Emerging Priorities

Part II of the Fermilab Campus Master Plan builds on the history, vision, and *Guiding Principles* set forth in Part I. Presenting an integrated, holistic approach, this *Emerging Priorities* chapter delineates initiatives to evaluate, organize, plan and design the campus to realize the FCMP 20 year vision. Responding to the aspirations embodied in the *Guiding Principles*, these initiatives provide a framework for campus development. When fully implemented, the result will be a campus supporting cutting-edge research, fostering international collaboration and community, and harmoniously integrating new developments with the natural setting. The campus will be transformed into an open, inviting and collaborative research community for 21st-century science.

"The Campus Plan looks at what type of experience we want to offer Fermilab's current users, users of the future, as well as our own scientists and staff, and our community neighbors. Campus improvements and new facilities will be undertaken with a view toward qualitatively reinforcing what makes Fermilab a unique and special place."

~ Tim Meyer, Fermilab Chief Operating Officer

Create Planning Regions

The Current Perspectives noted the haphazard feel of the campus resulting from the scattered nature of the structures, roadways and utilities about the site. Creating planning regions aims to address this issue, providing context, logic and framework for future campus design and development. While the entire site is open for science (reference FCMP Part I, Campus Geography), four planning regions are identified herein and are illustrated on the map on the facing page. Each has a distinct focus, character and requirements. Creation of these regions provides guidance for future planning and design guidelines.

Core Campus: The core campus comprises the most public, most accessible and most populated areas of Fermilab. Including the arrival area of the campus as well as Wilson Hall, Ramsey Auditorium, FCC, the Lederman Science Education Center, IARC and the Technical District, this region is also the location for the future IERC and a possible Global Accelerator Center. The Core Campus should be characterized by a refined, qualitative approach to its architecture and site planning. Over time, this region will be the focus of improvements in landscaping, pedestrianization, transit, signage, and wayfinding initiatives to transform and unify this vibrant core of the campus.

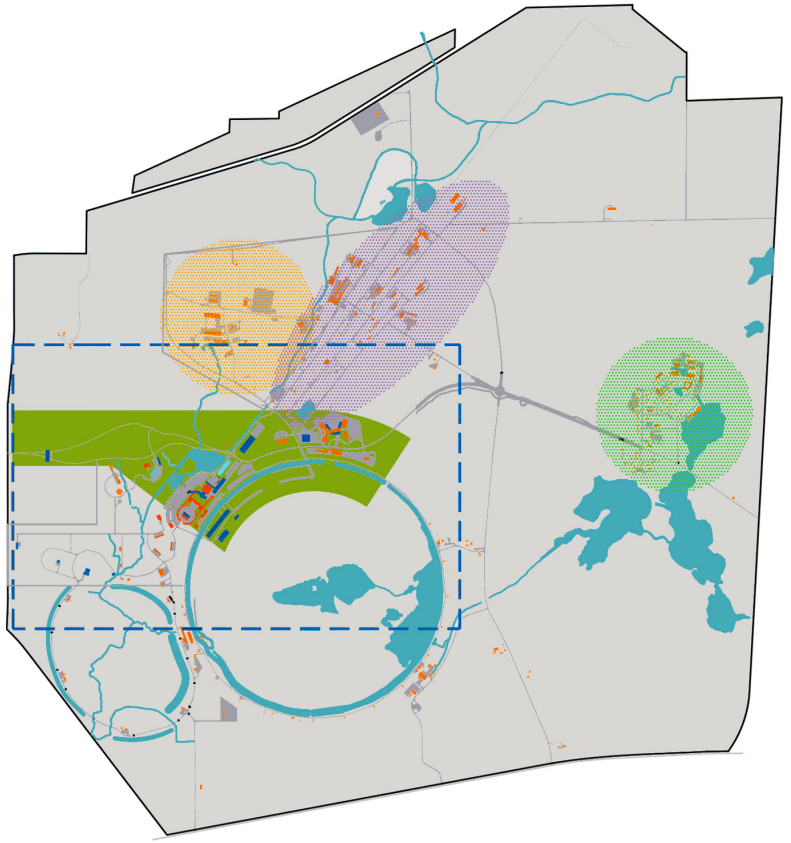
Test: As the oldest operating science region, the Test Region includes the Fermilab Test Beam Facility, Labs A through G, the landmark Robert Wilson-designed NML building and the recently built Cryomodule Test Facility. The long-term vision for the region is one redevelopment and renewal, removing some obsolete facilities while revitalizing others for new usage.

Village: The Village is where the laboratory began. Many of the buildings in the Village are currently obsolete shops, labs and small offices. Due to their poor conditions and distance from Wilson Hall, these present prime candidates for consolidation and centralization projects. As staff and functions are moved out, antiquated buildings can be removed and areas returned to nature, enhancing the Village as a place focused on housing and recreation.

Services: The Services Region is home to many support groups such as shipping and receiving, vehicle refueling, operations and maintenance, and the Fire Department. Long-term plans for the area may include the construction of a new consolidated warehouse. Consideration should also be given to the creation of a consolidated facilities management building and a consolidated fire station and security facility.

Planning Regions Key Map

- Core Campus
- Services
- Test
- Village



Consolidate and Centralize

Condensing the development footprint of the laboratory will enable the envisioned collaborative international research community, y bringing staff from remote locations into the core of the campus. As noted in the Campus History (Part I), many parts of the campus were not purpose-built but rather developments of opportunity. As such, they are not ideal for their usage and are in poor locations. Other regions are remote because they were originally built near experiments due to technological limitations. Guided by the planning region concept, this initiative to consolidate and centralize moves people and functions from distant, antiquated, scattered and obsolete facilities to modern consolidated facilities within the core campus. Ultimately, up to 500 staff members currently dispersed across the site can be moved to optimally located, modern state-of-the-art facilities.

The diagram to the right illustrates the general nature of these movements. It identifies the regional clusters of outdated facilities. It then indicates the movement to campus core destinations. The resulting condensed footprint will enable the envisioned consolidated and integrated, connected and engaged workplaces. Pedestrian-friendly outdoor connections, as well as climate-controlled links between buildings, will create a collaborative community where researchers work nearby, easily meeting together to exchange ideas. Following are additional notes on three color-coded circled regions on the map on the facing page.

Green: The green circle targets the Village. While maintaining its housing and recreational facilities and functions, future developments will allow the Village to shed unrelated functions into more optimized locations. Over time, dozens of obsolete shops, labs and offices will be relocated to modern, consolidated and optimal facilities in the Core Campus.

Blue: The blue circle primarily targets the test area. While many well-functioning and effective facilities exist here, many others are obsolete and deteriorating. Over time, new modern, centralized and consolidated replacement facilities will be constructed in the Core Campus. As staff and functions relocate, these movements will make way for the removal or adaptive reuse of the current antiquated structures in the test area.

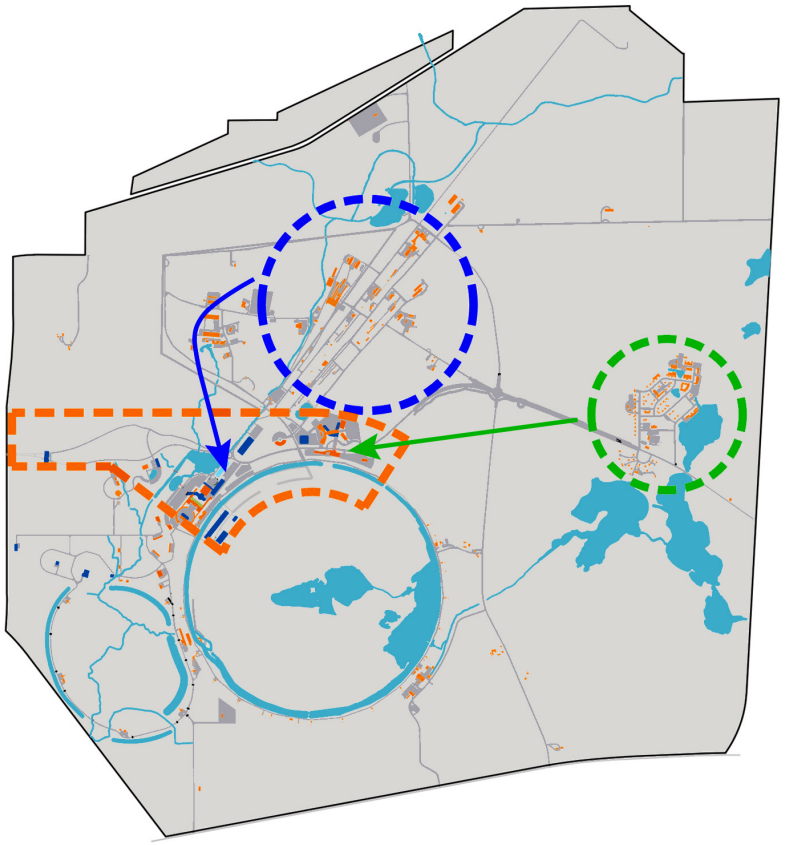
Orange: The orange boundary delineates the newly defined Core Campus region. As the focus of new development, the region is the destination for consolidation and centralization into new state-of-the-art facilities. Staff from all over the site will increasingly be located here, becoming the envisioned place where researchers and staff easily connect, work collaboratively and exchange ideas.

Consolidation and Centralization Key Map

Village

Test

Core Campus



Strategically Assess Buildings and Infrastructure

A fully integrated, holistic approach to long-term planning must consider the state and appropriateness of the buildings and structures on site. Additionally, planning must assess the capacity and condition of the utility systems that provide the campus buildings, experiments and accelerators with electricity, heating, cooling and water. Improvement and expansion of these systems to meet the present and future needs of the laboratory, while delivering enhanced functionality, reliability and efficiency, must be at the core of the assessment process. In that spirit, this campus plan initiative aims to strategically assess and align the campus buildings and utility systems, considering the future direction and development plans for the laboratory.

Campus Buildings: The Campus History (Part II) noted that 127 (35%) of Fermilab's current buildings were on site by 1963. Predating the laboratory's founding by many years, these structures, totaling 13% of Fermilab's total square footage, are rooted in the farm and suburban periods. A second grouping of buildings, 95 structures (26% of Fermilab's total) date from its 1967 founding through 1979. In total, 222 buildings, totaling about 60% of the laboratories square footage, is more than 40 years old. As an aging facility, the future of the campus is as much about erasure as it is about addition.

To that end, this campus plan initiative aims to strategically asses and align the campus buildings to the future vision. Location, condition, quality, design, flexibility, safety and risk are among the criteria for evaluation. The Appendix at the end of this FCMP provides background information, assessment criteria and a broad roadmap for this process. Then, hand in hand with new developments in FCMP Part III, informed modernization of the laboratory can take place. At the end of 20 year planning horizon, dozens and perhaps hundreds of obsolete buildings could be renovated, repurposed or removed from the site.

Campus Utilities: The 20 year plan for the campus delineates significant movements of population and activities to new locations around the campus. It envisions major new experiment facilities and beamlines. These changes, along with the effects of time, require ongoing improvement to the sitewide utility systems. The Appendix of this FCMP document provides an overview of the systems and proposes further study and development of a free-standing campus utilities plan. The plan should assess the condition, capacity, location and suitability of all systems as Fermilab prepares for the future.

Establish Design Guidelines

Fermilab has a legacy of distinctive buildings and structures, each taking their place in the unique history and development of the campus. The founder's "Utopian" vision upon which Fermilab was based, and from which its early design inspiration proceeded ,stands. However, much has changed since the founding era. Like many places of its time, the original design of the campus and buildings was meant to be accessed and experienced by automobile and are not pedestrian-friendly. Additionally, much has changed in terms of science, values and performance since the founding period.

The *Guiding Principles* envision a state-of-the-art laboratory with a sense of community, fostering the free exchange of ideas central to the laboratory's scientific mission. The founding-era design approach presents a conflict with the sense of community which Fermilab seeks to create amongst its scientists and staff and presents a challenge to sustainability goals. The Campus History chapter (Part I) described how the design of many of the recent buildings evidences an unsolved transition from the Wilson Era design approach to the present time. Many newer projects emphasize looking backwards, resulting in poorly and inappropriate emulations of the Wilson Era.

Dozens of new buildings are planned for the next 20 years. As the FCMP unfolds in the coming decades, it is vital to set forth design approaches consistent with the goals embodied in the *Guiding Principles*. The design of buildings and open spaces should support these goals by creating modern facilities that encourage interaction, bringing staff, users and visitors together, and create vibrant centers of laboratory life. While continued care and stewardship of the campus requires an appreciation for the existing buildings and open spaces defining Fermilab, new buildings and future renovations must create the best campus environment possible. Design teams should recognize Fermilab's legacy, carrying the vision forward in innovative ways.

In that spirit, the Appendix of this FCMP highlights the need for design guidelines. Informed by the *Guiding Principles*, these will guide the creation of modern, state-of-the-art facilities. New buildings and structures will be designed to be fresh, inviting, dynamic and forward-looking. They will also be designed with a view toward flexibility and efficiency, enabling them to meet the needs of current and future generations of staff and users.

Strengthen Campus Landscapes

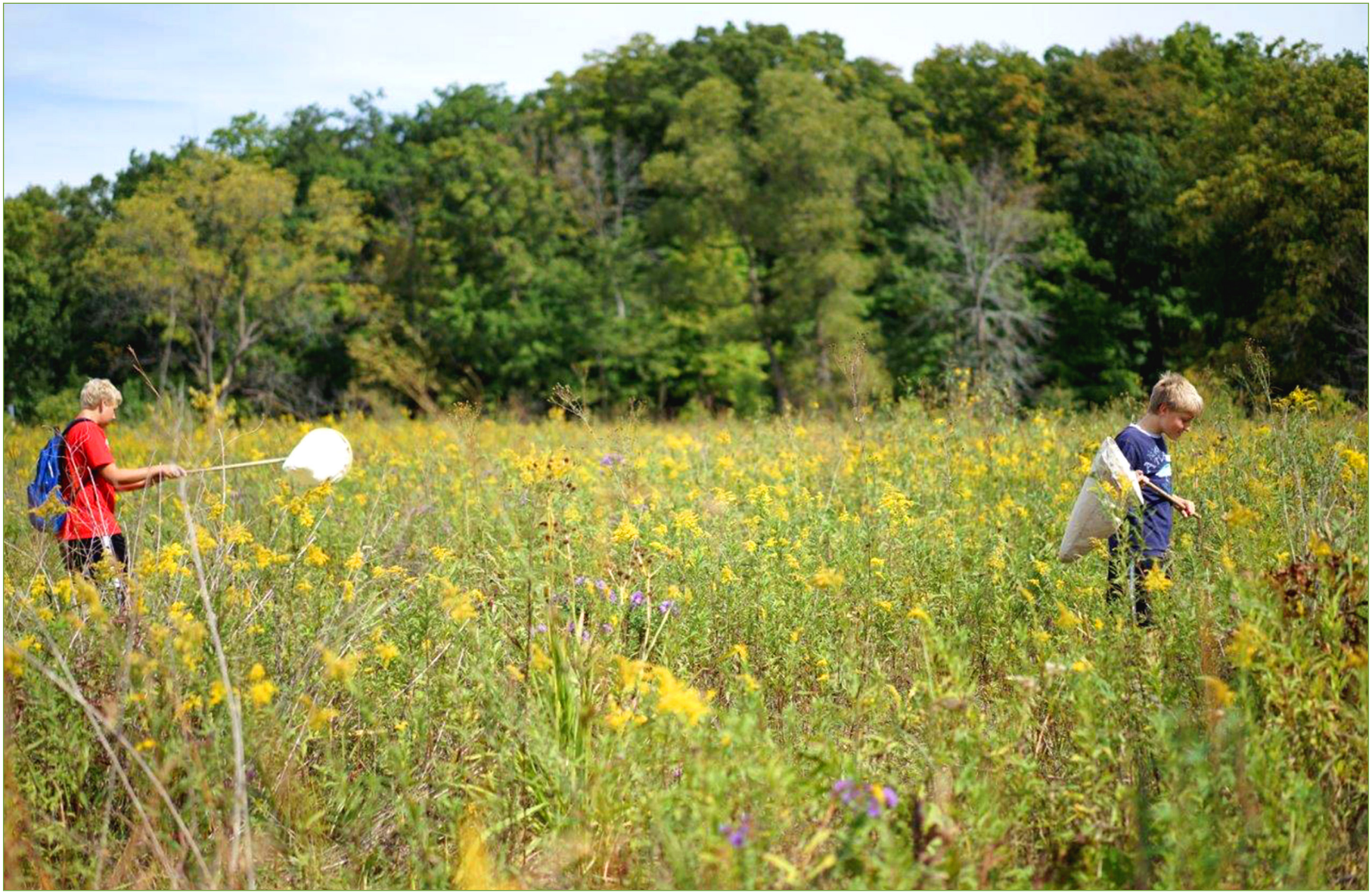
Conserve Natural Resources: The Campus Plan envisions smart growth and development to conserve open space. The land and its ecological integrity is one of the most important assets at Fermilab. It is an important component of the laboratory's STEM education initiatives and programs. Also, it is an important aspect of our regional stewardship, positively benefiting and serving the surrounding communities.

The Fermilab campus is spread across four watersheds and boasts over 2,500 acres of natural areas such as tallgrass prairie, oak savanna, open water marsh, sedge meadow and floodplain forest. There are also many acres of agricultural lands and old-field grasslands. Responsible management of the physical site is an important consideration for realizing the campus of the future. Indeed, the abundant open space on the site allows for construction of the large machines needed to carry out cutting-edge particle physics research.

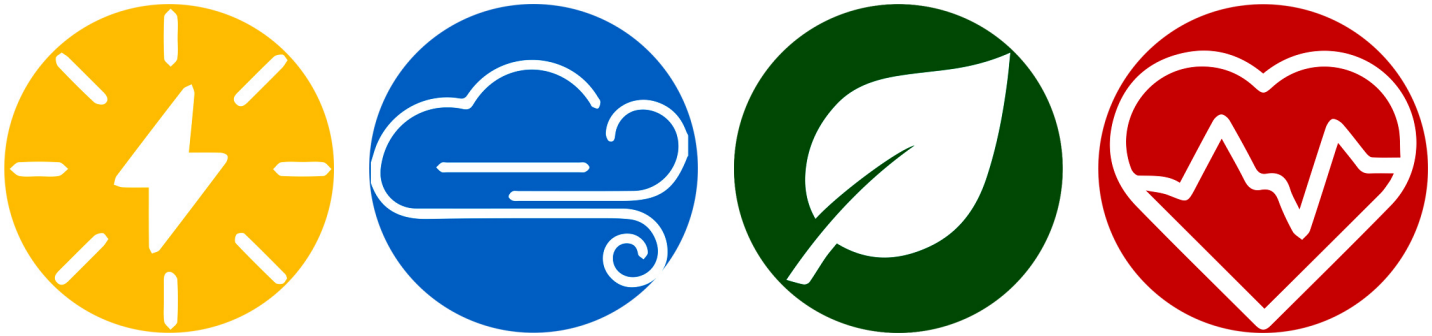
DOE and Fermilab recognize the significance of conserving and restoring biological diversity. Both are members of the Chicago Wilderness partnership and are committed to supporting their Biodiversity Recovery Plan for the region. The Fermilab Ecological Land Management (ELM) Committee is charged with providing sound, ecologically informed recommendations during lab planning through formal review mechanisms. The ELM Committee is composed of consulting professionals and internal experts, and together, they author a plan for enhancing the natural resources of the Fermilab site through an ecosystem management approach. This includes monitoring plant and animal communities as indicators of environmental health and assessing presence and viability of keystone and rare species. Ultimately, these contribute to restoration and expansion of core habitat, wildlife corridors and connecting remnant ecosystems across the 6,800-acre site and with adjacent public areas. These efforts require that Fermilab remain open to experimenting with new and different land management techniques as a part of how it does business effectively.

The ecological science behind managing open land continues to guide approaches to land stewardship and resource conservation. The ELM Committee also reference the Illinois Wildlife Action Plan and relevant Executive Orders concerning environmental protection. The committee works closely with the Roads and Grounds Department to integrate the ecosystem management approach into their broader responsibility of managing the site. Individual members of the ELM Committee also serve on the Campus Facility and Planning Board and Fermilab's ESH&Q Committee, chaired by the laboratory director.

Create New Landscapes: Landscapes beautify the Fermilab Campus, helping establish the identity of different areas, and balance development with green space and outdoor amenities. Currently, many of Fermilab's existing buildings and utility installations tend to dominate and distract from the laboratory's natural setting. Proposed landscape initiatives at select portions of the Core Campus will screen and moderate the intrusiveness of the built environment, bridging the gap between natural settings. A "connective tissue" will be created, helping shape and define the character of Fermilab for the coming generations.



Prioritize and Integrate Sustainability



Energy: Fully implement both active and passive building design strategies in all future projects. Retrofit current facilities where possible. Optimize building orientation in response to seasonal solar exposure and location. Adhere to Site Sustainability Plans goal to work toward renewable and alternative energy, providing 25% of all energy used by FY2025. Adhere to Site Sustainability Plan calling for the inclusion of net-zero design strategies by FY2020.

Ventilation: Natural ventilation is a key component of the passive design systems. It contributes to a healthy indoor environment and energy savings. Use cross-ventilation to cool interior spaces and to circulate air through the spaces. Use controlled ventilation during the day and night. Consider stack ventilation to cool interior spaces. Advanced ventilation and mechanical systems increase air flow and reduce exposure to air-borne microbial agents.

Environment: Conserve and maintain Fermilab's more than 2,000 acres of restored ecosystems per Fermilab's Ecological Land Management Plan. Preserve native plant communities and soil as much as possible. Preserve the strategy of natural landscaping and ecosystem management that requires minimal watering or mowing. Minimize erosion-causing construction practices. Connect occupants to the external environment in a meaningful and educational way.

Health and Well-Being: Central and attractive open staircases encourage occupants to take the stairs rather than the elevator. Bike racks, bike paths and showers encourage workers to bike to work. Natural daylighting and proper ventilation increase productivity. Double - and triple-pane insulating glass help maintain comfortable interior temperatures during the winter. Provide views to outside from as many workspaces as possible, as they have a restorative effect on workers.

Water: Fermilab collects rainwater to provide adequate industrial cooling water. Water is then recycled many times before evaporating into the atmosphere. This minimizes Fermilab's demand for water from external sources. At Fermilab, no potable water is used for landscape or agricultural purposes. Surface-water management is a high priority. As the land drainage systems depend on topography, a surface water management program is in place to guide long-term surface water management.

Waste Management: A sitewide recycling program consistently diverts well over 50% of municipal waste and construction and demolition waste from landfills. A public bus transportation system, on-site electric vehicles and encouraging carpooling would decrease pollution. Use local materials when possible to decrease the transportation load, and support the local economy. Use recycled or recyclable building materials when possible. Choose materials that provide a healthy working environment.

Climate Change Adaptation: Fermilab will seek to incorporate climate change resilience into campus planning and facility operations. The potential impacts of climate change will be proportional to extreme weather-related variations currently experienced in this region of the country. The implementation of forward-thinking, progressive design with an eye towards climate variability will help mitigate the potential variability risks to laboratory mission and function.

Transportation: A coordinated and integrated transportation system can promote health and reduce emissions. This integrated approach begins with making improvements for pedestrians and cyclists and then considering the creation of a multipassenger shuttle system between the major central districts and regions within the campus. Increasingly centralized campus developments will reduce on-site vehicular use by minimizing the need to travel around the site encouraging more pedestrian and bike use.

Improve Mobility and Wayfinding

How Fermilab's campus functions and the experience it provides depend in large part on how people move about and how well-connected the lab's various parts are to one another. Given its location, size and land-use diversity, Fermilab must accommodate multiple modes of travel. This section addresses aspects of the laboratory's movement systems, focusing on strategies to make the campus more pedestrian and bicycle friendly and less automobile-dependent. Additionally, it addresses the need for informational and directional signage in order to make the campus more navigable and understandable.

Approach and Arrival: The initial experience of the first-time visitor is via the Pine Street entrance. The experience is unimpressive and possibly disorienting. Jersey barriers, flashing lights, an unoccupied guardhouse, the visual clutter of piping and mechanical equipment west of the MINOS building, the lack of signage, and a confusing intersection as one approaches Wilson Hall are components of the visitor's impression upon arrival.

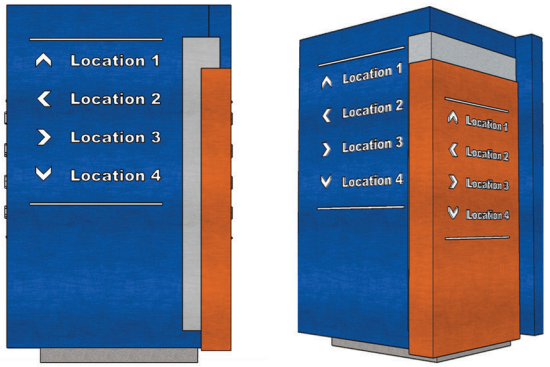
Visitor Experience: As mentioned previously, a compact core campus with new visitor-friendly buildings can greatly enhance the visitor experience. Improved signage will welcome, inform and direct visitors guiding their visit and help them understand what happens at Fermilab. The Campus Plan also proposes informative sign kiosks at key points around the site. Examples include the bison field, the prairie, the butterfly trail and the site entrance.

Signage and Wayfinding: The Fermilab Campus Master Plan *Guiding Principles* aim to ensure an enhanced campus experience that is welcoming and informative to both local and international visitors. The campus plan initiatives envision integrative design, improvements in campus landscapes, and improvements in mobility and wayfinding. A complete integrated signage system approach and design should be developed and incrementally realized as the campus plan implementation proceeds.

Parking: Parking will continue to be a necessary and significant presence on the site. However, large uninterrupted fields of asphalt should be avoided by using landscape initiatives to integrate entire developments with their natural surroundings. Whenever possible, parking should be reduced, consolidated, screened and/or tucked under buildings to minimize its visual impact. Paving areas should be reduced to a minimum throughout the site. Where vehicles are welcome, the needs of pedestrians and transit users should be a paramount concern, ensuring the development of a truly pedestrian-oriented campus.

Cycling: Improvements for cycling the campus should include the creation of designated bike lanes along Pine Street and Discovery Road, along with and improved signage and segregation for primary bike routes through campus. Major new buildings should include indoor bike storage spaces, along with shower and changing rooms. All occupied buildings should have adequate bike rack space. Consideration should be given to a bike sharing program with stations at major populations areas within the campus.

Vehicles and Traffic: Given limited mass transit options to reach Fermilab, cars will continue to have a large presence on the campus. However, as consolidation and centralization progress, the number of vehicles traveling around and across the campus can be reduced. Walking, cycling and transit use can become realistic options for day-to-day business.



Regional Signage

Building Signage

Wayfinding Signage