



**Michigan
Technological
University**

BUILD THE FUTURE

CAMPUS MASTER PLAN
TECHNICAL REPORT
AUGUST 2022

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LABORATORY UTILIZATION BY DEPARTMENT

D. STUDENT LIFE ANALYSIS

E. CAMPUS AND COMMUNITY ANALYSIS

Acronyms

Assignable Square Feet (ASF): The sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant or specific use.

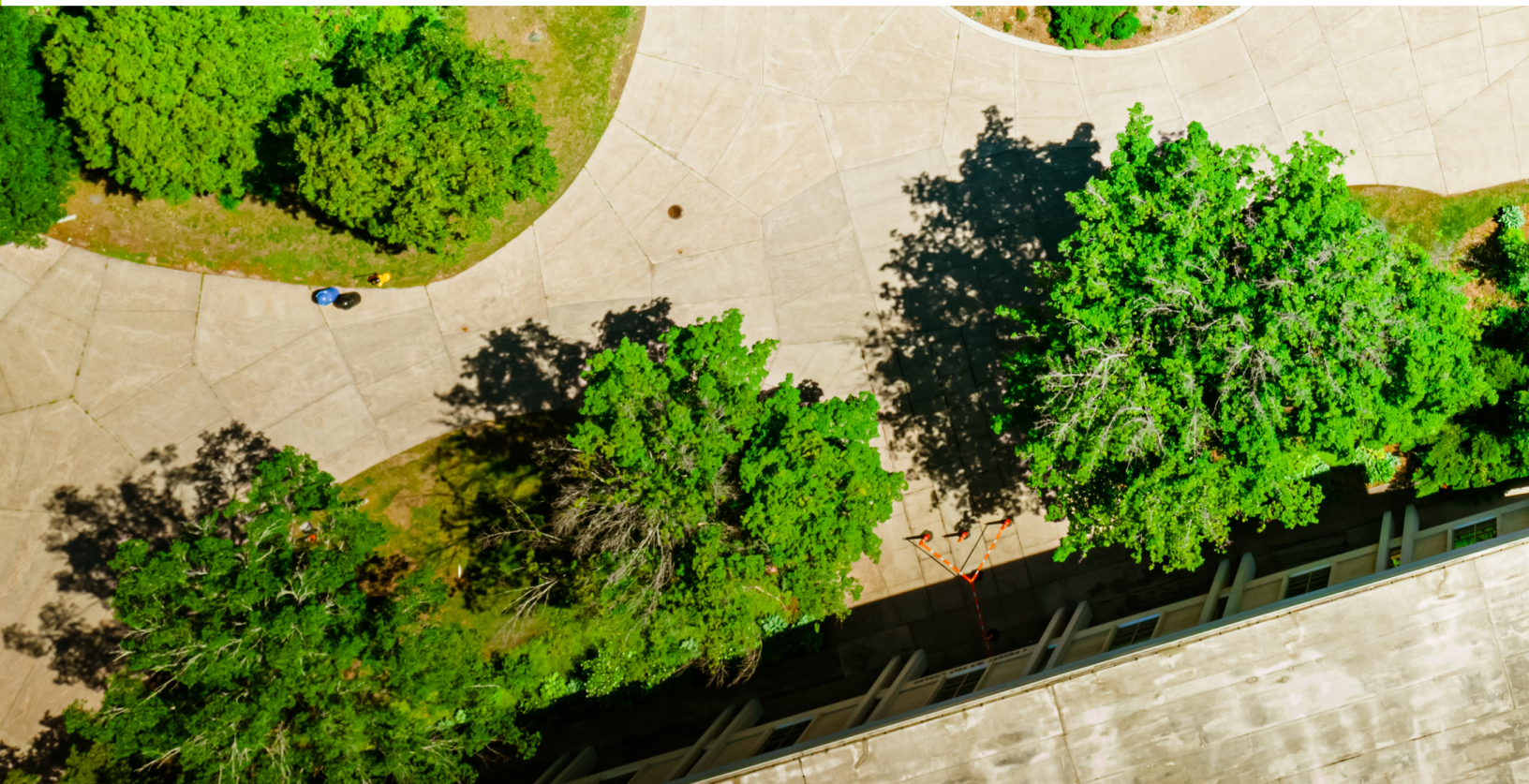
Gross Square Feet (GSF): The sum of all areas on all floors of a building included within the outside faces of its exterior walls, including all vertical penetration areas, for circulation and shaft areas that connect one floor to another.

SMITHGROUP

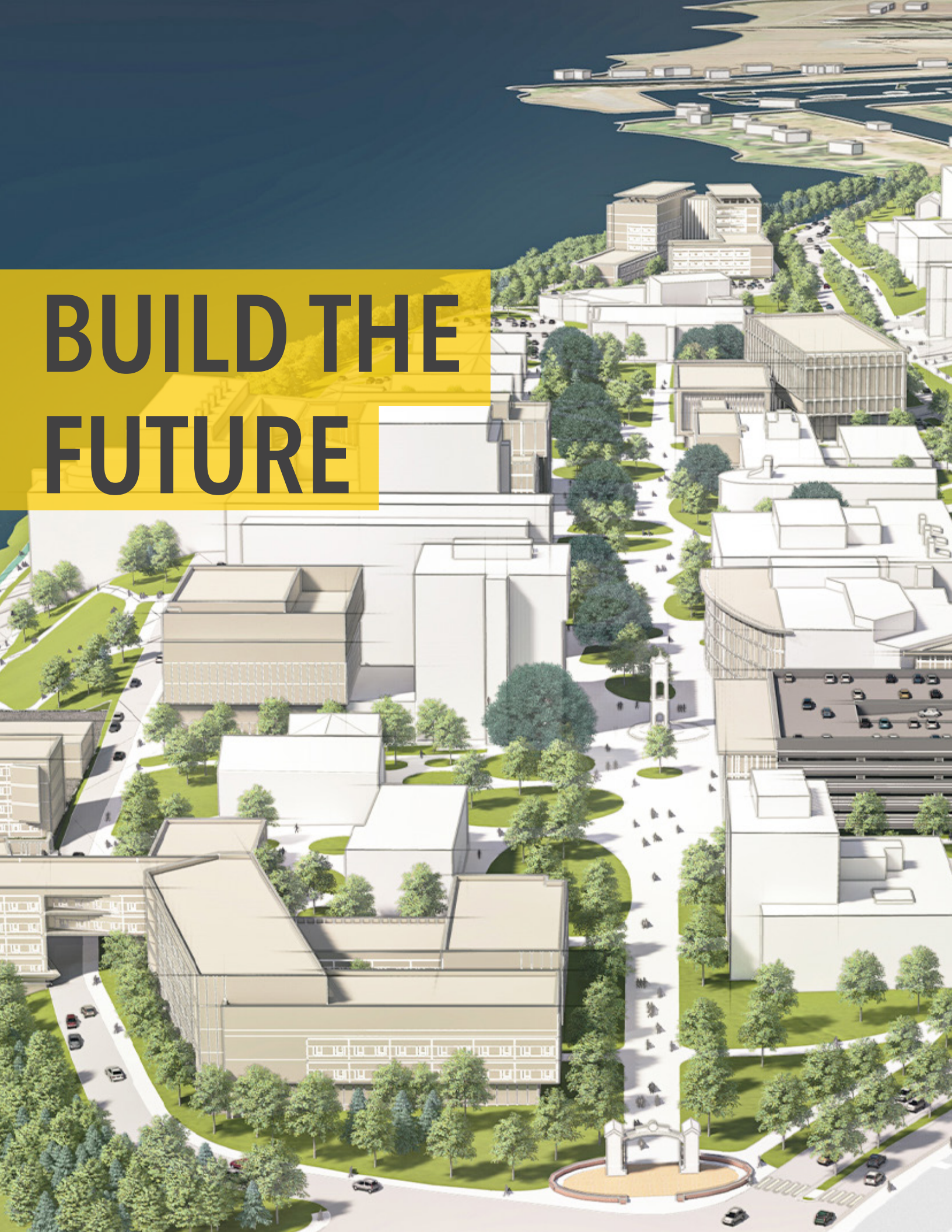
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SUMMARY







BUILD THE FUTURE



A MESSAGE FROM **PRESIDENT KOUBEK**



Richard Koubek
President

As more than 500 faculty, staff, and students engaged in healthy dialogue through a series of campus conversations, it became clear that our vision to become an internationally recognized academic thought leader would need an enhanced campus, equipped to handle leading-edge research and a growing student population. This document is a culmination of those many campus conversations on how we can

realize our goal of becoming a leader in the Fourth Industrial Revolution.

This past spring, we broke ground on the H-STEM Engineering and Health Technologies Complex (H-STEM Complex), where multiple disciplines will come together to engage in innovative research to improve the health and quality of life, not just of Michigan’s citizens, but of people around the globe. Progress on this project is just one of the many exciting improvements and enhancements you will read about in the following pages.

After nearly 140 years serving as the Upper Peninsula’s leading research institution and the state’s premier STEM-based university, Michigan Tech has a new, comprehensive blueprint for what comes next. We are building the future and encourage all members of our community to take their place in our vision for 2035 and beyond.

President Rick Koubek
Michigan Technological University

VISION 2035

EXCELLENCE AND INNOVATION

“The Vision 2035 Campus Plan ensures that Michigan Tech takes the next steps forward that are crucial to our mission to create solutions for society’s challenges by delivering action-based undergraduate and graduate education, discovering new knowledge through research, and launching new technologies through innovation.”

Rick Koubek, President

For more than 135 years, Michigan Technological University has offered a distinct experience. Grounded in the wild yet welcoming landscape of the Keweenaw Peninsula, Michigan Tech is known for its grit and tenacity—but more so for its premier academic programs, groundbreaking research, exceptional student achievements, and pioneering faculty.

As Michigan’s flagship technological university—uniquely positioned at the confluence of science, art, technology, engineering, and human factors—Michigan Tech understands the role we must play in influencing and adapting to the disruptive forces of the 21st century. A series of campus conversations held in 2018-19 identified nine institutional initiatives to further define Tech’s trajectory in the Fourth Industrial Revolution.

The Vision 2035 Campus Plan ensures that Michigan Tech remains equipped for the demands of tomorrow by defining an exciting vision for 2035 and beyond. The premise is simple: Translate the University’s nine strategic initiatives into physical responses to enhance the campus. The impact is profound: Create innovative teaching, learning, and research spaces; develop resilient and sustainable infrastructure; celebrate the “place” of campus; connect to our host community; and enhance the student experience.

BOLD ASPIRATIONS

The campus plan reflects the University’s vision to become a globally recognized technological university that educates students, advances knowledge, and innovates to improve the quality of life—and to promote mutual respect and equity—for all people within the state, the nation, and the global community.

To grow Michigan Tech’s physical capacity and reputation in fulfilling this vision, the campus plan reflects the University’s foundational goals to grow total student enrollment, innovate in academic program delivery, recruit competitive faculty, increase annual research expenditures and international research recognition, and create a transformative residential experience for students.

Taken collectively, these goals underpin the campus plan and signal an exciting new direction for Michigan Tech.

PLAN FOR TOMORROW

The past few years have underscored the need for a highly adaptive campus ecosystem. Michigan Tech is facing a rapid shift in student demographics, the resurgence of the skills economy, and unprecedented technology changes in teaching and learning environments. All of these challenges require facility adaptations and a reprioritized investment strategy.

Through the campus plan, Michigan Tech is well-positioned to lead the state and nation in creating these environments for tomorrow's leaders. We refocused planning efforts on the following University priorities:

- Realign existing facilities to match our national reputation,
- Put "Tech on display"—showcase our best academic, research, and makerspaces,
- Create networked collaboration spaces for faculty and students,
- Express the MTU brand through the physical campus environment,
- Embrace the waterfront, and
- Elevate the student experience.





POWERFUL IDEAS. EARLY PRIORITIES.

Michigan Tech's Vision 2035 Campus Plan is a framework of powerful ideas to manage growth and facilitate decision-making. The plan reflects a series of strategic opportunities, remaining durable yet flexible through expected programmatic, fiscal, and political change.

"Around 60 of our faculty do research that is somehow related to human health. This new H-STEM Complex will give them modern facilities that support collaborative, interdisciplinary research. Having the Departments of Chemistry, Chemical Engineering, Biomedical Engineering, and Kinesiology and Integrative Physiology in one facility, along with our Health Research Institute, will facilitate continued growth of these important activities."

Dave Reed, Vice President for Research

One of the early priorities that reinforce our strategic mission and vision is to complete construction of and populate the H-STEM Engineering and Health Technologies Complex (H-STEM Complex). H-STEM is the application of science, technology, engineering, and math to improve human health and quality of life. This capital outlay project addresses what Michigan Tech recognizes to be a critical need: industry-relevant, STEM-based educational and research programs in health- and human-centered engineering.

Michigan Tech’s STEM-focused niche allows it to contribute to the design of human-centered technologies (e.g., therapeutic devices, instruments, sensors, and preventative strategies) through research, development, and education. The H-STEM Complex will permit research teams from 10 different departments to work together in collaborative spaces with shared equipment. Ground for the complex was broken April 29, 2022, and the project is planned to be completed and the building occupied in early 2024.

Another campus priority is to develop and advance the Center for Convergence and Innovation. The Center for Convergence and Innovation will prepare students for lifelong prosperity and employability through relevant, contemporary programs steeped in digital technologies—supporting and driving cutting-edge, market-centered research in computing fields. The center will further transform Michigan Tech into an academic institution that reflects the technological, economic, and social realities of the Fourth Industrial Revolution.

The campus plan also supports the University’s priorities to reinvest in core academic and research facility renovations, enhance the Memorial Union Building to better serve students, and augment student housing and dining offerings.



H-STEM COMPLEX: EXTERIOR



H-STEM COMPLEX: INTERIOR

RESEARCH

ADVANCING THE HUMAN CONDITION

Michigan Tech is making a difference through our groundbreaking research. We are leveraging our “technology in service of the human condition” model to address today’s intractable problems—resilient communities, health disparities, social and economic inequality, and climate change. The next 10 years of research growth and differentiation for Michigan Tech are essential, and the implications for the campus plan are important.

COLLABORATIVE GROWTH MODEL

Critical elements of our research future include adding additional principal investigator research faculty and increasing annual reported research expenditures. Michigan Tech seeks to achieve a goal of \$210 million in sponsored awards through the 2035 plan horizon, a significant increase in research activity. Key strategies to achieve these goals are four-fold:

- Establish an accelerated enrollment trajectory for graduate and doctoral students to match principal investigator faculty growth.
- Repurpose existing facilities and add new space to meet the needs of increased research activity. Additional swing space is essential to simultaneously address both research expansion and existing facility renovations.
- Challenge where and how and research activities are delivered. Advocate for a transdisciplinary, flexible, and theme-based model that realigns program affinities and blurs physical boundaries between colleges and academic units.
- Incentivize business and industry partnerships and cooperative space sharing.

Tech @ the Water

The confluence of terrestrial, atmospheric, energy, and life science research are hallmarks of Michigan Tech. The campus plan envisions research transformations—through both new and renovated facilities—to create additional research clusters and new centers and institutes. Strategic research investments on the waterfront and academic core position Michigan Tech to lead global conversations about the future of regenerative campuses, their role in decarbonization, and transformation of post-industrial landscapes.





Cutting-edge Partnerships

Michigan Tech continues to integrate experiential learning into the student experience. The next generation of integrated research spaces will bring together business and industry partners with faculty, graduate, and undergraduate students to provide real-world projects and job-ready experiences to prepare the next generation of Husky leaders. We're ready to go.

Research Powerhouse

It's a question of scale, really. Michigan Tech offers students the opportunity to explore multidisciplinary research facilities ranging from macro to micro subject matter. Our students ask better questions because of this experience—leveraging cutting-edge facilities and renowned faculty. The campus plan recommends both new and renovated facilities and more research faculty to allow our students to solve the world's leading problems.

ACADEMICS

OUR ETHOS

Students and their success come first at Michigan Tech. We celebrate the importance of teaching and learning spaces as central to our purpose. We believe in the value of face-to-face education, intimate faculty relationships, and a uniquely residential experience. This differentiates Michigan Tech and remains at the core of our ethos today as Michigan's flagship technological university. Today, the University educates a very diverse student body offering more than 125 programs at the undergraduate, graduate, and doctoral levels.

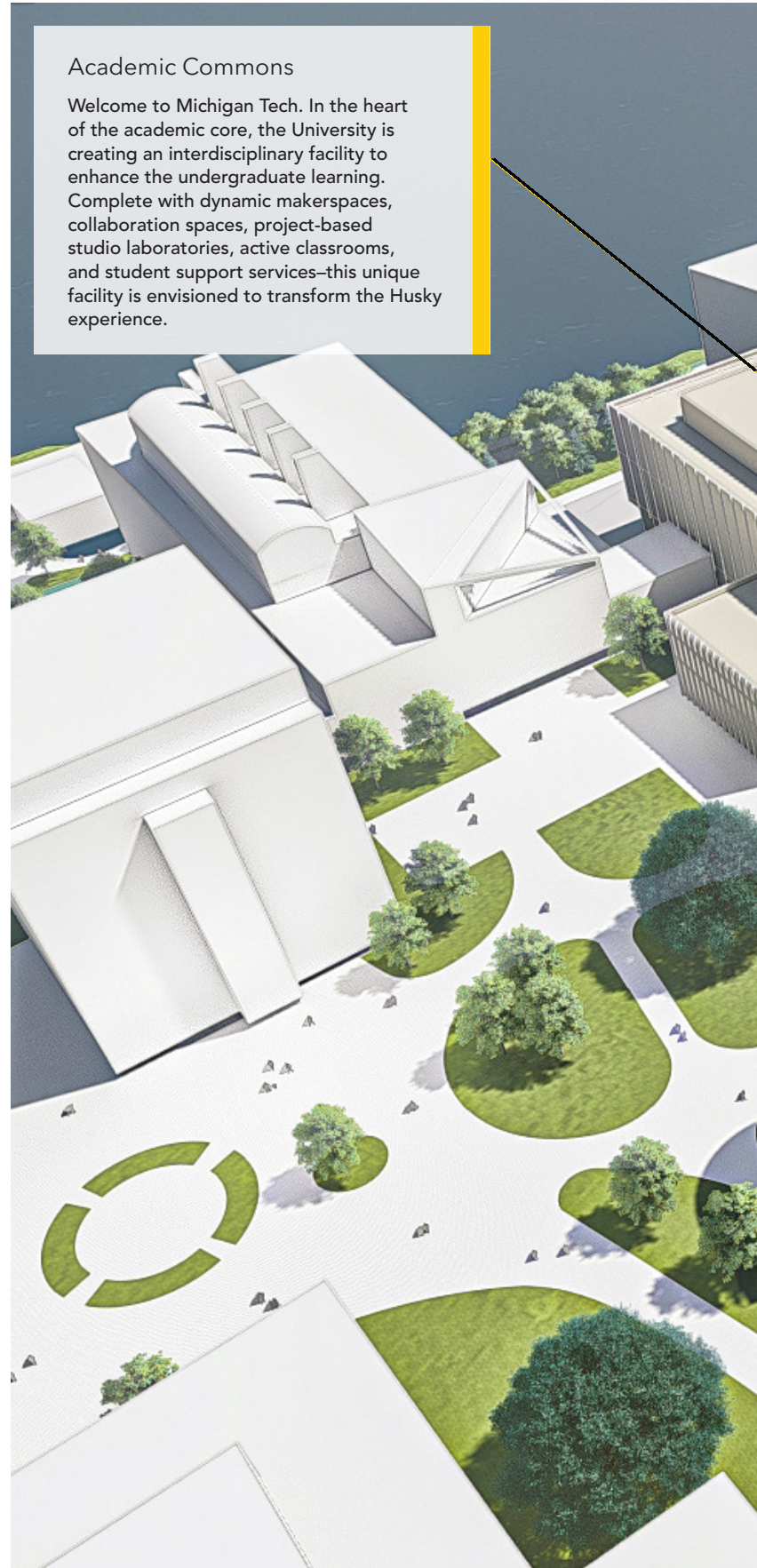
REPOSITION FOR EXPERIENTIAL EDUCATION

Michigan Tech promises students an unparalleled learning environment. To fulfill that promise, the campus plan recommends several initiatives to reposition the academic core:

- Create a technology-rich undergraduate commons in the campus core containing experiential and project-based learning spaces at the intersection of arts and humanities, science and technology, and engineering,
- Create additional medium- and large-capacity teaching laboratories,
- Develop additional collaboration spaces for informal student and faculty interaction,
- Create comprehensive makerspaces, and
- Diminish the role of large lecture hall classrooms, migrating learning to smaller-scale learning environments.

Academic Commons

Welcome to Michigan Tech. In the heart of the academic core, the University is creating an interdisciplinary facility to enhance the undergraduate learning. Complete with dynamic makerspaces, collaboration spaces, project-based studio laboratories, active classrooms, and student support services—this unique facility is envisioned to transform the Husky experience.



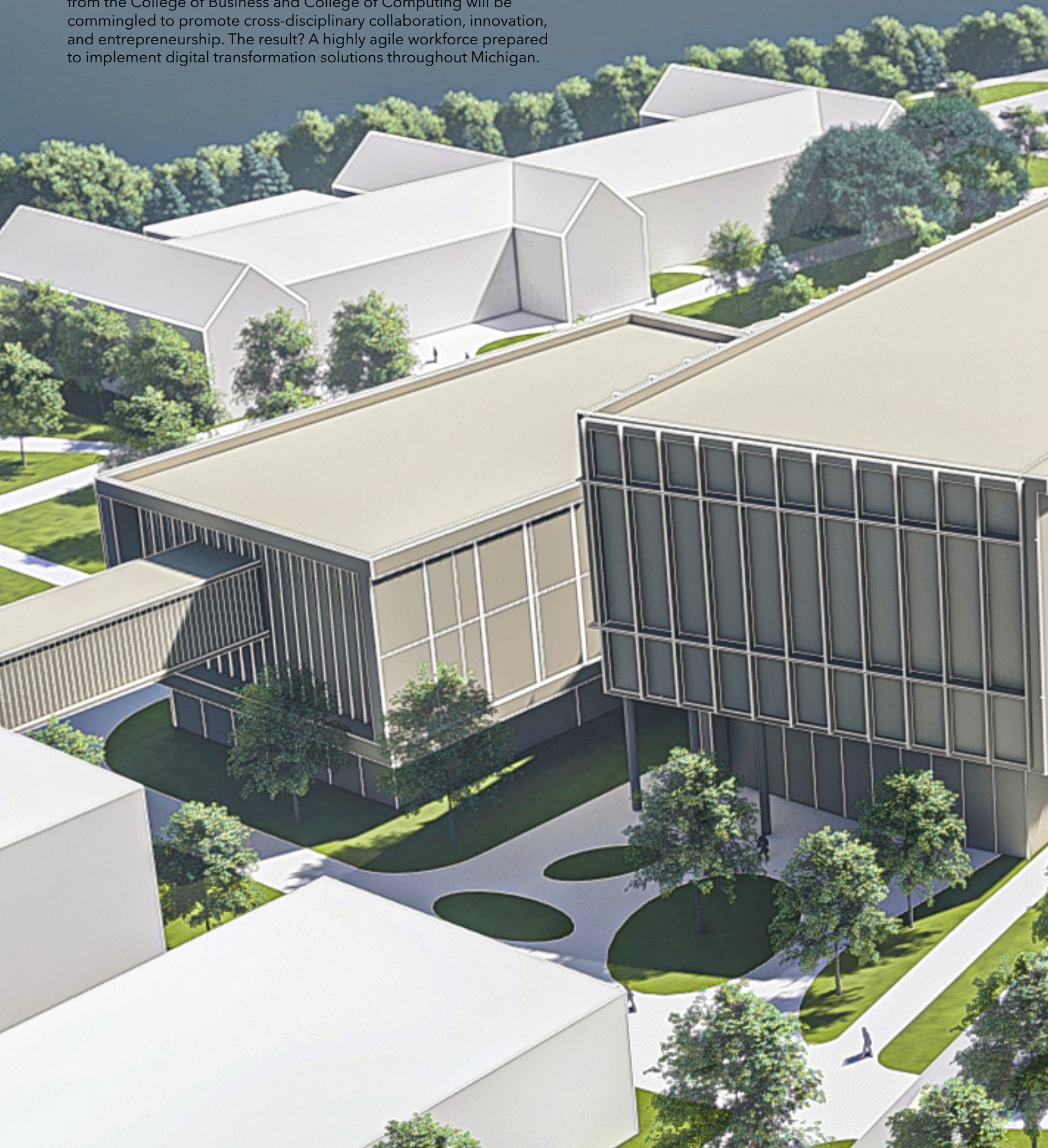


Modern and Interactive Instruction

Problem-solving was never so important. Imagine team-based projects with student colleagues from diverse backgrounds—business, computing, engineering, arts and humanities, and science. Michigan Tech is implementing facility renovations to reshape the classroom and laboratory experience to provide the Michigan Tech difference: real-world interaction.

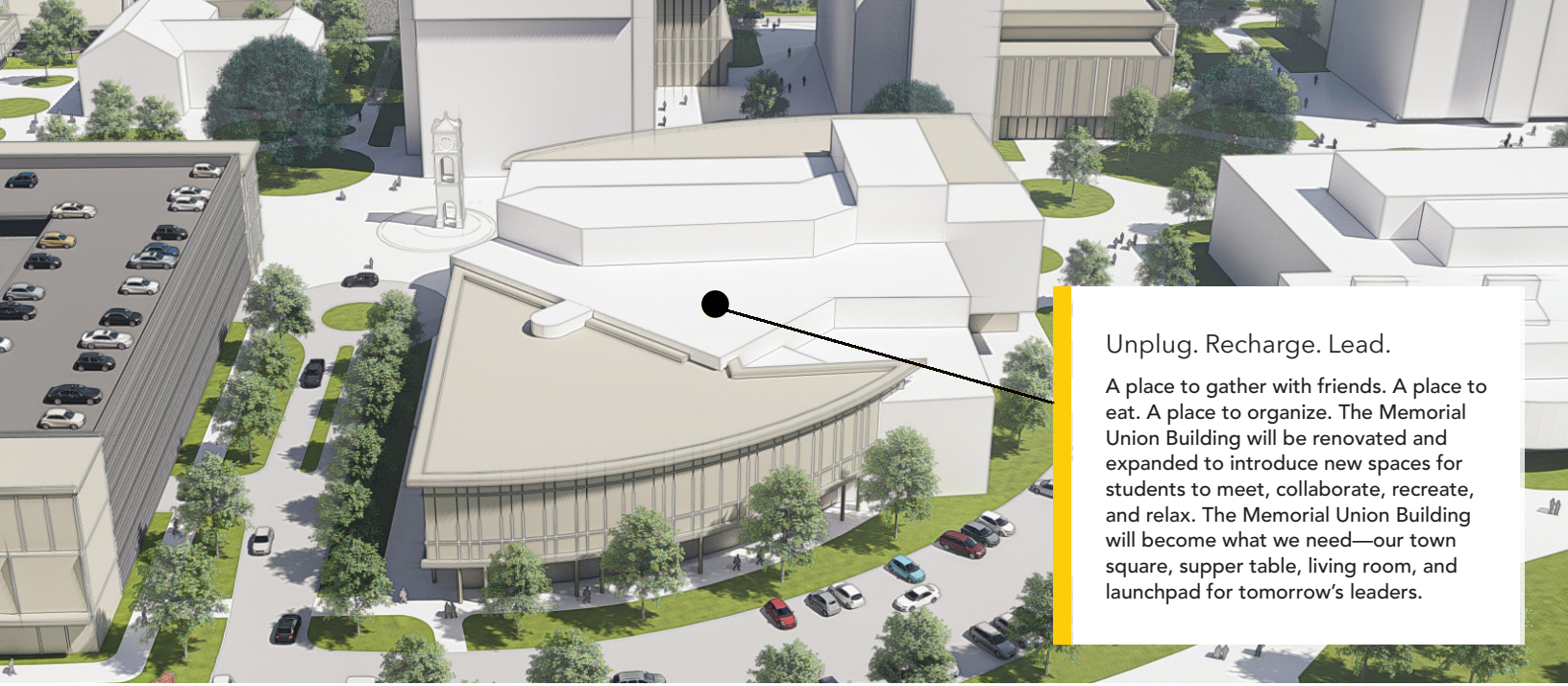
National Impact

The Center for Convergence and Innovation will help position Michigan's economy as a leader in digital transformation through cutting-edge research, workforce development, and strategic partnerships. The project will provide a place to converge existing business, data science, and computing programs to spur new degree programs and increase funding for research. Students and employees from the College of Business and College of Computing will be commingled to promote cross-disciplinary collaboration, innovation, and entrepreneurship. The result? A highly agile workforce prepared to implement digital transformation solutions throughout Michigan.



An architectural rendering of a modern campus. The scene features several large, light-colored buildings with flat roofs and large windows. A prominent building in the foreground has a long facade with vertical window slats. The campus is landscaped with green lawns, numerous trees, and winding pedestrian paths. Several cars are parked in a lot on the left and are also seen driving on a road that curves through the campus. In the background, more campus buildings and a taller structure are visible under a clear sky. A semi-transparent yellow rectangular box is overlaid on the right side of the image, containing the text 'STEM + BUSINESS' in a bold, black, sans-serif font.

STEM + BUSINESS



Unplug. Recharge. Lead.

A place to gather with friends. A place to eat. A place to organize. The Memorial Union Building will be renovated and expanded to introduce new spaces for students to meet, collaborate, recreate, and relax. The Memorial Union Building will become what we need—our town square, supper table, living room, and launchpad for tomorrow's leaders.

STUDENT LIFE

A SENSE OF BELONGING

Education extends beyond the classroom, the lab, and the makerspace. At Michigan Tech, students from diverse backgrounds and perspectives converge, cooperate, and learn from each other. Michigan's future leaders hone their soft team-building skills in Michigan Tech's recreational teams, student organizations, and Winter Carnival.

Only on campus can interpersonal collaboration occur. While Michigan Tech's different approach to learning prompts students to enroll, it is the personal connections made in residence halls, clubs, and the Memorial Union Building that pull students back to campus.

THE HUSKY CONNECTION

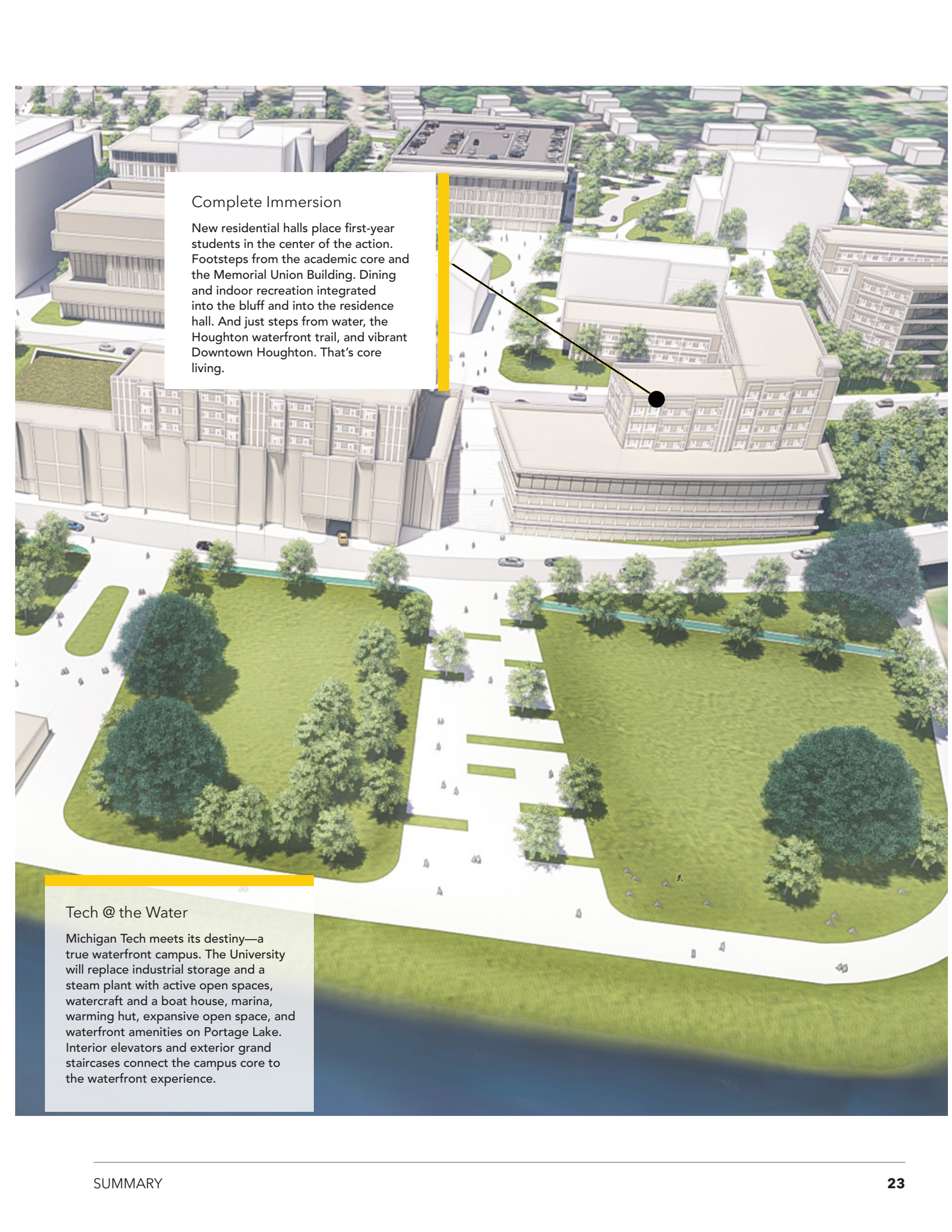
The Michigan Tech on-campus experience is so dynamic that our residence halls have exceeded design occupancy for years. As undergraduate student enrollment grows, the number of on-campus beds will also expand to grow the on-campus community. The campus plan welcomes up to 1,500 additional lower division students into new residence halls at the west and east edges of the academic core.

We will continue to provide a progressive range of housing types, ensuring new Huskies are embedded in a community and graduating Huskies are ready for independent living. Michigan Tech will continue to partner with the City of Houghton and residential developers to house our returning students and their families.

We seek an inclusive, vibrant, and healthy on-campus life that will produce our future leaders.

"Tech's record-breaking enrollment in 2021-22 is proof positive that Michigan Tech is one of the top universities in the world, and we are indeed a destination institution for talented women, minority, international, and other students."

Wallace Southerland III, Vice President for Student Affairs and Dean of Students



Complete Immersion

New residential halls place first-year students in the center of the action. Footsteps from the academic core and the Memorial Union Building. Dining and indoor recreation integrated into the bluff and into the residence hall. And just steps from water, the Houghton waterfront trail, and vibrant Downtown Houghton. That's core living.

Tech @ the Water

Michigan Tech meets its destiny—a true waterfront campus. The University will replace industrial storage and a steam plant with active open spaces, watercraft and a boat house, marina, warming hut, expansive open space, and waterfront amenities on Portage Lake. Interior elevators and exterior grand staircases connect the campus core to the waterfront experience.



WELCOME TO HOUGHTON



Lakefront Living

The East Gateway Residence Hall will transform the east edge of campus and create a signature entry experience for the entire city. Residents will enjoy easy access to the water and Prince's Point.

ATHLETICS AND RECREATION

ATHLETIC EXCELLENCE

Huskies are raising the bar at the conference, state, and national levels. The University will improve and expand the facilities that support student-athletes, as Huskies continue to improve their level of play on the field, court, ice, and slopes, around the track, and in the Esports arena.

Huskies never stand still. Over the plan horizon, MTU Athletics will expand the number of NCAA sports from 14 to 16, adding men's soccer and women's lacrosse. To provide space for these new sports, the campus plan proposed a new indoor field house. The new field house will feature a turf field and additional locker rooms, weight room, and more sports medicine space. The indoor field will be a recreation and community asset throughout the year.

The new field house will be attached to the northwest corner of the Student Development Center, on the site of the outdoor tennis courts. Huskies Tennis will be improved when the outdoor courts are replaced south of the Gates Tennis Center, co-locating indoor and outdoor courts with tennis support facilities. The adjacent Little Huskies will expand.



COMMUNITY ASSET

Competitive athletes, students focused on wellness, and community residents all want to be in the Student Development Center. As a result, the existing locker rooms are overtaxed. An addition will include more locker

rooms, benefiting recreational users, intramural sports, and community users.

Michigan Tech intends to be become a national university of choice academically and athletically.

The Next Century of Hockey

Men's ice hockey is more than a game—it's an event that is thoroughly Michigan Tech. The game-day experience will improve through an expansion of John J. MacInnes Student Ice Arena, adding capacity and additional suites.



PLACE MATTERS

ELEVATE THE BRAND

Consider the importance of the spirit of our place. The Keweenaw Peninsula, Houghton, and the Michigan Tech campus have the power to create indelible memories and reinforce Husky traditions. Our brand is our environment. Our topography, our waterfront, the bluffs, and commanding views of Portage Lake. Tech Trails, Mont Ripley, and Winter Carnival.

We continue to improve our campus open spaces with vibrant malls and new plazas, punctuated with native landscape and seasonal outdoor amenities. We are redefining the place and experience of campus.

VITAL PLACES FOR PEOPLE

Michigan Tech is unique—world-class academic and research set amidst a backdrop of unparalleled physical beauty. The world wants to “see what we are doing” and simultaneously demands a relationship with the natural environment. It is this indoor-outdoor juxtaposition that make our campus so special. While we excel at advancing knowledge through technology, our priority is the human experience—our common needs to move, collaborate, and socialize. To do this, we elevate several key tenets:

- Exterior gathering spaces are vital to our purpose,
- Pedestrian mobility is a priority,
- Campus connectivity is paramount, and
- Vehicular movement, parking, and service are necessary but subservient to the pedestrian experience.

Now is the time the celebrate the unique place of campus.



A Transformed Waterfront

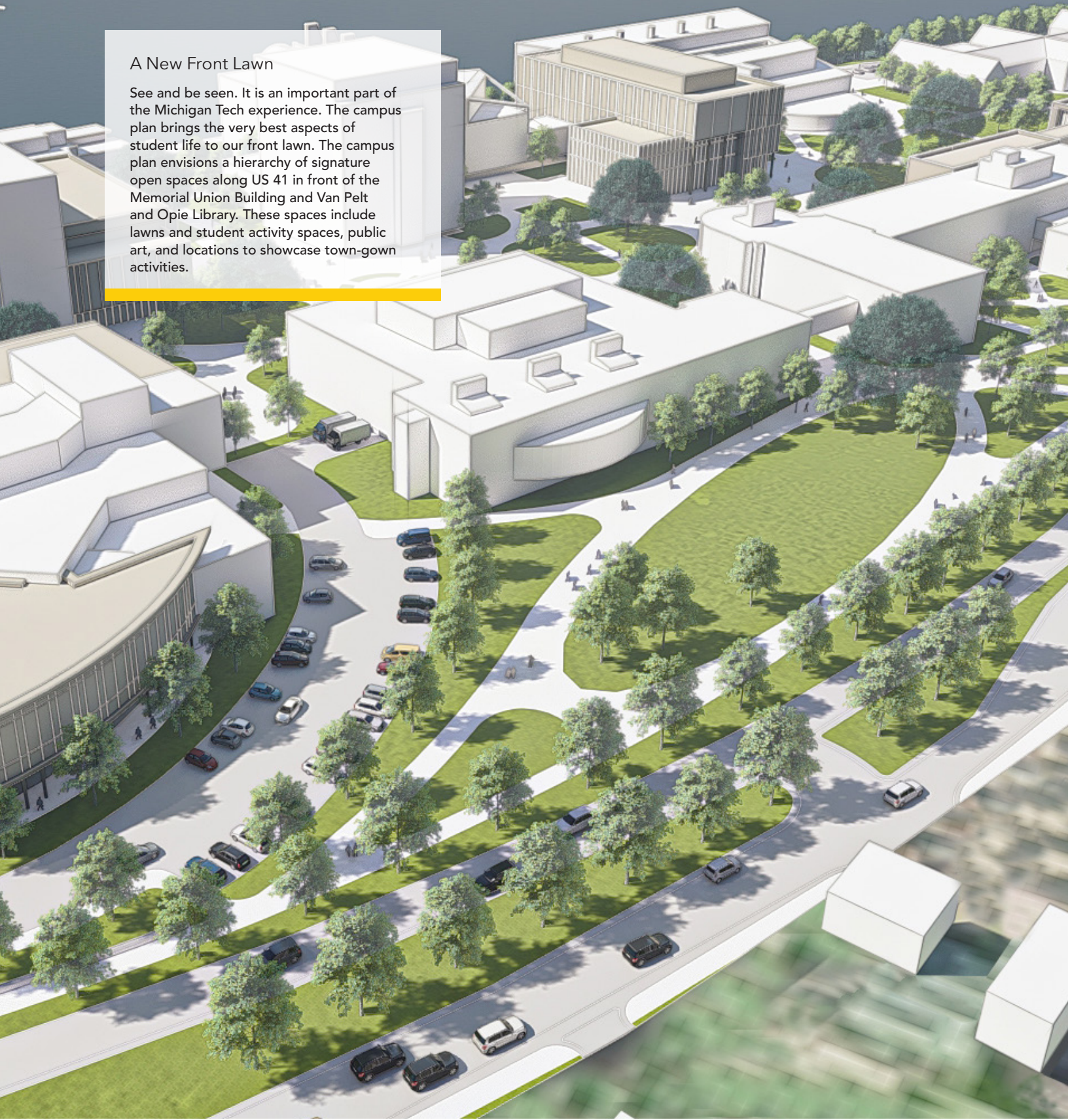
Once an industrial, infrastructure landscape, the waterfront will be a campus and public asset. Michigan Tech is creating a new public destination to address the need to enhance recreation opportunities, to connect to Houghton's Waterfront Trail system, and to showcase environmental and sustainable leadership.

Extended Mall

The campus plan extends the pedestrian mall and alumni plaza westward to enhance the core academic experience and to create a new western gateway.

A New Front Lawn

See and be seen. It is an important part of the Michigan Tech experience. The campus plan brings the very best aspects of student life to our front lawn. The campus plan envisions a hierarchy of signature open spaces along US 41 in front of the Memorial Union Building and Van Pelt and Opie Library. These spaces include lawns and student activity spaces, public art, and locations to showcase town-gown activities.



MAJOR INITIATIVES

ACADEMICS AND RESEARCH

- 1 H-STEM Engineering and Health Technologies Complex
- 2 Center for Convergence and Innovation
- 3 Classroom and Laboratory Renovations
- 4 Business and Industry Research Addition
- 5 Fisher Hall Addition
- 6 Academic Commons
- 7 Lakefront Research Building

STUDENT LIFE AND HOUSING

- 8 Memorial Union Building Renovation and Expansion
- 9 East Gateway Housing, Parking Structure
- 10 Downtown Connector Housing
- 11 Tech Bluff Housing, Dining, Recreation, Parking Structure
- 12 The Link Housing, Retail, Parking Structure

ATHLETICS AND RECREATION

- 13 MacInnes Student Ice Arena Expansion
- 14 Field House
- 15 Student Development Center Addition
- 16 Gates Tennis Center Expansion
- 17 Tech Trails Cross Country Ski Lodge

FACILITIES

- 18 Little Huskies Child Development Center Expansion
- 19 Shipping, Receiving, Storage, and Facilities Complex

PARKING AND CIRCULATION

- 20 Central Parking Structure, Offices
- 21 Surface Parking Expansion

PLACE

- 22 Student Activity Lawn
- 23 West Campus Mall Extension
- 24 MacInnes Plaza
- 25 Transformed Waterfront







PLANNING PROCESS





CAMPUS MASTER PLAN PURPOSE

From its beginnings in 1885 as the first post-secondary institution in the Upper Peninsula intended to train mining engineers, Michigan Technological University (Michigan Tech) has grown into a leading research university. This campus master plan comes at an important point in Michigan Tech's history.

It reflects the vision, mission, and values of the institution and the goals and objectives of a multitude of University stakeholders. It represents a unifying vision that aligns the University's academic mission, strategic plan, and physical development goals into a single document to help guide the future direction of the campus.

This document outlines the facilities and campus improvements that Michigan Tech will need to remain a leading technology university in the coming new industrial revolution. It is a collection of ideas that establishes a flexible, realistic, and multiple-decade framework for coordinating facility improvements

across the institution. It is a guide for academic and research space development, a framework of land uses, building forms, and open spaces, and a roadmap for mobility and parking changes.

This campus master plan will not only guide the planning and design of campus facilities, but it will also influence academic programming, existing and future space scheduling, and appropriate building and open space uses. It demonstrates a path for increased sustainability and resiliency.

This campus master plan is a living document that should be periodically reexamined and updated as the University and its campus continue to evolve. It should serve as a guide, not as a set of binding prescriptive actions, and the specific recommendations should be modified as additional requirements and needs arise. However, such revisions should follow and support the plan's guiding principles.



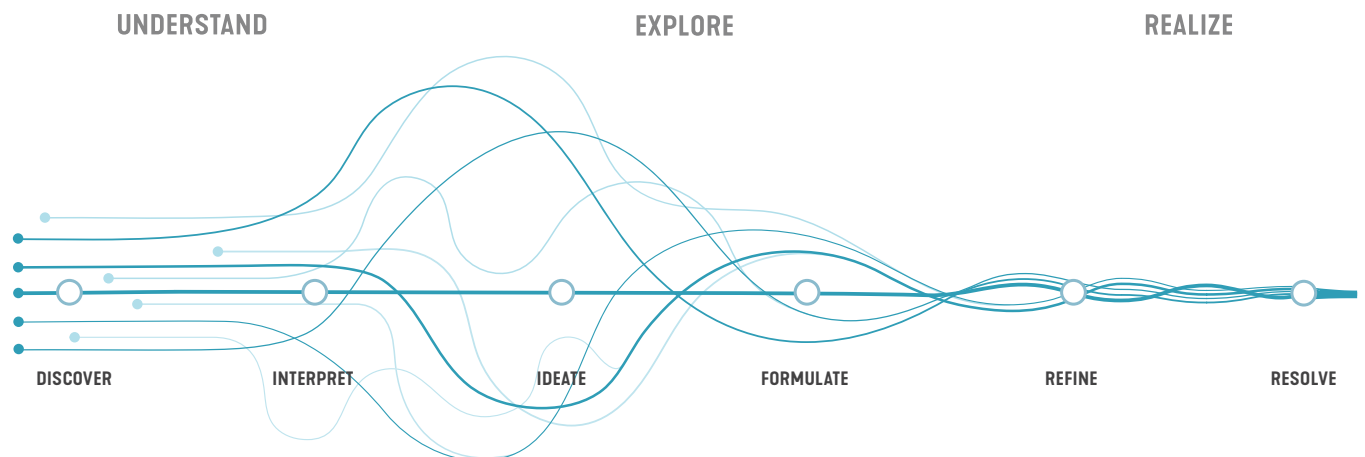
CAMPUS PLANNING PROCESS

The planning process included three sequential phases—Understand, Explore, and Realize. This rigorous process identified pressing campus and urban issues, analyzed facility assets, and conducted campus-wide qualitative and quantitative analyses.

During the **Understand** phase, the planning team met with the campus master plan Steering Committee and the Campus and Community Advisory Committees and conducted interviews with key stakeholders. The planning team reviewed previous planning efforts like the existing campus master plan and explored student enrollment targets, research growth targets, and on-campus housing goals. The planning team prepared benchmarking analyses and assembled best practices. The planning team established planning objectives, identified key issues for the campus master plan, and determined future space needs. The Steering Committee toured the campuses of two peer universities to better understand national best practices. The information generated during this phase was used to identify the opportunities and constraints.

During the **Explore** phase, the planning team developed and refined a set of “alternative future scenarios” to guide the campus’s change and growth. Through extensive and wide-ranging meetings with campus leaders, faculty, staff, students, and community leaders, the planning team tested a wide variety of potential campus development patterns. The resulting plan addressed questions ranging from enrollment changes, program delivery/offering, demographics, workforce and industry needs, research, transportation, student life and housing, land use impacts, and building renovations.

Finally, the planning team drafted a consensus campus master plan during the **Realize** phase. The resulting plan is an integrated vision that is focused on implementation so it includes project phasing and a capital plan. The plan is a blueprint for implementation while also allowing flexibility to adapt to the university’s needs.



COMMITTEE GUIDANCE

Four committees directly supported the planning process. See Appreciation chapter for a list of participants.

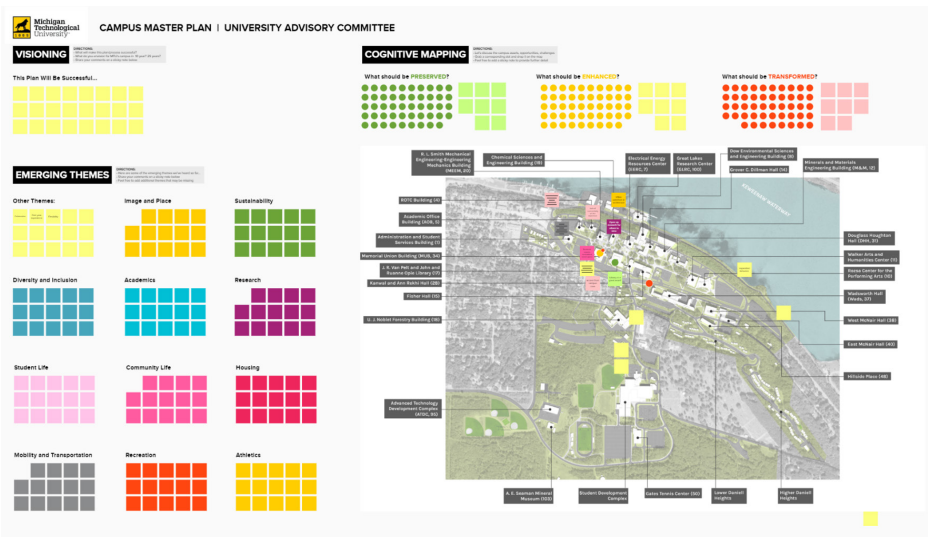
The **Executive Committee** met near the end of each phase of work for presentation, synopsis, and approval of work done during that phase.

The **Steering Committee** provided final direction to the planning team at all critical steps of the planning process. The Steering Committee met 12 times throughout the planning process.

The **University Advisory Committee** and the **Community Advisory Committee** provided input throughout the planning process. The participants represented a broad range of campus users and community residents for idea generation and consensus building. These committees each met six times.

In addition, the **Board of Trustees** met with the planning team four times to be briefed on the planning process and provide interim direction.

The Working Group, consisting of Jake Guter, assistant director, planning and construction, and Gregg Richards, director of engineering services, was responsible for the overall planning process, engaging in day-to-day activities with the planning team. The Working Group and the planning team met weekly throughout the planning process.



UNIVERSITY ADVISORY COMMITTEE ONLINE VISIONING SESSION



HOUGHTON CITY HALL MEETING

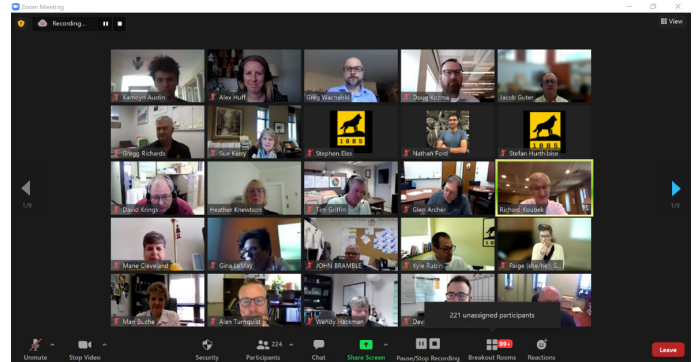
CAMPUS AND COMMUNITY ENGAGEMENT

TOWN HALLS

The entire Michigan Tech community was invited to participate in town halls, which occurred throughout the planning process, both online and on-campus. Town halls occurred at the start of the project to gather ideas and discuss the implications of the alternative development scenarios.

The **online** town hall in June 2021 had more than 275 attendees who discussed their concerns and submitted suggestions in three breakout rooms. The online format allowed Michigan Tech alumni and supporters to participate, even if they were far from Houghton. The alumni voice and perspective was captured in another town hall.

The **on-campus** town halls attracted dozens of faculty, staff, and students in Memorial Union Building conference rooms.



ACADEMICS & RESEARCH

- Programs
- Academic & Research Spaces
- Departmental Collaboration
- Enrollment & Growth

STUDENT LIFE

- Housing & Dining
- Recreation & Athletics
- Student Orgs
- Social Spaces & Events
- Health & Wellness

CAMPUS-COMMUNITY LIFE

- Transportation & Mobility
- Open Space & Trails
- Lakeshore & Winter City
- Family Support & Childcare
- Quality of Life

THE ONLINE TOWN HALL HAD THREE BREAKOUT ROOMS



TOWN HALL DOT EXERCISE



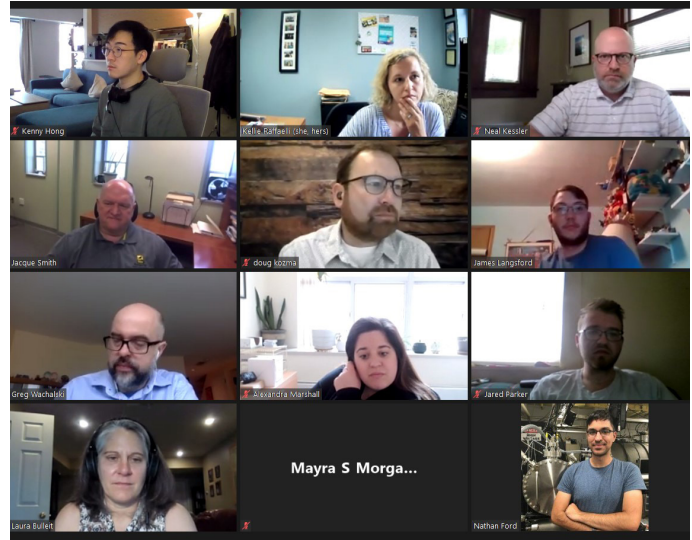
TOWN HALL DISCUSSION

LISTENING SESSIONS

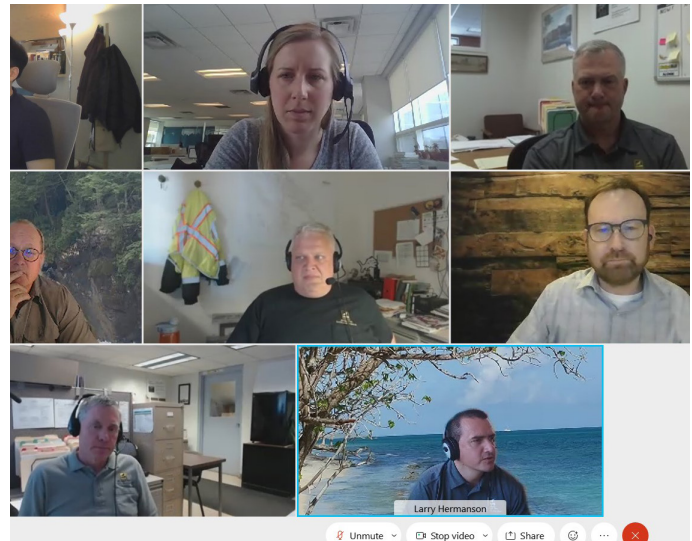
The planning team met with hundreds of members of the Michigan Tech community—faculty, staff, students, alumni, and Houghton/Hancock community leaders and residents in over 25 listening sessions. Since the planning process occurred during a pandemic, most listening sessions occurred online. Partially because the online format allowed for scheduling that was more convenient for the Michigan Tech stakeholders and partially due to Michigan Tech’s enthusiasm for the campus master plan, the participation level was high and the conversations were enlightening and engaging.

In March-June 2021, the planning team interviewed representatives of the following groups:

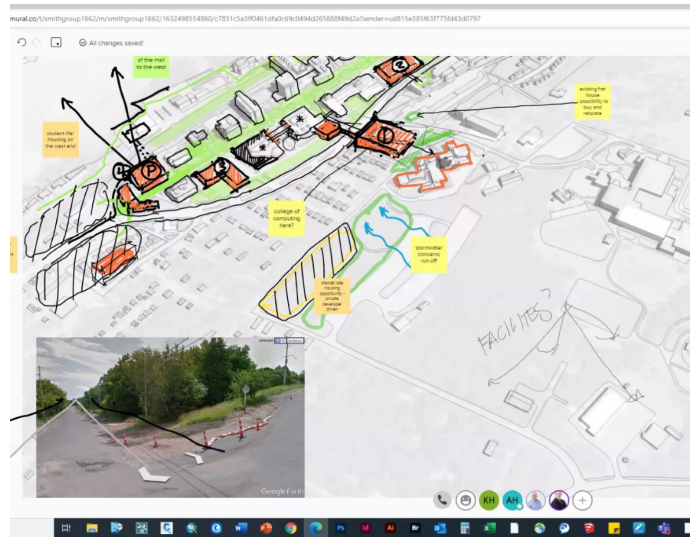
- University Leadership
- Deans
- UGS/GSG
- Research Advisory Council
- Academic Forum
- University Senate
- Sustainability
- Diversity and Inclusion
- Center for Teaching and Learning
- Athletics/Recreation
- Library
- Memorial Union Building
- Student Life/Housing
- Campus Facilities
- Public Safety and Police Services
- Houghton/Hancock community leaders



ONLINE LISTENING SESSION



ONLINE LISTENING SESSION

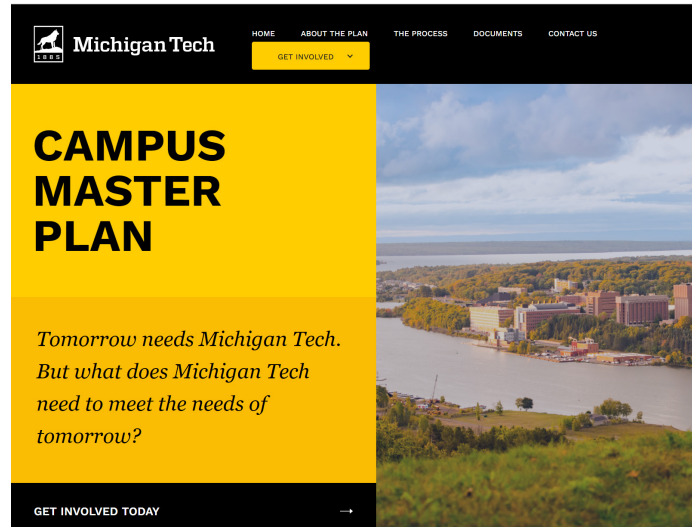


ONLINE WHITE BOARD

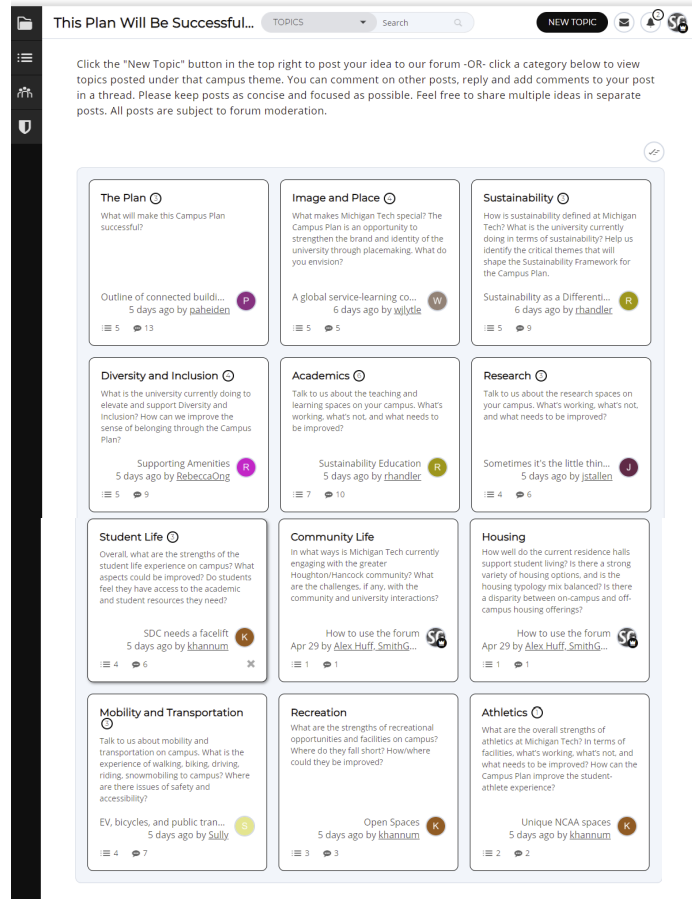
INTERACTIVE WEBSITE

To allow for continuous virtual and remote engagement and provide current information regarding the planning process, the planning team maintained a campus master plan website. The website provided information on data gathering, results of engagement opportunities, and draft and revised presentation materials so that the campus community could stay up to date and informed throughout the process.

The website also allowed for comment and engagement to permit participation beyond our scheduled virtual events. Website participants provided more than 175 comments on the online forum.



INTERACTIVE WEBSITE HOMEPAGE



We have some amazing professors here and I hope we can continue to grow our enrollment, our value, be on the forefront of the Fourth Industrial Revolution, technology and help our students become leaders in their industries.

WEBSITE PARTICIPANTS PROVIDED 175+ COMMENTS

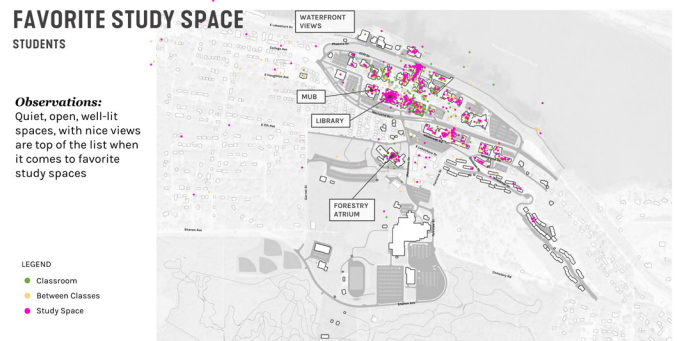
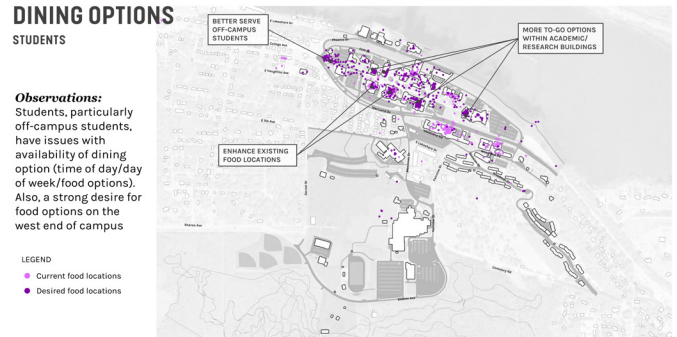
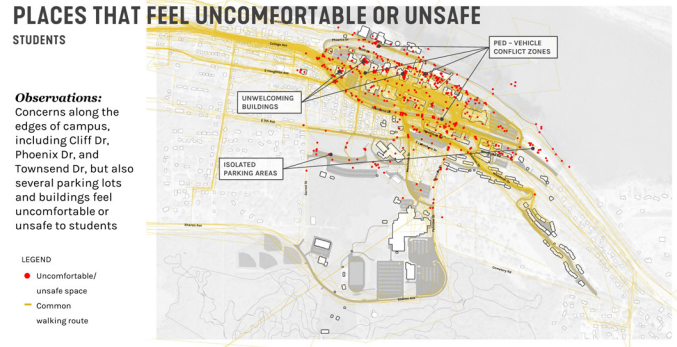
MAPMYTECH MOBILE APP

An innovative tool for virtual engagement, the MapMyTech mobile app allowed faculty, staff, and students to share their personal place-based campus experiences. The MapMyTech app was launched during the Understand phase and garnered important feedback that the planning team was able to map and analyze. The number of stakeholders reached with this tool was far greater than using face-to-face interaction alone.

The MapMyTech survey was open for two weeks in early April 2021. In total, 2,281 individuals participated:

- Students: 1,546 participants (24 percent of the student body)
- Faculty: 196 (43 percent of all faculty)
- Staff: 539 (50 percent of all staff)

Questions were tailored to the participant (student, faculty, or staff), and participants added comments and suggestions.



Currently I do most of my studying in my room, but the library and upper floors of Fisher are also good spots.

I love the facilities that the AOB has, but it definitely could use some remodeling/updating.

The atrium in the forestry department gives a lot of natural light, usually fairly quiet and it's easy to go to a professors office if I have a question.

The spot in the Biological Sciences wing, 7th floor of Dow, it has a big window facing the portage and there's a small waterfall on with plants in there that's relaxing. Its always quiet there and there's a printer nearby. Also I can stop at Fusion when I'm there.

The Rekhi circle room is the best place to study. Well-lit, Cozy, and has plenty of outlets and couches.

GLRC - Natural light, high tables, little noise.

GLRC - It has an amazing view and great study vibes. Although I also really enjoy first floor of the library because you can soak in a lot of sunlight.

MAPMYTECH ANALYSES

STUDENT LIFE SURVEY

The planning team conducted an in-depth student survey to fully understand their experience with housing, dining, recreation, and student-centered facilities. Participants answered questions about their expectations for student life facilities and assessed the current facilities against those expectations.

The student life survey was distributed via email to 6,400 students. Over 900 students, or over 14 percent of the student body, responded. The survey was statistically valid.



MAKERSPACE



MOVE-IN WEEKEND

GUIDING PRINCIPLES FOR CAMPUS MASTER PLANNING

STRATEGIC ALIGNMENT

NINE TECH FORWARD INITIATIVES

ADVANCED MATERIALS AND MANUFACTURING

AUTONOMOUS AND INTELLIGENT SYSTEMS

DATA REVOLUTION AND SENSING

DIVERSITY AND INCLUSION

EDUCATION FOR THE 21ST CENTURY

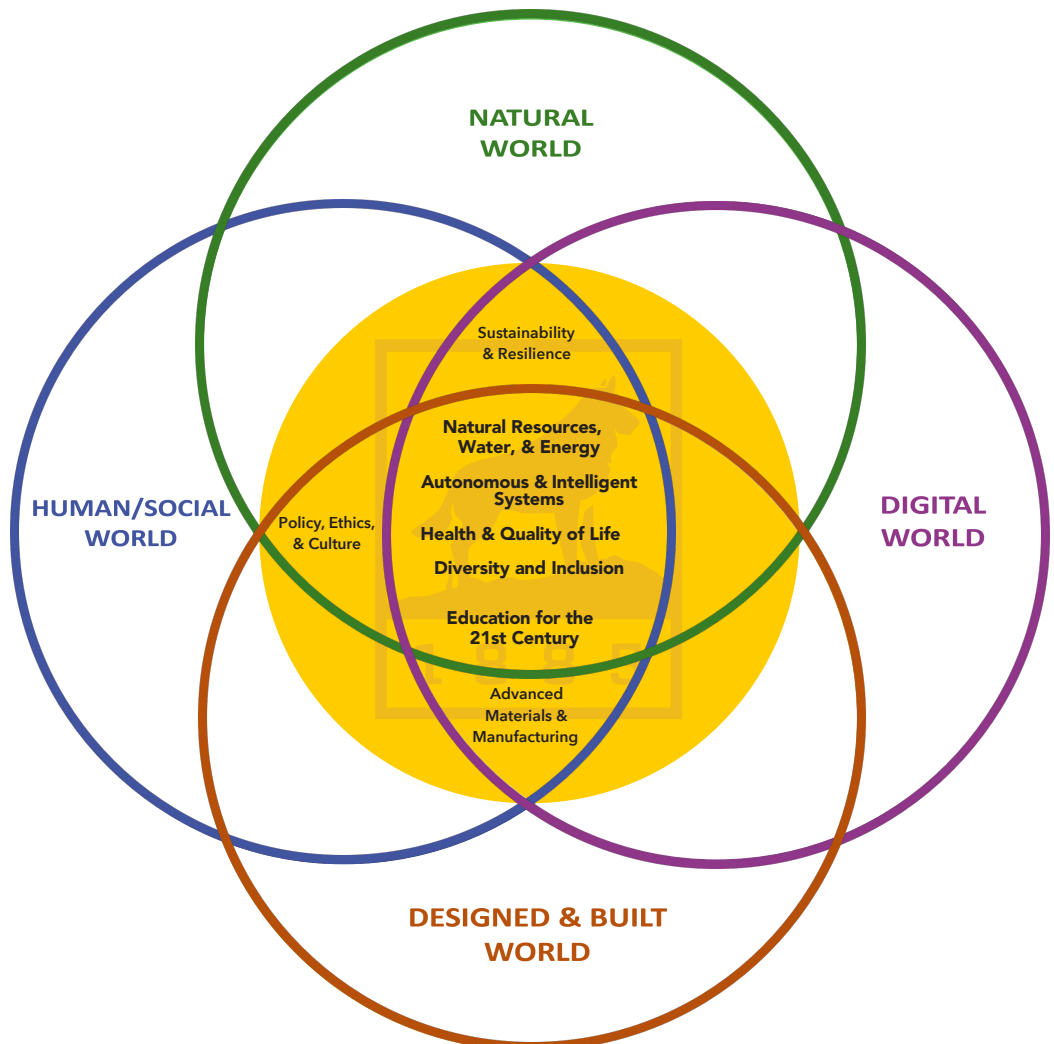
HEALTH AND QUALITY OF LIFE

NATURAL RESOURCES, WATER, AND ENERGY

POLICY, ETHICS, AND CULTURE

SUSTAINABILITY AND RESILIENCE

The guiding principles for the campus master plan are derived from the nine institutional Tech Forward initiatives. These nine principles were developed by the University Advisory Committee with input from students, faculty, staff, and community members. Collectively, they represent the directionality of the campus master plan: a sustainable, innovative, integrated, inclusive, and flexible Michigan Tech. The planning team was inspired by these principles and believes they represent both a commitment to our students and the relentless innovation required to achieve the Tech Forward vision.



TECH FORWARD INITIATIVES



SUSTAINABLE

Commit to a socially, environmentally, and economically sustainable future

Michigan Tech will be a living laboratory, demonstrating how our campus operations, research, education, and engagement can enhance sustainability and resilience on our campus, in our community, and around the globe.

- Design new and renovate existing buildings, landscapes, and infrastructure so that they are compatible with the regional environment, conserve natural and financial resources, reduce our carbon footprint, and may be sustainably managed and maintained
- Minimize the campus's carbon footprint and energy consumption through strategic investment in conservation, efficiency, and renewable energy production
- Leverage operations sustainability goals, such as reducing our carbon footprint and solid waste stream, into opportunities to engage students, staff, and faculty in evaluating and executing innovative and replicable solutions
- Enhance our scholarly contributions to sustainability and resilience through strategic faculty hiring and support for students and staff
- Complement facilities upgrades with improved management through better space utilization, increased interdisciplinary collaboration, improved maintenance of facilities, and responsible funding
- Invest in alternative transportation and mobility systems
- Address the policy implications, ethical considerations, and cultural significance of complex emerging issues such as climate change, biotechnology, algorithmic culture, autonomous labor, and the changing media environment



INNOVATIVE

Optimize facilities for innovation and research

Michigan Tech will provide the physical spaces and infrastructure necessary to support cutting-edge research, free exchange of ideas, and nurturing of innovation. Michigan Tech will be a leader in research, development, testing, and education specifically in unstructured environments and in extreme conditions.

- Prioritize projects that put research and learning on display
- Increase transdisciplinary research collaboration and cross-departmental learning through shared facilities and social/idea spaces
- Increase the variety and flexibility of learning environments and provide spaces for “convergence” academic programs
- Consider the campus site itself to be a laboratory and a marketing tool for enticing and retaining quality students, faculty, and staff
- Invest in University-owned makerspaces, resources, equipment, and storage that supports student needs
- Invest in buildings and renovations that support the needs of researchers and provide for more collaboration between the Centers and Institutes



INTEGRATED

Build integrated and connected campus systems and programs

Michigan Tech will create a vibrant campus that promotes excellence in academics, research, student life, and the campus environment through physical planning initiatives and strategic reinvestment efforts.

- Improve indoor and outdoor campus experience to create a stronger “sense of place” and enhance learning and social interaction
- Increase access to health and wellness through residential life, recreation, dining, counseling, and other campus systems and infrastructure
- Create a clear campus identity including strong gateways, better connectivity, and greater consistency in the quality of spaces across campus
- Take advantage of the waterfront
- Embrace Houghton’s natural beauty and Winter Cities identity by investing in open space and providing better access
- Provide high-quality recreation and athletic facilities that support the needs of student athletes, students, faculty, staff, and the community
- Transition to a more multimodal campus, prioritizing walking, cycling, and shuttle transit while still providing adequate vehicle parking and supporting snowmobile use
- Provide adequate infrastructure and support to our virtual and in-person students



INCLUSIVE

Foster a sense of community and an inclusive campus culture

Michigan Tech will provide a welcoming and rich cultural environment, inclusive spaces, accessible facilities, and diverse programming to support student success and sense of belonging.

- Design campus physical spaces to be inclusive, including clear wayfinding, diverse representation in art and displays, welcoming spaces, and universal access
- Ensure facilities are accessible to people of all abilities and learning styles
- Increase visibility and access to student services and resources while also continuing to prioritize student privacy and provide safe spaces
- Recognize and celebrate the cultural diversity and international quality of the campus
- Foster connection by enhancing the first-year experience for all individuals, including students, faculty, and staff
- Promote student leadership opportunities by supporting student organizations
- Improve and expand campus housing options
- Support Michigan Tech families
- Strengthen connections and partnerships across campus and between the campus and the community



FLEXIBLE

Plan for flexibility and adaptability

Michigan Tech will satisfy the campus's current program and functional requirements without compromising future flexibility and adaptability for changing needs and uses.

- Create a flexible blueprint that clearly articulates the strategic roadmap
- Create training spaces that are flexible to adapt to changing workforce needs
- Provide for modular implementation and protect opportunities for future growth
- Ensure renovations do not become quickly outdated
- Utilize features in new structures that are modern by current standards and flexible enough to incorporate future innovative features
- Design and build to accommodate changing pedagogy, technologies, and user requirements in buildings and infrastructure





CAMPUS TODAY





FACILITY HISTORY

Michigan Tech was founded in 1885 as the Michigan Mining School. Jay Abel Hubbell, a politician and judge who served and represented the Houghton area, donated land for the school's first buildings in 1885. The school started with four faculty members and 23 students. It was housed in the Houghton Fire Hall from 1886 through 1889.

The campus moved to the then outskirts of Houghton along College Avenue overlooking the canal. College Avenue later became US Highway 41, which increased the vehicle traffic passing through campus.

Two of the most impactful recommendations from the 1966 campus master plan were to relocate US Highway 41 and increase density by building high-rise buildings.

First residential and then academic facilities crossed Townsend Drive and moved up the hill in the 1960s and 1970s. Campus grew down the bluff to the water in the 1990s with the construction of the Minerals and Materials Engineering Building and the Dow Environmental Sciences and Engineering Building.

Houghton's average snowfall is 218 inches, which has shaped the campus and its facilities.

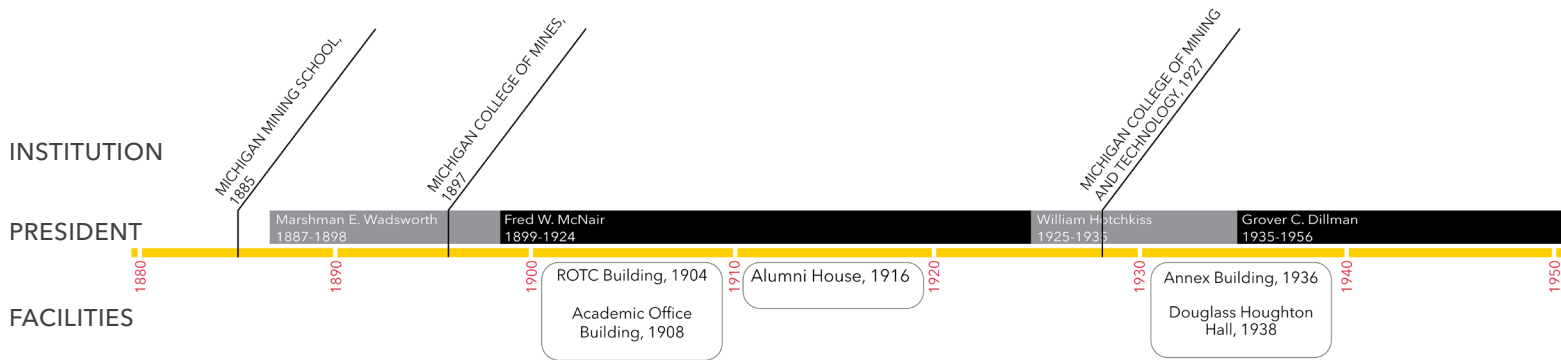


FIGURE 1: FACILITY CONSTRUCTION AND RENOVATION TIMELINE



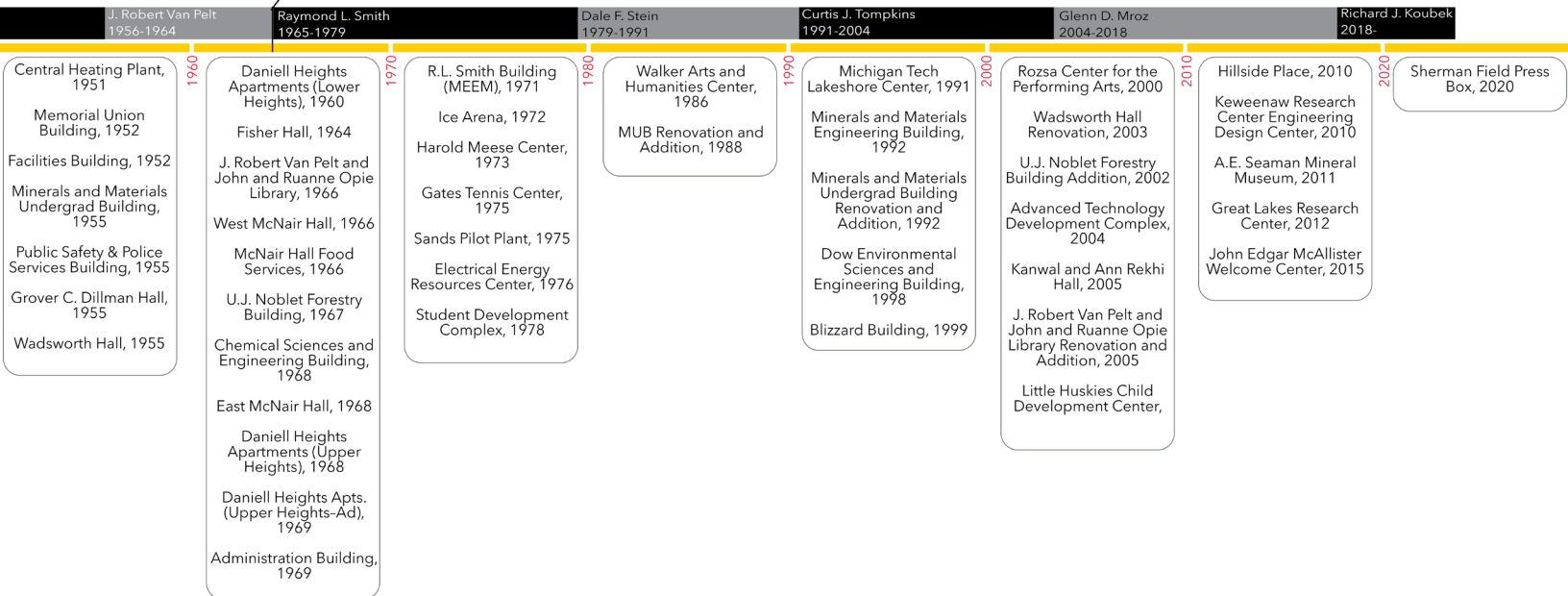
AERIAL 1950S



PHOTOS: MICHIGAN TECH ARCHIVES

R.L. SMITH BUILDING (MEEM) CONSTRUCTION 1970S

MICHIGAN TECHNOLOGICAL
UNIVERSITY, 1964



FRAMEWORK

The campus is clearly organized with several single-building use zones. All academic and research facilities are north of Townsend Drive, except the U.J. Noblet Forestry Building. All residence halls are south of Townsend Drive, except Douglass Houghton Hall. All athletics and recreation facilities are located to the south up the hill, separated from both.

A result of this segregation is an uneven activity pattern. The academic zone is active midday weekdays, but very quiet during evenings and weekends. The residential area is active evenings and weekends. This “suburban” commuting pattern causes and is reinforced by the dining facility operating hours. Only dining facilities in the residential areas operate in evenings and weekends.

Impact on the campus master plan: Physical segregation of building uses reduces the feeling of an active on-campus experience. Commuter and graduate students are most negatively impacted in the evenings and weekends by the lack of dining options and campus activity.

The academic colleges also operate much like islands. Academic and research buildings are largely dedicated to particular colleges.

Impact on the campus master plan: Tech Forward seeks multidisciplinary answers to tough societal challenges, but physical segregation of colleges makes interdisciplinary research and learning more difficult.

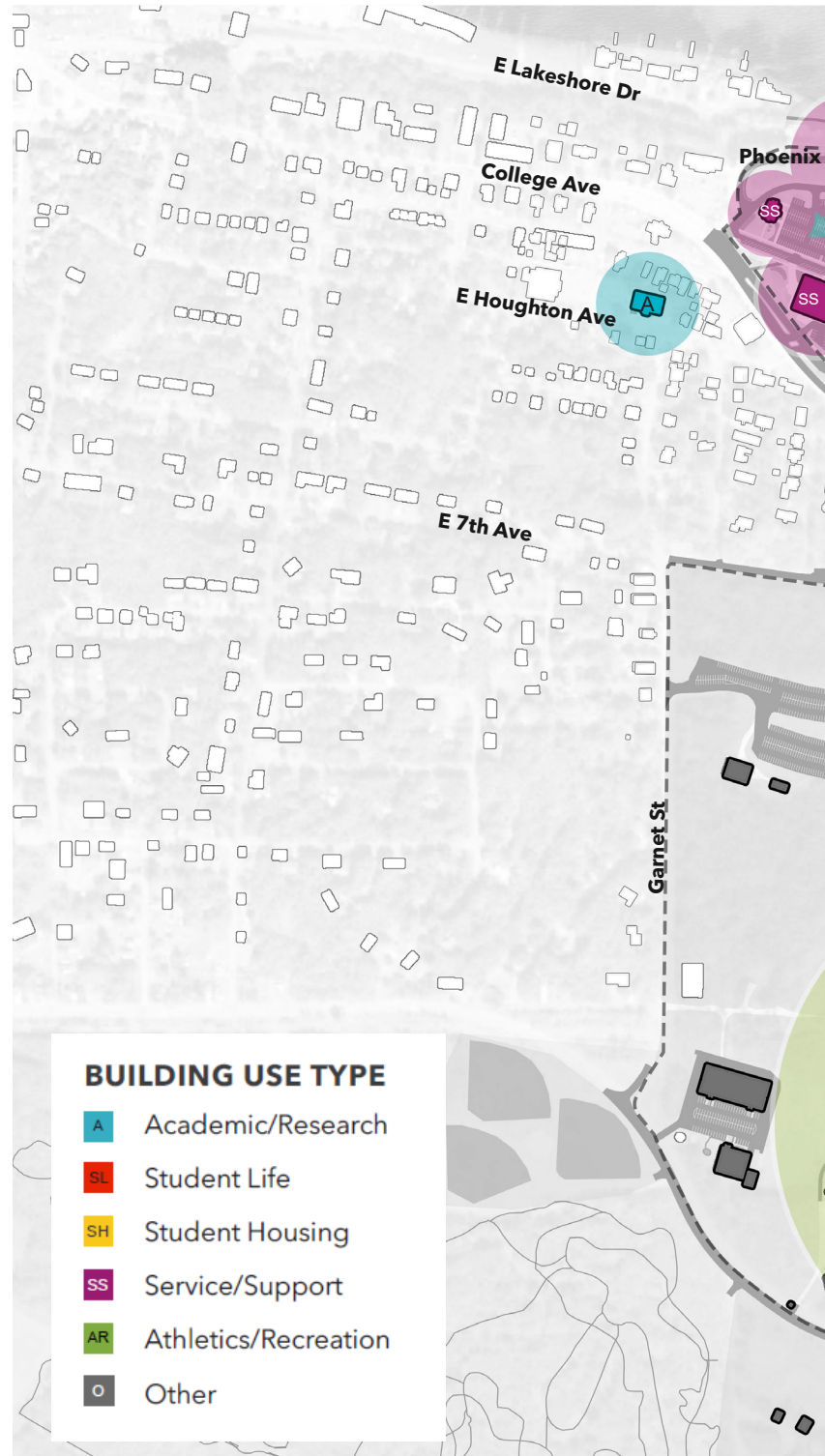
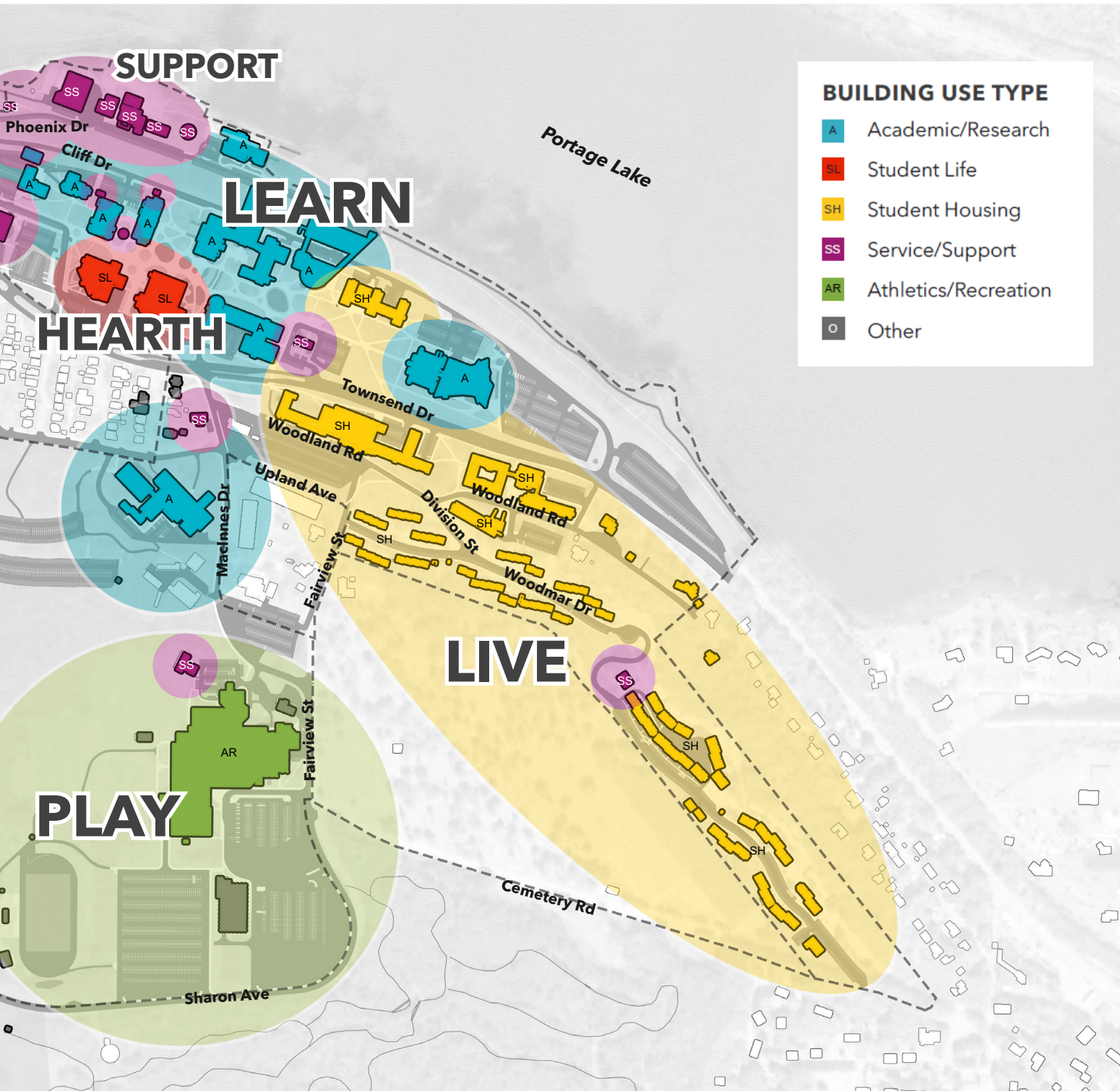


FIGURE 2: CAMPUS USE ORGANIZATION



FACILITY CONDITIONS

BUILDING AGE

The oldest section of the current campus is the western end, which is closest to the center of Houghton. The campus grew east in the 1950s, expanding along the ridge edge and crossing over Townsend Drive for the first time. Student enrollment and the campus footprint grew considerably in the 1960s, expanding south across Townsend Drive with residential and academic halls and up with several high-rise buildings. In the 1970s and 1980s, the campus edge expanded to the top of the hill with the Ice Arena and the Student Development Center. Limited infill has occurred in the last three decades.

Impact on the campus master plan: The majority of campus buildings date back to the 1950s, 1960s, and 1970s, and they are in need of deferred maintenance and upgrades. Despite a target of greater student enrollment, the University does not intend to expand its campus boundary. The west end of the campus core offers the oldest buildings, multiple interior surface parking lots, and proximity to downtown, and thus is the most attractive for investment and redevelopment.

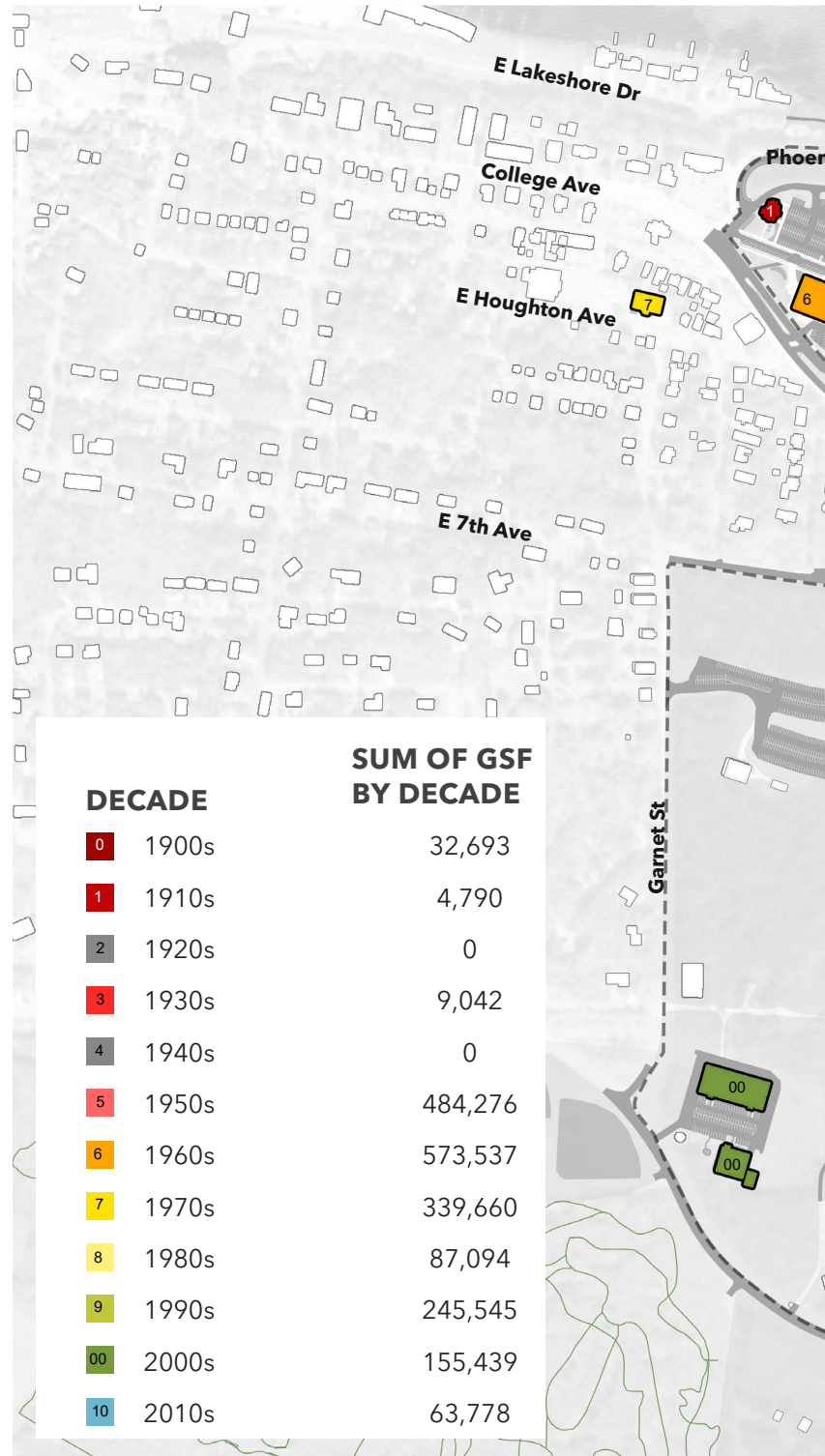
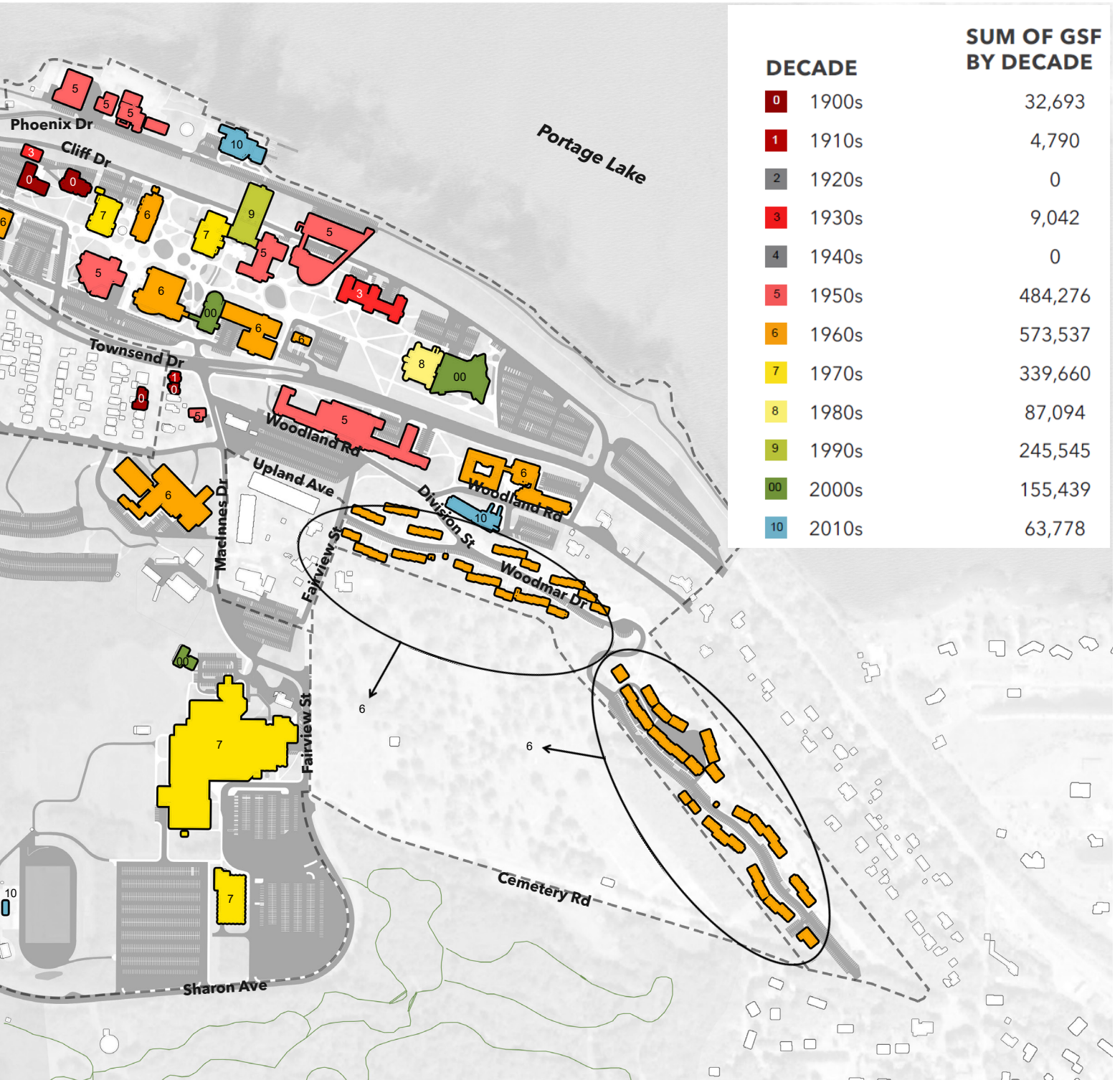


FIGURE 3: BUILDING AGE BY DECADE



FACILITY CONDITION NEEDS INDEX

Michigan Tech performed a comprehensive high-level facility condition assessment of all campus buildings in May 2011, and the University continues to update it for 26 academic and administrative buildings in the campus core. The assessment considered the costs of investments necessary to repair buildings, relative to their replacement cost. This ratio is the Facility Condition Needs Index (FCNI). Figure 4 depicts the most recent FCNI score for each building.

Since the 2011 assessment, over \$13 million has been invested to address identified deferred maintenance priority concerns. However, over that time, the deferred maintenance backlog has grown from \$78 million in 2011 to the current value of \$87 million. The campus-wide aggregate FCNI has worsened from 10 percent in 2011 to a current value of 13 percent (both scores are in the FCNI Poor category).

The University has been unable to keep up with the growing deferred maintenance backlog. The goal of the University is to invest \$17 million annually, \$8 million to address deferred maintenance and \$9 million in planned renewals for non-residential core campus buildings.

Impact on the campus master plan: Many key academic, research, and student life facilities require significant investment to address deferred maintenance.

The planning process should consider replacing, renovating, or disposing the facilities with the largest deferred maintenance needs. Larger investments in deferred maintenance and planned renewals will be necessary to bring campus facilities up to the brand expectations of Michigan Tech as a leading research university.

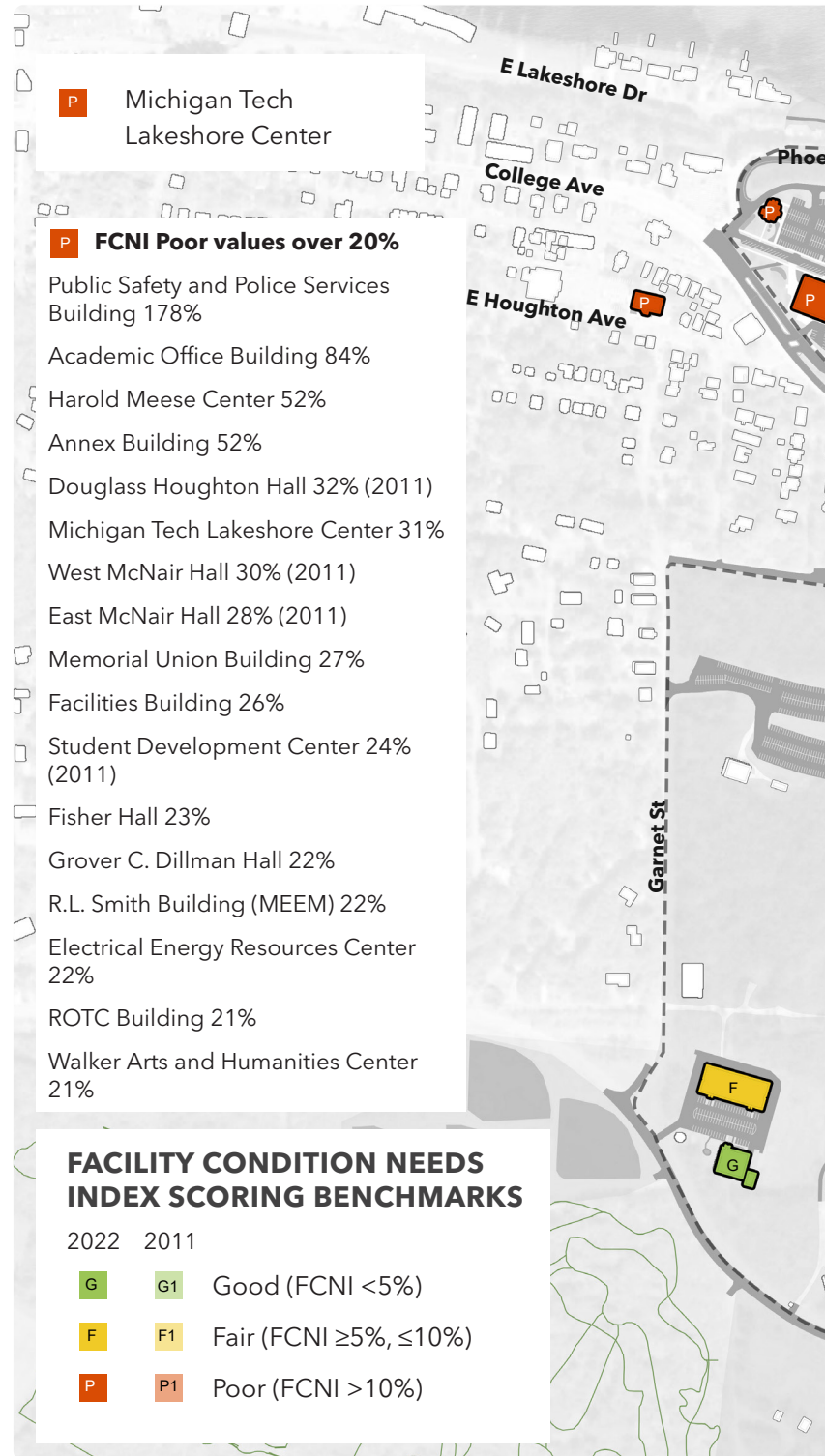


FIGURE 4: FACILITY CONDITION NEEDS INDEX



ACADEMIC AND RESEARCH SPACE BENCHMARKING

The planning team conducted a comparative space analysis and directly compared Michigan Tech with similar institutions to understand existing space allocations. The analysis was prepared at the institutional-level and compared assignable space with space grouped according to the National Center for Education Statistics' Postsecondary Education Facilities Inventory and Classification Manual (FICM) taxonomy.

The planning team compared Michigan Tech against the similar institutions through the following benchmark metrics:

- Space type by percent of total inventory
- Total ASF/student headcount
- Total ASF/faculty headcount
- Instructional space/student headcount
- Classroom space/student headcount
- Research space/faculty headcount
- Office space/faculty headcount
- Office space/staff headcount

Campus-level benchmarking compares the campus total of space in one category or a group of categories. Because space needs vary by program, and no two institutions will have the same set of programs or even the same emphases in the same program, this is an extremely general indicator of how institutions with similar enrollment and composition compare on a broad scale.

The benchmarking analysis identified the following key takeaways:

- Michigan Tech's space per student is below peer group average (10 percent)
- Michigan Tech's instructional space per student is second highest, due to teaching and open laboratories (45 ASF)
- Classroom space per student is on the low end of peer group (10 ASF)
- Research laboratory space per faculty is at the high end (701 ASF)
- Office space per faculty is relatively aligned with peer group average (1,020 ASF)
- Office space per staff is at the low end of the peer group (167 ASF)

The details of the benchmarking analysis can be found in Appendix B: Academic and Research Benchmarking.

Impact on the campus master plan: Since the total space per student is below the peer group average, the University could consider additional space as enrollment grows.

ACADEMIC SPACE BENCHMARKING

- Average of Peer Institutions (A)
- Median of Peer Institutions (M)

The comparative analysis outcomes are calculated using actual decimal values, while the results are rounded for legibility of display. This means an occasional value might appear or display slightly differently than expected.

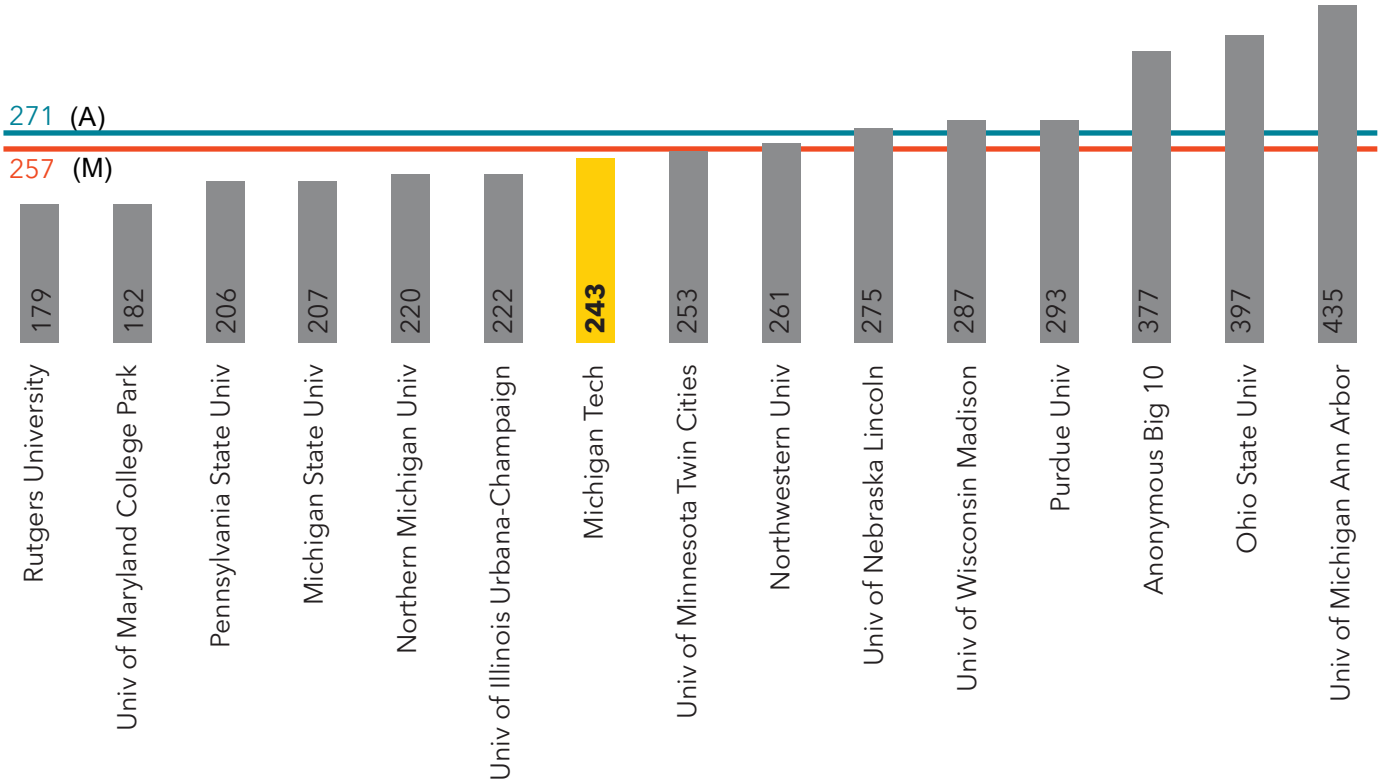


FIGURE 5: TOTAL SPACE PER STUDENT HEADCOUNT (ASF)

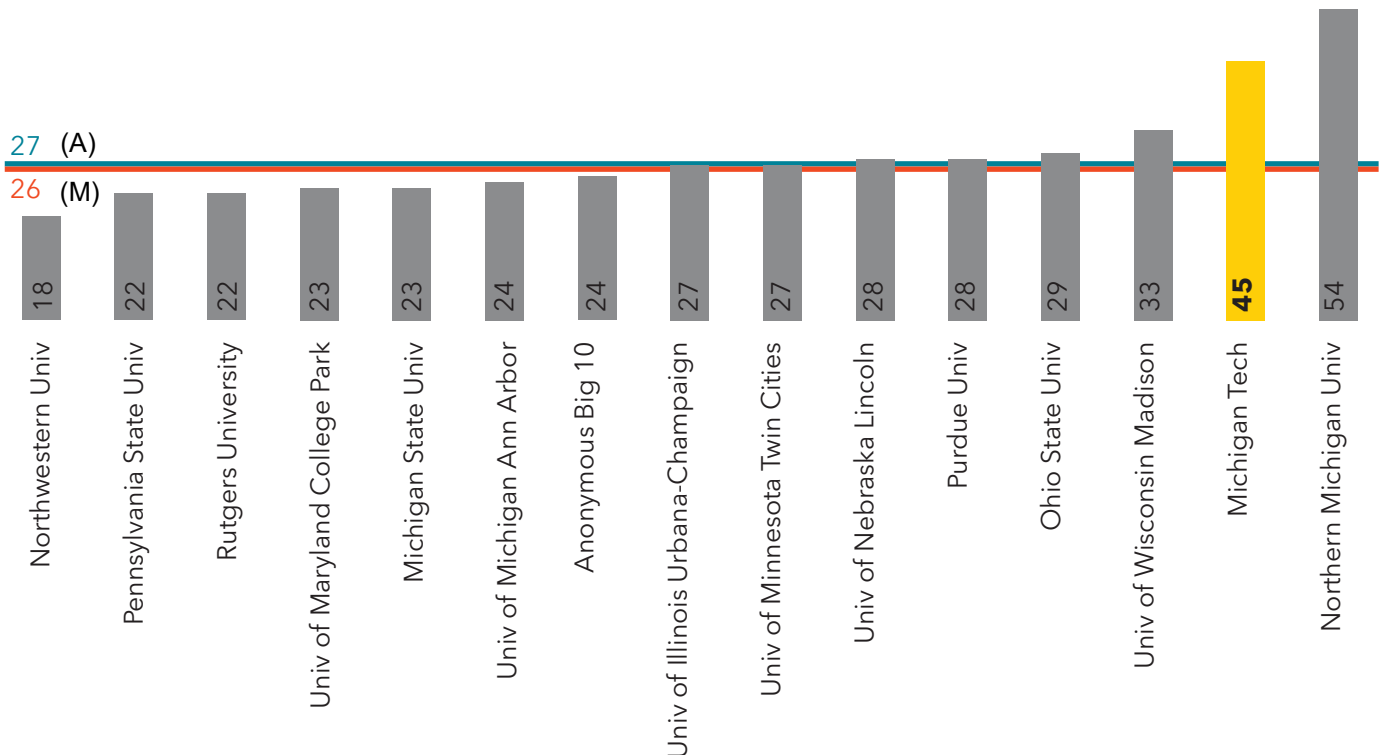


FIGURE 6: INSTRUCTIONAL SPACE PER STUDENT HEADCOUNT (ASF)

INSTRUCTIONAL SPACE UTILIZATION

CLASSROOM UTILIZATION

The planning team analyzed the utilization of regularly scheduled teaching spaces to facilitate discussion regarding appropriate use expectations, uncover reasons as to why significant usage deviation between space use and expectations might occur, and provide information to establish metrics for the space needs analysis.

There were 64 scheduled classrooms on campus during the Fall 2019 term. Classroom utilization is a function of the number of courses, enrollment in those courses, and the expectation of how many hours per week a student station/seat in a classroom should be occupied.

The guideline established for Michigan Tech is 32 hours per week with 70 percent of the seats filled when the room is scheduled. For Fall 2019, classrooms were scheduled, on average, 26.3 hours per week with a 54 percent seat fill rate (number of students enrolled compared to number of seats).

| Time of Day | Monday | | Tuesday | | Wednesday | | Thursday | | Friday | | Average | |
|-------------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|
| | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use |
| 8:00 AM | 16 | 25% | 17 | 27% | 15 | 23% | 17 | 27% | 12 | 19% | 15 | 24% |
| 9:00 AM | 46 | 72% | 43 | 67% | 47 | 73% | 42 | 66% | 42 | 66% | 44 | 69% |
| 10:00 AM | 49 | 77% | 52 | 81% | 48 | 75% | 50 | 78% | 42 | 66% | 48 | 75% |
| 11:00 AM | 51 | 80% | 45 | 70% | 50 | 78% | 43 | 67% | 48 | 75% | 47 | 74% |
| 12:00 PM | 50 | 78% | 44 | 69% | 49 | 77% | 43 | 67% | 41 | 64% | 45 | 71% |
| 1:00 PM | 49 | 77% | 31 | 48% | 46 | 72% | 32 | 50% | 43 | 67% | 40 | 63% |
| 2:00 PM | 54 | 84% | 35 | 55% | 54 | 84% | 32 | 50% | 45 | 70% | 44 | 69% |
| 3:00 PM | 39 | 61% | 36 | 56% | 41 | 64% | 36 | 56% | 24 | 38% | 35 | 55% |
| 4:00 PM | 32 | 50% | 20 | 31% | 30 | 47% | 19 | 30% | 10 | 16% | 22 | 35% |
| 5:00 PM | 8 | 13% | 6 | 9% | 10 | 16% | 4 | 6% | 1 | 2% | 6 | 9% |
| 6:00 PM | 0 | 0% | 1 | 2% | 1 | 2% | 1 | 2% | 0 | 0% | 1 | 1% |
| 7:00 PM | 7 | 11% | 3 | 5% | 8 | 13% | 5 | 8% | 0 | 0% | 5 | 7% |

Total classrooms = 64. Darker colors indicate a large percentage of rooms are scheduled.

FIGURE 7: SCHEDULED CLASSROOM USE BY DAY AND TIME (FALL 2019)

CLASSROOM USE BY DAY AND TIME

Of the 64 classrooms on campus, the greatest number in use at one time is 54, or 84 percent, at 2 p.m. on Mondays and Wednesdays. Use is fairly evenly distributed from 9 a.m. to noon. Monday through Friday. Usage on Tuesdays and Thursdays starts to taper off at 1 p.m. (see Figure 7).

CLASSROOM UTILIZATION BY BUILDING

The most predominately used classrooms are housed within five buildings: Chemical Sciences and Engineering Building, Dow Environmental Sciences and Engineering Building, Electrical Energy Resources Center, Fisher Hall, and R.L. Smith Building (MEEM). The classrooms in these buildings are scheduled 24 to 36 hours per week. However, the seat fill rate ranges from 47 to 68 percent, which indicates potential qualitative issues. For example, the 17 classrooms in Fisher Hall are only filled, on average, 54 percent, which might reflect the low space per seat, which is 14 ASF (see Figure 8).

| Building Name and IDA | No. of Rooms ^A | Average Room Size ^A | Average ASF per Station ^A | Average Section Size ^A | Weekly Seat Hours ^A | Average Weekly Room Hours ^A | Seat Fill Rate ^A | |
|-------------------------------------|---------------------------|--------------------------------|--------------------------------------|-----------------------------------|--------------------------------|--|-----------------------------|-----|
| Academic Office Building | 05 | 1 | 610 | 20.3 * | 16 | 11.2 | 22.0 | 51% |
| Chemical Sciences & Engr Bldg | 19 | 7 | 915 | 19.7 * | 23 | 14.6 | 29.1 | 47% |
| Dow Envir Sciences & Engr Bldg | 08 | 1 | 1,601 | 19.1 * | 52 | 21.7 | 36.0 | 60% |
| Electrical Energy Resources | 07 | 9 | 752 | 15.3 * | 25 | 12.6 | 23.7 | 49% |
| Fisher Hall | 15 | 17 | 1,142 | 14.2 * | 40 | 17.0 | 32.8 | 54% |
| Grover C. Dillman Hall | 14 | 2 | 764 | 21.2 * | 22 | 15.2 | 16.0 | 61% |
| Harold Meese Center | 84 | 2 | 622 | 24.9 * | 11 | 8.1 | 17.3 | 47% |
| Kanwal and Ann Rekhi Hall | 28 | 4 | 1,222 | 25.7 * | 27 | 14.3 | 25.0 | 56% |
| Minerals & Materials Engr Bldg | 12 | 3 | 1,343 | 12.2 * | 44 | 10.8 | 23.0 | 37% |
| R.L. Smith Building (MEEM) | 20 | 6 | 1,290 | 19.6 * | 46 | 19.3 | 27.1 | 68% |
| ROTC Building | 04 | 2 | 1,318 | 34.2 * | 13 | 2.5 | 7.0 | 34% |
| Rozsa Center | 10 | 1 | 1,448 | 24.1 * | 26 | 9.2 | 21.0 | 44% |
| U.J. Noblet Forestry Building | 18 | 1 | 1,768 | 14.1 * | 59 | 13.5 | 26.0 | 52% |
| Van Pelt & Opie Library | 17 | 1 | 578 | 27.5 * | 13 | 5.4 | 9.0 | 60% |
| Walker Arts & Humanities | 11 | 7 | 690 | 26.4 * | 17 | 18.9 | 26.5 | 64% |
| Total No. of Rooms = 64 | AVERAGE | 1,023 | 17.5* | 31 | 15.2 | 26.3 | 54% | |
| Total No. of Stations = 3746 | Total ASF | 65,475 | | | | | | |

* weighted average using totals

FIGURE 8: CLASSROOM UTILIZATION BY BUILDING (FALL 2019)

CLASSROOM UTILIZATION BY CAPACITY

Classrooms with 41 to 45, 61 to 75, 101 to 150, and 151 to 250 student seats are the most actively scheduled on campus. Rooms in the 41 to 45 and 61 to 75 ranges exceed the guideline expectation of 32 weekly room hours. However, the seats are not meeting the fill target of 70 percent. Note the average section sizes in Figure 9.

| Classroom Capacity Grouping | No. of Rooms | No. of Seats | Average Room Size | Average ASF per Station | Average Section Size | Weekly Seat Hours | Average Weekly Room Hours | Seat Fill Rate |
|------------------------------|------------------|---------------|-------------------|-------------------------|----------------------|-------------------|---------------------------|----------------|
| 20 and Under | 3 | 39 | 417 | 33 | 7 | 5.9 | 12.0 | 49% |
| 21 - 25 | 5 | 121 | 621 | 26 | 13 | 10.5 | 19.1 | 54% |
| 26 - 30 | 6 | 173 | 718 | 25 | 12 | 10.0 | 21.8 | 45% |
| 31 - 35 | 6 | 201 | 661 | 20 | 16 | 12.7 | 28.2 | 45% |
| 36 - 40 | 8 | 300 | 793 | 21 | 21 | 13.1 | 22.6 | 57% |
| 41 - 45 | 6 | 265 | 776 | 18 | 22 | 17.4 | 33.2 | 52% |
| 46 - 50 | 7 | 333 | 1,156 | 24 | 23 | 12.9 | 24.8 | 52% |
| 51 - 60 | 6 | 342 | 1,071 | 19 | 32 | 15.3 | 27.5 | 56% |
| 61 - 75 | 8 | 537 | 1,073 | 16 | 40 | 20.7 | 33.4 | 62% |
| 76 - 100 | 4 | 354 | 1,433 | 16 | 58 | 19.3 | 29.2 | 66% |
| 101 - 150 | 3 | 365 | 1,812 | 15 | 69 | 17.9 | 30.7 | 59% |
| 151 - 250 | 1 | 240 | 2,540 | 11 | 96 | 11.4 | 30.0 | 38% |
| 251 and Over | 1 | 476 | 5,036 | 11 | 188 | 12.5 | 29.5 | 42% |
| Total No. of Rooms = 64 | AVERAGE | 1,023 | 17.5 * | 31 | 15.2 | 26.3 | 54% | |
| Total No. of Stations = 3746 | Total ASF | 65,475 | | | | | | |

FIGURE 9: CLASSROOM UTILIZATION ANALYSIS BY CAPACITY (FALL 2019)

CLASSROOM MIX ANALYSIS

A classroom mix analysis compares section sizes with the sizes of existing classrooms based upon utilization targets. The mix analysis identifies imbalances in the classroom inventory and misalignments between section sizes and classroom capacities. The outcomes can inform optimization and right-sizing the inventory of learning environments.

There are currently 64 classrooms on campus. In the higher utilization scenario, the Fall 2019 course schedule would need 51 classrooms. The needs are in the 101 to 150, 151 to 250, and 251 and over seat ranges.

| Classroom Size | Existing Rooms | Total Rooms Needed | Difference |
|----------------|----------------|--------------------|-------------|
| 20 and Under | 3 | 3 | 0 |
| 21 - 25 | 5 | 5 | 0 |
| 26 - 30 | 6 | 6 | 0 |
| 31 - 35 | 6 | 6 | 0 |
| 36 - 40 | 8 | 5 | (3) |
| 41 - 45 | 6 | 3 | (3) |
| 46 - 50 | 7 | 1 | (6) |
| 51 - 60 | 6 | 6 | 0 |
| 61 - 75 | 8 | 4 | (4) |
| 76 - 100 | 4 | 4 | 0 |
| 101 - 150 | 3 | 4 | 1 |
| 151 - 250 | 1 | 2 | 1 |
| 251 and Over | 1 | 2 | 1 |
| | 64 | 51 | (13) |

This scenario assumes 32 weekly room hours and 70 percent student station occupancy. In Fall 2019, these values were 26.3 weekly room hours and 54 percent student station occupancy.

FIGURE 10: CLASSROOM MIX SCENARIO (FALL 2019)

TEACHING LABORATORY UTILIZATION

There were 96 scheduled teaching laboratories on campus in the Fall 2019 term. Teaching laboratory utilization is a function of the number of courses, enrollment in those courses, and the expectation for how many hours per week a student station in a laboratory should be occupied.

The guideline established for Michigan Tech is 20 to 32 hours per week with 80 percent of the seats filled when the room is scheduled. The weekly rooms hours vary by discipline as detailed in Figure 11.

For Fall 2019, teaching laboratories were scheduled, on average, 16.4 hours per week with a 63 percent seat fill rate.

| DISCIPLINE | ASF/SEAT | WEEKLY ROOM HOURS |
|--------------------------------------|----------|-------------------|
| Biological Sciences | 65 | 32 |
| Business & Management | 40 | 28 |
| Computer & Information Science | 60 | 28 |
| Education | 40 | 28 |
| Engineering | 120 | 28 |
| Agricultural Engineering | 125 | 28 |
| Chemical Engineering | 120 | 32 |
| Civil Engineering | 120 | 28 |
| Electrical Engineering | 100 | 28 |
| Mechanical Engineering | 140 | 28 |
| Metallurgical Engineering | 120 | 28 |
| Art | 80 | 20 |
| Music | 60 | 20 |
| Dance | 150 | 28 |
| Health Professions (except Medicine) | 80 | 28 |
| Mathematics | 30 | 32 |
| Physics | 75 | 32 |
| Chemistry | 75 | 32 |
| Geology | 60 | 32 |
| Social Sciences | 50 | 28 |
| Computer-Based Lab | 40 | 32 |

FIGURE 11: TEACHING LABORATORY UTILIZATION EXPECTATIONS

TEACHING LABORATORY USE BY DAY AND TIME

Of the 96 teaching laboratories on campus, the greatest number in use at one time is 65 on Tuesdays at 2 p.m. and 3 p.m.

| Time of Day | Monday | | Tuesday | | Wednesday | | Thursday | | Friday | | Average | |
|-------------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|
| | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use | Rooms in Use | % In Use |
| 8:00 AM | 15 | 16% | 25 | 26% | 8 | 8% | 23 | 24% | 14 | 15% | 17 | 18% |
| 9:00 AM | 27 | 28% | 44 | 46% | 27 | 28% | 40 | 42% | 29 | 30% | 33 | 35% |
| 10:00 AM | 21 | 22% | 52 | 54% | 21 | 22% | 50 | 52% | 18 | 19% | 32 | 34% |
| 11:00 AM | 20 | 21% | 50 | 52% | 23 | 24% | 56 | 58% | 21 | 22% | 34 | 35% |
| 12:00 PM | 20 | 21% | 46 | 48% | 26 | 27% | 53 | 55% | 15 | 16% | 32 | 33% |
| 1:00 PM | 26 | 27% | 42 | 44% | 24 | 25% | 44 | 46% | 13 | 14% | 30 | 31% |
| 2:00 PM | 32 | 33% | 65 | 68% | 32 | 33% | 58 | 60% | 14 | 15% | 40 | 42% |
| 3:00 PM | 32 | 33% | 65 | 68% | 43 | 45% | 56 | 58% | 7 | 7% | 41 | 42% |
| 4:00 PM | 23 | 24% | 52 | 54% | 40 | 42% | 49 | 51% | 4 | 4% | 34 | 35% |
| 5:00 PM | 12 | 13% | 31 | 32% | 23 | 24% | 29 | 30% | 0 | 0% | 19 | 20% |
| 6:00 PM | 2 | 2% | 1 | 1% | 2 | 2% | 1 | 1% | 0 | 0% | 1 | 1% |
| 7:00 PM | 5 | 5% | 10 | 10% | 11 | 11% | 11 | 11% | 0 | 0% | 7 | 8% |

Total laboratories = 96. Darker colors indicate a large percentage of rooms are scheduled.

FIGURE 12: TEACHING LABORATORY UTILIZATION BY DAY AND TIME (FALL 2019)

TEACHING LABORATORY UTILIZATION BY BUILDING

The most predominately used teaching laboratories are housed within five buildings: Chemical Sciences and Engineering Building, Electrical Energy Resources Center, Fisher Hall, Grover C. Dillman Hall, and R.L. Smith Building (MEEM). The laboratories in these buildings are scheduled 14 to 22 hours per week.

| Building Name and ID | No. of Rooms | Average Room Size | Average ASF per Station | Average Section Size | Weekly Seat Hours | Average Weekly Room Hours | Seat Fill Rate |
|-------------------------------------|------------------|-------------------|---------------------------------|----------------------|-------------------|---------------------------|----------------|
| Chemical Sciences & Engr Bldg 19 | 13 | 1,179 | 48.2 * | 18 | 12.6 | 18.0 | 70% |
| Dow Envir Sciences & Engr Bldg 08 | 8 | 1,313 | 26.6 * | 25 | 12.8 | 13.7 | 56% |
| Electrical Energy Resources 07 | 17 | 1,128 | 36.4 * | 19 | 15.2 | 18.9 | 65% |
| Fisher Hall 15 | 8 | 807 | 29.4 * | 16 | 14.8 | 21.5 | 63% |
| Great Lakes Research Center 100 | 1 | 1,374 | 49.1 * | 11 | 3.5 | 9.0 | 39% |
| Grover C. Dillman Hall 14 | 12 | 1,159 | 33.5 * | 19 | 8.4 | 13.7 | 57% |
| Kanwal and Ann Rekhi Hall 28 | 4 | 864 | 27.6 * | 24 | 8.8 | 10.3 | 73% |
| Minerals & Materials Engr Bldg 12 | 4 | 471 | 26.5 * | 12 | 3.1 | 5.5 | 70% |
| R.L. Smith Building (MEEM) 20 | 14 | 1,219 | 47.5 * | 18 | 13.0 | 17.1 | 72% |
| Rozsa Center 10 | 1 | 1,790 | 35.8 * | 17 | 10.1 | 30.1 | 34% |
| Student Development Complex 24 | 2 | 747 | 17.0 * | 13 | 4.1 | 16.3 | 26% |
| U.J. Noblet Forestry Building 18 | 6 | 946 | 34.6 * | 16 | 10.6 | 17.5 | 60% |
| Van Pelt & Opie Library 17 | 1 | 1,192 | 47.7 * | 15 | 6.5 | 11.0 | 59% |
| Wadsworth Hall 37 | 1 | 2,385 | 18.6 * | 70 | 25.1 | 34.0 | 74% |
| Walker Arts & Humanities 11 | 4 | 978 | 42.1 * | 11 | 6.4 | 12.3 | 52% |
| Total No. of Rooms = 96 | AVERAGE | 1,100 | 35.1 * | 19 | 12.1 | 16.4 | 63% |
| Total No. of Stations = 3005 | Total ASF | 105,587 | * weighted average using totals | | | | |

FIGURE 13: TEACHING LABORATORY UTILIZATION BY BUILDING (FALL 2019)

Impact on the campus master plan: The classroom and teaching laboratory utilization analyses indicate that there is an opportunity to improve use of existing teaching spaces through increased scheduling and aligning section sizes with room capacities.

STUDENT LIFE

HOUSING

Michigan Tech operates a very successful on-campus student housing program. The program provides approximately 2,191 beds in four residential structures:

- Wadsworth Hall: 1,041 beds (community-style)
- McNair Hall (East and West): 597 beds (community-style)
- Douglass Houghton Hall: 360 beds (community-style)
- Hillside Place: 193 beds (apartments)

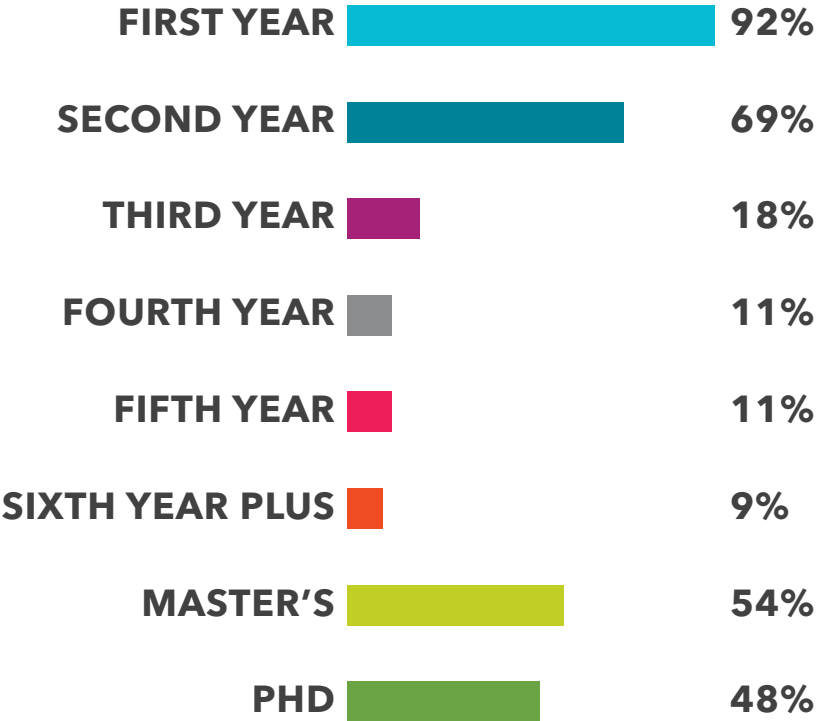
In addition to the undergraduate, single-student program described above, Michigan Tech offers apartment-style family units available primarily to graduate students and students with families. These units (total of 348) are available at Daniell Heights Apartments in the following mix:

- One-bedroom: 190 units
- Two-bedroom: 152 units
- Three-bedroom: 6 units

The maximum allowable adult occupancy at Daniell Heights Apartments is 860 people, as determined by Residence Education and Housing Services.

Michigan Tech requires first-year students to reside on campus. In addition, a large percentage of second-year students and those receiving merit-based scholarships also must live on campus.

Impact on the campus master plan: The University is highly residential—almost 40 percent of undergraduates live on campus and approximately 88 percent of students are full time. Thus, the campus must provide an integrated set of residential support services—dining, recreation, student organizations, wellness and counseling, etc., as the current offerings fall short of student demand.



As percentage of full-time enrollment

FIGURE 14: HOUSING RATES (FALL 2019–PRE-COVID-19)



DOUGLASS HOUGHTON HALL EXTERIOR



DOUGLASS HOUGHTON HALL INTERIOR



MCNAIR HALL EXTERIOR



MCNAIR HALL INTERIOR



WADSWORTH HALL EXTERIOR



WADSWORTH HALL INTERIOR

DINING

COMMUNITY DINING

The dining program at Michigan Tech consists of primarily community dining facilities including:

- Wadsworth Dining Hall (425 seats)
- McNair Dining Hall (225 seats)
- Douglass Houghton Dining Hall (120 seats)

RETAIL DINING

Retail options supplement these large operations:

- North Coast Grill and Deli - located in the Memorial Union, serves made-to-order grill items, stir fry, salads, and sandwiches
- Library Café - located in the Van Pelt and Opie Library; serves beverages, grab-and-go salads, wraps, sandwiches, and snacks
- Campus Café - located on the ground floor of Wadsworth Hall; serves pizza, burgers, chicken tenders, dessert items, and beverages; late-night dining option

The following three small retail venues complete the Michigan Tech food offerings:

- Fusion - small convenience store-like operation located in the Dow building lobby; serves smoothies, coffee, salads, wraps, and snacks
- Huski Café - small retail venue located at Mont Ripley
- Par and Grill - located in the clubhouse of the Portage Lake Golf Course; offers full-service bar and pub-style food

Convenient groceries are available only at Jim's Foodmart at 300 Pearl Street, west of campus. The Husky Food Access Network provides a pantry on the first floor of Fisher Hall.

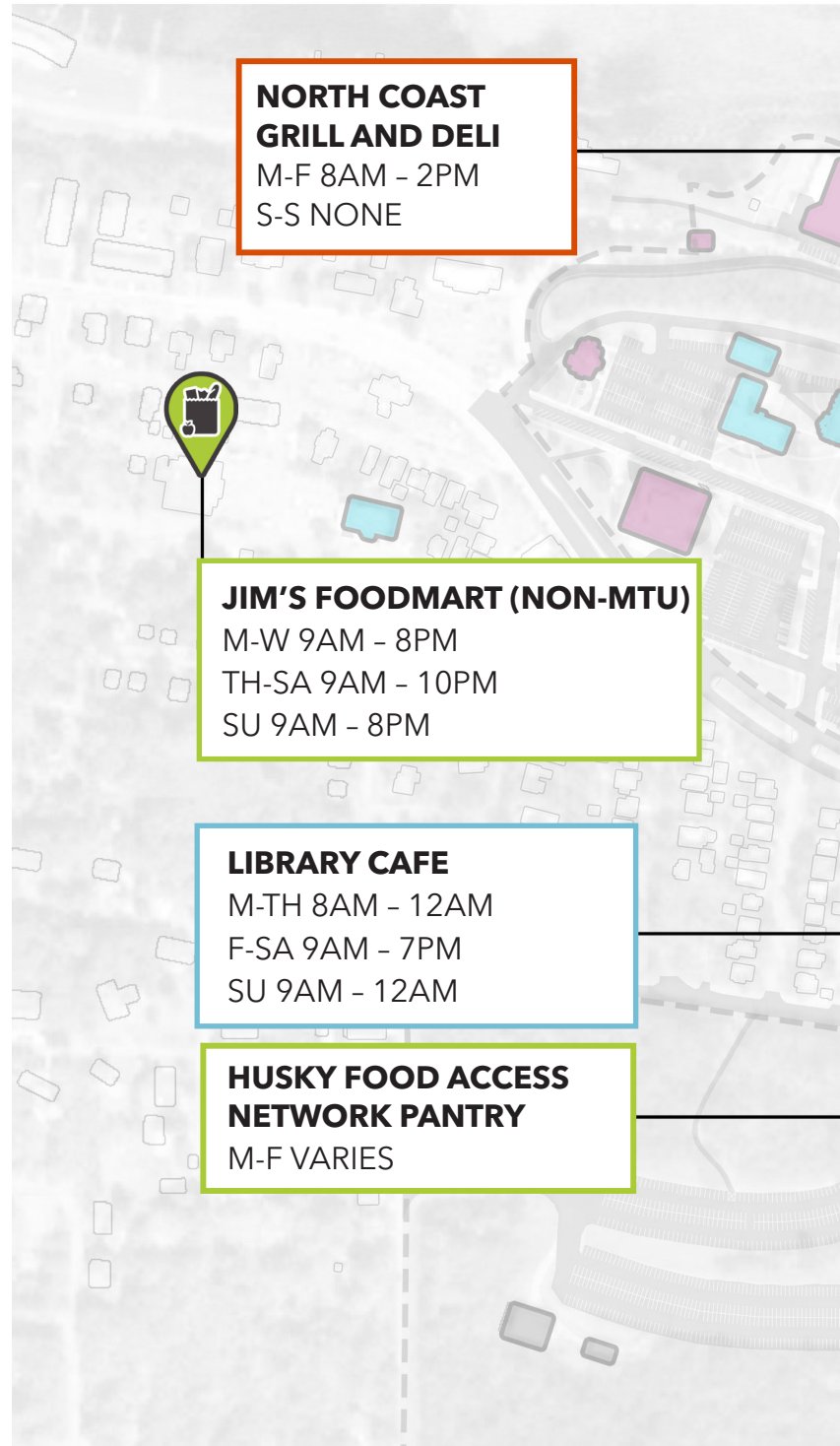
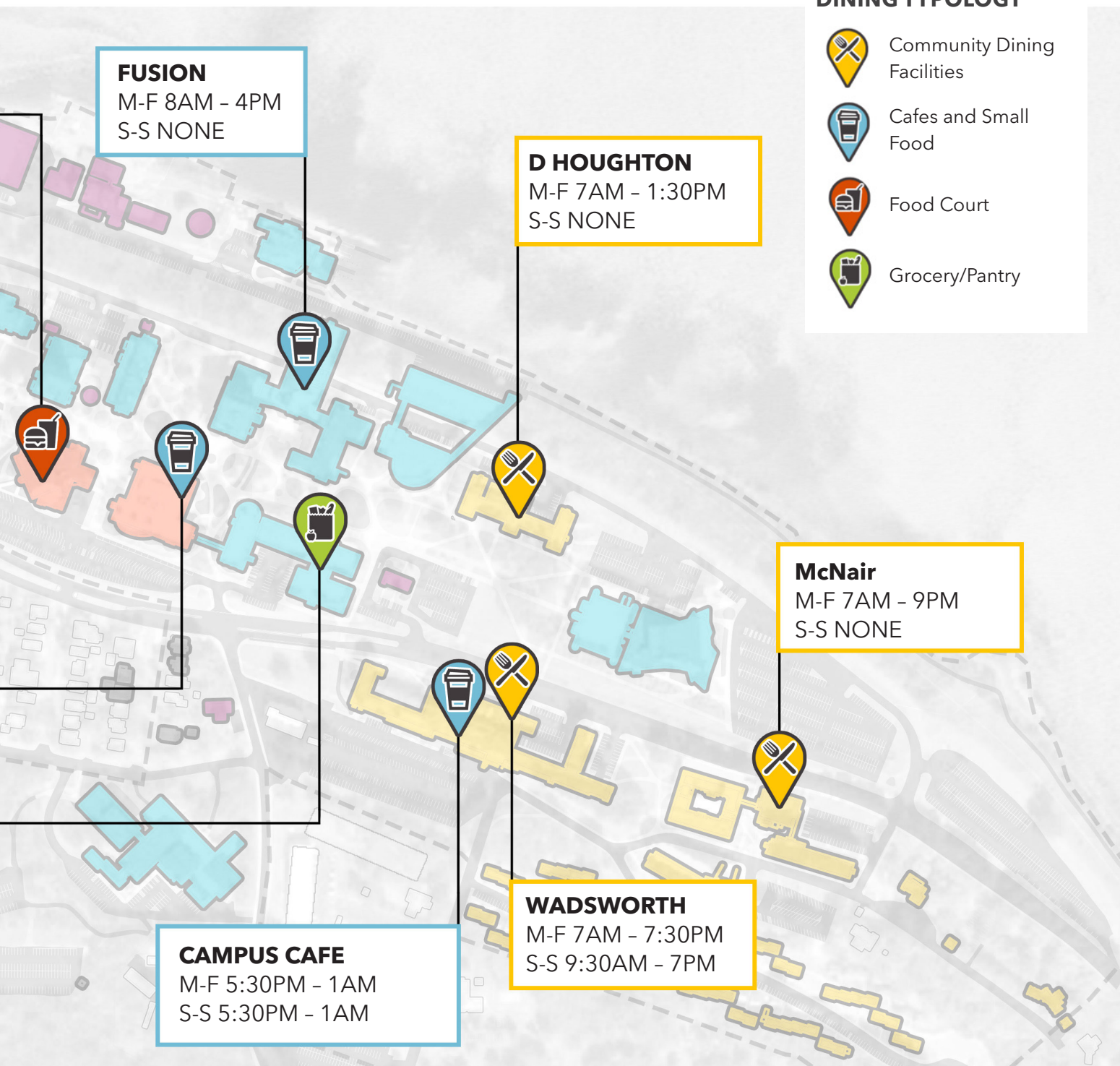


FIGURE 15: DINING OPERATING HOURS



Dining services are generally available on weekdays before 6 p.m. On weekends and after 6 p.m. availability of food service is much more limited. The dining hours, in particular, do not reflect the patterns of Michigan Tech students who often are in laboratories or are collaborating on group projects late in the evening.

Access to on-campus food is worse on weekends, when no food is available in the campus core. All commuters and residents of Douglass Houghton Hall and McNair Hall must walk to Wadsworth Dining for all meals.

Impact on the campus master plan: While the community-style dining halls adequately serve campus residents on meal plans, the campus lacks an appropriate balance between dining hall options and retail offerings. The retail offerings are insufficient, particularly at the Memorial Union Building, to satisfy the Michigan Tech population demand. For example, no branded food options are currently available. The most underserved populations are off-campus students and graduate students.

All residence halls and their dining facilities are on the east end of campus. When new residential halls are located at the west end of campus, the Memorial Union Building dining facility will initially need to expand operations to be able to serve the west end residents. When the number of west end residents increases beyond the capacity of the Memorial Union Building dining facility, a new residential dining facility will be necessary.

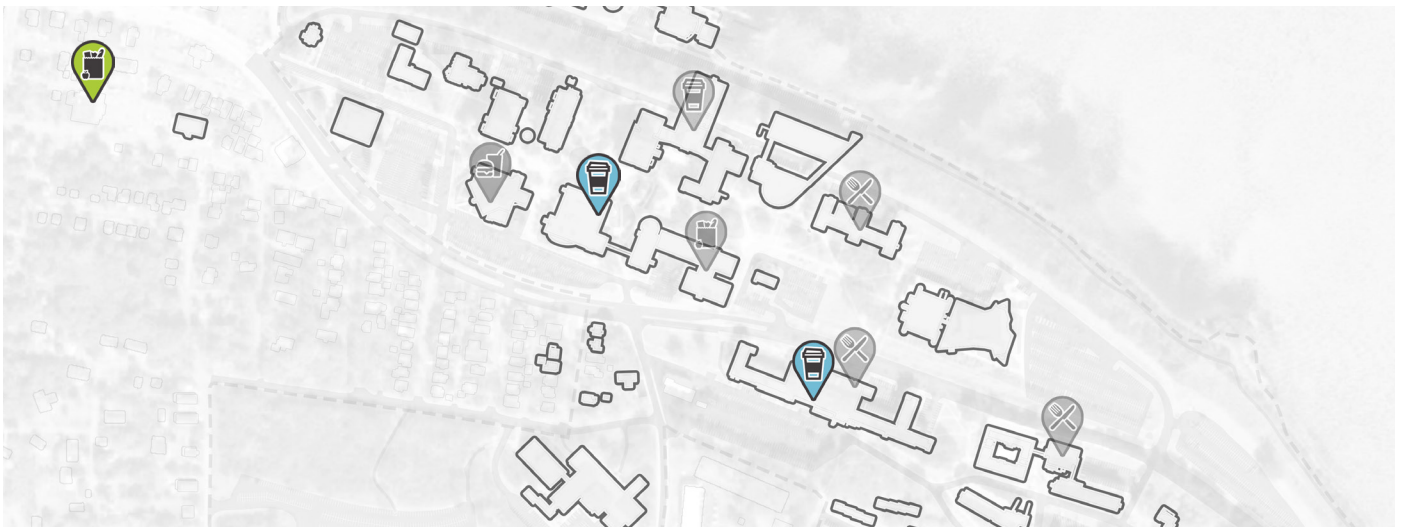


WEEKDAYS BEFORE 6PM

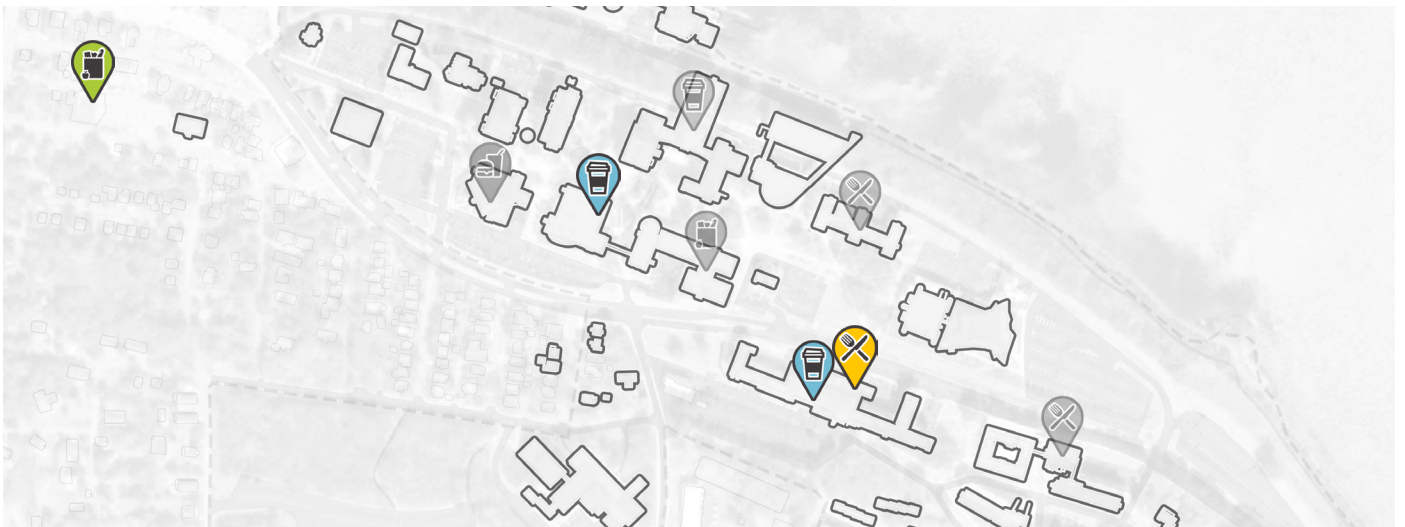
FIGURE 16: DINING LOCATION, TYPOLOGY, AND OPERATING HOURS



WEEKDAYS 6PM - 9PM



WEEKDAYS AFTER 9PM



WEEKENDS

MEMORIAL UNION BUILDING

The Memorial Union Building serves as the campus center and offers programs including food service at Keweenaw Commons Food Court (North Coast Grill and Deli), Campus Bookstore, student organization space, meeting rooms, ballroom space, makerspace, and the Admissions Office. The Memorial Union Building is approximately 90,000-square feet.

Based on student input, the planning team concluded that the Memorial Union Building lacks identity (student center vs. campus center vs. conference center) and does not offer services and programs to meet student demand. In addition, the facility is located in close proximity to the Van Pelt and Opie Library—a popular student destination due to a variety of study spaces, computer workstations, and food service. The Memorial Union Building is missing the informal student lounge and casual living room space that the Van Pelt and Opie Library has.

Student visits to the Memorial Union Building are transactional in nature, rather than encouraging engagement and connections. The primary reasons that students indicated for visiting the Memorial Union Building are shopping at the campus store, eating at the food court, and attending a meeting.

The space available for student organization office and storage space is insufficient.

Impact on the campus master plan: The University should expand campus center offerings, either in an expanded or renovated Memorial Union Building or distributed in other facilities.



MUB HALLWAY



MUB BALLROOM



MUB THE ALLEY MAKERSPACE

RECREATION

The Student Development Complex is a 235,000-square foot facility offering both recreation and athletic amenities to the Michigan Tech community and off-campus patrons. The key recreational program elements include:

- Weight/fitness space (7,200-square feet, SDC rooms 205 and 206),
- Multipurpose studio space (3,600-square feet),
- Basketball/volleyball courts (4 courts),
- Indoor track (200 meters),
- Eight-lane/25-yard swimming pool,
- Racquetball courts,
- Indoor climbing wall, and
- Esports suite.

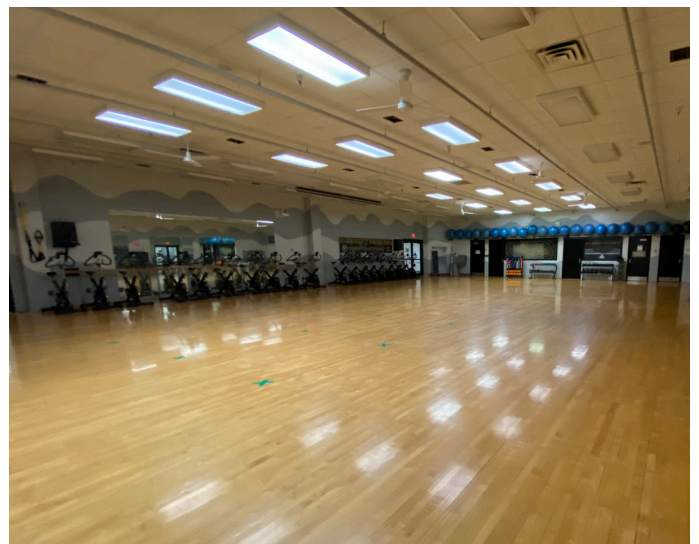
Well-equipped weight and fitness areas are located in each residence hall.

Many students take advantage of a wide variety of outdoor amenities such as Tech Trails (cross country skiing), outdoor broomball courts, outdoor soccer fields, softball fields, sand volleyball courts, disc golf course, ropes course, Mont Ripley Ski Area (alpine ski hill), and Portage Lake Golf Course. Facilities at Tech Trails, Mont Ripley, and Portage Lake Golf Course are in need of upgrades and expansions.

Impact on the campus master plan: The University is well-served by existing dedicated recreational facilities and those facilities shared with athletics. As student enrollment and the on-campus residential population grows, additional recreational facilities, primarily in the form of weight/fitness space and multipurpose studio space, will be needed.



SDC SWIMMING POOL



SDC FITNESS STUDIO



SDC ESPORTS

CIRCULATION

GROUND FLOOR EXPERIENCE

The central campus open space is an effective area for gathering and circulation. After its redevelopment, the lakefront can also be a premier gathering and recreation space. It is not clear for pedestrians how to access the bluff edge and the lakefront from the central campus.

The entrances to many buildings are not coordinated, making building-to-building circulation, and thus interdisciplinary collaboration, more difficult. Some adjacent buildings have ground floor or upper floor bridge connections, which provide sheltered interior circulation during cold days but detract from the chance encounters in the exterior campus open space year-round.

The lobbies and hallways within most buildings were designed for maximum efficiency of circulation. The result is that interior corridors do not provide sufficient collaboration spaces. Some of the most important learning occurs shortly before or after class, in peer-to-peer group work or small group discussion with instructors. These informal conversations most often happen in collaboration spaces adjacent to classrooms. Most of Michigan Tech's efficiently designed academic buildings lack these important informal spaces.

Most academic and research buildings lack a front door experience—a welcoming informal space that provides orientation for the visitor and a location for informal gathering and collaboration out of the cold.

Within buildings, wayfinding is often confusing. Additional wayfinding signage is needed.

Impact on the campus master plan: Renovations should consider creating informal front door areas and collaboration areas within corridors.

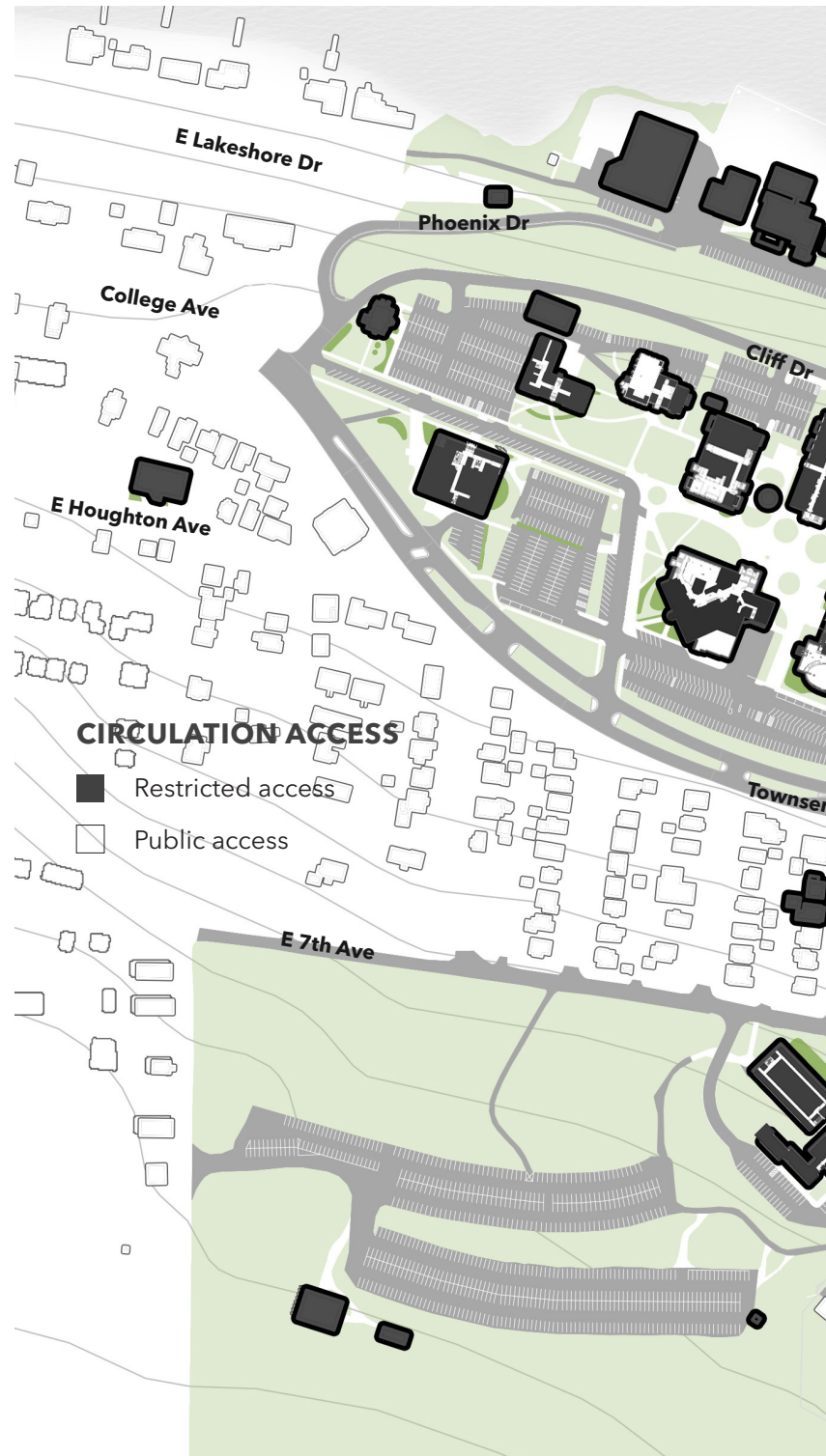


FIGURE 17: GROUND FLOOR EXPERIENCE



PEDESTRIAN AND BICYCLE

Michigan Tech is compact and thus most residential students, commuter students, faculty, staff, and visitors walk between destinations. The pedestrian experience, especially during Houghton's long winters, is crucial.

The on-campus pedestrian experience in the academic and research campus core is excellent. The University has removed streets and constructed wide pedestrian paths, landscaping, and points of interest in the former right-of-way. The looping circular path pattern of the academic and research core and the straight diagonal path pattern of the eastern end of the campus are both effective.

Outside of this area, pedestrians must share right-of-way with vehicles, degrading safety and the pedestrian experience. West of the Memorial Union Building, sidewalks are narrow and pedestrians walk through parking lots to access the Administration Building and the Alumni House.

Sidewalks are narrow on MacInnes Drive, which makes navigating the elevation change particularly challenging for pedestrians, especially in the winter. Crossing Townsend Drive (US Highway 41), which is necessary for most on-campus residents to access most academic and research buildings, requires twice carefully crossing a lane of regional higher-speed traffic. The center island and the recent roadway reconstruction improved the crossing experience, but it is still difficult and risky.

Sidewalks along most roads are narrow, with shallow or no setback from the curb. Houghton receives more than 200 inches of snow, and much of that snow is plowed onto sidewalks, making sidewalks even narrower.

The resulting pedestrian experience was reported to the planning team through the MapMyTech day-in-the-life survey. Figure 19 depicts the most common walking routes and the areas where campus users feel most

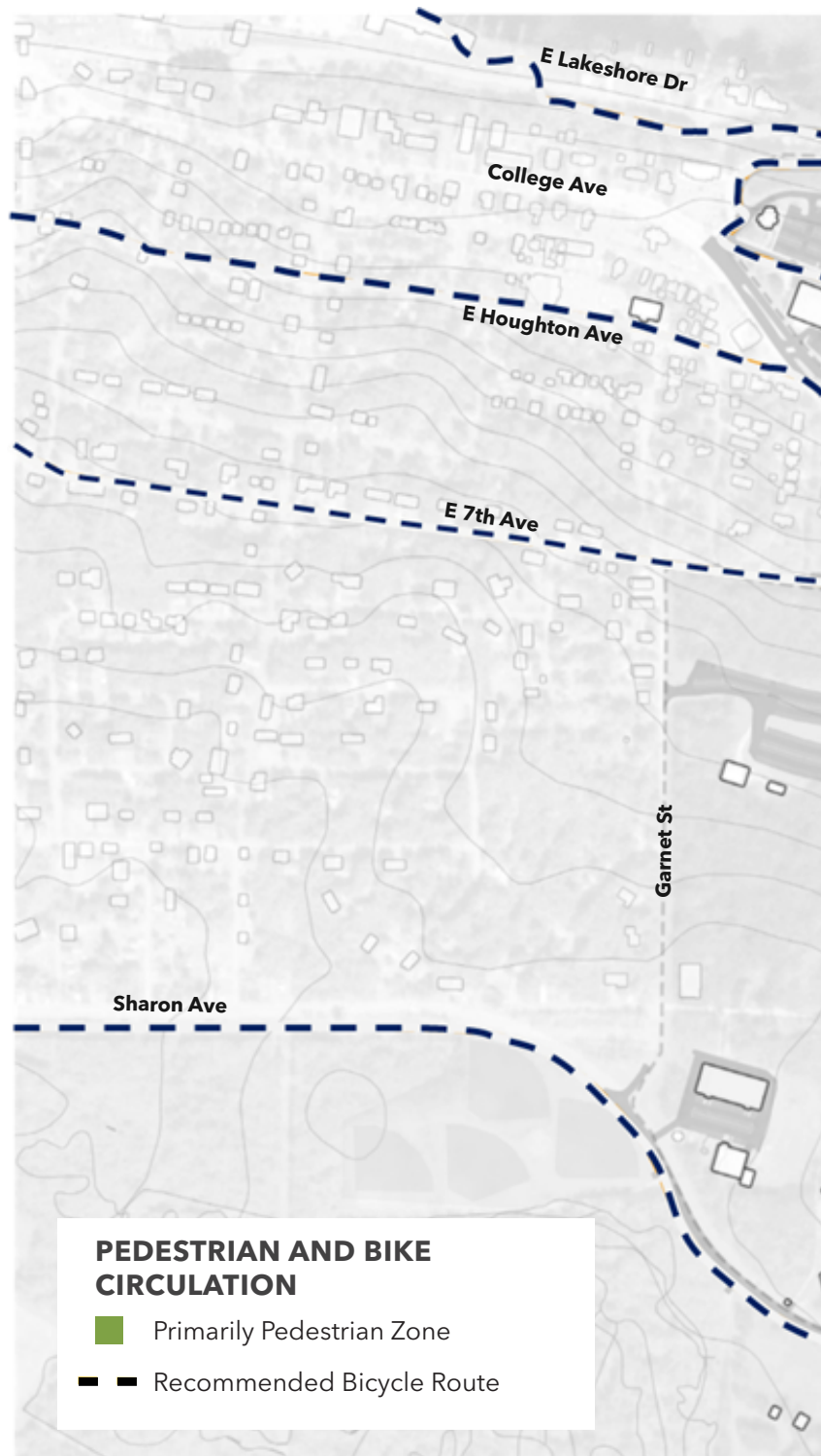


FIGURE 18: PEDESTRIAN AND BICYCLE CIRCULATION



uncomfortable and most unsafe.

Clusters of reported unsafe/uncomfortable areas are at multiple Townsend Drive crossings and along College Avenue on campus, Cliff Drive, and Phoenix Drive. Cliff Drive lacks sufficient pedestrian paths along the bluff edge.

Impact on the campus master plan: The University should improve the pedestrian experience outside the academic and research core. College Avenue and Hubbell Street should be removed and reconstruction along MacInnes Drive should result in wider, more protected pedestrian paths. As redevelopment activity occurs at the lakefront, Cliff Drive should be reconstructed for more comfortable pedestrian experience for those crossing the street and those walking along the street.

The bicycle network that connects the campus with residential origins in the city is primarily along public streets. The City of Houghton has constructed a 4.5-mile trail which runs along the Portage Lake waterfront. The trail, which is paved and barrier free, accommodates walkers, joggers, and bikers. When on campus, trail users must share Phoenix Drive with vehicles accessing the facilities complex and those parking in Lots 31 and 34.

The University encourages cyclists to dismount their bicycles when in the pedestrian-focused campus core.

Impact on the campus master plan: When the lakefront is redeveloped, the University should reconstruct Phoenix Drive so that the waterfront trail is safer and welcoming for city residents experiencing the campus. Parking could be removed from Phoenix Drive. The University should consider consolidated bicycle corral facilities where major bicycle routes end at the edges of the campus core to encourage cyclists to store their bicycle outside the campus core.

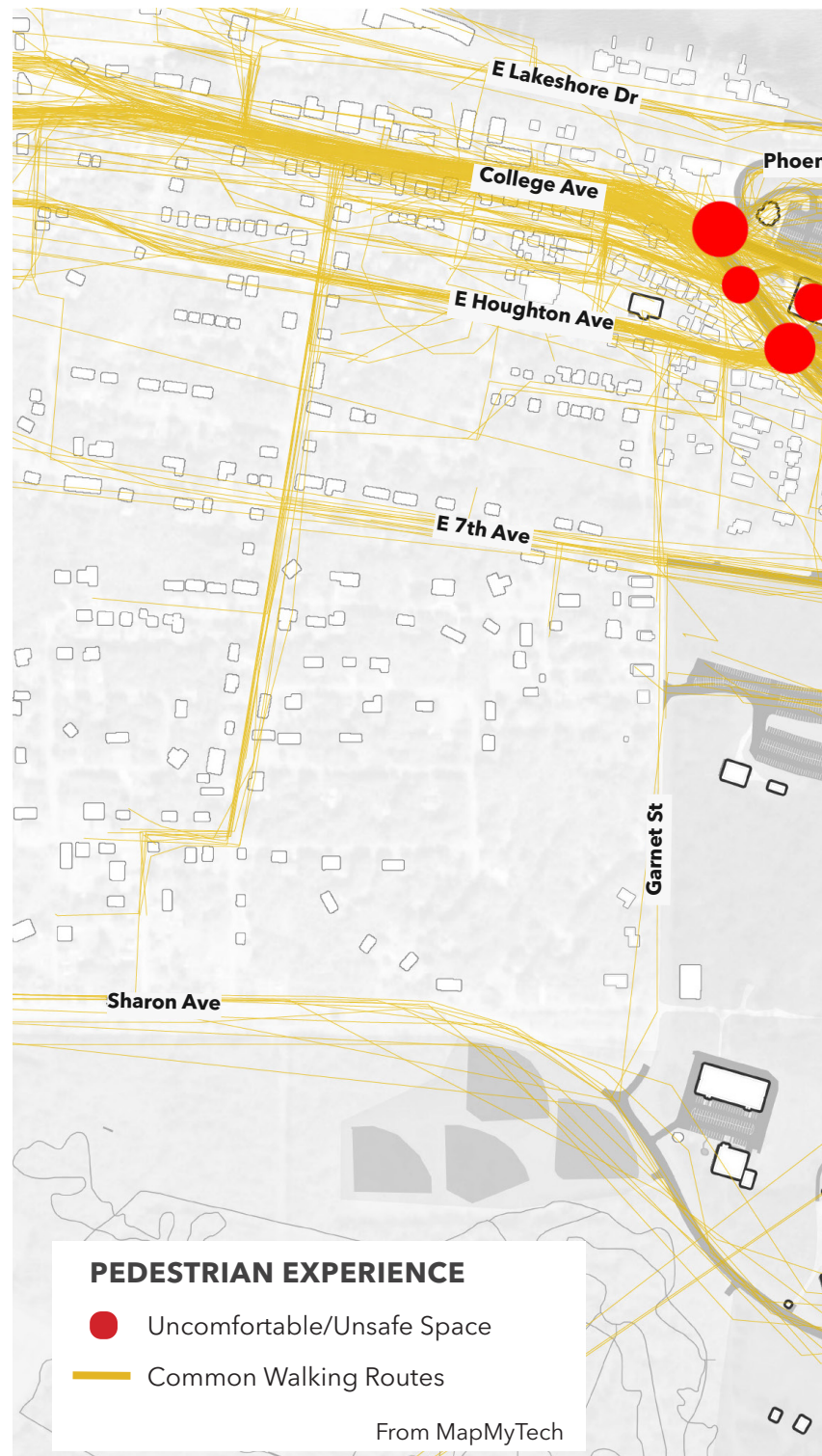
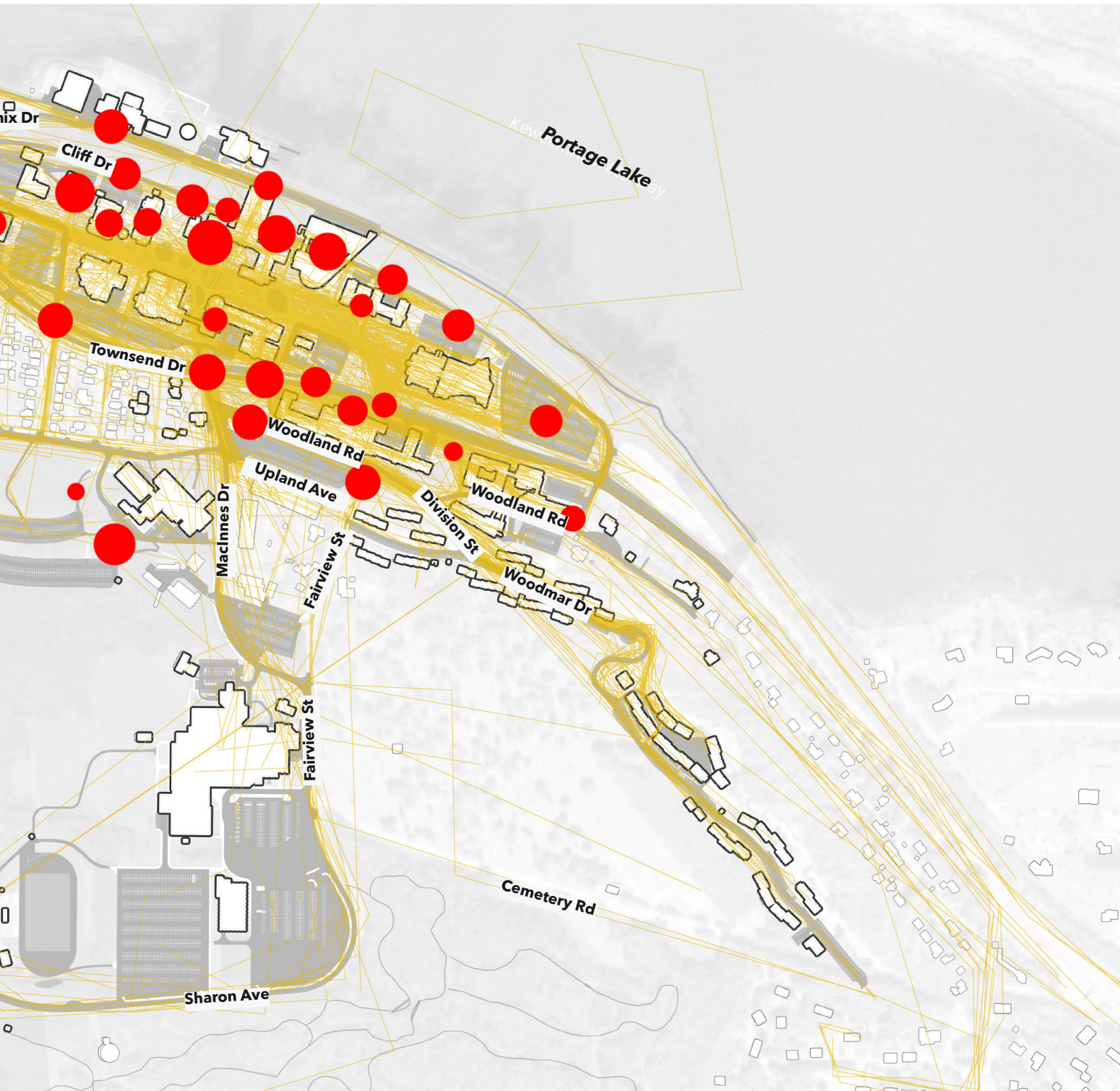


FIGURE 19: PEDESTRIAN EXPERIENCE



VEHICULAR PARKING

Vehicular parking is positioned around the edges of the academic and research core in three areas. Large remote lots are located at the east end of campus, along 7th Avenue, and south of the Student Development Center. All parking is in the form of lots except on-street parking on Phoenix Drive and Woodmar Drive. The campus has no structured parking facilities.

All drivers seek parking close to their destinations. As a policy, the University has prioritized certain groups for access to parking near the campus core:

1. Faculty and Staff - All vehicular parking spaces north of Townsend Drive and west of the Rozsa Center are reserved for faculty and staff, except those for visitors.
2. Visitors - Around the Memorial Union Building.
3. Commuter students - East of the Rozsa Center, along 7th Street, and near the Student Development Center.
4. Residential students - Limited residential students can park near Wadsworth and McNair Halls, but most parking spaces for residential students are remote—along 7th Avenue, at the far east end of campus, or the far southeast corner of campus.

Impact on the campus master plan: There are higher and better uses for surface parking lots that are within the academic and research core, such as Lots 1, 11, 14, and 27. Removed surface parking likely will need to be replaced in denser parking structures.

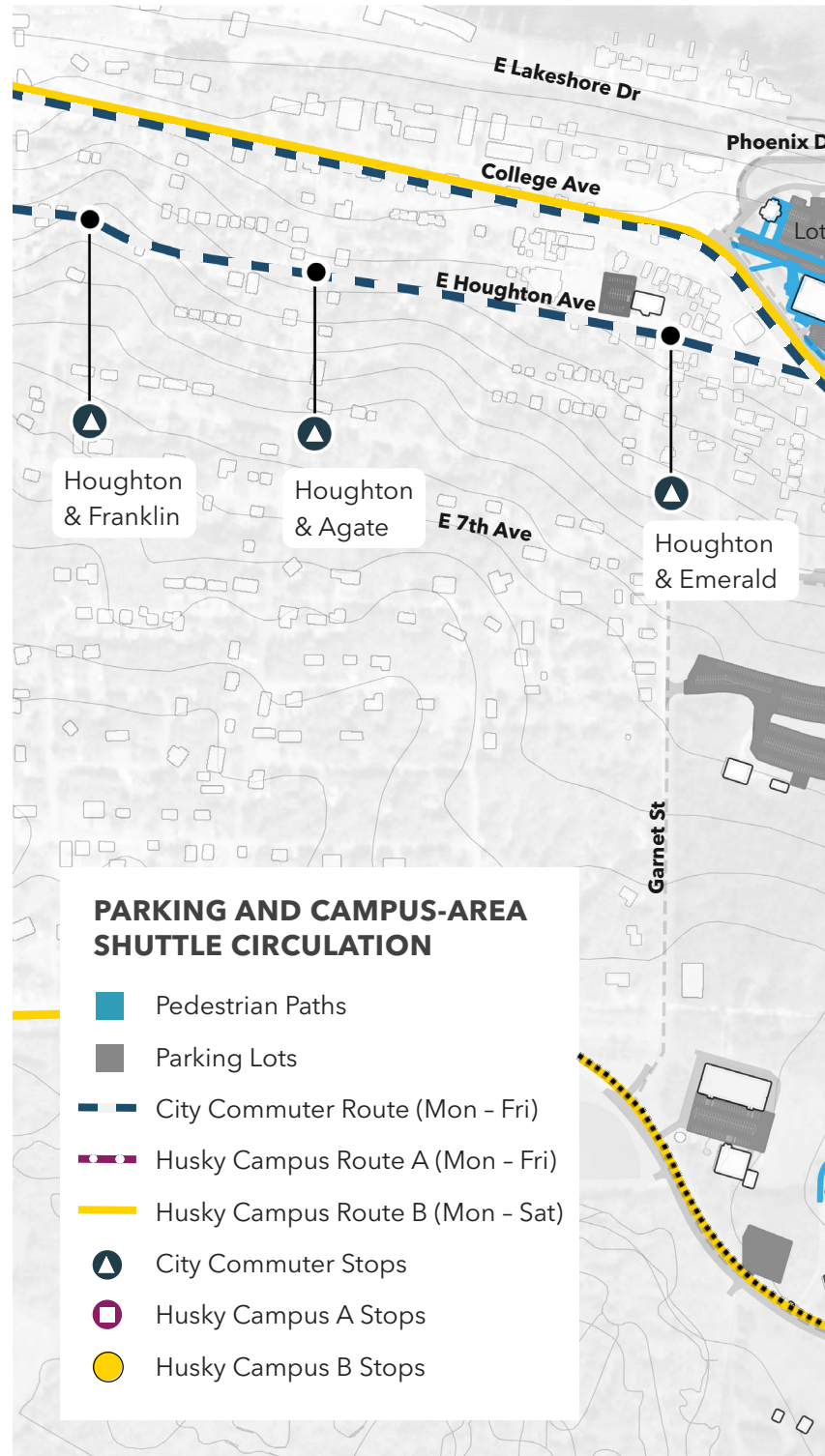
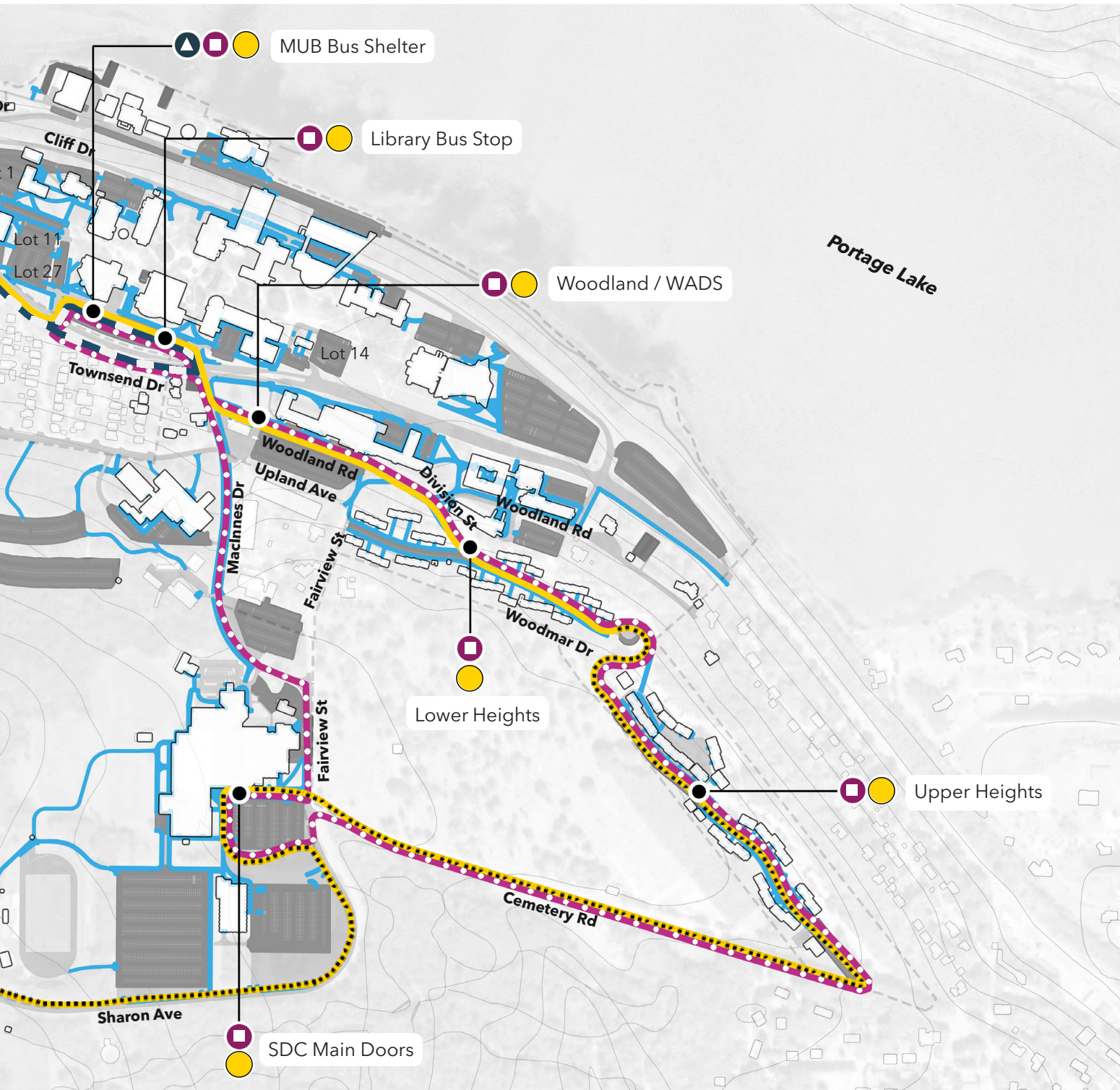


FIGURE 20: PARKING AND CAMPUS-AREA SHUTTLE CIRCULATION



MTU SHUTTLE

During the fall and spring semesters, MTU Transportation Services provides shuttle service around campus and throughout downtown Houghton. Shuttles are free of charge to students, faculty, staff, and guests. It is a fixed-route service and not on-demand; i.e., shuttles are only permitted to stop at the pre-designated locations.

Both MTU Transportation Services shuttle routes are long one-way loops that connect the on-campus residential areas with the Student Development Center and the Memorial Union Building, to off-campus downtown Houghton and suburban shopping centers. The result is that transit trips are long and circuitous, and a desire to go a short distance requires a long trip to the far side of Houghton just to return to the campus. Long routing and long waits between shuttles (headways) are disincentives for shuttle ridership.

Impact on the campus master plan: The University should consider different routing that will make routing more direct and reduce headways.

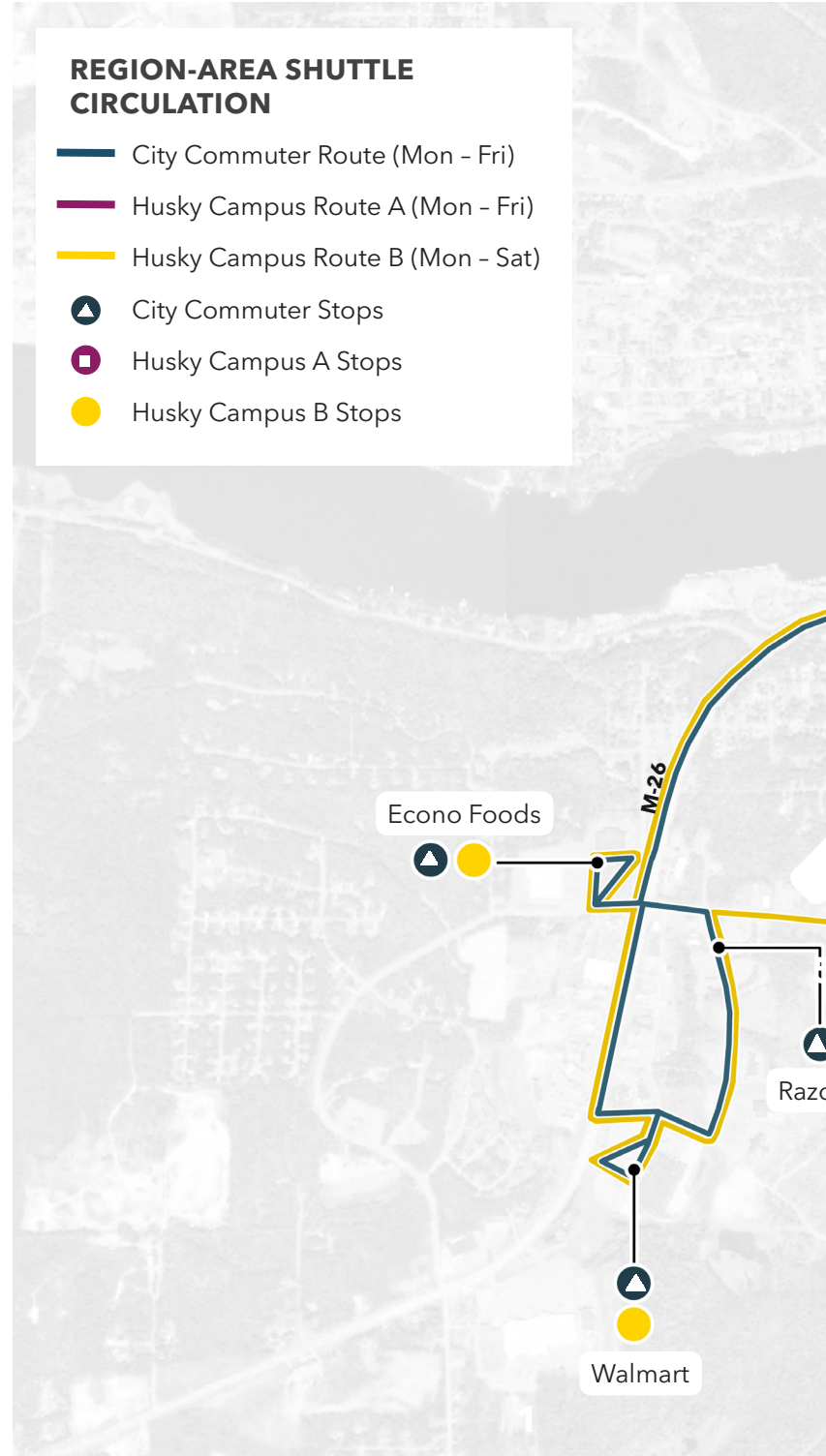
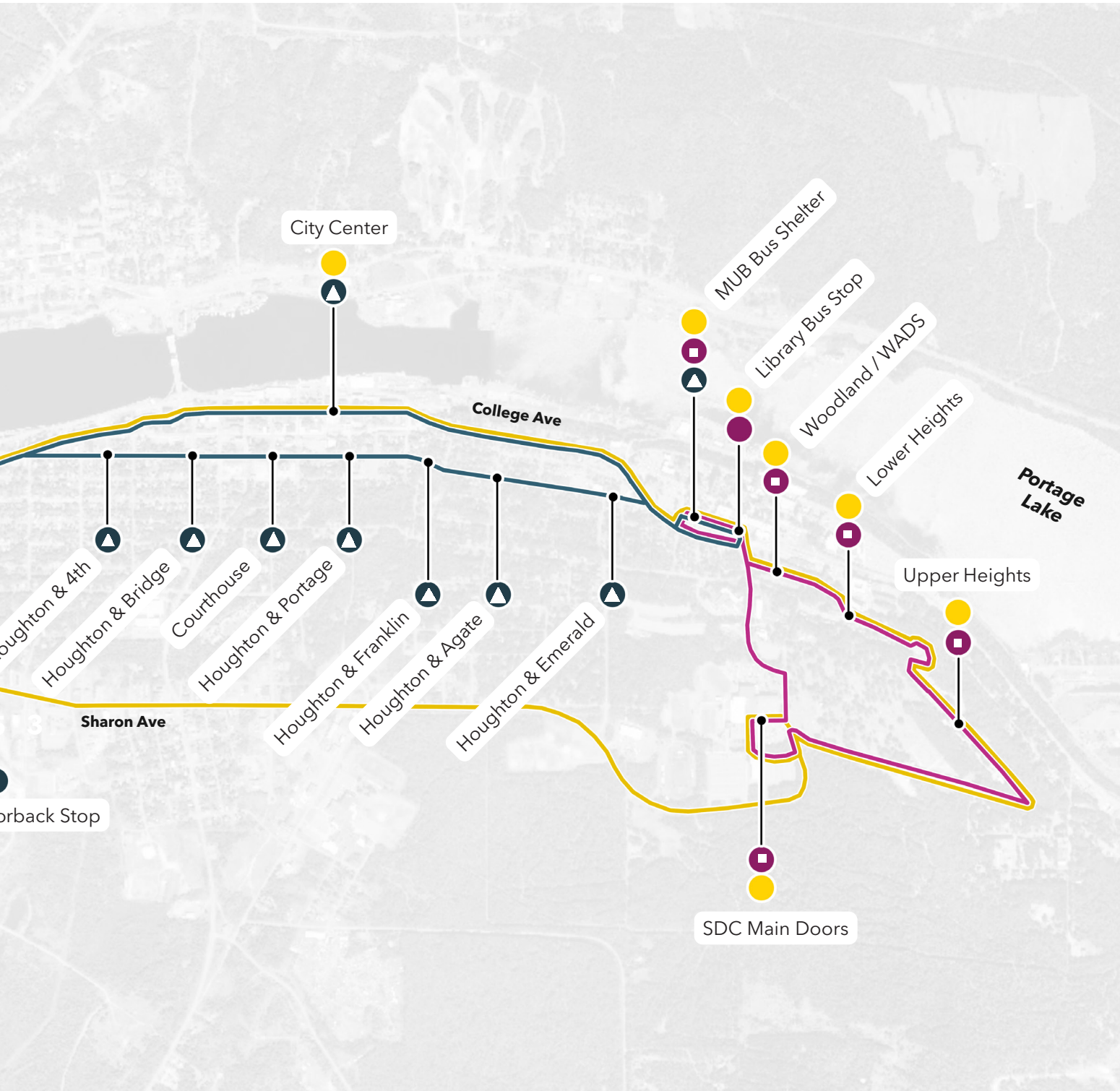


FIGURE 21: REGIONAL SHUTTLE CIRCULATION



TOPOGRAPHY

The campus is located on the Keweenaw Peninsula. It climbs up from Portage Lake, part of the Keweenaw Waterway. The steep hillside location creates challenges for infrastructure maintenance, winter driving, walking, and cycling, but provides spectacular views and contributes to the campus's unique sense of place.

The academic and research core is located on a relatively flat area at approximately 700 feet elevation, and thus pedestrian and cycling circulation are relatively easy. The Great Lakes Research Center, Facilities, and Central Heating Plant are at the Portage Lake level, approximately at 610 feet elevation. The 90-foot bluff is a major challenge for accessing the lakefront. Vehicles must use Phoenix Drive to access the lakefront, and pedestrians can use elevators in the Dow Environmental Science and Engineering Building and the Minerals and Materials Engineering Building. More extensive use of the waterfront will require additional interior and exterior pedestrian paths between central campus and Phoenix Drive.

MacInnes Drive is the most direct connection from the academic and research core to the upper campus where the Student Development Center and athletic facilities are located. The elevation of U.J. Noblet Forestry Building is approximately 790 feet and the elevation of the Student Development Center is approximately 870 feet. It is a challenge for pedestrians to climb the 170-foot elevation change on the narrow sidewalks along MacInnes Drive.

Impact on the campus master plan: Cycling is difficult on the campus and in Houghton due to topographic change. Pedestrians with limited mobility are challenged walking outside the campus core. Transit is a relatively important mode for circulating within campus and within the community.

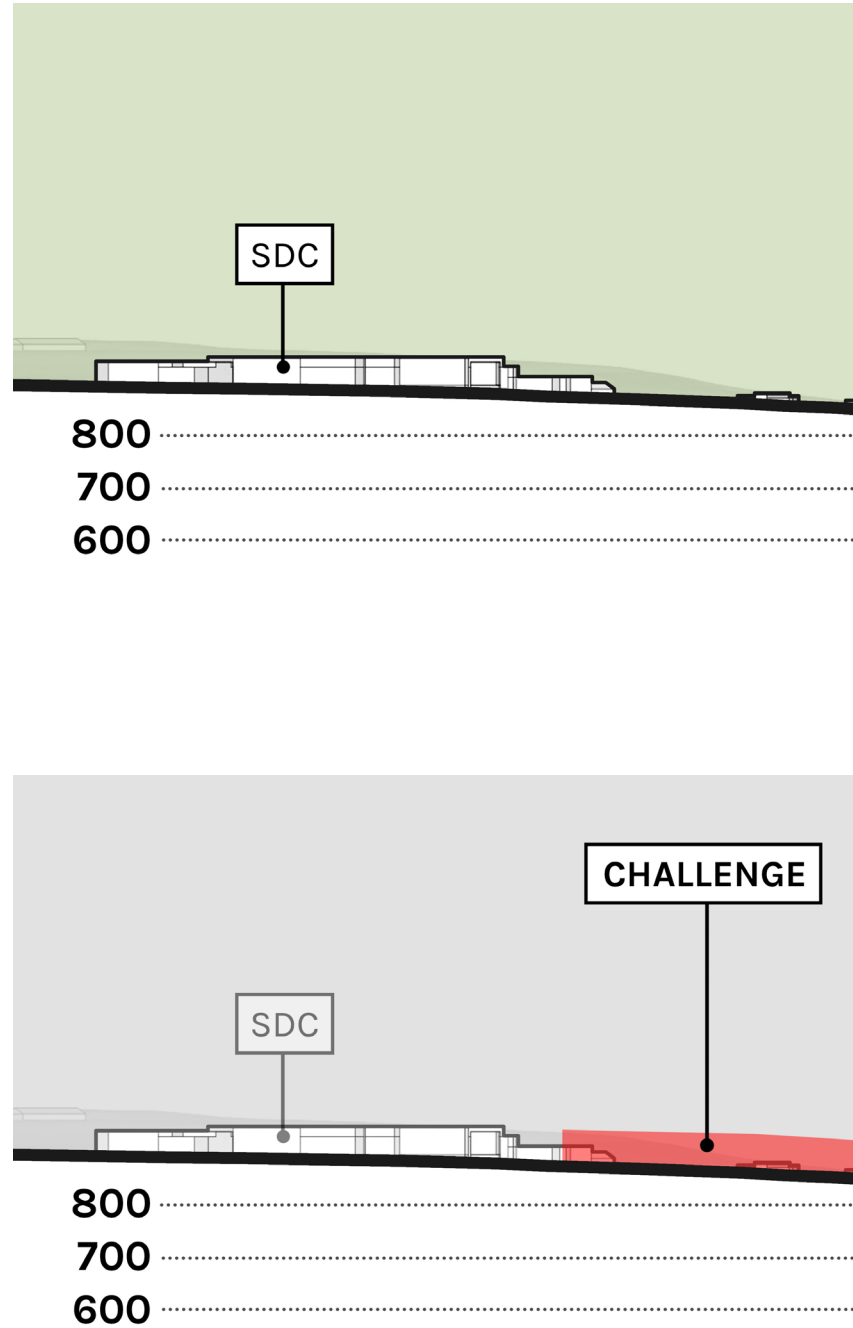
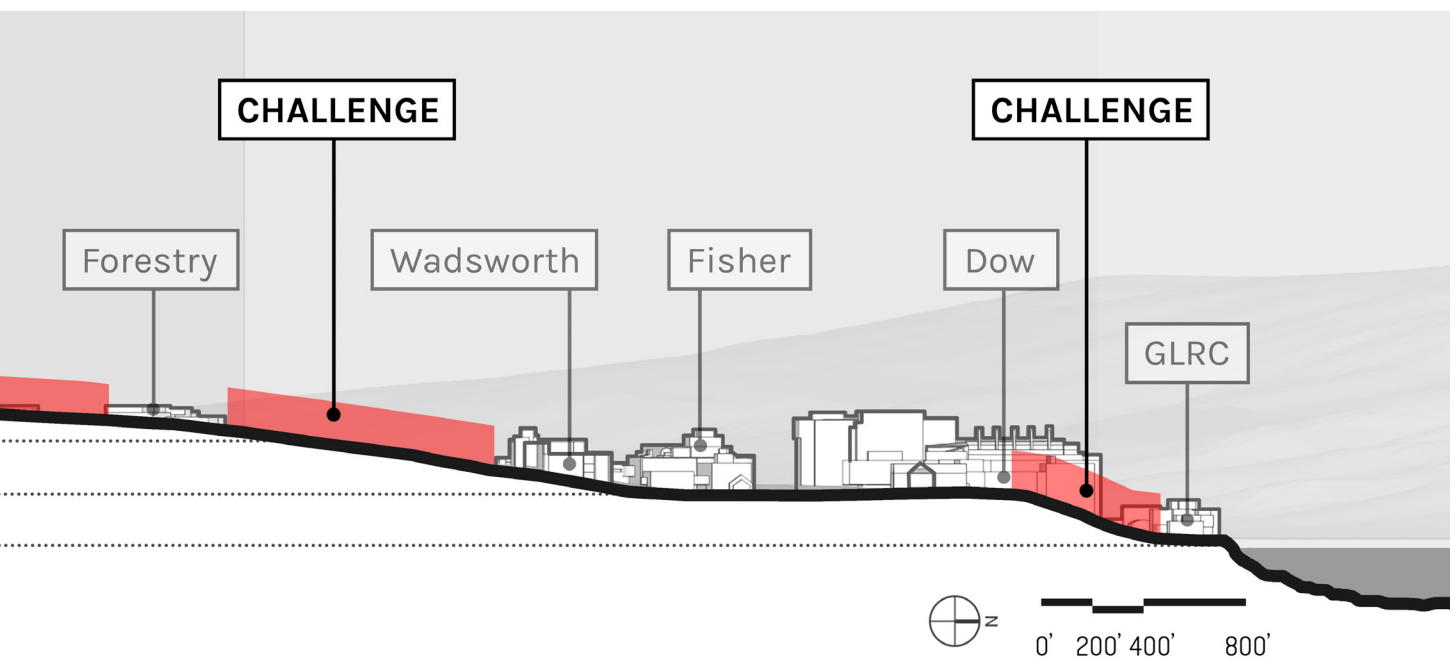
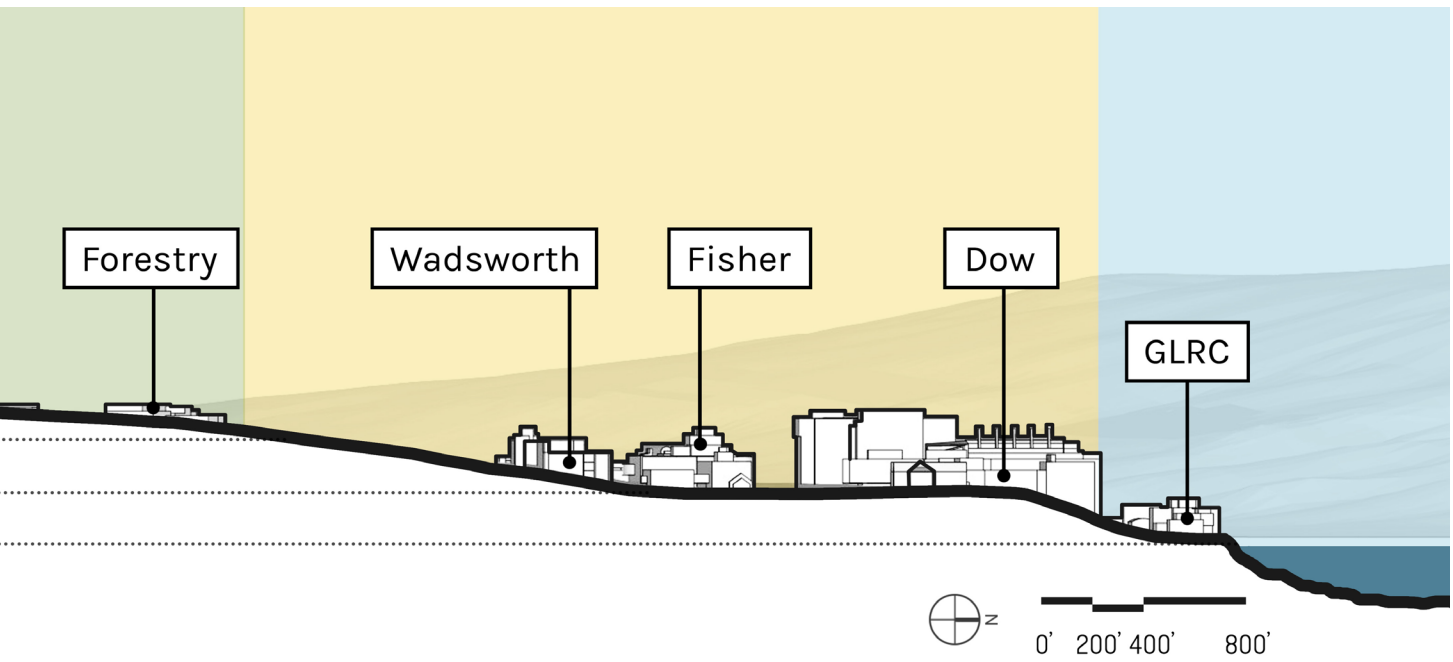


FIGURE 22: TOPOGRAPHY CROSS-SECTION



OPEN SPACE

CHARACTER

The character of the campus open space varies widely. The University has improved the character of the academic and research core with the removal of streets and construction of wide pedestrian paths, landscaping, and points of interest. The John Rovano Plaza adjacent to the Library is particularly effective.

East of Walker and west of the Memorial Union Building, the character is less pedestrian and more vehicular with roads and surface parking lots. Other than a plaza constructed for the Great Lakes Research Center, the lakefront is dedicated to industrial uses or surface parking.

The student residential areas south of Townsend Drive are constructed on a steep slope which hinders easy walking. Better open space connections are needed so that pedestrians can more easily cross the terrain. The residential areas border the Forest Hill Cemetery and are heavily wooded.

The upper campus open spaces are predominantly athletic and recreational fields. The area west and north of Hubbell Field and the soccer fields is heavily wooded.

South of campus are the Tech Trails, which include 33 kilometers of groomed cross country ski trails (both classic and skate sections) and 11.7 kilometers of groomed snowshoe trails. The Tech Trails are nationally recognized for the quality of skiing, consistency of grooming, and variety of terrain.

North of campus across the Keweenaw Waterway is Mont Ripley, the oldest ski area in Michigan (established in the 1900s). Mont Ripley has 22 trails, a terrain park, a tubing park, and sits on 112 acres. It is approximately 2 miles from campus and the hill is viewable from most campus buildings. The ski hill chalet, which is almost 60 years old, is outdated, undersized, and not accessible.

Impact on the campus master plan: When the parking lots at the west end of the academic and research core are redeveloped, the open space character of the core should be extended west.



JOHN ROVANO PLAZA



FALL



SUMMER



SPRING



WINTER



SUMMER



WINTER

OUTDOOR THERMAL COMFORT

The campus is on the Keweenaw Peninsula that extends into Lake Superior. As the result, the area receives significant wind and snow over an extended winter season. The snowy period of the year lasts for 6.5 months, from late October to early May. The planning team completed an analysis to study the outdoor thermal comfort level across the campus.

The purpose of the analysis was to find out the most feasible areas to invest in new outdoor developments on campus, where both the heat and wind feel comfortable for students to gather, study, and play on campus.

The planning team built a digital campus model and simulated summer and winter domain wind patterns. In January, wind blows most often from the west. Buildings on the campus alter the natural wind pattern and can create a wind tunnel and generate stronger wind effects. Wind tunnel effects are often reported near R.L. Smith Building (MEEM), Chemical Sciences and Engineering Building, and the Memorial Union Building.

In Figure 23, the color range represents wind speed—red is the strongest at 15 mph and dark blue is the lightest at 0 mph. Wind speeds up to 6 to 9 mph can be comfortable.

The John Rovano Plaza outdoor patio east of the Van Pelt and Opie Library is protected from west wind, and the protection is a reason it is one of the most comfortable areas on campus.

Impact on the campus master plan: The areas colored blue are most feasible for development as outside areas because the cold winter winds are blocked by buildings. This outdoor thermal comfort analysis should be use as a guide to locate and create comfortable outdoor spaces.

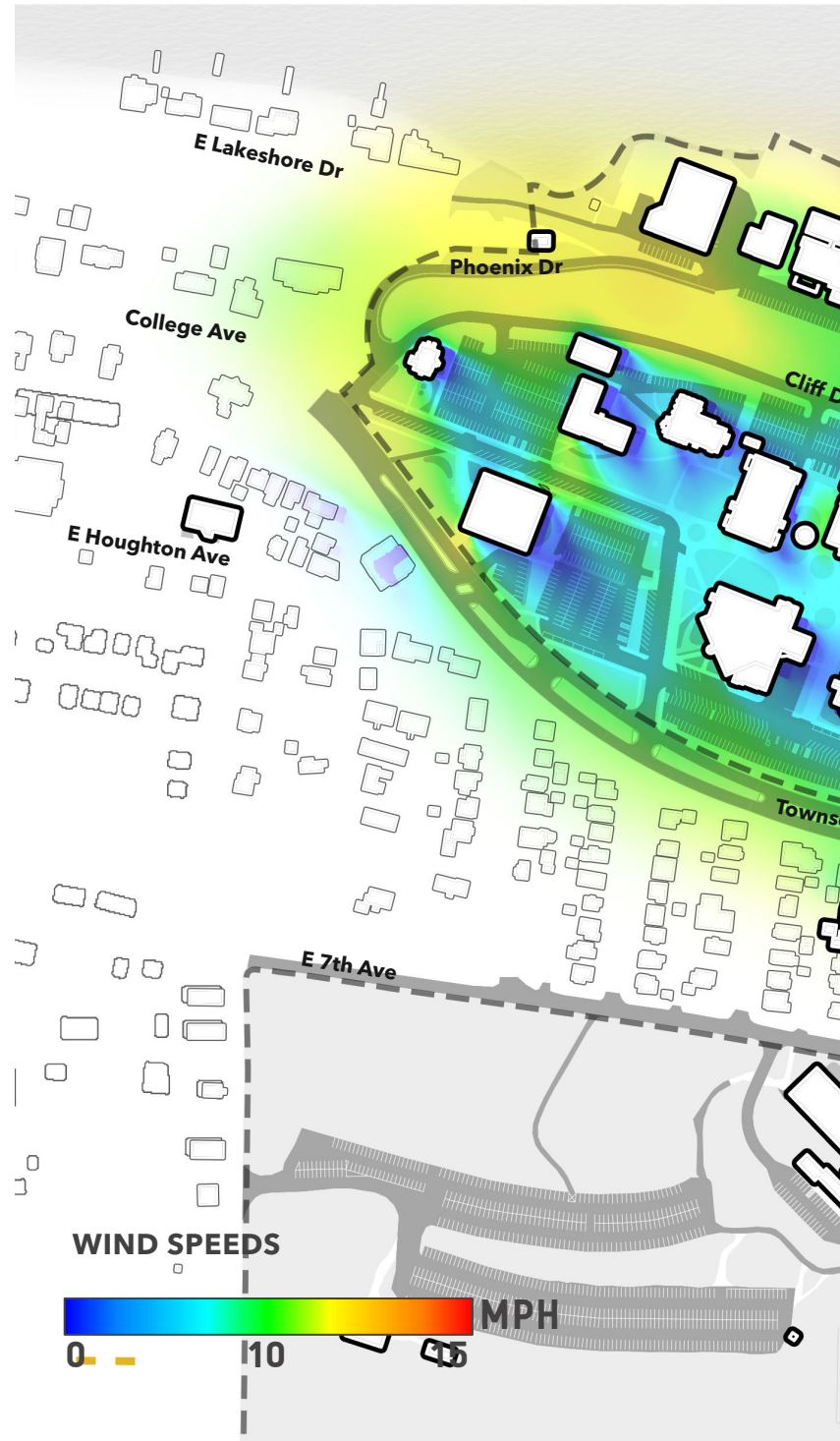
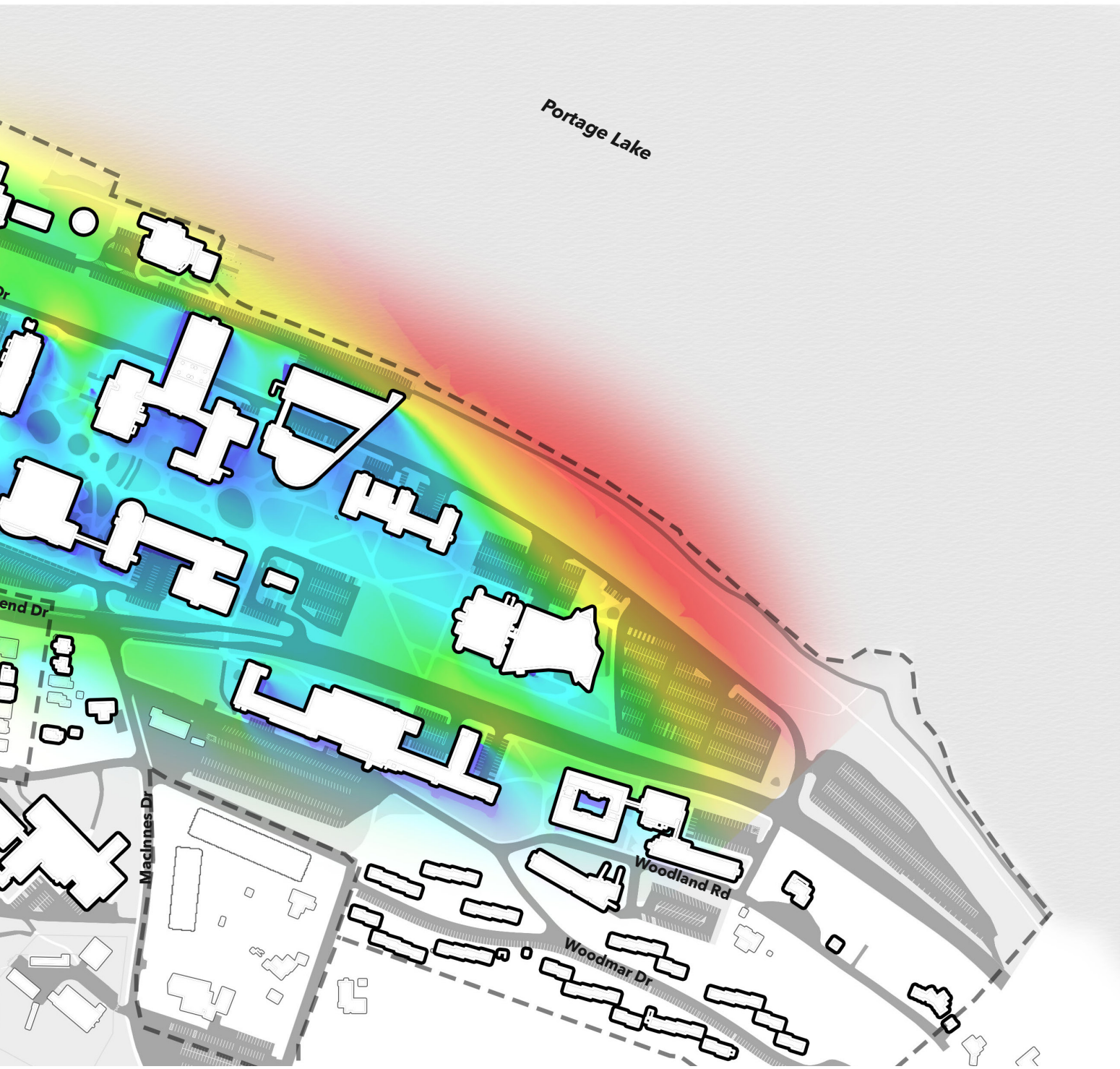


FIGURE 23: OUTDOOR THERMAL COMFORT



SURFACE COVER

The campus is located on the east edge of the City of Houghton. There is limited development east of campus.

Half of the campus is pervious. A pervious surface is a surface that allows the percolation of water into the underlying soil. Pervious surfaces include grass, wooded areas, mulched groundcover, planted areas, vegetated roofs, and permeable paving. In contrast, impervious surfaces are those areas that prevent or impede the infiltration of stormwater into the soil. Common impervious areas include, but are not limited to, rooftops, sidewalks, walkways, patio areas, driveways, parking lots, storage areas, and compacted gravel and soil surfaces.

Large sections of the campus are wooded, in particular along the bluff, south of East 7th Avenue, and the Tech Trails.

Pervious surfaces reduce opportunities for flooding and reduce temperatures from the heat island effect. Forests serve as carbon sinks.

Impact on the campus master plan: The University should seek to maintain or increase its pervious surfaces to support resiliency and sustainability. Redevelopment of surface parking lots for new buildings minimizes the reduction of pervious surfaces.



FIGURE 24: SURFACE COVER





PROGRAM NEED





FUTURE TRENDS

EXCELLENCE AND INNOVATION

Michigan Tech is changing the world—premier academic programs, groundbreaking research, record enrollment, unparalleled student achievements, and pioneering faculty. To continue this impressive trajectory, the institution created a campus master plan to define an exciting vision for the next 20 years and beyond. The premise is simple—translate the nine strategic initiatives from the Tech Forward vision into physical responses to enhance the campus.

The impact is profound—create innovative teaching, learning, and research spaces, develop resilient and sustainable infrastructure, celebrate the “place” of campus, connect to our host community, and enhance the student experience.

BOLD ASPIRATIONS

Michigan Tech has bold and achievable aspirations as Michigan’s flagship technological university. It seeks to grow its reputation as a nationally prominent public research institution. It aims for an important new space in higher education—the confluence of arts and humanities, business, science and technology, and engineering.

To achieve this, the campus master plan reflects several foundational goals. The University must:

- Innovate and pursue academic program excellence,
- Recruit competitive faculty,
- Grow in internationally recognized research and associated research expenditures, and
- Create a transformative residential experience for students.

Taken collectively, these goals underpin the campus master plan and point to an exciting future for Michigan Tech.

ENROLLMENT ASSUMPTIONS

Foremost among the campus master plan’s foundational goals is growing total enrollment to **10,000 students**—8,000 undergraduate and 2,000 graduate students. Relative to the Fall 2019 base year, the University established growth projections for each campus population:

- Student enrollment will increase over 52 percent to approximately 10,000 students
- Faculty staffing will add 109 new positions for a total of 400 tenure/tenure-track and 133 instructional-track faculty
- Staff growth will grow at half the rate of student growth (approximately 26 percent)

It is expected that all colleges will grow their enrollment, but that some colleges will grow more than others. The College of Engineering is expected to remain the college with the largest enrollment (see Figure 25).

COLLEGE ENROLLMENT ASSUMPTIONS

- CF — College of Forest Resources and Environmental Science (29% growth)
- CB — College of Business (88% growth)
- CC — College of Computing (98% growth)
- CS — College of Sciences and Arts (28% growth)
- CE — College of Engineering (53% growth)

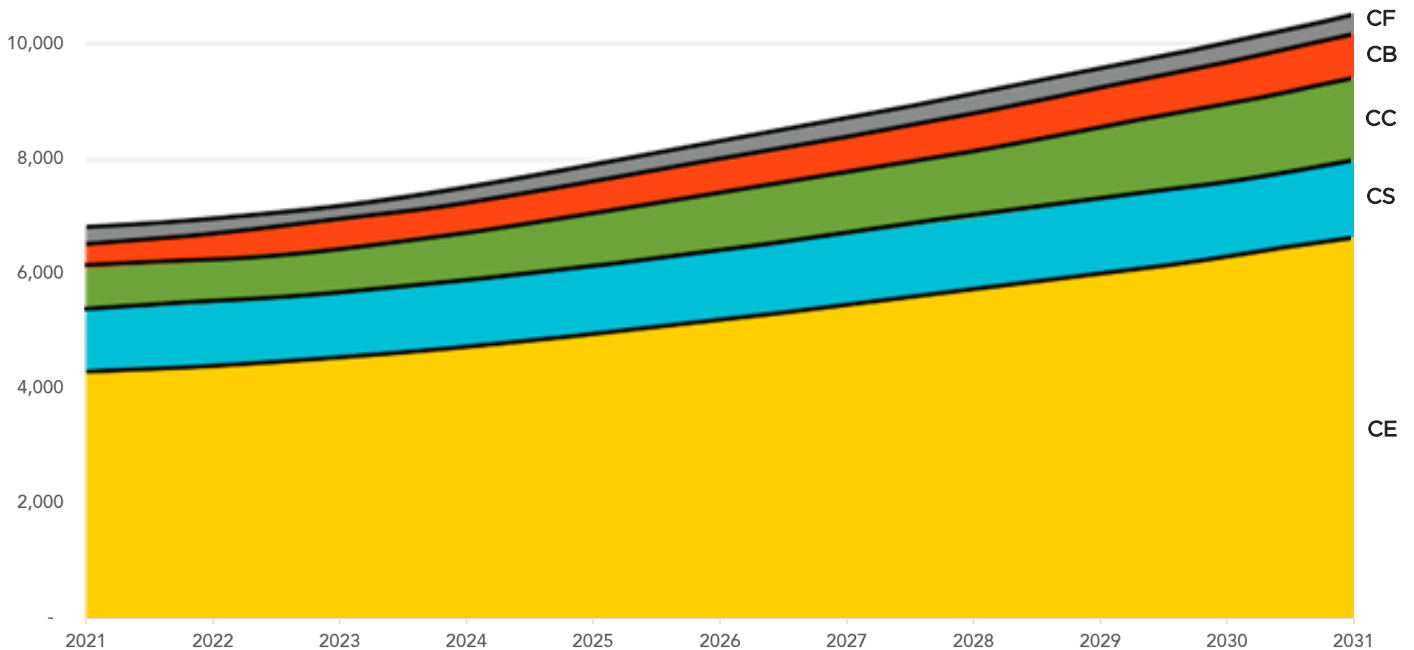


FIGURE 25: COLLEGE ENROLLMENT PROJECTIONS

SPACE NEEDS

SUMMARY

In determining the future space needs for Michigan Tech, the planning team augmented past data trends with campus discussion. The planning team incorporated the outcomes of these meetings into the instructional space utilization expectations and space needs guidelines.

Key quantitative highlights:

- The future need for **teaching laboratories** is driven by courses and assumes the University meets teaching laboratory utilization targets
- The **classroom** square footage quantity is in balance but will be a shortage as enrollment increases
- **Student collaboration**/informal learning areas should be distributed across campus
- **Research** space quantity is sufficient; however, the condition, quality, configuration, and location hinder interdisciplinary collaboration
- **Office** “surplus” cannot easily be repurposed as physical inventory reflects spaces scaled based upon a different workplace environment. In addition, significant capital investment would be needed to renovate existing space to meet modern planning guidelines
- **Student-centered space** is currently sufficient in quantity; however, enrollment growth will create a need for additional space

Key qualitative highlights:

- Appropriate **location** of space
- **Condition** and **quality** of existing space
 - For example, classrooms are more traditional in nature with low space per seat, which impacts pedagogical flexibility
- **Configuration** of legacy buildings particularly impacts adaptability for next-gen spaces
- **Lack of collaboration areas**, which impacts ability to develop learning communities and showcase student success
- **Space alignment** with marketing needs:
 - Hands-on learning occurs, but it is not on display and there is a lack of transparency in buildings
 - Welcoming physical environment to support recruiting greater diversity and support changing demographics

The base year (Fall 2019) space needs analysis indicates that overall, the academic and academic support space on campus is adequate. However, like most campuses, Michigan Tech has surpluses in several space categories and some deficits in others. The greatest need is in teaching laboratories and collaboration spaces.

At the future state, the H-STEM Complex is added to the existing square footage. As is expected, student enrollment growth drives space needs as current year deficits increase, as well as creates new need for classrooms and student-centered space.

| Space Category | Fall 2019 | | | | Fall 2031 | | | |
|------------------------------|----------------------------------|------------------|--------------------|----------------------------|-----------------------------------|------------------|--------------------|----------------------------|
| | Student Headcount = approx 7,000 | | | | Student Headcount = approx 10,000 | | | |
| | Existing ASF | Guideline ASF | Surplus/ (Deficit) | Percent Surplus/ (Deficit) | Existing ASF | Guideline ASF | Surplus/ (Deficit) | Percent Surplus/ (Deficit) |
| Academic and Research Spaces | | | | | | | | |
| Classroom | 68,297 | 65,000 | 3,000 | 5% | 69,442 | 97,500 | (28,000) | (40%) |
| Teaching Laboratories | 120,771 | 150,000 | (29,000) | (24%) | 120,771 | 223,500 | (103,000) | (85%) |
| Open Laboratories | 103,558 | 52,500 | 51,000 | 49% | 103,558 | 79,500 | 24,000 | 23% |
| Research Laboratories | 311,124 | 271,500 | 39,500 | 13% | 340,820 | 345,500 | (5,000) | (1%) |
| Academic Support Spaces | | | | | | | | |
| Academic Offices | 217,741 | 123,500 | 94,000 | 43% | 230,678 | 118,500 | 112,000 | 49% |
| Administrative Offices | 164,323 | 113,000 | 51,000 | 31% | 164,323 | 78,500 | 86,000 | 52% |
| Library Space | 81,296 | 48,500 | 32,500 | 40% | 81,296 | 54,500 | 27,000 | 33% |
| Collaboration Spaces | 9,621 | 15,500 | (5,500) | (60%) | 9,621 | 23,500 | (14,000) | (145%) |
| Assembly & Exhibit | 44,993 | 44,000 | 1,500 | 3% | 44,993 | 57,000 | (12,000) | (27%) |
| Physical Plant | 69,645 | 93,000 | (23,500) | (34%) | 69,645 | 82,000 | (12,500) | (18%) |
| Other Department Space | 38,067 | 33,000 | 5,000 | 14% | 41,459 | 50,000 | (8,500) | (20%) |
| Student-Centered Space | 67,165 | 65,500 | 1,500 | 2% | 67,165 | 100,000 | (32,500) | (48%) |
| Student Healthcare Space | 0 | 3,500 | (3,500) | - | 0 | 5,500 | (5,500) | - |
| INSTITUTION TOTAL | 1,296,601 | 1,079,000 | 217,500 | 17% | 1,343,771 | 1,315,000 | 29,000 | 2% |

The guidelines and surplus/deficits values are calculated using actual decimal values, while the results are rounded. This means an occasional value might appear slightly differently than expected.

FIGURE 26: ACADEMIC, RESEARCH, AND SUPPORT SPACES NEEDS

ACADEMIC AND RESEARCH SPACES

CLASSROOMS

Classrooms are defined as any room primarily used for scheduled instruction requiring no special equipment. The rooms are generally referred to as “general-purpose” classrooms, seminar rooms, or lecture halls. Classroom space need was determined by a formula that combines expected utilization with a guideline of 25 ASF per student station. Student station size can range from 18 ASF for fixed lecture halls to 35 ASF for flexible active learning classrooms. Currently, Michigan Tech station size averages approximately 18 ASF.

Based on this formula, Michigan Tech currently has a surplus of approximately 3,000 ASF in classroom space. When the enrollment targets are met, there will be quantitative need for an additional 28,000 ASF of classroom space.

TEACHING LABORATORIES

Teaching laboratories are defined as rooms used primarily for regularly scheduled classes that require special purpose equipment to serve the needs of a particular discipline for group instruction, participation, observation, experimentation, or practice. Space requirements are calculated using a formula that is similar to that used to determine classroom space with the exception of space per student seat. The space per seat varies by discipline and ranges between 30 and 140 ASF, which includes support space. With application of these guidelines, there is a current deficit of approximately 29,000 ASF. At the future enrollment state, the deficit increases to almost 103,000 ASF due to the laboratory-intensive nature of Michigan Tech’s academic programs.



OPEN LABORATORIES

Open laboratories are rooms that are available for unscheduled or informally scheduled instruction and student use in a particular activity. Types of rooms in this category typically include computer laboratories with specialized software, language laboratories, healthcare education laboratories, music practice rooms, makerspace, and tutorial and testing facilities.

The guideline for open laboratories varies by campus. Based upon the planning team's experience, the guideline for Michigan Tech was established at 8 ASF per full-time enrollment student. This yields a current surplus of approximately 51,000 ASF. It is likely some open laboratories are helping to address the teaching laboratory shortage. With anticipated enrollment growth, the surplus in open laboratories is reduced to approximately 24,000 ASF.

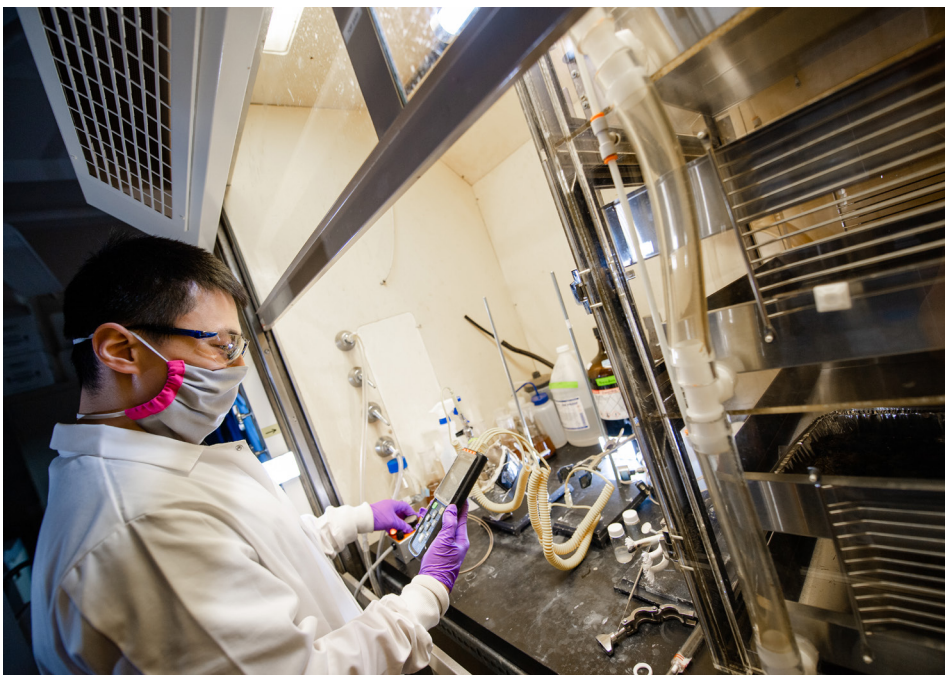


RESEARCH LABORATORIES

Research laboratories are rooms used for unscheduled laboratory experimentation or training in research methods and observation. The research might be conducted by either faculty or students for both funded and non-funded research. Research is a significant component of the graduate student experience. Additionally, research is an increasingly important part of the undergraduate student experience as well.

Michigan Tech is a research-focused institution, and as such, a guideline approach was established to apply ASF per principal investigator. The number of principal investigators was based upon information provided by the University.

Quantitatively, there is a surplus of approximately 39,500 ASF of research space in the base year. As the number of faculty increases, there is a quantitative deficit of 5,000 ASF. However, perhaps more importantly, there is a current qualitative deficit. The condition, quality, and configuration of research laboratory space as well as the fragmentation of existing space impacts productivity and efficiency and limits interdisciplinary research opportunities.



| DISCIPLINE | GUIDELINE ASF/ PRINCIPAL INVESTIGATOR |
|---|--|
| Applied Computing | 120 |
| Biological Sciences | 1,000 |
| Biomedical Engineering | 1,280 |
| Chemical Engineering | 1,920 |
| Chemistry | 1,000 |
| Civil and Environmental Engineering | 1,600 |
| Civil, Environmental, and Geospatial Engineering | 80 |
| CMH Division (Computing) | 80 |
| Cognitive and Learning Sciences | 240 |
| College of Business | 80 |
| College of Computing | 120 |
| College of Forest Resources and Environmental Science | 800 |
| Computer Science | 320 |
| Electrical and Computer Engineering | 1,280 |
| Geological and Mining Engineering and Sciences | 400 |
| Great Lakes Research Center | 960 |
| Kinesiology and Integrative Physiology | 960 |
| Manufacturing and Mechanical Engineering Technology | 640 |
| Materials Science and Engineering | 2,560 |
| Mathematical Sciences | 40 |
| Mechanical Engineering-Engineering Mechanics | 2,240 |
| Physics | 1,280 |
| Social Sciences | 160 |

FIGURE 27: RESEARCH SPACE GUIDELINES

ACADEMIC SUPPORT SPACES

LIBRARY SPACE

The contemporary academic library is best defined as a blend of the traditions of the past integrated with digital media. Space such as stack areas, individual study space, group study rooms, staff offices, and processing or technical areas comprise the library.

The guideline for this category includes factors for the library collection, support space, and study space. The factors applied consider the 365,650 physical volumes in the Michigan Tech collection and a study space allocation of 20 ASF for 10 percent of the undergraduate population. The collection is projected to be reduced slightly at the future state.

In the current year, there is a surplus of approximately 32,000 ASF, which decreases to approximately 27,000 ASF (as a result of the enrollment increase).

COLLABORATION SPACES

Campus study space is no longer concentrated in the library, but rather informal learning and collaborative study space are distributed across campus. A space allocation of 20 ASF for 10 percent of the undergraduate population and 10 percent of the graduate population was applied.

In the current year, there is a deficit of collaboration spaces of approximately 5,500 ASF, which increases to almost 14,000 ASF in the future state.



ACADEMIC AND ADMINISTRATIVE OFFICES

The category includes private and open offices, conference rooms, and service space (i.e., file rooms, kitchenettes, small closets). Most of the existing office space is from an era dramatically different than the new normal, in which flexible work arrangements have gained traction.

For the base year, a 200 ASF per employee (except craft and trades positions) was allocated. The future state allocation is based on an allocation per employee type for workspace plus additional space amounts for conference space, workrooms, and office storage.

Application of these approaches yields a current surplus of academic offices of approximately 94,000 ASF and 51,000 ASF of administrative space. In the future state,

the H-STEM Complex adds additional academic office space, which brings the academic office surplus to approximately 112,000 ASF. Administrative office space increases to over 86,000 ASF.

To reiterate, the quantitative surplus cannot easily be repurposed, as physical inventory reflects spaces scaled based upon a different workplace environment. As staff office spaces are incrementally renovated, staff office assignments that reflect flexible work arrangements and the greater need for collaboration should be considered. While flexible work arrangements for faculty are becoming more common, the shift from private faculty offices to more collaborative faculty space will require incremental and gradual cultural and expectation changes.



OTHER DEPARTMENT SPACE

Other department space consists of a variety of spaces that are not included in the space categories above. At Michigan Tech, this includes media production space, child care, meeting rooms, and storage areas. The guideline of 5 ASF per student is based on similar institutions of Michigan Tech's type and enrollment. Application of the guideline results in a surplus of over 5,000 ASF in the base year, and a deficit of nearly 8,500 ASF in the future state.

PHYSICAL PLANT

Plant operations space typically includes shops, central storage, and central services, but can also include other space types assigned to the physical plant. The factors considered when determining the appropriate guideline include purchasing practices that affect warehousing needs, increased interior storage due to climate, and the types of facilities being maintained. A guideline of 6 percent of campus space was determined to be appropriate for Michigan Tech.

For the base year, the guideline is applied to the existing facility footprint, which yields a physical plant space need of approximately 23,500 ASF. At the future state, the guideline is applied to the guideline/optimized ASF for the entire campus, which reduces the deficit to approximately 12,000 ASF.

ASSEMBLY AND EXHIBIT

Assembly and exhibit space at Michigan Tech includes the performance space in the Rozsa Center for the Performing Arts and gallery/exhibition space. The recommended guideline in this category varies depending on the extent of the fine and performing arts programs offered. Due to the extensive fine and performing arts programs offered at Michigan Tech, an allocation of 27,450 ASF was used, which is typically applied as the core allocation at institutions of 5,000 students or more with an additional space allocation due to the active arts programs. An additional allocation was made to meet back-of-house space needs.

When this guidelines is applied to the current state, the University meets the guideline. As enrollment increases, the future state has an approximate 12,000 ASF deficit.



STUDENT-CENTERED SPACE

Examples of the various functions that are typically found in the student-centered space category include bookstore, lounge, meeting space, student government, and student organization space. An allocation of 10 ASF per student (both undergraduate and graduate) was applied. At the current year, student-centered space is in relative balance. As enrollment grows, the need will increase to approximately 32,500 ASF.

STUDENT HEALTHCARE

Healthcare space includes both medical and counseling services space needed to support students. Michigan Tech offers full medical and counseling services to its students; however, there is no University-owned space that is coded as student healthcare. Medical healthcare is provided through collaboration with an off-campus outside service provider. Group therapy counseling at Michigan Tech occurs in staff offices in the Administration Building, and thus these spaces are coded as staff offices.

A metric of 0.5 ASF per student was used to generate the need for space. Should the University choose to provide these student healthcare services on campus in the future state, guidelines indicate a future need of approximately 5,500 ASF.



STUDENT LIFE SPACES

HOUSING

Michigan Tech views its on-campus housing program as a strategic asset facilitating student recruitment and retention, building campus community, and providing a meaningful cash flow to support its mission. With that in mind, the University wants to invest in housing to realize the projected enrollment growth.

As shown in Figure 28, preferences with respect to amenities vary with enrollment level. While first-year students prioritize *parking, proximity to dining, and private bedroom*, second-year students picked *kitchen in the unit, parking, and private bathroom* as their top three choices.

Based on the survey data and enrollment projections, the planning team developed a housing demand model which reconciled existing housing supply with the current and potential future demand. Based on the model, the planning team concluded the following:

- The housing program will have to increase in size to accommodate the projected enrollment growth. Based on the Michigan Tech-supplied enrollment projections and historical housing rates for first-year students (92 percent) and second-year students (69 percent), the University will have to provide approximately 1,500 additional beds over the next 10 years. The planning team suggests three phases of roughly 500 beds each to align the delivery of new beds with the enrollment growth trajectory. Full-suites and semi-suites should be considered for the lower-division program with both single- and double-occupancy bedrooms.

- Historically, Michigan Tech housed 18 percent of third-year students and approximately 10 percent of fourth-year plus students in on-campus housing. With growing enrollment, an additional 330 beds will be needed within 10 years at the historical housing rates. Furthermore, the planning team's demand modeling suggests that with a larger variety of apartment-style units, the 10-year potential demand could reach approximately 580 beds.
- Graduate students have typically resided in Daniell Heights Apartments. The planning team's analysis shows that the demand for additional graduate student beds will not grow as quickly as the undergraduate. In the future, Michigan Tech should consider a small-scale (up to 100 units) development consisting of studio/efficiency units, as these are not available on campus now.

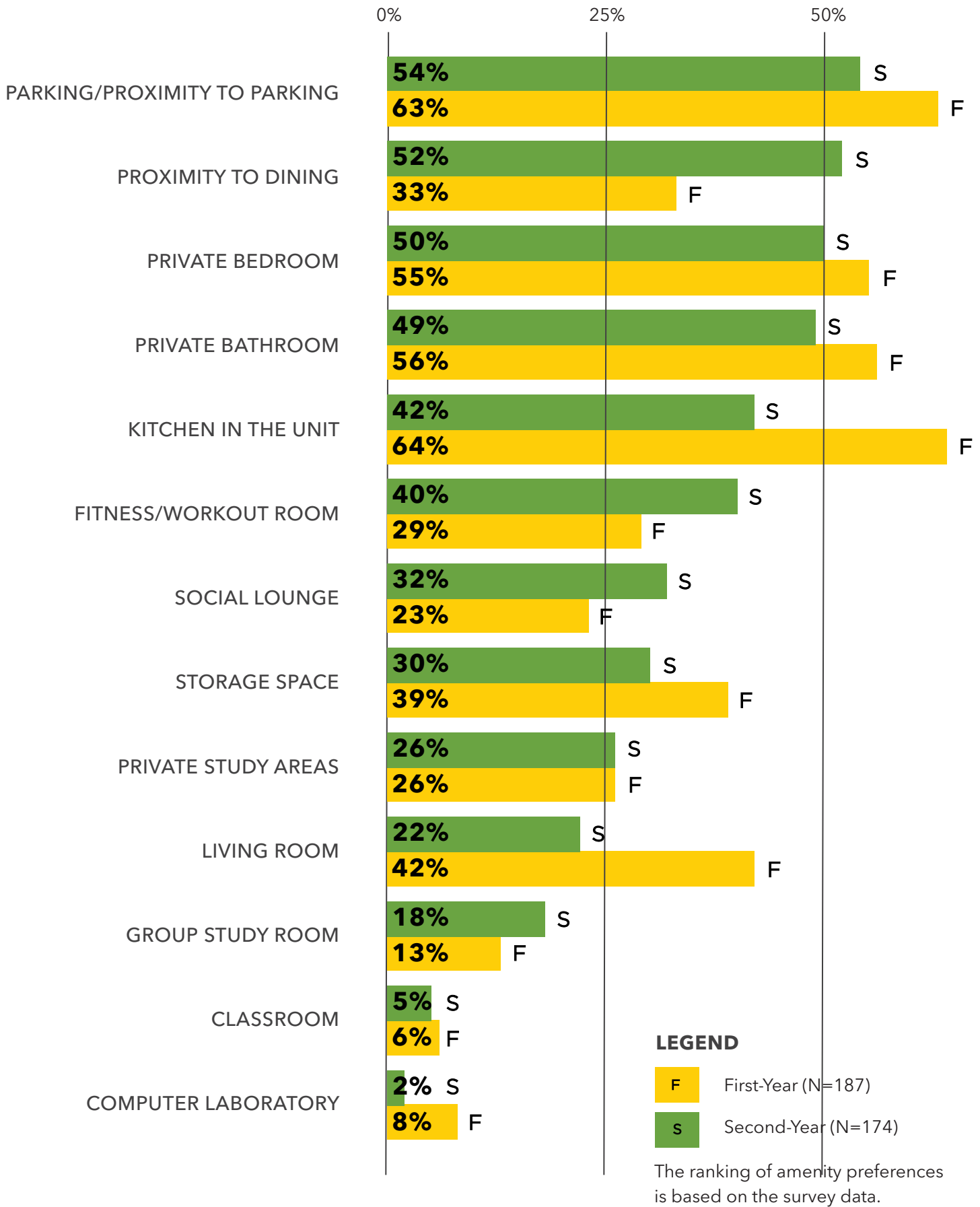


FIGURE 28: STUDENT HOUSING AMENITY PREFERENCES

STUDENT LIFE SPACES

DINING

Figure 29 displays the most important improvements to Michigan Tech dining, as prioritized by on-campus and off-campus students. For on-campus students, the top items include *quality of food, variety of menu items, and availability of healthy food options*. The off-campus students marked similar priorities, although *cost of food* was more important to them than to the on-campus residents.

The planning team used the meal plan sales (number of meal plans sold), meal plan utilization (percentage of meal plan holders utilizing the meal plans during the peak periods), enrollment projections, and the corresponding growth in meal plan sales to quantify the demand for dining venue capacities.

RETAIL DINING

The peak demand for retail dining by off-campus students occurs at lunchtime. Based on the survey data, the planning team estimated that approximately 26 percent of off-campus residents may choose to dine at the Memorial Union Building (or other convenient locations offering retail options). Factoring in the projected enrollment growth, the planning team concluded that approximately 650 additional seats would have to be provided to satisfy the retail dining demand.

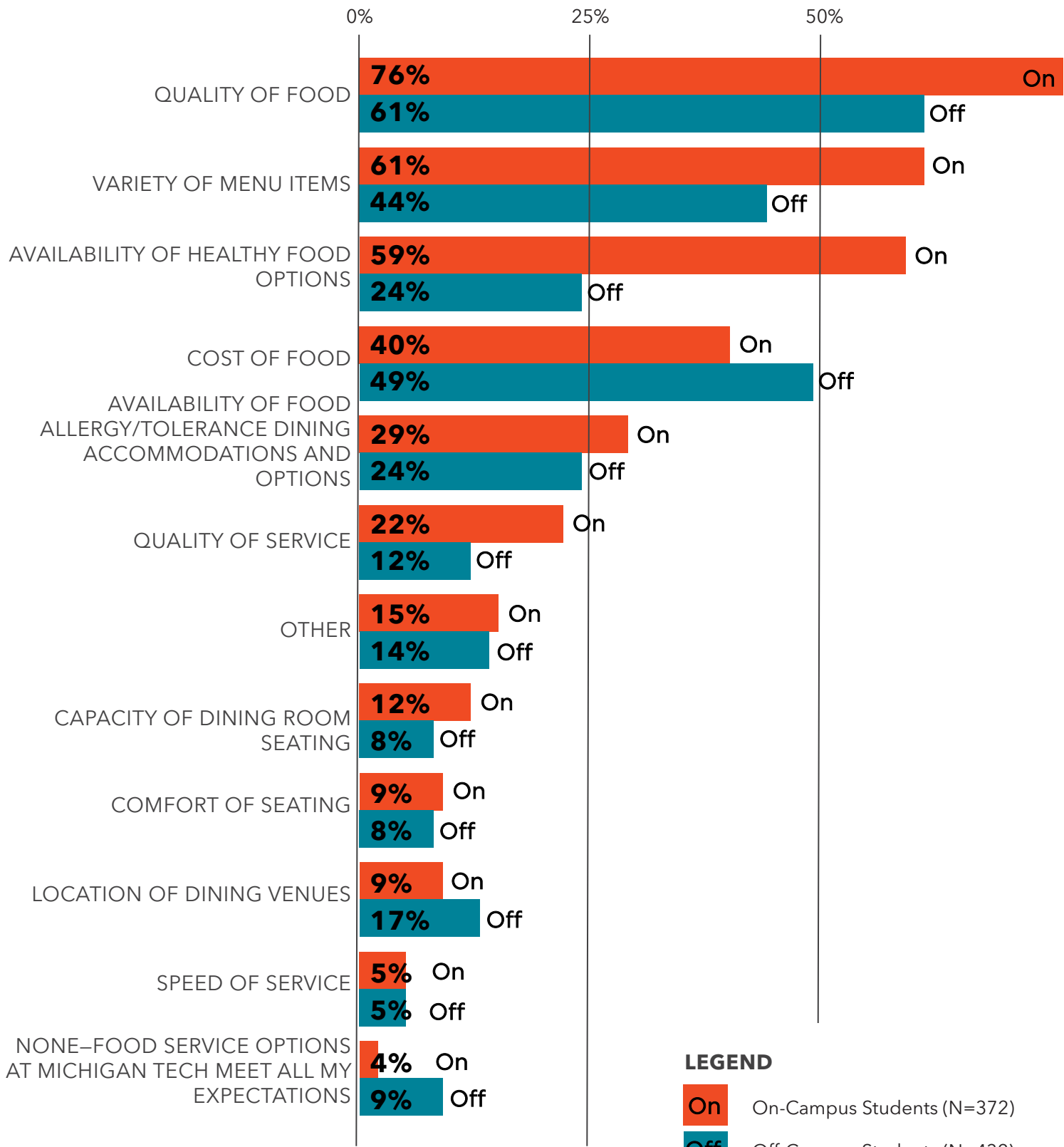
One of the key components of the Memorial Union Building retail food service will be the presence of national brands, such as Starbucks or Chick-fil-A, that are extremely popular with students on campuses across the country. In addition, an inviting dining environment will have to be designed for students and other customers to attract them to the renovated venue.

These new seats should be implemented as the first phase of dining improvements. This approach would accommodate the enrollment growth without the necessity to immediately expand the capacity of dining halls, as many meal plan participants will choose retail options when those become available, as evident in the student survey data. Meal plan types should be modified to recognize the increase in retail offerings. In addition, the new retail capacity would address faculty and staff demand, which will likely grow if appropriate choices become available.

COMMUNITY-STYLE DINING

The peak demand by on-campus residents occurs during dinnertime with 77 percent of meal plan holders dining at one of the venues (week of September 10 to 14). Assuming the addition of approximately 1,500 on-campus students over the next 10 years, 2.5 turns per meal, and the seating inefficiency of 20 percent, the planning team concluded that approximately 550 more seats will have to be added to the community-style dining offerings. If the Douglass Houghton Dining Hall remains closed for dinner, an additional 120 seats should be provided.

If Michigan Tech initially provides extra retail dining capacity, the expansion of community-style venues will not have to occur until the later stages of housing expansion—likely the third phase if the additional 1,500 beds are implemented in three equal phases of 500 beds.



LEGEND

- On-Campus Students (N=372)
- Off-Campus Students (N=432)

The ranking of dining program preferences is based on the survey data.

FIGURE 29: STUDENT DINING PROGRAM PREFERENCES

STUDENT LIFE SPACES

MEMORIAL UNION BUILDING

It is important to note that graduate and undergraduate students have different priorities when it comes to the Memorial Union Building offerings. As shown in Figure 30, the top priorities for graduate students include improvements to food service, graduate student lounge, and longer operating hours, while undergraduates pointed to longer operating hours, individual study spaces, and quiet study areas.

Based on its research, the planning team concluded that the key future improvements to the Memorial Union Building should include:

- Expansion and reconfiguration of the food service area
- Enhancement and expansion of the student activity/ involvement area
- Expansion of student-oriented areas such as social lounges, individual study areas, game room, and graduate student lounge. Students asked for these spaces to be informal and designed for drop-in use without reservations

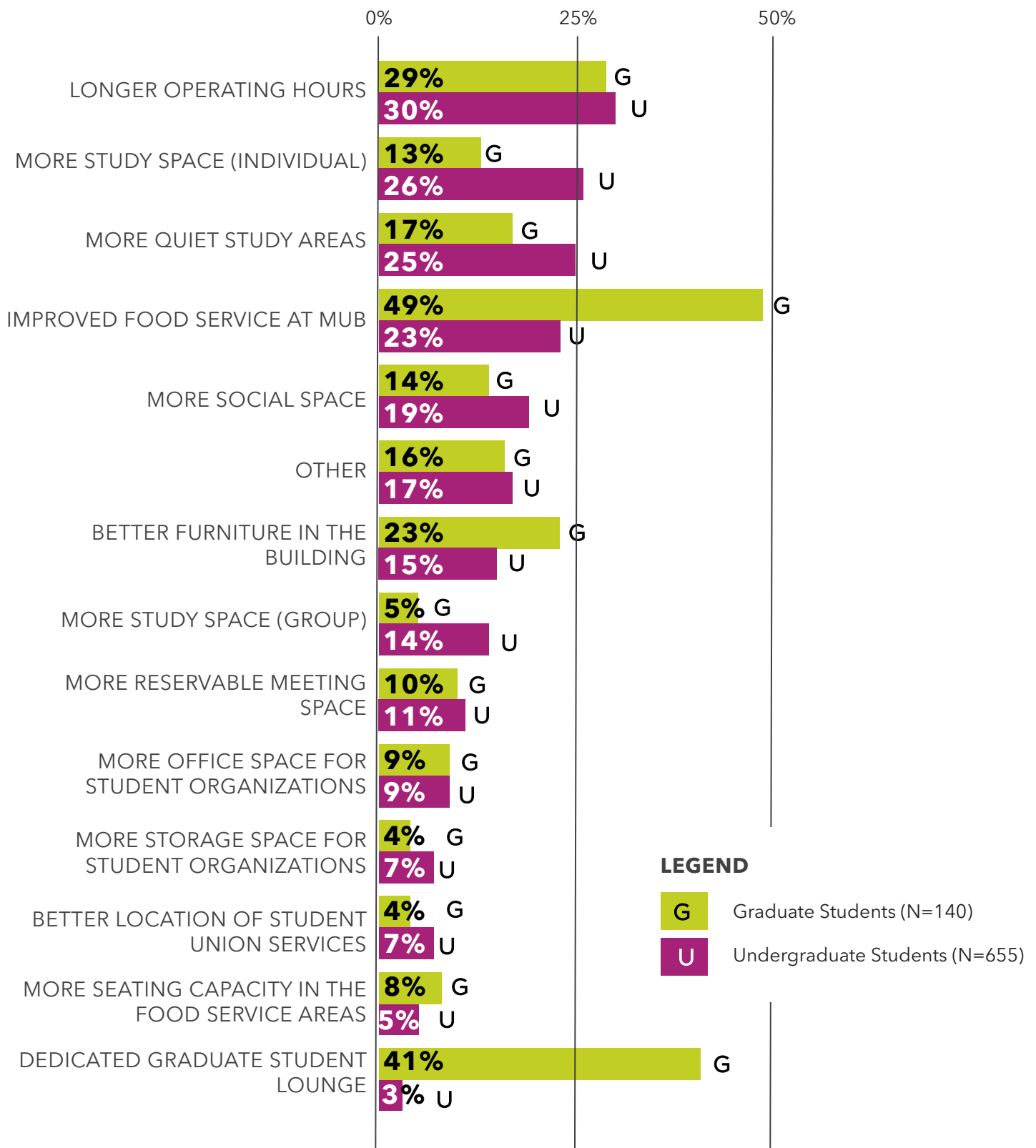


FIGURE 30: STUDENT MEMORIAL UNION BUILDING AMENITY PREFERENCES

STUDENT LIFE SPACES

RECREATION

The most popular indoor amenities among students include cardiovascular equipment, free weights, and weight machines. These amenities are currently offered at the Student Development Center, although the quantity of space is insufficient. Figure 31 displays indoor priorities for the entire student population and two minority groups: women and non-White/European students.

The planning team utilized survey data to quantify demand for various recreational activities based on projected student participation during peak times. The potential demand was then reconciled with the existing supply of space to estimate the demand-supply imbalances. Using this approach, the planning team concluded that the following additions to Michigan Tech's recreation offerings will be needed:

- Weight/fitness space (5,000-square feet),
- Multipurpose/dance rooms (two more studios with storage),
- Gymnasium space (two to four courts; consider multiactivity court),
- CrossFit/functional training area,
- Climbing wall (replacement of existing wall with climbing/bouldering wall to be co-located with new outdoor pursuits area), and
- Counseling (adding counseling services in the Student Development Center in spaces to be vacated by Kinesiology).

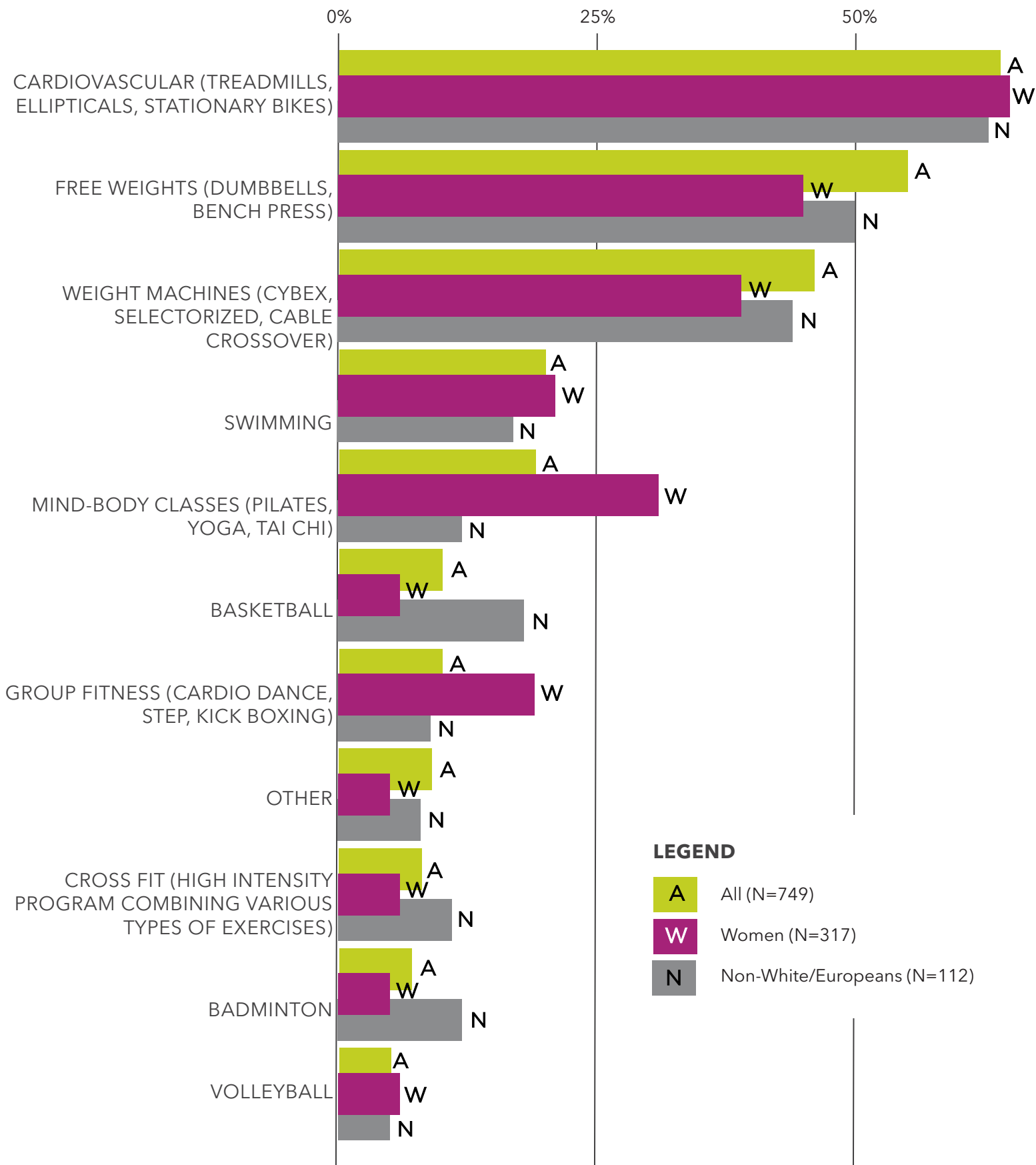


FIGURE 31: STUDENT INDOOR RECREATION PROGRAM PREFERENCES



VISION







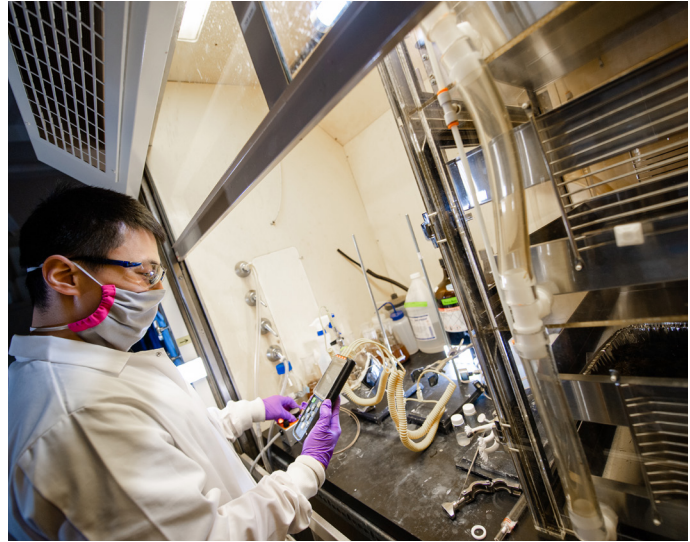


PLAN INTENTS

PLAN FOR TOMORROW

The past few years have underscored the need for a highly adaptive campus ecosystem. Michigan Tech is facing a rapid shift in student demographics, the resurgence of the skills economy, and unprecedented technology changes in teaching and learning environments. All of these challenges require facility adaptations and a reprioritized investment strategy.

Through the campus plan, Michigan Tech is well-positioned to lead the state and nation in creating these environments for tomorrow's leaders. We refocused planning efforts on the following University priorities.



REALIGN AND RENOVATE EXISTING FACILITIES TO MATCH THE MICHIGAN TECH NATIONAL REPUTATION



PUT **"TECH ON DISPLAY"**—SHOWCASE THE BEST ACADEMIC, RESEARCH, AND MAKERSPACES



CREATE NETWORKED **COLLABORATION** SPACES FOR FACULTY AND STUDENTS



EXPRESS THE MTU **BRAND** THROUGH THE PHYSICAL CAMPUS ENVIRONMENT



EMBRACE THE **WATERFRONT**



ELEVATE THE **STUDENT EXPERIENCE**

OPPORTUNITY-BASED ROADMAP

The future is ours to shape. At its essence, the campus master plan is a collection of powerful ideas to facilitate decision-making for the next 20 years. These ideas serve to establish a framework for coordinating physical change. This framework reinforces simple patterns and foundational elements to maintain Michigan Tech's unique spatial characteristics, while at the same time identifying opportunities for responsible growth.

Philosophically, the campus master plan is an opportunity-based tool, not a rigid list of mandated implementation projects. The campus master plan needs to remain flexible and durable in the midst of changing enrollment, curricular, programmatic, fiscal, political, and external challenges.

It is with purpose and confidence that Michigan Technological University boldly moves forward with the campus master plan. More than ever, tomorrow needs Michigan Tech.

FRAMEWORK PLAN

The existing campus has a strong organization of building and site uses. This campus master plan strengthens and expands that organizational framework.

Academics will center the campus, centered on the Van Pelt and Opie Library and Fisher Hall. The academic core will be strengthened with the addition of the Center for Convergence and Innovation, which moves the College of Business into the academic core. When Grover C. Dillman Hall is reconstructed, the core undergraduate experience will be focused in these four adjacent buildings.

The Research + Innovation zone stretches along the bluff and is already a powerhouse of research. Renovations of existing laboratories will improve their performance, and the H-STEM Complex, the Business and Industry Research Addition to the R.L. Smith Building (MEEM), and a future water-based research center will further infill the Research + Innovation zone.

The campus master plan proposes the most dramatic changes on the edges of the campus. The East Gateway will expand the on-campus residential neighborhood, bringing more beds north of Townsend Drive and remaking the approach to campus from the east.

The Downtown Connector reimagines the entire west end, replacing academics and the Alumni House with a new fully integrated student neighborhood that is directly connected to the campus core. How the campus is integrated with Houghton will be forever changed.

With development of Tech @ the Water, Michigan Tech finally becomes an effective waterfront campus. Finally, a new apartment building with ground floor retail at Townsend and MacInnes will transcend the hill and connect the campus with the U.J. Noblet Forestry Building and the Student Development Center.

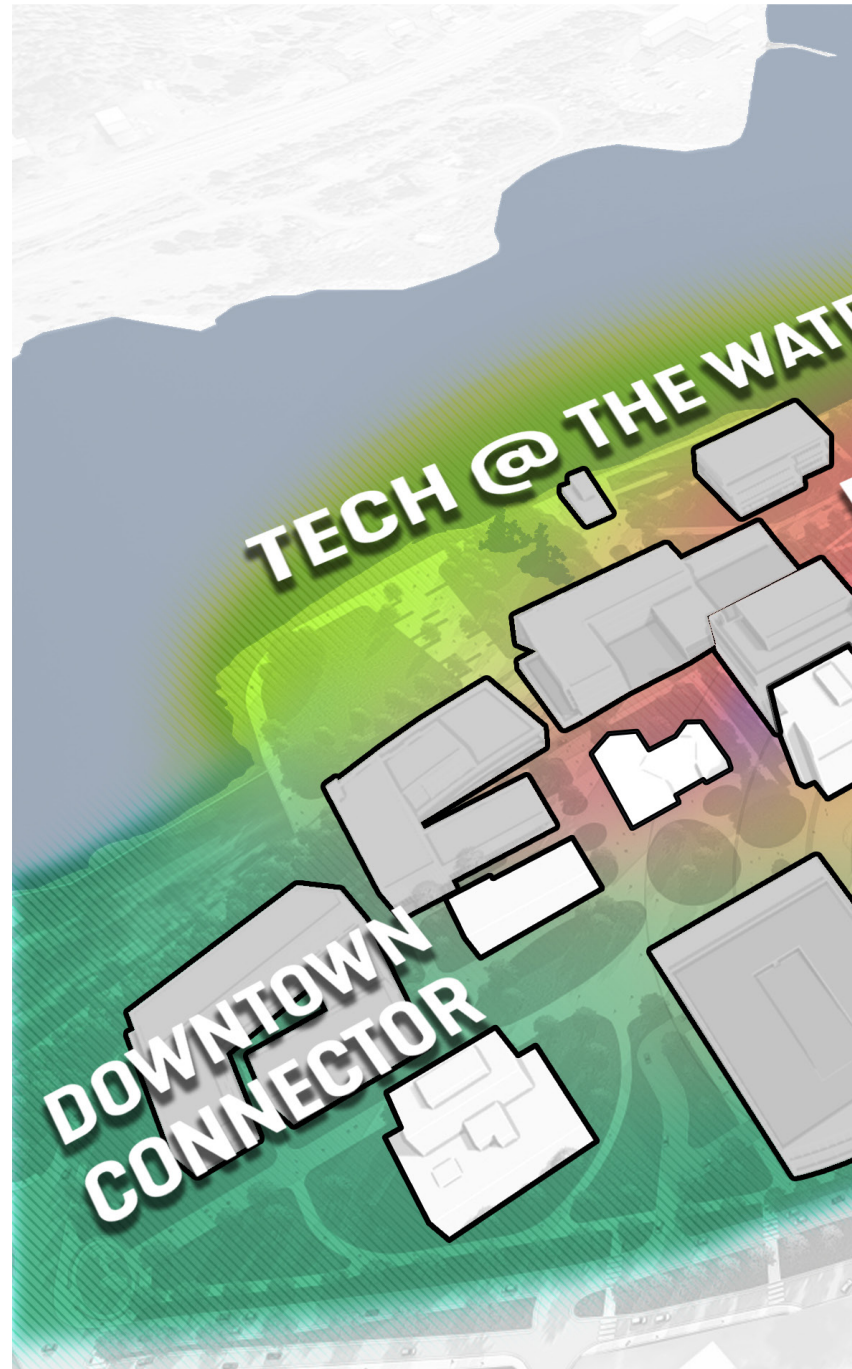
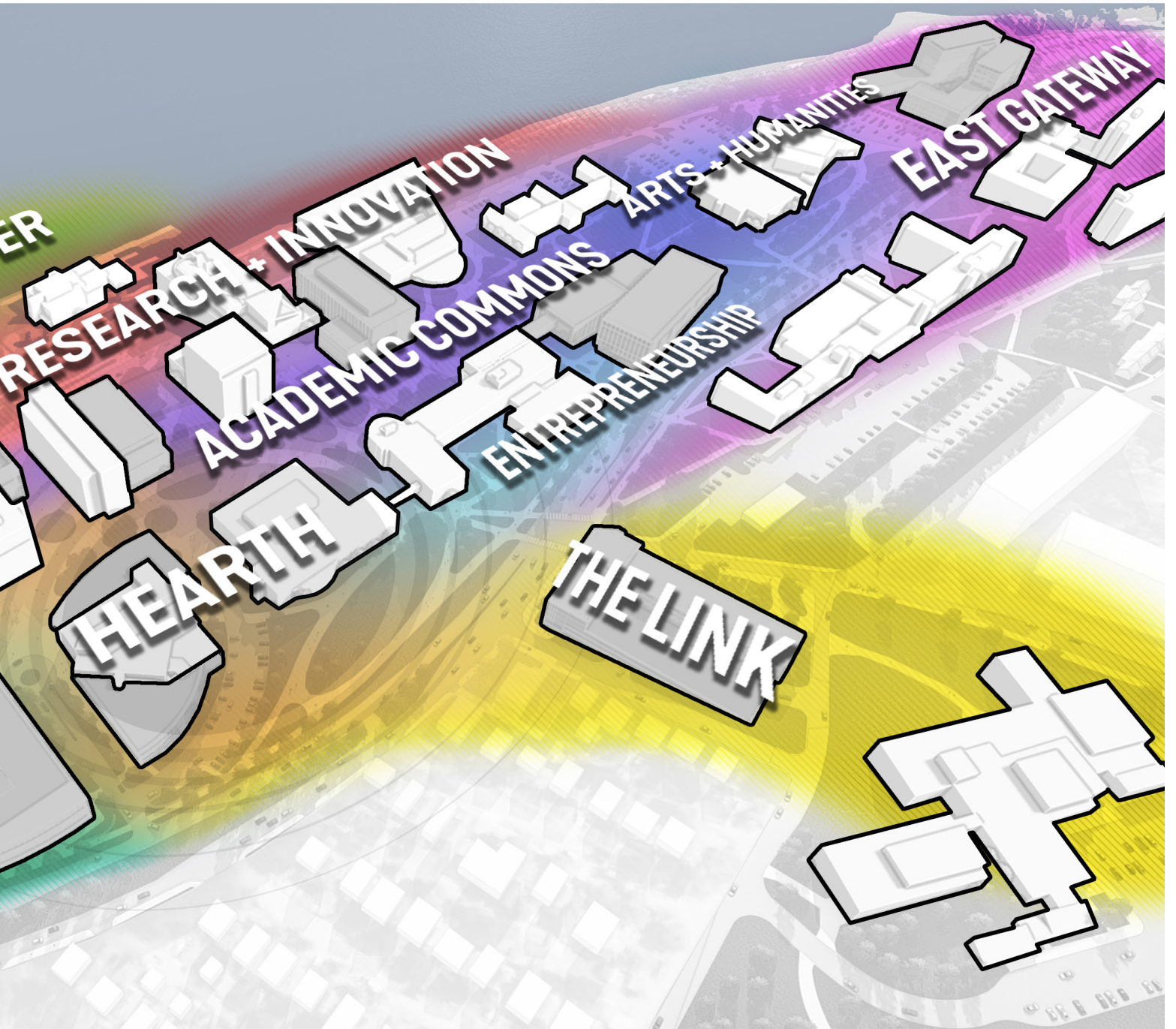


FIGURE 32: FRAMEWORK PLAN



NEAR TERM PRIORITIES

Michigan Tech intends to initially complete these **early priorities** to reinforce our strategic mission and vision:

- Academic and Research Renovations
- H-STEM Engineering and Health Technologies Complex (H-STEM Complex)
- Center for Convergence and Innovation
- East End Student Housing
- Memorial Union Building Renovation and Mallside Addition

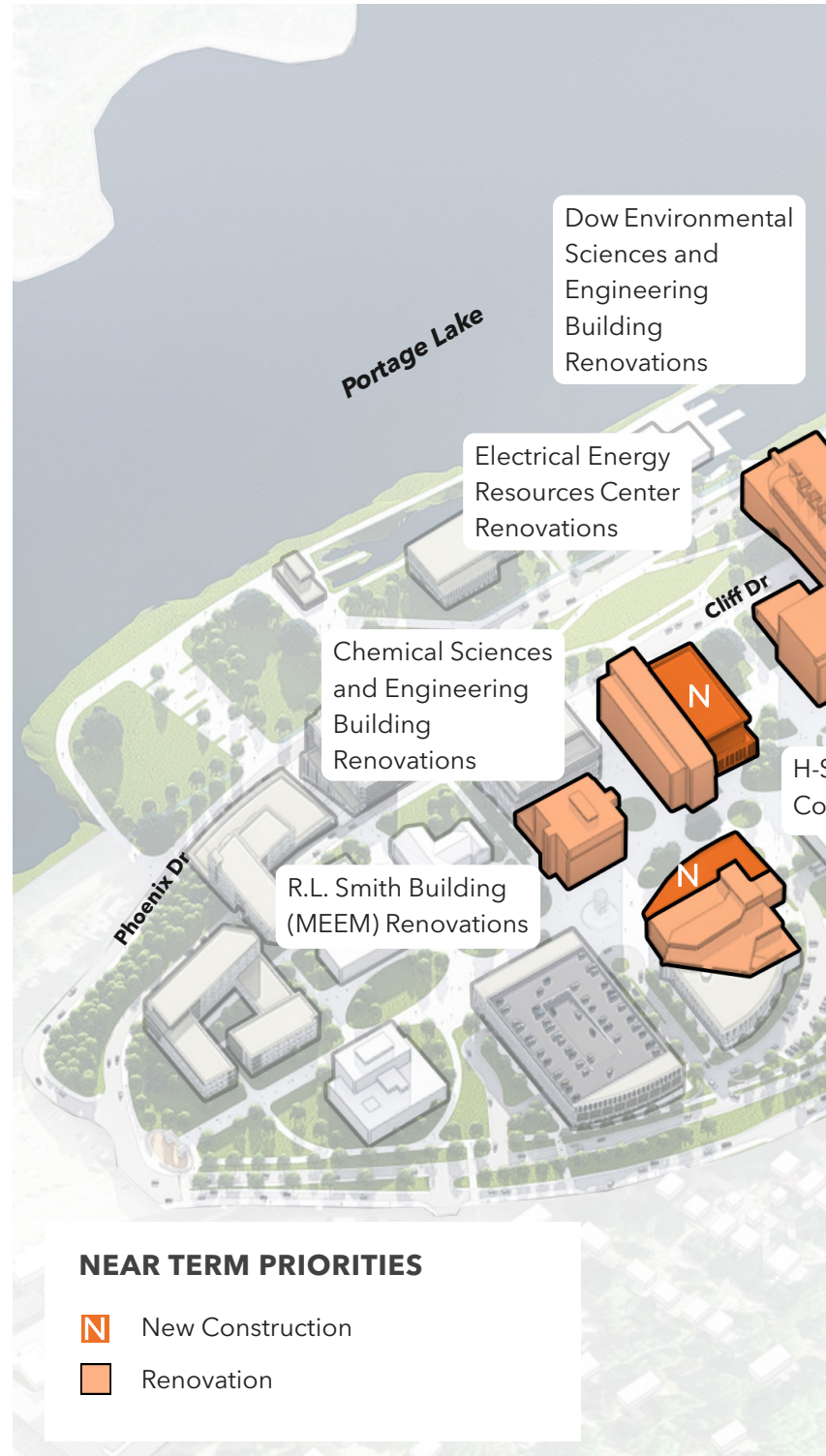
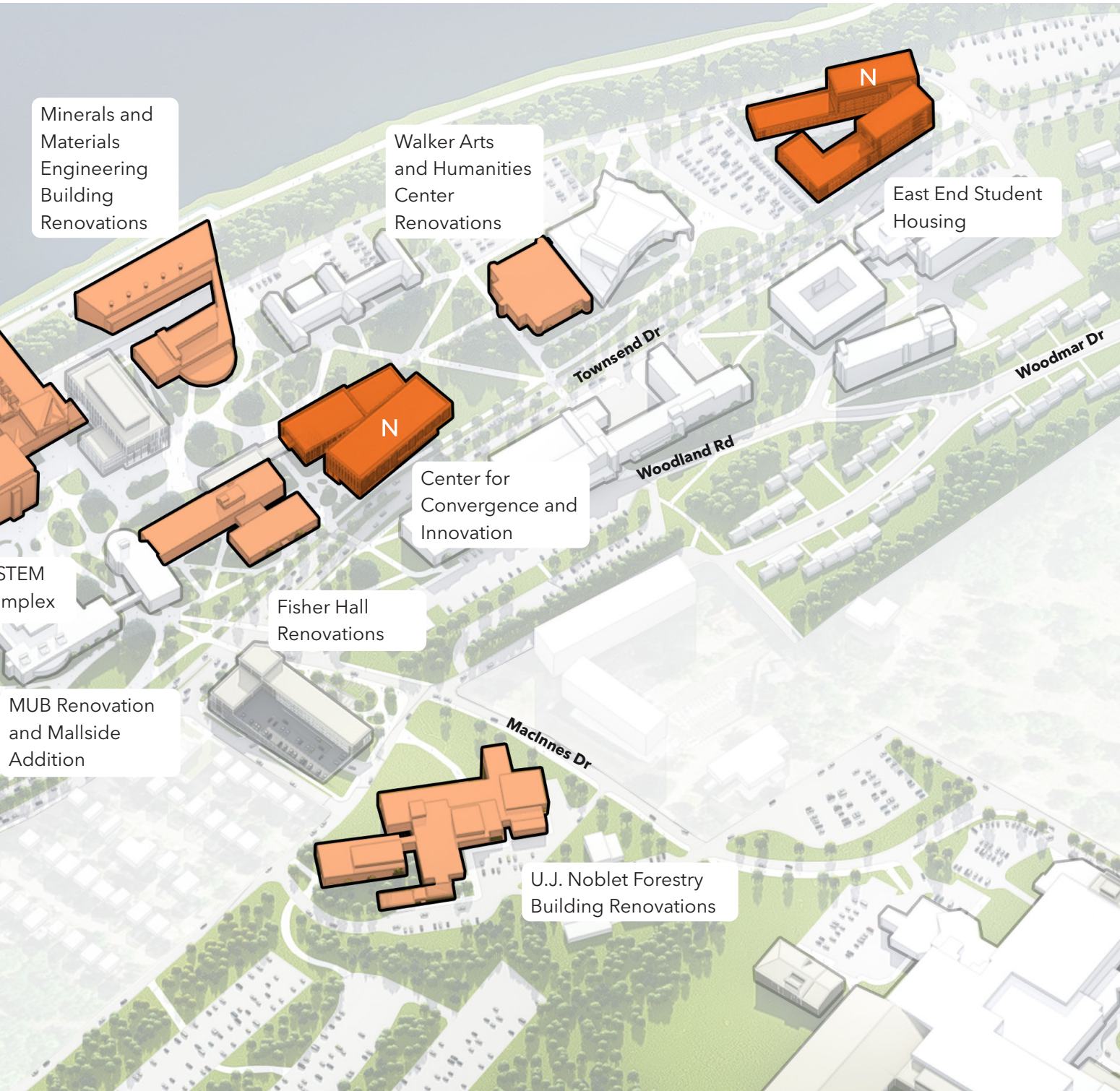


FIGURE 33: NEAR TERM PRIORITIES



Minerals and
Materials
Engineering
Building
Renovations

Walker Arts
and Humanities
Center
Renovations

East End Student
Housing

Center for
Convergence and
Innovation

Fisher Hall
Renovations

STEM
Complex

MUB Renovation
and Mallside
Addition

U.J. Noblet Forestry
Building Renovations

ACADEMIC AND RESEARCH RENOVATIONS

PROJECT NEED

The University's primary academic and research buildings have lacked regular investment and renovations, and suffer from significant deferred maintenance. The teaching and research spaces do not meet Michigan Tech's brand and do not sufficiently attract top students, faculty, and researchers.

DESCRIPTION

The University should incrementally and comprehensively renovate classrooms, teaching laboratories, and research laboratories in all core buildings. The renovations should include the inclusion of:

- Active learning classrooms
- Experiential teaching laboratories
- Flexible, shared, and theme-based research
- Maker and collaboration space
- Accessible and inclusive environments
- Sustainable and resilient infrastructure
- Improved indoor air quality control

The University should engage students, teaching faculty, and researchers to determine and understand the priorities for renovation. The University should consider renovating and updating classrooms, large lecture halls, and teaching laboratories to better meet academic needs such as flexible furniture, active learning, upgraded electrical and lighting, and new finishes and furniture.

Core academic and research buildings include:

- Electrical Energy Resources Center (EERC)
- Chemical Sciences and Engineering Building (Chem Sci)
- R.L. Smith Building (MEEM)
- Fisher Hall
- Minerals and Materials Engineering Building (M&M)
- Dow Environmental Sciences and Engineering Building
- Walker Arts and Humanities Center
- U.J. Noblet Forestry Building



RECENT LABORATORY RENOVATIONS

H-STEM ENGINEERING AND HEALTH TECHNOLOGIES COMPLEX

PROJECT NEED

The H-STEM Complex addresses what Michigan Tech recognizes to be a critical need: industry-relevant, STEM-based educational and research programs in health- and human-centered engineering.

DESCRIPTION

Michigan Tech's STEM-focused niche allows it to contribute to the design of human-centered technologies (e.g., therapeutic devices, instruments, sensors, and preventative strategies) through research, development, and education for our students. The planned H-STEM Complex will include newly constructed shared and flexible laboratory spaces co-located with renovated classrooms and learning spaces within an existing building (Chemical Sciences and Engineering) that will meet industry standards for safe operation.

The H-STEM Complex will allow teams of researchers and students from Biomedical Engineering, Chemical Engineering, Mechanical Engineering, Biological Sciences, Chemistry, Cognitive and Learning Sciences, Computer Science, and Kinesiology and Integrative Physiology to work together in collaborative spaces with shared equipment.

During the past two decades, Michigan Tech's faculty and students have become increasingly involved in developing technological innovations that improve the human condition. Since planning for the H-STEM Complex began, Michigan Tech faculty have been increasingly successful in attracting external funding for their H-STEM Complex research and human-centered innovations. This increase in research has resulted in enrollment growth for associated degree programs.





H-STEM COMPLEX PROJECT RENDERINGS

CENTER FOR CONVERGENCE AND INNOVATION

PROJECT NEED

The University expects that the College of Business, located in the Academic Office Building, and the College of Computing, located in Rekhi Hall, will be the fastest growing colleges over the next decade. The College of Computing saw a 10 percent year-over-year increase in undergraduate enrollment for Fall 2021 and is poised to double in size by the end of the decade. The Academic Office Building is largely inaccessible per ADA requirements and its teaching spaces do not meet the current needs of the College of Business.

DESCRIPTION

The Center for Convergence and Innovation will provide a place to co-locate existing Business, Data Science, and Computing programs to spur new degree programs, entrepreneurial projects, outreach to businesses and communities, increased industry and government funding for research, and the development of a highly agile workforce prepared to implement digital transformation solutions. Students and employees from the College of Business and College of Computing will be commingled to promote cross-disciplinary collaboration, innovation, and entrepreneurship.

The design of the building should intentionally promote connections among faculty and students from across both colleges. Reconfigurable spaces and theme-based shared digital laboratory facilities should be spread throughout. Additional features of the building should include convergence centers of excellence, active-learning, computer-learning, and remote-learning classrooms, flexible collaboration spaces open to all, student learning centers, a reconfigurable digital makerspace, entrepreneurship training hall, and large-, mid- and small-sized lecture halls.

SITE IMPROVEMENTS

The new building should be sited to preserve the open space between the construction site and the Walker Arts and Humanities Center Building, which is the location of broomball events, a tradition loved by students. Should the University seek a pedestrian bridge over US Highway 41, one possibility is a connection between the Center for Convergence and Innovation and the Wadsworth Dining Hall. Internal circulation control within Wadsworth Hall would be required to enable access to the bridge for non-residential students.

PRECEDENT PROJECTS

The Center for Diversity and Inclusion must be relocated, such as into the Memorial Union Building, and the Hamar House removed. The 84 parking spaces in Lots 14 and V2 should be relocated elsewhere.

ENABLED PROJECTS

The relocation of the College of Business will allow the partial demolition and renovation of the Academic Office Building to be used for administrative leadership offices. The relocation of the College of Computing will allow renovation of spaces in Rekhi Hall for centrally scheduled state-of-the-art classrooms and teaching laboratories.



PRECEDENT: DURHAM UNIVERSITY MATHEMATICAL AND COMPUTER SCIENCE BUILDING



PRECEDENT: BOSTON UNIVERSITY CENTER FOR COMPUTING & DATA SCIENCES



PRECEDENT: UNIV OF HARTFORD HARRISON LIBRARY



PRECEDENT: UNIVERSITY OF RHODE ISLAND FASCITELLI CENTER FOR ADVANCED ENGINEERING



PRECEDENT: UNIVERSITY OF SOUTHERN CALIFORNIA VITERBI SCHOOL OF ENGINEERING

CENTER FOR CONVERGENCE AND INNOVATION

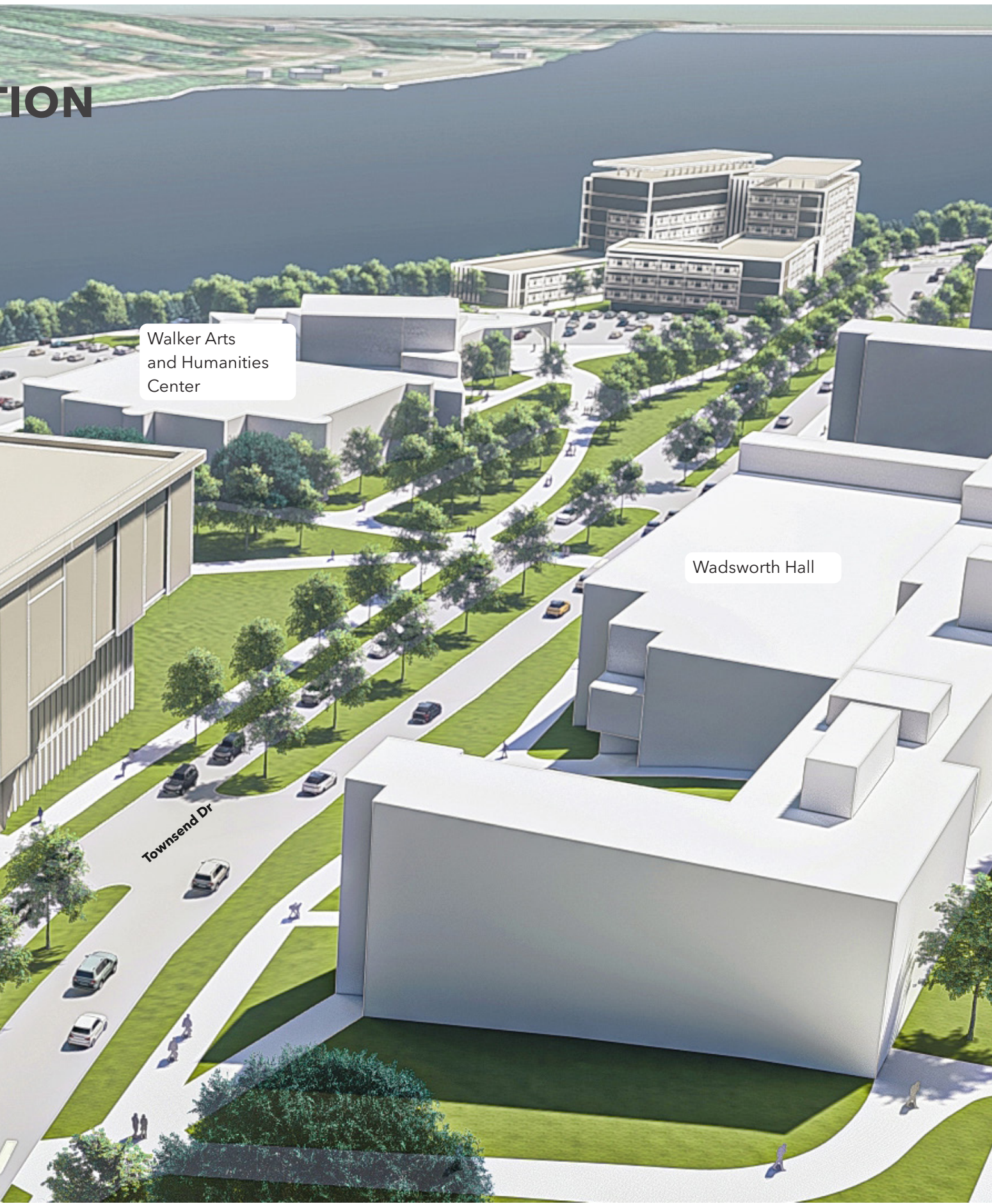


Douglass
Houghton Hall

Center for
Convergence and
Innovation

Fisher Hall

Portage Lake



Walker Arts and Humanities Center

Wadsworth Hall

Townsend Dr

EAST END STUDENT HOUSING

PROJECT NEED

On-campus housing is a foundational component of the undergraduate experience. Although Michigan Tech requires only first-year students and second-year students on merit-based academic scholarships to live on campus, student demand for on-campus housing has outstripped supply for years. There is an immediate need for more on-campus housing for lower division students.

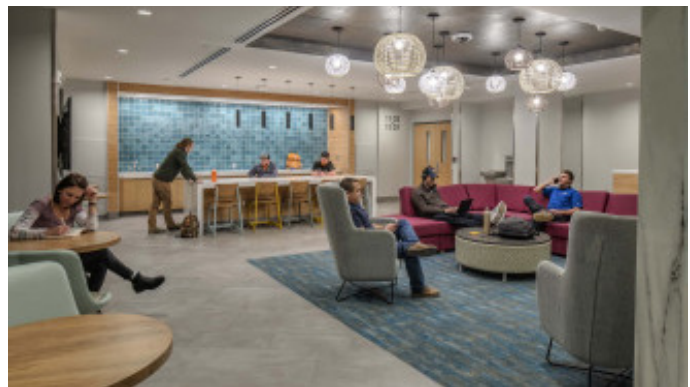
DESCRIPTION

The East End Student Housing project should be a residence hall with approximately 500 beds. The program and design should be focused on the socialization and retention needs of lower division students. To balance the existing inventory of traditional double occupancy rooms, the East End Student Housing should provide semi-suites and full-suites in both single- and double-occupancy.

The base of the project should be a parking structure that should minimally replace the existing 261 parking spaces in Lot 9 and accommodate some of the additional parking demand generated by the residential use. The East End Student Housing project is a near-term project because the site is relatively unencumbered.

SITE IMPROVEMENTS

The site is high profile—its serves as the east gateway of not only the Michigan Tech campus but also the City of Houghton. The East End Student Housing project should transform the east edge of campus and create a signature entry experience for the entire city. The gateway should include campus edge signage and significant landscaping.



PRECEDENT: WESTERN MICHIGAN UNIVERSITY ARCADIA FLATS



PRECEDENT: UNIVERSITY OF UTAH LASSONDE STUDIOS

EAST END STUDENT HOUSING

Rozsa Center for the Performing Arts

East McNair Hall

Townsend Dr



Portage Lake

East End Student
Housing

MEMORIAL UNION BUILDING RENOVATION AND MALLSIDE ADDITION

PROJECT NEED

The Memorial Union Building retail dining does not currently meet the needs of students, particularly commuter and graduate students who do not participate in community-style dining. Student organization space is undersized and ineffective for collaboration and leadership development. The building does not provide informal and gathering spaces for on-campus residential students and commuter students.

DESCRIPTION

The University should expand and reconfigure the food service area on the first floor to accommodate Michigan Tech's retail dining needs. The expanded seating area should accommodate approximately 650 seats. Retail dining options should include, but not be limited to, three to four branded concepts such as Chick-fil-A, Subway, and Starbucks. The existing North Coast Grill and Deli could remain and would benefit from enhanced patron traffic.

The University should enhance and expand the student activity/involvement area to better accommodate student organizations and their programming, such as Undergraduate Student Government and Graduate Student Government.

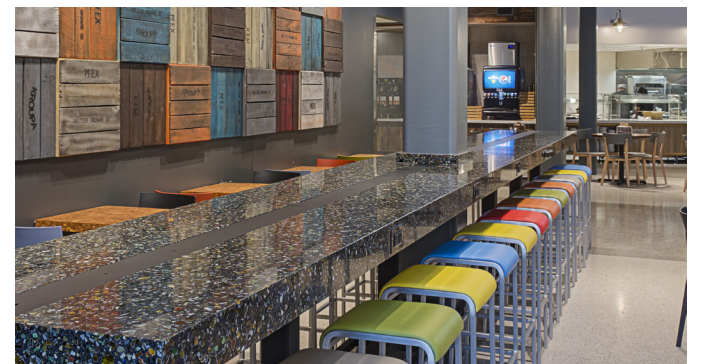
The University should also expand the Memorial Union Building by constructing an addition on the north/mallside. On each floor, the newly created spaces should be student-controlled areas such as space for student organizations like the Center for Diversity and Inclusion, social lounges, and individual and group study areas. A more social alternative than in the library, students will gather in new living rooms to engage with others. The Memorial Union Building will once again draw students who want to see and be seen.

The priorities for the renovation and addition will be improved dining, student organization space, and student lounge and study space. Secondly, the University may consider other student-focused spaces such as meditation space, a non-denominational prayer room, performance space, an art gallery, dance/multipurpose space, and a lactation room. Co-locating student service functions such as Admissions, Cashiers, Financial Aid, Career Services, and Records and Registration could help generate student traffic to the Memorial Union Building, but these uses should not be prioritized over student-controlled spaces.

The connection to the central mall is important, and the mallside addition should feature transparency so there is a visual connection between those in the Memorial Union Building addition and those passing by.

SITE IMPROVEMENTS

The addition should occur within the existing Memorial Union Building mallside setback, and not significantly reduce the width of the campus mall walking paths.



PRECEDENT: UNIVERSITY OF MICHIGAN SOUTH QUADRANGLE ADDITION

PRECEDENT: WESTERN MICHIGAN UNIVERSITY VALLEY DINING CENTER RENOVATION

ACADEMIC INITIATIVES

To improve the teaching and learning experience and expand the instructional spaces that are flexible and support modern teaching methods, Michigan Tech intends to complete these academic initiatives:

- Academic Classroom and Teaching Laboratory Renovations (a Near Term Priority)
- H-STEM Complex (a Near Term Priority)
- Center for Convergence and Innovation (a Near Term Priority)
- Academic Commons

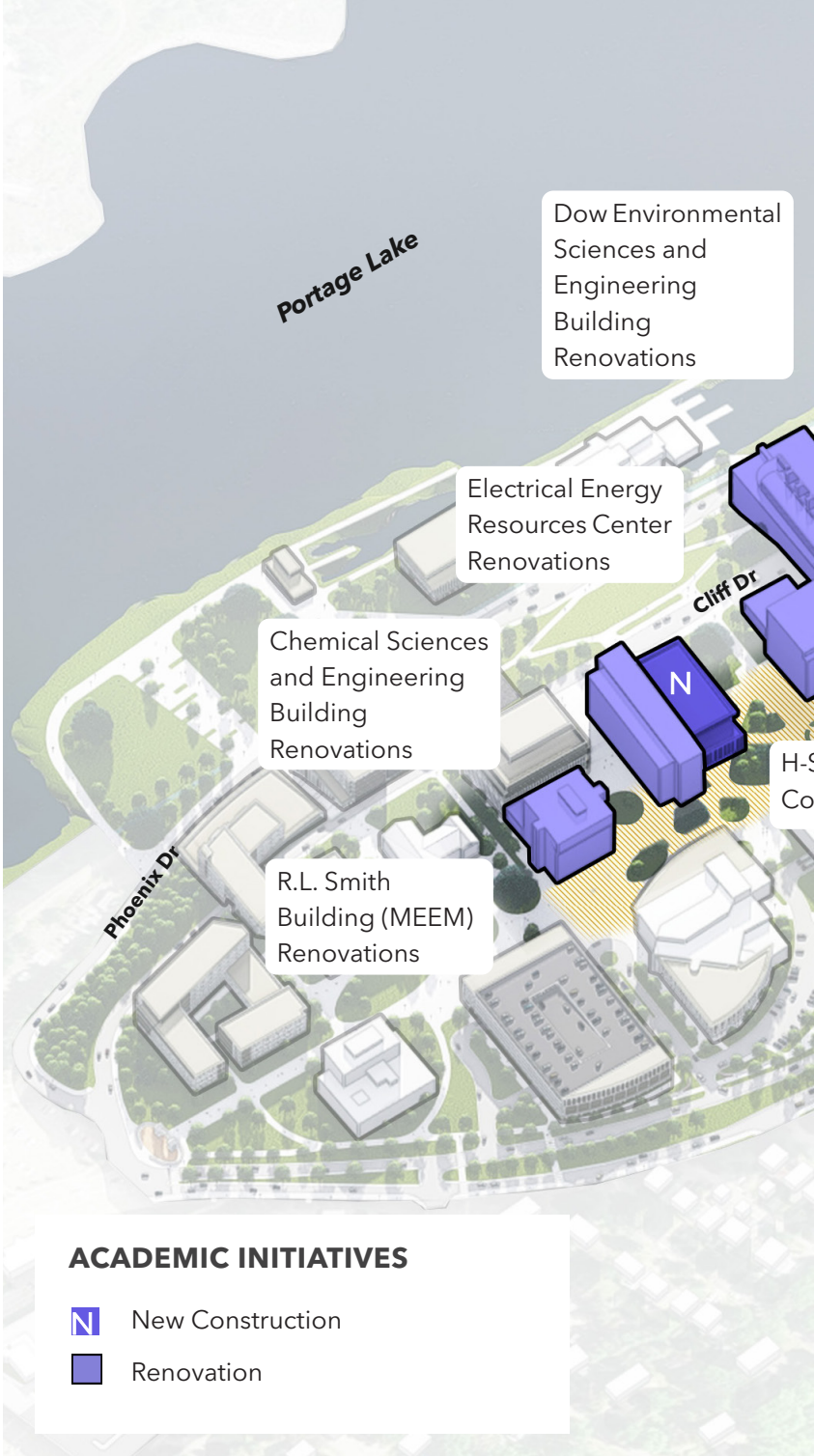
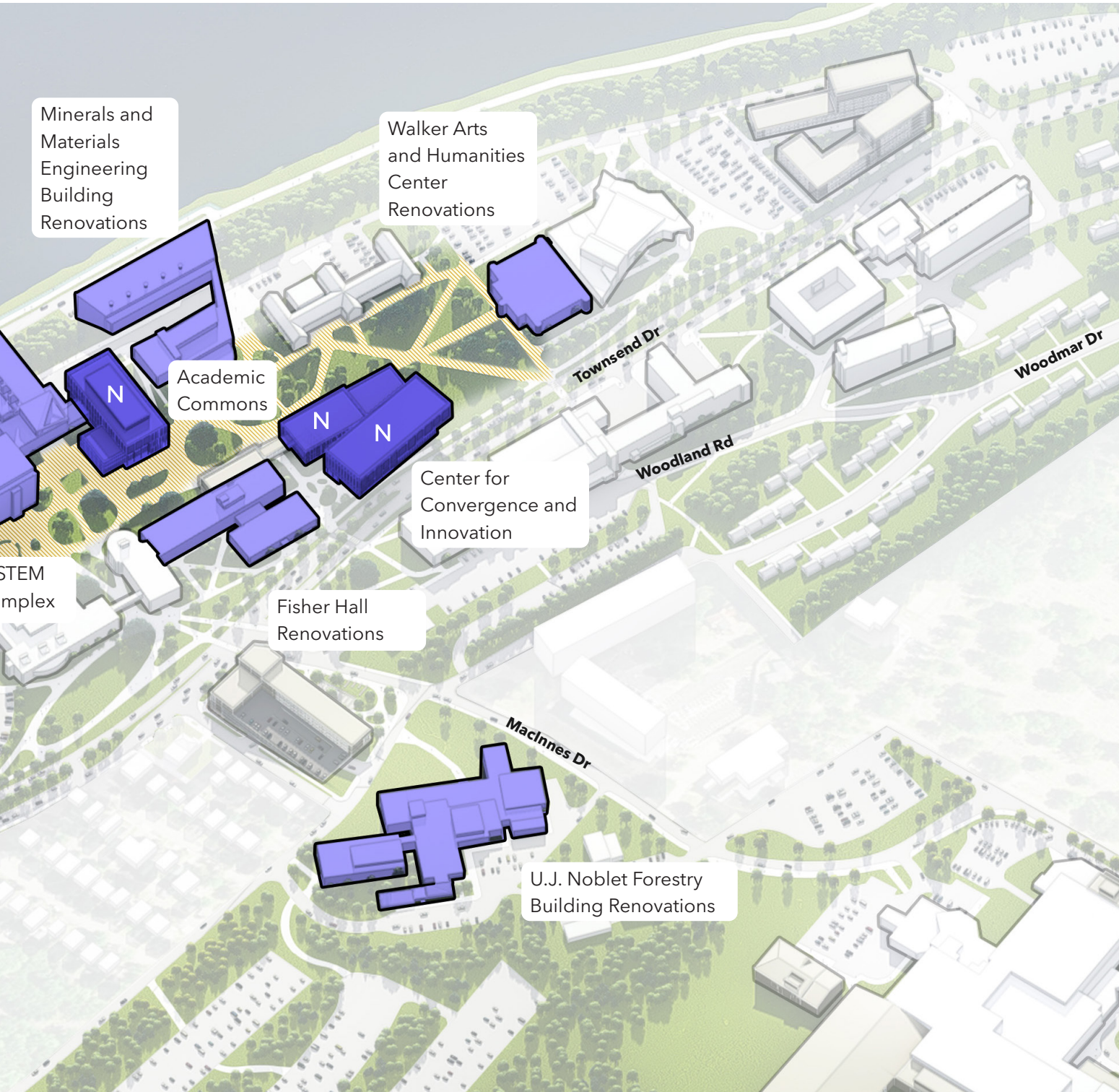


FIGURE 34: ACADEMIC INITIATIVES



Minerals and
Materials
Engineering
Building
Renovations

Walker Arts
and Humanities
Center
Renovations

Academic
Commons

Center for
Convergence and
Innovation

Fisher Hall
Renovations

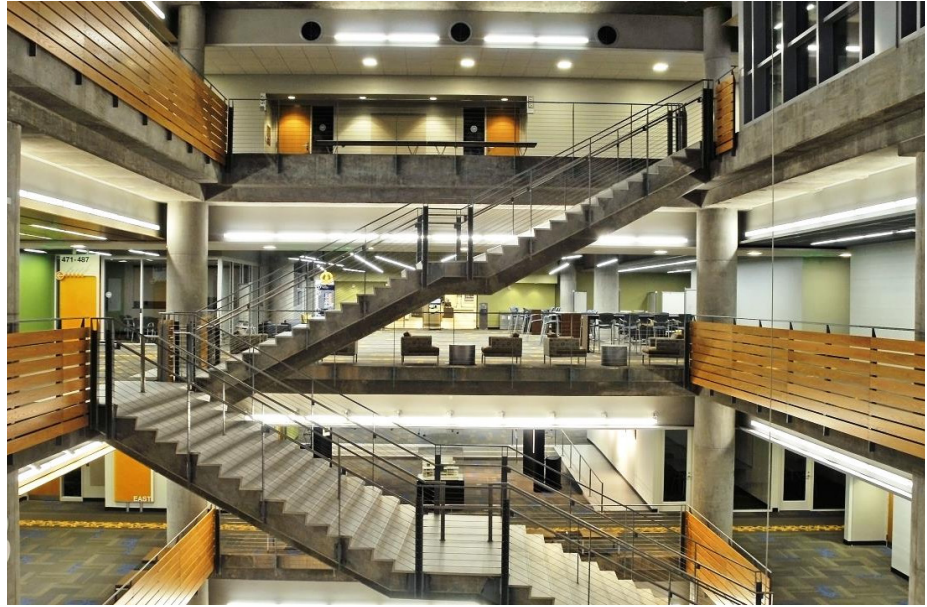
U.J. Noblet Forestry
Building Renovations

ACADEMIC COMMONS

The classrooms and teaching laboratories in Grover C. Dillman Hall are highly utilized and a critical part of the undergraduate experience. However, they do not reflect modern instructional best practices. The building design and deferred maintenance issues make renovation of Grover C. Dillman Hall difficult.

Several new projects will reduce the demand on Grover C. Dillman Hall's classrooms and teaching laboratories. The Center for Convergence and Innovation will include modern classrooms and teaching laboratories. Additionally, the Business and Industry Research Addition to the R.L. Smith Building (MEEM) will include civil engineering teaching laboratories currently in Grover C. Dillman Hall.

After all programs are moved out of Grover C. Dillman Hall for more modern teaching spaces, the University should demolish Grover C. Dillman Hall. On its site, the University should construct a modern classroom building with state of the art, flexible, active learning classrooms with full technology.

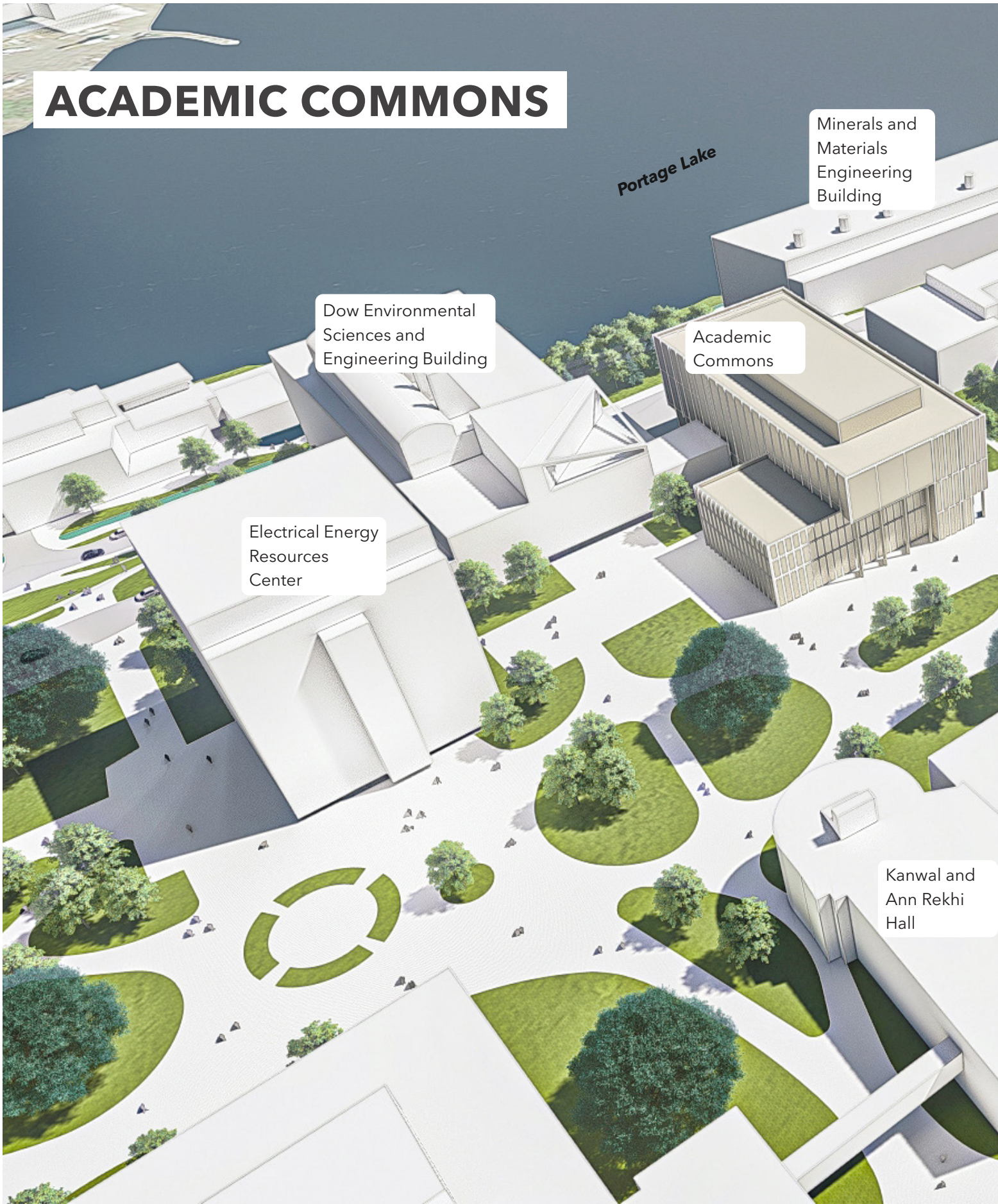


PRECEDENT: GEORGIA INSTITUTE OF TECHNOLOGY CLOUGH COMMONS BUILDING



PRECEDENT: UNIVERSITY OF GEORGIA DRIFTMIR ENGINEERING CENTER

ACADEMIC COMMONS



Portage Lake

Minerals and
Materials
Engineering
Building

Dow Environmental
Sciences and
Engineering Building

Academic
Commons

Electrical Energy
Resources
Center

Kanwal and
Ann Rekhi
Hall



Center for
Convergence and
Innovation

Fisher Hall

Townsend Dr

RESEARCH INITIATIVES

To spur further innovation and grow research expenditures, Michigan Tech will provide better and additional research facilities to support existing researchers and attract new researchers. Michigan Tech intends to complete these research initiatives:

- Research Laboratory Renovations (a Near Term Priority)
- H-STEM Complex (a Near Term Priority)
- Business and Industry Research Addition
- Lakefront Research Building

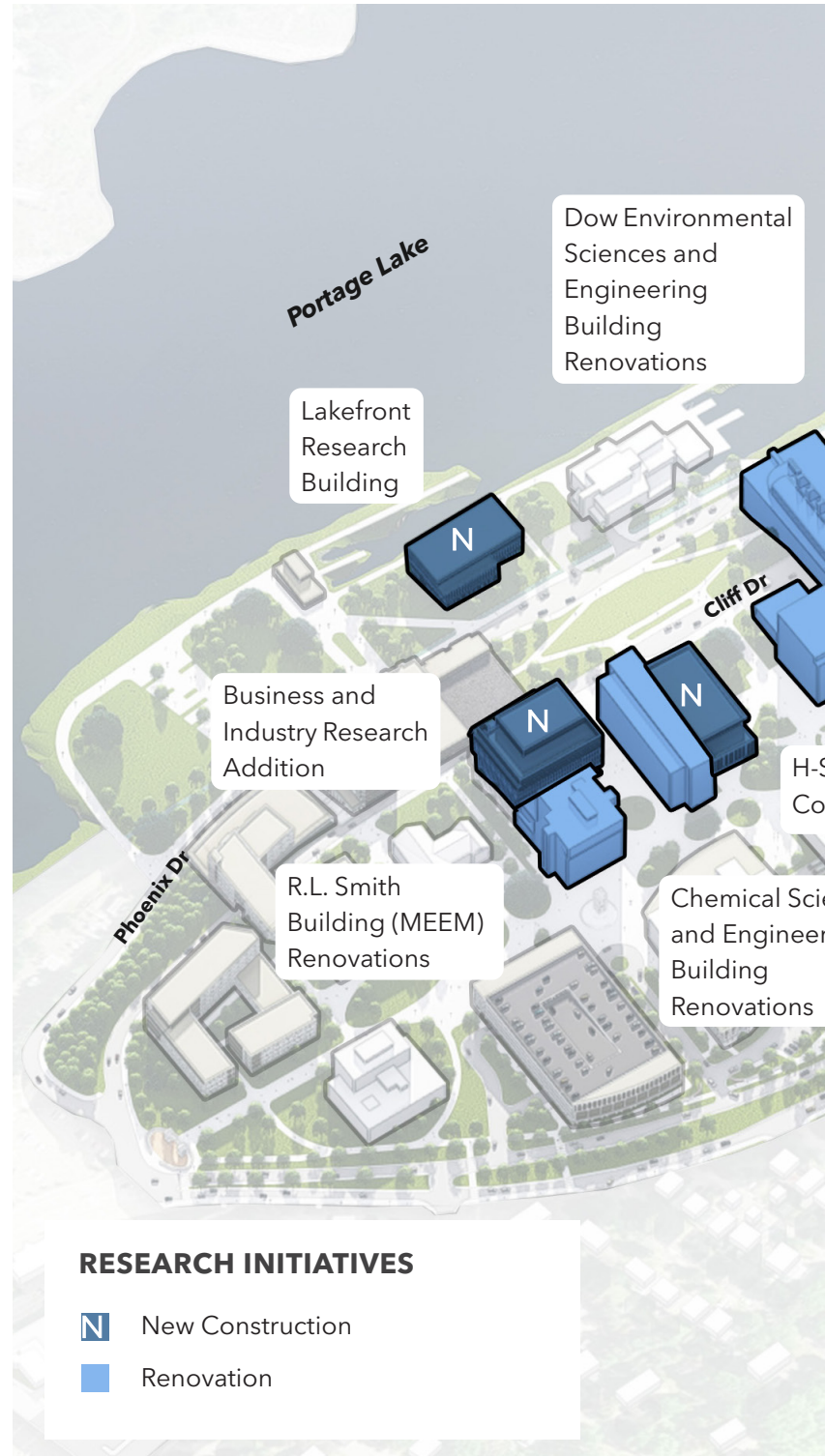
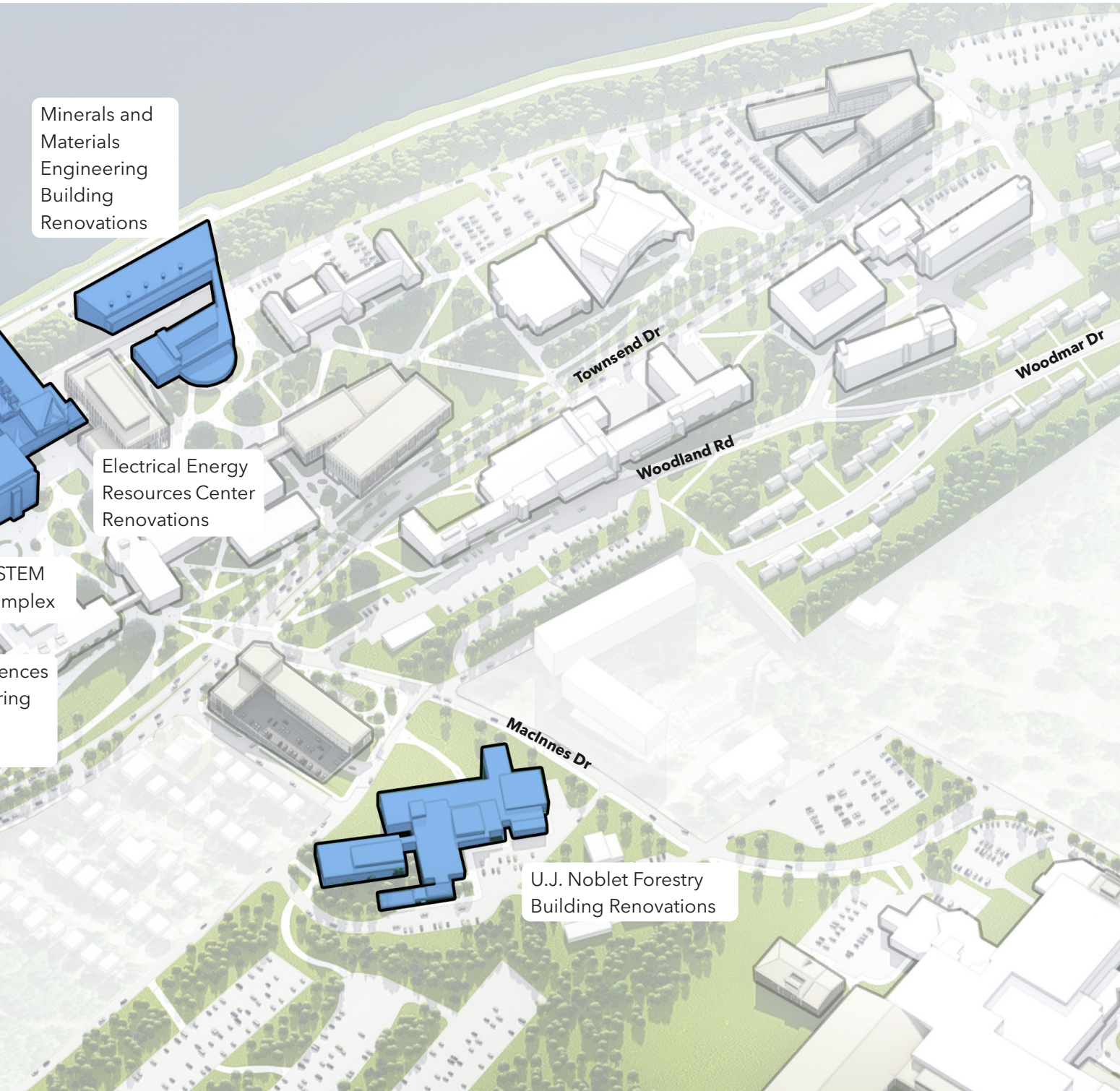


FIGURE 35: RESEARCH INITIATIVES



Minerals and
Materials
Engineering
Building
Renovations

Electrical Energy
Resources Center
Renovations

STEM
Complex
Renovations
Engineering

U.J. Noblet Forestry
Building Renovations

BUSINESS AND INDUSTRY RESEARCH ADDITION

Michigan Tech seeks greater international recognition for its research activity. The space needs analysis indicated that Michigan Tech has a sufficient amount of space to meet its funded research goals, but the quality of research laboratories should be improved. Existing research space should be incrementally renovated to improve health and safety issues, address deferred maintenance, and create state-of-the-art research space that enables current researchers to win more funded research projects that attract leading researchers. All existing research space is occupied, precluding researchers to be moved out of existing laboratory space.

The Business and Industry Research Addition is an enabling project that allows for the incremental renewal of existing research laboratories. Flexible research laboratories will host rotations of existing researchers, which allows the University to renovate existing laboratories two to three floors at a time. The incremental rotation through the new flexible research laboratories is an opportunity to allocate modern laboratory space to researchers only while their research grant is active. The incremental rotation is also an opportunity to purposefully integrate researchers from complementary disciplines into interdisciplinary centers.

This project will support university-industry collaboration. The building will include public-private partnership (P3) space reserved for industries to co-locate on campus as University and industry researchers work together.

The project is an enabling project for longer term initiatives. The project will include the loud and dirty civil engineering teaching laboratories now in Grover C. Dillman Hall, allowing for the eventual replacement of Grover C. Dillman Hall with the Academic Commons.



PRECEDENT: UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN ELECTRICAL & COMPUTER ENGINEERING BUILDING

LAKEFRONT RESEARCH BUILDING

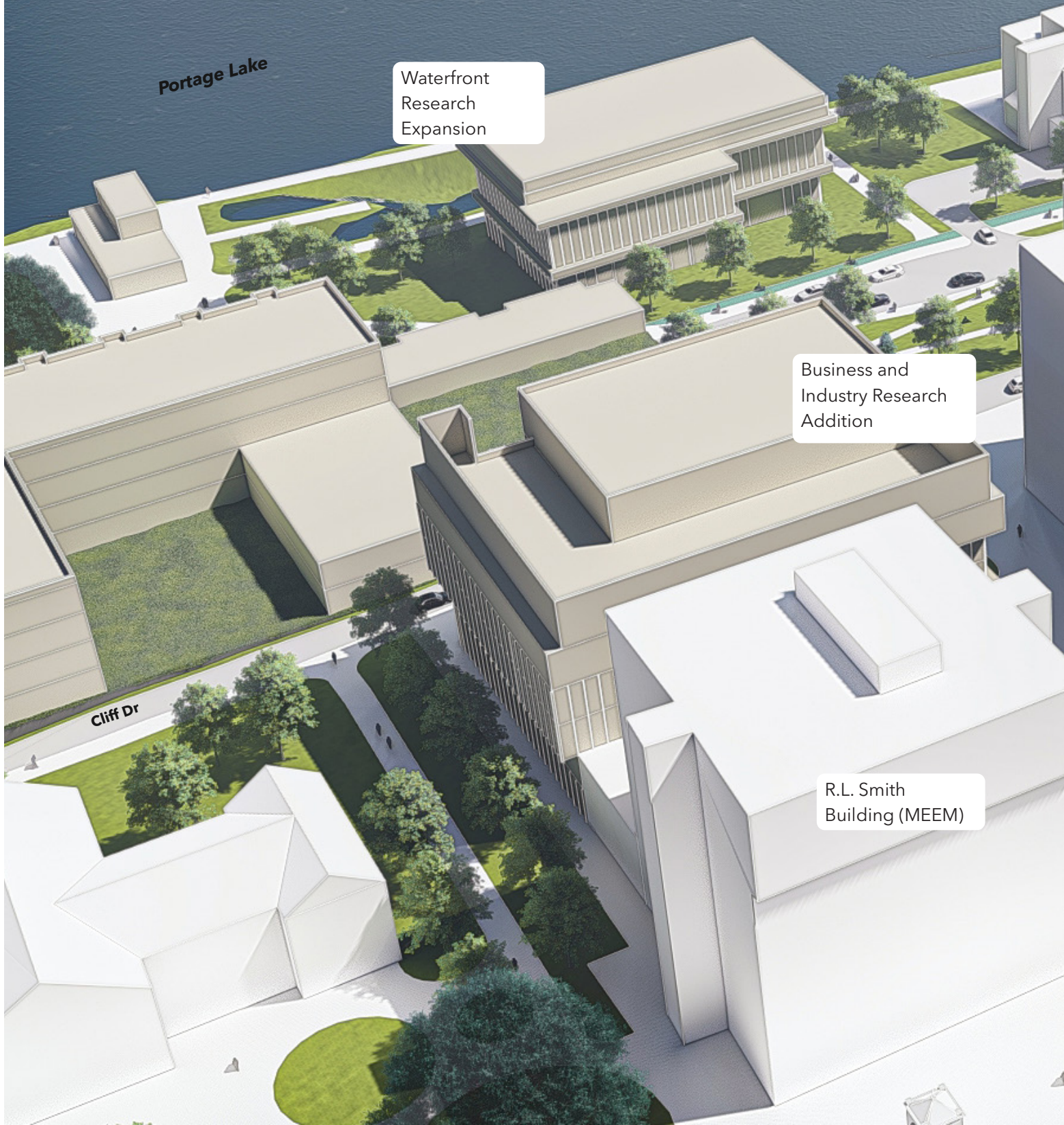
The Great Lakes Research Center provides state-of-the-art laboratories to support research on a broad array of topics. Faculty members from many departments across Michigan Tech's campus collaborate on interdisciplinary research, ranging from air-water interactions to biogeochemistry to food web relationships. Michigan Tech intends to build on this success and expand water-based research.

The campus master plan reserves a site on Phoenix Drive, west of the Great Lakes Research Center, for additional water-based research. The program for the intended interdisciplinary research will be determined in the years ahead.

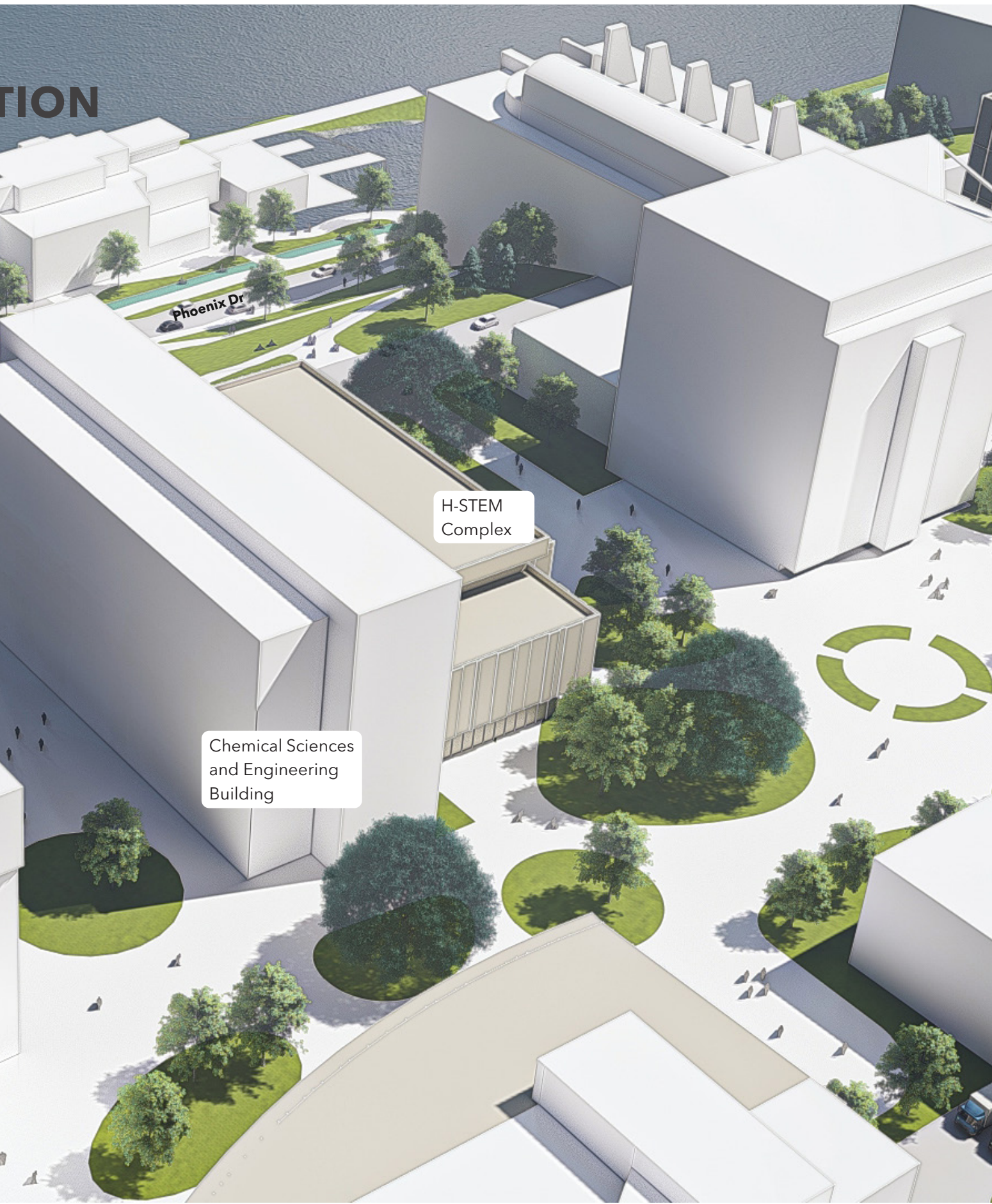


PRECEDENT: LAKE SUPERIOR STATE UNIVERSITY
CENTER FOR FRESHWATER RESEARCH AND EDUCATION
BUILDING

BUSINESS AND INDUSTRY RESEARCH ADDITION



TION



STUDENT LIFE INITIATIVES

To accommodate additional students in on-campus housing, improve the dining and recreation experience, and promote leadership through student gathering and organizations, Michigan Tech intends to complete these student life initiatives:

- Memorial Union Building Renovation and Mallside Addition (a Near Term Priority)
- Memorial Union Building Expansion and Student Activity Lawn
- East End Student Housing (a Near Term Priority)
- Downtown Connector Student Housing
- The Link Housing and Retail Mixed Use Development
- Tech Bluff Housing, Dining, and Recreation
- Student Development Center Additions
- Gates Tennis Center Expansion
- Tech Trails Outdoor Trailhead Lodge
- Mont Ripley Ski Hill Chalet
- Portage Lake Golf Course Clubhouse

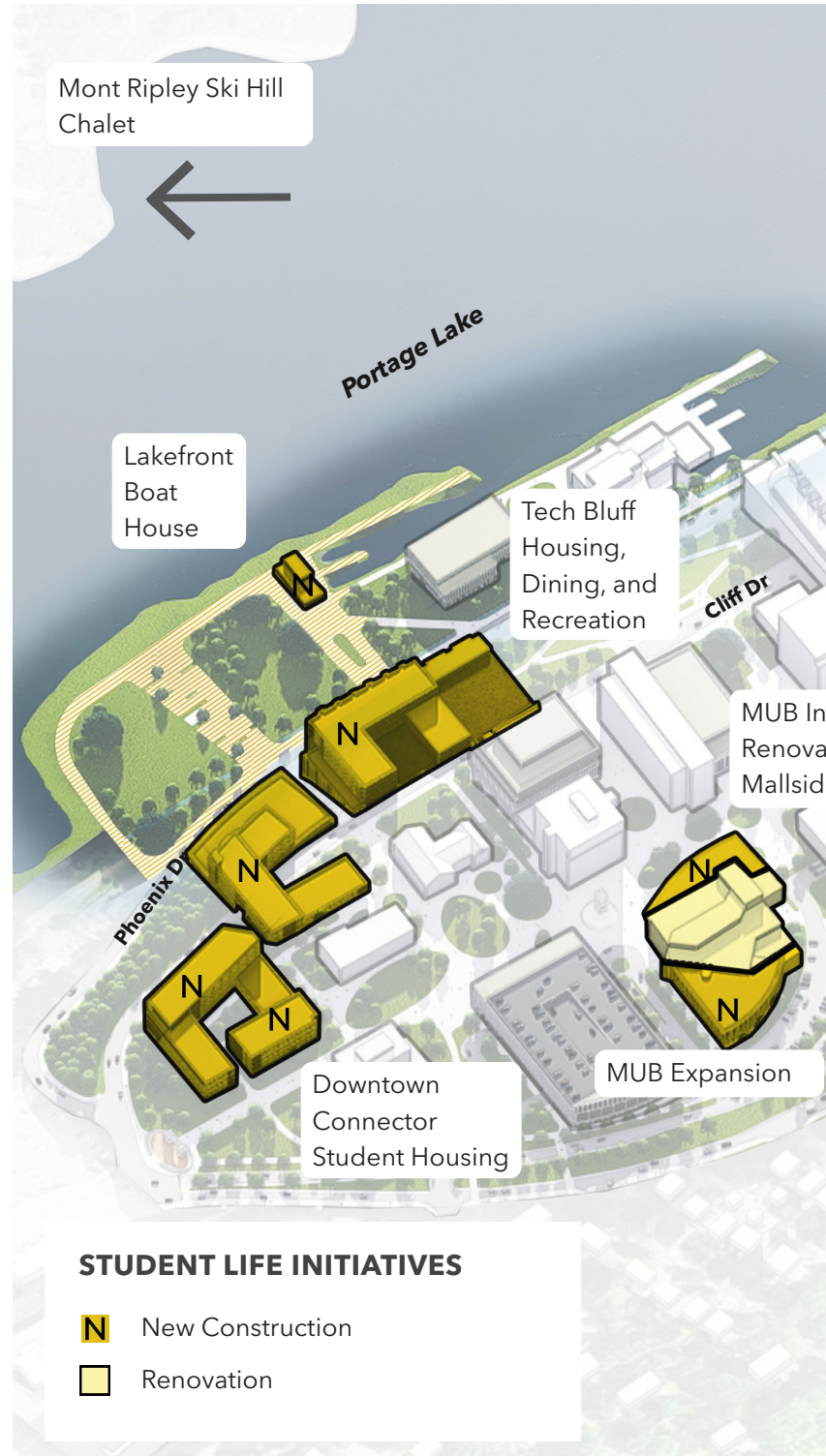
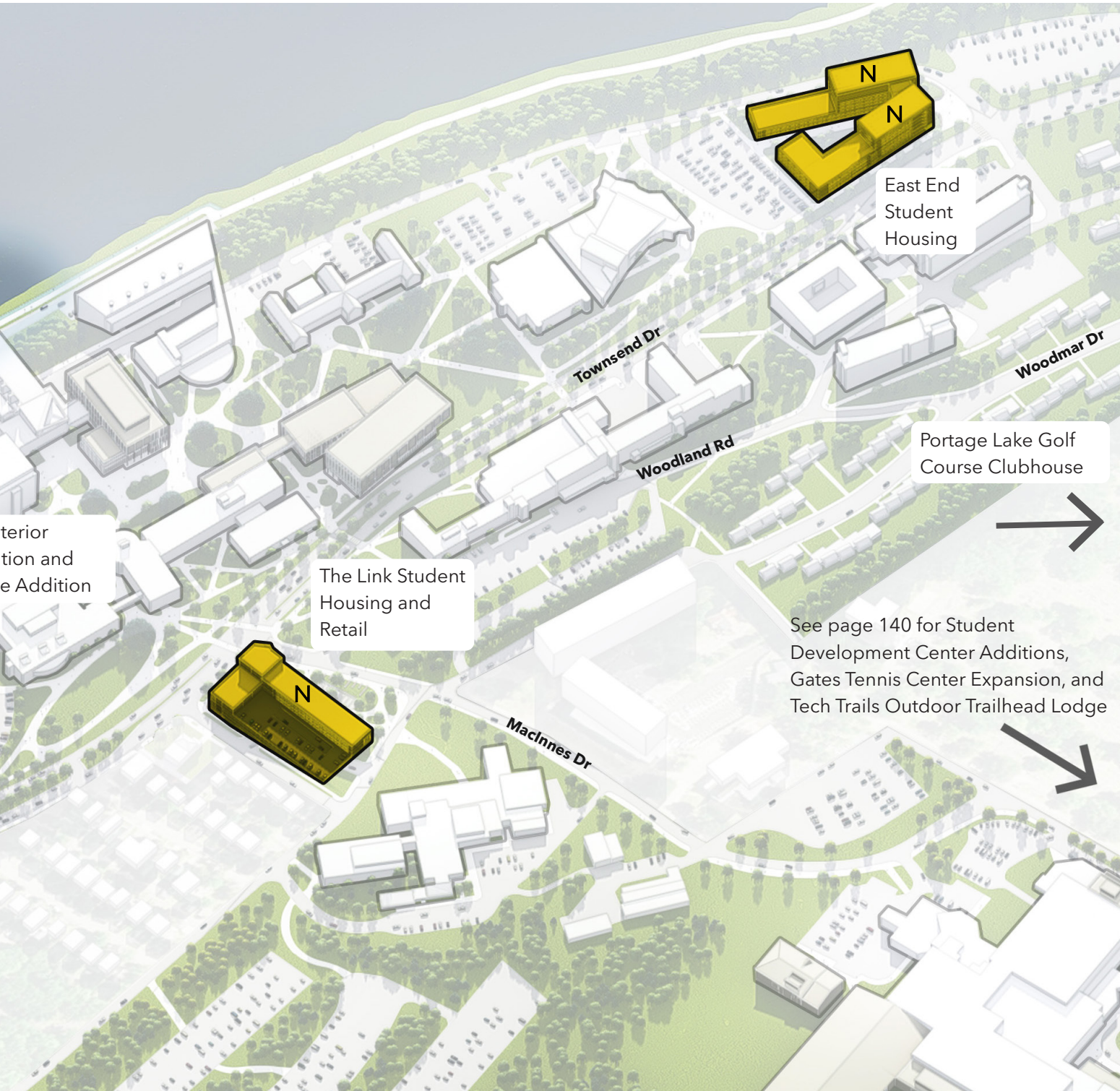


FIGURE 36: STUDENT LIFE INITIATIVES



terior
tion and
e Addition

The Link Student
Housing and
Retail

East End
Student
Housing

Portage Lake Golf
Course Clubhouse

See page 140 for Student
Development Center Additions,
Gates Tennis Center Expansion,
and Tech Trails Outdoor Trailhead Lodge

MEMORIAL UNION BUILDING EXPANSION AND STUDENT ACTIVITY LAWN

As enrollment grows to 10,000 students, additional student center space will be needed to support the on-campus experience. The Memorial Union Building will need more student organization space, loud social spaces, as well as quiet study areas, and better and more food service.

The University will expand the Memorial Union Building to better serve the needs of both residential and commuter students. An addition on the south side of the Memorial Union Building would change the image of the campus for those on US Highway 41. The Memorial Union Building addition could be an open and glassy facade highlighting student activity.

The Memorial Union Building south addition should be accompanied by the removal of surface parking. In place of Lots 12 and 13 and the Houghton Avenue visitors parking lot, the University should create a campus front lawn. The open space should support many functions such as plazas that support Memorial Union Building student activities spilling outside, passive lawn recreation, and landscaping that shapes outdoor rooms.



PRECEDENT: SAM HOUSTON STATE UNIVERSITY
LOWMAN STUDENT CENTER

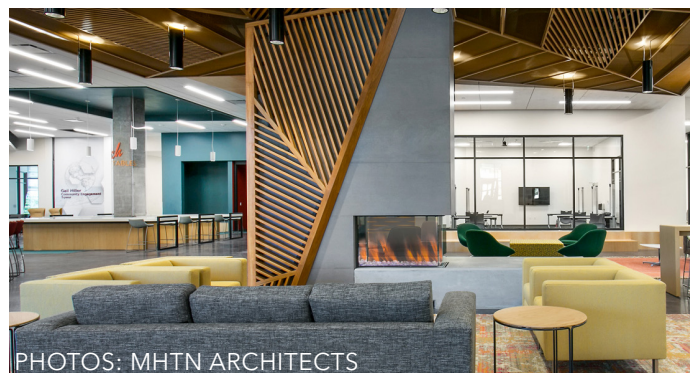
DOWNTOWN CONNECTOR STUDENT HOUSING

On-campus housing is a foundational component of the undergraduate experience. Although Michigan Tech requires only first-year students and second-year students on merit-based academic scholarships to live on campus, student demand for on-campus housing has outstripped supply for years. As the undergraduate student enrollment grows, there will be continued need for more on-campus housing for lower division students.

The Downtown Connector Student Housing project will introduce student housing into the western end of campus. It will be a residence hall with approximately 500 beds. The program and design should be focused on the socialization and retention needs of lower division students. To balance the existing inventory of traditional double occupancy rooms, the Downtown Connector Student Housing should be semi-suites and full-suites in both single- and double-occupancy.

To ready the site, the staff of Alumni Engagement should relocate from Alumni House and the parking in Lot 1 and along College Avenue should be relocated.

Parking lots and College Avenue should be replaced by the west extension of the beautiful campus mall, including the full construction of the Alumni Way. Site improvements will include a gateway element where the campus mall intersects with US Highway 41 to serve as the connector between the campus and downtown Houghton.



PHOTOS: MHTN ARCHITECTS

PRECEDENT: UNIVERSITY OF UTAH KAHLERT VILLAGE

DOWNTOWN CONNECTOR STUDENT HOUS

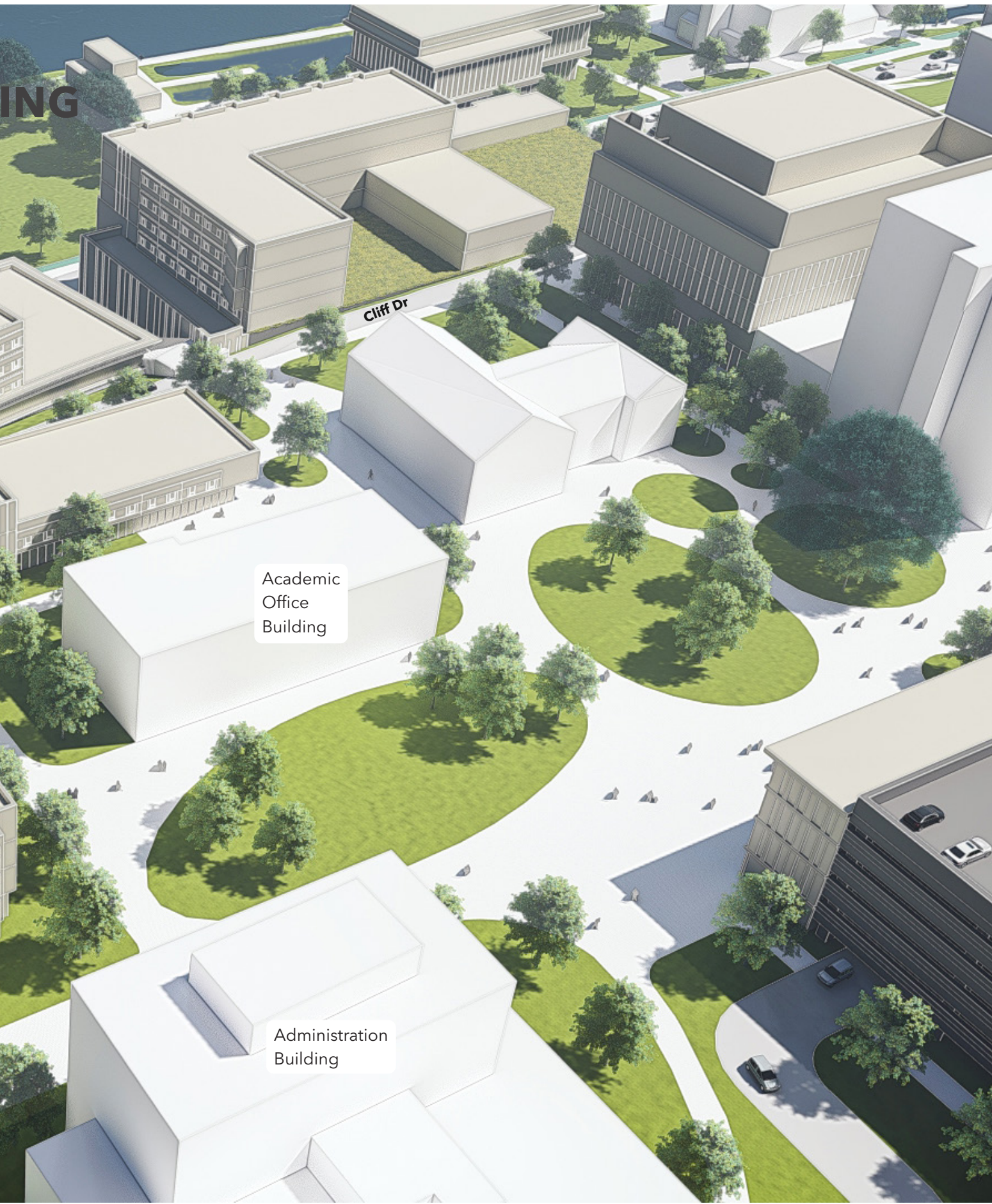
Portage Lake

Tech Bluff Housing,
Dining, and Recreation

Downtown
Connector
Student
Housing

Alumni Dr

Alumni Walk



ING

Cliff Dr

Academic
Office
Building

Administration
Building

THE LINK HOUSING AND RETAIL MIXED USE DEVELOPMENT

As student enrollment grows, demand for upper level and graduate housing will increase. Additionally, the programmatic connection between the campus core and the Student Development Center and the U.J. Noblet Forestry Building is weak, interrupted by the block of single-family houses. On the block defined by US Highway 41, Maclnnes, 7th Avenue, and East Street, Michigan Tech owns all but two of the parcels.

The University should acquire the two remaining parcels from the willing sellers, and then demolish the existing houses. The University and/or a development partner should construct a mixed-use development project. The program could include apartments for upper level and graduate students, ground floor retail, and structured parking to support the development. The project will be very visible for those driving on US Highway 41, and the corner of US Highway 41 and Maclnnes should be prominent and urban.

Both the flow of pedestrians from the campus core across US Highway 41 at Maclnnes and up to the Student Development Center and the change in grade on the block is significant. The project should include a plaza on the east side of the new building that welcomes pedestrians after they cross US Highway 41. The plaza design could include terraces to accommodate the grade change, seating areas that could support the ground floor retail, and landscaping.



PRECEDENT: UNIVERSITY OF WISCONSIN-MADISON
UNIVERSITY SQUARE

TECH BLUFF HOUSING, DINING, AND RECREATION

On-campus housing has exceeded the designed occupancy for years and the demand will grow as student enrollment increases. Student housing on the west end of campus will need residential support like dining and recreation. The University will construct a bold and comprehensive student life project that encompasses the hillside between the ROTC Building and the Facilities Building. The project has several interconnected parts.

Student Housing: On top of the bluff and adjacent to the ROTC Building and the Downtown Connector Student Housing, the University should expand the west campus student neighborhood. The residence hall could have 500 beds across two buildings. Student housing would be located at the top floors with easy access to the academic core and panoramic views of the Keweenaw Waterway.

Dining Commons: Under the student housing, the University should construct a dining commons that is open to both residential and commuter students. The student dining area should open up to scenic views of the water, and storage, kitchens, and offices should be positioned in the interior space. Outdoor terraces are possible.

Indoor Recreation: Between the dining commons and Cliff Drive, the University should construct an indoor recreation space that is an extension of the Student Development Center recreation programming. Programming could include cardio, climbing wall, and the Outdoor Adventure program. The recreation space should have direct access to Phoenix Drive and the proposed waterfront park on the Facilities Building site. The multistory recreation space should have transparent walls with views of the water. Storage, offices, and other back of house uses should be positioned in the interior space.

Parking Structure: Under the student housing, the University should construct a multilevel parking structure into the bluff. Vehicular access can happen at both the Cliff Drive and Phoenix Drive levels. The location could accommodate over 350 parking spaces, directly serving the connected housing, recreation, dining, and office uses, as well as accommodating the spaces relocated from Lots 30, 31, 31A, and 33, which will improve the pedestrian character of Phoenix Drive and the City of Houghton Waterfront Trail.

Office Liner on Parking Structure: The water-facing side of the parking structure should be fronted by an office liner building. The office liner will add an active and attractive front to the parking structure and provide water and hillside views to office workers. The office liner could be approximately 30 feet deep, with connections to the parking structure.

The Tech Bluff Housing, Dining, and Recreation project requires the removal of significant soil from the bluff to create a place for the construction of the parking structure and indoor recreation spaces. Phoenix Drive should be reconstructed as a waterfront trail that connects to the city waterfront trail network, but should also be constructed sufficiently wide and resilient to serve delivery and emergency vehicles to the Great Lakes Research Center, Dow Environmental Sciences and Engineering Building, and Minerals and Materials Engineering Building.

While the campus is water adjacent, there is not an effective link between them. The project will directly connect the campus core with the campus lakefront. A grand staircase will provide outdoor access, while an elevator within the parking structure would provide public access from the Cliff Drive level to the Phoenix Drive level.

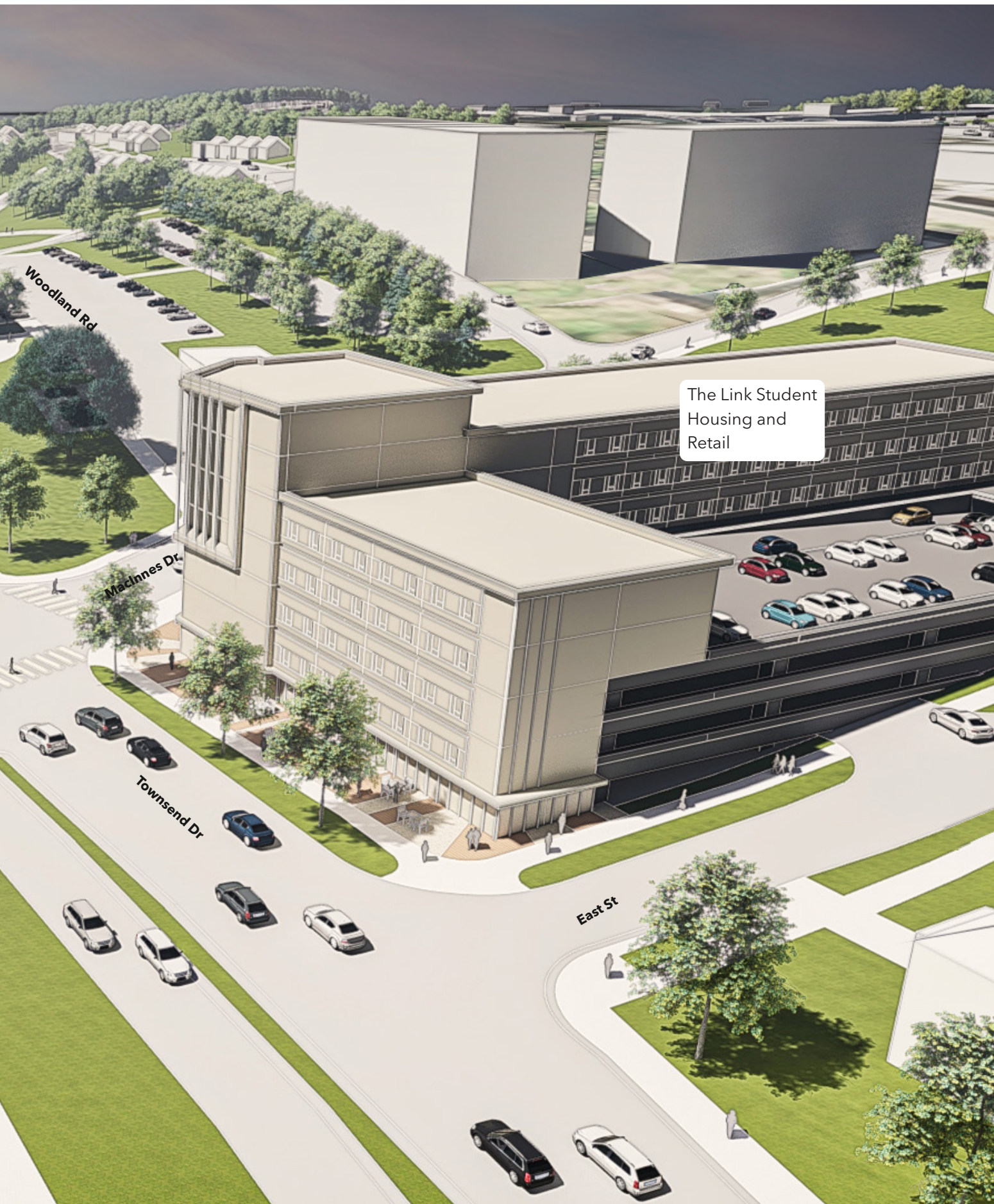
THE LINK HOUSING

Portage Lake

Center for
Convergence
and Innovation

Wadsworth Hall

Kanwal and Ann
Rekhi Hall



The Link Student
Housing and
Retail

STUDENT DEVELOPMENT CENTER ADDITIONS

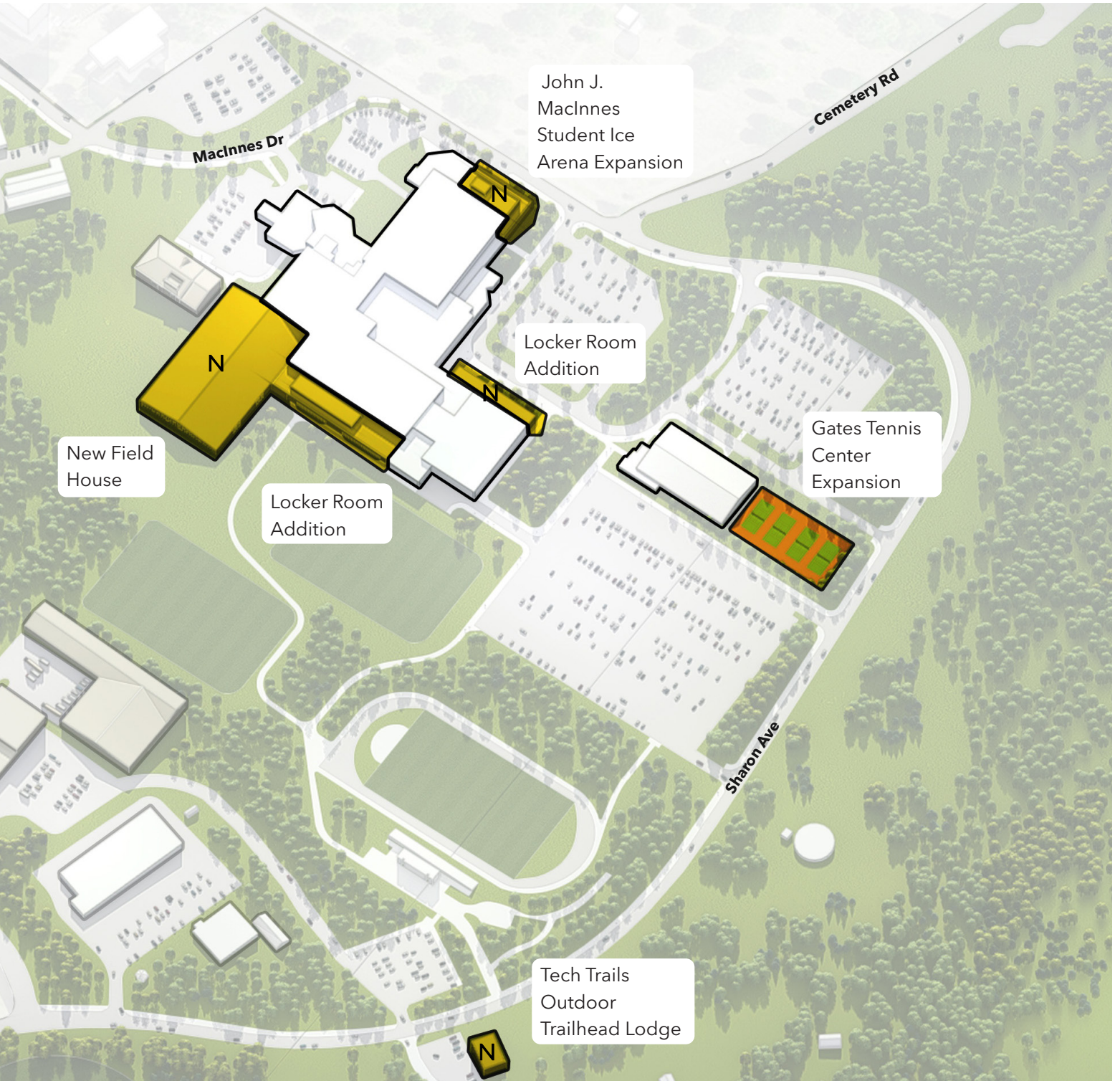
The campus master plan anticipates that Michigan Tech Athletics will expand the number of NCAA sports from 14 to 16, adding men's soccer and women's lacrosse. To provide space for these new sports, the University will construct a new indoor field house as an addition to the Student Development Center. The new field house will feature a turf field and additional locker rooms, a weight room, and more sports medicine space. The indoor field will be a recreation and community asset throughout the year.

To improve the game-day experience, the University will expand the John J. MacInnes Student Ice Arena, adding capacity and additional suites.

The additional Athletics program will require additional locker rooms. An addition to the Student Development Center will be necessary.



FIGURE 37: STUDENT LIFE INITIATIVES, STUDENT DEVELOPMENT CENTER



ER

GATES TENNIS CENTER EXPANSION

The new field house will be attached to the northwest corner of the Student Development Center, on the site of the existing outdoor tennis courts. The University will construct six new outdoor tennis courts south of the Gates Tennis Center, co-locating indoor and outdoor courts with tennis support facilities.

TECH TRAILS OUTDOOR TRAILHEAD LODGE

To support the popular outdoor recreation area, the University will construct a two-story ski lodge at the trailhead of Michigan Tech's outdoor trails.

The building should be a full mass timber project with cross-laminated timber walls and floors, and manufactured beams and columns, which can also serve as a research opportunity for the College of Forest Resources and Environmental Science and the Department of Civil, Environmental, and Geospatial Engineering. The building should provide space for Michigan Tech's Outdoor Adventure program administration, equipment, and events, and for multiple student organizations and programs.

The building will serve as headquarters for multiple national collegiate and state high school Nordic ski and cross country events. The patio and deck would support outdoor gatherings year-round. The new building on the currently undeveloped site will require access from Sharon Drive, and a parking lot.



IMAGE: OHM

TECH TRAILS OUTDOOR TRAILHEAD LODGE

MONT RIPLEY SKI HILL CHALET

A large percentage of students recreate on Mont Ripley during the winter months. Recent figures indicate that approximately 2,600 students make approximately 19,000 visits to the Ski Hill each winter.

The current chalet facility is an early 1970s building that is too small in all areas, has severe accessibility concerns, and does not allow for expanded use or development of the Ski Hill. A new chalet is needed that would provide for larger and more efficient equipment rental, expanded and varied food service, and greater seating/gathering space. The new facility would also be designed to meet universal accessibility design recommendations to encourage the use of the skiing and tubing opportunities by all students and the public. This would allow for greater use of the campus amenity and provide for additional revenue to offset the subsidy of the Ski Hill operations.

In addition, the functionality of the Ski Hill would be greatly improved with increased parking and a new beginner ski trail. These features, along with a new Mont Ripley Ski Hill Chalet, would ensure the continued viability of this outdoor activity asset that helps define the Michigan Tech brand.

PORTAGE LAKE GOLF COURSE CLUBHOUSE

The current Portage Lake Golf Course Clubhouse is an older facility (approximately 40 years old) that has had some updates, but is too small for current use and has accessibility concerns. A larger meeting/dining facility would allow for expanded use by the members and the community for a wide variety of functions and activities including meetings, conferences, rental activities, and more. Additional locker room space that meets universal accessibility standards would also benefit the 900 Michigan Tech student users and the 450 season pass holders and provide a more inclusive environment. An addition and a remodel of the existing facility would greatly enhance this campus amenity.

OFFICE AND ADMINISTRATION INITIATIVES

In support of the University's academic and research mission, the administrative staff play important roles in supporting students, faculty, and researchers. Michigan Tech intends to complete these office and administrative initiatives:

- Academic Office Building Renovation
- Michigan Tech Lakeshore Center Repurpose
- Harold Meese Center Repurpose
- Central Parking Structure Office Space
- Tech Bluff Parking Structure Office Space

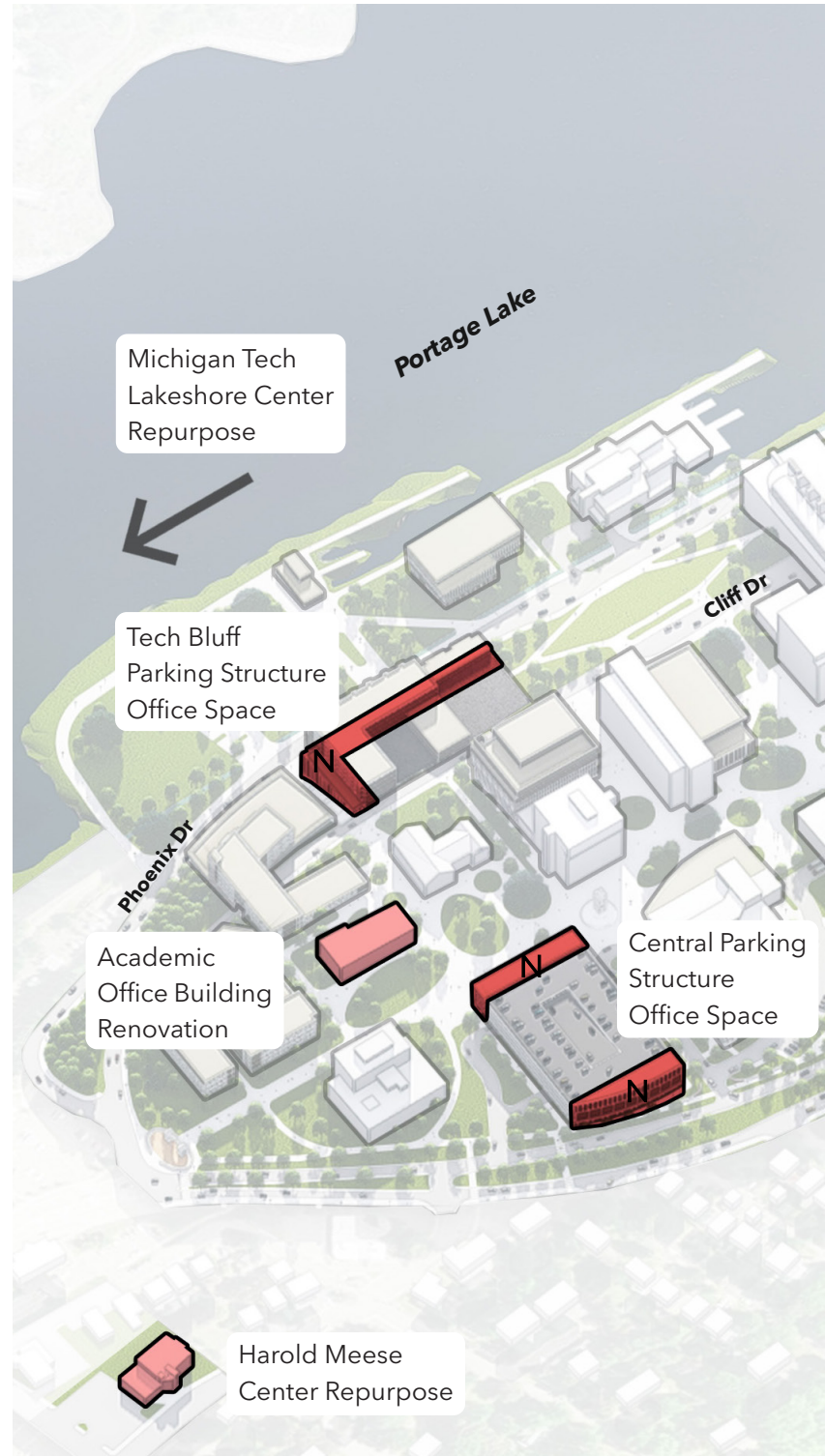
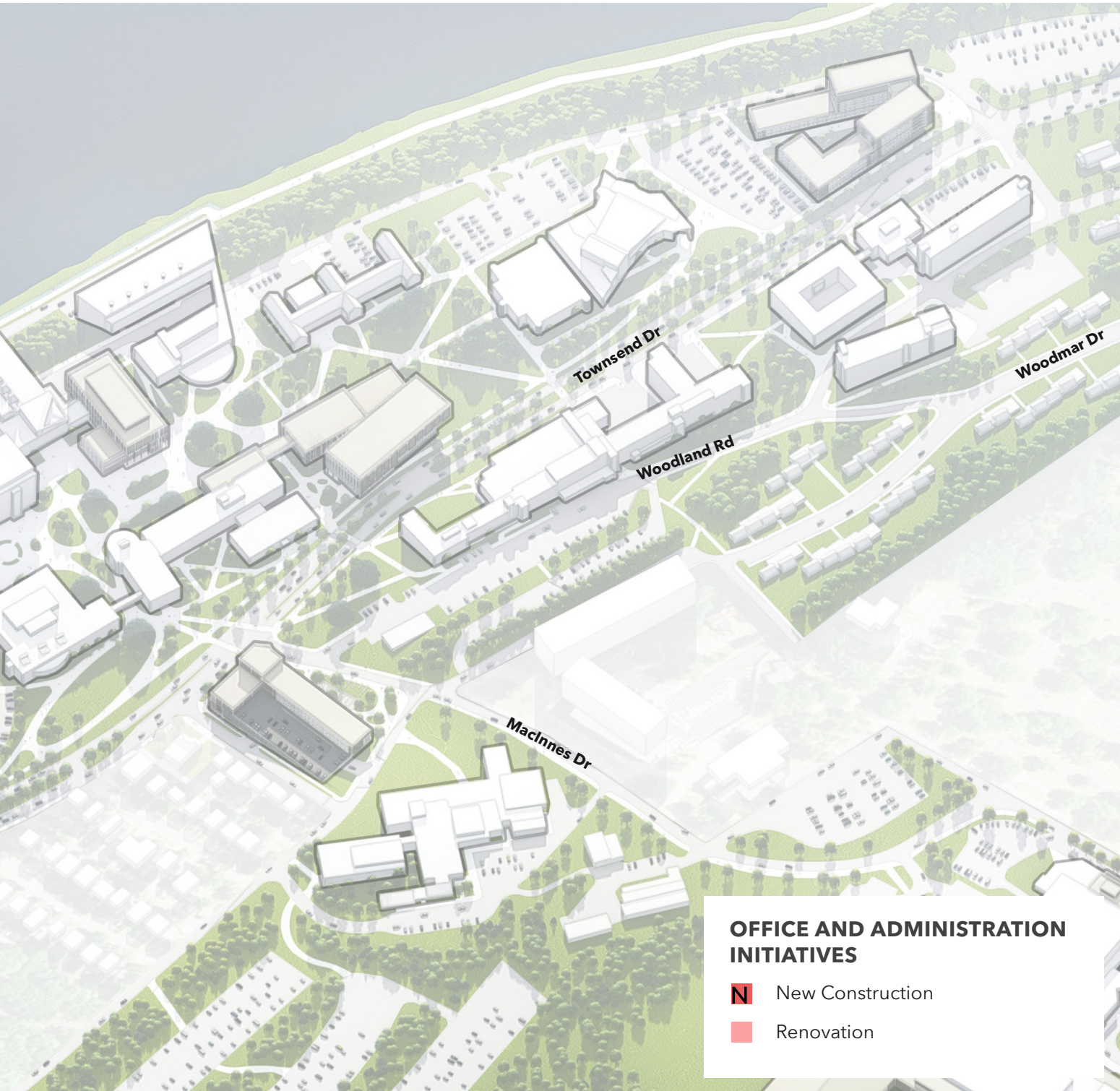


FIGURE 38: OFFICE AND ADMINISTRATIVE INITIATIVES



ACADEMIC OFFICE BUILDING

After the College of Business moves into the Center for Convergence and Innovation, the University should renovate the Academic Office Building to address significant deferred maintenance and ADA accessibility concerns. Prior to renovation, Department of Social Sciences offices will be relocated to a different building on campus.

The University should remove the back wing addition, which was constructed with a different floor-to-floor distance than the main building, one challenge for internal accessibility. The removal of the back wing will also enable the Tech Bluff Housing, Dining, and Recreation project at a later time.

After renovation, the president's and provost's offices may relocate into the Academic Office Building to create space for more student-focused offices in the Administration Building.



PRECEDENT: UNIVERSITY OF MICHIGAN LITERATURE SCIENCE AND ARTS RENOVATION

MICHIGAN TECH LAKESHORE CENTER REPURPOSE

The office uses in the Lakeshore Center, currently primarily Financial Services and Operations, Human Resources, and programs under the Vice President for Research, should move back to campus. Research grant requirements will guide when the research programs may relocate. After program relocation, the University should dispose of the building to allow it to redevelop into active uses that support downtown Houghton economic development. Potential new uses are retail, housing, a conference center, or a mixture of these uses.

HAROLD MEESE CENTER REPURPOSE

The Department of Cognitive and Learning Sciences is currently located in the Harold Meese Center. The academic program should be relocated into the academic and research campus core. After program relocation, the University should dispose of the building to allow it to redevelop into active uses that support neighborhood economic development, such as market rate off-campus housing.

CENTRAL PARKING STRUCTURE OFFICE SPACE

To allow for redevelopment of surface parking lots in the campus core, the University should construct a parking structure between the Memorial Union Building and the Administration Building. The parking structure should include approximately 33,000 GSF of liner office space on both the US Highway 41 and interior mall sides. The liner office space will add an active and attractive front to this high-profile parking structure.

Offices that are not student-facing are appropriate candidates for the office spaces that face US Highway 41. For example, Public Safety and Police Services (relocated from the MacInnes block) is a good candidate, and it could also store its vehicles in the parking structure).

Student-facing offices are appropriate candidates for the office spaces that face the interior mall. In particular, retail uses are appropriate for the ground floor. For example, the bookstore (relocated from the Memorial Union Building) would be more visible and accessible in a ground floor location on the campus mall.

Office employees could park their vehicles in the parking structure and have direct access to their floor. Visitors to the offices could use ground floor direct entrances or use the structure elevator to access upper floors.

TECH BLUFF PARKING STRUCTURE OFFICE SPACE

Similarly, the Tech Bluff Parking Structure should also include an office space liner on all floors, facing the lakefront. This office space would have dramatic views of the Keweenaw Waterway and enjoy convenient structured parking. However, the office space would not be easily visible from the campus core, and thus should be populated by non-student-facing office users, such as those that are currently in the Michigan Tech Lakeshore Center.

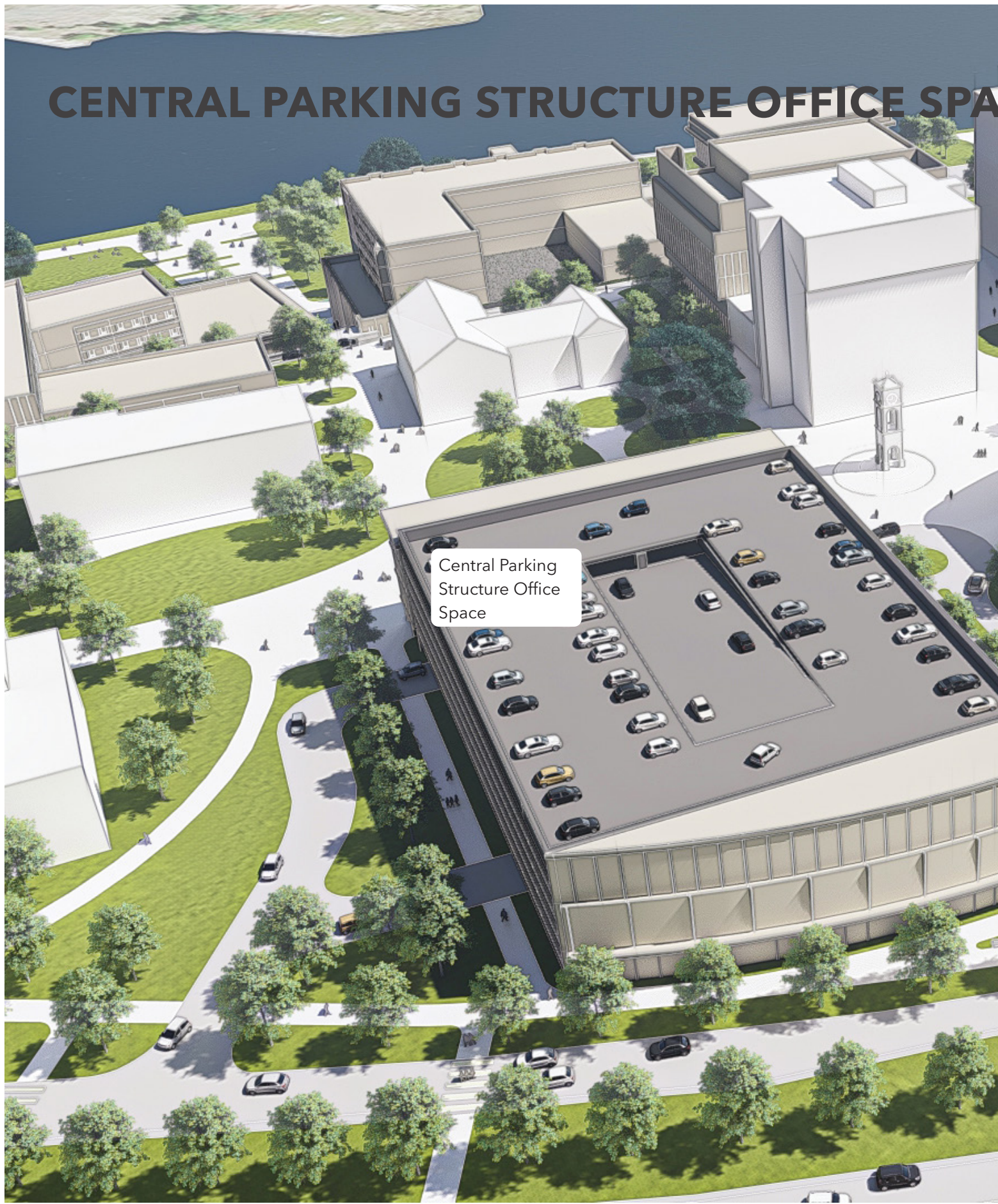


PRECEDENT: COLORADO SCHOOL OF MINES MCNEIL HALL



PHOTO: OZ ARCHITECTS

CENTRAL PARKING STRUCTURE OFFICE SPA





CE

Portage Lake

Memorial Union
Building Addition

MacInnes Dr

Townsend Dr

SUPPORT INITIATIVES

The transformation of the Michigan Tech waterfront requires that the University's support facilities move. To better support student and staff parents and enable the waterfront transformation, Michigan Tech intends to complete these support initiatives:

- Little Huskies Child Development Center Expansion
- Shipping, Receiving, Storage, and Facilities Complex
- Central Heating Plant

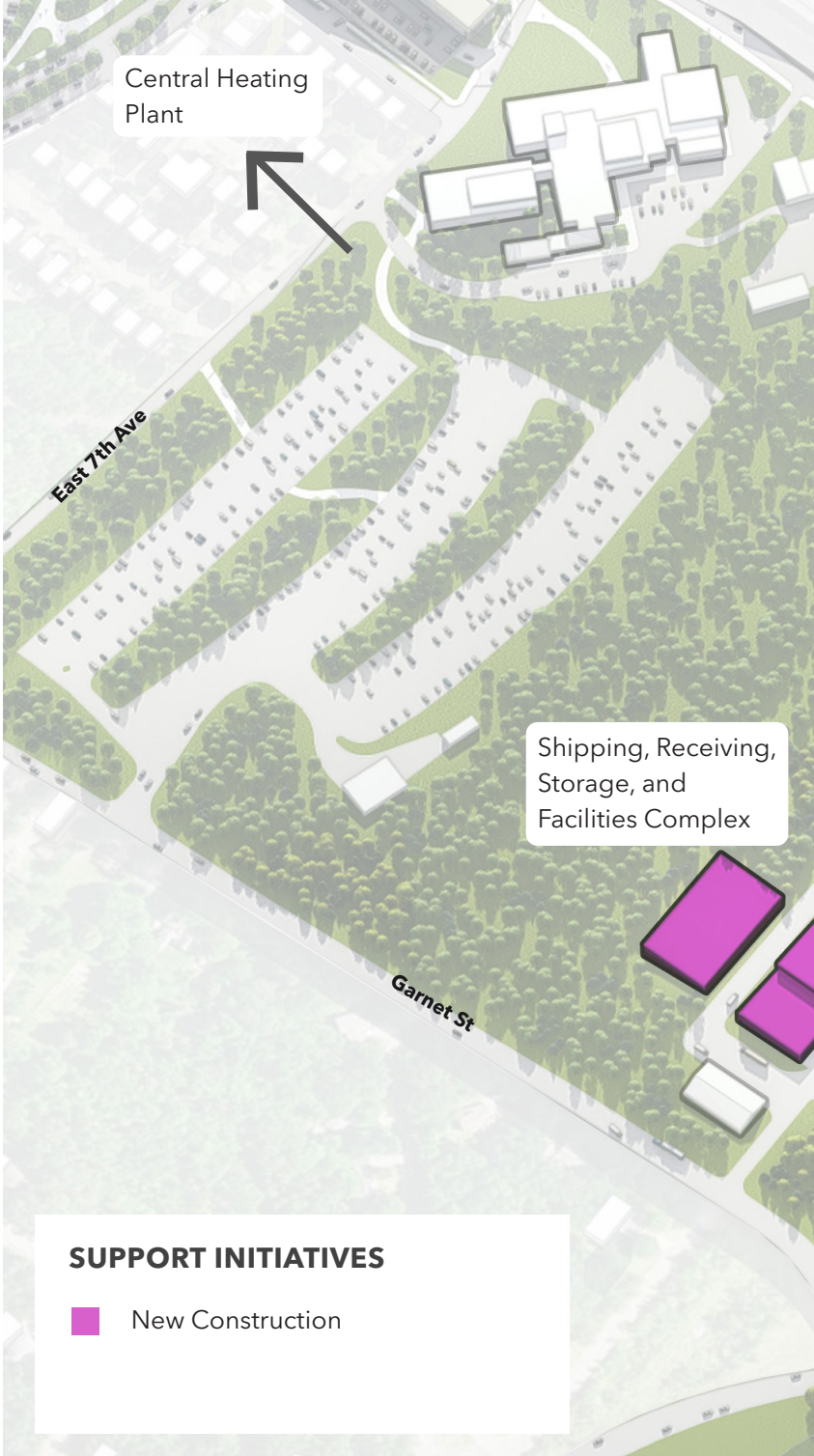
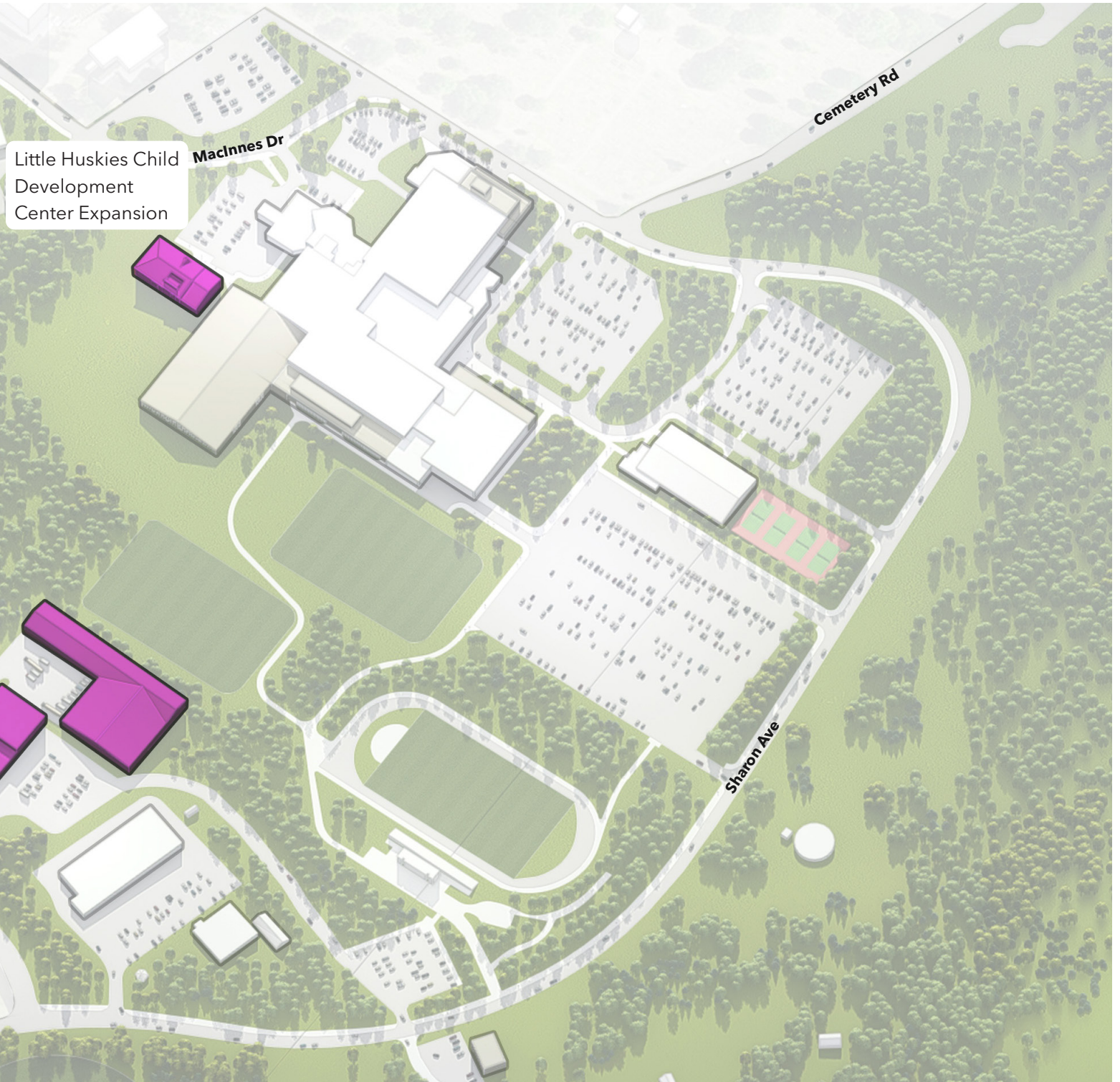


FIGURE 39: SUPPORT INITIATIVES



Little Huskies Child
Development
Center Expansion

MacInnes Dr

Cemetery Rd

Sharon Ave

LITTLE HUSKIES CHILD DEVELOPMENT CENTER EXPANSION

Little Huskies Child Development Center is very popular on campus with students, faculty, and staff. There are multiyear wait lists for new children to be admitted and a corresponding shortage of available child care in the community. The size of the current building restricts the growth of the program. The upper campus location is good—it provides easily vehicular drop-off and the children use the adjacent Student Development Center gymnasium and other facilities. The University should expand the building, possibly doubling its size to over 9,000 GSF.

SHIPPING, RECEIVING, STORAGE, AND FACILITIES COMPLEX

The existing Shipping and Receiving and Facilities Office buildings are in poor condition. Additionally, the buildings and the associated motor pool and outdoor equipment are on the waterfront. A higher and better use of the waterfront is for open access for the campus and community.

The University should relocate the Shipping and Receiving and Facilities offices from the waterfront to Garnet Street adjacent to an existing Facilities Building. To meet physical plant facility size guidelines and benchmarking, the relocated Shipping and Receiving and Facilities Office space should be expanded to approximately 50,000 GSF.

In addition to the multiple physical plant buildings, the motor pool and other outdoor equipment storage should be relocated to the Garnet Street site.

CENTRAL HEATING PLANT

The Central Heating Plant provides high-pressure steam to most campus buildings. This in turn provides thermal heating of building air, radiant heat along windows and stairwells, domestic water heating for bathrooms and maintenance, and a variety of other uses in laboratory buildings. It is the heart of the campus-wide heat system. Originally built in 1951, the boiler ages are 1950, 1957, 1964, and 1970, and will need to be replaced. The fuel is natural gas with fuel oil backup.

The campus master plan recommends that instead of replacing the aging boilers, the University should transition to a more sustainable method of heating and cooling the campus buildings. The University should commission studies to determine how best to distribute heating and cooling, and eventually decommission the Central Heating Plant. After demolition, the site should be redevelopment into a campus-wide waterfront amenity.

OPEN SPACE INITIATIVES

Through a series of projects, the campus master plan seeks to improve the on-campus experience by connecting the campus to its unique lakefront, improving the connection between the campus core and upper campus and downtown Houghton. The result would be a more beautiful, more connected, and more sustainable campus.

- Transformed Waterfront
- Bluff Stairs and Elevator
- Bluff Trail
- West Campus Mall Extension
- Student Activity Lawn
- MacInnes Plaza

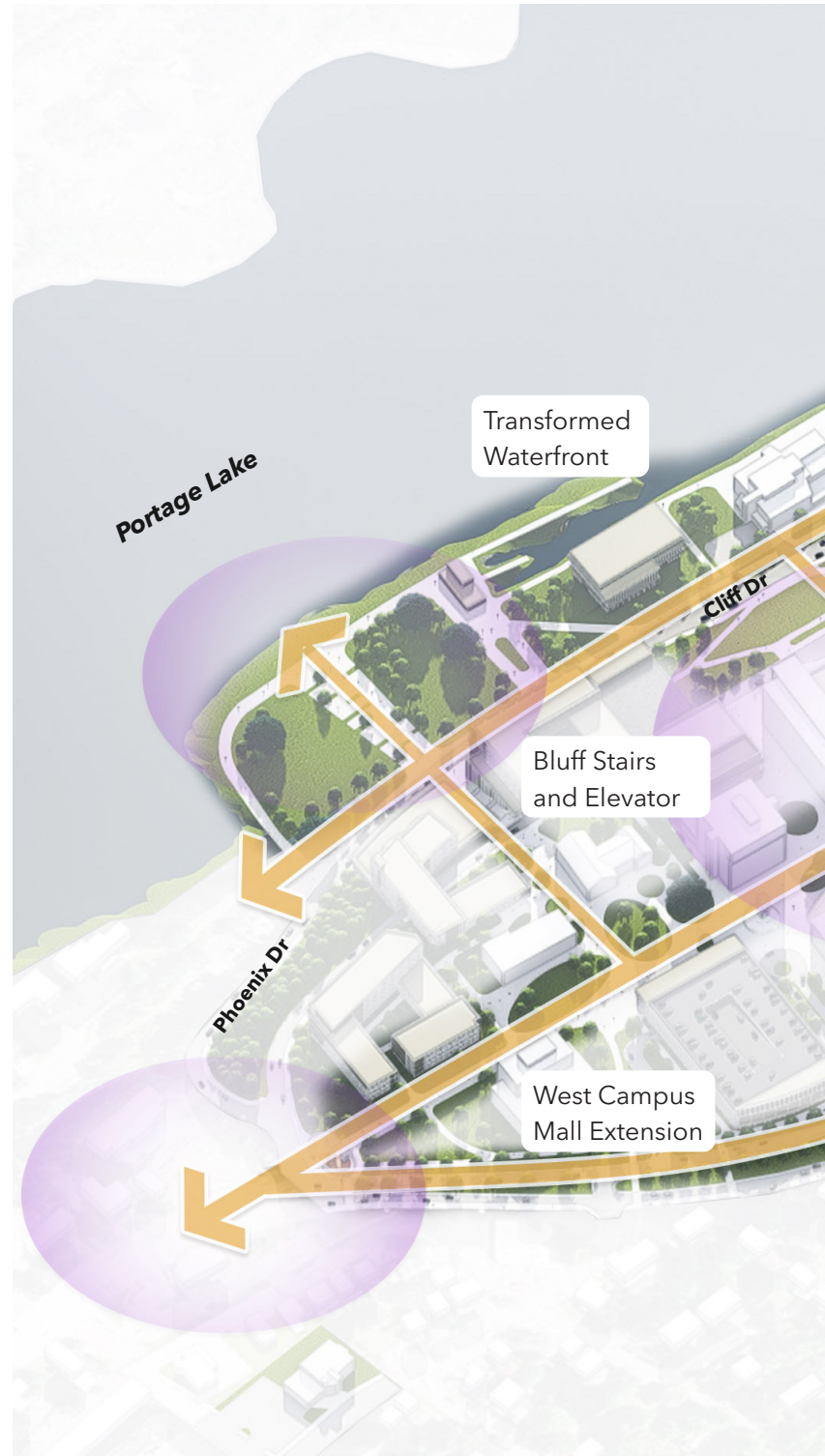


FIGURE 40: OPEN SPACE INITIATIVES



TRANSFORMED WATERFRONT

After Shipping and Receiving, Facilities Offices, and associated outdoor storage are relocated, the buildings should be demolished and the parking removed. After the Central Heating Plant is decommissioned, the building and its parking should be removed.

In their place, the University should construct a waterfront park that is an attraction for students, faculty, staff, and Houghton residents. Amenities could include lawns for passive recreation, small plazas for events, and walkways along the waterfront. The park should include a boat house that will house some of the operations and storage of the Outdoor Adventure Program. A small protected dock or launch area could be used by those on canoes, kayaks, and paddleboards to explore the Keweenaw Waterway. Winter activities would include fire pits, ice skating, and snow sculptures.

The City of Houghton's waterfront trail should purposely pass through the site, inviting the entire community into the open space.



PRECEDENT: UNIVERSITY OF WISCONSIN-EAU CLAIRE WATERFRONT

BLUFF STAIRS AND ELEVATOR

The Tech Bluff Housing, Dining, and Recreation project will include both outdoor and indoor connections between the waterfront and the campus core. An outdoor grand staircase through the multibuilding complex will connect Phoenix Drive to the area northwest of the ROTC Building. An indoor connection, available in all weather conditions, will be incorporated into the Bluff Parking Structure. An elevator will provide both access among the parking structure floors and from Phoenix Drive level to the campus core level. The elevator will accommodate cyclists who are connecting to the City of Houghton waterfront trail.

BLUFF TRAIL

A second outdoor connection from the campus core to Phoenix Drive will be constructed on the bluff face west of Dow Environmental Sciences and Engineering Building. The switchback trail should incorporate grades that are accessible for those in wheelchairs and cyclists. The trail could provide midbuilding access to the Dow Environmental Sciences and Engineering Building and the new parking structure, creating additional connections to Phoenix Drive.

TECH @ THE WATER



Bluff Trail

Lakefront
Research Building

Tech Bluff
Student Housing

Office and
Parking

Phoenix Dr

Boathouse

Portage Lake



Downtown
Connector
Student
Housing

Tech Bluff
Student Housing

Cliff Dr

Grand Stairs

Dining

Recreation

WEST CAMPUS MALL EXTENSION

The University has made good progress in creating a comfortable and welcoming campus core open space, including landscaping, the William J. Bernard Jr. Family Clock Tower, and Husky Plaza with the Husky statue and more than 1,000 personalized, engraved stones. The University will continue to implement the full Alumni Way vision with the West Campus Mall Extension. The extension should include landscaping, paths, and places to gather and rest. The mall should terminate at Townsend Drive with a gateway plaza that creates a prominent connection between the campus core and downtown Houghton.



WEST CAMPUS MALL EXTENSION GATEWAY

STUDENT ACTIVITY LAWN

Most Houghton residents and visitors experience Michigan Tech from their vehicles while driving past on US Highway 41. They see narrow sidewalks, drive aisles, and surface parking. The construction of the Central Parking Structure will relocate surface parking south of the Memorial Union Building, Van Pelt and Opie Library, Rekhi Hall, and Fisher Hall into the structure. When the parking structure is constructed, the vehicular drop-off loop will be relocated to the west side of the Memorial Union Building.

As a result, the University will have the opportunity to reimagine its Townsend Drive frontage. The surface lots should be replaced by open space. Paths should provide convenient access from the MacInnes/Townsend crossing to the Memorial Union Building, Van Pelt and Opie Library, Rekhi Hall, and the campus core. Lawns should provide opportunities for Memorial Union Building and library programming to spill outside. Limited vehicle parking for visitors and accessible spaces should be convenient to the Memorial Union Building and the library.

MACINNES PLAZA

A significant number of pedestrians flow between the campus core across US Highway 41 at MacInnes and up to the Student Development Center. They must navigate a significant change in grade on the block. The Link student housing project should include a plaza on the east side of the new building that welcomes pedestrians after they cross US Highway 41. The plaza design should include terraces to accommodate the grade change, seating areas that could support the ground floor retail, and landscaping.

WEST CAMPUS MALL EXTENSION



Tech Bluff
Student Hou

Tech Bluff
Student Housing

Academic
Office Building

Downtown
Connector
Student Housing

Administration
Building

Gateway



ing

ROTC
Building

Central Parking
Structure and Office

Townsend Dr

WEST GATEWAY



Portage Lake

Tech Bluff
Student Housing

Downtown
Connected
Student

Cliff Dr

Phoenix Dr



own
ctor
t Housing

Central Parking
Structure and Office

Administration
Building

Alumni Way

Townsend Dr

Gateway

PARKING AND CIRCULATION

PARKING REMOVAL

The campus master plan seeks to accommodate further enrollment and research growth through greater density in the campus core. There are few unused sites in the core; thus most new buildings will be constructed on existing surface parking lots.

Near Term Priorities

- Center for Convergence and Innovation - Lot 14 (Faculty/Staff, 65 spaces) and Visitor 2 (Visitor, 19 spaces)
- East End Student Housing - Lot 9 (Commuter Student, 261 spaces, replaced on site); Lot 10W (Commuter Student, 25 spaces removed to allow for new entry landscaping)

Research Initiatives

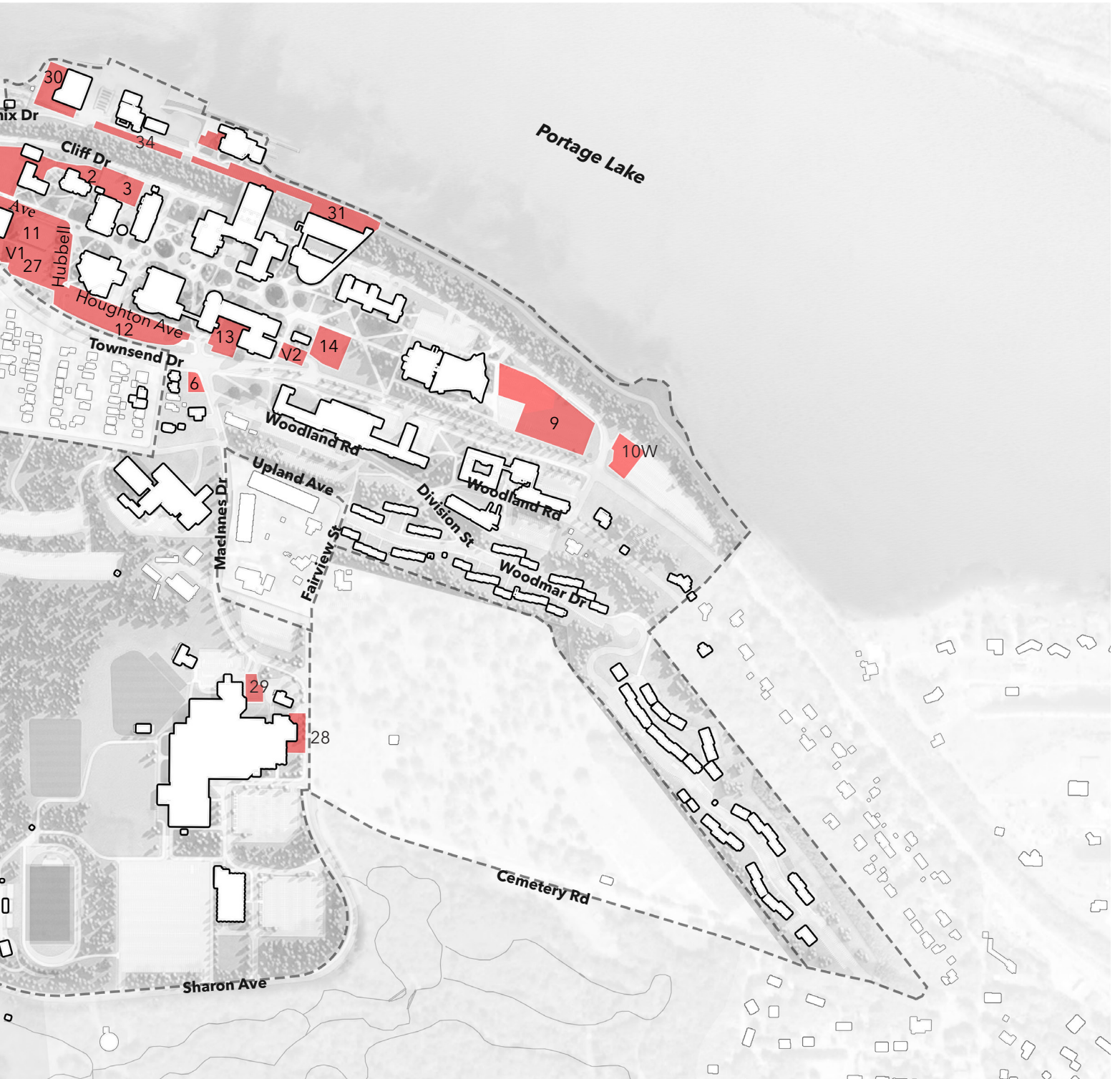
- Business and Industry Research Addition - Lot 3 (Faculty/Staff, 72 spaces)

Student Life Initiatives

- Memorial Union Building Expansion - Lot 12 (Faculty/Staff, 109 spaces), Houghton Avenue (Visitor, 68 spaces), and Circle/Alcove (Visitor, 7 spaces),
- Downtown Connector Student Housing - Lot 1 (Faculty/Staff, 158 spaces), College Avenue (Visitor, 42 spaces, on-street parking)
- Link Housing and Retail Mixed Use Development - Lot 6 (Faculty/Staff, 10 spaces)
- Tech Bluff Housing, Dining, and Recreation - Lot 2 (Faculty/Staff, 46 spaces)
- Student Development Center Additions - Lot 28 (Faculty/Staff, 12 spaces), Lot 29 (Commuter Student, 40 spaces)



FIGURE 41: PARKING REMOVAL



Office and Administrative Initiatives – office space and the associated vehicle parking that are currently off-campus but are recommended to relocate to campus.

- Michigan Tech Lakeshore Center Repurpose (Faculty/Staff, 104 spaces)
- Harold Meese Center Repurpose – Lot 33 (Faculty/Staff, 35 spaces)

Open Space Initiatives

- Transformed Waterfront – Lot 30 (Faculty/Staff, 94 spaces), Lot 31 (Faculty/Staff, 147 spaces), Lot 31A (Faculty/Staff, 21 spaces), Lot 34 (Graduate Student, 50 spaces)
- Student Activity Lawn – Lot 13 (Faculty/Staff, 42 spaces)

Parking

- Central Parking Structure – Lot 11 (Reserved, 62 spaces); Lot 27 (Visitor, 85 spaces); Visitor 1 (Visitor, 12 spaces), Hubbell St (Visitor, 33 spaces, on-street)

PARKING ADDITIONS

The campus master plan recommends the construction of three on-campus parking structures, two new surface parking lots, and one partnership parking structure. In addition, the campus master plan assumes higher utilization of existing parking spaces due to improved circulation.

EAST END PARKING STRUCTURE

When the University constructs the East End Student Housing project, it should incorporate into its base a two-level parking structure with approximately 390 parking spaces. The structure will replace the 261 commuter student spaces in Lot 9 and provide additional spaces for the residents of the residence hall above. A portion of the parking structure, as well as Lots 5 and 8, will meet the event parking needs of the Rozsa Center for the Performing Arts.

CENTRAL PARKING STRUCTURE

The University should construct a Central Parking Structure located between the Memorial Union Building and the Administration Building on Lots 11, 27, V1, and Hubbell Street on-street parking. The capacity of the structure should minimally replace the surface parking that will be removed for early phase projects (approximately 550 spaces, to accommodate the removal of Lots 14, Visitor 2, 9, 10W (25 spaces), 11, 27, Hubbell Street, and Visitor 1). Ideally, the structure will be sized larger to enable the removal of surface parking lots in later phases (approximately 670 spaces). A 670-space structure on the site would require five stories.

Vehicular access to the parking structure from US Highway 41 should occur between the parking structure and the Administration Building to prioritize the pedestrian movement through the Student Activity Lawn.



FIGURE 42: PARKING ADDITION



FIGURE 43: PARKING ADDITIONS AND REMOVALS

| Lot # | Type | Location | Total Spaces | Parking Type | Spaces Added | Spaces Removed | Purpose |
|-----------------|------|----------------------------|--------------|--------------|--------------|----------------|--|
| Parking Removed | | | | | | | |
| 14 | FS | E of Hamar House | 65 | Surface | | (65) | Center for Convergence and Innovation |
| Visitor 2 | V | Hamar | 19 | Surface | | (19) | Center for Convergence and Innovation |
| 9 | SC | E of Rozsa | 261 | Surface | | (261) | East End Student Housing (replaced) |
| 10W | SC | US Highway 41/ Cliff | 125 | Surface | | (25) | East End Student Housing—new entry landscaping |
| 3 | FS | R.L. Smith Building (MEEM) | 72 | Surface | | (72) | Business and Industry Research Addition |
| 12 | FS | S of MUB, Library | 109 | Surface | | (109) | Memorial Union Building Expansion |
| Houghton Ave | PAY | Houghton Ave | 68 | Surface | | (68) | Memorial Union Building Expansion |
| Circle/ Alcove | V | MUB/Library | 7 | Surface | | (7) | Memorial Union Building Expansion |
| 1 | FS | N of Admin | 158 | Surface | | (158) | Downtown Connector Student Housing |
| College Ave | PAY | College Ave | 42 | Street | | (42) | Downtown Connector Student Housing |
| 6 | FS | US Highway 41/ MacInnes | 10 | Surface | | (10) | Link Housing and Retail Mixed Use Development |
| 2 | FS | N of Academic Office | 46 | Surface | | (46) | Tech Bluff Housing, Dining, and Recreation |
| 28 | FS | Hockey Educ. Center. | 12 | Surface | | (12) | Student Development Center Additions |
| 29 | SC | Portage Lake Vault | 40 | Surface | | (40) | Student Development Center Additions |
| | FS | Lakeshore Center | 104 | Surface | | (104) | Michigan Tech Lakeshore Center Repurpose |
| 33 | FS | Meese | 35 | Surface | | (35) | Harold Meese Center Repurpose |

| Lot # | Type | Location | Total Spaces | Parking Type | Spaces Added | Spaces Removed | Purpose |
|------------------------------|-------|---------------------|--------------|--------------|--------------|----------------|--|
| 30 | FS | North of Facilities | 94 | Surface | | (94) | Transformed Waterfront, move 50 motor pool space to Garnett Street |
| 31 | FS | N of M&M, Dow | 147 | Street | | (147) | Transformed Waterfront |
| 31A | FS | GLRC | 21 | Street | | (21) | Transformed Waterfront |
| 34 | GS | Phoenix Dr | 50 | Street | | (50) | Transformed Waterfront |
| 13 | FS | Fisher | 42 | Surface | | (42) | Student Activity Lawn |
| 11 | PR | E of Admin | 62 | Surface | | (62) | Central Parking Structure |
| 27 | PAY | Pay Lot | 85 | Surface | | (85) | Central Parking Structure |
| Visitor 1 | V | Admin | 12 | Surface | | (12) | Central Parking Structure |
| Hubbell St | PAY | Hubbell St | 33 | Surface | | (33) | Central Parking Structure |
| Total Parking Removed | | | | | | (1,619) | 31% of all existing spaces |
| Parking Added | | | | | | | |
| Central Structure | | On Lot 11/27 | | Structure | 665 | | Central Parking Structure |
| East Structure | | On Lot 9 | | Structure | 388 | | East End Student Housing |
| Bluff Structure | | North of ROTC | | Structure | 473 | | Bluff Structure |
| MUB Surface | | Adj to MUB | | Surface | 50 | | MUB Surface |
| Lot 21 Expansion | | Lot 21 | | Surface | 361 | | Upper Campus Surface |
| Total Parking Added | | | | | 1,936 spaces | | |
| Parking Fully Utilized | | | | | | | |
| 21 | SR | SW of Forestry | 538 | Surface | 404 | | |
| 23 | SR | E of Gates | 258 | Surface | 194 | | |
| 24 | GEN'L | W of Gates | 707 | Surface | 530 | | |
| Total Parking Fully Utilized | | | | | 1,127 spaces | | |

The Central Parking Structure will be a very large building that is prominent from both US Highway 41 and the campus mall. Office uses should be incorporated into all levels on both the north (campus mall) and south (US Highway 41) sides.

BLUFF PARKING STRUCTURE

The Tech Bluff Housing, Dining, and Recreation project includes a parking structure built into the bluff. The campus master plan assumes a parking capacity of approximately 475 spaces, constructed in a four-story structure. Vehicle access should be provided both at the Phoenix Drive and Cliff Drive levels. The parking structure will be the base for a student residence hall, and an office liner will face the waterfront. The parking structure should include a high-capacity elevator to provide pedestrian and bicycle access between Phoenix Drive and the campus core.

MEMORIAL UNION BUILDING SURFACE LOT

When the University expands the Memorial Union Building on the US Highway 41 side, it will remove Lot 12 and the Houghton visitor lot. These spaces will have already been replaced by the Central Parking Structure. To accommodate the parking needs of visitors to the Memorial Union Building and Rekhi Hall and provide accessible parking in the campus core, the University will construct a surface parking lot with approximately 50 spaces.

LOT 21 EXPANSION

The campus master plan recommends that surface vehicle parking shift from the campus core where the pedestrian experience is prioritized to the campus edges. The University should expand Lot 21 with up to 360 new parking spaces. The new surface

parking lot should be between existing Lot 21 and 7th Avenue. In the future when these vehicular parking spaces are not required, the disturbed land can be the location where 7th Avenue redevelopment can occur.

THE LINK PARKING STRUCTURE

The campus master plan recommends that The Link student housing and retail development include a parking structure to serve the residents and retail customers. The parking may be developed in partnership with the University, so some of the parking may be available to University users. The campus master plan assumes that these parking spaces are fully private, and thus not included in the parking model.

FULLY UTILIZED EXISTING PARKING

Lots 21, 23, and 24 are remote parking lots on upper campus designated for use by residential students (Lots 21 and 23) and general permit holders (Lot 24). The University does not have a recently completed parking utilization study, but anecdotal evidence indicates that these parking lots are lightly used, perhaps only achieving 25 percent occupancy during the institution-wide peak parking demand (typically late morning midweek). It is estimated that over 1,000 spaces are unoccupied during peak parking demand.

The parking model assumes that these remote lots will be more fully utilized during peak demand times. Greater utilization of these remote lots during the institution-wide peak parking demand will occur through improved campus shuttle service and in the near future when autonomous vehicles park themselves in remote lots.

Outside of the institution-wide peak parking demand periods, Lots 21, 23, and 24 will continue to meet the parking needs of events at the Student Development Center, Sherman Field, and other nearby facilities.

PARKING BALANCE

The campus master plan recommends the removal of approximately 1,619 surface and on-street spaces. The plan recommends the construction of 1,936 spaces in parking structures and new surface lots, an addition of approximately 320 spaces (If the greater utilization of the existing 1,127 spaces in Lots 21, 23, and 24 is considered, the effective expansion of capacity is approximately 1,450 vehicle spaces).

The parking model assumes that use of vehicles will not dramatically shift, due to Houghton's remote location and lack of high-quality transit. The total peak-hour campus user parking demand is expected to increase from approximately 5,550 drivers to 7,225 drivers. The current ratio of 2.1 campus users per space is modeled to change to 3.5 campus users per space. This ratio change recognizes the greater utilization of existing spaces to accommodate a larger campus population.

PARKING DEMAND REDUCTION

While the parking demand model conservatively assumes that the use of vehicles will not significantly change, the University should continue to support programs that reduce the need for personal vehicles.

Transportation demand management programs seek to provide alternatives to driving to campus. If successful, faculty and staff may choose to commute via a different mode and students may choose to leave their car at home. Through a robust transportation demand management program, the University can provide information, incentives, resources, and support to faculty, staff, and students to choose transportation options like public transit, carpooling, vanpooling, ridesharing, walking, and cycling.

The University should monitor commuting and vehicle ownership patterns to determine if the user/vehicle ratio changes as shared and autonomous vehicles become more widespread.

Shifting the travel preferences of faculty, staff, and students is a challenge and often requires regional partnerships. Faculty and staff must feel that the ride from their homes throughout the region to campus is more convenient and less expensive than driving alone. Students must feel comfortable that they will be able to efficiently access off-campus shopping, entertainment, and jobs. The University should collaborate with the Cities of Houghton and Hancock to promote more robust transit, ridesharing, walking, and cycling.

TRANSIT

Greater utilization of existing remote lots and a reduction of the need for parking requires more effective campus shuttles. The MTU shuttle and City of Houghton transit service should reconsider their transit routes and patterns. The existing long one-way loops are inefficient, resulting in long wait periods between buses, thus discouraging transit use. The University and the city should consider out-and-back routes that focus on the particular needs of Michigan Tech students. The three routes should converge at the Central Parking Structure, which will incorporate a bus transfer station into its design. Three potential routes could be:

1. Daniell Heights - A route that delivers Daniell Heights residents from their homes to the Central Parking Structure.
2. SDC and Remote Parking - A route that shuttles commuter students from the remote parking lots to the Central Parking Structure, and shuttles residential and commuter students between the Student Development Center and the Central Parking Structure.
3. Downtown/Shopping - A route that shuttles residential students from the Central Parking Structure to downtown Houghton. During weekends or evenings, select shuttles could continue west to access the west-side shopping destinations.

The day and time demand differ for each of these student populations, and the shuttle schedule should reflect the demand, so that premium transit service can be provided at peak demand periods.

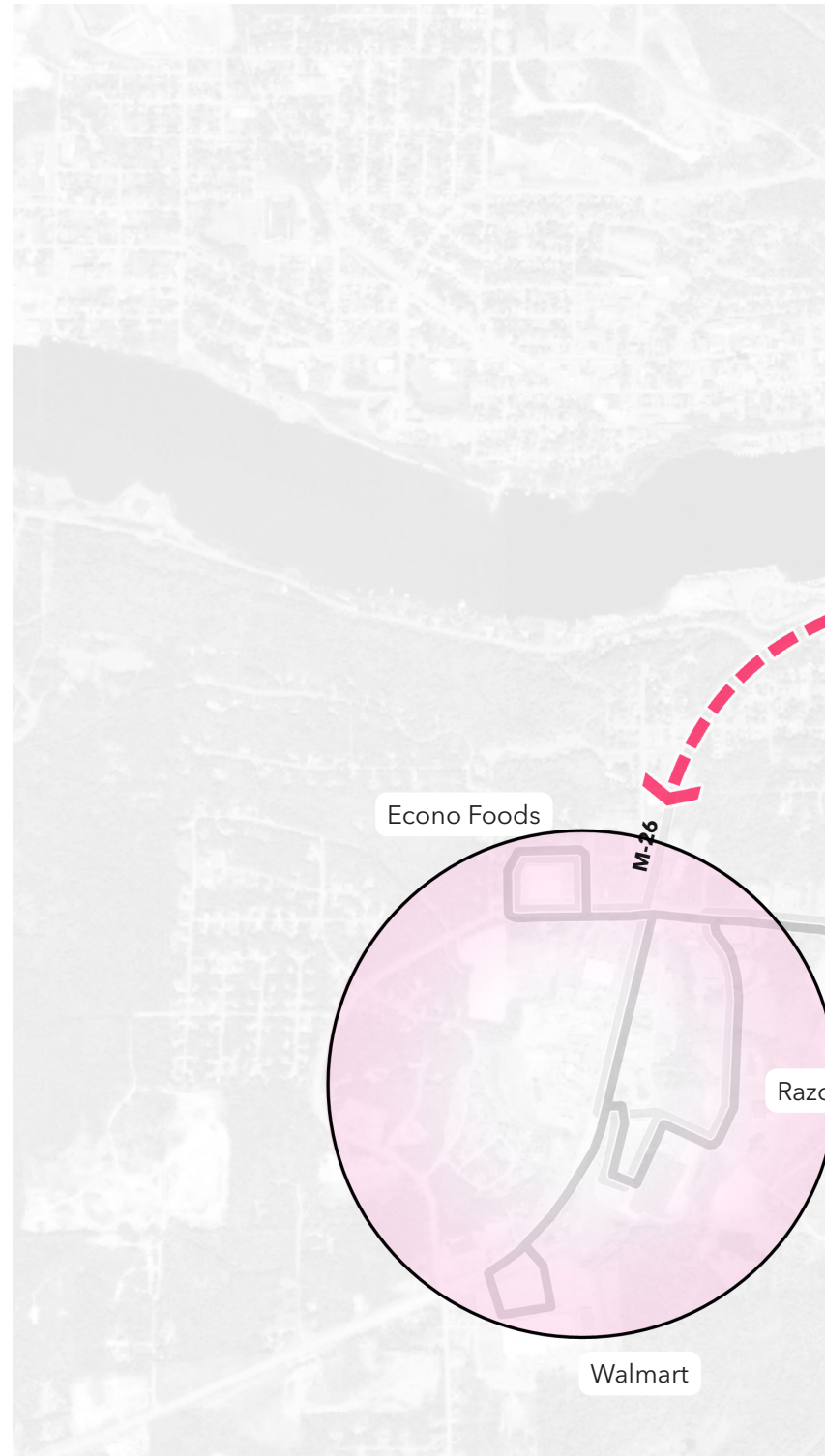
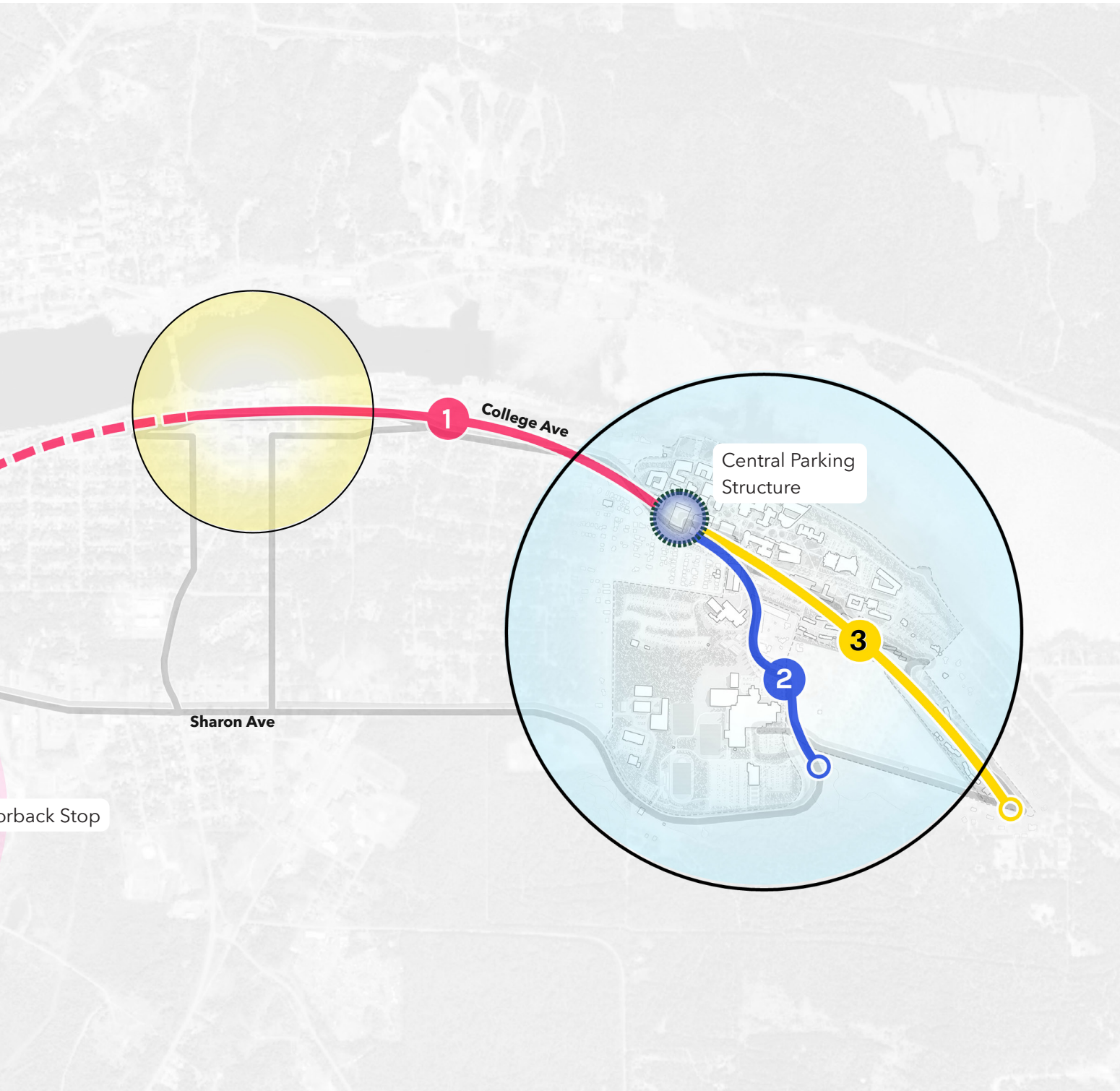


FIGURE 44: PROPOSED SHUTTLE ROUTING



PEDESTRIAN AND BICYCLE

The campus master plan expands the pedestrian character of the academic and research campus core in all directions.

- West - with the removal of College Drive and interior surface parking lots and the extension of the campus mall and the Alumni Way
- North - through stairs, elevators, and switchback trail connections between the campus core and the waterfront
- East - with additional sidewalks around the Walker Arts and Humanities Center and the Rozsa Center for the Performing Arts to connect East End Student Housing to the campus core
- South - through the Student Activity Lawn, The Link, and MacInnes Plaza projects, the pedestrian focus is extended to 7th Avenue



FIGURE 45: PEDESTRIAN AND BICYCLE CIRCULATION



SUSTAINABILITY AND RESILIENCE FRAMEWORK

As our society, environmental conditions, and campus change simultaneously, the University has a unique opportunity. An opportunity to rise to the challenge, not only in how we renovate our facilities and grounds, but also how we prepare our students to lead, and support our researchers to generate knowledge that benefits the world.

Since the outset, a Guiding Principle of the campus master plan has been to create a sustainable Michigan Tech. The University is currently developing a comprehensive Sustainability and Resilience Plan, but the following are broad guidelines of what will be considered for inclusion and future benchmarking in terms of facilities development and operations.

ENERGY AND CLIMATE

- Reduce our carbon footprint by
 - Focusing first on strategic energy efficiency improvements in existing campus buildings, and then
 - Following best-in-class design standards for new construction and major renovations
- Seek opportunities to develop distributed and renewable energy systems in conjunction with new buildings and major renovations
- Repurpose and reuse existing facilities to the extent possible before adding additional square footage

WASTE MANAGEMENT AND PROCUREMENT

- Investigate methods to divert, track, and report construction and demolition waste in all major campus construction and renovation projects
- Prioritize waste reduction efforts in highly visible places such as athletics and public events to demonstrate our commitment and raise awareness
- Identify, assess, and pursue key opportunities for institution-wide waste reduction



DEMONSTRATE RENEWABLE ENERGY COLLECTION (SOLAR PANEL IN L'ANSE, MICHIGAN)



THE SUSTAINABILITY DEMONSTRATION HOUSE IS A LIVING ON-CAMPUS EXAMPLE OF SUSTAINABILITY



PROMOTE NON-VEHICULAR CIRCULATION



SUSTAINABLE CAMPUS LANDSCAPING HAS MANY BENEFITS FOR HUMANS AND THE ENVIRONMENT



THOUSANDS OF ACRES OF MICHIGAN TECH FOREST LANDS PROVIDE UNIQUE OPPORTUNITIES FOR IMMERSIVE EDUCATION AND CARBON STORAGE



GROW PRODUCE ON-CAMPUS FOR USE IN DINING SERVICES



PHASING





PROJECT PRIORITIES

STRATEGIC PHASING

The long-term value of the campus master plan will be its power to establish capital priorities and optimize limited and valuable resources. Through the planning process, the planning team identified dozens of potential projects, including building renovation, new building construction, parking, and open spaces. The projects range in complexity from an expanded surface parking lot to a student life complex constructed on the bluff.

Michigan Tech leadership phased the potential projects to reflect the Tech Forward priorities and the University’s financial constraints. The planning team took every opportunity to leverage the investments of the University through partnerships with industry partners, student housing developers, and the City of Houghton. The reliance on student fees was minimized.

Student housing projects were phased to meet immediate needs for lower division students, while preparing for growing student enrollment in the longer term (see Figure 46).

The project phasing reflects reasonable project sequencing—which projects must precede or follow other projects. For example, sites must be made available before new construction can occur, programs must be moved before a repurposing or removal, and building projects must occur before related site and parking improvements.

Approximate phasing is indicated; however projects will move forward only after a demonstrated programmatic need is established and sufficient funding is available.

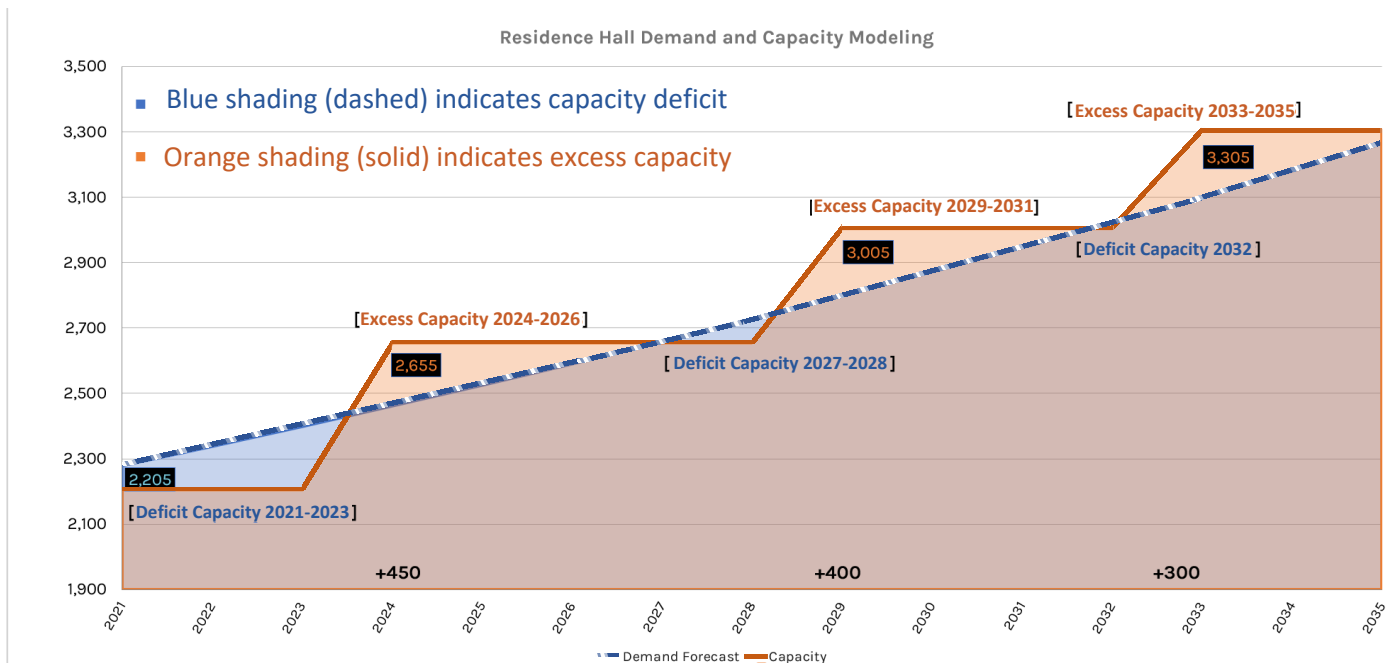


FIGURE 46: RESIDENCE HALL DEMAND AND CAPACITY MODELING

PROJECT PHASING

The phasing plan provides a framework for the implementation of the campus master plan recommendations. The phasing diagrams shown in this chapter depict four major phases to provide Michigan Tech with a road map to act on strategic priorities. The phasing plan maintains flexibility in implementation to take advantage of new opportunities, unexpected program growth, and funding availability.

The planning team worked with Michigan Tech leadership to ensure that the phasing order maximized the impact of the University's resources, reduced campus disruption, and minimized the need to move programs or user groups multiple times.

OPPORTUNITY PROJECTS

The Opportunity Projects are those that can happen at any time—they are not dependent on other enabling projects. They can happen simply when there is a demonstrated need and there are sufficient financial resources. These projects are focused on the upper campus area and at off-campus recreational facilities.

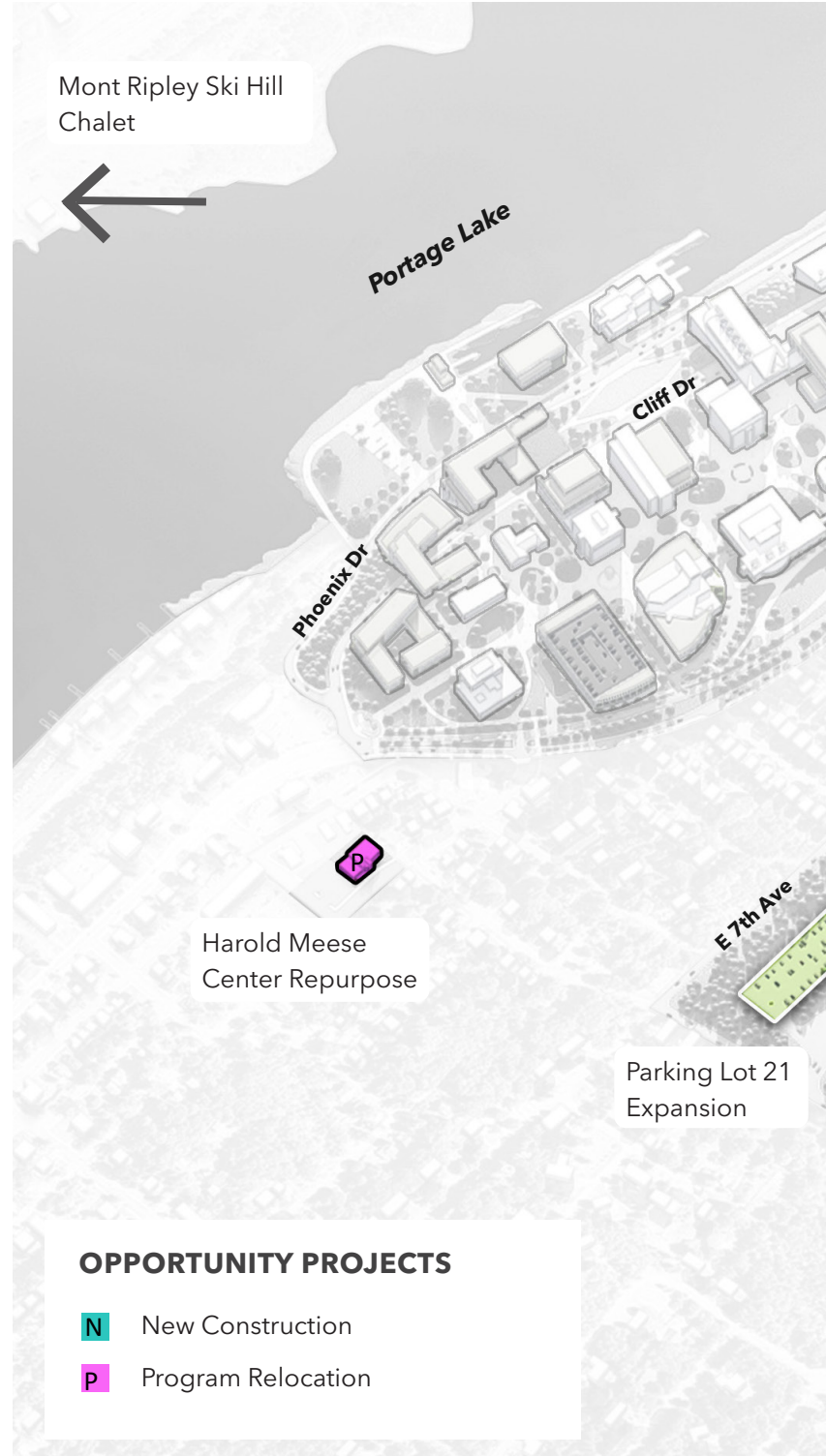
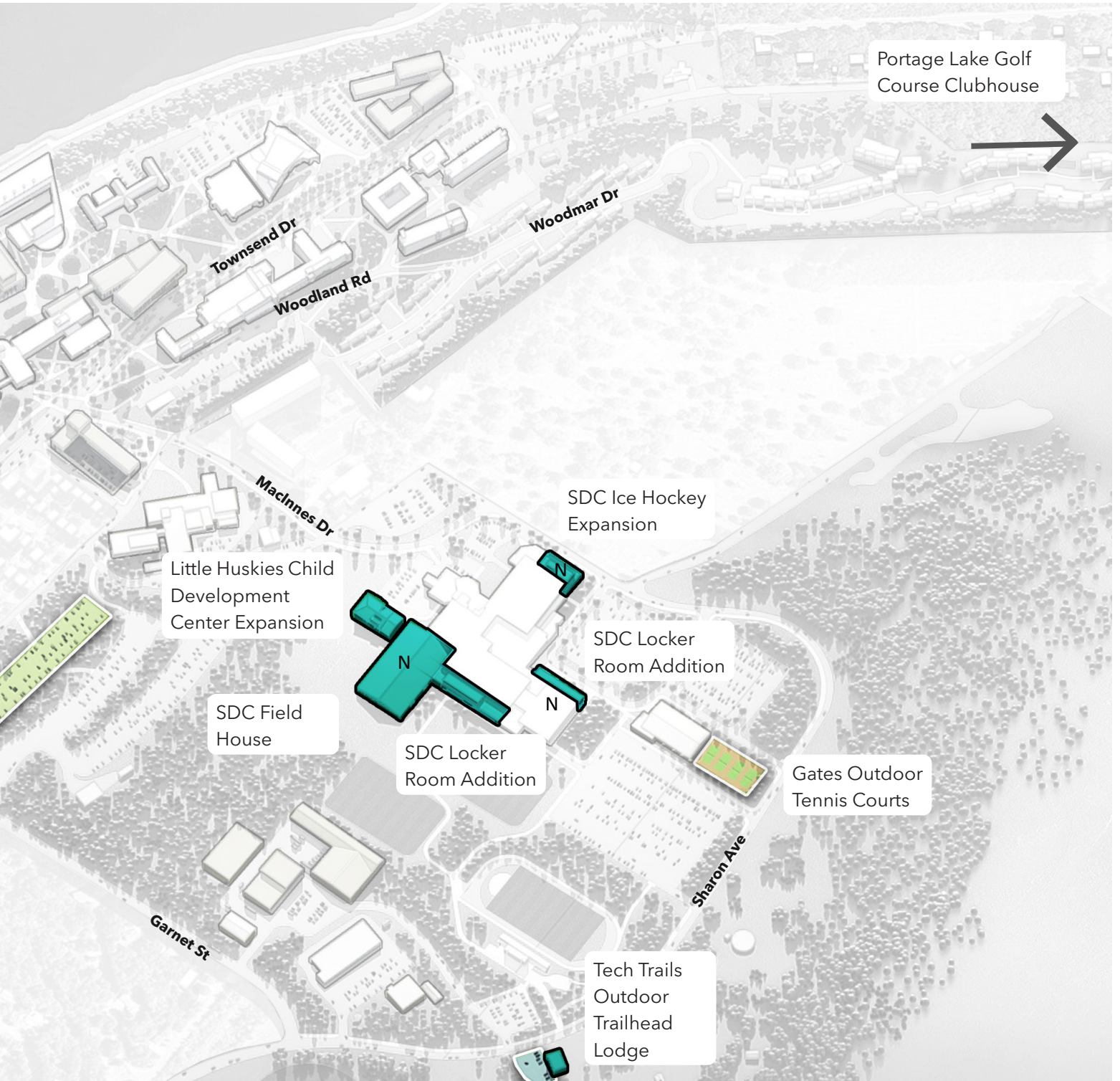


FIGURE 47: OPPORTUNITY PHASE PROJECTS



NEAR TERM PROJECTS

The Near Term Projects are the highest priority concerns to address immediate academic, research, and student life needs. Near Term Projects set the foundation for and enable projects that follow.

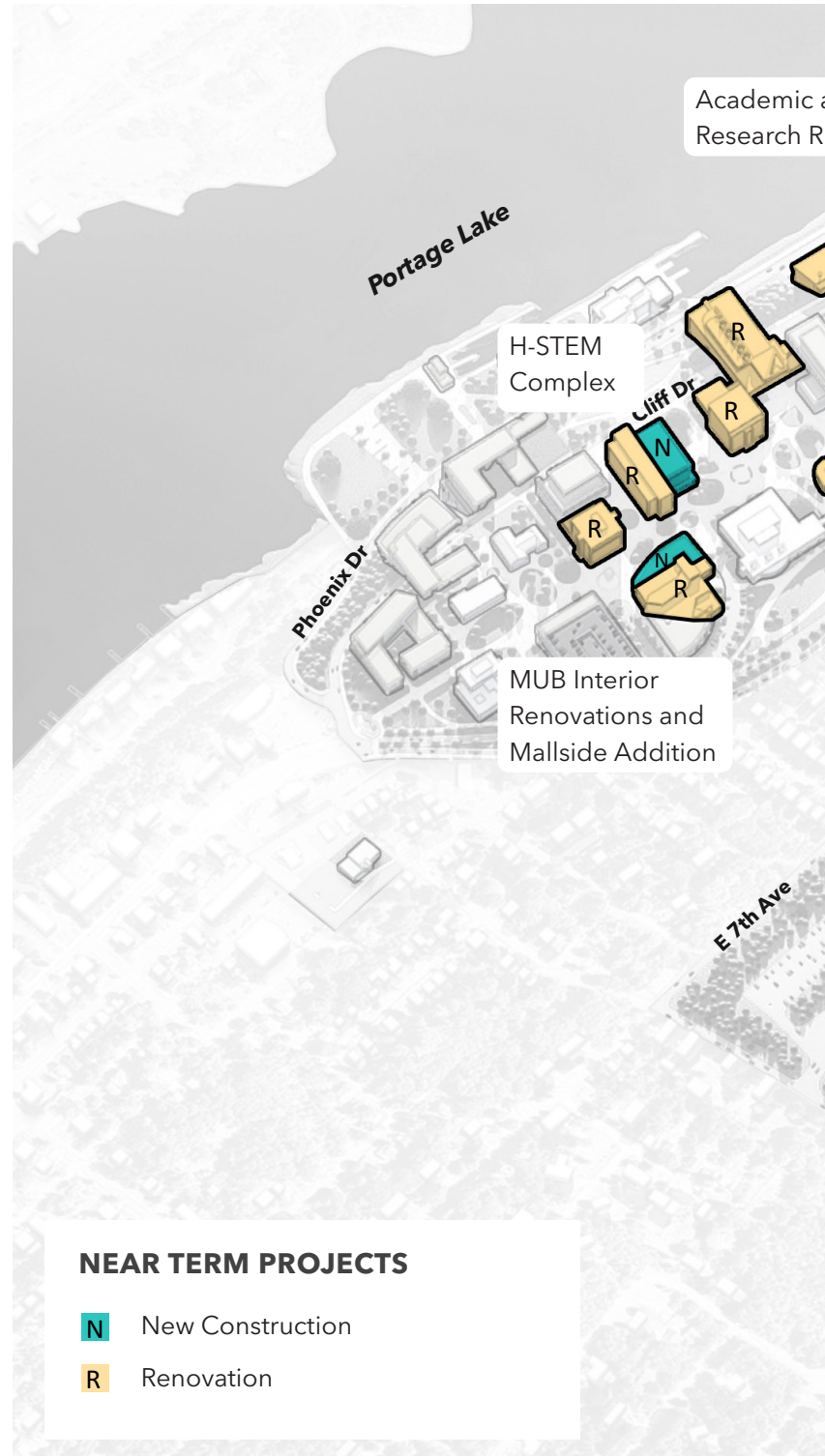
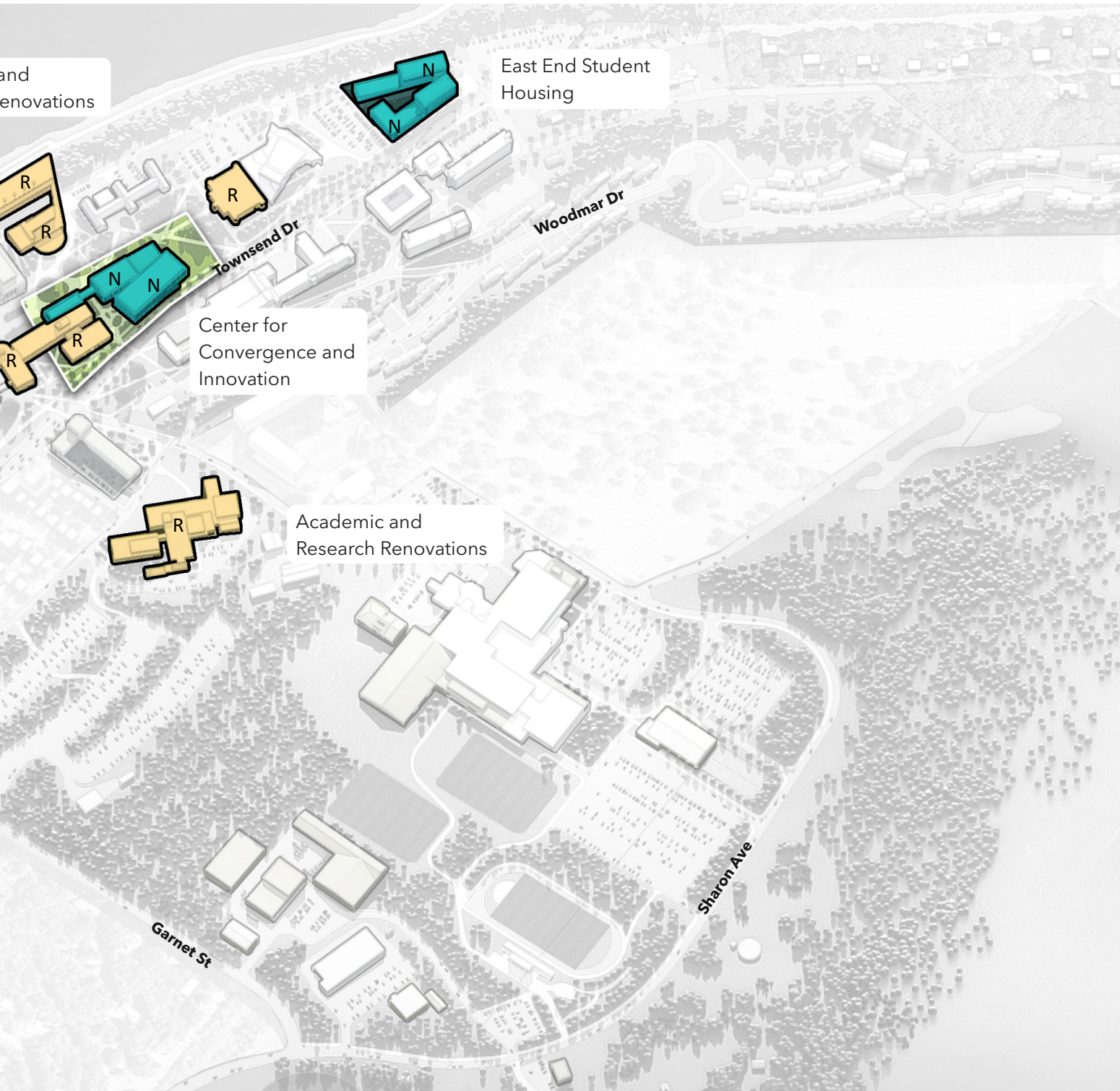


FIGURE 48: NEAR TERM PROJECTS



and
renovations

East End Student
Housing

Center for
Convergence and
Innovation

Academic and
Research Renovations

Garnet St

Sharon Ave

Townsend Dr

Woodmar Dr

MID TERM PROJECTS

Mid Term Projects can follow the Near Term Projects. They are opportunities created by Near Term Projects, such as the renovation of the Academic Office Building after the College of Business relocates to the Center for Convergence and Innovation. They are also projects that prepare the University for enrollment growth, such as the Downtown Connector Student Housing and the Central Parking Structure.

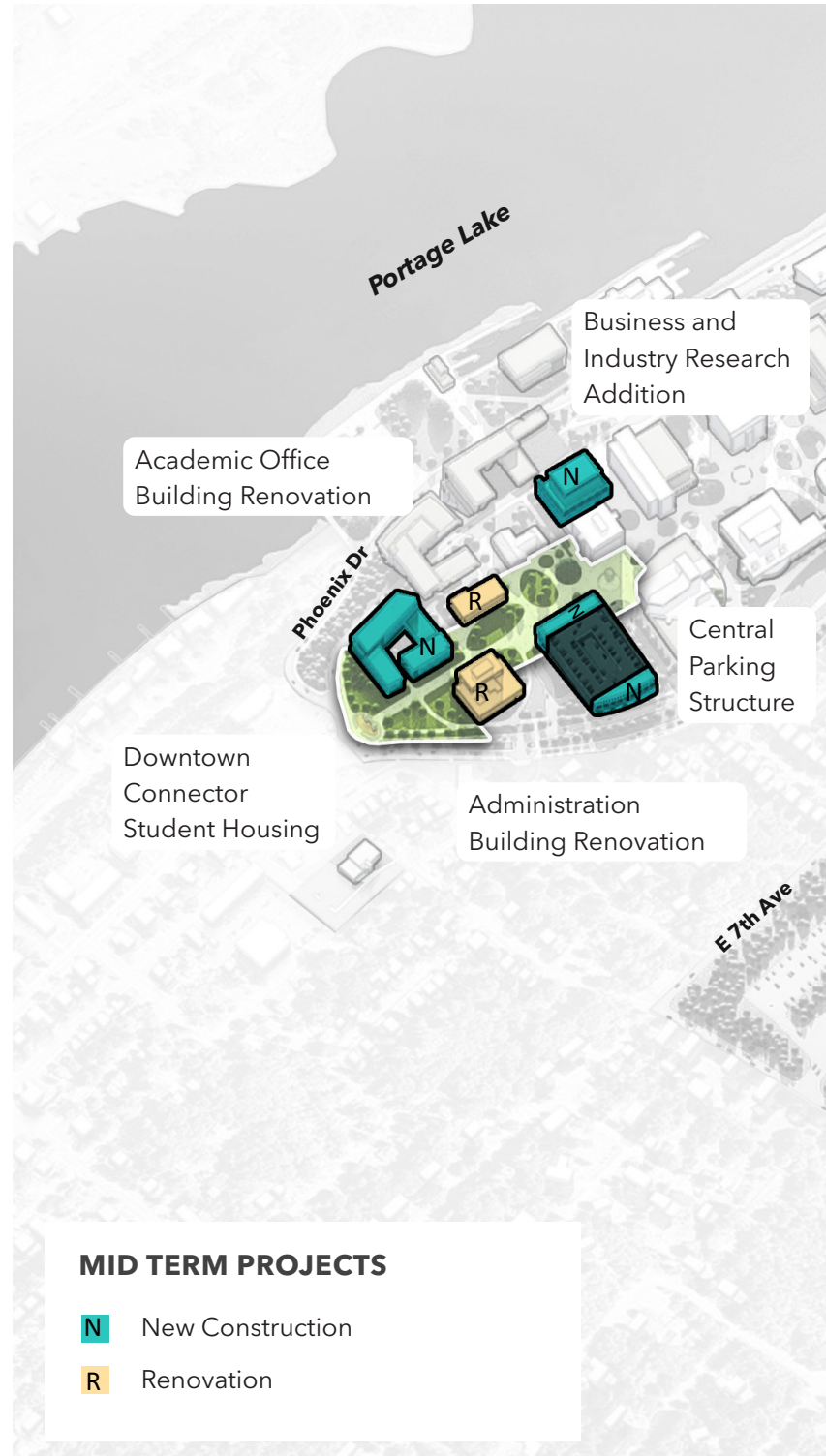
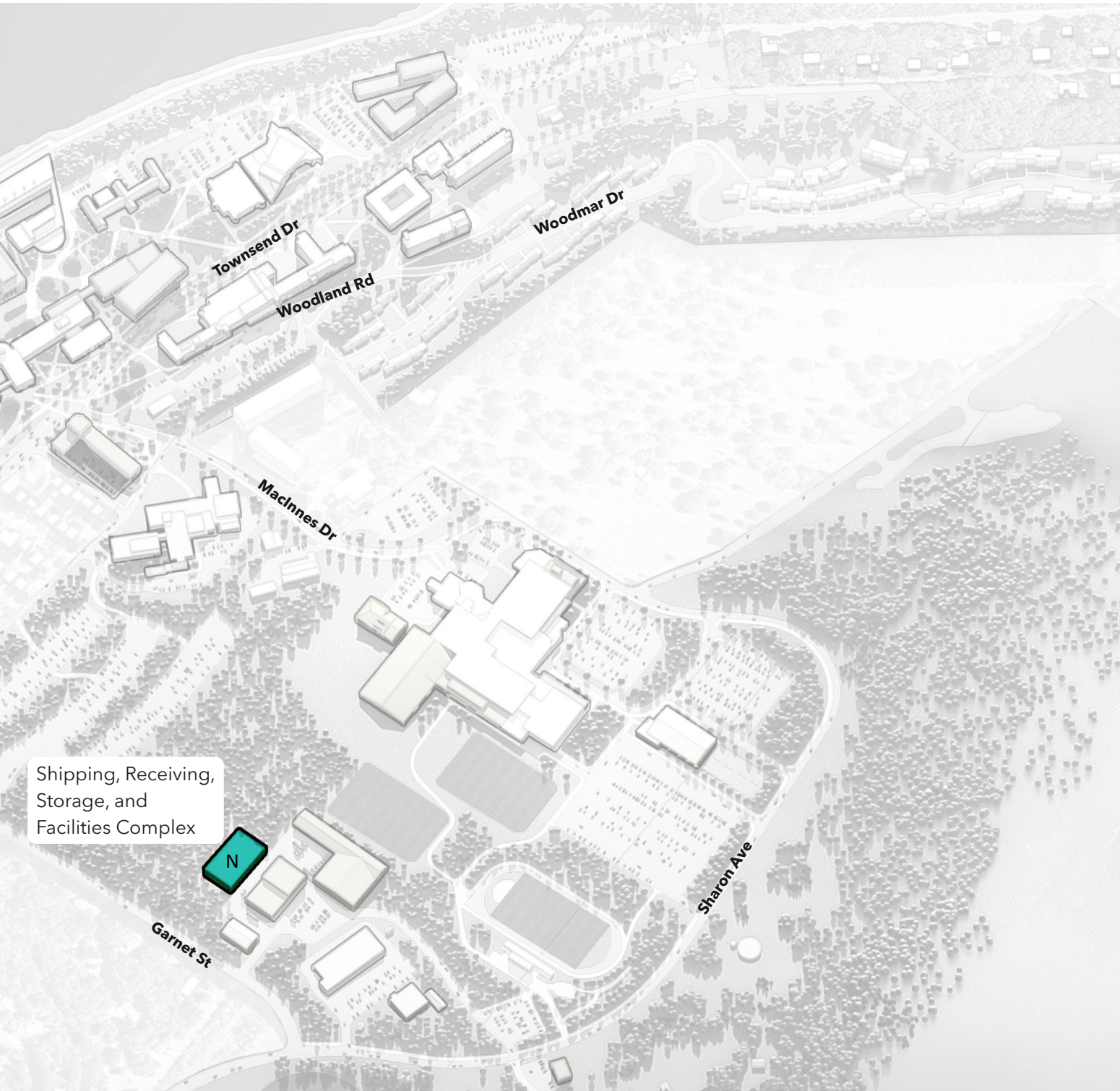


FIGURE 49: MID TERM PROJECTS



Shipping, Receiving,
Storage, and
Facilities Complex

N

LONG TERM PROJECTS

Long Term Projects require the greatest lead time for technical, financial, or partnership reasons. They are intended to support the University at a future state, when it has a larger student enrollment, larger annual research expenditures, and more students living on campus.

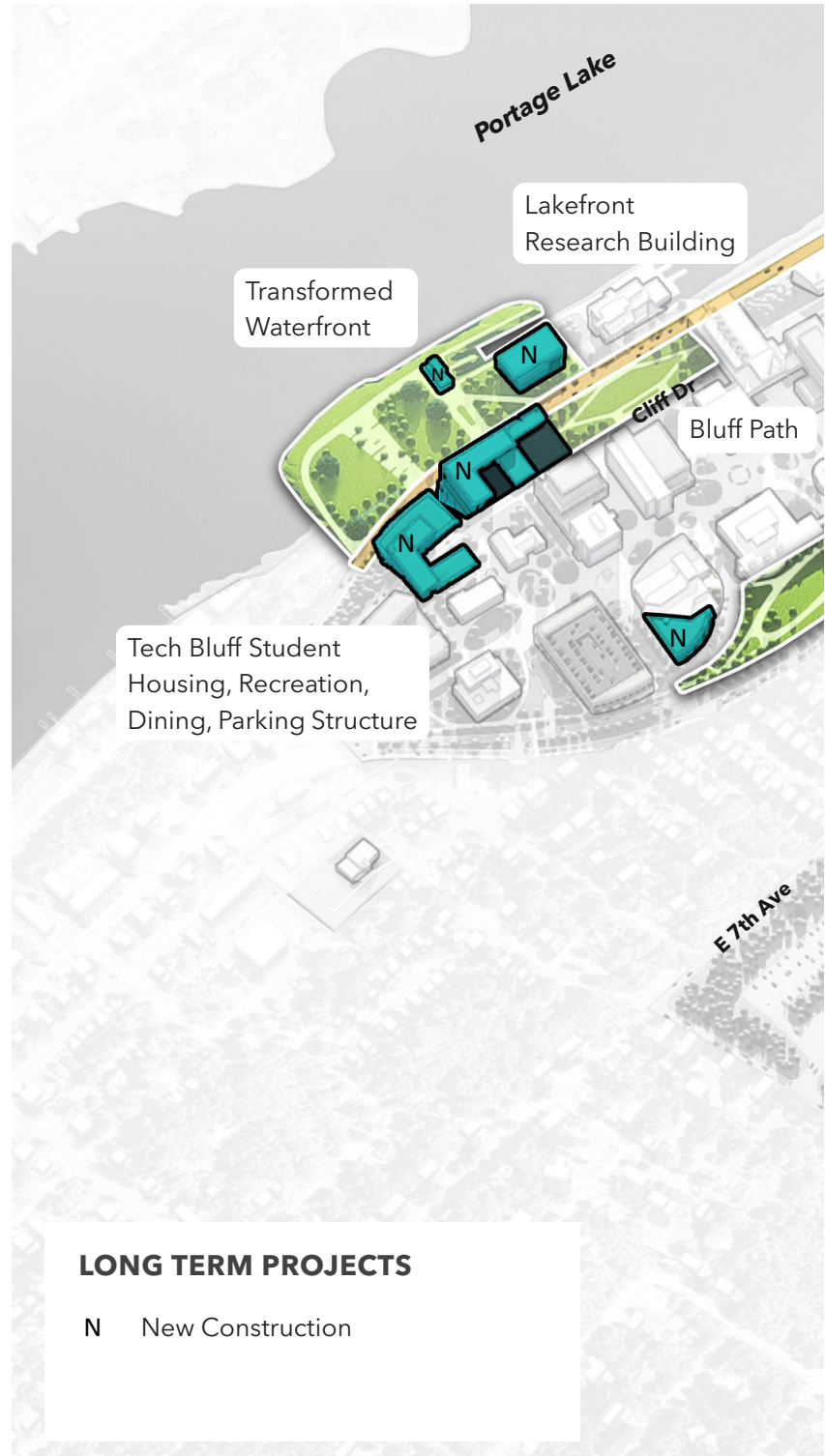
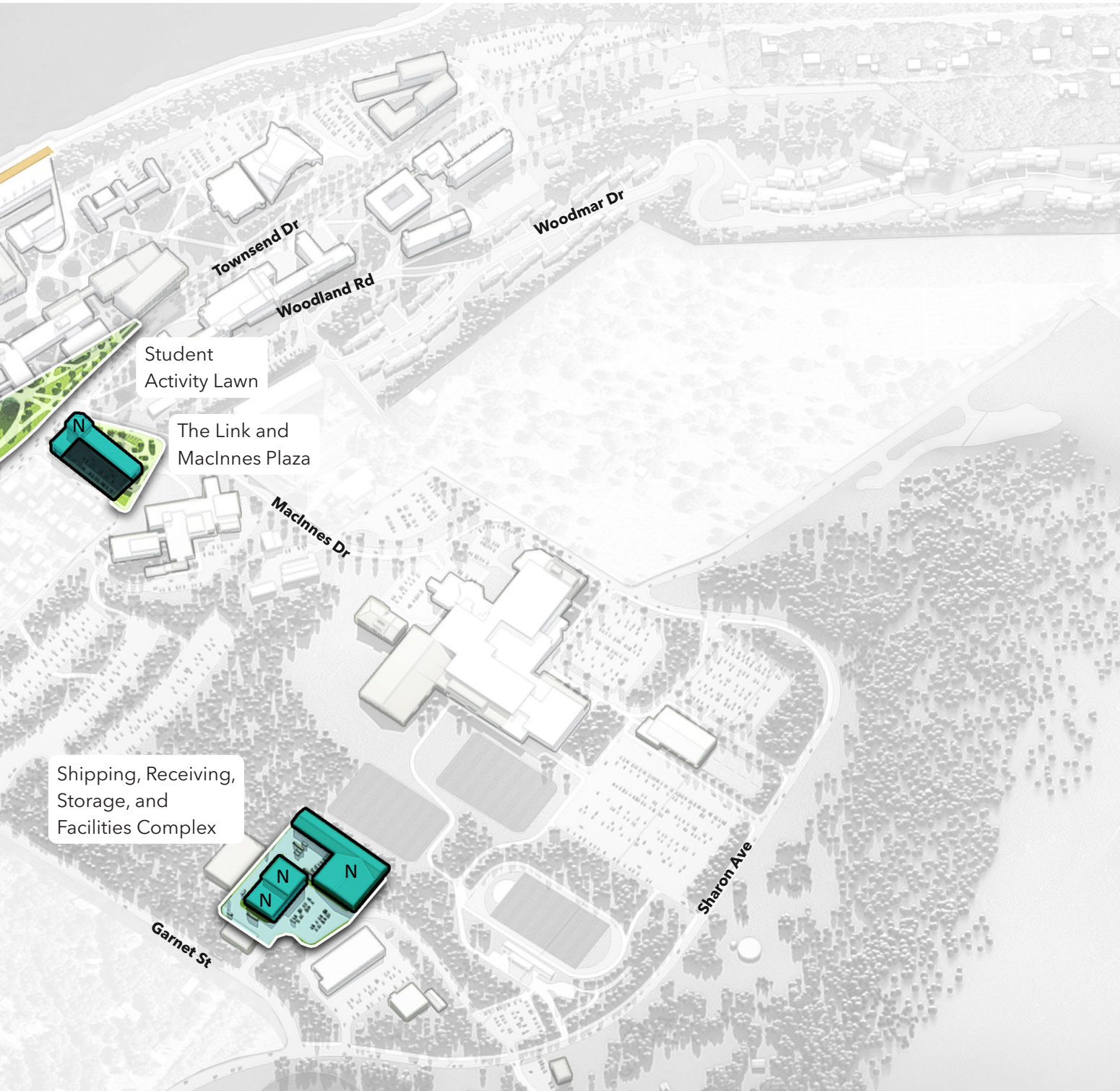


FIGURE 50: LONG TERM PROJECTS



POTENTIAL PROGRAM MOVEMENTS

Some programs are located in buildings that are recommended for repurposing or replacement. As a part of project sequencing, all programs must be relocated first before replacement or repurposing can begin.

There are many possibilities of where programs can be relocated. The following pages outline a few of them. The intent is that programs are moved as few times as possible, preferably only once.

The H-STEM Complex will relocate programs from other parts of campus so they can grow and better interact with other programs. In the Minerals and Materials Engineering Building, the Cognitive and Learning Sciences program in the Harold Meese Center could relocate to space vacated by the H-STEM Complex.

The Center for Diversity and Inclusion will relocate into the renovated or expanded Memorial Union Building, prior to the preparation of the site for the Center for Convergence and Innovation.

The Central Parking Structure will include a liner of office space on all floors that face the campus mall that will help activate it. The approximate size of that office liner is 21,600 GSF. Potential programs that could be located in the mallside office space should be offices that regularly engage with students. They could include:

- Bookstore, relocated from the Memorial Union Building, currently approximately 12,500 GSF
- Student Mental Health and Well-being, relocated from the Administration Building, currently approximately 3,400 GSF. One advantage of incorporating this critical student resource into the mixed office space is that there would be a reduced stigma for students seeking out its services
- Alumni Engagement, relocated from the Alumni House, nine employees, approximately 7,000 GSF

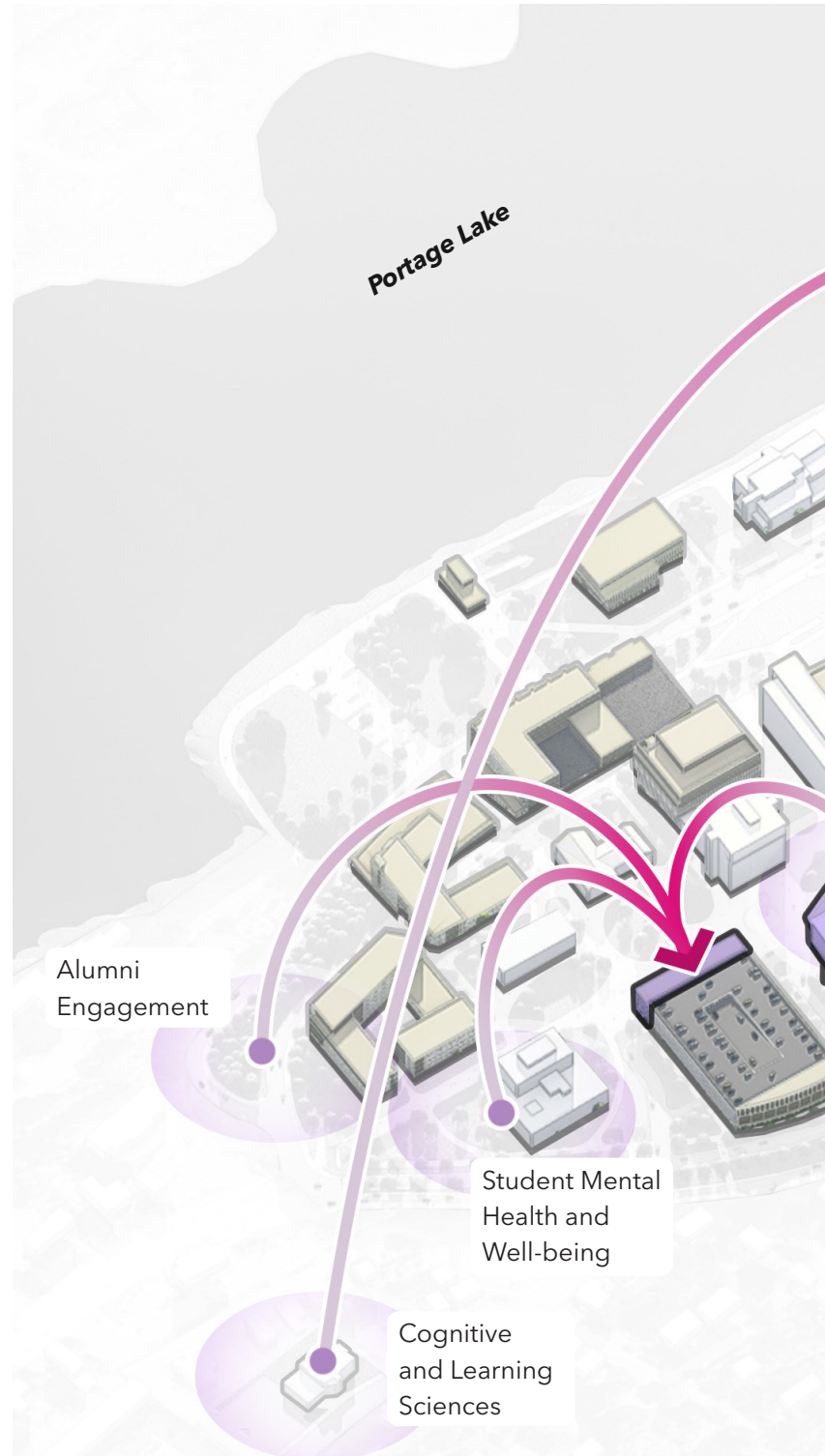


FIGURE 51: POTENTIAL PROGRAM MOVES 1



The Center for Convergence and Innovation will relocate the College of Business from the Academic Office Building. After the University relocates Social Sciences and removes the back wing addition, it could renovate the vacated space for the President's Office and the Provost's Office. These two prominent offices with frequent outside visitors in the campus's most historic building will indicate that the University embraces its more than 135-year history while preparing students for tomorrow's industries and making new research discoveries. As a result, the Administration Building programming can be more focused on student-serving programs.

The Central Parking Structure will include a liner of office space on all floors that face US Highway 41 to improve its appearance for the Houghton community and those traveling on US Highway 41. The approximate size of that office liner is 12,000 GSF. Potential programs that could be located in the US Highway 41 office space should be offices that do not engage with students. They could include:

- Public Safety and Police Services, relocated from a facility at MacInnes Drive and US Highway 41, currently approximately 3,700 GSF. The Public Safety and Police Services vehicles will be stored in the covered parking structure. The adjacency of this location to US Highway 41 will help public safety officers to quickly get around campus and in nearby neighborhoods
- Information Technology, relocated from a number of buildings including Electrical Energy Resources Center, Minerals and Materials Engineering Building, and the Administration Building. Information Technology estimates it will need approximately 7,000 GSF. Consolidating their operations will help with their efficiency and effectiveness

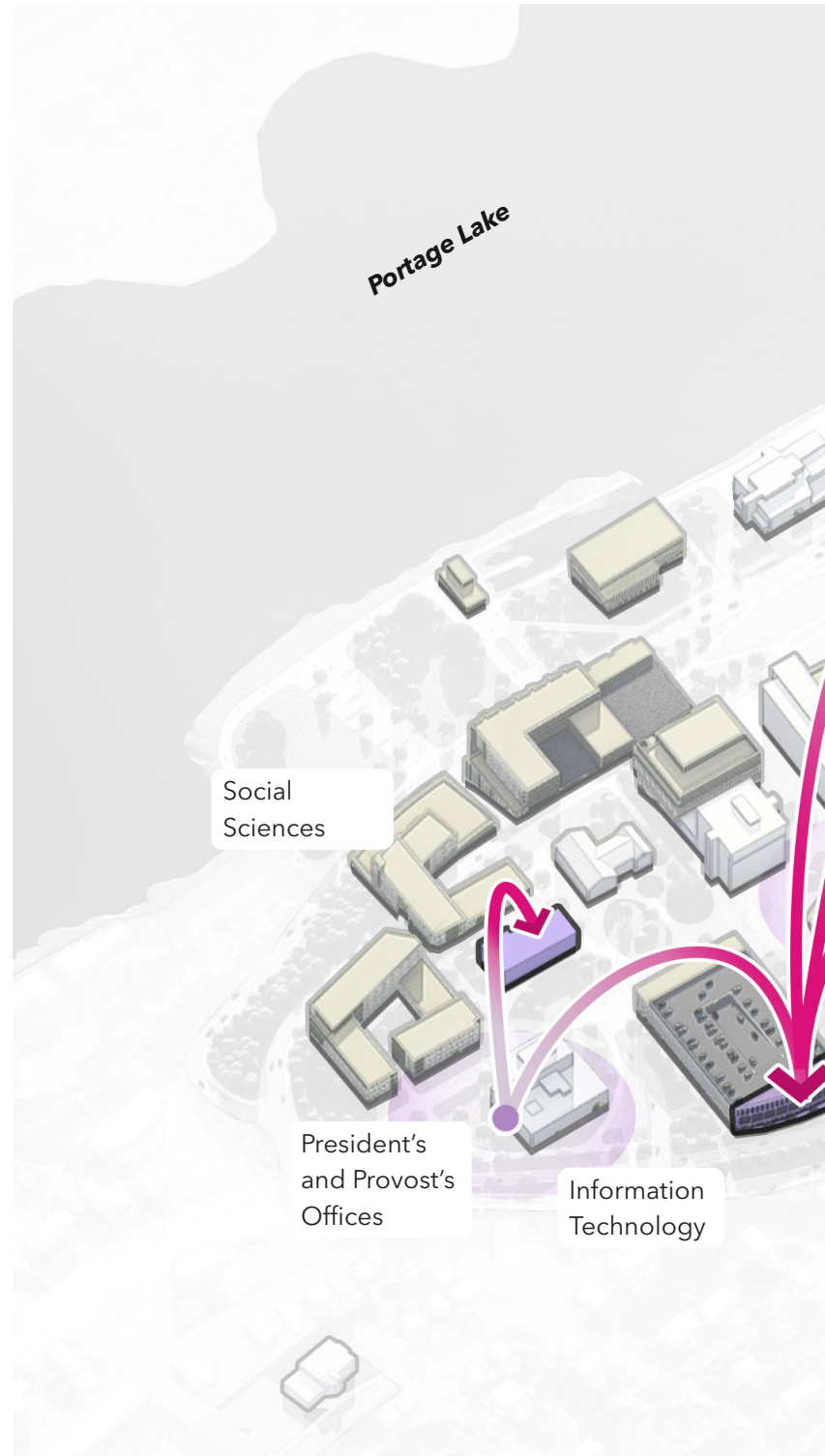
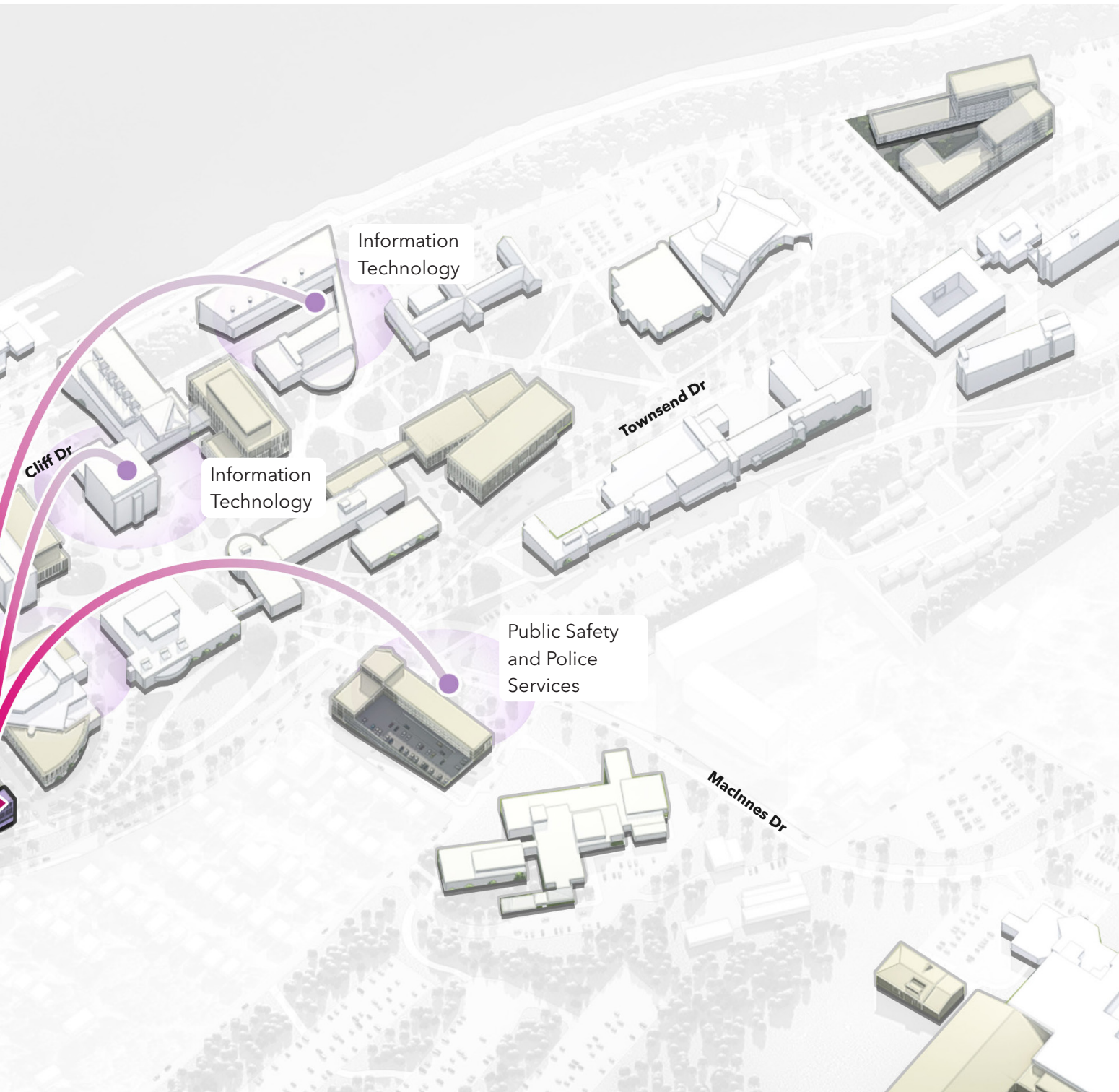


FIGURE 52: POTENTIAL PROGRAM MOVES 2



When the Student Development Center ice hockey arena is expanded, the Huskies Pep Band and its instrument storage could be relocated from Walker Arts and Humanities Center.

The Bluff Parking Structure will include a liner of office space on all floors that faces Portage Lake to improve its appearance for the Houghton community and provide new waterfront and Mont Ripley views characteristic of only Michigan Tech. The approximate size of that office liner is 48,000 GSF. Because the location is somewhat disconnected from the campus core, the potential programs that could be located in the Bluff Parking Structure office space should be offices that do not engage with students. They could include the programs that are currently in the Lakeshore Center, which is currently approximately 47,000 GSF. Office staff of these programs will enjoy immediately adjacent covered parking and dramatic views.

In order to transform the waterfront, the Physical Plant and Facilities programs should be relocated away from the campus core. An expanded complex of new facilities and temperature-controlled storage buildings on Garnet Street could include these potential programs:

- Physical Plant/Facilities, relocated from the waterfront, initial space guidelines and benchmarking indicate a space need of approximately 97,000 GSF in future years
- Social Sciences research materials, relocated from the Annex Building
- Student organization storage, relocated from near the Student Development Center

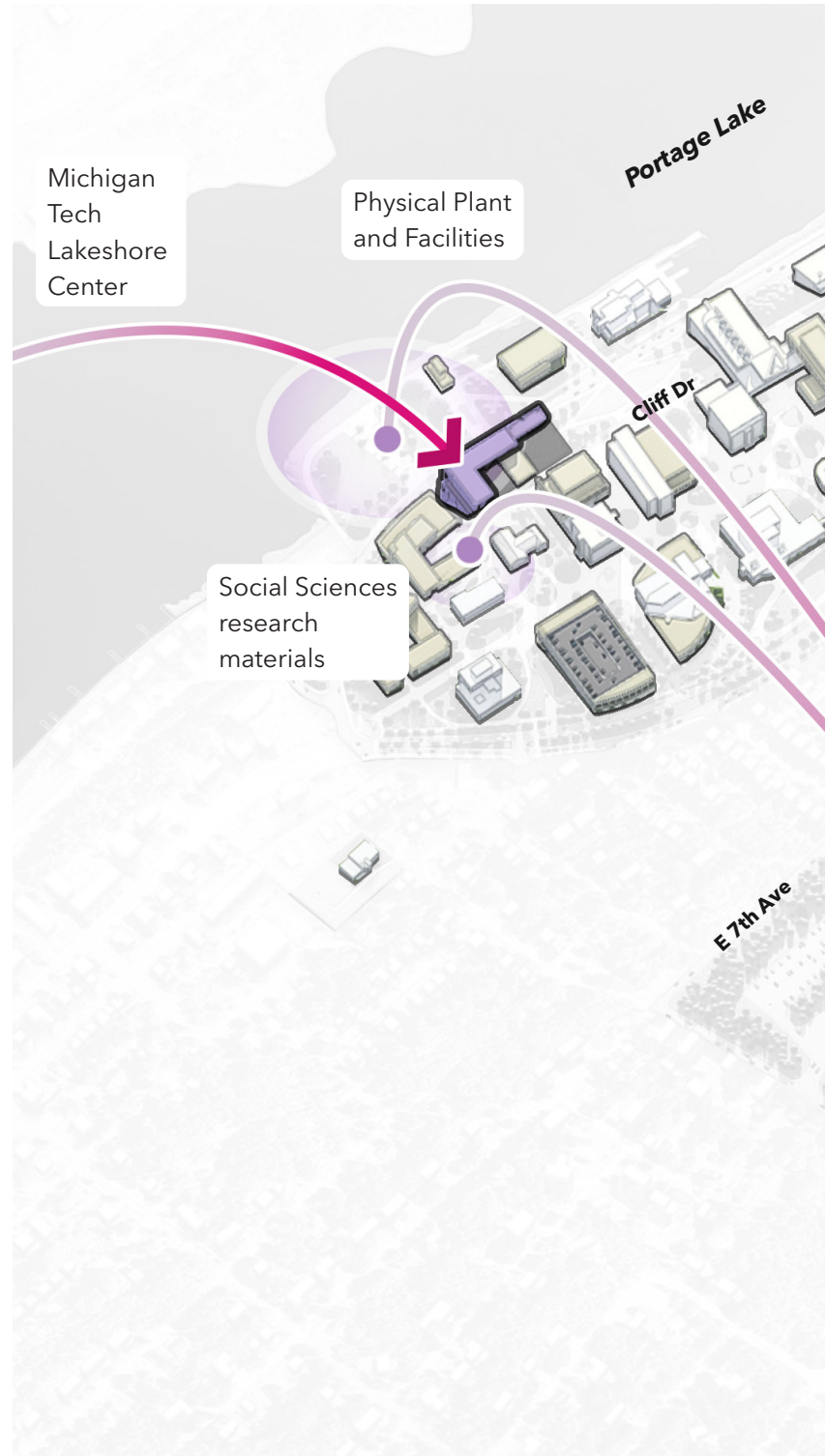
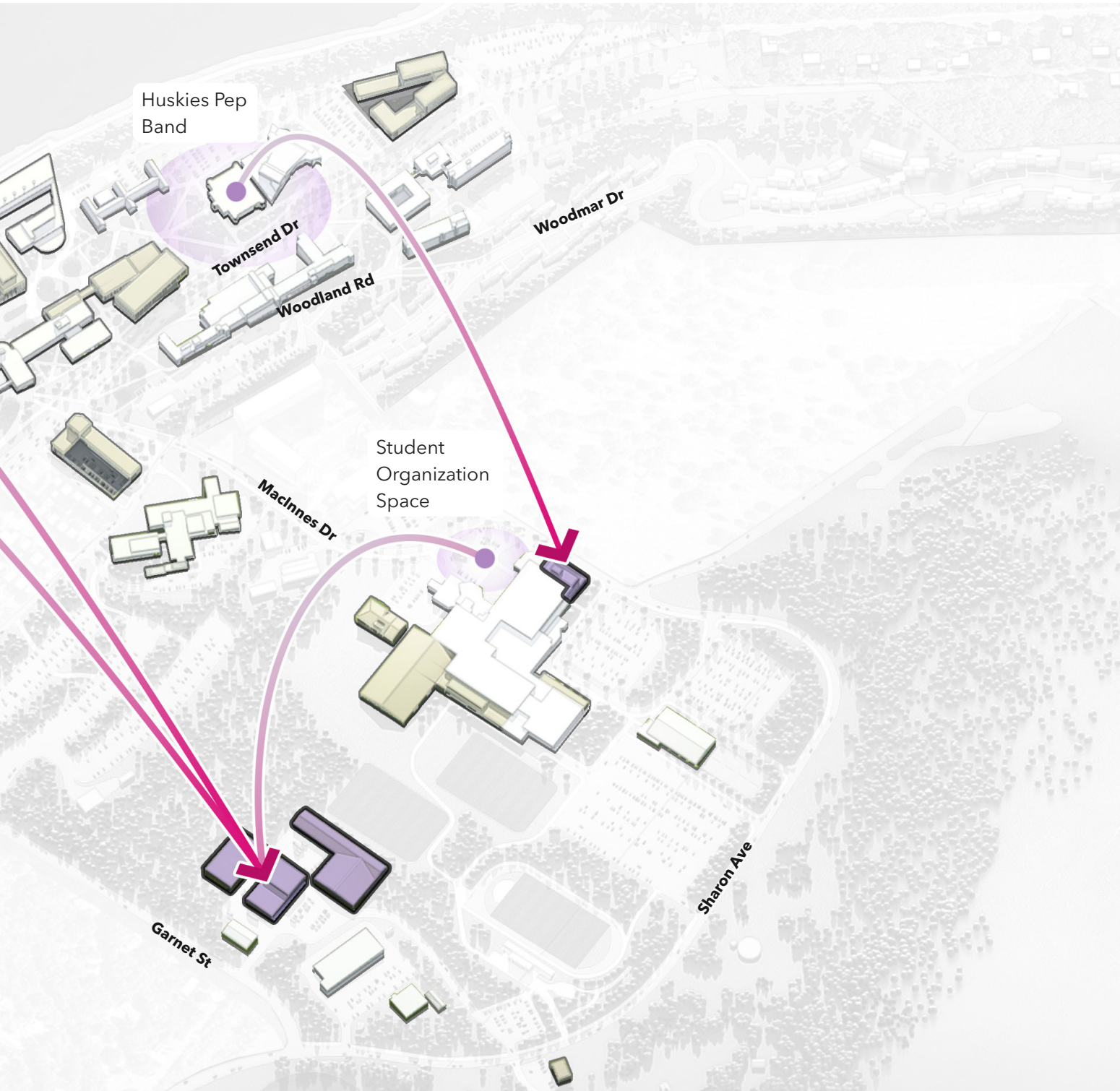


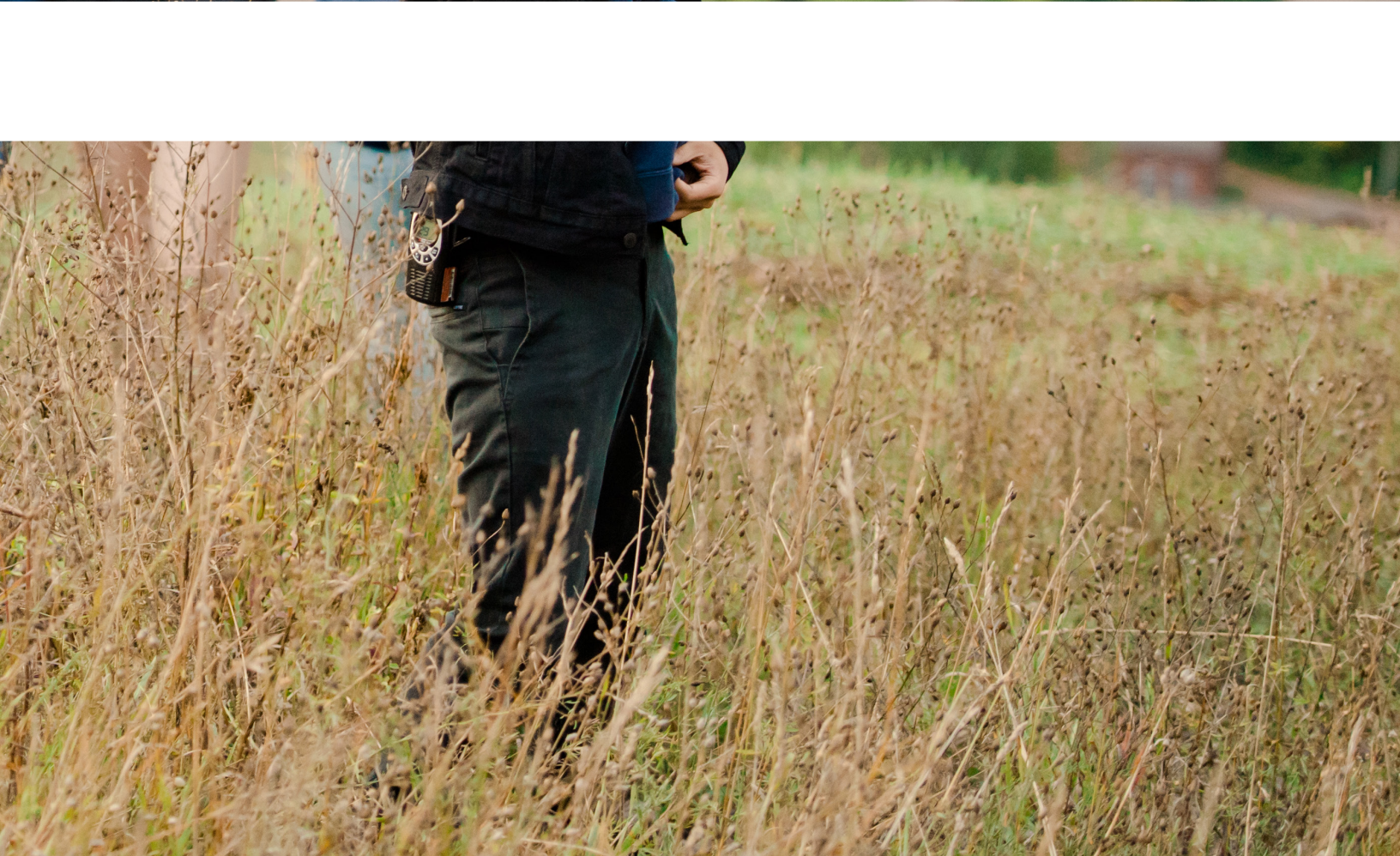
FIGURE 53: POTENTIAL PROGRAM MOVES 3





APPRECIATION





APPRECIATION

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- William Roberts, Vice President for Advancement and Alumni Engagement
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- Joe Cooper, Interim Vice President for Student Affairs and Dean of Students
- Suzanne Sanregret, Athletic Director
- Sarah Schulte, General Counsel

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- Jacqueline Huntoon, Provost and Senior Vice President for Academic Affairs
- David Reed, Vice President for Research
- William Roberts, Vice President for Advancement and Alumni Engagement
- Alan Turnquist, Director of Sustainability and Resilience
- Gregg Richards, Director of Engineering Services
- Jacob Guter, Project Manager

The dedication of time during this planning process and the recommendations that have resulted as presented in this report are credited to the Michigan Tech community as a whole. The transparent process yielded ideas that defined the forward-thinking vision of all committees, faculty, staff, students, and community members.



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