2019

MERCED COLLEGE

FACILITIES MASTER PLAN

MERCED COLLEGE

MERCED COLLEGE

2019 Facilities Master Plan

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Chris Vitelli

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PROJECT TEAM
Gensler, Facilities Planning
RHAA, Landscape Planning
PAE, Infrastructure Planning
BCG, Cost Consulting

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Vision + Mission + Values

VISION

Merced College will provide transformative and empowering educational experiences to meet student and community needs.

MISSION

Growing our community through eduction and workforce training:

- Lifelong Learning
- Basic Skills
- Career Technical Education
- Transfer
- Degrees / Certificate Programs

Ensuring student success through equitable access, continuous quality improvements, institutional effectiveness, and student achievement.

CORE VALUES

STUDENT SUCCESS

SUPPORTIVE ENVIRONMENT

PROACTIVE

PARTNERSHIP

DIVERSITY

SELF-REFLECTION

Letter from the President

Merced College is leading innovation through best practice educational programs and services. We have model, fast-track career technical education programs, accelerated curriculum, high profile transfer agreements, robust degree and certificate programs, and one of the nation's best workforce development and training programs.

Last year, we developed our comprehensive Educational Master Plan (EMP) to serve as the roadmap for the next five years for the College. The EMP aligns with our mission, vison, and core values, while also connecting to the Chancellor's Office Vision for Success. The Facilities Master Plan supports the EMP with a focus on the modernization and development of state-of-the-art facilities needed to facilitate growth and change to better serve our community.

The Facilities Master Plan is designed to support student access and success—a core mission of our system. Additionally, it integrates planning principles of student success, access and wayfinding, collegiate identity, efficiency, stewardship, and community engagement. Collectively, these principles guided the development of the final plan and paved the way for a new and innovative infrastructure for Merced College.

I want to extend my appreciation to our consultants throughout the process, M. Arthur Gensler Jr. & Associates, the chair of the Task Force, Vice President of Administrative Services, Joe Allison, the members of the Facilities Master Plan Task Force, and all stakeholders who participated both internally and externally to develop this comprehensive plan.

On behalf of the District and the Merced College Board of Trustees, we appreciate your continued efforts in making this plan a reality. We welcome your support in helping us advance our master planning efforts and innovations to better serve our students and this amazing community.

Chris Vitelli, Ed.D.
Superintendent / President

Merced Community College District

The Merced Community College District encompasses 2,184 square miles and includes Merced County, the Chowchilla Union High School District in Madera County, and the Dos Palos Joint Union Elementary School District. The District also serves the Mariposa service area. The Governing Board is comprised of seven elected members. Merced College is a California Public Community College and was formed by a vote of the people of the Le Grand and Merced Union High School Districts on February 27, 1962. The Merced Community College District became effective for all purposes July 1, 1963.

The main campus of Merced College covers 269 acres; the Los Banos Campus is an approved educational center of Merced College, located on 120 acres. In addition, the College has a Business Resource Center in downtown Merced and offers classes at locations outside its two main locations for residents in Delhi, Dos Palos, Chowchilla, and Mariposa.

The Facilities Master Plan focuses on the Merced Campus and the Los Banos Campus. The Business Resource Center was recently constructed and expansion is not expected for 2028.

LOS BANOS CAMPUS

MERCED CAMPUS

BUSINESS RESOURCE CENTER

01

PROCESS + PARTICIPATION

PROCESS + PARTICIPATION

The Merced College 2019 Facilities Master Plan (FMP) has been developed to serve as a guide for future development. It is informed by the Merced College 2018 Educational Master Plan (EMP), which serves as the foundation for facilities recommendations.

This chapter of the FMP describes the planning process and presents the findings from the multiple engagement activities that took place.

Planning Process

The Educational Master Plan is the centerpiece of Merced College's cycle of integrated planning. It is the foundation for the College's long-term Facilities Master Plan and also guides the short-term planning processes, such as program review and strategic planning.

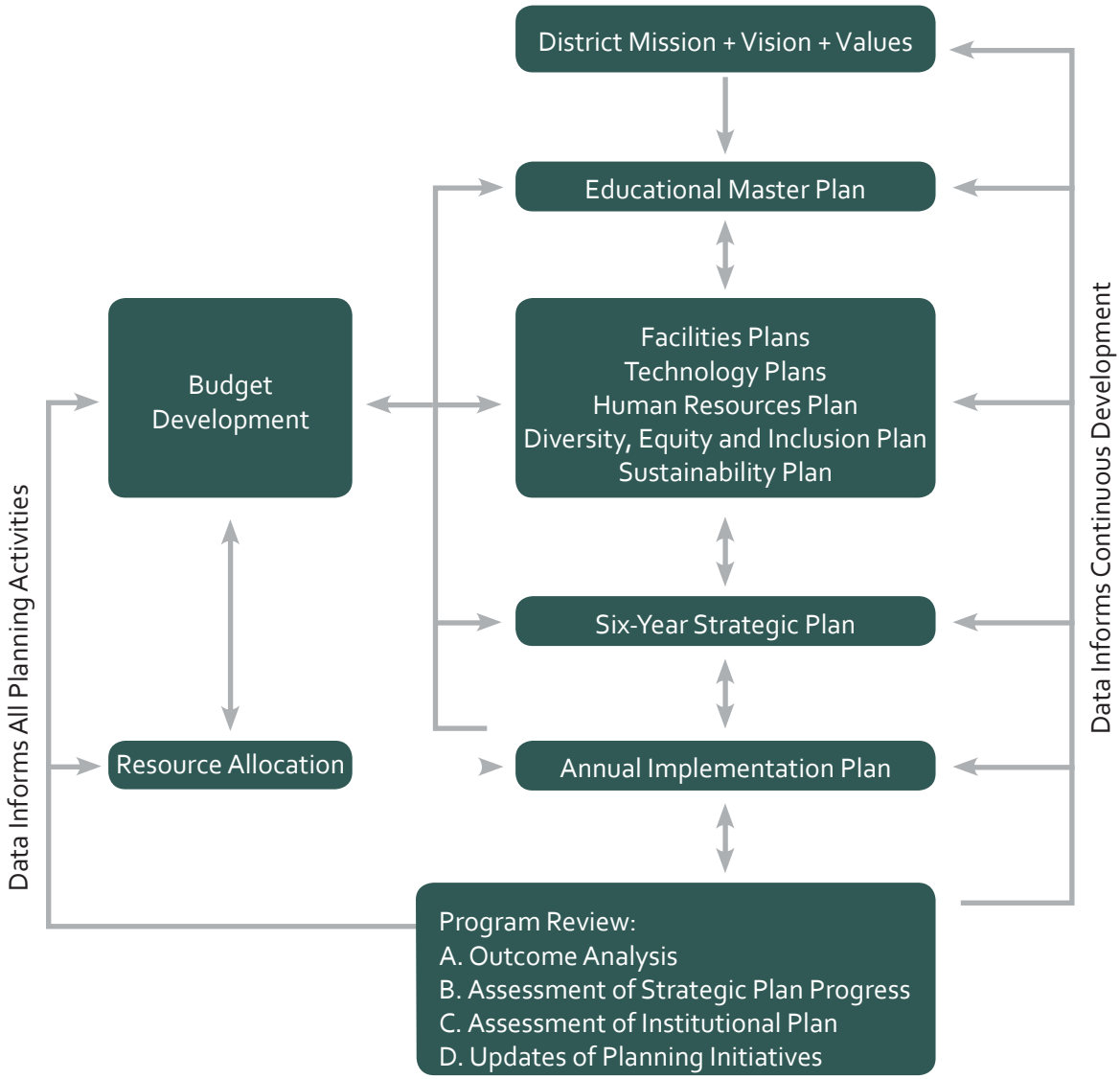
The 2019 Merced College Facilities Master Plan builds upon the District's priorities for student learning and success, providing a guide for future development of the District's three teaching sites.

INTEGRATED PLANNING MODEL

Within the integrated planning model, the specific purpose of the Facilities Master Plan is to:

- Identify needs for renovation, repair, or replacement of existing facilities to accommodate current and future academic and support needs
- Provide long-range guidance for the development of new facilities to accommodate projected academic and support needs
- Include and integrate current construction and maintenance information
- Describe the District's priorities for future design and construction standards

INTEGRATED PLANNING MODEL



Planning Process

The planning team worked with the College to develop the FMP in a collaborative 5-step process described on the following page. The planning team worked with the FMP Task Force to identify key issues to address in the FMP, review the existing conditions analysis, evaluate a series of development options, and make decisions that led to the development of the FMP recommendations.

1. PREPARE:

- Met with Merced leadership to coordinate the FMP process and schedule
- Collected and organized information provided by the College

2. ANALYZE:

- Conducted site visits with key personnel to observe existing conditions, patterns, and uses
- Developed graphics to illustrate the documented and observed campus patterns and other characteristics
- Reviewed the existing conditions analysis with the FMP Task Force and planning groups
- Worked with the FMP Task Force to identify key issues to address in the FMP

3. FRAME:

- Analyzed the qualitative and quantitative information collected, including Planning Data Forecasts, to create the framework for the Facilities Master Plan
- Collected and analyzed demographic trends, labor market analyses, programmatic trends and utilization rates to develop the draft program forecasts
- Linked the EMP data to the FMP process

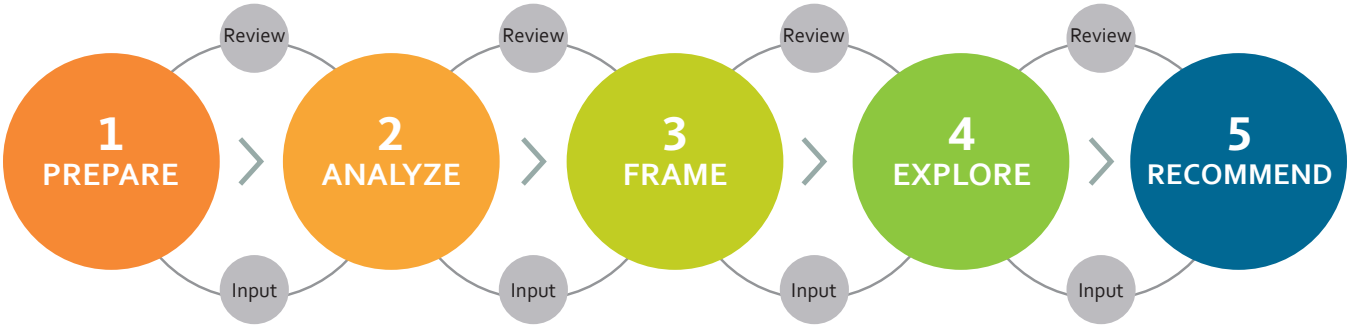
4. EXPLORE

- Developed the facilities planning principles with the FMP Task Force that serve as a guide for the FMP recommendations
- Explored campus development options for review and selection with the FMP Task Force

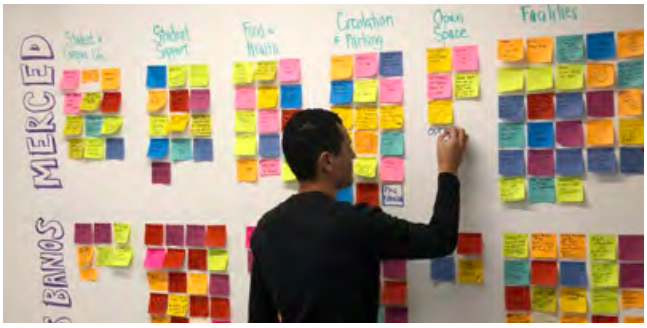
5. RECOMMEND

- Developed a preliminary recommendation for review with the FMP Task Force
- Coordinated strategies to maximize state funding opportunities based on these recommendations

5 STEP PLANNING PROCESS



TASK FORCE MEETING #4



GENSLER TEAM ANALYZING FEEDBACK

TASK FORCE MEETING #2

CONCEPT DEVELOPMENT

Participation

Maximizing campus engagement was identified as one of the "keys to success" for the 2019 Facilities Master Plan. To support this goal, the Merced College leadership collaborated with the Planning Team at the start of the process to identify the many stakeholders, establish the FMP Task Force, and design a series of engagement activities.

The engagement activities included a series of meetings, presentations, workshops and discussions. These activities integrated into the planning process to include the many voices of Merced College, broaden the plans perspective and enhance the acceptance of the recommendations.

A summary of this broad campus participation is included on the following pages.

CAMPUS FORUMS

In order to maximize participation and to include the many voices of Merced College, the planning process included a series of presentations with key groups on campus. The meetings were attended by stakeholder representatives from all areas of the college: administration, faculty, staff, and students.

The forums included sessions at the Merced and Los Banos Campuses. Each session included a mix of faculty, students, administration, and individuals with a shared interest.

VISION SESSIONS

SUSTAINABILITY WORKSHOPS

ONLINE SURVEY

MERCED CAMPUS FORUM

MERCED COMMUNITY FORUM

The FMP Task Force, composed of faculty, staff, students, and administrative representatives - were the lead group collaborating closely with the Planning Team throughout the planning process.

FMP TASK FORCE

ADMINISTRATION
Joseph Allison, Vice President of Administrative Services
Bobby Anderson, Dean of Instruction Area 4
John Albano, Dean of Instruction Area 5
Brenda Latham, Dean of the Los Banos Campus
Kelly Fowler, Vice President of Instruction
FACULTY
Louisa Benhissen, Fine and Performing Arts
Ivan Navarro, Science, Math, and Engineering
Bryan Donnelly, EMT and Fire Technology Programs
Wayne Altenberg, Faculty Librarian
Nate Devine, Athletics
ASSOCIATED STUDENTS OF MC
Jess Betancourt
Julius Sweet
STAFF
Denise Butler, Administrative Assistant
Sheila Flores, Manager of Events and Capital Planning
Ron Perez, Director of Facilities Management
Bryan Tassey, Dir. of Grounds and Farm Management
Will Resendes, Dir. of Tech. Infrastructure & Architecture
Traci Veyl, Director Financial Aid
Estelina Jones, Acting Director of DSPS
Jeanette Martin, CSEA
Gabriela Garcia, Classified Senate
Shannon Gragg, Classified Senate

MERCED COLLEGE VISION SESSION

TASK FORCE MEETING #3

COMMUNITY FORUM

Vision Sessions

The Merced and Los Banos campus communities were invited to participate in Campus Vision Sessions that were held in the fall of 2018. Faculty, staff, and students were engaged with the planning team through a series of interactive boards and conversations. The findings of these sessions are summarized on the following pages.

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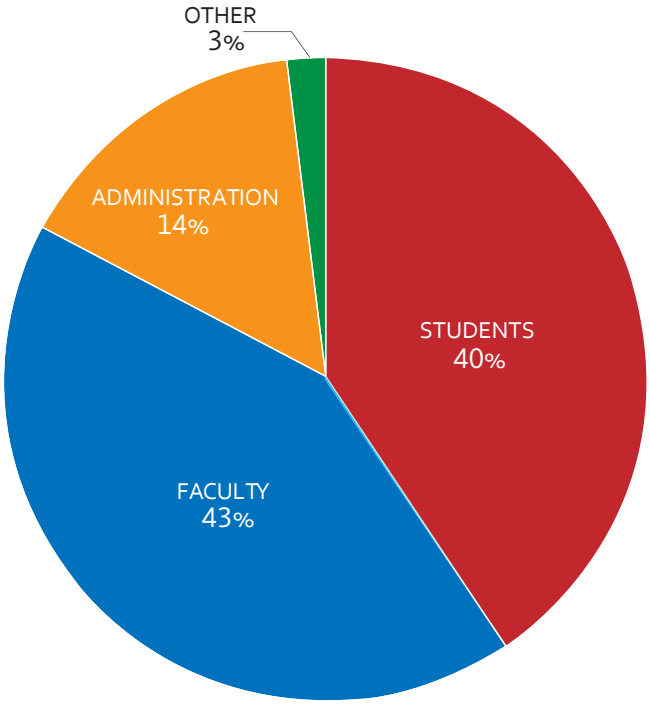
PARTICIPANTS

PARTICIPANTS



VISION SESSION - LOS BANOS CAMPUS

VISION SESSION - MERCED CAMPUS

GETTING TO CAMPUS

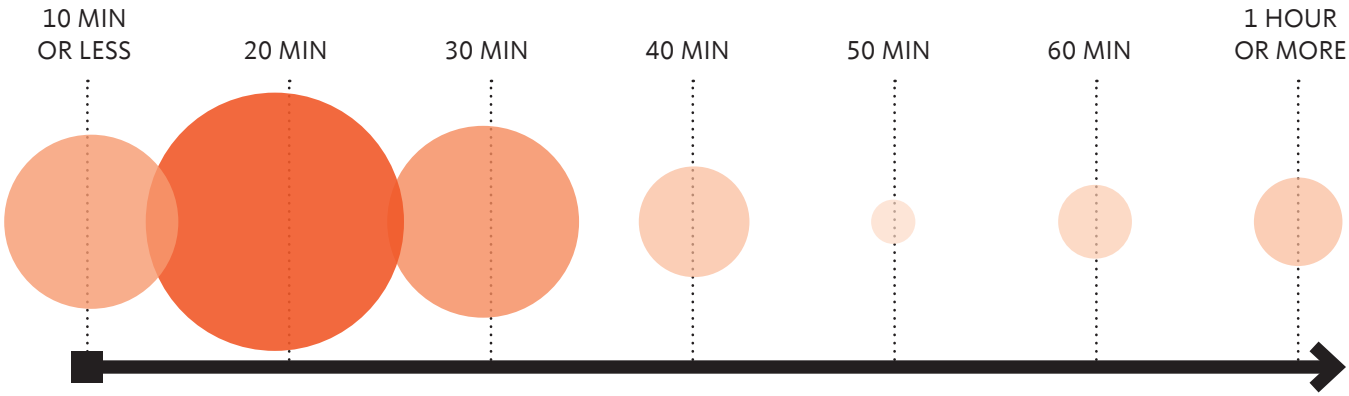
Participants were asked to identify how they commute to campus. The majority of participants on both campuses drive alone with a 10 minute or less commute.

This short commute indicates both campuses serve the local community.

HOW DO YOU GET TO CAMPUS?

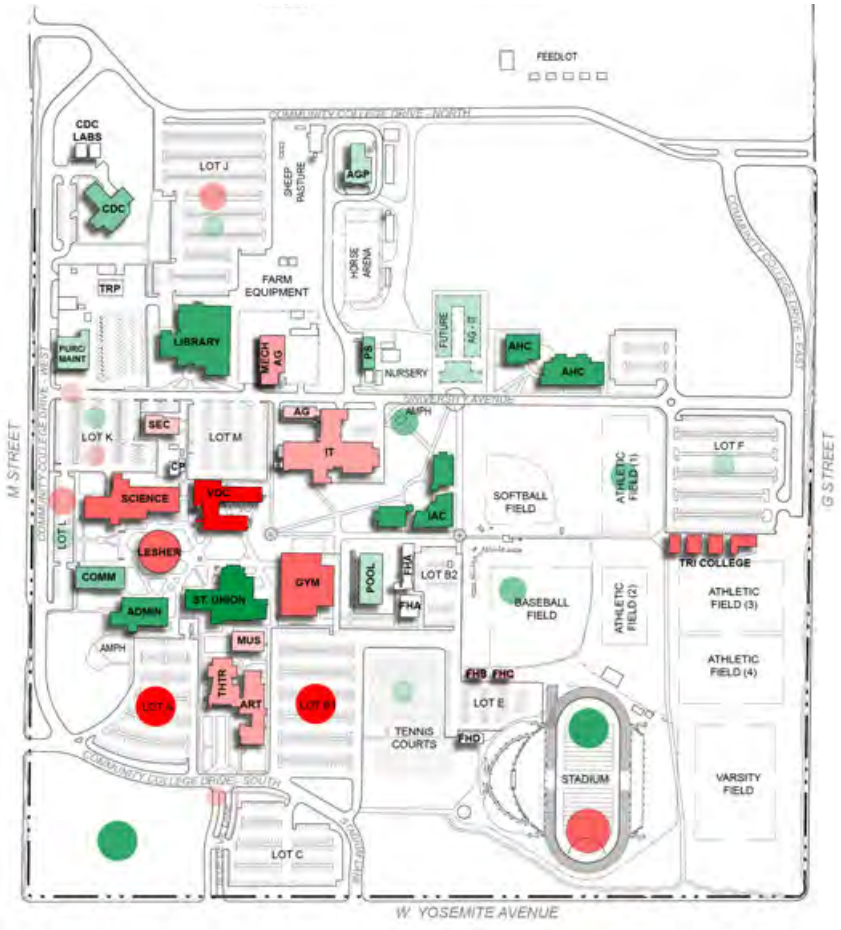
DRIVING (ALONE)	CARPOOLING (DRIVING WITH OTHERS)	**DROP OFF/ RIDE-SHARE**
PUBLIC TRANSIT	BIKE / SCOOTER	**WALK**

HOW LONG IS YOUR COMMUTE TO CAMPUS?



CAMPUS EXPERIENCE

Participants were asked to identify their 'favorite' and 'least favorite' spaces on campus. The results are illustrated in the graphic to the right for Merced Campus and Los Banos Campus. The following observations were made:



MERCED CAMPUS

- The Student Union and the Library are well-liked
- Older facilities were voted least favorite due to lack of windows, HVAC issues, and overall condition

LOS BANOS CAMPUS

- Building A is well favored for the student services offered, such as the student lounge and library
- The gravel parking Lot E is not well liked due to the condition and proximity to the buildings

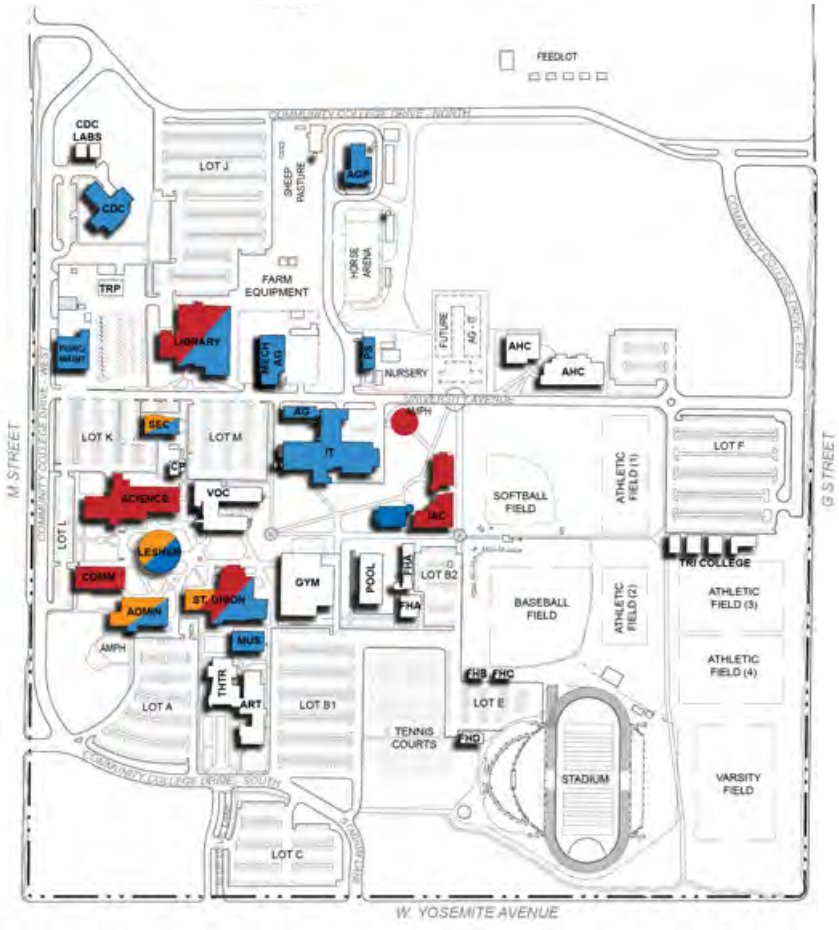
FAVORITE
LEAST FAVORITE

PLACES ON CAMPUS

Participants were asked to identify the places they most frequently study and socialize. The following observations were made:

MERCED CAMPUS

- The majority of students focus and socialize in the Student Union
- Restrictions in the Library (water bottles and food prohibited), deter participants from using the space



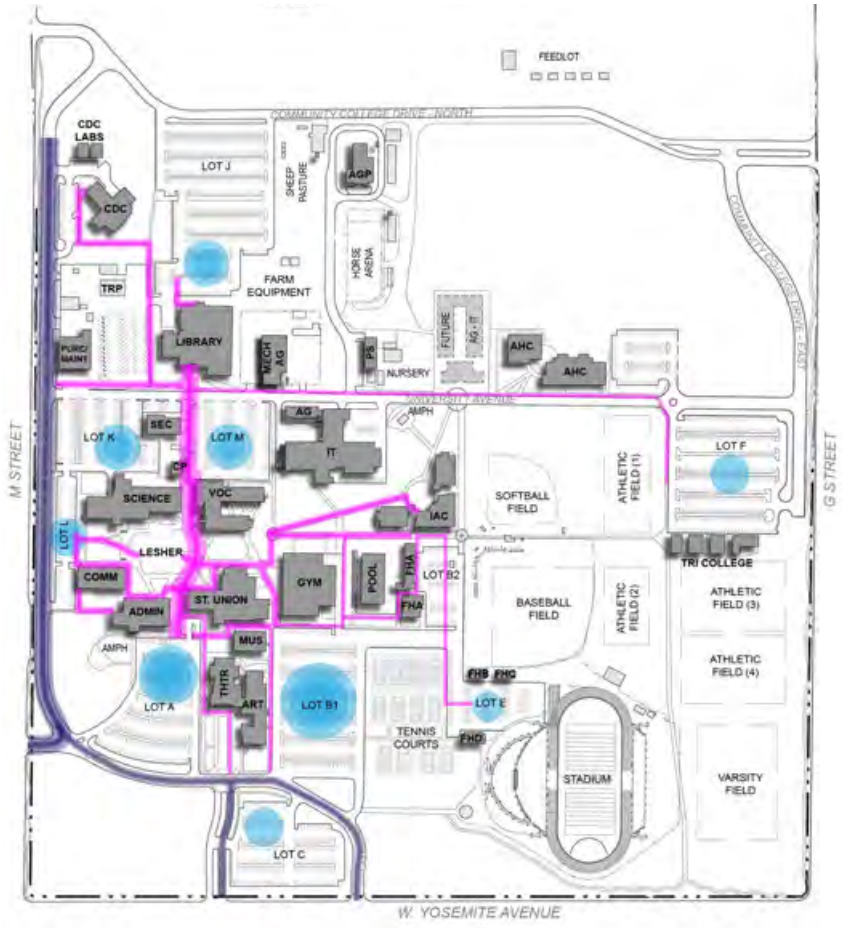
LOS BANOS CAMPUS

- The student lounge in Building A is a popular area for socializing
- The library is identified as a shared study/focus area for the majority of participants

FACULTY + STAFF
STUDENTS
ADMINISTRATION/ MANAGEMENT

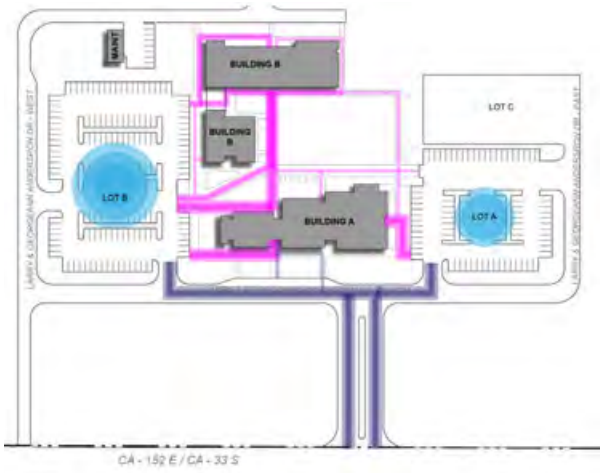
PATHS OF TRAVEL

Participants were asked to identify the areas they typically park their vehicles and to draw their typical paths of travel through campus. The results are illustrated in the graphics to the right and the observations for each campus are listed below.



MERCED CAMPUS

- A popular path of travel is between the Student Union and the Library - this is through a large parking area - Lot M
- Circulation is focused around the quad and in close proximity to the Student Union
- The most popular parking locations were Lot A and Lot B1 for both faculty and students



LOS BANOS CAMPUS

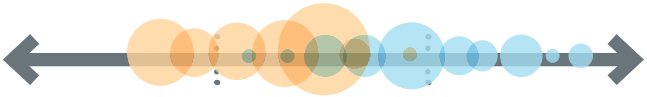
- The most popular pedestrian path is between Buildings A and B
- The majority of parking occurs in Lot A

ORIGIN
VEHICULAR PATH
PEDESTRIAN PATH

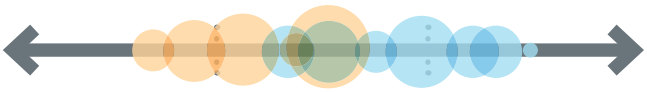
CAMPUS CULTURE

Participants were asked to describe the campus culture, based on where they believe Merced College is today, and where they would like Merced College to be in the future.

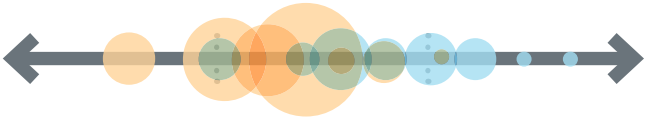
Although the words used for the scales were left open to interpretation by the individuals, there is a clear correlation in the shifts between the present and future.



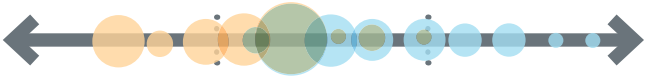
TRADITIONAL — CONTEMPORARY



FIXED — FLEXIBLE



DISPERSED — CENTRALIZED



INTROVERTED — EXTROVERTED

QUIET — ACTIVE

● TODAY

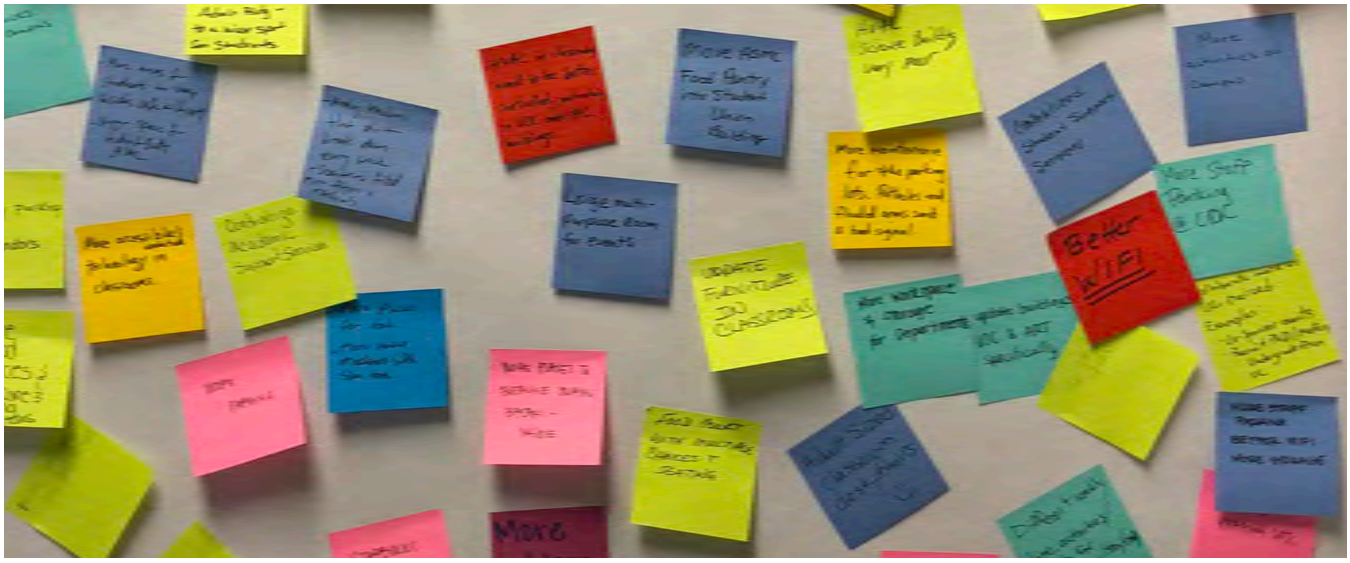
● TOMORROW

VISION SESSION - MERCED CAMPUS

100 IDEAS

Participants were asked to share their ideas for how to improve Merced College. Following the Vision Session, the Planning Team sorted the many comments in order to identify common themes.

Six themes rose to the top of the top ideas/topics that Merced College community is most interested in improving.



CAMPUS VISION FEEDBACK

GENSLER TEAM SYNTHESIZING FEEDBACK

GENSLER TEAM SYNTHESIZING FEEDBACK

COMMON THEMES

STUDENT + CAMPUS LIFE

Integrate Community
Brand + Identity
Date + Nighttime Activities
Collaborate with UC Merced
Social Spaces

STUDENT SUPPORT SERVICES

Modern Technology + Equip.
Improved Wi-Fi
Accessible Technology
More Childcare
Open Communication

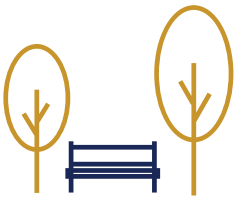
FOOD + HEALTH

Variety of Food Options
Indoor Exercise Areas
Coffee Carts + Cafes
Food Trucks

CIRCULATION + PARKING

Better Maintenance
Improve Vehicular Circulation
Debit/Credit Parking Machines
More Parking
Charging Stations

OPEN SPACE



Sidewalk Paths
Electrical Outlets on Quad
Gathering Spaces
Lighting and Seating
Utilize Open Space

FACILITIES

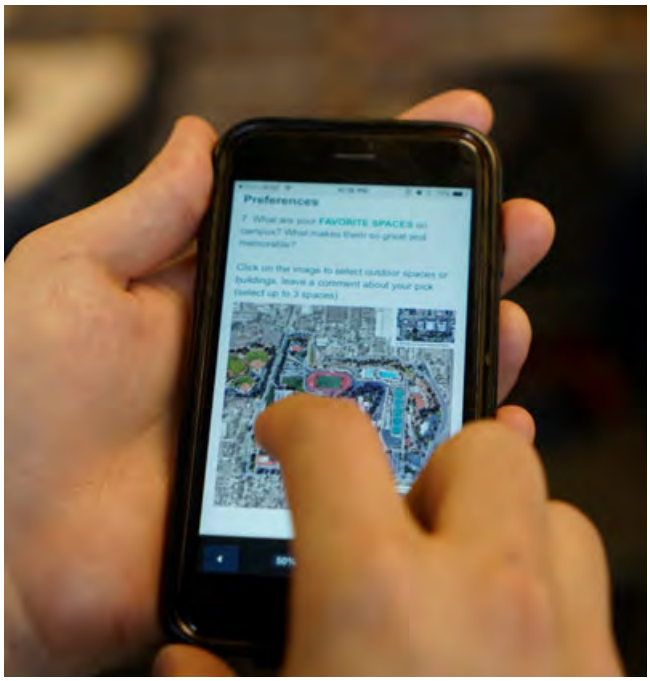
Renovations of Existing Buildings
Centralize Student Services
New Furniture
Innovative Classroom Design
Large Multi-Purpose Event Space

Online Survey

In addition to the Planning Committee and technical meetings, the College conducted a mobile online experience survey to capture comments and ideas from a wide group of students, faculty, staff, administration, and alumni.

There were 324 survey responses consisting mostly of students. The survey indicates that most students drive alone to campus with an average commute of 27 minutes. Students come to campus for scheduled lectures and lab sessions, but are remaining on campus for other activities. The quality of student life and support services is closely tied to the quality of campus facilities.

The following pages are a summary of the survey responses.



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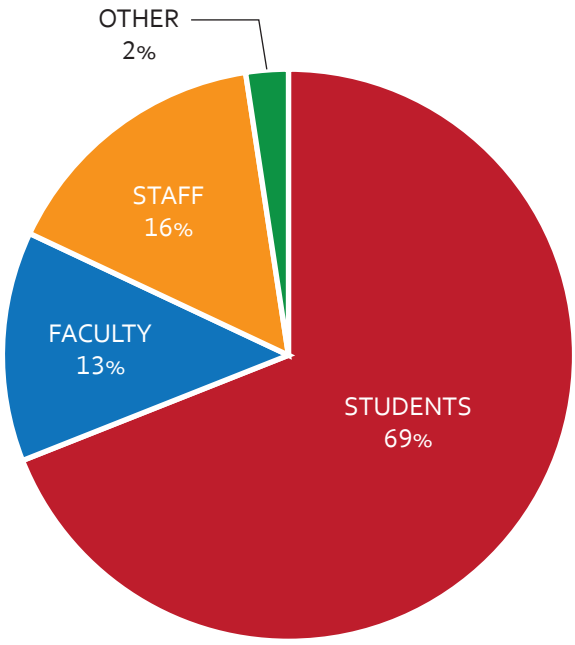
RESPONSES



GETTING TO CAMPUS

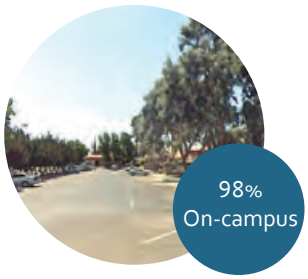
Average commute to Campus

27 M
Student commute time

23 M
Faculty and staff commute time

STUDENTS

FACULTY AND STAFF



MANY STUDENTS DRIVE ALONE TO CAMPUS

81%

Students drive alone

11%

Students are dropped off

5%

Students carpool

CAMPUS ENGAGEMENT

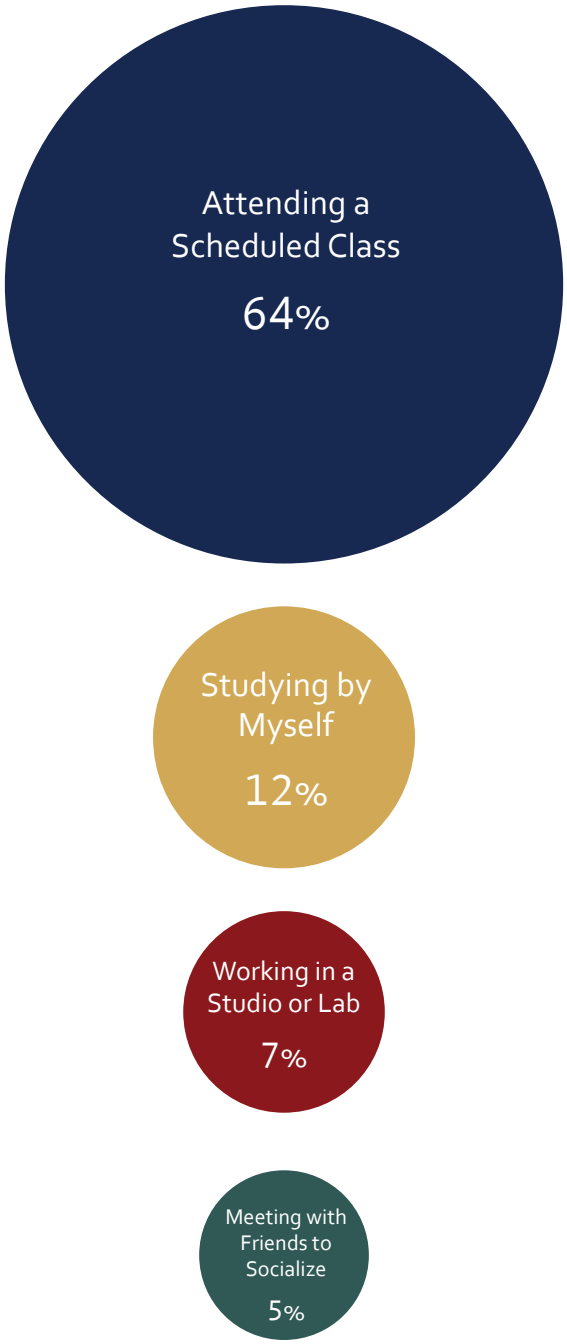
WHEN ASKED ABOUT THE FREQUENCY OF THEIR VISITS TO CAMPUS, FACULTY AND STAFF RESPONSES SHOWED LONGER HOURS ON CAMPUS WHEN COMPARED TO STUDENTS

SIXTY SEVEN
PERCENT of people (students, faculty, and staff) come to campus 4-5 days per week

FORTY
PERCENT of students spend 2-4 hours per day on campus

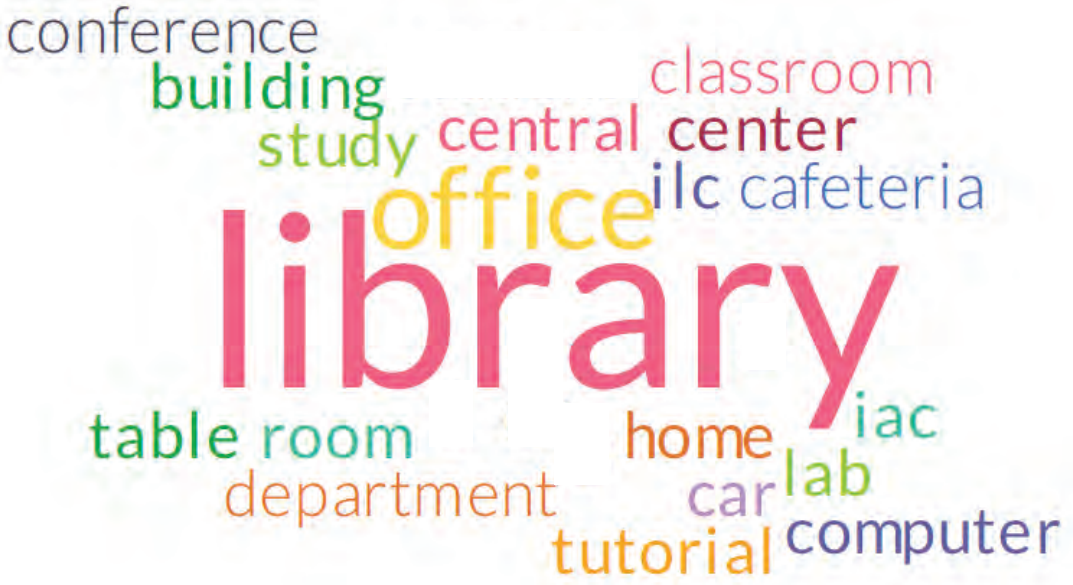
THIRTY SIX
PERCENT of faculty and staff spend over 8 hours per day on campus

HOW DO YOU SPEND YOUR TIME ON CAMPUS



PREFERRED SPACES ON CAMPUS

STUDYING / FOCUSING



SOCIALIZING

SATISFACTION

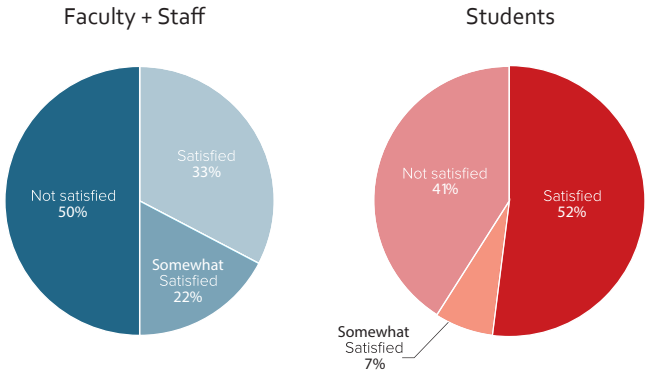
Participants were asked to rate their satisfaction with their campus for the following:

- Classroom and Lecture Space
- Outdoor Spaces
- Cafeteria and Food Service
- Lab and Studio
- Library and Tutorial
- Athletic Facilities and Fields

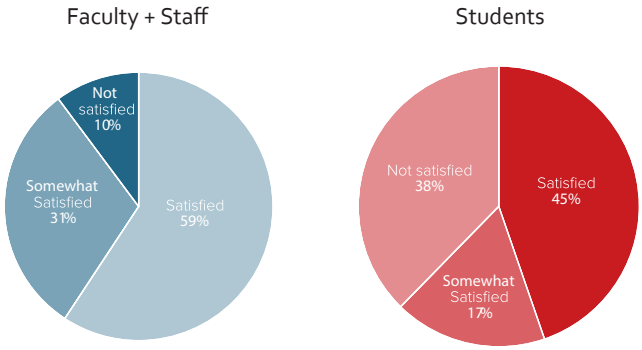
The survey showed that more students are satisfied with classroom and lecture spaces than are Admin, Faculty, and Staff.

The majority of participants are the most satisfied with the Library and Tutorial Spaces, but least satisfied with outdoor spaces (plazas & lawns).

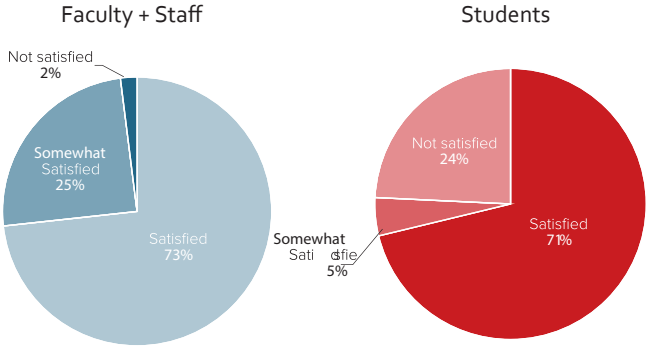
HOW SATISFIED ARE YOU WITH CLASSROOM + LECTURE SPACES?



HOW SATISFIED ARE YOU WITH OUTDOOR SPACES?



HOW SATISFIED ARE YOU WITH LIBRARY + TUTORIAL SPACES?



MOTIVATIONS

When considering enrollment, about 75% of students report prioritizing affordability, quality of academic programs, and resources.

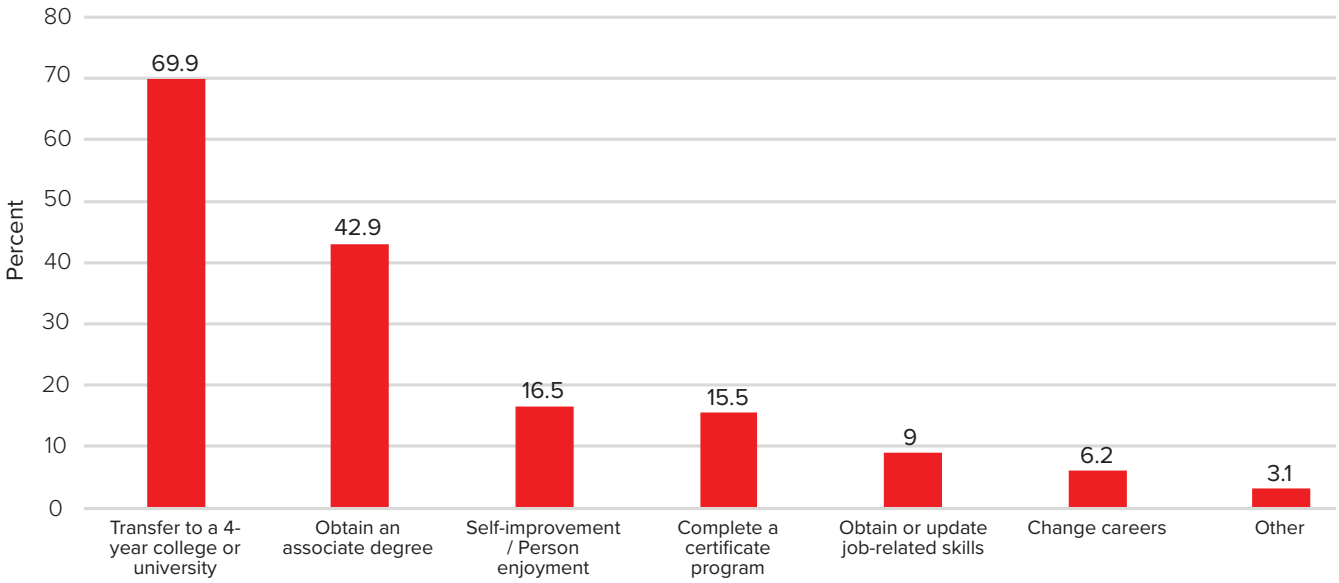
A significant portion of students report academic goals that suggest a prolonged relationship to Campus.

73%
Prioritize affordability

69%
Academic programs

46%
Proximity to home

34%
Student resources + community

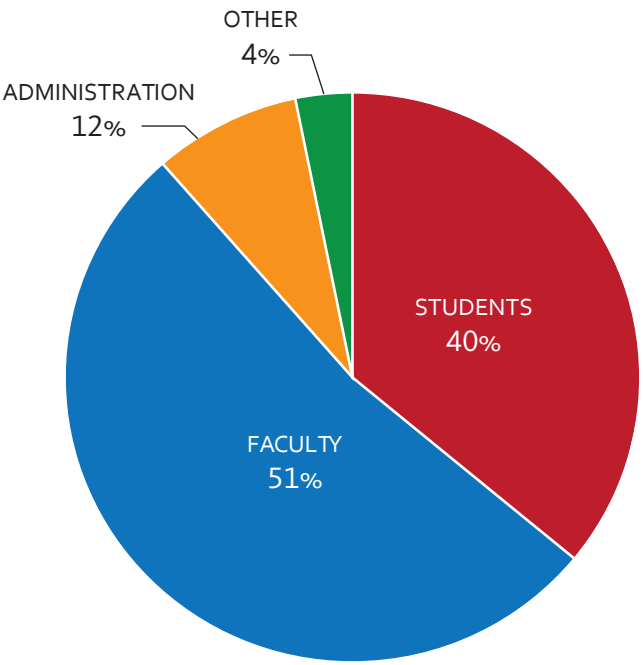


Sustainability Workshop

As part of the FMP, the planning team conducted a study of energy and water use, as well as a carbon emission profile. This information was presented as part of the Sustainability Workshop conducted on December 5, 2018.

Workshop participants included faculty, staff, students, and community members who engaged in a dialogue focused on sustainability at the Los Banos Campus and the Merced Campus. The group discussed current strategies and participated in a series of activities that contribute to the sustainability goals for the FMP.

PARTICIPANTS



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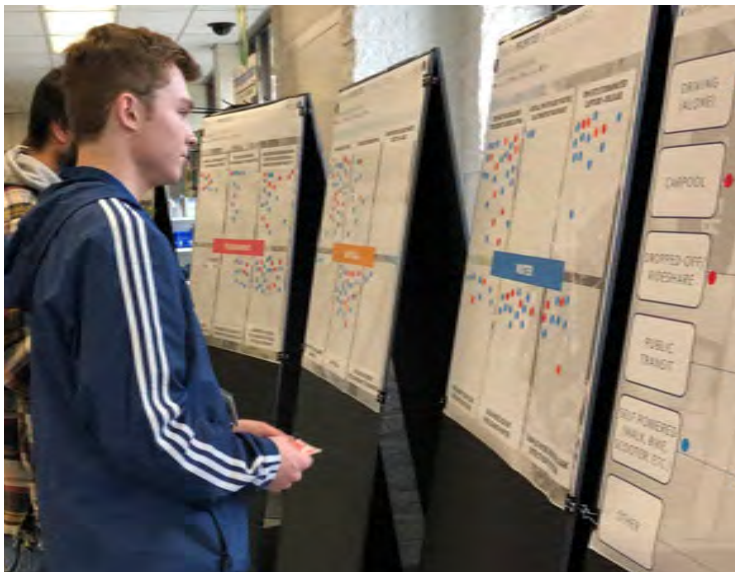
PARTICIPANTS



SUSTAINABILITY WORKSHOP - MERCED CAMPUS

SUSTAINABILITY WORKSHOP - LOS BANOS CAMPUS

PRIORITIES

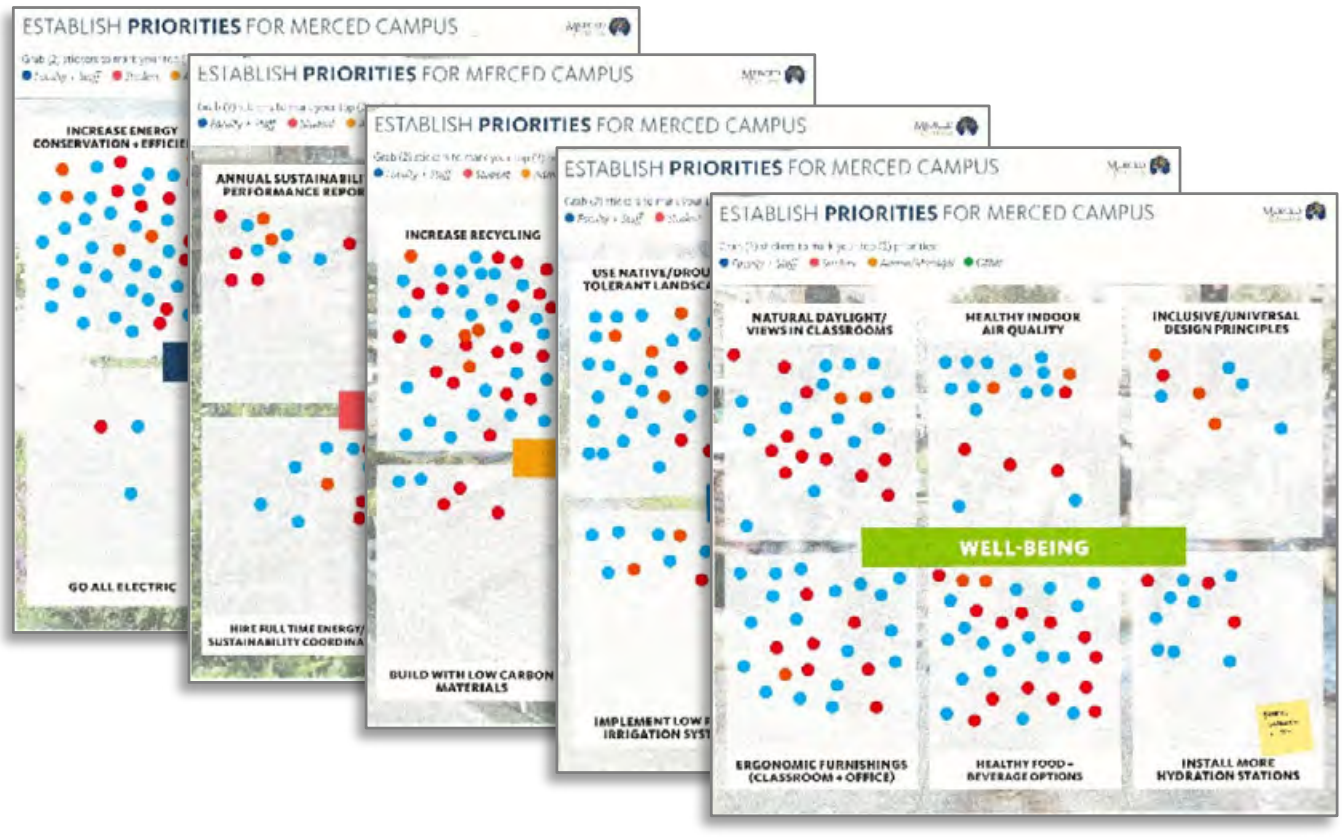
Participants were given two dots per sustainability topic to identify their top priorities. The sustainability topics included Climate Smart, Well-being, Mobility, Water, Materials, and Transparency.

MERCED CAMPUS

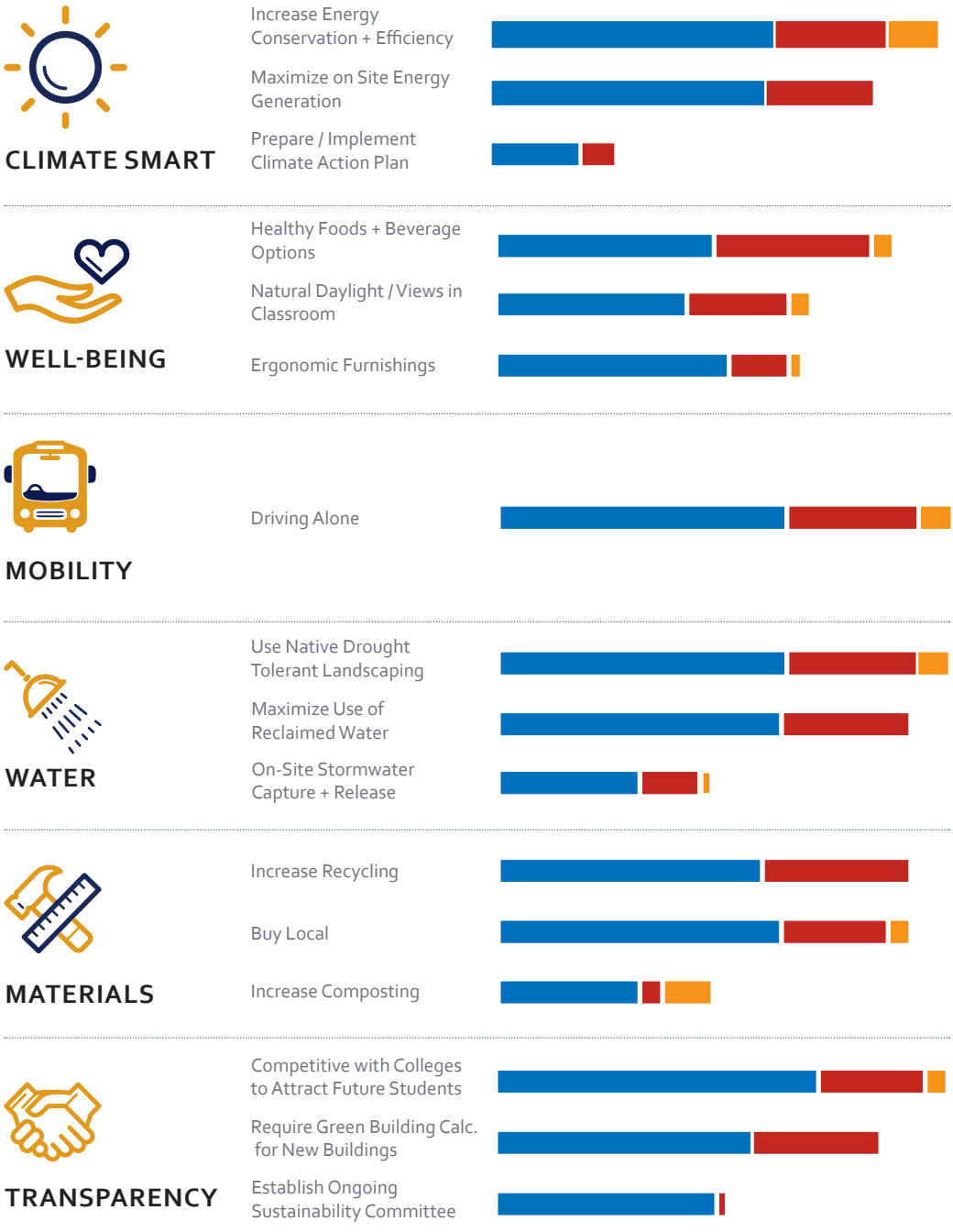
- Increase energy conservation and efficiency
- Healthy foods and beverage options
- Using native drought tolerance landscaping
- Increase recycling
- Being competitive with colleges to attract future students

LOS BANOS CAMPUS

- Maximizing site energy generation
- Healthy foods and beverage options
- Maximizing use of reclaimed water
- Rethinking sustainability in the curriculum



MERCED CAMPUS PRIORITIES

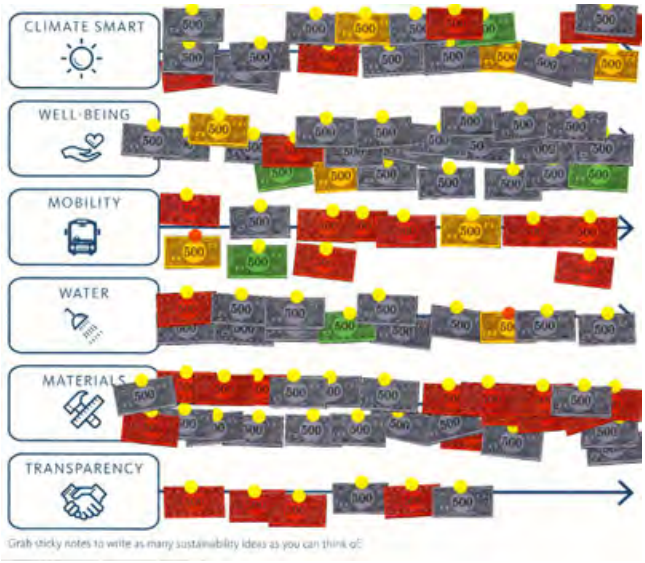


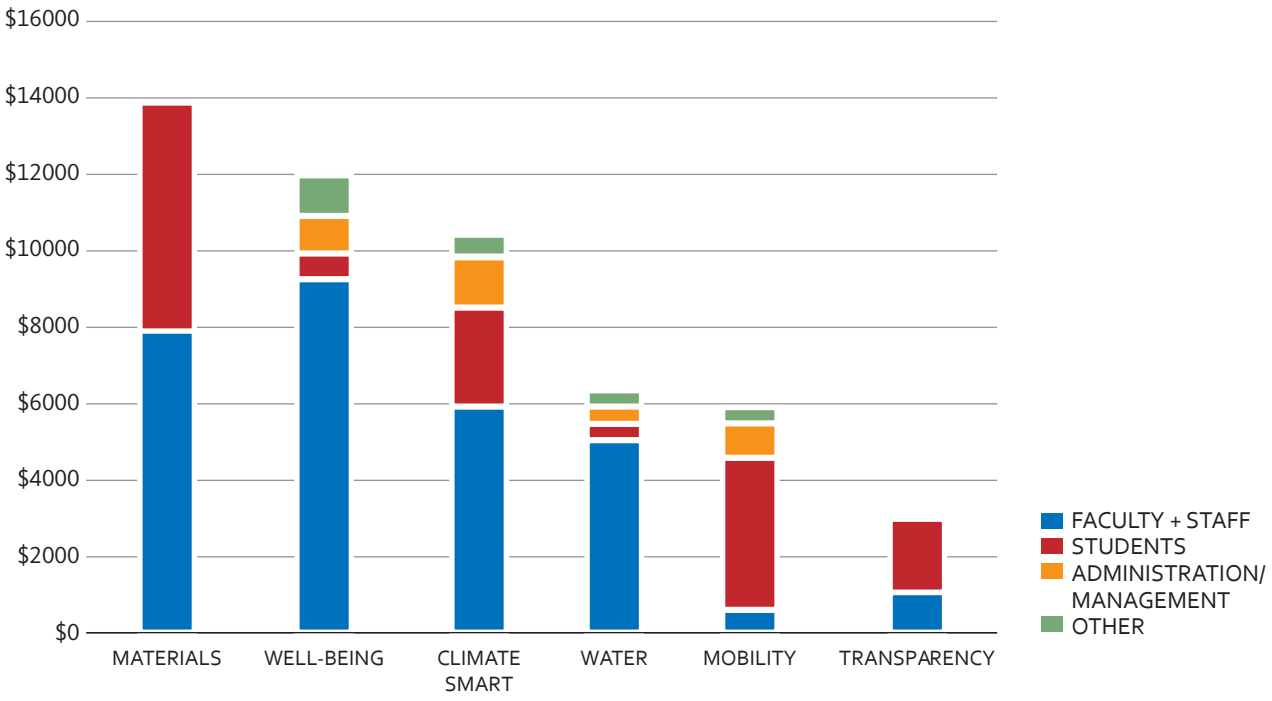
INVEST IN THE FUTURE

Participants were given two $500 bills to spend on the 6 sustainability topics in order to clarify where participants would like to see Merced College invest in the next 5 years.

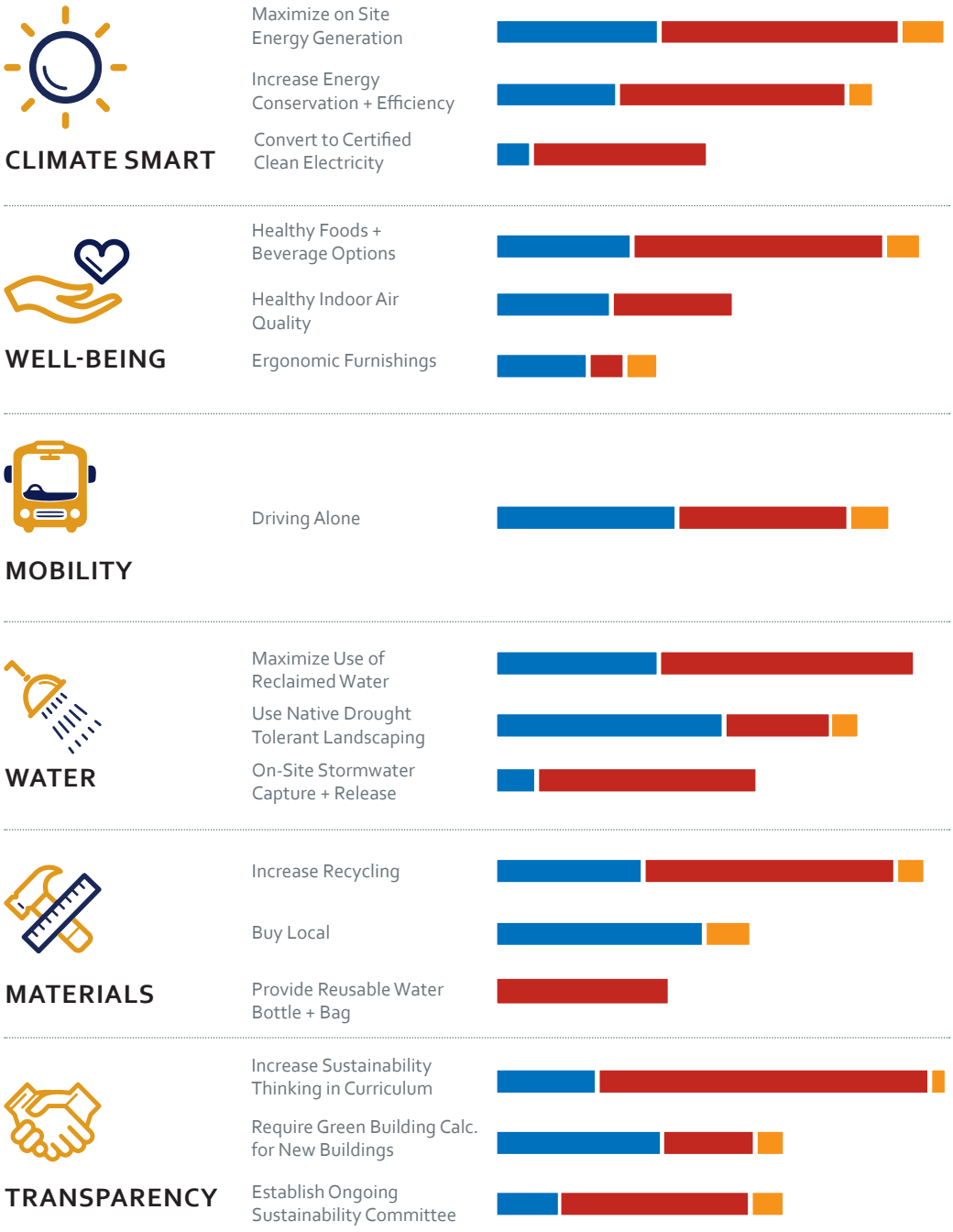
The following investments were made of Merced Campus:

- Materials
- Well-Being
- Climate Smart





LOS BANOS CAMPUS PRIORITIES

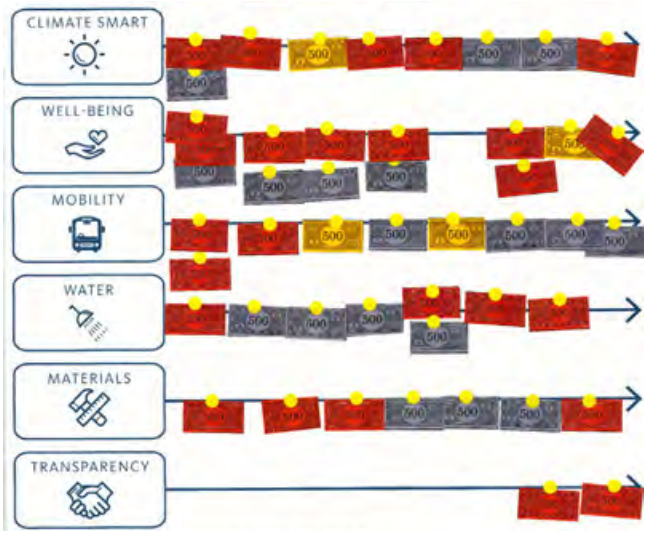


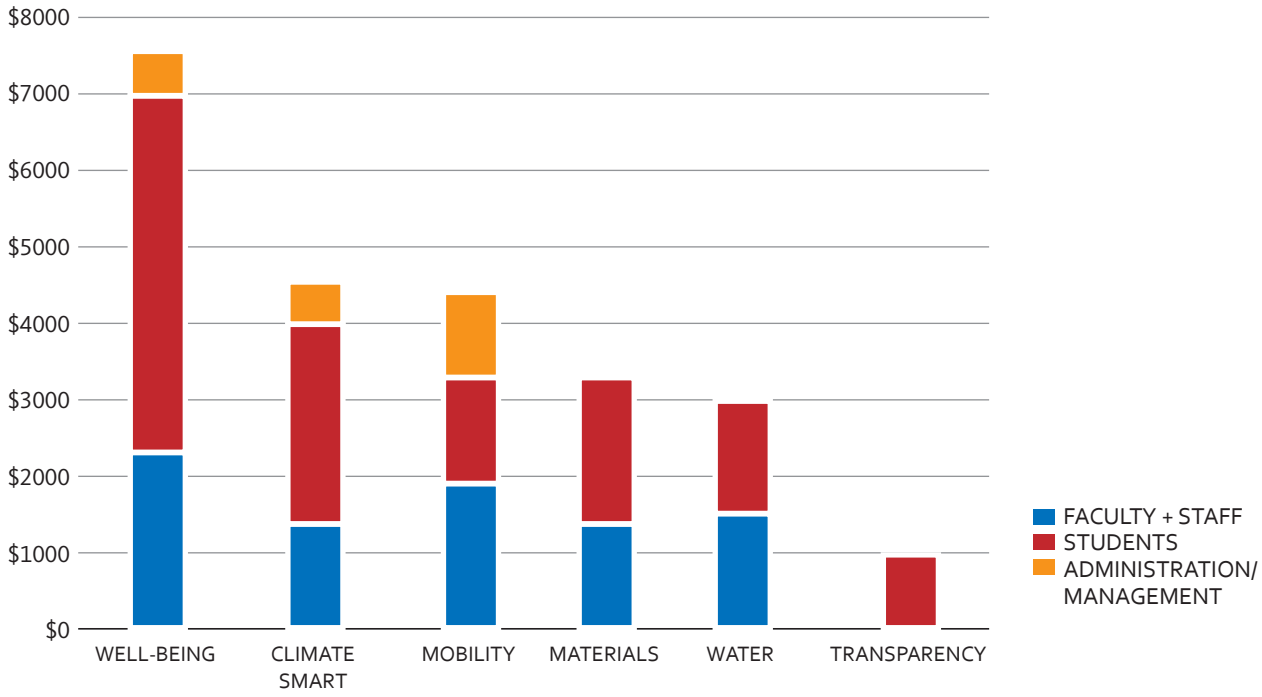
INVEST IN THE FUTURE

Participants were given two $500 bills to spend on the 6 sustainability topics in order to clarify where participants would like to see Merced College invest in the next 5 years.

The following investments were made of Los Banos Campus:

- Well-Being
- Climate Smart
- Mobility





02

EMP / FMP LINKAGES

EMP / FMP LINKAGES

The 2019 Facilities Master Plan (FMP) for Merced College (MC) is an extension of the 2018 Educational Master Plan (EMP). The EMP provides the data upon which the instructional program and support service needs are established. This facilitates the development or update of other College plans, including the FMP. Projections for enrollment and instructional programs serve as the basis for the development of the FMP Space Program.

This section describes the linkages between the EMP and the FMP and the methodology used to determine the facilities space needs through the year 2028.

The following elements are included in this section:

MASTER PLAN FRAMEWORK
ENROLLMENT FORECASTS
SPACE INVENTORY
SPACE UTILIZATION AND STANDARDS
FMP SPACE PROGRAM

Master Plan Framework

The Educational Master Plan (EMP) was approved on May 17, 2018 and provides the foundation for long-range planning for Merced College. The EMP provides direction for a multi-year Strategic Plan to operationalize the EMP and establish a Facilities Master Plan (FMP).

The Educational Goals and Objectives and the Integrated Planning Program Review Cycle are included in this FMP to highlight the integrated planning process

EDUCATIONAL GOALS AND OBJECTIVES

1 Employ enrollment management strategies to support student success, progression, and completion/transfer.

2 Increase student access and streamline entry processes.

3 Maximize future financial stability via data-driven, long-range, integrated fiscal planning.

4 Strengthen campus safety and align facilities and technology planning with educational master planning.

5 Strengthen existing and creating new partnerships with educational institutions, employers, and government.

6 Design streamlined, integrated technological and human systems that work effectively towards desired outcomes.

INTEGRATED PLANNING AND PROGRAM REVIEW CYCLE

Enrollment Forecast

Annually, the State Chancellor's Office generates a long-range forecast for growth of WSCH (weekly student contact hours) and Headcount. The forecast extends through the year 2025. The data is for fall semesters. The data shows that the forecast implies an annual growth of 1.73% for enrollments (headcount) and 1.83% for WSCH. The State Chancellor's Office growth forecast is based on population growth, participation rates, and other internal and external factors.

The following table is directly from the 2018 Educational Master Plan and illustrates the actual headcount and FTES through 2017 and projections to the 2028-2029 academic year. The numbers for 2017-2018 include an estimate from the College's Office of Institutional Effectiveness for spring 2018 FTES.

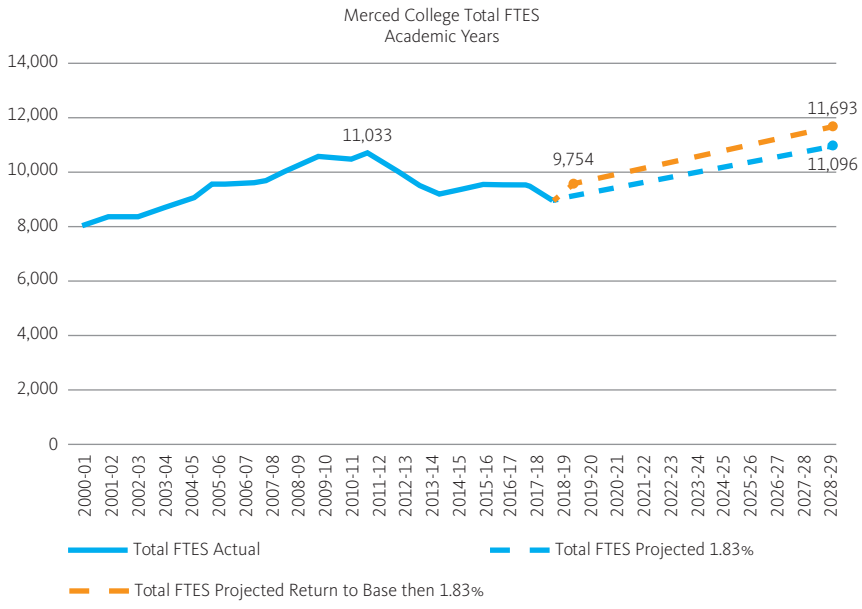
The EMP includes two growth models for future FTES growth. The consulting team has created two growth models for future FTES growth.

1. Growth at 1.83%. This will be referred to as the "growth at 1.83%."

2. Return to base level of FTES in 2018-2019, then growth at 1.83% annually. This will be referred to as the "return to base then 1.83% annual growth."

During the FMP process, it was determined that growth model 2 (return to base) would be used to forecast space needs.

Fall Semester	Enrollment	WSCH
2017	11,571	137,485
2018	11,772	140,060
2019	11,977	142,688
2020	12,185	145,359
2021	12,397	148,084
2022	12,613	150,864
2023	12,833	153,495
2024	13,056	156,162
2025	13,283	158,877
Annual Growth Rate	**1.74%**	**1.83%**



History		Projections		
Fall Semester	FTES	Academic Year	Growth at 1.83%	Return to Base then 1.83% Annual Growth
2000-2001	8,076	2017-2018	9,090	9,090
2001-2002	8,610	2018-2019	9,256	9,754
2002-2003	8,717	2019-2020	9,425	9,933
2003-2004	8,991	2020-2021	9,598	10,114
2004-2005	9,639	2021-2022	9,773	10,299
2005-2006	9,616	2022-2023	9,952	10,488
2006-2007	9,743	2023-2024	10,134	10,680
2007-2008	10,387	2024-2025	10,320	10,875
2008-2009	10,960	2025-2026	10,509	11,074
2009-2010	10,911	2026-2027	10,701	11,277
2010-2011	11,033	2027-2028	10,897	11,483
2011-2012	10,014	2028-2028	11,096	11,693
2012-2013	9,592			
2013-2014	9,818			
2014-2015	9,843			
2015-2016	9,925			
2016-2017	9,783			
2017-2018	9,090			

Space Inventory

The inventory of facilities is an important tool for planning and managing college campuses. The California Community Colleges Facilities Space Inventory database (FUSION) includes descriptive data on buildings and rooms for each college. This information is essential for developing the annual Five Year Capital Construction Plan, planning for capital outlay construction projects, analyzing space utilization, and projecting future facilities space needs.

The District maintains a detailed Space Inventory of all buildings on each campus according to the requirements of the State Chancellor's Office Space Inventory Handbook. As required by the state standards, it is updated and submitted to the State Chancellor's office annually. The Space Inventory contains data about every building and room according to state guidelines for space code, space type name, and assignable square feet (ASF).

SPACE TYPES

100s
Classrooms
Support

LECTURE

400s
Library
Study
Tutorial
Support

LIBRARY

200s
Labs
Support

LAB

530s
AV/TV
Technology
Support

INSTR. MEDIA

300s
Offices
Support
(All offices including administrative and student services)

OFFICE

520, 540 – 800s
PE
Assembly
Food Service
Lounge
Bookstore

OTHER

The 2017 Space Inventory Report was used as the basis for the FMP. These tables include a summary of the categories of space on the Merced and Los Banos campuses and their respective assignable square foot (ASF) totals.

It is important to note that the Space Inventory includes all facilities on campus that are in use, including temporary facilities.

2017 MERCED CAMPUS SPACE INVENTORY

Space Category	Current Inventory (2017)
Lecture	39,502
Lab	92,091
Office	50,863
Library	45,863
Instructional Media	9,514
Other	151,238
Total ASF	389,513

2017 LOS BANOS CAMPUS SPACE INVENTORY

Space Category	Current Inventory (2017)
Lecture	13,716
Lab	9,203
Office	5,515
Library	4,019
Instructional Media	299
Other	2,211
Total ASF	34,963

Space Utilization

PLANNING STANDARDS

To determine space capacity requirements for a college, the enrollment and program forecasts are applied to a set of standards for each type of space. These standards, when applied to the total number of students, or weekly student contact hours (WSCH), produce total capacity requirements that are expressed in assignable square feet (space available for assignment to occupants). The Title 5 space standards used to determine both existing and future capacity requirements are listed in the table at right.

Each component of these standards is applied with an appropriate form of enrollment to produce a total assignable square feet (ASF) capacity requirement for each category of space.

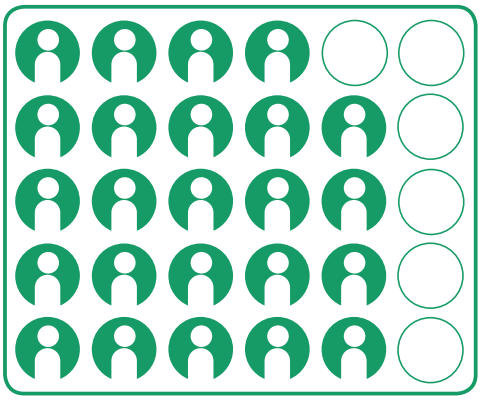
Category	Formula	Rates / Allowances
Classrooms	ASF / Student Station	15
	Station Utilization Rate	66%
	Average hours room/ week	53
Labs	ASF / Student Station*	
	Station Utilization Rate	85%
	Average hours room / week	27.5
Offices / Conference Rooms	ASF per FTEF	140
Library / Learning Resource Center	Base ASF Allowance	3,795
	ASF / 1st 3,000 DGE	3.83
	ASF / 3,001-9,000 DGE	3.39
	ASF / > 9,000 DGE	2.94
Instructional Media AV / TV / Radio	Base ASF Allowance	3,500
	ASF / 1st 3,000 DGE	1.50
	ASF / 3,001-9,000 DGE	0.75
	ASF / > 9,000 DGE	0.25

* Varies per TOPS code

CAPACITY LOAD RATIO

- The capacity/load ratio is the measure of the space utilization efficiency according to Title 5 standards
- The ratio compares existing space (capacity) to enrollment levels (load)
- A ratio of over 100% indicates that there is additional available capacity; a ratio of under 100% indicates a need for additional space to support enrollment (see illustrations at right)
- Assumed utilization for classrooms is 53 hours per week; utilization for labs varies per discipline
- Capacity/load ratios are rolled up and measured as an aggregate by room-use category for each campus

# of seats **=** **#** of students
100% capacity / load



# of seats **>** **#** of students
over 100% capacity / load

# of seats **<** **#** of students
under 100% capacity / load

FMP Space Program

PROJECTING FUTURE SPACE NEEDS

The methodology for projecting future space needs is summarized as follows:

- Enrollment forecasts and WSCH projections were applied in combination with appropriate space planning standards to result in a total space requirement in ASF by type of space.
- The current inventory (2017) for each campus was subtracted from the total space requirements to result in the net ASF need by type of space for the 2028 master plan horizon.
- The result, net assignable square footage by type of space, served as the basis for developing options for each campus.
- The FMP Space Program tables for each campus were created as part of the EMP process and used for the development of this 2019 FMP.

FACILITIES MASTER PLAN SPACE PROGRAMS

MERCED CAMPUS

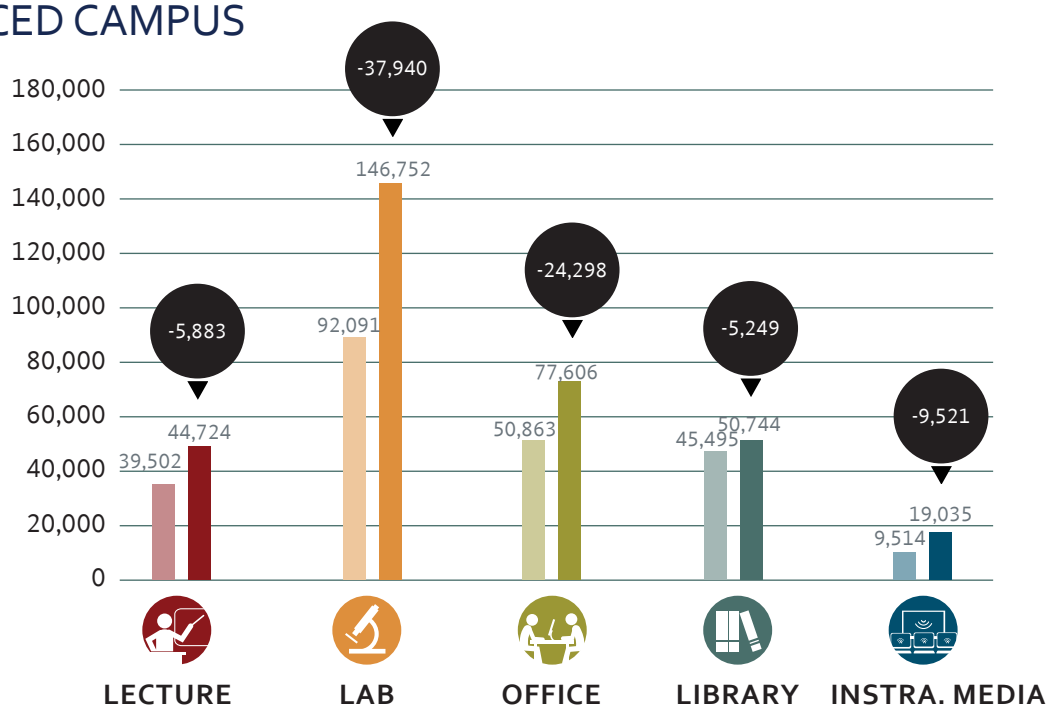
Space Category	Current Inventory (2017)	Master Plan Space Program (2028)	Difference
Lecture	39,502	44,724	-5,883
Lab	92,091	146,752	-37,940
Office	50,863	77,606	-24,298
Library	45,863	50,744	-5,249
Instructional Media	9,514	19,035	-9,521

LOS BANOS CAMPUS

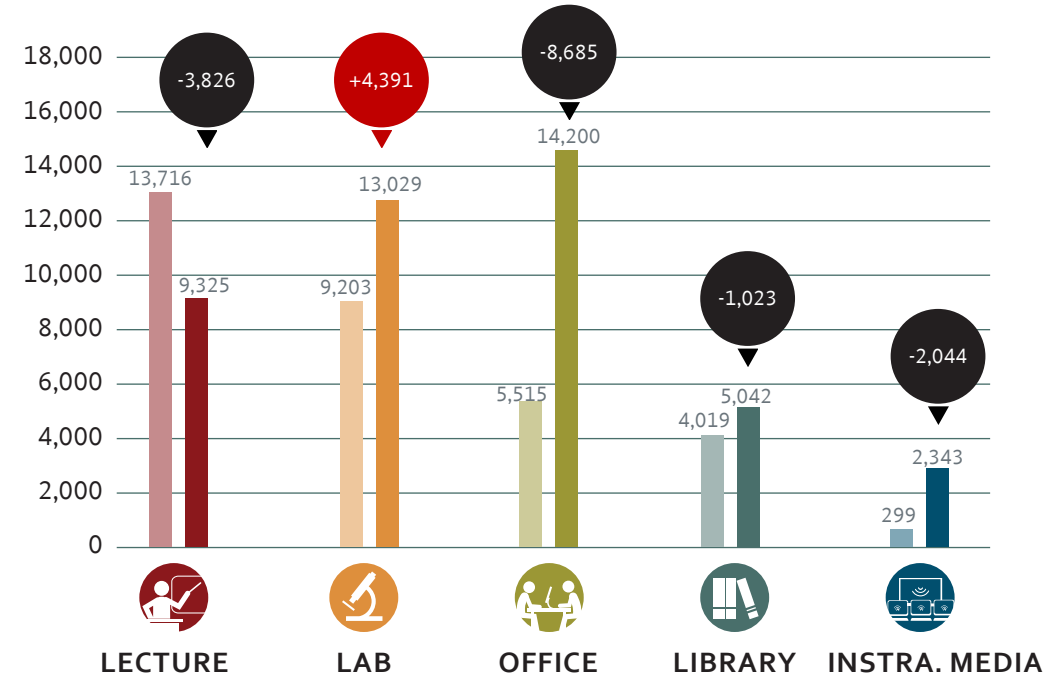
Space Category	Current Inventory (2017)	Master Plan Space Program (2028)	Difference
Lecture	13,716	9,325	4,391
Lab	9,203	13,029	-3,826
Office	5,515	14,200	-8,685
Library	4,019	5,042	-1,023
Instructional Media	299	2,343	-2,044

* NOTE: a negative value in the difference column indicates that additional space is justified.

MERCED CAMPUS



LOS BANOS CAMPUS



Facilities Planning Principles

The Facilities Planning Principles were developed during the planning process to support the EMP goals, address key planning issues, and provide the basis for discussions related to site and facilities improvements.

The following principles were developed with the FMP Task Force and used to develop the recommendations included in this 2019 Facilities Master Plan.

STUDENT SUCCESS

ACCESS + WAYFINDING

COLLEGIATE IDENTITY

EFFECTIVE + EFFICIENT

STEWARDSHIP OF RESOURCES

COMMUNITY ENGAGEMENT

STUDENT SUCCESS

- Improve access to student support services
- Integrate and consolidate functions and services
- Develop spaces to encourage collaboration and engagement
- Create a mixture of active and quiet spaces

ACCESS + WAYFINDING

- Develop welcoming and inviting campus entries
- Improve campus organization to enhance wayfinding
- Create logical groupings of functions
- Improve physical connections (pedestrian, bike, vehicular, transit)
- Enhance campus safety and security

COLLEGIATE IDENTITY

- Create a collegiate campus identity
- Enhance student and faculty engagement
- Develop campus spaces to support collaboration
- Create a sense of belonging and pride
- Improve campus edges and image within community

EFFECTIVE + EFFICIENT

- Align facilities to support college priorities
- Replace temporary, inefficient and under-performing facilities
- Right-size facilities to support program needs
- Develop flexible, multi-purpose space to adapt over time
- Position to maximize state funding opportunities

STEWARDSHIP OF RESOURCES

- Optimize available resources
- Increase awareness and create a culture of sustainability
- Prioritize well-being, health, and comfort in design
- Increase partnerships and collaborations
- Create a safe and comfortable campus environment

COMMUNITY ENGAGEMENT

- Increase visibility of campuses
- Strengthen connections with surrounding communities
- Improve access to college events and performances
- Develop campus to enhance community engagement
- Enhance community partnerships


NOW
THIS
CYLINDER
AND I ARE
BOTH
GRADUATED
15'

03

MERCED CAMPUS

MERCED CAMPUS

This chapter of the FMP focuses on the Merced Campus and includes two sections with the following sections:

EXISTING CONDITIONS

- Local Context
- Existing Campus
- Development History
- Facilities Condition Index
- Vehicular Circulation
- Pedestrian Circulation
- Campus Zoning
- Landscape Analysis

RECOMMENDATIONS

- Development Concept
- 2019 Facilities Master Plan
- FMP Project Alignments
- Project Descriptions
- Site Development Projects
- Sustainability

Local Context

Merced Campus is located approximately 2.5 miles north of Downtown Merced and approximately 120 miles east of San José. The 269 acre campus is located within the City Planning area, and services the County of Merced as well as students from across the region.

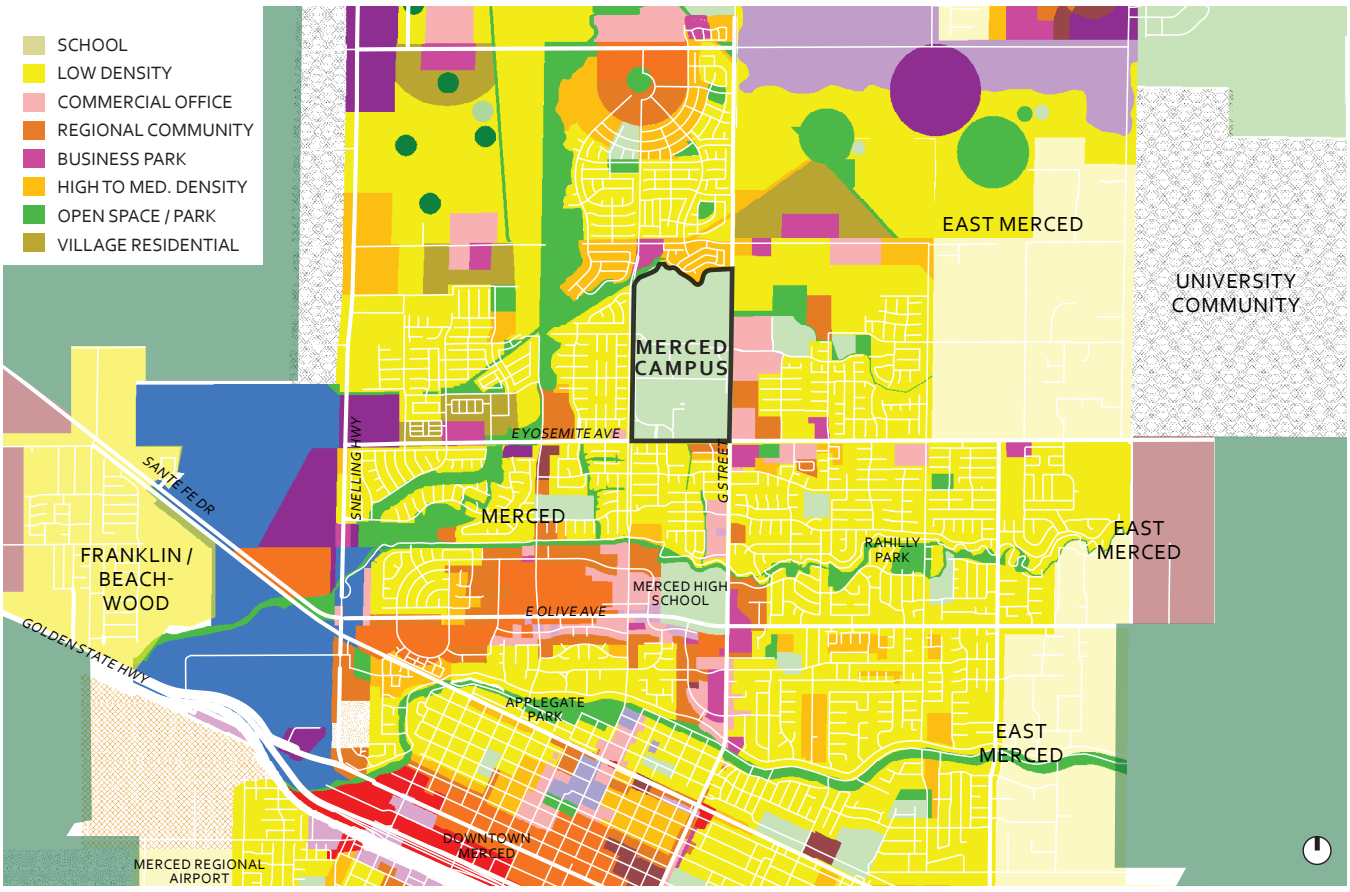
The Merced Campus is within the School Zone and surrounded by Low Density Residential to the north, south, and west, and Commercial Office to the east, including the Mercy Medical Center. The campus is bordered by Yosemite Avenue on the south, between G and M Street, and is bound by Cardella Road to the north.

MERCED THEATER

MERCED COURTHOUSE

MERCED COUNTY FARMLAND

CONTEXT MAP



LAND USE MAP

2030 General Plan

Existing Campus

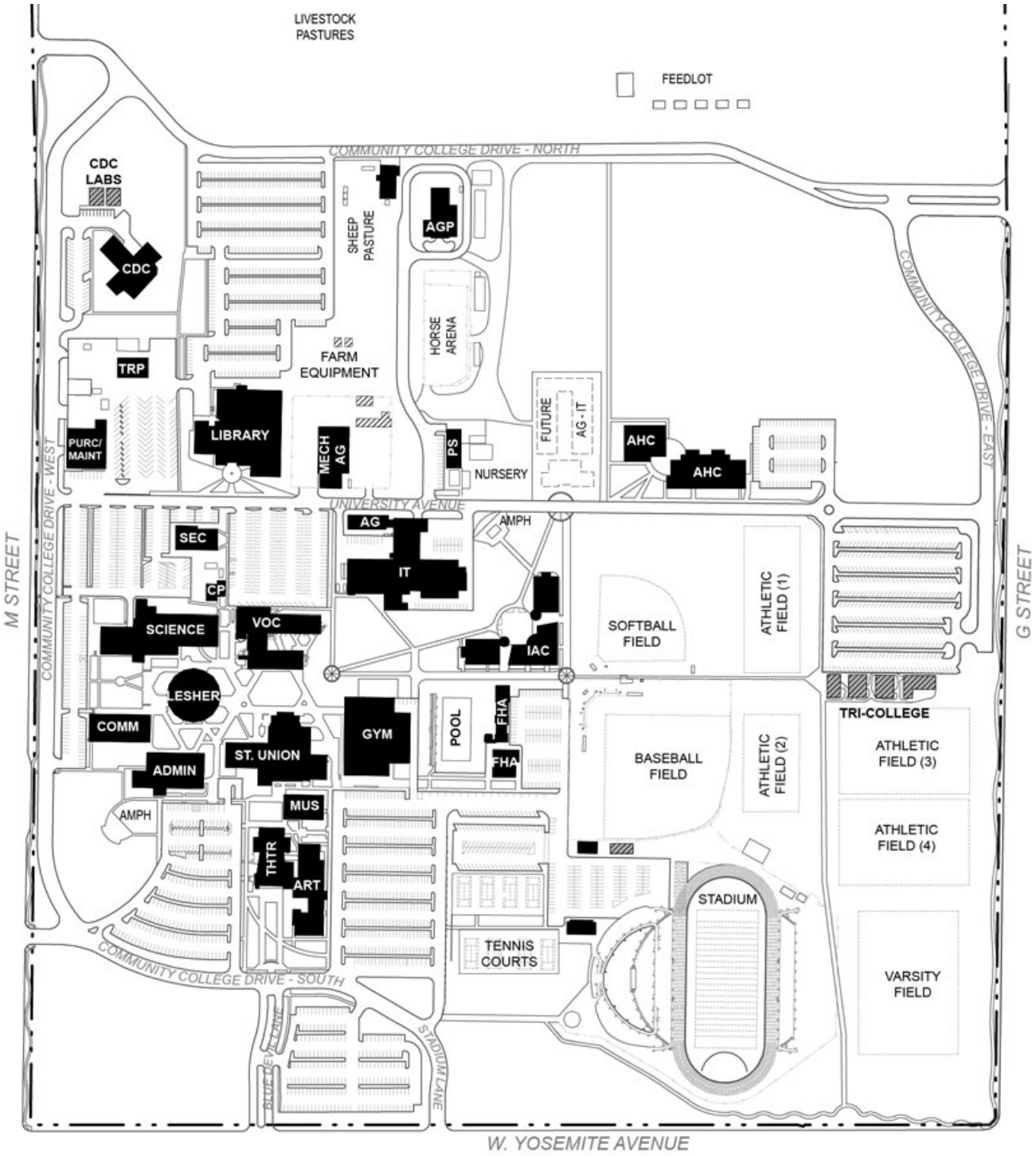
The planning process included the analysis of existing conditions in order to identify key issues to address in the Facilities Master Plan. The information was gathered through campus visits and interactions with the college staff, faculty, administration, students, and community members.

STUDENTS ON THE QUAD

ALLIED HEALTH CENTER

LESHER BUILDING

INTERDISCIPLINARY ACADEMIC CENTER



EXISTING CAMPUS

0 200' 400'

PERMANENT
TEMPORARY

Development History

The Merced Campus first offered student service programs in 1962. The main campus became operational in the spring of 1967 and has grown in enrollment and infrastructure over the last 57 years.

As enrollment grew, additional space was needed and the college expanded to build facilities to the north and east of the campus between 1970 to 1990.

The campus expanded to the north and east once the Agriculture, Child Care Development, Theater and Arts, and Allied Health programs were offered on campus.

The diagrams that follow graphically illustrate the physical development of the campus from 1960 through to the present.

EARLY CONSTRUCTION OF MERCED CAMPUS

1960 - 1969

1970 - 1979

1980 - 1989

1990 - 1999

2000 - PRESENT

Facilities Condition Index

The California Community College Chancellor's Office (CCCCO) conducts surveys of college campuses at regular intervals to asses building conditions and to assign a Facilities Condition Index (FCI) score.

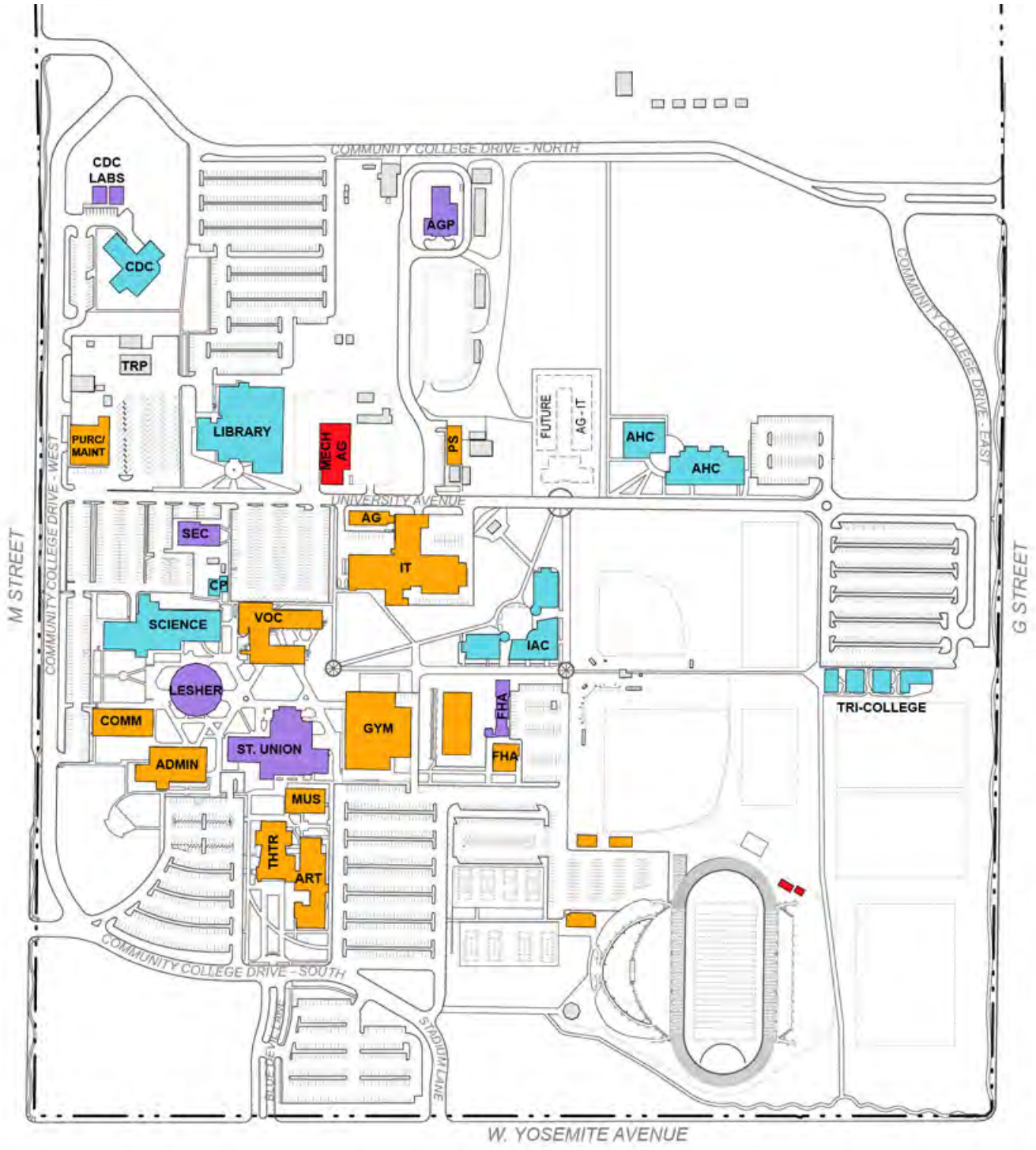
The Facilities Condition Index (FCI) for a building represents the ratio of the cost to correct a facility's deficiencies to the current replacement value of the facility.

The majority of original buildings constructed in the 1960's and 1980's have high FCI scores (>50%). This indicates that the cost to renovate would be very high and that replacement should be considered.

VOCATIONAL BUILDING

GYMNASIUM BUILDING

AGRICULTURE BUILDING



FACILITIES CONDITION INDEX

0 200' 400'

- < 10%
- 10% - 50%
- 50% - 70%
- > 70%

Vehicular Circulation

The graphic on the adjacent page illustrates the vehicular circulation patterns on campus. Campus access points and allocated parking are shown along with drop off zones, transit stations and circulation, and emergency vehicular access. Existing parking counts are listed on the following chart.

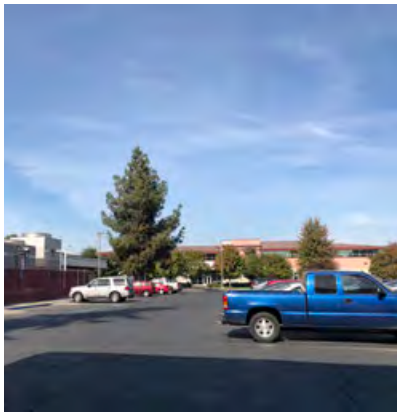
OBSERVATIONS

- Vehicular circulation is not continuous within the campus property and requires drivers to use the adjacent public streets
- Heavy congestion and turning issues occur at the intersection of M Street and Community College Drive North, and the intersection of Community College Drive West and University Avenue
- The ratio of parking spaces to campus enrollment exceeds the standard for community colleges located in similar settings

PARKING COUNT

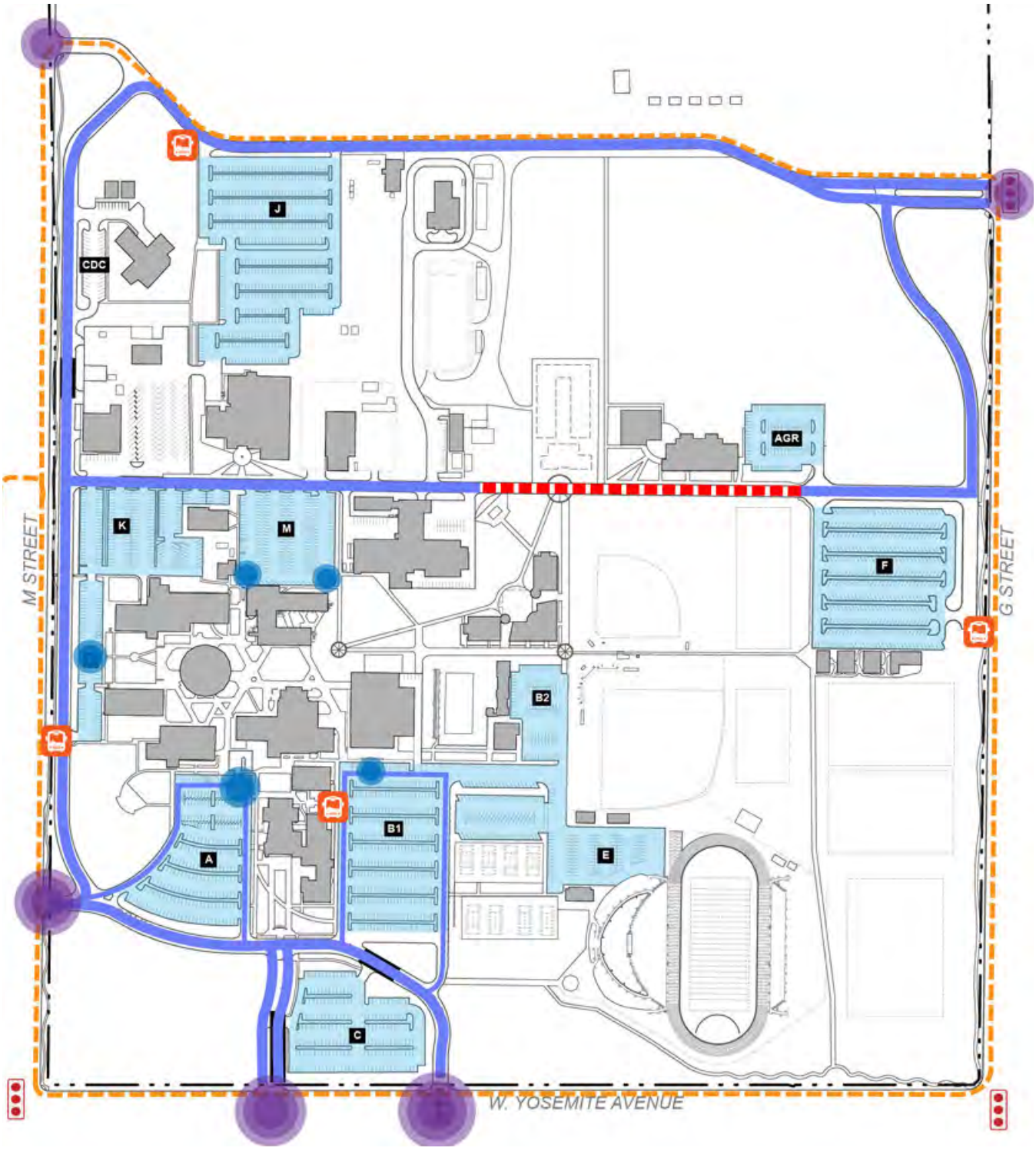
Parking Lot #	# of Spaces
A	234
B1 + B2	446
C	207
E	101
F	338
J	402
K	232
L	54
M	203
CDC	38
AGR	21
CCDW	62
CCDS	43
BLUE DEVIL LN	18
OTHERS	109
TOTAL	**2,552**

LOT B1



LOT M

LOT A



VEHICULAR CIRCULATION

0 200' 400'

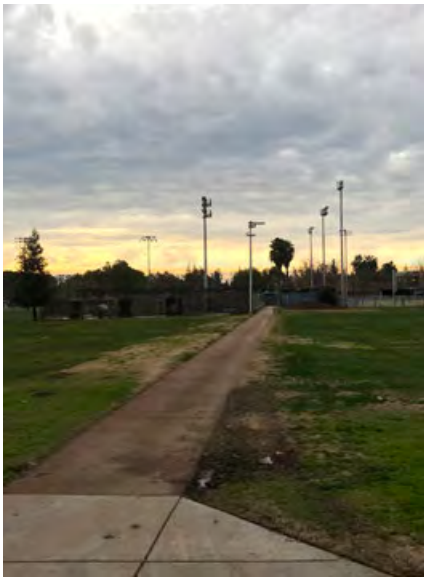
- ACCESS
- VEHICULAR PATH
- PARKING LOT
- DROP OFF ZONE
- BUS STOP
- BUS TRAFFIC
- EMERGENCY ACCESS
- STOP LIGHT

Pedestrian Circulation

Pedestrian circulation patterns were analyzed and mapped in order to identify key issues to address in the FMP. The graphic on the following page highlights these patterns.

OBSERVATIONS

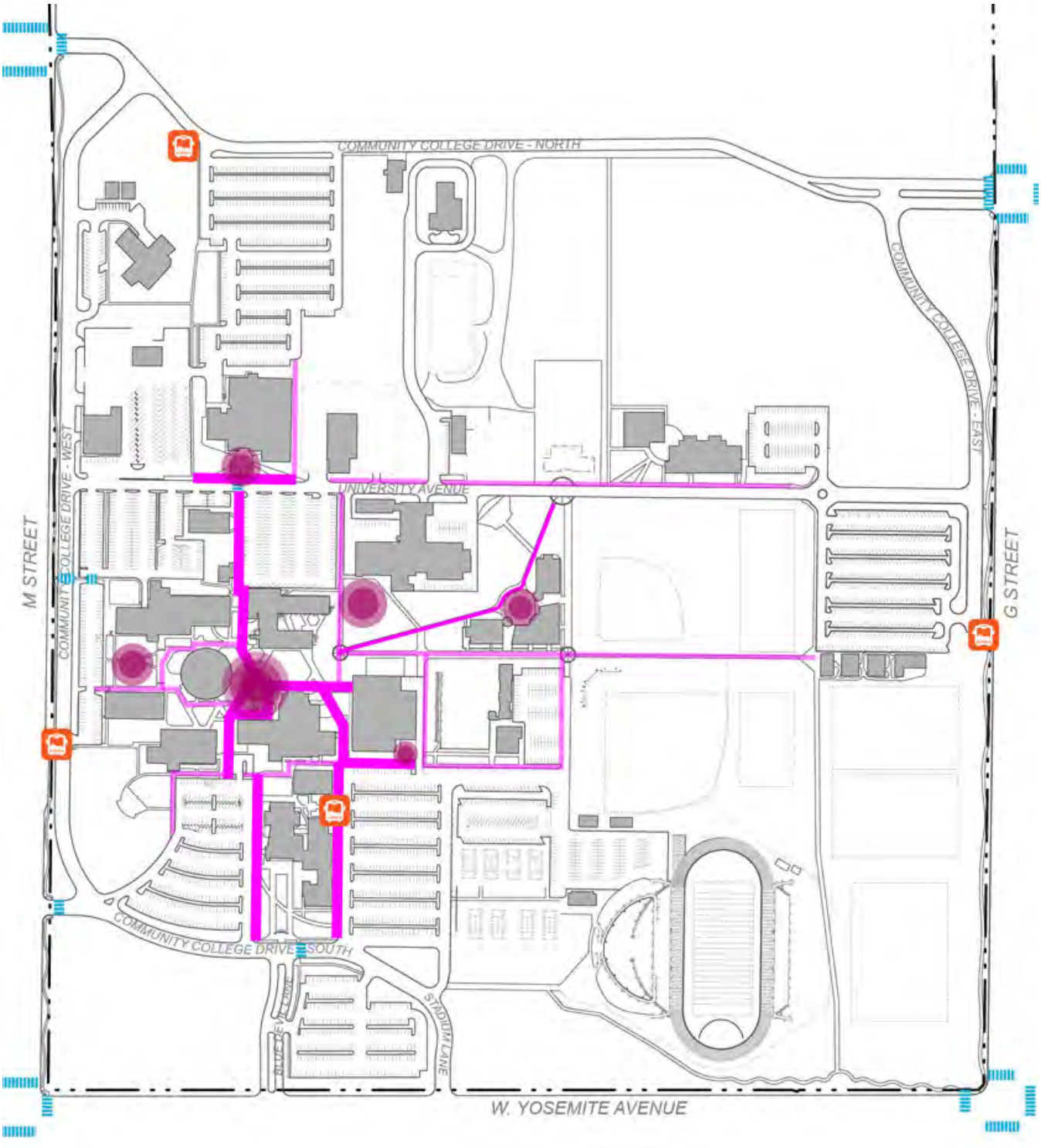
- Campus wayfinding is unclear and visibility to some facilities is lacking
- The pedestrian path from the Student Union to the Library is through a parking lot
- Portions of University Avenue include pedestrian - vehicular conflicts
- Sidewalks are absent along University Avenue and Community College Drive
- Paths to athletic fields are restricted and in poor condition
- Outdoor gathering spaces are minimal
- Amphitheaters are under utilized



PEDESTRIAN PATH FROM TRI-COLLEGE TO STADIUM

PEDESTRIAN PATH FROM LIBRARY TO LESHER

PEDESTRIAN PATH TO IAC



PEDESTRIAN CIRCULATION

0 200' 400'

- PRIMARY PEDESTRIAN CIRCULATION
- SECONDARY PEDESTRIAN CIRCULATION
- PEDESTRIAN HUBS
- BUS STOP
- CROSSWALKS

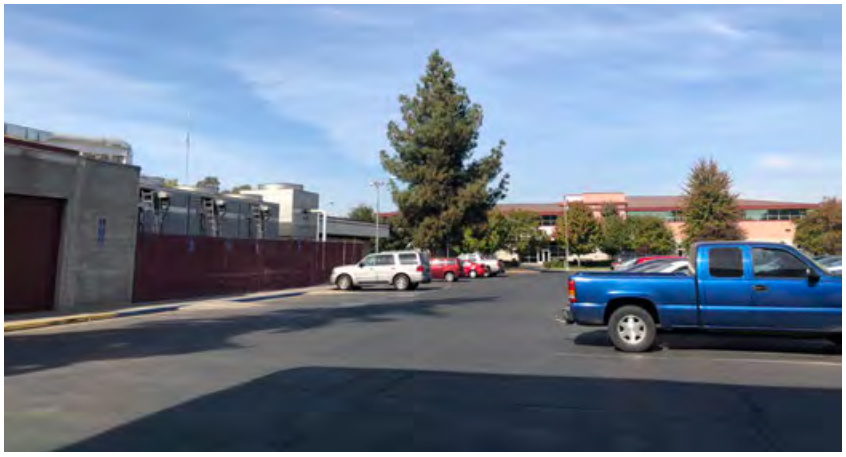
Campus Zoning

Campus and building uses are zoned by the following uses: Instructional; Library and Tutorial; Student Services; Administration; Physical Education; Child Care Development; Agriculture; and Service and Support.

The graphic on the adjacent page illustrates the location of functions at the buildings and campus. Patterns are identified to inform the planning process.

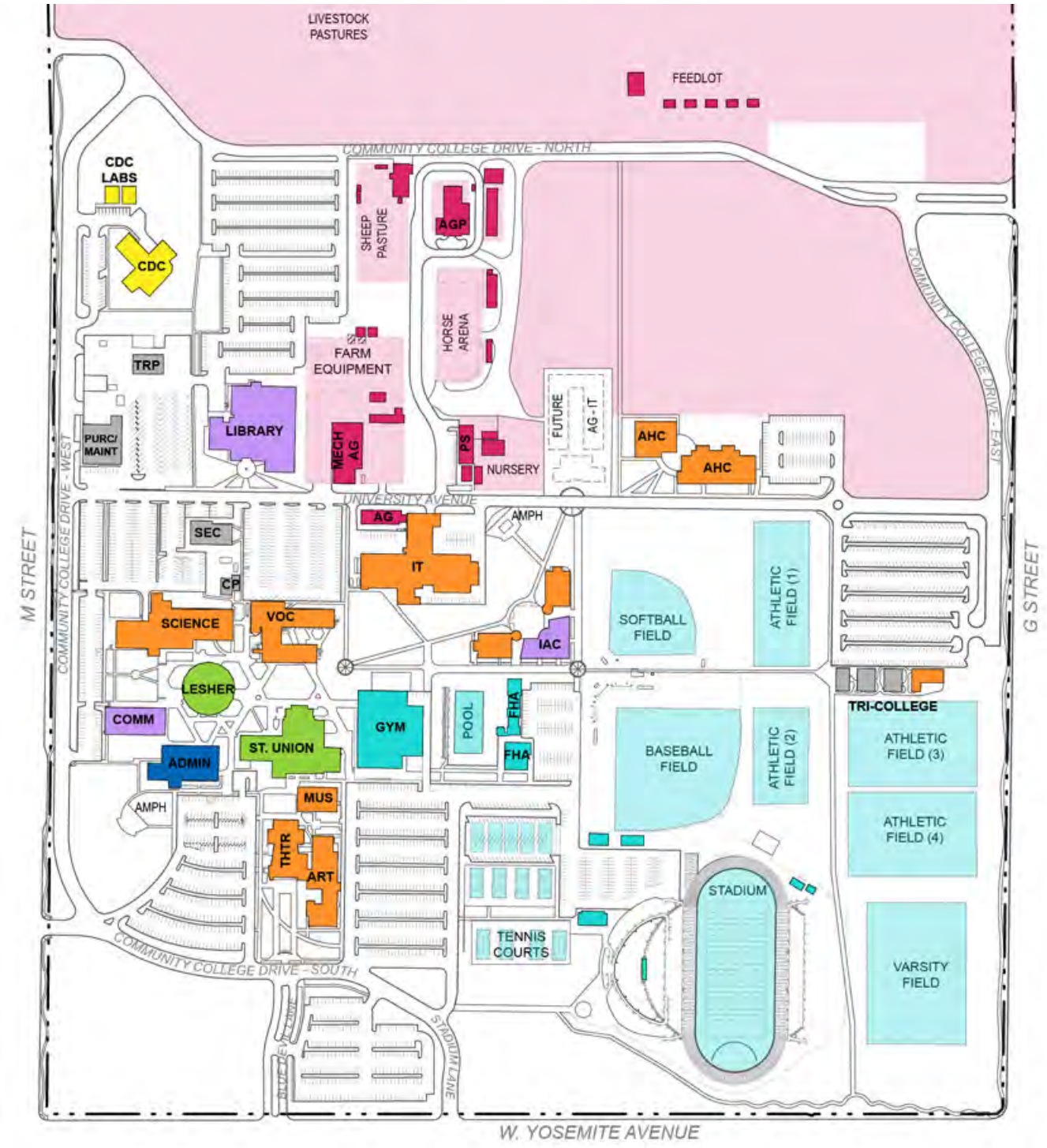
OBSERVATIONS

- Student Service functions are not easily located by the first time visitor to the campus
- The Library is separated from the campus core by parking lot M
- The Gym is in close proximity to the campus core, but distant from the athletic fields
- The Purchasing/Maintenance Building is located along a main campus entrance
- The Lesher building was originally the Library, but was renovated for student services following the construction of the Library in 2006



LIBRARY VISIBILITY IS LIMITED

GYMNASIUM REMOVED FROM CAMPUS CORE



CAMPUS ZONING

0 200' 400'

- INSTRUCTIONAL
- LIBRARY/TUTORIAL
- STUDENT SERVICES
- ADMINISTRATION
- PHYSICAL EDUCATION
- CHILD CARE DEVELOPMENT
- AGRICULTURE
- SERVICES

Landscape Analysis

The landscape is currently developed as an open lawn throughout most of the campus. Pedestrian paths connect major buildings but are not taking advantage of the outdoor learning opportunities the campus could provide. The large amount of lawn did not provide planting diversity and was an unsustainable feature, utilizing large amounts of water for irrigation.

The campus has the space to revamp the existing landscape and provide habitat gardens, stormwater gardens, butterfly gardens, etc, which will not only enhance the campus visually but provide an extension to the outdoor education curriculum.

OBSERVATIONS

- Buildings visually block main pedestrian promenades disconnecting the campus visually
- Insufficient outdoor learning opportunities
- Low diversity of planting
- Large swaths of lawn
- Unclear activation zones
- Unclear campus entry
- Unclear wayfiniding
- Large swaths of lawn provide space for a more sustainable approach to the planting
- Large open land to provide a botanical garden

THEATER PLAZA

AMPHITHEATER

AGRICULTURE FARM

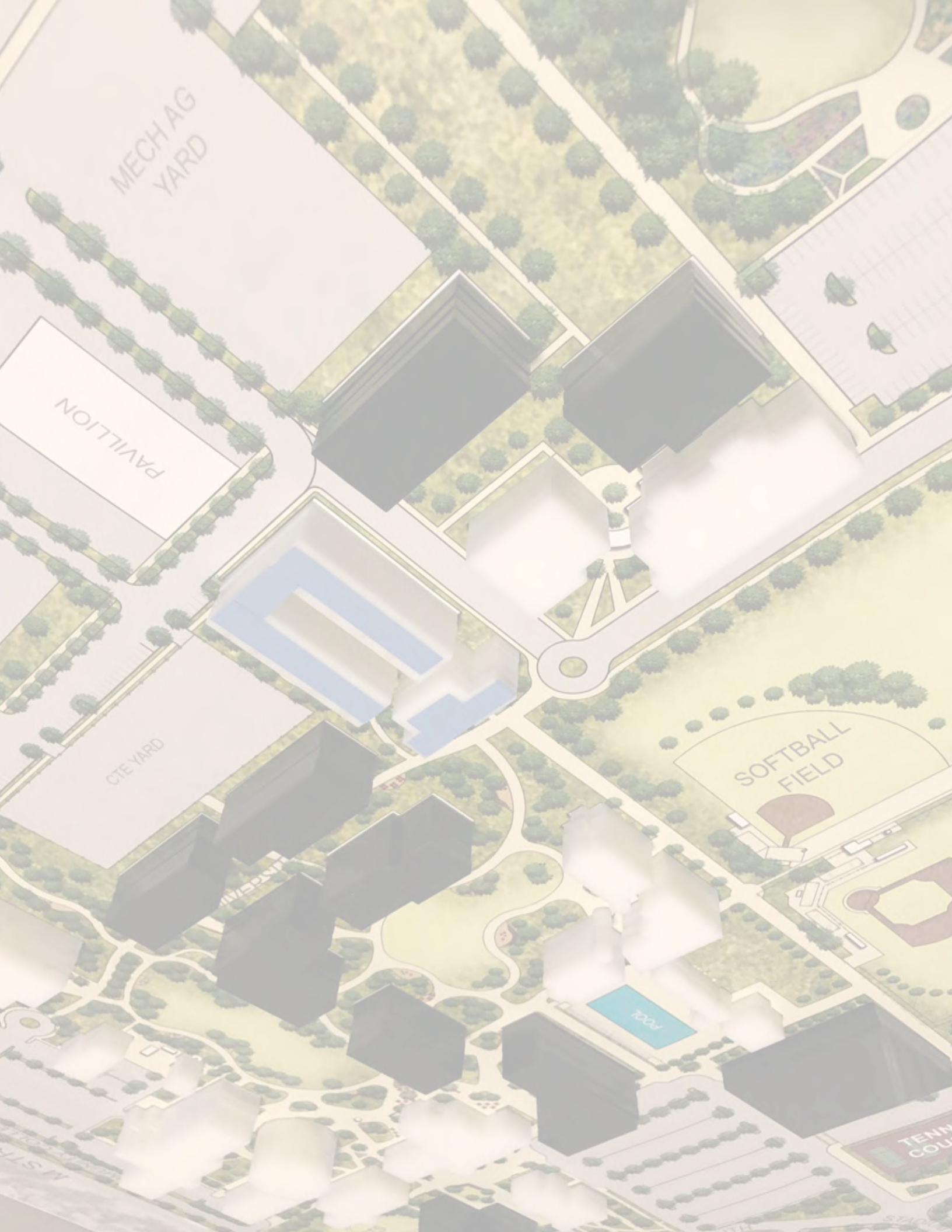
- Season events - pumpkin patch
- Teaching for AG students

AMPHITHEATER

- Large swaths of lawn
- Unprotected from the roadway
- Inactive

QUAD

- Large swaths of lawn
- Low diversity of planting
- Inadequate seating
- Insufficient outdoor learning opportunities


MECH AG YARD
PAVILLION
CTE YARD
SOFTBALL FIELD
POOL

MERCED CAMPUS

RECOMMENDATIONS

The 2019 Facilities Master Plan (FMP) recommendations for Merced Campus present an overall picture of the future developed campus that is informed by the Educational Master Plan, the analysis of existing conditions, and discussions with the campus community. It includes recommendations for new construction, building reconstruction, change of use and site development projects.

The recommendations included in this section follow the facilities master plan program from the previous section and address the discussions that took place during the planning process.

The recommendations are organized into the following sections:

DEVELOPMENT CONCEPT
2019 FACILITIES MASTER PLAN
FMP PROJECT ALIGNMENTS
PROJECT DESCRIPTIONS
SITE DEVELOPMENT PROJECTS
SUSTAINABILITY

Development Concept

The six principles are the key drivers that led to the Merced Campus FMP recommendations and serve as a guide for the future development of the campus. They provide the framework for identifying the required improvements to the campus environment, facilities, and infrastructure that are articulated throughout this section.

STUDENT SUCCESS

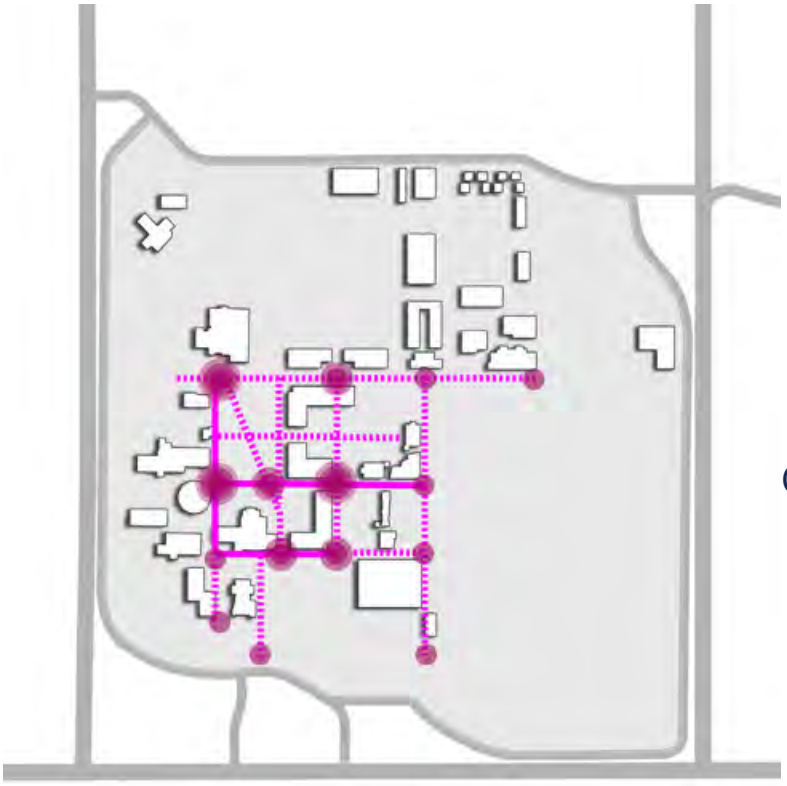
ACCESS + WAYFINDING

COLLEGIATE IDENTITY

EFFECTIVE + EFFICIENT

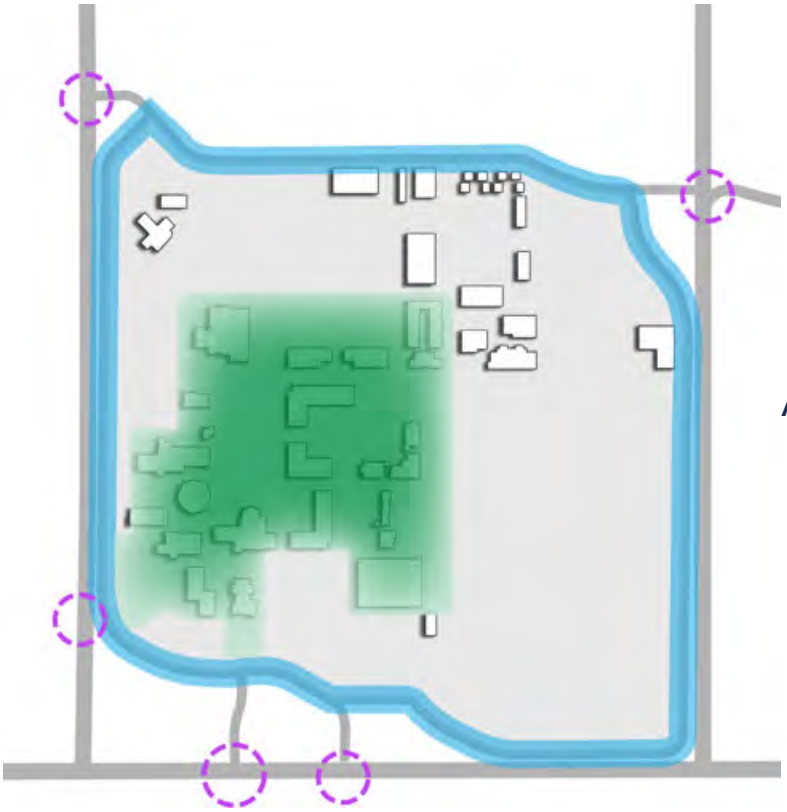
STEWARDSHIP OF RESOURCES

COMMUNITY ENGAGEMENT



CLARITY + CONNECTIVITY

- A clear network of pedestrian paths connect all areas of the campus
- Campus organization and wayfinding is improved
- Access to programs and services is improved
- Open spaces are developed to enhance student engagement



ACCESS + WAYFINDING

- Welcoming and inviting campus entries are developed
- A continuous campus loop road connects all areas of the campus
- Parking lots are redistributed to improve access and safety
- A 'car free zone' is developed to enhance the overall experience

2019 Facilities Master Plan

The 2019 Facilities Master Plan serves as a guide for future development. It provides a quantitative and qualitative description of the College's strategy to support the educational program needs, address the long range forecast for enrollment, and maximize funding opportunities.

The plan provides a framework for future development including the placement of new facilities, the renovation of existing facilities, and additional facilities the campus has expressed interest or may require beyond the 2019 Facilities Master Plan.

The list to the right indicates the FMP projects. They are listed in alphabetical order and do not represent a priority order.

NEW CONSTRUCTION

Agriculture Technology
Animals Quarters
Animal Science (AGP)
Arts + Music
Career Technical Education (CTE) 1
Career Technical Education (CTE) 2
Child Development Center
Fire Station / Public Safety
Gymnasium + Athletic Support
Instructional Building 1
Instructional Building 2
Mechanized Agriculture
Purchase / Maintenance
Student Services

RENOVATION / CHANGE OF USE

Communications
Field House A
Lesher
Student Union
Theater

FUTURE (BEYOND FMP)

Community Center
Allied Health Center
Dormitories

KEY SITE PROJECTS

University Walk
Main Quad
Campus Lawn
Loop Road
Arts Plaza
Theater Plaza
Botanical Garden

2019 FACILITIES MASTER PLAN

0 200' 400'

- EXISTING
- NEW CONSTRUCTION
- RENOVATION / CHANGE OF USE
- FUTURE (BEYOND FMP)

FMP Project Alignments

This section includes a description of the recommended projects and how they reflect the Facilities Planning Principles.

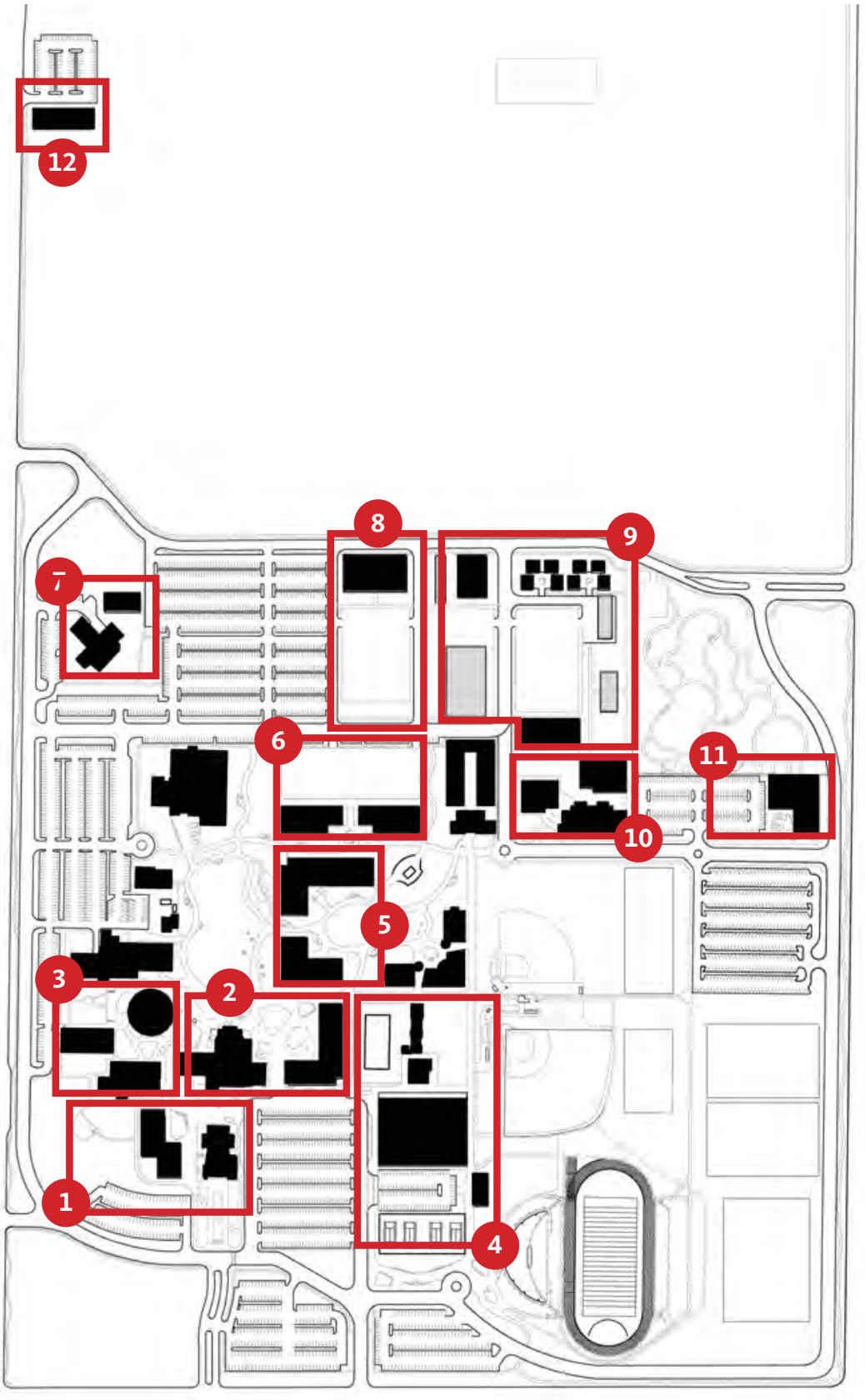
All of the projects identified in this 2019 Facilities Master Plan align with multiple facilities planning principles that were developed during the planning process. The matrix on the following page highlights these important intersections.

	SUCCESS	ACCESS	IDENTITY	EFFICIENCY	STEWARDSHIP	COMMUNITY
NEW CONSTRUCTION						
Agriculture Technology	●	●		●		
Animals Quarters		●	●	●	●	●
Animal Science	●	●	●	●	●	●
Arts + Music	●	●	●	●		●
Career Technical Education	●		●	●		●
Career Technical Education	●		●	●		●
Child Development Center				●		●
Fire Station / Public Safety		●	●		●	●
Gymnasium		●	●	●		●
Instructional Building A	●	●				
Instructional Building B	●	●				
Mechanized Agriculture	●	●		●		
Purchase and Maintenance		●		●		
Student Services	●	●	●	●		
RENOVATION/ CHANGE OF USE						
Communications	●			●		
Field House A	●			●		
Lesher	●	●	●	●		
Student Union	●	●	●	●		
Theater		●	●		●	●
FUTURE (BEYOND FMP)						
Community Center		●	●		●	●
Allied Health Center	●	●				
Dormitories	●	●	●			●
SITE PROJECTS						
Arts Plaza		●	●		●	●
Botanical Garden	●		●		●	●
Campus Lawn	●	●	●	●		●
Loop Road		●		●		
Main Quad	●	●	●	●		●
University Walk		●		●		

Project Descriptions

Descriptions for each of the projects identified in the FMP are described on the following pages and grouped as illustrated in the key plan to the right.

1. THEATER
   ARTS + MUSIC
2. STUDENT UNION
   STUDENT SERVICES
3. COMMUNICATIONS
   LESHER
4. GYMNASIUM
   STADIUM CONCESSION
   FIELD HOUSE A
5. INSTRUCTIONAL FACILITIES
6. CAREER TECHNICAL EDUCATION FACILITIES
7. CHILD DEVELOPMENT CENTER
8. PURCHASE + MAINTENANCE BUILDING
9. AGRICULTURE DORMITORIES
   GREENHOUSE + NURSERY
   MECHANIZED AGRICULTURE
   ANIMAL SCIENCE PAVILION + BARN
10. ALLIED HEALTH CENTER
11. COMMUNITY CENTER
12. PUBLIC SAFETY



KEY PLAN

0 250' 500'

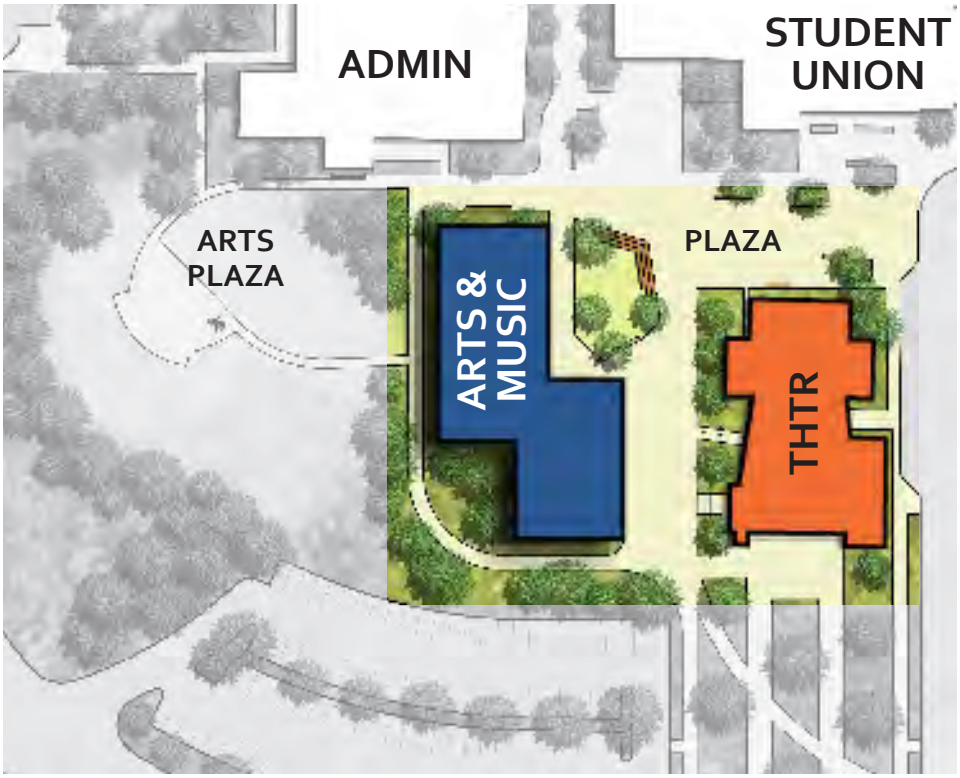
Zone 1

THEATER

The existing Theater is proposed to be renovated to address the building deficiencies and to support program needs. A new Theater Plaza, currently in development, will enhance the main entry experience and create outdoor program space. Access to theater events will be improved with the enlarged parking area to the east and the new drop-off.

ARTS + MUSIC

The existing Arts and Music facilities will be removed and functions will be relocated into the new Arts and Music Building. The new facility will be designed to support the instructional programs needs and align with the FMP space program. The recommendation includes the development of the adjacent outdoor spaces, including the existing amphitheater.



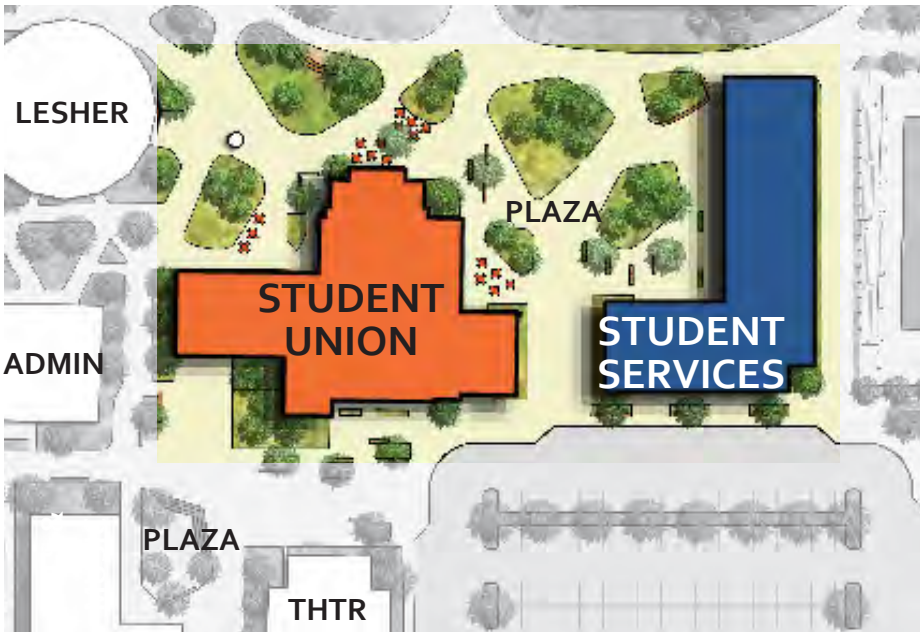
Zone **2**

STUDENT SERVICES

A new Student Services Center will create a welcoming gateway to the campus. All student support services will be co-located into this front door location and make it easier for first time visitors and all students to access these important services.

STUDENT UNION

Adjacent to the new Student Services Center, the existing Student Union will be renovated to complement the arrival experience and enhance student engagement. Tutorial services will shift to Lesher and allow for re-alignment and expansion of building functions.



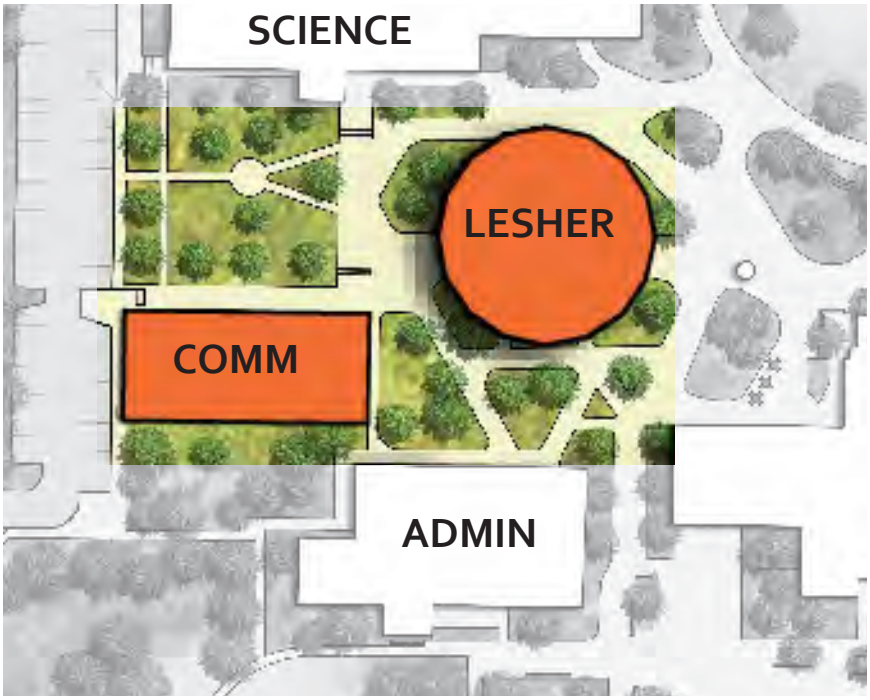
Zone 3

LESHER

All student support services currently located in Lesher will be relocated to the new Student Services Center, freeing up space for other uses. The FMP recommends that the building be re-purposed into a centralized area for all instructional support services. This will improve access and increase awareness of these services that are so essential for student success. The round configuration of the building supports an open plan design, that aligns with the vision for the new uses.

COMMUNICATIONS

Following the relocation of tutorial spaces into the Lesher Building, a portion of the Communications Building will be vacated and become available for other uses. Space will be re-purposed and designed to support the need for additional administrative services space. The convenient location, adjacent location to the existing Administration Building, supports this change of use.



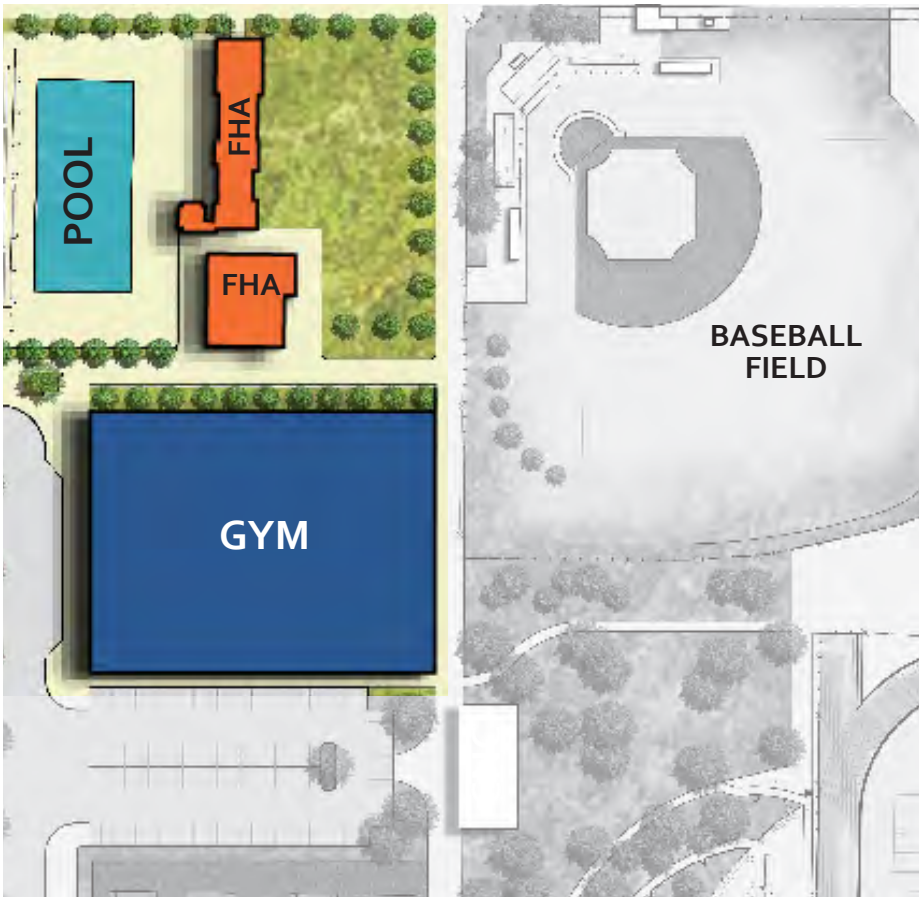
Zone **4**

GYMNASIUM

A new Gymnasium will be reconstructed to address building deficiencies and support program needs. A new location, adjacent to the athletic fields is proposed and would include expanded support spaces, locker rooms for sport teams, weight room, offices for faculty and coaches, and provide storage for equipment.

FIELD HOUSE A

The existing Field House A will be renovated to address the building deficiencies and to provide support space for the adjacent athletic facilities.

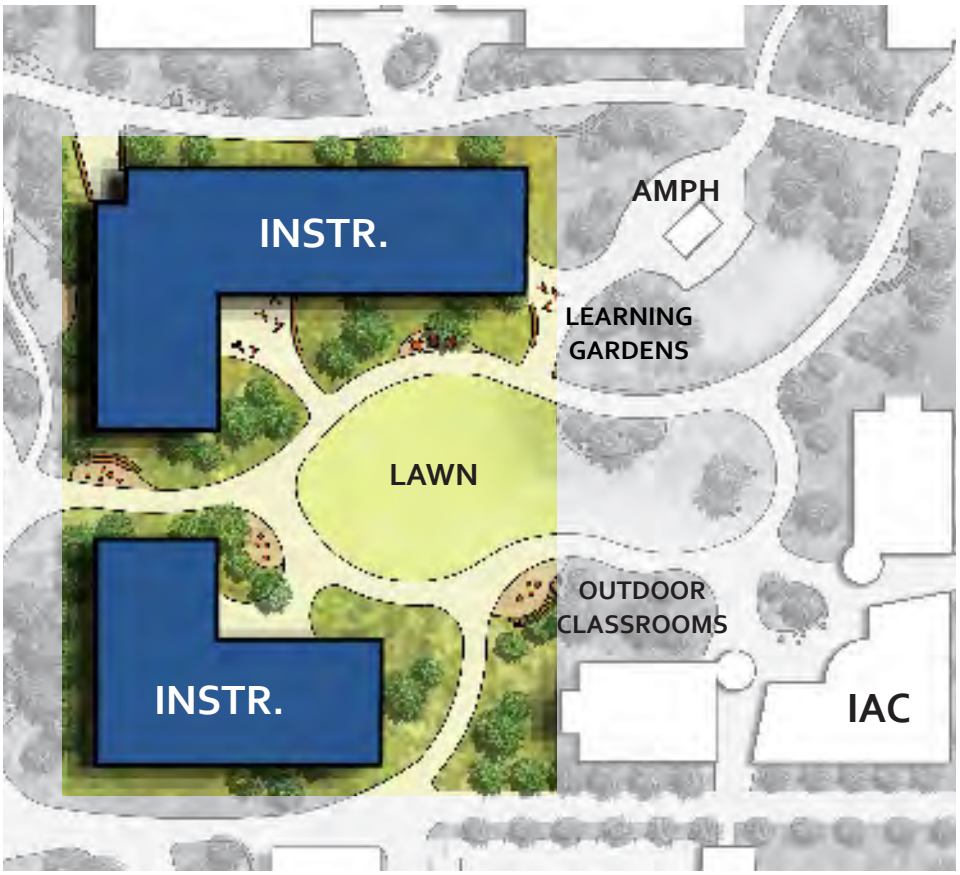


Zone **5**

INSTRUCTIONAL FACILITIES

Two new Instructional Buildings are proposed to replace functions located in buildings planned to be removed, and to address the current and projected program needs. The new facilities will be designed to enhance learning environments and support interdisciplinary collaboration.

The location of these two buildings will frame two new outdoor areas on campus - the Campus Quad to the west and the Campus Lawn to the east.



Zone 6

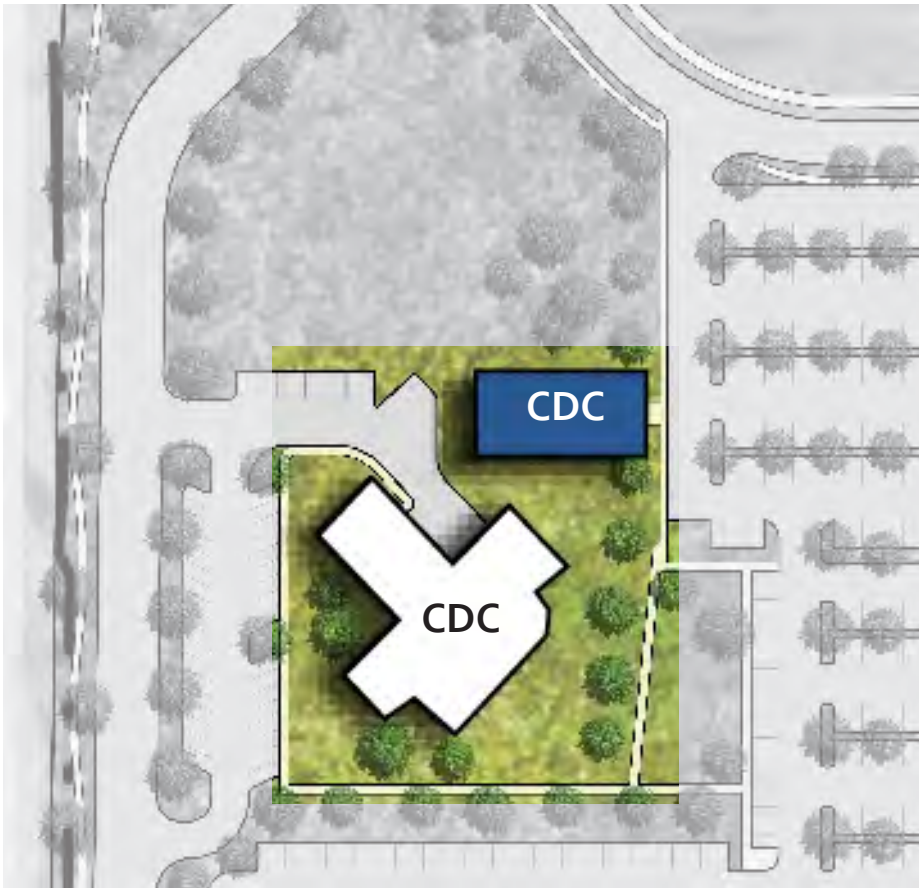
CAREER TECHNICAL EDUCATION

New CTE Buildings and outdoor learning yards will be developed to house the Auto Shop and Welding/ Metal Technology programs currently housed in the Vocational Building. The new location, along University Walk, will improve access, increase visibility, enhance learning environments and support collaboration.

Zone 7

CHILD DEVELOPMENT CENTER

The existing Child Development Center occupies space in both a permanent building and temporary portables. The FMP includes a recommendation to remove the portable buildings and to relocate functions to a new permanent building.

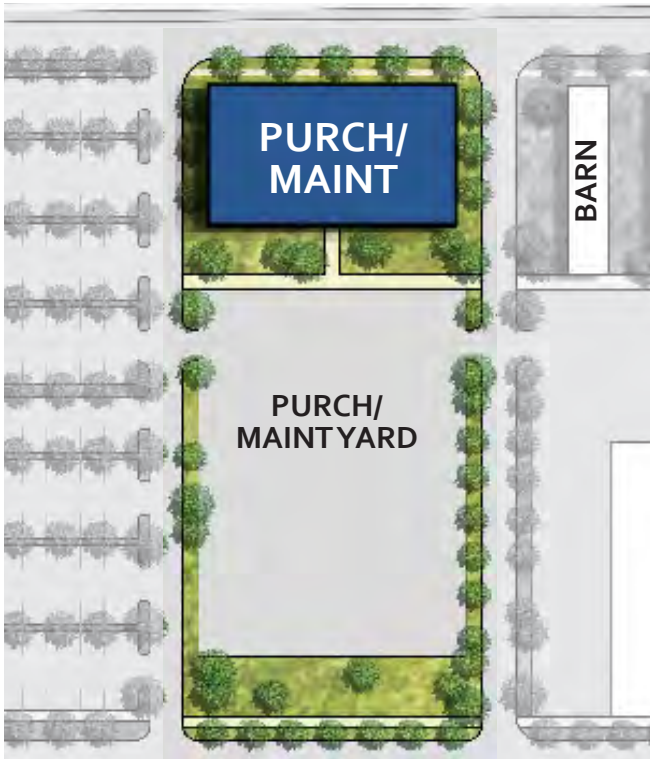


Zone 8

PURCHASE + MAINTENANCE

The Purchase and Maintenance facility will be relocated to the north - east location on campus, along Community College Drive - North in order to create available space at the existing location for parking and a new drop off zone.

This location allows loading and services to easily access the facility and does not disrupt the campus core and vehicular circulation. The Yard allocates an equal square footage to the existing yard and provides adequate space for vehicles, transportation needs, and grounds storage.



Zone 9

AGRICULTURE DORMITORIES

A zone for campus dormitories is recommended to serve the future students in the Agriculture department. These dorms will provide beds for 4 students per building, for a total of 16 beds.

MECHANIZED AGRICULTURE

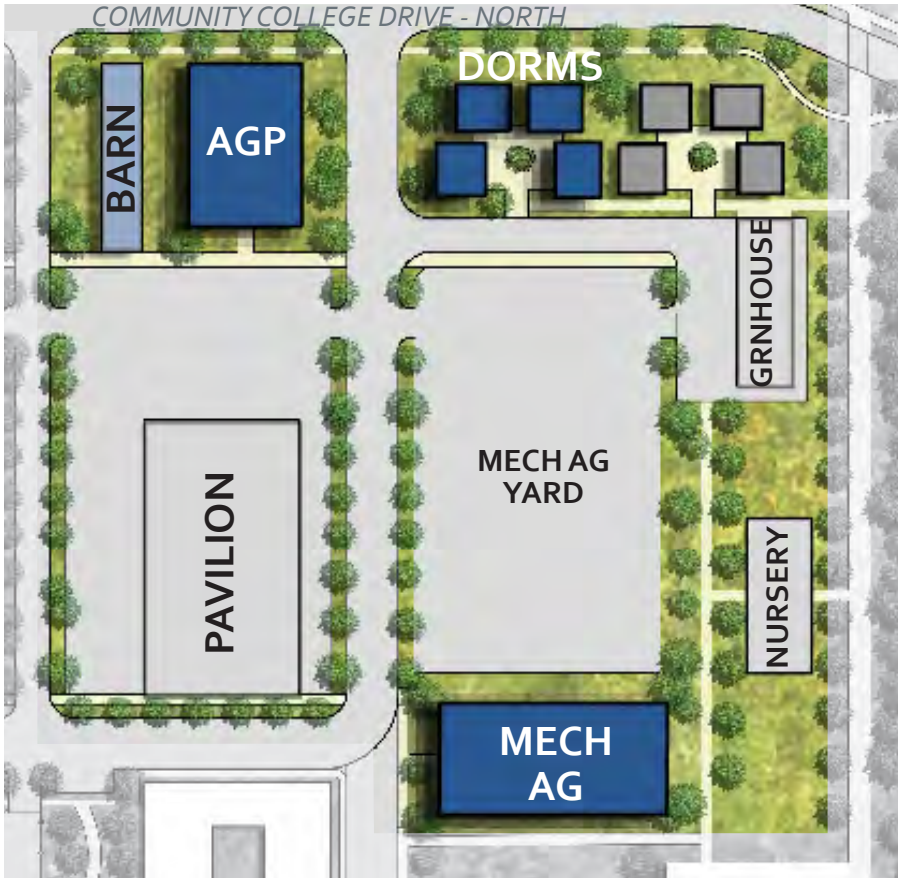
The existing Mechanized Agriculture will be relocated adjacent to the Agriculture Technology Building and within the Agriculture Zone. The Yard allocates an equal square footage to the existing yard and provides adequate space for the automobiles, equipment, and storage for the program.

ANIMAL SCIENCE + PAVILION + BARN

The existing Animal Science facility, pavilion, and barn will be relocated adjacent to the Agriculture Technology Building and within the Agriculture Zone.

GREENHOUSE + NURSERY

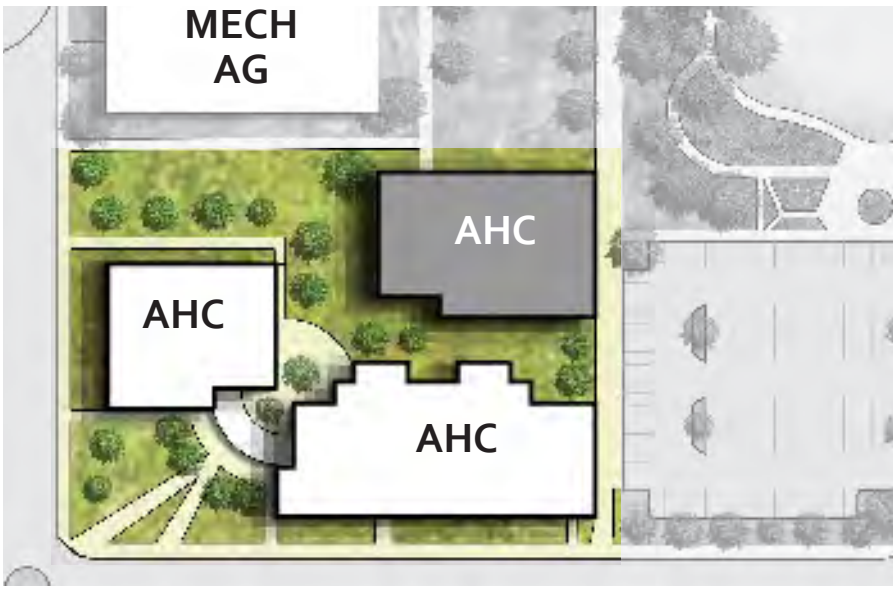
The Greenhouse is currently in storage on the Merced Campus and will be located in close proximity to the Botanical Garden. The existing nursery will be relocated adjacent to the Botanical Garden and parking lot.



Zone **11**

ALLIED HEALTH CENTER

A location for a potential future Allied Health Center is identified in this FMP. The proposed location is adjacent to the existing Allied Health buildings and will create a central hub for collaboration.

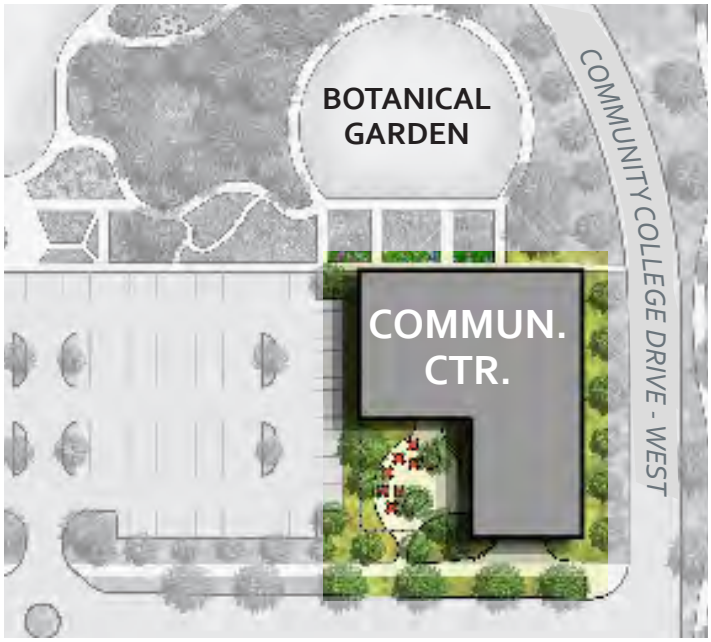


Zone 11

COMMUNITY CENTER

A location for a potential future Community Center is identified in this FMP. The Community Center provides the opportunity to develop flexible space to support a variety of programs and events.

Located along a public edge of the campus and adjacent to the new Botanical Gardens, the Community Center will increase opportunities to engage with the Merced community and host special events and activities.



Zone **12**

PUBLIC SAFETY

The existing Tri-College portables will be removed and functions are proposed to be relocated to new facilities on the north side of campus. The property at the intersection of M Street and W. Cardella Road is currently owned by the City of Merced and an ideal location to co-locate EMT training, and a fire tower.

Site Development

The design approach is 'campus as arboretum' where the quads act as clearings in the forest. Plazas are activation nodes near building entrances. Outdoor classrooms and learning opportunities are located around the edges of the quads and serve as an extension of the educational curriculum.

The arrival sequence to the campus is redefined by relocated parking and a new drop off area. Three plaza entries from the drop off lead to the campus core and administration, the theater district and the gym and field. This allows for clear wayfinding and a sense of arrival. A new activation area is created at the student center adjacent to the main quad. Outdoor dining, seating, gathering areas are located in this zone, encouraging interaction and collaboration. Views to the green quad make the area welcoming.

A special component of the landscape plan is the addition of a 6+ acre botanical garden with a community event center. The California focused Botanical Garden has six plant communities, a multi-purpose event lawn connected to the Community Center and a series of outdoor learning spaces in the Botanical Garden.

SITE DEVELOPMENT

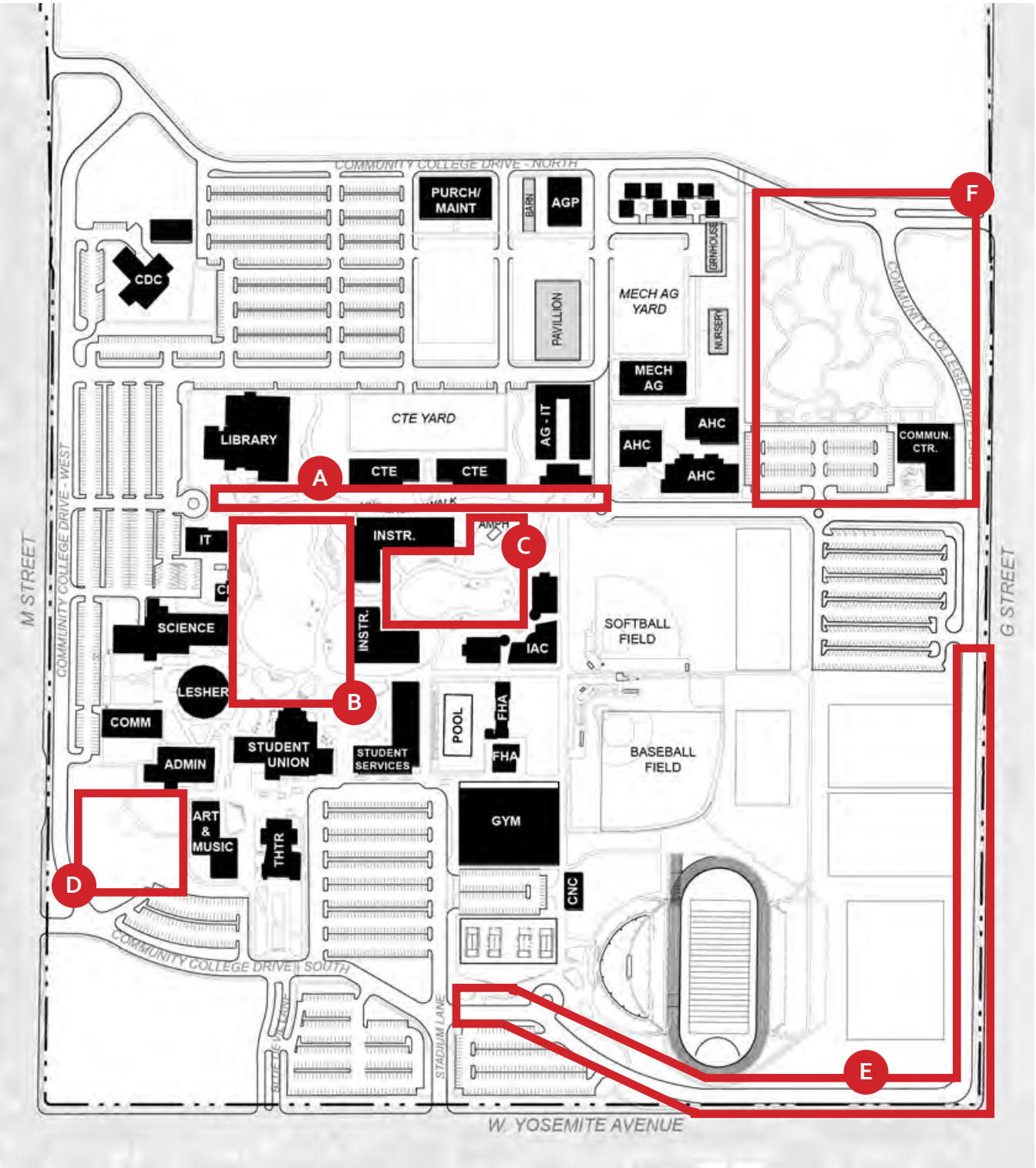
0 200' 400'

Site Development Projects

The new landscape plan enhances the campus experience by providing spaces for outdoor classrooms as well as areas to study and relax. A series of distinctive landscape programs add natural interest to the campus and create specific experiences that make the campus unique, creating a sense of place for students, faculty, and visitors alike.

Descriptions for each of the site development projects are identified in the FMP and are described on the following pages and grouped as illustrated in the key plan to the right.

- A UNIVERSITY WALK
- B MAIN QUAD
- C CAMPUS LAWN
- D ARTS PLAZA
- E LOOP ROAD
- F BOTANICAL GARDEN



SITE DEVELOPMENT PROJECTS

0 200' 400'

A - University Walk

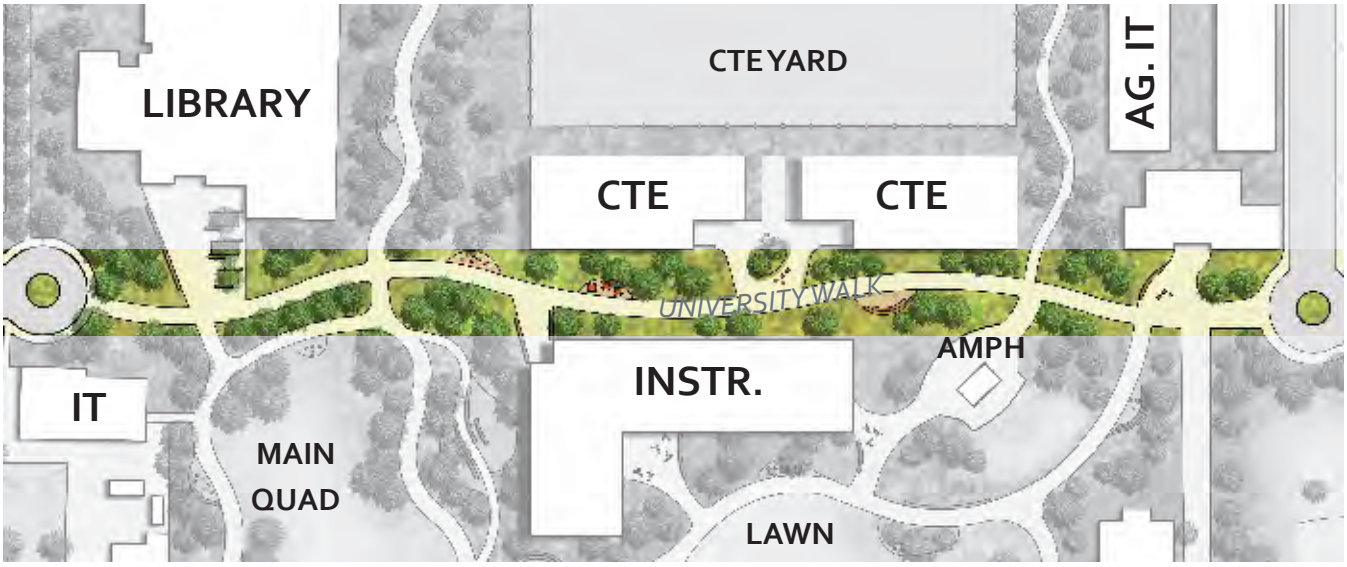
University Avenue will be converted for pedestrian and emergency only use to improve safety, eliminate vehicular/pedestrian conflicts and create a 'car-free' zone surrounding the campus core. These improvements will accomplish the following:

- Improve safety and security by eliminating vehicular/pedestrian conflicts
- Improve connections between the Instructional and Career Technical Education Facilities
- Showcase learning opportunities
- Encourage collaboration between students, faculty, and the community

This pedestrian promenade will be identified as "University Walk".

LANDSCAPE

- The pathway provides a connection from the library to the heart of the campus, the future Botanical Garden and the Community Center
- The walkway is lined with shade trees and small seating areas for gathering
- Outdoor classrooms border the pathway adjacent to Instructional buildings to provide an expanded classroom space
- The path is wide enough for emergency and service vehicles to access, but designed to appear as a pedestrian path
- Designated drop off zones on either side of University Walk will strengthen connections and improve vehicular circulation


LIBRARY
CTE YARD
AG. IT
CTE
CTE
UNIVERSITY WALK
AMPH
INSTR.
IT
MAIN
QUAD
LAWN

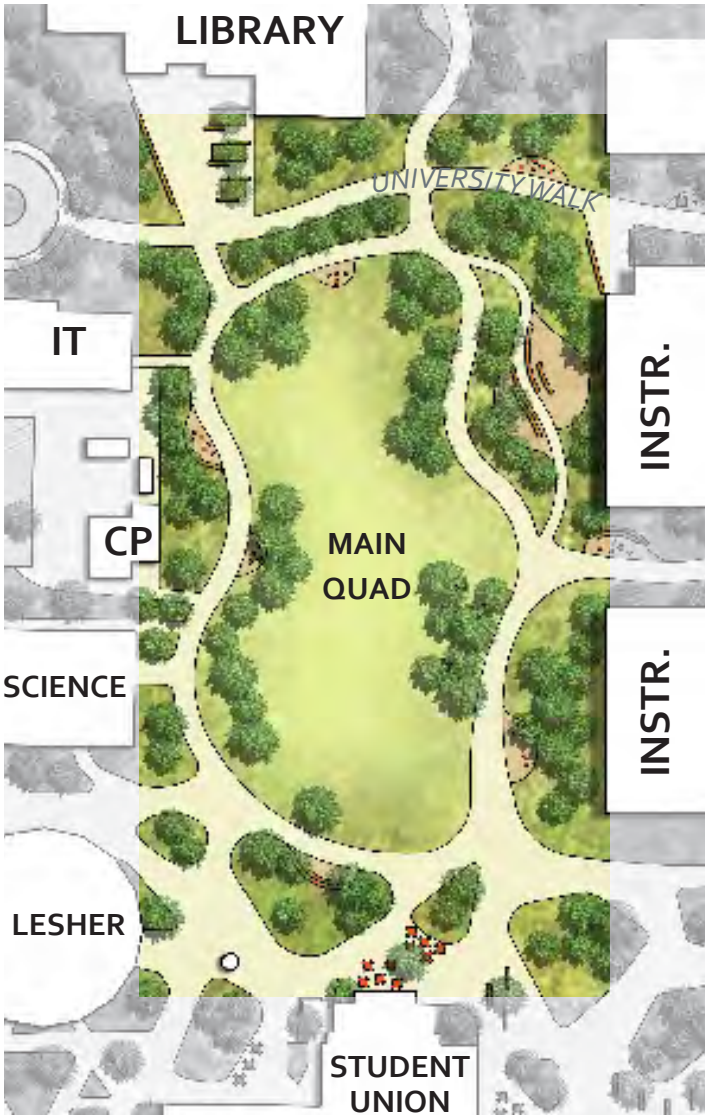
B - Main Quad

The new Main Quad utilizes the land that becomes available from the demolition of the Vocational Building and relocates the parking spaces in Lot M to the north of the campus. This site development accomplishes the following:

- Increases access to student support services
- Improves visibility between facilities
- Enhances engagement and provides opportunities for large events and activities
- Creates a sense of community through activation zones and a sense of collegiate identity
- Provides active and quiet spaces to study and socialize
- Showcases learning opportunities
- Provides outdoor classroom space and learning gardens along the pedestrian paths and adjacent to facilities

LANDSCAPE

- The design approach is 'campus as arboretum' where the quads act as clearings in the forest
- Provides a visual connection across the campus
- An outdoor learning laboratory
- Informal quad layout with meandering pathways
- The quad is framed with outdoor classrooms and learning gardens provide and extension to the educational curriculum
- Landscaping buffer for the Central Plant


LIBRARY
UNIVERSITY WALK
IT
INSTR.
CP
MAIN
QUAD
SCIENCE
INSTR.
LESHER
STUDENT
UNION

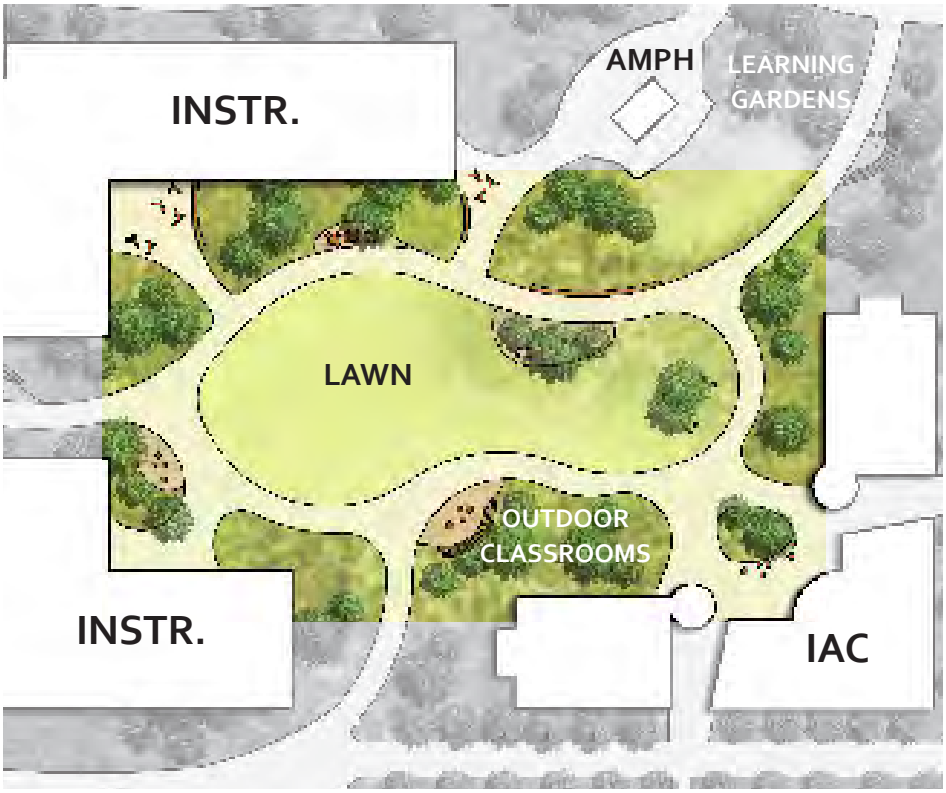
C - Campus Lawn

The Campus Lawn is framed by the Interdisciplinary Academic Center and proposed Instructional buildings. This campus improvement will accomplish the following:

- Utilize the existing amphitheater
- Create a strong connection between the Instructional Buildings and the Allied Health Center
- Create a pedestrian friendly transition from the Student Services building to the campus core

LANDSCAPE

- The quad provides a secondary loop pathway connecting the new and existing classroom buildings
- The existing amphitheater is retained and framed within a new garden area off the quad
- Plazas at the entries to the buildings provide welcome areas to sit before and after class
- Adjacent outdoor classroom and learning gardens expand learning opportunities


INSTR.
AMPH
LEARNING GARDENS
LAWN
OUTDOOR CLASSROOMS
INSTR.
IAC

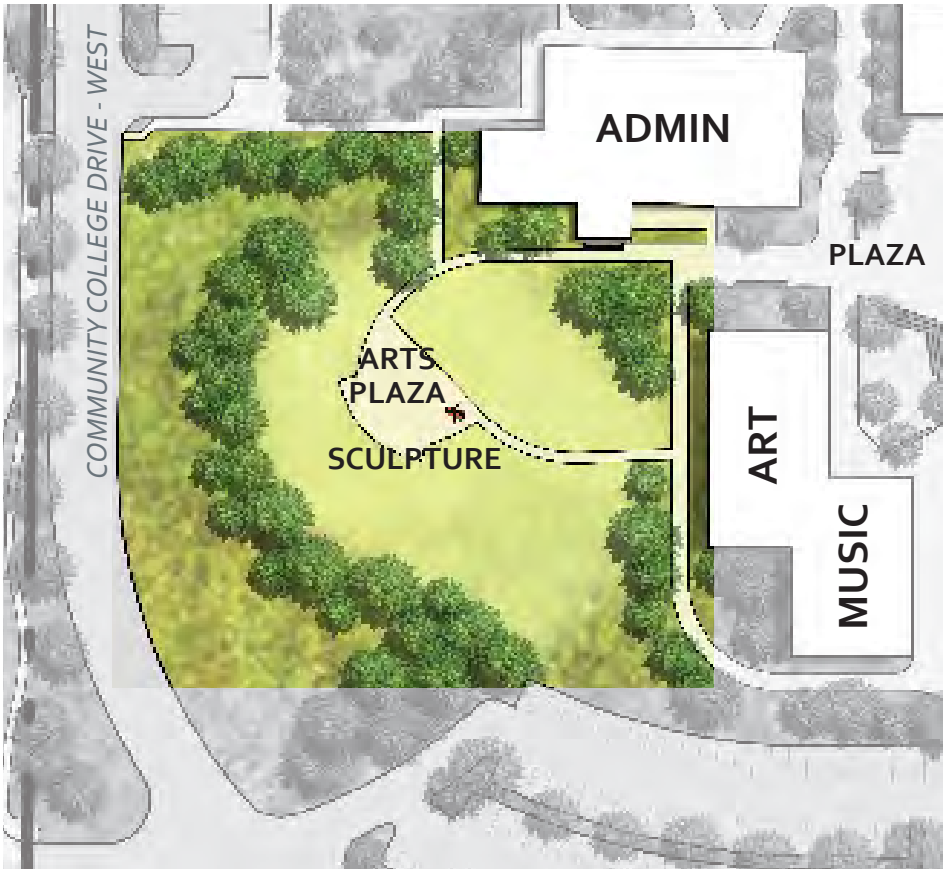
D - Arts Plaza

The existing amphitheater and landscape adjacent to the Theater is a great amenity of the campus. Utilizing this space and enhancing the user experience will accomplish the following:

- Showcase the Arts in the community and students in the Arts program
- Preserve and optimize resources by utilizing the existing amphitheater and preserving the trees
- Enhance community engagement by providing outdoor events and activities

LANDSCAPE

- Retain the existing amphitheater
- Provide new planting to frame the space and provide a visual barrier to the roadway
- Create a new art plaza to enhance the entry to the amphitheater
- The new theatre and arts building provides an indoor / outdoor connection to the amphitheater extending the classroom into the outdoors


COMMUNITY COLLEGE DRIVE - WEST
ADMIN
PLAZA
ARTS
PLAZA
SCULPTURE
ART
MUSIC

E - Loop Road

Connecting Community College Drive East with the South will create a "ring road" and will provide an internal vehicular connection on campus. Creating this vehicular connection will accomplish the following:

- Ease traffic congestion along Yosemite, M and G Street
- Provide internal connection between facilities and parking lots
- Improve wayfinding on campus
- Designated drop off zone for the Athletic facilities, stadiums, and fields will improve circulation and parking during events and games
- An "Athletes Walk" will connect the drop off zone to the campus core
- A "Wellness Walk" has been created along the perimeter of the campus to promote exercise and a relaxing experience

LANDSCAPE

- Provide an extension to the walking path loop around the campus
- Enhance the campus edges with planting and a buffer from the roadway


POOL
FHA
FHA
BASEBALL FIELD
GYM
CNC
TENNIS COURTS
STADIUM

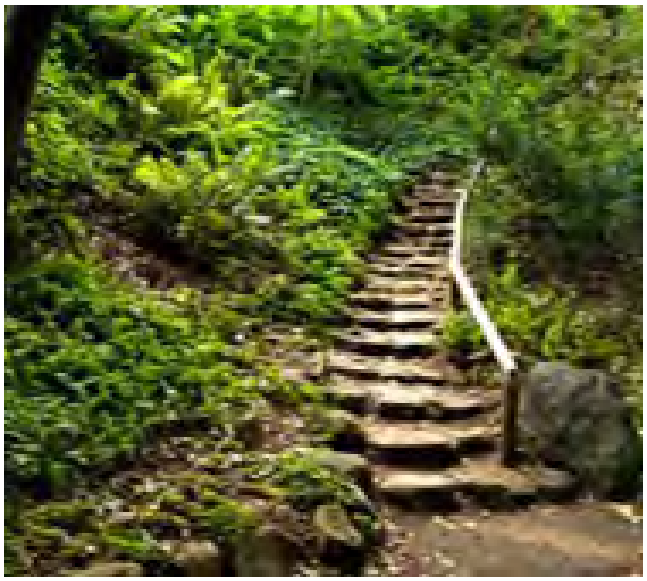
F - Botanical Garden

A 6 acre Botanical Garden will be an amenity for students, faculty, visitors, and the community. The Garden is located in close proximity to the Community Center and within the Agriculture zone. This amenity will accomplish the following:

- Enhance community engagement and create collegiate identity
- Increase visibility of the campus along G Street
- Provide revenue through events
- Maximize resources and utilize the existing land

LANDSCAPE

- A series of outdoor learning spaces in the Botanical Garden, including a new greenhouse
- A new multi-purpose Community Center with an outdoor garden to house a range of events



F - Botanical Garden

Sustainability

Colleges are leaders in their communities. They are knowledge centers and provide opportunities for research and practice. They inform community education and provide positive opportunities for communities' sustainable futures.

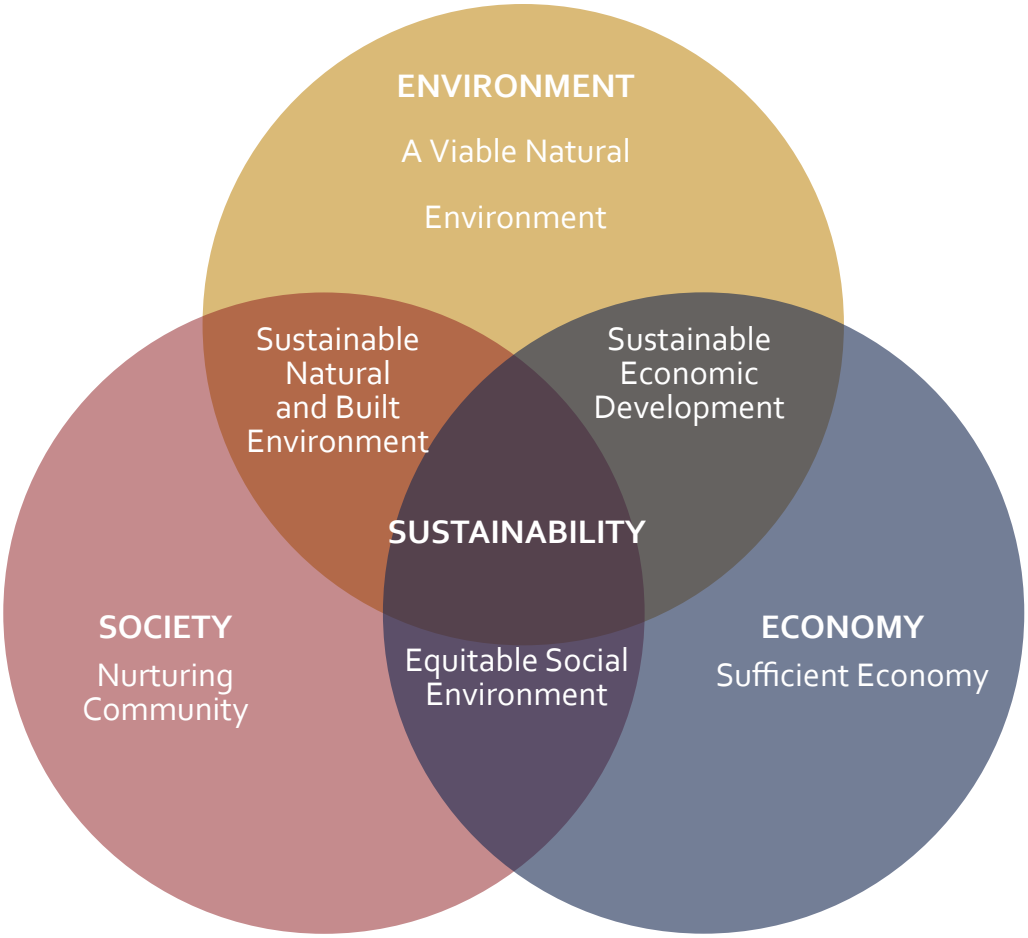
The term "sustainable" is most simply defined as being able to be maintained; to cause to continue; to prolong. Within the architectural community, sustainability has long been defined by developments which meet the needs of today, without compromising the needs of the future. However, the concept of sustainability has evolved.

The Associated Students of Merced College issued a Sustainability Challenge, which was authorized by the Board of Trustees.

1. To make Merced College as sustainable as possible in all regards.
2. To become as close to zero waste and zero pollution as possible.
3. To promote and implement sustainable practices for the resources of water, land, energy, materials, and waste throughout Merced College.
4. To encourage the inclusion of sustainability and campus improvement projects within course curriculum and Student Learning Outcomes.
5. To leave Merced College a better place than we found it.
6. To build the foundation for a sustainable Merced.

Sustainability is not just about doing better for the planet; it is about maintaining balance in a triple bottom line approach that enhances society, the economy, and the environment. Where these strategies collide: sustainability can take root and prosper within a community. Where strategies support the needs of the individuals living, working and learning in that community, an equitable social economy thrives. Where the natural environment, both interior and exterior of the building are better served, the community further prospers. And when financially, the decisions made support further growth and prosperity, while respecting inhabitants and resources, those developments become the new standard.

Creating an equitable social environment leads to a more successful society which therefore leads to a thriving economy. Within these facets of life is the desire to be true stewards of the earth and to protect it for future generations.



Sustainability Recommendations

The recommended sustainability actions are focused into six categories:

ENERGY LEADERSHIP

Become a leader in Energy Efficiency and increase the levels of on-and off-site renewable energy

Reduce Energy Consumption / Increase Energy Efficiency

Increase Self-generated Energy Capacity

SUSTAINABLE LANDSCAPE

Transition to a more climate responsive, drought tolerant landscape palette.

Increase Biodiversity Across Campus

Avoid Invasive Plant Species

Avoid Heat Island Effect

HEALTH & WELL-BEING

Promote healthy living culture, and provide a safe and healthy environment

Provide Healthy Food & Beverages

Improve Indoor / Outdoor Air Quality

Provide Access To Daylight And Views

Provide Public Transit Access

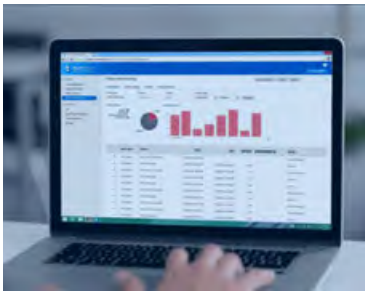
TRANSPARENCY ACCOUNTABILITY

Set high bars for building performance goals, with consistent monitoring and routine reporting

Develop A Sustainability Action Plan

Monitor And Report

Pursue LEED Silver or Higher Certification on New Construction Projects



RESPONSIBLE SOURCING

Promote a culture of reduce, reuse and recycle

Purchase Equipment With Positive Environmental Attributes

Procure Food And Products From Local Region

Make Recycling Easy

EDUCATION INTEGRATION

Nurture environmental stewardship + literacy, educate + prepare students for the green workforce

Provide Student And Employee Orientation

Promote Sustainability In Curriculum

Develop Outreach Material And Publications

Promote Community Service And Partnership

04

LOS BANOS CAMPUS

LOS BANOS CAMPUS

This chapter of the FMP focuses on the Los Banos Campus and includes two sections with the following sections:

EXISTING CONDITIONS

- Local Context
- Existing Campus
- Development History
- Facilities Condition Index
- Vehicular Circulation
- Pedestrian Circulation
- Campus Zoning
- Landscape Analysis

RECOMMENDATIONS

- Development Concept
- 2019 Facilities Master Plan
- FMP Project

Local Context

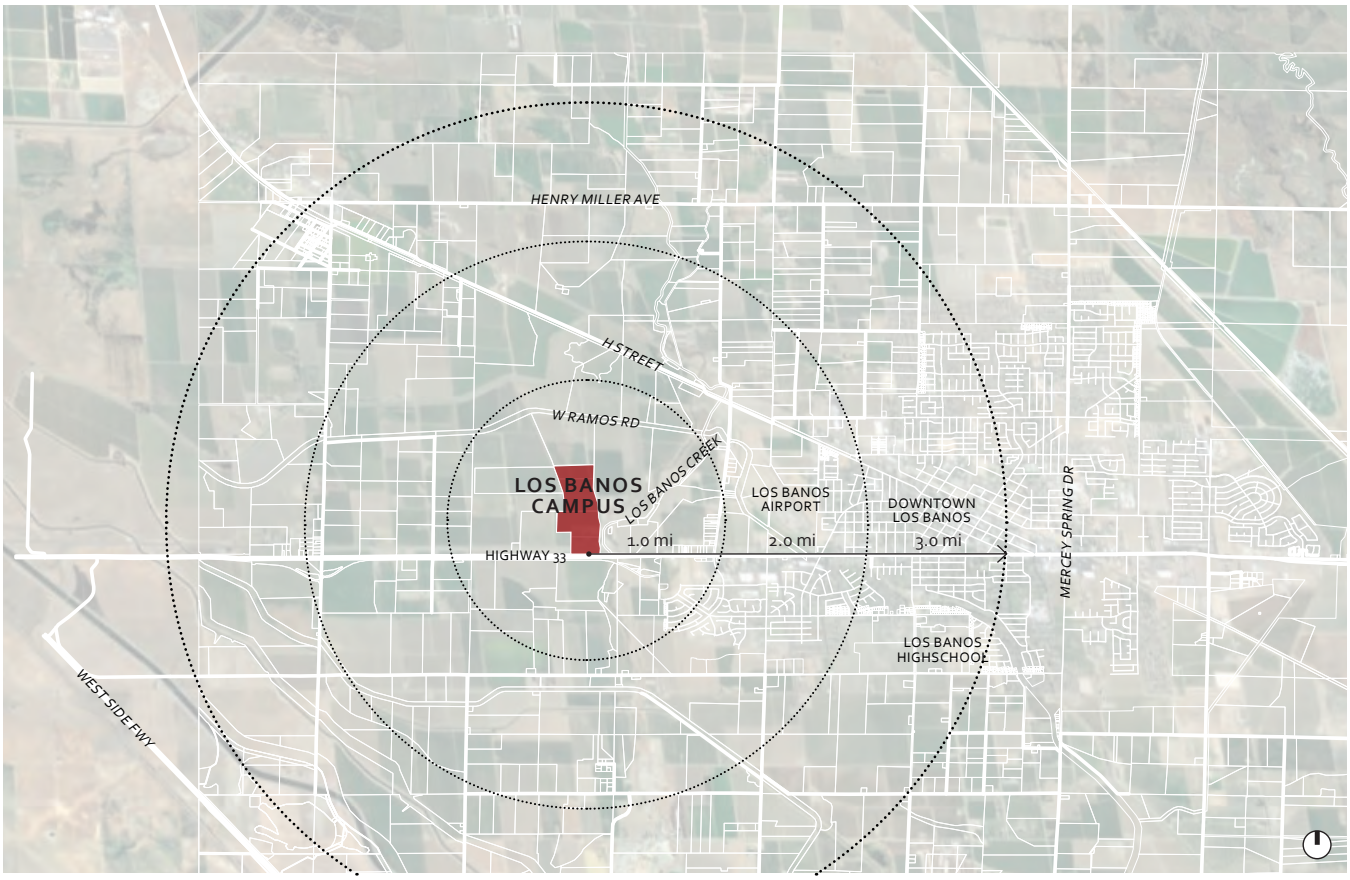
Los Banos Campus is located 2.6 miles from Downtown Los Banos and approximately 40 miles south of the Merced Campus. The 120 acre campus is comprised of two Student Service buildings: Building A and Building B and a maintenance building.

The Los Banos Campus is a full-service educational center of Merced College, providing services to residents of the Westside of Merced County.

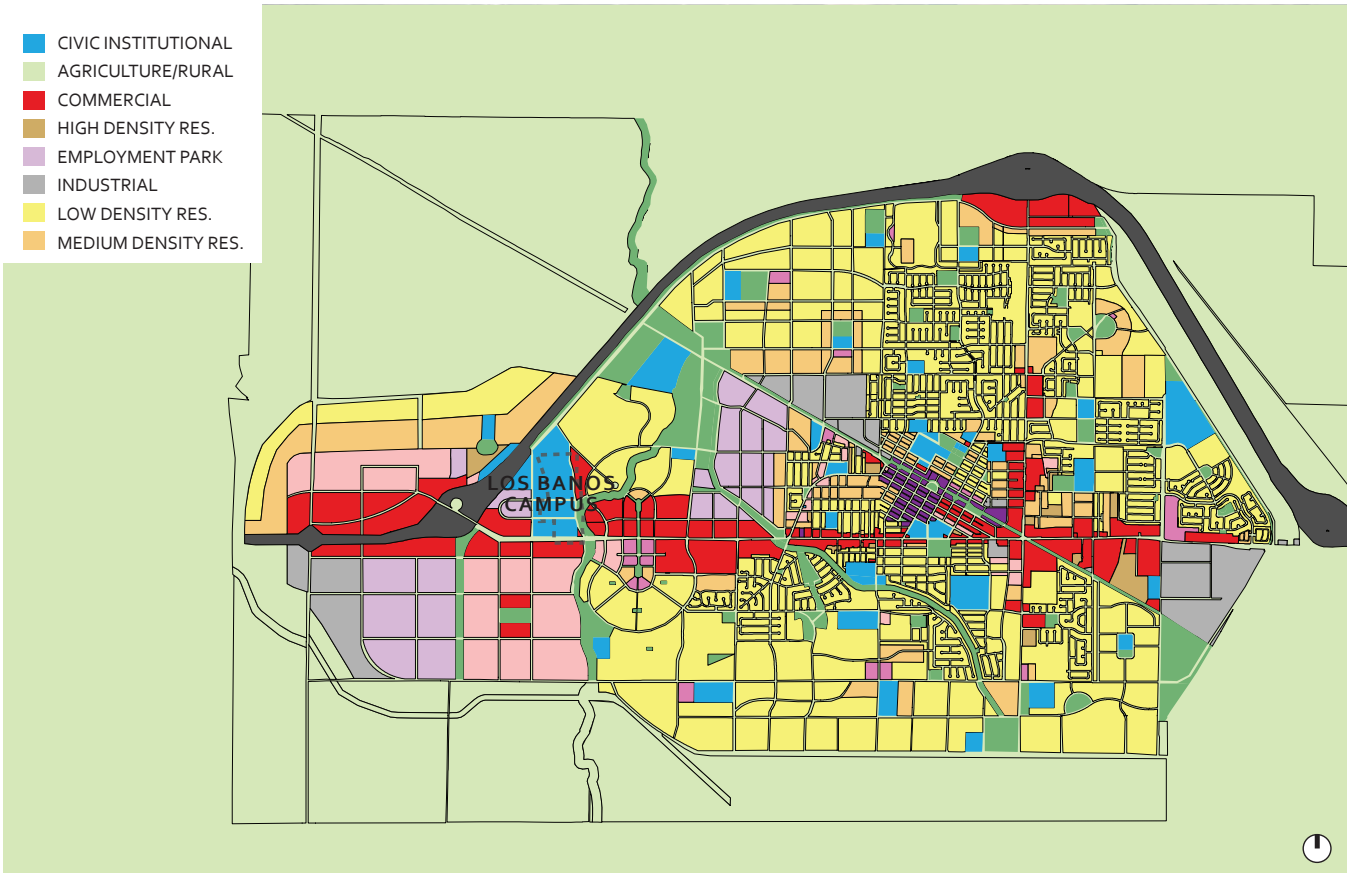
The Campus is zoned as Civic / Institutional Land Use within the 2030 Los Banos General Plan with mostly Agriculture / Rural land to the north, south, and west. and Downtown Los Banos to the east.

DOWNTOWN LOS BANOS

LOS BANOS FARMLAND



CONTEXT MAP



LAND USE MAP

2030 General Plan

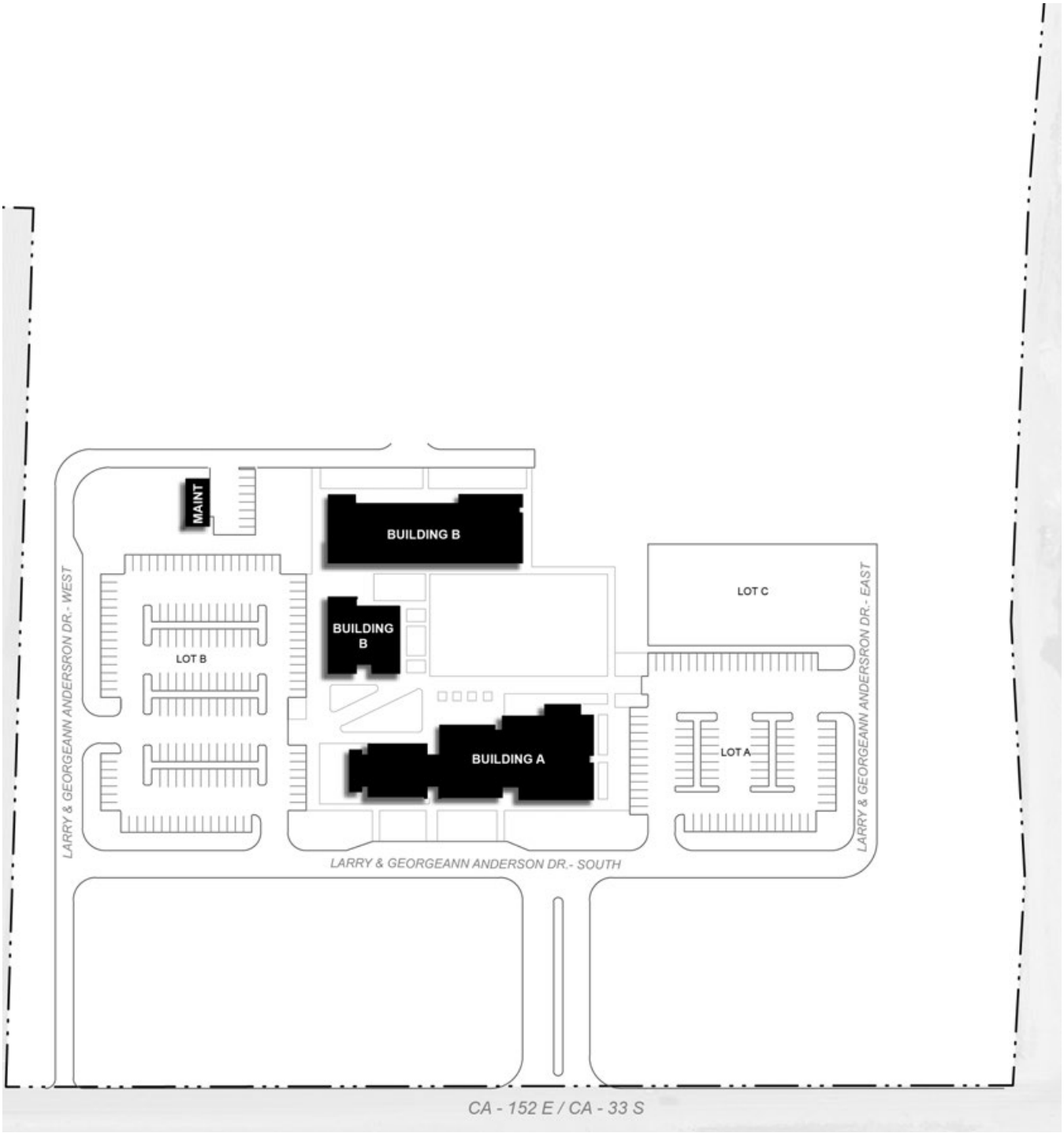
Existing Campus

The planning process included the analysis of existing conditions in order to identify key issues to address in the Facilities Master Plan. The information was gathered through campus visits and interactions with the college staff, faculty, administration, students, and community members.

LOS BANOS CAMPUS

LOS BANOS COURTYARD

BUILDING A



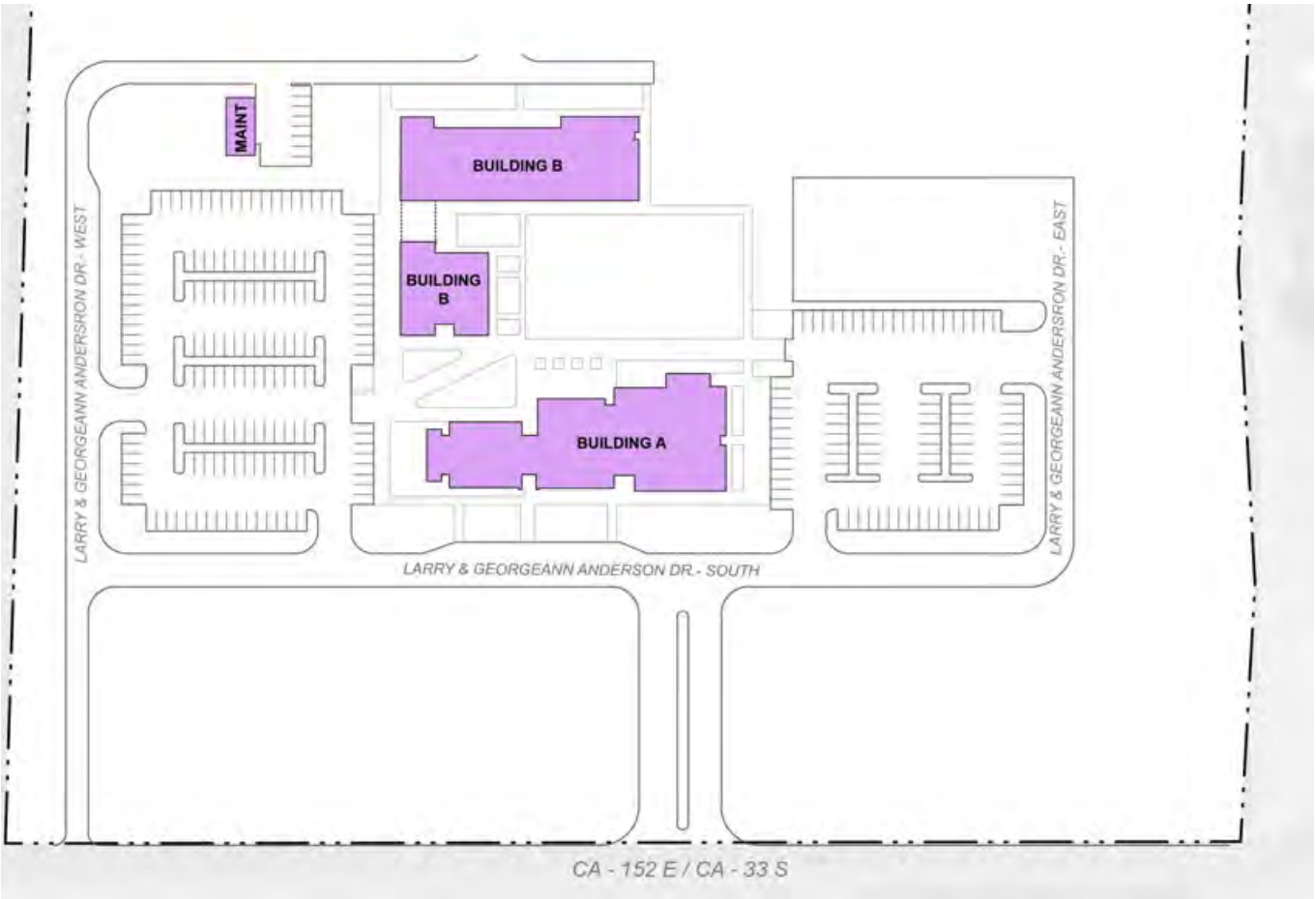
EXISTING CAMPUS

0 100' 200'

PERMANENT

Development History

Merced College expanded their services to the Los Banos Campus to meet the growing enrollment and demand by the community. Construction for Building A, Building B, and the maintenance building were completed in 2007.



Facilities Condition Index

The California Community College Chancellor's Office (CCCCO) conducts surveys of college campuses at regular intervals to asses building conditions and to assign a Facilities Condition Index (FCI) score.

The Facilities Condition Index (FCI) for a building represents the ratio of the cost to correct a facility's deficiencies to the current replacement value of the facility.

Buildings A and B are <10% due to their recent construction between 2006 and 2007. They are not in need of renovation or replacement.

Vehicular Circulation

The graphic on the adjacent page illustrates the vehicular circulation patterns on campus. Campus access points and allocating parking are shown along with drop off zones, transit stations and circulation, and emergency vehicular access. Existing parking counts are listed on the following chart.

OBSERVATIONS

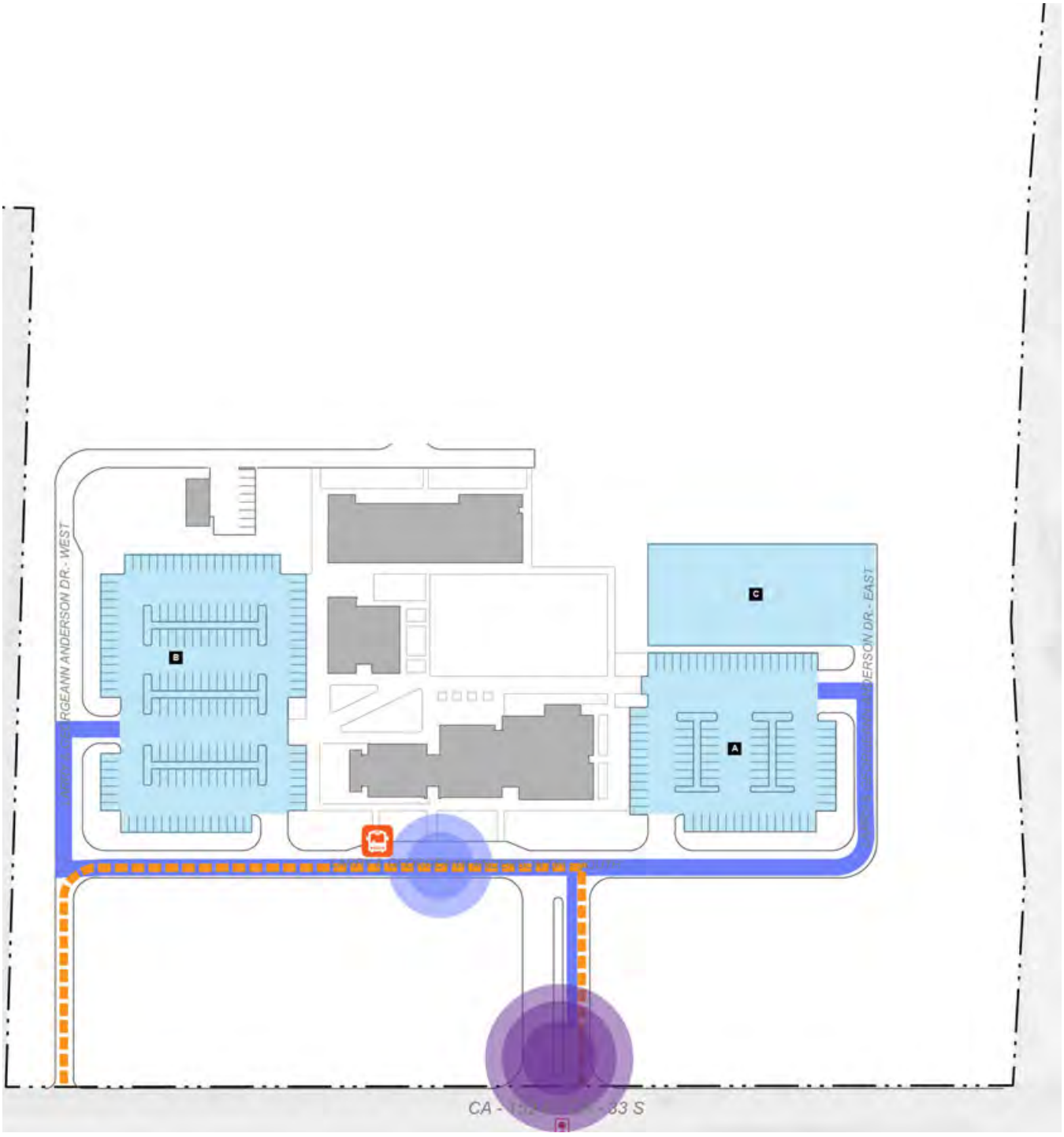
- Lot C is planned land for future development and currently serves as a parking lot
- Lot B is the preferred parking lot
- The only entry point for vehicles is off of CA- 152
- Entry point is a dangerous intersection for vehicles to enter and exit

PARKING COUNT

Parking Lot #	# of Spaces
A	93
B	158
C	70
TOTAL	**321**

ENTRANCE ON LARRY & GEORGE ANDERSON DRIVE - SOUTH

LOT A



VEHICULAR CIRCULATION

0 100' 200'

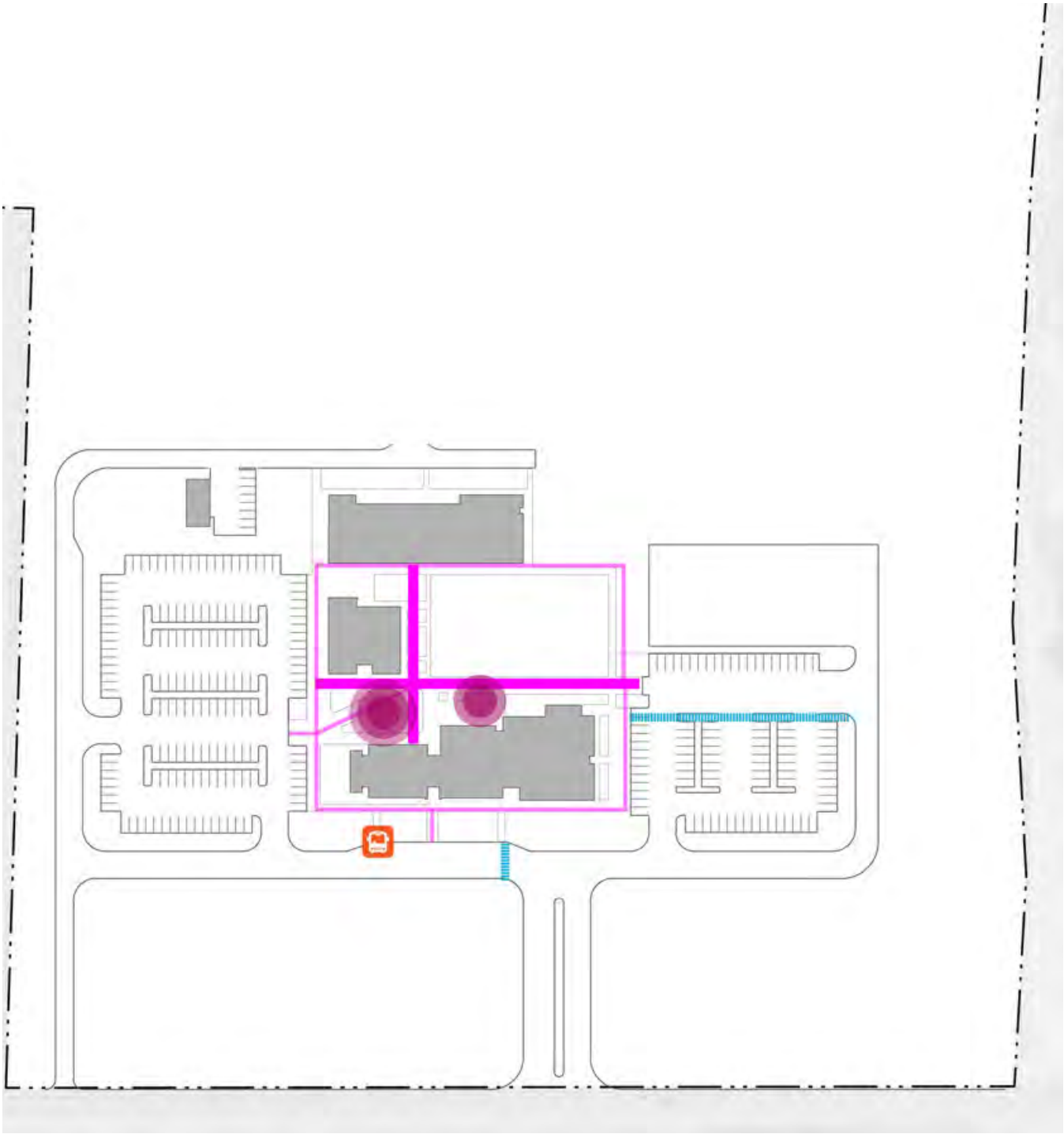
- ACCESS
- VEHICULAR PATH
- PARKING LOT
- DROP OFF ZONE
- BUS STOP
- BUS TRAFFIC
- STOP LIGHT

Pedestrian Circulation

Pedestrian circulation patterns were analyzed and mapped in order to identify key issues to address in the FMP. The graphic on the following page highlights these patterns.

OBSERVATIONS

- The path between Building A and Building B is most commonly used
- Outdoor gathering space and seating is underutilized
- A bicycle connection is planned by the City of Los Banos to connect Downtown to the campus
- Sidewalk paths from Downtown to campus are desired



PEDESTRIAN CIRCULATION

0 100' 200'

- PRIMARY PEDESTRIAN CIRCULATION
- SECONDARY PEDESTRIAN CIRCULATION
- PEDESTRIAN HUBS
- BUS STOP
- CROSSWALKS

Campus Zoning

Building uses are zoned by the following uses: Instructional; Library and Tutorial; Student Services; Administration; and Service and Support. These zoning categories are useful to clarify the function(s) of each facility at a glance.

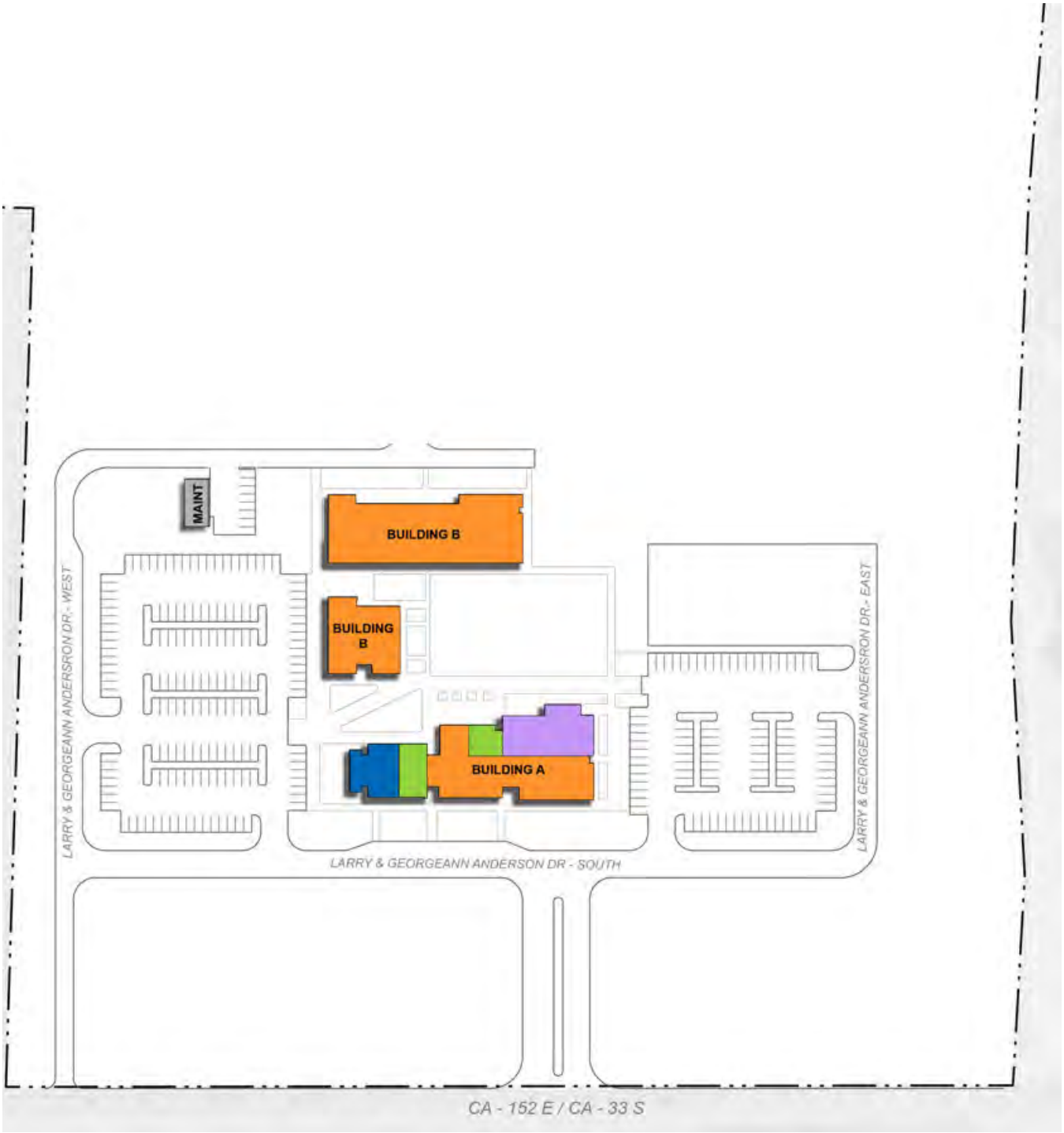
The graphic on the adjacent page illustrates the location of functions at the buildings and campus. Patterns are identified to inform the planning process.

OBSERVATIONS

- The Student Lounge, located within Building A, has seating, vending machines and direct access to the outdoor seating area
- Library/Tutorial, Student Services, and Administration uses are centralized within Building A

CONNECTION BETWEEN BUILDING A AND BUILDING B

BUILDING B



CAMPUS ZONING

0 100' 200'

- INSTRUCTIONAL
- LIBRARY/TUTORIAL
- STUDENT SERVICES
- ADMINISTRATION
- SERVICES

Landscape Analysis

The campus is small, but there are ample opportunities to grow the campus, add educational and social amenities, and enliven the experience. Outdoor classrooms and furnished gathering spaces can provide additional classroom and social space as well as activate the large turf open spaces. An expanded approach to planting can enrich the campus experience and also enhance the existing food forest. Overlaying these spaces and amenities with a well designed wayfinding program will greatly improve the visitor and student experience while helping define the campus identity.

OBSERVATIONS

- Unclear entry, parking lot and campus wayfinding
- Unactivated large central lawn
- Inadequate outdoor seating
- Insufficient outdoor classroom space
- Limited planting around the quad

ENTRANCE

- Unclear wayfinding at the entrance and parking lots

QUAD

- Large open grass area with a few trees on one end
- Lacks furniture and usable outdoor space

SEATING AREA

- Inadequate outdoor seating

LOS BANOS CAMPUS

RECOMMENDATIONS

The 2019 Facilities Master Plan (FMP) recommendations for the Los Banos campus present an overall picture of the future developed campus that is informed by the Educational Master Plan, the analysis of existing conditions, and discussions with the campus community. It includes recommendations for new construction, building reconstruction, change of use and site development projects.

The recommendations included in this section follow the facilities master plan program from the previous section and address the discussions that took place during the planning process.

The recommendations are organized into the following sections:

DEVELOPMENT CONCEPT
2019 FACILITIES MASTER PLAN
PROJECT + SITE DEVELOPMENTS

Concept Development

The six principles are the key drivers that led to the Los Banos Campus FMP recommendations and serve as a guide for the future development of the campus. They provide the framework for identifying the required improvements to the campus environment, facilities, and infrastructure that are articulated throughout this section.

STUDENT SUCCESS

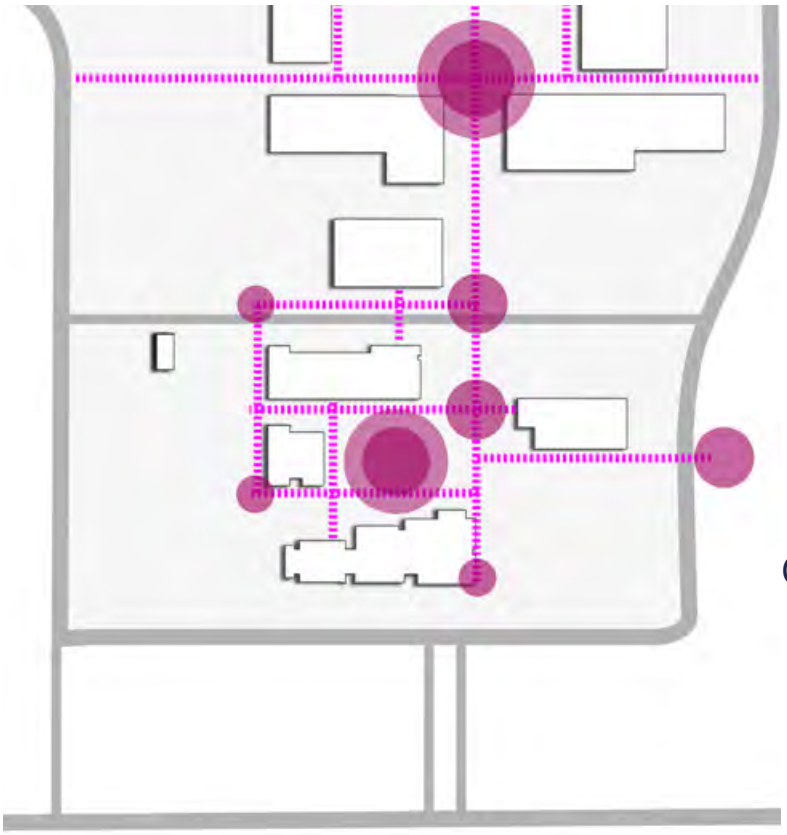
ACCESS + WAYFINDING

COLLEGIATE IDENTITY

EFFECTIVE + EFFICIENT

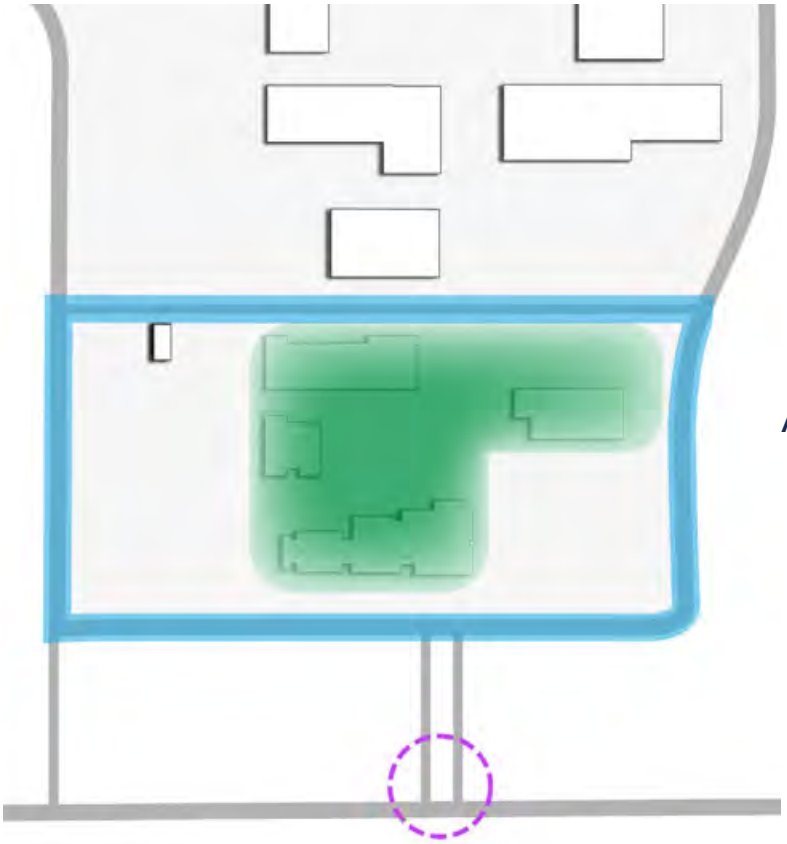
STEWARDSHIP OF RESOURCES

COMMUNITY ENGAGEMENT



CLARITY + CONNECTIVITY

- A clear network of pedestrian paths connect all areas of the campus
- Campus organization and wayfinding is improved
- Open spaces are developed to enhance student engagement



ACCESS + WAYFINDING

- Welcoming and inviting campus entries are developed
- A continuous campus loop road connects all areas of the campus
- Parking lots are redistributed to improve access and safety
- A 'car free zone' is developed to enhance the overall experience

2019 Facilities Master Plan

The 2019 Facilities Master Plan serves as a guide for future development. It provides a quantitative and qualitative description of the College's strategy to support the educational program needs, address the long range forecast for enrollment, and maximize funding opportunities.

The plan provides a framework for future development including the placement of new facilities and additional facilities the campus has expressed interest or may require beyond the 2019 Facilities Master Plan.

The list to the right indicates the FMP projects. They are listed in alphabetical order and do not represent a priority order.

NEW CONSTRUCTION

Career Technical Education

Child Development Center

FUTURE (BEYOND FMP)

Future facilities have not been identified and will depend on community needs.

KEY SITE PROJECTS

Main Quad

Food Forest

2019 FACILITIES MASTER PLAN

0 200' 400'

- EXISTING
- NEW CONSTRUCTION
- FUTURE (BEYOND FMP)

2019 Facilities Master Plan

The 2019 Facilities Master Plan includes expanded facilities to support instruction and student support programs. A new Career Technical Education (CTE) building is identified along with a Child Development Center. Both facilities will support the long range goal for Los Banos of serving a growing population.

The design for the expanded Los Banos Campus takes a traditional approach to the quads, but weaves a contemporary curvilinear promenade through the new fabric of the campus. This pedestrian corridor is framed by outdoor classrooms and habitat gardens which add richness to the campus experience. Located at the confluence of the promenade and the quad is the "heart" of the campus; a grand quad providing a variety of outdoor spaces for students, faculty and visitors. Further activating the quad are plazas that frame the space and expand the educational curriculum into the open air.

2019 FACILITIES MASTER PLAN

0 100' 200'

- EXISTING
- NEW CONSTRUCTION
- FUTURE (BEYOND FMP)

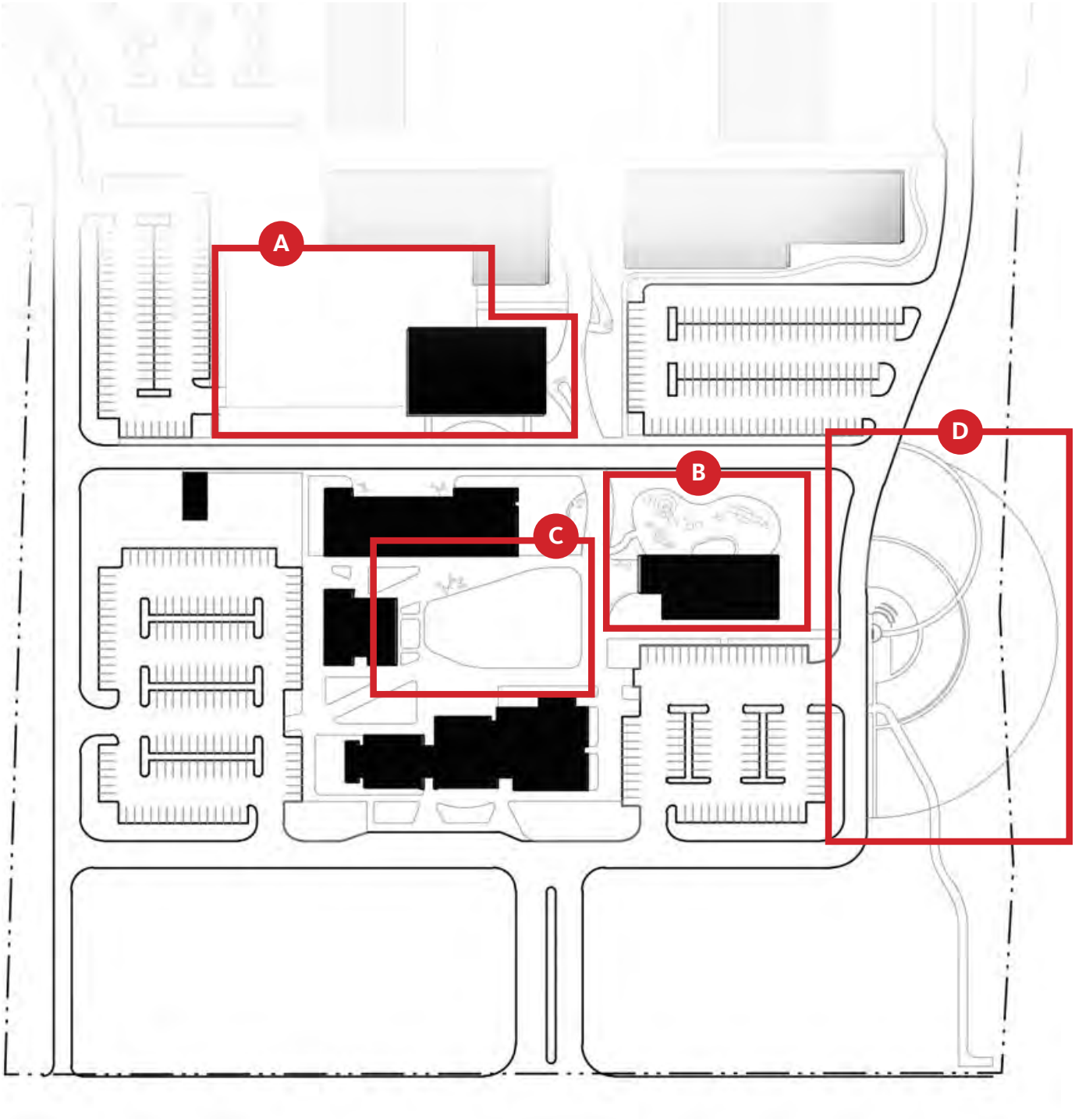
FMP Projects

Descriptions for each of the projects identified in the FMP are described on the following pages and grouped as illustrated in the key plan to the right.

This chart below includes a description of the recommended projects and how they reflect the Facilities Planning Principles.

- **A** CAREER TECHNICAL EDUCATION FACILITIES
- **B** CHILD DEVELOPMENT CENTER
- **C** CAMPUS QUAD
- **D** FOOD FOREST

	 SUCCESS	 ACCESS	 IDENTITY	 EFFICIENCY	 STEWARDSHIP	 COMMUNITY
NEW CONSTRUCTION						
Career Technical Education	●		●	●		
Child Development Center	●	●				●
SITE PROJECTS						
Campus Quad	●	●	●	●	●	●
Food Forest			●		●	●



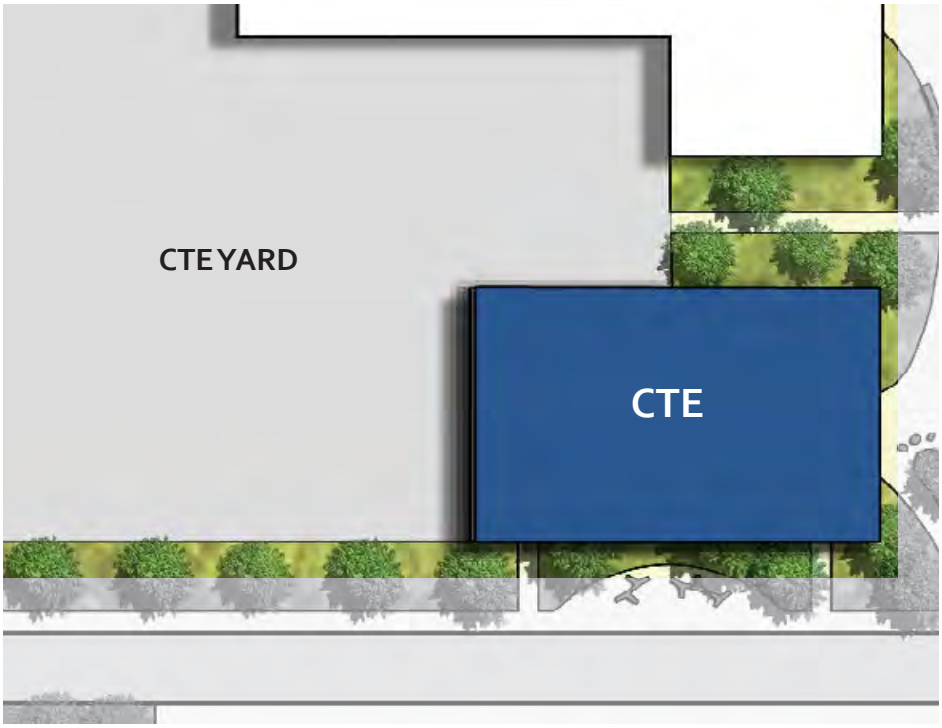
KEY PLAN

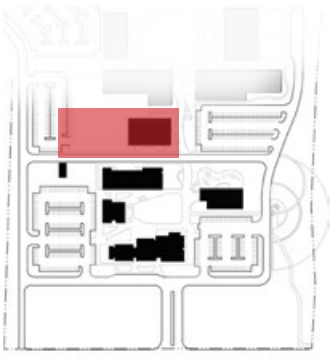
0 100' 200'

A - Career Technical Education

CAREER TECHNICAL EDUCATION

A new CTE Building and outdoor learning yards will be developed with opportunity for expansion to the north of the campus. The new location, north of Building B, will improve access, increase visibility, enhance learning environments and support collaboration.

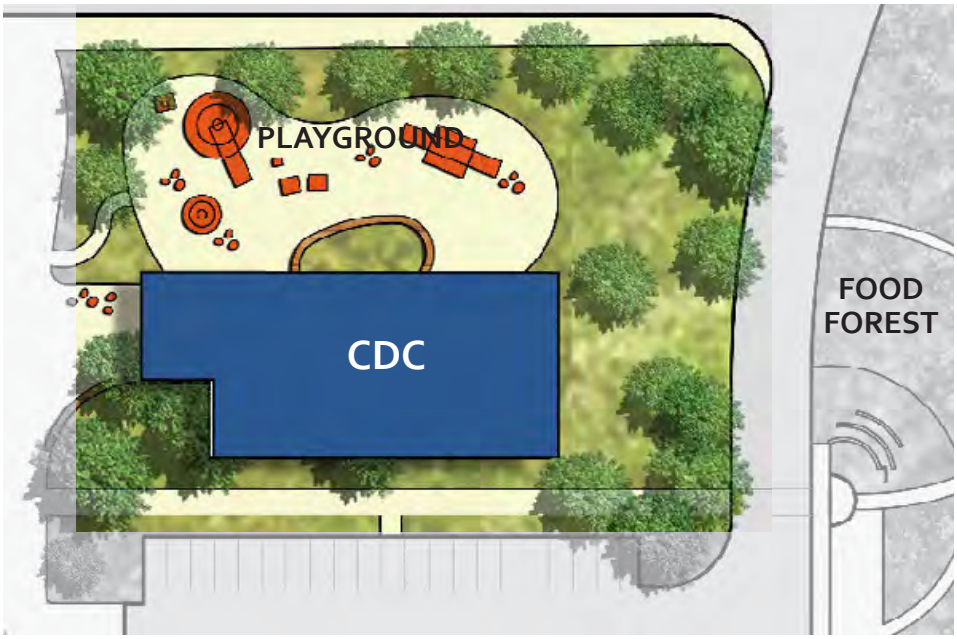


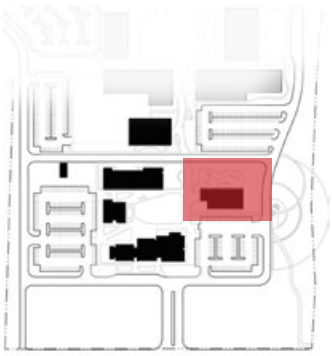


B - Child Development Center

CHILD DEVELOPMENT CENTER

A location for a potential Child Development Center is identified in this FMP. The proposed location is adjacent to the Food Forest with a designated crosswalk to provide learning opportunities and a connection to the outdoor space. A playground to the north will provide activity space for children in a safe and secure area.





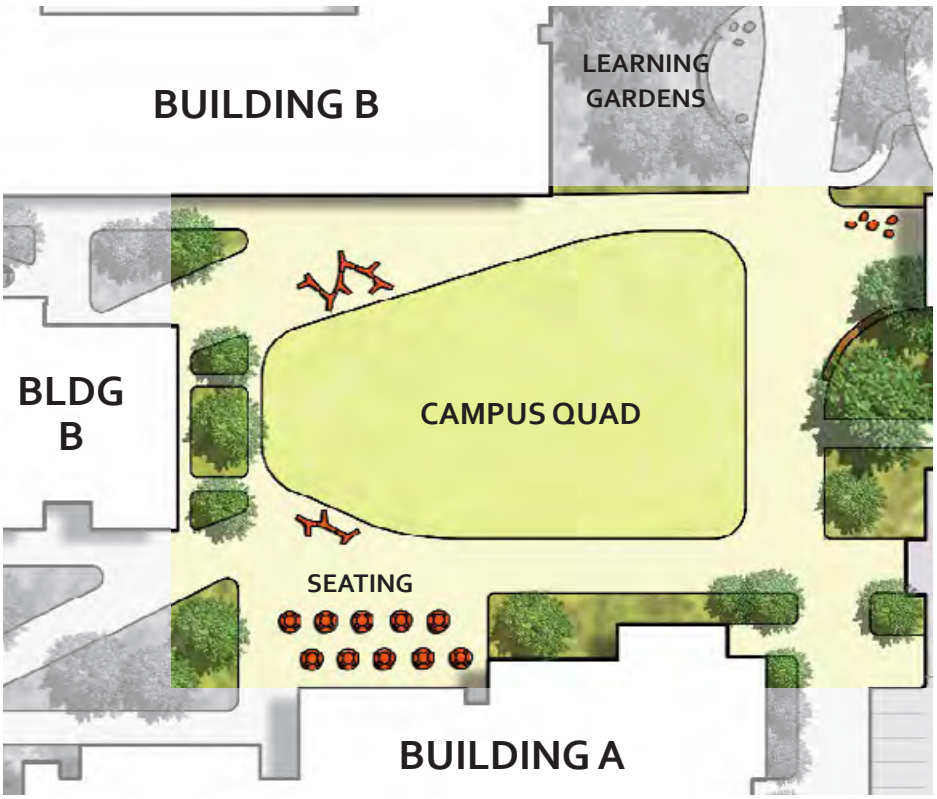
C - Campus Quad

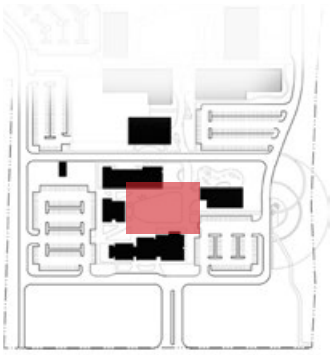
The existing Quad will be renovated to accommodate outdoor gathering spaces and create connections between facilities. This site development accomplishes the following:

- Creates a sense of community through activation zones and a sense of collegiate identity
- Provides active and quiet spaces to study and socialize
- Showcases learning opportunities
- Provides outdoor classroom space and learning gardens along the pedestrian paths and adjacent to facilities

LANDSCAPE

- The main quad provides a large open lawn framed by plazas with a range of seating types
- Habitat gardens frame the exterior quad space providing an extension of the educational curriculum into the gardens
- Located at the confluence of the promenade and the quad is the "heart" of the campus; a grand quad providing a variety of outdoor spaces for students





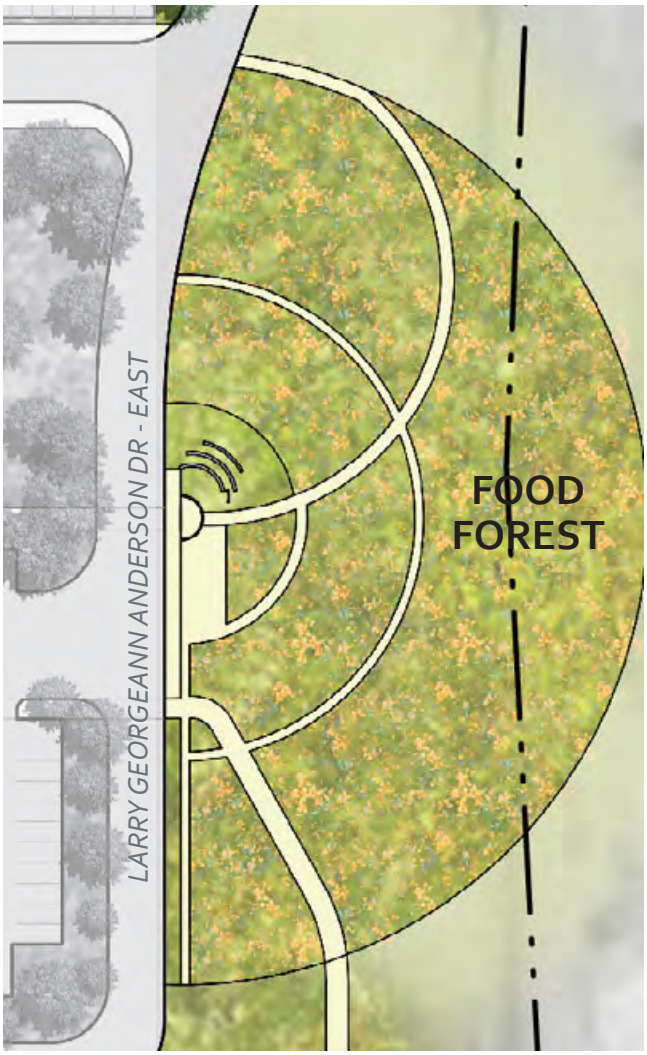
D - Food Forest

A Food Forest is currently under construction and will provide outdoor space for the community and students. This site development accomplishes the following:

- Provides a communal space for food production
- A place for the community to gather, host events and workshops
- Provides a connection with the students and community

LANDSCAPE

- Outdoor classroom and amphitheater
- Demonstration garden beds and tool shed
- Showcase artwork
- 8' path for bike access
- Barn owl / bat boxes
- Apiary / bee hives
- Seating and gathering spaces
- Espalier fruit trees



05

APPENDIX

APPENDIX

This chapter focuses on information that was referenced and developed during the planning process.

The following elements are included in this section:

MERCED CAMPUS INFRASTRUCTURE

Merced Campus Infrastructure

1.0 GENERAL PROJECT DESCRIPTION

This report by PAE includes an evaluation of the Merced CCD campus existing MEP infrastructure and an impact study on the 2028 masterplan on that infrastructure. The goal of this report is to identify changes to MEP infrastructure required to meet the goals of the 2028 Masterplan.

PAE visited the Merced campus on 4/24/2019 to understand the capacity of the existing MEP equipment and infrastructure. PAE staff met with Ronald Perez and other facility staff.

As-builts for additional renovations and updates to the facilities were not available, however PAE gathered as much information as was possible on the 4/24/2019 site visit and documented it in this report.

2.0 MEP DUE DILIGENCE + EXISTING CONDITIONS

The information available to PAE was limited to information during the 4/24/2019 site visit, which limits PAE's knowledge of the MEP infrastructure to the central plant area where the mechanical and electrical central systems are located supporting the entire campus. As-built information for the Merced campus was not available for the central plant the buildings it supports, therefore this report is focused on the central plant mechanical and electrical capacity and does not go into detail of the mechanical and electrical infrastructure (piping and conduit/conductors) sizing and capacity of the system at specific areas of the campus or for specific buildings. A more in-depth site visit and study would be required for that level of MEP system evaluation, which was not a goal of this study or project.

This study also does not include information on MEP systems for the Los Banos Campus of Merced CCD.

COOLING TOWERS FRONT AND BACK

Existing Infrastructure

MECHANICAL SYSTEMS

The central plant includes equipment and infrastructure that provides chilled water and heating hot water to most of the buildings in the Merced campus. The only building that is not served by the central plant is the Administration Building, which has an air-cooled DX rooftop unit. Chilled water and heating hot water is distributed and used by systems at each building to provide space cooling and heating for each building. Ventilation and exhaust systems are local to each building and are not addressed on this report.

The Merced campus central plant includes the following equipment:

- Two cooling towers
  - First (older) cooling tower has three cells (Evapco SST39742)
  - Second (newer) cooling tower has one cell (Evapco USS112812)
- Three condenser water pumps
- Water-economizer heat-exchanger
- Three chillers
  - Chiller 1, Trane CGHF 570, ~570 Tons of cooling capacity
  - Chiller 2, Trane CGHF 650, ~650 Tons of cooling capacity
  - Chiller 3, Trane CVHE 500, ~500 Tons of cooling capacity
- Six chilled water pumps
- Eight Boilers
  - Boilers 1 to 8, Cleaver Brooks MCF, 1750 MBH capacity each
- Two heating water pumps

The existing chillers hydronic and controls set up configuration allows only for two of the three chillers to run at anyone time. Revisions to the plant configuration are required to allow it to provide full (three chiller) capacity to the campus.

CONDENSER WATER PUMPS

CONDENSER WATER PUMPS AND HEAT EXCHANGER FOR WATER-ECONOMIZER

Existing Infrastructure

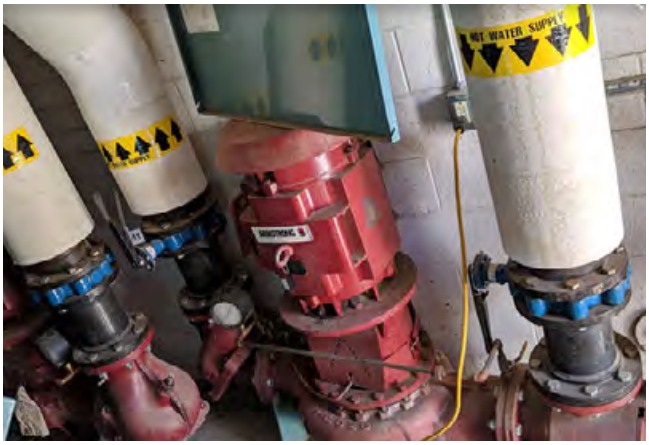
The existing plant has a combined cooling capacity of 1,720 Tons, currently serving approximately 540,000 SF of buildings and resulting in an average cooling capacity of 313 SF/Ton. This metric indicates the plant has extra cooling capacity, which was confirmed by Merced CCD staff during PAE's site visit. A typical student classroom building in the Merced climate requires approximately 450 SF/Ton, while a lab building will require closer to 300 SF/Ton, and the current average of 313 SF/Ton which suggests the current plant has capacity to serve future buildings.

The existing plant has a combined heating capacity of 14,000 MBH, currently serving approximately 540,000 SF of buildings and resulting in an average heating capacity of 26 Btuh/SF. This metric indicates the plant has extra heating capacity, which was confirmed by Merced CCD staff during PAE's site visit. A typical student classroom building in the Merced climate requires approximately 15 Btuh/SF, while a lab building will require closer to 45 Btuh/SF, and the current average of 26 Btuh/SF which suggests the current plant has capacity to serve future buildings.

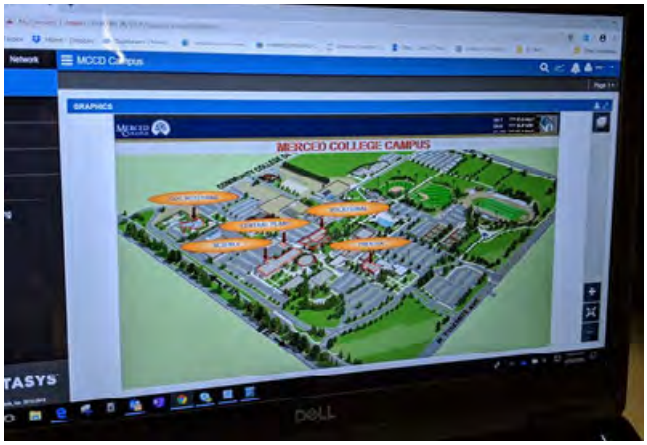
The current plant equipment and infrastructure appear to be well maintained and in good condition, which was also confirmed by Merced CCD staff during PAE's site visit. However, some boiler heating equipment, specifically the boilers, does require some attention as noted on the photos.

The existing central plant and campus is currently undergoing a renovation project to replace the campus controls system with a new Johnson Controls Metasys, Bacnet based system. At the time of PAE's site visit, the central plant controls had been replaced and were being tested, as well as the controls of several buildings on campus. See image below from the new Johnson Controls graphical interfaced, showing campus buildings in red that have already had their controls system renovated.

Based on conversations with the Merced College staff, PAE understands that the current plant design and controls allow for a maximum of two chillers to run at any one time.



HEATING HOT WATER PUMPS 1 AND 2



NEW JOHNSON CONTROLS METASYS SYSTEM GRAPHICAL INTERFACE



BOILERS 1 THROUGH 8




CHILLED WATER PUMPS 1 THROUGH 6

Existing Infrastructure

PLUMBING SYSTEMS

The plumbing infrastructure at the central plant is limited to a gas meter, see image below. PAE was not able to determine gas meter capacity. PAE understands that due to the sustainable goals of the masterplan new buildings would be designed to be all-electric to reduce campus carbon foot print and therefore any existing buildings that remain could be served by the existing gas meter and gas piping infrastructure.

PAE was not able to identify the location of the campus water meter nor its current capacity.

PAE also does not have information on the existing water and sewer piping infrastructure for the campus. This information should be reviewed by a civil engineer team member in future project development. As the masterplan develops and more information becomes available for the new buildings, PAE would be able to provide water use loads (domestic cold, sewer, storm) for the new buildings and be able to provide this information to a civil consultant to determine impact of the new buildings on existing piping infrastructure.

The central plant building includes air compressor systems that feed adjacent laboratory classroom buildings, but it is assumed that new buildings would have stand-alone compressed air, vacuum, RO or DI, and lab-gas systems to serve them.

GAS METER AT CENTRAL PLANT

EXISTING ELECTRICAL DISTRIBUTION

Following PAE's review of the electrical available as-built documents, energy bills, and site visit to survey the existing central plant, this section is intended to evaluate the electrical distribution capacity to support the masterplan goals.

MAIN SERVICE

Electrical service is provided to the campus by the Merced Irrigation District (MID). As-built drawings and a site survey indicate that 21kV and 12kV medium voltage distribution is present on the campus.

The central plant utility yard contains a MID 21kV utility switch and 3MVA MID medium voltage utility transformer.

The MID utility transformer then steps the voltage down from 21kV to 12kV and feeds an exterior-rated, 12kV switchgear located directly opposite the MID utility equipment. The 12kV switchgear contains a MID utility main meter, main circuit breaker, and (5) 12kV distribution sections for distributing 12kV service throughout the campus. Ratings of the 12kV distribution breakers was not readily visible (access panels were locked) and the available as-builts do not contain this information. However, the distribution sections were labeled:

- Switch #1 Central Plant
- Switch #2 Loop East
- Switch #3 Loop South
- Switch #4 TCC Athletics
- Switch #5 New Childcare

MID 21KV UTILITY SWITCH

MID 21KV:12KV UTILITY TRANSFORMER

Existing Infrastructure

Within the central plant utility yard, there are two distribution switchboards fed from the 12k switchgear. MSB 1, rated at 3000 amps, 480/277 volt, 3-phase 4-wire, serves the central plant equipment (chillers, central plant motor control center), services building, vocational SO wing, O&M Grounds, Transportation, and Cart Charging Lot via an exterior pad-mounted transformer 'T1' rated at 1750kVA.

MSB 2, rated at 1200 amps, 480/277 volt, 3-phase 4-wire, serves the Lesher Building, roadway lighting, bus stop, and lighting contactors via an exterior pad-mounted transformer 'T2' rated at 750kVA.

The utility yard also contains a 150kW, 480/277 volt, 3-phase 4-wire emergency generator housed within an exterior rated weatherproof enclosure. It is unclear what loads the generator supports.

DISTRIBUTION

The rating of each 12kV distribution line, as well as its routing, which buildings are served from each circuit, and how each building is services, is not clear from the site survey and available documents. According to a Facilities representative, each building typically has its own service tapped off of the 12kV distribution loops which is stepped down to utilization voltage by exterior pad-mount transformers. Individual building services are not metered.

12KV SWITCHGEAR

MSB 1

MSB 2

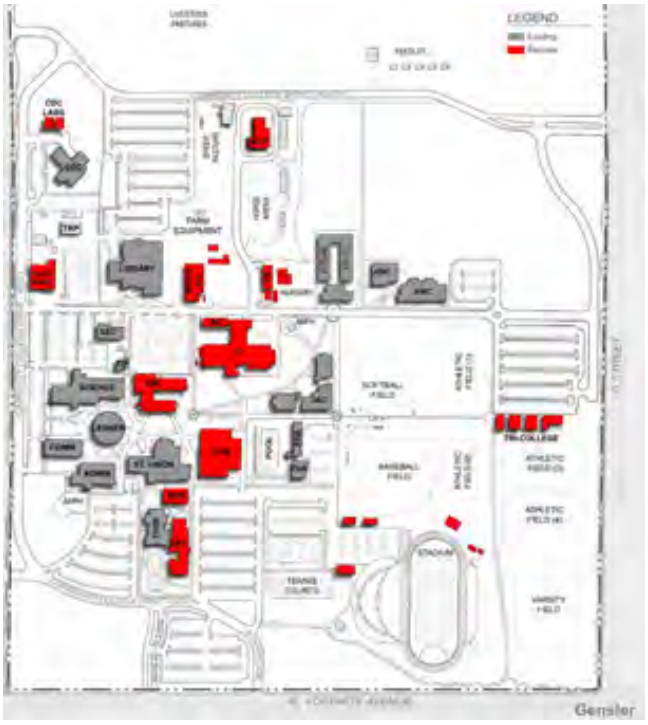
Recommended Infrastructure

MASTERPLAN GOALS

The masterplan for Merced CCD, Merced Campus, intends to decommission and demolish several buildings, and add several new buildings to accomplish the college educational goals.

In addition, the college also has several sustainability goals, which are outlined in the FMP.

In this section, PAE provides a summary for how MEP systems may be modified to achieve both the accommodation of the new building and educational program, as well as attempt to achieve the sustainable goals of the college by 2028.



MERCED CAMPUS MASTERPLAN, EXISTING WITH BUILDINGS TO BE REMOVED ON THE LEFT, AND NEW BUILDINGS ON THE RIGHT

EXISTING + FUTURE LOADS

The current and future cooling and heating loads for the campus are detailed on tables 1 and 2. See the end of this section for a summary of PAE's findings.

The future cooling load with new buildings online by 2028 is expected to be 2,145 Tons, which exceeds the current central plant capacity of 1,720 Tons. Note that PAE assumed "typical" cooling load densities for the new buildings and that the existing buildings will not be renovated within the masterplan period. If the existing buildings go through renovations that will reduce existing buildings cooling loads, and new buildings are designed, built, and operated in an energy efficient way, it is possible to keep the cooling load within the current existing plant capacity.

The future heating load with new buildings online by 2028 is expected to be 14,373 MBH, which is a slight increase from the current central plant capacity of 14,000 MBH. So with slight upgrades to the boiler plant, it can be reused to support the 2028 masterplan.

BUILDING	STATE	AREA	Sizing (sf/ton)	Cooling Load (tons)	AREA 2018	2018 Cooling Load (tons)	AREA 2028	2028 Cooling Load (tons)
Plant Science	existing	3,289	250	13.2	3,289	13.2	3,289	13.2
Science	existing	38,198	250	152.8	38,198	152.8	38,198	152.8
Student Union	existing	21,663	400	54.2	21,663	54.2	21,663	54.2
Pool Dress Building	existing	4,222	400	10.6	4,222	10.6	4,222	10.6
Administration	existing	14,935	450	33.2	14,935	33.2	14,935	33.2
AG Portables	remove	1,400	450	3.1	1,400	3.1	-	-
Agriculture	remove	3,270	250	13.1	3,270	13.1	-	-
Animal Quarters	remove	13,892	250	55.6	13,892	55.6	-	-
Animal Science	remove	7,280	250	29.1	7,280	29.1	-	-
Arts	remove	12,939	400	32.3	12,939	32.3	-	-
Athletic Equip. Storage	remove	3,130	400	7.8	3,130	7.8	-	-
Athletic Lockers / Showers	remove	1,500	400	3.8	1,500	3.8	-	-
Athletic Trailers	remove	1,440	400	3.6	1,440	3.6	-	-
Allied Health Center	existing	11,483	220	52.2	11,483	52.2	11,483	52.2
Allied Health Complex	existing	30,930	220	140.6	30,930	140.6	30,930	140.6
Auto Shop	remove	24,721	250	98.9	24,721	98.9	-	-
Business Resource Center	existing	21,360	450	47.5	21,360	47.5	21,360	47.5
Central Plant	existing	5,000	400	12.5	5,000	12.5	5,000	12.5
Child Development Center	existing	11,632	400	29.1	11,632	29.1	11,632	29.1
Child Development Portable 1	remove	1,440	400	3.6	1,440	3.6	-	-
Child Development Portable 2	remove	1,440	400	3.6	1,440	3.6	-	-
Communication	existing	8,064	450	17.9	8,064	17.9	8,064	17.9
East Stadium Restrooms	remove	2,500	400	6.3	2,500	6.3	-	-
Faculty Office Building	remove	3,147	450	7.0	3,147	7.0	-	-
Field House	existing	4,466	400	11.2	4,466	11.2	4,466	11.2
Grounds Building	remove	3,440	400	8.6	3,440	8.6	-	-
Gym	remove	30,224	400	75.6	30,224	75.6	-	-
Interdisciplinary Resource Center	existing	33,823	450	75.2	33,823	75.2	33,823	75.2
Lesher	existing	31,153	450	69.2	31,153	69.2	31,153	69.2
Library	existing	74,549	350	213.0	74,549	213.0	74,549	213.0
Mech AG	remove	14,395	400	36.0	14,395	36.0	-	-
Music	remove	5,978	400	14.9	5,978	14.9	-	-
Purch & Maint.	remove	16,972	450	37.7	16,972	37.7	-	-
Plant Science	remove	3,289	250	13.2	3,289	13.2	-	-
PS Greenhouse	remove	4,130	400	10.3	4,130	10.3	-	-
PS Fieldhouse	remove	960	400	2.4	960	2.4	-	-
Service Center	existing	6,357	450	14.1	6,357	14.1	6,357	14.1
Stadium Concessions	remove	651	450	1.4	651	1.4	-	-
Stadium Pressbox	existing	500	450	1.1	500	1.1	500	1.1
Stadium Restrooms	remove	2,673	400	6.7	2,673	6.7	-	-
Theater	existing	16,778	350	47.9	16,778	47.9	16,778	47.9
Transportation Building	remove	4,094	450	9.1	4,094	9.1	-	-
Tri-College 3	remove	2,880	400	7.2	2,880	7.2	-	-
Tri-College 5	remove	2,880	400	7.2	2,880	7.2	-	-
VOC I	remove	12,573	400	31.4	12,573	31.4	-	-
VOC II	remove	11,157	400	27.9	11,157	27.9	-	-
Welding & Metal Tech	remove	7,551	250	30.2	7,551	30.2	-	-
Gymnasium (inc. CNC)	new	61,000	400	152.5	-	-	61,000	152.5
Student Services	new	47,000	450	104.4	-	-	47,000	104.4
Music & Art	new	26,000	400	65.0	-	-	26,000	65.0
Instructional A	new	59,000	400	147.5	-	-	59,000	147.5
Instructional B	new	40,000	400	100.0	-	-	40,000	100.0
CTE A	new	28,000	400	70.0	-	-	28,000	70.0
CTE B	new	28,000	400	70.0	-	-	28,000	70.0
Mechanical Agriculture	new	30,000	250	120.0	-	-	30,000	120.0
Purchase & Maintenance	new	42,000	450	93.3	-	-	42,000	93.3
Tri-College	new	11,000	400	27.5	-	-	11,000	27.5
Animal Quarters	new	5,000	250	20.0	-	-	5,000	20.0
Animal Science	new	11,000	250	44.0	-	-	11,000	44.0
CDC	new	6,000	400	15.0	-	-	6,000	15.0
AG IT	new	30,000	250	120.0	-	-	30,000	120.0
TOTAL					540,348	1,583	762,402	2,145

TABLE 1 : COOLING LOADS CURRENT AND FUTURE

BUILDING	STATE	AREA	Sizing (btu/h/sf)	Heating Load (MBH)	AREA 2018	2018 Heating Load (MBH)	AREA 2028	2028 Heating Load (MBH)
Plant Science	existing	3,289	40	132	3,289	132	3,289	132
Science	existing	38,198	40	1,528	38,198	1,528	38,198	1,528
Student Union	existing	21,663	15	325	21,663	325	21,663	325
Pool Dress Building	existing	4,222	15	63	4,222	63	4,222	63
Administration	existing	14,935	15	224	14,935	224	14,935	224
AG Portables	remove	1,400	15	21	1,400	21	-	-
Agriculture	remove	3,270	40	131	3,270	131	-	-
Animal Quarters	remove	13,892	40	556	13,892	556	-	-
Animal Science	remove	7,280	40	291	7,280	291	-	-
Arts	remove	12,939	15	194	12,939	194	-	-
Athletic Equip. Storage	remove	3,130	15	47	3,130	47	-	-
Athletic Lockers / Showers	remove	1,500	15	23	1,500	23	-	-
Athletic Trailers	remove	1,440	15	22	1,440	22	-	-
Allied Health Center	existing	11,483	15	172	11,483	172	11,483	172
Allied Health Complex	existing	30,930	15	464	30,930	464	30,930	464
Auto Shop	remove	24,721	40	989	24,721	989	-	-
Business Resource Center	existing	21,360	15	320	21,360	320	21,360	320
Central Plant	existing	5,000	15	75	5,000	75	5,000	75
Child Development Center	existing	11,632	15	174	11,632	174	11,632	174
Child Development Portable 1	remove	1,440	15	22	1,440	22	-	-
Child Development Portable 2	remove	1,440	15	22	1,440	22	-	-
Communication	existing	8,064	15	121	8,064	121	8,064	121
East Stadium Restrooms	remove	2,500	15	38	2,500	38	-	-
Faculty Office Building	remove	3,147	15	47	3,147	47	-	-
Field House	existing	4,466	15	67	4,466	67	4,466	67
Grounds Building	remove	3,440	15	52	3,440	52	-	-
Gym	remove	30,224	15	453	30,224	453	-	-
Interdisciplinary Resource Center	existing	33,823	15	507	33,823	507	33,823	507
Lesher	existing	31,153	15	467	31,153	467	31,153	467
Library	existing	74,549	15	1,118	74,549	1,118	74,549	1,118
Mech AG	remove	14,395	15	216	14,395	216	-	-
Music	remove	5,978	15	90	5,978	90	-	-
Purch & Maint.	remove	16,972	15	255	16,972	255	-	-
Plant Science	remove	3,289	40	132	3,289	132	-	-
PS Greenhouse	remove	4,130	15	62	4,130	62	-	-
PS Fieldhouse	remove	960	15	14	960	14	-	-
Service Center	existing	6,357	15	95	6,357	95	6,357	95
Stadium Concessions	remove	651	15	10	651	10	-	-
Stadium Pressbox	existing	500	15	8	500	8	500	8
Stadium Restrooms	remove	2,673	15	40	2,673	40	-	-
Theater	existing	16,778	15	252	16,778	252	16,778	252
Transportation Building	remove	4,094	15	61	4,094	61	-	-
Tri-College 3	remove	2,880	15	43	2,880	43	-	-
Tri-College 5	remove	2,880	15	43	2,880	43	-	-
VOC I	remove	12,573	15	189	12,573	189	-	-
VOC II	remove	11,157	15	167	11,157	167	-	-
Welding & Metal Tech	remove	7,551	40	302	7,551	302	-	-
Gymnasium (inc. CNC)	new	61,000	15	915	-	-	61,000	915
Student Services	new	47,000	15	705	-	-	47,000	705
Music & Art	new	26,000	15	390	-	-	26,000	390
Instructional A	new	59,000	15	885	-	-	59,000	885
Instructional B	new	40,000	15	600	-	-	40,000	600
CTE A	new	28,000	15	420	-	-	28,000	420
CTE B	new	28,000	15	420	-	-	28,000	420
Mechanical Agriculture	new	30,000	40	1,200	-	-	30,000	1,200
Purchase & Maintenance	new	42,000	15	630	-	-	42,000	630
Tri-College	new	11,000	15	165	-	-	11,000	165
Animal Quarters	new	5,000	40	200	-	-	5,000	200
Animal Science	new	11,000	40	440	-	-	11,000	440
CDC	new	6,000	15	90	-	-	6,000	90
AG IT	new	30,000	40	1,200	-	-	30,000	1,200
TOTAL					540,348	10,642	762,402	14,373

TABLE 2 : COOLING LOADS CURRENT AND FUTURE

Recommended Infrastructure

PLUMBING

The building program area for the new buildings is yet to be developed, thus plumbing demands and services sizes shall be determined at a later phase of the project. These plumbing services will likely include (but may vary per building): domestic cold water, fire water, natural gas, sanitary waste, and storm drainage.

The current design includes approximately 220,000 GSF of additional new building area greater than the building area being removed. This additional building area likely has associated plumbing demands. The Civil Engineer shall evaluate the utility mains within the area and verify available capacities and sizes to accommodate the new program area.

ELECTRICAL

Existing peak kVA load data was not available for the campus. Detailed information regarding ratings and sizes of the overall campus distribution equipment and routing of distribution conductors was also not available, nor was load data for individual buildings. According to facilities, individual buildings are typically not provided with any metering equipment.

The following table estimates the current, and projected overall NEC demand load for the campus, based on individual building estimated power density (watts per square foot) and square footages.

As indicated in table 3, the estimated existing NEC demand for the campus is approximately 9,008 kW. The 2028 masterplan adds approximately 222,000 square feet to the campus and adds approximately 2,664 kW to the overall campus electric demand.

While these estimates are approximate, the projected total 2028 electrical demand of 11,671 kW equates to 540 amps at 12.47kV, the campus distribution voltage. Although the exact size of the campus distribution equipment was not available to PAE at the time, 600 amps at 12.47kV is a typical utility distribution increment.

Preliminary estimates imply that the existing campus service should be adequate for the 2028 masterplan; however, PAE strongly recommends further investigation into the existing system loads, capacities, ratings, and architecture.

BUILDING	STATE	2018 AREA (SF)	2018 Power Density* (W/SF)	2018 Electrical Load (kW)	2028 AREA (SF)	2028 Power Density* (W/SF)	2028 Electrical Load (kW)
Plant Science	existing	3,289	20	66	3,289	20	66
Science	existing	38,198	20	764	38,198	20	764
Student Union	existing	21,663	16	347	21,663	16	347
Pool Dress Building	existing	4,222	16	68	4,222	16	68
Administration	existing	14,935	16	239	14,935	16	239
AG Portables	remove	1,400	10	14	-	-	-
Agriculture	remove	3,270	16	52	-	-	-
Animal Quarters	remove	13,892	10	139	-	-	-
Animal Science	remove	7,280	16	116	-	-	-
Arts	remove	12,939	16	207	-	-	-
Athletic Equip. Storage	remove	3,130	5	16	-	-	-
Athletic Lockers / Showers	remove	1,500	10	15	-	-	-
Athletic Trailers	remove	1,440	5	7	-	-	-
Allied Health Center	existing	11,483	16	184	11,483	16	184
Allied Health Complex	existing	30,930	16	495	30,930	16	495
Auto Shop	remove	24,721	16	396	-	-	-
Business Resource Center	existing	21,360	16	342	21,360	16	342
Central Plant	existing	5,000	250	1,250	5,000	250	1,250
Child Development Center	existing	11,632	16	186	11,632	16	186
Child Development Portable 1	remove	1,440	16	23	-	-	-
Child Development Portable 2	remove	1,440	16	23	-	-	-
Communication	existing	8,064	16	129	8,064	16	129
East Stadium Restrooms	remove	2,500	5	13	-	-	-
Faculty Office Building	remove	3,147	16	50	-	-	-
Field House	existing	4,466	10	45	4,466	10	45
Grounds Building	remove	3,440	10	34	-	-	-
Gym	remove	30,224	10	302	-	-	-
Interdisciplinary Resource Center	existing	33,823	16	541	33,823	16	541
Lesher	existing	31,153	16	498	31,153	16	498
Library	existing	74,549	10	745	74,549	10	745
Mech AG	remove	14,395	20	288	-	-	-
Music	remove	5,978	16	96	-	-	-
Purch & Maint.	remove	16,972	10	170	-	-	-
Plant Science	remove	3,289	20	66	-	-	-
PS Greenhouse	remove	4,130	5	21	-	-	-
PS Fieldhouse	remove	960	5	5	-	-	-
Service Center	existing	6,357	16	102	6,357	16	102
Stadium Concessions	remove	651	5	3	-	-	-
Stadium Pressbox	existing	500	20	10	500	20	10
Stadium Restrooms	remove	2,673	5	13	-	-	-
Theater	existing	16,778	20	336	16,778	20	336
Transportation Building	remove	4,094	16	66	-	-	-
Tri-College 3	remove	2,880	16	46	-	-	-
Tri-College 5	remove	2,880	16	46	-	-	-
VOC I	remove	12,573	12	151	-	-	-
VOC II	remove	11,157	12	134	-	-	-
Welding & Metal Tech	remove	7,551	20	151	-	-	-
Gymnasium (inc. CNC)	new			-	61,000	8	488
Student Services	new			-	47,000	12	564
Music & Art	new			-	26,000	12	312
Instructional A	new			-	59,000	12	708
Instructional B	new			-	40,000	12	480
CTE A	new			-	28,000	16	448
CTE B	new			-	28,000	16	448
Mechanical Agriculture	new			-	30,000	16	480
Purchase & Maintenance	new			-	42,000	10	420
Tri-College	new			-	11,000	16	176
Animal Quarters	new			-	5,000	10	50
Animal Science	new			-	11,000	16	176
CDC	new			-	6,000	16	96
AG IT	new			-	30,000	16	480
TOTAL		**540,348**		**9,008**	**762,402**		**11,671**

2028 Net	Area	**222,054** SF
	Electrical Load	**2,664** kW

TABLE 3 : ESTIMATED ELECTRICAL DEMAND LOADS FOR 2018 AND 2028

Recommended Infrastructure

ENERGY EFFICIENCY

The campus current EUI (in kBtuh/SF-Yr) for current operation and projected operation by 2028 is shown on the table below. Note that future energy use projections were used assuming new buildings will be more energy efficient than current building stock, but not designed to be Net-Zero Energy (NZE) buildings. If the existing buildings go through renovations that improve their energy efficiency, and new buildings are designed, built, and operated for NZE performance, it is possible to expect a lower EUI for the campus in 2028.

BUILDING	STATE	AREA	EUI	AREA 2018	EUI 2018	AREA 2028	EUI 2028
Plant Science	existing	3,289	342.8	3,289	343	3,289	343
Science	existing	38,198	342.8	38,198	343	38,198	343
Student Union	existing	21,663	68.8	21,663	69	21,663	69
Pool Dress Building	existing	4,222	63.4	4,222	63	4,222	63
Administration	existing	14,935	68.8	14,935	69	14,935	69
AG Portables	remove	1,400	68.8	1,400	69	-	-
Agriculture	remove	3,270	40.5	3,270	40	-	-
Animal Quarters	remove	13,892	342.8	13,892	343	-	-
Animal Science	remove	7,280	342.8	7,280	343	-	-
Arts	remove	12,939	40.5	12,939	40	-	-
Athletic Equip. Storage	remove	3,130	63.4	3,130	63	-	-
Athletic Lockers / Showers	remove	1,500	63.4	1,500	63	-	-
Athletic Trailers	remove	1,440	63.4	1,440	63	-	-
Allied Health Center	existing	11,483	122.8	11,483	123	11,483	123
Allied Health Complex	existing	30,930	122.8	30,930	123	30,930	123
Auto Shop	remove	24,721	40.5	24,721	40	-	-
Business Resource Center	existing	21,360	68.8	21,360	69	21,360	69
Central Plant	existing	5,000	40.5	5,000	40	5,000	40
Child Development Center	existing	11,632	40.5	11,632	40	11,632	40
Child Development Portable 1	remove	1,440	40.5	1,440	40	-	-
Child Development Portable 2	remove	1,440	40.5	1,440	40	-	-
Communication	existing	8,064	68.8	8,064	69	8,064	69
East Stadium Restrooms	remove	2,500	63.4	2,500	63	-	-
Faculty Office Building	remove	3,147	68.8	3,147	69	-	-
Field House	existing	4,466	63.4	4,466	63	4,466	63
Grounds Building	remove	3,440	68.8	3,440	69	-	-
Gym	remove	30,224	63.4	30,224	63	-	-
Interdisciplinary Resource Center	existing	33,823	40.5	33,823	40	33,823	40
Lesher	existing	31,153	40.5	31,153	40	31,153	40
Library	existing	74,549	40.5	74,549	40	74,549	40
Mech AG	remove	14,395	342.8	14,395	343	-	-
Music	remove	5,978	40.5	5,978	40	-	-
Purch & Maint.	remove	16,972	68.8	16,972	69	-	-
Plant Science	remove	3,289	342.8	3,289	343	-	-
PS Greenhouse	remove	4,130	40.5	4,130	40	-	-
PS Fieldhouse	remove	960	40.5	960	40	-	-
Service Center	existing	6,357	342.8	6,357	343	6,357	343
Stadium Concessions	remove	651	128.2	651	128	-	-
Stadium Pressbox	existing	500	68.8	500	69	500	69
Stadium Restrooms	remove	2,673	40.5	2,673	40	-	-
Theater	existing	16,778	102.6	16,778	103	16,778	103
Transportation Building	remove	4,094	40.5	4,094	40	-	-
Tri-College 3	remove	2,880	40.5	2,880	40	-	-
Tri-College 5	remove	2,880	40.5	2,880	40	-	-
VOC I	remove	12,573	68.8	12,573	69	-	-
VOC II	remove	11,157	68.8	11,157	69	-	-
Welding & Metal Tech	remove	7,551	342.8	7,551	343	-	-
Gymnasium (inc. CNC)	new	61,000	20.0	-	-	61,000	20
Student Services	new	47,000	24.0	-	-	47,000	24
Music & Art	new	26,000	24.0	-	-	26,000	24
Instructional A	new	59,000	22.0	-	-	59,000	22
Instructional B	new	40,000	22.0	-	-	40,000	22
CTE A	new	28,000	24.0	-	-	28,000	24
CTE B	new	28,000	24.0	-	-	28,000	24
Mechanical Agriculture	new	30,000	132.0	-	-	30,000	132
Purchase & Maintenance	new	42,000	24.0	-	-	42,000	24
Tri-College	new	11,000	22.0	-	-	11,000	22
Animal Quarters	new	5,000	132.0	-	-	5,000	132
Animal Science	new	11,000	132.0	-	-	11,000	132
CDC	new	6,000	24.0	-	-	6,000	24
AG IT	new	30,000	132.0	-	-	30,000	132
TOTAL				540,348	110	762,402	69

CURRENT (2018) AND FUTURE (2028) ESTIMATED ENERGY USE INTENSITY (EUI)

Recommended Infrastructure

PHOTOVOLTAIC ARRAYS (PV)

Installing PV arrays can reduce both the campus' utility bills and the campus' carbon footprint. The campus appears to have significant site capacity to install PV arrays. PV arrays can be installed atop building roofs, parking canopies, or in large monolithic arrays on the site.

The ability of the PV power generation to be shared across the campus depends greatly on the tie-in point. Smaller arrays limited to discrete areas (e.g. building roofs) will tie into the respective building's main switchboard and will typically allow only that building to benefit from electricity generation offsets.

Should PV be a consideration for the masterplan, PAE would recommend further exploration into providing a large PV array tied into the medium voltage side of the campus distribution. This arrangement would allow electric generation to be shared/distributed as needed across the entire campus.

This would also involve coordinating with MID's electrical generation requirements as well as investigating the capacity of the existing 12kV switchgear to undergo modification.

Battery storage should also be considered. Battery storage will allow the campus to capture and store electric generation during times of low demand (weekends, spring break, etc), and utilize it during times of high demand.

The table below shows the size of the PV array required to have the Merced campus achieve NZE operation without battery storage or a micro-grid option. Based on current utility bills the campus operates at an EUI of ~110 kBtu/SF-Yr (multi-year average) requiring a 10,500 kW PV array.

In 2028, the expected PV array size for NZE operation is 9,300 kW, which interestingly is lower that the current requirement. The PV array size can be further reduced (and its physical and cost impact with it) if energy efficiency measures are implemented on the existing buildings to remain and the new buildings are designed with more aggressive energy efficiency goals. In addition, including PV battery storage and micro-grid strategies in the masterplan can further improve the campus energy efficiency and affect PV size.

	2018				2028			
Building Area	Area	EUI	kBTU		Area	EUI	kBTU	
	540,348	110	59,312,530		762,402	69	52,701,046	
NZE PV Array	Area	# of panels	Size(kWdc)	kWh	Area	# of panels	size(kWdc)	kWh
	512,377	29,167	10,500	17,383,508	453,820	25,833	9,300	15,445,793
PV/Building Area	0.95				0.60			
*PV Area based off Sunpower SPR-X22-360-COM production and dimensions, no spacing accounted for								

CURRENT AND ESTIMATED ENERGY USE INTENSITY (EUI)

PAE recommends the MEP strategies require further exploration as the masterplan develops. In some cases, further investigation into the existing mechanical, plumbing and electrical distribution system is required. This information will further inform whether specific components of the campus distribution system have adequate capacity, and whether equipment or infrastructure resizing is required.

The strategies include recommendations for mechanical, plumbing, and electrical systems to support the programmatic and building needs. In addition, PAE also included recommendations for energy and water conservation measures for the masterplan.

MECHANICAL

- Increase central plant cooling capacity to address future cooling load of campus 2028
- Or, implement campus design practices that will reduce existing buildings and new buildings cooling loads that will allow current plant cooling capacity to remain the same or be only slightly increased. If this strategy is used, current plant operation and maintenance should be reviewed to increase its life and energy efficiency.
- Current heating plant capacity can remain as is to support 2028 masterplan. However, current plant operation and maintenance should be reviewed to increase its life and energy efficiency.
- Consider including domestic hot water heating loads (restrooms, lockers, showers, kitchens) in the central plant load to further diversify the heating load, increase campus energy efficiency. This strategy can be achieved by using current heating hot water piping loop and adding heat exchangers at each building to use the heating hot water loop energy at each building. This strategy would make energy recovery and phase change thermal storage at the central plant more feasible.

Recommended Infrastructure

PLUMBING

- Renovate existing buildings with water-efficient plumbing fixtures to reduce domestic cold water and sewer water flows. This will help with the need to increase water infrastructure for the 2028 masterplan.
- See last item on mechanical section related to using the campus heating hot water loop to provide domestic heating hot water to campus buildings.

ELECTRICAL

- Renovate existing buildings with LED and current code required lighting and lighting controls to reduce electrical demand at existing buildings. This will help with the need to increase electrical infrastructure for the 2028 masterplan.
- Consider electrical system upgrades discussed in the energy efficiency section.

ENERGY EFFICIENCY

- Provide electrical sub-meters for every building.
- Provide electrical sub-metering at the central plant
- Provide gas sub-meters for every building.
- Sub-metering allows for energy use on campus to be better understood and for the facilities department and future consultant teams to have data to make more informed decisions on how to reduce current energy use and inform future energy use.
- Design future buildings for NZE operation with EUI target values based on Zero-Tool, or even better - https://zerotool.org/zerotool/
- Consider implementing a micro-grid strategy for the campus that includes PV arrays, electrical battery storage, and submetering for each building.
- See Energy Efficiency section for PV array sizing to achieve NZE operation.

WATER EFFICIENCY

- Provide a water meter on the domestic water service to each building.
- Provide a water meter for irrigation per building and each large lawn area.
- Provide a domestic water sub-meter on the following equipment within the building:
    - Mechanical Equipment
    - Domestic Water Heaters (exception: point-of-use heaters)
    - Commercial Kitchens
    - Locker Rooms
- Provide drought tolerant and native plants for all new landscape.
- Provide a drip irrigation system for all new landscape.
- Provide low flow fixtures (water closets, urinals, and faucets) for all new plumbing fixtures. Consider replacing fixtures in existing buildings.
- Utilize the Heating Hot Water provided to each building by the mechanical central plant. Provide a double-walled heat exchanger within the building to provide pre-heat before feeding the central domestic water heater.
- Review the Stormwater Management Plan developed by the Civil Engineer. If a cistern is required for rainwater collection, reuse this water to supply the drip irrigation system.

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