DRAFT January 2021

4.0

LONG RANGE DEVELOPMENT PLAN

4.1 Introduction

4.2 Physical Planning Principles and Guidelines

4.3 Land Use Plans

4.4 Integrated Transportation Strategy

4.5 Infrastructure and Utilities Framework

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4.1 Introduction

This Long Rang Development Plan will guide the placement and character of new development for academic, student and employee housing, and campus support facilities, while protecting the natural features in open space areas. It also guides the development of the circulation framework, utilities and other infrastructure in support of specific land uses. The land use plan has been guided by the planning considerations noted in the preceding Basis of Planning chapter. These criteria include the building program where specific areas are sized to accommodate the projected capacity; environmental conditions including significant slopes and biological resources that must be carefully navigated; and more stringent sustainability drivers and resiliency thinking which are integrated into every planning decision. The plan is informed by what the campus has learned from previous planning studies over the last fifty-five years, including campus planning principles set forth upon its founding in 1963, and has been further shaped and refined through engagement with our campus and surrounding community.

This chapter of the Long Range Development Plan includes these four key elements:

4.2 Physical Planning Principles and Guidelines

4.3 Land Use Plans
- Main Residential Campus Land Use Plan
- Westside Research Park Land Use Plan

4.4 Integrated Transportation Strategy
- Circulation Framework
- Transportation Modes
- Transportation Demand Management

4.5 Infrastructure and Utilities Framework
- Water
- Energy
- Data Network and Telecommunications

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4.2 Physical Planning Principles and Guidelines

The following Physical Planning Principles reflect the campus's approach that carefully balances its academic, research, and service mission with a commitment to environmental stewardship. This approach is framed by a deep respect for the spectacular natural environment entrusted to the campus. The campus is committed to being a model of sustainability leadership in development, design, and operations. The Physical Planning Principles articulate a pattern of development that will contribute to student success and promote the academic mission while respecting the unique history and environment of the site.

A. The Campus Land – Respect and Resiliency

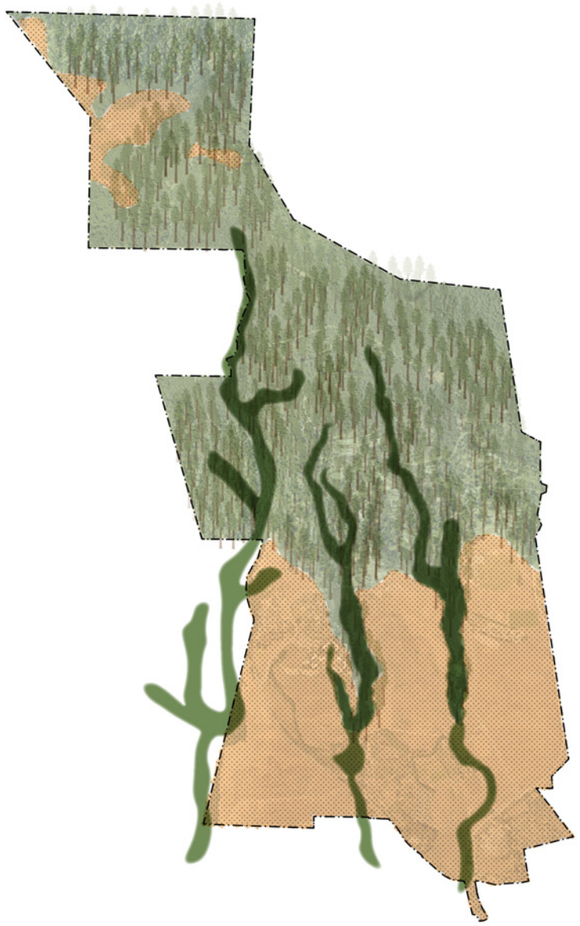
1. **Preserve the integrity of campus landscapes.**
   Buildings shall respond to the varied natural environments -- meadow, ecotone (forest edge), and forest – with architecture that is sensitive to the natural setting.

2. **Respect major natural features.**
   Maintain continuity of wildlife habitats, surface drainage flows, and compatibility of landscaping with surrounding native plant communities.

3. **Minimize disturbance to open space.**
   Retain for research and for its aesthetic values, as well as to honor the character and cultures of this incomparable site chosen for UC Santa Cruz.

4. **Integrate planning for long-term resilience.**
   To the extent possible, include climate adaptive strategies in all development to manage potential long-term and short-term challenges to the campus buildings and infrastructure. Foster conservation and maintenance of the land resource.

5. **Integrate the natural and built environment.**
   In forested areas, buildings should not protrude above the surrounding tree canopy; in visually sensitive areas, interruption of prime viewsheds and viewpoints will be minimized.



▲ Figure 4.1 Respect and Resiliency

B. Campus and Community - Culture and Connectivity

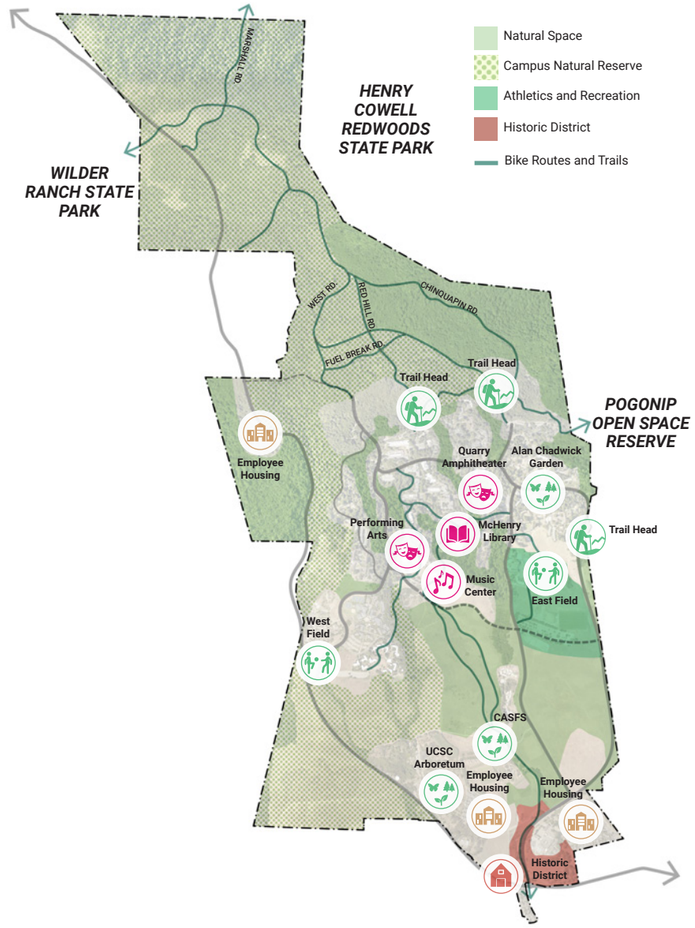
1. **Protect historic cultural resources.**
   Maintain the historical integrity of the Cowell Lime Works Historic District and other cultural resources through rehabilitation of structures while embracing opportunities for the area to more actively contribute to campus and community life.

2. **Protect prehistoric, archaeological and tribal cultural resources.**
   In recognition of the history of Indigenous peoples and their relationship to their traditional homeland, partner with the Amah Mutsun Tribal Band in designing land stewardship practices.

3. **Cultivate public programs as community resources.**
   Continue investments in programs serving both the campus and the Santa Cruz communities.

4. **Expand employee housing near campus entries.**
   Cluster development to share resources and infrastructure and locate with ease of access to city destinations and amenities.

5. **Ensure continued collaboration and communication with the greater community.**
   Work together to sustain economic, social and physical health for the region by identifying shared strategies that address common goals.



▲ Figure 4.2 Culture and Connectivity

C. Academic Core Infill and Expansion – Growth from Within

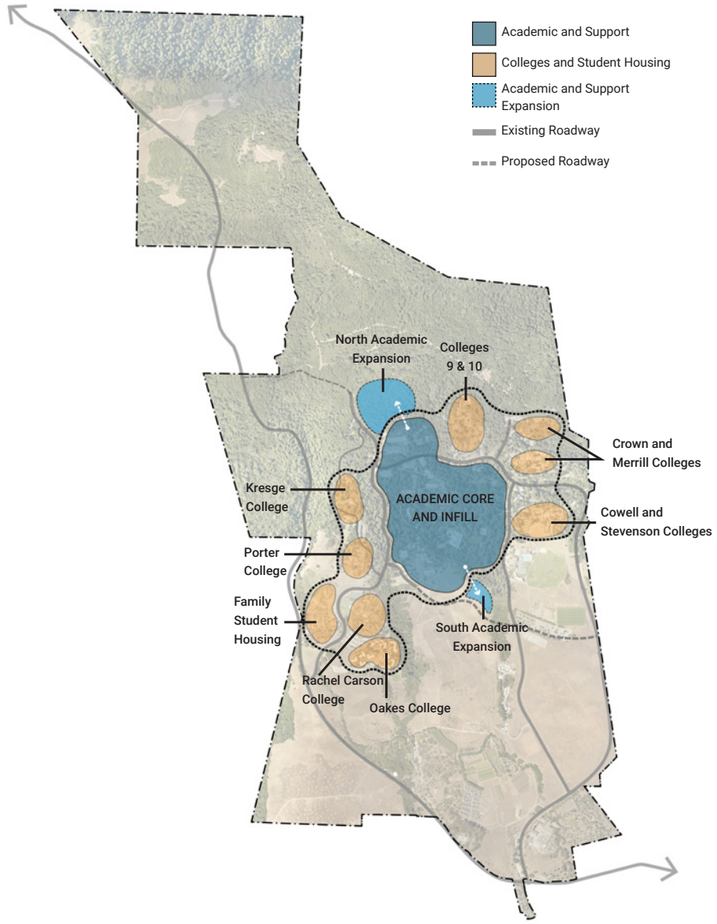
1. **Grow from within.**
   Focus growth in previously developed areas of the academic core, including infill buildings and opportunities to densify, to minimize impacts on the natural environment.

2. **Maintain adjacencies with existing development.**
   Continue compact expansion north of the Academic Core to facilitate connections to new neighboring colleges and student housing.

3. **Sensitively site buildings to protect scenic viewsheds.**
   Extend clustered development south of the Academic Core, maintaining the existing pattern of lower density development to minimize visibility of new buildings and maintain view corridors from existing buildings.

4. **Maintain an open space network within the academic core.**
   Provide a variety of outdoor spaces for colloaboration, contemplation, reflection and wellness.

5. **Build sustainably and efficiently.**
   Optimize investment in the land by considering long-term life cycle costs and increased building height, where feasible.



▲ Figure 4.3 Growth from Within

D. Campus Life and Housing – The Expanded Ring

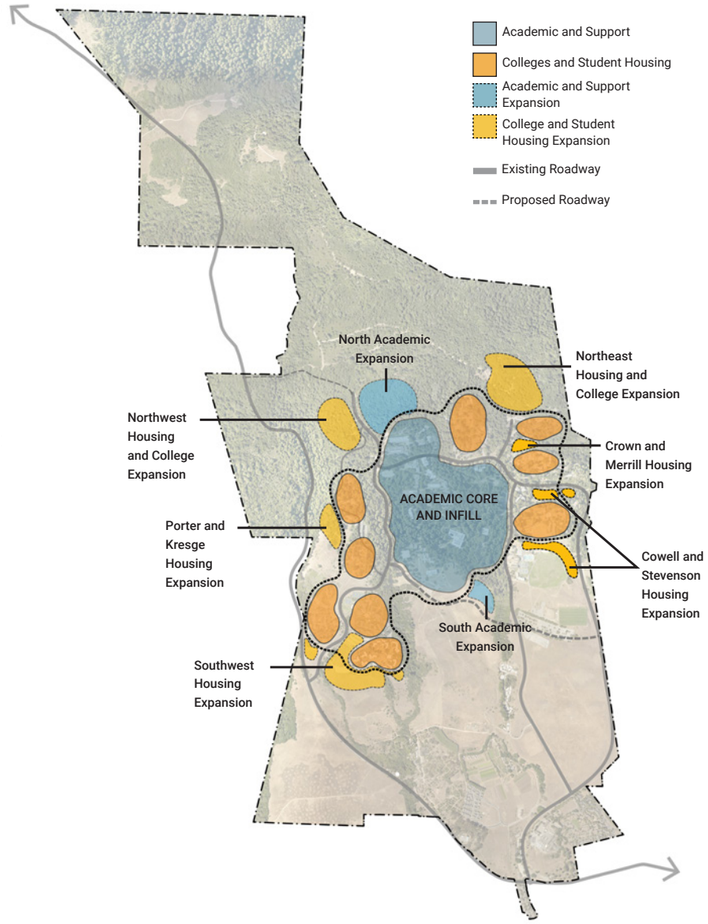
1. **Continue the pattern of colleges and student housing around the periphery.**
   Optimize access to learning, research, and student support destinations by locating colleges and housing as close to the academic core as possible.

2. **Cluster non-college student housing in infill locations near or adjoining existing colleges.**
   Support the diverse student body with a variety of housing types, located with convenient access to academic and student support services.

3. **Distribute recreational opportunities close to student housing.**
   Complement concentrated college athletic facilities at the Athletics and Recreation area by promoting a diverse array of other opportunities for wellness and exercise throughout the campus.

4. **Enrich the quality of campus life.**
   Provide a variety of public services and student support spaces to help meet basic needs and allow students to thrive.

5. **Provide supportive living / learning communities.**
   Continue to balance the context of a major research university with the more intimate scale in the residential colleges.



▲ Figure 4.4 The Expanded Ring

E. Integrated Transportation – Walkable Core

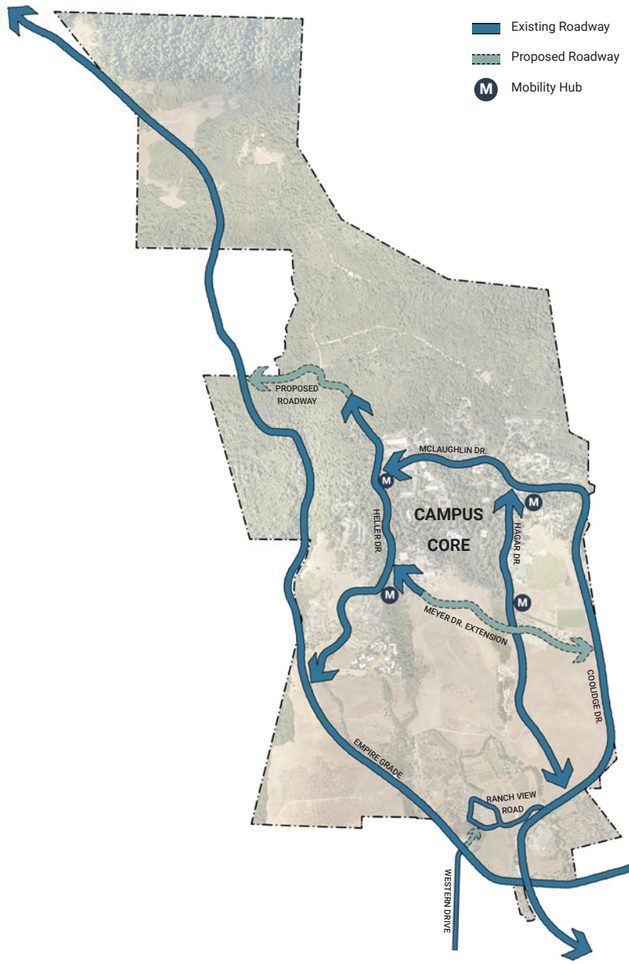
1. **Consolidate parking at the periphery of the academic core.** Serve with frequent, direct transit service and enhanced walking and biking pathways directly connecting to the academic core.

2. **Activate the core.** Limit routine vehicular traffic flow from internal roadways to prioritize pedestrian connectivity and promote a safe pedestrian environment.

3. **Prioritize efficient transit access and routes.** Extend Meyer Drive to create an inner campus loop and interconnected roadway network for improved access.

4. **Create active building frontages at ground level.** Enhance the visual and experiential quality of the pedestrian and connect interior programs visually with exterior surroundings.

5. **Generate dynamic public gathering spaces.** Provide gathering spaces shared between buildings and at entries for increased public activity and to foster dynamic interactions between students, faculty and staff.



▲ Figure 4.5 Walkable Core

F. Pedestrian Mobility - Web of Pathways

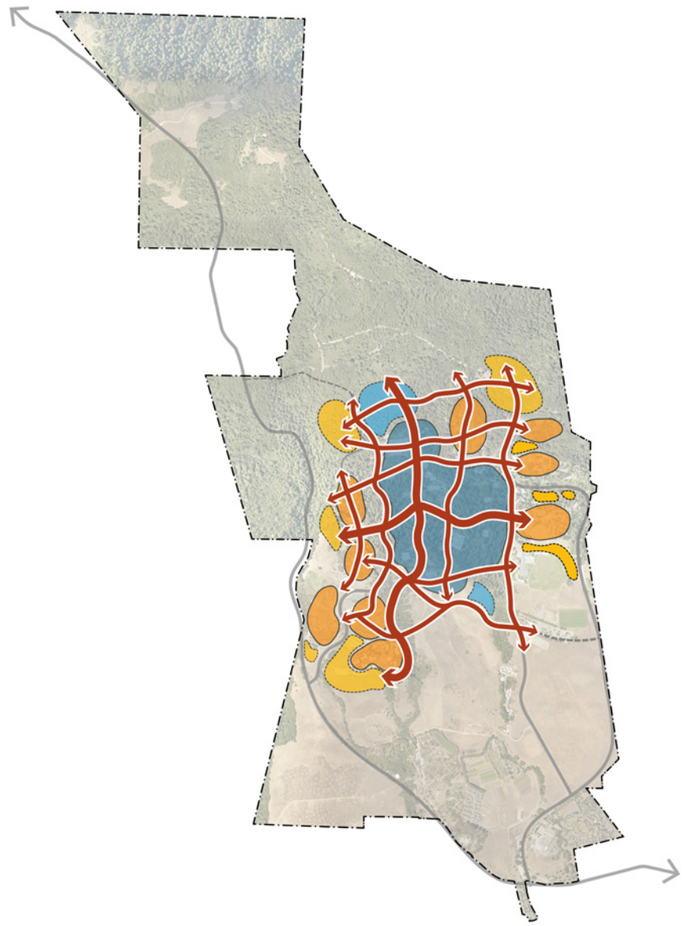
1. **Extend the pattern of east-west pedestrian paths.** Provide convenient and direct access from new housing at the periphery to academic and social destinations in the core.

2. **Improve existing pathways to reinforce walkability.** Designate and prioritize select pedestrian corridors between key destinations throughout campus.

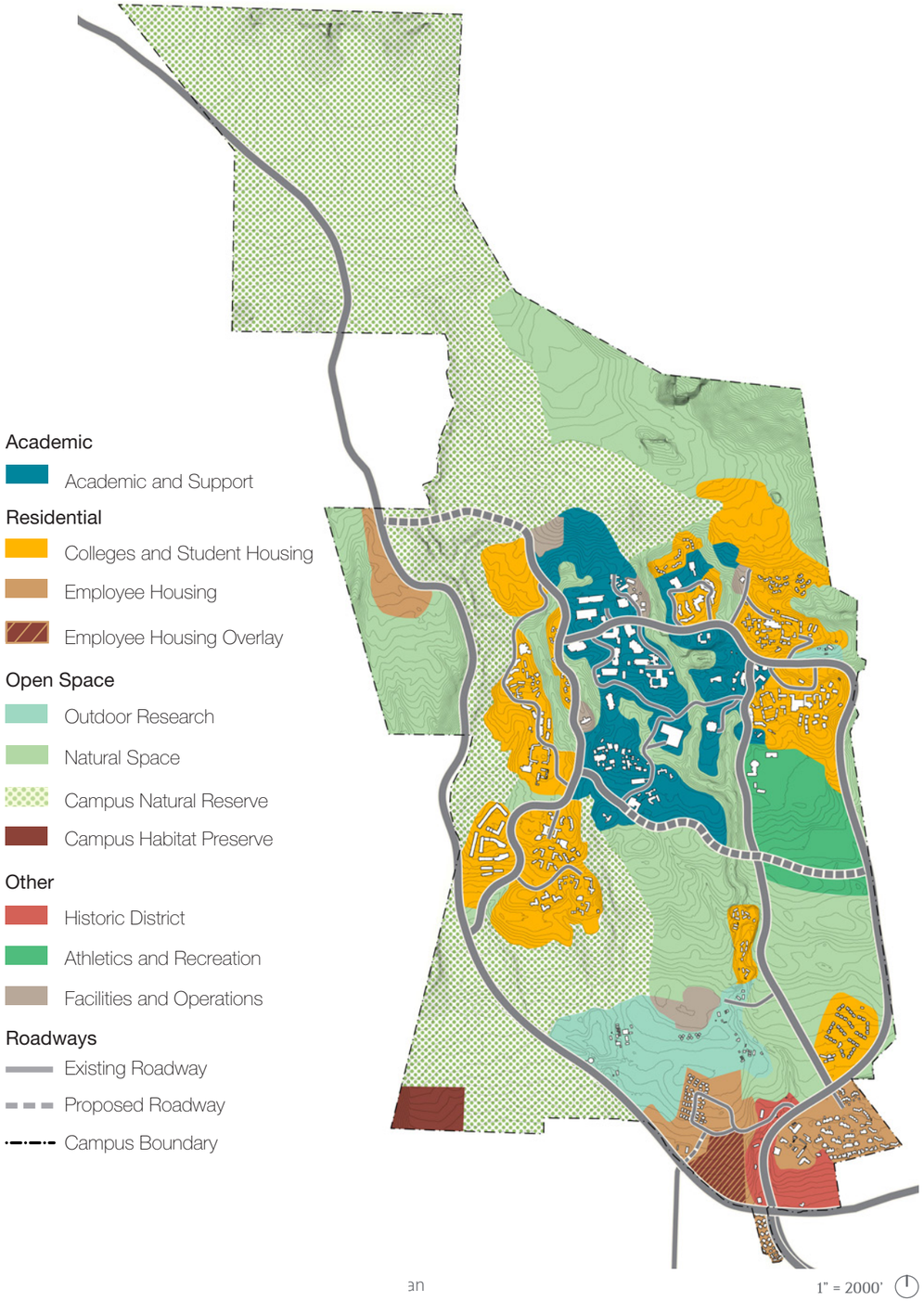
3. **Strive to provide equal access throughout campus.** Remove barriers through physical and programmatic improvements.

4. **Expand comprehensive program of Travel Demand Management (TDM) strategies.** Continue to expand options and incentives for alternative circulation modes, such as walking and bicycling.

5. **Manage service road access with public circulation.** Promote use of service roads to safely accommodate bicycle and pedestrian circulation. Avoid pedestrian and vehicular conflicts where possible and route deliveries and loading docks away from building entries and gathering spaces.



▲ Figure 4.6 Web of Pathways



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4.3 Land Use Plans

Main Residential Campus Land Use Plan

The land use plan is characterized by a compact academic core to minimize the need to build on natural open space areas. Maximizing access to academic destinations, creating dynamic concentrations of social activity, and sharing amenities across multiple programs are added benefits. The strategy of growing from within relies on utilizing remaining infill sites within already developed areas. The unique topography and vegetation at UCSC can be challenging to navigate; increased density offers opportunities for greater collaboration and interaction throughout the campus.

The academic core continues to be surrounded by an expanded ring of colleges and student housing, where two pairs of colleges are proposed. The college pairs punctuate the northwest and northeast corner of the campus, and a greater amount of student housing for upper division undergraduate, transfer, and graduate students nestles between colleges as infill projects. The plan includes capacity to house 100 percent of new student enrollment on campus to minimize the impact off campus, strengthen the student experience, and encourage convenient access to academic and support facilities.

With the developable footprint only slightly larger than that proposed in the previous LRDP, the campus is able to embrace a robust open space network of Campus Natural Reserve, Natural Space, Outdoor Research and Habitat Preserve. This open space will reinforce the campus's commitment to environmental stewardship, bridge concepts learned in class with a living library and laboratory, and connect students with a sense of place in the greater community.

The plan also includes a new vision for the Westside Research Park. The west side of Santa Cruz is a newly evolving area with interesting potential as it transitions from traditional light industrial and logistics uses to a mix of research and development, office and support services. In addition, the area has added modest amounts of housing as well as coffee shops, restaurants, and breweries, among other uses. A former freight rail line runs east-west just north of the site. In the short run is being improved as a multi-modal (bike and pedestrian) corridor, and in the long run may support commuter rail potentially extending to Watsonville.

The land use plan is complemented by an integrated mobility strategy, which envisions integrating alternative modes of transportation (transit, pedestrian and biking) with peripheral parking to promote a walkable campus. Integral to this concept is constructing the proposed Meyer Drive extension, creating an inner campus roadway loop for more efficient transit, and developing of mobility hubs for a more seamless and efficient transfer from one mode to another.

Finally, the land use plan is supported by a framework of utilities and infrastructure to support new development. As the campus has aged, the need to invest in existing systems is greater. The compact developable area allows the campus to continue to rely on our existing system, with new extensions for areas of expanded development. The tight footprint of academic space and student housing will foster a more socially and physically resilient framework to support increased growth.

A fundamental premise of the 2021 LRDP is to build upon the foundation of previous plans, including the pattern of development that has evolved since the campus was founded, while reinforcing the best elements and guiding the campus toward continued evolution and success.

Land Use Designations

Academic

Academic and Support (AS) *163 acres*

The principal uses include teaching, research, faculty and administrative offices, classrooms, libraries, student support and amenities such as food services, the bookstore, and conference and special event spaces.

Allowable support uses may include utility and facilities maintenance space, storage, delivery zones, and a limited amount of parking.

Approximately 163 acres are designated Academic and Support land use at the main residential campus and approximately 8 acres at the Westside Research Park under the LRDP (approximately 20 additional acres compared to the 2005 LRDP). The Academic and Support land use designation is the primary land use associated with the academic mission, as well as the administrative and student support space necessary to fulfill it. Along with housing, it accommodates the vast majority of the overall campus development area (i.e., area that is not open space.)

New buildings would generally be similar in height to those in the academic core today, ranging in height between four and six stories in height. To the south of the academic core, in the meadow, buildings would range from two to four stories in height, and would be sited to minimize their visibility at the top of the adjoining meadows. To the north of the academic core, within forested areas, buildings may be as tall as six or more floors, as dictated by their programs. This greater density of development will allow academic destinations to be located in close proximity to one another, maximizing land use efficiency and accessibility for faculty, staff, and students.

The Academic and Support land use is predominantly clustered in the academic core, with some academic and support building space included in the colleges and the Westside Research Park. In addition to new areas for the development of this land use, the land use designation provides for the use of existing infill sites, as well as potential renovation of existing buildings under the LRDP.

Residential

Colleges and Student Housing (CSH) *277 acres*

The principal uses include student housing, food services, student services, academic, student support, childcare, and athletics and recreation spaces.

Allowable supporting uses include limited campus support and parking.

The Colleges and Student Housing land use designation totals 277 acres (approximately 32 additional acres compared to the 2005 LRDP). As shown in Table 4.1, the LRDP plans land uses to house up to an additional 8,500 students in residence halls and apartments. Colleges and student housing will continue to be provided around the perimeter of the academic core to facilitate convenient access to instruction and research facilities and student support spaces throughout the day.

Two distinct student housing types will be provided on campus: housing in new colleges intended primarily for first year students, and housing not formally affiliated with the colleges and intended for continuing, upper division or graduate students.

The campus will continue to grow by colleges, which are organized as active living – learning environments and include academic space as well as residential amenities such as dining halls, food service, community rooms, social and study spaces, and administrative support. Colleges

at UC Santa Cruz are paired to share common resources with two new pairs of colleges proposed in the LRDP. The college environment combines a supportive social structure, essential to academic success and personal growth, with an enhanced intellectual life to create a vibrant living – learning community for students.

Where colleges primarily support first year housing needs, non-college-affiliated housing is also offered for continuing students, graduate students, and transfer students, who desire more independent housing types and additional privacy. Student housing would continue to include amenities such as food service, recreational facilities, study and social lounges, among others.

As the campus includes various landscape typologies, the density of housing development will generally be informed by where it is sited and the immediate natural setting. Where housing is located in or near the evergreen and redwood forests toward the north, buildings will likely be denser, generally four to eight stories and potentially higher, in order to reduce their footprint and physical extent. Where located in visually sensitive areas, housing will be lower in density and height to maintain scenic viewsheds and configured to minimize visual interruptions.

Employee Housing (EH) *82 Acres*

The principal uses include housing for staff and faculty.

Allowable supporting uses include childcare, recreation and other community amenities, public services, limited campus support facilities, and parking.

Approximately 82 acres are designated Employee Housing land use in the LRDP (approximately 7 additional acres compared to the 2005 LRDP). Employee housing designation would provide on-campus housing for up to 25 percent of new employees, based on demand, in a variety of housing types primarily including townhomes and apartment-style buildings.

The land use is included in several distinct areas on the south and west side of the campus, primarily clustered around the main residential campus entrance in order to allow families and spouses convenient off-campus access, and to utilize more centrally located areas near the academic core for student housing.

The plan proposes expanding two areas of existing employee housing, including south of Coolidge, maintaining the character of the surrounding Historic District, and adjacent to Ranch View Terrace. A new area across Empire Grade, tucked into the woods, is also included. Additional employee housing, allowable under the Mixed-Use land use designation, would be located at the Westside Research Park.

Employee Housing Overlay Site

Approximately 12.5 acres of the Employee Housing land use designation is shown within the southern portion of the main residential campus as an overlay on Inclusionary Parcel D Preserve. The area was previously set aside in a Habitat Conservation Plan (HCP) as a habitat preserve for the Ohlone tiger beetle and the California red-legged frog. UC Santa Cruz is interested in exploring the feasibility of developing this parcel, while seeking to enhance the conservation strategy of the HCP at a different location. Because this area was previously set aside as a habitat preserve, UC Santa Cruz understands that any development on the parcel would require permission from state and federal agencies and, most likely, a set aside of other property that would be a suitable habitat for these species. UC Santa Cruz anticipates engaging in broader habitat conservation planning in cooperation with United States Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) to ensure the long-term viability of sensitive species and habitat on the campus.

Open Space

Outdoor Research (OR) *74 acres*

The principal uses would include landscape-based instruction and research with accompanying buildings for educational programs and visitor resources.

Allowable supporting uses could include minor access roads and a limited amount of parking.

Approximately 74 acres are designated Outdoor Research in the proposed LRDP, which is a decrease of about 78 acres of land designated Site Research and Support in the 2005 LRDP. This designation includes active landscapes for teaching, learning, research, and community education. It supports the following existing research programs: CASFS farm; the Arboretum and Botanic Garden; and the Chadwick Garden. The principal academic divisions associated with this land use include Social Sciences and Physical and Biological Sciences.

The acreage of land designated Outdoor Research to support the Chadwick Garden has remained the same as in the 2005 LRDP. The acreage of land designated to support the CASFS program, or Farm, is also the same as in the 2005 LRDP; the area known as the Village, where the Program in Community and Agroecology is located, is now included in the Colleges and Student Housing land use designation. At the Arboretum, approximately 20 acres stretched in a north-south direction along the Moore Creek ravine were removed from the previous Site Research and Support land use designation and now are designated Natural Space and Campus Natural Reserve.

The Chadwick Garden is located at the east end of McLaughlin Drive. The Arboretum and the Farm are located in the lower campus subarea. The Arboretum is accessed off of Empire Drive and the Farm can be entered from multiple locations, including Village Road or Ranch View Road, or by foot on Farm Road.

Natural Space (NS) *513 acres*

The principal use is to preserve the landscape in its natural state, including the Great Meadow and existing ravines and drainages throughout the campus.

Supporting uses could include carefully sited paths, roads, and unobtrusive research uses which do not impinge on overall character.

Approximately 513 acres are designated Natural Space in the proposed LRDP, an increase of about 10 acres compared to the 2005 LRDP (where it was designated Protected Landscape). The purpose of the Natural Space designation is to maintain special campus landscapes for their scenic value and maintain special vegetation and wildlife continuity zones that are intrinsic to the campus's identity.

Campus Natural Reserve (CNR) *789 acres*

The principal use is to preserve landscapes in their natural state, where construction is prohibited except as required for maintenance of the area as a teaching, learning and research reserve.

Supporting uses include the limited construction of carefully sited roads, access paths, bridges, below-grade utility access and unobtrusive research equipment.

Approximately 789 acres is designated Campus Natural Reserve in the proposed LRDP, an increase of approximately 379 acres from the 2005 LRDP. This is largely a result of the compact boundaries of land designated Colleges and Student Housing and Academic and Support translating into more land being protected as Campus Natural Reserve, as well as removal of the Campus Resource Land designation from the 2005 LRDP. The intent of this land use designation is to protect natural features and processes for the purposes of teaching, learning, and research, as integral to the academic mission. The boundary of the Campus Natural Reserve captures critical habitat and sensitive vegetation, specific sites engaged in long-term research, wildlife continuity zones, and sensitive archaeological resources.

The Campus Natural Reserve will continue to be managed in consultation with the Campus Natural Reserve Committee and, where there are common borders, the UC Santa Cruz Arboretum. The Campus Natural Reserve is located primarily on the west side of the campus.

Campus Habitat Preserve

Two areas on the campus, which total approximately 26 acres, are designated as Campus Habitat Preserve in the LRDP. The larger of these two areas, a 13 acre parcel in the southwestern corner of the campus adjacent to Wilder Creek, is designated as a preserve to retain high-quality grassland and forest habitat on the campus for the California red-legged frog and the Ohlone tiger beetle. This preserve was established pursuant to a 2005 Implementing Agreement between USFWS and the Regents and is referred to as Inclusionary Parcel A Preserve. The second area, a 12.5 acre parcel, is located in the southern portion of the campus near the main entrance. It is referred to as Inclusionary Parcel D Preserve. The southern portion of the parcel is designated as a management site for Ohlone tiger beetle habitat with the remainder of the site managed for California red-legged frog. Campus Habitat Preserve lands are protected lands that will remain undeveloped except as permitted by the terms of the Implementing Agreement and associated HCP. Under the LRDP, an employee housing overlay on Parcel D Preserve is proposed.

Other

Historic District (HD) *28 acres*

Principal uses within the Historic District would include academic and support, and public services, including campus and community amenities.

Supporting uses include facilities and operation, as well as limited parking.

The Historic District designation pertains to approximately 28 acres within the lower campus subarea that are associated with the Cowell Lime Works Historic District. The Cowell Lime Works Historic District, which is listed on the National Register of Historic Places and the California Register of Historical Resources, encompasses cultural resources related to the original 19th century Cowell Ranch limestone industry. This area is currently used primarily for campus support activities (e.g. admissions office), facilities and operations, and academic (e.g. hay barn.) Under the proposed LRDP, the boundary of the Historic District is the same as the land use designation. In the 2005 LRDP, the Historic District was an overlay district layered on the Campus Support land use designation. The intent of the Historic District designation is to recognize and integrate our regional history by rehabilitating historic structures with programs that will actively contribute to our campus and community life. Located at the entry to the main residential campus, an intentional gateway is envisioned to express the unique historic and cultural context of UC Santa Cruz.

Athletics and Recreation (AR) *67 acres*

Principal uses associated with this land use designation include playing fields and outdoor courts, indoor recreational facilities, event spaces and health and wellness facilities.

Supporting uses include parking and transit/ mobility hub facilities, and limited public services, including food service, academic and student support uses.

Approximately 67 acres are designated Athletics and Recreation in the proposed LRDP, a decrease of about 19 acres compared to the 2005 LRDP. This decrease is due to the removal of a secondary Athletics and Recreation area on the west side of the campus which was identified in the 2005 LRDP and is not included in the proposed LRDP. Instead, in recognition of the need for distributed recreational facilities to support increased housing throughout the campus, recreation and athletics facilities have also been included as a supporting use in the Colleges and Student Housing land use designation. As with Rachel Carson College, these may include small field houses offering courts and exercise rooms and may also include small playing fields and open areas suitable for informal use.

Existing recreational and athletic facilities on campus are concentrated in one area of relatively flat land in the eastern portion of the campus, and support recreational programs, intercollegiate athletics, and health and wellness activities for the UC Santa Cruz and local community. The fields and facilities are also used for special events, such as graduation, concerts, and fairs. The Recreation and Athletics land use designation serves an important aspect of public life for both the campus and local community.

The area designated Recreation and Athletics also includes a potential site for an event center that could accommodate both athletics and cultural events. Buildings supporting indoor recreation would be sensitively sited and developed at a low density and profile to maintain the sense of open space and scenic viewsheds. The Recreation and Athletics land use designation may also include utility infrastructure systems such as stormwater facilities, field illumination, bicycle infrastructure, and pedestrian amenities.

Facilities and Operations (FO) *21 acres*

The principal uses include facilities-related support offices, mechanical equipment, storage, corporation yards, and parking for faculty and staff.

Approximately 21 acres are designated Facilities and Operations land use under the proposed LRDP, a decrease of 68 acres compared to the 2005 LRDP. This land is intended to serve the operational needs of the campus. Limited campus support use is included as an allowable supporting use in housing designations for flexibility.

The proposed land use plan identifies several areas for dedicated Facilities and Operations support. Four of these areas expand existing Facilities and Operations facilities, including an area near the Cogeneration plant, an area near the campus fire station, an area adjacent to the Environmental Health and Safety facility off of Heller Drive at the west, and an area around the Recycling Yard in the Lower Meadow. The plan also introduces a new area located at the northwest corner of the central campus subarea with access via Heller Drive, which would allow for campus operations-oriented functions to be relocated from the lower campus subarea to allow improvements to the main residential campus entry for community-facing programs, public services and employee housing.

Table 4.1 Land Use Designations and Proposed Acreages - Main Residential Campus

	LAND USE DESIGNATIONS	2005 LRDP (ACRES)[1]	2021 LRDP (ACRES)
Academic Land Use Designations	Academic and Support[2]	132	163
Residential Land Use Designations	Colleges and Student Housing	245	277
	Employee Housing[3]	75	82[2]
Open Space Land Use Designations	Outdoor Research[4]	152	74
	Campus Natural Reserve[5]	410	789
	Natural Space[6]	503	513
	Campus Resource Lands[7]	318	0
	Campus Habitat Preserve[8]	26	26
Other	Historic District[9]	0	28
	Athletics and Recreation[10]	86	67
	Facilities and Operations	89	21
	Total acreage[11]	**2,036**	**2,040**

1. Two minor amendments were made to the 2005 Land Use Map. In 2016, Phase 1 of the Recycling Yard Project amended the LRDP by converting 1.6 acres of land from Protected Landscape to Campus Support and 2.1 acres of land from Site Research and Support to Campus Support for a total of 3.7 acres converted to Campus Support. In 2019, approximately 17 acres of land were redesignated from Campus Resource Land to Colleges and Student Housing in a LRDP amendment for the Student Housing West Project, which was approved by the Regents in 2019.
2. Called “Academic Core” in the 2005 LRDP
3. The 12.5-acre Employee Housing Overlay on the Inclusionary Parcel D Preserve is not included in the overall acreage.
4. Called “Site Research and Support” in the 2005 LRDP
5. Called “Campus Natural Reserve and Campus Habitat Reserve” in 2005 LRDP
6. Called “Protected Landscape in the 2005 LRDP”
7. This 2005 designation was redistributed across “Campus Natural Reserve” and “Natural Space” designations
8. Campus Habitat Preserve is composed of two mitigation parcels: Inclusionary Parcel D Preserve, which is 12.5 acres, and Inclusionary Parcel A Preserve, which is 13 acres. Both Inclusionary Parcel A Preserve and Inclusionary Parcel D Preserve were preserved under the Habitat Conservation Plan (HCP) prepared in support of the Incidental Take Permit (ITP) for the Ranch View Terrace project. Inclusionary Parcel A Preserve is preserved in perpetuity, and Inclusionary Parcel D Preserve is preserved through the ITP term of 60 years. Inclusionary Parcel D Preserve has an Employee Housing overlay under the LRDP, which would require a modification to the HCP if it were be developed in the future.
9. The Historic District was included as an overlay District in the 2005 LRDP
10. Called “Physical Education and Recreation” in the 2005 LRDP
11. Acreages are approximate, include rounding, and are based on 2005 LRDP, Draft 2021 LRDP, County parcel information, and GIS data.

West Side Research Park Campus Land Use Plan

The west side of Santa Cruz is a newly evolving area with interesting potential as it transitions from traditional light industrial and logistics uses to a mix of research and development, office, and support services (Figure 4.8). In addition, the area has added modest amounts of housing as well as coffee shops, restaurants, and breweries, among other uses. A former freight rail line runs east-west just north of the site. In the short term it is being improved as a multi-modal (bike and pedestrian) corridor, and in the long term may support commuter rail potentially extending to Watsonville.

Academic and Support (AS) *7 acres*

The principal uses and the allowable supporting uses under this designation at the Westside Research Park are the same as described above for the main Residential Campus.

With UCSC's acquisition of the former Texas Instrument facility, the campus has been able to move select research, teaching and administrative uses to this site and buildings. The Academic and Support land use designation is concentrated at the existing building, which will continue to anchor the research park.

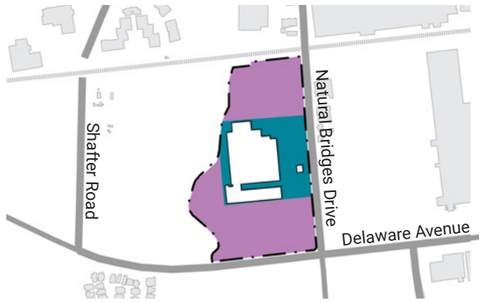
Mixed Use (MU) *11 acres*

The principal uses under this designation include academic and support, student housing, employee housing, public services, and limited campus support.

Supporting uses include food services, mobility/ transit service space, and parking.

Approximately 11 acres are included in the Mixed Use land use designation in the LRDP. This land use designation applies specifically to land at the Westside Research Park. The intent of this designation is to recognize the evolving nature of the surrounding area, and to allow the development of other program opportunities beyond academic and support to create a diverse, vibrant, and active site.

The site and adjoining street and curb space may also help to support an expanded mobility hub with shuttle stop and connections to the railroad bikeway and the main residential campus.



▲ Figure 4.8 Westside Research Park Land Use Plan

▼ Table 4.2 Land Use Designations and Proposed Acreages - Westside Research Park

LAND USE DESIGNATIONS	2005 LRDP (ACRES)	2021 LRDP (ACRES)
Academic & Support[1]	18	7
Mixed Use	--	11
Total Acreage	**18**	**18**

1. Called "Academic Core" in the 2005 LRDP
2. Acreages are approximate, include rounding, and are based on 2005 LRDP, Draft 2021 LRDP, County parcel information, and GIS data.

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4.4 Integrated Transportation Strategy

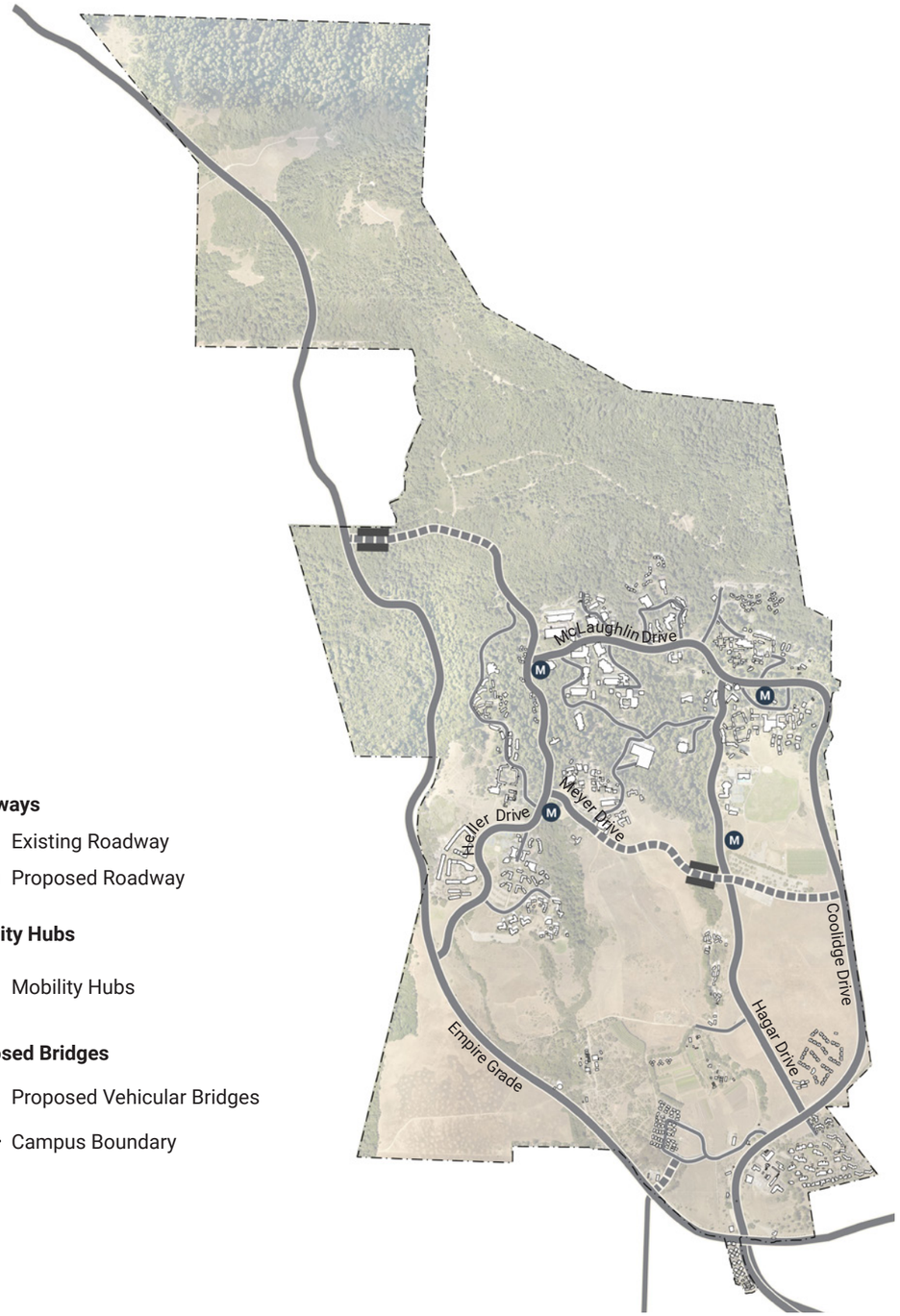
Introduction

The LRDP integrated transportation strategy builds on the substantial progress UCSC has made on transportation and further articulates a campus-wide vision combining improved access and connectivity for all forms of mobility.

As the UC Santa Cruz campus grows, it is essential to fill gaps in the existing transportation network, expand circulation infrastructure, and continue travel demand management (TDM) programs, or strategies that result in more efficient use of transportation resources by decreasing demand and incentivizing transit, bike, and walking to reduce single occupant vehicle (SOV) trips. Over the course of the last 15 years, the campus has been successful in limiting total campus trips, maintaining an approximately 35 percent single occupant vehicle mode share, building minimal new parking, increasing transit ridership and improving bicycle facilities. The LRDP transportation strategy requires innovation, partnerships, and a recognition of how integral transportation is in all aspects of campus life.

Vision and Goals

The 2021 LRDP envisions a mobility approach where transportation programs are integrated with a compact land use plan to facilitate improved and efficient access. The LRDP Integrated Transportation Strategy is guided in part by State, UC and campus sustainability goals to reduce single occupant vehicle use and resulting greenhouse gas emissions, reduce the number and distance of trips, promote transit and encourage infill development to ease access. In support of these goals and targets, the 2021 LRDP envisions a walkable campus core with interconnected pedestrian corridors linking colleges and housing to academic and student support destinations at the main residential campus. To encourage safe pedestrian activity, vehicular access would be limited within the academic core, where multimodal hubs at the periphery would provide commuter parking and direct connections to paths and transit. Similarly, the Westside Research Park is positioned to make good use of the mixed use land use designation and proximity to the Coastal Science Campus, state parks, and city amenities to promote active transportation, such as walking and biking. A mobility hub on the north end of the site will help ensure seamless integration with transit and enhanced connectivity with the main residential campus.



▲ Figure 4.9 Roadways and Primary Mobility Hubs

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Circulation Framework

The following sections provide an overview of each transportation mode serving campus.

Roadway Network

UC Santa Cruz's main residential campus is served by two roadway entrances: the main entrance at the Bay Drive/High Street/Coolidge Drive intersection and the west entrance at the Empire Grade/Heller Drive intersection. Four primary roadways provide circulation within the campus: Coolidge Drive, Hagar Drive, Heller Drive, and McLaughlin Drive. Other internal campus roadways serve individual colleges, housing areas and the academic core. Westside Research Park is served by two city streets: Natural Bridges Drive and Delaware Avenue.

The LRDP vehicular circulation framework includes several planned new roads to provide better cross-campus transit service, create safer bicycle and pedestrian environments, and fill gaps in the existing roadway system. All new roadways are envisioned as multimodal "complete streets," where bicycle and pedestrian amenities are included to reflect integrated transportation principles and guidelines.

As shown in Figure 4.9, three new roadways are proposed as part of this plan.

- **East-West Extension of Meyer Drive from Heller Drive to Coolidge Drive**. Meyer Drive would be extended from the Arts Area across the top of the Great Meadow, over Jordan Gulch via a new bridge structure to connect with Hagar Avenue at a new intersection near the entrance to the East Remote parking lot. The roadway extension alignment would generally continue from this intersection along the southern edge of the East Remote parking lot and terminate at Coolidge Drive. This extension would facilitate cross-campus bus travel and could also provide a new east-west walking and bicycling connection. The Meyer Drive extension would increase overall campus mobility and facilitate improved transit routing. The Meyer Drive extension would also allow for private vehicle access to be restricted on McLaughlin Drive during certain time periods such as class changes to facilitate better and safer walking, bicycling and transit access. Automobile access could be limited on a portion of the extension between the Arts Area to Hagar Drive to prioritize transit, bicycle, and pedestrian circulation. Careful consideration would be given to the final alignment of the roadway, to avoid conflicts with the Webster Way Bike Path through the Great Meadow.
- **Northern Entrance**. A new roadway connection from the northern terminus of Heller Avenue (the current North Perimeter parking area) across Moore Gulch via a bridge structure to Empire Grade will provide a third access and egress point to the main residential campus, which may help facilitate north campus subarea development and emergency access.
- **Western Drive Extension**. Western Drive would be extended across High Street at a new signalized intersection to provide access to the Ranch View Terrace housing and other proposed employee housing sites.

In addition to planned new roads, the LRDP envisions a pedestrian priority area in the academic core supported by vehicular access restrictions, including a key east-west campus multimodal corridor along Steinhart Way.

- **Vehicular Access Restrictions**. Personal automobile access may be restricted at certain times and on limited portions of upper Hagar Drive, Meyer Drive Extension, McLaughlin Drive, and internal roadways to prioritize transit, bicycle and pedestrian access and reduce vehicle/pedestrian conflicts. Vehicle access on these segments of the roadways would be limited to transit and service vehicles only.
- **Steinhart Way Corridor**. In order to promote the campus core as a pedestrian priority area, Steinhart Way is proposed to be converted from a service road to a pedestrian and bicycle priority corridor with automobile access for

private automobile traffic limited to the far east and west segments accessing local parking facilities. Service and accessibility vehicles may be limited or required to travel at low speeds to minimize conflicts with pedestrians and bicycles in this new east-west corridor. Service vehicles would use alternate routes wherever possible to avoid conflicts with pedestrians and bicycles.

Emergency Egress

The campus circulation and transportation system are critical elements in the event of an emergency evacuation. The proposed Northern Entrance, Meyer Drive extension, and Western Drive linkage into employee housing will help enhance existing vehicular networks and offer additional opportunities for egress, depending on the challenges being faced.

Mobility Hubs and Parking

The LRDP envisions that commuter parking would be consolidated at the periphery of the academic core and a variety of mobility hubs would be established in strategic locations of the campus to provide multimodal options for both on- and off-campus trips.

Mobility Hubs

Mobility hubs would help consolidate campus circulation transfer points with multiple options to connect to campus destinations, including bikeshare, electric shuttles and key bicycle and pedestrian corridors. Mobility hubs are locations where multiple transportation modes are situated in close proximity, generally at a key transit location, commuter parking areas and major campus activity centers. Mobility hubs would include high quality bus stops with route and timing information, space for bike sharing, secure bike parking, signage and campus maps, direct pedestrian connections to activity centers, and centralized ride-hailing for Transportation Network Company (TNC) services like Uber and Lyft. The mobility hubs would provide an environment that is safe and convenient, encouraging riders to walk, bike or take transit as an alternative to driving throughout the campus.

Mobility hubs would be organized according to their primary function as follows:

Primary Mobility Hubs. Primary mobility hubs would be oriented toward commuters to and from the main residential campus and would focus on providing seamless transfers between park-and-ride type of travel modes to allow commuters to access their end destination quickly and efficiently. These hubs would be located at the four corners of the academic core. The Core West parking garage and new mobility hub near Stevenson College would primarily serve faculty/staff commuters, while the mobility hubs located at Heller/Meyer and East Remote would primarily serve student commuters. Parking facilities at commuter hubs may be provided in parking structures where appropriate and feasible.

The locations of primary mobility hubs on campus are shown in Figure 4.9.

Residential-Focused Mobility Hubs. Residential mobility hubs would be smaller in size and focus more on providing access from on-campus housing areas to academic uses, recreational uses, and other major activity centers. In general, residential mobility hubs would provide access to frequent transit service to other campus destinations as well as centralized bike parking, electric bikes, and with direct access to clearly signed active transportation corridors. There would be limited surface parking for vehicles.

Gateway Hub. The Gateway Hub would provide alternative transportation options for mode transfers and pedestrians, such as bikeshare and campus shuttles at the main entrance near High Street to access the campus core. The entry hub would include small-scale visitor parking lot(s), walking paths, bicycle routes, and enhanced transit stops.

Westside Research Park Mobility Hub. The Westside Research Park mobility hub would provide a central location and opportunity for integrating transit, biking, and walking connections to the main residential campus, the Coastal Science Campus and other Santa Cruz locations. The Westside Research Park site is located

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adjacent to a potential rail station which is being considered by the Santa Cruz County Regional Transportation Commission and a recently constructed multi-use rail trail extending from the site east to Bay Street. The Mixed Use land use designation identified for the West Side Research Park identifies uses characteristic of a transit-oriented development (Figure 4.10).

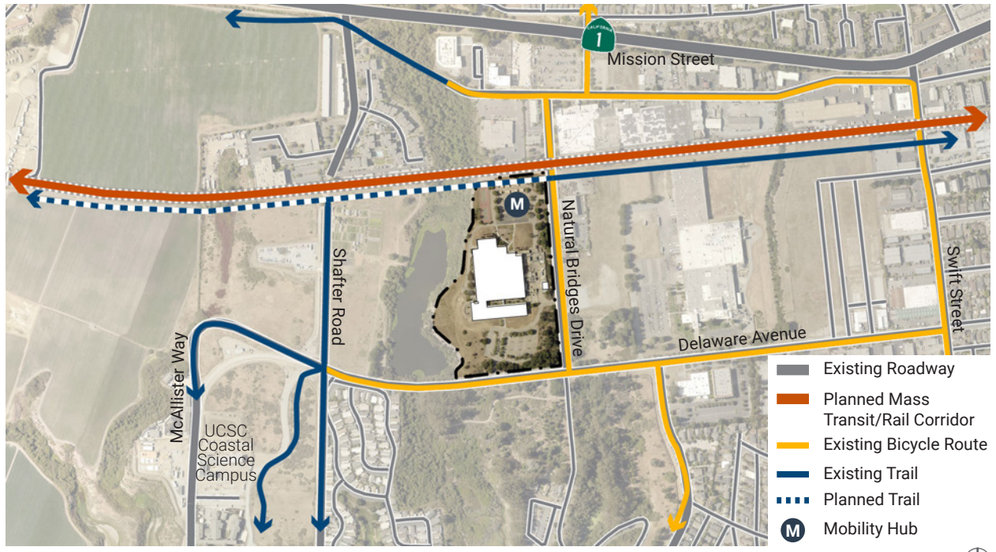
Parking Supply and Demand

Approximately 5,800 parking spaces currently exist on the main residential campus and Westside Research Park. These are all provided in surface parking lots and the Core West Parking Structure at McLaughlin and Heller Drives. There are two large remote lots, the East and West Remote lots, located on Hagar Drive and near the west entrance, respectively, with a total of 1,400 spaces primarily for student commuters. Another 2,300 surface spaces within the academic core and the colleges, are primarily for faculty/staff/graduate commuters. Approximately 1,000 spaces are designated as visitor, ADA, medical, reserved or for university use. 300 motorcycle spaces are also available. In addition, 800 spaces are provided for campus graduate, student family, and employee housing residents. Parking on campus is managed by Transportation and Parking Services (TAPS) through parking permits and metered spaces.

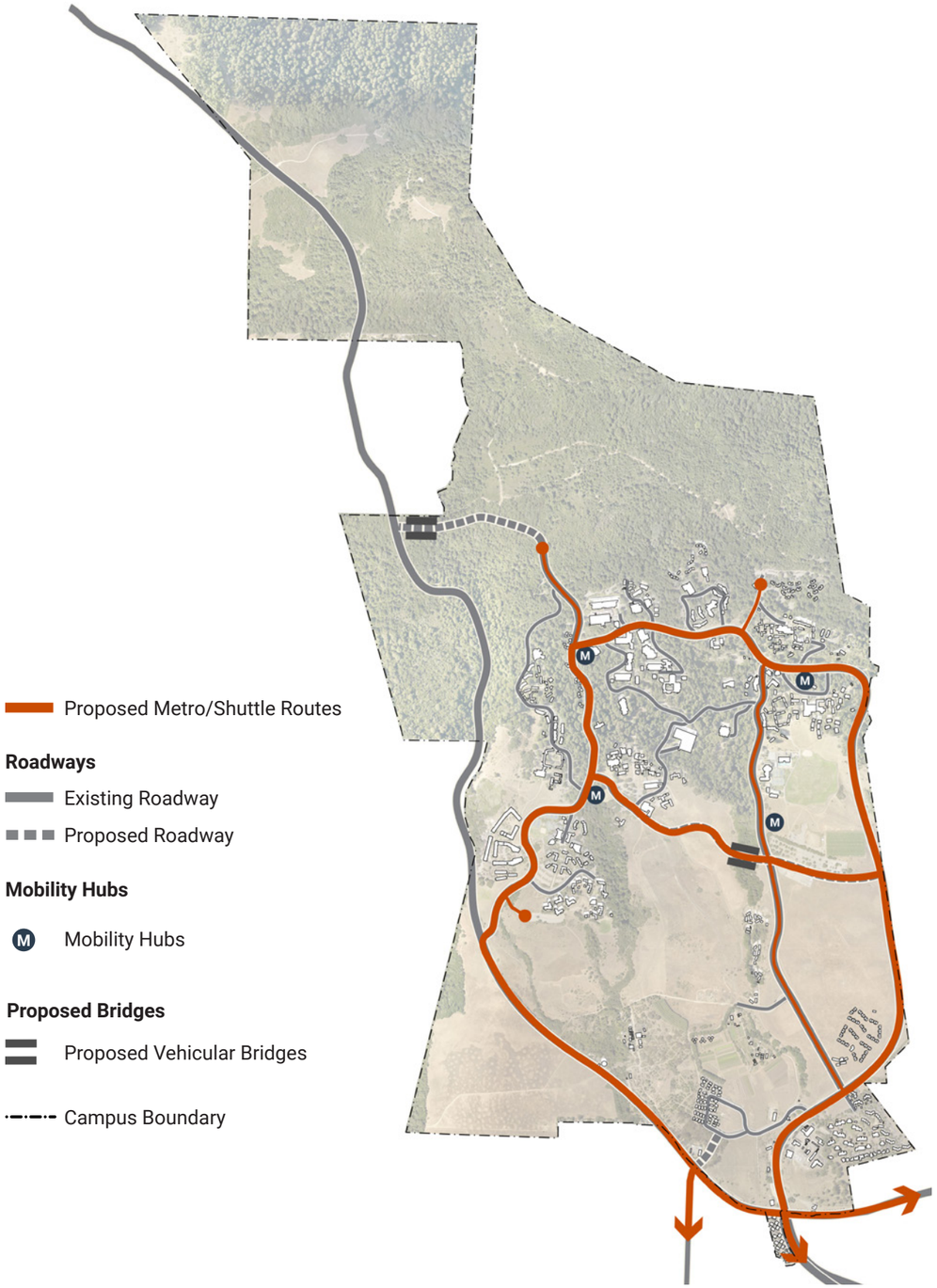
UC Santa Cruz currently manages parking through pricing and permit eligibility requirements, such as higher cost permits near the academic core, more affordable permits in remote lots and restricted parking for freshmen and sophomores who live on campus. Additionally, all public streets near the main residential campus within the City of Santa Cruz are subject to the City's residential permit parking program, which deters parking overflow into the community.

The proposed on-campus student and employee housing will significantly reduce the need for additional commuter parking. The land use plan is predicated on a compact core which will rely on infill sites, potentially including existing surface lots. Some existing parking spaces could be displaced due to new development; these existing spaces will be replaced.

The 2021 LRDP proposes to provide some new commuter parking for staff, faculty and students. Through parking demand management, the supply of available parking can be actively managed to encourage turnover. Potential parking demand management strategies are detailed in the TDM section below.



▲ Figure 4.10 Westside Research Park - Transportation



▲ Figure 4.11 Transit and Shuttle Routes

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Transportation Modes

Transit Systems

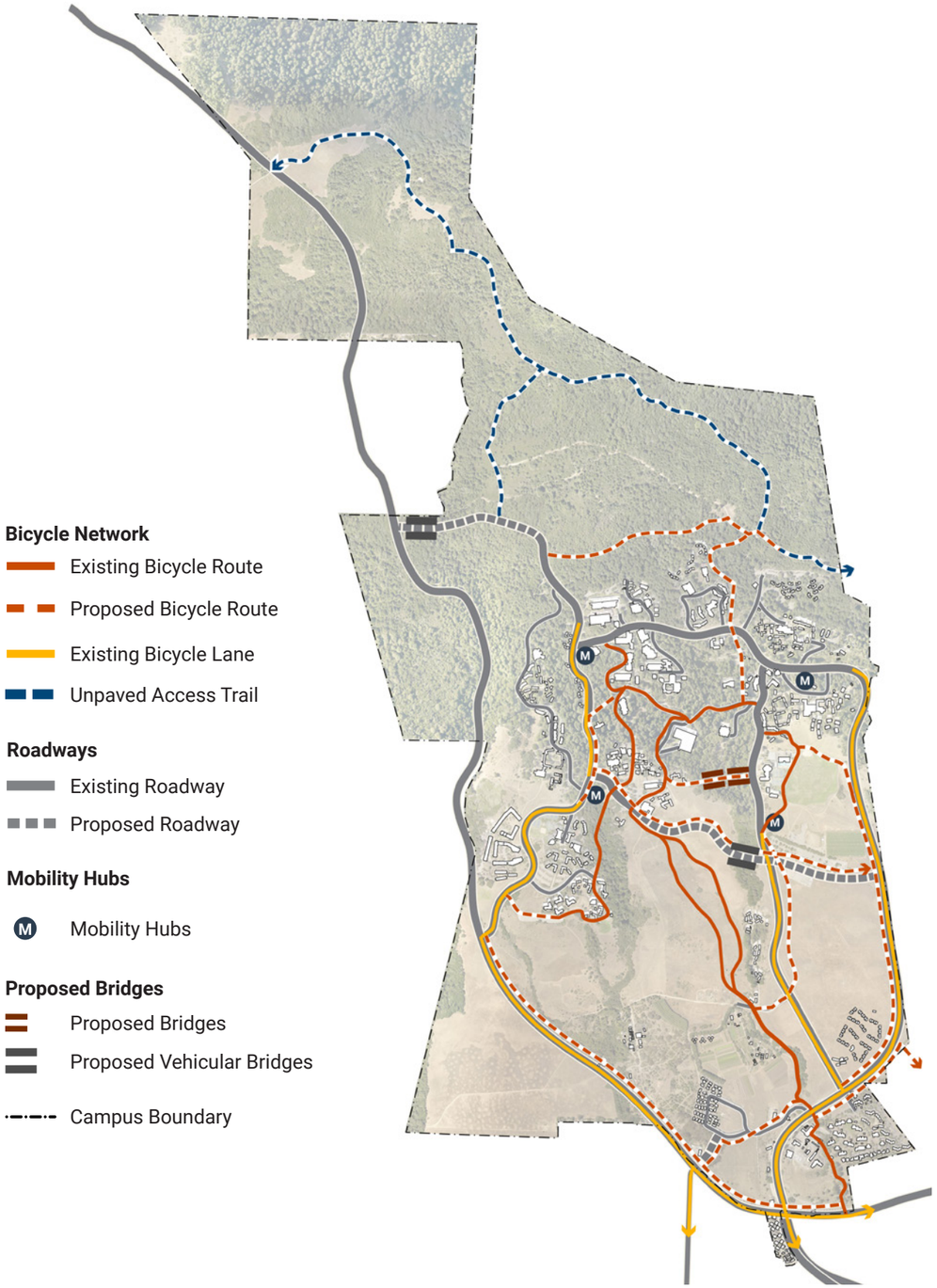
UC Santa Cruz operates a campus shuttle on two loops, serving stops from the main entrance, Coolidge Drive to Hagar Drive, McLaughlin Drive, and Heller Drive Empire Grade/High Street. The loops operate in clockwise and counter clockwise directions on 10 minute frequencies. An evening service operates on the same route, with limited on-demand stops. Santa Cruz Metropolitan Transit District (METRO) provides direct service to the main residential campus and Westside Research Park on four UC Santa Cruz specific routes.

Bus and shuttle transit are crucial components of the campus transportation system and play a major role in reducing campus vehicle trips. Regional transit service provided by METRO will continue to play a major role for trips to and from the main residential campus and Westside Research Park. The campus will work with METRO and other partners to explore express or limited-stop type regional service options from population centers directly to campus. Existing bus stops on campus could be expanded to accommodate a higher number of increased capacity buses.

With the Meyer Drive extension, the internal campus shuttle system, which runs concurrent with METRO services, will operate on shorter campus loops and continue to provide connections to key academic buildings, student housing, administrative buildings, and proposed mobility hubs (Figure 4.11). Disability van service will continue to play a vital role as an intra-campus mobility option. Electrification of shuttles and the campus fleet will help reduce campus local and regional greenhouse gas emission goals.

Improvements to other non-motorized modes of travel may help increase transit efficiencies by providing practical and functional alternatives, such as improving pedestrian and bicycle connectivity, to free up bus and shuttle capacity.

▲ Shuttle stop on the UC Santa Cruz main Residential Campus



▲ Figure 4.12 Current and Proposed Bicycle Facilities

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Bicycle Circulation

UC Santa Cruz's beautiful site and proximity to off-campus housing and retail locations make bicycling a suitable mode of travel. The campus recently upgraded its flagship bicycle facility, the Webster Way Bike Path through the Great Meadow, which extends from Coolidge Drive in the lower campus to Meyer Drive in the Arts Area of the academic core. Other paved bike paths exist on campus near Cardiff Avenue and Athletics and Recreation Services. Due to right-of-way and topographical constraints, on-street bike lanes are not continuous on campus roadways. Internal campus roadways serve as bicycle routes, creating connectivity throughout the main residential campus. Westside Research Park has on-street bicycle lanes on both frontages and a paved multi-use path extends from Bay Street to Natural Bridges Drive in the rail corridor adjacent to the site.

The planned bicycle network recognizes and builds on existing bicycle facilities at the main residential campus and Westside Research Park. Although the campus topography can be challenging for some users, bicycle travel is expected to continue to grow as on-campus housing and the availability of electric assisted bicycles increases. The campus envisions the availability of an electric bike (eBike) fleet for faculty and staff use, and working with partner agencies on a campus/regional bikeshare program.

Bicycle Routes

The LRDP proposes improved and new bicycle routes to connect key locations on campus (Figure 4.12). Some of these bicycle routes may be multi-use corridors, which include a separated bicycle path with adjacent pedestrian path or combined bicycle and pedestrian routes. New bicycle routes are defined as being primarily paved or level surface, and do not refer to dirt trails or fire roads, which are described separately below. The following bicycle routes are proposed in the LRDP, facilitating the following key connections:

East-west connections:

- North Connection: New route between proposed academic and support development north of Science Hill to proposed housing development north of Chinquapin Road
- Steinhart Way Improvements: Improved bicycle route as part of multi-use corridor between Kerr Road and Quarry Plaza
- New Meyer Drive Extension: New bike lane between Heller Drive and Coolidge Drive

North-south connections:

- Empire Grade Bicycle Corridor: Bicycle improvements along Empire Grade between Heller Drive and Cardiff Place
- New Connection to Housing in Northeast: New bike route from Quarry Plaza to proposed housing development north of Chinquapin Road
- New Link along Hagar Drive: New bike route between the Farm entrance and the East Remote Lot
- Coolidge Drive Bicycle Corridor: Bicycle improvements along Coolidge Drive between the corridor from the Historic District to Athletics and Recreation

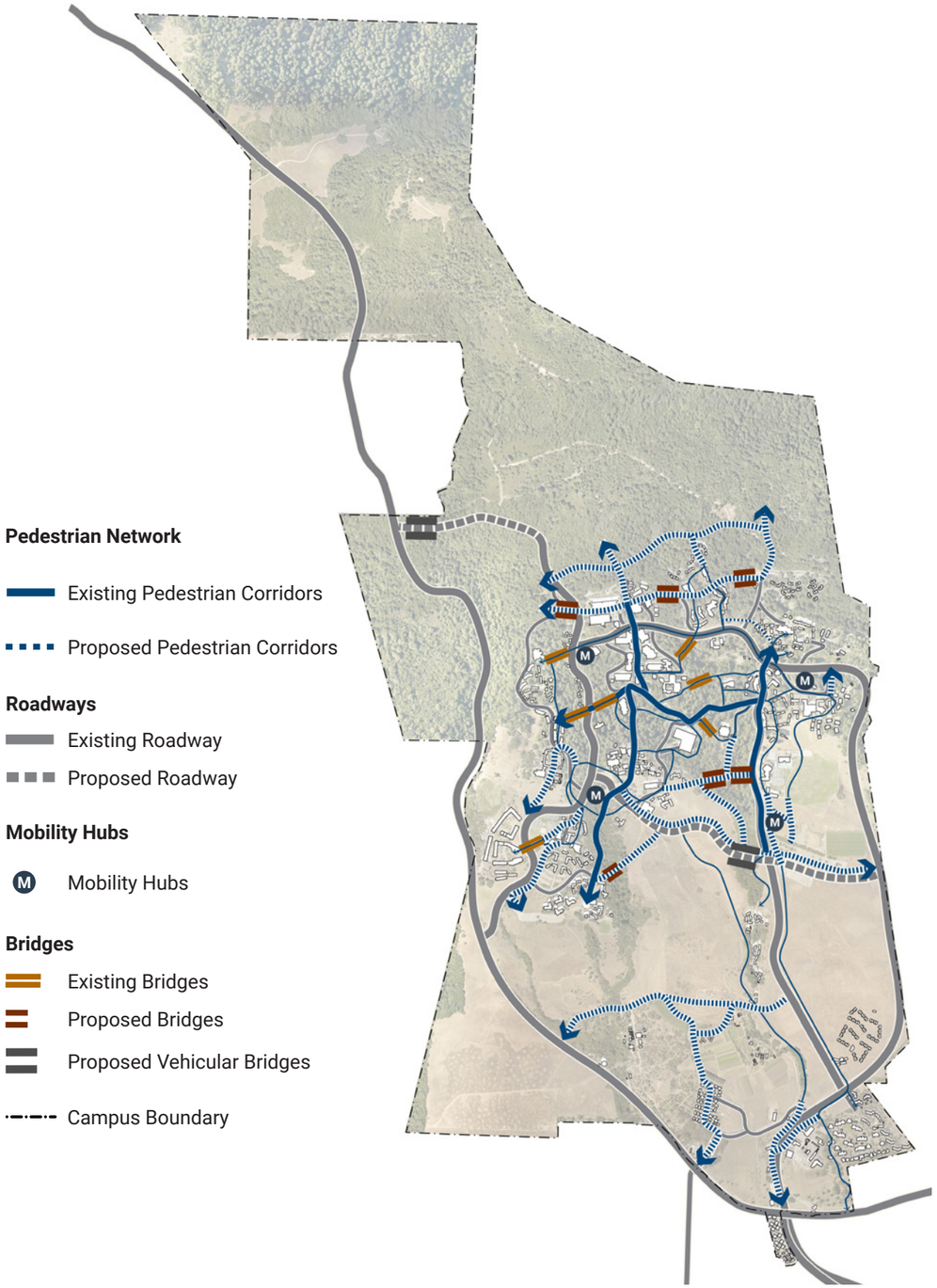
▲ Meadow Bike Path

In addition, other minor bicycle connections are proposed to close gaps in the existing network and provide new links to mobility hubs and key destinations. New pedestrian corridors, described below, will strive to be multi use corridors which will provide increased access for bicycles.

Bicycle Trails

Bicycles are permitted on the gravel and dirt fire roads, primarily located in the upper campus, that connect west to Wilder Ranch State Park and east to Pogonip in the City of Santa Cruz. Adjacent to campus, bicycles are permitted on designated multi-use trails located throughout the Pogonip area via U-Con Trail and Emma McCrary Trail, which connect to Henry Cowell Redwoods State Park, via Rincon Connector Trail. The fire roads located on the northern edge of campus provide recreational bicycle opportunities, connections to the central campus and regional connections to the surrounding parks.

There are also a number of undesignated trails throughout the campus, some of which are used by bicyclists. The LRDP integrated transportation strategy recommends better managing the fire roads and existing campus bike paths and identifying key through-campus routes to connect the lower, central and upper campus to adjacent parks. This on-going planning process balances pedestrian access for student research areas, recreation and wellness with the need for protecting environmental resources to ensure the health of the natural landscape while providing regional bicycle trail connectivity. New bicycle trail connections from the main residential campus south to Westside Research Park and the Coastal Science Campus could also be explored as an alternative to Western Drive.



▲ Figure 4.13 Current and Proposed Pedestrian Pathways and Bridges

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Pedestrian Circulation

Walking is the primary mode of travel for students within the academic core and within the colleges. The walking network on campus consists of paved pathways and sidewalks, and unpaved ad-hoc trails. Similar to the bicycle network, some pedestrian routes are not continuous on campus roadways. Formal pedestrian routes are complemented by a more informal system of pathways that connect many destinations in the academic core and colleges, utilizing bridges to span ravines and gulches across campus. While bridges are constructed across many ravines to limit grade differences, many other paths, constructed decades ago, are steep or have stairs on them. As a result, the terrain on campus limits the ability to easily walk between destinations without barriers to travel. Due to their low vehicle use, restricted access service roads in the campus core are commonly used by pedestrians.

The most heavily used pedestrian walkways are in the heart of campus, primarily on Science Hill and the Engineering area, and link academic and administrative destinations. These walkways are punctuated with plazas and gathering areas near buildings and provide important locations for socialization.

Pedestrian Corridors

Supporting and improving pedestrian circulation is a key element of the integrated transportation strategy. The increased density of facilities within the Academic Core will need improvement of pedestrian linkages for safe and efficient circulation. Connections extending out from the core to the colleges and student housing areas will have improved lighting, signage and clearly defined routes to strengthen the appeal and convenience of walking on campus.

An expansion of the pedestrian network will provide more convenient access throughout campus. The following pedestrian corridors are proposed in the LRDP (Figure 4.13), which facilitates the following key connections:

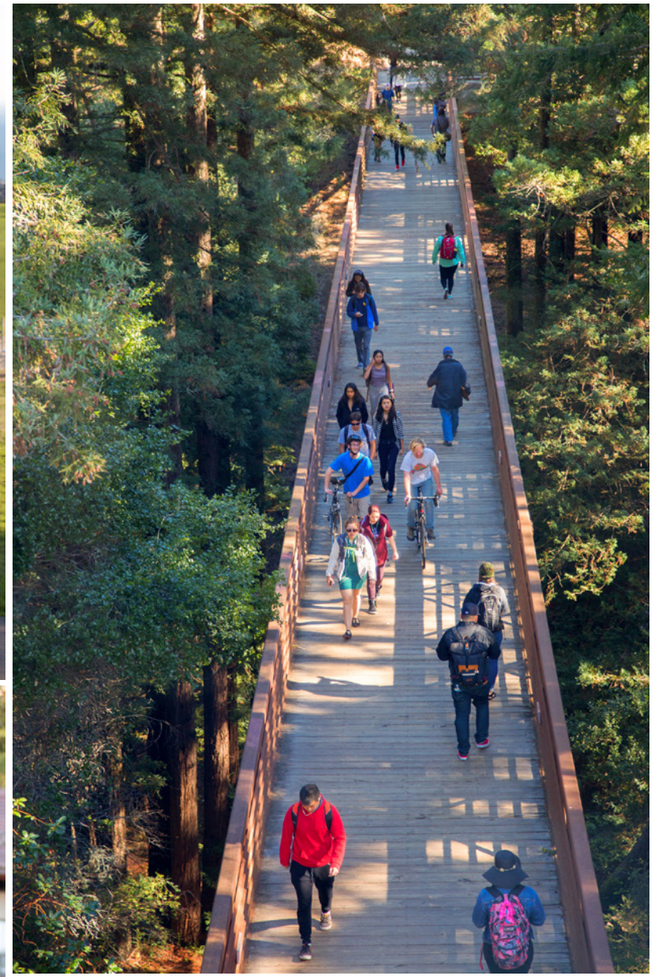
- North of the Academic Core, two new east-west pedestrian corridors are proposed to expand the web of pathways, one connecting the engineering buildings on the west through Colleges Nine and Ten to the proposed student housing on the east at Chinquapin Road. Further north, another east-west pedestrian corridor will connect proposed academic and support space on the west with proposed student housing on the east.
- South of the Academic Core, an additional east-west connection will be needed to connect the south end of the academic core to future potential facilities on the current Hahn parking lot and Athletics and Recreation on the east and ultimately to housing on the west
- The Science Hill Corridor, Steinhart Way Corridor, and Hagar Drive Corridor will be emphasized as key pedestrian spines within the network.

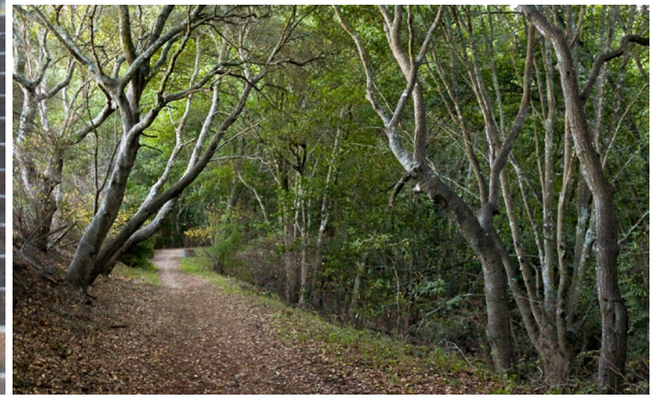
The planned pedestrian network of north-south and east-west corridors would be integrated with transit stops, mobility hubs and activity clusters, and would strive to be multi-use to expand bicycle access across the campus. Pedestrian crossings at major campus roadways may be improved to ensure safety. Depending on location and conditions, improvements may include: raised or consolidated crosswalks, striping enhancements, and operational changes such as “scramble” crossings at high volume locations, which is a type of traffic signal movement that temporarily stops all vehicular traffic, thereby allowing pedestrians to cross an intersection in every direction, including diagonally, at the same time. Additional traffic signals and traffic calming measures may be needed in certain locations. Further improvements are planned such as sidewalk widening, improved nighttime lighting, and directional wayfinding.

Pedestrian and vehicular conflicts can be acute at times along McLaughlin Drive between Heller and Hagar. During class changes in particular, the press of pedestrians crossing the road adds to congestion and delays, especially for METRO and shuttles. These conditions will likely be exacerbated with projected population increases. Completing the Meyer Drive extension will allow many transit vehicles to use that connection across campus rather than McLaughlin. Additional pedestrian access and safety solutions will be explored, including raised crosswalk crossings, consolidated crossings, traffic signals and restricting automobile access on McLaughlin Drive.

Pedestrian Trails

Existing trail networks could be improved, and new connections provided within campus and to adjacent public lands surrounding the campus. Unpaved multi-use trail networks could include east-west connections in the north campus from Wilder Ranch State Park to Henry Cowell State Park via Pogonip City Park. North-south trail networks could connect from Moore Creek Preserve, up through the Great Meadow, and connecting routes to the north.





Transportation Demand Management

Transportation Demand Management (TDM) programs promote alternatives to driving to campus alone, such as walking, cycling, riding transit, carpooling, and vanpooling, thereby reducing trips to and from the campus. Existing UC Santa Cruz TDM programs include:

- Transit, bicycle shuttle, and vanpool subsidies
- Bicycle loans, bicycle parking, and education
- Carpool incentives and carshare programs
- Electric car incentives and EV charging
- Parking permit restrictions

The 2021 LRDP will build on the existing TDM programs and explore new efforts to further reduce campus trips and single-occupant vehicles (SOVs.)

Parking Management

Parking supply on campus will continue to be limited for on-campus housing and SOV commuters to encourage carpooling, transit and other non-SOV alternatives. Improved transit service from remote parking areas would be supported by enhanced pedestrian and bicycle facilities, improving connectivity with key corridors from parking areas to major campus activity centers and relieving some transit capacity for those commuters willing to walk and bike to their final campus destination. Additional incentives include varied pricing structures to limit congestion near the core.

Ride Hailing

Transportation Network Companies (TNCs), such as Uber and Lyft can be managed with designated drop-off and pick-up areas, co-located with mobility hubs. The campus can explore options, such as surcharges and geo-fencing, to manage this emerging technology. This will increase campus roadway capacity for more frequent and reliable transit service, reduce trip numbers and VMT and reduce vehicle/pedestrian conflicts to promote a more pedestrian-friendly campus.

Bike Shuttles and Bikeshare

UC Santa Cruz will expand the bike shuttle program and explore on and off campus bikeshare programs, including those with electric-assisted bicycles or eBikes, to make traversing the campus's challenging terrain more appealing and convenient. Incentives can be expanded to promote the use of these and other emerging electric mobility options.

Integrated Land Uses

New campus development under the 2021 LRDP will be integrated with transit-oriented land use concepts, with buildings clustered, pedestrian areas enhanced, parking consolidated in peripheral lots, transit stops integrated into pedestrian corridors, and vehicle access restricted. New development at Westside Research Park would be designed and oriented as a transit village, integrating the recent multi-use rail trail, bus routes and planned mass transit in the rail corridor with planned housing, academic and other mixed uses on site. Increased student support and public services on-campus will also help reduce trips by those living and working on campus.

TDM Data Collection and Monitoring

The measured success of 2021 LRDP TDM programs will rely on accurate and ongoing data collection, monitoring and performance evaluations. The 2021 LRDP proposes to identify, establish and implement a data collection and planning program to establish existing transportation trends, establish metric based goals, and track performance over time.

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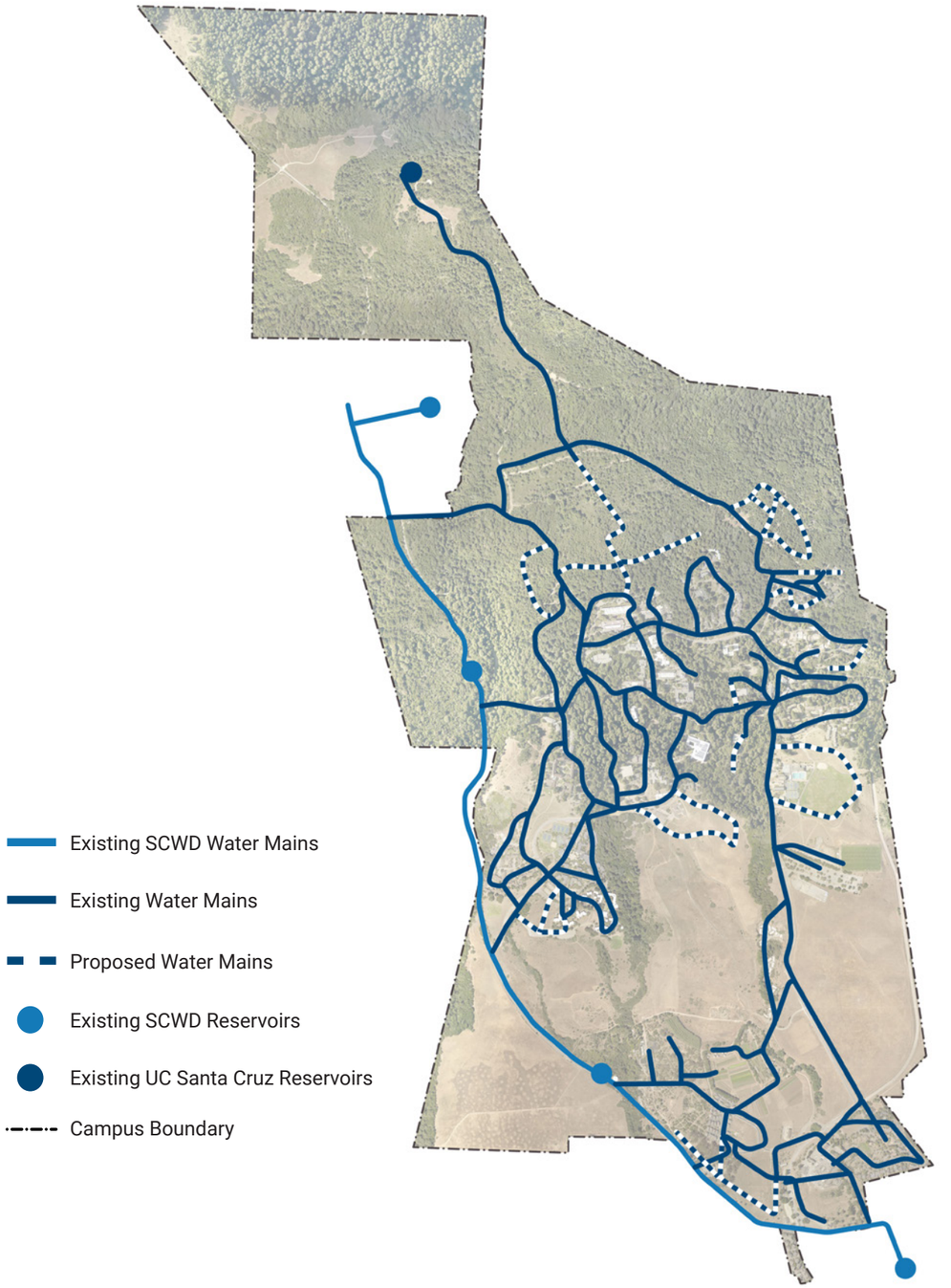
4.5 Infrastructure and Utilities

Framework

This LRDP offers the opportunity to evaluate larger issues around water and energy strategies, and to align campus planning and operations with the goals of the State of California and the University of California Office of the President (UCOP).

The main residential campus is at a turning point regarding the condition of its infrastructure; the campus must balance the need for renewal of the 55 year old infrastructure systems and components with new priorities to increase capacity and performance to meet state and UC goals. The campus has recently undertaken a comprehensive capacity study of the utility systems on the main residential campus and has developed plans to address deficiencies and support the growth envisioned in the land use plans. In addition, studies were conducted to confirm adequate capacity of utility systems for the projected development at Westside Research Park, where development would be fed directly by city-owned utilities.



▲ Figure 4.14 Water Supply

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Water

Goals and Integrated Water Strategy

UCSC has been a proactive leader in water conservation, water-related research, education and outreach, and technological innovation. The UC Sustainable Practices Policy on Sustainable Water Systems sets forth a requirement for all UC campuses to reduce potable water consumption by 36 percent by 2025, when compared to a three year average baseline of Fiscal Year (FY)2005-06, FY2006-07, and FY2007-08. UCSC met this goal in 2016-17, and in 2018-19. UCSC remains committed to further lowering the potable water use per weighted campus user throughout the proposed LRDP growth period by continuing to implement aggressive water conservation measures and offset demand by developing non-potable water supplies on campus.

Potable Water

Existing System

The UCSC potable water supply system is a complex network with five metered connections to the City of Santa Cruz Water District (SCWD) system (Figure 4.14). The SCWD pumps potable water to a series of four reservoirs located at elevations ranging from 400 feet in the lower campus to approximately 1,100-feet in the upper campus. The uppermost reservoir has a capacity of 1 million gallons and serves as an emergency backup water supply for the main residential campus. The four campus reservoirs supply water to eight separate pressure zones across the campus, due to elevation changes to keep water pressure within safe limits.

Existing water use on the main residential campus and the Westside Research Park is approximately 154 million gallons per year (MGY). The highest consumption categories include student housing (44 percent) and irrigation (28 percent).

The City of Santa Cruz water supplies are limited and have been a key driver for increased water conservation on campus. UCSC's potable water conservation to date has been driven almost entirely by demand-side reduction.

In response to the 2013 to 2016 drought, UCSC implemented conservation projects that achieved reductions of 22 percent to 28 percent from the 2012-2013 peak season baseline, attributable primarily to: reductions to landscape and turf irrigation, adoption of web-based water management systems, and extensive campus outreach and engagement to promote conservation. In addition, the Sustainability Office created a Water Action and Drought Response team, which conducted a campus-wide audit of all restroom, kitchen and lab fixtures, identified sub-metering needs with leak detection, and posted signage to promote conservation across campus. The Farm and Arboretum and Botanic Garden also undertook measures to reduce irrigation demands by changing irrigation patterns, converting to drip irrigation systems, and closely monitoring water use.

Additional water conservation efforts currently in progress include removing and replacing turf, replacing single pass cooling systems with waterless condensers, maintaining low flow water fixtures, and continuing to conduct education and outreach programs that promote awareness and behavioral change. The 2021 LRDP calls for continued conservation efforts by acting on the policies outlined in the Campus Sustainability Plan. Key policies include compiling and updating centralized lists of proposed water infrastructure and fixture improvement projects and increased monitoring and leak detection of existing water lines.

Envisioned Strategy

Overall campus water demand is projected to increase by almost 60 percent over FY2017-18 water use to approximately 292 MGY, to accommodate planned growth under the LRDP (if fully implemented.) However, significant increases in demand for potable use can be considerably offset by ongoing conservation efforts, such as non-potable use for irrigation and central plant cooling systems and continued conservation strategies as outlined above. The existing domestic water system on campus is, for the most part, in adequate condition and has sufficient capacity to serve increased projected water demand. The 2021 LRDP envisions new development to connect to highest pressure zones when feasible, maximize use of looped networks to optimize pressure, and improve capacity for fire flow to build in redundancy for increased resilience.

▲ Biomed Stormwater Treatment

Non-Potable Water

As part of a broader strategy to reduce water demand, developing non-potable water sources on the main residential campus and the Westside Research Park is a critical next step to further reducing the campus's reliance on potable water sources. The campus's non-potable water system and stormwater system are both part of a larger, more integrated water management strategy envisioned in this LRDP. There is no existing system for non-potable water on the main residential campus, only limited localized systems for stormwater discharge.

The campus has an opportunity to leverage site water resources to meet non-potable demands including:

- Groundwater Source: The karst aquifer in the central and lower portions of the campus has been identified as a non-potable and potable water source with sufficient recharge to provide sustainable yield.

- Stormwater and Rainwater Harvesting: Harvesting is a strategy that will continue to be implemented across the campus at a building or district scale, both as a means of offsetting potable water use and complying with campus stormwater management requirements. It is a seasonal source, and likely would need to be supplemented by other means. The Kresge College Renewal Project is an example of a harvesting project that is currently under construction; both stormwater and rainwater run-off is harvested and filtered to be reused for toilet flushing and irrigation.

In order to maximize water conservation opportunities, new development is planned to be dual plumbed, and irrigation systems to be non-potable water ready. Developing water reuse systems on campus will also provide insulation against escalating potable water and sewer costs by reducing both consumption of potable water and discharge of wastewater back to the City of Santa Cruz treatment facility. The campus will also explore the potential for wastewater treatment and reuse for non-potable water demands in future

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Stormwater

Existing System

Many small channels found throughout the upper campus gradually combine into two main ephemeral streams, Moore Creek on the west side of campus, and Jordan Gulch on the east. These natural drainage channels have allowed the campus to be developed without a backbone storm drain system. A karst geological formation underlies the central campus, which has led to the development of many natural sinkholes, most of which are located along the drainage channels. These sinkholes offer an effective means to reduce total runoff leaving campus and provide local groundwater recharge.

Due to the unique drainage features of the campus, stormwater infrastructure is limited to individual colleges or building clusters which typically discharge to nearby depressions or tributaries to the main drainage channels.

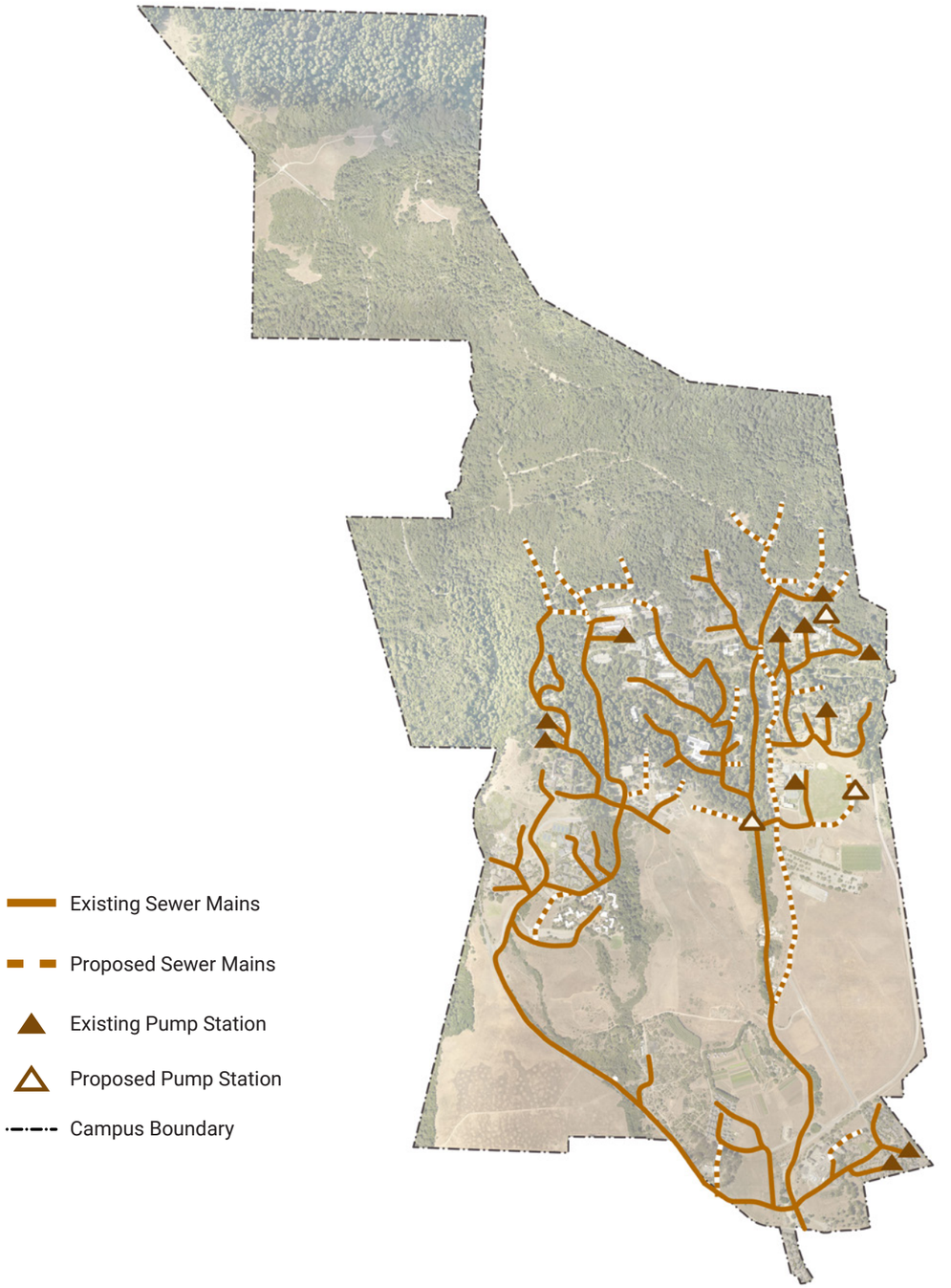
The main residential campus includes separate watersheds within its boundary, based on underlying soil conditions and localized hydrologic conditions. The underlaying watersheds determine specific post-construction stormwater management requirements which, depending on the size of the project, include water quality, retention, and peak mitigation (flow rate) components. In general, stormwater management guidelines require prioritization of retention via infiltration-based stormwater facilities in the upper campus, where underlying soils are more favorable. In the central and lower campus, soils are less favorable and harvesting and reuse may be needed to meet retention requirements. Key challenges in stormwater management include the increased quantity and rate of runoff due to increasing imperviousness across campus and sinkhole degradation due to upstream erosion and sedimentation of the sinkholes, which reduces capacity.

Envisioned Strategy

As new development is implemented, each project will continue to meet post-construction stormwater management requirements. In general, upper campus developments on the main residential campus are located within watersheds that require projects to prioritize retention and infiltration of stormwater where soil conditions are favorable. This approach offers the best opportunity to reduce runoff, recharge the underlying groundwater aquifer, and reduce burden on the campus sinkholes.

The central and lower campus generally do not have as favorable soils for infiltration, so alternative methods to meet detention and retention requirements may need to be evaluated. Consolidating stormwater management, including rainwater harvesting systems for clusters of buildings, as opposed to building-by-building, may provide effective means to meet retention requirements. Additionally, existing stormwater management facilities can be evaluated for unused capacity or expansion potential, such as the detention system at Cowell College or the detention pond near Rachel Carson College.

▲ Stormwater management at Emergency Response Center



▲ Figure 4.15 Sanitary Sewer

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Sanitary Sewer

Existing System

All wastewater produced at the main residential campus and the Westside Research Park is discharged to the City of Santa Cruz's collection system. The existing sanitary sewer system at the main residential campus consists of approximately 12 miles of sewer pipes, 400 manholes, 9 pump stations, and other related infrastructure. There are two main gravity trunk lines, one on the west side of campus generally following Heller Drive and the other on the east side running almost exactly down the center of Jordan Gulch. Discharged wastewater is metered near the intersection of Bay Street and High Street at the base of the campus.

Wastewater system meter data from 2018 indicates the average, year-round flow is 357,698 gallon per day (gpd) or approximately 130 MGY. Most of the sanitary sewer mains were constructed in the late 1960s and early 1970s and are over 50 years old; thus, there are some issues with the existing system that will need to be addressed. These include review of additional trunk line capacity to convey increased wastewater flows, and rehabilitation or replacement of aged pipes and manholes.

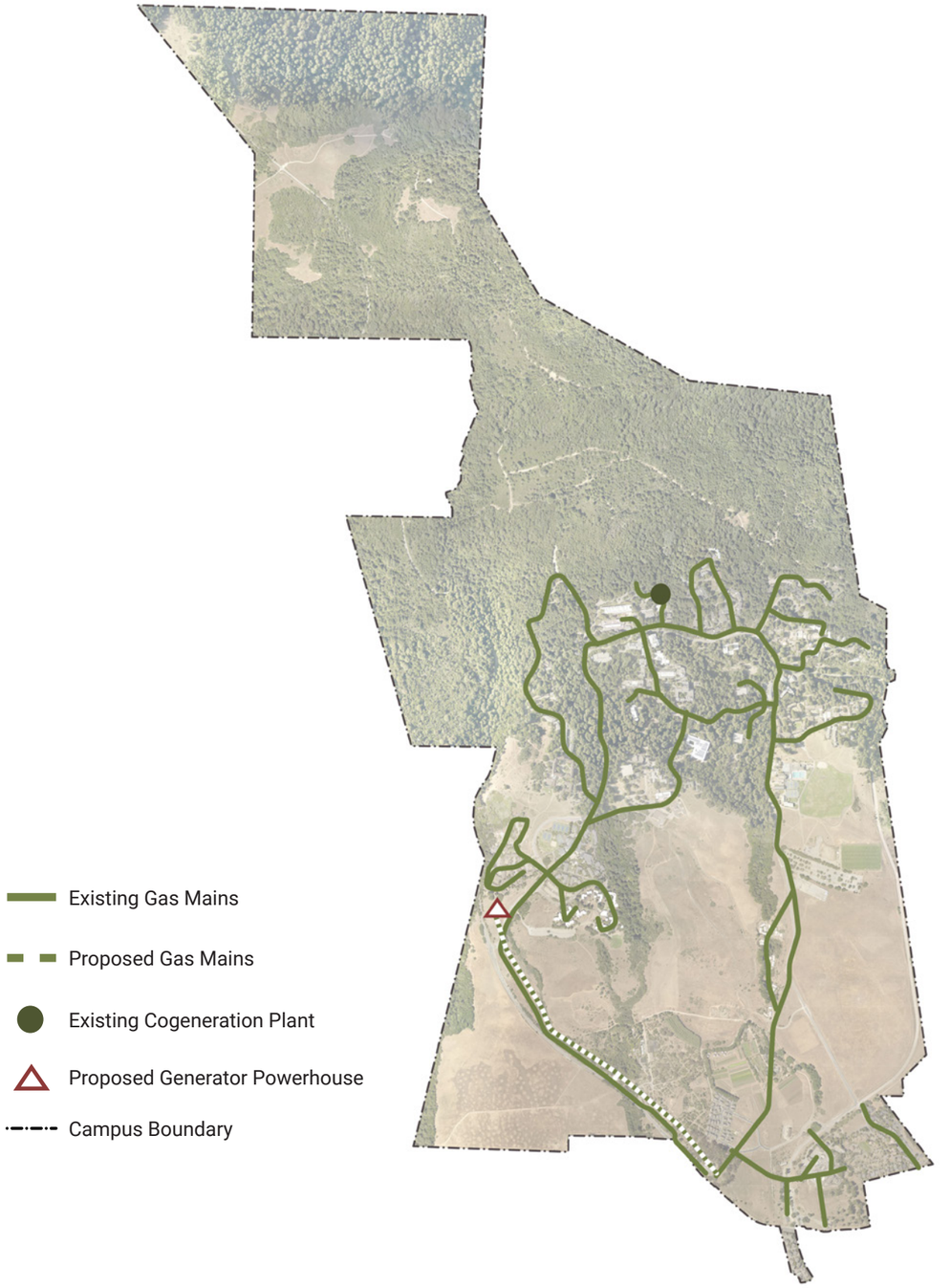
Envisioned Strategy

The existing system at the main residential campus was sized for a capacity of 27,500 students under the 1963 LRDP and has greater capacity than the campus currently requires. The system will need to extend existing trunk lines to serve new proposed developments (Figure 4.15).

A proposed relocation of the east trunk line out of Jordan Gulch should be implemented alongside this LRDP in order to prevent future risks to Jordan Gulch and its surrounding environment. The preferred solution involves relocating the pipe to beneath Hagar Drive and will require a lift station to be constructed within the gulch to handle some of the flows.

Pump stations introduce extra cost, maintenance, and energy demands. Campus expansion should strive to minimize the use of pump stations and consider alternatives that would decommission existing pump stations where feasible

▲ Jordan Gulch above grade sewer



▲ Figure 4.16 Natural Gas

DRAFT January 2021

Energy

Introduction

The time span of the 2021 LRDP is a critical period of action to address climate change and advance UCSC's ambitious greenhouse gas emissions reduction goals to align with UCOP's goal of achieving carbon neutrality by 2025 for scope 1 and scope 2 emissions, as described in the UC Sustainable Practices Policy. Scope 1 and 2 emissions include greenhouse gas emissions from stationary sources of combustion, campus-owned vehicles, and purchased electricity. The LRDP provides an opportunity for the campus to develop a robust long-term strategy to decarbonize emissions. These reductions will be achieved through a multi-pronged approach which includes conservation, energy efficiency, renewable energy, and offsets.

UCOP has identified four major pathways to achieve carbon neutrality: decarbonization of wholesale electricity purchasing, investment in campus energy efficiency and renewables, biogas procurement to reduce natural gas emissions, and cap and trade program participation. Major aspects of this effort are managed by the UC Energy Services Utility (ESU) that has dramatically adjusted the university's energy procurement portfolio to minimize and, where they cannot be reduced, offset greenhouse gas emissions.

Key ESU initiatives include the procurement of renewable energy and biogas, as well as the management of carbon allowances in the cap-and-trade market to fund additional investments in GHG reducing programs. The ESU's activities to procure renewable energy have resulted in a rapid decline in the greenhouse gas emissions associated with purchased electricity on UC campuses. By 2020, the ESU's decarbonization programs have pushed the emissions factor for purchased electricity at the participating UC system locations to zero. As a result, the greenhouse gas emissions footprint of UCSC's operational electricity consumption has been significantly minimized.

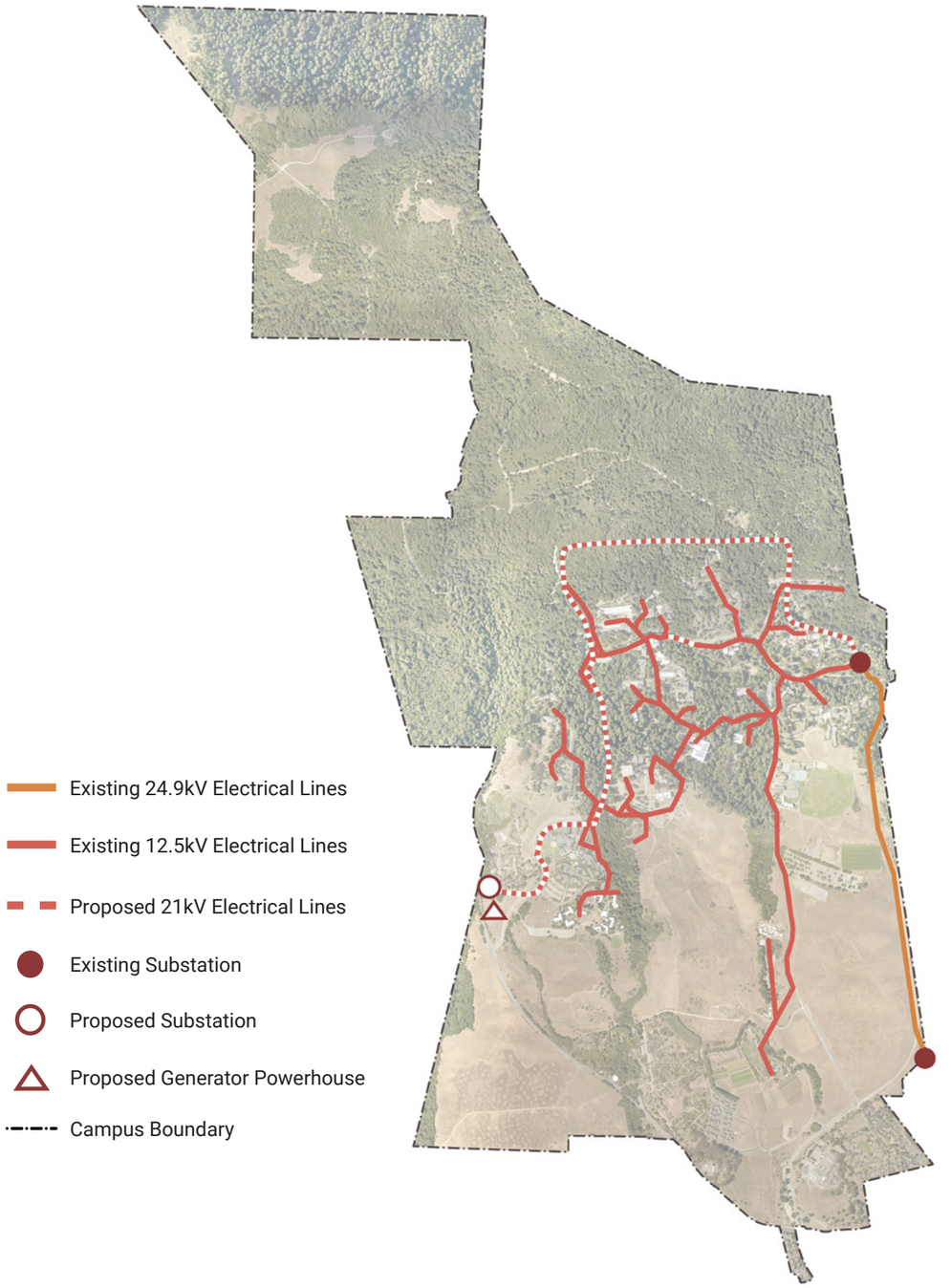
Energy Sources at UCSC

Existing System

Major sources of energy for UCSC include natural gas used as a fuel for the campus's cogeneration (cogen) plant at the main residential campus and purchased electricity. The cogen plant produces power for campus operations and the waste heat generated is captured and distributed via a district heating water loop to the Academic Core for building heating/cooling. Even though the cogen plant is highly efficient, due to the low greenhouse gas emissions factors associated with ESU purchased electricity, the cogen plant comprises the majority of UCSC's carbon impact from operational energy use.

The campus natural gas distribution network is owned by the University and is supplied by Pacific Gas and Electric (PG&E). The network is laid out in two main transmission segments routed along Hagar Drive and Empire Grade/Heller Drive. Local service lines branch off these mains to serve the various colleges and building clusters. During the 2015-2016 fiscal year, the University used approximately 5 million therms of natural gas (Figure 4.16).

The cogen plant produces heat that serves Science Hill and parts of the Academic Core and produces enough electricity to meet over half of the campus electricity demand. The cogen plant provides resiliency to campus operations by maintaining electrical service to critical lab and research buildings during utility power outages due to winter storms or public safety power shutoff (PSPS) events. While the natural gas cogeneration plant will continue to serve as a component of UCSC's energy portfolio, providing back up for emergency responders, safety systems and research equipment as well as supplement emergency systems for PG&E. Future projects are recommended to pursue all-electric or mostly electric mechanical systems to eliminate stationary combustion of natural gas for heating.



▲ Figure 4.17 Electrical Network

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Electricity is supplied to campus by PG&E primarily through a single 21 kilovolt (kV) service connection along Coolidge Drive. A substation is located south of Merrill College. Most of the campus receives service through this connection except for employee housing at Ranch View Terrace, Cardiff Terrace and Hagar Court and Hagar Meadows, and the Family Student Housing complex, which have separate connections to the local PG&E network.

The majority of the power lines on campus are buried, which make them less susceptible to interruption. The single 21kV service entrance lacks redundancy and is nearing capacity (Figure 4.17).

The 2017–2022 Campus Sustainability Plan calls for the development of an additional four megawatts of solar photovoltaic to the campus. A photovoltaic array already exists on McHenry Library. A two-megawatt solar parking canopy has been built at the East Remote Parking Lot. An additional energy storage system is planned for that site. The solar photovoltaic canopy and battery storage system will help provide the campus with clean, reliable electricity for at least 20-years and save the campus on its energy bill over its life. While no immediate projects are planned, the campus intends to explore future opportunities to pursue solar.

Envisioned Strategy

Alternative Energy Sources

The University of California's carbon neutrality goals, as detailed in the UC Sustainable Practices Policy on Clean Energy and Climate Protection, will drive the implementation of alternative energy sources, such as biogas, and a reduction of natural gas demands at UCSC. The capacity of the existing natural gas distribution network is sufficient to serve the campus and any planned expansion, although the network is experiencing some challenges due to aging infrastructure, such as corroding pipes. As the ESU increases procurement of biogas, the carbon impact of the cogen plant will be reduced over the course of the LRDP period.

UCSC plans to be primarily all-electric for new development and systems and phase out the use of natural gas where possible, in alignment with the UC Sustainable Practices Policy on Climate Protection. To achieve this goal, a secondary 21kV electricity transmission line on the west side of campus is required to provide additional service capacity and add system redundancy. A new 21 kV distribution main is planned that would tie into the Merrill Substation and provide electrical service to proposed development on the upper campus. A standby generation facility would be constructed on the west side of campus to ensure the campus remains operational during utility power outages. The campus plans for consolidated standby generators to power the entire campus with the power provided by the cogen facility during power shut-offs or outages. This would replace approximately sixty standby generators that are currently distributed across campus.

Targeting an all-electric campus will leverage the carbon-free purchased electricity from ESU, positioning the campus to reduce new greenhouse gas emissions from development. Even as electricity consumption on campus increases over time, greenhouse gas emissions are set to decline – through a combination of carbon-free ESU energy purchasing, the steady decarbonization of the California electrical grid, potential increases in the percentage of biogas fuel stock for the cogen plant, and purchase of qualified carbon offsets.

Energy Efficiency

ESU's important programs provide powerful system-wide tools for decarbonizing campus operations and incentivizing the transition from natural gas to electricity. Complementing these initiatives is the fourth component of the UCOP carbon neutrality initiative, which empowers campuses to pursue energy efficiency and renewable energy generation projects. This emphasis on local energy conservation will advance climate conscious design and development at UCSC.

UCSC will continue its current practice of investing in energy efficiency retrofits to achieve campuswide energy and carbon reductions amongst the existing building stock.

Positioning itself as a leader in high-performance building development, UCSC will continue to strive to achieve UCOP's 'stretch' energy-use-intensity (EUI) targets for all new capital projects. These metrics, which are enumerated in the UC Sustainable Practices Policy, describe energy targets per square foot of built area for different program types.

UCSC can expand upon the UC Sustainable Practices Policy on Climate Protection goals, not only achieving net neutrality for projected growth but also increasing the feasibility of on-site zero emissions for some new capital projects. Ultimately, a combination of UC system-wide initiatives, such as the ESU's decarbonization efforts, and local requirements for high-performance new construction will position the UCSC to achieve robust climate action over the course of the 2021 LRDP.

Data Network and Telecommunications

Providing data and telecommunications infrastructure with adequate capacity and flexibility to support the educational and research mission of UCSC is a central element of the 2021 LRDP. This technology will serve the campus itself, link it to off-site facilities, and provide new opportunities for students, faculty, and staff through initiatives such as distance learning.

In 2009, UCSC embarked on a campus wide Telecommunications Infrastructure Upgrade Project (TIU) which included the following:

1. New technology spaces including redundant core networking locations

2. A fiber optic backbone ring with adequate capacity and flexibility to support the education and research mission of UCSC

3. New electronics and cable capable of providing high capacity service to the desktop

4. Ubiquitous wireless service

5. Converged network incorporating data, voice and media for the myriad services monitored and controlled via the network including security cameras, building management systems, lighting control, irrigation systems, laundry and vending services, electronic signage, electronic door control and programming

6. Access to the CENIC network, a high capacity computer network serving over 20 million users across California, including the University of California and other California academic and research institutions

While electronics, wireless and data cabling supports short-term requirements, in the long term these will need to be refreshed to support the bandwidth requirements of new and emerging technologies. ITS will need to establish a secondary minimum point of entry on campus to build in redundancy and resilience in the network. A strategy to support current and future applications for data center technology is required and will need to be flexible enough to support both onsite, onsite cloud and external cloud applications. ITS will continue to work with a consortium of staff addressing the emerging technologies of cellular service to campus and its integration with emergency service communications and wireless networking.