Penn State University

2023 University Planned District Transportation Study Update

FINAL REPORT

January 22, 2024

Revised October 30, 2024

Completed for:
Penn State University

Submitted by:

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Executive Summary

The 2023 Penn State University Planned District (UPD) Transportation Study fulfills compliance and planning requirements of the UPD zoning ordinance—namely to submit a District Plan Transportation study for the 2023-2033 ten-year period. Previous UPD District Plan Transportation Study Updates were completed in 1994, 2001, and 2013.

The University Planned District

The UPD zone for Penn State's University Park Campus comprises approximately 4,200 acres. Land development within the three UPD-adopting municipalities of State College Borough, College Township, and Patton Township is governed by the UPD Zoning Ordinance. The ordinance purpose states:

> *The University Planned District is designed to promote the careful planning and orderly development of the University campus, consistent with the community development goals of the Centre Region and its member municipalities as described in the Centre Region Comprehensive Plan.*[1]

The ***District Plan Transportation Study*** is to be prepared every tenth year to document travel trends and identify potential transportation effects of campus development projects within the district during the next ten-year period. The following requirements of the District Plan Update are noted:

- Parking Area Identification and Projections – Identify general size and location of parking areas within the sub-districts which are projected for use as parking areas within a 10-year period.
- Traffic Assessment – Existing transportation conditions for highway links and intersections serving the UPD must be described and the existing level of use analyzed. Potential transportation impacts of future parking development must be assessed for a 10-year period. Recommendations for potential system or service improvements in order to accommodate the projected transportation impacts of UPD development shall be included. When feasible, the study shall identify specific recommendations designed to reduce or avoid transportation impacts.
- Internal Circulation and Facilities – Describe existing and proposed internal roads for vehicular traffic; existing and proposed connections to the public street network; plans for street openings and closings, and possible impacts on the adjoining transportation system and adjoining zoning districts; existing and proposed facilities and accommodations for public transportation, pedestrian circulation, bicycle paths and other transportation methods.
- Travel Demand Management – Include a travel demand management analysis, addressing the manner in which various methods, such as promotion of ride sharing, pedestrian/bicycle improvements, and changes to on-campus and public transportation systems, will be utilized to reduce the number of single-occupancy vehicle trips associated with existing or future development under the District Plan.

Stakeholder Engagement & Outreach

The 2023 UPD Study benefited from a more broad and formalized stakeholder engagement and outreach effort. Internal Penn State teams provided guidance and direction to the work plan, while community

[1] State College Borough Zoning Ordinance, University Planned District, Section 1201.a.

perspectives were better understood with engagement of external stakeholders, who participated in interviews and advised the study.

The UPD **Project Management Team** provided primary oversight and execution of the UPD Planning Process. The Team functioned as a highly engaged steering committee that participated in bi-weekly status meetings, provided day-to-day project direction, and reviewed project deliverables. The Team included Penn State staff and the lead consultant team members.

The UPD **Executive Committee** reviewed project direction and deliverables at key milestones. The Committee was comprised of Penn State's senior leadership with responsibility for campus planning, properties, and the physical plant infrastructure.

Whereas previous UPD studies were largely an internal exercise, the 2023 UPD Update was informed by an outreach component that drew input from municipal, regional, and agency stakeholders through the UPD **Advisory Committee**.

The study incorporated two **UPD Study Workshops** at University Park. Each two-day workshop included field visits, data collection, and collaborative meetings with the Project Management Team and Advisory Committee. The first Discovery Workshop in December 2022 emphasized the collection of input and information on the current state of campus and community transportation. The second Network Design Workshop in March 2023 explored physical design of the University Park transportation system.

The study was informed by **Stakeholder Interviews** with additional Penn State staff and agency stakeholders who did not participate in the Advisory Committee. These included staff from State College Borough, College Township, and Patton Township (the UPD-adopting municipalities) as well as the PA Department of Transportation (PennDOT) Centre Regional Planning Agency (CRPA), Centre County Metropolitan Planning Organization (CCMPO), and Centre Area Transportation Authority (CATA).

Parking Assessment

Penn State's Transportation Services department manages, enforces, and collects fees for more than 18,000 parking spaces within the UPD sub-districts. The department has roles in financing, maintaining, and managing surface and structured parking.

As part of the University Planned District (UPD) Ordinance, Penn State is required to prepare an annual *Parking Projections Report*. In the past, Penn State has prepared the Parking Projections Report as a submittal, that is separate from the ten-year UPD Transportation Study. However, for the 2023 UPD Study, Penn State identified an opportunity to integrate the Parking Projections Report into the full body of the UPD Study and modernize the methods that are used to monitor, calculate, and report parking supply, demand, and trends both to satisfy the external UPD requirements and to streamline the workflow and utility of the reporting activity internally. Consistent with previous parking projections report, the 2023 UPD study reports three years of parking history, one year of parking actuals, and five years of future parking projections.

The 2023 UPD study provides the following updates to this approach which satisfy elements of the codified parking projections requirements that we not previously addressed:

- Changes in UPD subdistrict boundaries affecting subdistricts 7, 8, and 11.
- Parking demand historical estimates (2019 to 2021) and projections (2023 to 2027) for staff, students (residents, commuters, and off-campus storage) and visitors.
    - Updates staff and student parking registration values to be aligned with parking software reports (for improved accuracy).
    - Updates the staff space assignment ratio from 1.10 to 1.25 to account for work from home and hybrid learning trends that have been heighted by the pandemic.

  - Updates visitor parking demand to be 15 percent of the campus population based on parking facility counts and comparable estimations at peer universities.

- Parking supply historical actual counts (2019 to 2021) and projections (2023 to 2027) for each sub-district. Quantifies total parking supply with the following available filters:
  - Within/Outside UPD Study Area.
  - By municipality (State College Borough, College Township, and Patton Township).
  - By UPD subdistrict.
  - By user type (faculty/staff, resident storage, commuter, transient/visitor).
  - By space type (ADA, service, delivery).
- List of planned projects (2019 to 2023) in each subdistrict that affect the *temporary and permanent* supply of parking.

Based on the 2023 projections, total parking supply for permit or visitor use (17,679 spaces) exceeds the projected University parking demand (15,771). This indicates that all University-generated parking needs can be accommodated within the UPD parking supply. Demand is projected to remain below the available UPD parking supply through and beyond 2027.

Curb Space Management

With the advent of transportation network companies (TNCs) and direct delivery, the "curb space" along streets has become an area of transportation conflict both on the street and on the adjacent street space (i.e., bike lanes, transit stops, sidewalk, store fronts, etc.). Based on an analysis of TNC data, the University Park streets in need of curb space management are along Shortlidge Road, Pollock Road and Bigler Road. Likely nearby destinations are the Hetzel Union Building (HUB) and Thomas Building (classrooms).

Curb space management strategies aim to reduce conflict by establishing policies, street design templates, and other controls for the most intensive demand areas. Currently, Penn State does not have a curb space management policy or plan and would benefit from the following:

- Establishment of a plan that would include an inventory of the physical curb spaces, investigation of demand data, design templates for areas with different needs, and updated policies about the intent and use of the curb space on campus.
- Regulation of campus curb space should engage users (Uber, Lyft, DoorDash, etc.) to inform them of new policies and explore the use of geofencing for the designated space. Regular contact with the most frequent users should be maintained to relay feedback and updates to the curb space policy, designations, and geography.
- Enforcement of campus curb space should engage University police and engage existing channels of communication for receiving feedback for the regular discussions with providers and users.

Baseline Transportation Analysis

The baseline transportation analysis looks at data collected in 2022 specifically for the UPD study as well as data reported in recent University-sponsored studies. The analysis responds to the UPD requirement for an assessment of the transportation "level-of-use". While the ordinance implies a focus on vehicular traffic, the UPD Study recognizes the multi-modal nature of the campus transportation system and presents level-of-use for vehicular, transit, pedestrian, bike, and emerging "micromobility" modes.

Vehicle Mode

Vehicular mode traffic encompasses motorized passenger vehicles (cars), transit buses, and other University service and delivery vehicles that function primarily on the street system. A transportation data collection

program (a.k.a., traffic counts) was completed in late-November and early-December 2022, following the Thanksgiving holiday when Penn State University and the local public schools were still in full-session. These dates were selected in coordination with PennDOT to minimize data quality impacts from the Atherton Street Improvement Project. The count locations were selected to match previous UPD studies so that comparisons could be made. The following trends and findings are noted:

- **Reductions in vehicle traffic since 2011 were broad and consistent across the network.** The downward momentum in vehicular traffic reductions noted between 2000 and 2011 was sustained to 2022. Reductions in traffic access and circulating on campus are attributed to Penn State's sustained commitment to travel demand management programs, the post COVID trend toward work-from-home policies, delivery-to-home for goods and services, ongoing social-distancing habits, and economic factors related to inflation and elevated vehicle fuel prices.
- **Increases in vehicle traffic seem related to streets and corridors with significant new land development activity.** Significant traffic increases (i.e., more than 5 percent over 2011 counts) were noted on only two roadways—Fox Hollow Road (related to new student housing in Toftrees and other growth in Patton and Benner Townships) and White Course Drive (related to the West Campus Parking Structure). Other minor increases were noted during the peak hours along University Drive and College Avenue.
- **Reductions in vehicle traffic since 2011 are evident throughout the day.** While traffic increased on a handful of streets, the 2022 vehicular volumes were lower than the 2011 volumes during all hours of the day at both Campus Gateway and On-Campus locations.
- **Reductions in daily traffic exceed commuter peak reductions on a percentage basis.** This trend suggests that peak hour employee/commuter vehicle trips have reduced more slowly than vehicle trips for other purposes, which tend to be discretionary and occur outside the peaks.
- **Road construction in the Atherton Street Corridor likely impacted traffic volumes on Atherton Street and other streets on the west side of campus.** Regardless, the broad traffic reductions elsewhere in the network suggest that some degree of traffic reduction has occurred on Atherton Street between 2011 and 2022.
- **The 2022 traffic data provided a reliable measure of traffic volumes and trends.** The 2022 data were validated against independent data collected by PennDOT both before and after the COVID-pandemic. The comparison showed consistency in the direction of change (increasing or decreasing) with some degree of variation in the volume change.

Transit Mode

Documentation of the transit mode in the 2023 UPD Transportation Study is summarized from the University's Transit Services Study prepared by Whitman Requardt and Associates, dated August 2022 with edits finalized in January 2023.

Transit at the University Park Campus encompasses transit bus services contracted through the Centre Area Transportation Authority (CATA) and shuttle services provided directly by Penn State Transportation Services. Summaries on transit ridership and volume data summaries that respond to the UPD requirements for reporting the existing "level of use" for campus transportation facilities.

Campus transit services are important for PSU's continued success with CATA providing twelve buses for the Loop and Link routes and PSU Transportation Services operating four shuttle buses. While the service is particularly effective and well-utilized, the Transit Services Study found additional efficiencies and proposes operational changes to optimize under-performing routes and segments.

The Transit Services Study provided the following conclusions about transit service and future needs:

1. There will be continued demand for improved campus transit service resulting from projected 1% annual non-resident student growth.
2. New downtown housing will continue to increase demand on the Blue and White Loops.
3. There is increasing ridership demand between the commuter parking lots on the east side of campus and the new West Deck. Suspension of the Green Link service between the commuter lots and central campus because of a lack of bus operators will result in overcrowding and missed classes for some students.
4. CATA Loop / Link routes are very productive except for the Blue Loop and Red Link between 5 a.m. to 7 a.m. and the Red Link service to Innovation Park.
5. The Campus Shuttle Beaver Avenue route is unproductive and should be repurposed.
6. The current "hybrid" service contracting approach—with CATA owning and operating the Loop/Link and Penn State owning and operating the Campus Shuttle—remains the most cost-effective for the foreseeable future.

The Transit Services Study recommendations include the following key changes:

1. Affirm the current partnership with CATA for negotiating Penn State's services and costs. The partnership may be enhanced with Penn State supporting and participating in CATA policy making. Meanwhile, Penn State and CATA would collaborate and cost-share on technology updates and integration (i.e., fare payment methods/vendors, vehicle location systems, data services, app development, etc.).
2. Revise the current commuter parking price structure by increasing permit costs to Revise commuter parking pricing (up).
3. Each year, optimize shuttle routes, stops, and timing based on an analysis of ridership data.
4. Optimize or truncate under-performing routes.
    - Sustain the Blue and White Loop routes and service, with enhancements that respond to increasing downtown housing and demand for trips to/from the campus.
    - Permanently discontinue Green Link service.
    - Truncate the Red Link at the Bryce Jordan Center Commuter Lots while increasing service to West Campus/West Deck via the Red Link and/or Campus Shuttles.
    - Repurpose the Beaver Avenue Campus Shuttle to serve Innovation Park and to replace service previously offered by the Red Link.
    - Work with transportation network companies (Uber, Lyft) to establish more cost effective, demand-responsive evening and weekend services.

Pedestrian Mode

The pedestrian mode encompasses travel via walking and other mobility-assistance devices (wheelchairs, electric carts, etc.) that utilize sidewalks and pathway networks. This section summarizes pedestrian crossing data collected in 2022 at campus intersections and other significant road crossing locations. These data summaries respond to the UPD requirements for reporting the existing "level of use" for campus transportation facilities. The following trends and findings are noted:

- **Penn State's *Guiding Principles for Campus Planning* establish the primacy of the pedestrian mode. Accommodation of all pedestrian users with diverse levels of ability or disability is a priority for Penn State.**
- **The concentration of pedestrian crossings at intersections and mid-block crossings during class change intervals and other travel peaks creates intense disruption to other modes.** The intensity of pedestrian travel observed at University Park rivals the most urban places in the United

States. Pedestrians are, by far, the largest user group, and the proverbial "mob mentality" likely creates disregard for other street users.

- **Based on data from the AM and PM Peak Travel periods, pedestrian travel on campus has increased substantially during the last ten years.** The pedestrian volume and crossing data support feedback from the UPD study stakeholders about escalating mode conflict on campus. AM peak pedestrian activity has more than doubled and PM peak activity has increased by about 20 percent since the previous UPD Study.
- **Prior to the COVID-pandemic, reportable pedestrian crashes (i.e., where one or more pedestrians were injured) were occurring at a rate of 12 to 13 per year and were concentrated in the Fall and Spring Semester months. Based on a spatial analysis of pedestrian-involved crashes, safety improvement strategies should be targeted to specific roadway segments and intersections where crash experience is noted.**

Bicycle Mode

Documentation of the bicycle mode in the 2023 UPD Transportation Study is a summary based on the Penn State University Park Bicycle Master Plan prepared by Nelson Nygaard, dated October 2023.

In 2022, Penn State University undertook a planning process that created the Penn State University Park Bicycle Master Plan. The resulting plan is based on observed biking conditions and analyses of demographic, crash, and bike travel trends. The bike planning process also engaged campus stakeholders through a series of on-campus "pop-up" engagement events and an online survey.

The study notes an increase in the use of bicycles for accessing and traveling on campus. Penn State's investments in the campus cycling experience and cycling culture are also evident through the University's Bicycle Master Plan effort, creating a shared micromobility partnership with Spin, integrating the Bike Den into the West Parking Deck, and expanding bicycle parking and commuter amenities. As a result, Penn State was designated a bronze-level Bicycle Friendly University in 2012 and reached gold level in 2022.

However, the off-street campus environment is still largely pedestrian-oriented, and some narrow campus paths do not provide enough space for accommodating the high pedestrian volumes when shared with bike riders. Meanwhile, street space is also constrained, and only a few campus streets are configured with dedicated bike facilities.

Based on observations on campus, stakeholder interviews, and pop-up engagement events, the two main issues for the University to tackle in the next phase of bikeway development are:

1. Deconflict the bike, pedestrian, and vehicle modes by providing dedicated spaces for each mode.
2. Partner with road owners to improve the safety of people biking at major campus entry points.

Existing biking facilities and operating conditions are likely a deterrent to attracting new bike riders. To address the concerns related to the physical biking network, the Bicycle Master Plan proposes a program of high priority Keystone Projects that add bike facilities to existing campus streets and create a cohesive off-street network of pathways to serve the highest demand areas of campus. The plan also identifies secondary Supporting Projects that serve lower demand areas and enhance connectivity of the campus network to the surrounding community networks.

Funding for the Bicycle Master Plan Projects has not yet been identified, but the master plan identifies a variety of funding streams and implementation strategies for building out the network. Regardless, many projects are envisioned to start as low-cost "pilot" projects for the purpose of testing before they are formalized into the campus transportation system.

Micromobility & Emerging Modes

Micromobility refers to a variety of personal mobility vehicles that are an emerging form of travel that are exceptionally popular in urban environments and college campus communities where short trips are prevalent. Vehicles include e-scooters, motorized pedal cycles (mopeds), motorized scooters (Vespa), Segways, e-bikes, and traditional pedal cycles. Micromobility represents an opportunity to extend transportation access and opportunities to people who do not have access to a car or transit service.

However, not only are micro-mode vehicles still evolving, but there are many questions about where and how the current range of vehicles fit into the transportation network. On the University Park Campus, the fast diversification of micro-modes has created spatial tension with other traditional modes and has escalated safety concerns about user behavior, vehicle speed differentials, and the lack of defined networks that can support the emerging modes. Finally, guidance and strategies for safely integrating micro-modes into campus environments are also emerging but are behind-the-curve.

PennDOT definitions and regulations for micro-mobility are well-established for certain devices, but there are gray areas for certain newer devices—e.g., electric skateboards, electric roller skates, and hoverboards.

Policies and regulations from four (4) peer universities—Maryland, Rutgers, Arkansas, and Texas A&M—were reviewed for ideas and issues that can be adopted into Penn State's approach and techniques. E-scooters and e-bikes seem to receive the greatest attention in regulations, and determining where and how these vehicles may operate and park are prominent in the policies and regulations.

Additionally, the Penn State Vehicle Code was reviewed to determine the applicability to the Penn State roadways. The PA Vehicle Code (Title 75) is applicable to "highways," which by definition also includes "a roadway open to the use of the public for vehicular travel on grounds of a college or university or public or private school or public or historical park." As such, any roadway that is open for public vehicular travel on University grounds is governed by the Vehicle Code and the associated code chapter that pertains to micromobility (Chapter 35 Special Vehicles and Pedestrians). State code provides the broadest guidance on the use of pedal cycles (human-powered or electrical assisted) but has not yet developed guidance for emerging forms of micromobility. Penn State may use Chapter 35 of the State Code as the foundation for micromobility programming and enforcement and then create or update University policies (such as the SY16 Regulations for Bicycles and Personal Mobility Devices) that provide additional regulations and prohibitions (as long as they do not conflict with State Code).

With the range of micro-modes already in use at University Park, Penn State desires strategies and policies that are informed by state regulations and can work in the University Park Campus environment with a minimal need for enforcement. This includes policy, spatial, operational, and enforcement considerations, as follows:

- Better definitions, classifications, and specific regulations for anticipated micromobility devices.
- Flexibility in instituting, evaluating, and then adjusting regulations.
- Continue tapping relationships with other universities and develop new ones with micro-mode providers when considering new policies and adjusting current regulations.
- Clarify parking regulations and designated parking areas for micro-modes.
- Develop dedicated space (or space shared only with wheeled vehicles).
- Establish public charging locations, likely in coordination with parking.
- Establish/revise fine structures for improper parking and usage.
- Ban sidewalk use entirely.
- Allow only University-owned devices on campus, which provides greater operational control.
- Establish spatial (geofencing) or time-of-day use restrictions.
- Provide incentives to commuters for training classes, helmet use, and good rider history.

Future Development Assumptions and Impact

This section of the UPD Study responds to the ordinance requirement for an assessment of transportation impacts of the University's Capital Plans and other priority development projects. Additional off-campus projects that are sponsored by municipalities or PennDOT/MPO were also identified. The potential impact of the University projects was assessed according to features that tend to add trip-making or change travel patterns—parking, added floor area, employment, visitors, and changes in access. Then, the traffic impact for each project was categorized as None, Nominal, Possible, or Likely to describe the degree of traffic impact and the type of traffic study that would be expected with land development.

For the next ten-year period, 50 discrete University projects in the UPD were identified that are or will become locatable projects that will add new facilities or renovate, change, expand existing ones. ***Only two (2) projects—the Applied Research Laboratory Master Plan at Innovation Park and the West Campus Multi-Modal Connector—are considered "Likely" to have traffic impacts that reach the level of requiring a detailed traffic study.*** These projects include significant new parking facilities, new buildings, or changes in campus access. Six (6) projects—mostly those that are early in the feasibility study and design stages—were identified as having "Possible" traffic impact, largely because the traffic impact and need for studies could not be determined until the project scale and scope are better defined. For the remaining projects, traffic impact has either already been addressed or was identified as "None" or "Nominal" traffic impact, and traffic studies should not be a factor in project development. Taken all together, the anticipated transportation impact is commensurate with the strategic philosophy and intent of the previous and current Capital Plan, which are decidedly maintenance-centric.

Transportation Demand Management

Transportation demand management (TDM) is defined as a set of strategies that help manage traveler demand while maximizing traveler choices. A successful TDM program will:

- Seek to understand the ways people travel *want* and *need* to travel.
- Identify strategies to reduce single occupancy vehicle (SOV) trips.
- Influence travelers to use alternative modes of transportation such as biking or transit.

At Penn State University, TDM is overseen by Transportation Services with a Sustainable Transportation Program Coordinator and Program Assistant tasked with strategic planning and day-to-day operations. Various other departments support the planning, deployment, and operations of TDM programs.

Penn State's TDM approach is broad-based and multi-layered, addressing the traditional modes of travel individually while also fostering innovation for new modes and ideas that cross modal boundaries. This approach includes longstanding, mature programs alongside those that are being steadily improved and others that are untested or planned and have potential for addressing a gap or emerging modes. Approximately 25 TDM "programs" can be discretely labeled, but Penn State's layered approach integrates direct-serving programs with others—such as the Loop/Link transit service and Campus Shuttle—to enable and strengthen the success of others.

Compared to peer institutions with developed TDM programs (Maryland, UNC-Chapel Hill, and Virginia Tech), Penn State's programs are more numerous and diversified, reflecting Penn State's position of national leadership in university campus TDM. Regardless, additional programs and more effective methods for implementing and developing current programs were identified, including new ideas for the post-COVID pandemic world that incentivize active transportation modes, restructure parking permit programs, and format transit services to be more demand responsive.

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Chapter 1.
Background & Purpose

1.1. The University Planned District

The University Planned District (UPD) for Penn State's University Park Campus comprises approximately 4,200 acres, which is divided into 13 sub-districts (**Figure 1.1**). All land within the UPD is owned by Penn State University. Land development within the UPD-adopting municipalities of State College Borough, College Township, and Patton Township is governed by the UPD Zoning Ordinance. UPD Sub-Districts extend into Ferguson and Benner Township, which are non-UPD-adopting municipalities, and the UPD designation is superseded by the underlying municipal zoning.

The UPD Ordinance purpose and intent states:

> *The University Planned District is designed to promote the careful planning and orderly development of the University campus, consistent with the community development goals of the Centre Region and its member municipalities as described in the Centre Region Comprehensive Plan.*[2]

1.2. Requirements for the District Plan Transportation Study

The **District Plan Transportation Study** (a.k.a., UPD Transportation Study) is a planning requirement unique to the UPD Zoning Ordinance. The study is to be prepared every tenth year to document travel trends and identify potential transportation effects of land development and transportation projects within the district during the next ten-year period. The following requirements of the District Plan Update are noted:[3]

- Parking Area Identification and Projections – Identify general size and location of parking areas within the sub-districts which are projected for use as parking areas within a 10-year period.
- Traffic Assessment – Identify the transportation systems to be studied. Existing transportation conditions for highway links and intersections serving the UPD must be described and the existing level of use analyzed. Potential transportation impacts of future parking development must be assessed for a ten-year period. Recommendations for potential system or service improvements in order to accommodate the projected transportation impacts of UPD development shall be included. When feasible, the study shall identify specific recommendations designed to reduce or avoid impacts created by campus development on existing and future residential neighborhoods.
- Internal Circulation and Facilities – Describe existing and proposed internal roads for vehicular traffic; existing and proposed connections to the public street network; plans for street openings and closings, and possible impacts on the adjoining transportation system and adjoining zoning districts; existing and proposed facilities and accommodations for public transportation, pedestrian circulation, bicycle paths and other transportation methods.
- Travel Demand Management – Include a travel demand management analysis, addressing the manner in which various methods, such as promotion of ride sharing, pedestrian/bicycle improvements, and changes to on-campus and public transportation systems, will be utilized to reduce the number of single-occupancy vehicle trips associated with future development.

[2] State College Borough Zoning Ordinance, University Planned District, Section 1201.a.
[3] State College Borough, Zoning Ordinance, University Planned District, Section 1209.

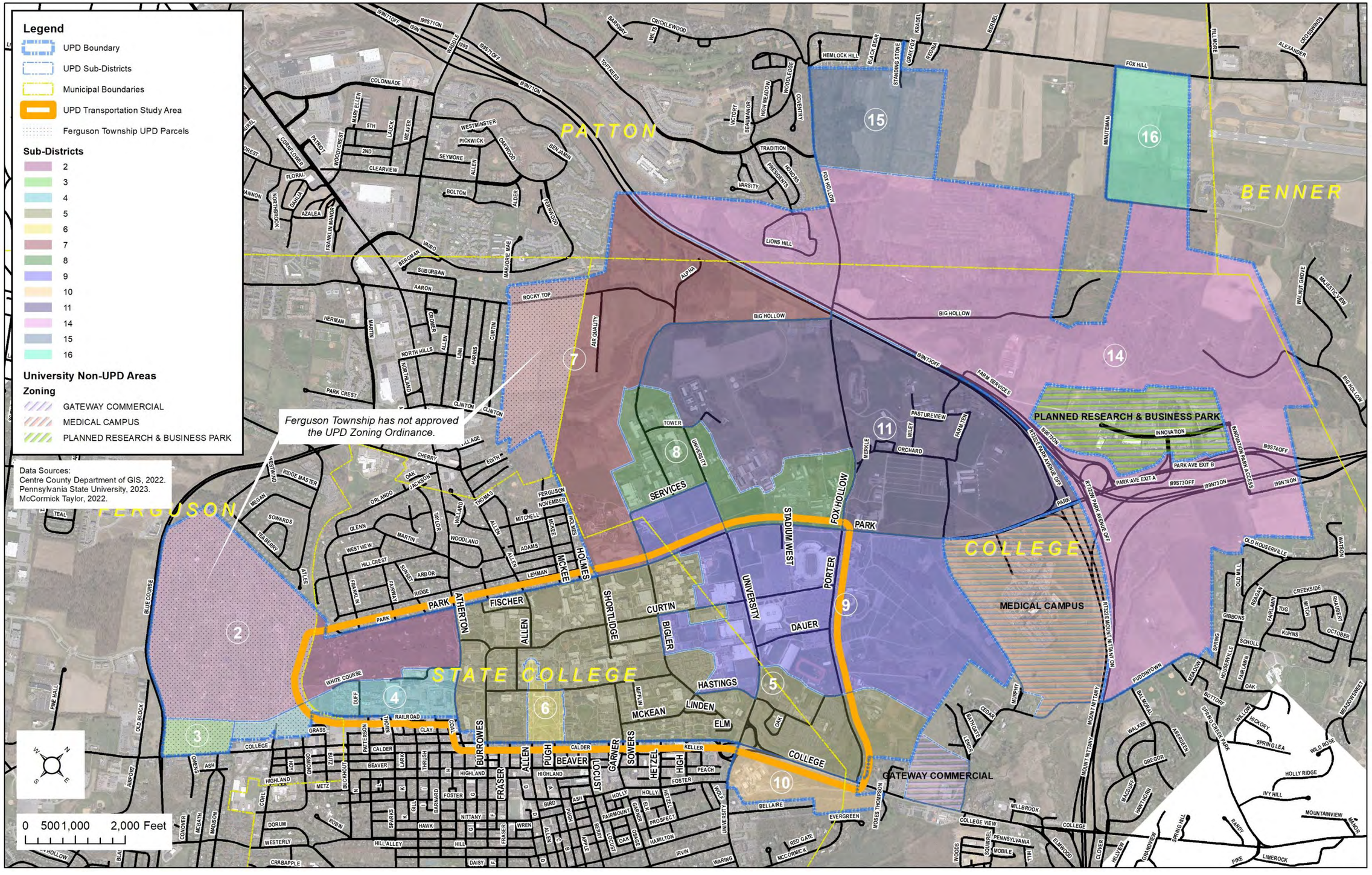


Figure 1.1. The University Park Planned District and Transportation Study Area

1.3. History of UPD Transportation Studies

Previous UPD Transportation Studies and Updates were completed in 1994, 2001, and 2013.

The 1994 *University Planned District Master Plan Traffic Study* was completed by Travers Associates in two parts. Part A provided an update to Penn State's 1988 Master Transportation Plan, and Part B provided a technical traffic study of the Master Plan Supplement update. The traffic study was largely a technical vehicle-focused forecasting and analysis activity conducted with the Quick Response System, Version 2 (QRS-II) software. The model reported performance of intersections and street links according to level-of-service letter grades, based on methods from the Highway Capacity Manual. The study also provided mapping of the UPD study area and street, bike, and pedestrian networks, as envisioned by the Master Plan update.

The 2001 *Penn State Phase 1 Transportation Study* was completed by McCormick Taylor following adoption of the 1999 University Park Master Plan (by JJR Incorporated) and 1999 Transportation Demand Management Plan (by BRW). The Phase 1 Study included a large data collection program and served as the ten-year UPD Transportation Study Update. It also provided a technical traffic analysis of certain street networking ideas recommended in the 1999 Master Plan. While the study was vehicle-focused, it contained a substantial section evaluating the transportation effects of transit recommendations from the Demand Management Plan.

The 2013 *University Planned District Transportation Study Update* was completed by McCormick Taylor specifically as the ordinance-required ten-year transportation study. The 2013 Study expanded the transportation "level-of-use" analysis to encompass the multi-modal nature of University Park's transportation system, including vehicle, transit, bike, and pedestrian modes. One key study goal was the determination of the "mode share" for the major modes serving campus. A data collection program to match the Phase 1 Study was conducted in 2011 to support the mode share analysis, and backward-looking comparisons to the 2000 data were made to check progress toward reducing vehicular travel demand for the campus.

1.4. The 2023 UPD District Plan Transportation Update

This report provides the ten-year UPD District Plan Transportation Study Update to fulfill the UPD Zoning Ordinance requirements. To match with the previous 2001 and 2013 UPD Studies, this 2023 Update includes baseline transportation data collected in 2022 and looks out to a Horizon Year of 2032, for the purposes of evaluating the transportation effects of the University's land development assumptions.

The 2023 Update looks back at level-of-use changes since the 2000 and 2011 data collection points, and also presents a forward-looking element to 2032. It presents an integrated multi-modal perspective, including new and emerging micro-mobility, curb-space management, and transportation network companies. The study is also informed by a more extensive outreach component that engaged local and regional transportation experts and stakeholders. As such this update is intended to meet and exceed the UPD ordinance requirements as a resource for the UPD-adopting municipalities.

Study Area Identification

While the Study Area for the UPD Transportation Study includes the entire zoned district, transportation analysis typically focuses on the most transportation-intensive areas of the University, including most

parts of UPD Sub-Districts 4, 5, 6 and 9 in State College Borough and College Township (orange boundary). This encompasses the traditional "Core Campus" and developing "West Campus".

Facilities and Systems Analyzed

This update assesses the "level-of-use" of the following transportation facilities and system elements within this Study Area:

Roadway Network System – The roadway system encompasses the network of state, municipal, and University roadways within the Study Area that functions as a traffic-carrying network. Some but not all driveways, access roadways, parking lots, and service areas were also investigated.

CATA Transit System – CATA operates the Loop, Link, and Regional Route public transit systems in the urbanized area of Centre County, with service generally focused in the Centre Region municipalities, but also in Bellefonte and Spring and Benner Townships. The University contracts with CATA to provide the Loop and Link services, and CATA's Regional Routes link to the University Park Campus and downtown State College as the primary hub of regional service.

University Park Shuttle Systems – The University operates shuttle systems that supplement transit services provided by CATA. Some of these shuttle routes extend beyond the Study Area but have significant transportation effects within the Study Area.

Pedestrian & Bicycle Systems – The pedestrian and bicycle facilities include crossings, gateways, shared-use paths, bike lanes, bike parks, and intermodal elements that support non-motorized travel. This investigation focuses on the transportation effects of these modes within the Study Area, as a connected element of the larger regional system.

Chapter 2.
Stakeholder Partnerships & Outreach

2.1. Stakeholder Partnerships

In order to hear multiple perspectives and better understand transportation in the University Planned District, outreach to municipal, regional, and agency stakeholders was conducted through meetings, interviews, and workshops held during development of the UPD Transportation Study.

Project Management Team

The Project Management Team (PMT) was established to provide primary oversight and execution of the UPD Planning Process. The Team functioned as a highly engaged steering committee that participated in bi-weekly status meetings, provided day-to-day project direction, and reviewed project deliverables. The Team included Penn State staff and the lead consultant team members (**Table 2.1**).

Table 2.1. Project Management Team Members

Name	Organization	Role
Kurt Coduti	Penn State University	Penn State Project Manager
Neil Sullivan	Penn State University	University Planner
Robert DeMayo*	Penn State University	Director of Transportation Services
Rick Ward	Penn State University	Associate/Interim Director of Transportation Services
David Samba	Kimley Horn	Consultant Lead
Kristin Saunders	Toole Design Group	Consultant Lead
Robert Watts	McCormick Taylor	Consultant Team Project Manager

Table Notes:
* Departed Penn State prior to adoption of the *2023 UPD Transportation Study*.

Executive Committee

The Executive Committee (**Table 2.2**) was comprised of Penn State's senior leadership with responsibility for campus planning, properties, and the physical plant infrastructure. The Executive Committee reviewed project direction and deliverables at key milestones.

Table 2.2. Executive Committee Members

Name	Title
William Sitzabee	Vice President of Facilities Management and Planning, Chief Facilities Officer
Steve Watson	Director of Planning, Design, and Properties
David Snyder	Associate Vice President for Auxiliary & Business Services
Kurt Coduti	Project Manager
Neil Sullivan	University Planner
Robert DeMayo*	Director of Transportation Services
Rick Ward	Interim Director of Transportation Services

Table Notes:
* Departed Penn State prior to adoption of the *2023 UPD Transportation Study*.

Advisory Committee

The Advisory Committee (**Table 2.3**) included stakeholders from across the Penn State Community plus regional and agency professionals with roles and expertise in transportation planning.

Table 2.3. Advisory Committee Members

Name	Organization	Role
Herb Combs	Intercollegiate Athletics	Associate Athletic Director
Jason Zajac	Police & Public Safety	Deputy Chief of Police
Tom Flynn	Planning, Design & Properties	Landscape Architect
Luke Anderson	Transportation Services	Parking Operations Manager
Jason Thomas	Transportation Services	Special Projects Manager
Rick Ward	Transportation Services	Associate/Interim Director of Transportation Services
Adway Das	Student Transportation Committee	Penn State Student
Joshua Reynolds	Student Transportation Committee	Penn State Student
Dwayne Witmer	University Access Committee	Facilities Project Coordinator
Bill Raab	Risk Management	Director of Risk Management
Meghan Hoskins	Sustainability Institute	Analysis and Planning Consultant
Bruce Smith	Buildings and Grounds	Senior Manager, Building Services
Eric Murnyak **	PennDOT District 2-0	Portfolio Manager
Chris Patterson	OPP Stores - Central Distribution/Freight	Inventory Control & Distribution Manager
Neil Sullivan	Office of Physical Plant	University Planner
Kurt Coduti	Office of Physical Plant	Project Manager
Robert DeMayo*	Transportation Services	Director of Transportation Services
James Saylor **	Centre County MPO	Director
Greg Kausch **	Centre County MPO/ CATA	Transit Planner
Dr. Andisheh Ranjbari	University Faculty	Asst. Professor, Civil & Environmental Engineering
Dr. Xianbiao Hu	University Faculty	Asst. Professor, Civil & Environmental Engineering

Table Notes:
* Departed Penn State prior to adoption of the *2023 UPD Transportation Study.*
** Regional/agency participants
CATA – Centre Area Transportation Authority
CRPA – Centre Regional Planning Agency

2.2. Workshops

The study incorporated two UPD Study Workshops at University Park. Each two-day workshop included field visits, data collection, and collaborative meetings with the Project Management Team and Advisory Committee.

Discovery Workshop – December 2022

The two-day Discovery Workshop was held over December 5-6, 2022, with meetings held at the Steam Services Building. **Figure 2.1** provides an overview of the Workshop Itinerary. The workshop emphasized the collection of input and information on the current state of campus and community transportation. During the Workshop, the consultant team conducted most of the Stakeholder Interviews and met with the Advisory Committee and Project Management Team. Meetings included "sketch map" sessions where issues, concerns, and ideas were recorded. The consultant team organized and facilitated a walking tour of campus, and several members of the Project Management Team and Advisory Committee participated.

Figure 2.1. Discovery Workshop

	Day 1	Day 2
Morning	Advisory Committee Meeting	Interviews (Consultant Team)
Afternoon	PMT Meeting	
Evening	Site Visit/Tour	

Network Solutions Workshop – March 2023

The two-day Network Design Workshop was held over March 27-28, 2023 and explored physical design ideas for the University Park Campus transportation system. Meetings were again held at the Steam Services Building. **Figure 2.2** provides an overview of the Workshop Itinerary. With the background provided during the Discovery Workshop, the consultant team facilitated "Come and See" Design Sessions to envision future campus transportation scenarios. The consultant team then facilitated a "network design session" with the Project Management Team to imagine network options that could become part of the Network Management Approach. The Team developed three options, and one of the three was selected to represent the Network Management Approach.

Figure 2.2. Network Solutions Workshop

	Day 1	Day 2
Morning	"Come and See" Design Sessions (PMT)	Advisory Committee Meeting
Afternoon	Design Session (Consultant Team)	PMT Meeting
Evening		

2.3. Interviews

The study was informed by Stakeholder Interviews that engaged additional Penn State staff and agency stakeholders who did not participate in the Advisory Committee or other project teams. Stakeholders included staff from State College Borough, College Township, and Patton Township (the UPD-adopting municipalities) as well as the PA Department of Transportation (PennDOT), Centre Regional Planning Agency (CRPA), Centre County Metropolitan Planning Organization (CCMPO), and Centre Area Transportation Authority (CATA).

The interviews were conducted during or soon after the Discovery Workshop. Seven (7) interview sessions were conducted, organized by transportation topic and/or jurisdiction (**Table 2.4**).

Table 2.4. Stakeholder Interviews

Topic	Interviewer	Date	Format
Sustainability / ADA	Kristin Saunders (T) Brittany Sink (T)	December 6, 2022	In-person
Transportation Services	Kristin Saunders (T) Brittany Sink (T)	December 6, 2022	In-person
Patton / College Townships	Kristin Saunders (T) Rob Watts(M)	December 6, 2022	In-person
State College / PSU	Brittany Sink (T) David Samba (K)	December 6, 2022	In-person
Office of Physical Plant	Kristin Saunders (T) Brittany Sink (T)	December 6, 2022	In-person
Partner Agencies	Kristin Saunders (T) David Samba (K) Rob Watts (M)	December 16, 2022	Virtual
Athletics and Recreation	Kristin Saunders (T)	December 20, 2022	Virtual

Table Notes:
Interviewer: (T) Toole Design Group; (K) Kimley-Horn; (M) McCormick Taylor

Key Findings

The following is a summary of the overlap in mission, concern, or need among the interviewed stakeholders. These areas should be considered in ongoing University transportation planning.

Common Themes:

- Class dismissal causes gridlock on campus for drivers at a few key intersections.
  - The overarching "yield to pedestrians" rule and high volume of pedestrians overwhelms crosswalks, sidewalks, and intersections during class changes.
  - Driving, biking, and walking habits increase in aggression due to the congestion.
  - The congestion delays buses and shuttles.
  - Pedestrians are prone to assuming a pedestrian-only environment and this causes conflict at campus roadway crossings and when they leave campus.
  - Bikes must share the road because sidewalks are too congested.
- People are not aware the campus shuttle can be used by anyone.
  - You do not need to be faculty or staff to use the shuttles.
  - Where they stop and their route is unclear to many.
  - The shuttle often does not come to a full stop unless they are approached.
- Some modes do not have dedicated accommodations on campus.
  - Roads do not have capacity for bikes or scooters. Sidewalks do not have capacity for bikes or scooters.
  - Campus-maintenance vehicles may not use state roads. Campus-maintenance vehicles may not use campus sidewalks.
- Places where bikes and cars, cars and pedestrians, pedestrians and bikes interact are uncomfortable without organization or adequate space.
  - Bikes coming up behind left-turning vehicles waiting for pedestrians to cross must choose which side to pass on.

  - Inconsistent bike facility standards and lack of clarity contribute to misuse.
  - Bike facilities terminating or only providing one-direction travel contributes to confusion with other modes.
  - Pathways wide enough to accommodate pedestrians and bikes or for bikes to pass pedestrians intermittently may be needed.

- Topography, stairs, connectivity, and building placement influence how bikes and pedestrians can move across campus.
  - Bikes cannot use routes with stairs.
  - Pedestrians cannot walk where there is no sidewalk or service roads.
  - Bikes and pedestrians will cross the street where a perpendicular sidewalk or driveway meets a street, and crosswalks would generally be appropriate.

Solutions

Interviewees offered ideas and potential solutions based on the themes and concerns discussed:

- Consider one-way vehicle and bus circulation on campus (deconflict).
- Build a one-stop hub for transit-choice information (transportation choice).
- Develop campus-wide mobility goals (vision unity).
- Add more off-campus to campus bicycling connections (sustainability).
- Provide more and reliable bus lines to affordable housing locations off campus (equity).
- Continue trend to move parking to exterior (deconflict).
- Improve and streamline connections between modes (transportation choice).

The project team was also informed of barriers that will need to be addressed when the plan is garnering support or proposing modifications:

- Set road layout, old growth trees, and utilities (steam tunnels).
- Historic buildings and campus aesthetic delays and sometimes limits bike facility design.
- Topography (inclines, walls, and stairs).
- Parking administration is complex and slow change may be a barrier to solutions such as dedicated space for all modes.

Chapter 3.
Parking Assessment

3.1. Introduction

Penn State's Transportation Services department manages, enforces, and collects fees for more than 18,000 parking spaces within the UPD sub-districts. The department has roles in financing, maintaining, and managing surface and structured parking. The successful execution of this responsibility and a well-managed parking system is of critical importance to the Penn State community; it allows for the safe, efficient, and convenient access of student, faculty, staff, and visitors; it allows for a right-sized approach to accommodating parking demand while moving the Penn State, incrementally, towards a more sustainable future; and it provides a structure to capitalize on university-wide athletic events that generate tens of thousands of short-term campus visitors each year.

Efficient and well-managed parking at Penn State is also of significant interest to the boroughs and townships near the University Park Campus. A well-managed Penn State parking system satisfies the university parking demand within its own boundaries, without creating undue impacts to the streets and neighborhoods of surrounding communities.

As part of the University Planned District (UPD) Ordinance, State College Borough, College Township, and Patton Township codified requirements for Penn State to prepare a *Parking Projections Report*, annually, and to prepare a *District Plan Transportation Study* every 10 years. The UPD code language in the State College Borough[4], College Township[5], and Patton Township[6] ordinances is nearly identical, as follows:

- **Parking Projections Report**. The applicant shall furnish a Parking Projections Report with the application for District Plan approval which shall show the manner in which the parking standards[7] in this section have been derived and applied. The Parking Projections Report shall indicate the current numbers of parking spaces for each category of parking users[8], a three-year projection of the number of parking spaces for each category of parking users, the methodology utilized to determine the number of spaces required (based upon demand history), and a narrative description of the assumptions and rationale upon which the methodology and current and projected number of a parking spaces are based. Every year following the approval of the District Plan, the applicant shall submit an updated Parking Projections Report in accordance with this subsection for review by the Centre Regional Planning Commission (CRPC). The parking standards set forth therein shall then become applicable to the District Plan and Narrative.

- **District Plan Transportation Study**. A district transportation study shall be submitted with the application for approval of the District Plan, and every 10th year following approval of the District Plan. The purpose of the transportation study is to generally identify the transportation impacts likely to result from projected development and activities within the District for a ten-year period.

[4] State College Borough, University Planned District, https://ecode360.com/32910964#32910964.
[5] College Township, University Planned District, https://ecode360.com/10704992#10704992.
[6] Patton Township, University Planned District, https://ecode360.com/6633586#6633586.
[7] Standards for the number of parking spaces to be provided shall be determined by historical demand for each parking user category and computed utilizing a formula that specifies the number of parking spaces to be provided for the number of persons within each category.
[8] Parking user categories include: 1) Students residing within the UPD; 2) Students who commute from a residence outside the UPD; 3) Employees; and 4) Visitors.

The transportation study shall include the following:

- Parking Area Identification and Projections. Transportation impacts within the UPD will principally arise from the location and size of parking areas within the district. **The transportation study, therefore, must identify existing parking areas, and the general size and location of areas within each subdistrict which are projected for use as parking areas within a ten-year period.**

Historically, Penn State has prepared the Parking Projections Report as a separate submittal, even within a UPD Transportation Study year. For the 2023 UPD Study, Penn State identified an opportunity to integrate the Parking Projections Report into the UPD Study and modernize the methods that are used to monitor, calculate, and report parking supply, demand, and trends both to satisfy the external UPD requirements and to streamline the workflow and utility of the reporting activity internally.

3.2. Comparison to 2013 UPD Study and Prior Parking Projection Report Methodology

The 2013 UPD Study addressed parking in the following ways:

- Identified investments, transportation projects, and development activities that would occur over the next year and alter the supply of parking.
- Provided a map and list showing parking infrastructure investments over the preceding 10 years.
- Summarized estimated event parking demand (referenced from a separate University study).
- Summarized existing and potential parking related Transportation Demand Management (TDM) programs.

The most recent Parking Projections Report (dated September 2022) consisted of a set of data summaries as shown in **Figure 3.1 and Figure 3.2.** The report included the following information:

- Parking demand historic estimates[9] (2017 to 2021) and projections (2022 to 2026) for staff, students (residents, commuters, and off-campus storage) and visitors.
- Parking supply actuals[10] (2019 to 2021) and projections (2022 to 2026) for each sub-district.
- List of planned projects (2019 to 2025) in each subdistrict that affect the supply of parking.

The 2023 UPD study provides the following updates to the previous parking projections report approach to satisfy elements of the codified parking projections requirements that were not previously addressed:

- Updates to the UPD subdistrict boundaries primarily impacting subdistricts 7, 8, and 11.
- Parking demand historical estimates (2019 to 2021) and projections (2023 to 2027) for staff, students (residents, commuters, and off-campus storage) and visitors
  - Updates staff and student parking registration values to be aligned with parking software reports (for improved accuracy).
  - Updates the staff space assignment ratio from 1.10 to 1.25 to account for work from home and hybrid learning trends that have been heighted by the pandemic.
  - Updates visitor parking demand to be 15 percent of the campus population based on parking facility counts and comparable estimations at peer universities.

[9] "Historic estimates" refer to the space demand calculations for years prior to the current parking projection report.
[10] "Actuals" refer to parking supply that has been manually verified with a parking count or similar process.

Figure 3.1. Parking Demand (2022 Parking Projections Report)

	Historic Estimates						Projected				
	2017	2018	2019	2020	2021		2022	2023	2024	2025	2026
Staff											
Employment	17137	16777	17037	20251	20063		20264	20466	20671	20878	21086
Registration	10909	11131	11400	9993	11563		11679	11795	11913	12033	12153
Registration Rate	64%	66%	67%	49%	58%		58%	58%	58%	58%	58%
Space Assignment Ratio	110%	110%	110%	110%	110%		110%	110%	110%	110%	110%
Space Demand	9917	10119	10364	9085	10512		10617	10723	10830	10939	11048
Student -- Commuter											
Non-resident enrollment	32011	31691	31804	35461	32587		32913	33242	33574	33910	34249
Registration	5011	5298	5760	3101	2850		5924	5984	6043	6104	6165
Registration Rate	16%	17%	18%	9%	9%		18%	18%	18%	18%	18%
Space Assignment Ratio	200%	200%	200%	200%	200%		200%	200%	200%	200%	200%
Space Demand	2506	2649	2880	1551	1425		2962	2992	3022	3052	3082
Student -- Resident											
Resident Enrollment	14599	14579	14919	10440	14343		13800	14000	14000	14000	14000
Registration	1648	1792	1723	1333	1723		1830	1723	1723	1723	1723
Registration Rate	11%	12%	12%	13%	12%		13%	12%	12%	12%	12%
Space Assignment Ratio	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%
Space Demand	1648	1792	1723	1333	1723		1830	1723	1723	1723	1723
Student -- Off Campus Storage											
Space Demand	1205	1205	1205	1205	1205		1805	1205	1205	1205	1205
Visitor											
Hourly/Metered Space Available	529	516	411	121	411		411	411	411	411	411
Average Daily Permits Sold	12	14	1	1	0		0	0	0	0	0
Average Daily Advance Sales	34	34	30	21	0		0	0	0	0	0
Average Daily Conf. Permits	147	134	139	71	0		0	0	0	0	0
Space Demand	722	698	581	214	411		411	411	411	411	411
Total Demand	15998	16463	16753	13387	15276		17625	17054	17191	17330	17469

Key

Staff Employment = from University Budget Factbook. (Full Time + Park Time + Casual Non-Student) - (Graduate Assistants).

Staff Demand = (Employment X Registration Rate) / Assignment Ratio

Student Commuter Demand = (Commuter Enrollment X Registration Rate) / Assignment Ratio

Student Resident Demand = (Housing Occupancy X Registration Rate / Assignment Ratio

Visitor Demand = Assigned Visitor Spaces + Average Daily Permits

Total Supply = existing inventory + Proposed Construction - Anticipated Losses

Staff Employment: Assume 1% grow th thru 2023.

Student Commuter: Assume 1% grow th thru 2023.

Hours/Metered Space Available: Increase due to less meters, able to track visitor usage

Figure 3.2. Sub-District Parking Supply and Planned Projects (2022 Parking Projections Report)

	Actual			Projected				
	2019	2020	2021	2022	2023	2024	2025	2026
Existing Supply by Sub District								
Sub District 2	195	195	195	195	195	195	195	195
Sub District 3	0	0	0	0	0	0	0	0
Sub District 4	1229	1229	2372	2372	2372	2372	2372	2372
Sub District 5	8928	9121	9007	8933	8909	8933	8841	8841
Sub District 6	31	31	31	31	31	31	31	31
Sub District 7	78	78	29	29	29	29	29	29
Sub District 8	662	662	662	662	662	662	662	662
Sub District 9	5408	5283	5288	5338	5338	5338	5338	5338
Sub District 10	74	74	74	74	74	74	74	74
Sub District 11	948	948	948	948	948	948	948	948
Sub District 14	40	40	40	40	40	40	40	40
Sub District 15	0	0	0	0	0	0	0	0
Sub District 16	0	0	0	0	0	0	0	0
Sub District Total -- adjusted for gains/losses	17593	17661	18646	18622	18598	18622	18530	18530

Planned Projects			
D-4 West Deck Construction	2021: +1658	D-5 L82 Tenor Hall	2020: +23
D-4 Red A Leonard North & South (Deck)	2019: -289	D-5 L82 Geary	2020: +21
D-4 Red A IST Construction	2020: -299	D-5 L82 Sproul	2020: +48
D-4 Red A Golf Constrction	2020: -216	D-5 YE Ferguson (Henning Done)	2021: + 35
D-5 BA Reber	2025: -92	D-5 YT Redifer Commons	2019: +23
D-5 BC Boucke Construction	2021: -114	D-5 Silver G (convert from 42)	2021: +38
D-5 BB Offline Construction	2023: -24 2024: +24	D-5 Lot 42 (reductionnow Silver G)	2021: -38
D-5 OHF Forest Resources Temp Building	2020: +101	D-7 New Art Museum	Preliminary
D-5 Green B Ford - new Oswald Tower	2022: -74	D-7 Arboretum	2021: -29
D-5 RJ Powerplant	2020: +10	D-9 Orange A Katz (Add HCP)	2021: +05
D-5 Red D Rec Hall	2020: -10	D-9 Orange F EALR/Lasch	2020: -125 2022: +50
D-5 YG Fenske Demo & Rebuild	2019: +17	D-11 Does not include OPP and Fleet Reserved/Gated spaces (492)	

- Parking supply historical actual counts (2019 to 2021) and projections (2023 to 2027) for each sub-district. Quantifies total parking supply with the following available filters:
  - Within/Outside UPD Study Area.
  - By municipality (State College Borough, College Township, and Patton Township).
  - By UPD subdistrict.
  - By user type (faculty/staff, resident storage, commuter, transient/visitor).
  - By space type (ADA, service, delivery).
- List of planned projects (2019 to 2023) in each subdistrict that affect the *temporary and permanent* supply of parking.

Consistent with previous parking projections report, the 2023 UPD study reports three years of parking history, one year of parking actuals, and five years of future parking projections. Plus, the year in which the report is submitted is considered the first future projection year given that potential changes in supply by the end of the current year have not all been reconciled at the time of report submission.

3.3. Parking Supply

Table 3-1 below shows the parking supply actuals in 2019, 2020, and in 2021 with projections through 2027. The parking supply in this table includes all space types in the UPD sub-districts (inclusive of permit, visitor, service, and delivery spaces).

Projected supply in future years is calculated by applying the temporary and permanent parking impacts from known activities and development projects as shown in **Table 3-2**. Approximately 160 parking spaces will be taken offline by 2027.

Table 3-1. Actual and Projected Parking Supply

	Actual				Reporting Year		Projected				
	2019	2020	2021		2022		2023	2024	2025	2026	2027
Supply by Sub District[11]											
Sub District 2	195	195	195		188		188	188	188	188	188
Sub District 3	0	0	0		0		0	0	0	0	0
Sub District 4	1,229	1,229	2,372		2,279		2,263	2,184	2,184	2,184	2,184
Sub District 5	8,928	9,121	9,007		8,378		7,897	8,346	8,346	8,443	8,443
Sub District 6	31	31	31		28		28	28	28	28	328
Sub District 7	78	78	29		0		0	0	0	0	0
Sub District 8	662	662	662		1,574		1,574	1,574	1,574	1,574	1,574
Sub District 9	5,408	5,283	5,288		5,336		5,328	5,338	5,398	5,363	5,363
Sub District 10	74	74	74		26		26	26	26	26	26
Sub District 11	948	948	948		472		472	472	472	472	472
Sub District 14	40	40	40		294		294	294	294	294	294
Sub District 15	0	0	0		40		0	40	40	40	40
Sub District 16	0	0	0		0		0	0	0	0	0
Sub District Total -- adjusted for gains/losses	**17,593**	**17,661**	**18,646**		**18,584**		**17,679**	**18,482**	**18,542**	**18,604**	**18,604**

[11] It should be noted that Subdistrict 1 no longer exists and Subdistricts 3, 15, and 16 have no parking areas.

Table 3-2. Temporary and Permanent Parking Impacts

Construction Project	Temporary Impact	Permanent Impact	Impact Start Date	Impact End Date	Complete Closure?
N Corl St Closure		-7	Sep-22	NA	No
Brown 11 Grubb Construction	-7	-60	Jan-23	NA	No
Red A Golf Construction	-216		Jan-20		Yes
Red A IST Construction	-299		Jan-20		Yes
Red A Machine Construction		-6	May-22	NA	Yes
Yellow A Construction		-12	Aug-22	NA	Yes
Red A Leonard North & South (Deck)	-289		Jan-19		Yes
Brown A Electrical Construction		-5	Aug-22	NA	No
Brown C Construction		-122	Jul-22	NA	No
Brown E Sparks Construction Impact		-1	Jan-23	NA	No
Green B Ford - new Oswald Tower		-60	Aug-22	NA	No
Green C Construction North		-4	Jan-23	NA	No
Green C Construction South		-4	Jan-23	NA	No
Lot 42 (reduction now Silver G)		-6	Jan-23	NA	No
Lot 81 McElwain Construction		-2	Jan-23	NA	No
Lot 82 Geary Construction		-20	Jan-22	NA	No
Red J South Construction		-6	Aug-22	NA	Yes
Silver B Impacts		-4	Mar-23	NA	No
President House Construction		-23	Jan-23	NA	No
Orange O Water Treatment Impacts		-2	Jan-23	NA	No
Orange O Field Maintenance Impacts		-4	Jan-23	NA	No
Jeffrey Field Loading Impacts		-1	Jan-23	NA	No
Lot 25 Construction		-49	May-22	NA	No
Orange F EALR/Lasch		-126	Jun-22	NA	No
Commuter Special Services Construction		-40	Jan-23	NA	No

Penn State confirms the supply of parking with the UPD sub-districts by performing periodic manual in-person and GIS-assisted parking space counts. Penn State maintains a GIS base map that contains information about each parking area, such as number of ADA spaces, service spaces, and delivery spaces and any observations that were made during the count.

Penn State also has an Online Map that overlays known construction projects with parking supply. This map provides clarity about which user types (Faculty/Staff, Student, Visitor, Service/Delivery) are allowed in which parking areas and how the primary user may change after peak weekday hours.

The 2023 UPD study used both the GIS base map and PSU Online Map to confirm the total parking supply, space type, and the available permit supply. **Table 3.3** shows the available permit or visitor parking supply by sub-district and user type. It should be noted that the available permit supply does not include service or delivery spaces. **Table 3.4** shows the total supply categorized by ADA spaces, service, and delivery spaces.

Table 3.3. Parking Supply Summary by District and User

PARKING SUPPLY SUMMARY		2022	2023	2024	2025	2026	2027
Subdistrict 2	Available Permit Supply (during year)	188	188	188	188	188	188
	Faculty/Staff	-	-	-	-	-	-
	Resident Storage	-	-	-	-	-	-
	Commuter	-	-	-	-	-	-
	Transient	188	188	188	188	188	188
Subdistrict 3	Available Permit Supply (during year)	-	-	-	-	-	-
	Faculty/Staff	-	-	-	-	-	-
	Resident Storage	-	-	-	-	-	-
	Commuter	-	-	-	-	-	-
	Transient	-	-	-	-	-	-
Subdistrict 4	Available Permit Supply (during year)	2,248	1,872	2,176	2,176	2,176	2,176
	Faculty/Staff	1,435	1,135	1,435	1,435	1,435	1,435
	Resident Storage	397	337	337	337	337	337
	Commuter	-	-	-	-	-	-
	Transient	399	399	399	399	399	399
Subdistrict 5	Available Permit Supply (during year)	8,378	7,897	8,346	8,346	8,443	8,443
	Faculty/Staff	4,804	4,393	4,759	4,759	4,806	4,806
	Resident Storage	2,653	2,599	2,646	2,646	2,646	2,646
	Commuter	8	8	8	8	8	8
	Transient	924	945	945	945	945	945
Subdistrict 6	Available Permit Supply (during year)	28	28	28	28	28	28
	Faculty/Staff	28	28	28	28	28	28
	Resident Storage	-	-	-	-	-	-
	Commuter	-	-	-	-	-	-
	Transient	-	-	-	-	-	-
Subdistrict 7	Available Permit Supply (during year)						
	Faculty/Staff						
	Resident Storage						
	Commuter						
	Transient						
Subdistrict 8	Available Permit Supply (during year)	1,574	1,574	1,574	1,574	1,574	1,574
	Faculty/Staff	1,059	1,059	1,059	1,059	1,059	1,059
	Resident Storage	-	-	-	-	-	-
	Commuter	-	-	-	-	-	-
	Transient	16	16	16	16	16	16
Subdistrict 9	Available Permit Supply (during year)	5,336	5,328	5,338	5,398	5,363	5,363
	Faculty/Staff	1,079	1,069	1,079	1,079	1,044	1,044
	Resident Storage	51	51	51	51	51	51
	Commuter	3,140	3,140	3,140	3,140	3,140	3,140
	Transient	1,077	1,077	1,077	1,077	1,077	1,077

Table 3.3. Parking Supply Summary by District and User (continued)

PARKING SUPPLY SUMMARY		2022	2023	2024	2025	2026	2027
Subdistrict 10	Available Permit Supply (during year)	26	26	26	26	26	26
	Faculty/Staff	26	26	26	26	26	26
	Resident Storage	-	-	-	-	-	-
	Commuter	-	-	-	-	-	-
	Transient	-	-	-	-	-	-
Subdistrict 11	Available Permit Supply (during year)	472	472	472	472	472	472
	Faculty/Staff	123	123	123	123	123	123
	Resident Storage	-	-	-	-	-	-
	Commuter	345	345	345	345	345	345
	Transient	4	4	4	4	4	4
Subdistrict 12	Available Permit Supply (during year)	-	-	-	-	-	-
	Faculty/Staff	-	-	-	-	-	-
	Resident Storage	-	-	-	-	-	-
	Commuter	-	-	-	-	-	-
	Transient	-	-	-	-	-	-
Subdistrict 14	Available Permit Supply (during year)	294	294	294	294	294	294
	Faculty/Staff	-	-	-	-	-	-
	Resident Storage	-	-	-	-	-	-
	Commuter	-	-	-	-	-	-
	Transient	294	294	294	294	294	294
Subdistrict 15	Available Permit Supply (during year)	40	-	40	40	40	40
	Faculty/Staff	-	-	-	-	-	-
	Resident Storage	-	-	-	-	-	-
	Commuter	40	-	40	40	40	40
	Transient	-	-	-	-	-	-

Table 3.4. Parking Supply Summary

2023 Report PARKING SUPPLY SUMMARY	Supply Count (2022)
TOTAL SPACES (at start of year)	19,099
ADA SPACES	577
SERVICE SPACES	294
DELIVERY SPACES	30
Temporary Construction Impacts	(115)
Permanent Construction Impacts (at end of year)	(76)
Total Available Permit Parking[12] (at end of year)	**18,584**

[12] Total Available Permit Parking = TOTAL SPACES – SERVICE SPACES – DELIVERY SPACES - Permanent Construction Impacts.

3.4. Parking Demand

Table 3.5 provides a full breakdown of parking demand. **Table 3.6** provides a comparison of the historic and projected parking demand estimates as reported in three different parking projection report years: 2018 (included because it had a demand calculation for 2013, the prior UPD transportation study year); 2022 (included because it is the most recent year); and 2023 (included because it is the current year). The total estimated parking demand is well below previous estimates for 2022; the impact of the pandemic on employment numbers and the growing flexibility of work from home and non-traditional work hours have contributed to a significant reduction in staff parking demand (by over 2,400 spaces).

It is noteworthy that student registration rates for parking permits have increased. This correlates to declining transit use and reduced participation in transportation demand management programs coming out of the COVID-pandemic.

The values presented in **Table 3.6** were derived as follows:

- University Faculty and Staff employment from the University Budget Book / Fall Data Digest
- Student enrollment numbers of from Housing Services
- Registered parking permits from the University's parking and permit inventory software
- Space Assignment Ratio – Percentage value reflects the planned efficiency of parking turnover (aimed to minimize empty or underutilized parking spaces). Historically this number has been 110 percent for faculty staff, 200 percent for student commuters, and 100 percent for student residents. Based on the parking analysis in the 2023 UPD Study:
    - The faculty/staff value was updated to 125 percent to account for increased flexibility, work from home, and hybrid learning that has been heightened post-pandemic.
    - The student commuter value of 200 percent was retained as appropriate because student schedules allow for flexibility and most student commuters do not park on campus every day during parking peak hours (7:30am to 4:00pm).
    - The student resident value of 100 percent was also retained as appropriate because residents are not likely to leave campus or move their vehicles during the day.
- Space Demand (On-Campus)
  = (Student Enrollment * Registration Rate) / (Space Assignment Ratio)
- Space Demand (Off-Campus) –Estimate for off campus storage based on permits sold and a space demand estimate for visitors based on a visitor to campus population ratio of 15 percent.

3.5. Parking Projections – Supply vs. Demand

The University deploys specific strategies to allocate and assign parking such that capacity is efficiently used and managed. Based on the 2023 parking projections, total supply for permit or visitor use (17,679 spaces) exceeds the projected parking demand (15,771). This indicates that, generally, all of the University's parking needs can be accommodated within the available UPD sub-district parking supply. Demand is projected to remain below the available parking supply through and beyond 2027, as presented in **Table 3.7**.

The updates to the approach to monitor and prepare the Parking Projections Report demonstrate a better alignment with the code requirements, reflect new trends in parking and campus travel behavior habits, and provide additional transparency that allow external partners to understand and recognize the adequacy of Penn State's parking supply.

Table 3.5. Parking Demand Projections

	PARKING DEMAND SUMMARY										
	Historic Demand Estimates					Report Year	Projected - Applying 1% Growth Rate to Employment/Enrollment				
YEAR	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Total Demand	15,998	16,463	16,753	13,387	15,276	15,861	15,771	15,928	16,087	16,248	16,410
Faculty/Staff											
Employment	17,137	16,777	17,037	20,251	20,063	19,947	20,146	20,348	20,551	20,757	20,964
Registration	10,909	11,131	11,400	9,993	11,563	10,285	10,388	10,492	10,597	10,703	10,810
Registration Rate	0.64	0.66	0.67	0.49	0.58	0.52	0.52	0.52	0.52	0.52	0.52
Assignment Ratio	1.10	1.10	1.10	1.10	1.10	1.25	1.25	1.25	1.25	1.25	1.25
Space Demand	9,917	10,119	10,364	9,085	10,512	8,228	8,310	8,393	8,477	8,562	8,648
Student -- Commuter											
Non-resident enrollment	32,011	31,691	31,804	35,461	32,587	33,789	34,127	34,468	34,813	35,161	35,513
Registration	5,011	5,298	5,760	3,101	2,850	6,573	6,143	6,204	6,266	6,329	6,392
Registration Rate	0.16	0.17	0.18	0.09	0.09	0.19	0.18	0.18	0.18	0.18	0.18
Assignment Ratio	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Space Demand	2,506	2,649	2,880	1,551	1,425	3,287	3,071	3,102	3,133	3,164	3,196
Student -- Resident											
Resident Enrollment	14,599	14,579	14,919	10,440	14,343	14,000	14,140	14,281	14,424	14,568	14,714
Registration	1,648	1,792	1,723	1,333	1,723	2,222	2,244	2,267	2,289	2,312	2,335
Registration Rate	0.11	0.12	0.12	0.13	0.12	0.16	0.16	0.16	0.16	0.16	0.16
Assignment Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Space Demand	1,648	1,792	1,723	1,333	1,723	2,222	2,244	2,267	2,289	2,312	2,335
Student --Off Campus Storage											
Space Demand	1,205	1,205	1,205	1,205	1,205	1,104	1,115	1,126	1,137	1,149	1,160
Visitors/ Transient											
Space Demand	722	698	581	214	411	1,020	1,030	1,040	1,050	1,060	1,070

Table 3.6. Parking Demand Comparisons

	2018 Parking Projection Report		2022 Parking Projection Report	2023 Parking Projection Report
YEAR	2013 Historic Estimate	2022 Projected Estimate	2022 Projected Estimate	2022 Projected Estimate
Total Demand	15,222	18,665	17,625	15,861
Staff				
Employment	16,703	20,658	20,264	19,947
Registration	9,816	11,514	11,679	10,285
Registration Rate	59%	56%	58%	52%
Space Assignment Ratio	110%	110%	110%	125%
Space Demand	8,924	10,467	10,617	8,228
Student -- Commuter				
Non-resident enrollment	31,376	36,174	32,913	33,789
Registration	5,782	6,511	5,924	6,573
Registration Rate	18%	18%	18%	19%
Space Assignment Ratio	200%	200%	200%	200%
Space Demand	2,891	3,256	2,962	3,287
Student -- Resident				
Resident Enrollment	14,808	13,800	13,800	14,000
Registration	2,172	1,723	1,830	2,222
Registration Rate	15%	12%	13%	16%
Space Assignment Ratio	100%	100%	100%	100%
Space Demand	2,172	1,723	1,830	2,222
Student -- Off Campus Storage				
Space Demand	784	1,205	1,805	1,104
Visitors/Transient				
Space Demand	451	411	411	1,020

Table 3.7. 2023 Parking Projections Summary

		Subdistrict	Total Available Permit Parking	Faculty/Staff	Resident Storage	Commuter	Transient
REPORT YEAR	2022	1	0	0	0	0	0
		2	188	0	0	0	188
		3	0	0	0	0	0
		4	2,248	1,435	397	0	399
		5	8,378	4,804	2,653	8	924
		6	28	28	0	0	0
		7	0	0	0	0	0
		8	1,574	1,059	0	0	16
		9	5,336	1,079	51	3,140	1,077
		10	26	26	0	0	0
		11	472	123	0	345	4
		12	0	0	0	0	0
		13	0	0	0	0	0
		14	294	0	0	0	294
		15	40	0	0	40	0
		16	0	0	0	0	0
		0	4,580	108	0	0	4,391
		Supply	**18,584**	8,554	3,101	3,533	2,902
		Demand	**15,861**	8,228	2,222	3,287	1,020
PROJECTED	2023	Supply	17,679	7,833	2,987	3,493	2,923
		Demand	15,771	8,310	2,244	3,071	1,030
	2024	Supply	18,482	8,509	3,034	3,533	2,923
		Demand	15,928	8,393	2,267	3,102	1,040
	2025	Supply	18,542	8,509	3,034	3,533	2,923
		Demand	16,087	8,477	2,289	3,133	1,050
	2026	Supply	18,604	8,521	3,034	3,533	2,923
		Demand	16,248	8,562	2,312	3,164	1,060
	2027	Supply	18,604	8,521	3,034	3,533	2,923
		Demand	16,410	8,648	2,335	3,196	1,070

3.6. Curb Space Management

Curb space management (a.k.a., curbside management) is the practice of collecting data on and documenting existing curb space to optimize, allocate, and manage the facilities to improve mobility, safety, and access for a variety of users. Curb space uses can include, but are not limited to, parking and/or vehicle storage, transportation network companies (TNCs) like Uber and Lyft, transit, pedestrians, bicyclists, and micromobility users, service vehicles, emergency services, local businesses, and streetscapes, parklets, and green infrastructure (**Figure 3.3**).

Figure 3.3. Potential Curb Space Functions[13]

Curb space is used by different groups, including pedestrians, bicyclists, micromobility users, commuters, service and delivery drivers, and rideshare and transit users, in a variety of ways on Penn State's campus. Successful curb space management can aid in creating a more balanced transportation system by creating and designating space for all users along travel corridors, which in turn reduces conflicts, improves safety, and increases accessibility to promote a healthier campus.

Current Curb Space Environment

Existing curb space uses on campus include service and delivery zones, loading zones, informal pick-up and drop-off areas, and pedestrian zones. The service and delivery zones on campus consist of allocated spaces in parking lots and, in some cases, along the curb that provide designated space for drivers. The University currently implements loading zones to allocate space for faculty and staff. These zones are subject to a 15-minute loading period in any parking lot. TNCs, which are rideshare services such as Uber and Lyft, currently operate within and around campus in an informal manner. Pick-up and drop-off locations are currently not regulated by the University/OPP.

[13] Institute of Transportation Engineers (ITE), https://www.ite.org/technical-resources/topics/complete-streets/curbside-management-resources.

Conflicts and Competing Uses

Curb space management strategies can be effective in reducing conflict areas in travel ways, improve first- and last-mile relationships between TNCs, existing transit, and active transportation systems. Shared transitional space between the roadway and sidewalk can and does create conflicts between drivers and active transportation users.

At University Park, there are conflicts with the designated delivery and service zones, loading zones, and pick-up and drop-off zones. While there are existing designated delivery and service zones, enforcement of these zones and the time limit is a challenge for OPP. Delivery service providers, which include UPS, Fed Ex, and Pepsi, often incorrectly use the curbside space during their stops instead of using the designated delivery spaces that the campus has provided. Primary service space constraints on campus exist at Old Main and Rec Hall. Currently, University parking enforcement does not have the capacity to regularly enforce curbside use. TNCs using the curb space for pick-up and drop-off services often forces cyclists and vehicles to travel into other lanes to avoid the independent vehicle.

Key Curb Space Locations

Figure 3.4 portrays data extracted from the nationwide personal travel simulations prepared by Replica. The graphic identifies areas with according to trip destination associated with rideshare services—including transportation network companies like Uber and Lyft. While these are not the only curb space

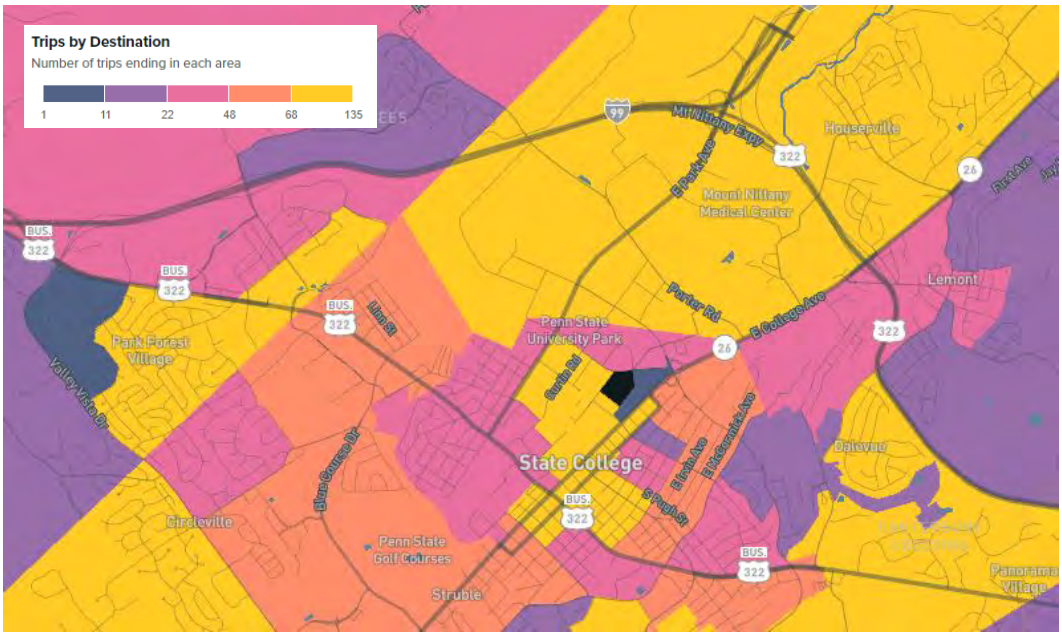


Figure 3.4. Rideshare Destination Demand in and around University Park[14]

users on the campus, anecdotal information indicates that they are a significant contributor to curb space use and street operations problems during pick-up and drop-off. The data was used as a starting point for identifying and putting into perspective the current curb space demand.

[14] Replica data, Rideshare Services Data as accessed by license, August 2023, https://www.replicahq.com/.

Using rideshare demand from Replica as a surrogate for curb space demand, the most intensive campus streets in need of curb space management are along Shortlidge Road, Pollock Road and Bigler Road. Likely nearby destinations are the Hetzel Union Building (HUB) and Thomas Building (classrooms).

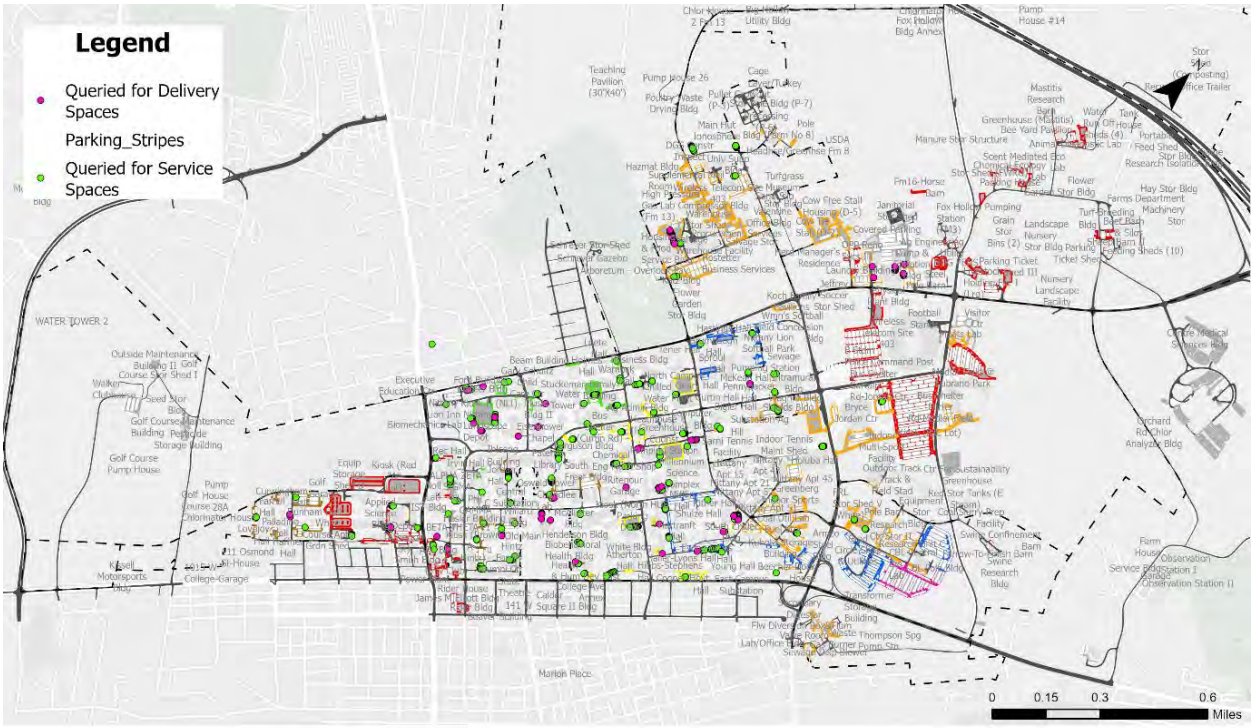


Figure 3.5. Delivery and Services Parking Space Locations within the UPD[15]

Table 3.8. Delivery and Service Parking Spaces by UPD Subdistrict[16]

UPD Subdistrict	Delivery Spaces	Service Spaces
02	0	0
03	0	0
04	4	17
05	42	266
06	3	2
07	0	0
08	14	18
09	0	16
10	0	0
11	14	0
14	0	0
15	0	0
16	0	0

[15] Pennsylvania State University, Office of Physical Plant, 2023.
[16] Pennsylvania State University, Office of Physical Plant, 2023.

Peer Review and State of the Practice

Designating space for deliveries, creating loading/unloading zones, formalizing drop-off zones, and creating more commercial spaces are all practices that have been and are currently being used at peer universities. Several of the peer institutions—including Ohio State University (OSU), Colorado State University (CSU), and University of Utah (Utah)—have integrated rideshare strategies with parking and curb space management. These peer institutions have successfully created incentive-based rideshare programs throughout their campuses via partnerships with Lyft and Uber. These partnerships include creating designated pick-up and drop-off locations (a.k.a., geofencing) on campus to better manage the curb space.

Curbside Opportunities and Recommendations

Curb space management strategies aim to reduce conflict by establishing policies, street design templates, and other controls for the most intensive demand areas. Currently, TNCs like Uber and Lyft are operating on-campus and in the adjacent municipalities. Penn State does not currently have a formalized curb space management policy or plan but would benefit from creating one.

There are both opportunities and challenges in partnerships and cooperation with TNCs, like Uber and Lyft. For a geofence to work, both need the geofenced boundaries to be set to ensure compliance in their apps. Plus, maintenance and coordination of physical signage for wayfinding and placemaking at the geofenced zones is needed to tell users that they are in the correct place for rideshare pick-up/drop-off. Formalizing TNC zones as part of the defined curb space (signage, painted curb treatments, etc.) improve safety, reduce conflicts, and increase mobility for a variety of users.

Additional opportunities include:

- Leveraging curbside functions based on the day and time.
- Automated enforcement.
- Creating "Flex Zones" – flexible areas designed to accommodate different right-of-way functions along segments of the roadway.
    - This can include combining commercial and passenger loading areas, conversion of a peak-period travel lane to off-peak parking or loading, or converting on-street parking to parklets, loading zones, and curb extensions.
- Relocating loading and delivery zones.
- Demand based pricing and priority parking programs.
- Bus bulbs, curb extensions, and parklets.
- Shuttle and transit management.
- Bicycle and shared mobility device storage.

Recommendations include:

- Establishment of a plan that would include an inventory of the physical curb spaces, investigation of demand data, design templates for areas with different needs, and updated policies about the intent and use of the curb space on campus.
- Regulation of campus curb space should engage users (Uber, Lyft, Doordash, etc.) to inform them of new policies and explore the use of geofencing for the designated space. Regular contact with the most frequent users should be maintained to relay feedback and updates to the curb space policy, designations, and geography.
- Enforcement of campus curb space should engage University police and engage existing channels of communication for receiving feedback for the regular discussions with providers and users.

Chapter 4.
Baseline Transportation Analysis

The analysis of transportation data collected in 2022 demonstrates the baseline condition and level-of-use of the transportation system in the vicinity of the University Park campus. The following five (5) sub-sections detail the major travel modes serving the campus:

4.1. Vehicular Mode

Vehicular mode traffic encompasses motorized passenger vehicles (cars), transit buses, and other University service and delivery vehicles that function primarily on the street system. Transit vehicles, as motorized traffic, are counted as vehicular traffic for the purposes of analyzing "level-of-use". Section 4.2 provides a more operational perspective on transit routes, stops, ridership, and system performance.

The collected vehicular traffic data and analysis respond to the UPD requirements for reporting the "level of use" for vehicular traffic. The evaluations of 2022 vehicular volumes include backward-looking comparisons to the data collected for previous 2011 and 2000 UPD studies, for a perspective on the University's progress toward the intent and purposes of the UPD. Namely, to manage and reduce personal vehicular traffic, avoid adverse community traffic impacts (congestion, crashes), and implement successful travel demand management programs.

Data Collection

Transportation data collection (a.k.a., traffic counting) was completed during the week of November 28, 2022 to December 2, 2022 when Penn State University and the local public schools were in full-session. These dates were selected in coordination with PennDOT to minimize data quality impacts from the Atherton Street Improvement Project. Construction operations were scaled back in advance of the Thanksgiving Holiday, and only limited "as needed" work was performed after Thanksgiving. Based the construction planning information, the data collection conducted as follows:

- ***Monday and Tuesday, November 28 and 29, 2022*** – Sewer line installation and base restoration work required lane closures at the College Avenue/Atherton Street intersection. No data were collected on College Avenue or Atherton Street during these dates. Instead, data was collected at locations on the eastern side of campus.
- ***Wednesday and Thursday, November 30 and December 1, 2022*** – Work was planned for the Westerly Parkway/Atherton Street intersection. Data collection on College Avenue and Atherton Street (deferred from earlier in the week) was conducted during these dates.

McCormick Taylor contracted with Imperial Traffic Data Collection (ITDC) to perform the data collection program at 47 locations using video count technology (Miovision). Many locations were the same as previous UPD studies, with additional locations added in new development areas (West Campus, etc.).

At 12 of the locations, video data were collected continuously for 24-hours, to obtain both daily and peak period traffic data. At the remaining 35 locations, 12-hours were collected from 6:30 AM to 6:30 PM, spanning the morning and evening commuter peaks, daytime traffic activity. The data identified vehicles by class (motorcycles, cars, buses, single-unit trucks, and heavy trucks) and counted bicycles on the road and pedestrians and bicycles crossing the road. Observations of vehicle queueing (stacking) were recorded at intersections where vehicle congestion is common.

For the purposes of the UPD study, the 47 data collection locations were placed into groups, according to their place in the network and the nature of traffic carried.

Benchmark, Gateway, and Primary intersection locations that coincide with those studied in the 2001 and 2013 UPD studies. Data from these locations serve as indicators of system-wide and historical changes in traffic volumes and patterns. In UPD terms, these counts describe the overall "level of use" of the transportation system.

Eight (8) Benchmark Locations:

1. Atherton Street & Park Avenue (Q)
2. University Drive & WB College Avenue Ramps (Q)
3. Atherton Street & College Avenue (Q)
4. University Drive & EB College Avenue Ramps (Q)
5. Atherton Street & Beaver Avenue (Q)
6. Park Avenue & Porter Road/Fox Hollow Road (*Q)
7. University Drive & Park Avenue (*Q)
8. College Avenue & Porter Road

Ten (10) Campus Gateway Locations:

1. Atherton Street & Curtin Road (*Q)
2. Park Avenue & Bigler Road (*Q)
3. Atherton Street & White Course Drive (Q)
4. University Drive & Curtin Road
5. Park Avenue & Fischer Road
6. University Drive & Hastings Road (*)
7. Park Avenue and Allen Road (Q)
8. College Avenue & Burrowes Road (*Q)
9. Park Avenue and Shortlidge Road (*)
10. College Avenue & Shortlidge Road (*Q)

Nine (9) Primary On-Campus Locations:

1. Curtin Road & Burrowes Road
2. Pollock Road & Burrowes Road
3. Curtin Road & Allen Road (*)
4. Pollock Road & Shortlidge Road
5. Curtin Road & Shortlidge Road
6. Pollock Road & Bigler Road (*)
7. Curtin Road & Bigler Road (*)
8. Bigler Road & Hastings Road/McKean Road
9. Curtin Road & Porter Road (*)

Targeted locations that parallel the 10-year Campus Development Plan and Scenario-Oriented Analysis. These locations were identified by the Project Management Team and provide context for assessing the transportation effects of the Campus Development Plan.

Twenty (20) Targeted Locations

1. Park Avenue & Stadium West Driveway
2. Curtin Road & Commuter Drive
3. University Drive & Dauer Drive
4. Commuter Drive & Dauer Drive
5. Porter Road & Dauer Drive
6. Porter Road & Hastings Road
7. College Avenue & Buckhout Street
8. Atherton Street & Railroad Avenue
9. College Avenue & Barnard Street
10. Barnard Street & Railroad Avenue
11. Park Avenue & Softball Park
12. Curtin Road & IM Building/Wagner Building
13. Park Avenue & East Halls Driveway
14. Bigler Road & East Deck Egress
15. Allen Road & Fischer Road
16. Pollock Road & Henderson Road
17. Curtin Road Crossing @ Transit Center
18. Curtin Road Crossing @ Forum Building
19. Burrowes Road & Steam Road
20. University Drive Crossing @ Stadium West

Location Notes

* = 24-hour count location
Q = Queue observations
\# = Roadway crossing

Campus-Wide Daily Traffic

Figure 4.1 illustrates the 2011 daily traffic volumes (24-hour, two-way totals) collected for the previous UPD Study. Gradations of traffic volume are indicated by the box size and outline color. The lowest volumes have a black outline, middle range volumes in orange, and the highest volumes in red. As expected, the highest volumes were recorded on the peripheral arterial streets (Atherton Street, Park Avenue, University Drive). The lowest volumes were recorded on certain gateway streets on the north side of campus (Allen Road and Shortlidge Road) and peripheral streets to the east (Porter Road and Curtin Road). Middle range volumes were recorded within the core of campus, where volume is relatively balanced across the primary on-campus streets. This indicates an efficient network where traffic is distributed and is not likely to overwhelm the street capacity at any particular point.

Figure 4.2 illustrates the 2022 daily traffic volumes with the percent change since 2011, by roadway corridor. Where a corridor had two or more counts, the percentage reflects data from all count locations. The following significant trends were noted:

- Overall, reductions in daily traffic were noted for the on-campus corridors and the immediate surrounding community streets, including Atherton Street, Park Avenue, and University Drive.
- The reduction on Atherton Street was likely influenced by construction work on the Atherton Street Improvement Project. Drivers were in the habit of avoiding this section of Atherton Street during Fall 2022 when lane closures caused significant travel delay. The decrease on Curtin Road between Atherton Street and Burrowes Road is likely related to Atherton Street.
- In general, traffic volume reductions on the east side of campus (University Drive, Park Avenue) were lower than on the west side of campus and in the range of 10-20 percent.
- A moderate increase on Fox Hollow Road north of Park Avenue is likely associated with new student housing in the Toftrees planned community in Patton Township. Between 2011 and 2022, 1,714 new student housing beds were added in The Station, The Valley, The View, and The Grove housing complexes along Toftrees Avenue, which connects directly to Fox Hollow Road.
- The significant reduction on Porter Road south of Curtin Road reflects reduced use of commuter parking adjacent to the Bryce Jordan Center. During and following the COVID-pandemic, Penn State Transportation Services staff implemented parking policy changes that permitted more student and commuter parking in more central lots and decks that were underutilized.
- On-campus roadways experienced consistent vehicle traffic reductions of 20-30 percent between 2011 and 2022.

Figure 4.1. Total 2011 Daily Traffic Volume by Location

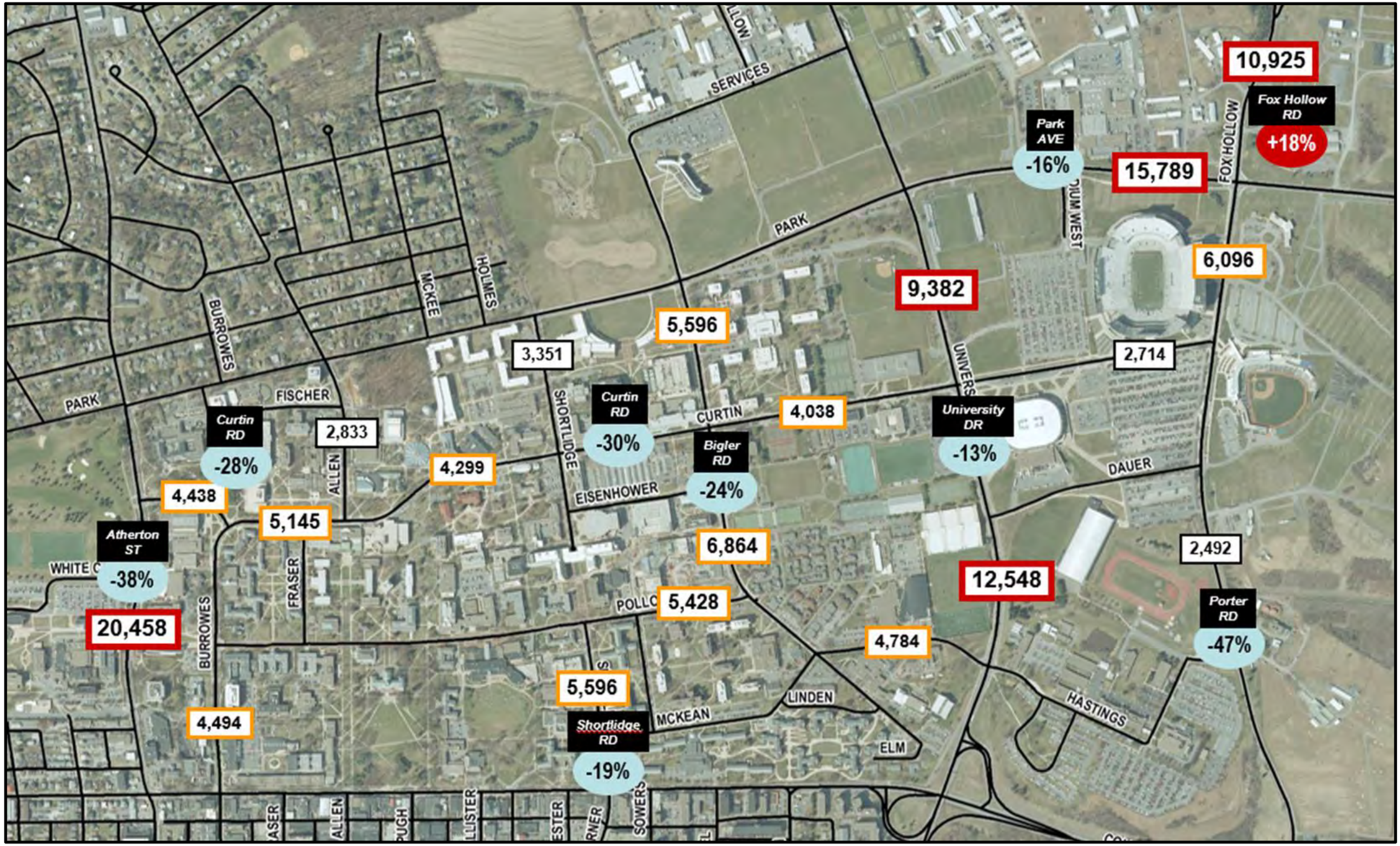


Figure 4.2. Total 2022 Daily Traffic Volume by Location, with Volume Change (2011-2022)

Daily traffic trends for volume and hourly variation were evaluated using samples of data from 2000, 2011, and 2022 at the locations noted in **Figure 2**. Two different sets of locations were evaluated:

- **Campus Gateway Locations** – These nine (9) locations (*) were sampled around the edges of Core Campus to reflect the dynamics of traffic accessing the campus.
- **On-Campus Locations** – These three (3) locations (#) were sampled within the Core Campus to reflect the traffic dynamics of circulating and cross-campus traffic.

Campus Gateway Trends

Figure 4.3 illustrates the total volume of daily traffic at the nine gateway locations and the trend from 2000 to 2011 to 2022. Traffic volumes have been decreasing since 2000. Traffic data collected in 2022 demonstrates a 21 percent decrease since 2011 and a 24 percent decrease since 2000.

Figure 4.4 illustrates the hourly variation in traffic volumes by hour throughout the day at the nine gateway locations. Volume data from 2022 (yellow) is compared to volumes for the same nine locations observed in 2011 (green) and 2000 (blue). The general shapes of all three curves are consistent in the tails with discernable spikes in the AM, Midday, and PM hours. The daily peak is around 5:00 PM. However, the hourly volumes were much more similar between 2000 and 2011. In 2022, the hourly volumes were noticeably lower.

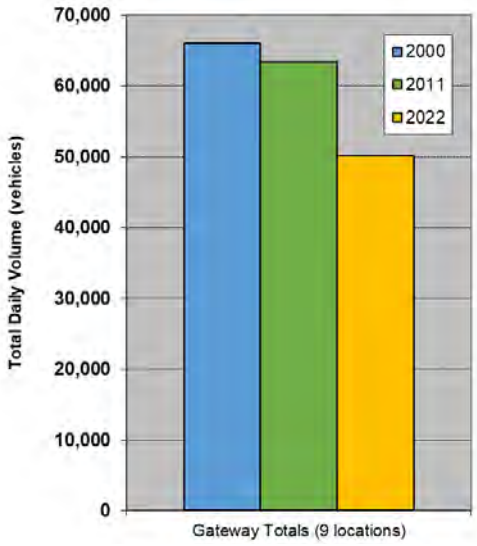


Figure 4.3. Total Daily Traffic on Campus Gateway Streets, 2000 vs. 2011 vs. 2022

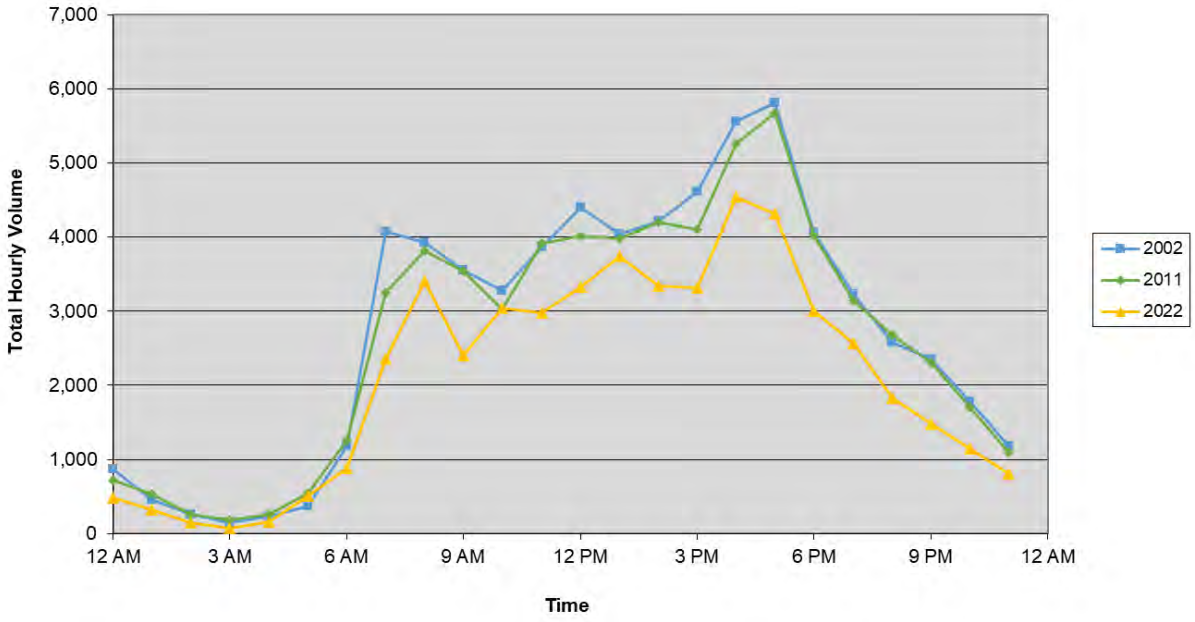


Figure 4.4. Intra-Day Hourly Variations in Traffic Volume on Campus Gateway Streets, 2000 vs. 2011 vs. 2022

On-Campus Traffic

Figure 4.5 illustrates the total daily traffic observed at three on-campus locations and the trend in traffic volume from 2000 to 2022. The 30 percent increase in traffic between 2000 and 2011 reflects the count locations and the impact of the Shortlidge Road Closure (2005). This change shifted traffic from Shortlidge Road to Pollock Road and Bigler Road and resulted in significant volume increases on both streets. Volumes on Curtin Road increased from 2000 to 2011 then decreased from 2011 to 2022. Overall, On-Campus volumes decreased by about 4 percent between 2000 and 2022.

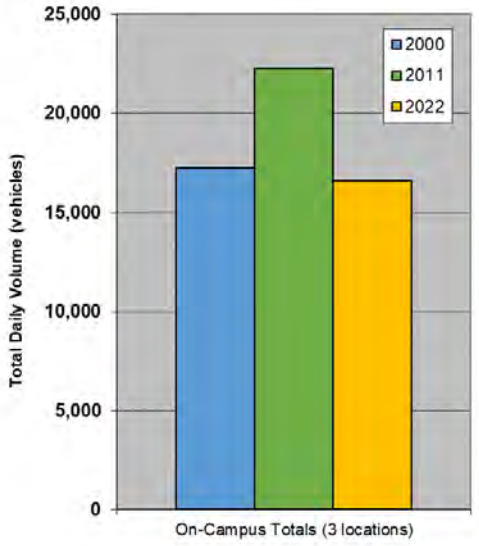


Figure 4.5. Total Daily Traffic on Campus Gateway Streets, 2000 vs. 2011 vs. 2022

Figure 4.6 illustrates the hourly variation in traffic volumes by hour throughout the day at the three on-campus locations. Volume data from 2022 (yellow) is compared to volumes for the same nine locations observed in 2011 (green) and 2000 (blue).

Interestingly the hourly volumes and curve shapes were similar for 2022 and 2000, with 2011 volumes being noticeably higher. The general shapes of all three curves are consistent in the tails with volumes rising throughout the day to the daily peak around 5:00 PM. Otherwise, the AM and Midday peaks are more muted at the on-campus locations, and during the daytime hours (7:00 AM to 5:00 PM), the curves each have unique hourly trends, with spikes and valleys often in distinctly different hours of the day.

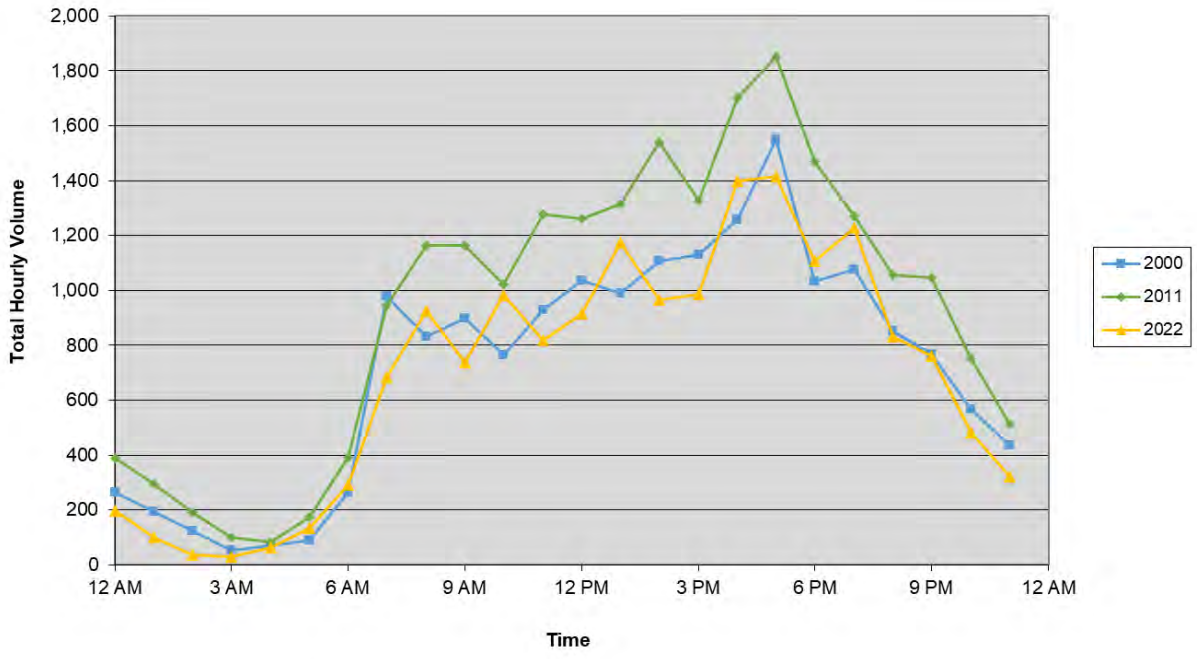


Figure 4.6. Intra-Day Hourly Variations in Traffic Volume on On-Campus Streets, 2000 vs. 2011 vs. 2022

Peak Period Traffic

The following sections examine vehicular traffic level-of-use during the peak traffic periods—typically between 6:00 AM to 9:00 AM for the AM peak period, and 3:00 PM to 6:00 PM for the PM peak period. For this evaluation, the peak periods were selected to be two hours long—including the peak hour and 30 minutes before and after the peak hour. The two-hour AM and PM peak period traffic volumes were summarized by intersection, and the intersections were divided into the following categories to evaluate level-of-use trends:

- Benchmark Intersections
- Gateway Intersections
- Primary On-Campus Intersections

The evaluation looks at each category separately, then provides an evaluation of "Total Campus Access," as a comprehensive measure of motorized traffic accessing the University Park Campus.

Benchmark Intersections – Regional Level-of-Use

The following eight intersections were designated as Benchmark Intersections for sampling the regional level-of-use for the transportation network. They are along the edges of the University Park Campus, and traffic reflects a mix of University and community travel activity. The level-of-use at these locations provide a community perspective on traffic activity and changes over time.

5. Atherton Street & Park Avenue
6. Atherton Street & College Avenue
7. Atherton Street & Beaver Avenue
8. University Drive & Park Avenue
9. University Drive & College Avenue WB Ramps
10. University Drive & College Avenue EB Ramps
11. Porter Road/Fox Hollow Road & Park Avenue
12. Porter Road & College Avenue

The bar graphs in **Figure 4.9** provide side-by-side comparisons of the 2000, 2011 and 2022 traffic data collected at the Benchmark Intersections during the AM and PM peak periods.

Overall, a net volume decreases of about 14 percent was observed during the 2022 AM peak period from 2011, and a decrease of about 18 percent was observed during the PM peak period, which translates to a net decrease of about 3,500 vehicles in the AM and 6,600 vehicles in the PM. Taking the AM and PM Peak Period volumes together, the composite peak period traffic volumes **decreased by approximately 16 percent** between 2011 and 2022.

The volume decrease was not uniform across all of the benchmark locations. The group of intersections along Atherton Street (west of the campus core) experienced a combined decrease of 22 percent in the AM and 21 percent in the PM. Intersections east of the campus core (Park Avenue and College Avenue) were more stable, with volumes increased at one intersection. However, overall these intersections also experienced a combined decrease of 8 percent in the AM and 15 percent in the PM. The one location that experienced an increase was the University Drive/College Avenue Ramps interchange, comprised of the University Drive and College Avenue Ramps Eastbound (EB) and Westbound (WB). AM peak period traffic increased by about 6 percent, while volumes decreased during the PM peak. The increase during the AM peak may be associated with the 3,518 new student housing beds in Downtown State College. The vehicular route to the commuter parking lots near Beaver Stadium runs through these intersections. Traffic diverted from Atherton Street to avoid the construction zones may also contribute to the increases.

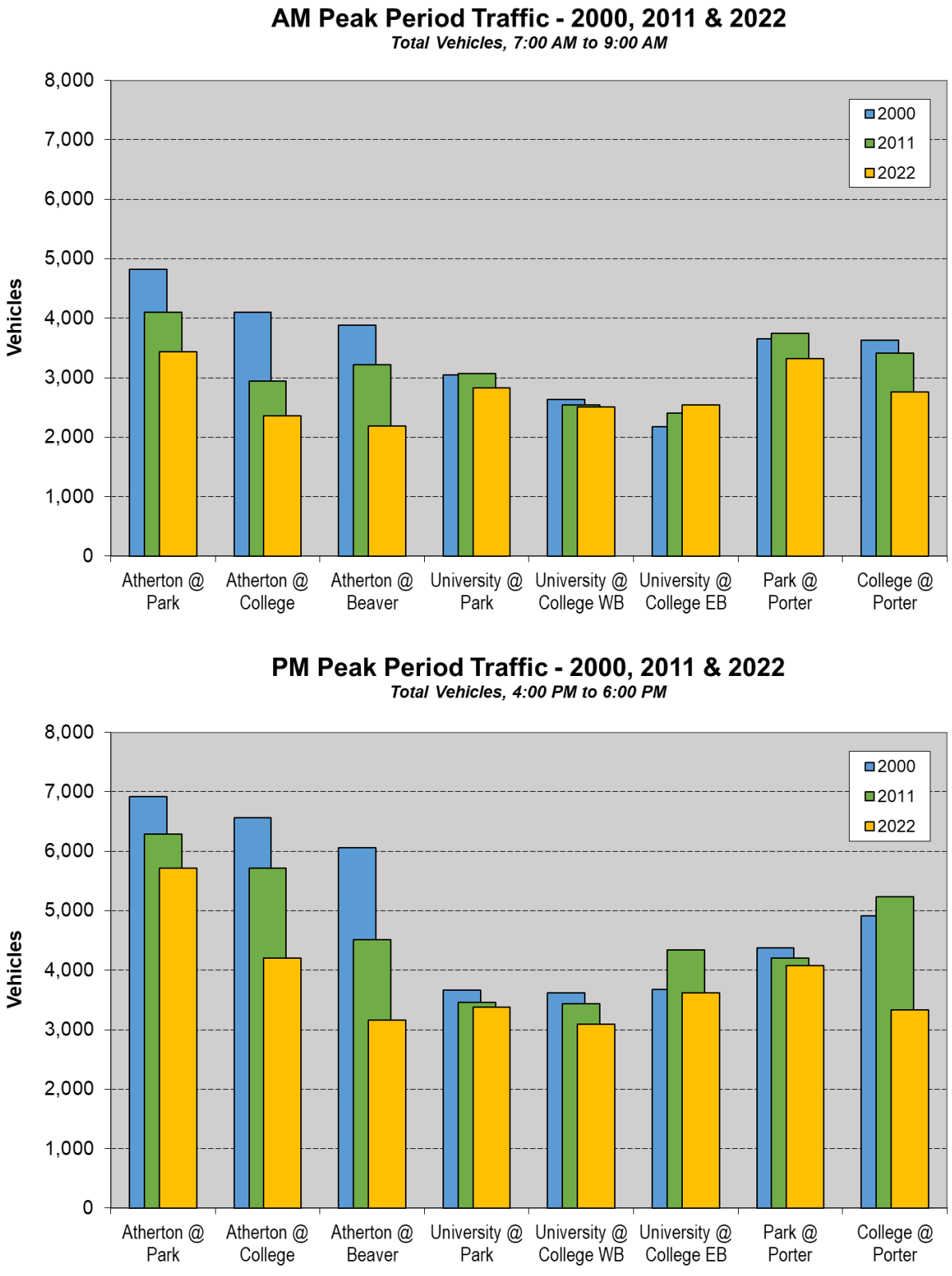


Figure 4.9. Peak Hour Vehicular Traffic at Benchmark Intersections, 2000 & 2011 vs. 2022

Gateway Intersections – Campus Access Level-of-Use

The following nine intersections were designated as Gateway Intersections for sampling the level-of-use associated specifically with access to the core of the University Park Campus. They link the surrounding community streets to the University-owned campus network. The traffic accessing campus provide a gauge for traffic activity changes associated exclusively with the University Park Campus.

1. Atherton Street & Curtin Road
2. Fischer Road & Park Avenue
3. Burrowes Road & College Avenue
4. Allen Road & Park Avenue
5. Shortlidge Road & Park Avenue
6. Bigler Road & Park Avenue
7. Shortlidge Road & College Avenue
8. University Drive & Curtin Road
9. University Drive & Hastings Road

The bar graphs in **Figure 4.10** provide side-by-side comparisons of the 2000, 2011 and 2022 traffic data collected at the Gateway Intersections during the AM and PM peak periods. The volumes only include vehicles entering or exiting the campus.

Overall, a net volume decrease of about **14 percent** was observed in the 2022 AM peak period from 2011 and a net decrease of about **12 percent** was observed in the PM peak period. Taking the AM and PM Peak Period volumes together, the composite peak period traffic volumes **decreased by approximately 11 percent** between 2011 and 2022. Again, the local trend toward decreased traffic activity is consistent with trends at larger geographic levels. The decreasing traffic trends are consistent with the Benchmark Intersections. Both the Gateway and Benchmark intersections saw a similar decrease in traffic activity during the AM peak period (on a percentage basis), but a greater percentage decrease was observed at the Benchmark Intersections during the PM peak period. This difference between the Gateways and Benchmarks indicates that, while much of the traffic reduction in the system can be attributed to the University, a portion is associated with other community and regional influences.

The volume changes were not uniform across all intersections. In the AM peak period, most intersections experienced a decrease in traffic volume, ranging from a 6 to 30 percent. However, for the intersection of University Drive and Hastings Road, an increase of 12 percent was observed. Ths increase is likely related to the increased student housing in the downtowns area, similar to the increase observed at the University Drive/College Avenue interchange. Most of the Gateway intersections also saw a decrease in volume during the PM peak period, ranging from a 11 percent decrease to a 22 percent decrease. However, in the PM peak there were two intersections that experienced an increase in traffic volumes. The PM peak increase at Fisher Road/Park Avenue (+28 percent), while large as a percentage was relatively small in total volume (about 80 vehicles). This location mostly carries traffic to/from the Nittany Parking Deck. The PM peak increase at Bigler Road at Park Avenue (+12 percent) amounted to about 130 vehicles, likely associated with the East Parking Deck.

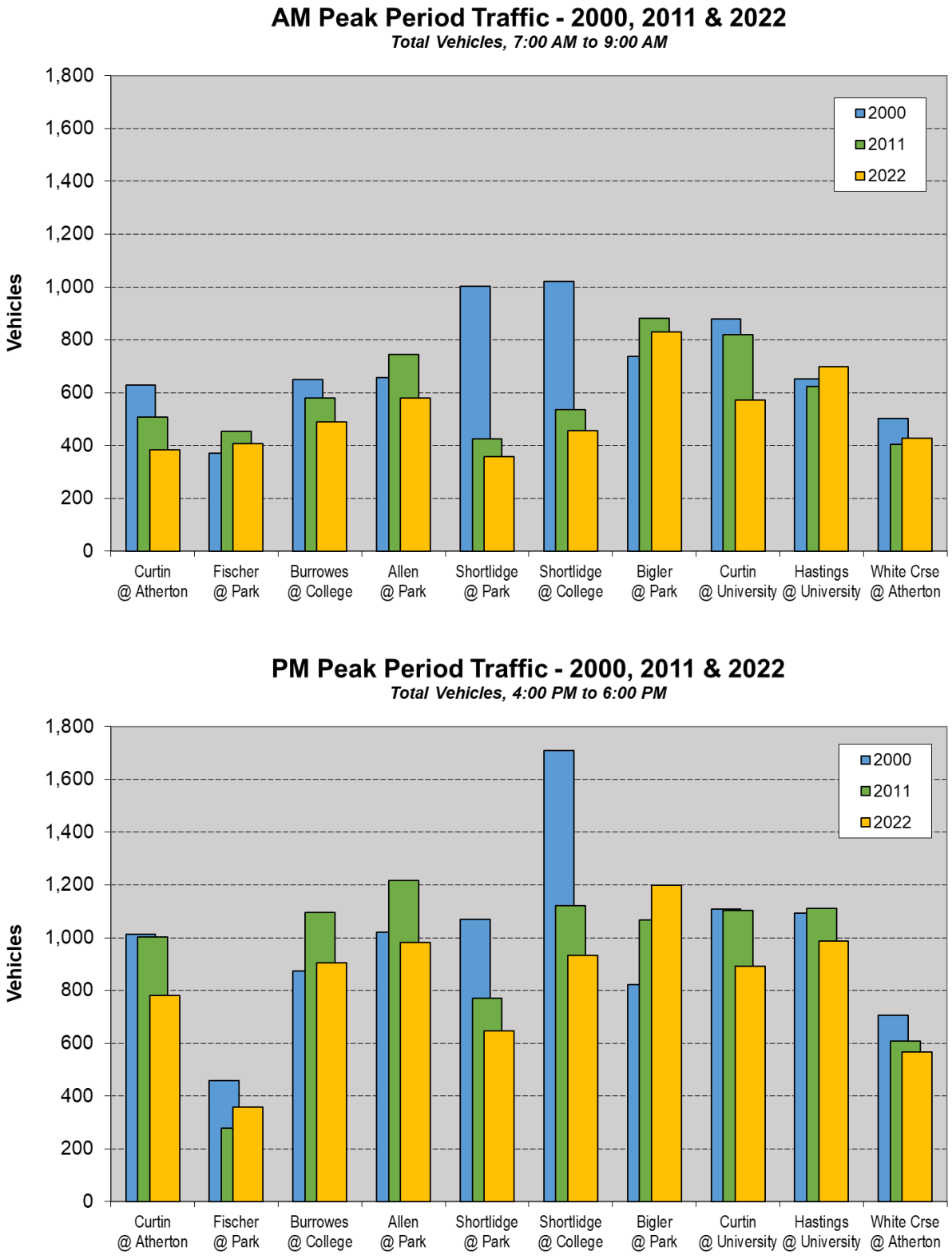


Figure 4.10. Peak Hour Vehicular Traffic Accessing Core Campus by Gateway, 2000 & 2011 vs. 2022

On-Campus Intersections – Campus Circulation Level-of-Use

The following eleven intersections were designated as Primary On-Campus Intersections for sampling the level-of-use internal to the University Park Campus roadway system. They are exclusively within the University-owned roadway network, and the total traffic volumes are an indicator of internal traffic activity within the University Park Campus.

1. Burrowes Road & Curtin Road
2. Burrowes Road & Pollock Road
3. Allen Road & Fischer Road
4. Allen Road & Curtin Road
5. Shortlidge Road & Curtin Road
6. Shortlidge Road & Pollock Road
7. Bigler Road & Curtin Road
8. Bigler Road & Pollock Road
9. Bigler Road & Hasting Road/McKean Road

The bar graphs in **Figure 4.12** provide side-by-side comparisons of the 2000, 2011, and 2022 vehicular traffic counted at the Primary On-Campus Intersections during the AM and PM peak periods.

Overall, a net volume decrease of about **13 percent** was observed in the AM peak period and a net decrease of about **14 percent** was observed in the PM peak period. Taking the AM and PM Peak Period volumes together, the composite peak period traffic volumes **decreased by approximately 14 percent** between 2011 and 2022. Between 2011 and 2022, all except one of the intersections experienced decreases in volumes. The increase at the Burrowes Road/Curtin Road intersection (+39 percent) appears to be an outlier that may indicate an issue in the 2011 count. The 2022 volumes are consistent with adjacent intersections.

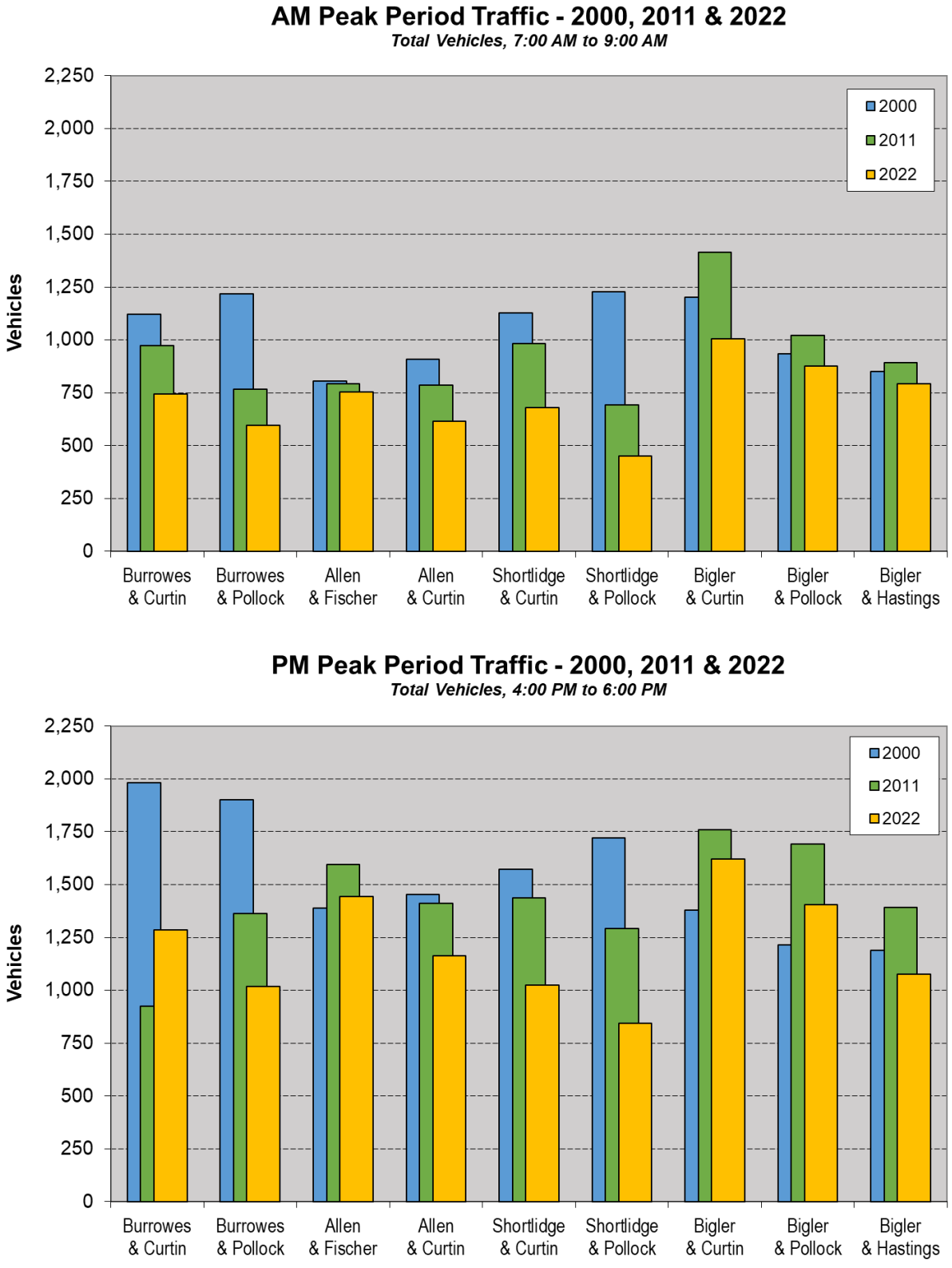


Figure 4.12. Vehicular Traffic at Primary On-Campus Intersections, 2000 & 2011 vs. 2022

Vehicle Mode Summary

- **Reductions in vehicle traffic since 2011 were broad and consistent across the network.**

  The downward momentum in vehicular traffic reductions noted between 2000 and 2011 was sustained to 2022. Reductions in traffic access and circulating on campus are attributed to:

  - Penn State's commitment to sustaining and expanding travel demand management (TDM) strategies—particularly investments that shift travel away from single-occupant, personal vehicles and incentivize alternative modes.
  - Macro trends toward remote work enabled by technology and employer practices that emerged during and following the COVID-pandemic. Penn State's formalization of "work-from-home" policies allow employees to eliminate daily trips to campus.
  - Online and delivery-to-home services (goods, tele-medicine, etc.) that were created and expanded during and following the COVID-pandemic.
  - Ongoing social-distancing and separation for personal health protection, which results in minimizing discretionary trip-making to crowded places.
  - Economic factors related to inflation and elevated vehicle fuel prices, which tend to suppress discretionary trip-making.

  IMPACT OF ATHERTON STREET CONSTRUCTION – Ongoing road work in the Atherton Street Corridor likely impacted traffic volumes on Atherton Street and other streets on the west side of campus in November and December 2022. Regardless, the broad traffic reductions elsewhere in the network suggest reductions on Atherton Street as well.

- **Increases in vehicle traffic seem related to streets and corridors with significant new land development activity.**

  Significant traffic increases (i.e., more than 5 percent over 2011 counts) were noted on only two roadways:

  - The increase on Fox Hollow Road (daily traffic analysis) reflects 1,714 new student housing beds in The Station, Valley, View, and Grove along Toftrees Avenue. Residential and commercial growth in Patton and Benner Township are also likely contributors.
  - The increase at the Atherton Street/White Course Drive intersection (peak hour gateway analysis) reflects consolidation of employee and visitor parking into the West Campus Parking Deck and building construction activity on West Campus.

  Other small increases are limited to a few intersections, and the increase is only evident during the AM or PM peak hour. For instance, the increases at the University Drive/College Avenue intersections and the University Drive/Hastings Road intersection during the AM peak, are likely associated with the 3,518 new student housing beds in Downtown State College. The vehicular route to the commuter parking lots near Beaver Stadium runs through these intersections.

- **Reductions in vehicle traffic since 2011 are evident throughout the day.**

  While traffic increased on a few streets, the 2022 vehicular traffic volumes were lower than the 2011 volumes during all hours of the day for both Campus Gateway and On-Campus locations.

- **Reductions in daily traffic exceed commuter peak reductions <u>on a percentage basis</u>.**

  This trend suggests that employee/commuter vehicle trips are being reduced more slowly than vehicle trips for other purposes. However, this trend may also be affected by the count dates.

The amount of On-Campus vehicular traffic activity in November 2022 dropped off quickly after 7:00 PM, whereas significant traffic activity in April 2011 extended past 9:00 PM.

Validation of UPD Traffic Volume Trends

Daily traffic data collected independently by PennDOT and made available through the Traffic Information Repository website (TIRe) was extracted to validate the traffic volume trends on state-owned roadways near the University Park Campus. **Table 4.3** summarizes the daily traffic volumes from PennDOT at four locations where post-COVID counts after January 2022 were available AND UPD counts were available for comparison. To screen out construction-related impacts of the Atherton Street Improvement Project, counts from 2016 and earlier were selected.

Table 4.3. PennDOT Traffic Data Summary and Comparison to UPD Traffic Volume Trends [17]

Location	PennDOT Traffic Data *Daily Traffic Volume*		PennDOT Data Trend	UPD Data Trend (2011-2022)
	Pre-COVID	Post-COVID		
Park Avenue Btw Porter Road & Orchard Road	17,118 W, 9/26/12	13,911 T, 3/29/22	- 18.7%	- 16%
University Drive Btw Curtin Road & Hastings Road	14,840 W, 11/16/16	13,055 W, 10/05/22	- 12.0%	- 13%
Atherton Street Btw Park Avenue & College Avenue	27,044 R, 11/07/13	21,753 W, 10/05/22	- 19.6%	- 38%
Fox Hollow Road Btw Toftrees Avenue & Big Hollow Road	9,553 T, 11/15/16	10,040 T, 3/29/22	+ 5.1%	+ 18%

Notes:

Day of the week notation: T = Tuesday; W = Wednesday, R = Thursday

The following observations are noted on the comparison of UPD and PennDOT traffic data:

- According to the comparison PennDOT and UPD data trends, there is general consistency in the corridor trends (whether increasing or decreasing), with some variation in the degree of the traffic volume change.
- The trends for Park Avenue and University Drive are remarkably similar, although the PennDOT count data from March and October 2022, respectively, was consistently higher than the UPD data collected in November 2022.
- For Atherton Street, the UPD data shows a larger decrease for 2011 to 2022, vs. 2013 to 2022 for the PennDOT data. However, the data from November 2022 for the UPD study (20,458) generally agrees with the PennDOT data from October 2022 (21,753), which provides assurance on the accuracy of the 2022 counts.
- For Fox Hollow Road, the UPD data shows a larger increase for 2011 to 2022, vs. 2016 to 2022 for the PennDOT data. It is likely that the larger time span in the UPD data accounts for the difference. The data from November 2022 for the UPD study (10,925) generally agrees with the PennDOT data from March 2022 (10,040).

[17] Pennsylvania Department of Transportation (PennDOT), Traffic Information Repository (TIRe), https://gis.penndot.gov/TIRe, as accessed February 2023.

4.2. Transit Mode (Transit Services Study Synopsis)

The following synopsis is a summary of the University's Transit Services Study prepared by Whitman Requardt and Associates, dated August 2022 with edits finalized in January 2023.

Transit at the University Park Campus encompasses transit bus services contracted through the Centre Area Transportation Authority (CATA) and shuttle services provided directly by Penn State Transportation Services. Summaries on transit ridership and volume data summaries that respond to the UPD requirements for reporting the existing "level of use" for campus transportation facilities.

Campus transit services are important for PSU's continued success with CATA providing twelve buses for the Loop / Link routes and PSU Transportation Services operating four shuttle buses. While the service is particularly effective and well-utilized, the Transit Services Study found additional efficiencies and proposes operational changes to optimize under-performing routes and segments.

Transit Network – Defining the Network

Loop and Link Service

The University Park on-campus transit services are operated with a hybrid service model where PSU Transportation Services operates two campus shuttle routes with four peak shuttle buses and CATA operates four campus Loop / Link routes with 12 peak full sized transit buses. The Blue Loop, White Loop, Red Link, and Green Link routes are depicted in **Figure 4.13**.

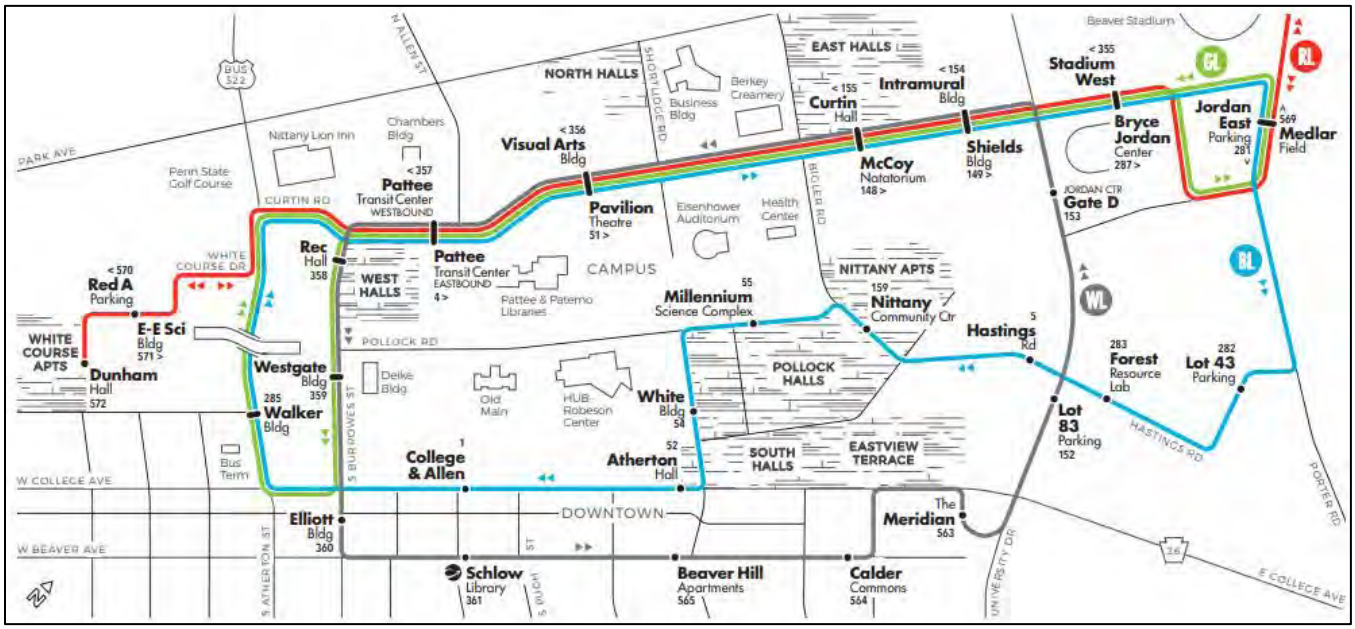


Figure 4.13. CATA Bus Loop and Link Campus Service, Spring 2022[18]

[18] Centre Area Transportation Authority, www.CATABUS.com. As presented in the *Penn State University Park Transit Services Study*, August 2022, Figure 8, page 12.

Annual ridership on CATABUS Campus Service comprises almost half of CATA's total Campus and Community annual ridership combined (**Table 4.4**). The total fiscal year ridership for Campus Service decreased by almost 11% from FY15 to FY19, while non-campus CATABUS Community Service decreased by 14% during the same time.

Table 4.4. CATABUS Ridership[19]

Route	FY15	FY16	FY17	FY18	FY19	Change FY15 to FY19
Blue Loop	1,391,955	1,313,548	1,284,067	1,191,527	1,200,106	-13.8%
White Loop	1,526,435	1,394,150	1,332,976	1,350,914	1,406,509	-7.9%
Red Link	437,641	419,419	430,178	366,991	379,919	-13.2%
Green Link	206,855	194,100	191,967	194,284	195,761	-5.4%
Campus Total	3,562,886	3,321,217	3,239,188	3,103,716	3,182,295	-10.7%
Non-Campus	3,760,658	3,734,111	3,674,829	3,401,035	3,230,944	-14.1%
CATA Total	7,323,544	7,055,328	6,914,017	6,504,751	6,413,239	-12.4%
Campus % of Total	48.6%	47.1%	46.8%	47.7%	49.6%	

Campus Shuttle

As shown in **Figure 4.14**[20], the Campus Shuttle via College Avenue operates a clockwise route every 15 minutes from Downtown through campus while the Campus Shuttle via Beaver Avenue operates a counterclockwise route every 20 minutes. The services are important for inter-campus travel as they connect facilities not served by the CATA Loop / Link routes including the Physical Plant, Ag Research, Dairy Barns, Law School and the future Palmer Museum with central campus and downtown.

Figure 4.14. Campus Shuttle, Spring 2022 [20]

[19] PennDOT, *CATA System Performance Reports*, 2015, 2016, 2017, 2018, and 2019. As presented in the *Penn State University Park Transit Services Study*, August 2022, Table 8, page 13.

[20] Penn State Transportation Services, www.transportation.psu.edu/buses-and-shuttles. As presented in the *Penn State University Park Transit Services Study*, August 2022, Figure 6, page 11.

Service Evaluation

The WRA Transit Services Study performed a service evaluation of ridership, boardings at bus stops, route length, headway, employment areas, and major transfer points of the Loop and Link and Shuttle Service Routes identified in **Figure 4.15**, based on recent data collected by CATA.

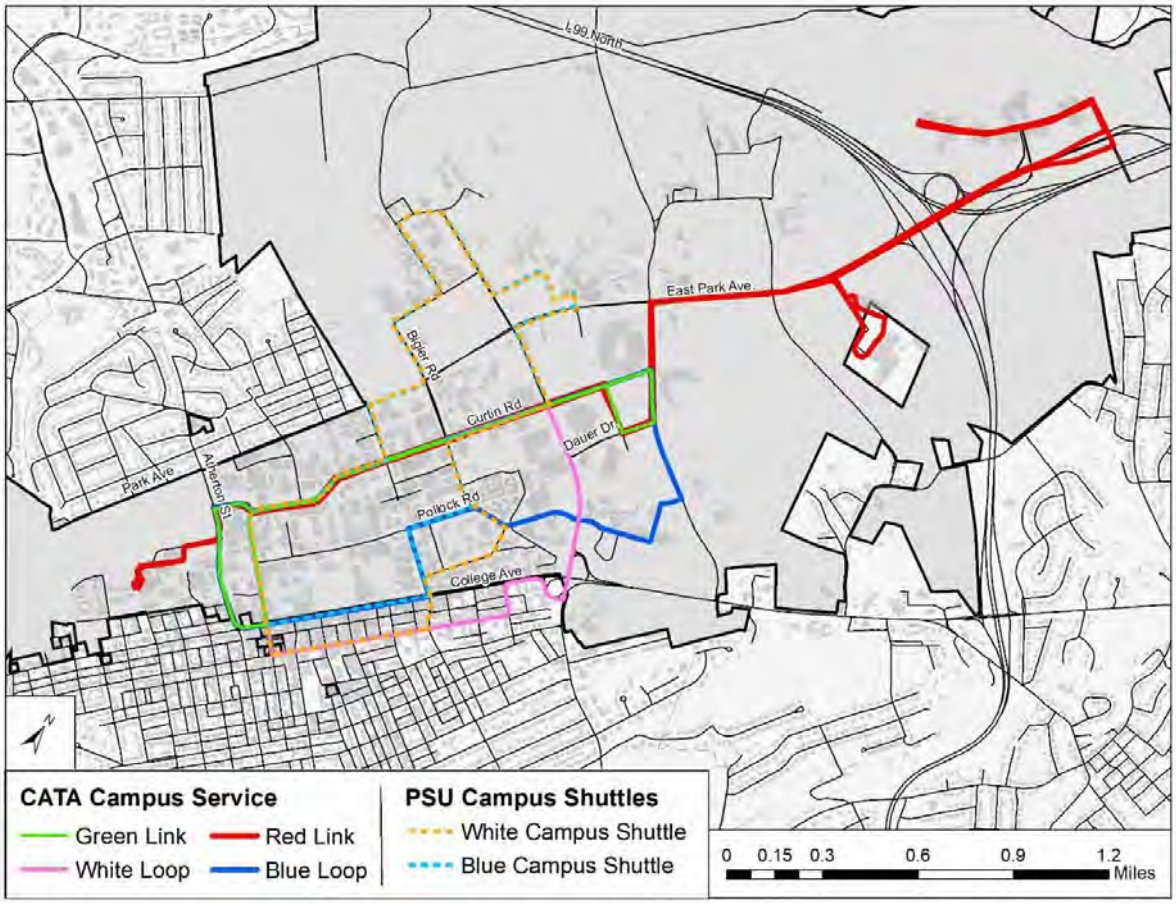


Figure 4.15. All Campus Transit Systems & Routes, Spring 2022[21]

Performance by Day of Week

Table 4.5 presents the Loop / Link service performance by day of the week based on school in session periods. The table compares Fall 2019 and Fall 2021 ridership, cost per ride and rides per revenue hour. On weekdays the White Loop has the highest ridership. The Red Link has the lowest performance as measured by rides, rides per revenue hour and cost per ride. On Saturdays and Sundays the Red Link has very low ridership for a college community.

[21] *Penn State University Park Transit Services Study*, August 2022, Figure 20, page 21.

Table 4.5. Loop/Link Service Performance by Day of the Week [22]

Service		Daily Revenue Hours	Daily Cost	Rides		Cost per Ride		Rides / Revenue Hour	
Day	Fall / Year	2021	2021	2019	2021	2019	2021	2019	2021
Weekday	Red Link	47.83	$3,771	2,045	1,251	$1.84	$3.01	43	26
	Blue Loop	44.08	$3,482	4,705	3,543	$0.74	$0.98	107	80
	White Loop	48.03	$3,716	6,810	4,338	$0.55	$0.86	142	90
	Green Link	21.25	$1,639	1,458	1,410	$1.12	$1.16	69	66
	Total	161.20	$12,607	15,018	10,542	$0.84	$1.20	93	65
Saturday	Red Link	14.92	$1,155	66	132	$17.49	$8.75	4	9
	Blue Loop	22.83	$1,769	1,708	1,269	$1.04	$1.39	75	56
	White Loop	35.23	$2,741	4,182	3,481	$0.66	$0.79	119	99
	Total	72.98	$5,665	5,956	4,882	$0.95	$1.16	82	67
Sunday	Red Link	11.58	$894	49	129	$18.24	$6.93	4	11
	Blue Loop	15.92	$1,233	1,346	703	$0.92	$1.75	85	44
	White Loop	15.10	$1,169	2,528	1,075	$0.46	$1.09	167	71
	Total	42.60	$3,296	3,923	1,907	$0.84	$1.73	92	45

PSU Campus Shuttle Evaluation

Two PSU Campus Shuttle routes operate from 8 a.m. to 6 p.m. weekdays while school is in session. Campus Shuttle ridership for the July to December period from 2019 through 2021 is compared in **Table 4.6**. The COVID-19 pandemic during the Fall 2020 and 2021 greatly affected ridership and productivity in terms of rides per revenue hour and cost per ride. During the Fall of 2022, ridership is expected to return to the 2019 level.

Table 4.6. Campus Shuttle Evaluation – Fall Semester 2019 to 2021 [23]

	College Avenue Campus Shuttle				Beaver Avenue Campus Shuttle			
Year - July to December	Average Daily Rides	Daily Revenue Hours	Rides / Revenue Hour	Estimated Cost / Ride	Average Daily Rides	Daily Revenue Hours	Rides / Revenue Hour	Estimated Cost / Ride
2019	289	22	13.2	$ 5.05	105	21.5	4.9	$ 13.60
2020	22	22	1.0	$ 66.63	15	21.5	0.7	$ 951.86
2021	117	22	5.3	$ 12.57	54	21.5	2.5	$ 26.65

[22] *Penn State University Park Transit Services Study*, August 2022, Table 17, page 26.
[23] *Penn State University Park Transit Services Study*, August 2022, Table 18, page 27.

Future Conditions

Composition and Population Through 2025 the total population of University Park is anticipated to grow by just over 4% or by approximately 1% annually. Population projections were not available beyond the fall of 2025. **Figure 4.16** illustrates the breakdown of planned growth between faculty/staff and students through 2025.

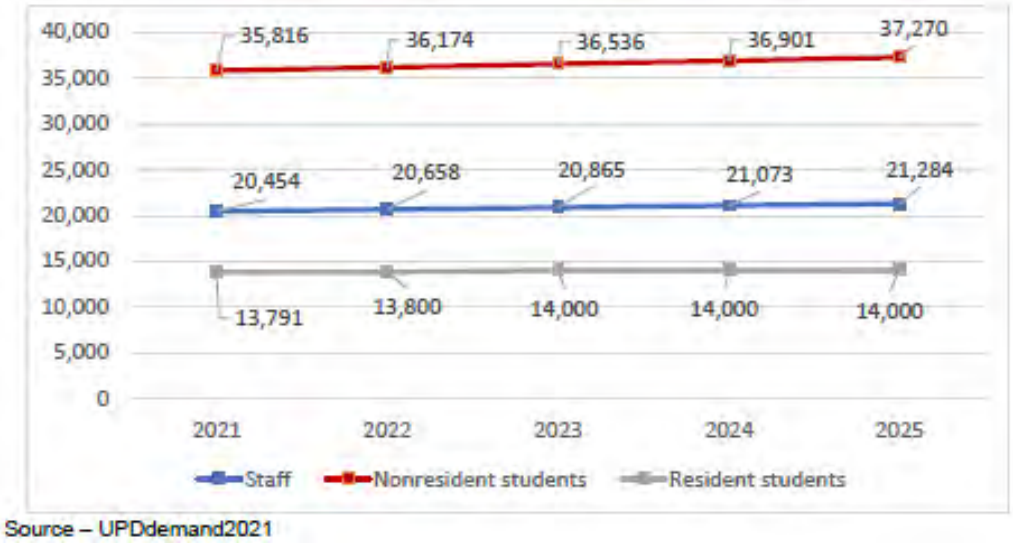


Figure 4.16. Total Campus Population, 2021-2025 [24]

Service Recommendations

The WRA Study recommended two service enhancements beginning with the Fall 2023 Semester. The Red Link is recommended to be truncated at the commuter lots to increase the number of trips and passenger capacity through campus between the West Deck and commuter lots as shown in **Figure 4.17**. This change replaces the need to re-start the Green Link which was recommended to be permanently discontinued.

The Beaver Avenue Campus Shuttle would be repurposed as shown in **Figure 4.18** as the Innovation Park Campus Shuttle. It would operate three buses from 7 a.m. until 8 p.m. and replace the portion of the current Red Link that provides service to Innovation Park. A Lyft Ride Smart zone is proposed for trips between central campus and Innovation Park during evenings and weekends. The WRA resulting projection of service hours is depicted in **Table 4.7**.

[24] *Penn State University Park Transit Services Study*, August 2022, Figure 27, page 28.

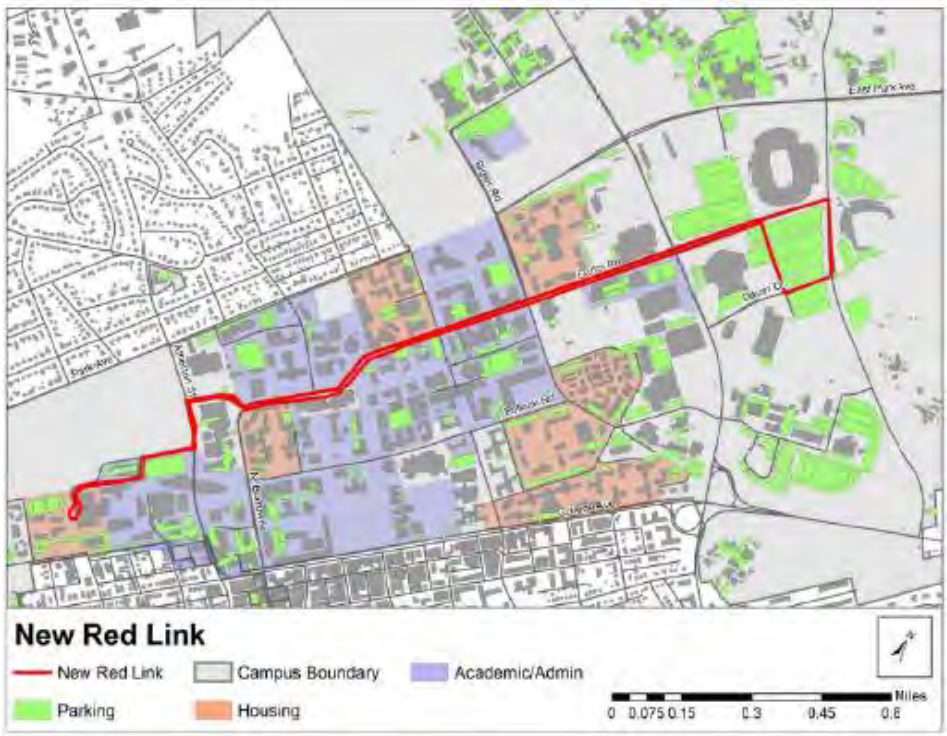


Figure 4.17. Proposed Red Link, Fall 2023 [25]

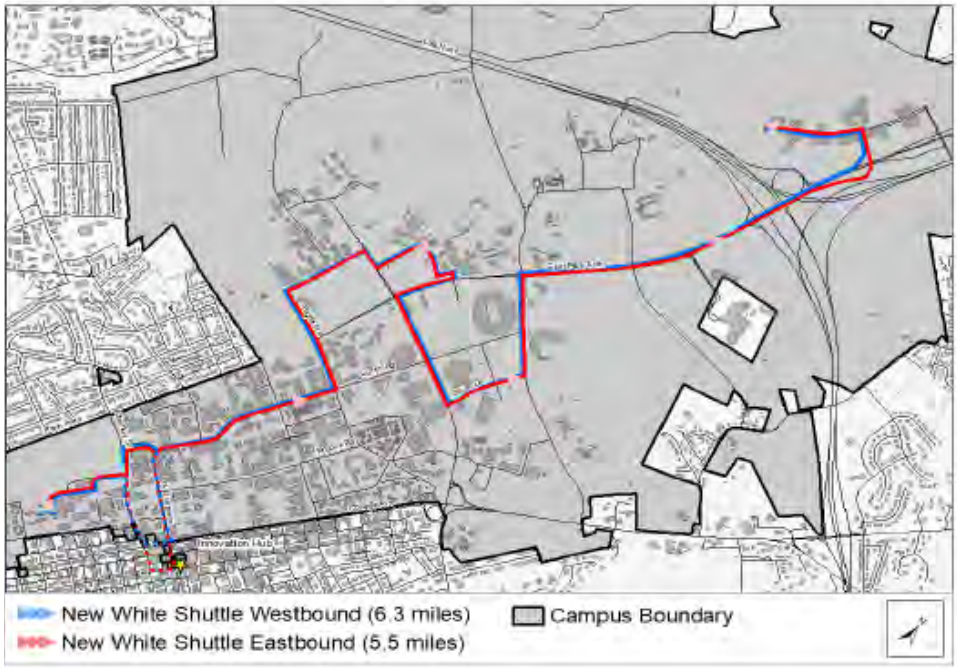


Figure 4.18. Proposed Innovation Park Campus Shuttle, Fall 2023 [26]

[25] *Penn State University Park Transit Services Study*, August 2022, Figure 32, page 34.
[26] *Penn State University Park Transit Services Study*, August 2022, Figure 33, page 35.

Table 4.7. Loop, Link and Shuttle Service Hours [27]

Service	FY22 Contract	FY22 Projected	FY23 Proposed	FY24 Proposed
CATA Loop / Link				
Blue Loop	10,201	9,786	9,895	9,895
White Loop	8,507	8,682	11,311	11,311
Red Link	10,766	10,395	10,582	7,753
Green Link	3,081			
Trippers		224	0	0
Loop / Link Total	**32,556**	**29,087**	**31,788**	**28,959**
PSU Campus Shuttle				
Beaver Ave Shuttle	3,297	3,297	3,297	
Innovation Park Shuttle				8,661
College Ave Shuttle	5,434	5,434	5,434	5,434
Campus Shuttle Total	**8,731**	**8,731**	**8,731**	**14,095**
Innovation Park Lyft				1,100
Program Total	**41,287**	**37,237**	**40,519**	**44,154**

Transit Mode Summary

The Transit Services Study included these findings relating to demand and transit routes:

1. There will be continued demand for improved campus transit service resulting from projected 1% annual non-resident student growth.
2. New downtown housing will continue to increase demand on Blue / White Loops.
3. There is increasing ridership demand between the commuter parking lots on the east side of campus and the new West Deck. CATA's suspension of the Green Link service between the commuter lots and central campus because of a lack of bus operators will result in overcrowding and missed classes for some students.
4. CATA Loop / Link routes are very productive except for the Blue Loop and Red Link between 5 a.m. to 7 a.m. and the Red Link service to Innovation Park.
5. The Campus Shuttle Beaver Avenue route is unproductive and should be repurposed.

The Transit Service Study recommended the following key transit services changes:

1. Affirm the current partnership with CATA for negotiating Penn State's services and costs. The partnership may be enhanced with Penn State supporting and participating in CATA policy making. Meanwhile, Penn State and CATA would collaborate and cost-share on technology updates and integration (i.e., fare payment methods/vendors, vehicle location systems, data services, app development, etc.).
2. Revise the current commuter parking price structure by increasing permit costs to Revise commuter parking pricing (up).
3. Each year, optimize shuttle routes, stops, and timing based on an analysis of ridership data.
4. Optimize or truncate under-performing routes.

[27] *Penn State University Park Transit Services Study*, August 2022, Table 22, page 35.

- Sustain the Blue and White Loop routes and service, with enhancements that respond to increasing downtown housing and demand for trips to/from the campus.
- Permanently discontinue Green Link service.
- Truncate the Red Link at the Bryce Jordan Center Commuter Lots while increasing service to West Campus/West Deck via the Red Link and/or Campus Shuttles.
- Repurpose the Beaver Avenue Campus Shuttle to serve Innovation Park and to replace service previously offered by the Red Link.
- Work with transportation network companies (Uber, Lyft) to establish more cost effective, demand-responsive evening and weekend services.

4.3. Pedestrian Mode

The pedestrian mode encompasses travel via walking and other mobility-assistance devices (wheelchairs, electric carts, etc.) that utilize sidewalks and pathway networks. This this section summarizes pedestrian crossing data collected in 2022 at campus intersections and other significant road crossing locations. These data summaries respond to the UPD requirements for reporting the existing "level of use" for campus transportation facilities.

Guiding Principles for Campus Planning

Penn State's *Guiding Principles for Campus Planning*[28] include 52 statements that establish planning direction for University Park with a rationale of the values that are foundational to the built environment. Nine of the 52 statements directly address the pedestrian mode, as follows:

Campus Character

- *Advance the ideal of a pedestrian centered campus by maintaining and improving the major pedestrian and open space corridors and in the campus core.*

Vibrant and Student Centered Campus

- *Maintain and expand coherent, efficient, and safe network of walkways. Connect all destinations on campus.*
- *Maintain and enhance pedestrian-friendly campus streets (comfortable, attractive, and safe).*
- *Provide accessible routes throughout campus and into all buildings.*

Multi-Modal Transportation, Circulation, and Parking

- *Provide accommodations for pedestrians, bicycles, and transit to enhance the pedestrian-centered campus experience of the academic core.*
- *Provide appropriate accommodations for emergency vehicles, service access, and those with enhanced mobility needs.*
- *Locate the majority of parking resources at the campus perimeter with dependable and comfortable transit service and bicycle accommodations to promote a pedestrian-oriented campus.*
- *Provide separation of vehicle and pedestrian traffic where major conflicts exist to enhance personal safety.*

These principles clearly establish the primacy of pedestrian transportation at University Park, where the pedestrian mode is fundamental for access to most on-campus facilities. According to surveys conducted

[28] *Penn State University, Guiding Principles for Campus Planning*, https://www.opp.psu.edu/planningdesignconstruction/campus-planning-resources/university-park-plans-and-studies, as accessed Spring 2023.

by the Penn State Office of Sustainability, usage of the pedestrian mode is second only to transit as the commute mode used by students and second to personal vehicle for faculty/staff.

The Pedestrian Network

Penn State maintains an extensive system of sidewalks, pathways, and connecting pedestrian facilities appropriate for travel within the compact and densely built environment present at University Park. Penn State maintains an inventory of pedestrian facilities that covers all of the University's properties, including the 16 UPD zones.

The University's formalized pedestrian transportation network encompasses mostly outdoor built facilities according to the seven sub-types listed in **Table 4.8**. Taken together across all of the UPD zones, these facilities cover about 70 acres—approximately 1.8% percent of the total UPD. However, about 62 acres of the pedestrian facilities are found in the most transportation intensive parts of the University Park Campus (a.k.a., the Campus Core). In this area, they occupy more than 5 percent of the total land area.

Table 4.8. Pedestrian Network Characteristics by Sub-Type [29]

	Total Coverage Area (Acres)	
	All UPD Zones	**Campus Core (Zones 4,5,6,8,9)**
TOTAL Land Area	**3846.550**	**1126.870**
Pedestrian Facility Sub-Type		
Sidewalk	66.074	58.677
Steps & Ramps	1.413	1.381
Patio	0.586	0.524
Loading Dock	0.018	0.018
Building Entrance	0.288	0.286
Plaza	1.287	1.287
TOTAL Pedestrian Facility Area	**69.665**	**62.173**
% of TOTAL Land Area	**1.8%**	**5.5%**

Pedestrian Accommodation & Accessibility

Accommodating pedestrian users with diverse levels of ability or disability is a priority for Penn State University that received emphasis in the early 1990s with passage of the Americans with Disabilities Act. Titles II and III of the Act set minimum standards for accessibility and removal of barriers to provide public accommodations for disabled persons. In 1994, Penn State adopted a Transitional Plan that identified initiatives, policies, and implementation projects necessary achieve a fully compliant and accessible campus.

University Access Committee

As part of the Transitional Plan, Penn State created the University Access Committee (UAC) with the goal to "continually monitor accessibility at Penn State and to recommend corrective actions when necessary". The UAC continues to meet bi-monthly and addresses needs emerging from new construction, renovation, changes in the use of buildings, and changes in walkways and accessible paths of travel. The UAC review process involves *obtaining and evaluation and analysis, preliminary cost estimates, prioritizing projects, and recommending the implementation and funding of projects. UAC members represent the*

[29] Penn State University, Office of Physical Plant, 2023.

major University operations impacted by ADA access, including those directly involved in maintaining and operating the campus transportation systems—Office of Physical Plant, Transportation Services, Student Affairs, Facilities Coordinators, and Intercollegiate Athletics.

Pedestrian Level of Use

Counts of pedestrian crossings were collected in November and December 2022 at roadway intersections and other significant crossing locations during the UPD Transportation Study data collection program. Crossing activity for these locations was summarized and mapped for three different hours of the day corresponding to peak travel conditions on the transportation network. **Figures 4.19, 4.20, and 4.21** illustrate the crossing activity. Note that the scales of the three figures are the same to allow cross-comparisons of the number of crossings.

2022 AM Travel Peak Hour

Figure 4.19 illustrates pedestrian crossing activity during the AM Travel Peak, which was identified as the hour between 7:00 AM and 10:00 AM when total travel activity was at its peak, considering both vehicles and pedestrian crossings. Comparing all three peaks, crossings at most intersections are lowest during the AM Peak. The highest crossing locations are at the Curtin Road Transit Center and Shortlidge Road/Curtin Road intersection.

2022 PM Travel Peak Hour

Figure 4.20 illustrates pedestrian crossing activity during the PM Travel Peak, which was identified as the hour between 3:00 PM and 6:00 PM when total travel activity was at its peak, considering both vehicles and pedestrian crossings. Crossings during the PM Peak are highest at locations near the Hetzel Union Building (HUB) and along College Avenue at Shortlidge Road and Burrowes Road, likely reflecting travel to apartment complexes and commercial/restaurants in the Downtown.

2022 Pedestrian Peak Hour

Figure 4.21 illustrates pedestrian crossing activity during the Pedestrian Peak, which was identified as the hour during the day when pedestrian crossing activity was at its maximum, regardless of the vehicle volumes present. This peak typically occurred in the middle of the day, between 11:00 AM and 3:00 PM, and these peaks often align with class change intervals. However, certain exceptions were noted where other transportation dynamics were more influential. For instance, the Pedestrian Peak on pathways along Curtin Road to/from the Commuter Lots were noted in the 4:00 PM hour, just before the PM Travel Peak Hour.

During the Pedestrian Peak Hour, the "concentration" of pedestrian travel in a shorter period—such as a class change interval—can be further quantified by comparing the volume of crossings counted during one hour with the volume during the peak 15-minute period. **Table 4.9** compares the Pedestrian Peak Hour Volume with the Pedestrian Peak 15-minute flow rates at eight of the highest volume on-campus locations. The Concentration is calculated as the Peak 15-Minute Volume divided by the Peak Hour Volume and indicates how much of the Peak Hour Volume occurs within the most intensive travel period within the hour. Where and when Concentrations are high, pedestrians cross for a short time at a rate that will be more disruptive to other modes than the volume alone might indicate.

Table 4.9. 2022 Pedestrian Crossing Intensity – Hourly Volume vs. Flow Rates

Location	Peak Hour Volume (A) *(Crossings/Hour)*	Peak 15-min Volume (B) *(Crossings/15-min)*	Concentration (B/A)
Curtin Road Transit Center	2,258	1,097	48.6%
Curtin Road @ Forum Building	776	322	41.5%
Curtin Road @ Shortlidge Road	1,828	998	54.6%
Curtin Road @ Bigler Road	1,150	359	31.2%
Bigler Road @ Geary Hall	1,030	478	46.4%
Pollock Road @ Burrowes Road	1,040	416	40.0%
Pollock Road @ Henderson Drive	2,445	1,281	52.4%
Pollock Road @ Shortlidge Road	1,692	877	51.8%

Comparisons of 2011 and 2022 Pedestrian Crossing Volumes

Table 4.10 provides comparisons between the pedestrian crossing counts at a sample of On-Campus and Gateway intersections during the 2011 and 2011 AM and PM Travel Peak Hours. Substantial increases in pedestrian crossing traffic are noted at most intersections between 2011 and 2022, with crossings more that doubling during the AM Travel Peak. A more modest 20 percent increase was observed during the PM Travel Peak. A Pedestrian Peak comparison was not possible, because counts of the 2011 pedestrian peak were not completed.

Table 4.10. Comparison of 2011 and 2022 Pedestrian Crossing Volumes

Intersection	AM Travel Peak			PM Travel Peak		
	2011	2022	Change	2011	2022	Change
Park Avenue/Allen Road	50	113	+ 126%	152	108	- 29%
Park Avenue/Bigler Road	40	60	+ 50%	48	127	+ 165%
Curtin Road/Allen Road	169	311	+ 84%	232	444	+ 91%
Curtin Road/Shortlidge Road	283	1,035	+ 266%	262	718	+ 174%
Curtin Road/Bigler Road	400	414	+ 4%	732	920	+ 26%
Curtin Road/University Drive	206	457	+ 122%	426	465	+ 9%
Pollock Road/Burrowes Road	267	510	+ 91%	482	424	- 12%
Pollock Road/Shortlidge Road	246	984	+ 300%	407	1,156	+ 184%
College Avenue/Burrowes Road	241	779	+ 223%	721	1,044	+ 45%
College Avenue/Shortlidge Road	318	515	+ 62%	1960	1,133	- 42%
Composite Totals and Change	**2,220**	**5,178**	**+ 133%**	**5,422**	**6,539**	**+ 21%**

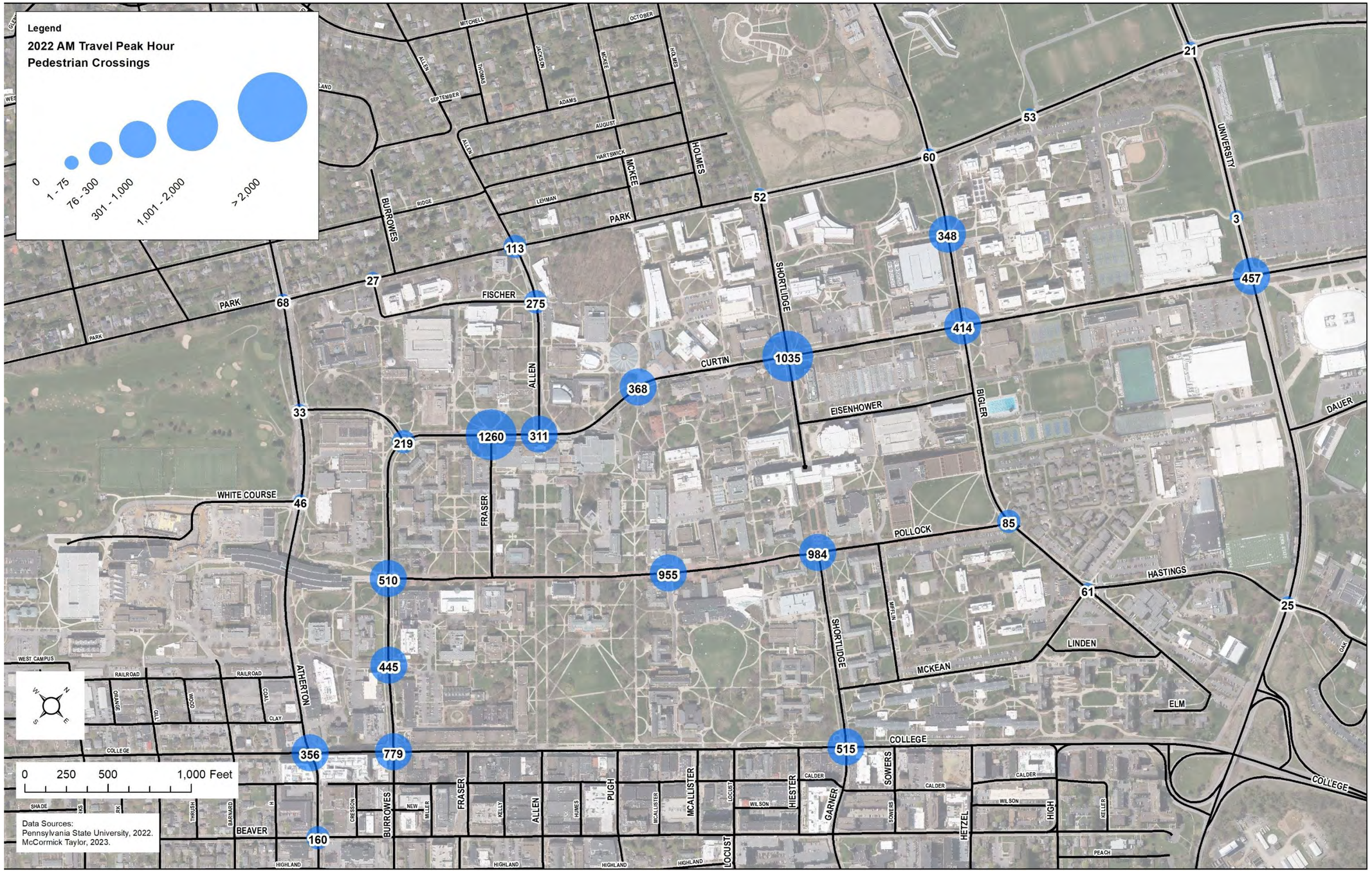


Figure 4.19. 2022 AM Travel Peak Hour Pedestrian Crossings

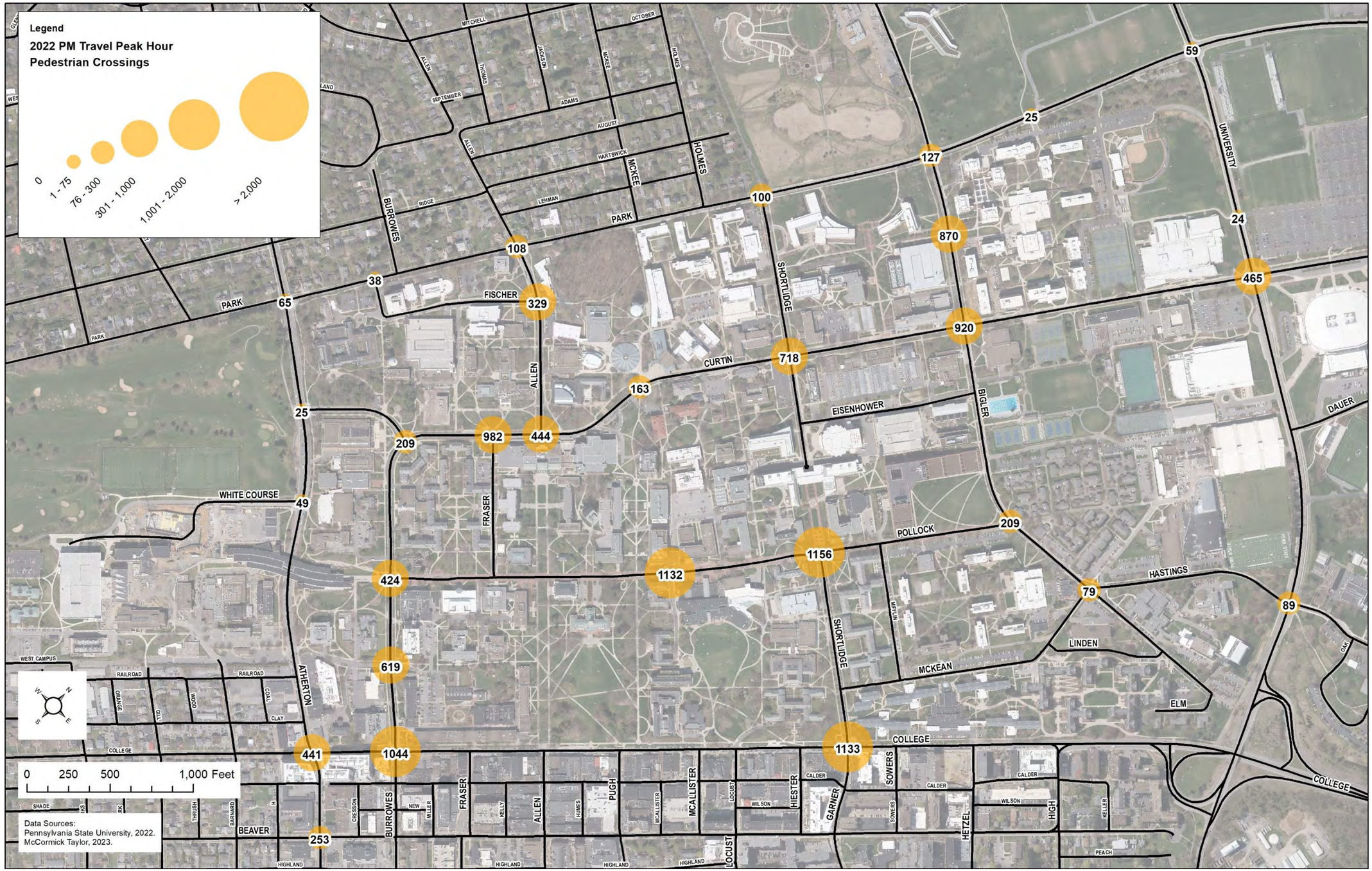


Figure 4.20. 2022 PM Travel Peak Hour Pedestrian Crossings

Figure 4.21. 2022 Class Change Peak Hour Pedestrian Crossings

Pedestrian Mode Summary

- **Penn State's *Guiding Principles for Campus Planning* establish the primacy of the pedestrian mode. Accommodation of all pedestrian users with diverse levels of ability or disability is a priority for Penn State.**

  Accommodations for pedestrians and enhancement of the existing pedestrian-oriented built environment are cornerstone principles underlying campus development decisions. Effective and accessible pedestrian facilities are needed to carry the bulk of daily trips on and across the University Park Campus. According to surveys conducted by the Penn State Office of Sustainability, the transit mode is second only to walking as the commute mode used by students and second to personal vehicle for faculty/staff.

- **The number of pedestrian crossings at high activity locations can exceed 1,000 per hour during the AM and PM Peak Travel periods.**
- **The number of pedestrian crossings at high activity locations can exceed 2,000 per hour during the Pedestrian Peak periods.**
- **The concentration of pedestrian crossings during class change intervals and other pedestrian peak periods intensifies the disruption to other modes and makes the pedestrian volume feel larger during those periods.**

  Crossing volumes at these levels along with the extra concentrated impact during peak periods would rival many of the most urban places in the United State for intensity of pedestrian travel. Crossings at these rates inevitably disrupt travel by other modes of travel using the street system. Pedestrians are, by far, the largest user group, and the proverbial "mob mentality" likely creates disregard for other street users.

- **Based on data from the AM and PM Peak Travel periods, pedestrian travel on campus has increased substantially since 2011.**

  The pedestrian volume and crossing data support feedback from the UPD study stakeholders about escalating mode conflict on campus. AM peak pedestrian activity as more than doubled and PM peak activity has increased by about 20 percent since 2011.

4.4. Bicycle Mode (Bicycle Master Plan Synopsis)

The following synopsis was developed based on UPD stakeholder interviews and a summarization of the Penn State University Park Bicycle Master Plan prepared by Nelson Nygaard, dated October 2023.

In 2022, Penn State University undertook a planning process that created the Penn State University Park Bicycle Master Plan. The resulting plan is based on observed biking conditions and analyses of bike travel and demographic trends. The bike planning process also engaged campus stakeholders through a series of on-campus "pop-up" engagement events and an online survey.

During the last 15 years, Penn State has progressively improved the campus cycling experience a cycling culture through the University's bicycle master planning effort, creating a shared micromobility partnership with Spin, integrating the Bike Den into the West Parking Deck, and expanding bicycle parking and commuter amenities. Thanks to the combination of these and other efforts, Penn State was designated a bronze-level Bicycle Friendly University in 2012 and reached gold level in 2022.

The Penn State UPD process is bringing all the modal plans across campus together. The process kicked off with a workshop, site visits, and a series of group interviews with various campus stakeholders to develop an understanding of the state of biking at Penn State.

That work resulted in the following observations about the comfort, convenience, and built environment for bicycling on campus and in the surrounding area. Together, these findings highlight the tension between the University's goals for bicycling on campus and existing campus conditions—in particular, the competition for space among travel modes and the lack of dedicated cycling infrastructure on campus.

What people think about biking to and on campus

Through different projects in 2022, including an online transportation survey, pop-up public outreach, and interviews, Penn State stakeholders, including students, faculty, and staff were invited to share their thoughts about moving around the Penn State campus.

Within campus, most people get around without a car and conflicts between people riding bikes, on scooters, and walking are on everyone's mind. The most frequently mentioned theme among faculty and graduate/post-doc students was making biking safer and easier on campus. Comments about the conflict between bicycles and scooters on sidewalks were also a common theme among staff and undergraduate students. The most common feedback involved concerns about personal safety, followed by challenges and costs of using Spin, conflicts between pedestrians and bicyclists, difficulty identifying Spin parking and dismount zones, a lack of clarity as to where biking is allowed on campus/clarity of the Limited Bike Zone[30], Spin bikes taking up too much bike parking space, and concerns with cyclist behavior expressed by transit operators.

Bikes generally share the roadway with cars on campus because walkways are busy with pedestrians. However, some of the existing street layouts do not dedicate space for cycling, creating an environment uncomfortable for many cyclists and resulting in risky behaviors and conflict. Further, streets do not access all locations on campus, forcing bikes to use walkways and creating conflicts with pedestrians.

Topography, stairs, connectivity, and building placement influence how bikes can move across campus. Penn State University sits on a hill and many pathways include staircases, which people biking cannot use. Cyclists also cross streets where convenient, such as places where an intersecting sidewalk or driveway ramps down to meet a street, often in the absence of a designated crosswalk across main streets. This has the effect of crossings occurring at many seemingly random places along campus streets.

Inconsistent bike facility design across campus is evidently a source of confusion for users and likely leads to misuse of the system. At the same time, implementing consistent facilities within the historic Core Campus must be balanced with other campus planning principles, according to the space available. In large part, the spatial requirements and changes necessary to impose by the current nationally recognized bikeway design standards on the historic campus fabric of streets and built space would severely denigrate the character of the Core Campus, as well as undermine the longstanding Campus Design Goals for a pedestrian-oriented environment. Penn State University may be better served by creating their own set of bikeway design standards that fit in the campus context.

Desired biking facilities and intersection improvements.

Opportunities identified by stakeholders include a need for improved bike lanes and paths, a need for more bike lanes and paths, and a need for better connections to existing trails/bike infrastructure and destinations.

[30] The "Limited Bicycle Zone" provisions were removed from Penn State's Policy SY-16 as part of revisions completed in 2023.

Conflict points between bicyclists and other users create uncertainty and lead to confusion and misuse of existing spaces. Stakeholders reported that this chaos is one reason they choose not to bike to campus. The interactions among pedestrians, bikes, and motor vehicles feel uncomfortable to many bike riders. Examples include:

- Left-turning vehicles are essentially trapped in large flows of pedestrians and bikes during class change. This creates confusion at intersections for people on bikes.
- Bike facilities terminate with no direction of where to go next.
- Bike facilities only go in one direction.
- Pathways are not wide enough to accommodate pedestrians and bikes or for bikes to pass pedestrians, even intermittently.

Identified concern areas between bicycles and other modes included:

- Shortlidge Road between Curtin Road and College Avenue
- Pollock Road between Allen Street and Shortlidge Road
- College Avenue between Atherton Street and Shortlidge Road
- Atherton Street between Park Avenue and White Course Drive
- Park Avenue and Bigler Road

Other locations of concern for bicycle riders included:

- Areas near the Library
- Park Avenue
- Atherton Street
- Curtin Road from Burrowes Road to Porter Road
- Burrowes Road from Curtin Road to College Avenue
- Pollock Road from Burrowes Road to Bigler Avenue.

Stakeholders generally requested biking facilities and connections on the following streets:

- Park Avenue from Atherton Street to Houserville
- Curtin Road from Burrowes Road to Porter Road
- Pollock Road from Burrowes Road to Bigler Road
- College Avenue from Burrowes Road to Houserville/Lemont Area
- Allen Street from Pollock Road to Beaver Avenue

Stakeholders most frequently expressed desire for intersection improvement at the following locations:

- Park Avenue and Atherton Street
- Park Avenue and Burrowes Road
- College Avenue and Allen Street
- West Campus Drive/Railroad Avenue and Atherton Street
- Pollock Road and Shortlidge Road
- Pollock Road and Burrowes Road/Fraser Street
- Curtin Road and Bigler Road

Bike parking primarily follows the pattern of existing rack locations with the highest concentration near HUB-Robeson Center, the Library, and Nittany Deck areas. Insufficient parking was most notable near athletic facilities and commuter parking lots in the northern part of campus, the area around East Deck and the Agriculture and Business buildings, and along the edge of campus on College Avenue.

The Current Bicycle Network at Penn State.

University Park Campus definitions:

Walkways – Internal campus paths where cycling is allowed and space is shared with pedestrians.

Sidewalks – Paths that border streets and where use is limited to pedestrians. Bike riding on sidewalks is not allowed.

The existing campus bicycle network consists largely of on-street shared roadways and paths shared with pedestrians. Penn State makes a distinction between walkways (where cycling is allowed, and space is shared with pedestrians) and sidewalks (where use is limited to pedestrians and cycling is not allowed) which can be confusing for users of all modes. Walkways are often wider than sidewalks, but there is no other clear distinction between them. They are constructed of similar materials and intersect with each other without signage or definition. Ultimately, because of a lack of designated cycling space and high pedestrian volumes, cyclists are left to navigate a gray area between drivers, who often expect cyclists to ride on the sidewalk, and pedestrians who do not expect to see bicycles on campus walkways.

Dedicated bicycle lanes are few on or adjacent to campus and exist largely near Beaver Stadium on Curtin and Fox Hollow Roads. Core campus has roughly 3.25 miles of bike lanes, 6.95 miles of shared use paths, and a further 7.27 miles of identified bike-friendly routes. Routes to neighborhoods adjacent to the core campus are limited to "bike friendly routes" without dedicated infrastructure. See **Figure 4.22.**

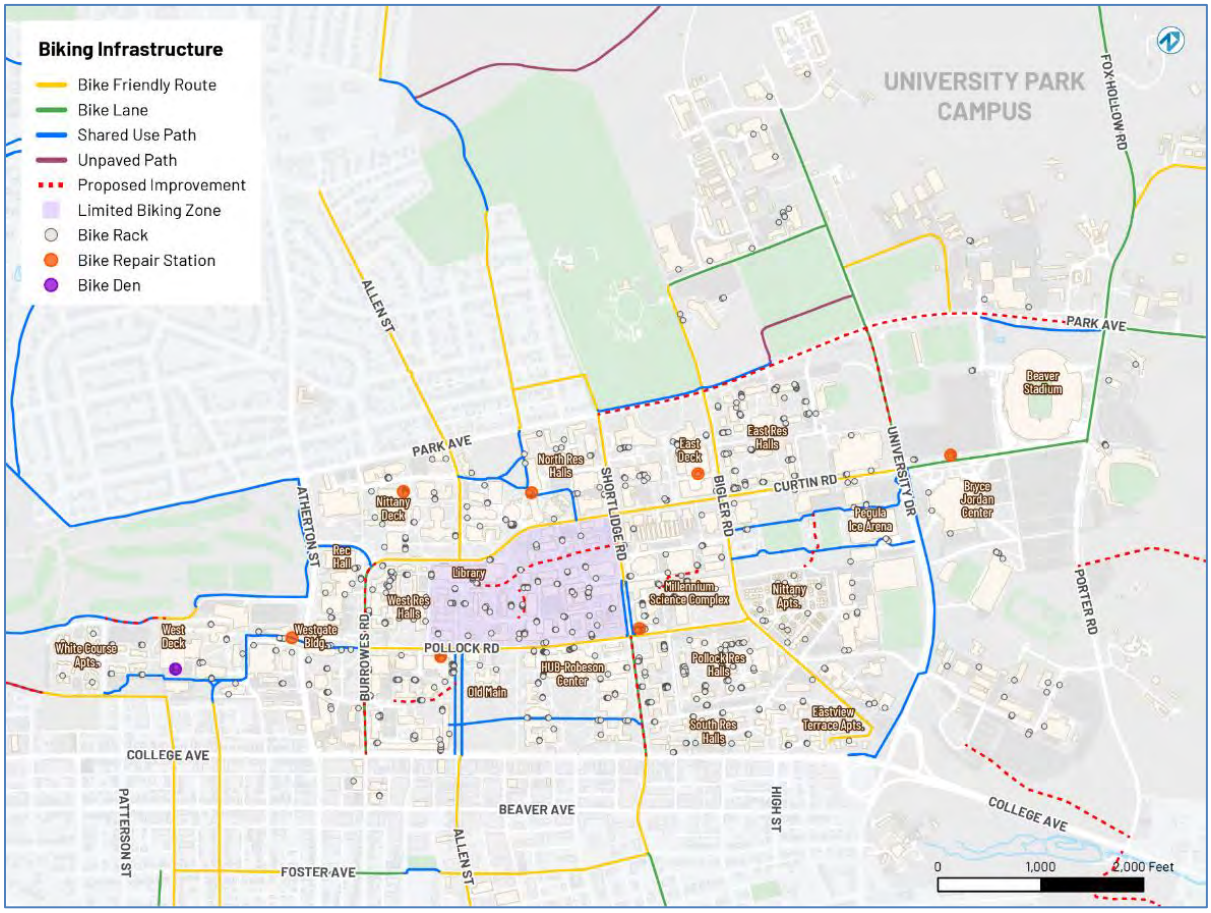


Figure 4.22. Biking Infrastructure at Penn State. Source: Penn State Bike Master Plan [31]

[31] *Penn State University Park Bicycle Master Plan Map Atlas*, Draft October 2022, Bicycling Infrastructure.

The Penn State University Park Bicycle Master Plan identifies a strong need for more bicycle facilities and infrastructure and notes that bicycle safety is perceived as a problem by bicyclists as well as users fof other modes. Bicyclists also identified the need for better biking connections to and from campus.

Bicycling Comfort

As part of the Penn State Bicycle Master Plan, streets within the core campus were evaluated for comfort using a Bicycle Level of Traffic Stress (BLTS) analysis. BLTS produces a value on a scale of 1 to 4 where 1 indicates the most comfortable conditions suitable for all ages and abilities to cycle and 4 is the least comfortable and most stressful.

BLTS was determined by evaluating factors including: the presence and width of bicycle lanes, number of vehicular travel lanes, speed limits, frequency of bike lane blockages, presence of on-street parking, presence of a marked center lane, and presence of a median.

Most streets within the campus core score a BLTS of 1 or 2 indicating a stress level generally comfortable for most users **(Figure 4.23).** The exceptions are wider arterial roadways near campus including Atherton Street, College Avenue, and University Drive—each of which have a BLTS of 4 and portions of Park Avenue which have a BLTS score of 3.

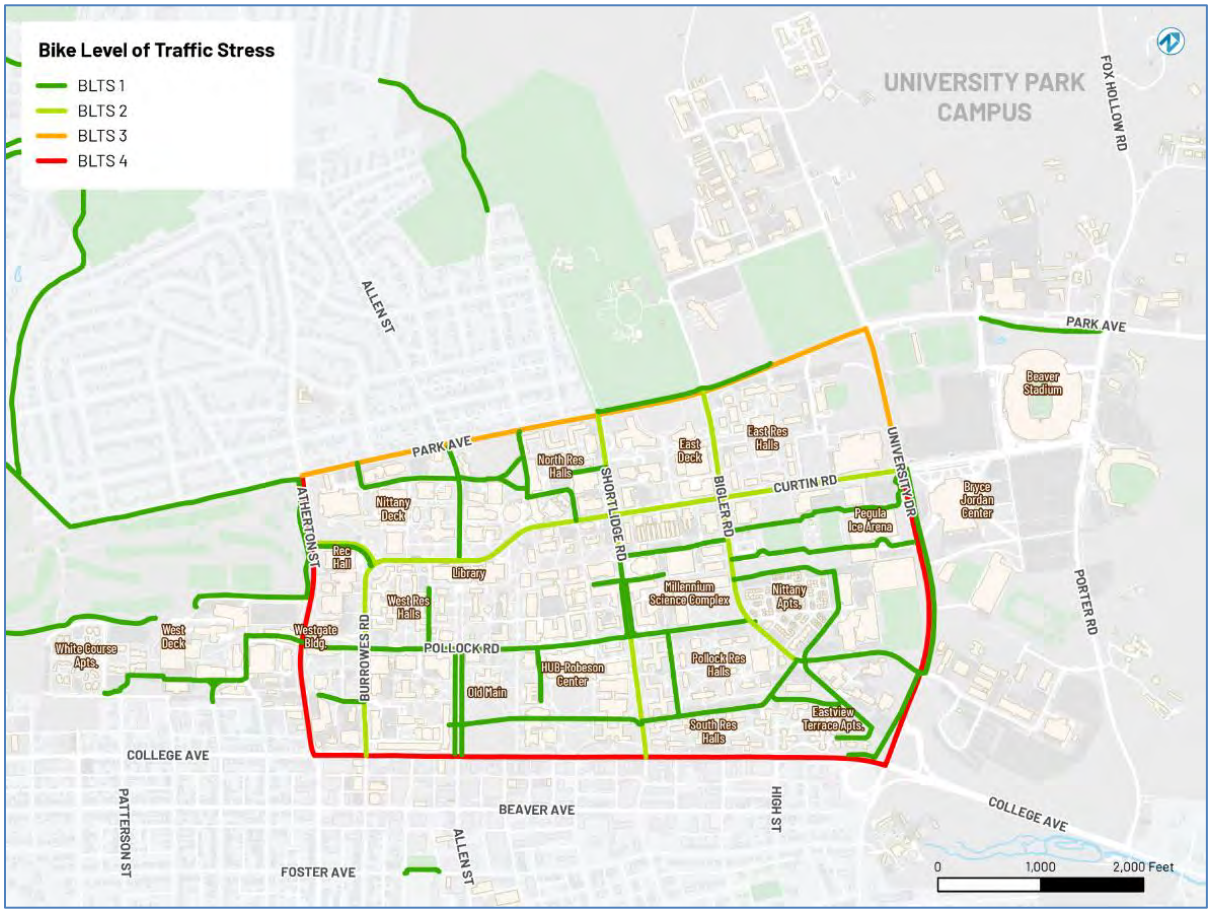


Figure 4.23. Bicycle Level of Traffic Stress Analysis [32]

[32] *Penn State University Park Bicycle Master Plan Map Atlas*, Draft October 2022, Bicycling Comfort (Bicycle Level of Stress).

Demand for Bicycling

The Penn State Bicycle Master Plan analyzed demand for biking on and near campus using the following factors: presence of student housing, employee home locations, relative classroom activity, Spin ridership patterns, key buildings and major intermodal parking lots, and number of bike racks. Several variations on the demand model were run to visualize how different inputs affected overall biking demand.

In each variation of the model, whether weighted based on campus priorities or unweighted, higher demand was identified in areas around residence halls and core campus facilities such as the Library and HUB-Robeson Center with some moderate demand noted in residential areas below College Avenue. When either bike racks, Spin ridership, or both inputs were removed from the model, demand increased in areas below College Avenue while remaining high around residence halls and campus facilities.

The variations of the demand model together demonstrate significant cycling demand in residential areas near campus, emphasizing the need for safe, comfortable, and convenient connections for cyclists between campus and adjacent neighborhoods (see **Figure 4.24**).

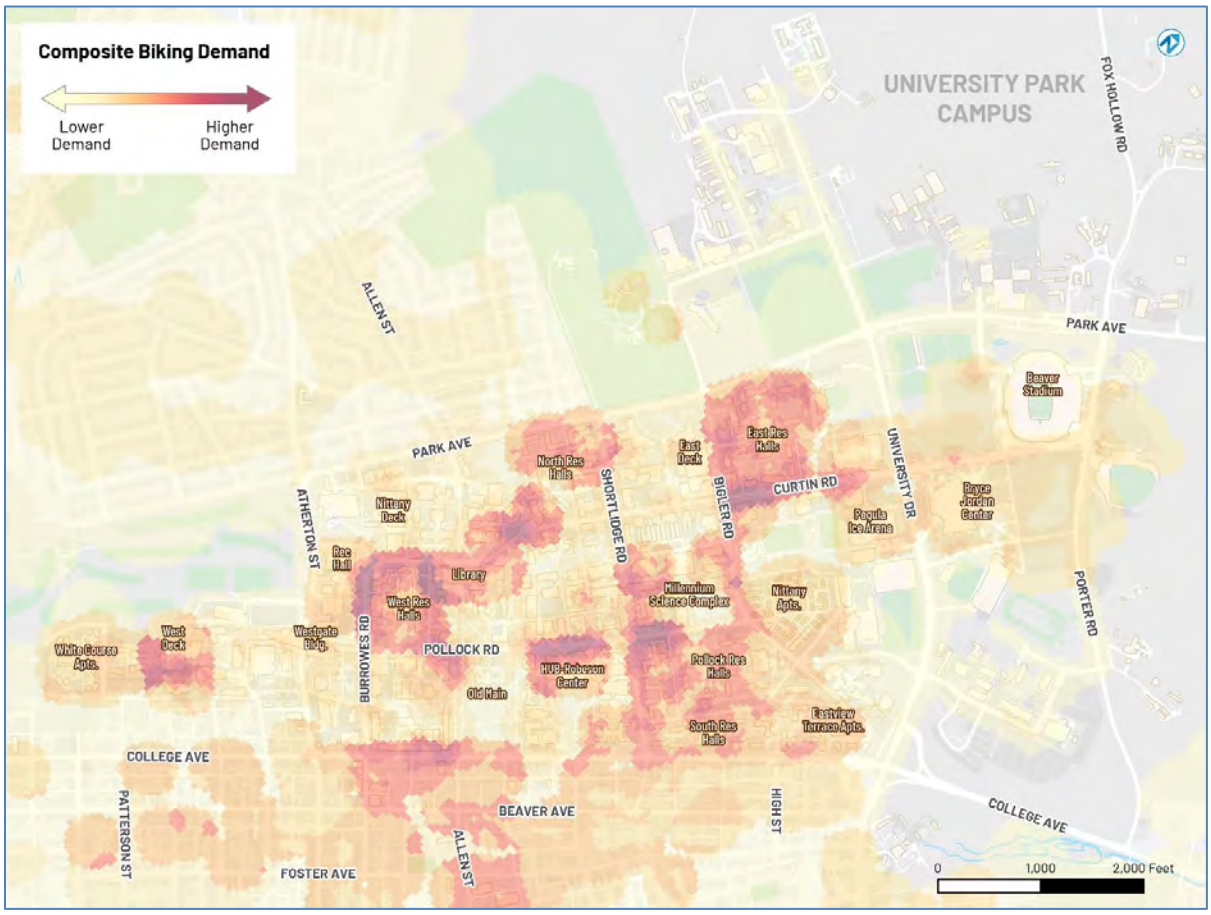


Figure 4.24. Composite Biking Demand (All inputs, No weighting) [33]

[33] *Penn State University Park Bicycle Master Plan Map Atlas*, Draft October 2022, Composite Bike Demand (AI inputs, No weights).

Observed Bicycle Usage

Bicycle usage was observed, and bicycle counts were collected in April 2022 at intersections around the core campus (see **Figure 4.25)**. Bicyclists were often observed riding on sidewalks to avoid motor vehicle traffic, especially where motor vehicle volumes were higher and bicycle infrastructure was absent.

The intersection of Pollock Road and Burrowes Road had the highest cycling activity of the intersections studied. Generally, transitions from on-street to or from off-street paths occurred at major internal nodes and intersections at the campus edge. On-street biking appears to be preferred on minor internal campus streets such as Curtin Road and Shortlidge Road.

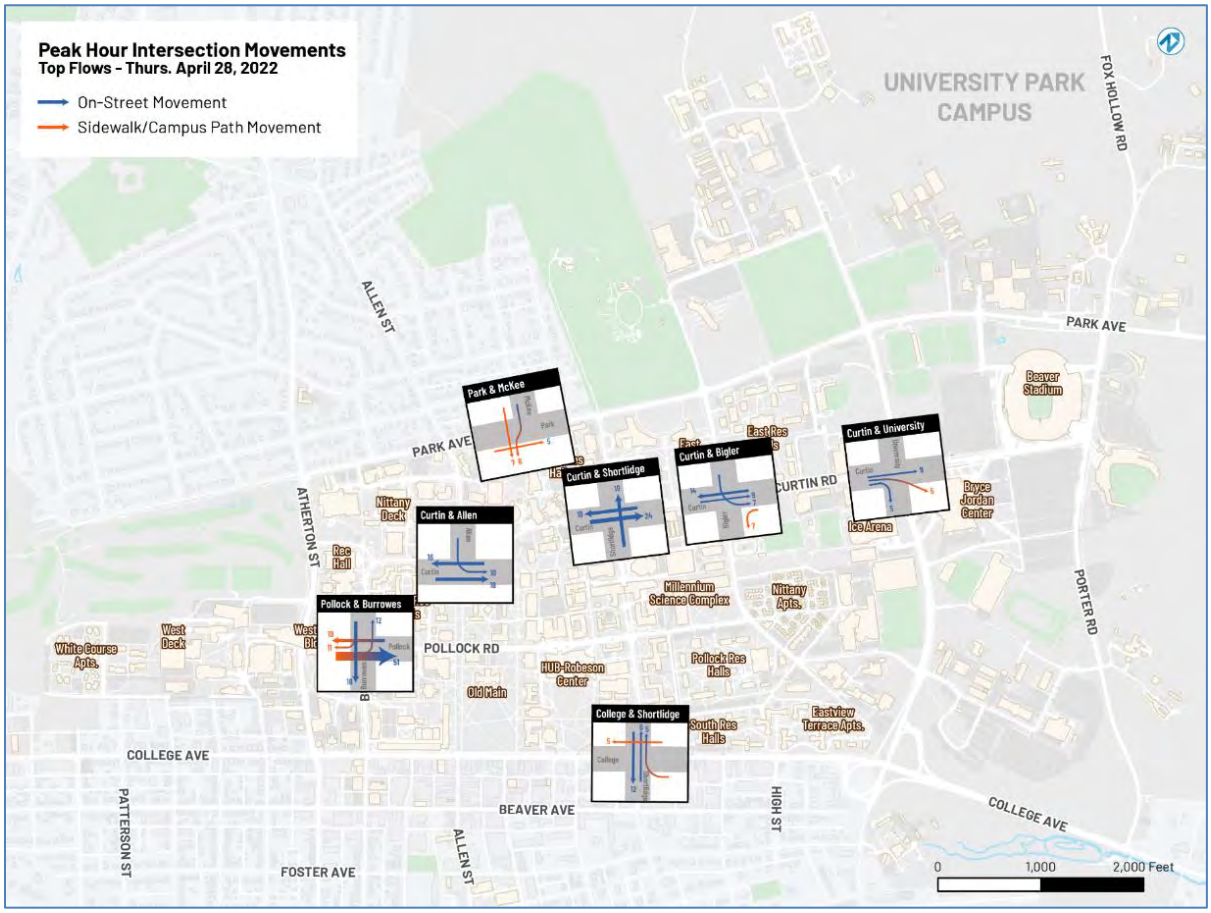


Figure 4.25. Peak Hour Intersection Movements [34]

[34] *Penn State University Park Bicycle Master Plan Map Atlas*, Draft October 2022, Intersection Flows.

The Future of Cycling at Penn State.

The proposed future of the cycling network at Penn State is distilled from two documents—the Centre Region Bike Plan (2015) and the University Park Bicycle Master Plan (near-final as of this writing).

Getting to University Park

The Centre Region Council of Governments (COG) developed its 2015 Centre Region Bike Plan to identify, among other components, regional bike facility needs in the State College/Centre Region of Pennsylvania.

The Plan overlaid each identified corridor on a map of existing and proposed municipal level bike infrastructure. Where overlap between an identified corridor and existing or proposed municipal bicycle infrastructure was observed, bike corridors were modified to only show areas not currently identified by municipalities. Further adjustments to the bounds of each corridor were made at a workshop held by the COG Transportation and Land Use (TLU) Committee. The plan allows municipalities the flexibility to implement the plan based on local priorities. Corridors identified for further study which connect to the Penn State campus include:

- College Avenue/Calder Alley/Beaver Avenue Corridor – Buckhout Street to High Street
- Park Avenue – North Atherton Street to Bigler Road
- Allen Street – Foster Avenue to College Avenue
- University Drive – East College Avenue to South Atherton Street
- State Route 26 East College Avenue – High Street to State Route 150
- Rocky Top Lane – Curtin Street to Big Hollow Road
- Big Hollow Road – Rocky Top Lane to Innovation Park and Services Road
- North Atherton Street Study Area – Valley Vista Drive to Route 26 College Avenue

Getting around University Park

The bicycle network proposed in the Penn State Bicycle Master Plan focuses on facilities that close existing gaps in the network, particularly in areas where higher biking demand exists. The proposed network also seeks to improve existing facilities and intersections to create low stress user experiences. Lastly, the plan identifies areas in need of bicycle supporting amenities such as bike parking, shade, signage, and commuter facilities.

The proposed bicycle network increases dedicated infrastructure for cycling while also delineating space on existing paths to convey space more clearly for bicycles.

The proposed network is based on the analysis of existing usage patterns and gaps, analysis of travel demand to, from, and within campus, feedback from stakeholders, feasibility, and consideration of perceived safety concerns.

The plan prioritizes ten "Keystone Projects" that build to the network illustrated in **Figure 4.26.** Each individual project includes recommendations for short-term interventions to improve biking conditions on campus today as well as longer-term projects involving built infrastructure such as curbs and widened rights-of-way to support bicyclists on campus. The plan also contains suggested projects of lower priority designed to serve lower demand links but that will, once built, reinforce network completeness and support the Keystone Projects.

College-Park Connector

The project proposes using an existing concrete path as a shared-use path running from College Avenue to Park Avenue. The goal of the project is to better link the very high bike and pedestrian demand area downtown with core campus. Short-term implementation calls for signs and markings, removal of pedestrian only and bike detour signage, and a painted crossing at Curtin Road. Long-term suggested

improvements include enhanced crossings, and selected path widening, and a more direct route through the Palmer Museum of Art complex when that area is repurposed.

Bike Lanes on Burrowes Road

This project envisions a painted bike lane in each direction along Burrowes Road which today has a single climbing bike lane in the uphill direction. Long-term suggestions include raising the bike lanes to sidewalk level for enhanced separation from motor vehicles.

Figure 4.26. Proposed Keystone Projects [35]

Pollock Road and Gateway Enhancements

"The Pollock Road project recommends marking a two-way bikeway to clarify usage along the north curb of the roadway in what is a high demand biking area. It further recommends adding stencils or striping in the short term to better clarify where and when Pollock Road is closed to general through traffic during the daytime. In the long term, the plan recommends rebuilding the Pollock Road intersections with Burrowes Road and Shortridge Road with gateway type treatments. The timing and implementation of bicycle-related changes—particularly changes to the Pollock Road gatehouses and intersections—would be coordinated with work on the Osmond Building Project."

[35] *Penn State University Park Bicycle Master Plan*, October 2023, Figure 6, Page 4.

Westgate Connector

The Westgate Connector project includes marking a bikeway along the eastern edge of the building and adding wayfinding to the trail network along the paths coming out of the building. In the long term the plan recommends seeking opportunities to widen paths and enhance intersections leading to the Westgate Connector.

Curtin Road Pathway

This project includes formalizing the northern sidewalk as a multi-use path. In the long-term the project recommends redeveloping this edge to provide a separated bikeway.

Academic-Athletic Connector

This connector project includes signs and markings on existing pathways and crossings between University Drive and the proposed College-Park Connector. Long-term plan recommendations are to widen paths as projects develop, and create separated biking and walking paths where possible.

Bike Lanes on Shortlidge Road and Gateway Enhancements

This project includes short-term installation of painted bike lanes on both curbs of Shortlidge and the installation of wayfinding signs at trail intersections. In the long-term the project includes rebuilding Shortlidge Road north of Science Drive to add raised bike lanes along the east curb, rebuild curbs and enhanced crossings at both ends of the Shortlidge Mall.

Residential Connector

The Residential Connector project includes a signed and striped path along the existing pathway between the North and East Residence Halls with appropriate intersection markings. In the long-term, paths less than 12 feet wide should be widened.

College Avenue – Collaborate Rebuild

This project is a longer term effort requiring collaboration between various property owners along the corridor. Ultimately, the project is a vision of a rebuilt campus edge with a dedicated two-way biking facility or multi-use path connecting downtown, campus and off-campus student housing.

University Drive Upgrades

This project includes installing marking on existing paths to clarify pedestrian and bicycle spaces in the short-term. In the long term the plan recommends building infrastructure on University Drive north of Curtin Road, and protected bike intersections at the University Drive intersections with Hastings Road, Curtin Road, and Park Avenue.

Bicycle Mode Summary

Penn State has continued developing its culture around bicycling on campus, having achieved gold status as a Bicycle Friendly University in 2022. While pedestrians dominate on campus, the University is working towards a future that accommodates pedestrians and bicyclists, providing new, dedicated infrastructure for cycling and improved shared use paths on campus.

On the Penn State campus, similar to many college campuses, pedestrian volumes are higher than almost any other location. They are unmatched by any other mode. While the high-quality walking environment and community of pedestrians are at the heart of what makes the Penn State campus so inviting, the narrow campus paths do not provide enough space for accommodating the high pedestrian volumes when shared with bike riders.

Based on observations on campus, stakeholder interviews, and pop-up engagement events, the two main issues for the University to tackle in the next phase of bikeway development are:

1. Deconflict the bike riders, pedestrians, and vehicles on campus by providing dedicated spaces for each mode.
2. Partner with road owners to improve the safety of people biking to campus at major gateways.

The University should carry forward efforts identified in the University Park Bicycle Master Plan, since existing biking facilities and operating conditions may be a deterrent to attracting additional bike riders. To address the concerns related to the physical biking network, the Bicycle Master Plan proposes a number of high priority Keystone Projects that add bike facilities to existing campus streets and create a cohesive off-street network of pathways to serve the highest demand areas of campus. The plan also identifies secondary Supporting Projects that serve lower demand areas and enhance connectivity of the campus network to the surrounding community networks. Expanding use of the bicycle mode would contribute significantly to Penn State's goals for becoming emissions-free by 2035[36].

While the University has not yet identified a funding stream for the Bicycle Master Plan's projects, the master plan identifies a variety of funding streams and implementation strategies for building out the network. Many projects could be implemented initially as low-cost "pilot" projects (via pavement markings, signage, etc.) that can be evaluated in the field under real conditions—before they are formalized and integrated into campus street renewal projects. Piloting the projects is a critical step, to confirm the operational feasibility and gather user input on the changes.

4.5. Micromobility & Emerging Modes

Micromobility refers to a variety of personal mobility vehicles that are an emerging form of travel. Ownership and use of these devices—primarily manual electric-motor assisted wheeled vehicles—has skyrocketed in recent years and the devices themselves are exceptionally popular in urban environments or dense college campus communities where short trips are prevalent.

In the US, bike share programs have existed at scale since 2008. Shared e-scooters launched in the US in late 2017 and quickly grew to nearly half of all shared micromobility trips. In 2018, 85,000 e-scooters were deployed nationwide, vs. 57,000 station-based bikes. In the US, e-scooters accounted for 38.5 million trips, compared with 36.5 million station-based bike share trips and 9 million dockless bike share trips.[37]

To those attempting to address transportation equity, micromobility represents an opportunity to extend access and opportunities to people who, due to income, availability, or other circumstances, do not have access to a car or transit service. Micromobilty, however, is still evolving with many questions about where and how it fits into the transportation network. On the University Park Campus, the fast diversification of micro-modes has created spatial tension with other traditional modes and has escalated safety concerns about user behavior, vehicle speed differentials, and the lack of defined networks that can support the emerging modes. Guidance and strategies for effectively incorporating micro-modes into campus environments are also emerging but are behind-the-curve. Policies are frequently reactionary, quickly outdated, or overly reliant on enforcement until the proper network can be designated or built.

[36] Psu.edu, For the Future: A Report from the President's Carbon Emissions Reduction Task Force, https://www.dept.psu.edu/ur/newsdocuments/PSU-CERTF-Report_5-02-22.pdf, as accessed August 2023.
[37] Nacto.org, *Shared Micromobility in the U.S. 2018*, https://nacto.org/wp-content/uploads/2019/04/NACTO_Shared-Micromobility-in-2018_Web.pdf, as accessed August 2023.

Overview of Micromobility

The range of micromobility vehicles is extremely varied. Per the Pennsylvania Vehicle Code, the following definitions are provided:

- **Electric personal assistive mobility device or EPAMD** – A self-balancing, two non-tandem-wheeled device designed to transport only one person with an electric propulsion system.
- **Motor-driven cycle** - A motorcycle or motor scooter, with a motor producing up to five brake horsepower.
- **Motorized pedalcycle** – A motor-driven cycle equipped with operable pedals, a motor rated no more than 1.5 brake horsepower, a cylinder capacity not exceeding 50 cubic centimeters, an automatic transmission, and a maximum design speed of no more than 25 miles per hour or an electric motor-driven cycle equipped with operable pedals and a comparable transmission and speed threshold as motor-driven types.
- **Pedalcycle** – A vehicle propelled solely by human-powered pedals. The term does not apply to traditional "tricycles" that are sized and designed for children 6 years of age and younger.
- **Pedalcycle with electric assist** – A vehicle weighing not more than 100 pounds with two or three wheels more than 11 inches in diameter, with an electric motor system rated at not more than 750 watts and equipped with operable pedals and capable of a speed not more than 20 miles per hour on a level surface when powered by the motor source only. The term does not include a device specifically designed for use by persons with disabilities.

Figure 4.27. User-Modified E-Scooter observed at Westgate Building, March 2023
(Photo by Robert Watts)

It is noted that the PA Vehicle Code does not include a specific definition of *micromobility*. However, PennDOT's Active Mobility Plan recognizes that these vehicles represent the next evolution of mobility options and recommends their integration into the long-term planning and design of our neighborhoods and streets. To this end, PennDOT has published fact sheets to summarize the laws and regulations that apply to different major types of low-speed, micromobility vehicles[38] (**Figure 4.28**). However, it is notable that this still excludes electric skateboards, electric roller skates, and hoverboards—as well as other devices that are seen on streets and college campuses (see **Figure 4.27**. Comparable diagrams of micromobility devices from Pedbikeinfo.org[39] (site owned by USDOT/FHWA) and the Sierra Club[40] are provided in **Figure 4.29** and **Figure 4.30**, respectively. In Penn State circles, the term "pseudo-vehicles" has been applied to encompass the range of non-traditional micro-vehicles that are appearing on the campus.

[38] PennDOT.PA.gov, PA Micromobility Fact Sheet, https://www.penndot.pa.gov/TravelInPA/active-transportation/Documents/Low_Speed_FACT_Sheet_2021_Final.pdf, as accessed August 2023.
[39] Pedbikeinfo.org, Common Micromobility Options, https://www.pedbikeinfo.org/topics/micromobility.cfm, as accessed 8/8/2023.
[40] Sierra Club, www.sierraclub.org/massachusetts/blog/2019/07/guide-riding-and-owning-electric-micro-mobility-greater-boston, *A guide to riding and owning electric micro-mobility in Greater Boston*, July 31, 2019, as accessed August 2023.

pennsylvania
DEPARTMENT OF TRANSPORTATION

PA MICROMOBILITY FACT SHEET

DESCRIPTION	MIN AGE	LICENSE	REGISTRATION	INSURANCE	HELMET	PASSENGER	LIGHTS	MAX CAPABLE SPEED	RIDE ON SIDEWALK	RIDE ON BIKE LANE	POSSIBLE DUI	PA VEHICLE CODE
ELECTRIC SCOOTER 	-	-	-	-	-	-	-	-	-	-	Yes	§ 102
Can operate only on private property. Electric scooters, like electric skateboards and electric unicycles, cannot be legally operated on public roadways.												
MOTORIZED PEDALCYCLE 	16	C	Yes	Yes	Yes, under 21	Yes	Yes	25	No	No	Yes	§ 102, § 3523(e), § 1714
Has operable pedals. Design speed of no more than 25 mph. Gas - motor rated 1.5 brake horsepower or less, has an automatic transmission. Electric - powered by an electric battery.												
MOTOR SCOOTER 	16	Class M/Class if >50 cc, Class C if <50cc	Yes	Yes	Yes, under 21	Yes	Yes	Up to 5 brake horsepower	No	No	Yes	§ 102, § 3525
Is a motor-driven cycle. Motor shall not exceed five brake horsepower.												
SEGWAY 	-	No	No	No	Yes, under 12	No	Yes	-	Yes	No	Yes	§ 102, § 3581-3583, § 3703 (c)
Is an electric personal assistive mobility device. An electric, self-balancing, two-nontandem-wheeled device. Lighting must be used when operating between sunset and sunrise. A Segway is allowed on sidewalks unless a municipality prohibits it.												
E-BIKE 	16	No	No	No	No	Yes	Yes	20	Yes, not in business district	Yes	Yes	§ 102, § 3514
Is a pedalcycle with electric assist. Weighs less than 100 pounds. Motor not more than 750 watts. Has operable pedals. Not capable going faster than 20 mph on a level surface when powered by the motor source only. Lighting must be used when operating between sunset and sunrise.												
BICYCLE 	-	No	No	No	Yes, under 12	Yes	Yes	-	Yes, not in business district	Yes	Yes	§ 102, § 3501 et seq., § 3802, § 1547
Is a pedalcycle. Is moved solely by human-powered pedals. Lighting must be used when operating between sunset and sunrise.												

For more information visit penndot.gov

May 2021

Figure 4.28. PA Low-Speed Micromobility Fact Sheet [37]

	Electric standing or sitting scooters (e scooters)	Electric bicycles (e-bikes)			Other[1]
Device					
		Class 1 Pedal assist (pedalec)	Class 2 Throttle assist	Class 3 Pedal assist (pedalec) at higher speed	
Example brands	**Shared:** Bird, Lime, and many others **Owned:** Inboard Glider, Segway 9Bot	**Shared:** Lime, Mobike, Ofo, Pace, Spin, and many others **Owned:** Most major bike brands; multiple passenger versions include Organic Transit (ELF) and Yuba	**Owned:** Several bike brands (less common than Class 1 and 3)	**Owned:** Several major brands; multiple passenger versions include Better Bike (PEBL), and Podride	**Owned:** Boosted, Inboard, Mellow Boards, Metroboard
Weight	Typically < 50 lbs	Typically < 100 lbs; multiple passenger versions near 200 lbs	Typically < 100 lbs	Typically < 100 lbs; multiple passenger versions near 200 lbs	< 50 lbs
Occupants	Single rider	Usually a single rider; some cargo e-bikes or bike cars designed for multiple riders	Typically designed for single riders	Usually a single rider; some designed for multiple riders	Single rider
Power supply	Electric motor typically < 750 watts	Electric motor typically < 750 watts	Electric motor typically < 750 watts	Electric motor typically < 750 watts	Electric motor typically < 750 watts
Product speed[1]	20 MPH or less; some cities apply additional speed restrictions	20 MPH or less	20 MPH or less	28 MPH or less	Most are 20 MPH or less though some can go up to 30 MPH
Operating space	Varies by place;[3] some cities restrict in crowded places	Varies by place;[3] usually allowed on bike transportation facilities and paths	Varies by place;[3] usually allowed on bike transportation facilities and paths	Varies by place;[3] some States restrict access on bike paths	Varies by place[3]
Regulated by	Consumer Product Safety Commission (CPSC), for personally owned devices[4]	CPSC (only for personally owned devices)	CPSC (only for personally owned devices)	CPSC (only for personally owned devices)	CPSC (only for personally owned devices)

Figure 4.29. Common Micromobility Devices [38]

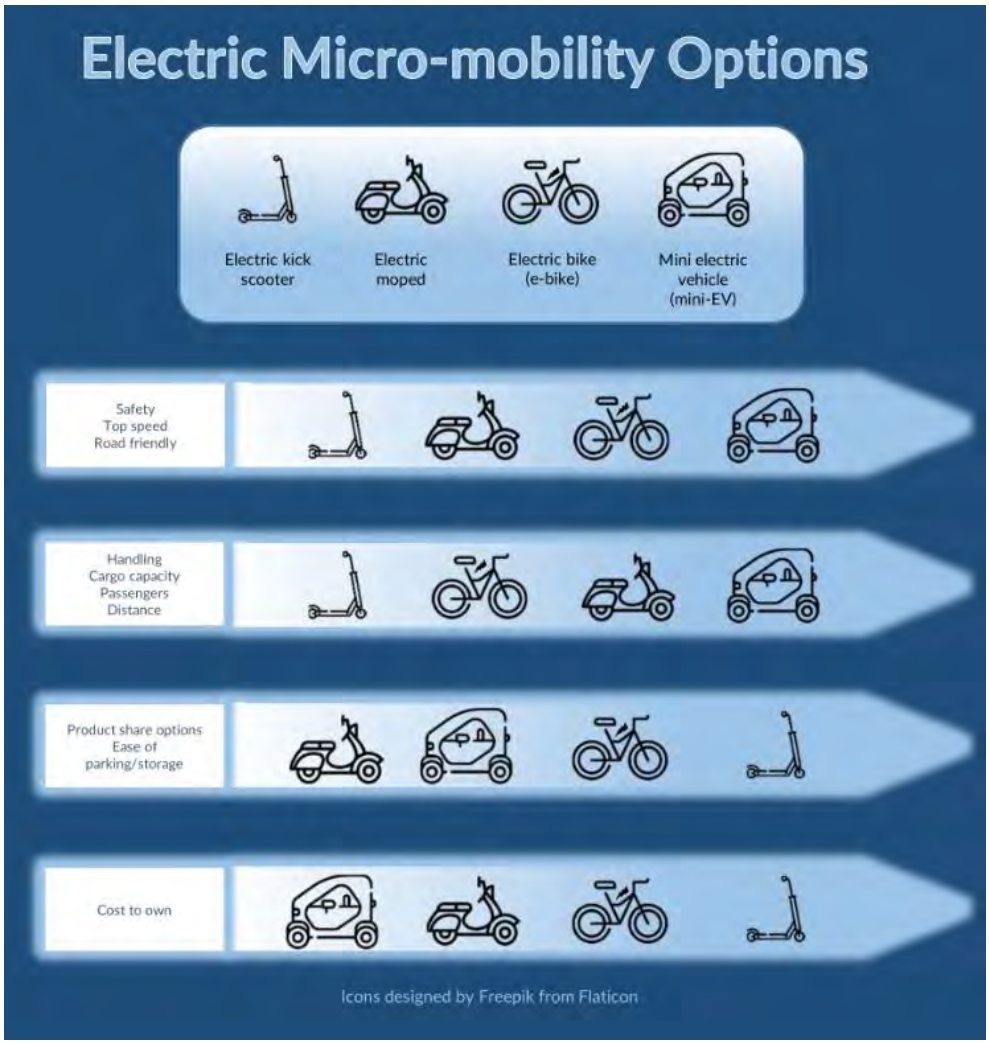


Figure 4.30. Types of Electric Micro-Mobility Options [39]

Micromobility in the PA Vehicle Code

While the Pennsylvania State Vehicle Code does not define micromobility it does include applicable requirements, rules, and regulations that speak to vehicles that are typically categorized with micromobility devices. First, a review was conducted to verify that that state vehicle code was applicable to the Penn State roadways. The Vehicle Code (Title 75) is applicable to "highways," which by definition also includes "a roadway open to the use of the public for vehicular travel on grounds of a college or university or public or private school or public or historical park." As such, any roadway that is open for public vehicular travel on the University grounds is governed by the Vehicle Code and the associated code chapter that pertains to micromobility (Chapter 35 Special Vehicles and Pedestrians). State code provides the broadest guidance on the use of pedalcycles (human-powered or electrical assisted) but has not yet developed guidance for emerging forms of micromobility. Penn State may use Chapter 35 of the State Code as the foundation for micromobility programming and enforcement.

Benefits to Penn State Users

Micromobility offers many benefits that would be attractive to students, faculty and staff at Penn State. As noted in the PennDOT Active Mobility Plan,[41] micromobility offers the following key benefits:

- Provides more mobility choices
- Offers last mile and first mile connections
- Reduces traffic congestion
- Mitigates various forms of pollution
- Reduces transportation costs
- Improves efficiency of transportation networks
- Provides options for those who cannot afford to buy and maintain a vehicle
- Offers accessible mobility options for persons of all ages, abilities, and skill levels

Additional benefits[42] that are unlocked by micromobility include:

- ***Health Improvement*** … Micromobility vehicles encourage physical activity and contribute to improved public health by offering an active alternative to sedentary modes of transportation.
- ***Flexibility*** … Micromobility vehicles offer flexibility in terms of routes and schedules, allowing users to travel where and when they want.
- ***Reliability*** … Micromobility vehicles are often reliable and serve as a dependable mode of transportation.
- **Congestion and Parking Relief** … Micromobility vehicles can alleviate traffic congestion and reduce the demand for traditional parking spaces, optimizing the use of urban space.

Common and Unique Challenges in the University Park Environment

There are many concerns with micromobility devices in the University Park Campus environment that stem from the fact that the campus was not designed for them. Nor is space readily available to create dedicated facilities for these vehicles. The likely outcome is that they must share space the street space with cars, bikes, and people. The number one concern with these shared transportation spaces is safety—particularly the increased potential for collisions among vehicles moving at significantly different speeds. As a real-world illustration, Austin (Texas) Public Health and the Centers for Disease Control (CDC) found that e-scooter use resulted in 20 injuries per 100,000 trips, 1/3 of injuries were sustained by riders on their first e-scooter ride, 48% of injuries were to the head, and more than 1/3 reported that excessive speed contributed to their injury [43].

Collisions and their severity are a function of the speed differentials among and between micro mobility devices and other street users. Some devices may operate at speeds higher than people can walk or propel a traditional pedal cycle. Meanwhile, they are often much slower than prevailing motorized vehicle traffic—placing them in disharmony with users on both the sidewalk and street, from a speed perspective.

And because these devices are new, policies, regulations, and guidelines either do not exist or have been hastily prepared without full consideration for the use and impact of these vehicles. Similarly, because these vehicles seem to change size, format, speed, and orientation on a continual basis, polices are always behind the curve of new device development.

Spatial challenges revolve around device parking, storage, and management of charging infrastructure. While the vehicles are smaller and demand less space when parked, the number of vehicles and their spatial needs are not

[41] PennDOT.pa.gov, *PennDOT Active Transportation Plan (2019)*, https://www.penndot.pa.gov/TravelInPA/active-transportation/Pages/default.aspx, as accessed August 2023.
[42] EnergyTheory.com, *Different Types of Micromobility Revolutionizing Urban Travel, June 21, 2023*, https://energytheory.com/types-of-micromobility/, as accessed August 2023.
[43] University of Oregon, Urbanism Next Center, *Emerging Technologies: Micromobility*, January 2020, https://bpb-us-e1.wpmucdn.com/blogs.uoregon.edu/dist/f/13615/files/2020/02/FS_Micromobility.pdf, as accessed August 2023.

easy to predict or regulate at every location. Campuses are often adapting after the modes are in use, and in this responsive mode, accommodating them can be *ad-hoc* or designated in areas not intended for this function. Service and safety challenges also extend to vehicle charging policies (i.e., energy infrastructure capacity, battery safety), with justifiable concern about lithium batteries.

Environmental and geographical conditions also come into play in the northeastern United States. Reliable, year-round use of these devices is a challenge, with many of these devices not particularly suited for travel over snow or ice events. Plus, with electric, battery-powered devices, cold conditions are known to adversely impact battery life, severely limiting their operable range. The geography/topography of State College could also present challenges related to power needed on hills and longevity of the battery for day-long use.

How Micromobility is Regulated

There are three broad strategies that can be deployed to regulate micromobility on college campuses:

- Permissive – Very few regulations beyond standard bicycle regulations or DOT regulations.
- Restrictive – Extensive regulation or full restriction (e.g., no scooters allowed on campus); may include night-riding bans, caps on numbers of devices, lock-to or other parking requirements, and geographical restrictions.
- Mixed – Combination of permissive and restrictive regulations by zone (geofencing) or certain times of the day.

Table 4.11 compares the degree of regulation among different U.S. urban areas, with an estimate of micromobility use for different modes and an estimate of overall micromobility usage.

At University Park, micromobility devices are loosely regulated in a mixed fashion by existing policy, mostly referencing SY16 Regulations for Bicycles / Skateboards / Scooters / In-Line Skates / Roller Skates / Electric Personal Assistive Mobility Devices. Relevant sections from SY16 are as follows:

- *Bicycles shall be ridden on campus roads and shared use paths only. Riders must dismount and walk their bicycle at all other places. Specifically, bicycles* ***shall not be ridden on sidewalks along university-owned roads within the campus proper,*** *bounded by Atherton Street, Park Avenue, College Avenue, and University Drive.*
- *The operator of bicycles on malls, shared use paths, and roadways must exercise due caution, follow traffic laws, ride with regard for the safety of pedestrians and property and yield to pedestrians.*
- ***SY16 Regulations for Bicycles / Skateboards / Scooters / In-Line Skates / Roller Skates / Electric Personal Assistive Mobility Devices***
    - *The use of skateboards and skateboard-like devices on campus property is prohibited.*
    - *Roller skates, in-line skates, scooters (excluding medical), sleds, hoverboards, and similar coasting devices are not vehicles and are prohibited in roadways. Persons on such devices are pedestrians for traffic control purposes.*
    - *Persons may coast or ride upon roller skates, in-line skates, scooters, or hoverboards on sidewalks provided they yield the right-of-way to pedestrians on foot and follow traffic rules at intersections.*

The Penn State policy defines rules and regulations for bicycles, mopeds, skateboards, scooters, in-line skates, roller skates and electric personal assistive mobility devices apply to all persons operating any such mode of transportation on University property. The policy defines a limited bicycle zone; defines the applicable e-bike size, power, and speed ratings; fully prohibits the use of skateboards and skateboard-like devices, and prohibits the uses of roller skates, in-line skates, scooters (excluding medical), sleds, hoverboards, and similar coasting devices in roadways. The last substantive update to SY16 was made in May 2019 (before the COVID pandemic), and the policy may be due for review and update to address travel conditions that exist on campus today, including micromobility and the emerging challenges.

Table 4.11. Comparison of Micromobility Regulation and Impact among U.S. Urban Areas [44]

City	Degree of Regulation		Micromobility Penetration
	Scooters	Dockless Bikeshare	
Atlanta, GA	Restrictive	Restrictive (night ban)	Medium (4.5k scooters, 1k e-bikes)
Austin, TX	Permissive	Permissive	Very High ("10k devices)
Boston, MA**	Ban	Permissive	Temporary Ban, low bike share outside of the city (Lime pulled out in 2020)
Chicago, IL	Restrictive	Restrictive/Ban	High ("10k devices)
Columbus, OH**	Permissive	Permissive	Medium
Davis, CA	Ban	Permissive	None (Jump/Lime pulled out)
Washington DC**	Mixed	Permissive	High (10k e-scooters, 4k e-bikes)
Denver, CO	Restrictive	Permissive	Medium (3k e-scooters, 600 e-bikes)
Detroit, MI	Permissive	Unknown, no dockless	Unknown
Houston, TX	Permissive	Permissive	Unknown
Kansas City, MO	Permissive	Permissive	High
Los Angeles, CA	Mixed	Mixed	High (37k devices)
Memphis, TN	Permissive	No dockless, docked city (Explore)	Medium (Lime leaves Bolt joins)
Minneapolis, MN	Permissive	Mixed	High
Nashville, TN	Mixed	Unknown	Unknown
New Orleans, LA	Ban	Ban	State ban
New York City, NY**	Restrictive	Restrictive/Ban	Low (3k e-scooters)
Newark, NJ**	Restrictive	Restrictive	Low (2k e-scooters)
Oakland, CA	Mixed	Docked city, adding dockless	High
Philadelphia, PA**	Ban	Ban	State ban
Phoenix, AZ	Restrictive	Permissive	Unknown
Portland, OR	Restrictive	Permissive	Medium
Raleigh, NC	Restrictive	Restrictive	Low (750 e-scooters)
Sacramento Region, CA	Mixed	Permissive	High
San Antonio, TX	Permissive	No dockless, docked city	Medium
San Diego, CA	Restrictive	Restrictive	Medium (6.4k e-scooters)
San Francisco, CA	Mixed	Permissive	High
San Jose, CA	Permissive	Permissive	High
Seattle, WA	Pilot program	Permissive	Medium (5k devices)

Table Notes:
** Notation and highlight indicates urban areas in the Northeastern United States.

[44] Fuller, S., Fitch, D., & D'Agostino, M. C. (2021), *Local Policies for Better Micromobility*, UC Davis: Institute of Transportation Studies, http://dx.doi.org/10.7922/G2FJ2F3B. As retrieved from https://escholarship.org/uc/item/8mw5j82x.

Peer Universities

The policies and regulations used by a sample of peer universities were investigated to see how they manage their micromobility systems and benchmark Penn State's approach and techniques.

Texas A&M University

The university has a three-year partnership with Veo[45] to provide seated e-scooters and pedal bikes. The most popular personal devices on the campus were seated scooters. As noted on the university's Transportation Services website under *University Bikes & Wheels Regulations*:

> *Micromobility is defined as lightweight vehicles such as bicycles, scooters, boards, etc. with drive systems which may be electric only, electric assist, or analog. Micromobility may be personally owned, borrowed, leased, or rented. When you ride a bicycle or other personal mobility device on a roadway and/or within the Texas A&M University campus, you are a driver. You must follow state laws, give signals, obey stop signs and yield right of way-just as car drivers do. Laws and regulations are designed for the safety of all campus users.*[46]

The *University Bikes & Wheels Regulations* webpage is organized into Registration and Use Requirements, Operation Regulations, Parking Regulations, and Transportation Services Enforcement. These and other university rules and regulations include the following:

- All micromobility devices brought to campus must be registered and comply with safety standards.
- Micromobility devices equipped with an electric motor exceeding 750 Watts or 1 horsepower are prohibited for use on campus.
- Scooters may only be operated in areas where bicycle traffic is allowed.
- Scooters should be operated at a low speed in the presence of pedestrians and pedestrians always have the right of way.
- Scooters should be parked at bike racks only.
- Electric devices with installed or removable lithium batteries are not allowed to be used, stored, or charged in any university buildings or facilities due to the significant fire hazard posed by these devices. This includes on-campus housing.

No micromobility user on university property, including sidewalks, bike paths, and shared use paths should exceed a speed that is reasonable and prudent. Users must consider the number of pedestrians or other micromobility present, visibility, traffic, weather, and surface conditions that exist at the time, or take action that endangers property or the safety of any person.

University of Arkansas

The university owns and operates a scooter share program that generates 5,000 to 8,000 scooter trips per day. The most popular mobility device is standing scooters. The following rules, regulations, and policies are noted on the university's website:[47]

- Scooters can be ridden anywhere bicycles are allowed, including streets and paved trails.
- Riding is permitted on most sidewalks, riders must yield to pedestrians and use extra caution at crosswalks and driveways. No riding on sidewalks that abut a building face.

[45] VEO X Texas A&M, https://www.veoride.com/texas-am/, as accessed August 2023.
[46] Texas A&M Transportation Services, https://transport.tamu.edu/Alternative/bicycles/regulations.aspx, as accessed August 2023.
[47] University of Arkansas, Campus Safety, https://safety.uark.edu/e-scooter-safety.php, as accessed August 2023.

- Using a cellphone, headphones, earbuds or any similar device that impairs hearing is prohibited while riding a scooter.
- E-Scooters are programed with a maximum speed of 15 MPH and will automatically slow to 6 MPH in designated "slow zones" (see **Figure 4.31**).[48]
- Park scooters neatly at a Scooter Corrals.
- Any person operating an electric motorized scooter upon a roadway at less than the normal and reasonable speed of traffic shall ride in the right-hand lane of the roadway.
- No person shall operate electric motorized scooters in university buildings or charge an electric scooter on university property.

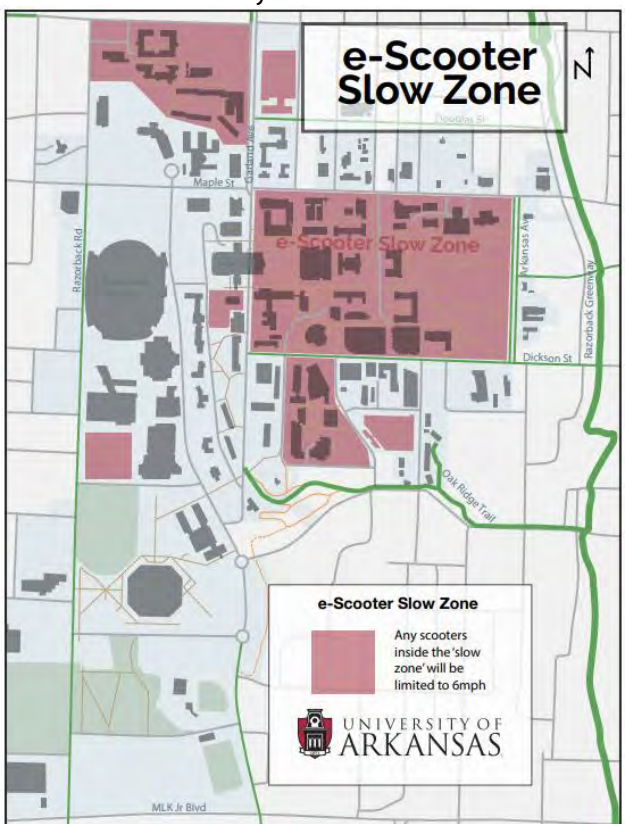


Figure 4.31. University of Arkansas E-Scooter Speed Limited Zone [47]

University of Maryland

The university partners with both Veo to provide stand up e-scooters and e-bikes. The university's most popular personal devices are standing scooters, pedal-assist e-bikes, and throttle-assist e-bikes. Per the university's website:[49]

- Maryland State Law regulates e-scooters under the same code that regulates standard bicycles. This means that e-scooters must be operated on the road and follow all traffic laws
- e-Scooters may not be operated:
  - On sidewalks or in crosswalks
  - Within campus parking garages
  - In an unsafe manner. This includes wearing earbuds or headphones while riding, acrobatic riding, distracted riding or more than one rider per vehicle.
- Bikes and scooters should generally be used on roads. However, sidewalks can be used when necessary. If you must use a sidewalk, dismount your scooter/bike and walk.

Rutgers University

The university partners with both Veo and Bird to provide various micromobility devices. The university's most popular personal devices are standing scooters. Per the university's website:[50]

- Scooters are not allowed on sidewalks and are subject to municipal fines.
- Return scooters to bike racks or check the Veo app for designated parking areas. Report improperly parked scooters on the app.

[48] University of Arkansas, e-Scooter Slow Zone, https://safety.uark.edu/eScooter-slow-zone-campus.pdf, as accessed August 2023.
[49] University of Maryland, Transportation Services, https://transportation.umd.edu/safety-starts-you, as accessed August 2023.
[50] University of Rutgers, Parking & Transportation Services, https://ipo.rutgers.edu/dots/scooters, as accessed August 2023.

- State Law:
  - The motorized scooter may only have a maximum speed capability of no more than 15 mph.
  - Motorized bicycles, or mopeds, are low-speed, two-wheeled vehicles with pedals, intended for limited use on public roadways. Moped drivers may not exceed 25 mph, must follow all traffic signs and signals and drive on the right side of the road with the flow of traffic.

Strategies and Recommendations for University Park

With the range of micro-modes already in use at University Park, Penn State is developing policies that are informed by existing state regulations and can work in the University Park Campus environment. This includes policy, spatial, operational, and enforcement considerations, as follows:

- Better definitions, classifications, and specific regulations for each type of micromobility devices.
- Flexibility in instituting, evaluating, and then adjusting regulations.
- Developing relationships with other universities and micro-mode providers themselves are beneficial when considering new policies and adjusting current regulations.
- Clarify parking regulations and designated parking areas for micro-modes.
- Develop dedicated space (or space shared only with wheeled vehicles).
- Establish public charging locations, likely in coordination with parking.
- Establish/revise fine structures for improper parking and usage.
- Ban sidewalk use entirely.
- Allow only University-owned micro-modes on campus, providing greater operational control.
- Establish spatial (geofencing) or time-of-day use restrictions.
- Provide incentives to commuters for training classes, helmet use, and good rider history.

Penn State has already pursued and implemented several of these considerations via their E-Bike partnership. These include time-of-day restrictions, speed limited areas, and dedicated parking.

The University also hopes to implement a similar approach to other micro modes—particularly standing scooters. However, there are limitations in what can be accomplished under the current PA Vehicle Code. That is, standing scooters remain illegal on Pennsylvania's public roads, which encompasses (by Vehicle Code definition) streets traversing university campuses. Pilot programs allowing electric scooters within the cities of Philadelphia and Pittsburgh were conducted during the last few years, and lessons learned are being studied. However, those pilot programs expired in July 2023, and as of this writing, the anticipated legislation to amend the Vehicle Code and address electric scooters has not yet been enacted. It is not clear when this issue will be taken up by the State Transportation Committee and General Assembly.

Chapter 5.
Future Development Assumptions and Impact

5.1. Background and Purpose

The text of the University Planned District (UPD) Ordinance states:

> *A district transportation study shall be submitted with the application for approval of the District Plan, and every 10th year following approval of the District Plan. The purpose of the transportation study is to generally identify the transportation impacts likely to result from projected development and activities within the District for a 10-year period.*

Therefore, this chapter identifies the University-funded development and activities projected within the UPD over the next ten-year period (2023-2033), as assembled from the following sources:

- University Park Five-Year Capital Plan, 2018-2023
- University Park Five Year Capital Plan, 2024-2028
- Interviews with Penn State's Office of Physical Plant staff, conducted in March 2023
- University Park Roadway Preservation Program, 2020-2040
- University Park Utilities Maintenance Program, 2022-2025

In addition to the University-funded projects, improvement plans developed by other agencies were reviewed to identify projects near the University Park Campus that may change the transportation system or otherwise influence travel activity at the University Park Campus.

- Centre County Metropolitan Planning Organization Transportation Improvement Program
- PennDOT Twelve Year Program (TYP)
- State College Borough Capital Plan
- College Township Capital Plan
- Patton Township Capital Plan
- Ferguson Township Capital Plan

The Ten-Year UPD Development Assumptions compiles projects from all of these University and Agency programs as planning-level information for the University Planned District Transportation Study.

For the University Projects, transportation impact is also addressed. The project descriptions focus on characteristics that are common drivers of trip-making and travel patterns—e.g., floor area, employment, visitors, parking, etc. From this information, the Future Year UPD Transportation Assessment states the Anticipated Transportation Impact during the next ten-year period can be assessed.

The Assumptions provide a concise overview and planning-level information to frame the discussion of transportation at the University Park Campus. However, the Assumptions are neither a commitment by the Pennsylvania State University nor an expectation of PennDOT or any municipality to build any particular project, design, or location. The Assumptions are not intended as an exhaustive catalog of projects or a limitation on projects that may be imagined, developed, or implemented within the next ten years. And the Anticipated Transportation Impact is a snapshot based on the University's most current information from the project development process. The Assumptions are subject to change as funding for certain projects is accelerated or delayed and feasibility, scope, and cost are clarified.

5.2. Ten-Year UPD Development Assumptions

Projects from the University's Capital Plans along with other projects anticipated within the next 10 Years were compiled together into the Ten-Year UPD Development Assumptions. **Figure 5.1** provides a composite map of University, Municipal and PennDOT/MPO projects. The map is followed by "exhibit" tables that are keyed to the mapping and supply project details.

University Projects (50) are identified **blue** and **purple** colors and are keyed to **Exhibit 5.1** (4 pages). These projects are drawn from the University's Capital Plans and are described in Section 5.3.

Municipal Projects (10) are identified in **green** colors and are keyed to **Exhibit 5.2**. These projects are drawn from municipal plans and are described in Section 5.4.

PennDOT/MPO Projects (2) are identified in **red** colors and are keyed to **Exhibit 5.3**. These projects are drawn from the MPO and PennDOT project programs and are described in Section 5.5.

5.3. University Projects

University Capital Planning

Penn State University is in the practice of adopting 5-year Capital Plans that address identification of strategic rationale, key needs, specific projects, and anticipated funding. The Capital Plans provided breakdowns of funding sources, distribution of funds to university units, and significant projects. Line-items may be used to account for campus-wide renewals, as well as building and infrastructure maintenance and enhancements. The current UPD Transportation Study is being conducted at a time that overlaps with both the 2018-2023 and 2024-2028 Capital Plans.

The Capital Plans typically divide projects and initiatives into two broad categories. **Education and General Initiatives** address the following:

- Systems Renewal includes internal building systems, such as automation, electrical, plumbing, elevators, envelopes, hazardous material abatement, HVAC, interiors and accessibility, life safety.
- Major Construction and Renovation projects encompass more comprehensive building projects that may construct new facilities or expand/replace existing buildings.
- Infrastructure projects maintain, repair, update, and rebuild the primary campus systems outside of the buildings themselves, including utilities, steam lines, streets/sidewalks, etc.
- Demolition involves the removal of facilities, including some that will be replaced in the future and others that will be removed without replacement.

Self-Supporting Units work cooperatively with the University staff in planning and developing projects that are funded through their own revenues and fees:

- *Auxiliary and Business Services* operates and maintains the housing operations, campus dining commons, general stores, information technology, marketing, accounting, safety, transportation services, and the Bryce Jordan Center.
- *Intercollegiate Athletics* operates Penn State's varsity athletics programs and associated facilities and venues, which includes the All-Sports Museum and Penn State Golf Courses.
- *Applied Research Laboratory* performs collaborative externally funded research and development activities that capitalize on the expertise of the University's faculty, staff, and students. Research focuses on defense, national security, economic competitiveness, and quality of life.
- *University Park Airport* operates all air-side aspects of the airport in coordination with the University Park Airport Authority, which handles the terminal and ground transportation.

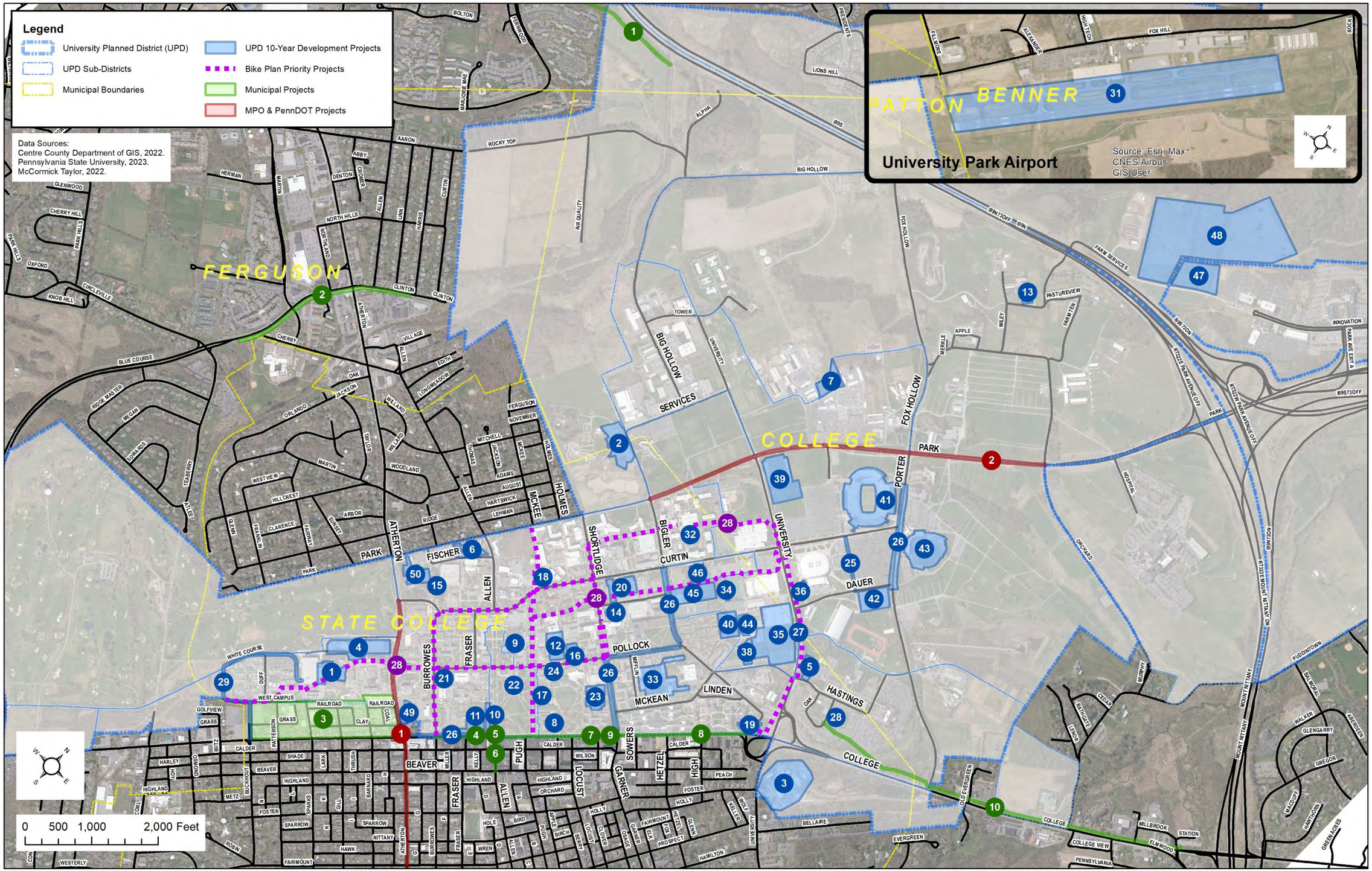


Figure 5.1. University Park Campus Ten-Year Development Assumptions

EXHIBIT 5.1. University Projects & Transportation Impact Projections

Map ID	Project	Project Description	Anticipated Completion Date	Master Plan, Study, or Program	Capital Plan 2018-2023	Capital Plan 2024-2028	Capital Plan 2029-2033	Current Status *August 2023*	Anticipated Net Change: Floor Area	Anticipated Net Change: Employ	Anticipated Net Change: Visitors	Anticipated Net Change: Parking	Anticipated Net Change: Access	Anticipated Transportation Impact
EDUCATION & GENERAL INITIATIVES														
01	College of Engineering, West 2	New 4-story, 98,000 SF teaching and research building occupying site of Red A parking lot. Traffic impact addressed in West Campus Parking Structure TIS, approved in December 2019.	May 2023	College of Engineering Master Plan	✓			Construction	↑	↑	-	↓	-	Addressed via Study
02	Penn State Art Museum at the Arboretum	New 3-story, 70,000 SF art museum replacing the existing museum on Curtin Road. Granted exemption from TIS.	June 2023	College of Arts & Architecture Master Plan	✓			Construction	↑	↑	↑	↓	-	Addressed via Memo
03	Water Reclamation Facility Reconstruction	Full renewal of existing wastewater treatment facility on the current site. Access changes addressed in a study completed during land development.	December 2023		✓			Construction	-	-	-	-	✓	Addressed via Study
04	College of Engineering, West 1	New 5-story, 279,000 SF teaching and research building occupying site of Red A parking lot. Traffic impact addressed in West Campus Parking Structure TIS, approved in December 2019.	March 2024	College of Engineering Master Plan	✓			Construction	↑	↑	-	↓	-	Addressed via Study
05	Forest Resources Laboratory Demolition	Building to be demolished without replacement. Current functions and uses will be distributed/consolidated elsewhere. All or part of the site may be converted to parking to replace parking reduced during other nearby projects.	TBD	Removal of Poor Performing Buildings	✓			Design	↓	↓	-	↑	-	Nominal
06	Susan Welch Liberal Arts Building	New 143,000 SF teaching and research building occupying site of Green B parking lot. Granted exemption from TIS.	October 2024			✓		Construction	↑	-	-	↓	-	Addressed via Memo
07	Environmental Management Facility	New building northwest of the OPP and Transportation Services buildings to house University-generated hazardous and universal waste in a centralized location	June 2024			✓		Construction	↑	-	-	-	-	Nominal
08	Nursing Sciences Building Renovation	The Nursing Sciences Building Renovation Project will address the major maintenance backlog by renewing the building envelope and provided programmatic upgrades for the College of Nursing. The project is expected to add on large classroom on the HUB side of the building (northwest).	December 2024			✓		Design	↑	↑	-	-	-	Nominal
09	Demolition of Oswald Tower	Remove existing Oswald Tower without replacement. Tied to construction and occupancy of the Susan Welch Liberal Arts Building.	Spring 2025			✓		Design	↓	↓	-	-	-	Nominal
10	Sackett Building Renovation	The Sackett Building will undergo a full gut renovation, including strategic improvements to its envelope and the replacement of the entire 4th floor and roof. The mid-century south and north wings will be replaced by two new symmetrical additions in keeping with the Klauder-designed original building. Significant site work, re-grading and utility infrastructure will be part of this multi-phase renewal of Sackett.	December 2026	College of Engineering Master Plan		✓		Design	↓	↓	-	-	-	Nominal
11	Demolition of Hammond Building & Engineering Units	Remove existing Hammond Building and Engineering Units without immediate replacement. Long-term plans envision new buildings on this site, but these are beyond the current UPD horizon.	Spring 2027	College of Engineering Master Plan		✓		Concept	↓	↓	-	-	-	Nominal
12	Osmond/Physics Building Renovation & Expansion	Reovate the existing Osmond Laboratory building and construct a new Osmond North building on the former Brown C parking lot. The project envisions a net increase of about 15,000 SF. Utility work between Whitmore, Davey, South Frear and Osmond would precede the demolition. Includes removal of all regular faculty/staff parking spaces in the Brown C Lot (127 regular spaces, 10 motorcycle spaces). Four (4) service spaces will be configured within the new site layout. Granted exemption from TIS.	June 2027	Eberly College of Science Master Plan		✓		Design	↑	↑	-	↓	-	Addressed via Memo
13	Animal Diagnostic Laboratory Renovation	Following a feasibility study for improvements to the facility, a full-scale renovation of the existing facility was proposed. In addition to building layout, systems, and technology renewal, the site will be modified to better accommodate large vehicle access and parking will be expanded to meet the projected needs.	TBD			✓		Feasibility	↑	↑	-	↑	✓	Possible
14	Eisenhower Auditorium Renovation	Eisenhower Auditorium will undergo "behind the scenes" updates, including mechanical system upgrades, emergency lighting modernization, asbestos removal, and accessibility improvements for performers to the dressing area, the exterior entrance, and the stage. A full roof replacement will also be completed.	TBD	College of Arts & Architecture Master Plan		✓		Concept	-	-	-	-	-	None
15	Carpenter Building Renovation	Primary systems replacement, building modernization to address functional building systems and improve efficiency.	TBD			✓		Concept	-	-	-	-	-	Nominal
16	Boucke Building Renovation	Primary systems replacement, building modernization to address functional building systems and improve efficiency.	TBD			✓		Concept	-	-	-	-	-	Nominal
17	Henderson Building Renovation	Primary systems replacement, building modernization to address functional building systems and improve efficiency.	TBD			✓		Concept	-	-	-	-	-	Nominal
18	Former Palmer Museum of Art Repurposing	Repurposing and renovating the existing interior museum space into general purpose classroom space.	TBD	College of Arts & Architecture Master Plan		✓		Concept	↑	-	-	-	-	Nominal
19	Demolition of Benedict, Beecher-Dock & Gardner Houses	Remove Benedict, Beecher-Dock, and Gardner Houses. All or part of the site may be converted to parking to replace parking reduced during other nearby projects.	TBD			✓		Concept	↓	↓	-	↑	-	Possible

EXHIBIT 5.1. University Projects & Transportation Impact Projections

Map ID	Project	Project Description	Anticipated Completion Date	Master Plan, Study, or Program	Capital Plan 2018-2023	Capital Plan 2024-2028	Capital Plan 2029-2033	Current Status *August 2023*	Anticipated Net Change: Floor Area	Anticipated Net Change: Employ	Anticipated Net Change: Visitors	Anticipated Net Change: Parking	Anticipated Net Change: Access	Anticipated Transportation Impact
EDUCATION & GENERAL INITIATIVES (continued)														
20	PlantWorks Greenhouse & Headhouse Replacement	Significant updates to the plant science infrastructure on campus, starting with a fully re-imagined greenhouse and headhouse facilities. The project envisions a new, modern, multi-story facility that consolidates growth chambers that are currently scattered around campus into new USDA APHIS-compliant facilities. These would be integrated with the headhouse, laboratories, instructional and collaboration spaces, and faculty and research offices. The facility may also house public-facing spaces for museums and tours. A new receiving area and loading dock would be added. Site evaluation and selection is part of the Feasibility Study and may recommend one or multiple sites.	TBD	Eberly College of Science Master Plan			✓	Feasibility	↑	↑	↑	-	-	Possible
21	Hostler Building Renovations	Primary systems replacement, building modernization to address functional building systems and improve efficiency.	TBD	Eberly College of Science Master Plan				Design	-	-	-	-	-	Nominal
22	Old Main Renovations	Primary systems replacement, building modernization to address functional building systems and improve efficiency.	TBD					Concept	-	-	-	-	-	Nominal
23	Wellness Center (White Building)	Potential new home for fitness and health services at the campus core. Project is primarily a programming effort to better determine the use of the proposed building, the needed floor area, and cost of expansion/renovation. Coordination between Student Affairs, ICA, and Academics (due to current use of classrooms by the Kinesiology Department) is recommended to determine the appropriate mix of programs to maximize the utility of this building and site.	TBD	Student Affairs Facilities Master Plan				Feasibility	-	-	-	-	-	Nominal
24	HUB Replacement/Expansion	Proejct seeks to maintain the current array of student life programming, dining, events, and student organizations. Project is primarily a programming effort to evaluate the future of dining in the facility (maintain, grow, or shrink). Look for further opportunities to decant non-student facing staff offices to other locations in order to maximize space for student-facing programs.	TBD	Student Affairs Facilities Master Plan				Feasibility	-	-	-	-	-	Nominal
INFRASTRUCTURE & UTILITITES PROJECTS														
25	Commuter Drive Sidewalk Addition	Add concrete sidewalk on the west side of Commuter Drive from Dauer Drive to Curtin Road. Lighting upgrades are integrated with the project.	August 2023					Construction	-	-	-	-	-	Nominal
26	Campus Pedestrian Lighting Upgrades	The project will replace, update, and add overhead roadway and pedestrian crossing lighting along Porter Road, Bigler Road, Pollock Road, Shortlidge Road, and College Avenue.	August 2023					Construction	-	-	-	-	-	Nominal
27	University Drive Enhanced Pedestrian Crossing	The project will install a pedestrian crossing of University Drive just north of Dauer Drive. The crossing would be ADA-compliant with new markings, lighting, and a user-activated rectangular rapid flashing beacon mounted overhead on mast arms.	July 2024					Construction	-	-	-	-	-	None
28	East Campus Thermal Storage Tank	The project will establish a new thermal energy storage complex at a site (to be determined) on East Campus, generally located in the long-term student parking lot near Hastings Road. The project is expected to reduce approximately 125 parking spaces, which may or may not be replaced in the University parking supply.	TBD			✓		Feasibility	-	-	-	-	-	Nominal
29	West Campus Multi-Modal Connection	New transportation facility/conneciton between the West Campus Parking Structure and College Avenue at Buckhout Street. The connection concept was initially evaluated in the DRAFT West Campus Paking Structure Transportation Impact Study (2018) but was removed from the project as a full vehicular connection to address community concerns. The connection may have future merit as a multi-modal link (transit, bike, ped only) with interest from CATA for using the link. The connection could also be opened as a future vehicular link, with additional study, agreement with the adjacent municipalities, and appropriate network design to address community concerns.	TBD	West Campus Parking Struture Transportation Impact Study (2018)				Concept	-	-	-	-	✓	Likely
30	Penn State University Park Bicycle Master Plan - Priority Network	Implementation of Priority Keystone Projects from the Penn State Bile Plan. Priority projects enhance eixsting campus streets and add pathways to address the highest demand areas and reate connectivity. The plan also identifies Secondary Supporting Projects that serve lower demand areas and would enhance connectivity of the overall network. Implementation is on hold awaiting funding.	TBD	Penn State University Park Bicycle Master Plan (2023)				Concept	-	-	-	-	-	Possible
31	University Park Airport Taxiway & Runway Rehabilitation Projects	Expansion of taxiways (currently in construction), rehabilitation of the runway (design), and upgrades to the cargo aprons (concept) are major projects that are currently moving forward. The UPA is also participating in the DCED Airport Land Development Zone Program (ALDZ), with the purpose of accelerating development activity on land and in vacant buildings owned by airports. The most recent airport master plan was completed in 2016 but is due for an update, in light of COVID-pandemic impacts and changes in the airline industry.	2025	Univeristy Park Airport Master Plan				Design/ Construction	-	-	-	-	-	Nominal

EXHIBIT 5.1. University Projects & Transportation Impact Projections

Map ID	Project	Project Description	Anticipated Completion Date	Master Plan, Study, or Program	Capital Plan			Current Status *August 2023*	Anticipated Net Change					Anticipated Transportation Impact
					2018-2023	2024-2028	2029-2033		Floor Area	Employ	Visitors	Parking	Access	
RESIDENCE HALLS PROJECTS														
32	East Residence Halls Renovations Phases 1a, 1b, 1c, 2a, 2b	Renovation of residence halls except Hastings, Stone and Snyder Halls. Includes new/more efficient building systems, climate-control, updated furniture and living spaces, improvements to building aesthetics, ADA-access, landscaping, etc. Maintains the current number of student beds.	August 2023			✓		Construction	-	-	-	-	-	Nominal
32	East Residence Halls Renovations Phase 2c	Renovation of Hastings, Stone and Snyder halls including new/more efficient building systems, climate-control, updated furniture and living spaces, improvements to building aesthetics, ADA-access, landscaping, etc. Maintains the current number of student beds.	August 2024			✓		Construction	-	-	-	-	-	Nominal
33	Pollock Halls Renovations Phases 3a, 3b, 3c and 3d	Renovation of Beaver, Porter, Shunk, Hiester, Shulze, Wolf and Ritner halls including new/more efficient building systems, climate-control, updated furniture and living spaces, improvements to building aesthetics, ADA-access, landscaping, etc. Maintains the current number of student beds. Progressive completion of phases 3a-3d from July 2026 to July 2029.	July 2029			✓		Architect Selection	-	-	-	-	-	Nominal
33	Pollock Halls Renovations Phase 4a	Renovation of Mifflin and Hartraft Halls including new/more efficient building systems, climate-control, updated furniture and living spaces, improvements to building aesthetics, ADA-access, landscaping, etc. Maintains the current number of student beds.	December 2029				✓	Architect Selection	-	-	-	-	-	Nominal
INTERCOLLEGIATE ATHLETICS PROJECTS														
34	Field Hockey Stadium Renovation/Expansion	The project would increase capacity of the venue to 1,200, incorporating an upper level press box, broadcast booth and multi-purpose hospitality area, as well as new field storage. Improvements would also include home and visiting team dressing areas, press/TV facilities, locker room space for officials, ticket office, public restrooms and concession areas.	October 2023	Penn State Athletics Facilities Master Plan	✓			Construction	↑	-	↑	-	-	Nominal
35	Holuba Hall, Lasch Football Building & Nittany Outdoor Football Practice Fields Renovation	Renovations to address functional building systems, efficiency, and facility capabilities--e.g., lighting, technical AV capabilities, climate-control, accessibility, etc. Lasch Building Renovation includes revisions to office and meeting space and expansion/enclosure of the building's patio as an all-weather venue for facility guests and events.	December 2023	Penn State Athletics Facilities Master Plan	✓			Construction	-	-	-	-	-	Nominal
36	Plyometric Hill Training Facility	Project will add a plyometric training facility for ICA, sited on the slope between University Drive and the Bryce Jordan Center. Outdoor facility would be closed to the general public and would include facilities for jumping and hill climbing.	December 2023			✓		Construction	-	-	-	-	-	None
37	East Area Locker Room Renovation	From Steve: Dining for Athletics and Athlete support space Will move Training Table from Pollock to new facility	June 2024			✓		Design	-	-	-	-	-	Nominal
38	Greenberg Indoor Sports Complex (GISC) Renovation/Expansion	The GISC Training Table Renovation and Addition project involves the renovation of the existing first floor laboratory swing space into a training table and the renovation of the existing ground floor office swing space into a wellness and athletic training space. The project also involves a new entry addition and sitework modifications to accommodate a loading dock along with parking lot reduction and site plaza modifications.	August 2025			✓		Design	↑	-	-	↓	-	Nominal
39	Jeffrey Field	Renovations would add home and visiting team locker facilities, chairback seats for fans with covered seating on the west side, concessions and restrooms, a videoboard, media facilities, and new lighting throughout. Seating capacity would be increased to 4,000 upon completion.	October 2025	Penn State Athletics Facilities Master Plan		✓		Design	↑	-	↑	-	-	Nominal
40	Indoor Practice Facility	New 108,000-square foot indoor practice facility, similar to Holuba Hall, would be attached to the East Locker Rooms or Center foe Excellence, providing practice space for the baseball, softball, men's and women's golf, lacrosse and soccer programs, as well as indoor workout space for all 31 sports. The venue may also host selected Penn State sports camps and other events. To be completed in combination with Jeffery Field.	October 2025	Penn State Athletics Facilities Master Plan		✓		Design	↑	-	-	↓	-	Nominal
41	Beaver Stadium Renovations	Renovations would improve the quality of fan amenities, establish the seating capacity, preserve and enhance the iconic nature of the stadium, utilize existing stadium assets, preserve and enhance the tailgating experience and provide premium amenities. Renovation projects are likely to extend to the surrounding transportation and parking infrastruture, including RV parking ehnancements and streetscape updates. First phase includes approximately $70 million of $700 million total.	August 2027 (Phase 1)	Penn State Athletics Facilities Master Plan		✓		Design	↑	-	↑	-	✓	Possible
42	ICA Practice & Training Facility	Potential site for a new ICA facility, possibly including indoor practice space, training rooms, meeting rooms, and offices for coaches and trainers. Funding not yet idenfitied. 300 to 400 existing parking spaces in the BJC Commuter Lot may be reduced/displaced.	TBD			✓		Concept	↑	-	-	↓	-	Nominal
43	Medlar Field at Lubrano Park Renovations & Addition	Renovations and addition to the existing facility to make the ballpark Professional Development League (PDL) compliant for the State College Spikes. Project includes upgrades for both the Spikes and Penn State baseball programs.	TBD			✓		Design	↑	-	-	-	-	Nominal

EXHIBIT 5.1. University Projects & Transportation Impact Projections

Map ID	Project	Project Description	Anticipated Completion Date	Master Plan, Study, or Program	Capital Plan 2018-2023	Capital Plan 2024-2028	Capital Plan 2029-2033	Current Status *August 2023*	Anticipated Net Change: Floor Area	Anticipated Net Change: Employ	Anticipated Net Change: Visitors	Anticipated Net Change: Parking	Anticipated Net Change: Access	Anticipated Transportation Impact
INTERCOLLEGIATE ATHLETICS PROJECTS (continued)														
44	Center of Excellence	New 450,000-square foot hub for Penn State student-athletes, staff, and coaches. Would replace the East Area Locker Room building. Facility would centralize services and other resources for student-athletes and would house locker rooms and coaches' offices for the field hockey and men's and women's lacrosse, soccer, and tennis programs. Project on hold, with East Locker Room Renovation satisfying current needs.	TBD	Penn State Athletics Facilities Master Plan			✓	Concept	↑	-	-	↓	-	Possible
45	Natatorium Replacement	New 130,000-square foot facility would replace the existing Natatorium, likely on a different site. Would include a 10-lane, 50-meter competition pool, a separate lap pool with campus recreation programming capability, and diving well. Complex would have facilities for men's and women's swimming and diving teams, seating for approximately 2,500 spectators, and campus community locker rooms. Project on hold awaiting funding.	TBD	Penn State Athletics Facilities Master Plan			✓	Concept	↑	-	↑	-	-	Nominal
46	Indoor Tennis Training Facility	New 100,000-square foot complex with 10 courts, facilities for men's and women's tennis teams, campus recreation space, seating for 500 spectators, and a pro shop. Project on hold awaiting funding.	TBD	Penn State Athletics Facilities Master Plan			✓	Concept	↑	-	↑	-	-	Nominal
APPLIED RESEARCH LABORATORY PROJECTS														
47	ARL IB-01	Create 126,000 SF secure interdisciplinary hub for ARL research at Innovation Park. Project expected to be coordinated and concurrent with ARL Main Laboratory Renovation. Building layout and function will evolve with final scope of the ARL Main Laboratory Renovation.	June 2026	ARL Facility Master Plan		✓		Design	↑	↑	↑	↑	✓	Addressed via Study
48	Applied Research Laboratory Replacement & Consolidation	50-year master plan to build 1.2 million SF at Innovation Park. Project development requires change in Regional Growth Boundary as part of municipal approval. The initial building in the master plan (ARL IB-01) would be built within the existing Innovation Park boundary.	50 Years	ARL Facility Master Plan				Concept	↑	↑	↑	↑	✓	Likely
49	ARL Main Laboratory Renovation	Renovation of the Main Laboratory Building update functional building systems, improve efficiency, and modernize certain spaces. Project may include vacating, reducing, and/or demolishing certain portions of the building. Building may be vacated/demolished entirely (without immediate replacement) once ARL functions move to new facilities.		ARL Facility Master Plan		✓		Concept	↓	↓	-	↓	-	Nominal
OTHER CAMPUS ACTIVITY														
50	Nittany Lion Inn Re-Opening	In July 2022, the Penn State Board of Trustees approved a purchasing agreement and lease with the Scholar Hotel Group, a private entity that will lease and operate both the Nittany Lion Inn and Penn Stater Hotel and Conference Center. The re-opening of the Nittany Lion Inn as a hotel is planned for Fall 2023. The Penn Stater has and will remain open.	September 2023					Awaiting Occupancy	-	-	-	-	-	Nominal

EXHIBIT 5.2. Municipal Projects

Map ID	Project	Project Description	Anticipated Completion	Master Plan, Study, or Program	Current Status
PATTON TOWNSHIP					
01	Oakwood Bicycle/Pedestrian Path, Benjamin Court to Bellefonte Central Rail Trail	The plan identifies the proposed Oakwood Bicycle/Pedestrian Path from Benjamin Court to Bellefonte Central Rail Trail (BCRT) in the Penn State Arboretum Lands. The proposed alignment starts in Patton Township at Oakwood Avenue and follow an existing path through the Village Square neighborhood. Where the path currently ends at Benjamin Court, an extension would extend between the Village Square and Heritage Oaks properties into College Township and the Penn State Arboretum lands and across to the existing Bellefonte Central Rail-Trail, generally following an existing dirt pathway along a fence-row.	TBD	Parks & Bike/Pedestrian Path Plan, 2020-2029	Concept
FERGUSON TOWNSHIP					
02	Blue Course Drive/Clinton Avenue Shared Use Path Connection	The Northland Area Mobility Study, completed by Ferguson Township in 2019, recommends connecting the existing shared use path west of Atherton Street to the McKee Street Path on the eastern end of Clinton Avenue. The project would address the "missing link" in bicycle and pedestrian facilities through this area that was identified in the Centre Region Bike Plan.	TBD	Northland Area Mobility Study	Concept
STATE COLLEGE BOROUGH					
03	West End Revitalization	Envisions changes in the character, density, and transportation connections in the Borough's West End adjacent to Penn State's West Campus.	TBD	State College Downtown Master Plan	Concept
04	Allen Street Transit Center Reloaction	A concept "alternative" for the Allen Street Transit Center envisions relocating the transit center west of Allen Street. The University may be supportive of the transit relocation to improve aesthetics by removing buses from the viewshed in front of Old Main.	TBD	State College Downtown Master Plan	Concept
05	College Avenue & Allen Street Intersection Reconfiguration	Catalyst Project concept for College Avenue at Allen Street, which seeks to make a more attractive and safer intersection. To help manage the current grade different between the campus and intersection levels, the intersection would be raised to sidewalk level and curbs removed, in favor of decorative bollards and stamped concrete pavement. Vehicular lanes would be narrowed and crosswalks made more prominent to express a more pedestrian-oriented feel.	TBD	State College Downtown Master Plan	Concept
06	Allen Street Promenade	Envisions various special event configurations for Allen Street between College Avenue and Beaver Avenue, where the street is temporarily converted to a "pedestrian mall". The plan suggests permanently closing the link to vehicular traffic.	TBD	State College Downtown Master Plan	Concept
07	College Avenue Streetscape	Envisions a unified streetscape design that expresses the "town and gown" character on either side of College Avenue. The plan implements the highest level of design between Garner Street/Shortlidge Road and Atherton Street, with adjacent sections using a similar aesthetic, but with less extensive changes. A Catalyst Project is proposed at the Allen Street Intersection.	TBD	State College Downtown Master Plan	Concept
08	College Avenue & High Street Intersection Reconfiguration	Envisions a reconfiguration of the intersection to allow direct access to the University Park Campus at a more traditional grid-network intersection. A University utility vault on the north side of College Avenue is a significant impediment to implementation.	TBD	State College Downtown Master Plan	Concept
09	College Avenue Signal Coordination and Interconnection Updates	Green Light Go Grant funded project to improve signal communications systems, hardware, and coordinated signal timing for the College Avenue Corridor.	2024		Design
	Next Generation Connectivity and Mobility Plan (Projects TBD)	Topics to be addressed include traffic calming, curb management & parking, micromobility, access to public transit, and capital projects that support multimodal activity. The plan is ongoing, and to date, public comments and surveys have been conducted. Plan completion and recommendations are anticipated by August 2023.	August 2023 (Study)	Next Gen. Connectivity and Mobility Plan	Study
COLLEGE TOWNSHIP					
10	East College Avenue Pedestrian Path	Listed as the first Priority Investment Corridor, and indicates that the corridor would extend from Elmwood Street into State College Borough and connecting with the University Park Campus. Based on interviews with Penn State and College Township staff, the routing of a pedestrian facility would be along East College Avenue to Porter Road. Then the facility could cross into State College Borough just west of Porter Road and follow the vacated former alignment of College Avenue along the hillside, north of the existing road. This would likely place the connection through the student storage parking areas east of University Drive, with the nexus point at the Hastings Road intersection.	TBD	Pedestrian Facilities Master Plan	Concept

EXHIBIT 5.3. MPO & PennDOT Projects

01	Atherton Street Improvement Project (SR 3014)	Ongoing, multi-year project to reconstruct Atherton Street along much of its length. Improvements will address roadway, drainage, water and sewer utilities, curb, sidewalks, accessible crossings, traffic signals, and other grading and roadside needs. The northern parts of the project in Patton and Ferguson Townships were completed during and prior to the COVID-pandemic in 2018 through 2021. Work in State College Borough adjacent to Penn State University and the State College Downtown is ongoing and should continue through 2024. The southern parts of the project in College and Harris Townships are expected to progress after 2024.	2024	MPO Transportation Improvement Program	Construction
02	Park Avenue Widening (SR 3007)	The project is listed as the first "Highway Project for Future Consideration" in Centre County MPO's 2050 Long Range Transportation Plan (LRTP). Such a project does not have funding identified within the 25-year long range planning horizon. However, it has been included as an aspirational priority in the LRTP since the early 2000s. The Park Avenue Master Plan was completed in 2007, and envisions a widening Park Avenue to a five-lane cross-section between Orchard Road and Bigler Road. The project would also integrate bicycle and pedestrian facilities, consistent with PennDOT and FHWA commitments to the Complete Street approach. The Master Plan included roadway sections that reflected the University Park Campus design aesthetics.	TBD	Park Avenue Master Plan	Concept

2018-2023 Capital Plan

The Penn State Board of Trustees approved the 2018-2023 Capital Plan in mid-September 2017. The strategic philosophy of the $3.8 billion plan was addressing the backlog of deferred maintenance while building for future needs. Factors driving the prioritization of projects included functional obsolescence, program impact, and academic accreditation requirements.

At the University Park Campus, the plan allocated about $1.9 billion for projects and facilities within the UPD planning zone (**Table 5.1**).

Table 5.1. Penn State Capital Plan, 2018-2023 – University Park

Plan Category	$ (millions)
Education and General	
Systems Renewal	$ 95.0
Major Construction & Renovation	$ 1,053.0
Self-Supporting Units	
Auxiliary & Business Services	$ 224.7
Intercollegiate Athletics	$ 440.6
Applied Research Laboratory	$ 50.8
Total – University Park	$ 1,864.1

2023-2028 Capital Plan

The Penn State Board of Trustees approved the 2024-2028 Capital Plan in early May 2023. The $2.2 billion plan is characterized as "maintenance-centric" and focuses on system renewals, life-cycle value, and reduced administrative burden at University Park and Commonwealth Campuses. The major projects progress strategic priorities and master plans that are in progress and address deferred projects from the former capital plan.

At the University Park Campus, the plan allocates about $1.94 billion for projects and facilities within the UPD planning zone (**Table 5.2**).

Table 5.2. Penn State Capital Plan, 2024-2028 – University Park

Plan Category	$ (millions)
Education and General	
Systems Renewal	$ 188.2
Major Construction & Renovation	$ 449.5
Infrastructure	$ 80.9
Demolition	$ 27.5
Self-Supporting Units	
Auxiliary & Business Services	$ 356.2
Intercollegiate Athletics	$ 700.0
Applied Research Laboratory	$ 133.7
Total – University Park	$ 1,936.0

2029-2033 Capital Plan

It is expected that the Penn State Board of Trustees will approve the next 5-year capital plan for 2029-2033 as the previous plan nears completion. However, specific projects for this plan are not known at this time. The University's Master Plan and Unit Plans identify projects that anticipate campus needs and may be developed for construction in the 2029-2033 timeframe. As such, for the purposes of the UPD Transportation Study, several projects are slotted in the 2029-2033 timeframe so that they may be considered in the 10-Year Development Plan, but these projects and their advancement to construction should be treated as uncertain.

Projects and Transportation Impact Assessment

The University is responsible for addressing the transportation needs of the campus by providing adequate parking and transportation infrastructure. When land is developed for new buildings, parking, or other transportation facilities, the University may be required to study and address the transportation impact of the development project. For the UPD zone (where the UPD zoning ordinance has been adopted), the ordinance requires traffic studies when the number of new trips generated by a project exceeds certain thresholds. The ordinance also provides for a waiver of the traffic study requirements.

For the benefit of municipal planning well in advance of a land development or transportation project, the UPD zoning ordinance requires completion of the University Planned District Transportation Study, which is to "identify the transportation impacts likely to result from the University's development assumptions over the next ten-year period."

Exhibit 5.1 lists the University Projects included in the Ten-Year Development Assumptions that are shown in **Figure 5.1**. The following information is given:

Map ID – Identifier that keys to the Development Plan map.

Project – Name of the Project.

Project Description – Short description of the Project, giving the project intent/use and site characteristics on floor areas, parking, transportation access, etc.

Anticipated Completion – Date when Project construction is anticipated to be complete.

Master Plan, Study, or Program Reference – External plan, study, and program reference.

Capital Plan – Indicates the Capital Plan that funds the Project. A check in the "2029-2033" column indicates that the Project is likely to occur within the 10-year horizon but is not in the 2018-2023 or 2024-2028 Capital Plan. Projects with no checks have been identified by the University but are at the beginning of project development.

Status – Current status of the project, as of June 2023. The following terms are used:

- *Concept* – Identified in master plan or study.
- *Feasibility* – Study phase for identifying needs, purpose, and scope.
- *Architect Selection* – Pending selection of a design team.
- *Design* – In the design/land development process. Site has been identified.
- *Construction* – Under construction and not occupied.
- *Built* – Project completed and occupied or awaiting occupancy.

For the purpose of identifying likely transportation impact, **Exhibit 5.1** also summarizes attributes of the project that are commonly used indicators of travel activity at land development sites. Based on this information, the likely traffic impact is classified.

Net Change – Indicates the estimated net change and direction (increase or decrease) for certain project attributes that tend to influence transportation activity. The following are referenced:

- *Floor Area* – Gross building floor area
- *Employ* (Employment) – Employees located in the building
- *Visitors* – Visitors accommodated or attracted to the building
- *Parking* – Parking spaces on the building site
- *Access* – Driveways and roadway connections to the site

Transportation Impact – A statement of the anticipated "degree" of transportation impact, as requested by the UPD ordinance. The following terms are used:

- *None* – Does not influence/impact transportation.
- *Nominal* – Does not directly influence/impact transportation (building renovation, replacements, small parking revisions/reductions, demolitions). Expected to require a *descriptive* evaluation to waive ordinance requirements for a traffic impact study (TIS).
- *Possible* – May directly influence/impact transportation (new buildings, building relocations, building expansions, projects that add parking). Expected to require a *quantitative* evaluation to clarify if the UPD ordinance requirements trigger a TIS.
- *Likely* – Expected to directly influence/impact transportation (new buildings with substantial parking, new parking facilities, new access/streets, street system revisions). Would require a traffic impact study, according to UPD ordinance requirements.

For projects entering or currently under construction, the following may apply if transportation impact has already been addressed:

- *Addressed via Study* – A traffic impact study was performed and approved.
- *Addressed via Memo* – A trip generation evaluation and request for exception from a traffic impact study was submitted and approved.

Anticipated Transportation Impact

The vast majority of the 50 University Projects listed in the Development Assumptions (**Exhibit 5.1**) for the next ten-year period are expected to have little or no transportation impact. The following break out of projects according to "anticipated transportation impact" is noted:

- The traffic impact for 7 of the projects (14%) has already been addressed via Study or Memo.
- The traffic impact for 35 of the projects (66%) is "None" or "Nominal", indicating no perceptible transportation impact—outside of temporary impacts that may occur during construction. These projects include renovations, adding ancillary uses, and demolitions. Some projects may result in trip and travel activity reductions.
- The traffic impact for 6 of the projects (14%) is "Possible", indicating that the project has some potential for generating impacts. These projects include building expansions, the addition of parking, new modal accommodations, and other operational changes.
- The traffic impact for 2 of the projects (4%) is "Likely", with the project trigger a formal traffic impact study according to the UPD zoning. These projects include new buildings requiring new parking facilities, significant changes/expansions to existing buildings and parking facilities, and new/revised campus roadway connections.

Transportation Impacts in the UPD

The potential transportation impacts of University Projects are considered in the following section. Impacts are identified on a project-level, starting with transportation access to the development site and extending through the immediate vicinity. All travel modes are considered, and the evaluation anticipates issues that would be scoped into a traffic impact study (TIS). Strategies for addressing impacts are suggested for the most impactful projects where impacts are most apparent.

UPD Traffic Impact Study Triggers

The UPD ordinance states TIS triggers that are specifically tied to parking facilities—whether the addition or modification of parking facilities that would increase trip making. A TIS required "if the land development plan includes parking facilities which would generate 100 new vehicle trips (inbound or outbound) during the peak hour of vehicular traffic use of the parking facilities." Throughout the development history of University Park under the UPD ordinance, the trigger has been interpreted to require a TIS only when both of the following conditions were met:

1. New parking is added OR the function of existing parking is modified, AND
2. The new or modified parking would produce 100 new vehicle trips (inbound or outbound) during the peak hour of vehicular traffic use of the parking facilities.

Project-Level Impact Evaluations

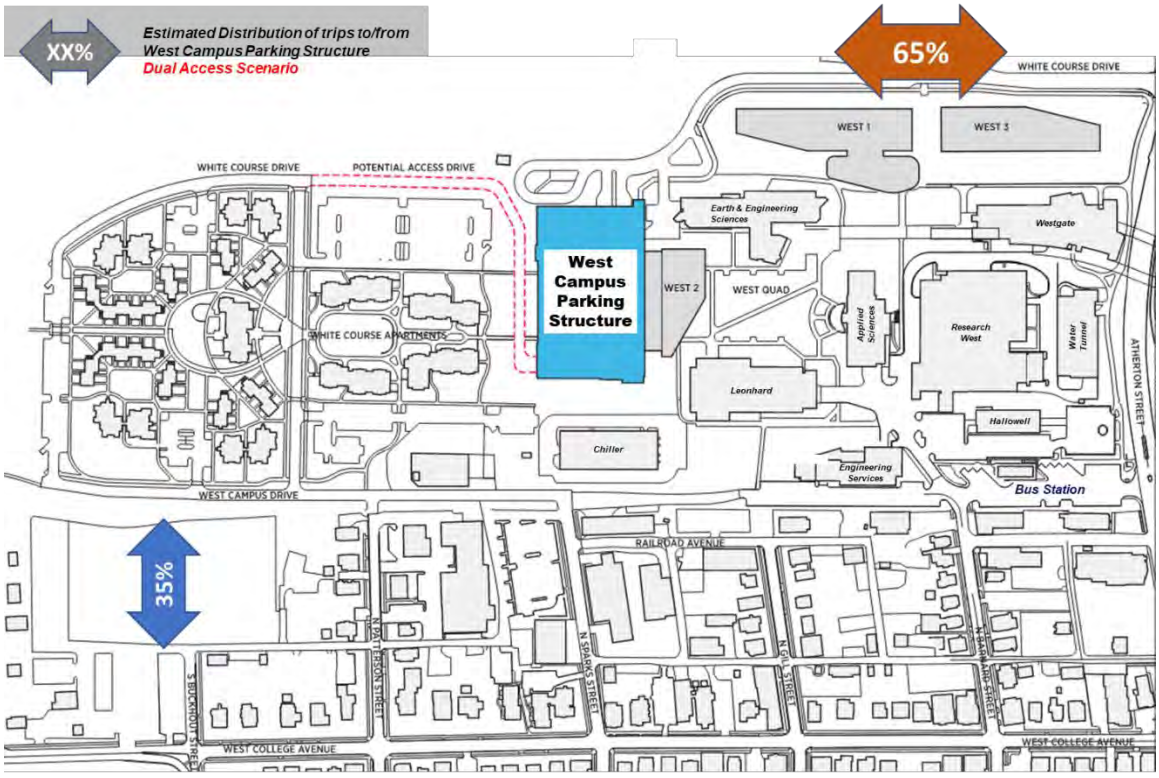
The Ten-Year Development Assumptions identifies 33 University Projects that are anticipated to have "None" or "Nominal" traffic impact. These projects are excluded from the project-level analysis because the scope of the project does not involve parking, does not have a direct impact on transportation, or has characteristics that reduce trip-making. The remaining 9 projects are anticipated to "likely" or "possibly" generate new traffic sufficient to create localized network impacts, and some may trigger the UPD ordinance requirements for additional planning or study.

Projects with LIKELY Traffic Impact

The following two (2) projects are known to possess a scale or development characteristics that are anticipated to "likely" have traffic impact and require a TIS. Map ID numbers are referenced to **Figure 5.1** and **Exhibit 5.1**.

West Campus Multi-Modal Connection (Map ID #28)

This new transportation facility between the West Campus Parking Structure (a.k.a., West Deck) and College Avenue was evaluated in a Feasibility Study and initially proposed as the "Dual Access Scenario" in the DRAFT West Campus Parking Structure Transportation Impact Study (2018). The connection followed North Buckhout Street through the former O.W. Houts site and around the White Course Apartments to West Deck (**Figure 5.2**). The Dual Access Scenario was later removed from consideration, in favor of a single access via White Course Drive to Atherton Street. However, the second access remains a feasible option for access to the West Deck and West Campus, depending on municipal interest and the ability to demonstrate mitigation of traffic effects. The connection could be configured as a non-vehicular route (bike and pedestrian only), a transit link with bike and pedestrian accommodations, or a future vehicular link. Regardless, general vehicular traffic would not be permitted to "cut-through" the West Deck between Atherton Street and College Avenue.



Sources: The Pennsylvania State University College of Engineering Master Plan, July 22, 2019, Payette.
PRELIMINARY-DRAFT West Campus Parking Structure Transportation Impact Study, submitted October 2018., McCormick Taylor.

Figure 5.2. West Campus Parking Structure Dual Access Scenario with Traffic Distribution

- *Trip Generation & Modal Considerations* – The connection itself is not expected to increase total trip-making to/from West Campus. If the connection is configured as a pedestrian and bike link, it may attract non-motorized trips from other parallel facilities. If configured for transit-service, the route could carry CATA and Penn State Campus Shuttle vehicles, but volumes would be low—likely less than 10 per hour. If configured for general traffic to/from the West Deck, the distribution of traffic accessing the Deck would be impacted. With Dual Access, the split of traffic was estimated to be 65% on the east side (Atherton Street/White Course Drive) and 35% on the west side (College Avenue/Buckhout Street). Estimates were based on 2018 home address locations of permit holders to be assigned to West Deck following construction.

- *Potential Impacts & Solutions* – The proposed connection was removed from the West Campus Parking Structure TIS because of community concerns about drawing traffic through the Borough's Holmes-Foster neighborhood. There were also divergent opinions about the feasibility of other alignments and the connection point on the western end. These issues would need to be addressed when/if the connector is reconsidered. A more robust and technical origin-destination study and traffic routing analysis may be required to resolve traffic-specific questions and objections. Based on the draft 2018 TIS that proposed the Dual Access Scenario, the shift in traffic would increase volumes on some streets while relieving traffic on others. The benefits/drawbacks of this traffic shift, agreement on the western connection point, and strategies for mitigating undesirable traffic impacts would be key outcomes from the study.

Applied Research Laboratory (ARL) Campus at Innovation Park (Map ID #46)
The project represents a 50-year "opportunity" plan for consolidating the varied functions of ARL at one cohesive campus location. The potential for 1.2 million square feet of laboratory and research office space at Innovation Park would replace ARL''s aging facilities and position ARL for growth over the next 5o-plus years. **Figure 5.3** illustrates the Master Plan and building massing on the site. As of this writing (August 2023), Penn State was engaged in discussions with College Township and the Centre Regional Planning Agency to determine the studies needed for approval of the master plan and a change in the Regional Growth Boundary.

- *Trip Generation* – Data from *Trip Generation, 11th Edition* as published by the Institute of Transportation Engineers was used to estimate the number of trips based on the 1.2 million square feet of new building space (see **Table 5.3**). Data for the ITE Lane Use Code #760, Research & Development Center was used.

Table 5.3. Trip Generation Estimate, ARL Campus at Innovation Park

ITE Land Use data	Daily Traffic	AM Peak Hour Traffic	PM Peak Hou Traffic
Research & Development Center (ITE Land Use Code #760) *1.2 million gross square feet*	13,296	1,236	1,176

Since the proposed development (1.2 million square feet) is significantly larger than any of the sites sampled by ITE, the use Land Use Code 760 would be discouraged by ITE for the ARL site. It may be appropriate to base the trip generation on ITE data for employment or on parking space trip generation rates sampled at University Park for other projects.

Figure 5.3. Applied Research Laboratory Campus, 50-Year Master Plan

Source: The Pennsylvania State University, 2023.

The following would also be considered when assessing the "new" trip generation for the site:

- While the project proposes new construction in Innovation Park, the building space would represent both "new" space and replacement of existing facilities—albeit moved to the new location and vacating/demolishing the existing facilities. Traffic studies should make a distinction between replaced/relocated trips and new trips.

- Approximately 30% of the proposed new floor area would be built within the current Innovation Park Innovation Park Planned Research & Business Park district. Since the traffic impact associated with land development inside this district was evaluated and mitigated previously, those trips should be represented in a traffic study but treated differently than trips associated with the expansion plan.

- *Modal Considerations* – Transit service changes implemented by Penn State in Fall 2023 should be reviewed as part of the ongoing master plan development, to discern when/if higher-capacity service is needed. In the future, travel demand and affinity between the University Park Core Campus and Innovation Park may justify the return of Red Link service to Innovation Park.

  Internally, Innovation Boulevard has been built with sidewalks on both sides, but the low-density style and spacing among buildings accommodates parking areas, but could be seen as an impediment to walking within Innovation Park. Access to Innovation Park by walking is not conducive. Dedicated bike facilities (lanes or paths) are not present within Innovation Park, but a bikeable, grade-separated connection to the Core Campus does exist under I-99 near the ARL development area.

- *Potential Impacts & Solutions* – The proposed development area in Innovation Park is adjacent to existing high-capacity vehicular infrastructure, including grade-separated interchanges at I-99 and the Innovation Park interchange system. Internally, Innovation Park is served by a 4-lane, boulevard-style spine road. Still, vehicular traffic impacts are anticipated, and studies of the ARL master plan traffic would likely address the following:

  ⇒ Capacity of the Park Avenue/I-99 Ramp intersections – The Park Avenue intersections are controlled by traffic signals. Sight distance issues require restrictive left turn phasing at the signal nearest to Innovation Park, inducing congestion during the afternoon commuter traffic peak. With added traffic, left turn capacity and queueing issues are expected. Solutions may include adding turn lanes and modifying the I-99 ramps. A traffic and interchange design study might identify other ramp reconfiguration and signalization solutions, to resolve the left turn capacity issues. Interchange modifications that change ramp alignments would likely trigger the need for a Point of Access Study that meets state and federal requirements for limited access interchanges.

  ⇒ Capacity of the Park Avenue Exit A/Innovation Boulevard Intersection – All traffic to the ARL development area would go through this intersection. The current all-way stop-control will likely have high delay and congested operation during peak traffic conditions. A traffic signal or roundabout and additional turn lanes may be justified.

  ⇒ Driveways along Innovation Boulevard – With added traffic, left turns to and from the parking lot driveways along Innovation Boulevard may become congested during peak traffic conditions. Traffic signals or roundabouts and new turn lanes may be justified.

Projects with POSSIBLE Traffic Impact

The following seven (7) projects are in the early stages of development, making it difficult to accurately discern project scale and development characteristics. However, these projects are anticipated to "possibly" have traffic impact and require a TIS. Map ID numbers are referenced to **Figure 5.1** and **Exhibit 5.1**.

Animal Diagnostics Laboratory Renovation (Map ID #13)
Penn State is conducting a feasibility study for a full-scale renovation of the existing facility. In addition to building layout, systems, and technology renewal, the site will be modified to better accommodate large vehicle access and parking will be expanded to meet the projected needs.

- *Trip Generation & Modal Considerations* – Trip generation increases would be related to the new parking built on the site. Providing access for larger vehicles would look at intersections and streets for appropriate turning radius and cartway width.

- *Potential Impacts & Solutions* – Only a small increase in parking is anticipated at the site, so no traffic operations or capacity impacts are expected with the project. However, the impact and needs of larger vehicles accessing and traveling along the University's street system (Orchard Road, Wiley Lane, Pastureview Road) should be evaluated. Intersection turning radii, cartway widths, and shoulder widths should be evaluated with turning templates for the design vehicle sizes and frequency expected. An evaluation of trip generation should be submitted with the land development plans to determine the need for a TIS.

Demolition of Benedict, Beecher-Dock, and Gardner Houses (Map ID #19)
Project would remove the Benedict, Beecher-Dock, and Gardner Houses located along College Avenue near University Drive. All or part of the site may be converted to parking to replace parking reduced during other nearby projects.

- *Trip Generation & Modal Considerations* – A trip generation increase would only be projected if the project resulted in a net increase in the number of parking spaces on the site. The net change in the number of parking spaces should be tracked for the purposes of traffic impact, and the re-routing of trips to the added parking could be studied.

- *Potential Impacts & Solutions* – The net change in parking spaces may be negative or positive for this project, depending on the need to replace parking lost during other projects. An evaluation of trip generation should be submitted with the land development plans to determine the need for a TIS.

PlantWorks Greenhouse & Headhouse Replacement (Map ID #20)
The project would update and consolidate the plant science infrastructure on campus, including modern greenhouse and headhouse facilities. Laboratories, instructional/collaborative space, and faculty and research offices would be integrated into a new building—which may include museum and other public-facing functions. The project feasibility study to select a project scope and potential sites is ongoing.

- *Trip Generation & Modal Considerations* – New (added) trip generation for the site may be driven by new access, parking, and visitor trip-making—particularly if museum and public-facing uses are proposed.

- *Potential Impacts & Solutions* – An evaluation of trip generation should be submitted with the land development plans to determine the need for a TIS.

Penn State University Park Bicycle Master Plan – Priority Network (Map ID #29)
The project implements the Priority Keystone Projects from the Penn State Bile Plan. Priority projects enhance existing campus streets and add pathways to address the highest demand areas and create connectivity. The plan also identifies Secondary Supporting Projects that serve lower demand areas and would enhance connectivity of the overall network.

- *Trip Generation & Modal Considerations* – While the project would not generate new vehicular trips, it may encourage expanded use of bike and e-bike modes on campus.

- *Potential Impacts & Solutions* – Implementation of the bike plan would change the street design (cross-section) of certain on-campus streets and may escalate conflicts among pedestrian crossings and bicycle and vehicular movements at on-campus intersections. Impacts would be related to the degree of expanded bicycle use and how intersections are operated with the new bicycle facilities. The University should conduct a multi-modal operational sensitivity analysis of critical campus intersections to better understand the potential impacts before implementing the Bicycle Master Plan recommendations.

Beaver Stadium Renovations (Map ID #39)
Renovations would improve the quality of fan amenities, establish the seating capacity, preserve and enhance the iconic nature of the stadium, utilize existing stadium assets, preserve and enhance the tailgating experience and provide premium amenities. Renovation projects are likely to extend to the surrounding transportation and parking infrastructure, including RV parking enhancements and streetscape updates.

- *Trip Generation & Modal Considerations* – Beaver Stadium primarily serves the Penn State Football Program, which hosts 7 or 8 home football games each season. Vehicular traffic is actively managed on game-day, and Intercollegiate Athletics maintains its own traffic studies and patterns for use the key entering and exiting traffic periods. Past Improvements to the stadium have allowed it to house the All-Sports Museum and host special events (Mt. Nittany Room, etc.), and future improvements could add uses that generate daily traffic (i.e., non-event traffic. Additional parking and changes that revise access or allow new connections used by daily traffic could also change traffic volumes and patterns, which would be subject to traffic studies.

- *Potential Impacts & Solutions* – Traffic-related changes and impacts of the project will likely affect the streets and intersections immediately surrounding Beaver Stadium—particularly Park Avenue, University Drive, Porter Road, and Curtin Road. For instance, the University has considered opening a new access to the Stadium West Parking Lot along Curtin Road. While no increase in overall trip-making would occur with such a change, more traffic would use Curtin Road when accessing the parking lot, and less would use Park Avenue. The potential for cut-through traffic in the Stadium West Lot should also be considered. A traffic study would likely be required to demonstrate the traffic effects and adjust traffic signal timing.

Intercollegiate Athletics Center of Excellence (Map ID #42)
The project proposes a new hub for Penn State student-athletes, staff, and coaches that would replace the existing East Area Locker Room building on the same site. The facility would centralize services and other resources for student-athletes and would house locker rooms and coaches' offices.

- *Trip Generation & Modal Considerations* – As a long-term concept, the site plan has yet to enter feasibility assessment, so the scale and full set of site uses has not been established. Trip generation would be based on added parking. The current conception reflects a decrease in parking to accommodate the building footprint, but previous conceptions allowed for parking increases or replacement of parking lost.

- *Potential Impacts & Solutions* – An evaluation of trip generation should be submitted with the land development plans to determine the need for a TIS.

5.4. University Transportation Projects not within the UPD

The University Park Airport (UNV)—now State College Regional Airport—is owned and operated by Penn State University as part of Auxiliary and Business Services. While the airport is not within the UPD, the following is presented for transportation context because trip-making activity at the airport is connected to the University Park Campus.

University Park Airport Master Plan (2015)

The University Park Airport Master Plan is a comprehensive plan for identifying "cost-effective solutions necessary to meet anticipated aviation demands and FAA safety standards." **Figure 5.13** illustrates the Conceptual Development Plan.[51] The following features are noted:

- New Airport Terminal and Concourse Buildings
- Expansion of Aprons and Extensions of the Runway
- Land Acquisitions, including parcels on either end of the runway.
- Parking Expansion and Diversification, to accommodate growth and provide revenue.
- Land-Site Airport Traffic Circulation Changes
- Roadway Connections and Relocations
- Commercial Development Opportunities

Between 2015 and 2020, Penn State University and the Airport Authority advanced several projects outlined in the Development Plan, including a significant expansion of parking, reconfiguration of access in front of the terminal, and a taxiway rehabilitation. As of this writing, a feasibility study was underway for adding passenger boarding bridges.

The airport has also implemented parking pricing schemes and incentive programs, as well as cooperative arrangements with other transportation providers. Agreements with Uber and Lyft provide fee-based revenue for trips accessing the airport zone. An agreement with Fullington Trailways allows their patrons to use airport parking facilities. A new maintenance facility has been built to serve both rental cars and airport vehicles. Such relationships are seen as incrementally increasing and sustaining travel activity and revenue to the airport.

[51] VHB and Meade & Hunt, *University Park Airport, Sustainable Master Plan*, July 2015, https://www.universityparkairport.com/about-our-airlines/, as accessed July 2023.

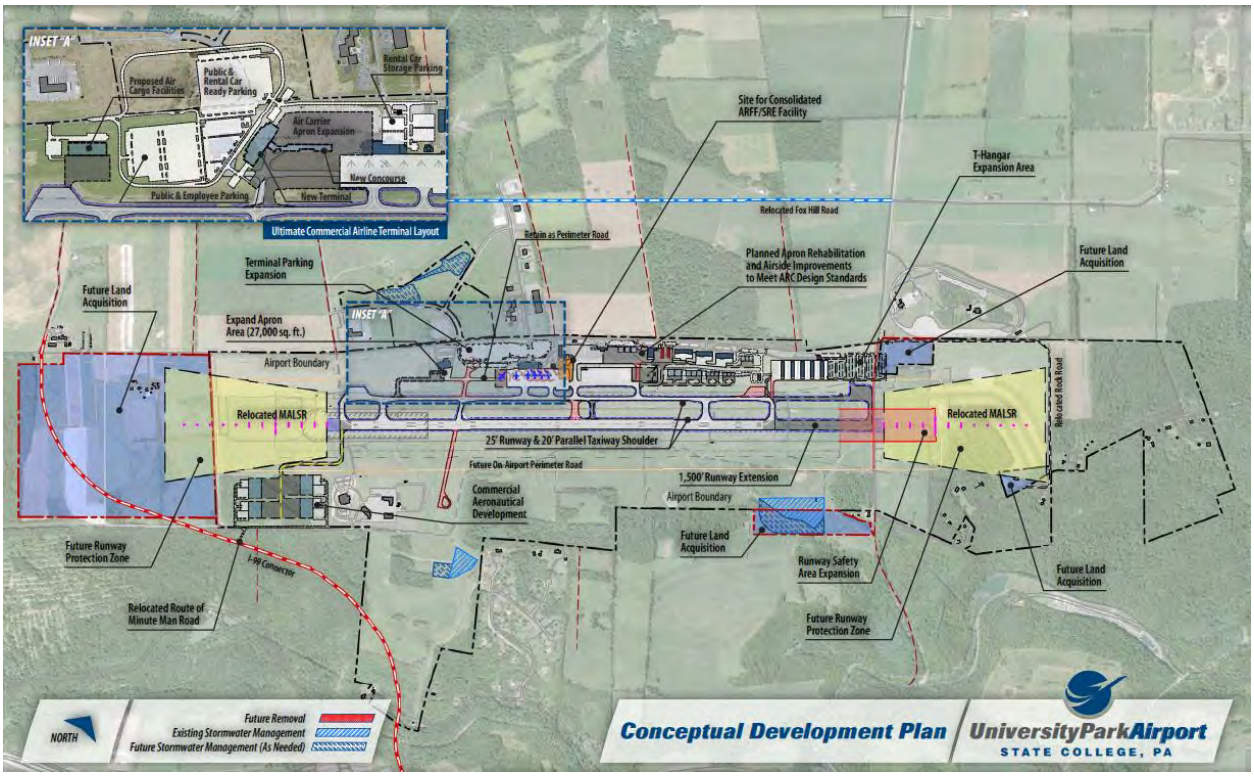


Figure 5.13. University Park Airport Conceptual Development Plan [50]

Roadway projects, including the connection to I-99 through Innovation Park, remain on the Metropolitan Planning Organization's listing of Aspirational Projects but do not have funding identified in the next 20 years for design or construction. Such projects may be a candidate for discretionary "spike" funding that can be allocated by the PA Secretary of Transportation to high-profile projects of regional importance.

Unfortunately, the COVID-pandemic altered aviation demand, airline viability and the availability of workers in profound ways across the U.S., with airlines both "suspending" and eliminating service at airports, including UNV. Airports in small and mid-size markets, such as UNV, have been impacted the most. The demand for pilots, an aging regional jet fleet, and the airlines placing an emphasis on the large hub airports is a challenge for regional airports and their air service development efforts. There continues to be passenger demand within the UNV market area to support additional air service. However, the service is not coming back quickly or with the same hubs and connectivity as before. An update to the 2015 Sustainable Airport Master Plan is programmed for funding in federal fiscal year 2026. The update will include a review of the aviation demand forecasts for passengers and aircraft operations and identification of the capital development needs to meet forecasted demand.

The most pressing needs at the airport have to do with maintenance of the existing airport infrastructure—aprons, taxiways, and runway in particular. With this understanding, only maintenance-oriented projects are considered in the UPD 10-Year Development Plan, and these are not assumed to significantly change transportation demand at the airport.

5.5. Municipal Projects

The UPD zone and its constituent sub-districts have been designated in State College Borough, College Township, Patton Township (which have adopted the UPD zoning ordinance) as well as Ferguson Township (which have not adopted the UPD zoning). Benner Township is immediately adjacent to the UPD zone to the northeast and is home to the University Park Airport, but no UPD sub-districts are designated in Benner Township.

Since transportation facilities and issues often extend across one or more municipalities when land development or other infrastructure improvement projects are considered, the University seeks partnerships with these municipalities to implement transportation improvement projects, whether initiated by the municipality or University.

Exhibit 5.2 lists the ten (10) Municipal Projects included in the Ten-Year Development Assumptions that are shown in **Figure 5.1**. The following information is given:

Map ID – Identifier that keys to the Development Plan map.

Project – Name of the Project.

Project Description – Short description of the Project, giving the project intent/use and site characteristics on floor areas, parking, transportation access, etc.

Anticipated Completion – Date when Project construction is anticipated to be complete.

Master Plan, Study, or Program Reference – External plan, study, and program reference.

Status – Current status of the project, as of June 2023. The following terms are used:

- *Concept* – Identified in master plan or study.
- *Design* – In the design/land development process. Site has been identified.
- *Construction* – Under construction and not occupied.
- *Built* – Project completed and occupied or awaiting occupancy.

Patton Township

Parks and Bicycle/Pedestrian Path Plan, 2020-2029[52]

Patton Township adopted the Parks and Bicycle/Pedestrian Path Plan in October 2020 to unify the previously separate plans for parks and bicycle/pedestrian facilities. The plan introduction states the following regarding the plan purpose and objectives:

> *The Parks Plan examines current and future needs for parks, recreation facilities, and*

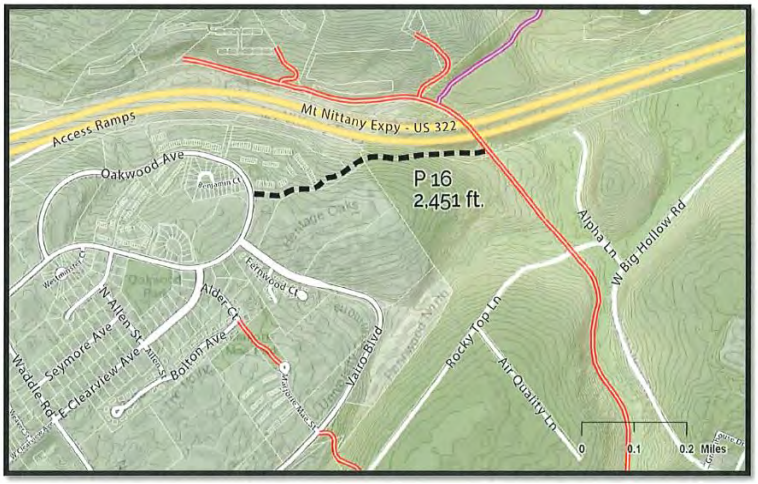


Figure 5.4. Oakwood Bicycle/Pedestrian Path, Benjamin Court to Bellefonte Central Rail Trail [51]

[52] Patton Township Recreation Advisory Committee, *Patton Township Parks and Bicycle/Pedestrian Path Plan, 2020-2029*, October 2020, https://twp.patton.pa.us/DocumentCenter/View/204/FINAL_PattonTownshipParksBicyclePedestrianPathPlan_2020_2029, as accessed December 2022.

bicycle/pedestrian paths and makes recommendations for development, land acquisition, and design standards. It is the objective of the Township to provide recreational opportunities for all age groups, and skill levels throughout the year, and the Parks Plan provides the mechanism for meeting this objective.

The plan identifies the proposed Oakwood Bicycle/Pedestrian Path from Benjamin Court to Bellefonte Central Rail Trail (BCRT) in the Penn State Arboretum Lands. **Figure 5.4** illustrates the proposed alignment of the pathway, starting in Patton Township at Oakwood Avenue and following an existing path through the Village Square neighborhood. Where the path currently ends at Benjamin Court, an extension would extend between Village Square and Heritage Oaks to the Penn State Arboretum lands and cross to the existing Bellefonte Central Rail-Trail.

Ferguson Township

Northland Area Mobility Study (2019)[53]

The Northland Area Mobility Study provided a balanced evaluation of the various transportation modes serving the area surrounding the Northland Center commercial development (**Figure 5.5**). A major portion of the study was devoted to generating alternative solutions and design concepts for making bike and pedestrian connections along Blue Course Drive and Clinton Avenue and across Atherton Street to complete the bike network through the area. As the studies highest priority project, that study recommended a shared use path configuration that would connect the existing shared use path to the southwest along Blue Course Drive with the McKee Street Bike Path northeast of Atherton Street at the end of Clinton Avenue. The Township has not yet committed Capital Funds to the project.

Figure 5.5. Northland Area Mobility Study Focus Area [52]

State College Borough

State College Downtown Master Plan[54]

The Downtown Master Plan was adopted by State College Borough in August 2013 as an update to the previous Downtown Vision and Strategic Plan for State College, which was completed in 2002. The following three primary goals were identified:

[53] McCormick Taylor, *Northland Area Mobility Study*, https://www.twp.ferguson.pa.us/public-works/pages/northland-area-mobility-study, May 2019, as accessed June 2023.
[54] Mahan Rykiel Associates, *State College Downtown Master Plan*, https://statecollegepa.us/410/Downtown-Master-Plan, August 2013, as accessed June 2023.

- Realize and market the downtown's unique identity and distinct role within the larger community, its development potential for a sustainable future and specific implementation strategies that will achieve this vision.
- Establish the framework to create a most memorable, attractive and comfortable downtown core that aesthetically unites the College Avenue corridor.
- Consider public and private sector improvements that can attract a diverse range of users in order to expand the businesses and services that can be supported in downtown.

The expansive "Looking Forward" vision includes themes for Navigating and Connecting the [Downtown] District. A broad set of recommendations are associated with each theme, along with Focus and Catalyst projects that serve as initial phases toward plan implementation. The following recommendations have transportation implications in areas immediately adjacent to the University Park Campus and UPD zone:

West End Revitalization – Envisions changes in the character, density, and transportation connections in the Borough's West End adjacent to Penn State's West Campus. **Figure 5.6** shows the Master Plan concept and massing diagrams for the West End Urban Village.

Figure 5.6. West End Revitalization Concept with Building Massing [53]

College Avenue Streetscape – Envisions a unified streetscape design that expresses the "town and gown" character on either side of College Avenue. The plan extends from High Street to Buckhout Street, with the most extensive work between Garner Street/Shortlidge Road and Atherton Street. **Figure 5.7** shows the Streetscape Concept in front of existing Hammond Building, between Fraser Street and Allen Street.

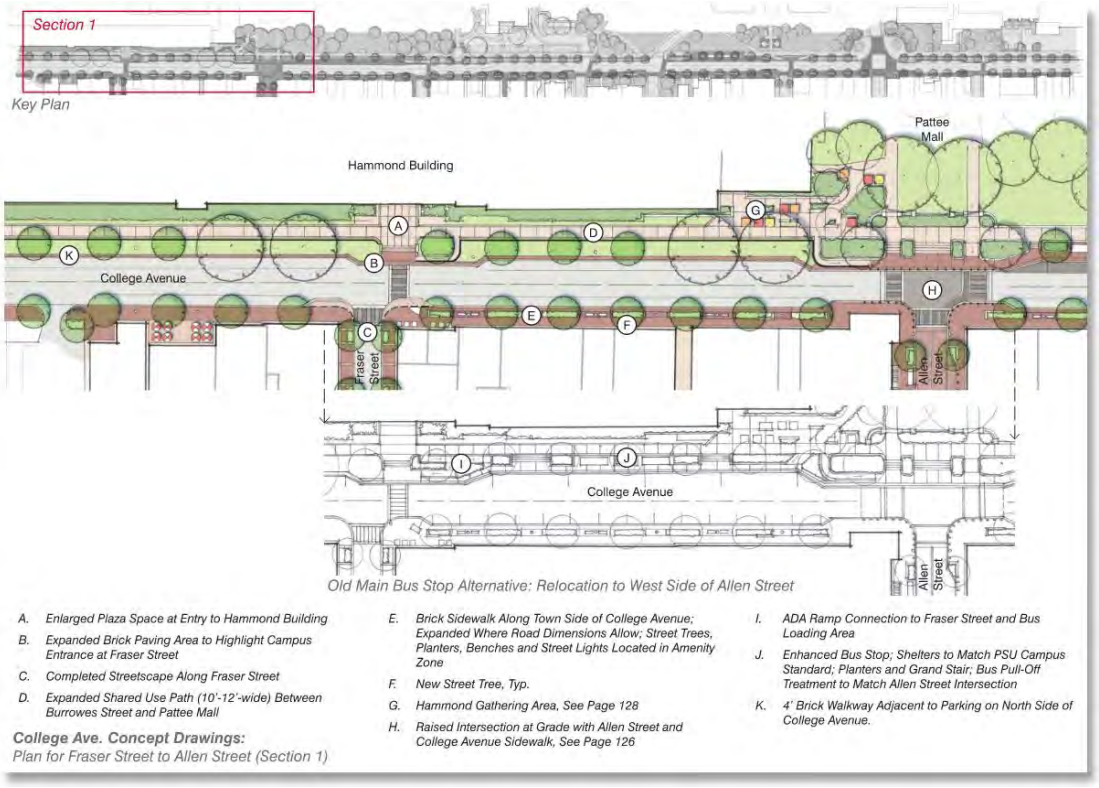


Figure 5.7. College Avenue Streetscape, Allen Street through Fraser Street [32]

Allen Street Transit Center Relocation – A concept "alternative" for the Allen Street Transit Center suggests relocating the center west of Allen Street (see line sketch below the concept in **Figure 5.7**). This idea has been considered by University planners. With the transit stop in the next block, aesthetics and viewsheds in front of Old Main are improved. The project may also dovetail with redevelopment of the current Hammond Building site. However, that project is likely beyond the ten-year development horizon.

Allen Street Promenade – Envisions a brick paved streetscape from building face to building face across the full width of the street (**Figure 5.8**). The road surface would be raised to sidewalk level with delineation by bollards and other street furniture. The plan suggests permanently closing the Allen Street to vehicular traffic between College Avenue and Beaver Avenue.

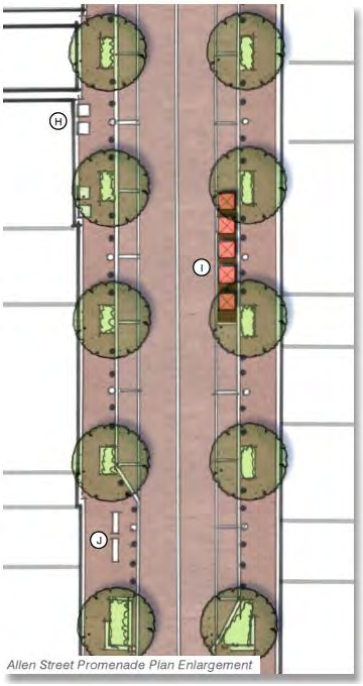


Figure 5.8. Allen Street Promenade [53]

College Avenue & Allen Street Intersection Reconfiguration – **Figures 5.9 and 5.10** illustrate the intersection concept for College Avenue at Allen Street, which seeks to make a more attractive and safe intersection for pedestrians. To help manage the current grade different between the campus and intersection levels, the intersection would be raised to sidewalk level and curbs removed. Decorative bollards and stamped concrete pavement would delineate the traveled way. Vehicular lanes would be narrowed and crosswalks made more prominent to express a more pedestrian-oriented feel.

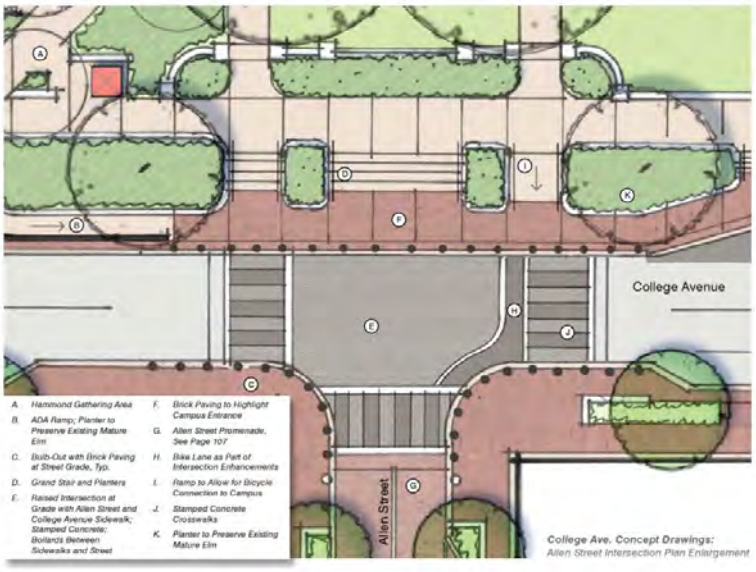


Figure 5.9. College Avenue & Allen Street Intersection Reconfiguration (Plan View) [53]

Figure 5.10. College Avenue & Allen Street Intersection Reconfiguration (Rendering) [53]

Calder Way – Figure 5.10 shows a concept plan for Calder Way, which envisoins the street as "a shared use space which is more friendly for pedestrians and bicyclists while maintaining vehicle access for emergency and essential services, deliveries, refuse and parking access." The project is complicated by the confluence of utilities that run both above and below the Calder Way space. The Borough has announced plans to begin utility work in Summer 2023, with the first phase asddressing Calder Way between South Faser Street and McAllister Street.

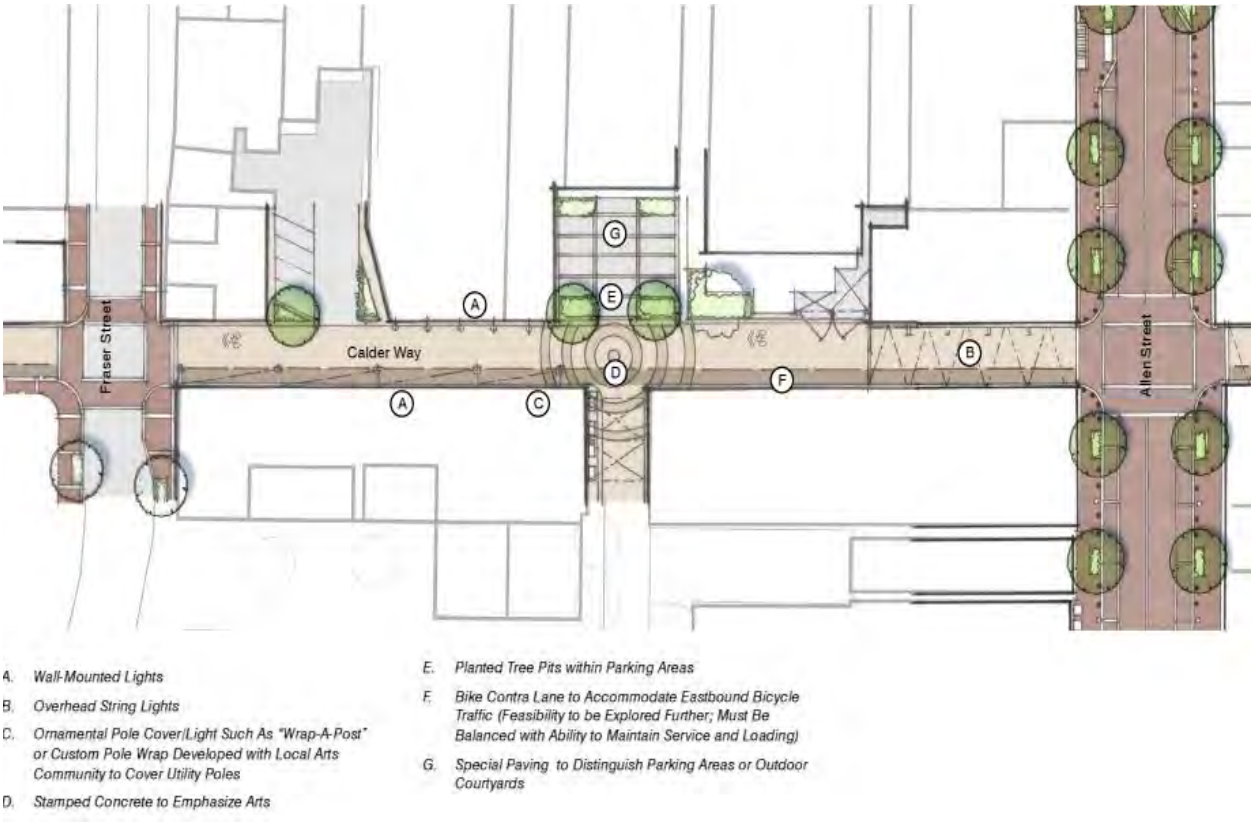


Figure 5.10. Calder Way Concept Plan, Fraser Street to Allen Street [53]

College Avenue & High Street Intersection Reconfiguration – **Figure 5.11** illustrates a concept for the College Avenue/High Street intersection that envisions a more traditional grid-network intersection that allows direct pedestrian access to campus at the intersection. The concept removes free flow vehicular movements and would warrant installation of a traffic signal. Strategies for narrowing College Avenue may be necessary to work around the existing utility vault on the north side of the intersection.

Portions of the Downtowns Master Plan have been implemented since 2013, with some parts of the plan implemented to different degrees or with significant deviations from what was envisioned. The State College Borough staff have indicated that the Master Plan is due for an update, and that work may be initiated in 2024.

Figure 5.11. College Avenue & High Street Intersection Reconfiguration [53]

State College Next Generation Connectivity and Mobility Plan[55]

State College Borough and Sustainable State College have undertaken the Next Generation Plan. to explore traffic calming, curb management and parking, micromobility, access to public transit, and new capital projects that support multimodal activity, with the following objectives: Developing a safe, reliable, efficient, integrated, and connected multimodal system.

- Understanding existing transportation network challenges and opportunities.
- Integrating existing community plans, ordinances, and policies.
- Identifying and implementing capital improvement projects to support future development.
- The plan is ongoing with the following objectives:

The plan is ongoing. The Borough has conducted surveys to collect public input on the location and nature of transportation issues. Recommendations are anticipated by August 2023.

College Township

Walkable College Township, A Pedestrian Facilities Master Plan[56]

College Township adopted their Pedestrian Facilities Master Plan in December 2022 with the following primary goal:

> *To provide an interconnected, continuous, and well-maintained network of sidewalks, shared use paths and other related facilities that provides all users, regardless of age and ability, with safe and efficient access to numerous key destinations throughout College Township and the Centre Region.*

The plan identifies pedestrian facilities, creates a prioritization framework, and provides strategic implementation steps that integrate pedestrian planning into the Township's ordinances and regular planning processes.

East College Avenue received the most public interest during the master plan outreach phase (see **Figure 5.12**) and is listed as the first Priority Investment Corridor. The corridor extends from Elmwood Street into State College Borough, connecting with the University Park Campus. Based on interviews with Penn State and College Township staff, the routing of a pedestrian facility would be along East College Avenue to Porter Road. Then the facility could cross into State College Borough just west of Porter Road

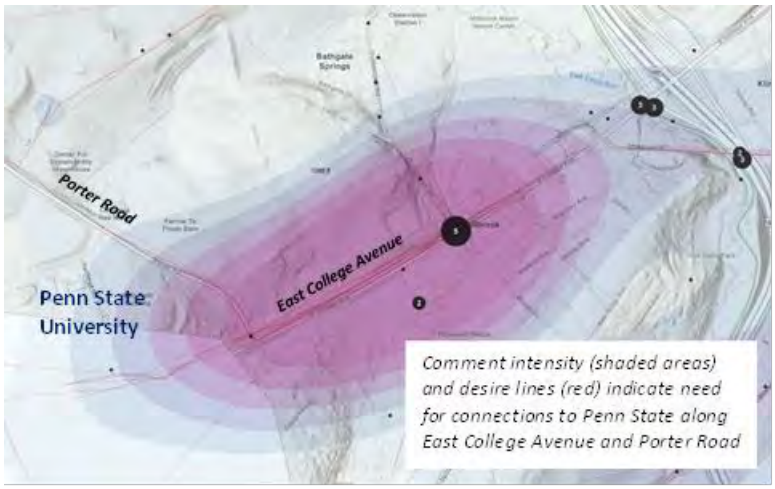


Figure 5.12. Comment Intensity Mapping from the College Township Pedestrian Facilities Master [55]

[55] State College Borough, *Next Generation Connectivity and Mobility Plan* (ongoing), https://statecollegepa.civilspace.io/en/projects/11, as accessed June 2023.
[56] College Township, *Walkable College Township, A Pedestrian Facilities Master Plan*, December 2022, https://www.collegetownship.org/325/Walkable-College-Township-A-Pedestrian-F, as accessed June 2023

and follow the vacated former alignment of College Avenue, north of the existing road. This would likely place the connection through the student storage parking areas east of University Drive, with the nexus point at the Hastings Road intersection.

The plan also identifies a "Core Pedestrian Faciity" that extend toward the University property along Orchard Road and Puddintown Road. While this connection allows indirect access to the University via Orchard Road, a direct connection is inhibited by topography and slopes that are not conducive to a convenient connection directly east toward Beaver Stadium.

5.6. MPO and PennDOT Projects

The Centre County Metropolitan Planning Organization (MPO) is the local Pennsylvania Planning Partner that conducts transportation planning and administrates the transportation improvement program (TIP) for all of Centre County. This includes working with PennDOT to identify, prioritize, and administrate funding for maintenance and improvement of the state highway system.

The traditional Core of the University Park Campus is bounded by state-owned and maintained roadways. **Exhibit 5.3** lists the two (2) Metropolitan Planning Organization and PennDOT Projects included in the Ten-Year Development Assumptions that are shown in **Figure 5.1**. The following information is given:

Map ID – Identifier that keys to the Development Plan map.

Project – Name of the Project.

Project Description – Short description of the Project, giving the project intent/use and site characteristics on floor areas, parking, transportation access, etc.

Anticipated Completion – Date when Project construction is anticipated to be complete.

Master Plan, Study, or Program Reference – External plan, study, and program reference.

Status – Current status of the project, as of June 2023. The following terms are used:

- *Concept* – Identified in master plan or study.
- *Design* – In the design/land development process. Site has been identified.
- *Construction* – Under construction and not occupied.
- *Built* – Project completed and occupied or awaiting occupancy.

The following sections identify current transportation planning and construction projects.

Park Avenue Improvement Study (SR 3007)[57]

The project would widen Park Avenue to a five-lane cross-section between Orchard Road and Bigler Road. The project would also integrate bicycle and pedestrian facilities, consistent with PennDOT and FHWA commitments to the Complete Street approach. As part of the Master Plan, Penn State University had developed roadway typologies and sections that reflected the University Park Campus design aesthetics. **Figure 5.14** illustrates the 5-lane cross-section with adjacent pedestrian and bicycle facilities. The improvement of Park Avenue is currently listed as the first "Highway Project for Future Consideration" in Centre County MPO's 2050 Long Range Transportation Plan (LRTP). Although the project has been included as an aspirational priority in the LRTP since the early 2000s, it does not have funding identified within the 25-year long range planning horizon.

[57] Penn State Office of Physical Plant, Park Avenue Improvement Study, 2007, https://www.opp.psu.edu/sites/opp/files/2007_park_ave_mp.pdf, as accessed June 2023.

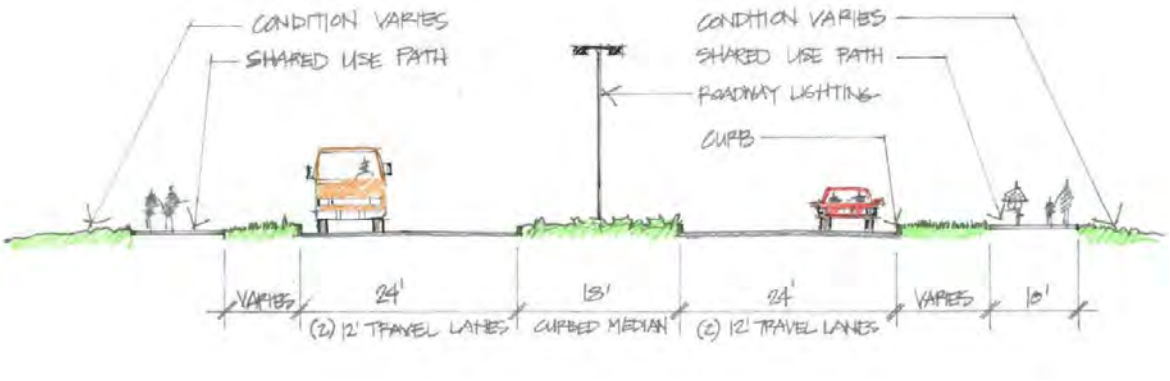


Figure 5.14. Park Avenue Conceptual 5-Lane Cross-Section, Bigler Road to Orchard Road [56]

Atherton Street Improvement Project (SR 3014)[58]

This ongoing, multi-year project will reconstruct Atherton Street and renew and enhance the existing roadway, sidewalk, and pathway facilities along much of its length from Patton Township in the north to Harris Township in the south. As such, the project is not considered "capacity-adding" that would attract and accommodate additional vehicular traffic volume and have indirect traffic impact to the University Park Campus or State College Downtown. The northern parts of the project in Patton and Ferguson Townships were completed during and prior to the COVID-pandemic in 2018 through 2021. Work in State College Borough adjacent to Penn State University and the State College Downtown is ongoing and should continue through 2024. The southern parts of the project in College and Harris Townships are expected to progress after 2024.

Figure 5.15 illustrates the active work zones in 2023 and 2024, when this UPD Transportation Update was prepared. During this period, construction activity is expected to be most active adjacent to the University Park Campus and through the State College Borough Downtown, from Curtin Road to Westerly Parkway. Some of the roadway and turn lane work adjacent to the University Park Campus between Curtin Road and White Course Drive was advanced in 2019 and 2020 as a coordinated project to address traffic impact associated with the West Campus Parking Structure.

Figure 5.15. Atherton Street Improvement Project, Section 153 Construction, 2023-2024 [57]

[58] Pennsylvania Department of Transportation (PennDOT), South Atherton Street Project (ongoing), https://www.penndot.pa.gov/RegionalOffices/district-2/ConstructionsProjectsAndRoadwork/Pages/North-Atherton-Street-project.aspx, as accessed June 2023.

Chapter 6.
Transportation Demand Management

6.1. Introduction

Transportation demand management (TDM) is defined as a set of strategies that help manage traveler demand while maximizing traveler choices. A successful TDM program will:

- Seek to understand the ways people travel *want* and *need* to travel
- Identify strategies to reduce single occupancy vehicle (SOV) trips
- Influence travelers to use alternative modes of transportation such as biking or transit

TDM programs are especially important on college campuses – the volume and density of people traveling to and through the same (or nearby) destinations with multiple times of peak concentration through a typical day put a tremendous strain on a campuses' mobility networks. Typically, college campuses also have limited parking supply and are space constrained with the priority to have the adequate facilities to fulfill the academic mission. This often means roadways, sidewalks, bicycle networks, and parking are necessarily limited in size and capacity to provide more room for the other vital campus infrastructure needs. Thus, it is critical to be able to get people (faculty/staff, students, visitors, and all other members of the campus population) to and from their destinations in a way that is safe and efficient. TDM programs are of high value in these environments because they seek to right-size and shape the demand to better align with the physical constraints of the campus.

At Penn State University, TDM programs are overseen by Transportation Services with a Sustainable Transportation Program Coordinator and Program Assistant tasked with strategic planning and day-to-day program operations. Various other departments are involved in or support the planning, deployment, and operations of TDM programs.

This modal profile will outline the previous and current TDM programs at PSU, upcoming planned TDM programs, a review of TDM programs at peer universities, and suggested recommendations for the continued strengthening of the TDM program at University Park.

"[TDM] is about providing and encouraging a variety of accessible, viable, and sustainable transportation options for both commuting and on campus travel.

By maximizing options and improving the convenience and efficiency of these travel choices, [PSU] wants to elevate these modes to the level of convenience and acceptance that is traditionally accorded to SOV travel. And with that, ultimately seeing a cultural and general mode-shift away from SOVs. "

Cecily Zhu, Sustainable Transportation Program Coordinator

6.2. University Park Mode Share

The University Park "mode share" estimates the proportion of travel that occurs on each mode. This context is useful to understand the current campus mode split and the population of campus users that could directly benefit from a diverse array of TDM options. Understanding the current mode split is also important as it might suggest the additional multimodal potential of the campus – i.e., how many more people could opt to make a daily or permanent travel behavior change from single occupancy vehicles to multimodal and active transportation modes. The Campus travel context has been built from a careful review of previous campus sampling and other data sources.

University Planned District (UPD) Study (2011)

A measurement of the mode share for the University Park Campus was developed from the traffic data collected in 2011. The methodology to develop the mode split consisted of analyzing AM and PM peak period data, bicycle, and pedestrian counts as well as transit ridership and vanpool data. **Figure 6.1** shows the mode split of the campus at the time of the 2013 UPD. It is important to note that more than 66% of University Park trips are on modes that do not involve a personal automobile.

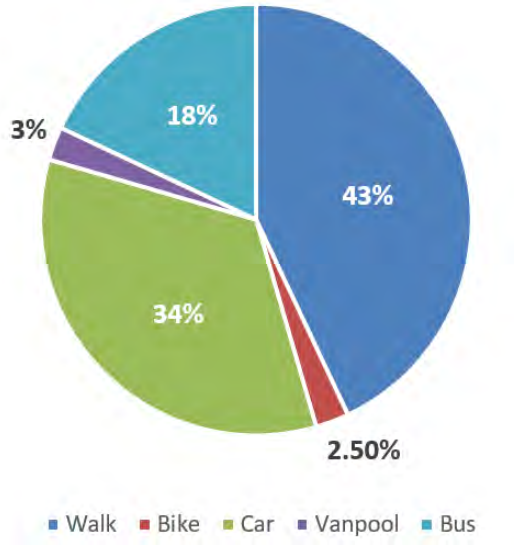


Figure 6.1. 2011 University Park Mode Share

PSU Sustainability Institute (2018-19)

The Penn State University Sustainability Institute Transportation Dashboard[59] includes mode share estimates for faculty, staff, and students based on survey samples taken in 2018-2019. The Dashboard categorizes travel for four (4) modes: SOV (single occupancy vehicles), CATA/Campus Shuttle, Walking/Biking/Other Zero Emissions, and Vanpool/Carpools.

Figures 6.2 displays the 2018-19 commute mode share for sampled for faculty/staff and students. This is the most recent survey conducted by Penn State, and it reflects pre-COVID-pandemic conditions.

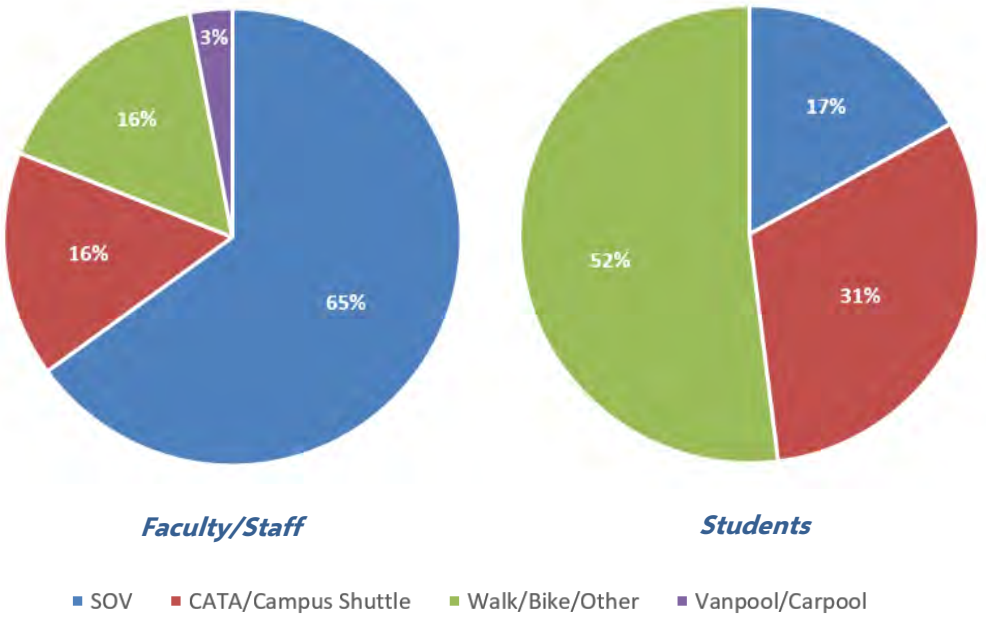


Figure 6.2. 2018-19 University Park Commuter Mode Share [58]

[59] Penn State University, Sustainability Institute, Transportation Dashboard, https://sustainability.psu.edu/campus-efforts/by-the-numbers/view-our-progress/transportation-dashboard/, sampled 2018-19.

While the mode share data collected in 2011 is composite for all transportation users, the survey used by the Sustainability Institute breaks out students and faculty/staff. Not unexpectedly, faculty and staff were four times more likely to use single occupancy vehicles compared to students.

Mode Split Estimation

Mode share is an extremely useful measure for gaging the effectiveness of travel demand management programs. For the purposes of ongoing tracking and evaluation of the University Park Travel Demand Management Programs, it is recommended that Penn State's Transportation Services sustain their partnership with the Sustainability Institute to implement a consistent mode share survey on a biennial basis. The survey recurrence can inform periodic decisions about demand management programs and serve as ready data for future UPD Transportation Studies.

Multimodal Potential

A multimodal potential analysis was performed to identify how much of the campus community had the *potential* to use active transportation modes in the trips to and from Penn State (see **Table 6.1**). The analysis is based on the reported home locations and the distance to campus when walking, biking, or taking transit. It is noted that the true multimodal potential would be based on a variety of other factors such as socioeconomic status, the availability of safe and complete networks, and schedule flexibilities. Acknowledging these caveats, the analysis suggests that high ceiling for the conversion of trips from single occupancy vehicles to active transportation modes.

Table 6.1. Sustainable Mode Participation Potential

Parking Permit Holder Group	Source Notes	Total	Walking Distance	Biking Distance	Transit Distance
			1 mile from Core Campus	*3 miles from Core Campus*	*1/4 mile from stop on route accessing campus*
Faculty/Staff Commuter	FY 2020/2021 permit address data (1/4 mile accuracy)	6,740	810 *12%*	2,651 *39%*	3,046 *45%*
Student Commuter	FY 2020/2021 permit address data (1/4 mile accuracy)	4,710	1,982 *42%*	3,888 *83%*	3,978 *84%*
All Full Time Employees	October 2012 permit address data; Home within 15 miles of campus (1/10 mile accuracy)	10,248	2,156 *21%*	5,948 *58%*	6,527 *64%*

6.3. Summary of Current TDM Programs

Penn State University currently has a wide variety of TDM programs in place to help manage transportation access and parking on campus while maximizing sustainable traveler choices. By providing a multitude of options, the University is able to:

- Address the needs of multiple users with different needs, wants, and capabilities
- Provide flexibility in daily decision-making
- Encourage travelers to form lasting changes in the way they travel

The 2013 UPD analyzed the TDM programs in operation at that time and resulted in recommendations for future TDM program implementation over the 2013-2023 UPD period. **Figure 6.3** outlines the TDM programs during the 2013 UPD Study. The previous UPD study and analysis serves as the foundation for the TDM program elements in place on the campus today.

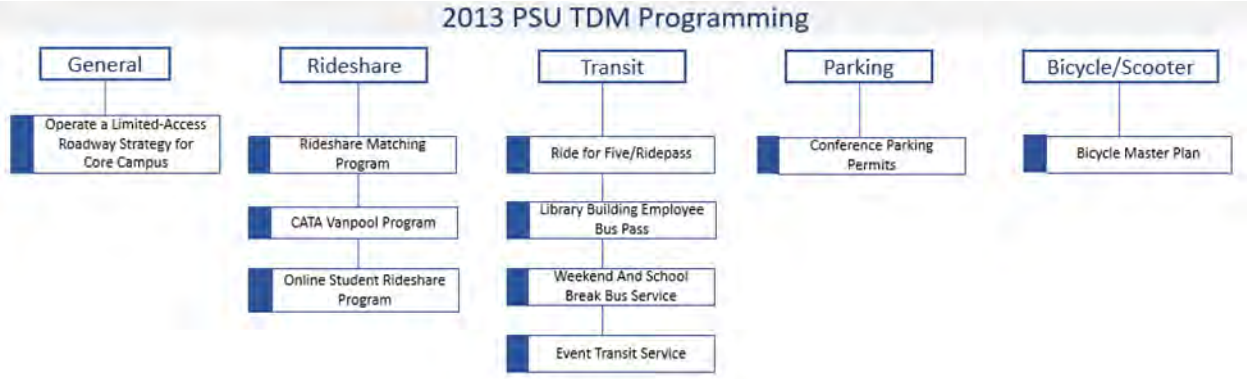


Figure 6.3. 2013 PSU TDM Programming

Since the previous UPD study, Penn State has implemented several new programs to bolster sustainable transportation in and around campus, as highlighted in green on **Figure 6.4.**

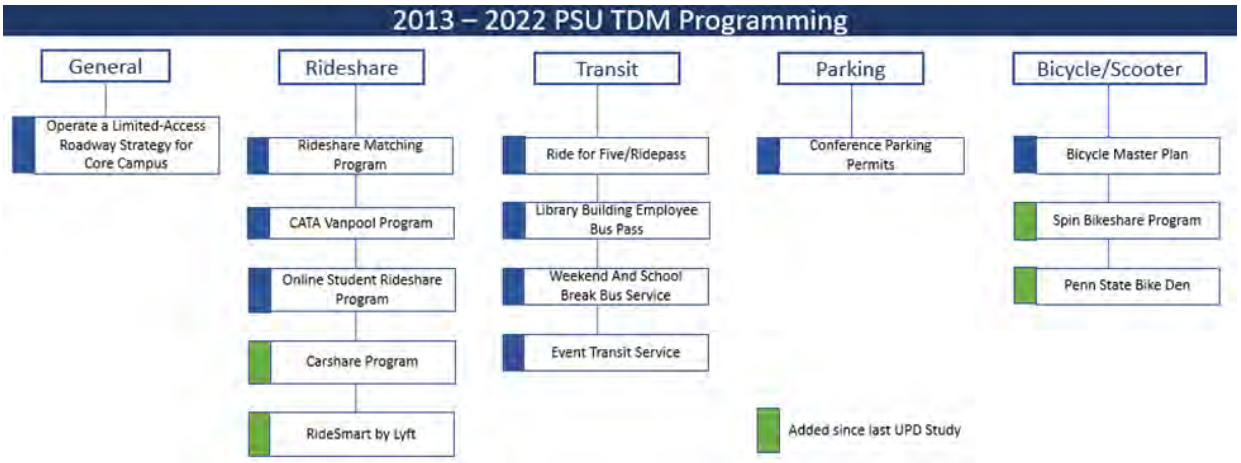


Figure 6.4. 2013-2022 PSU TDM Programming

Active during the 2013 UPD Transportation Study

General Programs

Operate a Limited Access Roadway Strategy – A limited access roadway enhances pedestrian and bicycle safety by preventing vehicles from using the road. Penn State transformed Pollock Road into a

limited access roadway at University Park with two automated gates at either end. The limited access Pollock Road now supports significant pedestrian activity in the center of the Penn State Campus.

Rideshare Programs

Penn State encourages rideshare usage by posting general information about the programs and ways to become involved on their website.

Rideshare Matching Program – The rideshare matching program matches Penn State faculty and staff with other individuals who share the same commute. This program is operated through CATA and is free for faculty and staff. Participants may also use Emergency Ride Home services.

CATA Vanpool Program – The vanpool program encourages groups of seven or more commuters who share the same commute to form a vanpool. If approved, groups are given use of a CATA van for commute purposes. Vanpool users share the cost of fuel, but maintenance of the vehicle is handled by CATA. In 2013, vanpools were required to begin and end in the State College/Bellefonte areas. Participants also had access to Emergency Ride Home services.

Online Student Rideshare Program – The online student rideshare program matches students with other students who share the same commute. As of the 2013 UPD study, most students had identified that they were unfamiliar with the program.

Transit Programs

Ride for Five Program/Ride Pass – In 2013, Penn State offered a discounted bus pass program to full time employees who gave up their daytime parking permits. Ride for Five evolved into Ride Pass when full time graduate students were given access to the program. The monthly program price also increased from $5 to $21, with the remaining cost subsidized by the University. This program provided access to all CATA Bus Routes.

Library Building Employee Parking Pass – This program is offered to Penn State University employees working in CATO Park, including those working at the Library Annex and College of Engineering buildings.

Weekend and School Break Bus Service – Local bus services provide weekend and school break transportation for the university and the public to reginal destinations in Central PA. Penn State does not manage this program, but it is advertised to university affiliates on the transportation services website.

Event Transit Service – Penn State University coordinates event transit services for football games and other large-scale events. During large attendance events, the University coordinates bus service through local vendors to operate a shuttle service from peripheral lots to the venue to reduce traffic congestion and parking demand. The program is not directly managed by the University but is supported and advertised by Penn State on the transportation services website.

Parking Programs

Conference Parking Permits – Penn State University provides conference organizers with parking permits upon request. These parking permits are separate from events permits and organizers are encouraged to request parking via email. Penn State advertises this program on a seasonal basis on the transportation services website.

Bicycle Programs

Bicycle Master Plan – A bicycle master plan has been completed to recommend specific bicycle enhancements throughout the University Park campus. Bicycle improvements are geared towards people that use a bicycle on campus including students, faculty/staff, and employees. Penn State University may

also continue to invest in bicycle infrastructure and amenities such as bike racks, bike zones, and bikeshare.

Initiated following the 2013 UPD

Carshare Program – This program consists of a fleet of cars on campus that employees may use to conduct University business only. Employees may reserve vehicles through transportation services. Penn State advertises this program on their transportation services website. This program was implemented as part of a recommendation from the 2013 UPD study.

RideSmart by Lyft – The University has added a partnership with Lyft to give students a late-night transportation option through the PSU RideSmart Program. University Park students receive up to eight $10 Lyft credits when they order a Lyft within separately defined pick-up and drop-off zone identified in **Figure 6.5**. Lyft credits are only available for use Thursday through Saturday between 2am and 7am.

- **Pickup Service Area** (gray shading) **–** Off-campus between College Avenue, University Drive, Bellaire Avenue, Hamilton Avenue, and Buckhout Street
- **Drop-off Service Area** (pink shading) – On campus between Park Avenue, University Drive, College Avenue, and White Course Apartments

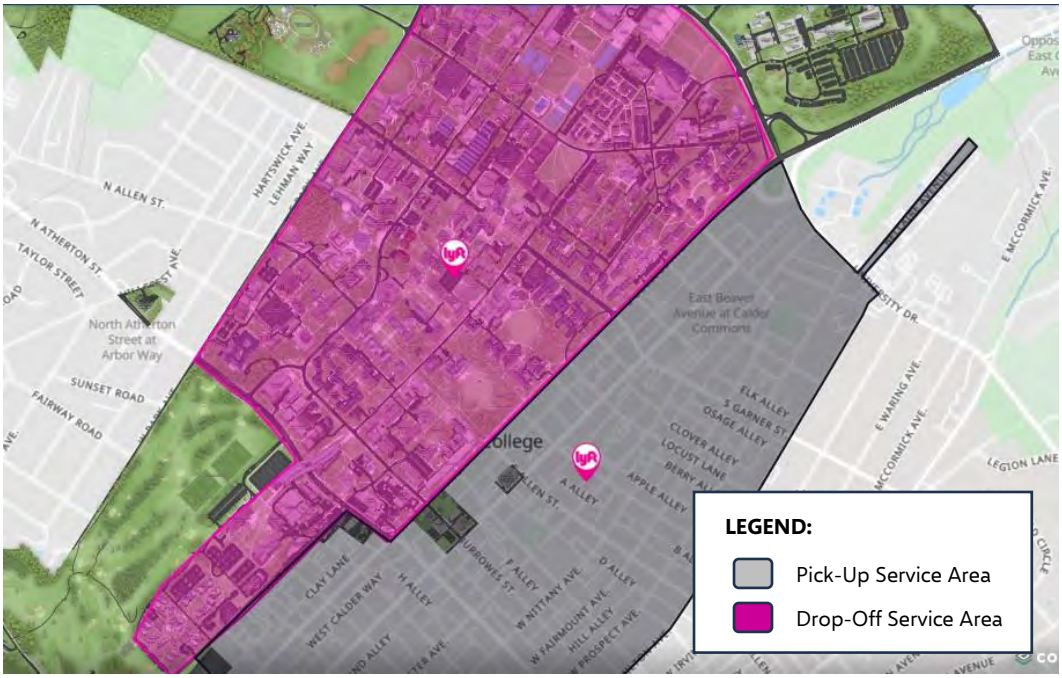


Figure 6.5. University Subsidized Late-Night Lyft Zones [60]

Bikeshare

Spin Bikeshare Program – The University added the Spin bikeshare program to enable cycling options for those that don't have a personal bicycle on campus. The initial launch of the program during the 2012-2013 school year consisted of 50 bikes through 8 campus locations. The bikeshare program was available to all university affiliates and was available on the University Park campus and in the neighboring

[60] Penn State University, Transportation Services, Ride Smart by Lyft Programs, https://transportation.psu.edu/lyft-programs, as accessed August 2023.

Borough of State College. Penn State students, employees, and local community members with limited incomes may apply for the Spin Access program, which provides discounted fares for those who qualify.

The Bike Den – The University created the Bike Den as a "free community-building space that aims to enhance the community and environment through the promotion of bicycle transportation and material stewardship." The Bike Den aims to:

- Establish a welcoming space for people of all ability levels to connect and engage around biking
- Provide DIY Bike repair and maintenance learning opportunities
- Prevent usable bikes and bike parts from entering the waste stream

The Bike Den functions as a self-serve bike repair facility located in the West Parking Deck. While the Den does not directly affect travel demand, it is an excellent example of how Penn State invests in facilities and services that support and enable alternative travel modes. In this case, the facility provides tools and resources that keep pedal bikes in good repair for use in everyday travel.

Table 6.2 lists all the TDM programs detailed in the 2013 UPD study and their status as of 2022.

6.4. TDM Program Usage

This section of the modal profile includes a snapshot of the data and general trends of TDM program usage since the last UPD. TDM programing is broken out into the key categories of rideshare, transit, bicycle, and parking.

Rideshare TDM Programs

Usage information is available for the following rideshare programs:

CATA Vanpool - Prior to the COVID pandemic, there were as many as 34 vanpool programs operated by CATA. Currently, there are only 12 vanpools operating. Vanpools can operate from any location but must travel a minimum distance of 40 miles roundtrip. Through the COVID pandemic, the CATA Vanpool program lost as much as 95% of its Penn State vanpools—which accounted for 70% of all CATA vanpool groups. Hybrid work schedules and the ability to work from home has made creating and sustaining a vanpool more challenging because those seeking a vanpool have difficulty finding other riders. In 2022 and 2023, vanpool group formation and ridership increased, but the totals have not recovered to pre-COVID numbers.

Carshare Program – The carshare program has been partially implemented, compared to the initial recommendation in 2013. The initial concept allowed all university affiliates to use a car for business or personal needs. The carshare program currently operates as a vehicle share for university employees only. Carshare was implemented in 2016 with 141 trips in the inaugural year. In 2018, before the COVID pandemic, there were as many as 1,343 carshare vehicle trips. During the pandemic, the primary vendor for carshare ceased operations, and the

The COVID Pandemic's Impact on University Park TDM Programs

The COVID pandemic presented a unique challenge for University Park TDM efforts because of the significant disruption it had on the need for transportation. Some programs, like vanpools and transit, suffered large and sudden decreases in use that did not return post-pandemic with hybrid work and school schedules. Other TDM programs gained popularity, particularly the bikeshare program. As such, the historical data on program usage should be interpreted in the context of the COVID pandemic. Meanwhile, it should be understood that short-term data on emerging and updated programs was not yet available or useable at the time of the UPD Study. In general, program usage is increasing or stable for the currently offered menu of TDM options. As a rule, programs that are no longer effective are under review for changes or elimination so that resources can be shifted to successful programs or emerging ideas.

program was put on hold while the University identified a new vendor. As of this writing, Penn State's search for a replacement carshare vendor was ongoing.

Online Student Rideshare Program – The online student rideshare program had 996 new student users in 2016 and grew to about 1,399 student users in 2019, before the COVID pandemic. During the pandemic, the primary vendor for carshare ceased operations. As such the program was put on hold while the University identified a new vendor. No post-pandemic usage statistics are available.

Table 6.2. Summary of TDM Program Status, 2013 to 2022.

	TDM Program	UPD Strategy (2013)	Strategy Status (2022)
General	Operate a Limited-Access Roadway Strategy for Core Campus	Existing Program	Ongoing
	University Park Event Scheduling System	Future Recommendation	To Be Implemented
	Integrated Access Management	Future Recommendation	Not Implemented
	RideOn	Not Included	To Be Implemented
Rideshare	Rideshare Matching Program	Existing Program	Ongoing – under *RideOn*
	Vanpool Program	Existing Program	Ongoing
	Online Student Rideshare Program	Existing Program	Ongoing – under *RideOn*
	Carshare Program	Future Recommendation	Searching for new vendor to replace Zipcar
	Penn State Ride Smart by Lyft	Not Included	Implemented
Transit	Ride for Five/Ride Pass	Existing Program	Ongoing; Updated
	Library Building Employee Bus Pass	Existing Program	Ongoing
	Weekend and School Break Bus Services	Existing Program	Ongoing
	Event Transit Service	Existing Program	Ongoing
	Expansion of Discounted Transit Pass Program (Ride for Five)	Future Recommendation	Implemented
	Enhanced Shuttle Services	Future Recommendation	Not Implemented
	Universal Transit Access	Future Recommendation	Not Implemented
Bicycle	Master Plan Bicycle Program	Existing Program	Ongoing
	Bikeshare Program	Future Recommendation	Implemented
	Walking/Bicycling Zone	Future Recommendation	Not Implemented
Parking	Commuter Parking Structure	Existing Program	Ongoing
	Conference Parking Permits	Existing Program	Ongoing
	Visitor Parking Accommodations	Existing Program	Ongoing
	Occasional-Use Parking Permits	Future Recommendation	To Be Implemented
	Park and Ride Facilities	Future Recommendation	Not formally Implemented; Informal facilities have emerged

Rideshare Matching Program – Starting on January 1, 2023, the CATA vanpool program partnered with Commute with Enterprise and is expecting an increase in groups and ridership. In 2013, there were 1,023 users based on the previous UPD study. There is no recent data on employee rideshare participants due to switching vendors.

RideSmart by Lyft – Since the inception of this program in 2021, Lyft rides have grown by a factor of four and Lyft users have grown by a factor of three. The validates anecdotal observations of rideshare pick-up and drop-off dominating the curbside space. **Figure 6.6** demonstrates the change in growth of users and rides between 2021 and 2022.

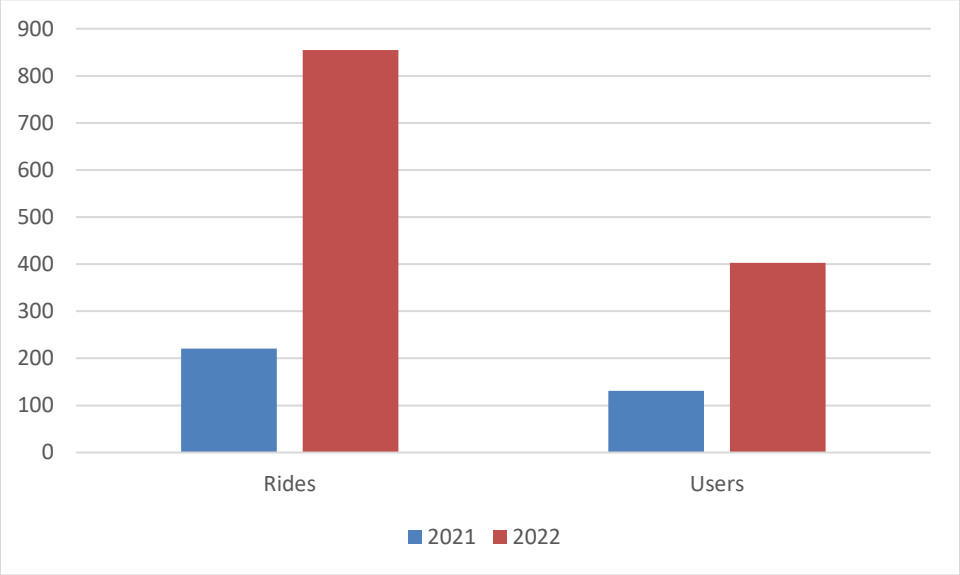


Figure 6.6. Lyft RideSmart Program Use, 2021 to 2022 [61]

Transit TDM Programs

Usage information is available for the following transit program:

Ride For Five/Ride Pass - During the 2013 UPD Study, the Ride for Five Program (now called Ride Pass) provided bus passes for full time faculty and staff at Penn State for $5 monthly. During the last iteration of the UPD study, it was recommended that Ride for Five expand to include graduate students. Since then, Ride Pass has evolved to include full time graduate students, and the monthly price has increased to $21, with the remaining cost subsidized by the University. An analysis of 2010 parking data (reported in the 2013 UPD Study) found that 66% of faculty and staff living within 1 mile of campus held a parking permit. By 2022, only 20% of faculty and staff that live within 1 mile of campus held a parking permit.

CATA regularly updates and optimizes routing to provide more direct connections and accessibility for its patrons. Changes taking place in fall 2023 include:

- Establishing the Centre Area West microtransit zone services Park Forest, Science Park, Pine Grove Mills, some neighborhoods within State College Borough and the vicinity. It will operate Monday through Friday 6 a.m. to 8 p.m.

[61] Penn State University, Transportation Services, 2023.

- Removing the CATA Bus XB Route serving Bellefonte due to extremely low ridership" and growing use of CATAGO.
- Expanding the Bellefonte/Pleasant Gap CATAGO! microtransit zone will be expanded by one hour on Saturdays until 8 p.m.
- Modifying the Boalsburg CATAGO! microtransit zone's boundaries
- Red Link service updates (as recommended by the University's 2022 Transit Services Study) which eliminates stops at the Athletic Administration Building, Orchard Road, Mount Nittany Medical Center, Centre Medical Sciences Building, and Innovation Park and updates routing to run from the West Deck to the Jordan East parking lot. The updated route will operate from 6:45 a.m. to 11 p.m., Monday, through Friday, 10 a.m. to 10 p.m. Saturdays, and noon to 10 p.m. Sundays.

The periodic updates enhance the value of the RIdePass program and investment.

Bicycle TDM Programs

Usage information is available for the following bicycle-related programs:

Bikeshare – The growth of bikeshare and use of the Bike Den are shown in **Figure 6.7**.[62] Bikeshare rides increased from 9,595 in 2019 (pre-pandemic) to 255,456 rides in 2022 (post-pandemic), indicating its popularity on-campus and viability for growth post-COVID. To date in 2023, The University's Spin program has had over 410,000 trips. 75 percent of all trips start on the Penn State Campus, 23 percent of trips start in State College, with the remaining 2 percent starting in the other surrounding townships. With respect to destinations, 74 percent of all trips end on the Penn State Campus, 24 percent of trips end in State College, with the remaining 2 percent starting in the other surrounding townships. This suggests the attraction of bikeshare for making intra campus trips and short distance local trips.

Bike Den – The Bike Den has quickly increased their annual visitors by a factor of 5 since opening in 2021.

Figure 6.7. 2022 Recent Growth in Bikeshare and Supporting Bike Facilities at University Park

Upcoming TDM Program Improvements

The University is also in the process of launching a handful of new TDM programs. Most notably is the Penn State **RideOn** app that will allow Penn State affiliates to get information on and choose from a variety of transportation alternatives for their specific needs.

TDM Recommendations

Figure 6.8 displays the recommended TDM Programming between 2023 and 2032. Upon analysis of existing programs at Penn State, the programs outlined below are anticipated to support the travel demand of the University Park campus while providing users with their choice of mode.

[62] Penn State University, Transportation Services, 2023.

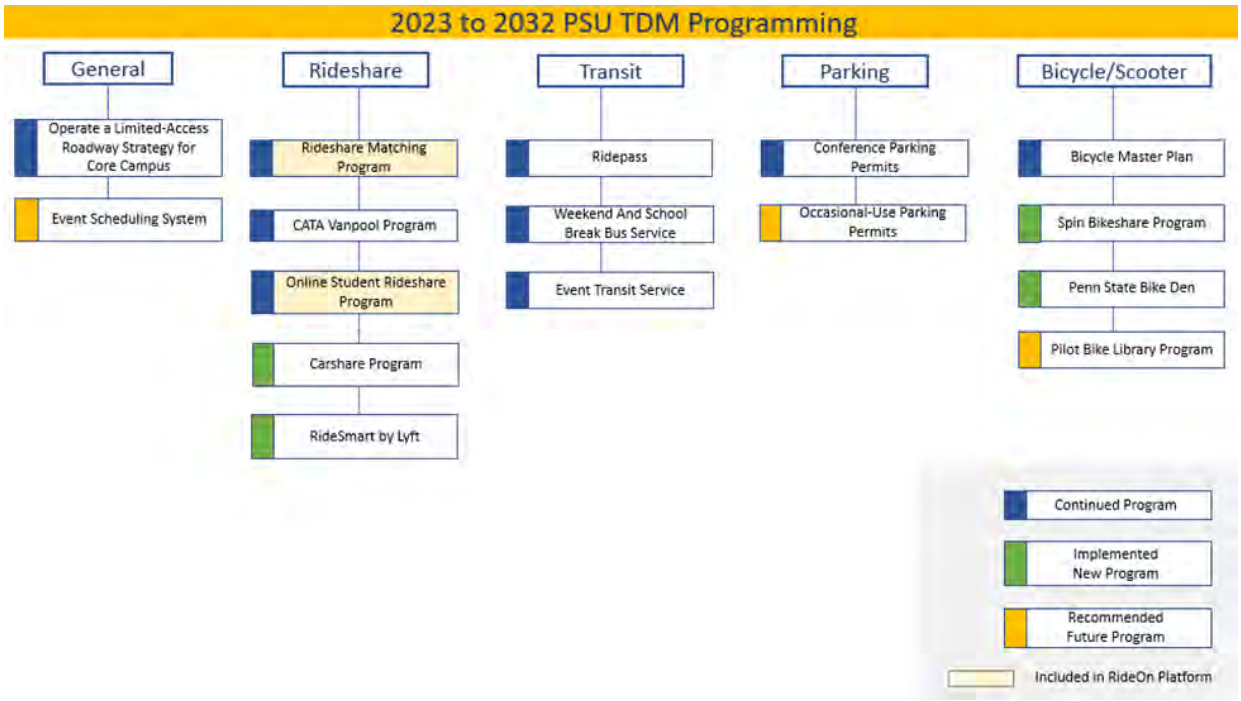


Figure 6.8. TDM Programming between 2023 and 2032

6.5. Other Demand Management Tools

Event Scheduling Program

Through ongoing communication with the University, it was determined that a University Park Event Scheduling System is in operation – though with no formal application. The program provides a PSU affiliates the opportunity to find parking arrangements (including parking exceptions) for campus events. The program helps to manage campus parking on event days. Groups organizing events coordinate Events Parking to determine where their event goers will park, which allows Event Parking to better manage the demand and capacity of Penn State's parking facilities. Recently, Penn State Events Parking was able to manage two sporting events on the same evening. One with 15,000 attendees and one with 6,000 attendees. With a well-organized and planned parking system, Events Parking was able to develop and communicate a plan to spread traffic across campus and use presales to encourage parkers to park in available spaces, rather than overflowing the last 1000 cars arriving.

RideOn

RideOn is a free ridesharing platform that will allow Penn State affiliates to choose from a variety of transportation alternatives for their specific needs. The RideOn application will house several TDM programs within one application including a rideshare matching program, trip planning, and emergency ride home opportunities. Users can view commute options via carpool, transit or bike share and will be able to see live feeds for CATA buses and Spin Bikeshare. The application will have a staggered launch with the rideshare matching and trip planning components as well as commute track modules launching in Spring 2023. The carpool, parking and commuter challenge modules will launch in Summer/Fall 2023. While the app is available for download, the program is currently on hold due to staffing shortage.

Flexible/Occasional Use Parking Permit

Occasional use parking permits provide increased flexibility when choosing a mode of transportation. Users could choose an alternative mode of transportation, such as transit, but still have the option to park on campus when they need to. Such a permit would be a direct response to the work-from-home policies that have become a fixture for many University Park employees. Currently, Penn State does not offer an occasional use permit. University faculty, staff, and students must either purchase a monthly permit or pay the hourly rate in the commuter lot or the gated parking decks.

6.6. Peer Institution Review

While Penn State currently offers a wide variety of TDM programs, there are always opportunities to learn from other TDM successes and expand upon their current TDM offerings. The following sections include TDM programs from peer universities that should be considered for implementation at Penn State.

A review of peer institutions was completed to compare TDM programs offered at Penn State University and TDM programs offered at peer universities. This comparison highlights what Penn State is doing successfully with their TDM program while also highlighting opportunities for new investments in TDM programs based on successes at other universities. **Table 6.2** summarizes three peer universities selected for this review: University of North Carolina-Chapel Hill, Virginia Tech, and the University of Maryland. The table indicates programs in effect as of April 2023.

Virginia Tech

Bike, Bus, and Walk Permits – These permits are available to faculty, staff, and students who "use sustainable transportation methods as their primary means of commuting to campus." The permits are available for semester and summer use and provide users with up to 32 discounted daily parking permits per year. This permit is part of a suite of options for the Commuter Alternatives Program at Virginia Tech.

Special Circumstances Parking Permits – These permits are available for temporary or short-term parking due to emergencies and for loading and unloading. Additionally, Virginia Tech offers temporary medical disability permits for students with a mobility impairment lasting six weeks or less.

UNC – Chapel Hill

Commuter Alternatives Program (CAP) – The commuter alternative program "rewards faculty, staff, and students who choose to take the bus, join a rideshare, ride a bike or walk to campus." CAP benefits include 1 free parking permit to use per month or semester, 20 free weeknight parking passes, and transit/vanpool subsidies.

Zipcar Accessibility – UNC employees and students have access to Zipcar, which is a car sharing service on campus. Cars are located throughout campus and are available for rent hourly or daily.

Point-to-Point Transit – A University-operated service providing on-demand and fixed route options to assist in getting around campus both after dark and during normal working hours.

University of Maryland

Parking Bundle Packs – Bundle Parking packs are sold to commuter students who drive to campus occasionally. A bundle pack consists of 10 one-day parking permits for designated campus parking lots.

Table 6.3. Travel Demand Management Program Comparison with Peer University Programs (as of April 2023)

	TDM Program	Penn State University	UNC Chapel Hill	Virginia Tech Blacksburg	University of Maryland
General	Operate a Limited-Access Roadway	✓			
	University Park Event Scheduling System	✓			
Rideshare	Rideshare Matching Program	✓	✓	✓	✓
	Vanpool Program	✓	✓	✓	
	Carshare Program	*	✓	✓	✓
	Rideshare App Partnerships	✓			
Transit	Employee Bus Pass	✓			
	Weekend and School Break Bus Services	✓			✓
	On-demand transit		✓		
	Event Transit Service	✓	✓		
	Universal Transit Access	✓	✓	✓	✓
Bicycle	Master Plan Bicycle Program	✓	✓		✓
	Bike Den	✓		✓	✓
	Bikeshare Program	✓			✓
Parking	Commuter Parking Structure	✓	✓	✓	✓
	Visitor Parking Accommodations	✓	✓	✓	✓
	Occasional-Use Parking Permits				
	Park and Ride Facilities	✓	✓		✓

TABLE NOTES:

✓ Program currently in place * Program currently under exploration

6.7. Future TDM Opportunities

This review of the current state of TDM suggests that it is a critical component to the campus transportation system. It both supports the multimodality desired by the campus community and reduces the single occupancy vehicle demand that would otherwise result in an overly congested transportation network. What is clear though, is that while Penn State offers a variety of TDM options, there is disparity in the awareness and usership of each program. This has been exacerbated by the COVID pandemic, during and after which many programs dropped to a fraction of the usership that they otherwise would have. This provides an opportunity and a catalyst for Penn State to reassess which TDM programs they could or should invest more energy and funding into, what TDM programs should be sunset, and what new TDM programs could be implemented on campus.

Chapter 7.
Synthesis & Conclusion

This Update of the District Plan Transportation Study fulfills the UPD zoning ordinance requirements for the planning period from 2023 to 2033. The District Plan Transportation Study is a UPD ordinance requirement that is to be prepared every tenth year as a planning tool to document travel trends and identify potential transportation effects of projected development and activities within the UPD.

The UPD Transportation Study demonstrates that the University continues to manage its transportation effects and vehicular traffic through thoughtful Campus Design Principles, strategic land development, and significant investments in travel demand management. The transportation data collected in 2022 show continued reductions in vehicular traffic over the levels measured previously in 2011 and 2001. These reductions are also likely to reflect changing travel dynamics in the wake of the COVID-pandemic, resulting from widespread work-from-home policies and the advent of virtual substitutes for some trip purposes—everything from shopping to delivery of health care.

In many ways, the COVID pandemic marked an "inflection point" for travel behavior and the resulting mode usage and traffic trends surrounding the University. Trends like traffic reductions on the major community streets are welcomed, while some trends are not particularly desired, like the reduction in fixed-route transit usage. Other trends, like how to address unoccupied parking in Core Campus parking lots, have stirred discussions about updating parking policies and the permitting system.

On the opposite side of these vehicular and transit reductions, commensurate increases in walking, biking, and emerging micro-modes were also noted in the transportation data. While the increase validates many Campus Design Principles and contributes to many of Penn State's sustainability and equity goals, the University Park Campus transportation space is limited and is becoming more saturated with more users and a diversifying set of transportation devices. The advent of micro-mobility is full of opportunity, but many of these new vehicle types do not fit in well on the University Park network with the other prevalent modes. Micro-modes operate too fast to safely mix with pedestrians on the sidewalk, but also too slow and without their own space to safely operate in the street. Plus, there would be hard choices to make, significant costs to bear, and trade-offs necessary to create new transportation space within the established campus development pattern. In short, the campus transportation space is constrained, and the current level of mode conflict is generating new forms of congestion and inefficiency on the network.

The maintenance-centric nature of the University's Capital Plans and campus development projects are not expected to exacerbate the modal conflict in the UPD Study Area (Core and West Campus). If anything, the development of the College of Engineering on West Campus would help to deconflict the Core Campus space. The other major University development effort is at Innovation Park, and a significant effort to address regional transportation, connectivity, and growth in that area is underway.

Options for resolving and reducing mode conflict on campus are already being developed through this UPD Study and previous studies commissioned by Penn State. New infrastructure, operational strategies, policy changes, and new regulations are all in-play going forward. However, the Core Campus network is largely considered "mature" and major expansions and changes to the campus network (like those seen in the early 2000s) are not in favor for the next ten-year period. Operational and spot fixes hold promise for incrementally updating the network to address systemic safety and congestion concerns. The University Park Bicycle Master Plan, for instance, envisions street changes that can be implemented as low-cost projects during roadway renewal efforts. Meanwhile, the University recognizes the growing municipal-interest in advancing "edge-campus" transportation projects as collaborations with the University.

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State College Borough, Chapter XIX, Part D, Article XI, UPD University Planned District {255}. https://ecode360.com/32910964#32910964

College Township, Part II, Article VII, Chapter 188, University Planned District. https://ecode360.com/10704992#10704992

Patton Township, Chapter 175, Article VII, University Planned District (UPD). https://ecode360.com/6633586#6633586

University Planned District Transportation Studies

1994 University Planned District Master Plan Traffic Study
2001 Penn State Phase 1 Transportation Study
2013 University Planned District Transportation Study

2023 University Planned District Transportation Study Interviews

University Planned District Transportation Study Stakeholder Interviews, December 2022.
University Planned District Transportation Study Development Plan Interviews with Penn State's Office of Physical Plant staff, March 2023

Penn State Entities and Web-Based Resources

Penn State University Office of Physical Plant (OPP) (https://www.opp.psu.edu/)
Penn State University Auxiliary & Business Services (https://www.abs.psu.edu/abs-units)
Penn State University Sustainability Institute (https://sustainability.psu.edu/)

Penn State Policies

Penn State Policy SY 16, Regulations for Bicycles and Personal Mobility Devices. https://policy.psu.edu/policies/sy16

Recent Studies, Master Plans & Campus Planning Resources

Penn State University Park Guiding Principles for Campus Planning
Penn State University Park Master Plan, 1999
Student Affairs Facilities Master Plan, 2021
College of Engineering Master Plan, 2019
Libraries Facilities Master Plan, 2014
College of Arts and Architecture Master Plan, 2011
Eberly College of Science Master Plan, 2008
Penn State University Park Bicycle Master Plan, October 2023
Penn State University Transit Services Study, January 2023
Penn State University West Campus Parking Structure Transportation Impact Study, December 2019
University Park Airport Master Plan, 2015
Penn State University Park Avenue Master Plan and Widening, 2007

Penn State University Capital Plans & Infrastructure Programs

University Park Five-Year Capital Plan, 2018-2023
University Park Five Year Capital Plan, 2024-2028
University Park Roadway Preservation Program, 2020-2040
University Park Utilities Maintenance Program, 2022-2025

Transportation Data Resources

Penn State Office of Physical Plant & Transportation Services GIS (https://www.opp.psu.edu/unit/gis)
2023 University Planned District Transportation Study Traffic Data Collection Program, McCormick Taylor/Imperial Traffic Data Collection, November/December 2022.
Replica (https://www.replicahq.com/)
PennDOT Traffic Information Repository (TIRe) (https://gis.penndot.gov/TIRe)

Municipal & Regional Agency Transportation Planning Resources

Patton Township Parks and Bicycle/Pedestrian Path Plan, 2020-2029 https://twp.patton.pa.us/DocumentCenter/View/204/FINAL_PattonTownshipParksBicyclePedestrianPathPlan_2020_2029
Ferguson Township Northland Area Mobility Study, 2019 https://www.twp.ferguson.pa.us/public-works/pages/northland-area-mobility-study
State College Borough State College Downtown Master Plan, 2013 https://statecollegepa.us/410/Downtown-Master-Plan
State College Next Generation Connectivity and Mobility Plan, 2024 (anticipated) https://statecollegepa.civilspace.io/en/projects/11
College Township Pedestrian Facilities Master Plan, 2022 https://www.collegetownship.org/325/Walkable-College-Township-A-Pedestrian-F

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Centre Area Transportation Authority (https://catabus.com/)
2023-2026 Centre County Transportation Improvement Program (https://www.crcog.net/2023TIP)
PennDOT Twelve Year Program (https://talkpatransportation.com/2023TYP/index.html)
PA Vehicle Code, Title 75, Vehicles (https://www.legis.state.pa.us/WU01/LI/LI/CT/HTM/75/75.HTM)
PennDOT Micromobility Fact Sheet (https://penndot.gov)
PennDOT Active Transportation Plan, 2019 (https://www.penndot.pa.gov/TravelInPA/active-transportation/Pages/default.aspx)
Atherton Street Improvement Project (ongoing) (https://www.penndot.pa.gov/RegionalOffices/district-2/ConstructionsProjectsAndRoadwork/Pages/North-Atherton-Street-project.aspx)

National Agency Transportation Resources

FHWA/USDOT Pedestrian and Bicycle Information Center (https://Pedbikeinfo.org)

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