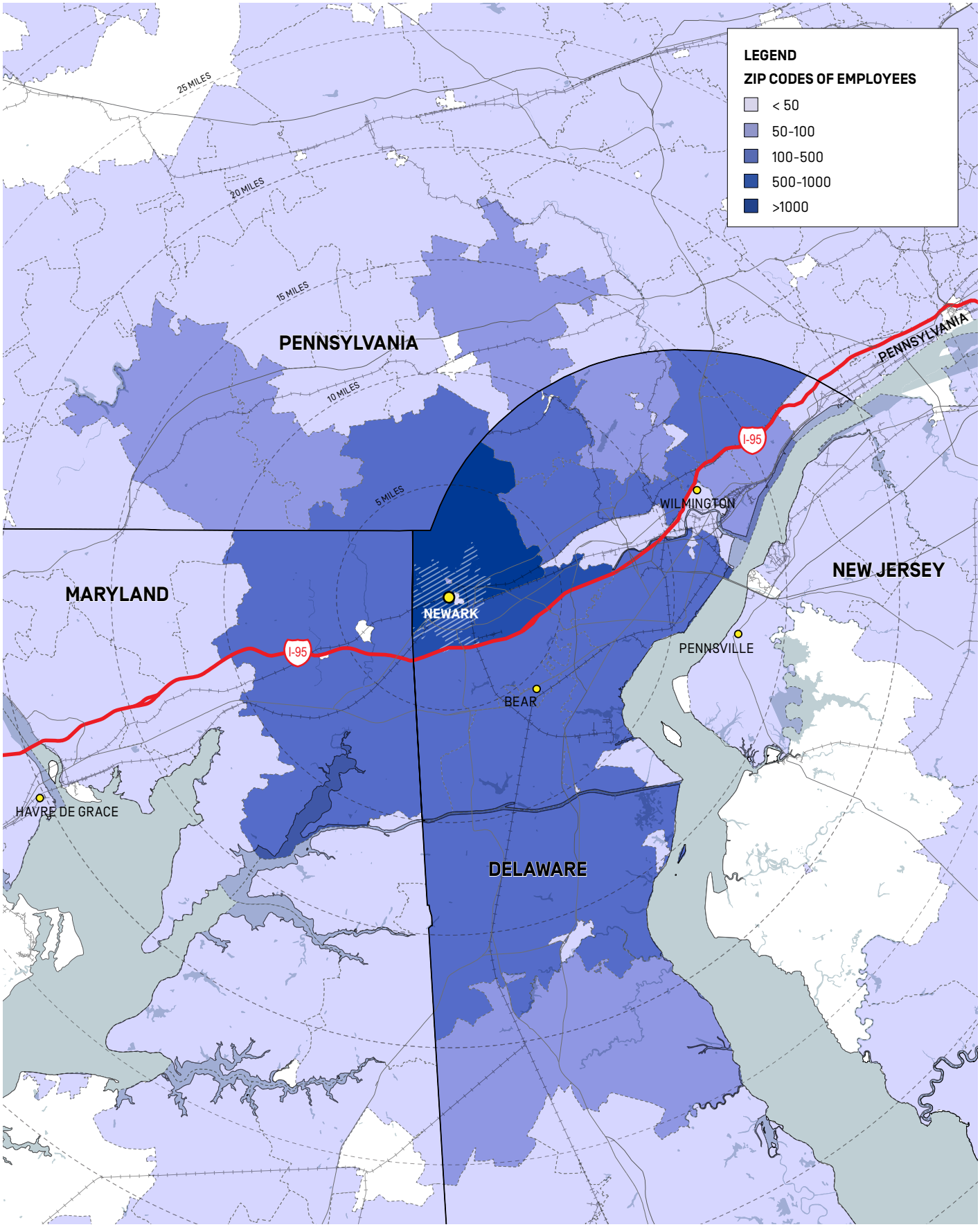
Employee Routes to Campus and Parking Demand

Zip code mapping of address data shows the majority of employees live farther than 5 miles from the university. This travel distance likely necessitates the use of a personal vehicle and increases the demand for employee parking close to the campus core.

To understand where the university community resides and how they travel to campus, their residence locations were obtained and mapped. The maps are based on employee zip code and student address data provided by the University of Delaware. The maps provide some insight into their commuting patterns to campus.

- The majority of employees and students reside northeast of campus. They would likely commute into the University using Route 72, and either Paper Mill Road or E. Main Street.

- Zip codes of employee home addresses show that the vast majority of employees commute from beyond 5 miles away from campus. This information is an indication of the demand for employee parking, and suggests that transportation demand management tools aimed at longer-distance commuting (such as telework and carpooling) may be more effective than those targeted at shorter-distance commuting (such as bike and walking promotion).



Employee Concentrations by Zip Code

Parking

The University of Delaware requires employees, students, and visitors to obtain a permit to park on campus. Spaces are distributed throughout the campus with those closest to the Green being in high demand (and limited supply) and thus most tightly controlled.

PARKING LOCATION PERMIT ZONES

The University of Delaware requires employees, students, and visitors to obtain a permit to park on campus. Spaces are distributed throughout the campus with those closest to the Green being in high demand (and limited supply) and thus most tightly controlled. Permit prices and availability are generally in tiered rings around the campus core. Parking permit schema represents the 2015-16 permit zones; the parking inventory data was provided by University of Delaware Parking and Transportation.

PARKING SUPPLY

The campus currently has 8,822 total parking spaces available for student, employee, service, and visitor parking. Parking accommodation is generally achieved through small and medium-sized lots closer to Central Campus and larger parking facilities in auxiliary campuses.

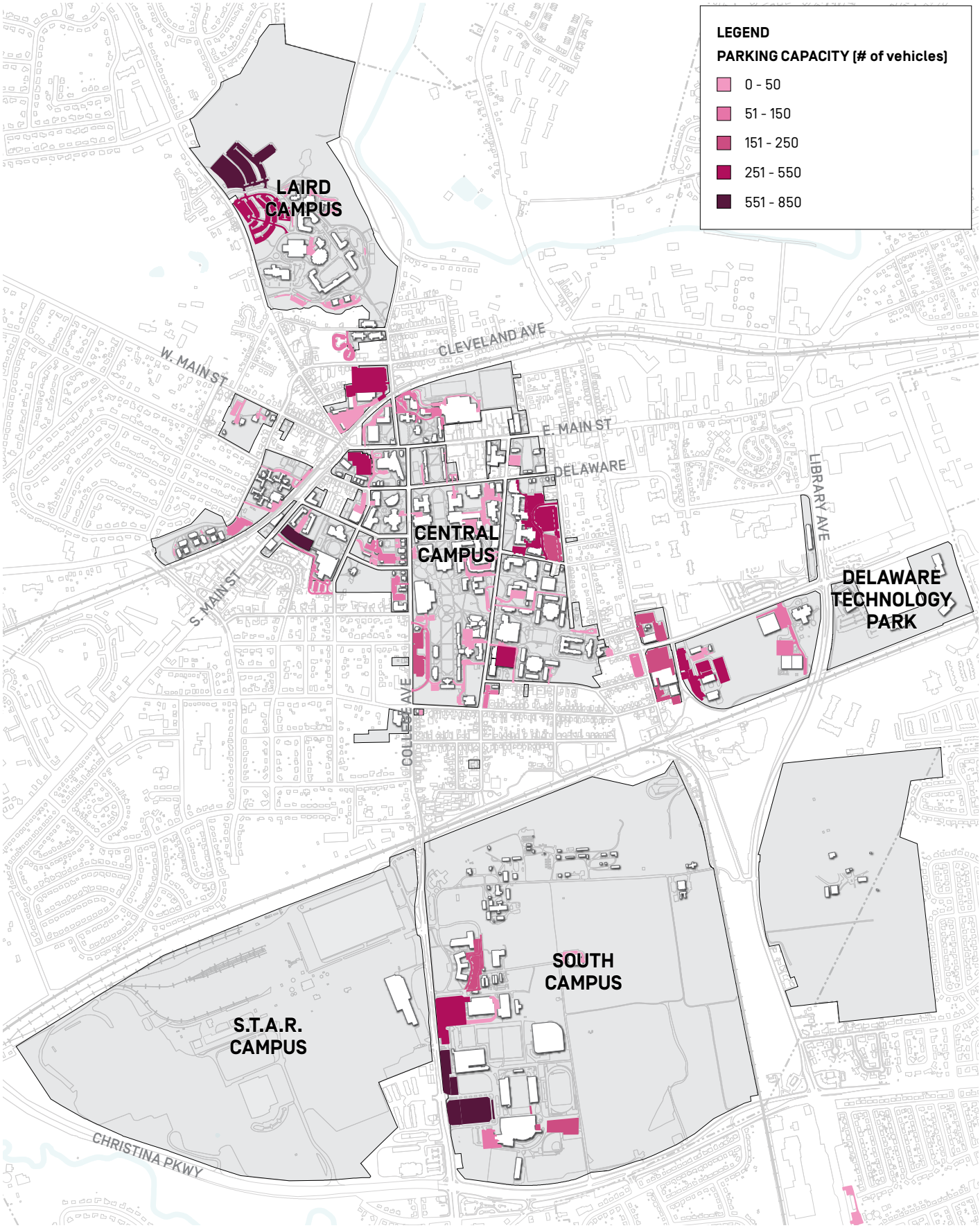
PARKING OCCUPANCY / BENCHMARKING

The following graphics represent average parking facility occupancy rates on weekdays from 10:00 AM to 3:00 PM (daytime peak period) during the 2015-2016 Academic Year, and the University's allocation of parking spaces per person compared to peer universities. The parking occupancy findings are based on parking count data provided by University Parking and Transportation that cover roughly half of all parking spaces. Though limited, the data provides some insight into the University's capacity to meet parking demand. The parking space comparison is based on student/employee population and parking inventory data received directly from universities and/or sourced from the Integrated Postsecondary Education Data System.

Analysis of parking counts data received from the University indicate that parking demand is approximately the same at Central Campus and North Campus. On average, 65% all total spaces on Central Campus are occupied during weekday peak hours (10:00 AM to 3:00 PM). On North Campus, about 60% of all total spaces are occupied during weekday peak hours. There was not sufficient parking count data to determine parking demand for the South Campus.

Analysis of parking counts data show that parking demand is highest between 12:00 PM noon and 2:00 PM on weekdays. During this "peak of the peak" timeframe, the average parking occupancy rate is approximately 80%. This indicates that the University can comfortably accommodate existing parking demand, with sufficient residual capacity for an additional 15% increase in parking demand. Interestingly, the University of Delaware has been able to maintain this comfortable parking occupancy rate even though it allocates less parking per person (total student and faculty/staff) than similar schools in a semi-urban setting.

	SPACES PER PERSON	SPACES PER STUDENT (UNDERGRAD + GRAD)	SPACES PER EMPLOYEE
INSTITUTION			
UNIVERSITY OF DELAWARE	**.33**	**.40**	**2.08**
Princeton University	.70	.50	
Liberty University	.64	.75	4.52
University of Kansas	.50	.64	2.22
Cornell University	.47	.53	1.02
UNC - Chapel Hill	.43	.61	1.49
Rutgers - New Brunswick	.41	.48	9.04
Rutgers - Camden	.23	.26	2.22
James Madison	.49	.55	4.49



Parking Capacity Analysis

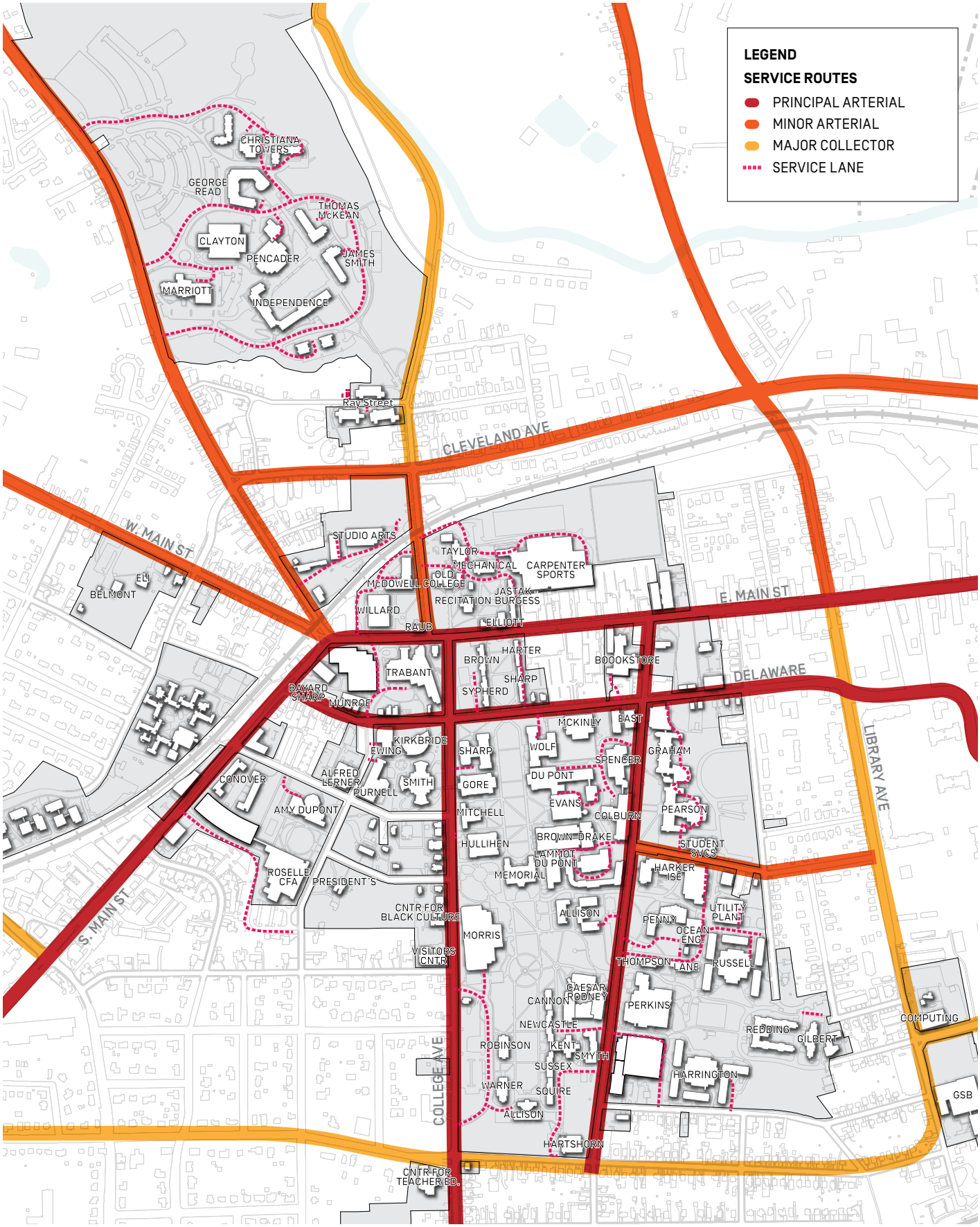
Loading and Service

Loading and service lanes are an essential for the proper functioning of the University. However, the location of these service lanes are often in conflict with pedestrian pathways, and lack clear standards to encourage safe practices by service and delivery vehicles.

The following map reflects the location of loading and service lanes on campus, based on observations conducted during a campus visit. The University has numerous loading and service lanes to facilitate the delivery of goods and to ensure emergency vehicle access. These lanes are a critical aspect of the University's day-to-day operations.

During stakeholder meetings, it was consistently reported that the University has received feedback from service vendors that there are too few service spaces on campus. Stakeholders also voiced concern about conflicts between service vehicles and pedestrians, and they indicated a desire to enhance pedestrian safety in service zones.

image caption



Street Hierarchy and Loading / Service Lanes

0.125 0.25 (mile)

Pedestrian Realm

Connections to Laird Campus and South campus are inconsistent and present significant safety and aesthetic concerns. The network does not adequately address east-west connectivity between the East Campus and the academic core west of College Avenue leading to significant conflicts between vehicles and pedestrians at key Intersections.

WALKWAYS + PATHS

While on campus, pedestrians are served by an extensive network of sidewalks and paths. Many of these paths have been recently constructed or rebuilt and are generally in good condition and meet current design standards. This network complements a campus environment that is well-lit and that borders residential neighborhoods with relatively low traffic volumes. While the campus is generally pedestrian-friendly, there are a few aspects of the pedestrian network that could benefit from further enhancement.

- While walkways and paths generally coincide with pedestrian flows, this alignment does not exist in all areas.
- There are several areas adjacent to the campus, along public streets, where the sidewalk is narrow relative to the pedestrian demand. These include Kent Way, and portions of South College Avenue, Lovett Avenue, and Wyoming Road west of South Chapel Street.
- There are several overlaps between pedestrian paths and service/emergency lanes, as previously noted. These lanes present opportunities for the University to clarify how these spaces should be used and by whom.

PRIMARY PEDESTRIAN FLOWS

The following graphic indicates areas and intersections where physical barriers exists for pedestrian movement

- Pedestrians have different options for north-south travel across the campus core. These options include walking along S. College Avenue, Academy Street, or various paths along ‘the Green’.
- Pedestrians have fewer options for east-west travel as a result of historic architectural walls surrounding The Green and larger buildings that block pedestrian access. For east-west travel, pedestrians typically cut across the Green from just north of Morris Library to 401 Academy Street and the Perkins Student Center.

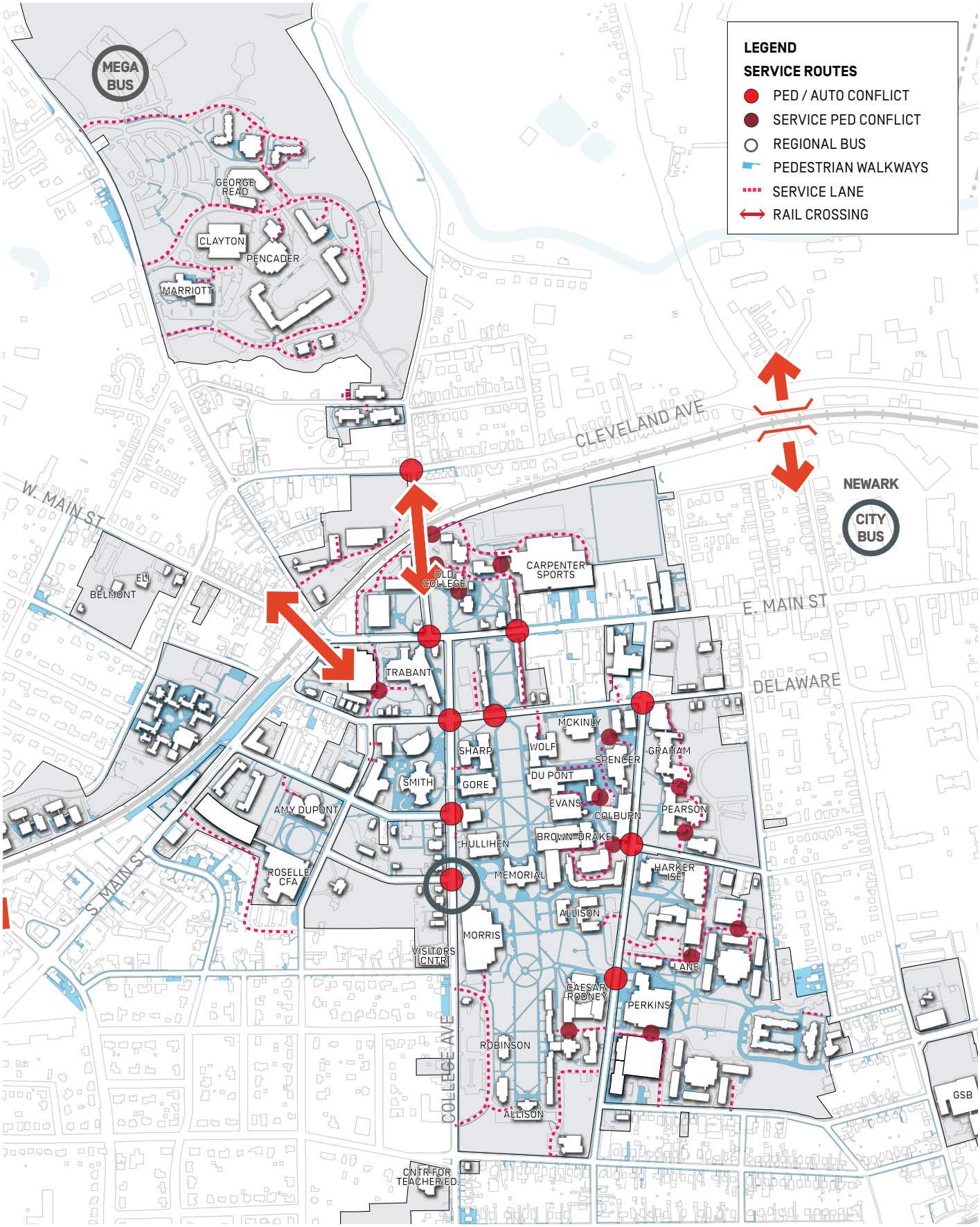
PEDESTRIAN VEHICULAR CONFLICT AREAS

The graphic displays pedestrian and vehicular conflict points, based on observations conducted during campus visits and feedback from stakeholders. Many of these conflict points coincide with the routes of several important regional arterial roads bordering the campus. While the rate of pedestrian-vehicular accidents on campus is unknown, this exposure of pedestrians to high-volume vehicular traffic increases the likelihood of such accidents.

The two primary areas of concern, historically, have been crossings of East Main Street and Delaware Avenue. In recent years, the Delaware Avenue crossing was consolidated to a single crossing to improve visibility for drivers and pedestrians and reduce driver frustration at two adjacent crosswalks. Additionally, a pedestrian signal is currently planned for East Main Street and the Green.

Pedestrian volumes along South College are high and can result in vehicle delay. The intersection at Delaware Ave has been converted to include an exclusive pedestrian phase. Intersections at Amstel and Kent also have high levels of pedestrian queuing that regularly spills into the roadway and results in pedestrians crossing out of phase.

Based on observations conducted during campus visits and feedback from stakeholders it became apparent that there are several locations where service lanes overlap or conflict with primary pedestrian travel paths. The presence of loading and service lanes, especially around core campus buildings, has resulted in conflicts between vehicles using the lane and pedestrians trying to access the buildings. In addition to resulting in pedestrians traveling in the “back of house” and creating an unpleasant walking environment, this confusion about the spaces each user occupies also poses a safety risk.



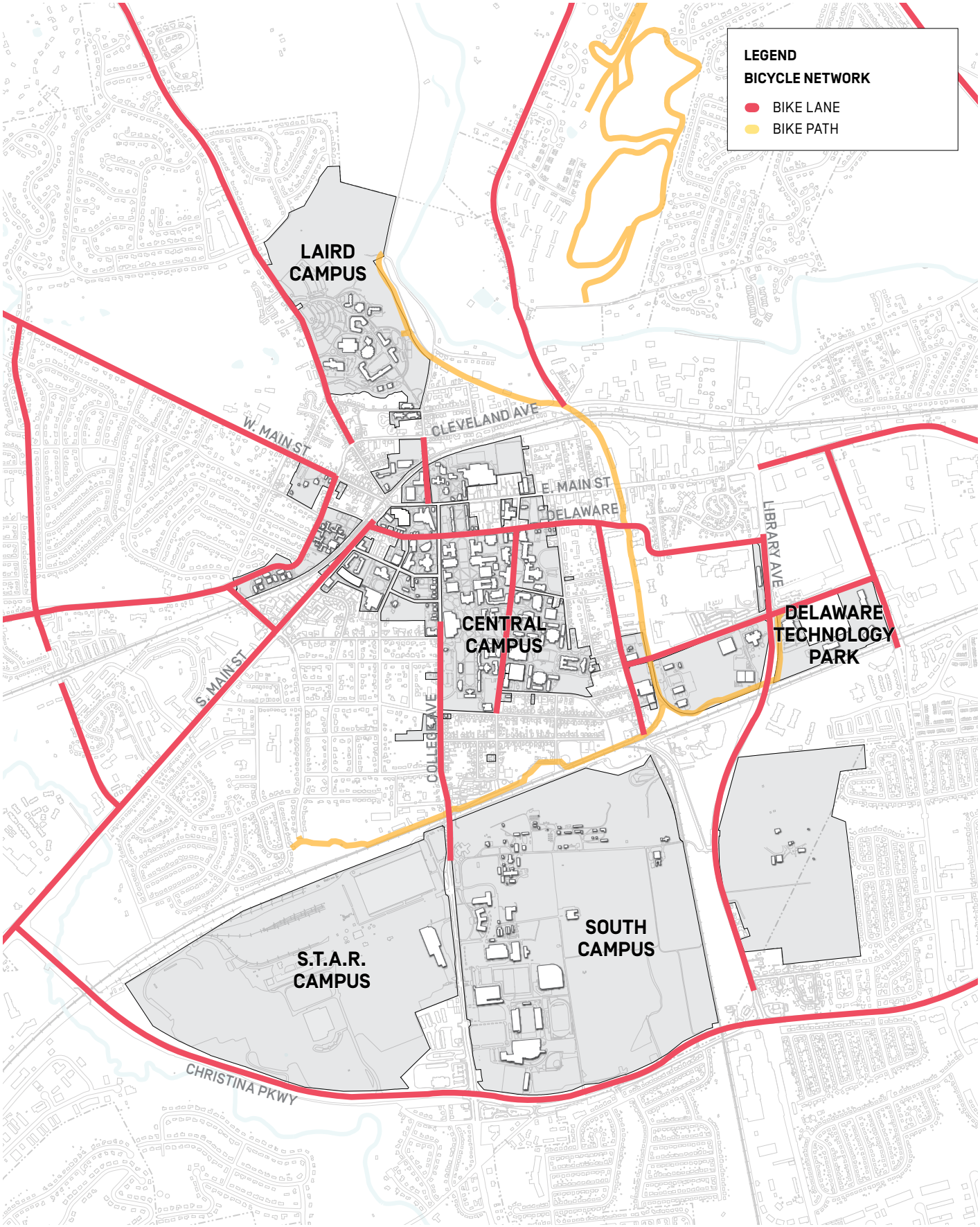
Conflicts With Pedestrian Movement

Bicycle Network

The bicycle network around campus lacks the consistency and definition necessary to encourage cycling as a safe and viable form of transportation. On-campus the lack of standards and clear rules leads to improper use of pedestrian paths and conflicts between pedestrians and bicycles.

This map is based on field observations, feedback from the Stakeholder Working Group, as well as bicycle route mapping provided by the University of Delaware. The Campus is currently served by several miles of bicycle lanes as well as the James F. Hall Trail, which circles the campus core along its eastern and southern edges.

The map reveals that many of the bike lanes are not interconnected, creating a fragmented network that limits bicycle access to key campus nodes which, in turn, raises safety concerns. The City currently has plans to install a two-way cycletrack along Delaware Avenue, improving westbound bicycle travel. While many of the streets adjacent to campus are low-volume and low-speed, these are generally disconnected from the rest of Newark, underscoring the importance of working with the City to create a comprehensive, continuous bicycle network.



Bicycle Network

Bicycle Network Assessment (Cont.)

Available mapping data shows a significant amount of bicycle usage within the city, and available data on bicycle crash data shows significant concentrations of recent incidents along the primary routes to campus.

BICYCLE USE INTENSITY

The attached map displays routes typically taken by campus bicyclists. The data is collected via individual tracking devices worn by riders and aggregated by the Strava software application. This data also includes pedestrian activity.

The graphic reveals where biking infrastructure demand is greatest, information that can be useful to inform the implementation of future bike lanes and sidewalks.

- The intersection of E. Main Street, Nottingham Road, and New London is an important campus node that is well traversed, despite there being a lack of bike routes.
- Cleveland Avenue, E. Main Street, and Park Place serve as important east-west routes for bicyclists and pedestrians.
- While S. College Avenue does support some northbound and southbound bicycle and pedestrian travel, the James F. Hall Trail and Apple Road appear to be primary routes for north-south movement.
- The James F. Hall Trail is a popular destination and a feature that the University may want to consider promoting.

BICYCLE CRASH DATA

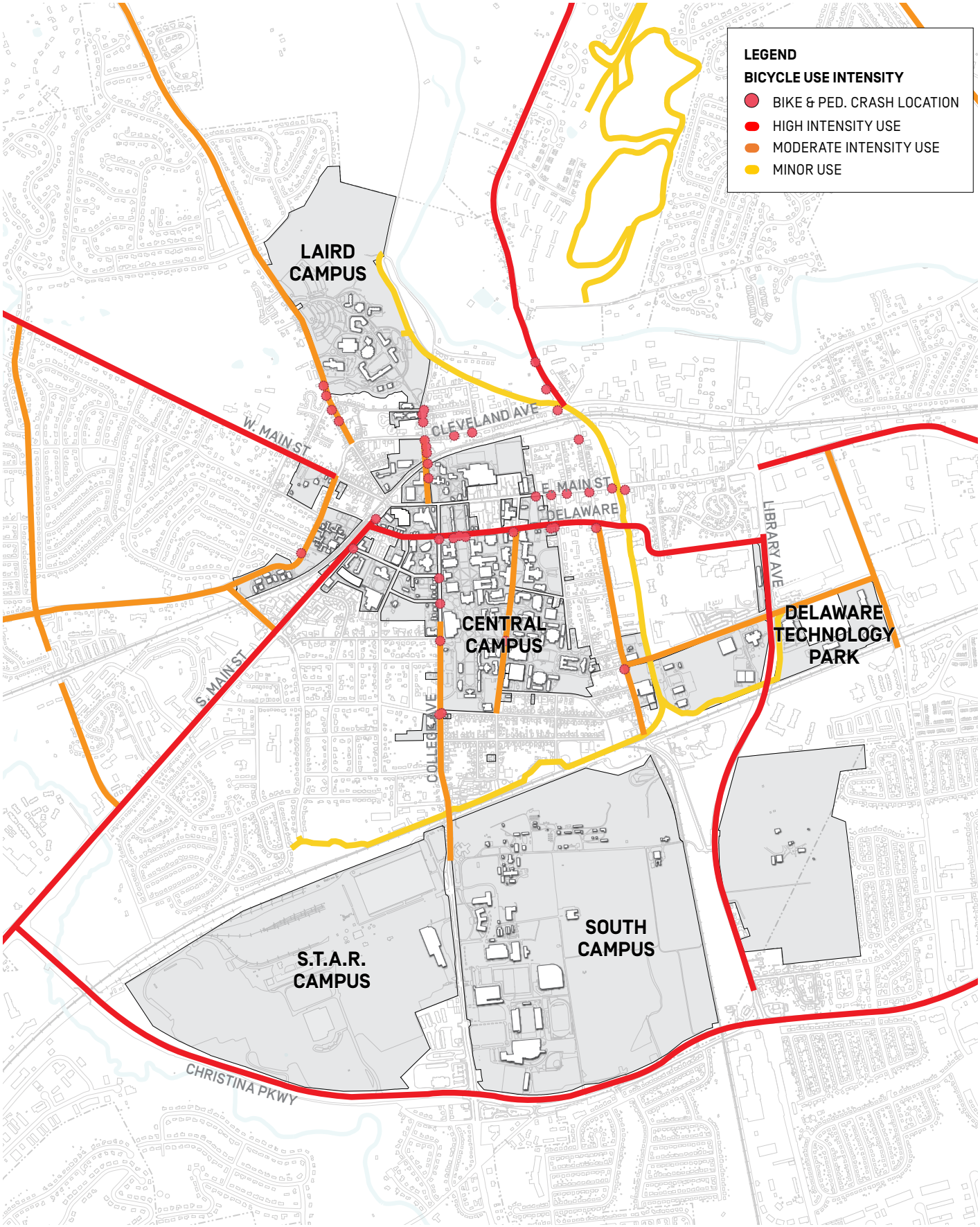
The attached map displays bicycle crashes that took place on campus between 2012 and 2014. Data for this graphic was provided through maps from the University of Delaware.

Each dot on the following map indicates that a bicycle crash took place at the site over the three-year period. A larger dot indicates that two or more bicycle crashes occurred at the site during the three-year period. For display purposes, adjacent locations are shown as a single location.

The pattern of collisions reveal that bicycle crashes mainly occurred along major corridors, including:

- S. College Avenue
- S. Main Street / Elkton Road; and
- E. Delaware Avenue

The number of crashes in the area is indicative of both the overall level of bicycle activity and also the need for additional infrastructure and awareness.



Bicycle Use Intensity

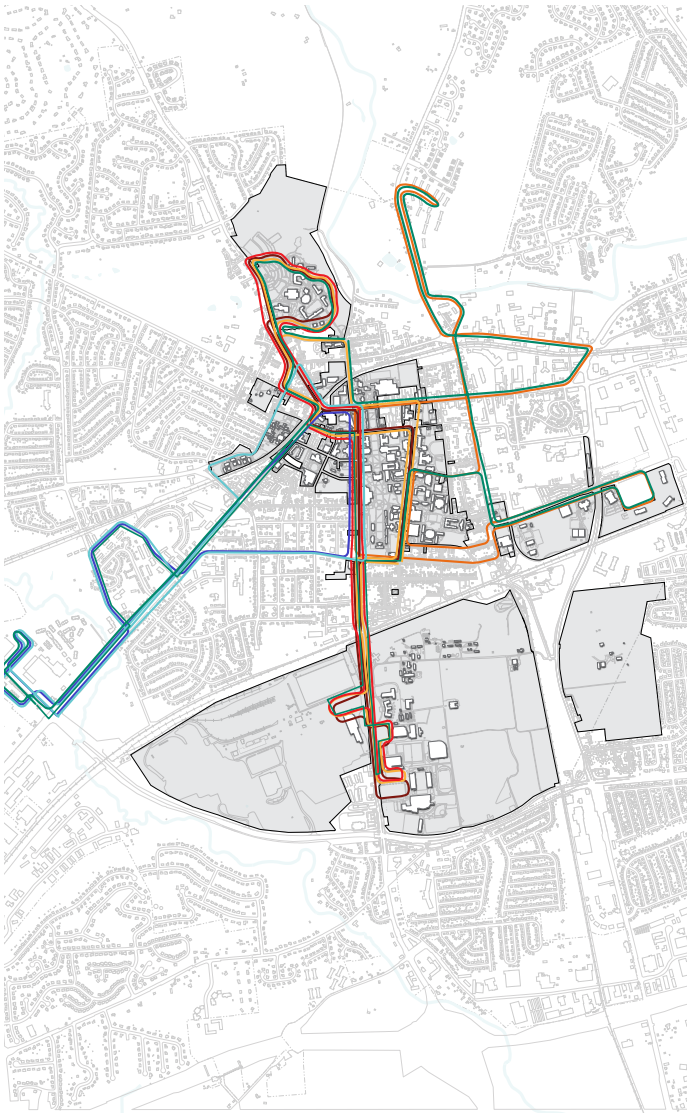
Transit Network

Riders are generally satisfied with the routes and destinations of university-run transit but have concerns about overcrowding during peak time. There were significant reports of the traffic along College Avenue affecting the ability of students to travel between central and south campus within class change periods.

CITY + UNIVERSITY TRANSIT SERVICE

The transit route map is based on UD Shuttle Bus information available through the University of Delaware website. The University's bus service is extensive, providing connections between the Laird and South Campuses and Central Campus as early as 4:30 AM to 2:30 AM on weekdays. On weekends, service begins around 12:00 PM noon and continues to as late as 3:00 AM. Headways during the weekday daytime range anywhere from 8 to 25 minutes. During the weekend daytimes, headways are approximately every 40 minutes. During evenings, headways are every 45 to 60 minutes.

According to a 2015 Transportation Service Study, riders are generally satisfied with University-run transit but have concerns about overcrowded busing during peak times. This sentiment was echoed by during stakeholder meetings.



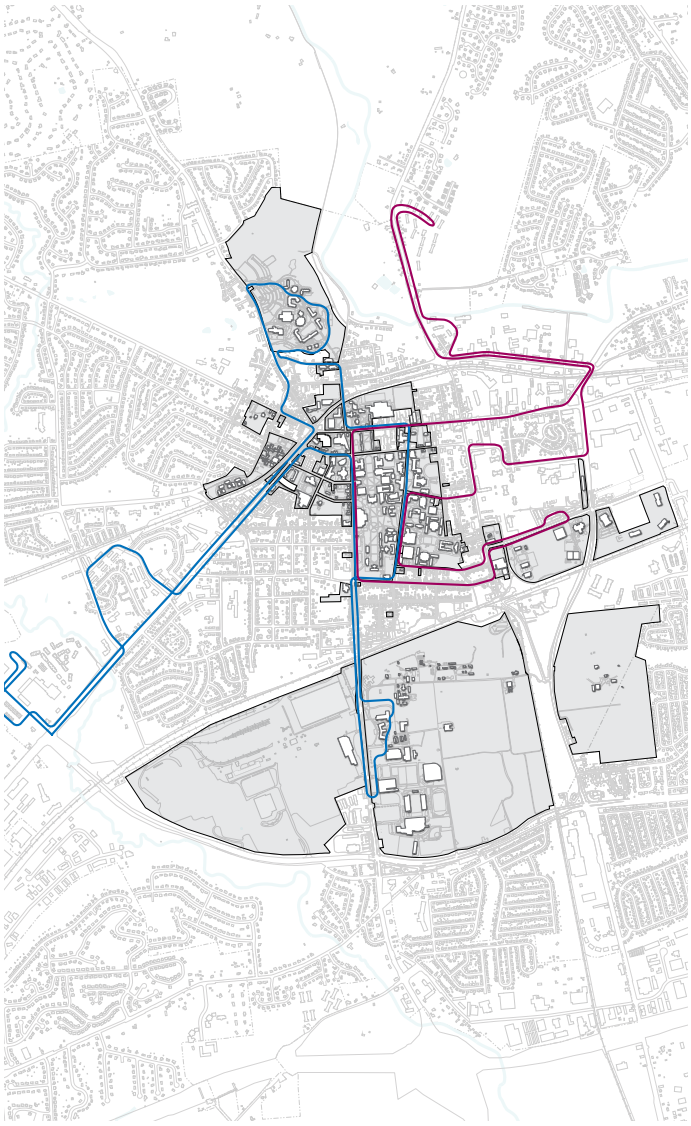
Weekday

WEEKEND BUS ROUTES

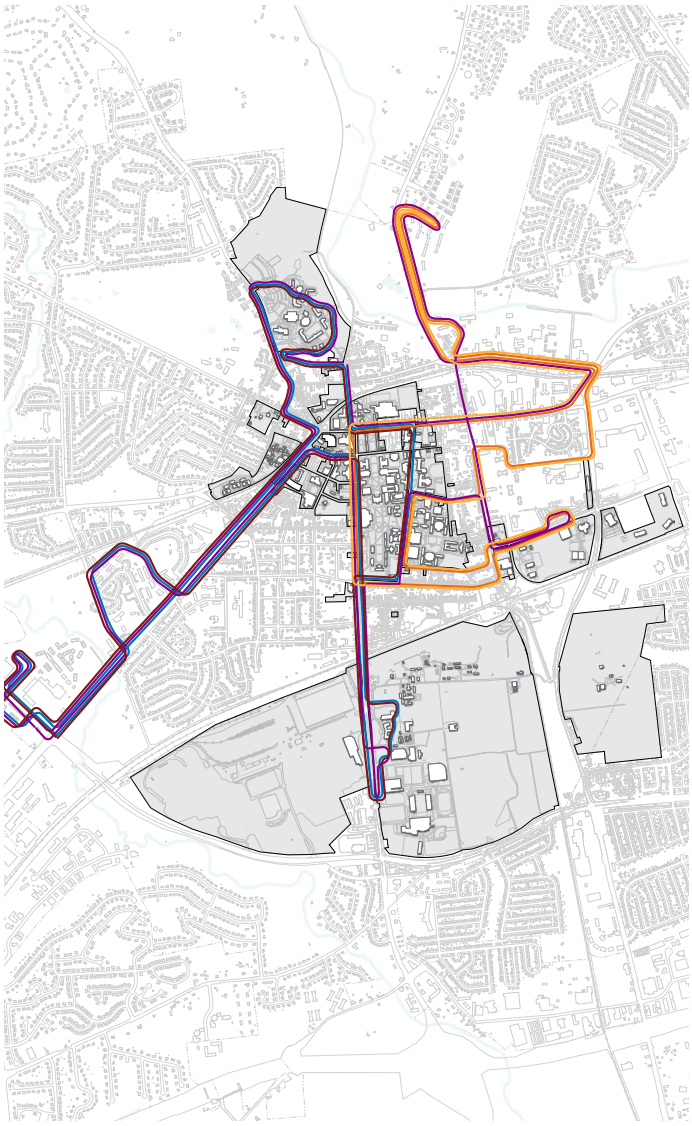
- WEEKEND I
- WEEKEND II

NIGHT BUS ROUTES

- EVENING I
- EVENING II
- EVENING ALL CAMPUS
- LATE BIRD I
- LATE BIRD II



Weekend



Night

0.25 0.5 1 (mile)

Infrastructure

STAKEHOLDER WORKING GROUP EMERGING THEMES

- Campus needs a more **comprehensive framework for connectivity** that supports all modes of transportation in safe and efficient manner.
- Lack of **comprehensive campus plan** drives decentralized decision making and piecemeal approach to building maintenance and modification.
- **Building maintenance** is largely reactionary, and needs a better operational model.
- Dependent **relationship of city and university** is a disincentive to modifying utility usage.
- **Analysis of available data** may offer significant opportunities for identification of efficiencies, demand management and usage reduction.
- **Building performance standards** are needed to prioritize improvements and facilities renewal investments.
- **Stormwater compliance** is likely to become a significant regulatory issue, necessitating a coordinated framework for the campus.

FINDINGS

- CAMPUS ELECTRICAL INFRASTRUCTURE
  All of the systems have developed organically over time, containing some new components from the development of ECUP in 2014 and some components over 50 years old.

- INCOMING POWER UTILITY
  Short, yet frequent, power interruptions have a significant impact on the operation of critical systems such and chillers and important research equipment.

- UNIVERSITY CHILLED WATER INFRASTRUCTURE
  Most buildings are served by district chilled water service, that are generally in good working order, and there is room for additional capacity to be added as the need arises.

  - Center for Arts, Amy DuPont struggle to meet demand on peak summer days.
  - Flow in network near Willard creates problems with service to nearby buildings.
  - A small number of buildings require process cooling CHW supply temps at 42F all year which does not allow CHW plant to run supply temps at 500F in the winter.

- STEAM AND HEATING NETWORK
  Generally in good working order and is well maintained for a system with components ranging from 10 to 50 years old. This is one of the only infrastructure systems that is well managed through a comprehensive facility renewal process.

  - South of Memorial Hall many lines come together creating pinch point in the network.
  - The age of the pipes across campus results in pipes bursting every year and emergency repairs at much higher cost than preventative costs.

- GHG EMISSIONS
  The University has implements a climate action plan and GHG reporting, but most reductions in GHG emissions has come largely from changes to the sources of energy within the regional distribution system and not through energy efficiency measures on campus.

- STORMWATER MANAGEMENT
  Stormwater is a significant concern for many buildings and landscape areas on campus and is not being managed in a comprehensive fashion.

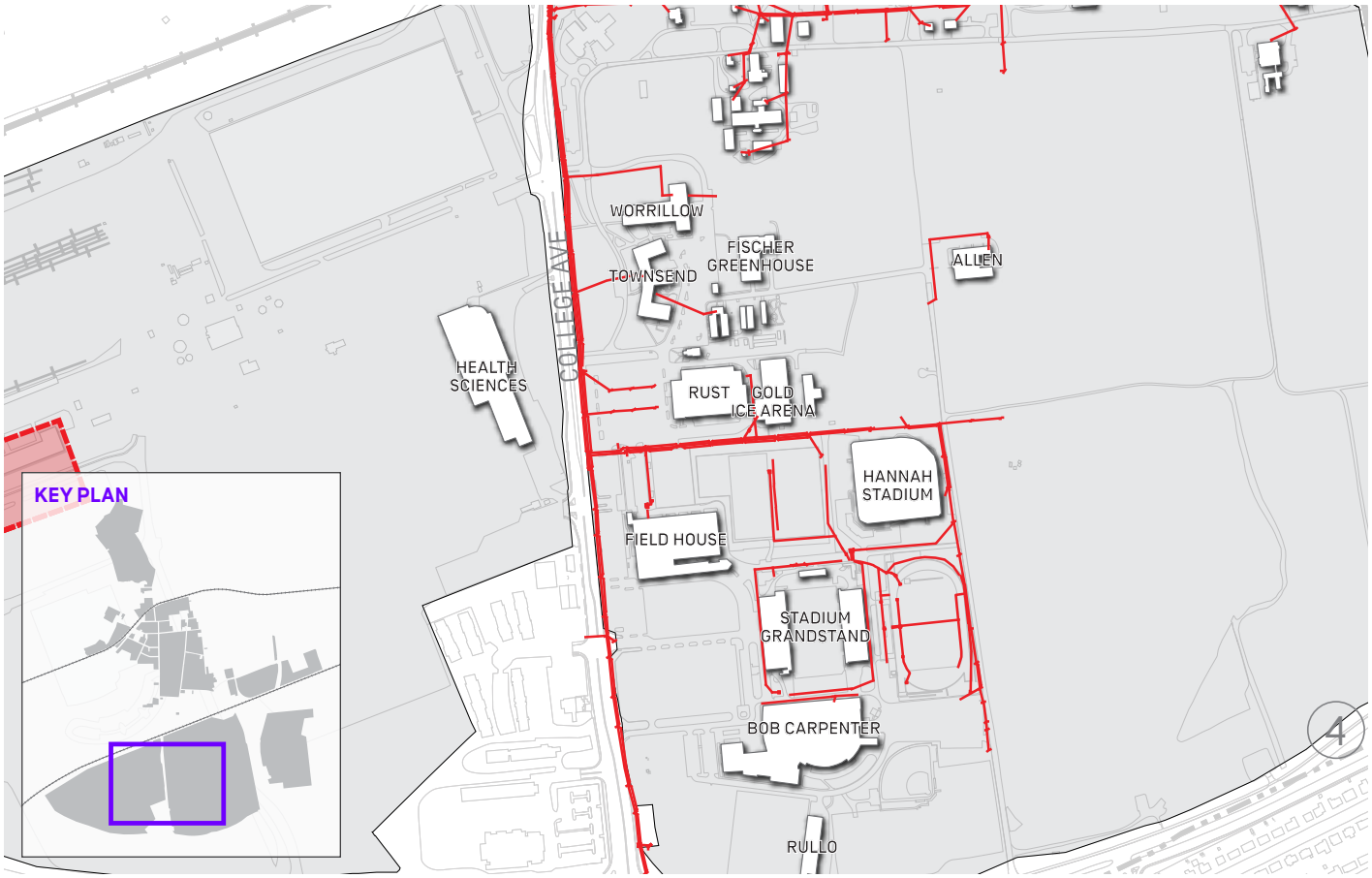
- ENERGY EFFICIENCY AND GHG REDUCTION
  Energy efficient has not been a driver of change on campus, but significant opportunities exist for low cost/high impact changes to be implemented.

Campus Electrical Infrastructure

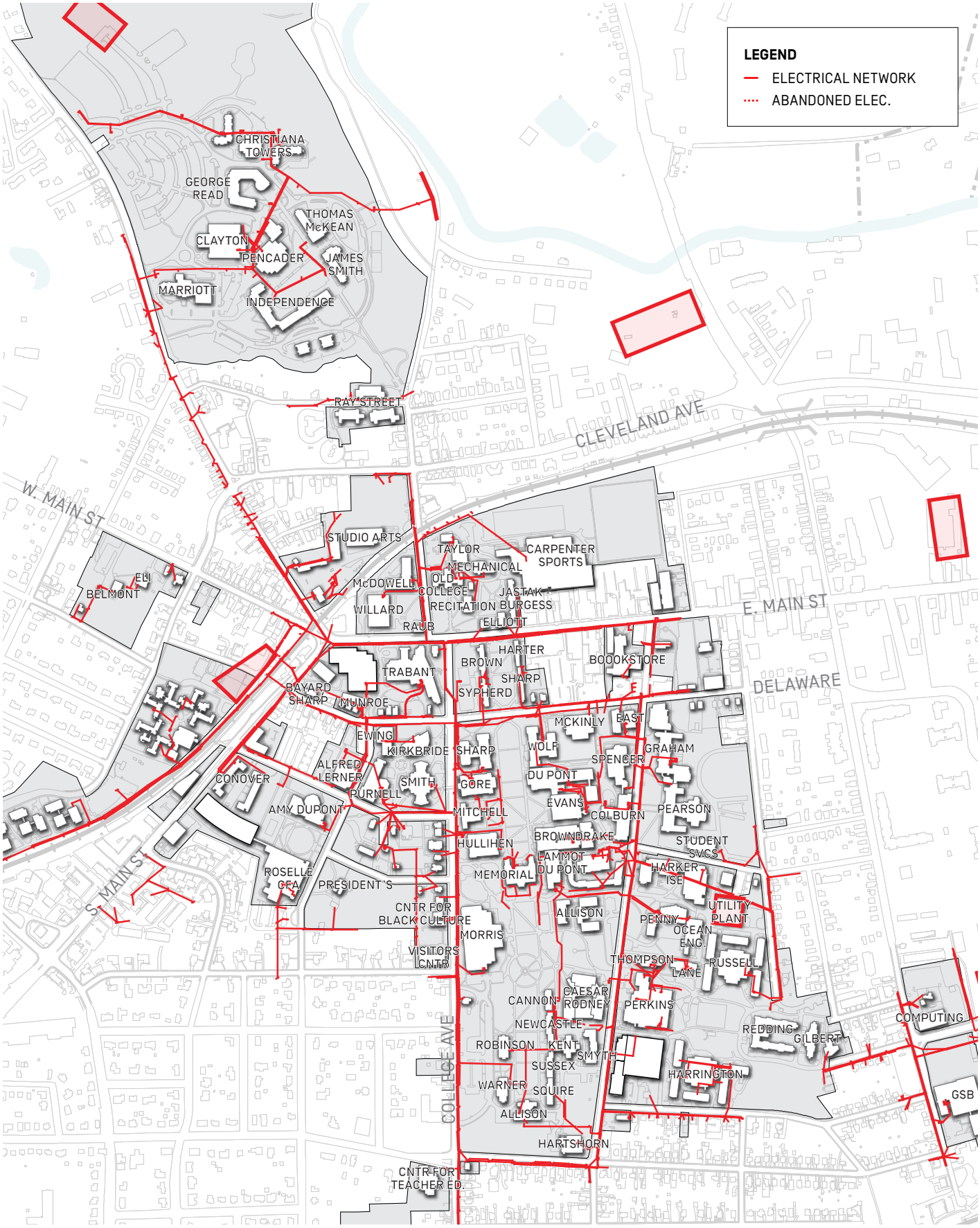
All of the systems have developed organically over time, containing some new components from the development of ECUP in 2014 and some components over 50 years old.

REGIONAL HIGH VOLTAGE ELECTRICAL NETWORK

The University of Delaware electrical infrastructure systems can be characterized to be in good working order. All campus buildings receive sufficient heating, cooling, and electricity to operate under normal conditions and during peak conditions in the summer and winter.



S.T.A.R. + South campus



Electrical Network

Incoming Power Utility

Short, yet frequent, power interruptions have a significant impact on the operation of critical systems such and chillers and important research equipment.

The Kershaw substation on Paper Mill Road is the primary incoming 34.5kV substation for the entire City of Newark from which all other area substations are fed. The Kershaw substation is fed from a single 34.5kV feeder from the Keeney substation which is part of a regional 500kV transmission network transmitting power from the Salem and Hope Creek Nuclear Reactors and other regional generating sources throughout the region.

The local electrical distribution grid, operated and maintained by the City of Newark, has been improving over the past decade, but the university still experiences short, yet frequent, power interruptions. Between January 1, 2016 and April 30, 2016 the University experienced 16 days with one or more PQ meters experiencing a service interruption. These interruptions can be minor incidents causing a flicker of lights in smaller buildings. But such a voltage drop causes chiller plants to shut down taking an hour to restart, and may cause computers or research equipment to shut down involuntarily. Considering the uses at the University of Delaware

The university receives electrical power at 24 primary electrical meters. 17 P-meters are 12,470V service, and 3 meters that are currently 4,160V are planned to be upgraded to 12,470V. 2 meters serve single buildings at 480V. Incoming service voltage and meter for ECUP is 34.5kV. The total annual electrical cost for the entire university is approximately $25M.

During the existing conditions assessment phase, there were no capacity limitations or expansion constraints identified for the electrical distribution network on any area of campus. This has not yet been confirmed with the City of Newark Electrical Engineering Department.

UD ANNUAL ELECTRICAL COST

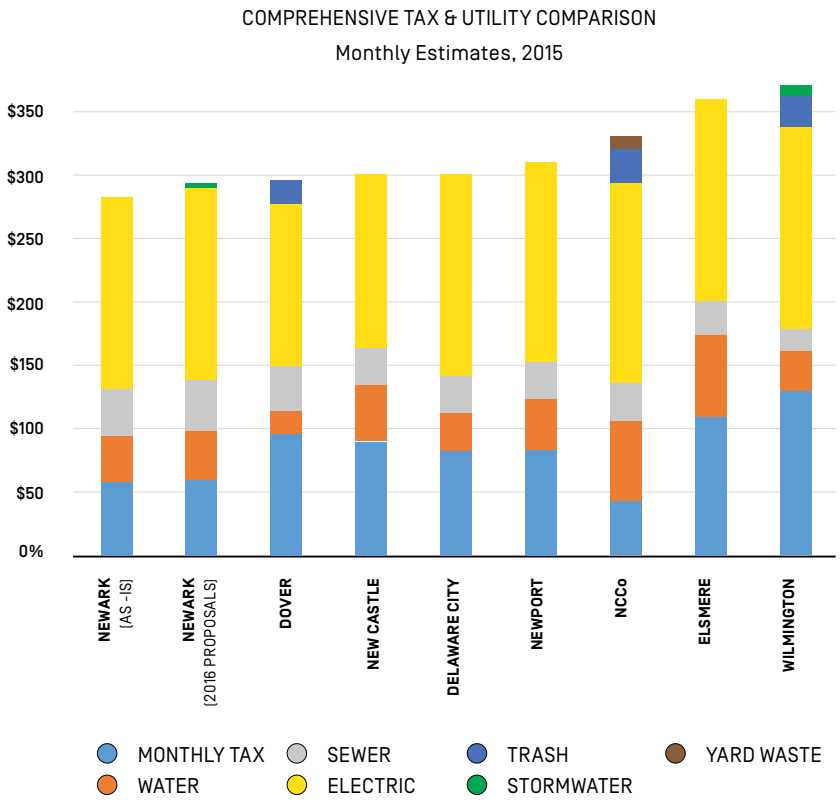
$20-25M

UD SHARE OF CITY UTILITY REVENUE

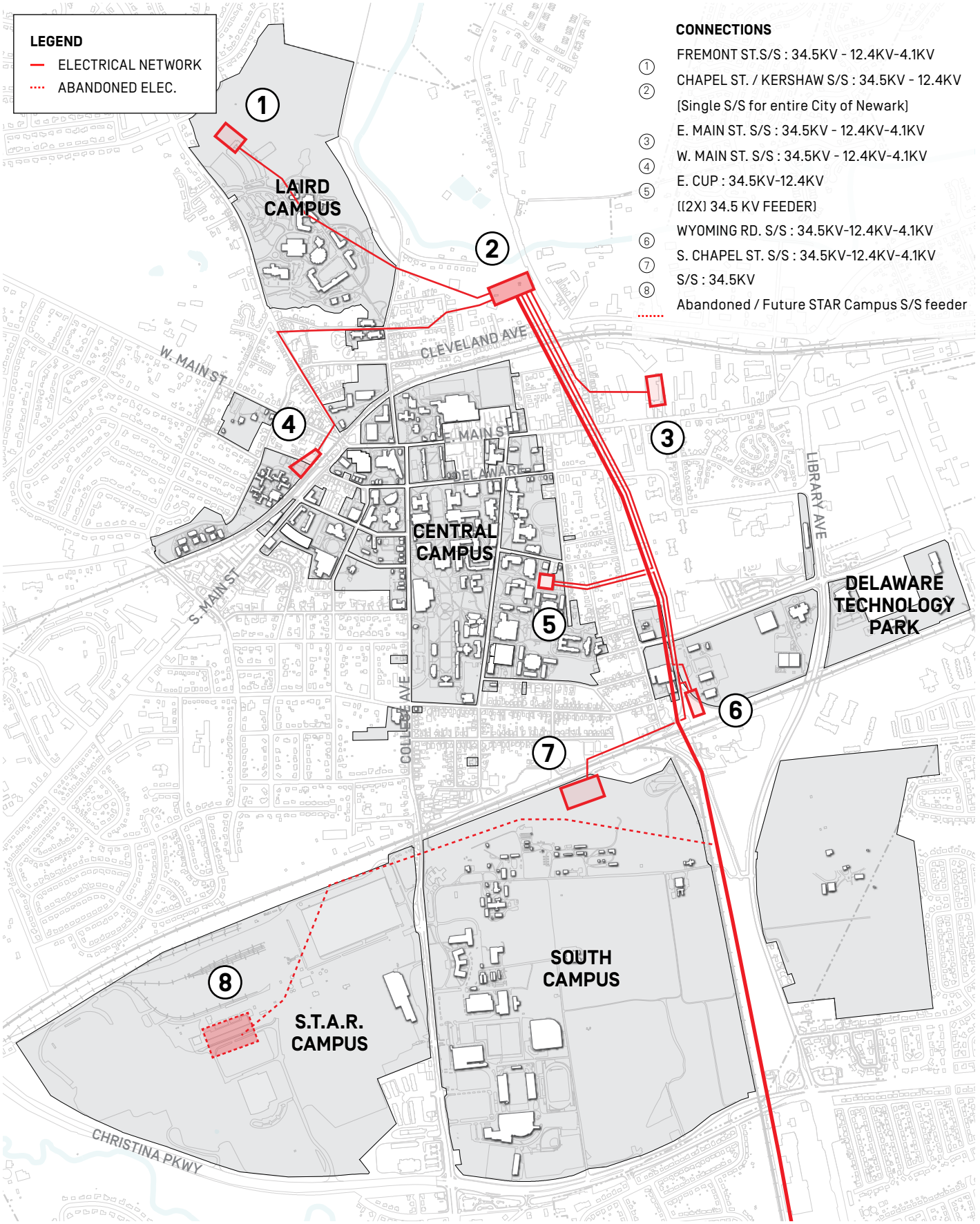
40-50%

NET UTILITY REVENUE SHARE OF NEWARK BUDGET

63%



S.T.A.R. + South campus


LEGEND
ELECTRICAL NETWORK
ABANDONED ELEC.
CONNECTIONS
1 FREMONT ST.S/S : 34.5KV - 12.4KV-4.1KV
2 CHAPEL ST. / KERSHAW S/S : 34.5KV - 12.4KV
(Single S/S for entire City of Newark)
3 E. MAIN ST. S/S : 34.5KV - 12.4KV-4.1KV
4 W. MAIN ST. S/S : 34.5KV - 12.4KV-4.1KV
5 E. CUP : 34.5KV-12.4KV
((2X) 34.5 KV FEEDER)
6 WYOMING RD. S/S : 34.5KV-12.4KV-4.1KV
7 S. CHAPEL ST. S/S : 34.5KV-12.4KV-4.1KV
8 S/S : 34.5KV
Abandoned / Future STAR Campus S/S feeder
LAIRD CAMPUS
CENTRAL CAMPUS
SOUTH CAMPUS
S.T.A.R. CAMPUS
DELAWARE TECHNOLOGY PARK
W. MAIN ST
E. MAIN ST
S. MAIN ST
CLEVELAND AVE
DELAWARE
COLLEGE AVE
LIBRARY AVE
CHRISTINA PKWY
0.125
0.25
0.5 (mile)

University Chilled Water Infrastructure

Most buildings are served by district chilled water service, that are generally in good working order, and there is room for additional capacity to be added as the need arises.

- **Center for Arts, Amy DuPont struggle to meet demand on peak summer days**
- **Flow in network near Willard creates problems with service to nearby buildings.**
- **A small number of buildings require process cooling CHW supply temps at 42F all year which does not allow CHW plant to run supply temps at 500F in the winter.**

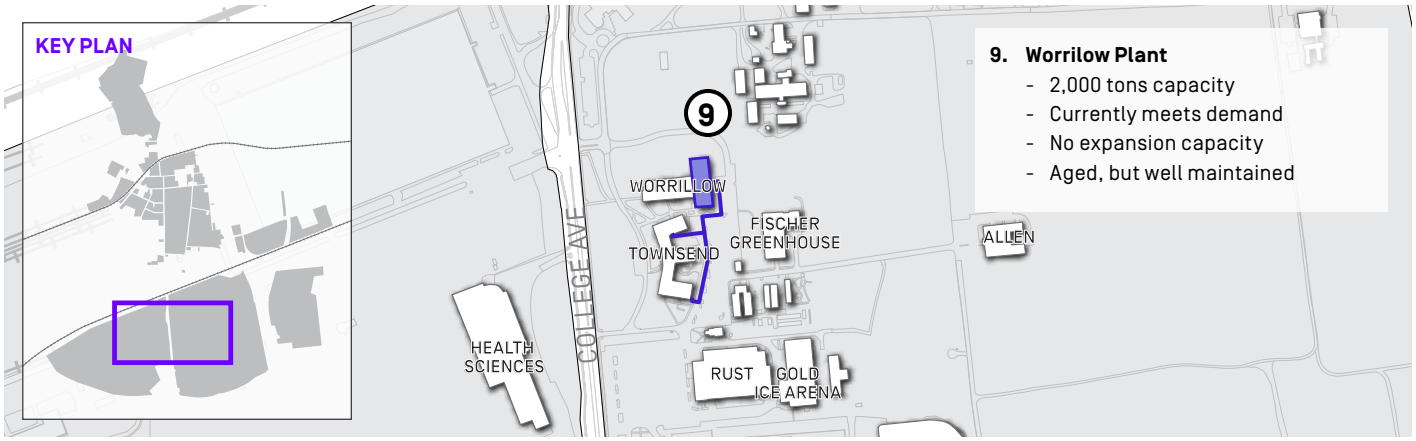
Nearly all buildings on campus are served by district chilled water service, the exceptions being: STAR campus, Christiana East and West (Laird campus) and small buildings/houses throughout campus.

The district chilled water network at University of Delaware is in good working order. The University has been able to maintain comfort conditions during normal operating conditions and met demand during a design condition in 2015. Like the other energy infrastructure systems, the network has developed organically and is comprised of a mix of new components and components that have exceeded their useful life. When older system components fail, the operations and maintenance team brings the system back to working order quickly based of their deep knowledge of the network that has been developed over time. A complete inventory of pipe legs, their conditions, and a capital improvement and replacement plan is not regularly updated.

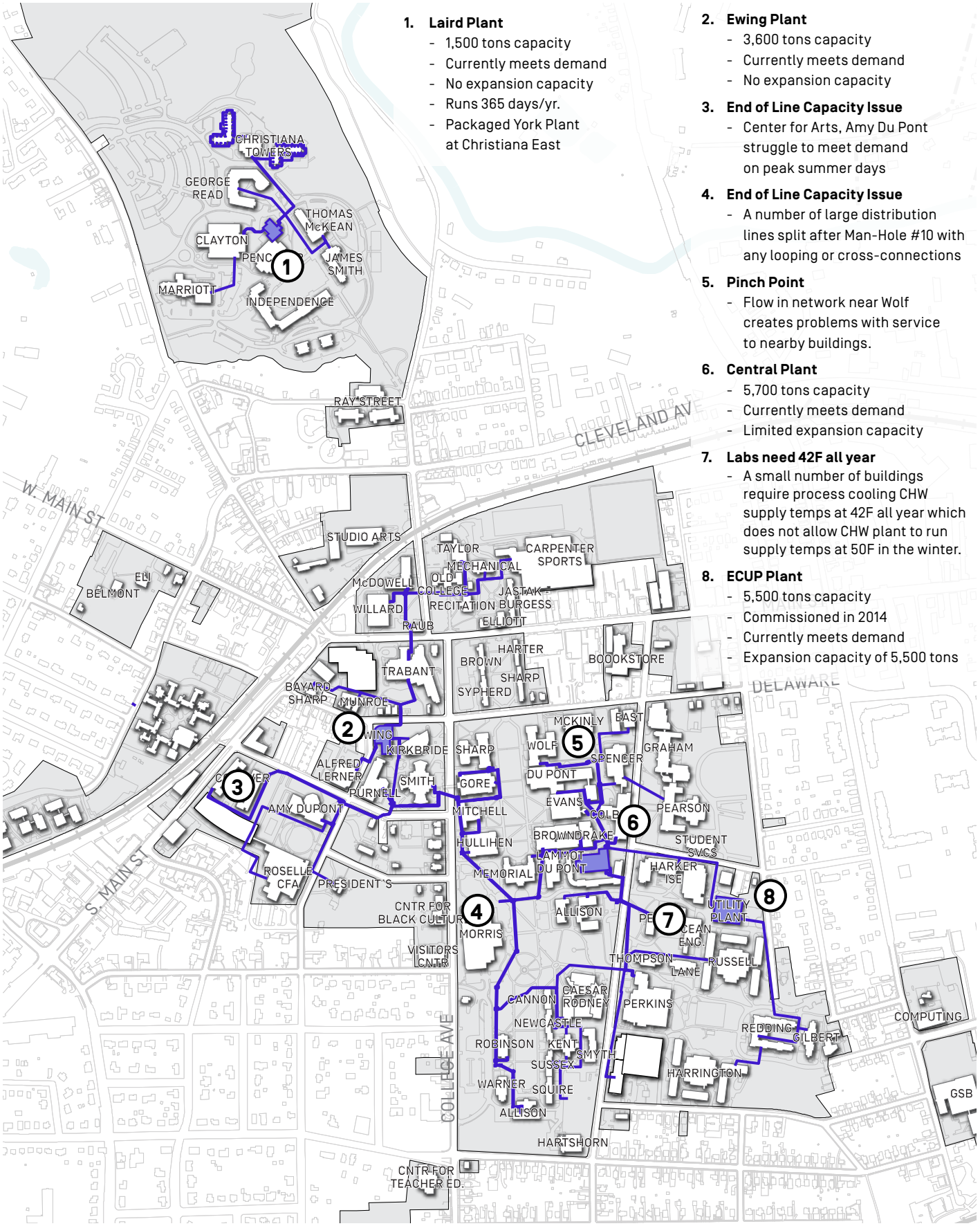
The development of ECUP in 2014 resulted in significantly expanded chilled water generation capacity and chilled water network integration for Central Campus. As a result, the dynamics of this complex hydraulic network are still being understood. Pinch points and end-of-line issues cause difficulties in some buildings such as Willard, Center for the Arts, and the south end of 'The Green'. Man-Hole #10 (south of Memorial Hall) is also a known pinch point of a convergence of multiple distribution lines.

Central campus currently has three interconnected central plant facilities: Central Plant, ECUP, and Ewing. The total generation capacity for this system is 14,800 tons with the potential to be expanded to 20,300 tons through the addition of 5,500 tons of new chillers at ECUP. Laird campus central chiller plant is operating at capacity, with Christiana East and West towers being serviced with an independent packaged York plant just outside the buildings. STAR campus is serviced predominantly with individual building cooling capacity. Worrilow has a 2,000 ton chiller capacity that also distributes to a small number of nearby buildings, but is not be considered a district facility.

The best locations for campus expansion in terms of chilled water service would be on the east side of central campus where both generation and distribution capacity would be fairly easy to expand.



S.T.A.R. + South campus



Chilled Water Network

Steam and Heating Network

Generally in good working order and is well maintained for a system with components ranging from 10 to 50 years old. This is one of the only infrastructure systems that is well managed through a comprehensive facility renewal process.

- **South of Memorial Hall many lines come together creating pinch point in the network.**
- **The age of the pipes across campus results in pipes bursting every year and emergency repairs at much higher cost than preventative costs.**

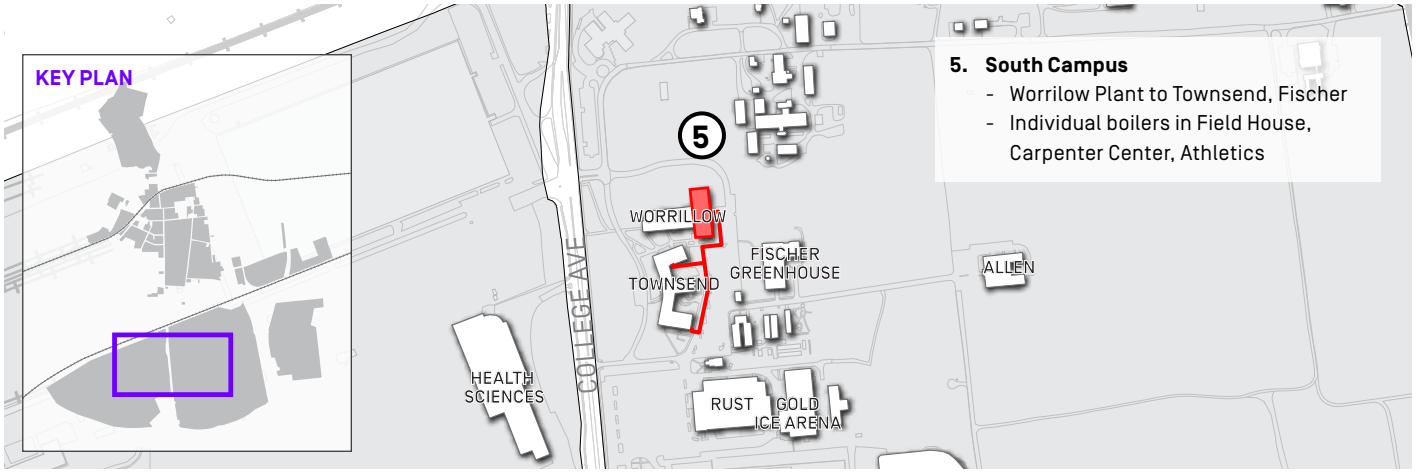
The University of Delaware steam heating network is in good working order and is well maintained for a system with components ranging from 10 to 50 years old. The district steam heating system in central campus met a design day condition in 2015. Like other campus systems, when failures occur the maintenance and operations team quickly and efficiently make repairs and bring the system back online.

Central campus district steam network is served by the central boiler plant that has 6 steam boilers and a total boilerplate heating capacity of 270,000pph. Although the boilers are old, they are well maintained and have been re-tubed in the past 5 years. Boilers generate steam at 125 psi to ensure steam pressure on one network leg even though a predominance of the network operates at 45psi. Condensate return piping covers the entire steam service area on campus.

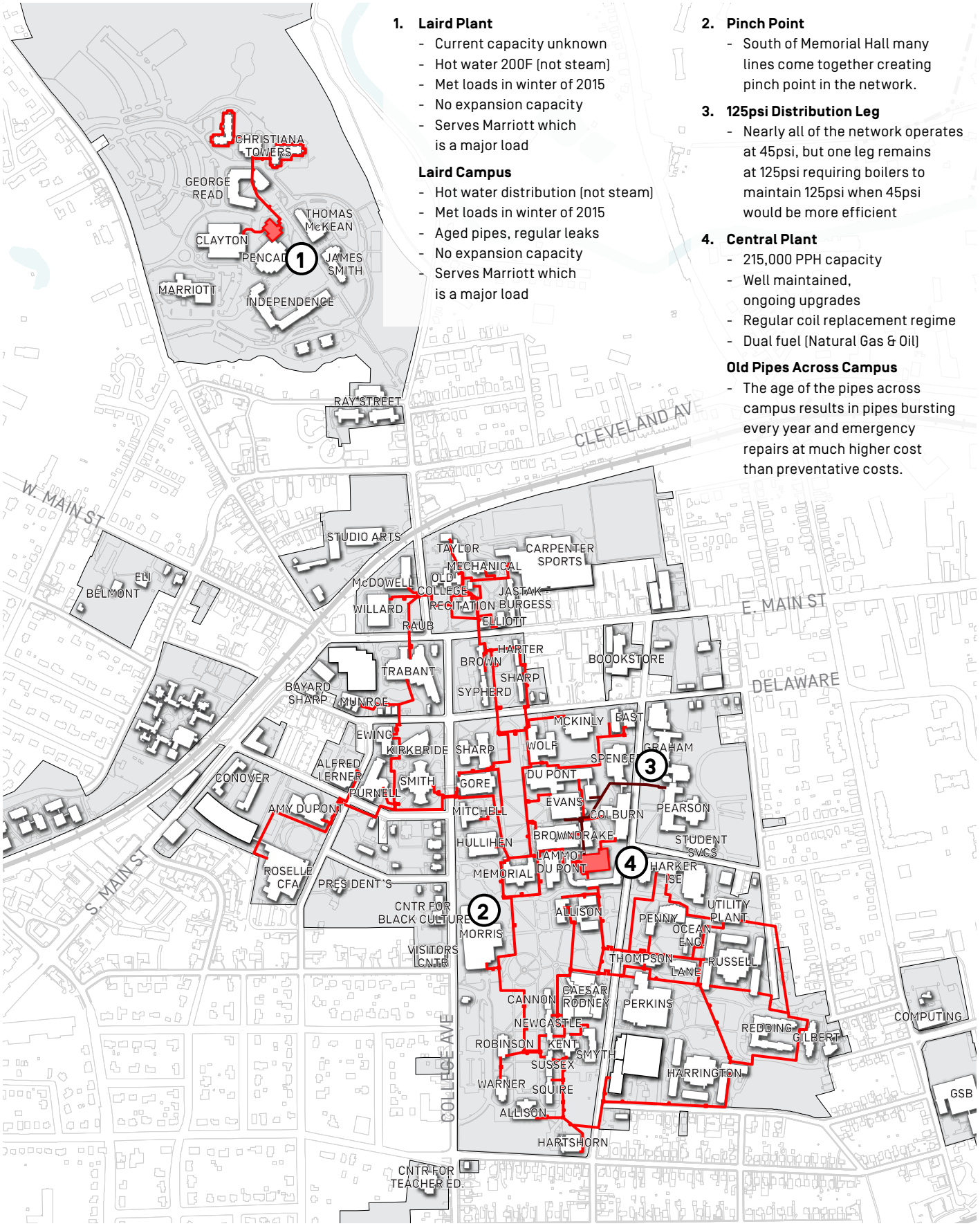
The maintenance and operations team that operates the campus steam network prepares an annual rolling 8-year investment plan and tracks the oldest pipe legs in the network to prioritize components most in need for replacement. This year's investment plan calls to invest $2.4M to replace approximately 1,000 feet of steam and condensate piping during the summer of 2016. Even after this investment, there will still be nearly 8,000 feet of steam piping more than 25 years old on campus.

Delmarva provides natural gas service to the central steam plant and to buildings with individual heating boilers. The natural gas distribution is in good working order and provides many buildings on campus with gas for natural gas fired backup electrical generators.

The university has negotiated a favorable natural gas rate partly because it is an interruptible rate meaning Delmarva guarantees only 1,200 mcf capacity which is less than half of the required gas load during peak winter conditions. When gas pressures drop, roughly when outdoor temperatures drop below 30oF, the university switches to heating oil fuel for up to 5 dual-fuel boilers in the central plant.



S.T.A.R. + South campus



1. **Laird Plant**
   - Current capacity unknown
   - Hot water 200F (not steam)
   - Met loads in winter of 2015
   - No expansion capacity
   - Serves Marriott which is a major load

   Laird Campus
   - Hot water distribution (not steam)
   - Met loads in winter of 2015
   - Aged pipes, regular leaks
   - No expansion capacity
   - Serves Marriott which is a major load

2. **Pinch Point**
   - South of Memorial Hall many lines come together creating pinch point in the network.

3. **125psi Distribution Leg**
   - Nearly all of the network operates at 45psi, but one leg remains at 125psi requiring boilers to maintain 125psi when 45psi would be more efficient

4. **Central Plant**
   - 215,000 PPH capacity
   - Well maintained, ongoing upgrades
   - Regular coil replacement regime
   - Dual fuel (Natural Gas & Oil)

   Old Pipes Across Campus
   - The age of the pipes across campus results in pipes bursting every year and emergency repairs at much higher cost than preventative costs.

Steam and Heating Network

0.125 0.25 (mile)

Greenhouse Gas Emissions / Stormwater Management

The University has implements a climate action plan and GHG reporting, but most reductions in GHG emissions has come largely from changes to the sources of energy within the regional distribution system and not through energy efficiency measures on campus.

Stormwater is a significant concern for many buildings and landscape areas on campus and is not being managed in a comprehensive fashion.

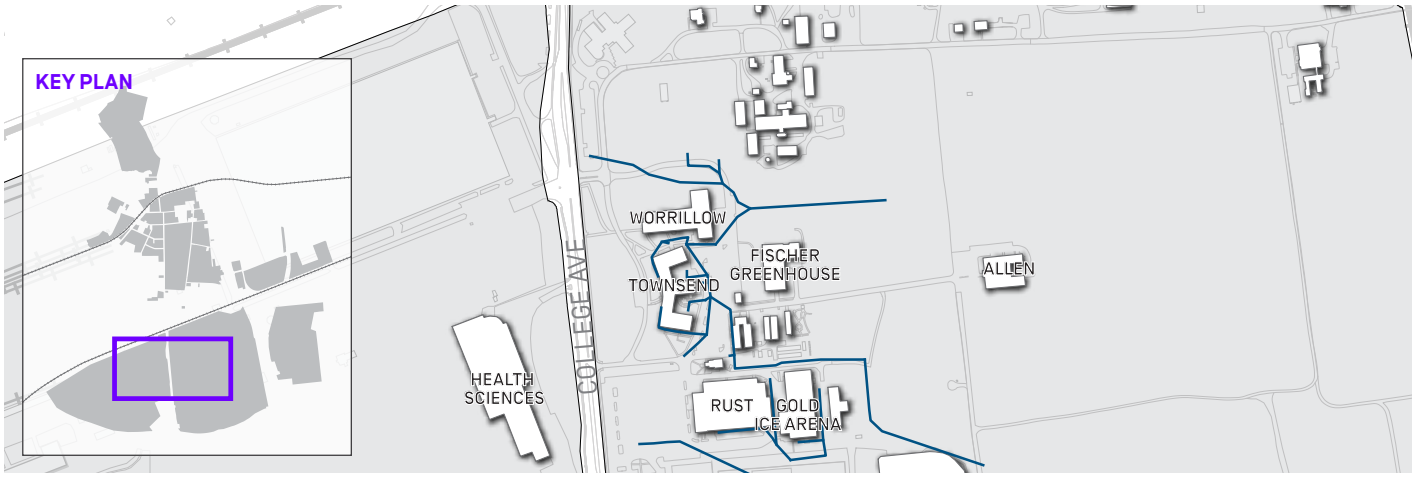
The university commissioned it's first GHG inventory in 2008 and has been tracking emissions annually through the Second Nature program since that time. During the Harker administration, the 2008 Strategic Plan and ACUP Climate Commitment in 2008 included the goal to reduce GHG emissions by 20% below 2008 levels by 2020. An advisory group and a working group, comprised of senior administrators, faculty and students contributed to the development of Carbon Inventory and Action Plan in 2009. Led by John Byrne at the Center for Energy and Environmental Policy, the Climate Action Plan set out how the university could reach their emissions reduction targets.

Since 2009, though there has been limited traction on investments, policies, and commitment required to achieve such ambitious carbon reduction goals. In 2015 the GHG emissions inventory showed a total reduction of 2.5% below 2008 levels, but this is attributed to a reduction in the carbon intensity of the local electrical grid and fuel switching from oil-fired power plants to natural gas and nuclear power generation.

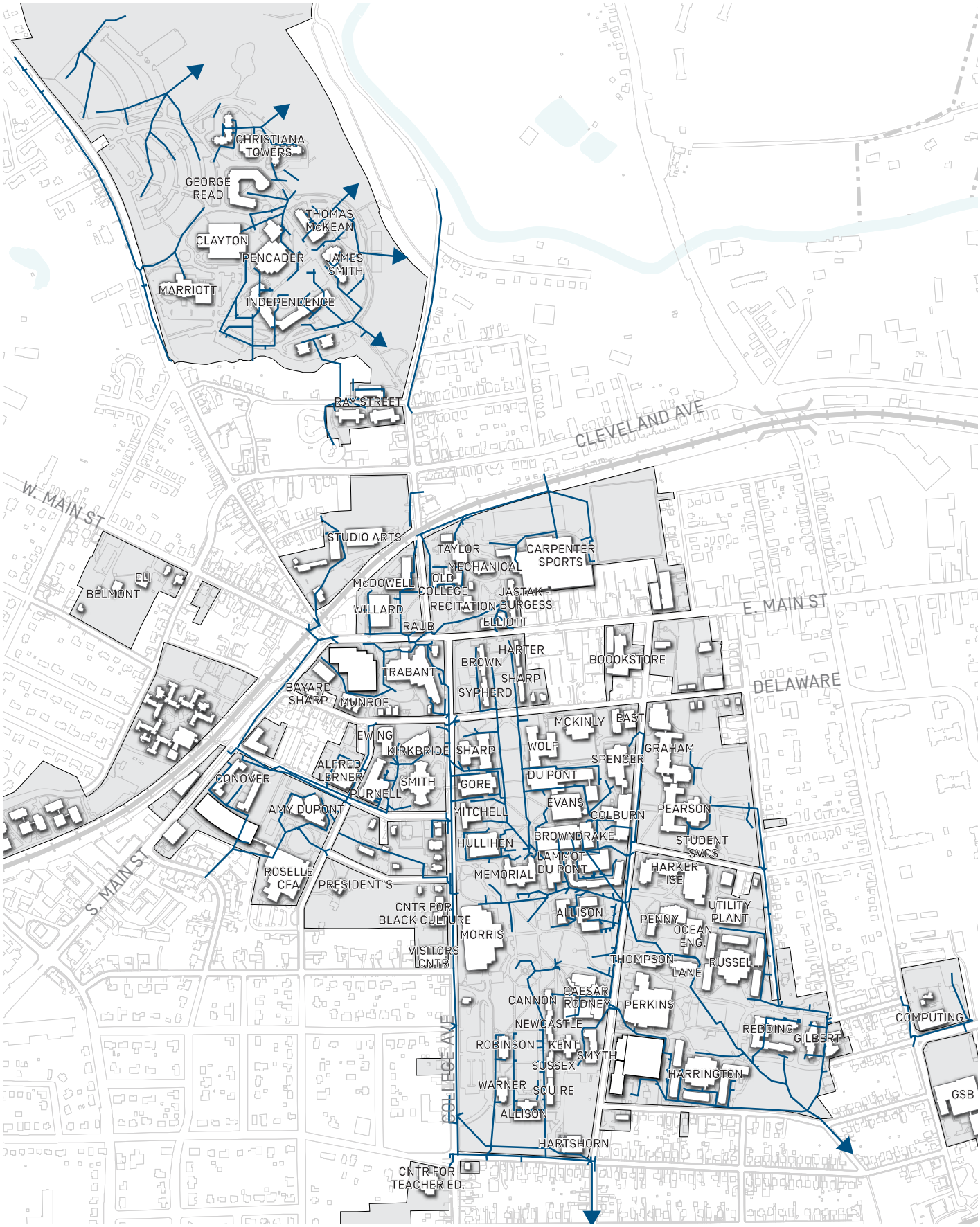
Like the associated energy efficiency initiatives described above, no clear line of responsibility or resources was dedicated to achieving the GHG emissions reductions targets, thus the targets of a 20% reduction will likely not be achieved by 2020.A broader list of GHG goals and targets from peer institutions is in the benchmarking table in Section 3: Assessment (Sustainability).

Stormwater management has recently arisen as a compliance issue for the university and the City of Newark as a sustainability strategy. A number of recent stormwater management projects have enhanced the landscape of the campus including the rain garden in the plaza of the new ISEB lab. The landscape treatment around the new Caesar Rodney residential project uses native plants and allows runoff from the rooftops to flow through the gardens to reduce runoff and recharge groundwater. The UD Rain Garden is also used as a teaching tool for students to understand how stormwater management can enhance landscape design and restore habitats.

The City of Newark is currently undertaking a city-wide stormwater master plan to achieve state water quality requirements, so a variety of on-campus and off-campus stormwater management programs are underway around the City of Newark.



S.T.A.R. + South campus



Stormwater Network

0.125 0.25 (mile)

Energy Efficiency and GHG Reduction

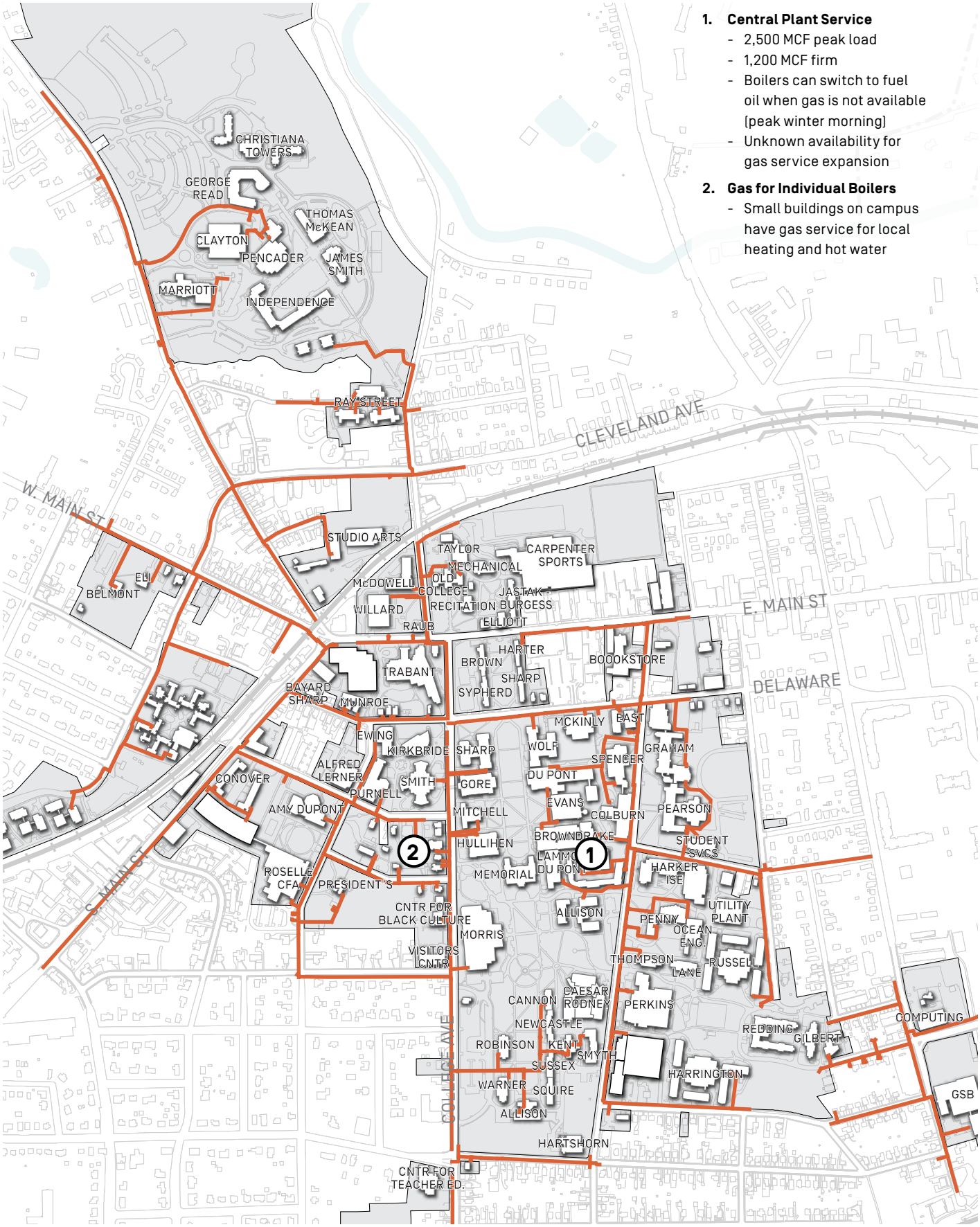
Energy efficient has not been a driver of change on campus, but significant opportunities exist for low cost/high impact changes to be implemented.

Due to the age of many of the buildings on campus, new technologies in the market, and new design practices in the industry, the university has extensive opportunities for energy efficiency projects in both new and old buildings. A formalized energy efficiency program has not been active on campus, though energy efficiency projects have been implemented on an ad-hoc basis.

Less than two years ago the university created an Energy Manager position and hired Zach Platsis for the role. A wide-ranging role, the energy manager is responsible for energy budgeting, consolidating energy bills from various utilities, and allocating energy bills to individual colleges. The current practice for allocating energy costs to colleges and departments is on a square-footage pro-rata basis, not on a building-by-building metered data basis. Thus any energy efficiency projects paid for and implemented by an individual college would not see the operational cost savings reduction of the project. In the past years Zach has led the roll-out of electrical meters on nearly all campus buildings and has begun collecting and analyzing the resulting energy data.

Some energy efficiency projects are already underway, and a preliminary list of potential energy efficiency opportunities on campus currently includes:

- Install PME electric meters in all remaining P-Meter associated buildings
- Install thermal energy metering in all remaining buildings served by respective energy districts
- Optimize controls systems; Convert older control systems to SBO operational model; convert pneumatic systems to DDC
- Retro-Commissioning program for all campus buildings coupled with DDC optimization program
- Begin deployment of Fault Detection and Diagnostic tool(s) - ISEB
- Retro-Commissioning or install fully functional de-couplers in all CHW district buildings
- Assess and Characterize CHW district (update Ross report) - optimize pumps and develop master plan for district hydraulics
- Colburn Demand Controlled Ventilation (DCV)
- Hood Zone Presence Sensors (ZPS)
- LDL DCV - Hood ZPS
- Brown DCV - Hood ZPS
- Study cogeneration option to supply base steam load in central plant
- Replace the 125psi steam leg with a 45psi leg and ancillary equipment in buildings to bring the entire network to 45psi and generate steam for a 45psi network rather than a 125psi network
- Lighting re-lamping, lighting sensors, and other HVAC measures proposed in Warren study 2012



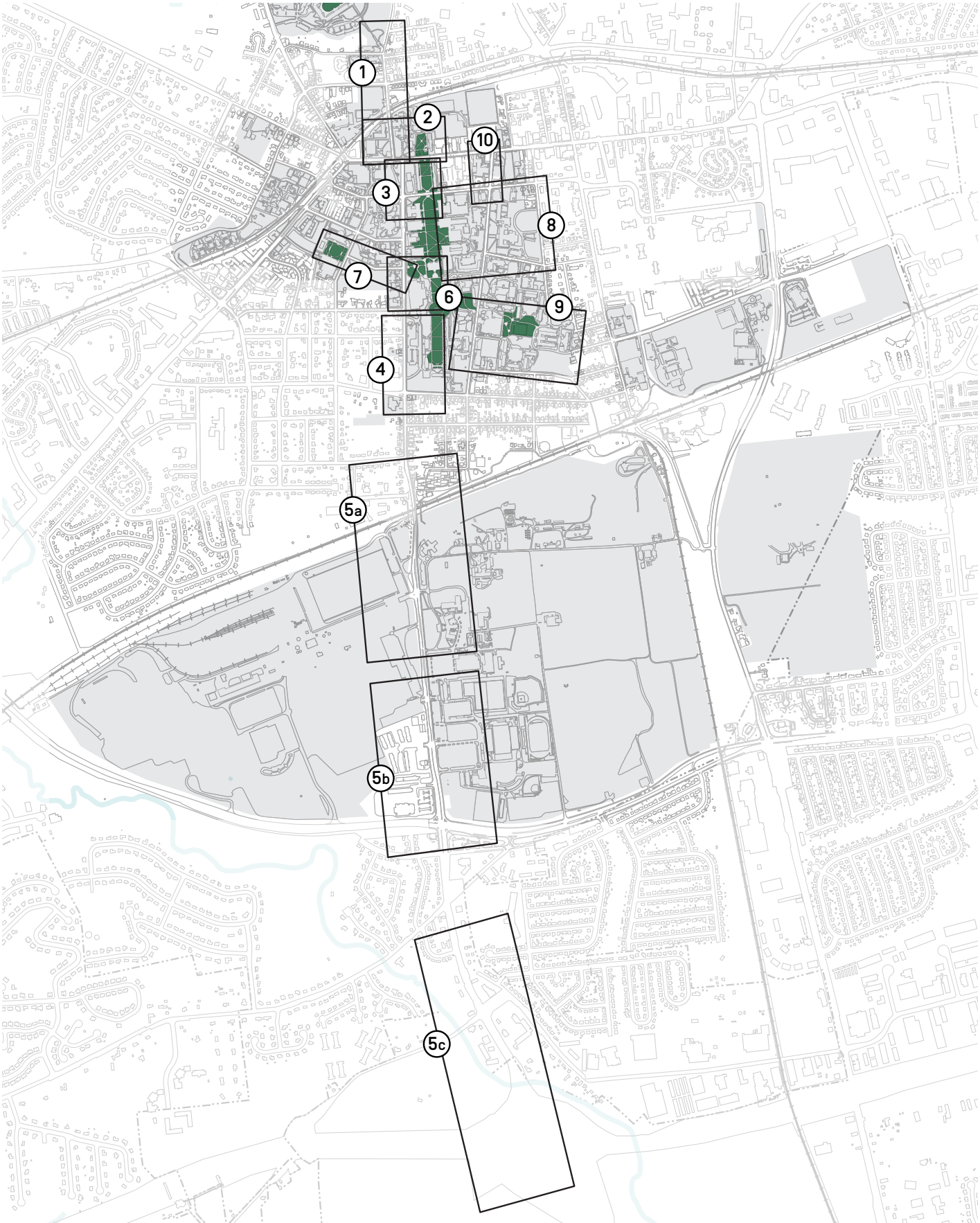
Natural Gas Network

4.

Opportunities & Constraints

Opportunities and Constraints

	OPPORTUNITY SITES
COLLEGE STREET CORRIDOR	1. Laird Campus to Old College
	2. Old College : At Main Street
	3. College Avenue : Main Street to Amstel Avenue
	4. College Avenue : Winslow Road to Park Place
	5a. South College Avenue at Agriculture College / S.T.A.R. Campus
	5b. South College Avenue at Athletics
	5c. South College Avenue to I-95
THE GREEN	6. Morris Library / Memorial Hall
	7. Kent Way & Amstel Avenue (Performing Arts to 'The Green')
ACADEMY	8. Engineering College Quad ('The Green' to Haines Street & Scholar Drive)
	9. South Residential Quad
	10. Engineering Campus (Academy Street to Main Street)


1
2
10
3
8
7
6
9
4
5a
5b
5c

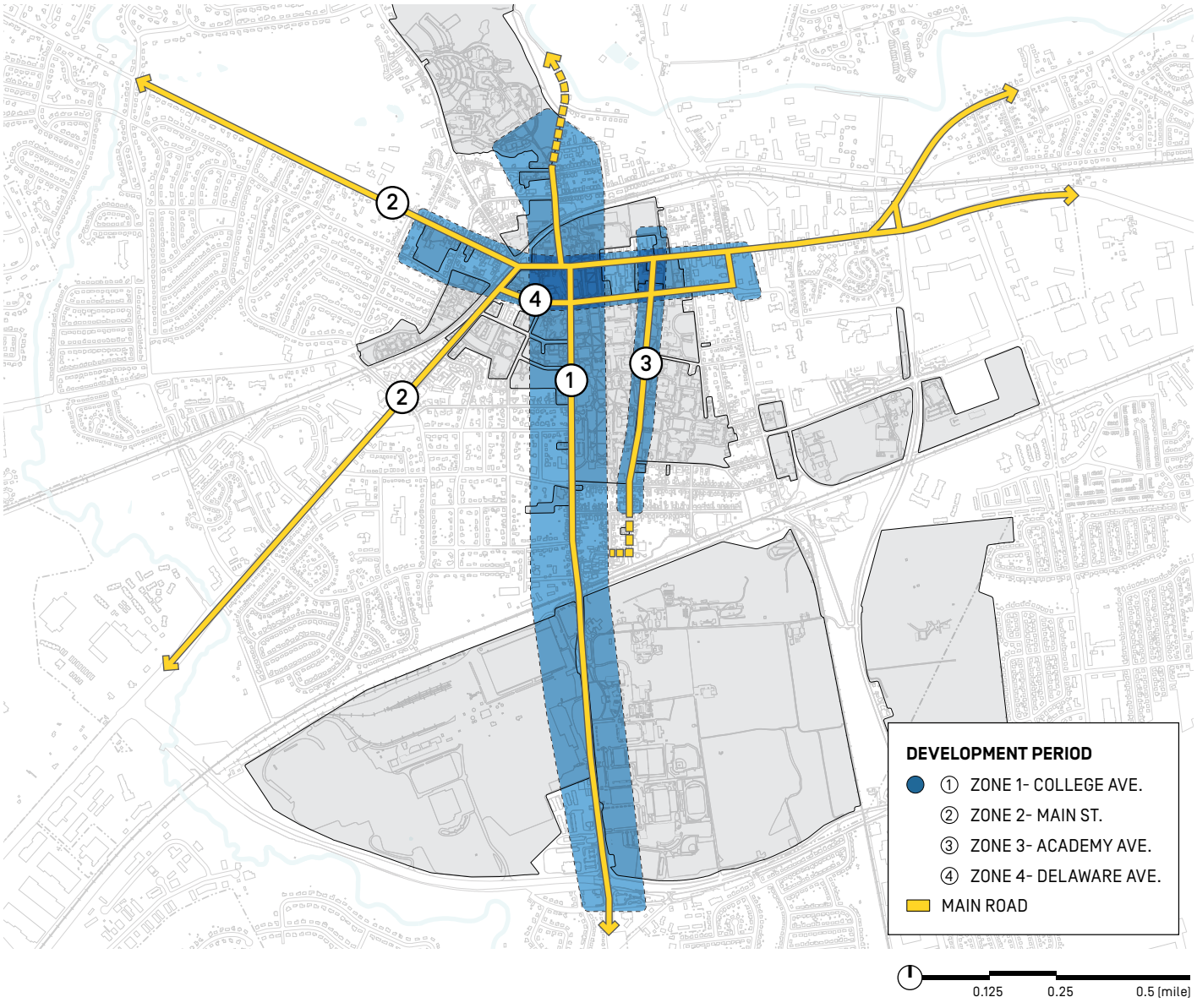
Opportunities and Constraints

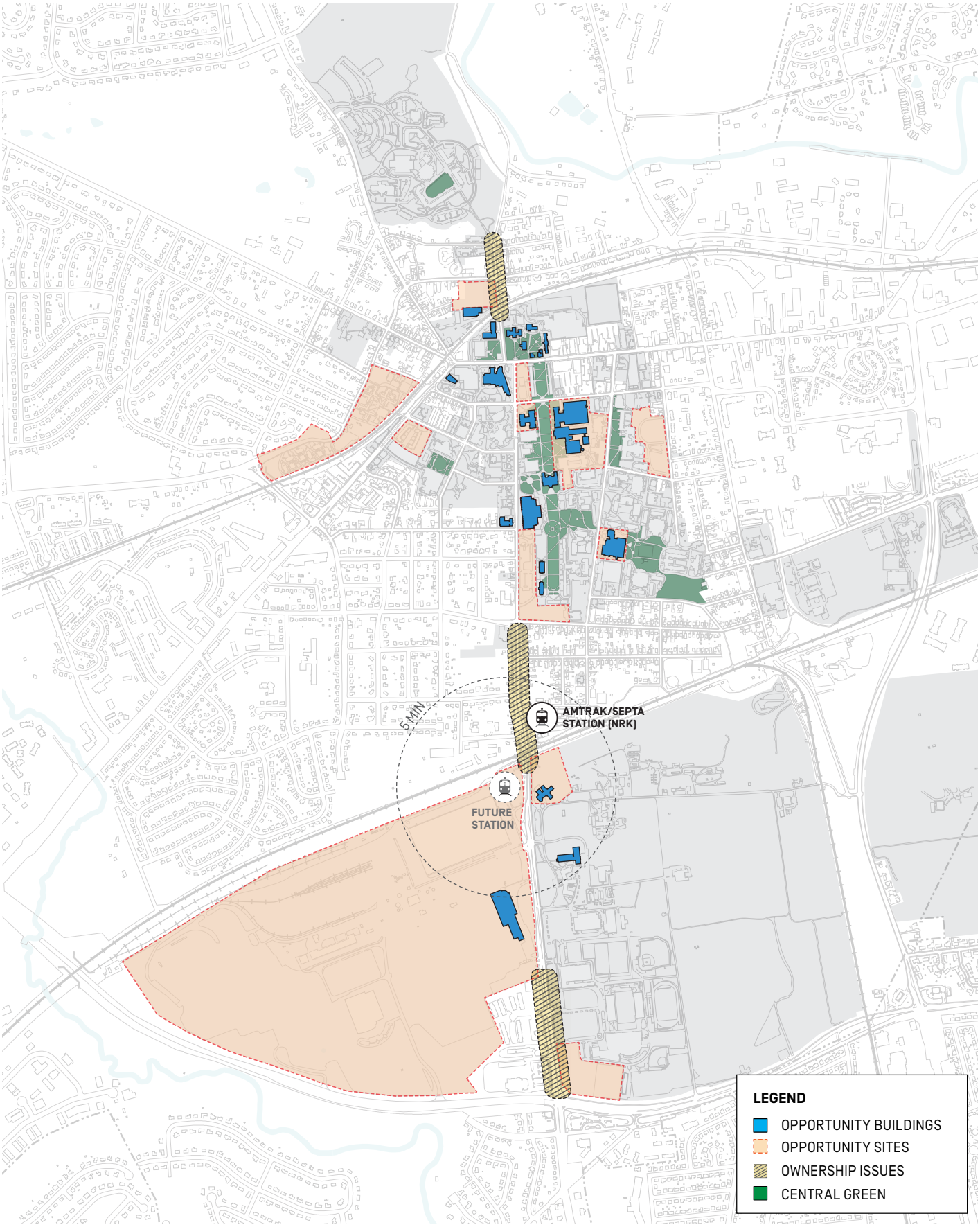
- Can be grouped by Topic :

  1. University Identity
  2. Open Space + Landscape
  3. Transportation Network + Connections (Interdisciplinary Programs)
  4. Program Catalysts + Reuse
  5. Building Sites
  6. Shared Interest Sites [City/University]

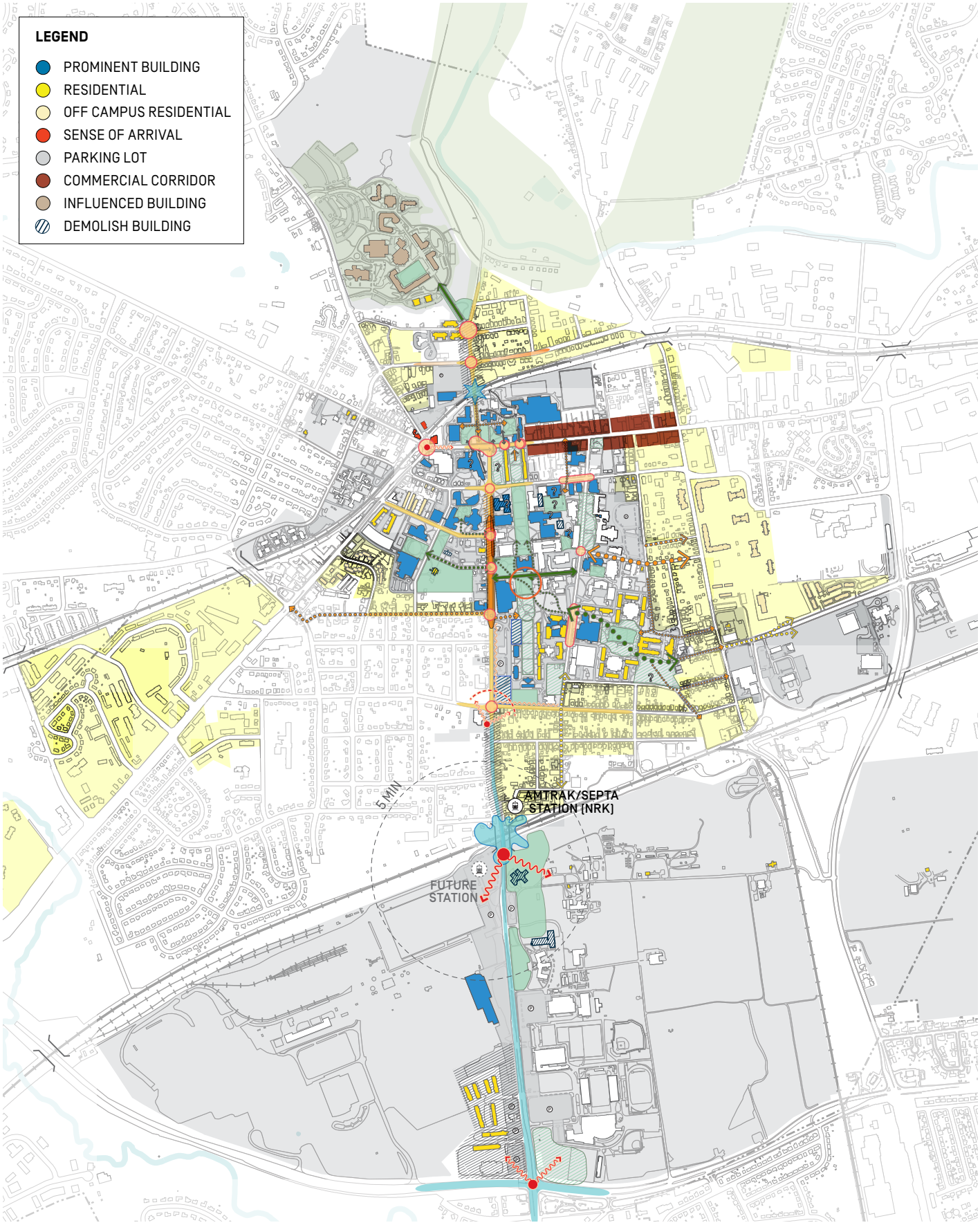
- They can also be clustered by location; related to the Three Campuses - North, Core, South; and related to Three Streets - College Street, Main Street & Delaware Avenue, Academy Street & 'The Green'.

- Ten to twelve areas of opportunities and constraints have been identified; based on the earlier findings and physical analysis of the campus data and conditions. There include: from North to South.





Opportunity Sites + Building Upgrades Or Reuse

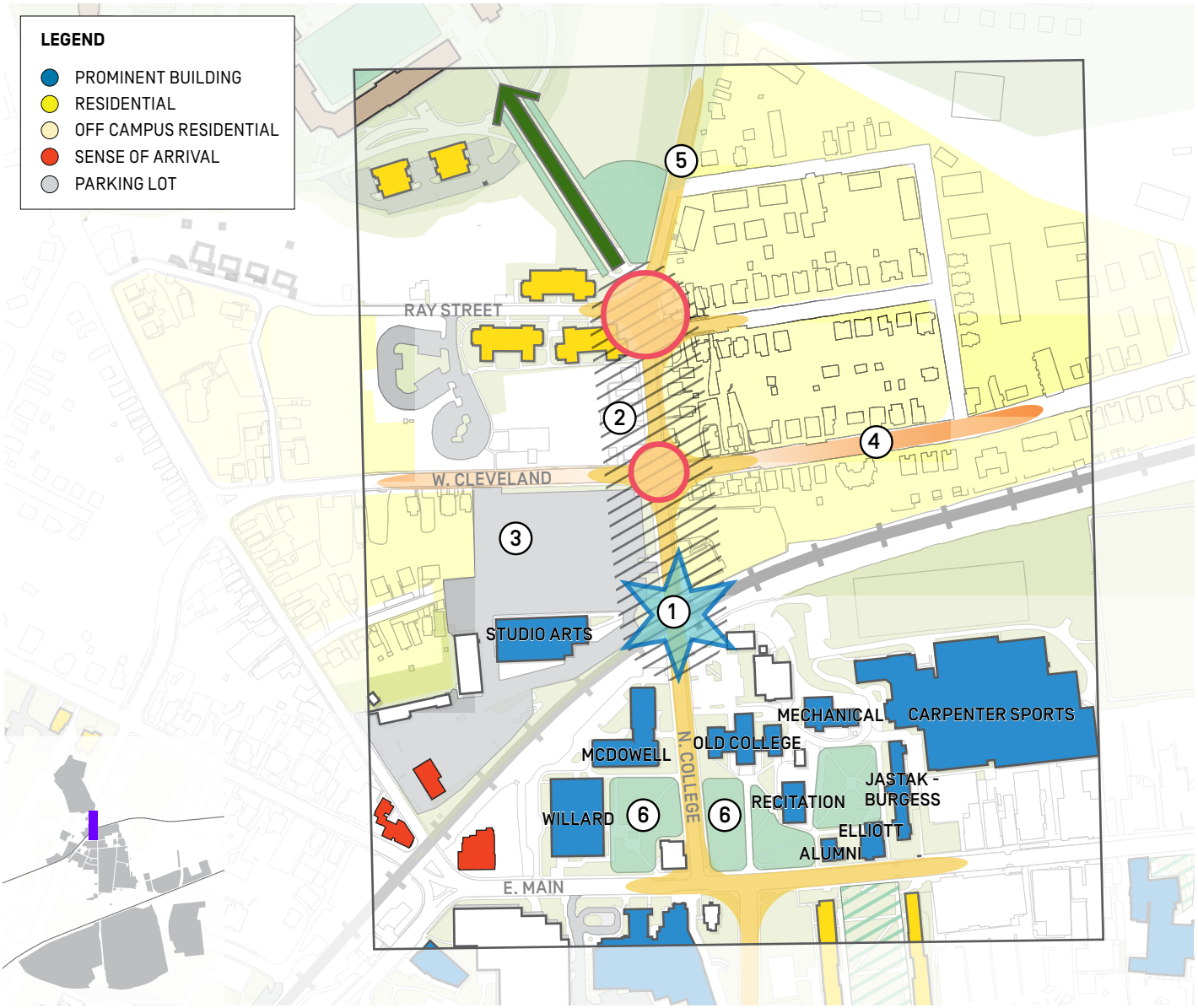


Opportunities + Constraints Summary Diagram

1. LAIRD CAMPUS TO OLD COLLEGE

1. Railroad crossing
2. Inactive/Unowned frontages on North College Avenue
3. Surface parking lots
4. Cleveland Avenue traffic
5. Connection to trails, parks, storm water basin
6. Open space & Landscape design upgrades

ISSUES	01
University Identity	●
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	
Building Sites or Property Reuse	●
Shared [City/University] & Interest Sites	●

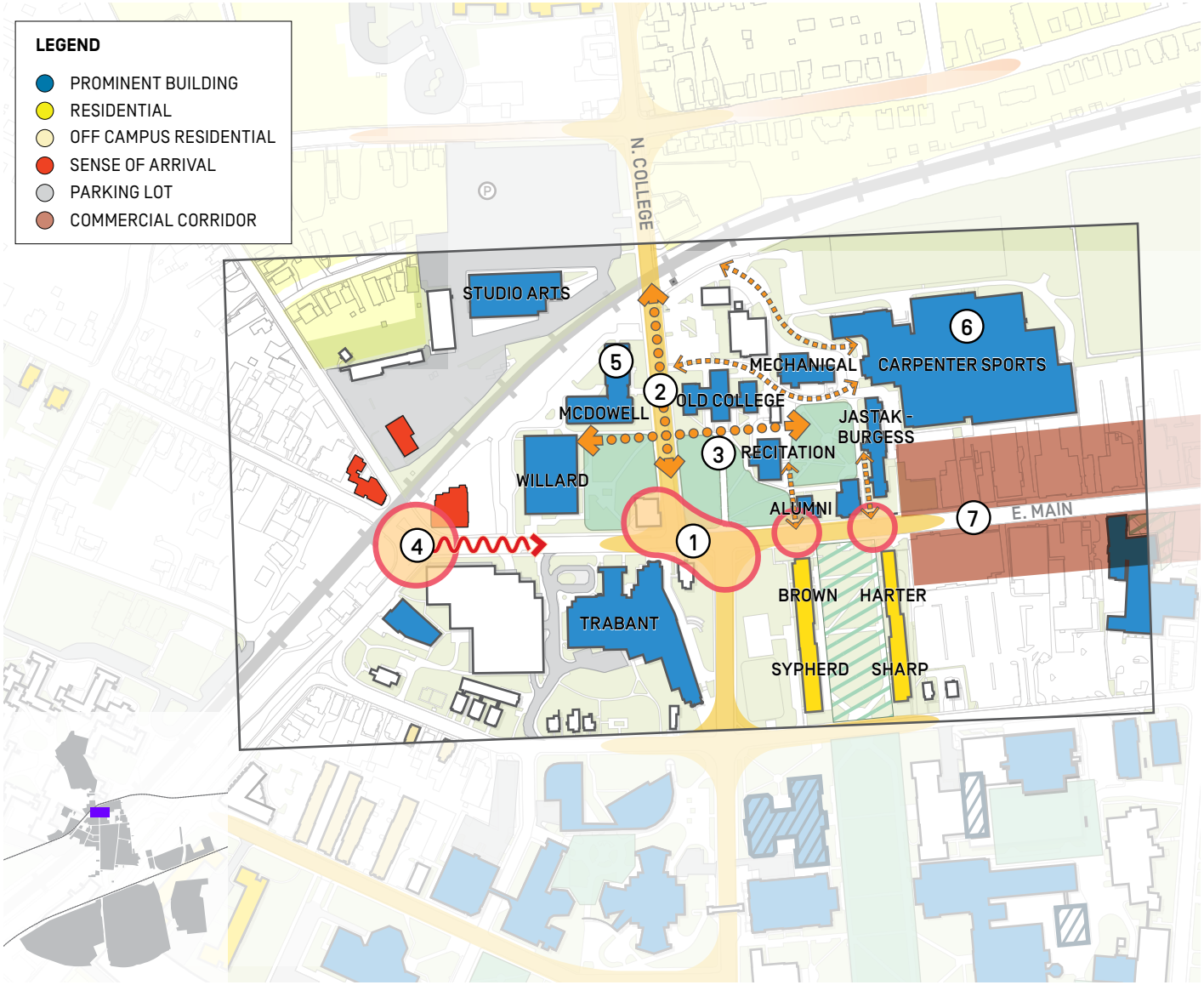


Key Plan

2. OLD COLLEGE : AT MAIN STREET

1. Misaligned College Avenue + Main Street intersection
2. Open space & Pedestrian circulation conflict patterns
3. Visitor center/Alumni focus at historic front door
4. Sense of arrival at Main Street
5. McDowell hall program for education + Health Sciences
6. Visibility of Carpenter Sports Center and it's connections to Main Street & North College Avenue
7. Main Street pedestrian crossings

ISSUES	02
University Identity	
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	



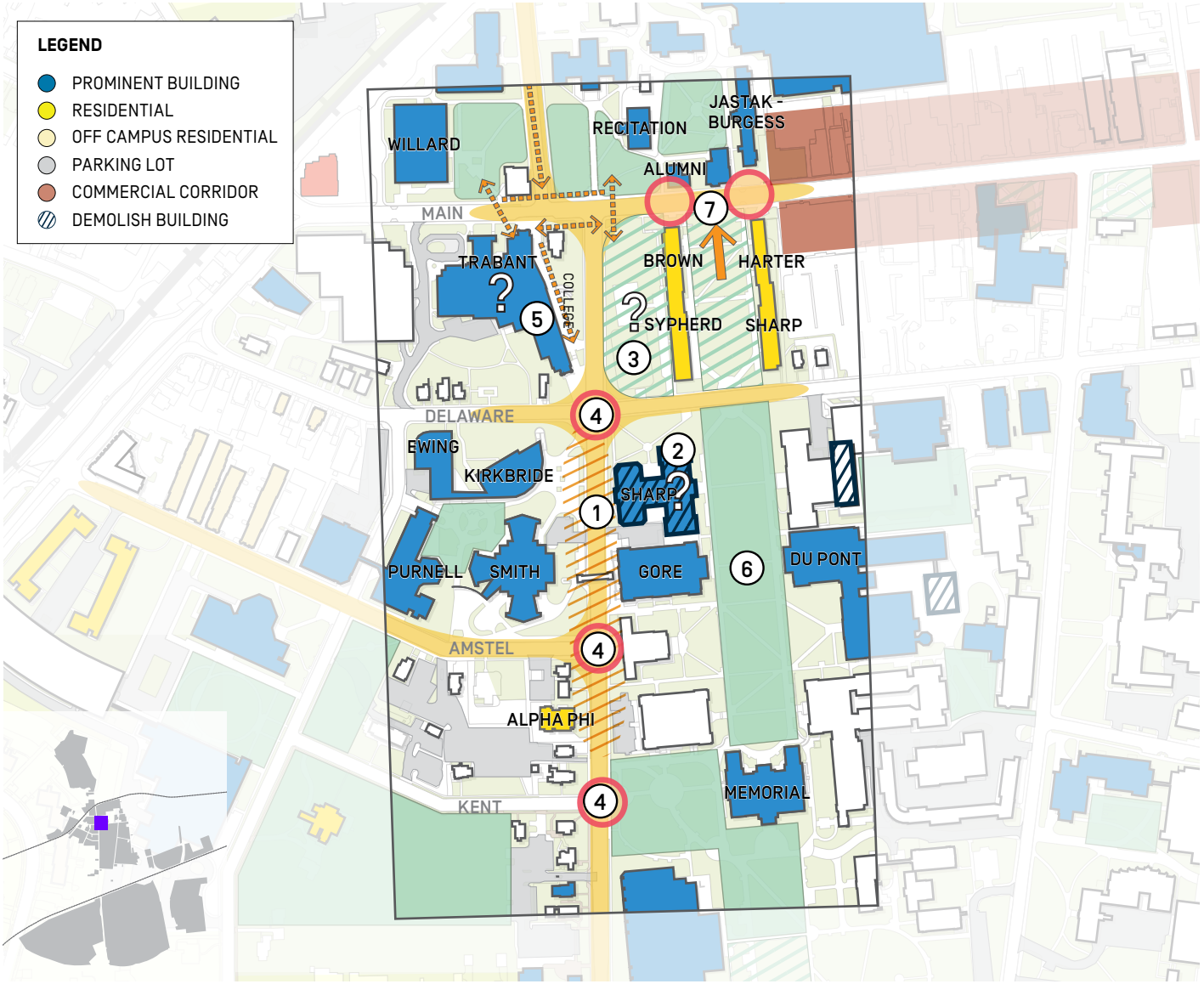
Key Plan

125 250 500 (ft.)

3. COLLEGE AVENUE : MAIN TO AMSTEL AVENUE

1. S. College Avenue focus: Front doors & back doors intense pedestrian/transportation node
2. Sharp Lab - Reuse vs. Renovation to activate both College Avenue & 'The Green'
3. Recreation courts at Brown/Sypherd as opportunity site?
4. Critical intersections:
   - College Avenue + Delaware Avenue
   - College Avenue + Amstel Avenue
   - College Avenue + Kent Way
5. Trabant program review
6. Activation and programming of 'The Green'
7. 'The Green' at Main Street as 'Gateway' design opportunity

ISSUES	03
University Identity	
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	●
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	



Key Plan

4. COLLEGE AVENUE : WINSLOW ROAD TO PARK PLACE

1. Sense of arrival to Central Campus & Visual identity
2. The brick wall: Icon or Barrier?
3. Surface parking lots
4. Opportunity sites (2)
5. A new model for campus wellness?
   (The proper use of Laurel Hall)
   Student Health Services
   Health Promotion + Wellness
   Center for Counseling

ISSUES	04
University Identity	●
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	
Program	●
Building Sites or Property Reuse	●
Shared (City/University) & Interest Sites	

Key Plan

5A. SOUTH COLLEGE AT AGRICULTURE COLLEGE / S.T.A.R. CAMPUS

1. Constrained dimensions at Bridge Crossing (40'Row) for Ped & Bike networks
2. Appropriate connection to rail station
3. Private ownership issues along College Avenue frontage from North of Railroad to Park Place
4. Gateway design: Sense of arrival + Quality of physical environments
5. STAR Campus:
   - Proper role/Consolidation vs. Dispersal of campus programs & facilities?
   - New location of Health Sciences
6. Re-Use of Girl Scout Site
7. Worrilow Hall Reuse/Demolition?

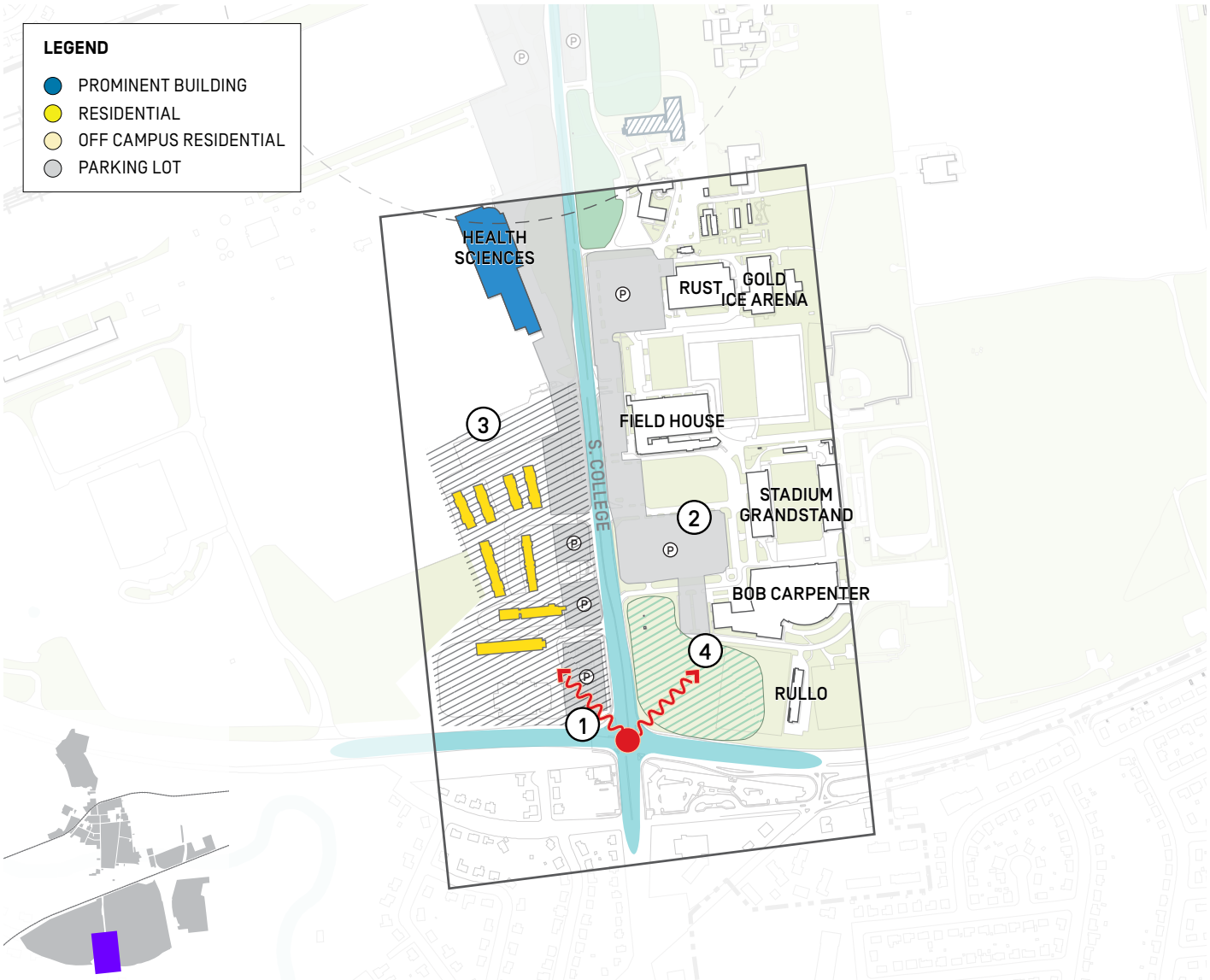
ISSUES	05A
University Identity	●
Open Space & Landscape	
Transportation/Pedestrian Network & Connections	●
Program	
Building Sites or Property Reuse	●
Shared [City/University] & Interest Sites	

Key Plan

5B. SOUTH COLLEGE AT ATHLETICS

1. Sense of arrival + Identity of the University from I-95
2. Surface parking lots & frontages
3. Ownership issues: West Side
4. Proper use/Character of highly visible corner

ISSUES	05B
University Identity	●
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	
Program	
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	

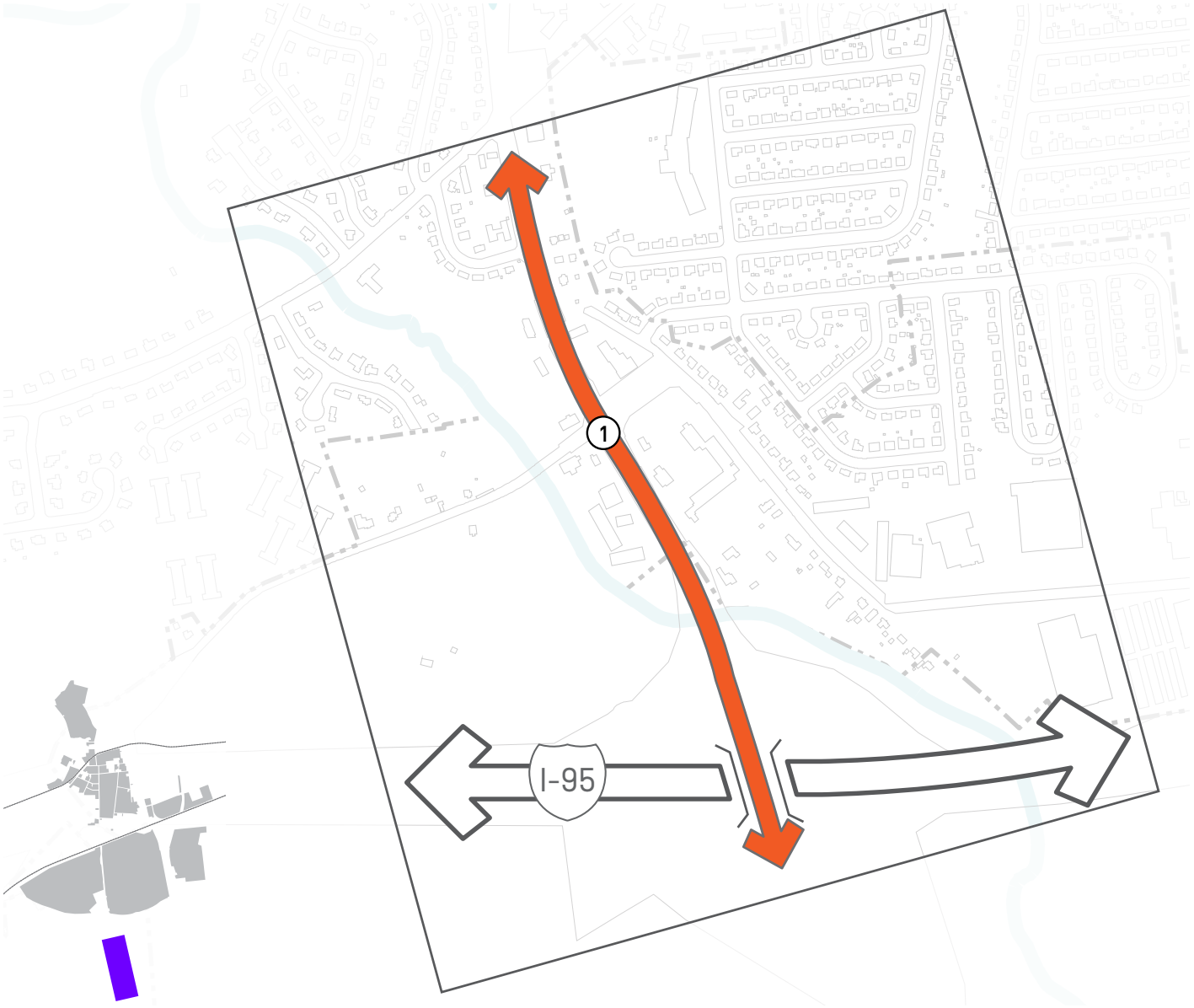


Key Plan

5C. SOUTH COLLEGE TO I-95

1. Wayfinding to Main Campus from I-95
2. Jurisdictional & Oversite Roles

ISSUES	05C
University Identity	●
Open Space & Landscape	
Transportation/Pedestrian Network & Connections	
Program	
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	●

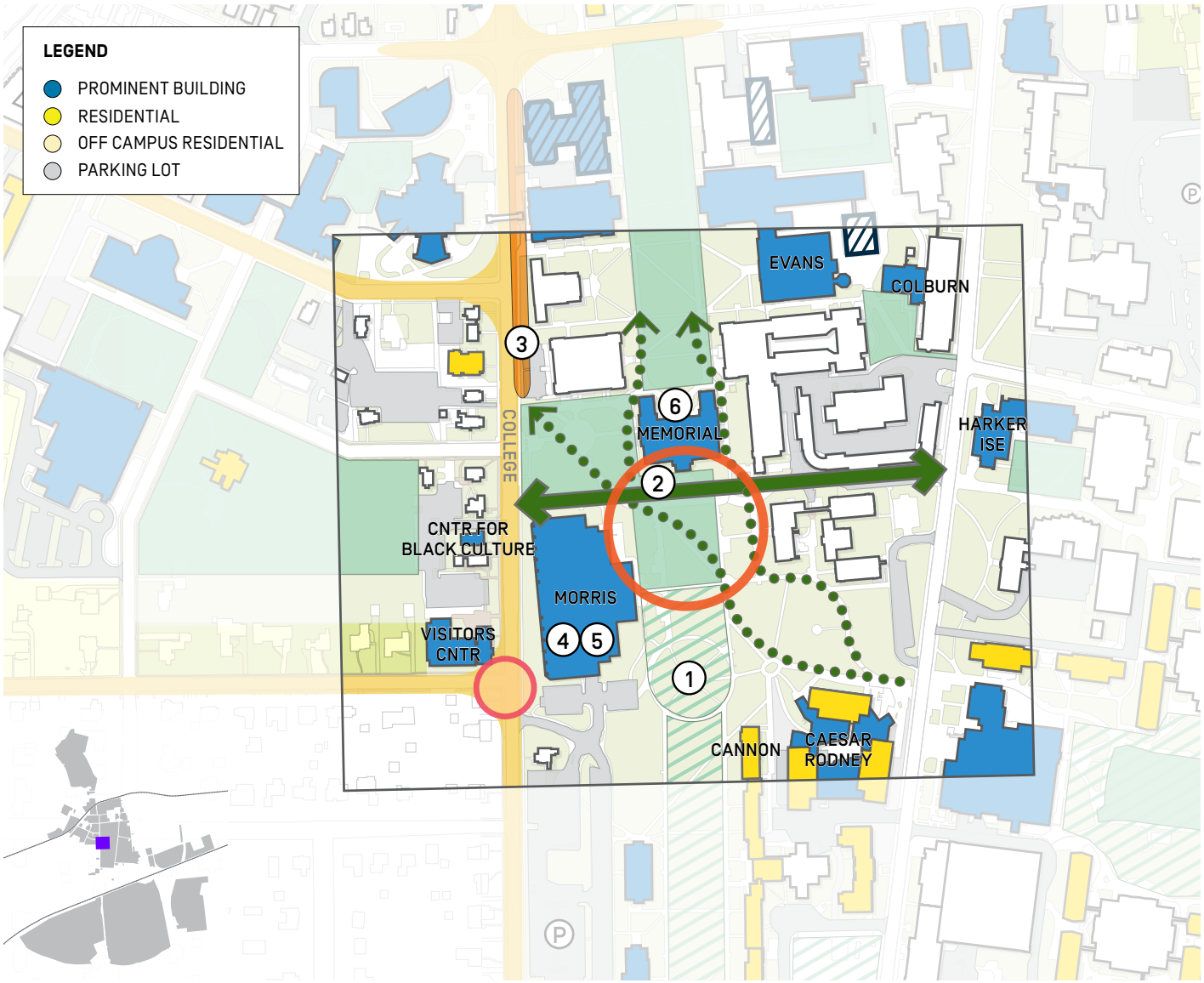


Key Plan

6. MORRIS LIBRARY / MEMORIAL HALL

1. Enhance nodal quality where North & South Greens come together
2. Upgrade South side of Memorial Hall
3. Potential for private campus street & Shuttle drop off for Library & Central Campus?
4. Renovate + Reprogram library as student hub
5. Special collection + Museum opportunities
6. Potential for Memorial Hall reuse?

ISSUES	06
University Identity	
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	●
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	

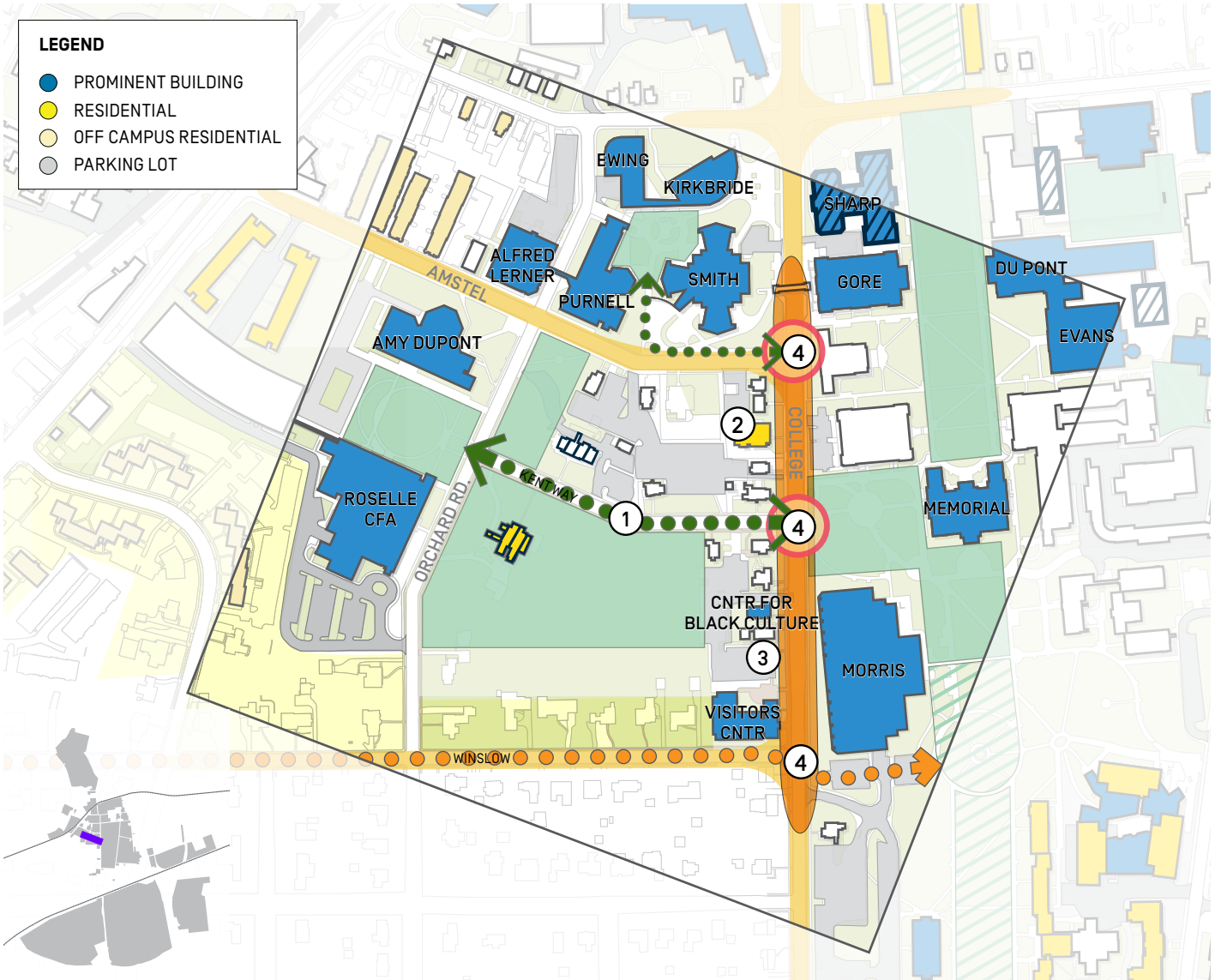


Key Plan

7. KENT WAY + AMSTEL (PERFORMING ARTS TO 'THE GREEN'

1. Stronger connection between CFA & Campus core via Kent Way?
2. Appropriate use of small scale houses along College Avenue?
3. Quality & Quantity of space of center for Black Culture/Appropriate location?
4. Pedestrian upgrades, intersection & open space design to receive E/W connections via Amstel Avenue, Kent Way & Winslow Road

ISSUES	07
University Identity	
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	



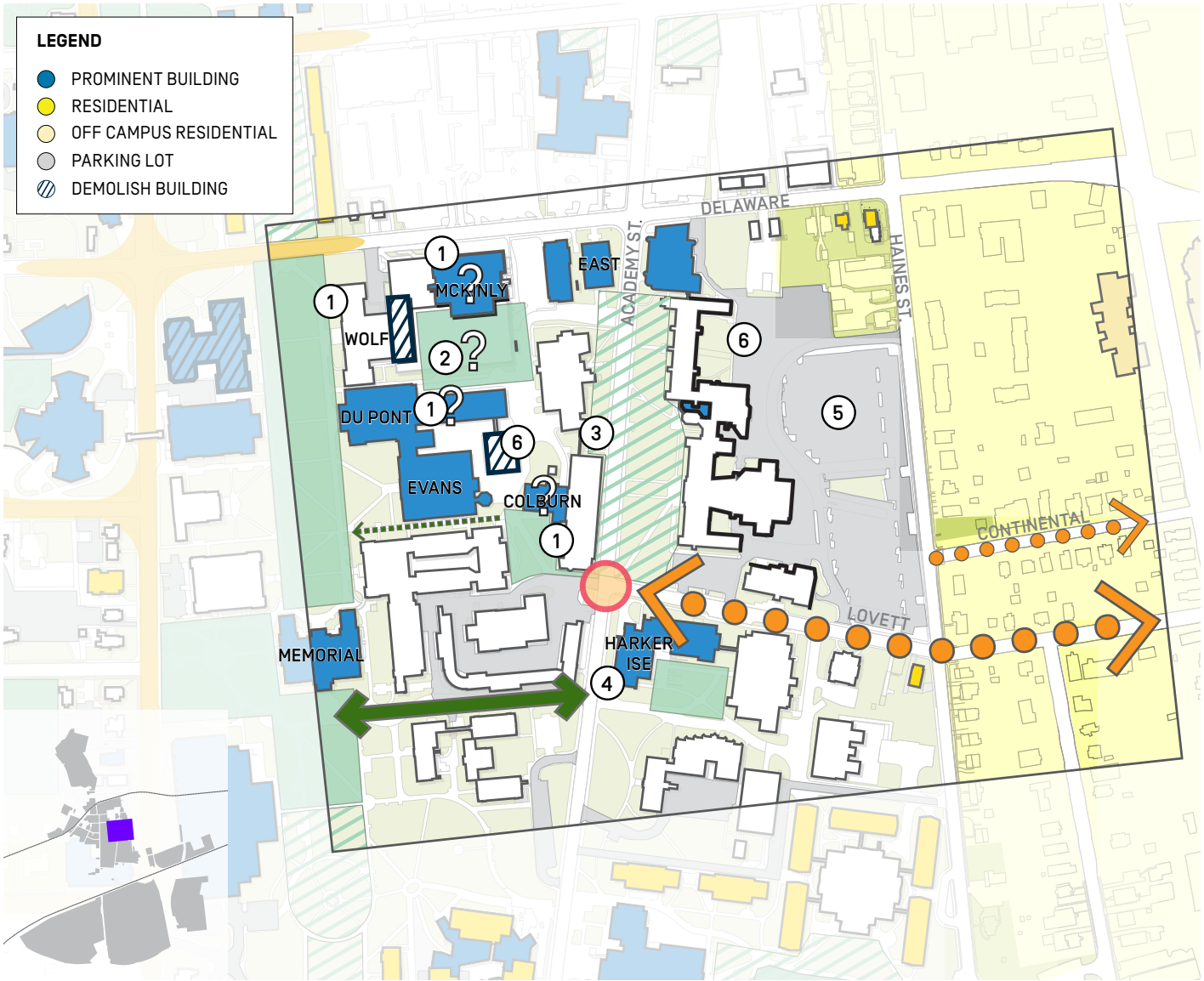
Key Plan

8. ENGINEERING COLLEGE QUAD ('THE GREEN' TO HAINES STREET AND SCHOLAR DRIVE)

- Sense of place?
- Degree of porosity or from Engineering to 'The Green'

1. Building program/Re-use/Demolition:
   McKinley Hall/Du Pont Hall/Wolf Hall/Colburn Lab
2. McKinley Lab terrace as potential quadrangle space
3. Academy Street open space & street design
4. New interdisciplinary social science facility
5. Surface parking lots as barrier to East-West connections
   & as inappropriate face to the neighborhood
6. Clarity servicing routes & facilities

ISSUES	08
University Identity	
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	●
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	

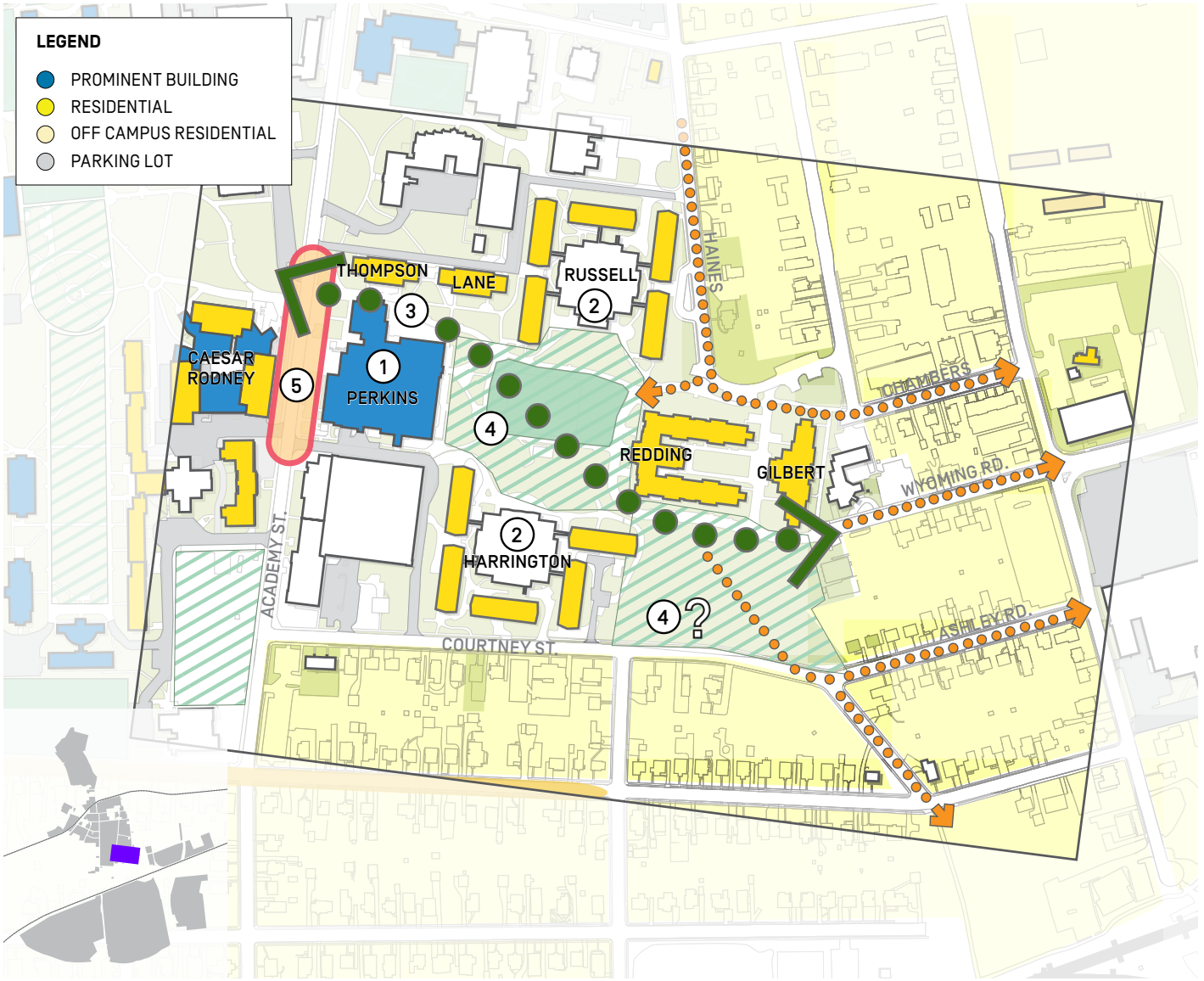


Key Plan

9. SOUTH RESIDENTIAL QUAD

1. Long term vision for Perkins Student Center
2. Long term futures of Harrington & Russel Residence Halls + Dining Facilities
3. Academy Street East-West crossroads & connection
4. Extending Harrington Beach: Programming of +peripheral open spaces
5. Proper role & design of Academy Street in this zone

ISSUES	09
University Identity	
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	●
Building Sites or Property Reuse	
Shared [City/University] & Interest Sites	

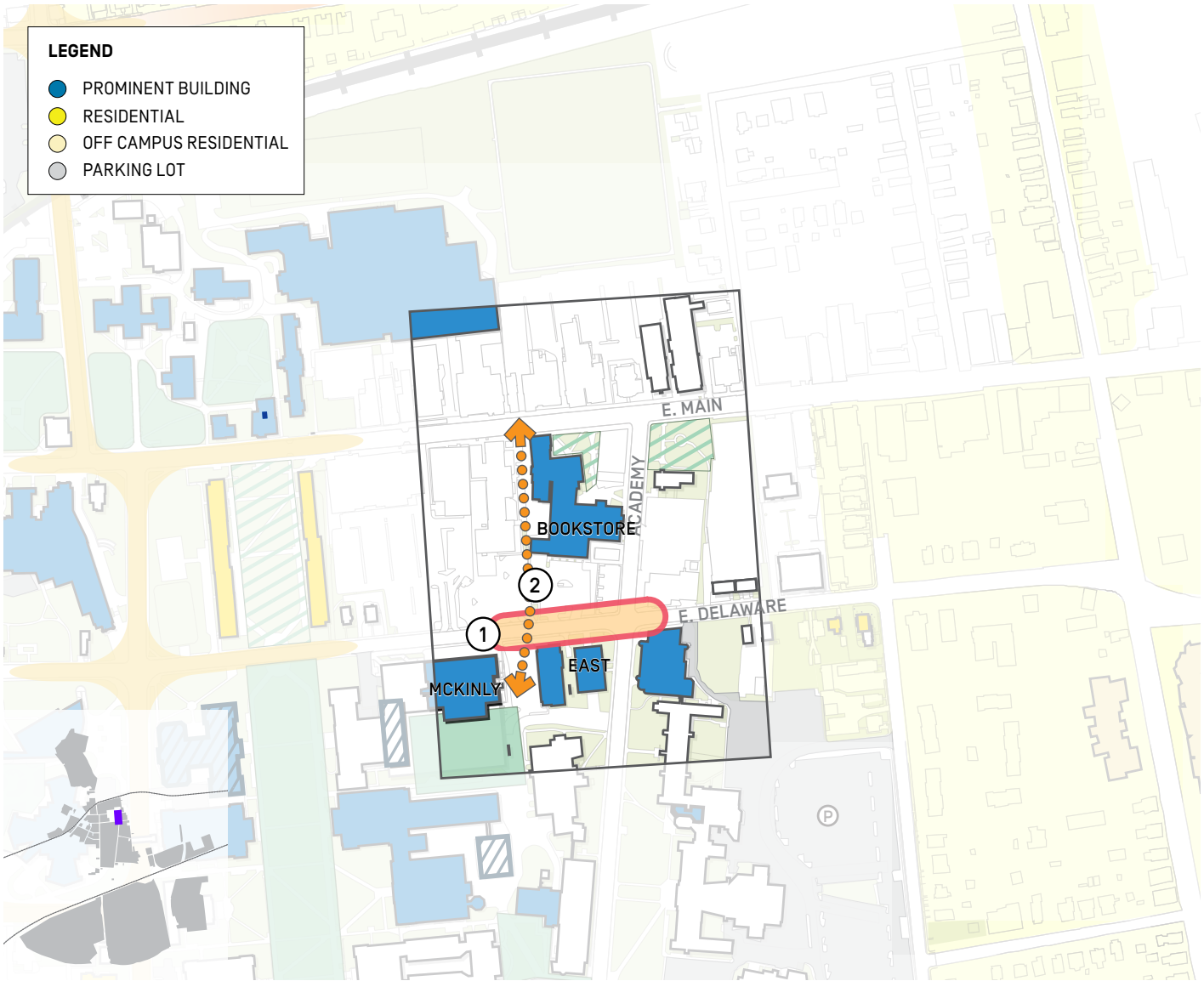


Key Plan

10. ENGINEERING CAMPUS (ACADEMY STREET TO MAIN STREET)

1. Quality of pedestrian experience on East Delaware Avenue
2. Linkage of E. Delaware Avenue & Engineering quadrangle to Main Street

ISSUES	10
University Identity	
Open Space & Landscape	●
Transportation/Pedestrian Network & Connections	●
Program	
Building Sites or Property Reuse	
Shared (City/University) & Interest Sites	●



Key Plan

5.

Acknowledgements

Acknowledgements

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Alan Brangman, Interim Executive Vice President, University Treasurer
Franklin Newton, Chief of Staff
Peter Krawchyk, Vice President, Facilities, Real Estate and Auxiliary Service & Campus Architect

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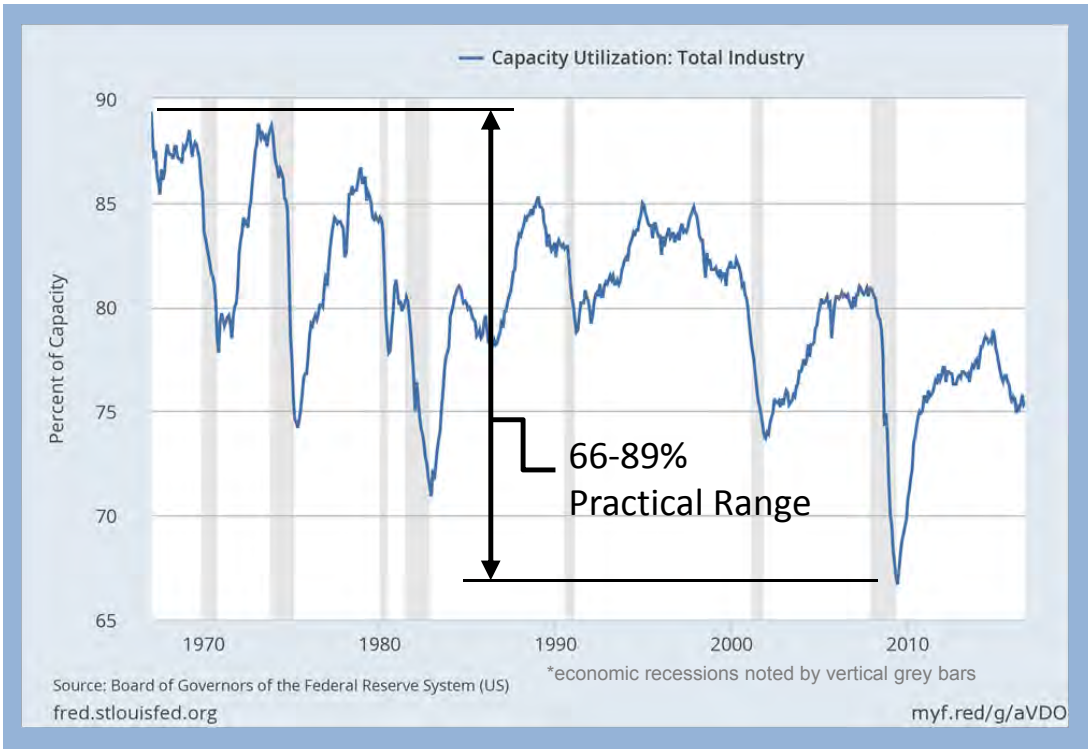
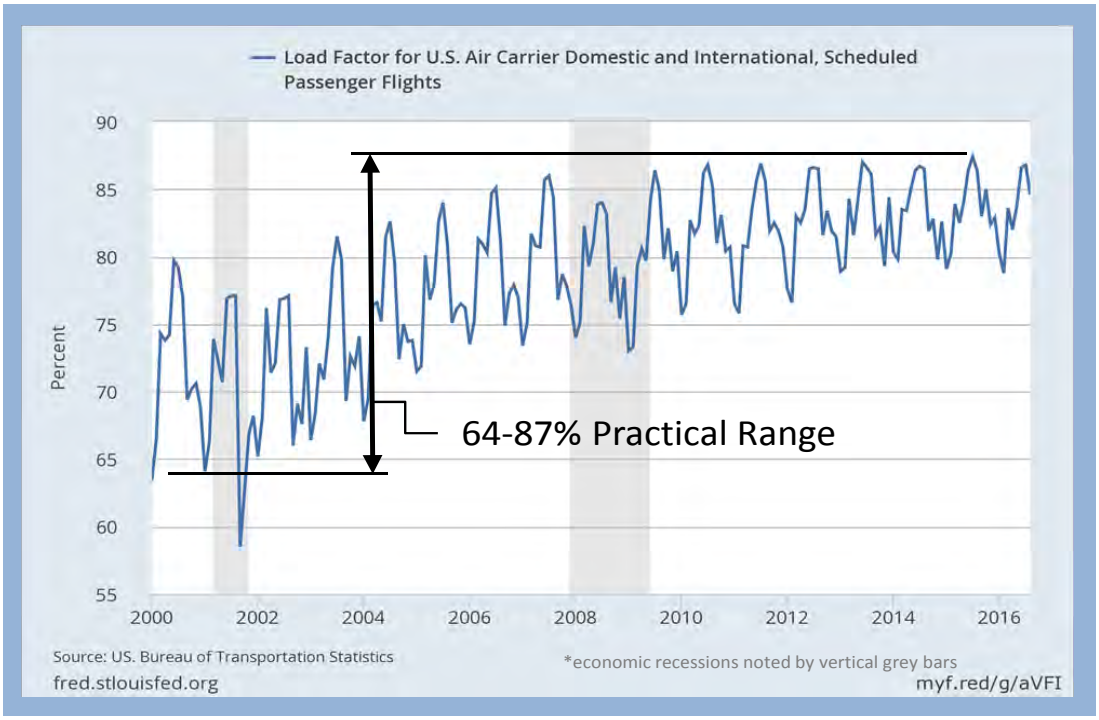
Jacobs Consultancy, Laboratory Planning
Stuart-Lynn Company, Cost Estimating

6.

Appendix & Data Summary

Research: Measuring Academic Space Utilization

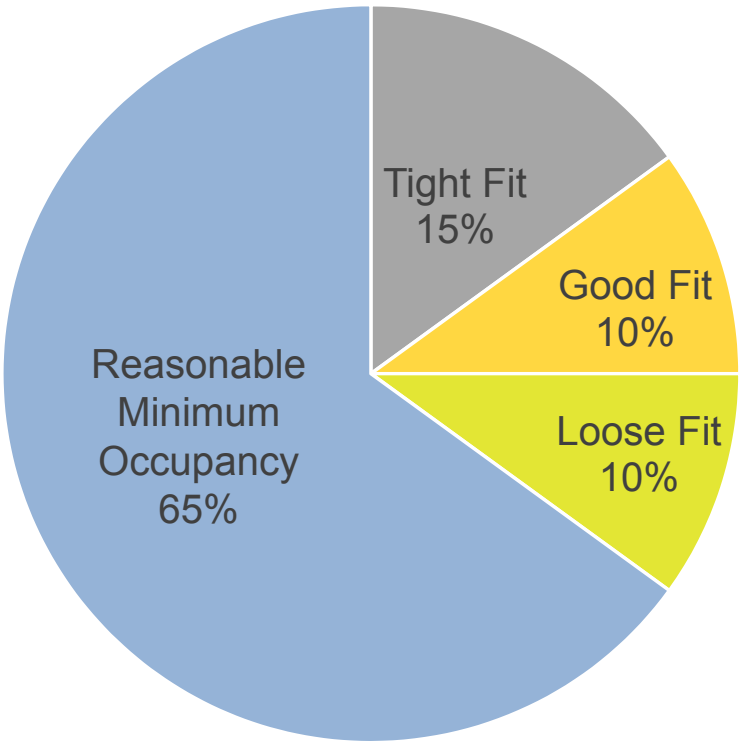




ca’pac·i·t·y u’til·i·za·tion
% of theoretically perfect, fully-loaded capacity actually occupied

’prac·ti·cal ca’pac·i·t·y
reasonable & ordinary space resources available given annual and seasonal variations in faculty and staffing occupancy

’u·til·i·za’tion
noun
1. using something effectively;
2. amount of something in active use compared with the total amount available;



Practical Utilization Capacity Range Research Space Occupants

Research: Appendix

University Summary Methodology

STEP 1: PEOPLE

Identify assigned research space & perform an occupancy census for a spring 2016 benchmark.

- Research PI count (Selected Faculty Principal Investigators assigned research space)
- Research FTE count (Other Faculty, Professional Staff, Trainees & Students assigned research space)

STEP 2: SPACE

Collect research space data records.

Organize the following space type categories:

- Experimental Research Lab + Lab Support
- Computational Research Space
- Office Space for Research Faculty, Post-Docs, Grad Research Assistant, Teaching Assistant & Undergrads
- Core Labs & Research Workshops

STEP 3: GRANT $

Gather grant expenditures by department.

- Include direct & indirect expenses
- Federal, State & Non-governmental Sources

STEP 4:

Analyze people, space & grant $

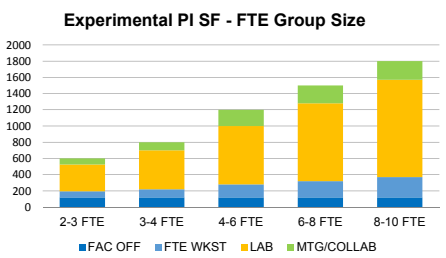
- Average PI group size; FTE per PI
- Average occupancy SF per FTE
- Grant $ per SF - Return on asset (ROA)
- Occupancy ratio
- SF demand to supply SF capacity

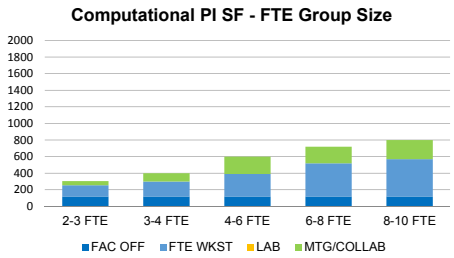
GRANT $ per ASF (directs & indirects):

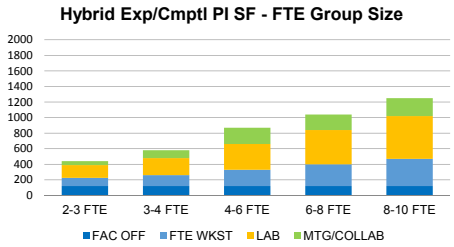
- $400–$600/ASF lab, lab support, office & shared confirm
- >$600/ASF over-crowded

RESEARCH-ACTIVE PI – SELECTED FACULTY PRINCIPAL INVESTIGATORS ASSIGNED RESEARCH SPACE	
TENURED & TENURE TRACK (TTK)	**FACULTY**
Research Faculty	Assistant, Associate or Full professor
Clinical Research Faculty	Assistant, Associate or Full professor
Distinguished Faculty	Special named or Endowed chair, or Full professor
Research Administrator	Dean , Associate dean, Assistant dean, Chair, Executive director, Director, Coordinator
RESEARCH-ACTIVE FTE – OTHER FACULTY, PROFESSIONAL STAFF, TRAINEES & STUDENTS ASSIGNED RESEARCH SPACE	
NON-TENURE TRACK (NTT)	**RESEARCH FACULTY & PROFESSIONAL STAFF**
Research Faculty	Fixed, Part-time, Limited term, Contract, Contingent, Sessional, Affiliated Lecturer, instructor, adjunct, assistant, associate, full professor, jr, sr or unranked
Visiting Faculty	Assistant, Associate, or Full professor, or Unranked
Scientist or Engineer	III, II, I, or unranked
Research Fellow	Junior, Senior, Assistant, Associate, or Unranked
TRAINEES / STUDENTS (PAID)	**RESEARCH FTE**
Post-Doctoral Fellow	Associate, or Unranked
Post-Graduate	Unranked
Research Assistants or Fellow	Graduate or Undergraduate
EXCLUDED – FACULTY, PROFESSIONAL STAFF, TRAINEES & STUDENTS NOT ASSIGNED TO RESEARCH SPACE	
NON-TENURE TRACK (NTT)	**TEACHING/ACADEMIC FACULTY & PROFESSIONAL STAFF**
Honorary Faculty	Fixed, Part-time, Limited term, Contract, Contingent, Sessional, Affiliated emeritus/emerita
Studio or Industry Faculty	Assistant, Associate, Full professor, or Unranked
Professor of (Professional) Practice	Assistant, Associate, Full professor, or Unranked
Teaching/Course Assistants or Fellow	Graduate or Undergraduate

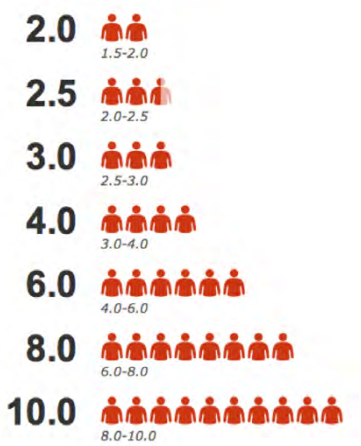
PEOPLE: Define and Count Research PI & FTEs







Practical
Average FTE Group Size
Ranges per PI



Model SF per FTE by Experimental PI Group Size

- 256 SF 1.4 FTE per PI
- 218 SF 2.5 FTE per PI
- 210 SF 3.0 FTE per PI
- 200 SF 4.0 FTE per PI

Model SF per FTE by Computational PI Group Size

- 310 SF 0.5 FTE per PI
- 130 SF 2.0 FTE per PI
- 110 SF 3.0 FTE per PI
- 100 SF 4.0 FTE per PI

Experimental - PEOPLE | SPACE | GRANT $

- 450 - 600 SF PI + 2-3 ~ $115K-$240K @ $200-$400 / SF
- 600 – 800 SF PI + 3-4 ~ $240K-$320K @ $250-$400 / SF

Computational - PEOPLE | SPACE | GRANT $

- 225 - 300 SF PI + 1.0-1.5 ~ $115K-$240K @ $200-$400 / SF
- 300 - 400 SF PI + 1.5-3.0 ~ $115K-$240K @ $250-$400 / SF

MEASURING ACADEMIC RESEARCH SPACE UTILIZATION

re’turn on as·sets
noun

1. a rate calculated by dividing annual research expenditures by available fixed assets - research space (sf)
2. an indicator of how efficiently assets are allocated to generate research expenditures
3. aka return on investment (ROI)

ex’pen·di·tures per a’vail·a·ble sf
(grant expenditures) / (available sf)

a’vail·a·ble sf
total research space (sf) available to principal investigators for research FTE occupants

Research: Appendix

UNIVERSITY SUMMARY
Colleges, Institutes & Centers, Platform Core, Vivarium & Highly Specialized Labs

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)	EXP + CMP	NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%	100%	100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380	100%	100%	Adjusted	2015	2015	2015
CANR		AGRICULTURE & NATURAL RESOURCES TOTALS	55	13	68	12	60	40	83	35	229	194	3.4	2.9	49,989	14,645	7,758	72,392	909	1,065	373	$ 14,911,326	$ 219,284	$ 206
CAS		ARTS & SCIENCES TOTALS	117	278	394	84	143	80	224	130	661	543	1.7	1.4	125,531	88,358	38,741	252,630	1,078	641	465	$ 28,236,788	$ 71,667	$ 112
CBE		LERNER COLLEGE of BUS & ECONOMICS TOTAL		114	114	13	7		36	32	87	61	0.8	0.5	1,670	17,993	3,645	23,308		204	381	$ 2,964,846	$ 26,007	$ 127
CEOE		EARTH OCEAN & ENVIRONMENT TOTALS	45	46	91	4	38	29	57	8	136	122	1.5	1.4	40,339	12,545	12,519	65,403	906	723	534	$ 13,361,741	$ 147,644	$ 204
CEHD		EDUCATION & HUMAN DEVELOPMENT TOTALS	2	57	59	54	160	4	49	19	286	266	4.8	4.5	2,386	11,040	6,469	19,895	1,193	337	75	$ 19,253,277	$ 326,327	$ 968
COE		ENGINEERING TOTALS	111	23	133.75	18	86	105	326	69	604	510	4.5	3.8	154,422	25,608	32,445	212,475	1,394	1,589	416	$ 44,033,321	$ 329,221	$ 207
CHS		HEALTH SCIENCES TOTALS	74	17	91	14	57	9	47	25	151	128	1.7	1.4	26,834	15,942	3,173	45,949	363	505	359	$ 11,157,417	$ 122,609	$ 243
(1)		COLLEGES BY DEPARTMENT - PI ASF SUBTOTALS	403	548	950	199	551	266	822	317	2,154	1,825	2.3	1.9	401,171	186,131	104,750	692,052	996	728	379	$ 133,918,715	$ 140,930	$ 194
(2)		INTERDISCIPLINARY INSTITUTES & CTRS SUBTOTAL				7	25	7	12	5	56	51			51,803	4,278	4,197	60,278			1,183	$ 4,184,215	$ -	$ 69
(3)		TOTALS | PI + INSTITUTES & CTRS (1)+(2)	403	548	950	206	576	273	834	322	2,210	1,876	2.3	2.0	452,974	190,409	108,947	752,330	1,125	792	401	$ 138,102,930	$ 145,333	$ 184
(4)		TOTALS | PLATFORM CORE w/VIVARIUM & HI SPEC LABS (4A)+(4B)				-	98	-	1	20	237	105			43,066	163	954	44,183			420	$ 604,707		$ 14
		GRAND TOTALS RESEARCH SPACE (3)+(4)	403	548	950	206	674	273	835	342	2,447	1,981	2.6	2.1	496,040	190,572	109,901	796,513	1,232	838	402	$ 138,707,637	$ 145,970	$ 174

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
CANR - Agriculture & Natural Resources

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
(1)	COLLEGES BY DEPARTMENT - PI ASF																							
CANR	02101	DEAN - CANR	2		2		4			7	11	6.3	5.3	3.1	4,160	372		4,532	2,080	2,266	722	$ 1,019,394	$ 509,697	$ 225
CANR	02130	APPL ECONOMICS & STATISTICS		13	13	2	3	6	19	6	36	29.0	2.7	2.2	791	3,373	1,419	5,583	-	429	193	$ 1,052,291	$ 80,945	$ 188
CANR	02150	ANIMAL AND FOOD SCIENCES	21		21	2	21	6	15	11	55	45.5	2.6	2.2	19,185	4,247	1,225	24,657	914	1,174	542	$ 4,207,863	$ 200,374	$ 171
CANR	02160	ENTOMOLOGY & WILDLIFE ECOLOGY	7		7	4	8	6	9	3	30	26.7	4.3	3.8	5,689	2,438	1,217	9,344	813	1,335	350	$ 2,356,647	$ 336,664	$ 252
CANR	02170	| Plant & Soil Science	25		25	4	24	22	41	8	98	87	3.9	3.5	20,164	4,215	3,897	28,276	807	1,131	326	$ 5,925,874	$ 237,035	$ 210
CANR	02174	| Plant & Soil Sci-DBI																				$ 349,256		
CANR		PLANT & SOIL SCIENCE SUBTOTAL	25		25	4	24	22	41	8	98	86.8	3.9	3.5	20,164	4,215	3,897	28,276	807	1,131	326	$ 6,275,131	$ 251,005	$ 222
CANR		**AGRICULTURE & NATURAL RESOURCES TOTALS**	**55**	**13**	**68**	**12**	**60**	**40**	**83**	**35**	**229**	**194**	**3.4**	**2.9**	**49,989**	**14,645**	**7,758**	**72,392**	**909**	**1,065**	**373**	**$ 14,911,326**	**$ 219,284**	**$ 206**

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT

CAS - Arts & Sciences

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
CAS	02515	ART CONSERVATION		5	5	1	27.5				29	29	5.7	5.7		526		526		105	18	$ 473,850	$ 94,770	$ 901
CAS	02590	BIOLOGICAL SCIENCES	21		21	9.5	10	6	19	2	47	42	2.2	2.0	24,827	8,082	3,272	36,181	1,196	1,744	854	$ 2,501,055	$ 120,533	$ 69
CAS	02522	CHEMISTRY & BIOCHEMISTRY	31		31	2	17	33	61	53	166	122	5.3	3.9	55,782	7,575	8,587	71,944	1,799	2,321	588	$ 8,066,556	$ 260,211	$ 112
CAS	02573	| Bartol Research Institute																				$ 3,054,483		
CAS	02570	| Physics & Astronomy	30		30	1.7	14	19	25	5	64	57	13.3	1.9	13,357	4,945	4,502	22,804	449	767	401	$ 2,686,612	$ 90,306	$ 118
CAS		PHYSICS & ASTRONOMY SUBTOTAL	30		30	2	14	19	25	5	64	57	2.1	1.9	13,357	4,945	4,502	22,804	449	767	401	$ 5,741,095	$ 192,978	$ 252
CAS	02577	PSYCHOLOGICAL & BRAIN SCIENCES	25		25	7	10	4	14	5	40	34	1.6	1.4	22,819	6,037	3,521	32,377	913	1,295	947	$ 4,321,634	$ 172,865	$ 133
CAS		CAS EXPERIMENTALISTS Subtotals	**107**	**5**	**112**	**21**	**78**	**62**	**119**	**65**	344	**284**	**3.1**	**2.5**	**116,785**	**27,165**	**19,882**	**163,832**	**1,097**	**1,469**	**576**	**$21,104,190**	**$ 189,275**	**$ 129**
CAS	02501	| Dean - CAS					12				12	12				1,404	2,919	4,323			368	$ 157,147		$ 36
CAS	02581	| Ctr Disaster Research Center					3	1	6		10	9				765	1,220	1,985			229	$ 718,075		$ 362
CAS	02582	| Ctr for Drug & Alcohol Studies					7		3		10	10					530	530				$ 1,379,037		
CAS	02575	| Ctr Translational Cancer Rech													4,007			4,007				($2,299)		($1)
CAS		DEAN - CAS SUBTOTAL					22	1	9		31	30			4,007	2,169	4,669	10,845			362	$ 2,251,959		$ 208
CAS	07325	| Ctr Applied Demography & Survey					4	1		2	7	6	3.5			284	242	526			92	$ 369,782		$ 703
CAS	07350	| Ctr Community Research & Serv					10		10	1	21	18	20.5			1,284	530	1,814			99	$ 1,016,068		$ 560
CAS	07360	| Ctr for Hist Arch & Design					1		4	3	7	5	2.8		1,933	176	1,490	3,599			742	$ 207,696		$ 58
CAS	07318	| Environ'l & Energy Policy Pgm							2		2	2						-				$ 63,582		
CAS	07380	| Institute for Public Admin					15	1	12	3	30	27	10.1			125	1,158	1,283			48	$ 758,623		$ 591
CAS	07310	| Public Policy & Administration		12	12	5.8			8		13	12		1.0		778		778		65	64	$ 56,967	$ 4,747	$ 73
CAS		PUBLIC POLICY & ADMIN (CTR & INST) SUBTOTAL		12	12.0	6	29	2	35	9	80	69	6.7	5.8	1,933	2,647	3,420	8,000			115	$ 2,472,718	$ 206,060	$ 309
CAS	02513	ART		15	14.8	1.8	1		1.5	10.5	15	8	1.0	0.5		3,434	2,694	6,128		415	796			
CAS	02510	ANTHROPOLOGY	7		7	1	1			3	5	3	0.7	0.4	903	1,360		2,263	129	323	742	$ 2,518	$ 360	$ 1
CAS	02516	ART HISTORY		13	13.0		1		3		4	4	0.3	0.3		1,748	377	2,125		163	599			
CAS	02503	BLACK AMERICAN STUDIES		3	3.0					4	4	1	1.2	0.4	124	639		763		254	623			
CAS	02534	COMMUNICATION		12	11.8	2.5	1		1.5	2	7	5	0.6	0.5		3,784		3,784		322	691	$ 38,513	$ 3,278	$ 10
CAS	02537	ENGLISH		31	30.8	11	1	5	5		22	21	0.7	0.7		7,889	1,011	8,900		289	419	$ 26,957	$ 877	$ 3
CAS	03350	FASHION & APPAREL STUDIES		6	6.0	2			2		4	3	0.6	0.5		2,492	554	3,046		508	930	$ 215,355	$ 35,892	$ 71
CAS	02550	FOREIGN LANGUAGE & LITERATURES		23	23.0	14.3			1	1	16	15	0.7	0.7		7,148		7,148		311	462			
CAS	02547	HISTORY		27	27.0	1	1	2	9.5	0.6	14	12	0.5	0.5		4,097	366	4,463		165	363	$ 61,110	$ 2,263	$ 14
CAS	02551	LINGUISTICS & COGNITIVE SCIENCE	3	6	9.0	0.8			2	6	9	5	1.0	0.5	1,779	1,877	850	4,506	593	501	990	$ 73,599	$ 8,178	$ 16
CAS	02553	MATHEMATICAL SCIENCES		36	36.0	6	2	7	12	11	38	29	1.0	0.8		7,903	3,105	11,008		306	385	$ 1,685,145	$ 46,810	$ 153
CAS	02560	MUSIC		20	20.0	8.5			12.3	12.6	33	23	1.7	1.2		4,126	230	4,356		218	187	$ 30,372	$ 1,519	$ 7
CAS	02567	PHILOSOPHY		9	8.5	1				2	3	2	0.4	0.2		2,328		2,328		274	1,369			
CAS	02574	POLITICAL SCI & INT RELATIONS		25	24.8				8		8	7	0.3	0.3		2,316	887	3,203		129	471	$ 20,599	$ 832	$ 6
CAS	02580	SOCIOLOGY		24	24.0	2		0.5	5.5		8	7	0.3	0.3		2,682	696	3,378		141	471	$ 173,834	$ 7,243	$ 51
CAS	02530	THEATRE		10	10.0	2	6.7			4.4	13	10	1.3	1.0		1,766		1,766		177	173	$ 79,920	$ 7,992	$ 45
CAS	02506	WOMEN & GENDER STUDIES		2	2.0	3.8					4	4	1.9	1.9		788		788		394	210			
CAS		CAS COMPUTATIONALIST subtotals	**10**	**273**	**283**	**63**	**66**	**18**	**105**	**65**	317	**259**	**1.1**	**0.9**	**8,746**	**61,193**	**18,859**	**88,798**	**875**	**314**	**343**	$7,132,598	**$ 25,248**	**$ 80**
CAS		**ARTS & SCIENCES TOTALS**	**117**	**278**	**394**	**84**	**143**	**80**	**224**	**130**	661	**543**	**1.7**	**1.4**	**125,531**	**88,358**	**38,741**	**252,630**	**1,078**	**641**	**465**	**$28,236,788**	**$ 71,667**	**$ 112**

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
CBE - Lerner College of Business & Economics

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
(1)	COLLEGES BY DEPARTMENT - PI ASF																							
CBE	02710	BUSINESS ADMINISTRATION		37	37	2				8	10	5	0.3	0.1	1,300	5,601		6,901	-	187	1,438	$ 705,327	$ 19,063	$ 102
CBE	02708	SMALL BUSINESS DEVELOPMENT CENTER									-	-	-	-				-				$ 1,614,306		
CBE	02709	WEINBERG JOHN L CORP GOV CTR									-	-	-	-				-						
CBE	02712	B&E FINANCE		15	15				0.3	1	1	1	0.1	0.0		1,484		1,484		99	2,638	$ 125,758	$ 8,384	$ 85
CBE	02715	B&E ACCOUNTING & MIS		28	28	4	1		12.3	16.5	34	21	1.2	0.8		4,336	1,049	5,385		192	254	$ 576	$ 21	$ 0
CBE	02720	ECONOMICS		26	26	4.9			16.5	1	22	19	0.9	0.7		3,708	1,212	4,920		189	256	($643)		
CBE	02725	CTR FOR ECON EDUC & ENTREPRNR					1				1	1	-	-				-				$ 224,815		
CBE	03365	HOTEL, RESTAURANT MANAGEMENT		8	8	1.8	1		3.5	5	11	7	1.4	0.9		1,564	335	1,899		237	254	$ 5,279	$ 660	$ 3
CBE	02701	LERNER COLG OF BUS & ECON					4		3.5	-	8	7	-	-	370	1,300	1,049	2,719			390	$ 289,429		$ 106
CBE		**LERNER COLLEGE of BUS & ECONOMICS TOTAL**		**114**	**114**	**13**	**7**		**36**	**32**	87	**61**	0.8	**0.5**	**1,670**	**17,993**	**3,645**	**23,308**		**204**	**381**	**$ 2,964,846**	**$ 26,007**	**$ 127**

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
CEOE - Earth Ocean & Environment

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
(1)	COLLEGES BY DEPARTMENT - PI ASF																							
CEOE	03501	DEAN - CEOE					15				15	15			514		737	1,251			83	$ 4,365,260		$ 3,489
CEOE	02541	GEOGRAPHY		14	14		5		8	3	16	13	1.1	0.9	427	1,990	1,050	3,467		248	270	$ 958,616	$ 68,473	$ 276
CEOE	02544	GEOLOGICAL SCIENCES	10		10	1	1	7	8	1	18	16	1.8	1.6	4,266	2,032	2,152	8,450	427	845	537	$ 881,120	$ 88,112	$ 104
CEOE	03515	MARINE SCI & POLICY	35	32	67	3	17	22	42	4	88	79	1.3	1.2	35,132	8,523	8,580	52,235	1,018	785	663	$ 7,156,745	$ 107,620	$ 137
CEOE		**EARTH OCEAN & ENVIRONMENT TOTALS**	**45**	**46**	**91**	**4**	**38**	**29**	**57**	**8**	136	**122**	1.5	**1.4**	**40,339**	**12,545**	**12,519**	**65,403**	**906**	**723**	**534**	**$ 13,361,741**	**$ 147,644**	**$ 204**

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
CEHD - Education & Human Development

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
(1)	COLLEGES BY DEPARTMENT - PI ASF																							
CEHD	02976	| Ctr De Educ Research & Develop					4		1		5	4					388	388				$ 461,565		
CEHD	07390	| Ctr Early Learning				42	42			4	88	85	22.0		512			512			6			
CEHD	02936	| Ctr Educational Leadership & P																-						
CEHD	07355	| Ctr for Disabilities Studies					20		5	4	28	25	7.1				180	180				$ 4,032,196		
CEHD	02904	| Ctr for Math & Science Education Resource					10		2	1	13	12	12.7			340		340				$ 2,133,634		$ 6,275
CEHD	07330	| Ctr Rsch Educ & Social Policy					7		1		8	7						-				$ 317,256		
CEHD	02535	| Ctr for Secondary Teacher Educ					5			1	6	5						-				$ 158,966		
CEHD	02947	| DE Ctr for Teacher Education					1		1	3	5	3					365	365				$ 1,157,561		
CEHD	02905	| Ofc Educational Technology					3				3	3			316			316			105			
CEHD	02922	| School of Education	2	43	45	8	9	4	32	3	56	49	18.8	1.1	1,558	6,892	3,981	12,431			251	$ 2,107,297	$ 46,829	$ 170
		SCHOOL OF EDUCATION SUBTOTAL	2	43	45	50	100	4	41	16	211	195	4.7	4.3	2,386	7,232	4,914	14,532	1,193	323	75	$ 10,368,474	$ 230,411	$ 713
CEHD	02971	THE COLLEGE SCHOOL-EDUCATION					7				7	7						-				$ 30,000		
CEHD	03320	HUMAN DVLPMNT & FAMILY STUDIES		14	14	4	50		9	1	63	61	4.5	4.4		3,808	1,555	5,363		383	88	$ 8,848,449	$ 632,032	$ 1,650
CEHD	03326	LAB PRESCHOOL					3			2	5	4						-				$ 6,353		
CEHD		**EDUCATION & HUMAN DEVELOPMENT TOTALS**	**2**	**57**	**59**	**54**	**160**	**4**	**49**	**19**	**286**	**266**	4.8	**4.5**	**2,386**	**11,040**	**6,469**	**19,895**	**1,193**	**337**	**75**	**$ 19,253,277**	**$ 326,327**	**$ 968**

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
COE - Engineering

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
(1)	COLLEGES BY DEPARTMENT - PI ASF																							
COE	02586	| Computer & Information Science		23	23	7	5	3	43	10	67	55	6.7	2.4	11,554	3,232	1,019	15,805		687	290	$ 3,311,903	$ 143,996	$ 210
COE	02578	| CIS - DBI					1				1	1						-		-	-	$ 394,274		
COE		COMPUTER & INFORMATION SCIENCE SUBTOTAL		23	23	7	6	3	43	10	68	56	3.0	2.4	11,554	3,232	1,019	15,805		687	285	$ 3,706,177	$ 161,138	$ 234
COE	03101	| Dean - Engineering	1		1	1	8				9	9			1,539	130	1,238	2,907			323	$ 162,018	$ 162,018	$ 56
COE	02140	| Bioresources Engineering																-			-	$ 38,940		
COE	03144	| Ctr for Composite Materials (CCM)					31	6		1	38	37	37.5		27,025	258	2,125	29,408			798	$ 5,528,172		$ 188
COE	03132	| Ctr Information & Comm Science (CICS)																-			-	$ 65,581		
COE	01165	| Del Environmantal Inst (DEI)	2		2		2	3		2	7	6	3.4	2.8		1		1		1	0	$ 2,779,877		$ 2,779,877
		DEAN - ENGINEERING SUBTOTAL	3		3	1	40	9		3	53	51			28,564	389	3,363	32,316			629	$ 8,574,587		$ 265
COE	03106	MATERIALS SCIENCE	12		12	1	6	15	46		68	61	5.6	5.1	13,641	1,532	1,924	17,097	1,137	1,425	282	$ 3,205,329	$ 267,111	$ 187
COE	03110	| Chemical & Biomolecular Engineering	23		23	3	10	46	84	4	147	132	36.8	5.7	35,330	3,883	9,939	49,152	1,536	2,137	373	$ 6,208,386	$ 269,930	$ 126
COE	03115	| Chem Engr-DBI																-				$ 1,252,992	$ -	
COE	03111	| Ctr Catalytic Sci & Tech (CS&T)																-				$ 1,503,156		
COE	03117	| Ctr for Mole & Enginrg Termodynamics (CMET)																-				$ 830,460		
COE	03116	| Ctr Chem Engr-Ctr for Composite Matls																-					$ -	
COE	03118	| Energy Frontier Res Cntr (EFRC) (CHEMENG)						19			19	19					126	126			7	$ 2,476,747	$ -	
		CHEMICAL & BIOMOLECULAR ENG SUBTOTAL	23		23	3	10	65	84	4	166	151	7.2	6.6	35,330	3,883	10,065	49,278	1,536	2,143	327	$ 12,271,741	$ 533,554	$ 249
COE	03120	| Civil & Environmental Engineering	22		22	2	7	6	58	19	92	70	4.8	3.2	28,595	5,830	5,644	40,069	1,300	1,821	569	$ 966,991	$ 43,954	$ 24
COE	03121	| Ctr Civil & Envrnmntl Eng-Disaster Research																				$ 34,430		
COE	03127	| Ctr for Applied Coastal Research	1		1	1		2			3	3		3.0								$ 1,229,074	$ 1,229,074	
COE	03129	| Ctr Innovative Bridge Engr																				$ 547,012		
COE	03128	| Ctr Study of Metals in Environment																				$ 454,058		
COE	03126	| DE Center - Transportation	1		1		1			10	11	5	11.0	4.5								$ 1,523,086	$ 1,523,086	$ 196
COE		CIVIL & ENVIRONMENT ENGINEERING SUBTOTAL	24		24	3	8	8	58	29	106	78	4.4	3.2	28,595	5,830	5,644	40,069	1,191	1,670	514	$ 4,754,649	$ 198,110	$ 119
COE	03130	ELECTRICAL AND COMPUTER ENGINEERING	18		18		10		47	5	62	52	3.5	2.9	11,691	4,577	5,020	21,288	659	1,199	412	$ 7,510,473	$ 423,125	$ 353
COE	03145	| Ctr Fuel Cell Research																				$ 433,750		
COE	03141	| Ctr Mech Engr-Ctr for Composite Matls																				$ 602,492		
COE	03140	| Mechanical Engineering	20		20	3	4	4	34	14	59	44	4.2	2.2	15,856	4,973	3,216	24,045	793	1,202	543	$ 1,743,243	$ 87,162	$ 72
COE		MECHANICAL ENGINEERING (CTR & INST) SUBTOTAL	20		20	3	4	4	34	14	59	44	2.9	2.2	15,856	4,973	3,216	24,045	793	1,202	543	$ 2,779,485	$ 138,974	$ 116
COE	03170	| Biomedical Eng Program	11		11		2	2	15	4	23	18	5.8	1.7	9,191	1,192	2,194	12,577	836	1,143	693	$ 928,171	$ 84,379	$ 74
COE	03143	| Ctr Biomed Engr Rsch																				$ 302,707		
COE		BIOMEDICAL ENGINEERING SUBTOTAL	11		11	-	2	2	15	4	23	18	2.1	1.7	9,191	1,192	2,194	12,577	836	1,143	693	$ 1,230,878	$ 111,898	$ 98
COE		**ENGINEERING TOTALS**	**111**	**23**	**133.75**	**18**	**86**	**105**	**326**	**69**	**604**	**510**	**4.5**	**3.8**	**154,422**	**25,608**	**32,445**	**212,475**	**1,394**	**1,589**	**416**	**$ 44,033,321**	**$ 329,221**	**$ 207**

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
CHS - Health Sciences

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
CHS	03701	DEAN - CHS		1	1		5	1	2	4	12	9	12.3	9.3	978	442		1,420		1,420	152	$ 301,868	$ 301,868	$ 213
CHS	03715	COLLEGE OF HEALTH SCIENCES SPECIAL PROGRAMS														585		585						
CHS	03760	BEHAVIORAL HEALTH & NUTRITION	8	16	24	1	2		12	3	18	14	0.7	0.6	1,851	2,616	592	5,059	231	211	366	$ 887,048	$ 36,960	$ 175
CHS	03750	HEALTH NUTRITION EXERCISE																-						
CHS	03770	KINESIOLOGY & APPL PHYSIOLOGY	20		20	3	16	1	9	1	30	28	1.5	1.4	11,770	3,283	1,134	16,187	589	809	582	$ 4,210,461	$ 210,523	$ 260
CHS	03720	MEDICAL TECHNOLOGY	7		7	1	2		1		4	4	0.6	0.6	1,600	1,084	113	2,797		400	682	$ 119,790	$ 17,113	$ 43
CHS	03717	NURSING	25		25	6	7		1	13	27	18	1.1	0.7	907	3,429		4,336		173	238	$ 1,021,377	$ 40,855	$ 236
CHS	02591	PHYSICAL THERAPY	14		14	3	25	7	22	4	61	55	4.3	3.9	9,728	4,503	1,334	15,565	695	1,112	284	$ 4,616,873	$ 329,777	$ 297
CHS		**HEALTH SCIENCES TOTALS**	**74**	**17**	**91**	**14**	**57**	**9**	**47**	**25**	151	**128**	1.7	**1.4**	**26,834**	**15,942**	**3,173**	**45,949**	**363**	**505**	**359**	**$ 11,157,417**	**$ 122,609**	**$ 243**

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
INTRD - Interdisciplinary Institutes & Ctrs

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
(2)	INTERDISCIPLINARY INSTITUTES & CTRS																							
INTRD	02587	CTR APPLIED SCI & ENGR (ASE)																				$ 31,921		
INTRD	07801	CTR BOB CARPENTER CENTER													2,403			2,403						
INTRD	07381	CTR FOR ENERGY & ENVIRONMENTAL POLICY (E&EP)				7		2	12		21	19				527	769	1,296			68	($35,864)		($28)
INTRD	01175	DEL BIOTECHNOLOGY INSTITUTE DBI (DBI)					10	3			13	13			33,288	2,311	1,950	37,549			2,888	$ 1,989,178		$ 53
INTRD	01567	INST DE REHABILITATION INSTITUTE (DRI)					3				3	3				1,440		1,440			480	$ 125,166		$ 87
INTRD	03801	INST OF ENERGY CONVERSION (IEC)					11			5	16	13			16,112		1,241	17,353			1,361	$ 1,697,614		$ 98
INTRD	01564	INST SUSTAINABLE ENERGY RSCH (ISER)					1	2			3	3					237	237				$ 376,200		
(2)	INTERDISCIPLINARY INSTITUTES & CTRS SUBTOTAL					7	25	7	12	5	56	51			51,803	4,278	4,197	60,278			1,183	$ 4,184,215	$ -	$ 69

Research: Appendix

COLLEGE SUMMARY BY DEPARTMENT
Platform Core & Highly Specialized Labs

			RESEARCH-ACTIVE TENURE-TRACK FACULTY PI (full-time)		PI FTE TOTALS	PROFESSIONAL, TECHNICAL, TRAINEE & STUDENT (FTE)					PEOPLE TOTALS & METRICS				SPACE SUPPLY			SPACE DEMAND TOTALS & METRICS				GRANTS Federal, State + Other	GRANT METRICS	
COLL	DEPT CODE	COLLEGES BY DEPARTMENT + INSTITUTES & CENTERS	EXP (wet)	CMP (dry)		NON-TTK CNTG TMP FAC	PROF + TECH	POST DOC FEL	GRAD RES+ TEACH ASST	UD UNDR GRD STU-DENT	TOTAL FTE	TOTAL FTE	AVG GROUP SIZE	AVG GROUP SIZE	EXP LAB (WET) FICM 250 + 255	RESEARCH OFFICE FICM 310 (ASF)	GRAD & POST DOC OFFICE FICM 380 (ASF)	TOTAL LAB + OFFICE	AVG EXP LAB SPACE PER PI	AVG LAB + OFF ASF PER PI	AVG LAB & OFF ASF PER FTE	EXPENDITURES TOTAL (excludes out-flowing subcontracts)	AVG GRANT PER PI	AVG RETURN ON ASSET
			FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE QTY	FTE / PI	FTE / PI	NSF	NSF	NSF	NSF	NSF / PI	NSF / PI	NSF / FTE	DIRECT + INDIRECT $	$ / PI	$ / ASF
			100%	100%		100%	100%	100%	85%	35%	100%	Adjusted	100%	Adjusted	100%	100%	100%	250+255+ 310+380				2015	2015	2015
(4)	PLATFORM CORE & HIGHLY SPECIALIZED RESEARCH LABS																							
CANR	02310	AGRICULTURE-NEWARK FARM					9		1	2	12	10												
CANR	02168	ENTMLGY & APPLIED ECLGY - BENEF INSECT LAB													5,289			5,289						
INTRD	02597	OFC LABORATORY ANIMAL MEDICINE					5				5	5			2,126			2,126			425			
(4A)	| VIVARIUM & AG RESEARCH FACILITIES						14	-	1	2	17	15			7,415			7,415				$ -		
COE	03130	COE - ECE CORE LABS													5,863			5,863			-			
COE	03101	DEAN - COLLEGE OF ENGINEERING CORE LABS													4,746			4,746			-			
COE	03102	COE - CE CORE LABS													1,655			1,655			-			
INTRD	01551	PROVOST - RESEARCH OFFICE CORE LABS					12				12	12			23,387	163	954	24,504			2,042			
INTRD	01301	LIBRARY					72			18	90	78										$ 604,707		
(4B)	| HIGHLY SPECIALIZED CORE FACILITIES						84	-	-	18	102	90			35,651	163	954	36,768	4.9%	TOTAL PI SF (3)		$ 604,707		
(4)	TOTALS | PLATFORM CORE & HI SPEC LABS (4A)+(4B)					-	98	-	1	20	237	105			43,066	163	954	44,183			420	$ 604,707	$ 14	

Research Space Utilization

UNIVERSITY OF DELAWARE TOTALS - Experimental+Computational Research

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
950	1824	1.9	728	379	$194	49%		692,052	
EXP PI		GRANT $						401,171	
403		$133,918,716		TOTAL				290,881	
CMP PI		$0		INDIRCT $					
548		$140,967		TOT $ / PI					
							Current Assigned PI Research Supply (ASF)	692,052	ample

MODEL

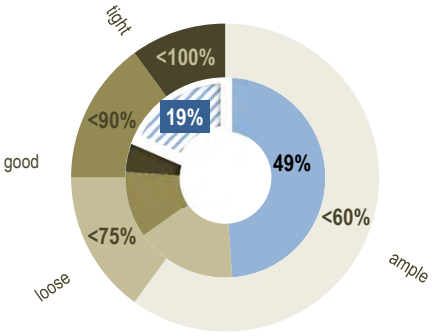
SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
594	309	$237	60%	128,030	564,022	loose
475	247	$297	75%	240,834	451,218	good
356	186	$396	100%	353,639	338,413	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

100% model = 45 sf/ fte office; 120 sf/ exp lab; 38 sf/ cmp lab; 130 sf/ PI office

Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



CANR

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
68	194	2.9	1,065	373	$206	52%		72,392	
		GRANT $					*Experimental Lab*	*49,989*	
55		$14,911,326		TOTAL			*Research Office*	*22,403*	
		$0		INDIRCT $					
13		$219,284		TOT $ / PI					
							Current Assigned PI Research Supply (ASF)	72,392	ample

MODEL

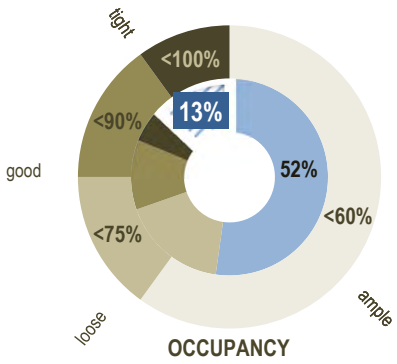
SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
927	325	$237	60%	9,377	63,015	loose
741	260	$296	75%	21,980	50,412	good
556	195	$394	100%	34,583	37,809	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

100% model = 45 sf/ fte office; 120 sf/ exp lab; 38 sf/ cmp lab; 130 sf/ PI office

Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



CAS - Research

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
394	543	1.4	641	465	$112	43%		252,630	
EXP PI		GRANT $					*Experimental Lab*	*125,531*	
117		$28,236,788		TOTAL			*Research Office*	*127,099*	
CMP PI		$0		INDIRCT $					
278		$71,667		TOT $ / PI					
							Current Assigned PI Research Supply (ASF)	252,630	ample

MODEL

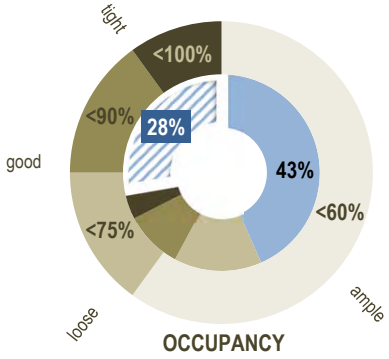
SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
463	336	$155	60%	70,024	182,606	loose
371	269	$193	75%	106,545	146,085	good
278	202	$258	100%	143,066	109,564	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

100% model = 45 sf/ fte office; 120 sf/ exp lab; 38 sf/ cmp lab; 130 sf/ PI office

Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



Research Space Utilization

CBE - Research

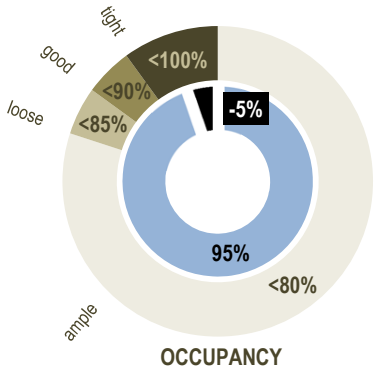
EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
114	61	0.5	204	382	$127	95%		23,308	
		GRANT $					*Experimental Lab*	*1,670*	
		$2,964,846	TOTAL				*Research Office*	*21,638*	
		$0	INDIRCT $						
114		$26,007	TOT $ / PI						
							Current Assigned PI Research Supply (ASF)	23,308	see below

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	RES DEMAND ASF	FIT
218	407	$119	80%	(1,542)	24,850	loose
205	383	$127	85%	(82)	23,390	good
194	362	$134	100%	1,218	22,090	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF
Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF
100% model = 45 sf/ fte office; 120 sf/ exp lab; 38 sf/ cmp lab; 130 sf/ PI office
Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



CEOE - Research

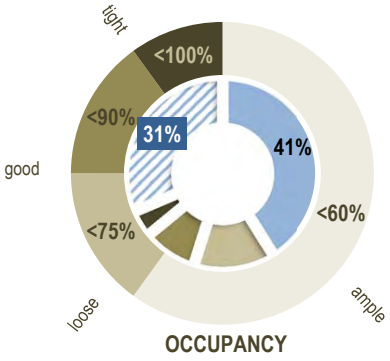
EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
91	122	1.3	719	536	$204	41%		65,403	
		GRANT $					*Experimental Lab*	*40,339*	
45		$13,361,741	TOTAL				*Research Office*	*25,064*	
		$0	INDIRCT $						
46		$146,832	TOT $ / PI						
							Current Assigned PI Research Supply (ASF)	65,403	ample

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
493	368	$298	60%	20,565	44,838	loose
394	294	$372	75%	29,532	35,871	good
296	221	$497	100%	38,500	26,903	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF
Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF
100% model = 45 sf/ fte office; 120 sf/ exp lab; 38 sf/ cmp lab; 130 sf/ PI office
Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



CEHD - Research

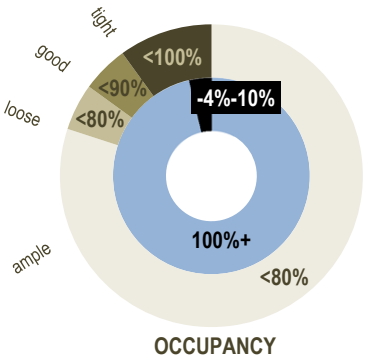
EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
59	266	4.5	337	75	$968	104%		19,895	
		GRANT $					*Experimental Lab*	*2,386*	
2		$19,253,277	TOTAL				*Research Office*	*17,509*	
		$0	INDIRCT $				*Field Research Space*	*not included*	
57		$326,327	TOT $ / PI						
							Current Assigned PI Research Supply (ASF)	19,895	see below

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
439	97	$743	80%	(6,008)	25,903	loose
413	92	$790	85%	(4,484)	24,379	good
351	78	$929	104%	(827)	20,722	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF
Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF
100% model = 45 sf/ fte office; 120 sf/ exp lab; 0 sf/ cmp lab; 130 sf/ PI office
Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



COE

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
134	510	3.8	1,586	417	$207	44%		212,475	
		GRANT $					*Experimental Lab*	*154,422*	
111		$44,033,321		TOTAL			*Research Office*	*58,053*	
		$0		INDIRCT $					
23		$328,607		TOT $ / PI					
						Current Assigned PI Research Supply (ASF)		212,475	ample

MODEL

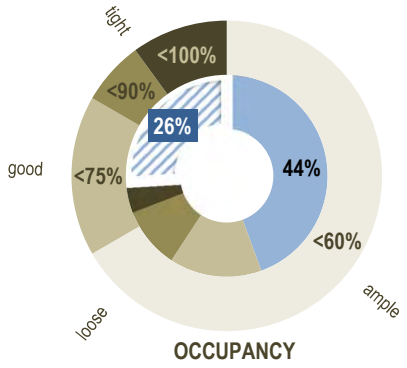
SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	RES DEMAND ASF	FIT
1,057	278	$311	67%	70,887	141,588	loose
845	222	$389	83%	99,201	113,274	good
704	185	$466	90%	118,083	94,392	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

100% model = 45 sf/ fte office; 120 sf/ exp lab; 38 sf/ cmp lab; 130 sf/ PI office

Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



CHS - Research

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
91	128	1.4	505	359	$243	67%		45,949	
EXP PI		GRANT $					*Experimental Lab*	*26,834*	
74		$11,157,417		TOTAL			*Research Office*	*19,115*	
CMP PI		$0		INDIRCT $					
17		$122,609		TOT $ / PI					
						Current Assigned PI Research Supply (ASF)		45,949	see below

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
568	404	$216	60%	(5,700)	51,649	loose
454	323	$270	75%	4,630	41,319	good
341	242	$360	100%	14,960	30,989	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

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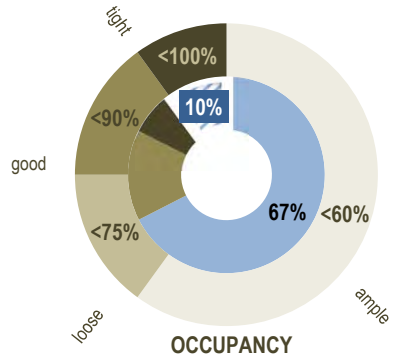
Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



CANR TOTALS - Experimental+Computational Research

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
68	194	2.9	1,065	373	$206	52%		72,392	
EXP PI		GRANT $					*Experimental Lab*	49,989	
55		$14,911,326		TOTAL			*Research Office*	22,403	
CMP PI		$0		INDIRCT $					
13		$219,284		TOT $ / PI					
						Current Assigned PI Research Supply (ASF)		72,392	ample

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
928	325	$236	60%	9,300	63,089	loose
742	260	$295	75%	21,920	50,471	good
557	195	$394	100%	34,540	37,854	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

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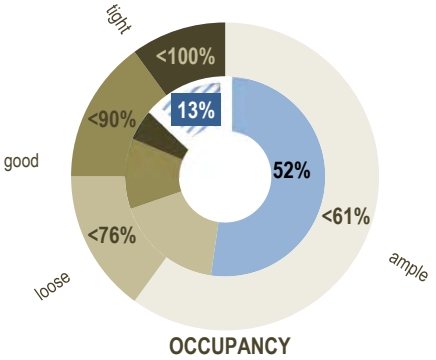

Research Space Utilization

CANR - Dean's Office

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
2	6	3.2	2,266	719	$225	29%		4,532	
		GRANT $					*Experimental Lab*	*4,160*	
2		$1,019,394	TOTAL				*Research Office*	*372*	
		$0	INDIRCT $						
		$509,697	TOT $ / PI						
						Current Assigned PI Research Supply (ASF)		4,532	ample

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
1,085	344	$470	60%	2,360	2,170	loose
865	275	$589	75%	2,800	1,730	good
650	206	$784	100%	3,230	1,300	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF
Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF
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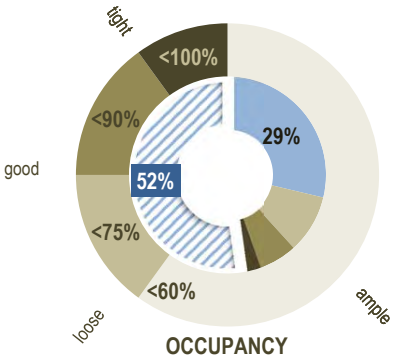

CANR - Animal & Food Sciences

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
21	46	2.2	1,174	542	$171	42%		24,657	
EXP PI		GRANT $					*Experimental Lab*	*19,185*	
21		$4,207,863	TOTAL				*Research Office*	*5,472*	
CMP PI		$0	INDIRCT $						
		$200,374	TOT $ / PI						
						Current Assigned PI Research Supply (ASF)		24,657	ample

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
812	375	$247	60%	7,600	17,060	loose
650	300	$308	75%	11,010	13,650	good
488	225	$411	100%	14,420	10,240	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF
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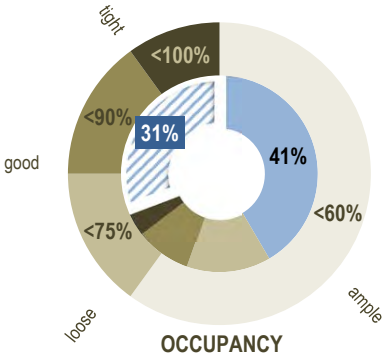

CANR - Applied Economics & Statistics

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
13	29	2.2	429	193	$188	73%		5,583	
		GRANT $					*Experimental Lab*	*791*	
		$1,052,291	TOTAL				*Research Office*	*4,792*	
		$0	INDIRCT $						
13		$80,945	TOT $ / PI						
						Current Assigned PI Research Supply (ASF)		5,583	ample

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
394	177	$206	80%	460	5,120	loose
371	166	$218	85%	760	4,820	good
315	141	$257	100%	1,480	4,100	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF
Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF
100% model = 45 sf/ fte office; 120 sf/ exp lab; 38 sf/ cmp lab; 130 sf/ PI office
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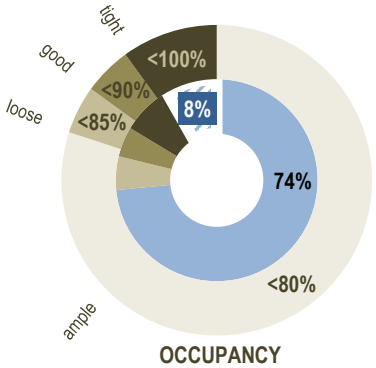

CANR - Entomology & Wildlife Ecology

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
7	27	3.8	1,335	350	$252	57%		9,344	
		GRANT $					*Experimental Lab*	*5,689*	
7		$2,356,647	TOTAL				*Research Office*	*3,655*	
		$0	INDIRCT $						
		$336,664	TOT $ / PI						
							Current Assigned PI Research Supply (ASF)	9,344	ample

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
1,266	332	$266	60%	480	8,860	loose
1,013	266	$332	75%	2,250	7,090	good
760	199	$443	100%	4,020	5,320	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

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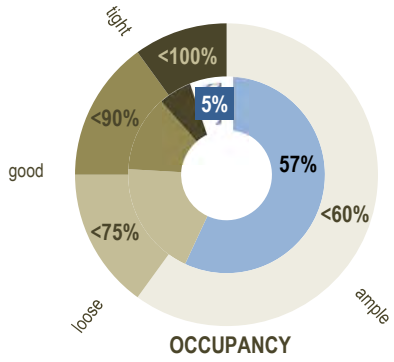
Research Occupancy Rate = 100% Research Demand (ASF) / Current Assigned PI Research Supply (ASF)



CANR - Plant & Soil Science

EXISTING

PI	FTE	FTE / PI	SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY		SUPPLY ASF	FIT
25	87	3.5	1,131	326	$222	62%		28,276	
		GRANT $					*Experimental Lab*	*20,164*	
25		$6,275,131	TOTAL				*Research Office*	*8,112*	
		$0	INDIRCT $						
		$251,005	TOT $ / PI						
							Current Assigned PI Research Supply (ASF)	28,276	see below

MODEL

SF / PI	SF / FTE	ROA TOT $/SF	OCCUPANCY	LAT VACANT	DEMAND ASF	FIT
1,131	326	$222	62%	0	28,280	loose
937	270	$268	75%	4,850	23,430	good
703	202	$357	100%	10,710	17,570	tight

Latent Vacant = (Supply ASF plus Core & Hi Spec ASF) less Research Demand ASF

Assigned SF (ASF) + Unassigned SF (USF) = Research Need SF

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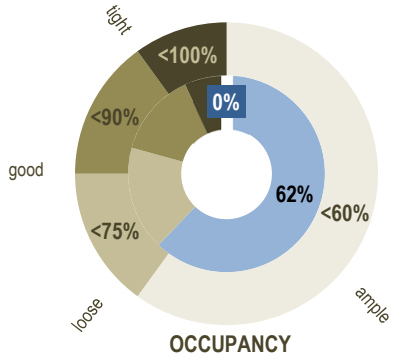


Research Space Utilization - Glossary of Terms

Glossary of Terms with Brief Explanation

ACRONYMS

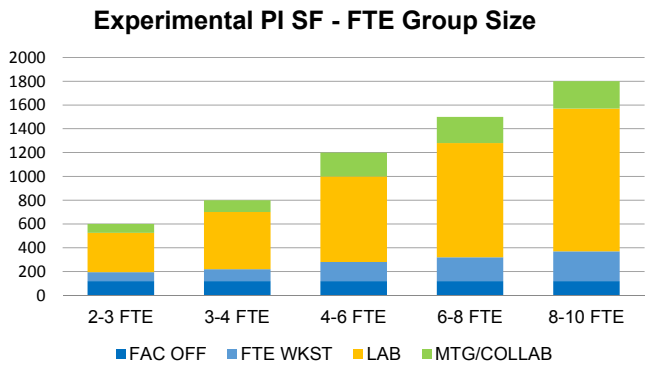
University of Delaware - Colleges

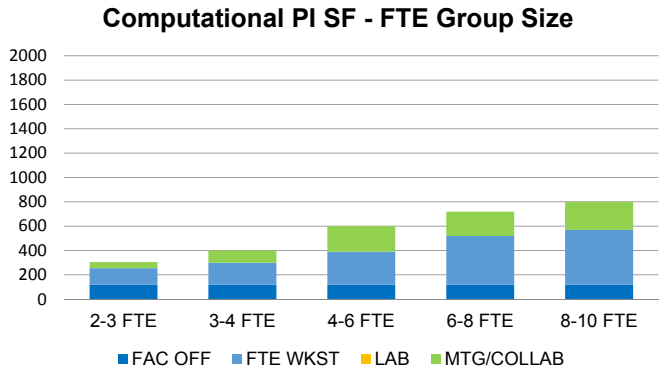
CANR	College of Agriculture and Natural Resources
CAS	College of Arts and Sciences
CBE	Lerner College of Business and Economics
CEOE	College of Earth, Ocean, and Environment
CEHD	College of Education and Human Development
COE	College of Engineering
CHS	College of Health Sciences

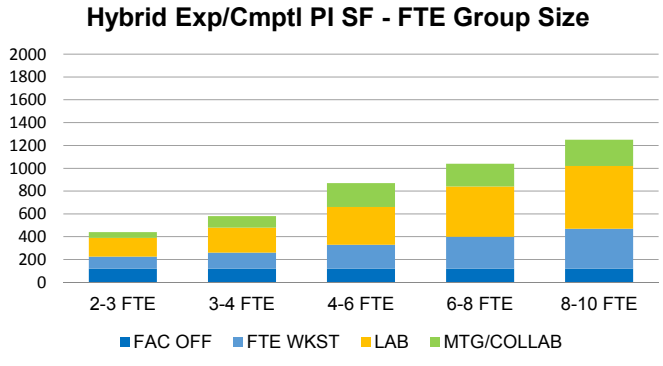
ASSIGNED PRINCIPAL INVESTIGATOR SPACE

Space for PI Research Group
Allocated per Principal Investigator

- SF based upon paid full-time equivalents (FTEs)
- Each full-time research-active tenured or tenure-track faculty member assigned 1 faculty office
- Each paid research staff, post-doc, student FTE for experimental research space = XXX net square feet of assigned laboratory and shared laboratory support space
- Each paid staff/student FTE for computational/ theory research = XXX ASF of research space







DATA SOURCES - RESEARCH SPACE UTILIZATION STUDY

- All research personnel, space and grant expenditure data is sourced from university data records provided to the planning team by the University.

- Facilities, Real Estate & Auxiliary Services, Planning and Project Delivery Space Management Space Inventory – functional SF by room

Data source – Facil_Space_Inventory_Totals_JCI edit 071216

- Human Resources

Tenured & tenure-track (TTK) research-active principal investigators, other research faculty, professional & technical staff, graduate and undergraduate paid FTE quantities)

Data source –Campus Frmwk Research FTE 06 21 2016

- Research Office

Federal, State and private sponsored (extramural research grant dollar expenditures

Data source – 2016_07_27 – 2015 Grant Dollars

FICM

The FICM codes (formerly HEGIS) are an institutional tool format to report and maintain an institutional space inventory and provide answers to such basic questions as how much space is available, what kind of space is it, to whom is it assigned, and how efficiently is it being used and maintained. This information permits institutions to assess the adequacy of their current space and allows them to begin planning for future space needs.

The manuals' intent reflects the perspective that along with human resources and financial assets, space is one of the primary resources of an educational institution.

U.S. Department of Education, National Center for Education Statistics. (2006). Postsecondary Education Facilities Inventory and Classification Manual (FICM): 2006 Edition (NCES 2006-160). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

FTE

Full-time equivalent (FTE) = employee's scheduled hours divided by employer's hours for a full-time work week.

A unit measure to indicate the paid workload of a person (or student) on a full-time basis in a way that makes workloads comparable. For example, if a 40-hour work week is observed as a full week, an employee scheduled to work 40 hours per week is a single FTE, or 1.0 FTE. 20-hour work week = 0.5 FTE.

With specific reference to the use of FTE in this study, the data presented in the model calculated the quantity of paid research employees: research-active, tenured & tenure-track principal investigators, other research faculty, professional & technical staff members and students in FTE units as defined by the human resources department's data provided to the planning team by the University.

This study is focused on modeling research space need allocation. As graduate and undergraduate FTE are traditionally allotted somewhat proportionately less space than full-time professional and technical staff, we recommend a proportional adjustment to the FTE count to reflect this. The difference in amount of assigned space primarily impacts the office portion of the space allocation. For graduate students, the recommended typical FTE space reduction is 85%. Undergraduate students, who are anticipated to spend most of their part-time work efforts inside research labs with little need for office space and who are expected to share lab bench positions, are recommended to have the typical FTE research space allocation reduced by 50%.

FTE – RESEARCH-ACTIVE RESEARCH SPACE OCCUPANTS

In general, this group includes non-PI, non-tenure track (NTT) research faculty & professional staff with fixed, part-time, limited-term, contract, contingent, sessional, or affiliated contract status, supported by self-funded or other regular source of extramural research funding. Research-active lecturers, instructors, adjuncts, assistant, associate, or full professor, junior, senior or unranked research faculty, visiting faculty, scientist or engineer levels I-III, or junior,

senior, associate or unranked research fellows, trainees, post-doctoral fellows, post-graduates, research assistants or fellows, graduate or undergraduate students.

FTE – EXCLUDED FROM RESEARCH FTE COUNTS
Non-tenure track (NTT) non-research dedicated teaching course assistants or fellows with either fixed, part-time, limited term, contract, contingent, sessional, or affiliated contracts, honorary emeritus/emerita , studio or industry faculty, professor of (professional) practice whether assistant, associate, full professor, or unranked, graduate or undergraduate students.

FTE CENSUS
Determine how many people typically occupy a PI's assigned space. A operations survey sent to each department may be effective. Alternately, an occupancy census performed over a length of time at regular intervals is another option. Another source is the human resources database that documents annual FTE count by job description.

GRANT EXPENDITURES
Data on local grant expenditures is more useful than data for grant awards which often contains dollars spent elsewhere with no local facility impact. Distinguish grant expenditures spent on campus, excluding grant flows outbound to other institutions. Also, distinguish federal grant expenditures from state/local and other sources.

OCCUPANCY DENSITY
Life safety building codes categorize research building occupancy as a commercial office, at an anticipated occupancy density of 100 square feet per person. In our experience, the actual planned occupancy is closer to 250-300 square foot per person, almost 1/3 less dense.

PRINCIPAL INVESTIGATOR
For the purposes of research space allocation research-active, tenured or tenure-track (TTK) faculty member is a most useful definition for a principal investigator.

The principal investigator (PI) taxonomy generally includes assistant, associate and full professors further classified as members of the research faculty, clinical research faculty, distinguished faculty, and research administrators. It regularly includes deans, associate deans, chairs, executive directors, directors and research coordinators. (refer to FTE)

PI - COMPUTATIONALIST / THEORIST / POLICY PLANNERS
Researchers assigned research space and associated research work areas in support of abstract or virtual research thought experiments. Their research space may be referred to as "dry" space to distinguish it from experimentalist "wet" space. It closely resembles typical office space, yet is distinguished by its' research function. Assigned research space may double as a "home-base" office/ workstation furnished with a computer, desk, file cabinets and guest seating. In certain disciplines, it is clearly distinct from the "home-base" office. For example, work group offices may be assigned in an office suite furnished with shared work tables and casual seating focused around white boards and wall-mounted display monitors. Computational research may also have sophisticated computer-modeling hardware rigs in their research space.

PI - EXPERIMENTALIST
A researcher who performs "concrete" experiments, as distinguished from "thought experiments. Their research space is generally recognized as a "laboratory," environment and is commonly independent of and separated from an assigned "home-base" office.

Experimentalist research space may be referred to as a "wet" lab to distinguish it from "dry" computational labs, or theoretical research space. Note that the "wet" label is problematic. Waterless experimental physics and engineering appear to be "dry" given the absence of sinks, but are more similar to their "wet" counterparts given dense utility infrastructure needs.

Scale and type of experimental lab space vary widely from relatively small research support rooms to warehouse-scale industrial pilot plants and field installations. Richly-resourced with electrical, HVAC and other utilities, experimental labs are robust environments designed to tolerate regular use of hazardous gases and chemicals. Often furnished with stout laboratory casework with chemical resistant countertops and deep utility sinks, they are generally well-appointed with a wide range of benchtop and floor-mounted research instruments, from the common microscope and refrigerator to

the cutting-edge exotic high resolution imaging instruments.

PI - HYBRID
Researchers whose research work combines significant computational-focused abstract research as well as "concrete" experimental work. Research activities and associated space needs vary and may well feature both computationalist (dry) and experimental (wet) work areas. Among the spectrum of hybrid researchers, clinical research specialists often qualify as a member of this class when they require both experimental lab and "dry" ambulatory clinical exam space. Hybrid research space demand per FTE is then less than a full-time experimentalist allocation, yet more than a dedicated computationalist.

RESEARCH SPACE - CORE LABS & HIGHLY SPECIALIZED LABS
Core laboratory space to house shared research equipment, instruments, and other technologies made available to the whole institutional platform, or beyond to a state or region. When strictly defined, Core labs are often staffed with dedicated technical advisors and experts who provide services on a fee-basis. Core lab types may range from highly sophisticated, exotic imaging instrument suites to shared media prep/ glassware wash and sterilizer facilities, from mundane freezer farms to robotic biorepositories, and electronics repair machine shops serving a building, research precinct or multiple institutions.

Highly specialized laboratories are extraordinary, idiosyncratic, or exotic space types often defined by specialized functions, equipment or instrument layout, spatial clearances, or environmental or containment requirements. Examples of highly specialized labs include: high bay labs, microelectronic fabrication clean rooms, wind tunnels, large-scale structural testing labs, linear accelerators.

The SF model target for both core labs and highly specialized labs are considered outside and above typical FTE research space allocation metrics.

The trending ratio of shared core lab space and highly specialized labs relative to the amount of assigned PI research space is increasing. A target ratio of 8% may be a reasonable long-range benchmark target for future development over next 15 years.

Specialized equipment is being centralized to promote higher utilization. If there is an increase in high-quality Core labs space, there may be justification to consider reducing the amount of assigned PI space formerly needed to house dedicated equipment.

RESEARCH SPACE – PRINCIPAL INVESTIGATOR ASSIGNED SQUARE FEET (ASF)
Determining which and how much assigned space each PI is responsible for is a complex, but achievable task. Its' units are assigned square feet (SF) of space assigned to paid, full-time equivalents (FTEs) who reside and work in the research area. It is generally equivalent to the research space as tracked by the Office of Institutional Research. The components typically include:

- research offices, work areas and laboratory spaces associated with research activities

- space for one full-time research-active, tenured or tenure-track faculty (TTK) member

- research staff, post-doc and graduate student FTE working on experimental research includes office, laboratory and shared laboratory support space

- research staff, post-doc, and graduate student FTE working on computational or theoretical research includes office and other dedicated research work space

- a prorated proportion of locally-shared collaboration areas including conference rooms regularly reserved for use by research staff working on research projects. For example, if shared with five other PI research groups, 1/5 of the space would be included in each PI's assigned space. A loose definition may exclude collaboration areas.

RETURN ON ASSET
From an operational perspective, research institutions do generate an economic return on their research space assets. That return can be measured in many ways. One noteworthy return are indirect cost recovery funds generated by sponsored research grant activity in research space. Many institutions have established reasonably achievable productivity targets for the amount of indirect cost recovery that needs to be generated by their research facilities.

One metric is a quantification of how many dollars of expenditures are derived from each square foot of assigned research space. Known as "Return on fixed asset (ROA)", this calculation is a tool that assesses an institutions' success at sustainably managing its' research space facility portfolio.

ROA is measurable and many institutions seriously consider the results. They can also be compared to national benchmarks, as well as across a single campus.

How is ROA calculated? Divide an institution's annual sponsored research expenditures by the square feet of research space assets, ROA is presented as a $/SF. This measure is also referred to as "(grant) dollar density," fixed asset utilization rate, or capacity utilization rate.

- Both direct and indirect costs should be included in the calculation.

- ROA targets will likely increase principal investigator awareness as to the amount of Indirect Cost Recovery (ICR) generated through sponsored grants.

- When the goal is to measure research space utilization, the most effective focus is on ROA for research space assigned to principal investigators. This focus excludes research space for core laboratories and highly specialized laboratories.

Economic returns include non-monetary ROA performance. Numbers of patents filed, grant application submitted, citations in peer-reviewed publications, conference presentations, peer-recognition awards, and other measures of scientific impact such as serving on national committees, or editorial boards.

SQUARE FEET (SF) – USABLE AREA OR ASSIGNABLE (ASF)
Square feet or usable area describes the space assigned for a tenant's staff, furniture, equipment and dedicated common support areas, usually including interior tenant-created wall thicknesses. ASF typically excludes dedicated circulation corridors and passageways that lead to life safety code required egress stairs or exits and other building elements that may include structural columns and lateral bracing, elevator shafts, toilets, janitor's closets, machine rooms, HVAC shafts, electrical and IT closets. (International Facility Manager's Association (IFMA) (ASTM Standard E 1836-01) standard to measure space).

Net square feet (NSF) is a more discrete spatial measure described as the functional space within the walls of a room, excluding wall, column and shaft thicknesses, toilets, stairs, exit corridors, and other building infrastructure space.

UTILIZATION METRIC CALCULATIONS - MODEL
(refer to DATA SOURCES)

PEOPLE
- Everyone measured in FTE units

SPACE (FICM)
- 250 Research / Nonclass Laboratory
- 255 Research/ Nonclass Laboratory Service
- 310 Office
- 380 Grad Student/ Post-Doc Workstation Offices
- 570 Animal Facilities
- 575 Animal Facilities Service
- 580 Greenhouse
- 585 Greenhouse Service
- 720 Shop
- 725 Shop Service

GRANT $
- Federal, State & Private Expenditures

UTILIZATION METRICS - Academic, Commerce & Industry
AVIATION FLEET
- Passengers Flown per # Available Seats

ACADEMIC CLASSROOM & LABORATORIES
- Students in Attendance per # Available Seats
- Periods Reserved / Overall Room Period Availability

COMMERCIAL RETAIL SPACE
- Sales per SF

RESTAURANT
- Parties Served per Table / # Available Tables (Turns per Table)

UTILIZATION METRICS – RESEARCH SPACE

- Assigned SF/ PI
- Occupied SF/ FTE

CAVEATS, LIMITATIONS & SHORTCOMINGS

- Understanding a department's ROA is a clearly useful metric, yet it is only one dimension of utilization. As a sole metric indicator, ROA is not rich enough in much the same way that knowing the relative humidity is not good enough to predict next week's weather. It is a much more useful when combined and weighed together with building condition assessment, and locally sensitized to current cultural and socio-political conditions and circumstances.

- Direct comparisons of ROA between different institutions can be problematic as there are a complex number of variables

- ROA is a relatively simplistic analysis of the research space occupancy rate relative to available assigned square foot capacity. This examination is made irrespective of architectural quality, building age, time past since last renovation, nor structural, mechanical, electrical and plumbing infrastructure condition or systems capacity.

- The three data sources are not expected to compatibly self-organize when portions are selectively combined together. Understanding this, mismatches were anticipated in how cleanly data mapped to a College's departments. Imprecise data alignment in the University's databases lessens the methodological rigor to measure utilization. Its' essence is as a soft science conceding less exactitude and objectivity than a hard science.

- FTE assignments to centers or institutes have no directly-associated sponsored research expenditures as the dollars are attributed by PI who is associated with a home department.

- Multi- or interdisciplinary centers and institutes are aligned with one department – understanding that staff and grant expenditures cross departmental and colleges.

- Align an institution's utilization of space resources with their strategic initiatives. Forecasts for recruiting and retention demand, planning, scheduling, capacity utilization, maintenance and many other factors are profoundly impacted by current utilization.

CHARACTERISTICS OF A CLEAR AND TRANSPARENT SPACE MANAGEMENT POLICY

Establish Clear Space Management Authority

Research space assignments to specific units or investigators are increased or decreased under the authority of the Dean or their designee. Research space is not indefinitely assigned to specific units or investigators.

Identify Who the Responsible Parties Are and Define Their Role in Managing Space Resources

Principal Investigators are primarily responsible for the effective use of their assigned research space. Department chairs and institute directors are responsible for managing faculty research efforts to meet productivity and performance targets.

At some institutions, a space planning and management committee is established, comprised of representatives of the executive administration. Their mandate is to: 1) oversee development of space allocation criteria and; 2) implement a transparent, standardized process for new space requests; 3) provide oversight of those who maintain an accurate and up-to-date database on research space use and assignment and assigned as tenant to be responsible for unassigned swing space;

Space Assignment Approaches

Space is assigned and re-assigned based upon a consistent utilization-focused policy considering quality and strategic priorities, as well as productivity and performance, measured using a variety of parameters:

- ROA based upon annual expenditures for both direct and indirect cost recovery

- Actual and awarded pending expenditures are considered, while pending proposals are not

- Indirect expenditures during the prior 12 months and indirect costs associated with net new grants is counted. "Net new grants" refers to the difference between grants lost and

gained over the 12 month assessment period, annualized to a 12-month period

- Indirect costs from planned, hoped for and unfunded grants will not be counted

- Research FTE occupancy where each full FTE is assigned one primary lab bench work station and a pro-rated shared of lab support space plus a desk, while part-time staff share lab, lab support and office workstations

- Quality of research space in terms of design and layout, time since last renovation
- Research space occupancy demand subject and relative to available research space supply

- Space allocation is typically reviewed annually and, if indicated by metrics, adjusted to assure adequate allocation and efficient use of space on an ongoing basis

- FTE counts are calculated using human resource records on an annual basis. Visiting scholars and post-doctoral fellows who are paid directly by outside sources are to be considered on a case-by-case basis

- Experimental lab space, support space, computational lab space, and vivarium space dedicated to one PI counts toward a PI's assignable space

- Shared collaborative conference rooms and break rooms can be allocated on a pro-rated basis

- Shared Core laboratory facilities and administrative space does not count toward a PI's assignable space

- Junior faculty members on start-up packages generally do not have indirect-bearing grants and are an exception. They will be allocated space for (x) FTEs in addition to their faculty office during their start-up period

- Extraordinary space requirements are considered as exceptions and may include unusual equipment-driven space needs, high-intensity clinical research, chemical or biological containment, etc. (see highly specialized labs)

- Tenured faculty members with no FTEs, or no indirect-bearing grants for >(x) months are allocated a faculty office, but no research space. They will be assigned space according to the established metrics at such time as they obtain indirect-bearing research grants and related FTEs