UNIVERSITY OF CALIFORNIA, RIVERSIDE

PARKING AND TRANSPORTATION ANALYSIS

July 2010 **FINAL REPORT**

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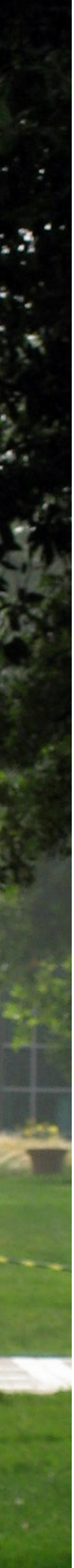
STUDENT



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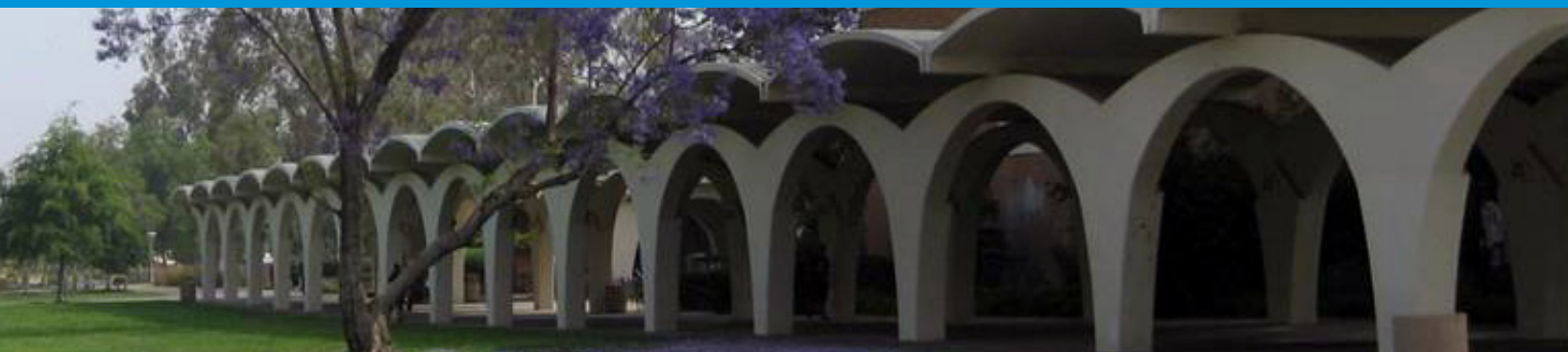


CHAPTER 1

EXECUTIVE SUMMARY

UC Riverside (UCR) faces an uncommon combination of circumstances in defining its transportation and parking program for the next ten years. Due to the current 2010 economic downturn and other external factors including direction from the University of California Office of the President, UCR has scaled back its estimates of student enrollment over the next ten years. Nevertheless, the campus will move forward with new academic programs; specifically, the construction of a medical school and development of the West Campus.

In addition, UCR's alternative transportation incentives have been very successful in shifting affiliates away from single-occupant vehicle commute trips to and from the campus and reducing parking demand. However, there is no guarantee that current parking demand will continue in a downward trend in the future, especially when student enrollment numbers and accompanying campus population increase.

Figure 1-1 UCR Parking Demand[1]

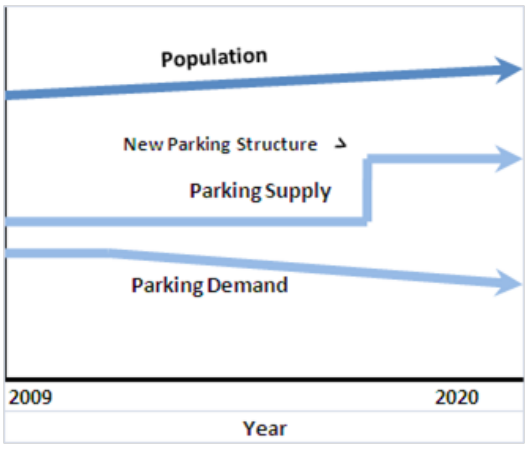
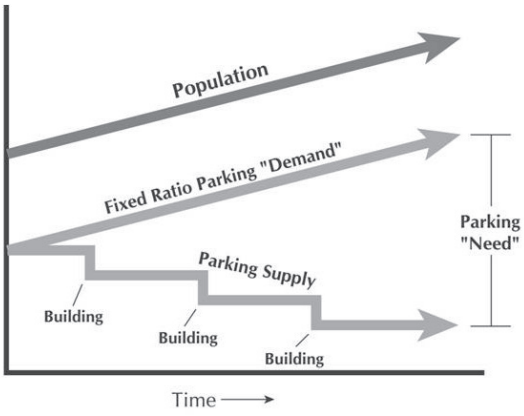


Figure 1-2 Impact of Population Growth and Campus Development on Parking "Need"



1 It is important to note that UCR's parking demand is projected to decline due to increasing permit fees necessary to pay for a multi-level structure.

As the campus matures, it is imperative to ensure an adequate land base dedicated to parking, most likely in structures as a permanent land use opposed to a surface lot which tends to be an interim use pending construction of a building in its place. Therefore, the campus's decision to construct a multi-level parking structure will likely not depend on campus-wide parking demand in the near term, but instead be based on a need to meet a critical local-area demand. Indeed, this condition occurred during the time of this study. The first parking structure on campus will be built as part of the new Glen Mor 2 apartment housing project. The three-level, 600-space Glen Mor parking structure will accommodate only student residents, and be located immediately adjacent to the new apartment units on an existing residential surface lot.

UCR has the advantage – and challenge – of choosing between different strategies to meet a potentially growing demand for parking. The campus could choose to construct more surface lots, or to renovate existing lots to gain additional spaces with a more efficient striping plan, or the campus could choose to cap the number of surface parking spaces and construct a parking structure in a high-parking demand area, such as Lot 24 or Lot 1. The course that UCR selects will be based on the campus's assessment of the advantages and disadvantages of each strategy. UCR, as have other UC campuses, will have to decide between convenient, more expensive parking (i.e.; building a parking structure) vs. inconvenient, less expensive parking (that is, building more surface parking and renovating existing lots). The shortfall of simply building more surface parking is that it often fails to satisfy high-parking demand in a localized area.

A classic parking-demand problem more often encountered by many growing campuses is the loss of parking spaces in surface lots due to new building construction occurring simultaneously with increasing student enrollments. The result is a widening gap between parking supply and demand as illustrated in Figure 1-1. In UCR's case, the graph is projected to look like Figure 1-2 through 2020.

The most significant finding illustrated by Figure 1-2 is that UCR's current supply of parking spaces is greater than the overall campus-demand for parking. UCR is likely to keep its excess supply of parking spaces through the coming decade even with a modest increase in the total campus population. The reasons for this are:

- UCR is not slated to lose significant amounts of existing surface parking to future building construction during the next ten-years (a basic assumption of the "classic" model)
- UCR has a robust and well-patronized alternative transportation program for students and employees
- There is free on-street parking adjacent to the campus, and free parking in nearby lots of religious buildings that many students and some staff consider a satisfactory alternative to paying to park on campus.

However, the campus is cautioned not to view its surface lots as permanent, as UCR's Long Range Development Plan shows future buildings occupying the footprints of current lots. Also, it is important for the reader to understand that both Figures are meant to summarize in a simplistic way how the functions of population and parking-supply and demand play out from a broad perspective. The limitation of the graph is that it may not accurately show parking demand and parking supply curves in a localized area.

To its credit, UCR recognizes that a traditional parking model may not be relevant. UCR wishes to explore flexible parking supply models that include balancing costs and benefits of providing multi-level structured parking versus more surface parking. The campus even wants to go a step further to look at balancing the costs of building any type of new parking versus increased funding toward successful alternative transportation incentives. This report defines clear goals and objectives for UCR's parking and transportation program. These goals and objectives, which are described below, will allow the campus to articulate more than one parking-supply strategy, and then to choose the one to best fit its needs at that moment in time.

PURPOSE OF STUDY

The purpose of this plan is to propose relevant transportation strategies and specific recommendations that meet the following goals:

- Provide well-patronized alternative commute options as mandated by the local Air Quality Management District, rather than simply building more parking to accommodate single-occupant vehicle trips
- Maintain a sufficient supply of parking on campus to support the Mission of the University of California
- Maintain the financial integrity of the parking and transportation system
- Define the initiatives that demonstrate UCR's commitment toward becoming a "green" university and adopting sustainable programs.

These goals are meant to provide UCR with an adequate parking supply while promoting alternative forms of transportation. To simultaneously achieve these goals, this plan will discuss the factors that UCR should recognize in order to make cost-effective decisions. The plan will recommend actions that will balance the campus's need to increase participation in alternative transportation programs while providing a suitable number of parking spaces.

As a result, Transportation & Parking Services will be able to fulfill its role in meeting the broader campus goals for environmental stewardship, while conforming to UCR's Long Range Development Plan objectives.

STUDY APPROACH

This report is structured as follows:

1. **Chapter 1**, Existing Conditions reviews the existing situation and projected trends for the campus population, new construction, housing, parking, alternative transportation incentives and public transportation serving the campus.
2. **Chapter 2**, Transportation Demand Management Strategies summarizes UCR's current alternative transportation program in a Baseline Scenario and then proposes other measures for the campus to consider. The new measures are described in a Preferred Scenario.
3. **Chapter 3**, Parking Supply and Demand Assessments analyzes current parking supply and demand on campus and estimates future parking supply and demand. This chapter shows how parking demand would increase assuming UCR does not change its policy to mitigate growing parking demand. Then an analysis of the Preferred Scenario shows the impacts of the new measures on both parking demand and finances.
4. **Chapter 4**, Comparing Costs and Revenues by Transportation Mode assesses the cost-effectiveness of UCR's existing TDM programs compared to the cost of building additional parking.
5. **Chapter 5**, Environment Impacts analyzes the effects of UCR's alternative transportation programs on the emission of greenhouse gases.

Figure 1-2 Peak Occupancy Summary

User	Population (a)	Parking Supply (b)	Peak Parking Demand (c)	Peak Parking Ratio (d) = (c/a)	Peak Parking Ratio (e) = (c/b)
Commuter Students & Visitors	14,618	3,025	2,390	.16	79%
Faculty & Staff	4,266	3,635	2,465	.58	68%
Total	**18,884**	**6,660**	**4,855**	**.26**	**73%**

EXISTING PARKING CONDITIONS – KEY FINDINGS

As part of the study, Nelson\Nygaard analyzed the results of both the October 2008 and April 2009 parking occupancy counts conducted by the campus. The peak counts, conducted in October 2008, revealed that parking demand for all non-resident student motorists peaked at 4,855 spaces, or 72.9% of the total 6,660 non-resident student spaces on campus.[2] Comparing this peak parking occupancy figure to the school population (commuter students, faculty and staff, and visitors), we can derive a peak-hour ratio of 0.26 spaces occupied per non-resident student.

There is a distinct difference in parking demand rates between commuter students and faculty/staff.

- Among commuter students and visitors, peak-hour parking demand is 0.16 spaces occupied per person.
- Among faculty and staff, peak-hour parking demand is 0.58 spaces per person.

THE BASELINE SCENARIO

The Baseline or status quo scenario (developed in detail in Chapter 3) assumes that the campus maintains and expands existing transportation demand management programs at the current per capita level. UC Riverside has a variety of alternative transportation programs for the convenience of students, faculty, and staff, including reduced permit fees for carpools, a transit pass program, a vanpool program, and a shuttle system. Faculty, staff, and students who enroll in the campus's Alternative Transportation program are eligible to participate in campus sponsored alternative transportation incentives.

Currently, the campus offers the following core strategies:

- U-Pass for all undergraduate students
- Campus Shuttle Services: Bear Runner, Trolley Express, Braveheart Loop
- Metrolink Shuttle: Riverside Transit Agency Route 1 and Route 16
- Vanpool Program: free parking on campus, $79 monthly charge
- Bicycle and Walking Program: complementary membership to Physical Education Building, complimentary bike registration, and 48 days per year of complimentary parking.
- Subsidized Metrolink transit passes for faculty and staff (15% subsidy)
- Subsidized Metrolink transit passes for students (25% subsidy)
- Subsidized RTA transit passes for faculty, staff, and graduate students (50% subsidy)
- Carpool Program: reduced cost parking permits, reserved parking
- Adjust parking rates to cover the full cost of providing parking spaces

Support strategies currently offered are:

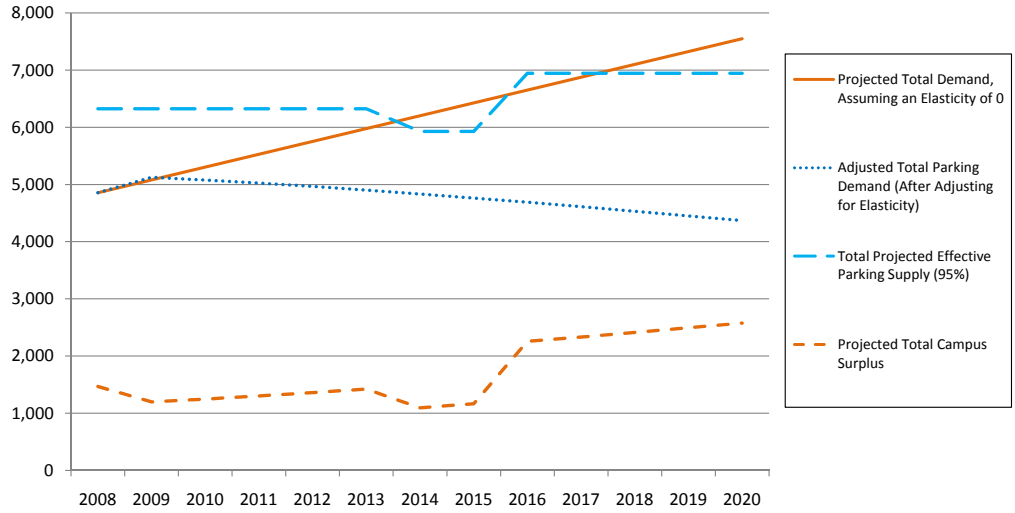
- Guaranteed Ride Home Program
- Restricting resident students from parking in commuter spaces until after 4 PM or purchasing general parking permits

To estimate the number of parking spaces demanded under the Baseline scenario, the population projections for each campus group (commuter students and faculty/staff) were multiplied by the peak-hour parking demand ratios for each group, taking into account the potential for current "spillover" motorists switching to on-campus parking. The peak-hour parking demand ratios for each group came from the October 2008 parking counts, as described above.

Under this Baseline scenario, as campus population rises to 25,000 students in 2020, projected parking demand falls from 4,855 spaces in 2008 to 4,369 spaces in 2020. This drop may seem counterintuitive, but the permit price increases necessary to finance a parking structure actually push demand beneath today's levels. It should be noted that the

2 This report excludes resident students from its analysis as management of their resources is separate and distinct from those of the remainder of the campus population.

Figure 1-3 Projected Parking Demand, Baseline Scenario



construction of garage parking is necessitated by the development of certain areas on campus leading to localized spikes in demand. These developments essentially act as trigger points for the building of a parking structure.

The Baseline Scenario (and Preferred Scenario) assumes that permit prices should be adjusted to cover the costs of providing parking in order to generate a "break-even" financial outcome. This leaves small reserves for extra special transportation related projects such as signage, restriping/re habilitation, and landscaping. In order to achieve this, the Baseline Scenario projects annual permit price increases of 11%. Although this appears to be a steep increase, it is only a moderate amount when we account for inflation and the funds necessary to build structured parking.

One important assumption used in both scenarios is that, all else being equal, *parking price increases reduce parking demand*. This scenario assumes a parking price elasticity of -0.3 (i.e. a one percent increase in parking price in real terms - that is, after inflation - yields a roughly 0.3 percent decrease in parking demand). This number represents a mid-point in values found in the national transportation research literature on parking demand elasticity with respect to price. Under the assumption that parking prices do affect demand, and given the substantial parking price increases required to fund new parking structures, projected parking demand is noticeably reduced. If one assumes that parking price increases will have *no* effect on demand, then 7,549 spaces would be demanded by 2020. However, assuming a parking price elasticity of -0.3[3], and using the parking price increases needed to fund a new parking structure, parking demand in 2020 is reduced from 7,549 to 4,369, a decrease in demand of over 42%.

Under this Baseline Scenario, it is necessary to build one parking structure on the site of Lot 24 to meet the future pressures of localized demand caused by the expansion of the Bannockburn development.[4] Although the LRDP provides for structures in several locations on campus, it is only necessary to build structures to meet localized peaks in demand since pricing will keep campus-wide demand at reasonable levels. By building a structure on Lot 24, there would be sufficient spaces to generate an "effective parking supply" of 7,311 in which 5% of spaces will still be vacant to ensure maneuverability of vehicles and extra space for abnormal peaks in demand. Figure 1-3 illustrates the impact of an assumed parking price elasticity of -0.3 on projected parking demand.

3 U.S. Department Of Transportation, Federal Transit Administration, TCRP Report 95 Chapter 13 "Parking Pricing and Fees: Traveler Response to Transportation System Changes," May 1995.

4 The Baseline Scenario envisions Lot 24 to close in 2014 and a parking structure to be built in 2016, but these dates may change based on the construction schedule of the Bannockburn development.

The Preferred Scenario

This scenario introduces several new transportation demand management measures that have the potential to reduce parking demand and traffic at reasonable cost. These measures would be funded through an Alternative Transportation fee that is described below. As stated above, UC Riverside has already implemented several programs, ranging from undergraduate student U-Passes to subsidized vanpool services. These existing programs can be expanded and combined with new strategies to further reduce the growth of traffic and parking demand.

Nationwide, the universities with the most effective transportation demand management programs have implemented packages of coordinated strategies. In this study, the most promising prospective transportation demand management strategies have been assembled into a Preferred Scenario. The core strategies include:

- Expand the UPASS program to cover faculty, staff, and graduate students at a 100% subsidy.
- Continue the current campus policy of adjusting parking rates to cover the full cost of providing parking spaces.[5]
- Increasing the price of permits for those within a certain distance of campus to encourage the use of alternative modes of transportation. (assuming that alternatives are available)

Support strategies include:

- Establish a car sharing service on-campus which will be available to students, faculty, and staff.[6]
- Expand shuttle service to serve West Campus.
- Encouraging a student vote on (and possible faculty/staff participation in) a $41 quarterly Alternative Transportation fee that will that will fund alternative transportation programs and reduce the campus carbon footprint.

5 UC Riverside currently charges parking rates to cover the full cost of providing parking spaces. This core strategy is included in the Preferred Scenario to note that rates will need to be adjusted in the future to cover the higher costs of providing structured spaces. It should be noted as well that UCR's current parking permit fees finance its AT program.

6 UC Riverside will introduce a minimum of five Zipcar vehicles for campus affiliate use beginning in Fall 2009 that will be paid for through user fees. Affiliate enrollment fees in the car sharing program will be allowed to be applied to future vehicle rentals.

Figure 1-4 Projected Parking Demand, Preferred Scenario

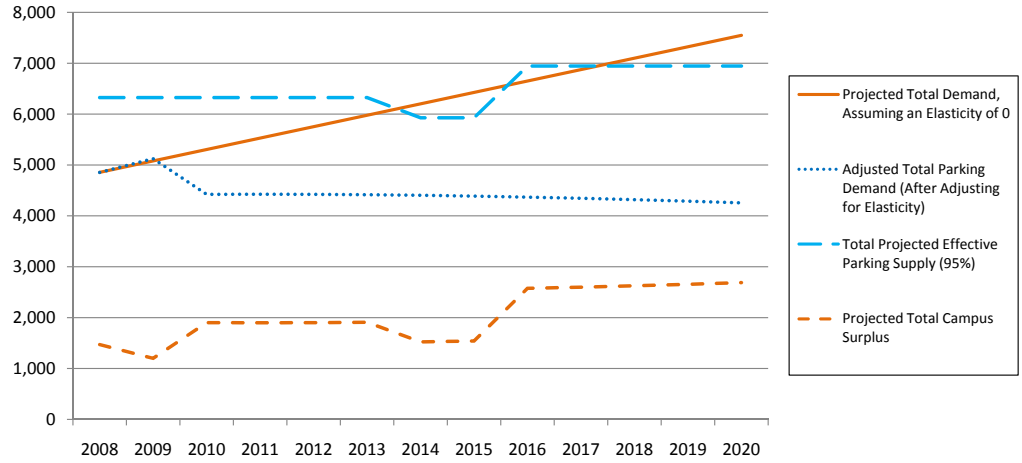
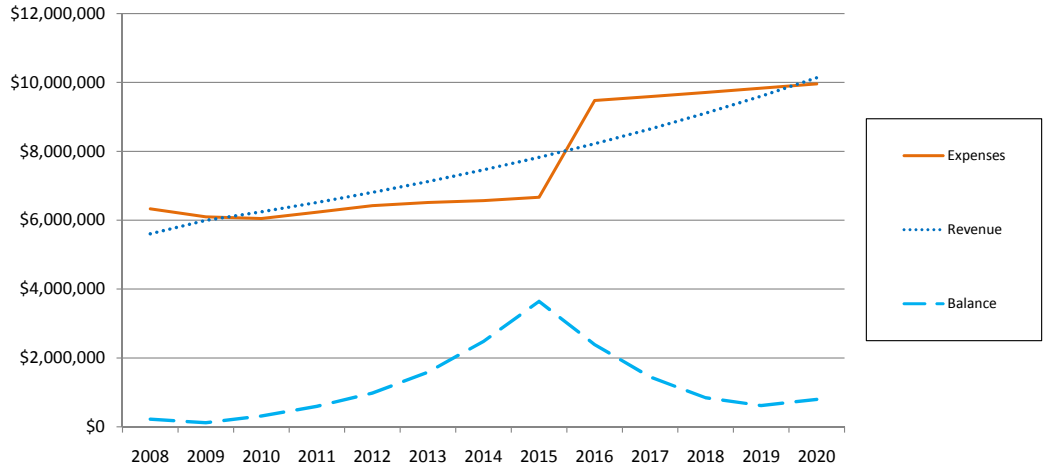
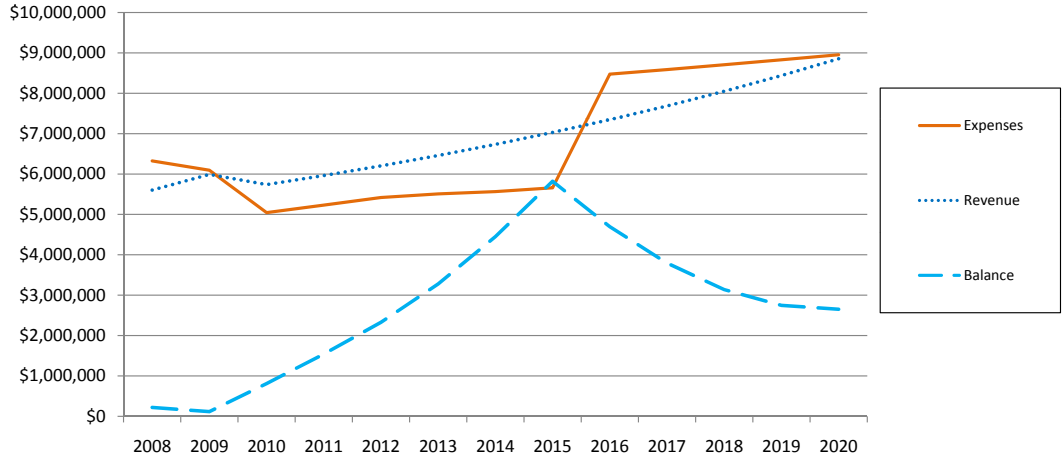


Figure 1-5 Revenues and Expenses, Baseline Scenario



Data provided by Transportation and Parking Services

Figure 1-6 Revenues and Expenses, Preferred Scenario



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- Improve bicycle facilities and programs by introducing a bike sharing program, installing more bicycle racks in high-demand locations, and improving the bicycle connection between the East and West campuses along University Avenue.
- Introduce on-campus services such as a dry cleaner, convenience store, grocery store, post office, personal services, and other amenities that will serve the needs of campus affiliates.
- Adjusting the hours and lots in which resident students are restricted from parking (or purchasing) in commuter spaces.
- Campus support of Parking Permit Districts created by the City to cope with potential spillover parking problems on neighborhood streets.

As in the Baseline Scenario above, assuming an elasticity of -0.3, projected future parking demand will drop substantially from the figures that do not take into account price elasticity or expanded TDM measures. If prices were adjusted to simply cover projected costs, a parking price elasticity of -0.3, combined with TDM measures, would reduce projected parking demand in 2020 from 7,549 to 4,256. This represents over a 3% reduction from the Baseline Scenario, with permit prices rising at only 9% per year.[7]

7 This does not include the price increase for those living within a certain distance of campus to encourage alternative mode use, which will take effect in 2010.

By providing funds for alternative forms of transportation, UCR will further mitigate parking demand, and improve its ability to provide an adequate number of parking spaces at a lower cost to permit holders as it is less expensive for campus permit holders to subsidize alternative transportation than to build multi-level parking structures. However, there is a limit to the number of students, faculty, and staff who will choose alternative transportation modes even given an increased financial investment in these modes, thus there may be a need for parking structures in the future to address parking demand (such as the buildng of a parking structure on Lot 24). Ongoing monitoring of parking supply and demand will be critical to determining the proper balance and timing of investment in alternative transportation facilities and programs, permit fee increases, and the construction of additional parking facilities as these measures all effect the demand for parking. For example, increased investment in alternative transportation may result in fewer auto commuters, which in turn results in decreased parking revenue which is necessary to fund new parking garage construction. However, a reduced demand for parking may negate the need for new multilevel structures. In contrast, if the demand for parking continues to grow, permit fees may need to be raised to generate the funding necessary for the construction of new parking. Thus, is it important to have ongoing monitoring in place. Figure1 4 illustrates the impact of an assumed parking price elasticity

Figure 1-7 Campus Parking Demand in Different Scenarios

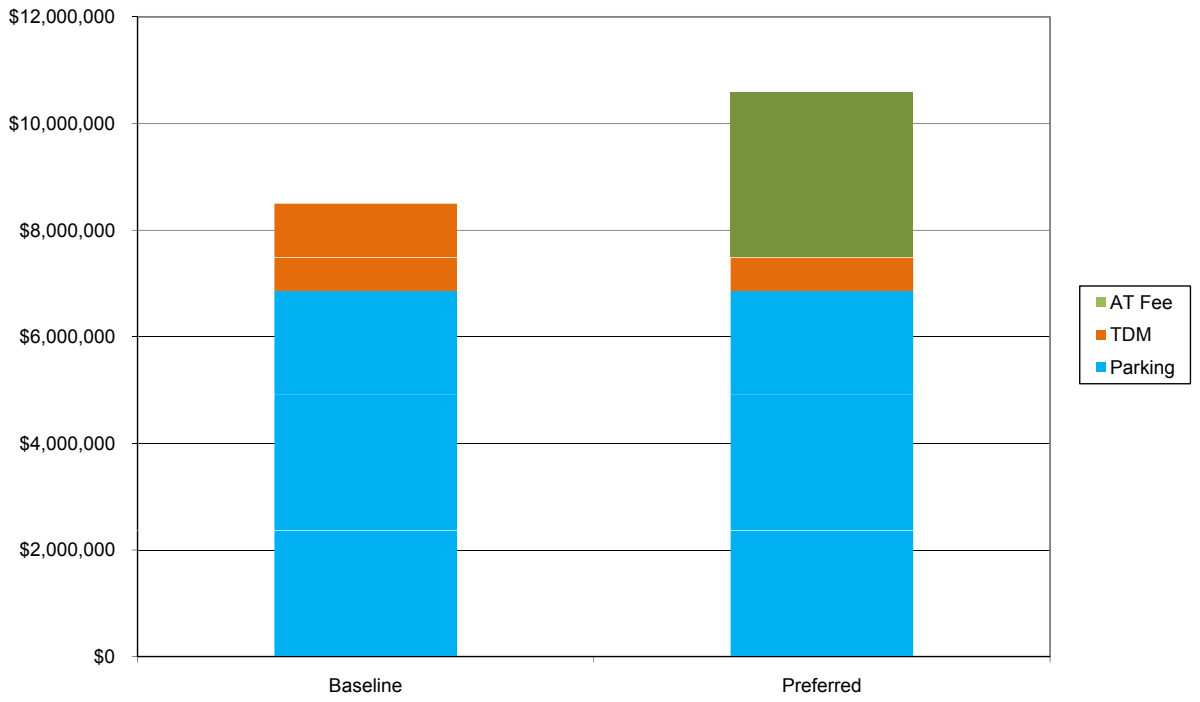
Scenario	2008 Parking Demand	2020 Parking Demand	Percent Reduction vs. Generic Analysis
Generic Analysis	4,855	7,549	0%
Baseline	4,855	4,369	42%
Preferred	4,855	4,256	44%

Figure 1-8 Scenario Cost Summary in 2020

Scenario	Total Annual Cost of TDM Programs	Total Annual Cost of Parking	Total Scenario Cost
Baseline	$1,639,164	$6,857,259	$8,496,423
Preferred	$3,731,957	$6,857,259	$10,589,216

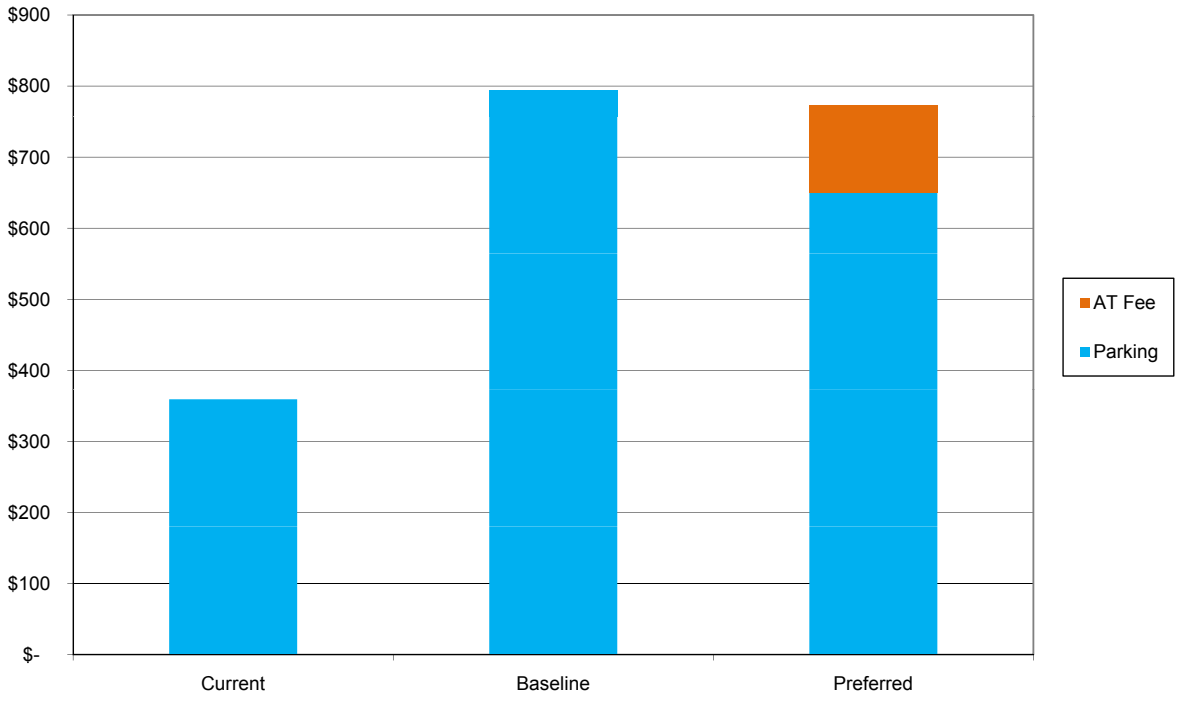
Data provided by Transportation and Parking Services

Figure 1-9 Annual Transportation Budget (2020



Data provided by Transportation and Parking Services

Figure 1-10 Annual Student Fees in Real Dollars (2020)



Data provided by Transportation and Parking Services

of -0.3[8] with TDM on projected parking demand assuming no parking structure is constructed.

Costs and Revenues for the Baseline and Preferred Scenarios

This section summarizes parking and transportation expenses and revenues under the Baseline and Preferred scenarios. The projections shown in the graphs include the costs of both transportation demand management (TDM) programs and parking construction and operations costs. Each scenario is analyzed through 2020. Figure 1-5 and Figure 1-6 show the predicted parking and transportation revenues and expenses for the Baseline and Preferred scenarios.[9]

Perhaps the most significant result of this analysis is the similarity of the projected expenses (and revenues therefore required) in the scenarios. The key difference between the two scenarios is due to the introduction of an Alternative Transportation fee in the Preferred Scenario. This fee allows for the campus to introduce new programs to reduce parking demand and defray costs, resulting in fewer expenses. The Preferred scenario ends with a larger balance than the Baseline Scenario that could be used to finance campus transportation improvements such as signage enhancements, restriping, and landscaping.

Parking Demand Effects – Summary

Both the Baseline and Preferred scenarios can be expected to significantly reduce campus parking demand over the long term as compared to a generic parking analysis that does not account for parking price. Figure 1-7 summarizes the differences in projected 2020 parking demand.

Cost Analysis

Figure 1-8 and Figure 1-9 show the cost results for the Baseline and Preferred scenarios. The scenarios show different costs, but it is important to note that the higher TDM costs in the Preferred Scenario represent significant upgrades to the campus's shuttle system to serve the West Campus and that those costs are paid for entirely by the Alternative Transportation fee. The parking permit fees required to support each scenario are different. In the Baseline Scenario, the required annual commuter student parking fee is $794 by 2020. For the Preferred Scenario, the estimated fee is $650.

It is important to note that these price levels could change dramatically if new housing or academic developments cause peaks of localized demand and trigger the need for a new parking structure. The future replacement of surface lots on the East Campus may result in fewer parking spaces and high levels of parking demand in particular corners of campus. This study does not possess sufficient future academic and housing construction information to offer a detailed forecast of necessary parking structures, but this does not preclude their construction on the sites identified in the LRDP. These sites should remain reserved for parking until a more thorough campus build-out plan is developed.

To defray permit fees, students (and possibly faculty/staff) will also be paying a quarterly Alternative Transportation fee of $41 to fund TDM measures in the Preferred Scenario (it is estimated that the fee would drop to $33 if faculty and staff also participated). Figure 1-10 shows the total permit fee in each scenario in 2020 and breaks out the amount from each fee that is dedicated to parking versus TDM. It is important to note that in this figure, the amount for TDM in the Preferred Scenario is funded entirely by the Alternative Transportation fee.

8 U.S. Department Of Transportation, Federal Transit Administration, TCRP Report 95 Chapter 13 "Parking Pricing and Fees: Traveler Response to Transportation System Changes," May 1995.

9 Baseline parking and revenue data was obtained from Transportation and Parking Services.

CONCLUSIONS

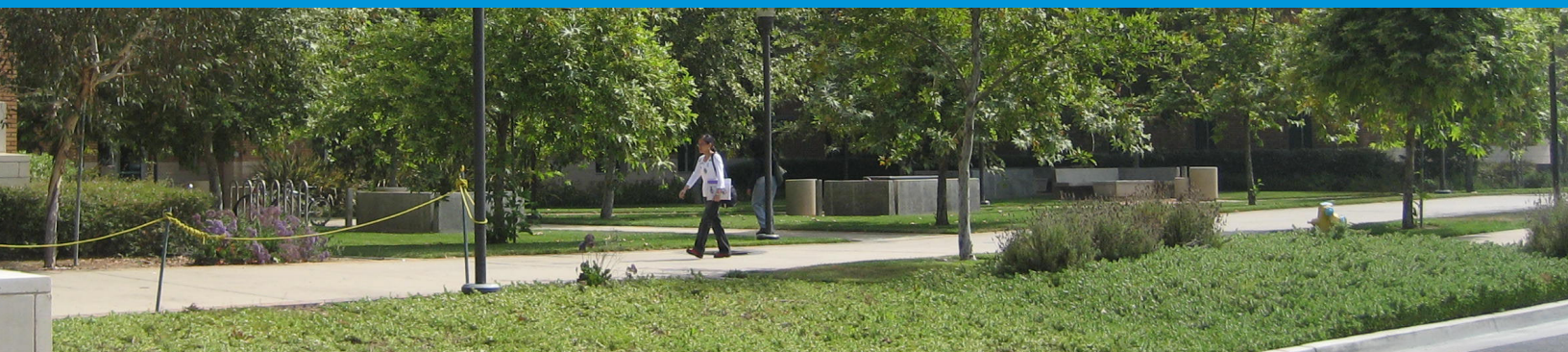
UC Riverside has the potential to keep parking permit prices relatively low given the construction of a new garage if it opts to implement new TDM measures. The campus's current alternative transportation program is already very successful at reducing the single-occupant vehicle travel and by building upon its current programs, it can both introduce new services such as upgraded shuttle service while keeping parking costs at reasonable levels. As noted above, TDM program expenses in the Preferred Scenario represent a significant increase from those in the Baseline Scenario, but it should be noted that since the Baseline Scenario does not assume any additional shuttle service to the West Campus, its costs are artificially low.

In terms of a phased implementation of measures within the Preferred Scenario, it is recommended that the campus begin by weighing support for the Alternative Transportation fee that would be used to fund a host of programs. With that in place, the campus can institute measures such a bikesharing program and then extend shuttle service once the West Campus begins development. It should be mentioned that the various strategies not only reduce campus parking demand, but also bring numerous other benefits. These include:

- Reductions in auto usage, which will reduce traffic congestion.
- Environmental benefits through lower auto emissions, thereby helping UCR meet its sustainability goals

Overall, implementing this plan can provide a coherent transportation strategy for the campus, helping to meet its goals for parking and transportation systems, as well as the broader campus goals of managing the growth of the campus population and fulfilling the campus's mission of environmental stewardship.

INTRODUCTION



CHAPTER 2

INTRODUCTION

University of California, Riverside is a campus on the rise. The 2005 Long Range Development Plan calls for expanding student population from 18,050 to 25,000 students by 2015, while also expanding campus facilities though the development of the 511.3 acre West Campus of which 295 acres are currently being used for agricultural teaching and research fields. It should be noted however, that due to the state budget crisis and the nationwide economic recession, the campus has recently scaled back its estimates of student enrollment. Instead of reaching 25,000 students by 2015, the year 2020 will become the new target year.

The expanded campus envisioned in the Long Range Development Plan will provide additional academic and research facilities, student housing, administrative buildings, and space for student and support services. Creating connections and ensuring ease of access between the East and West Campuses as well as to the surrounding community is a key component of the Long Range Development Plan. This goal will be addressed by making walking, bicycling and transit attractive and pleasant, and fostering the campus vision that most students seek tree-lined paths, quadrangles where people meet and ideas flow, and an environment that fosters educational enrichment and creates campus and community life and excitement on campus.

However, enrollment expansion and the development of the West Campus impose substantial challenges for parking and transportation both on campus and in the surrounding community. In the absence of strategies to alter travel demand, campus population growth leads to commensurate increases in community traffic and parking demand on campus. At the same time, campus development aimed at accommodating growth logically targets underutilized spaces including replacement of surface parking lots with new academic, administrative and other support buildings. The result for campus parking and transportation is a constriction of parking supply alongside a swelling in baseline parking demand, leading to a widening gap between parking supply and demand. (See Figure 2-1)

Under these conditions, many campuses close the gap in parking "need" by providing new parking in the form of multi-story, structure parking garages at many times the cost of former surface parking lots. An alternative approach aims to close this gap by introducing transportation demand management (TDM) measures to reduce the growth in parking demand and facilitating mode switch for a proportion of the campus commuting population. Different solutions have different costs per user served. For most types of approaches, the cost per user tends to increase as more and more users are served, due to increasing marginal costs. For example, bicycle and pedestrian improvements can

be very cost effective as a means to facilitate users who are pre-disposed to walk or ride a bicycle; however, much greater amounts of money must be spent in order to encourage people who have a strong preference for driving their cars to walk or bicycle instead.

The most cost-effective solution for accommodating new commuter demand in an environment of reduced surface parking usually involves a combination of these two approaches through a package of housing, alternative transportation and new parking construction.

The balance between parking supply and demand is complex and often counterintuitive. For example, at several campuses, increasing parking permit fees to raise money for transit, bike and pedestrian facilities has reduced demand sufficiently (through the higher parking price and improved alternatives to driving alone) to obviate the need for additional parking structures. By contrast, building the parking structures instead would have required a far higher rise in parking fees to cover the cost. At these campuses, the least expensive way to provide a parking space for a student who had to drive turned out to be to help another student leave his or her car at home. Counter intuitively, the best way to keep parking prices low was to spend a large portion of parking revenues on improving alternatives to driving.

At UC Riverside, the coming wave of growth may place new buildings on existing parking lots. Current transportation policies help in keeping parking demand levels low, but new measures may be needed to meet future needs. In addition to addressing parking needs, the development of the West Campus will require a concentrated effort to ensure that adequate bike, shuttle, pedestrian, and transit connections are developed to provide ease of access between the East and West Campuses and the surrounding community.

Nelson\Nygaard undertook the development of this plan in consultation with campus staff. As an important first step, the campus developed clear goals and objectives for campus transportation at UC Riverside. Those goals and objectives, which are described below, have guided the development of the specific transportation strategy and the transportation measures proposed in this report.

The purpose of this plan is to create a campus transportation strategy that meets the following **goals**:

- Provides good access to campus whether through driving, carpooling, bicycling, walking or using public transportation
- Maintains a sufficient supply of parking on campus and provides effective transportation services
- Maintains the financial integrity of the parking and transportation system for the campus
- Manages parking and transportation costs for UCR commuter students, faculty and staff
- Supports the campus's mission as an environmental steward and "green" campus

To meet the goals of the study, this plan evaluates the following topics:

- The campus's planned parking program at a campus population of 25,000 students in terms of potential costs and ability to meet parking demand.
- Alternative parking construction scenarios and associated programs of alternative transportation strategies that can optimize access to the campus for students, faculty, staff, and visitors.
- Environmental impacts of increasing and expanding the campus's alternative transportation program.
- Expanded intra-campus shuttle service, in terms of routing and level of service.

This plan determines when and where it would be cost-effective for UC Riverside to make additional investments in transportation demand management programs. It assesses the particular transportation and parking strategies that appear to have the greatest potential to reduce traffic and parking demand at UC Riverside and quantifies the likely costs of the strategies to help identify the most cost-effective package of new parking construction and improved alternatives to driving alone.

Overall, this plan provides a coherent transportation strategy for UC Riverside, which meets all of the campus's goals for responsive parking and transportation systems, as well as broader campus goals for building the campus Long Range Development Plan and acting as an environmental steward.

EXISTING CONDITIONS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CHAPTER 3

EXISTING CONDITIONS

INTRODUCTION

Each day, thousands of students and faculty and staff, plus a number of visitors arrive and traverse UC Riverside. This movement of people to, from and about the campus speaks to the success of the campus as an educational institution. With the increased student enrollment and expansion of campus facilities, it is important to weigh the effects of growth on the parking and transportation system. UCR is to be commended for recognizing that traditional parking demand models may no longer be relevant. This appears to be a transition period as the historical auto-predominant transportation model is shifting to one that embraces more alternative transportation modes. Given the rising costs of constructing new parking facilities, now is an appropriate time to look at whether a more dynamic and flexible parking supply model is necessary. This section provides background information to form an innovative campus Parking and Transportation Management Analysis (PTMA) that will guide decision making toward multi-modal accessibility and managed growth, and will discuss the cost-effectiveness of the various campus transportation programs.

CAMPUS POPULATION & HOUSING

In its 2005 Long Range Development Plan, the campus was targeted to grow from 18,050 FTEs (Full Time Equivalent Students) in 2005, to 21,000 in 2010 (16% increase), and 25,000 in 2015 (39% increase from 2005). The Plan also includes provisions to increase the number of students living on campus with a goal of eventually housing 50% of the student population, or 12,500 students, on campus by 2015. To accommodate this growth, the LRDP recommends adding 2,986 beds in residence halls, 4,921 apartment beds, and 714 family housing units, for a total of 8,353 new beds or units. The increase in student population will be coupled with an increase in staff and faculty population.

However, due to the state budget crisis and the nationwide economic recession, the campus has recently scaled back its estimates of student enrollment. Instead of reaching 25,000 students by 2015, the year 2020 will become the new target year.

Figure 3-1 Current Population and Housing Projections*

Year	2008	2009	2010	2011	2012	2013	2014
Commuter Students & Visitors	14,618	14,660	14,703	14,745	14,787	14,829	14,871
Resident Students	4,610	5,268	5,925	6,583	7,240	7,898	8,555
Faculty/Staff	4,266	4,570	4,874	5,179	5,483	5,787	6,091

Year	2015	2016	2017	2018	2019	2020
Commuter Students & Visitors	14,913	14,955	14,998	15,040	15,082	15,124
Resident Students	9,213	9,870	10,528	11,185	11,843	12,500
Faculty/Staff	6,395	6,699	7,004	7,308	7,612	7,916

* Population projections assume a linear increase from 2008 to 2020 using the projections made in LRDP Table 1, p. 34.

Campus Development

In addition to its enrollment and housing needs, UC Riverside is planning a major expansion in academic and research facilities on its West Campus.

Agricultural research predominates on the West Campus where the new School of Medicine, academic buildings, and support facilities will be located. In addition, roughly half of the new gross square footage for student housing that will be needed to accommodate the increased student population will be sited on the West Campus. Figure 3-2 shows the anticipated build-out for the entire campus by use.

Figure 3-2 Proposed Campus Development*

Use	Fall 2001 Baseline (GSF)	Projected 2015/2016 (GSF)	Net Increase (GSF)
Academic Programs	2,190,947	5,500,000	3,309,053
Professional Schools	103,365	700,000	596,635
Administration	163,018	500,000	336,982
Public Service	206,512	400,000	193,488
Non-Institutional Agencies	102,181	102,181	0
Student Services	187,444	500,000	312,566
Maintenance & Physical Plant	132,263	200,000	67,737
Recreation & Athletics	98,269	470,000	371,731
Housing	1,513,017	3,430,526	1,917,509
Total	**4,697,016**	**11,802,707**	**7,105,691**

* LRDP, pg 41

PARKING

Existing Parking Studies and Recommendations

The 2005 LRDP projects that 9,800 commuter and visitor spaces will be needed to meet demand, of which 10% or 980 spaces will be designated as visitor parking, based on the assumed commuter to visitor parking ratio. Special permits and service vehicle parking demand projections are proportional to the demand of the overall population growth rate.

Residential parking projections assume that 50% of the student population will be housed on campus. In order to project future parking needs for residential populations, the LRDP uses the following ratios:

- 1 space per 4 beds for residential halls
- 1 space per 2 beds for campus apartments
- 1.5 spaces per bed for family housing.

Figure 3-3 summarizes the projected number of parking spaces that will be needed by each user group.

In order to accommodate the projected number of parking spaces that will be needed as a result of development and to conserve the land base, the LRDP projects the construction of several new multi-level parking structures. On the East Campus, there are currently five surface parking lots which may be ultimately used as sites for new parking structures in order to accommodate the projected parking demand. Figure 3-4 shows the proposed parking structure sites in the LRDP.

On the West Campus, the 2005 LRDP proposed building four new parking structures (excluding those at the School of Medicine) in order to accommodate campus growth. Based on the proposed development described earlier, Figure 3-5 shows the number of parking spaces projected for each structure.

Figure 3-3 Projected Parking Inventory*

User Group	Existing Spaces 2001	Projected Spaces at 25,000 Students	Current Configuration	Proposed Configuration
Commuter	6,217	8,820	Surface Lots	Structure
Visitor	626	980	Surface Lots	Surface/Structure
Special Permits, disabled, special needs	307	500	Surface Lots	Surface/Structure
Campus Vehicles	40	80	Surface Lots	Primarily Surface
Residential				
Residence Halls	880	1,477	Surface Lots	Primarily Surface
Apartments	494	2,940	Surface Lots	In buildings/On Street/ Surface/Structure
Family Housing	268	1,071	On Street	In buildings/On Street/ Surface
Total Parking	**8,832**	**15,868**		

* LRDP pg 91, based on TAPS inventory

Figure 3-4 LRDP Land Use Map

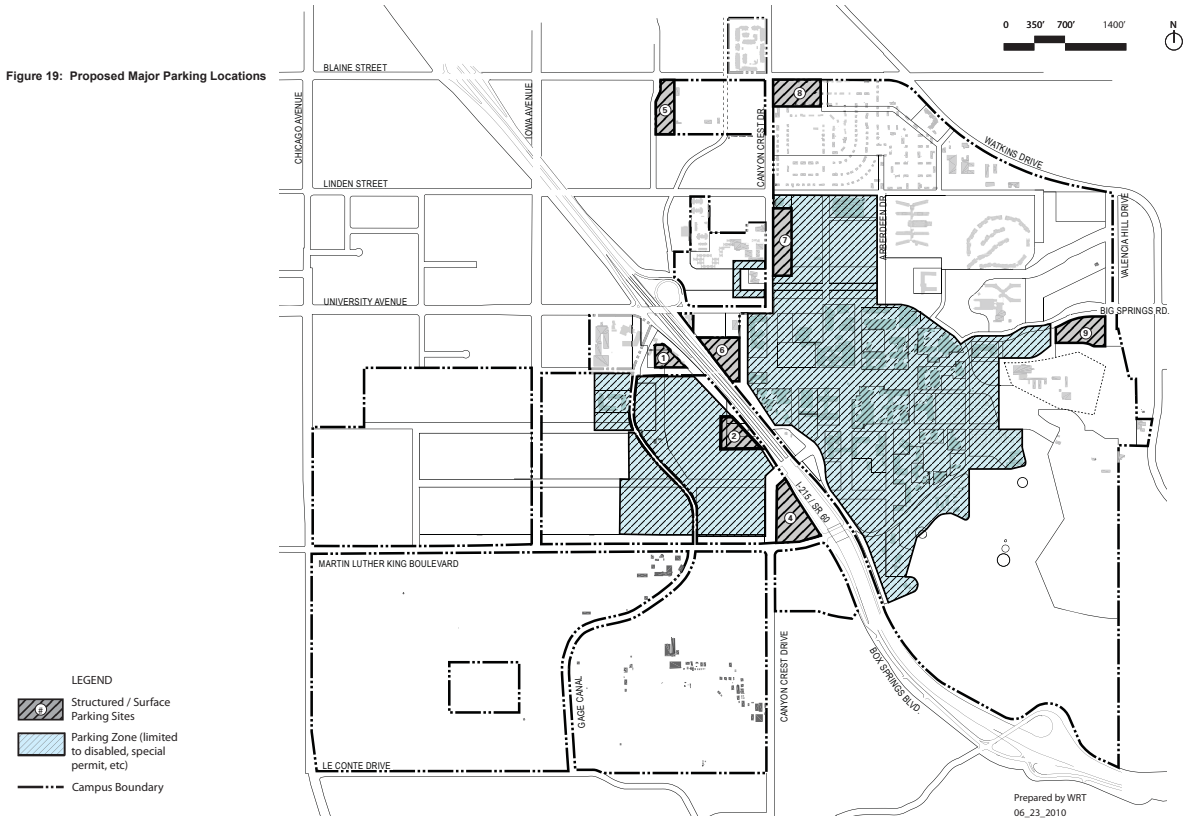


Figure 3-5 West Campus Parking Spaces Required*

Parking Location	Number of Spaces
Structure 1	524
Structure 2	869
Structure 4	1,644
Structure 5	1,075
Structure 6	1,274
Structure 7	1,070
Structure 8	1,513
Structure 9	956
Total	**8,925**

* LRDP pg 89-90. This table has been updated with the latest information from the LRDP Amendment 2. The number of spaces in Structure 7has been updated by the UCR 10-year capital financial plan.

Trends in Parking Supply & Demand

There are a variety of standards and methods to gauge current and future parking demand on the UCR campus. Previous studies, such as the estimates made in the 2005 LRDP, have been based on conservative figures that assume the current parking supply is appropriate to meet existing demand, so the current ratios should be used in the future. This methodology is problematic because it does not take into account the actual campus-wide peak parking demand and today's economic climate, which shows that nearly three out of ten parking spaces are vacant. Therefore, the LRDP's future needs analysis appears to overestimate the amount of parking necessary to meet demand.

A second option for gauging parking demand is to use figures cited by the Institute for Transportation Engineers (ITE), a national standard used in parking analyses, which estimate demand as a function of total school population. Fortunately, for our purposes, generalized national standards are not necessary as the campus conducted parking counts on October 15, 2008 and April 8, 2009.

The October 15, 2008 counts reveal that parking demand peaks at 4,855 spaces, or 72.9% of the total 6,658 spaces available; April 8, 2009 counts are slightly lower with only 67.7% of spaces occupied. Figure 3 6 shows the parking supply and demand figures by lot for both survey dates. It should be noted that the supply numbers in Figure 3-6 include service dock spaces. However, the number of service dock spaces is so small that they will have no noticeable impact on demand and it is also possible that faculty and staff may be parking in these spaces currently.

It is important to note that these counts are presented here as the most recent data available. They are not being used for the purposes of comparison as the number of spring students is lower than those of the fall. Given the steady decline in parking ratio per user at UCR since the inception of the AT program, it would not be logical to compare current fall data to previous academic years. UCR staff has also noted that the figures presented below are a reasonable representation of campus demand and do not present an anomaly.

Figure 3 7, Figure 3 8, and Figure 3 9 graphically illustrate these data and show the parking supply locations. For the purposes of this analysis, residential students have not been included in the calculations of supply and demand, since their parking ratios are set by the UCR Long Range Development Plan. Certain lots that are mixed residential student/other user parking areas are shown in the maps, but only the non-resident spaces are shown. Lots that are entirely reserved for resident students have been excluded.

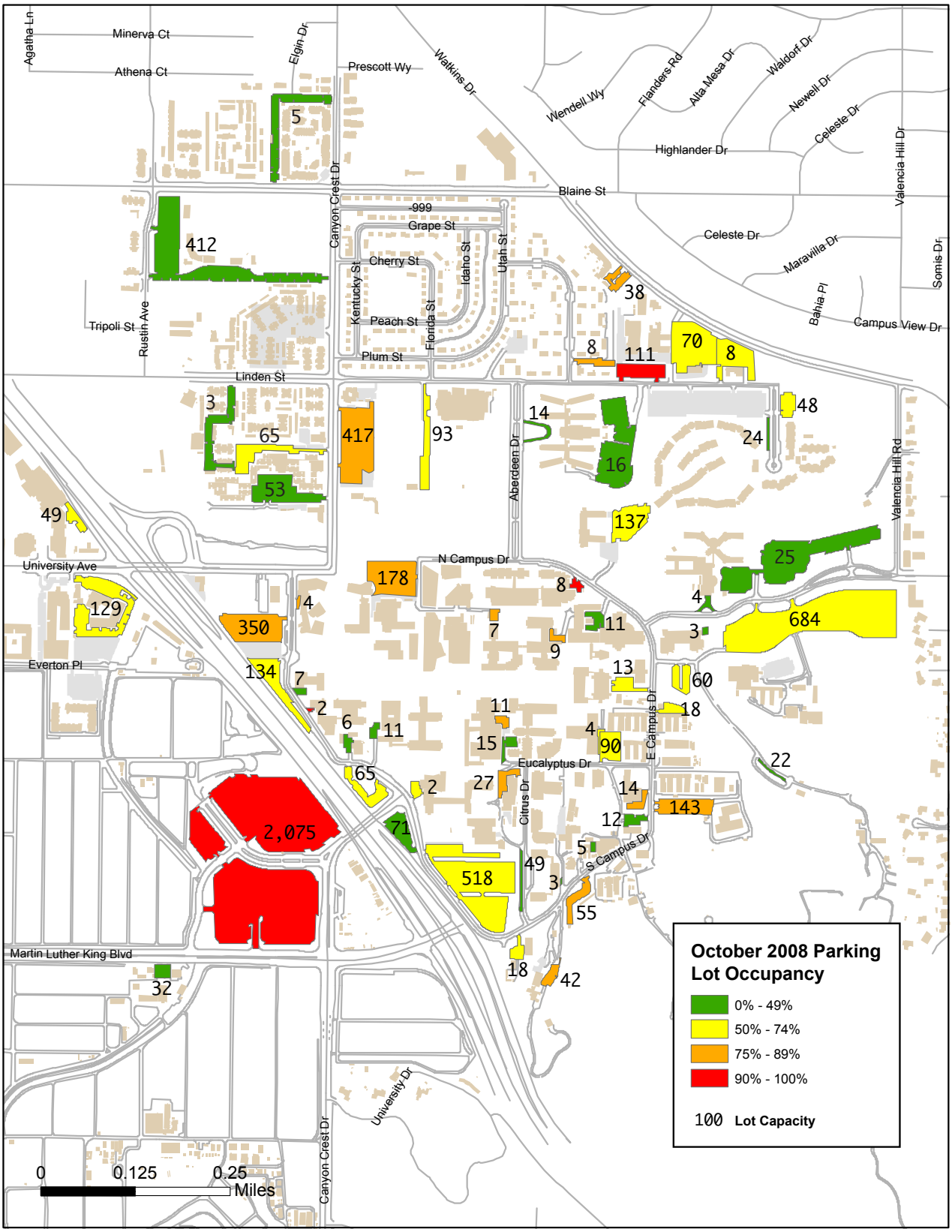
Figure 3-6 Current Parking Supply & Demand by Lot and Service/Loading Dock

Lot	Supply	October 15, 2008 Demand	October 15, 2008 Occupancy	April 8, 2009 Demand	April 8, 2009 Occupancy
Aberdeen & Inverness	13	4	31%	3	23%
AGSM East	7	3	43%	2	29%
AGSM West	3	1	33%	0	0%
Arts Service	4	3	75%	0	0%
Bannockburn North	65	33	51%	30	46%
Bannockburn South	53	9	17%	9	17%
Bannockburn South - Dock	2	2	100%	1	50%
Barn Service	6	2	33%	4	67%
Batchelor Service	4	2	50%	1	25%
Biological Medicine	13	11	85%	11	85%
Bookstore Service	4	3	75%	4	100%
Botanic Gardens	22	3	14%	16	73%
Boyce Hall Service	5	0	0%	4	50%
Canyon Crest Housing	8	6	75%	4	50%
Career/Counseling Centers - Dock	3	1	33%	0	0%
Chemical Science - Dock	3	1	33%	0	0%
Child Development Center	38	30	79%	10	26%
Corp Yard	70	38	54%	24	34%
EH&S	18	13	72%	15	83%
Engineering Building Unit 2 Service	8	8	100%	3	38%
Entomology Service	2	0	0%	0	0%
Fawcett	13	11	85%	6	46%
Fleet	100	74	74%	69	69%
Geology Service	9	7	78%	6	67%
Glass Houses	18	12	67%	12	67%
Grounds	12	5	42%	7	58%
Health Center Service	2	0	0%	0	0%
Highlander Hall	129	65	50%	49	38%
Hinderaker Service	7	3	43%	1	14%
Humanities & Social Sciences Service	2	2	100%	0	0%
Insectary	5	1	20%	1	20%
Life Sciences	15	3	20%	3	20%
Lot 1	350	292	83%	286	82%
Lot 10	60	44	73%	53	88%
Lot 11	80	66	83%	62	78%
Lot 12	13	5	38%	11	85%
Lot 13	684	366	54%	461	67%
Lot 14	25	7	28%	9	36%
Lot 15	137	88	64%	96	70%
Lot 19	178	153	86%	101	57%
Lot 2	134	86	64%	94	70%

Lot	Supply	October 15, 2008 Demand	October 15, 2008 Occupancy	April 8, 2009 Demand	April 8, 2009 Occupancy
Lot 20	48	27	56%	39	81%
Lot 22	16	5	31%	10	63%
Lot 23	111	107	96%	87	78%
Lot 24	417	322	77%	262	63%
Lot 25	93	60	65%	47	51%
Lot 26	412	123	30%	84	20%
Lot 3	43	36	84%	24	56%
Lot 30	2075	1984	96%	1773	85%
Lot 31	32	13	41%	10	31%
Lot 4	65	32	49%	32	49%
Lot 5	71	31	44%	38	54%
Lot 6	525	350	67%	417	79%
Lot 7	43	21	49%	19	44%
Lot 8	55	49	89%	NA	NA
Lot 9	143	122	85%	106	74%
Lothian Residential Service	4	0	0%	3	75%
Mail Services	4	4	100%	2	50%
Medical Entomology	4	2	50%	4	100%
Pentland Way	24	9	38%	5	21%
Physics Service	11	5	45%	4	36%
Pierce Hall Service	7	6	86%	4	57%
Psychology Bldg Service/Dock	7	0	0%	0	0%
Rivera Library Service	11	9	82%	5	45%
Science Library Service	2	0	0%	0	0%
Sproul Hall Service	11	5	45%	4	36%
Statistics and Computing	13	9	69%	9	69%
Steam Plant	27	22	81%	21	78%
Stonehaven	5	1	20%	1	20%
TAPS	8	4	50%	5	63%
Theater Service	2	1	50%	1	50%
University Plaza	3	0	0%	1	33%
University Village	44	33	75%	24	55%
Total	**6,660**	**4,855**	**73%**	**4,507**	**68%**

* Lot 8 data is not available for April, 2009 counts and have been excluded from the April totals.

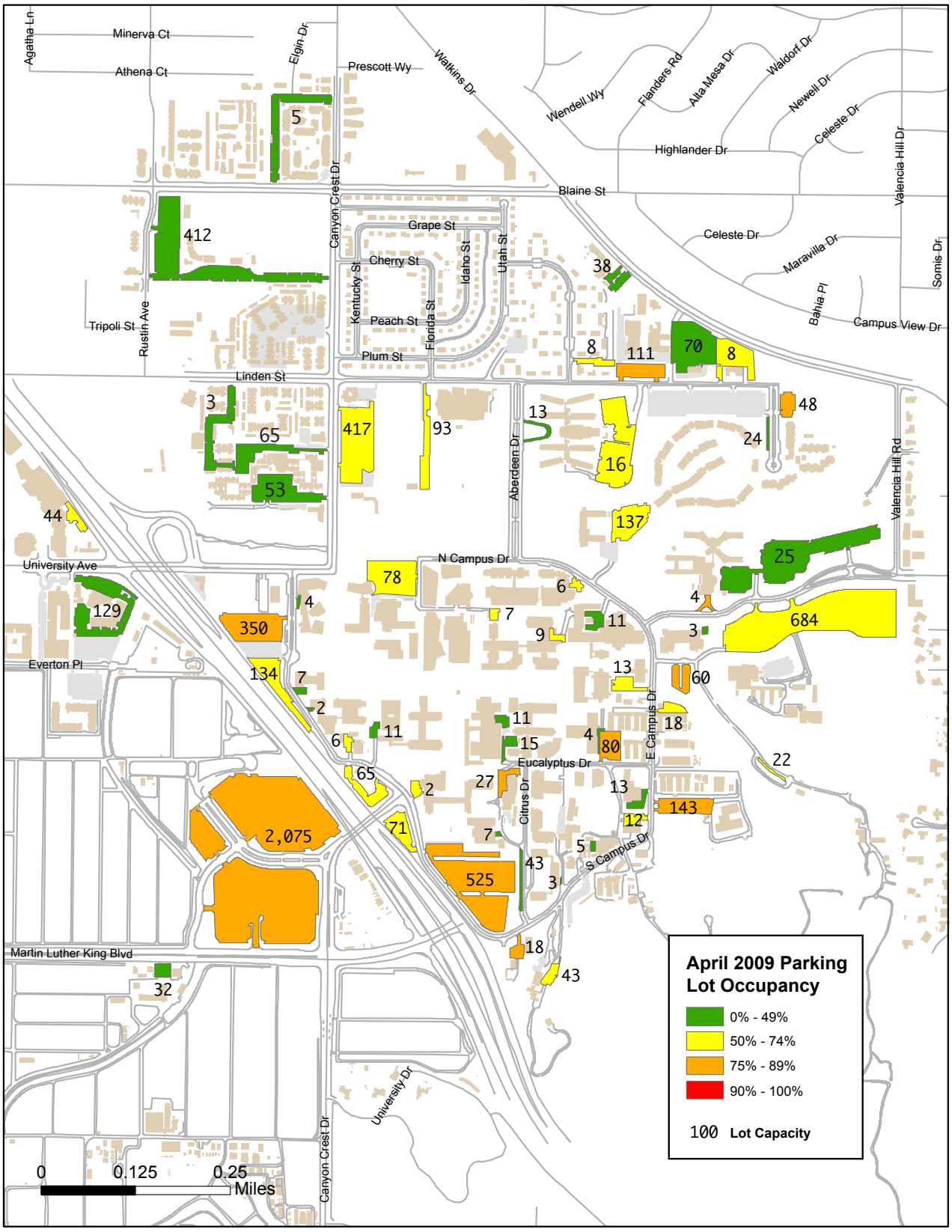
Figure 3-7 Parking Lot Occupancy – October 15, 2008



Nelson|Nygaard consulting associates

GIS Data Source: UC Riverside

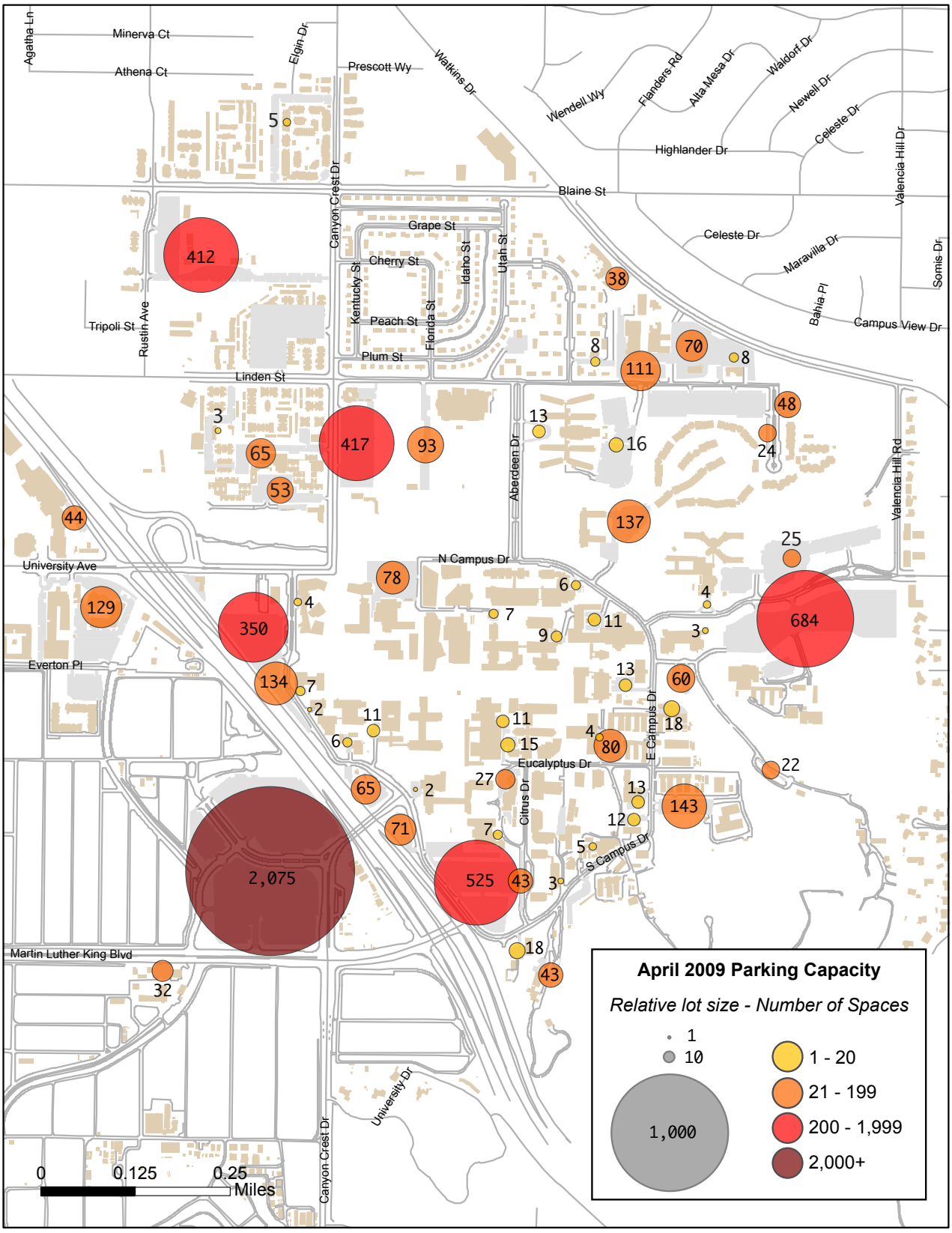
Figure 3-8 Parking Lot Occupancy – April 8, 2009



Nelson | Nygaard consulting associates

GIS Data Source: UC Riverside

Figure 3-9 Parking Supply Locations



Nelson|Nygaard consulting associates

GIS Data Source: UC Riverside

Although the total number of vehicles parked on-campus during peak periods is an important function to quantify, it is also necessary to identify which user groups are occupying those spaces. We have used two simple group identifications – commuter students and faculty/staff. Resident students were not included in this analysis since the parking ratios for this group are set by the LRDP. We have categorized the two groups by parking space type (e.g. commuter students using gold permits, faculty/staff using red and blue permits, etc). This methodology includes visitor vehicles in the commuter student group since there is no mechanism in place to decipher campus affiliate from visitor vehicles. As such, there may be some limited inaccuracies in using this method as multiple user groups may use a single space type (e.g. disabled spaces), but those should be minor considering the number of parked vehicles in these areas. Figure 3 10 shows parking demand by user group.

Based on the peak parking demand of each group and their respective population figures (i.e. potential number of parkers), we can derive basic demand ratios. In the 2008-2009 academic year, there were 14,618 commuter students and visitors, and 4,266 faculty/staff. Using the demand figures from Figure 3-10, we can establish that the peak parking demand rates for these two groups are .16 and .58 vehicles per person, respectively (.26 for the two groups combined).[1] During the same academic year, the numbers of parking permits sold to each group were 4,680, and 2,598, respectively. Parking occupancy counts show that the peak demands for commuter students (gold permits) and faculty/staff (blue, red, and X permits) were 2,107 and 2,012 (with peak permit parking rates are .45 and .77), respectively. The peak permit parking rate for both groups combined is .57. See Figure 3-11 for data.

1 Although ITE parking demand rates are drawn from generalized national studies, it is useful to note here that UCR's overall peak parking ratio of .26 closely corresponds with that of suburban university sites surveyed by ITE, which show a rate of .30.

Figure 3-10 Current Parking Supply & Demand by Use*

User	Supply	October 15, 2008 Demand	October 15, 2008 Occupancy	April 8, 2009 Demand	April 8, 2009 Occupancy
Commuter Students & Visitors	3,025	2,390	79%	2,119	70%
Faculty & Staff	3,635	2,465	68%	2,388	66%
Total	**6,660**	**4,855**	**73%**	**4,507**	**68%**

* Note: User groups are arranged by the following parking data space types: Commuter Student – Disabled, Dispenser, Gold, Medical, Meter, Motorcycle, Time-Controlled, Two-Hour; Faculty/Staff – Blue, Carpool, Delivery, Department, Red, Service, X

Figure 3-11 Parking Ratios by User Group

User (Pass)	Population (a)	Peak Parking Demand (b)	Peak Parking Ratio (c) = (b/a)	Permits Sold (d)	Permitted Parking Demand (e)	Permit Parking Ratio (f) = (e/d)
Commuter Students (Gold) & Visitors	14,618	2,390	.16	4,680	2,107	.45
Faculty & Staff (Blue, Red, X)	4,266	2,465	.58	2,598	2,012	.77
Total	18,884	4,855	.26	7,278	4,119	.57

Figure 3-12 Parking Ratios Accounting for Spillover Effec

User (Pass)	Population (a)	Peak Parking Demand + Spillover (b)	Peak Parking Ratio (c) = (b/a)	Permits Sold (d)	Permitted Parking Demand (e)	Permit Parking Ratio (f) = (e/d)
Commuter Students (Gold) & Visitors	14,618	2,875	.20	5,200	2,341	.45
Faculty & Staff (Blue, Red, X)	4,266	2,465	.58	2,598	2,012	.77
Total	**18,884**	**5,340**	**.28**	**7,798**	**4,353**	**.56**

Figure 3-13 Projected Parking Demand in 2020

User	2008 Population (a)	Peak Parking Demand (b)	Peak Parking Ratio (c) = (b/a)	2020 Population (d)	Peak Parking Ratio + Spillover (e)	Peak Parking Demand (f) = (d*e)
Commuter Students & Visitors	14,618	2,390	.16	15,124	.20	2,974
Faculty & Staff	4,266	2,465	.58	7,916	.58	4,574
Total	**18,884**	**4,855**	**.26**	**23,040**	**.33**	**7,549**

Figure 3-14 Projected Parking Supply in 2020

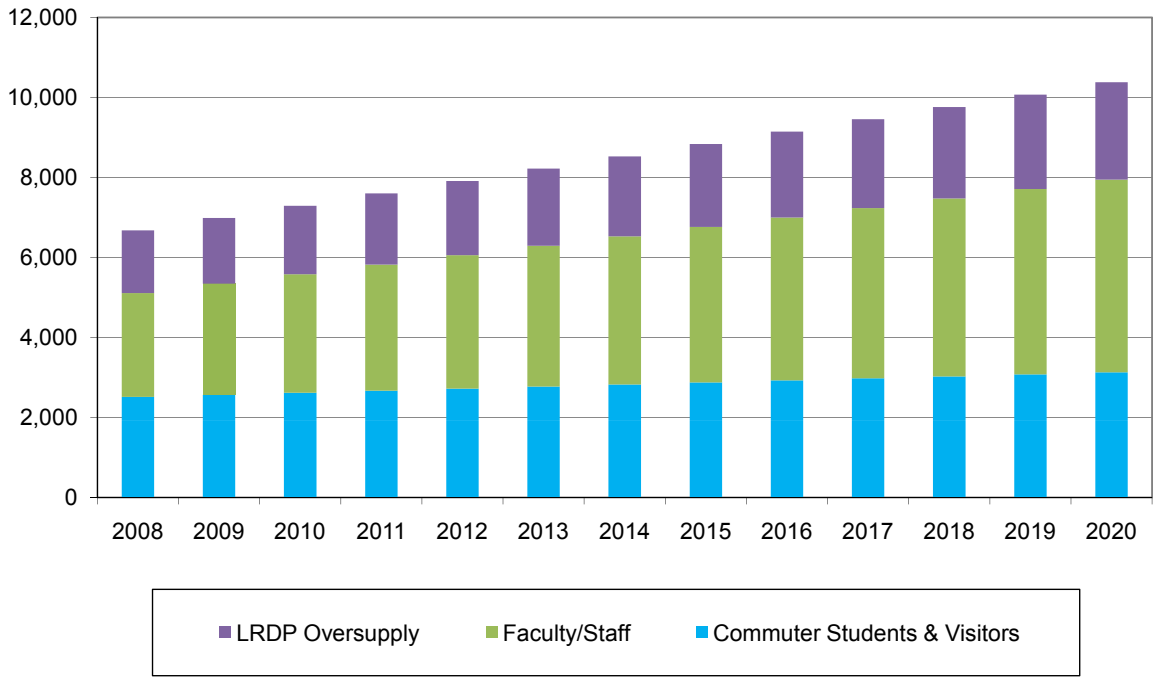
User	2008 Population (a)	2008 Peak Parking Demand (b)	2008 Appropriate Parking Supply (c) = (b/.95)	2020 Population (d)	2020 Peak Parking Demand + Spillover (e)	2020 Appropriate Parking Supply (f) = (e/.95)
Commuter Students & Visitors	14,618	2,390	2,516	15,214	2,974	3,131
Faculty & Staff	4,266	2,465	2,595	7,916	4,574	4815
Total	**18,884**	**4,855**	**5,111**	**23,040**	**7,549**	**7,946**

If we use these ratios to project future parking demand, it is important to account for campus affiliates who park in areas immediately off-campus to avoid paying parking fees. The Director of Transportation and Parking Services, Mike Delo, has estimated that roughly 485 commuter vehicles are "spilling over" onto these off-campus residential streets and retail centers. In the future, these motorists may park on campus if proper enforcement comes into effect. If the full number of commuters were to park on-campus and purchase permits accordingly, a higher peak parking ratio would result. Figure 3-12 shows that peak parking demand (column b) would increase to 5,340 vehicles taking this spillover into account.

Fusing these parking ratios in combination with population growth estimates, we can calculate future parking demand. By 2020, the overall peak parking demand ratio is anticipated to rise from .26 to .33. Total peak-period demand is expected to rise from 4,855 to 7,549 spaces. It should be noted that these figures are strictly based on current parking demand rates, and do not take into account changes in parking behavior due to higher permit price increases or highly incentivized transportation demand management measures.

Given the current and future peak parking demand figures, we can develop an estimate for the appropriate supply of parking. This study uses an "effective parking supply factor" of 95%. Effective supply is defined as the total number of parking spaces, less the percentage of spaces that the parking operator wishes to have vacant even at the typical peak hour. Choosing an effective parking supply factor of 95% means that the operator wishes to have 5% of the parking supply vacant at the peak hour. This provides a cushion of spaces to reduce the search time for the last few available

Figure 3-15 Projected Parking Supply



parking stalls and to allow for the dynamics of vehicles moving in to and out of parking stalls during peak periods. This cushion also allows for unanticipated variations in parking activity as well as the temporary loss of spaces due to improperly parked vehicles, construction, and other factors. The effective supply cushion also compensates for the loss of utilization and efficiency due to the segregation of spaces for various user groups (e.g. special events). For example, there are currently 6,660 spaces supplied for all commuter students, faculty, staff, and visitors with 4,855 spaces being occupied at peak hour. An appropriate amount of parking for this demand would be 5,111 spaces (4,855 ÷ 95%). Since there are 6,660 spaces currently built, there is presently a parking oversupply of 1,549 spaces. By applying this 5% "cushion" in 2020, we can estimate the amount of necessary total parking to be 7,946 spaces (see Figure 3-14).

The projections for necessary parking supply differ greatly from those of the LRDP. This discrepancy is largely due to the continuing success of the AT program. The decline in parking ratios for campus affiliates has resulted in the need for fewer parking spaces. Whereas the LRDP projects a necessary parking supply of 10,380 spaces, current parking ratios that take into account both spillover parkers and a 5% effective parking supply, show an appropriate future parking supply of 7,946 spaces. The LRDP estimate reflects a 31% over-supply of parking that will result in an occupancy rate of 73% in 2020 – over one out of four parking spaces will be empty at peak hour. Figure 3-15 illustrates this concept.

Parking Fees

There are a number of parking options available to students, faculty, staff, and visitors ranging from permit dispensers to parking lot or vehicle-specific permits, for both short-term and long-term parkers.

Student commuters currently are eligible to purchase gold, night, medical, motorcycle and a limited number of blue permits. In addition, students living on campus may purchase parking near their on-campus housing location. Staff, faculty and graduate students are eligible to purchase vendor, blue, red, gold, X, carpool, medical, night, and motorcycle permits. The type of permit purchased dictates within which lots one can park. Faculty, students and staff may purchase only one parking permit. Due to high demand for specific lots, there may be a waiting list for red or blue permits. Hourly parking is also available to visitors. The daytime hourly rate is $2 with a two hour maximum. After 4 pm and on weekends the hourly rate is $1 with no time limit. Figure 3-16 provides a cost breakdown by permit type.

Figure 3-16 Current Parking Fee Structure

Permit Type	Payroll Deduction/ per month	Daily	Weekly	Monthly	Quarterly	Academic Year	Annual
Gold	$28	$6	$16	$32	$84	$252	$336
Blue	$35	$8	$20	$40	$105	$315	$420
Red	$49	$10	$25	$50	$147	$441	$588
Night	$10	$5	NA	$10	$30	$90	$120
Medical	$35	NA	NA	$40	$105	$315	$420
Motorcycle	$14	$6	NA	NA	$42	$126	$168
Blue Carpool	$17.50	NA	NA	Per person	NA	$157.50	$210
Red Carpool	$24.50	NA	NA	Per person	NA	$220.50	$294
X-Permit	$77	NA	NA	NA	NA	NA	$924
Vendor	NA	$10	$30	$56	NA	NA	$280

UC RIVERSIDE ALTERNATIVE TRANSPORTATION

UC Riverside has a variety of alternative transportation programs for the convenience of students, faculty, and staff, including reserved parking for carpools, a transit pass program, a vanpool program, and a shuttle program. Faculty, staff, and students who enroll in the campus's Alternative Transportation program are eligible to receive program incentives.

Carpool Program

UC Riverside offers a reduced permit fee to carpools of two or more persons (faculty and staff and graduate students only), in addition to reserved parking spaces. Carpoolers also receive 24 complimentary daily parking passes per year, and are eligible for the campus's Guaranteed Ride Home program.

Carpoolers must register with the Alternative Transportation Services office to acquire a parking permit, and participants must carpool for a minimum of 3-days-a-week for more than 50 percent of their commute to be eligible. The cost of the parking permit is divided among the participants through monthly payroll deductions. Undergraduate students are ineligible to participate in the carpool program.

Two types of parking permits are available to carpools. Red carpool permits are available to faculty or staff only for parking in the assigned Red lot, in other unreserved Red or Blue parking lots for a maximum of 2 hours, or a Gold parking lot. Blue carpool permits are valid in their assigned Blue lot, in other Blue lots for a maximum of two hours, or any Gold parking lot. Lot assignments are based on space availability. Wait lists are maintained for high demand locations.

Campus Vanpool Program

UC Riverside sponsors a vanpool service for staff, faculty, and all students that serves designated locations throughout the South Coast Air Basin. Participants sign up online and are placed in a vanpool based on their addresses. The cost per person is $79 a month, which is adjusted annually to cover the costs of leasing and operating the vehicles. Each vanpool has an assigned driver who must pass a physical every two years as well as an alternate driver.

Vanpool vehicles may park at no cost in unreserved Blue and Red faculty/staff lots. Like carpoolers, faculty and staff participants receive 24 complimentary daily permits per year, and are eligible for the campus's Guaranteed Ride Home program. In just two years the university has nearly doubled the number of vans, which currently carry about 200 passengers daily.[2]

Guaranteed Ride Home Program

Carpool and vanpool participants are eligible to use the campus's Guaranteed Ride Home program for emergency situations such as unscheduled overtime or personal and family emergencies. Transportation is provided with leased vehicles from Fleet Services and the cost for a one-day rental is paid through the Emergency Ride Home Program. There is a limit of one ride each quarter.

Bicycle and Walking Programs

For bicycle and walk commuters, UC Riverside offers complimentary membership to the Physical Education Building for access to showers and lockers as well as complimentary bike registration. Participants in the Alternative Transportation program are eligible for 48 daily permits per year of complimentary parking.

Shuttle

UC Riverside operates a shuttle service comprised of three routes called the Braveheart Loop, Bear Runner, and Trolley Express.

The Braveheart Loop runs daily between 6:30 am and 10:00 pm on a continuous 30-minute loop between the Campus Sports Center, Student Recreation Center, Bannockburn Village, and Lot 30. The Bear Runner operates Monday through Thursday from 6:20 pm to 12:45 am on a 30-minute continuous loop covering both northern and southern portions of the East Campus. The Trolley Express runs daily between 6:30 am and 10:00

2 UCR Sustainability Action Plan 2009, pg 69

Figure 3-17 Highlander Shuttle Routes

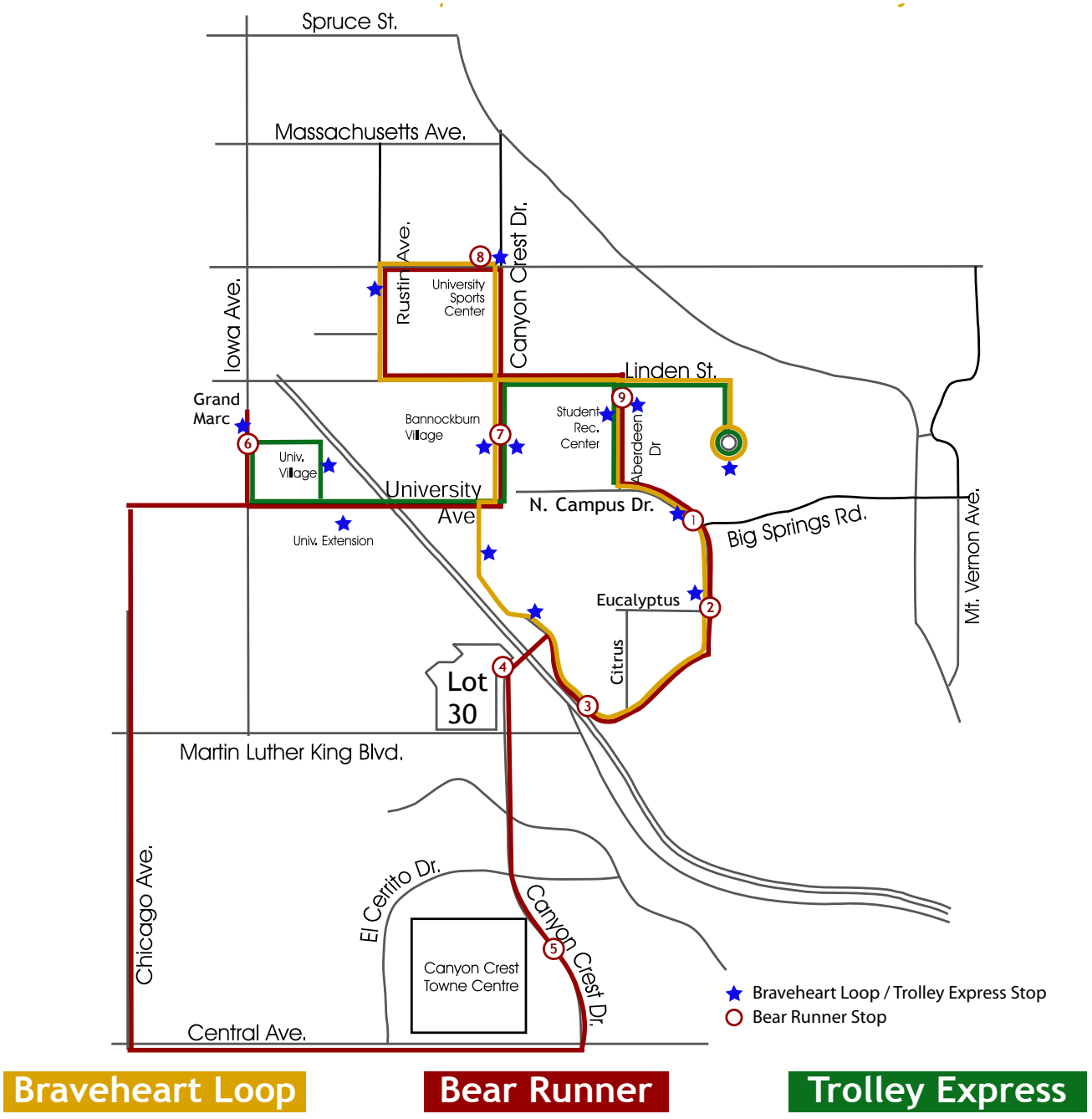
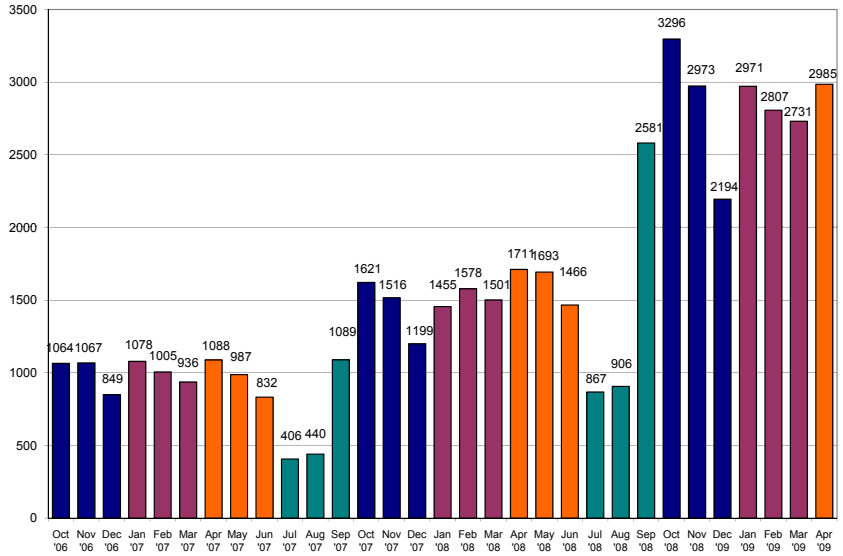


Figure 3-18 UPASS Boardings



pm on a continuous 15-minute service between Grand Marc Apartments and A & I residential units. These shuttle services only operate during the academic year.

In the 2008-09 academic year, there were a total of 132,943 boardings on the Braveheart Loop shuttle and a total of 251,731 boardings on the Trolley Express.

Metrolink

The campus offers a free Metrolink shuttle service between the Downtown Riverside station and campus. The shuttle operates during morning and afternoon peak hours only, and is compatible with Metrolink's arrival and departure times. There are two RTA routes, Route 1 and Route 16, which provide connections between the Riverside Metrolink Station and Campus. Route 1 terminates at the UCR campus and only stops at Metrolink during train arrival and departure times. Route 16 runs every 30 minutes, but does not terminate at the UCR campus. During the am peak period there is an additional shuttle which provides service between the Metrolink Station and Sproul Hall.

In addition, UCR provides faculty and staff a 15% subsidy for Metrolink 10-trip tickets and monthly passes, and participates in Metrolink's "College Pass Program" which offers students a 25% discount on 10-trip tickets and monthly passes.

Passes are sold on campus, and faculty and staff participants using Metrolink are eligible for 48 days per year of complimentary parking.

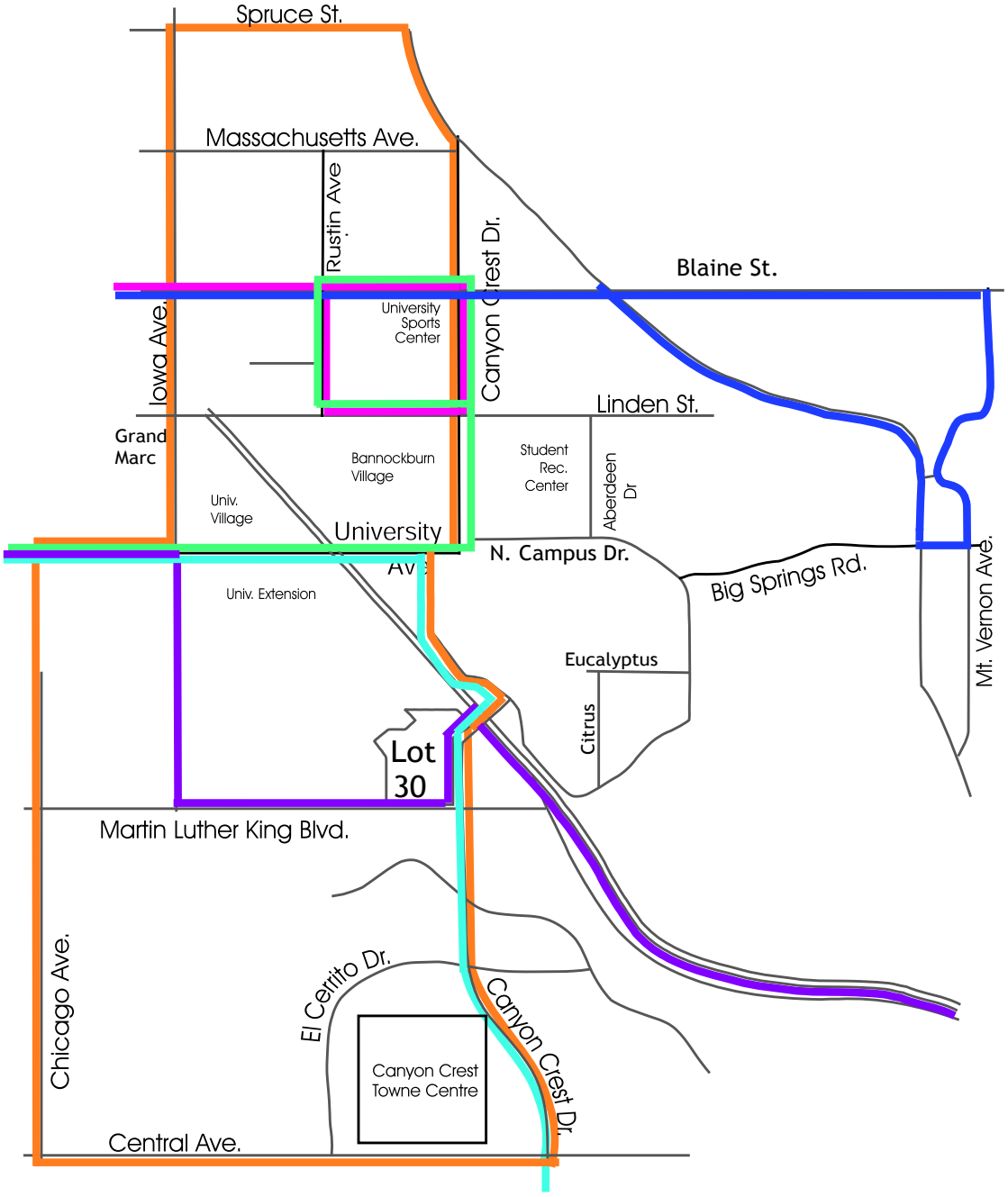
UPASS and Transit Subsidies

All UC Riverside undergraduates may ride any Riverside Transit Agency (RTA) bus for free through the campus's UPASS program. Students simply swipe their ID cards at the fare box when they board the bus. Since the program's inception in October 2006, the number of students utilizing the UPASS has steadily grown. Figure 3-18 shows on a monthly basis the number of unique boardings between 2006 and 2009. Looking at the data from October 2006 and April 2009, the number of boardings has almost tripled since the start of the program, increasing from 1,064 to 2,985 unique boardings.

Faculty, staff, and graduate students are eligible to purchase 31-day bus passes at a 50% discount. Passes are sold on campus, and faculty and staff participants in the bus program receive 48 daily complimentary parking permits. In 2008, a total of 368 RTA passes were sold on campus, which is equivalent to 30 passes per month over a calendar year.

Beginning September 1, 2009, the campus will pay RTA 90 cents per boarding on the agency's fixed-route bus system, excluding the Route 51 Crest Cruiser, with a $35.00 maximum per

Figure 3-19 RTA Routes



calendar month cap applied to each student card, and a maximum program obligation amount of $120,800 annually.[3] The campus currently pays $259,791 (based on 3,892 revenue service hours) separately for no-cost service on Route 51 for all students, faculty, and staff.[4] In addition, the campus pays $50,280 (based on 753.25 revenue service hours) for no-cost service provision of the Bear Runner for all students, faculty, and staff.[5]

EXISTING PUBLIC TRANSPORTATION

There are currently eight Riverside Transit Agency bus lines serving UC Riverside, four of which provide local service, and the other four providing commuter service. Routes 204, 208, 210, and 212 provide commuter service between the UC Riverside campus and Montclair Transcenter, Temecula, Banning, and Hemet, respectively during the morning and evening commute period. All four routes operate with headways of approximately 40 to 50 minutes.

Local routes serving the campus include Route 1, 10, 16, and 51. All operate on both weekdays and weekends. On weekdays, Route 1 runs from 4:00am to 10:30pm with headways of approximately 20 minutes. On Saturday, Route 1 operates from 5:30am to 9:30pm with headways of 30 minutes and on Sundays Route 1 runs from 6:00am to 9:30pm with headways of 30 minutes. Route 10 runs every hour on weekdays from 4:00am to 9:00pm. On the weekends, Route 10 runs from 6:00am to 7:30pm with headways of approximately 75 minutes. Route 16 runs every 30 minutes from 4:00am to 10:00pm on weekdays. On the weekends, Route 16 runs approximately every 40 minutes from 6:00am to 10:00pm.

3 Agreement 9-024.

4 Agreement 9-025.

5 Agreement 9-023.

Figure 3-20 Percentage Boardings by RTA Route

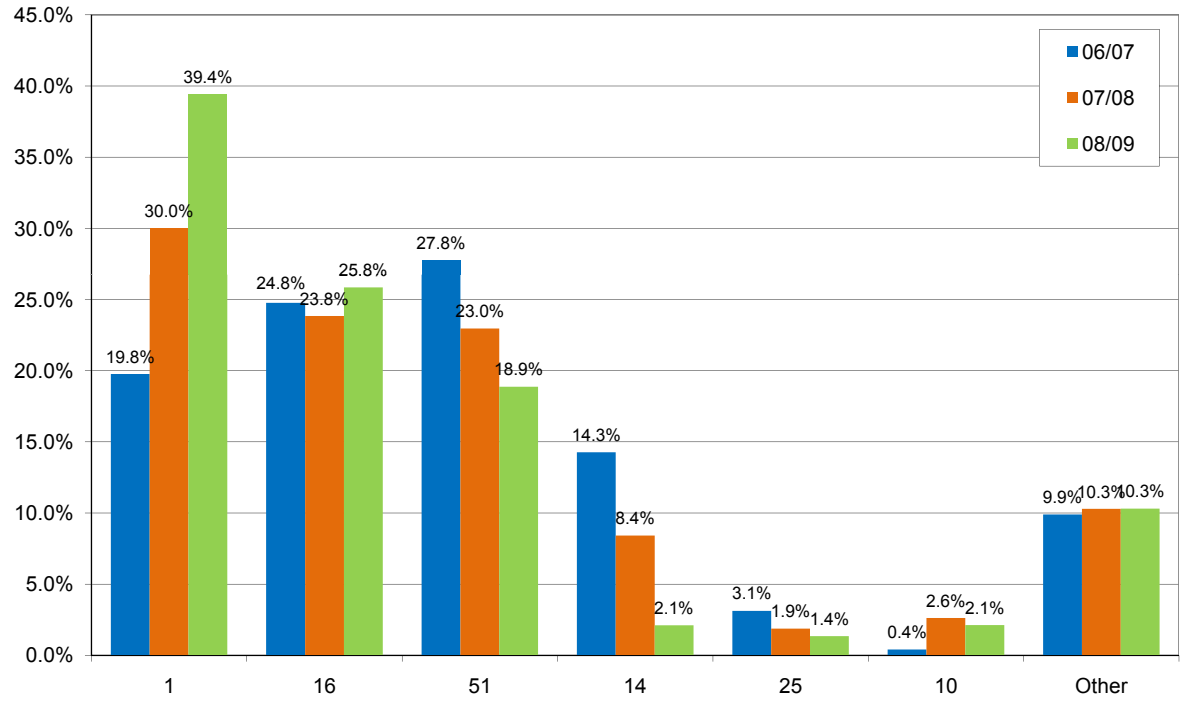


Figure 3-21 2008 Mode Split for Faculty and Staff

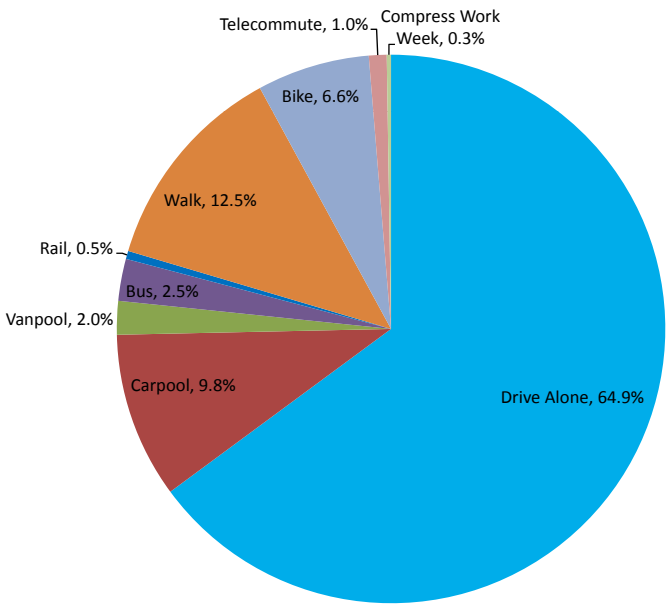
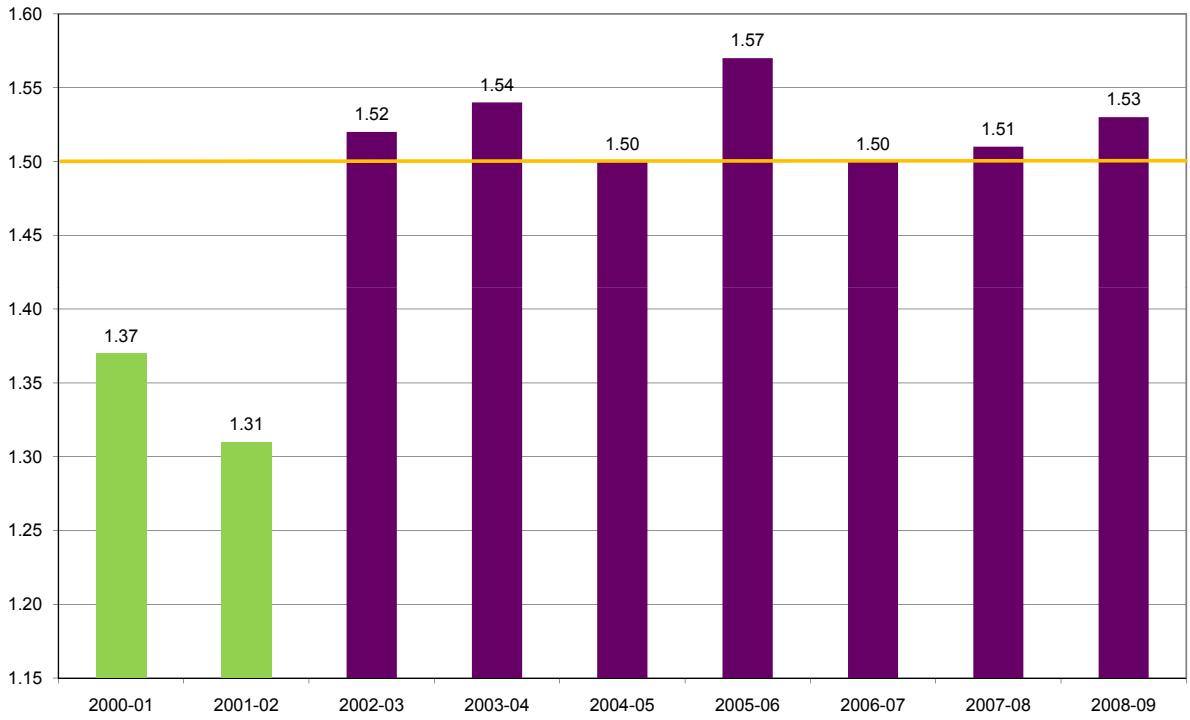


Figure 3-22 Average Vehicle Ridership 2000 to 2009



RTA recently expanded Route 51, known as the Crest Cruiser, to serve larger portions of the UC Riverside campus and surrounding areas, adding one-third of a mile to the route. The route now includes larger portions of Iowa Avenue, Canyon Crest Drive and Spruce Street, and better serves housing complexes where students reside. The Agency has added a second trolley to the new route, which was launched last year. The route runs every 20 minutes on academic days from 7:00am to 7:00pm and is not in service on weekends or holidays.

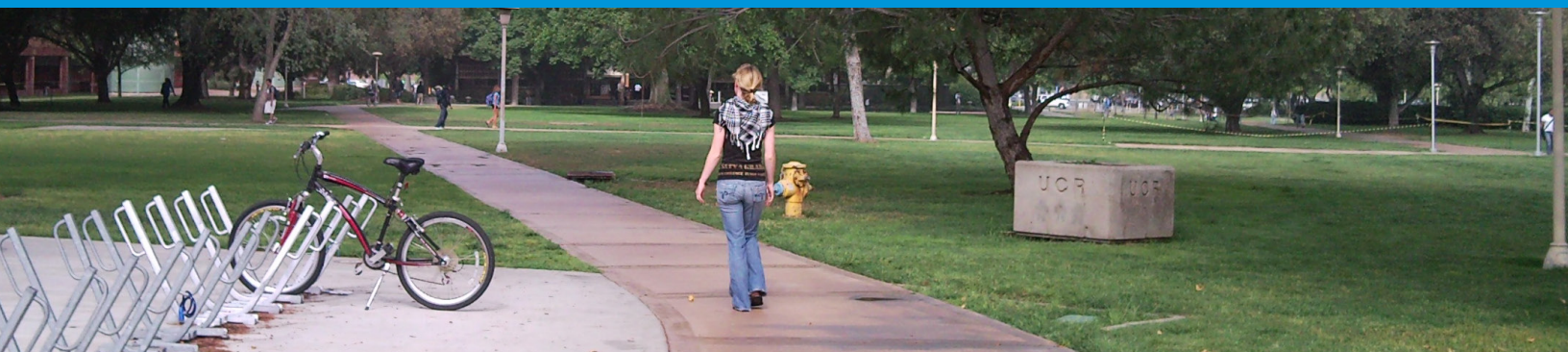
Figure 3-20 shows the percentage of boardings by the most popular routes used by students for the 2006-07, 2007-80 and 2008-09 academic years.

MODE SPLIT

The Transportation and Parking Service Department collects data on the commute modes taken by faculty and staff to UC Riverside. According the 2008 commute survey, the majority, or 65 percent, of campus faculty and staff drive alone to work. Almost 10 percent of faculty and staff carpool, and over 12 percent walk to work. Figure 3-21 shows the mode split for 2008.

The South Coast Air Quality Management District has mandated that employers with 250 or more employees achieve a 1.5 Average Vehicle Ridership (AVR), which is equivalent to having every other vehicle commuting to campus be a two-person carpool. Figure 3-22 presents the AVR for the past nine years. The campus has met its AVR requirement since 2002, averaging just over the 1.50 minimum.

TRANSPORTATION DEMAND MANAGEMENT STRATEGIES



CHAPTER 4

TRANSPORTATION DEMAND MANAGEMENT STRATEGIES

UC Riverside has implemented several programs to reduce the number of students, faculty and staff driving alone to campus. These existing programs can be expanded and combined with new strategies to further reduce the growth of traffic and parking demand. The reduction in parking demand will be determined by the approach chosen, with more extensive strategies resulting in a greater decrease in parking demand.

Nationwide, the universities with the most effective transportation demand management programs have implemented packages of coordinated strategies. For example, free transit passes for employers, staff and students will increase transit use; however, the approach will be more successful if the frequency of service is increased in tandem with the transit passes, and the program supported by extensive marketing.

This chapter outlines the Preferred Scenario for the expansion of the existing alternative transportation program (i.e. Baseline) as well as the inclusion of new programs. The Preferred Scenario adds additional and more extensive transportation demand management strategies to what is currently offered by UC Riverside.

Both the Baseline and Preferred scenarios include core and supporting strategies. Core strategies are those that will have a direct impact on parking demand, such as varying parking pricing. Supporting strategies are those that will indirectly impact parking demand by enhancing alternative modes such as through the Guaranteed Ride Home program or carsharing.

The demand reduction estimate for the Preferred Scenario is based upon detailed analysis and also the evidence from published research on transportation demand management. In general, for the core strategies, empirical evidence is available from the research literature and is described later in this chapter or in previous chapters. For many of the supporting strategies, which are often more qualitative in nature, effects are often difficult to quantify. However, these supporting strategies are part of many of the most successful campus's transportation demand management programs, and therefore should be viewed as complementing strategies rather than lower priority items.

BASELINE SCENARIO

UC Riverside has a variety of alternative transportation programs for the convenience of students, faculty, and staff, including reserved parking for carpools, a transit pass program, a vanpool program, and a shuttle. Faculty, staff, and students who enroll in the campus's Alternative Transportation program are eligible to participate in campus sponsored alternative transportation incentives.

Currently, the campus offers the following core strategies:

- U-Pass for all undergraduate students
- Campus Shuttle Services: Bear Runner, Trolley Express, Braveheart Loop
- Metrolink Shuttle: Riverside Transit Agency Route 1 and Route 16
- Vanpool Program: free parking on campus, $79 monthly charge
- Bicycle and Walking Program: complementary membership to Physical Education Building, complimentary bike registration, and 48 days per year of complimentary parking.
- Subsidized Metrolink transit passes for faculty and staff (15% subsidy)
- Subsidized Metrolink transit passes for students (25% subsidy)
- Subsidized RTA transit passes for faculty, staff, and graduate students (50% subsidy)
- Carpool Program: reduced cost parking permits, reserved parking

Support strategies currently offered are:

- Guaranteed Ride Home Program
- Restricting resident students from parking in commuter spaces until after 4 PM or purchasing general parking permits.

PREFERRED SCENARIO

The Preferred Scenario includes all existing strategies, and builds on those with expanded incentives, services and infrastructure support to provide a wider variety of mode choices.

Additional core strategies include:

- Expand the UPASS program to cover faculty, staff, and graduate students at a 100% subsidy.
- Continue the current campus policy of adjusting parking rates to cover the full cost of providing parking spaces.[1]
- Increasing the price of permits for those within a certain distance of campus to encourage the use of alternative modes of transportation.

Additional support strategies include:

- Establish a car sharing service on-campus which will be available to students, faculty, and staff.[2]
- Expand shuttle service to serve West Campus
- Encouraging a student vote on (and possibly including faculty/staff in) a $41 quarterly Alternative Transportation fee that will that will fund alternative transportation programs and reduce the campus carbon footprint.
- Improve bicycle facilities and programs by introducing a bike sharing program, installing more bicycle racks in high-demand locations, and improving the bicycle connection between the East and West campuses along University Avenue.
- Introduce on-campus services such as a dry cleaner, convenience store, grocery store, post office, personal services, and other amenities that will serve the needs of campus affiliates.
- Adjusting the hours and lots in which resident students are restricted from parking in commuter spaces.
- Campus support of Parking Permit Districts created by the City to cope with spillover parking problems on neighborhood streets.

1 UC Riverside currently charges parking rates to cover the full cost of providing parking spaces. This core strategy is included in the Preferred Scenario to note that rates will need to be adjusted in the future to cover the higher costs of providing structured spaces.

2 UC Riverside will introduce a minimum of five Zipcar vehicles for campus affiliate use beginning in Fall 2009 that will be paid for through user fees. Affiliate enrollment fees in the carsharing program will be allowed to be applied to future vehicle rentals.

Figure 4-1 Effects of Universal Transit Pass Introduction*

Location	Drive to work		Transit to work	
Municipalities	**Before**	**After**	**Before**	**After**
Santa Clara (VTA)	76%	60%	11%	27%
Bellevue, Washington	81%	57%	13%	18%
Ann Arbor, Michigan	N/A	(4%)	20%	25%
Downtown Boulder, Colorado	56%	36%	15%	34%
Universities				
UCLA (faculty and staff)	46%	42%	8%	13%
Univ. of Washington, Seattle	33%	24%	21%	36%
Univ. of British Colombia	68%	57%	26%	38%
Univ. of Wisconsin, Milwaukee	54%	41%	12%	26%
Colorado Univ. Boulder (students)	43%	33%	4%	7%

*Brown, et. al. (2003) Fare-Free Public Transit at Universities. Journal of Planning Education and Research 23: 69-82.
King County Metro (2000) FlexPass: Excellence in commute reduction, eight years and counting. Accessed on August 18, 2006 at http://www.commuterchallenge.org/cc/news-mar01_flexpass.html.
LA Metro (2006) Phone Interview with Donna Blanchard at Metro's Commute Services Department on June 30, 2006.
Meyer et. al. (1998) An Analysis of the Usage, Impacts and Benefits of an Innovative Transit Pass Program. Mode shift one year after implementation in 1994.
Santa Clara Valley Transportation Authority. Accessed on August 31, 2006 at http://www.vta.org/ ecopass/ecopass_corp/index.html
Toor, et. al. (2004) 1989 to 2002, Weighted average of students, faculty, and staff; Transportation and Sustainable Campus Communities.
White et. al. Impacts of an Employer-Based Transit Pass Program: The Go Pass in Ann Arbor, Michigan. Accessed on August 18, 2006 at http://www.apta.com/research/info/briefings/documents/ white.pdf
Wu et. al. (2004) "Transportation Demand Management: UBC's U-P ass – a Case Study", 2002 to 2003, the effect one year after U-Pass implementation.
Poinsatte F. et. al. (1999) Finding a New Way: Campus Transportation for the 21st Century.

CORE STRATEGIES

The following section details the components of each of the core strategies included in the Preferred Scenario.

UPASS

Currently, all UC Riverside undergraduates can ride any Riverside Transit Agency (RTA) bus for free through the campus's UPASS program. Students simply swipe their ID cards at the fare box when they board the bus. Since the program's inception in October 2006, the number of students utilizing the UPASS has steadily grown. Looking at the data from October 2006 and April 2009, the number of boardings has almost tripled since the start of the program, increasing from 1,064 to 2,985 unique boardings.

Research has also shown that universal transit passes are typically an extremely effective means to reduce the number of commuters driving to work, as shown in Figure 4-1.

Faculty, staff, and graduate students can currently purchase RTA monthly passes for 50% off the full cost. Under the Preferred Scenario, the UPASS program would be expanded to include all faculty, staff, and graduate students at a full 100% subsidy. This represents a significant effort by the campus to encourage alternative mode use among employees. While the subsidy currently offered to faculty, staff, and graduate students is valuable, research has shown that universal transit passes are more effective in increasing transit ridership than just offering the option to purchase discounted transit passes, because with a universal transit pass persons who typically would not use transit before or did not use transit enough to purchase a pass, are more willing to use transit since there is no upfront cost to them.

Cost and Impacts

Currently, the campus pays RTA 90 cents per student boarding on the agency's fixed route bus system, excluding the Route 51 Crest Cruiser, with a $35.00 maximum per calendar month cap applied to each student card and a maximum program obligation amount of $120,800 annually.[3]

In order to calculate the cost of implementing a UPASS program for faculty and staff, the number of faculty and staff taking the bus to work was determined. Based on case study research[4], it was assumed that the existing 2.5%[5] mode share for bus commuters would increase to a 4% mode share with the implementation of the faculty and staff UPASS program. The 4% bus mode share was then applied to the faculty and staff population, using the projected population growth for years 2009 to 2020, to determine the actual number of faculty and staff who will take the bus to work.

The total cost of providing the program was then calculated by multiplying the total number of boardings by the cost per boarding, which is assumed to remain at 90 cents. The total number of boardings is based on the number of bus riders multiplied by 2 trips per day and the total commute days per academic year.[6] See Figure 4-2 for the annual cost and boardings for future years (2009 to 2020) with a universal pass program. Also included in the table is the current year's (2008) transit riders and estimate of cost with a 50% subsidy.

The annual cost for fully subsidizing the staff and faculty UPASS in the Preferred Scenario is $57,765 in 2009, increasing to $100,056 in 2020, as a result of the projected growth in the faculty and staff population, which translates to an annual subsidy of $313.20 per bus rider.

PARKING PRICING

The University of California's current parking policy mandates that parking revenues must cover the full cost of providing spaces. When structured spaces are necessary for the continued development of the campus, permit prices will need to rise in order to meet anticipated costs. Research shows that increasing parking fees can significantly reduce both parking demand and trip generation. In the mostly Southern California case studies shown below, priced employee parking reduced both parking demand and vehicle trips by an average of 27%.

3 Agreement 9-024.

4 Using the experiences of UCLA which saw an increase in bus mode split from 8% to 13% with the implementation of a Universal Transit Pass program.

5 Based on AQMD AVR Historical Report for 2008

6 Employees will likely use transit during summer months, but this number of users is offset by the fact that not all employees will commute five days each week during the academic year.

Figure 4-2 Staff and Faculty UPASS Costs

Year	Faculty/Staff Population	Transit Riders	Commute Days per Year1	Boardings per Day per Rider	Total Boardings per Year	Cost per Boarding	Cost at 100% Subsidy*
2008	4,266	106	174	2	36,869	$0.45	$16,591
2009	4,570	184	174	2	64,184	$0.90	$57,765
2010	4,874	197	174	2	68,456	$0.90	$61,610
2011	5,179	209	174	2	72,727	$0.90	$65,455
2012	5,483	221	174	2	76,999	$0.90	$69,299
2013	5,787	234	174	2	81,271	$0.90	$73,144
2014	6,091	246	174	2	85,543	$0.90	$76,988
2015	6,395	258	174	2	89,814	$0.90	$80,833
2016	6,699	270	174	2	94,086	$0.90	$84,677
2017	7,004	283	174	2	98,358	$0.90	$88,522
2018	7,308	295	174	2	102,630	$0.90	$92,367
2019	7,612	307	174	2	106,901	$0.90	$96,211
2020	7,916	319	174	2	111,173	$0.90	$100,056

* In 2008, there is only a 50% subsidy

Figure 4-3 Employee Parking Pricing Effect on Parking Demand

Location	Scope of Study	Parking Fee in $/Month (2006 $)	Decrease in Parking Demand
Group A: Areas with little public transportation			
Century City, CA[1]	3500 employees at 100+ firms	$107	15%
Cornell University, NY[2]	9000 faculty and staff	$45	26%
Warner Center, CA[1]	1 large employer (850 employees)	$49	30%
Bellevue, WA[3]	1 medium-size firm (430 employees)	$72	39%
Costa Mesa, CA[4]	State Farm Insurance employees	$49	22%
Average		*$64*	*26%*
Group B: Areas with fair public transportation			
Los Angeles Civic Center[1]	10,000+ employees, several firms	$166	36%
Mid-Wilshire Blvd, LA[1]	1 mid-sized firm	$119	38%
Washington DC suburbs[5]	5500 employees at 3 worksites	$90	26%
Downtown Los Angeles[6]	5000 employees at 118 firms	$167	25%
Average		*$135*	*31%*
Group C: Areas with good public transportation			
University of Washington[7]	50,000 faculty, staff and students	$24	24%
Downtown Ottawa[1]	3500+ government staff	$95	18%
Average		*$59*	*21%*
Overall Average		**$89**	**27%**

1 Willson, Richard W. and Donald C. Shoup. "Parking Subsidies and Travel Choices: Assessing the Evidence." Transportation, 1990, Vol. 17b, 141-157 (p145).
2 Cornell University Office of Transportation Services. "Summary of Transportation Demand Management Program." Unpublished, 1992.
3 United States Department of Transportation. "Proceedings of the Commuter Parking Symposium," USDOT Report No. DOT-T-91-14, 1990.
4 Employers Manage Transportation. State Farm Insurance Company and Surface Transportation Policy Project, 1994.
5 Miller, Gerald K. "The Impacts of Parking Prices on Commuter Travel," Metropolitan Washington Council of Governments, 1991.
6 Shoup, Donald and Richard W. Wilson. "Employer-paid Parking: The Problem and Proposed Solutions," Transportation Quarterly, 1992, Vol. 46, No. 2, pp169-192 (p189).
7 Williams, Michael E. and Kathleen L Petrait. "U-PASS: A Model Transportation Management Program That Works," Transportation Research Record, 1994, No.1404, p73-81.

Figure 4-4 Employee Parking Pricing Effect on Auto Commute Rates*

	Autos Driven per 100 Employees		
Case Study and Type	Employer Pays for Parking	Driver Pays for Parking	Decrease in Auto Trips
Mid Wilshire, Los Angeles (before/after)	48	30	-38%
Warner Center, Los Angeles (before/after)	92	64	-30%
Century City, Los Angeles (with/without)	94	80	-15%
Civic Center, Los Angeles (with/without)	78	50	-36%
Downtown Ottawa (before/after)	39	32	-18%
Average of Case Studies	70	51	-27%

*Willson, Richard W. and Donald C. Shoup. "Parking Subsidies and Travel Choices: Assessing the Evidence." Transportation, 1990, Vol. 17b, 141-157 (p145).

Figure 4-5 Current Parking Fee Structure

Permit Type	Payroll Deduction/ per month	Daily	Weekly	Monthly	Quarterly	Academic Year	Annual
Gold	$28	$6	$16	$32	$84	$252	$336
Blue	$35	$8	$20	$40	$105	$315	$420
Red	$49	$10	$25	$50	$147	$441	$588
Night	$10	$5	NA	$10	$30	$90	$120
Medical	$35	NA	NA	$40	$105	$315	$420
Motorcycle	$14	$6	NA	NA	$42	$126	$168
Blue Carpool	$17.50	NA	NA	Per person	NA	$157.50	$210
Red Carpool	$24.50	NA	NA	Per person	NA	$220.50	$294
X-Permit	$77	NA	NA	NA	NA	NA	$924
Vendor	NA	$10	$30	$56	NA	NA	$280

Existing Parking Pricing Structure

Currently, there are a number of parking options available to students, faculty, staff, campus affiliates and visitors ranging from simple parking meters to vehicle-specific permits, for both short-term and long-term parkers. Student commuters are eligible to purchase gold, night, medical, motorcycle and a limited number of blue permits. Staff, faculty and graduate students are eligible to purchase vendor, blue, red, carpool, medical, night, and motorcycle permits. Figure 4-5 provides a cost breakdown by permit type.

As UC Riverside continues to grow and the West Campus is developed, existing surface parking lots may be replaced with multistory parking garages, significantly increasing the cost of providing parking on campus. Given this increase in parking cost as well as the campus's goals of reducing vehicle trips and encouraging the use of alternative modes of transportation, parking should be priced to reflect the actual cost of providing parking.

Cost

In order to determine the annual cost of providing parking spaces in new multistory parking garages, a "life cycle cost analysis" was conducted. A life cycle cost analysis calculates the cost of a system or piece of infrastructure, such as a parking structure, over its entire lifespan.

For a parking garage, a life cycle cost analysis includes capital costs, such as purchasing land and construction costs, as well as all ongoing operating costs, such as security and enforcement, maintenance and insurance. If a parking structure is typically expected to last 50 years, the capital costs can be translated into an annual costs by spreading the cost of building and financing it over a standard 30-year loan period, using a long-term interest rate of 5%.

Figure 4-6 summarizes the results of the life cycle cost analysis if the campus built a structure on Lot 24 with costs for existing surface parking included. Under annual cost, the "Debt Service" column shows the annual debt service payments that would be created if repayment of the capital cost was extended over the lifetime of the facility. For this garage, the annual cost per parking space gained is $3,145 which translates to a per month cost of $262 and a per work day cost of $12.07.[7] If no surface spaces are displaced by the structure the annual cost per parking spaces is $2,057. It should be noted, however, that this $2,057 amount does not include the value of land, which is estimated at almost $67 per square foot.[8]

7 The cost per space gained is based on the net spaces constructed (i.e. the number of spaces constructed minus the number of spaces displaced).

8 The price of land is based on a sample property for sale at 1550 University Avenue listed on Realtor.com.

Figure 4-6 Projected Campus Wide Parking Costs

Assumptions

Variables	Input Value	Comments
Parking structure construction cost per space	$20,000	Source: TAPS
Surface lot construction cost per space	$5,000	Source: Victoria Transport Policy Institute
Expected loan cycle of structure:	30	years
Expected useful life of lot:	20	years
Projected soft costs	27%	Source: Carl Walker Inc. research, taking design, architects, internal administrative and management costs into account
Long-term interest rate:	5.00%	Source: TAPS
Maintenance cost and operation for surface lot:	$75	Source: Walker Parking Consultants
Maintenance cost and operation for parking structure:	$300	Source: Walker Parking Consultants
Insurance cost:	0.20%	of original construction cost per year. Source: standard S.U. charge levied by Risk Management Office. Earthquake insurance not included.
Enforcement/security costs for surface lot per space:	$54	Source:2005 Data from Cal Poly
Enforcement/security costs for structure per space:	$54	Source: 2005 Data from Cal Poly
Workdays per month:	21.72	workdays per month
Schooldays per year:	174	schooldays per year
Number of surface parking spaces per acre	145	Assumes 300 sq. ft. per space, includes circulation. Based on the dimensions of Lot 24
Number of structured parking spaces per acre	124	Assumes 350 sq. ft. per space, includes circulation. Based on the dimensions of proposed SOM garage.

Capital Costs

Parking	Spaces Built	(Land Occupied Garage Footprint)	Spaces Displaced	Net Spaces Gained	Construction Cost in Current Dollars	Total Cost in Current Dollars	Cost Per Space Gained in Current Dollars: Construction	Cost Per Space Gained in Current Dollars: Total
Structured Spaces	1070	2.1	417	653	$21,400,000	$27,178,000	$20,000	$41,620
Surface Spaces	6241	43.0	0	6241	$31,205,000	$31,205,000	$5,000	$5,000
TOTAL	**7311**	**45**	**417**	**6894**	**$2,605,000**	**$58,383,000**	**$7,195**	**$10,360**

Resulting Costs Per Space Per Year

		ANNUAL COSTS PER SPACE GAINED				TOTAL COST PER SPACE GAINED			
Parking Structure	Project Cost Per Space Gained	Debt Service	Operation & Maintenance	Insurance	Security/ Enforcement	Per Year	Per Month	Per Workday	Total Cost Per Year
Structured Spaces	$41,620	$2,707	$300	$83	$54	$3,145	$262	$12.07	$3,364,824
Surface Spaces	$5,000	$401	$75	$10	$54	$540	$45	$2.07	$3,371,469
TOTAL	**$10,360**	**$739**	**$108**	**$21**	**$54**	**$921**	**$77**	**$3.54**	**$6,736,293**

Adjusted Annual Parking Pricing Structure

To calculate the cost per person/permit, the number of permits sold per parking space must be determined since the campus sells more permits than there are parking spaces because permit holders do not drive to campus every day. Based on the analysis done as part of the Existing Conditions chapter, the campus currently has a total permit parking ratio of 0.56. To determine the number of permits sold per space, the permit oversell ratio was calculated by dividing 1 by the permit parking ratio for each permit group. Commuter students currently have the highest oversell ratio, 2.22 (Figure 4-7).

To calculate the annual parking cost per permit holder, the average cost per parking space gained, $921, was then divided by the permit parking ratio for each group to determine what the cost of a parking permit would need to be to fully cover the annual cost of providing a parking space on-campus.

Figure 4-7 provides a breakdown of the annual cost per parking space gained, which would increase parking prices to fully cover the annual cost of parking.

Of the two permit groups, commuter students have the lowest annual cost, due to the high oversell ratio for this group, whereas faculty and staff have the highest annual cost due to the lower oversell ratio. It should be noted that the commuter student annual cost is based on the academic year from September to June while the faculty and staff annual cost is based on the calendar year.

DISTANCE-BASED PERMIT PRICING

Currently, parking permits are available to all faculty, staff and students, and are priced at the same rate regardless of whether the permit holder's residence is immediately adjacent to campus or miles away. This produces the unfortunate effect of encouraging those close to campus to purchase permits rather than use easily accessible alternative modes such as the campus shuttle system. To remedy the situation, the Preferred Scenario recommends varying permit prices based on the purchaser's distance from campus. Parking permit sales could be modified so that permit prices will be set higher for those campus affiliates who live within a certain distance of campus. Exceptions to this policy could be made for those with mobility limitations or other extenuating circumstances.

Equity Objective

By instituting distance-based permit pricing, the campus can move towards a more equitable distribution of transportation benefits to campus affiliates. Currently, parking is priced equally (according to user group) regardless of the permit holder's location of residence since the cost to the campus to provide a parking space does not vary if the user travels one or fifty miles. However, a portion of parking fees are currently used to fund alternative transportation programs that most benefit those affiliates closest to campus as they are more able to take advantage of shuttles, transit subsidies, and bicycling incentives. The result is that permit holders living farther from campus are essentially subsidizing affiliates who live closer to campus and have the opportunity to use more alternative mode programs. There are alternative mode options, such as vanpooling, designed to bring longer distance travelers to campus. These

Figure 4-7 Annual Cost per Permit Holder

Permit Group	Permit Parking Ratio	Permit Oversell Ratio	Annual Cost per Permit Holder 100% Coverage
Commuter Student	0.45	2.22	$553
Faculty and Staff	0.77	1.30	$709
Total	0.56	1.79	$515

programs, though, generally come at far lower cost than the incentives used by those living near UC Riverside. By increasing permit prices for those closer to campus, the campus will help achieve a more equal distribution of costs and encourage nearby affiliates to use alternative modes.

SUPPORT STRATEGIES

The following section details the components of each of the support strategies included in the Preferred Scenario.

Carsharing

UC Riverside will introduce a new carsharing program in Fall 2009 that will include access to five Zipcar vehicles. Carsharing programs allow people to have on-demand access to a shared fleet of vehicles on an as-needed basis. Usage charges are assessed at an hourly and/or mileage rate, in addition to a refundable deposit and/or a low annual membership fee. Carsharing is similar to conventional car rental programs with a few key differences:

- System users must be members of a carsharing organization.
- Fee structures typically emphasize short-term rentals rather than daily or weekly rentals.
- Vehicle reservations and access is "self-service."
- Vehicle locations are widely distributed rather than concentrated.
- Vehicles must be picked up and dropped off at the same location.

A number of universities have established carsharing programs in partnership with existing carshare operators. Pomona College in Claremont, Stanford University, UC Berkeley, UC Santa Barbara, UC Irvine, UC Santa Cruz, UC San Diego, UC San Francisco, San Francisco State University, UC Los Angeles, and University of Southern California are just a few of the colleges in California that provide carsharing on-campus.

While it is unlikely that a carshare program will become a primary means of commuting to campus, UC Riverside can significantly encourage the use of shared modes by providing or coordinating a carshare program. Faculty, staff, and students that currently drive alone may be reticent to give up the flexibility of having a vehicle on campus, in case they need to make a mid-day trip, such as for lunch or to purchase supplies. If a relatively inexpensive car share program were available for such trips, they might be more willing to make use of transit, carpool, or vanpool services to commute.

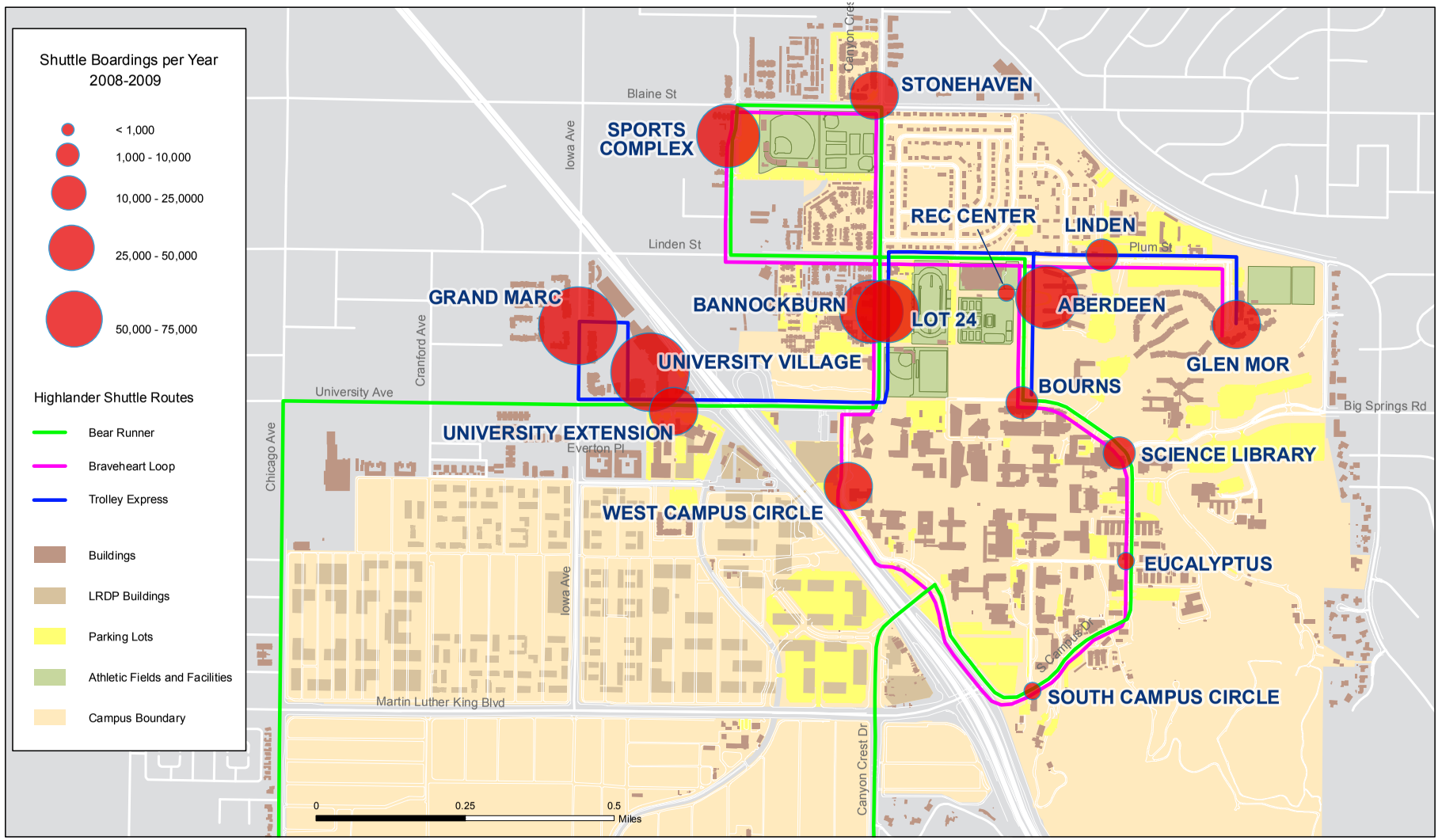
A carshare program could have an even greater impact on the travel behavior of campus affiliates who live on or very close to campus. Currently, resident students have a considerably higher demand for parking than commuters, since their cars remain on campus during both peak and off-peak hours. Nonetheless, since these students walk or bike to classes, their use of their cars is likely to be considerably more sporadic than commuters. When the new Zipcar program becomes operational in fall 2009, many students may be willing to forego car ownership altogether, thereby reducing the need for parking.

With plans to increase the number of students living on-campus to 50 percent of the total student population, the establishment of a carsharing service on-campus is a critical strategy in helping reduce the number of vehicle trips generated by campus residents.

Shuttle Service

UC Riverside operates a shuttle service called the Highlander Shuttle. The shuttle operates on three routes: Braveheart Loop, Bear Runner, and Trolley Express. The Braveheart Loop runs daily between 6:30am and 10:00pm on a continuous 30-minute loop between the City/UCR Sports Center, Student Recreation Center, Bannockburn Village, and Lot 30. The Bear Runner operates Monday through Thursday from 6:20pm to 12:45am on a 30-minute continuous loop covering both northern and southern portions of the East Campus. The Trolley Express runs daily between 6:30am and 10:00pm on a continuous 15-minute service between Grand Marc Apartments and A&I Dorms. These shuttle services only operate during the academic year. In the 2008-09 academic year, there were a total of 132,943 boardings on the Braveheart Loop shuttle and a total of 251,731

Figure 4-8 Annual Shuttle Boardings

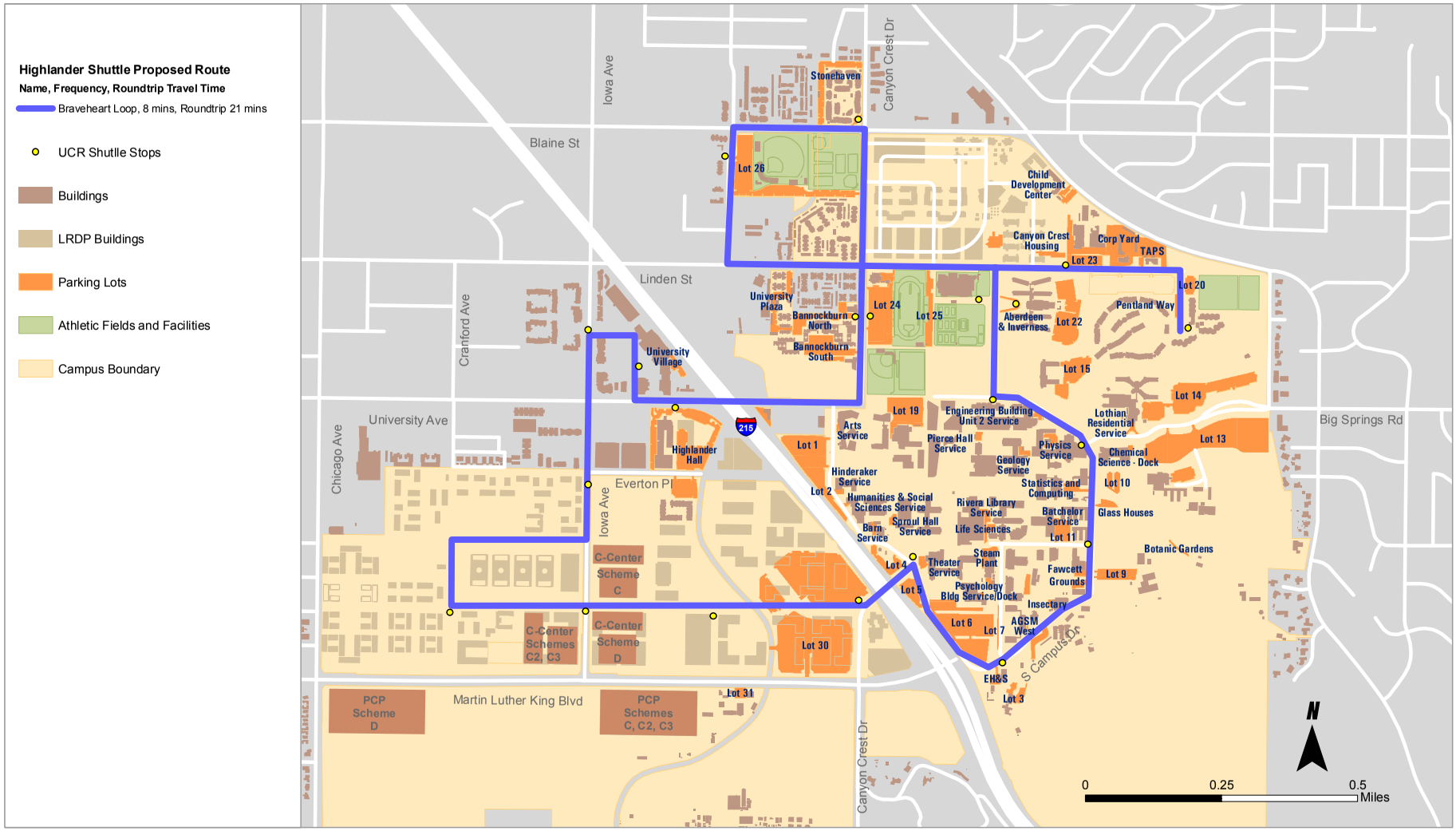


GIS Data Source: University of California, Riverside

Nelson|Nygaard consulting associates

Figure 4-9 Preferred Scenario Shuttle Route

University of California, Riverside - Proposed Shuttle Route



Nelson | Nygaard consulting associates

GIS Data Source: University of California, Riverside

boardings on the Trolley Express. See Figure 4-8 for an illustration of campus shuttle boardings.

Under the Preferred Scenario, service on existing shuttle routes would be significantly upgraded by combining the Trolley Express and Braveheart Loop into a single route, and extending that route into the West Campus. The new comprehensive shuttle route, called the Braveheart Loop, would have a frequency of 8 minutes and a travel time of 21 minutes to complete one loop. The service is anticipated to run weekdays from 6:30 am to 10:00 pm and connect campus housing, academic uses, the new School of Medicine, and nearby shopping.

The proposed shuttle expansion would represent a considerable improvement with service that is frequent enough that users do not need to consult a schedule in order to ride. Typically, transit systems aim for this level of frequency as it tends to produce larger ridership gains. However, this proposed system would also come with increased costs. If we assume that the average shuttle costs $66.75 per service hour, the system (including current routes) would cost approximately $1.8 million annually. This cost is assumed to be paid for by the alternative transportation fee. Figure 4-9 shows the proposed route map.

Alternative Transportation Fee

The development of high quality and affordable alternative transportation options is key to encouraging campus affiliates to reduce the number of trips they make by private vehicle, which in turn reduces the total number of vehicle trips, vehicles miles travelled, and green house gas emissions. As the campus works towards continually improving its alternative transportation program and environmental sustainably, more fiscal invest in these programs will be necessary.

The implementation of a quarterly "alternative transportation fee" is one tool that the campus can utilize to help it achieve its sustainability and transportation goals. Any student fee would require a vote of the student body in order to be implemented. Several other UC campuses currently have student fees that support transit pass programs. Figure 4-10 shows the wide discrepancy in student fees by campus due to their varying types of service available.

Under the Preferred Scenario, the campus should implement a quarterly alternative transportation fee of $41 per student. If the campus wishes to expand the fee to cover faculty and staff, the fee would decrease to $33 per person. Both of these amounts are at the bottom cost range compared to other UC campuses and would be used specifically to fund alternative transportation programs and reduce the campus carbon footprint.

Bicycle Facilities and Programs

For bicycle commuters, UC Riverside offers complimentary membership to the Physical Education Building for access to showers and lockers as well as complimentary bike registration. Participants in the Alternative Transportation program are eligible for 48 days per year of complimentary parking. The campus provides bike rack facilities throughout the campus and there are several bike lanes which serve the campus and surrounding area.

While bicycle registrations and ridership has been increasing over the past three years, there are several

Figure 4-10 Peer UC Campus Student Fees

Campus	Student Fee Amount (per year)
UC Berkeley	$136
UC Davis	$99
UC Merced	$175
UC Santa Barbara	$39
UC Santa Cruz	$335

programmatic and facility improvements that can make bicycling to and around campus a more feasible, safe, and enjoyable transportation option.[9]

- Develop a bicycle map that highlights bike paths; secure bike parking areas; the number of bicycles that can be parked at each area; locker and showering facilities.
- Identify locations for future bike paths and lanes which will connect the West Campus to the East Campus as well as provide connections to the City of Riverside bicycle network.
- Monitor bicycle parking occupancy periodically to determine where additional bicycle parking is needed.
- Create a bike dismount zone on the Carillon Mall and other high pedestrian volume areas during peak hours, to reduce pedestrian and bicycle conflicts and improve pedestrian safety.
- Institute a bike sharing program that allows for paid, joint use of bicycles that are resistant to theft.

Bicycle Sharing on University Campuses

Universities with Bike Sharing Programs

Over the years, bicycle sharing programs have evolved from donated bikes painted in school colors distributed freely on campus through to today's systems with purpose-designed bicycles and electronic access control.

Schools that currently have modern bike sharing programs include St. Xavier University and University of California at Irvine. These include widely distributed parking stations, electronic access control based on student or faculty ID, and web integration to locate the nearest available bike.

The University of Buffalo and Northern Arizona University both have variants of older type bicycle sharing schemes, either with free bikes or with a single central pick-up location and pre-booking like a conventional rental.

Experiences

The quality of bicycle can vary greatly and will influence the likely success of a bike sharing program. Examples of different qualities:

- Donated, used, bikes. While these bicycles have low initial costs, ongoing maintenance can quickly add up.
- Basic cruiser bikes. Some programs, such as Collegiate Bicycles, offer fairly basic bikes with the option of upgrades (at a price): hub gears, chain guards, fenders, baskets, lights
- Custom built city bikes. Top of the range city bikes from programs such as Bixi and Velib feature hub gears, hub brakes, chain guards, skirt guards (on Velib), integrated lights, carrier rack.[10]

UC Irvine will soon be starting its own bike sharing program called Zotwheels. Members will be able to swipe their cards to rent bicycles from solar-powered kiosks at four locations around campus. Members will be able to check for bicycle availability on the campus's website. Each bicycle will contain RFID tracking equipment to prevent theft.[11]

Although UC Irvine ultimately purchase bicycles through Collegiate Bicycles, an interview with their bicycle sharing coordinator revealed that the campus was particularly impressed by the Bixi system as the bike stations are self-contained units with solar power that can be installed anywhere with no requirement other than a flat surface. This provides tremendous flexibility in situating bike stations, and also means that they can be moved to optimize location as experience dictates. Additionally, the Bixi bikes are purpose-built practical bicycles and come with many features as standard that would be optional extras from other vendors.

9 Some of these options are listed in the 2004 UCR Multimodal Transportation Management Strategy. We have reiterated them here to highlight their effectiveness.

10 Bike sharing companies include Bixi (www.bixi.com), B-cycle (www.bcycle.com), Collegiate Bikes/Eco Trip (www.collegebikes.com), and SmartBike (ClearChannel) (http://www.smartbike.com/)

11 For more information on the Zotwheels program see UC Irvine's Zotwheels program website: http://www.bike.uci.edu/bike/zotwheels.cfm

In general, the transportation value of city bikes with lights, fenders and means of carrying school bags or briefcases is greater than more basic models.

Cost

Most companies quote prices of roughly $3,000 to $4,000 per bicycle, but that usually includes the parking station and back-of-house software. For large purchases it would be possible to negotiate a bulk discount. In addition, there might be upfront and annual software licensing fees.

Potential Difficulties

Bicycle sharing schemes have been around for some time, but are constantly evolving to meet some of the problems that faced the earliest programs:

- Lack of student incentives to maintain shared bicycles
- Failure to return bicycles to racks and left in undesignated locations
- Poor initial quality of donated bicycles (e.g. Walmart bought second-hand bicycles)
- Theft

Early programs were often free to use and left the shared bikes unlocked. The idea was that users would find a bike for their trip, and then leave it available for the next user at their destination. In practice, these systems rapidly lost bicycles through theft or neglect because users could not be identified or held accountable.

Advances in technology have to a large extent conquered these problems in so-called "third generation" bike sharing programs. Shared bikes are now locked securely at bike sharing stations, and can only be unlocked by users with the appropriate key (student ID, credit card, electronic key fob etc). This means that each bike in use is registered to a unique user, who can be held accountable for loss or damages.

All systems now provide flexibility in terms of charging for use. Some are free for two hours, after which there is a penalty. Others charge from the first minute. Many follow the Paris Velib model of granting a free first half hour, with charges for each half hour thereafter.

Bicycle sharing programs need to provide a sufficient number of stations in the right locations to ensure that it is a viable transportation system. The successes of systems like Velib in Paris and Bicing in Barcelona stem in part from the dense network of parking stations, meaning that almost regardless of starting point and destination there will be a bicycle station nearby. In a campus context this means that bicycle stations should be located close to major activity centers such as residence halls, lecture halls, services and sports facilities.

Conclusions

Bicycles are in many ways the ideal campus transportation. Implemented correctly, a bike sharing program can provide convenient and cheap mobility for students and faculty, and staff, and ease congestion and parking demand on crowded campuses. Crucial details to get right are:

- Accountability – electronic access control permits each user to be identified, which tends to dissuade misuse of the system
- Quality – with electronic access control and GPS tracking, one should not be afraid to invest in high quality bicycles, as they will prove far more pleasant in use and mean reduce maintenance costs in the long term
- Cost – most companies can offer complete systems from $3000 to $4000 per bike, depending on the quantity purchased

Depending on the precise context, an alternative may be merely giving students a personalized bicycle in return for a promise not to bring their car with them. The University of New England and Ripon College of Wisconsin have programs in cooperation with a major bicycle manufacturer that offers freshmen bikes if they forgo bringing a car to campus. Ownership provides the incentive not to neglect bikes, and the program has proved to be popular.

On-Campus Retail and Services

A greater mix of uses has been shown to decrease the number of vehicle trips and to reduce both traffic congestion and parking demand. The reasoning is simple – if a student can buy his or her basic needs (food, class supplies, etc.) on campus,

there is no need to make multiple trips off-campus during the day. The need to leave campus several times throughout the day leads to auto-dependence because a transit user does not have as great a flexibility to leave campus after having arrived. The lack of on- or near-campus retail also makes living on-campus or nearby less attractive and requires automobile ownership for those who do so.

On-campus, UCR provides a number of food options for affiliates, including residential dining halls and a food court as well as a campus bookstore. The inclusion of more cafeteria space and basic retail would provide an even greater benefit to the campus, in terms of reducing both traffic and parking demand. In addition, the expanded presence of on-campus dining and retail would help strengthen the campus community with students, faculty, and staff eating and mingling together rather than dispersing to nearby casual dining restaurants and fast-food chains.

With plans to increase the number of students living on-campus to 50 percent of the total student population, increasing on-campus retail and services is a critical strategy in helping reduce the number of vehicle trips generated by campus residents. A priority should be given to uses which address basic needs such as a grocery store, convenience store, drug store, post office and dry cleaner, to reduce the need for residents as well as staff and faculty to leave campus to run common errands.

Resident Student Parking in Commuter Spaces

Currently, resident students may park in commuter spaces after 4 PM, the time at which most classes are finished for the day. UCR staff has noted, however, that immediately prior to 4 PM, resident students form queues in certain lots as commuter students are attempting to leave. This results in poor maneuverability and congestion. To alleviate this problem, the Preferred Scenario recommends changing the time at which resident students may park in commuter spaces at staff's discretion. This modification only need be applied to those lots currently experiencing congestion.

Parking Permit Districts

Currently, it is estimated that almost 500 campus affiliates are parking off-campus either in free parking lots or on-street in surrounding neighborhoods. Figure 4-11 provides a breakdown of the number of cars parking off-campus by area.

While the City of Riverside has not voiced any concerns about campus affiliates parking off-campus, the projected growth in the student, faculty and staff population in combination with the implementation of higher parking prices may potentially result in an increasing number of campus affiliates looking for parking in the residential neighborhoods surrounding campus. If spillover parking does become a concern, the campus may wish to consider collaborating with the City in identifying those streets best suited to become parking districts.

In order to prevent spillover parking in residential neighborhoods, many cities implement residential permit districts (also known as preferential parking districts) by issuing a certain number of parking permits to residents usually for free or a nominal fee. These permits allow the residents to park

Figure 4-11 Off-Campus Parkers by Location

Location	Estimated Number of Vehicles Parked per Day
Watkins Drive (UCR Side)	90
Big Springs	40
Linden Street & City Parking Lot	80
University Village and Parking Structure Surface Lot	100
Canyon Crest Drive	50
Spruce Street and Vacant Lot	25
Other Neighborhood: a) Nearby streets b) Retail lots c) Churches / Places of worship	100

within the district while all others are prohibited from parking there for more than a few hours, if at all. At least 130 other cities and counties currently have such residential parking permit programs in effect in the US and Canada.[12]

As the campus grows, there may be an opportunity for the campus to work with the City of Riverside to establish parking permit districts if the number of campus affiliates parking off-campus continues to increase. By restricting parking in overflow areas to either businesses or residents for a given time period, UCR affiliates will be discouraged from parking in these areas.

It should be noted that residential parking permit districts in the City of Riverside only can be implemented if a simple majority (50% +1) of property owners on a block supports formation of the district.

12 "Residential Permit Parking: Informational Report." Institute of Transportation Engineers, 2000, p1.

PARKING SUPPLY & DEMAND ASSESSMENT


UC RIVERSIDE
LANE
BIKE

CHAPTER 5

PARKING SUPPLY & DEMAND ASSESSMENT

INTRODUCTION

In order to describe the current parking supply and demand at UC Riverside and then estimate future parking supply and demand, a multi-stage model was developed as outlined below.

The steps in making the model are the following:

1. Review current parking supply and demand and current population, by user group (faculty/staff, students);
2. Estimate future population of each user group;
3. Estimate resulting future parking demand for each user group;
4. Project parking supply changes;
5. Compare and summarize scenario results;

INPUT VARIABLES

The model requires numerous inputs:

- Campus population of commuter students and faculty/staff;
- Number of parking spaces on campus;
- Parking utilization rates;
- Future plans for campus parking (2005 LRDP);
- Current and projected revenues and expenditures, including parking permit sales, salaries & benefits, and transit services;

MODEL ASSUMPTIONS

In any model, a number of assumptions must be made. This model used the assumptions listed below:

- Population and revenue growth projections received from TAPSs were used from 2009 to 2020 for baseline calculations;
- Student and faculty/staff projections were estimated using 2020 LRDP projections and assuming a linear progression.
- Price elasticity of demand for parking was assumed to be -0.3 (i.e. a 10% increase in parking price reduces demand by approximately 3%).
- Annual inflation rate of 3%.
- Parking expense and revenue projections were provided by TAPS.
- Revenue projections from 2009 to 2020 were based on current budget estimates with parking fee increases associated with the construction of new parking, calibrated to generate a "break-even" financial outcome.

Figure 5-1 Parking Supply (October 2008)

Lot	Supply	Lot	Supply
Aberdeen & Inverness	13	Lot 14	25
AGSM East	7	Lot 15	137
AGSM West	3	Lot 19	178
Arts Service	4	Lot 2	134
Bannockburn North	65	Lot 20	48
Bannockburn South	53	Lot 22	16
Bannockburn South - Dock	2	Lot 23	111
Barn Service	6	Lot 24	417
Batchelor Service	4	Lot 25	93
Biological Medicine	13	Lot 26	412
Bookstore Service	4	Lot 3	43
Botanic Gardens	22	Lot 30	2,075
Boyce Hall Service	5	Lot 31	32
Canyon Crest Housing	8	Lot 4	65
Career/Counseling Centers - Dock	3	Lot 5	71
Chemical Science - Dock	3	Lot 6	525
Child Development Center	38	Lot 7	43
Corp Yard	70	Lot 8	55
EH&S	18	Lot 9	143
Engineering Building Unit 2 Service	8	Lothian Residential Service	4
Entomology Service	2	Mail Services	4
Fawcett	13	Medical Entomology	4
Fleet	100	Pentland Way	24
Geology Service	9	Physics Service	11
Glass Houses	18	Pierce Hall Service	7
Grounds	12	Psychology Bldg Service/Dock	7
Health Center Service	2	Rivera Library Service	11
Highlander Hall	129	Science Library Service	2
Hinderaker Service	7	Sproul Hall Service	11
Humanities & Social Sciences Service	2	Statistics and Computing	13
Insectary	5	Steam Plant	27
Life Sciences	15	Stonehaven	5
Lot 1	350	TAPS	8
Lot 10	60	Theater Service	2
Lot 11	80	University Plaza	3
Lot 12	13	University Village	44
Lot 13	684	**Total**	**6,660**

* UCR staff have noted that Lot 13 may be restriped to accommodate approximately 140 additional spaces. For the purposes of this analysis, we have not included those potential spaces.

Figure 5-2 Current Parking Supply & Demand by User Group*

User	Supply	October 15, 2008 Demand	October 15, 2008 Occupancy	April 8, 2009 Demand	April 8, 2009 Occupancy
Commuter Students & Visitors	3,025	2,390	79%	2,119	70%
Faculty & Staff	3,635	2,465	68%	2,388	66%
Total	**6,660**	**4,855**	**73%**	**4,507**	**68%**

*Note: User groups are arranged by the following parking data space types: Commuter Student – Disabled, Dispenser, Gold, Medical, Meter, Motorcycle, Time-Controlled, Two-Hour; Faculty/Staff – Blue, Carpool, Delivery, Department, Red, Service, X

- For all parking spaces, this study uses an "effective parking supply factor" of 95 percent. Effective supply is defined as the total number of parking spaces in a lot, less the percentage of spaces that the parking operator wishes to have vacant even at the typical peak hour. Choosing an effective parking supply factor of 95% means that the operator wishes to have 5% of the parking supply vacant at peak hour. This provides a cushion of spaces to reduce the search time for the last few available parking stalls and to allow for the dynamics of vehicles moving into and out of parking stalls during peak periods. This cushion also allows for unanticipated variations in parking activity as well as the temporary loss of spaces due to improperly parked vehicles, construction and other factors. The effective supply cushion also compensates for the loss of utilization and efficiency due to the segregation of spaces for various user groups (e.g. special events). For the purposes of this analysis, the effective supply calculation combines commuter student, visitor and faculty/staff spaces

PARKING SUPPLY

The parking supply monitored by TAPS showed a total commuter student and faculty/staff campus parking inventory of 6,658 spaces. It should be noted that the supply numbers in Figure 5-1 include service dock spaces. However, the number of service dock spaces is so small that they will have no noticeable impact on demand and it is also possible that faculty and staff may be parking in these spaces currently. The parking spaces available to permit holders as well as visitors and other non-permit holders allocation is shown in Figure 5-1.

Current estimated parking demand, as well as future parking demand, is based on parking occupancy counts conducted by the campus. To estimate peak parking demand during the most recent school year, parking occupancy counts for the Fall and Spring semesters were examined.

As noted in Chapter 3, by 2020 the overall peak parking demand ratio is anticipated to rise from .26 to .33. Total peak-period demand is expected to rise from 4,855 to 7,549 spaces. These rates are key inputs into the parking model.

GROWTH IN POPULATION

UC Riverside is a campus on the rise. In its 2005 Long Range Development Plan, the campus was targeted to grow from 18,050 FTEs (Full Time Equivalent Students) in 2005, to 21,000 in 2010 (16% increase), and 25,000 in 2015 (39% increase from 2005). The increase in student population will be coupled with an increase in staff and faculty population.

However, due to the state budget crisis and the nationwide economic recession, the campus has recently scaled back its estimates of student enrollment. Instead of reaching 25,000 students by 2015, the year 2020 will become the new target year.

SCENARIO 1 – BASELINE SCENARIO

Future Parking Supply and Demand

According to the 2005 LRDP, the campus is expected to need 10,380 spaces to meet the parking demands of commuter students, faculty, staff, and visitors in 2020. As such, the LRDP provides for

Figure 5-3 Projected Parking Demand in 2020

User	2008 Population (a)	Peak Parking Demand (b)	Peak Parking Ratio (c) = (b/a)	2020 Population (d)	Peak Parking Ratio + Spillover (e)	Peak Parking Demand (f) = (d*e)
Commuter Student & Visitors	14,618	2,390	.16	15,124	.20	2,974
Faculty & Staff	4,266	2,465	.58	7,916	.58	4,574
Total	18,884	4,855	.26	23,040	.33	7,549

Figure 5-4 Current Population Projections*

Year	2008	2009	2010	2011	2012	2013	2014
Commuter Students & Visitors	14,618	14,660	14,703	14,745	14,787	14,829	14,871
Faculty/Staff	4,266	4,570	4,874	5,179	5,483	5,787	6,091

Year	2015	2016	2017	2018	2019	2020
Commuter Students & Visitors	14,913	14,955	14,998	15,040	15,082	15,124
Faculty/Staff	6,395	6,699	7,004	7,308	7,612	7,916

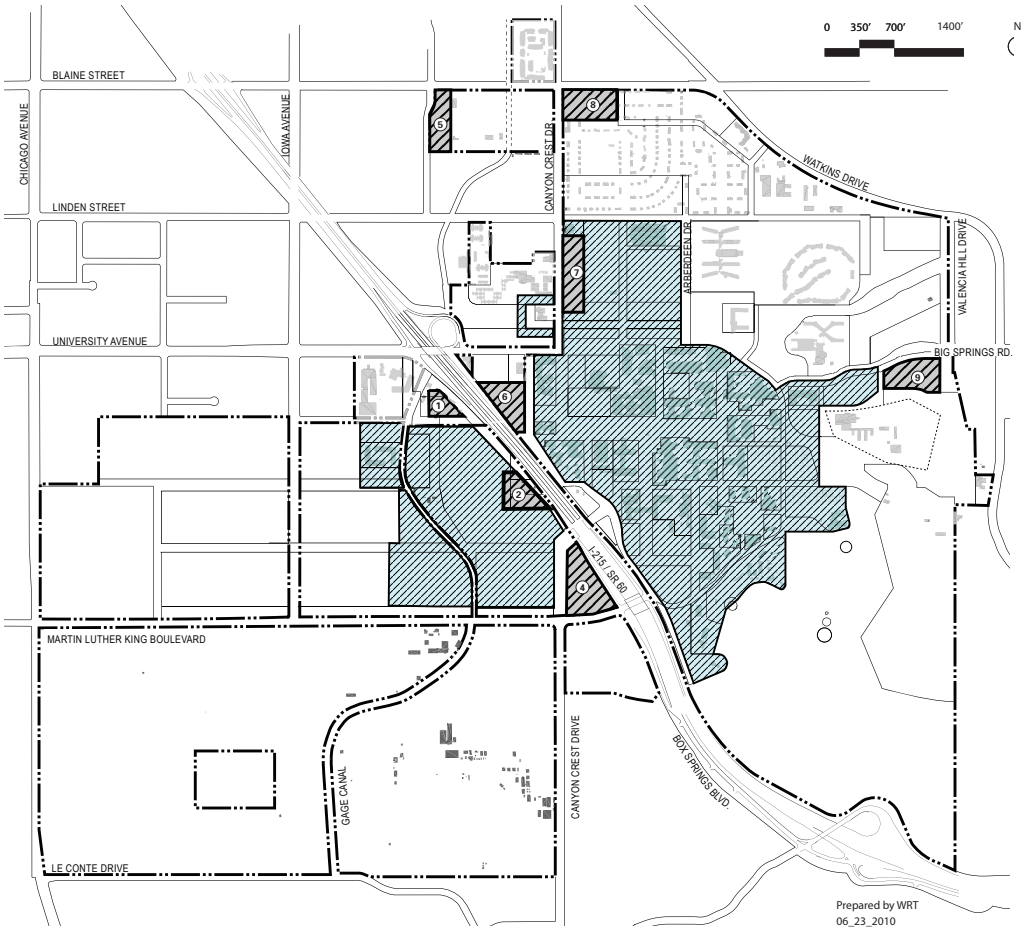
*Population projections assume a linear increase from 2008 to 2020.

Figure 5-5 Parking Structure Capacities*

Parking Location	Acres	Parking Levels	Site Coverage	Parking Spaces
1	1.84	4	80%	524
2	3.7	5	80%	869
4	5.4	7	80%	1,644
5	2.7	4	80%	1,075
6	3.2	4	80%	1,274
7	3.7	4	80%	1,070
8	3.8	4	80%	1,513
9	3.2	3	80%	956
Total	27.5			8,925

*Reflects updated structure capacities from LRDP p. 90 for all structures except parking Location 7. Parking location 7's capacity was obtained from the UCR 10-Year Capital Financial Plan.

Figure 5-6 Proposed Parking Structure Locations



Source: LRDP Amendment

several potential parking structures to preserve the land base for academic and support facilities and open space instead of a sea of surface parking lots. Figure 5-5 shows the capacity of each structure. Figure 5-7 shows the proposed site of each structure.

In addition, the campus has noted that the first of these structures to be built will be in Location 7, which will replace the current parking Lot 24. This has been identified as the logical site for the first parking structure on campus due to the location among public uses which will offer the opportunity of shared use with students, staff and faculty using the garage during the weekday hours and civic and campus special events using it at night and on weekends. In the future Bannockburn Housing Complex will be demolished and a mixed use residential complex will take its place with the parking garage providing additional spaces for residents and retail/office and commercial users. As infill takes place on the East Campus, there will be fewer surface lots available for parking as they are turned into building sites.

Although the LRDP provides for several potential structures, increasing parking prices to cover parking costs may encourage campus commuters to use alternative forms of transportation, thereby eliminating the need for some garages. As significant price increases would be necessary to cover projected bond debt, the impact of parking price increases may be material. This scenario assumes a parking price elasticity of -0.3 (i.e. a 10 percent increase in parking price yields a roughly 3 percent decrease in parking demand). This number

Figure 5-7 Commuter Student/Visitor Elasticity Curve

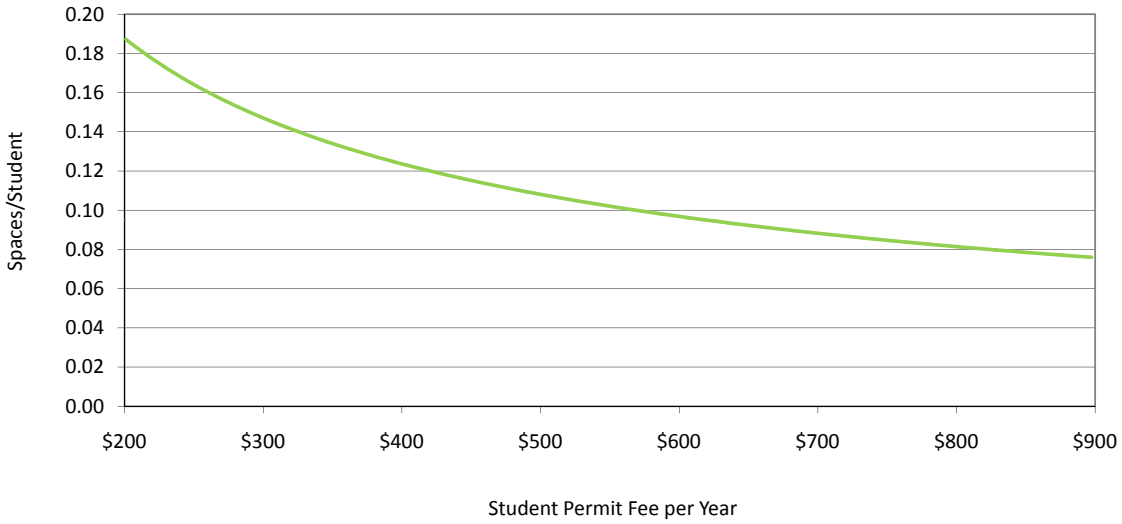
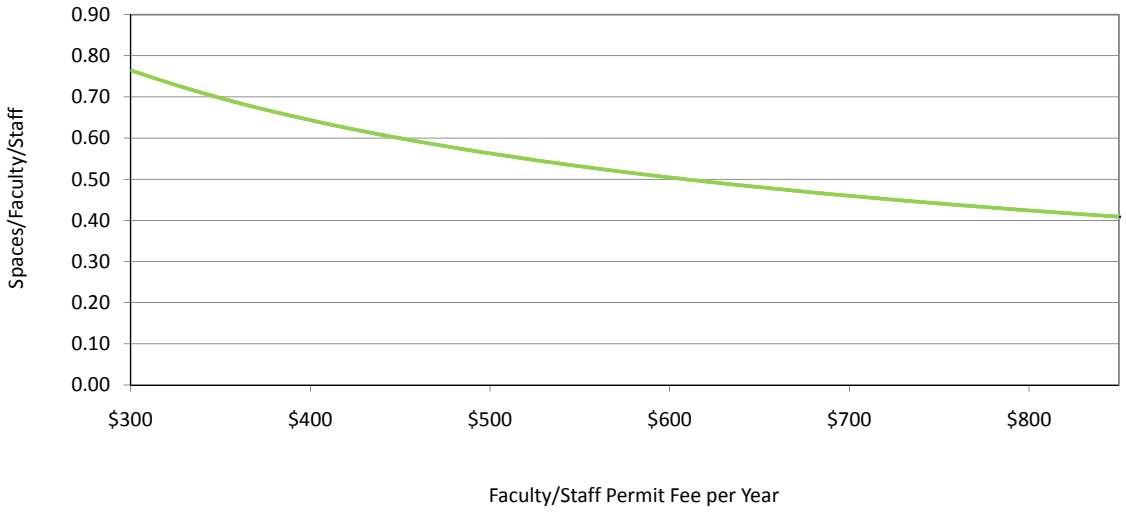


Figure 5-8 Faculty/Staff Elasticity Curve



represents a midpoint in values found in the national transportation research literature on parking demand elasticity with respect to price, which range from -0.1 to -0.6, with -0.3 being the most frequently cited value. The figures below illustrate the effect of a -0.3 parking price elasticity on the demand of spaces per student and faculty/staff.

Assuming an elasticity of -0.3, projected future parking demand will drop substantially from the figures cited in the Existing Conditions report. If prices were raised by 11% each year to cover projected costs, a parking price elasticity of -0.3 would reduce projected parking demand in 2020 from 7,549 to 4,369, a reduction in demand of over 42%. The increase in permit prices is necessary to finance a parking structure on Lot 24 to meet the effects of localized demand as discussed above.[1] This does not preclude the campus from building structures on other sites that have been identified in the LRDP. If areas of highly localized demand emerge in the future, it may become necessary to replace more surface parking lots with structures. For example, it is projected that Lot 30 will need to be closed to make way for development on the West Campus, but this is not expected to occur until 2025.[2] Figure 5-9 illustrates the impact of an assumed parking price elasticity of -0.3 on projected parking demand.

Figure 5-9 below shows commuter student and faculty/staff parking demand over time when accounting for elasticity and inflation. The table is a demonstration of permit price increases necessary to guarantee an acceptable revenue stream.

PARKING SYSTEM REVENUE AND EXPENSE REVIEW

Data on current parking expenses and revenues, as well as parking expense and revenue projections, were provided by TAPS through 2020 with construction, operations, and maintenance costs included from Nelson\Nygaard. As stated above, permit prices were adjusted to guarantee a scenario that was as close as possible to revenue-neutral. Under this Baseline scenario, real permit prices must increase 121% by 2020 to meet anticipated costs. These permit fees support not only parking provision, but also a variety of other items discussed in more detail below.

1 The Baseline Scenario envisions Lot 24 to close in 2014 and a parking structure to be built in 2016, but these dates may change based on the construction schedule of the Bannockburn development. A change in dates may cause prices to increase or decrease based on the construction cost index and inflation.

2 See CAMPS p. 14 for reference.

Figure 5-9 Projected Parking Demand

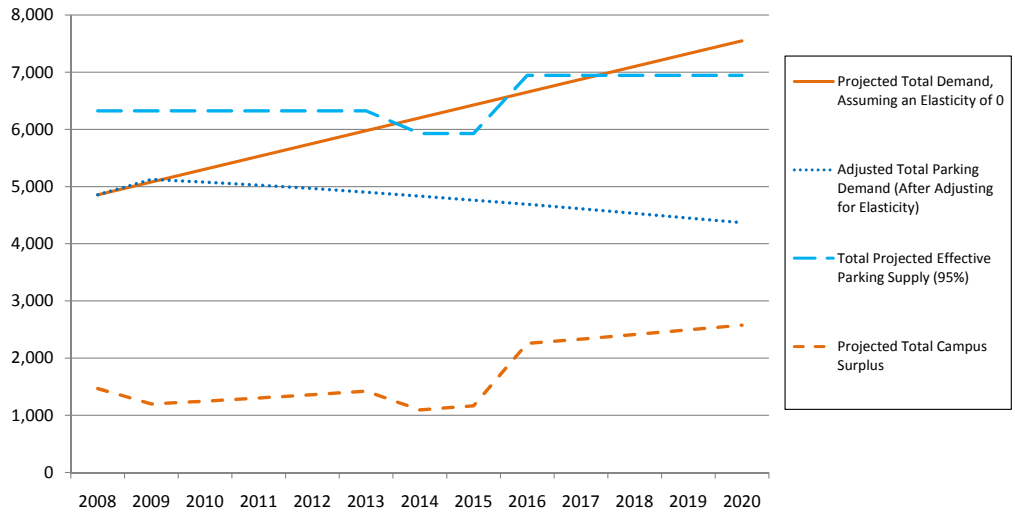


Figure 5-10 Projected Baseline Parking Demand

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commuter Students & Visitors	14618	14660	14703	14745	14787	14829	14871	14913	14955	14998	15040	15082	15124
Faculty/Staff	4266	4570	4874	5179	5483	5787	6091	6395	6699	7004	7308	7612	7916
Total School Population	18884	19231	19577	19923	20269	20616	20962	21308	21655	22001	22347	22694	23040
Projected Commuter Student Parking Demand, Assuming an Elasticity of 0	2,390	2,439	2,487	2,536	2,585	2,634	2,682	2,731	2,780	2,828	2,877	2,926	2,974
Projected Faculty/Staff Parking Demand, Assuming an Elasticity of 0	2,465	2,641	2,817	2,992	3,168	3,344	3,520	3,695	3,871	4,047	4,223	4,398	4,574
Projected Total Parking Demand, Assuming an Elasticity of 0	4,855	5,079	5,304	5,528	5,753	5,977	6,202	6,426	6,651	6,875	7,100	7,324	7,549
Price Index Assuming 3% Inflation	1.00	1.03	1.06	1.09	1.13	1.16	1.19	1.23	1.27	1.30	1.34	1.38	1.43
Commuter Student Price Increase Projected	0%	0%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%
Commuter Student Price, in Current Year Dollars	$ 252	$ 252	$ 280	$ 310	$ 345	$ 383	$ 425	$ 471	$ 523	$ 581	$ 645	$ 716	$ 794
Student Price in Real Dollars	$ 252	$ 245	$ 264	$ 284	$ 306	$ 330	$ 356	$ 383	$ 413	$ 445	$ 480	$ 517	$ 557
% Reduction in Student Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	0.1%	6.1%	11.7%	16.9%	21.8%	26.4%	30.7%	34.7%	38.5%	42.1%	45.4%	48.5%
Faculty/Staff Price Increase Projected	0%	0%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%
Faculty/Staff Price, in Current Year Dollars	$ 479	$ 479	$ 532	$ 590	$ 655	$ 727	$ 807	$ 896	$ 994	$ 1,104	$ 1,225	$ 1,360	$ 1,510
Faculty/Staff Price in Real Dollars	$ 479	$ 465	$ 501	$ 540	$ 582	$ 627	$ 676	$ 728	$ 785	$ 846	$ 912	$ 983	$ 1,059
% Reduction in Faculty/Staff Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	-1.8%	2.7%	7.0%	11.1%	15.0%	18.7%	22.3%	25.7%	29.0%	32.1%	35.1%	38.0%
Adjusted Commuter Student Parking Demand (After Adjusting for Elasticity)	2,390	2,437	2,337	2,240	2,148	2,059	1,974	1,892	1,814	1,739	1,667	1,598	1,532
Adjusted Faculty/Staff Parking Demand (After Adjusting for Elasticity)	2,465	2,687	2,740	2,783	2,817	2,842	2,860	2,870	2,874	2,873	2,865	2,853	2,837
Adjusted Total Parking Demand (After Adjusting for Elasticity)	4,855	5,125	5,077	5,023	4,964	4,901	4,833	4,762	4,688	4,612	4,532	4,451	4,369
Projected Supply	6,658	6,658	6,658	6,658	6,658	6,658	6,241	6,241	7,311	7,311	7,311	7,311	7,311
Projected Effective Supply	6,325	6,325	6,325	6,325	6,325	6,325	5,929	5,929	6,945	6,945	6,945	6,945	6,945
Projected Total Campus Surplus/Deficit	1803	1533	1581	1635	1694	1757	1408	1479	2623	2699	2779	2860	2942
Projected Total Campus Effective Supply Surplus/Deficit (95%)	1470	1200	1248	1302	1361	1424	1096	1167	2257	2334	2413	2494	2577

Figure 5-11 Projected Parking Revenues and Expenses

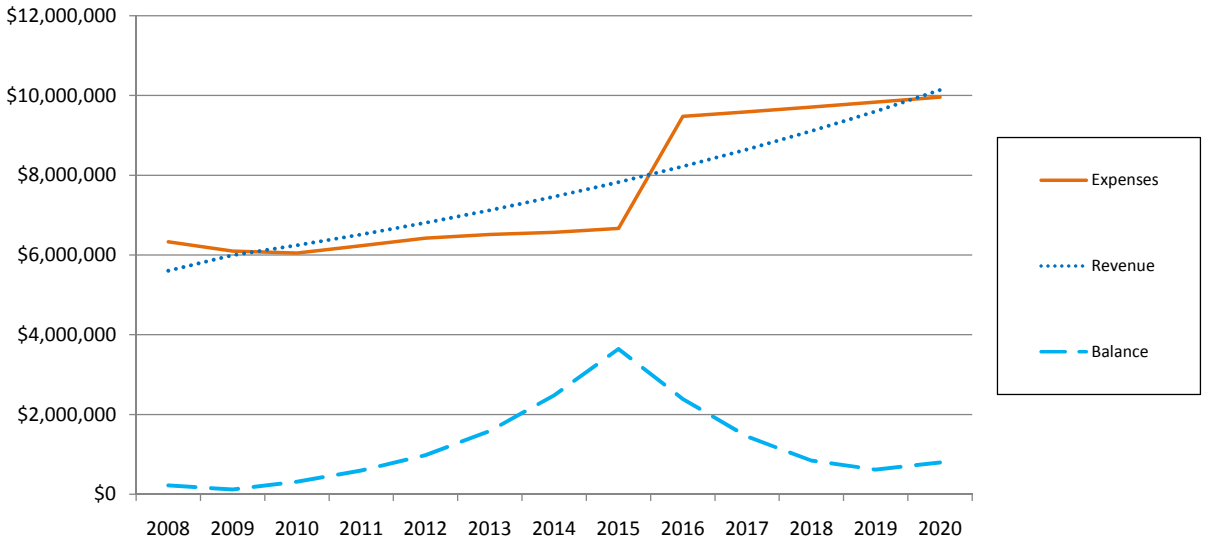


Figure 5-11 shows the expenses, revenues, and resulting annual balances from building a structure on Lot 24 and introducing permit price increases. Although there is a larger balance anticipated in 2020, it is expected that these funds can be used to finance campus transportation improvements such as signage, landscaping, and pedestrian ways that currently may lack resources.

SCENARIO 2 – PREFERRED TDM SCENARIO

The baseline scenario described above (Scenario 1) assumes that there is no change from the current alternative transportation program used by the campus. Scenario 2 projects the parking demand and financial impacts of instituting or expanding TDM measures while still weighing the effects of parking price elasticity. These TDM measures include:

1. A faculty/staff UPASS program that will cover 100% of costs.
2. Continuing the current campus policy of adjusting parking rates to cover costs.
3. Instituting a carsharing program.
4. Expanding transit service to cover the West Campus.
5. Allowing for a student vote on (and possible faculty/staff participation in) an Alternative Transportation fee that will that will fund alternative transportation programs and reduce the campus carbon footprint.
6. Installing new bicycle facilities (e.g. bike sharing program, improved bikeways, etc.)
7. Introducing new campus services, such as grocery stores or personal services.
8. Increasing the price of permits for those within a certain distance of campus to encourage alternative mode use.
9. Adjusting the hours and lots in which resident students are restricted from parking in commuter spaces, or purchasing general parking permits.
10. Campus support of Parking Permit Districts created by the City to cope with spillover parking problems on neighborhood streets.

As in the Baseline Scenario above, assuming an elasticity of -0.3, projected future parking demand will drop substantially from the figures cited in the Existing Conditions report. If prices were raised by 2020 to cover projected costs, a parking price elasticity of -0.3, combined with TDM measures, would reduce projected parking demand in 2020 from 7,549 to 4,256. This reduction is very similar

to that of the Baseline Scenario, but under the Preferred Scenario permit prices need to only rise 9% per year (as opposed to 11% under the Baseline Scenario) to finance parking construction.[3]

By providing more funding for alternative modes through the Alternative Transportation Fee, the campus lowers the burden placed on its parking supply, which in turn makes certain price increases to handle excess demand unnecessary. As in the Baseline Scenario, it is beneficial to the campus to construct a parking structure on Lot 24 to meet anticipated peaks in localized demand.[4] Figure 5-12 illustrates the impact of an assumed parking price elasticity of -0.3 with TDM on projected parking demand.

Figure 13 shows commuter student and faculty/staff parking demand over time when accounting for elasticity and inflation. The table is a demonstration of permit price increases necessary to guarantee an acceptable revenue stream.

PARKING SYSTEM REVENUE AND EXPENSE REVIEW

As in the Baseline scenario, data on current parking expenses and revenues was used, as well as parking expense and revenue projections to adjust permit prices to guarantee a scenario that was as close as possible to revenue-neutral. Figure 5-14 shows the expenses, revenues, and resulting annual balances from introducing permit price increases that result in 18% lower real permit prices than the Baseline Scenario. The balance in this scenario is roughly equivalent to that of the Baseline Scenario, which is made possible through the Alternative Transportation fee that will defray costs for TAPS and allow for lower parking permit prices. As in the Baseline Scenario, these funds can be used to finance campus transportation improvements such as signage, landscaping, and pedestrian pathways that may currently lack resources.

3 This does not include the price increase for those living within a certain distance of campus to encourage alternative mode use, which will take effect in 2010.

4 The Preferred Scenario envisions Lot 24 to close in 2014 and a parking structure to be built in 2016, but these dates may change based on the construction schedule of the Bannockburn development. A change in dates may cause prices to increase or decrease based on the construction cost index and inflation.

Figure 5-12 Projected Parking Demand

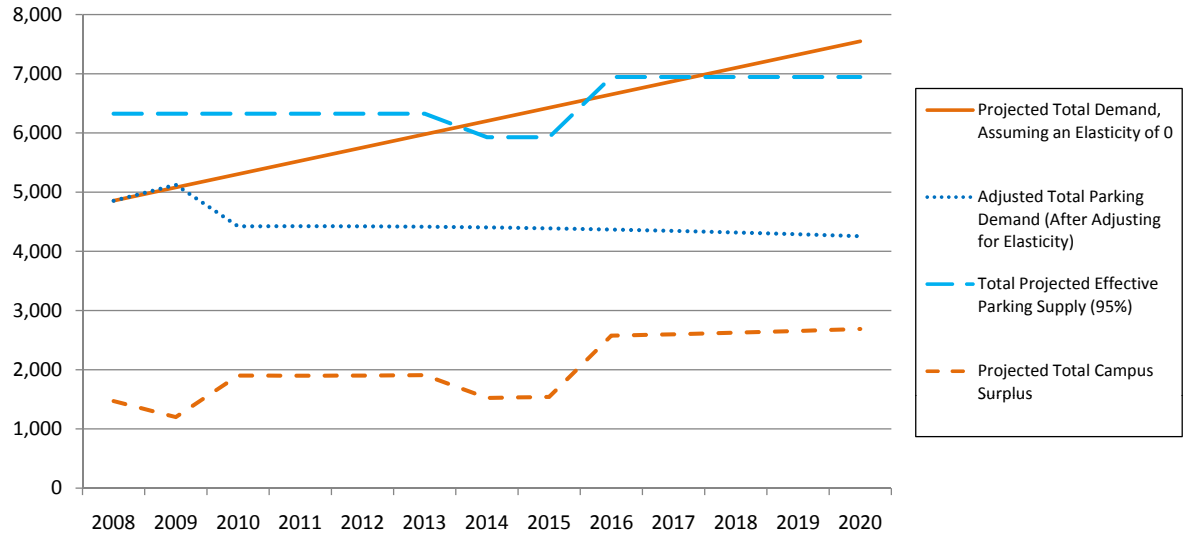


Figure 5-13 Projected Preferred Package Parking Demand

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commuter Students & Visitors	14618	14660	14703	14745	14787	14829	14871	14913	14955	14998	15040	15082	15124
Faculty/Staff	4266	4570	4874	5179	5483	5787	6091	6395	6699	7004	7308	7612	7916
Total School Population	18884	19231	19577	19923	20269	20616	20962	21308	21655	22001	22347	22694	23040
Projected Commuter Student Parking Demand, Assuming an Elasticity of 0	2,390	2,439	2,487	2,536	2,585	2,634	2,682	2,731	2,780	2,828	2,877	2,926	2,974
Projected Faculty/Staff Parking Demand, Assuming an Elasticity of 0	2,465	2,641	2,817	2,992	3,168	3,344	3,520	3,695	3,871	4,047	4,223	4,398	4,574
Projected Total Parking Demand, Assuming an Elasticity of 0	4,855	5,079	5,304	5,528	5,753	5,977	6,202	6,426	6,651	6,875	7,100	7,324	7,549
Price Index Assuming 3% Inflation	1.00	1.03	1.06	1.09	1.13	1.16	1.19	1.23	1.27	1.30	1.34	1.38	1.43
Commuter Student Price Increase Projected	0%	0%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Commuter Student Price, in Current Year Dollars	$252	$252	$275	$299	$326	$356	$388	$423	$461	$502	$ 547	$ 597	$650
Student Price in Real Dollars	$252	$245	$259	$274	$290	$307	$325	$344	$364	$385	$407	$431	$456
% Reduction in Student Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	0.1%	13.9%	18.1%	22.1%	25.9%	29.5%	32.9%	36.1%	39.1%	42.0%	44.7%	47.3%
Faculty/Staff Price Increase Projected	0%	0%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Faculty/Staff Price, in Current Year Dollars	$479	$479	$522	$569	$620	$676	$737	$803	$876	$954	$1,040	$1,134	$1,236
Faculty/Staff Price in Real Dollars	$479	$465	$492	$521	$551	$583	$617	$653	$691	$731	$774	$819	$867
% Reduction in Faculty/Staff Demand Resulting from the Projected Price Increase, Assuming an Elasticity of -0.3	0.0%	-1.8%	10.8%	13.8%	16.7%	19.5%	22.2%	24.8%	27.3%	29.7%	32.1%	34.4%	36.6%
Adjusted Commuter Student Parking Demand (After Adjusting for Elasticity + TDM)	2,390	1,267	1,114	1,080	1,047	1,015	983	953	924	895	868	841	815
Adjusted Commuter Student Demand Within 3-Miles (After Adjusting for Elasticity + TDM)	0	1,170	900	872	846	820	794	770	746	723	701	679	658
Adjusted Faculty/Staff Parking Demand (After Adjusting for Elasticity + TDM)	2,465	1,801	1,683	1,729	1,769	1,804	1,836	1,863	1,886	1,905	1,922	1,934	1,944
Adjusted Faculty/Staff Demand Within 3-Miles (After Adjusting for Elasticity + TDM)	0	887	726	745	763	778	791	803	813	821	828	834	838
Adjusted Total Parking Demand (After Adjusting for Elasticity + TDM)	4,855	5,125	4,424	4,426	4,424	4,416	4,405	4,389	4,369	4,345	4,319	4,289	4,256
Projected Supply	6,658	6,658	6,658	6,658	6,658	6,658	6,241	6,241	7,311	7,311	7,311	7,311	7,311
Projected Effective Supply	6,325	6,325	6,325	6,325	6,325	6,325	5,929	5,929	6,945	6,945	6,945	6,945	6,945
Projected Total Campus Surplus/Deficit	1803	1533	2234	2232	2234	2242	1836	1852	2942	2966	2992	3022	3055
Projected Total Campus Effective Supply Surplus/Deficit (95%)	1470	1200	1902	1899	1901	1909	1524	1540	2577	2600	2627	2657	2689

PERMIT FEE EXPENDITURES

Student, faculty and staff permit fees are set at an amount in order to pay for the administration of a comprehensive parking and transportation program that includes incentives for the use of alternative forms of transportation. The following list of Program functions is not meant to be exhaustive, but is meant to illustrate the diverse elements of a comprehensive parking and transportation program. Currently, permit fees solely fund:

- maintenance, repair and renovation of existing parking facilities
- construction of new parking facilities
- achieving adequate debt-coverage ratios of bond-financed capital projects
- campus street signs
- vehicle and pedestrian directional signs
- subsidies for using public transit
- emergency call boxes in parking lots.

In addition, permit fees help to fund several other amenities:

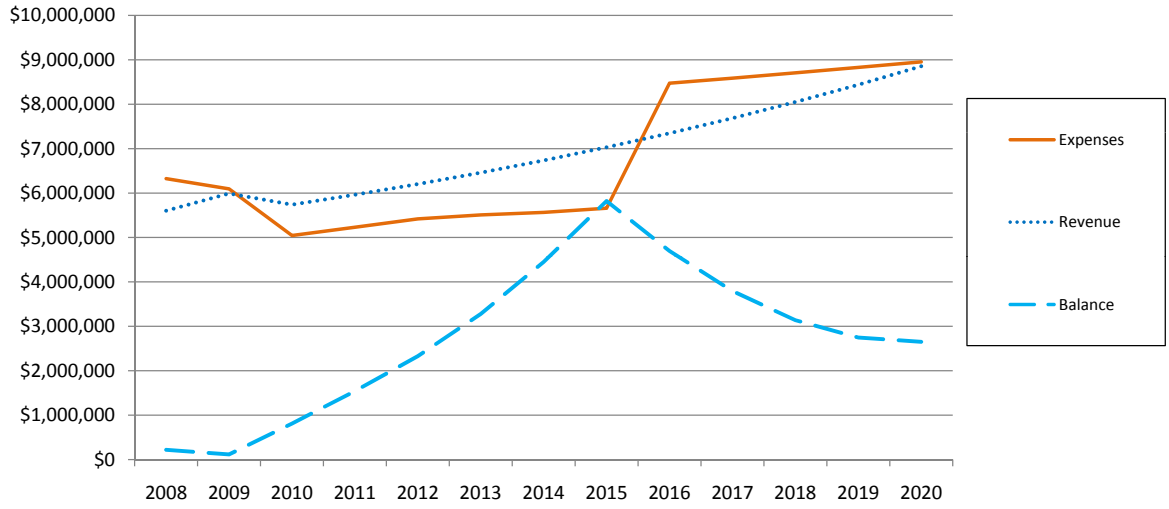
- maintenance, repair and renovation of campus roads
- accessible pathways
- pathway lighting
- other transportation programs sponsored by the campus such as the campus shuttle and vanpooling
- planting trees on campus, especially native and drought-tolerant species
- the administration of campus Sustainable Programs.

CONSTRUCTION & OPERATION OF CAMPUS PARKING BY PRIVATE DEVELOPER

Based on the parking construction and operation cost analysis, the total annual cost per parking spot in a newly constructed parking garage on Lot 24 is $3,145 per space gained. The annual cost per parking space accounts for displaced surface spaces and construction costs as well as debt service and operations and maintenance costs. For further discussion of the analysis and assumptions please refer to Chapter 2.

Having a private developer construct and operate on-campus parking is one potential way that the campus could avoid spending funds on constructing, operating, and maintaining parking on-campus.

Figure 5-14 Projected Parking Revenues and Expenses



University of California policy states that permit parking rates must be set such that they fully cover the cost of providing parking. At the same time, however, the campus does not use parking fees to generate additional revenue; rather, the idea is that parking fees should be set to a price that is revenue neutral. Given this policy it would be difficult to attract private developers to construct and operate on-campus parking as they would not be able to generate any profit unless they were allowed to raise permit prices, which would go against current UC policy.

Additionally, the campus covers its parking related costs with the revenue generated from parking permit fees, meaning it would not recoup funds by turning over the responsibility of constructing and maintaining parking to a private developer. Unless University of California policy changes with regards to the financing of parking, it is not advisable for a private developer to operate and manage the campus's parking supply.

COMPARING COSTS AND REVENUES BY TRANSPORTATION MODE

CHAPTER 6

COMPARING COSTS AND REVENUES BY TRANSPORTATION MODE

This section begins by describing the life cycle cost analysis approach used to evaluate both UC Riverside's potential alternative transportation programs and additional investments in parking. Next, it describes the facilities and programs currently serving those who walk, bicycle, carpool and vanpool, and take transit. Finally, we compare the results of the life cycle cost analysis for each of the transportation modes.

APPROACH: LIFE CYCLE COST ANALYSIS

To compare the cost-effectiveness of the campus's investments in transportation (such as parking structures and shuttle service), a cost/benefit analysis was performed for the programs and facilities of each transportation mode. In the coming years, two primary strategies will be available to balance parking demand with supply: either build more parking, or reduce parking demand. To understand when it is cost-effective to invest in reducing parking demand (and when it is not), it is helpful to carry out what economists refer to as a "life cycle cost analysis". A life cycle cost analysis calculates the cost of a system or piece of infrastructure, such as a shuttle system or parking structure, over its entire lifespan. For a shuttle system, for example, a life cycle cost analysis will include both any capital costs, such as purchasing and then replacing buses, and also all ongoing operating costs, such as fuel, maintenance and driver's wages and benefits.

Most demand-side measures that reduce parking demand (e.g., operating a shuttle service) have relatively little or no capital cost, but do carry significant ongoing annual operating costs. By contrast, parking structures have high initial capital costs, but typically last, according to industry standards, for a lifetime of 50 years. Life cycle cost analysis helps solve the problem of comparing investments in transportation systems with such different cost structures. For example, the cost of building a parking structure and operating it over an expected 50-year lifetime can be compared to the cost of operating a transit system for a 50-year period.

The analysis provided here is not exhaustive. For example, this analysis does not attempt to apportion the cost of certain facilities, specifically campus roadways and sidewalks. Campus roadways and sidewalks are shared by the users of several different modes of transportation: roadways are shared by transit buses, carpools, single-occupancy vehicles and cyclists; campus sidewalks are useful to pedestrians, transit riders going to the bus stop, and drivers going to their cars. Attempting to divide up the cost of these facilities would be a difficult and uncertain exercise.

Comparing annual costs

One point about life cycle cost analysis deserves some elaboration. The costs of a transportation system typically occur over an extended period of time. How can costs that accrue at different dates be compared? As economist Joseph Stiglitz describes it, "the basic procedure employed by economists (and business people) is based on the premise that *a dollar today is worth more than a dollar tomorrow.*" If a firm (or a university) receives $1 today, it can take it down to the bank, deposit it, and have (if the rate of interest is 5%) $1.05 after one year. Thus, $1 today is worth $1.05 next year. Accordingly, economists normally consider a cost of $1 that is incurred today to be equivalent to a cost of $1.05 incurred one year from now. As Stiglitz explains, "To evaluate projects with receipts and expenditures in future years, [economists multiply] those receipts and payments by a *discount factor*, by a number (less than one) that makes those future receipts and payments equivalent to current receipts and payments." Adding up the value of all of the receipts and payments, both current and future, economists arrive at a single number that is called the "present discounted value" of the project. An alternate presentation method, which many people find easier to understand, and which we have used in this study, is to translate all capital costs into annual costs, and then express the cost of each transportation facility in terms of its cost per year. If a parking structure is expected to last 50 years, the capital costs can be translated into an annual costs by spreading the cost of building and financing it over its expected 50-year lifespan, using a long-term interest rate equivalent to the discount factor. (For this study, a discount factor of 5% was used, based upon current long-term interest rates.) This annual cost can then be usefully compared to, for example, the annual cost of operating a transit system or vanpool program. For purposes of this comparison, the capital cost is spread over the entire lifetime of the facility or piece of equipment (such as a transit bus) regardless of whether the facility or equipment was paid for with cash, a short term loan, or a very long-term mortgage.

Calculating net costs

For several of UC Riverside's transportation programs and facilities, a user fee can cover all or part of the cost. The *net cost* to UC Riverside of a transportation program or facility is defined as the total costs for the program incurred by the campus less any user fees received. For example, if the campus were to fully subsidize the existing vanpool program, each commuter could pay a monthly fee that covers the cost for maintenance, insurance and fuel, but not the cost of administering and marketing the vanpool programs. If the total cost to UC Riverside for the program is $87,000 per year, and the commuters' monthly fees cover $60,000, this leaves a net cost to UC Riverside of $27,000 per year for the program.

It is important to note that this approach provides a snapshot of the net cost to UC Riverside *given current costs and current policies*. Changing costs or changing policies would alter these results. In the case of the vanpool program, for example, a rise in future administration costs would raise the net cost to UC Riverside, while a change in policy, such as requiring the participants to cover all costs, could reduce the net cost to UC Riverside to $0. Our primary purpose in providing this snapshot is to help inform decision-making, as potential transportation investments and/or policy changes are considered.

For some investments (specifically, parking structures that are under consideration), a projected cost was available. For these investments, the net cost is defined as the projected cost, less current parking fees, in order to arrive at a net cost to UC Riverside under current policies. Again, a policy change (such as an increase or decrease in parking fees) could change the projected net cost for these facilities.

Considering Marginal Costs

Where possible, this analysis examines the *marginal cost* per commuter (i.e., the cost to accommodate one more commuter) for each transportation mode, rather than the average cost per commuter (i.e., the total cost of a transportation program, divided by the total number of users). This approach was taken because on the financial side, perhaps the most significant potential change for UC Riverside is the switch from surface parking lots to parking structures in order to be able to provide additional parking (or replacement parking) to accommodate planned future growth.

The transition from surface lots to parking structures means that the marginal cost for parking (i.e., the cost to add one more parking space) is far higher than the average cost for parking. If a parking structure were built on Lot 24, total project cost is estimated at $25,400 per space built, and $41,260 for each new space gained (a measure that takes into account the lost opportunity to provide a surface parking lot on the same land). Using typical parking industry assumptions, this translates into a life cycle cost per space gained of $3,145 per space per year, every year for the expected loan cycle of the parking structure.

When discussing the marginal costs of accommodating one more driver it is also important to note that the value of converting surface parking lots to parking structures varies based on the lot's location on campus. While it is UCR's policy to locate parking near the periphery of the academic cores on both the East and West Campuses the construction of new buildings in the core may necessitate additional parking to serve those buildings. If parking in the future parking is needed in the core it should be constructed either as a multi-level parking garage or as part of a mixed-use facility in order to make the efficient use of the limited availability of land in the core.

In a system where parking revenues must cover the cost of parking system, the need to change just a few percent of the campus parking supply from surface lots to structures can mean much higher average prices for campus parking permits. Both the Baseline and Preferred Scenario contain such fee increases to meet costs.

This change also shifts the balance between the cost to accommodate one more commuter with a parking space, versus the cost to provide that commuter with incentives and services to carpool, walk, bicycle, or take transit. Investments in alternative transportation that were hard to justify financially when parking could be accommodated in inexpensive surface lots may now deserve a second look. Just as the requirement to accommodate even a few percent of commuter students' cars in parking structures can result in large price increases for all student drivers, an increase of just a few percent in the number of students using alternative transportation can eliminate the need for one or more parking structures. For parking, we were able to examine marginal costs for the parking structure on Lot 24.

For UC Riverside's transit, carpool, vanpool, bicycle and pedestrian programs, this analysis examines *average cost per commuter*. Examining the current average cost per commuter for each of these programs helps to reveal whether the current programs are providing good value for the money invested, and is useful for identifying where additional investment may be cost-effective.

In summary, this report examines the current cost per commuter served for each of UC Riverside's transportation programs and services, as a way of examining the potential for these programs to be expanded to cost-effectively serve additional commuters. Overall, the goal is to help UC Riverside consider the most cost-effective mix of investments in additional parking and improvements to other transportation modes.

Mode Split

The Transportation and Parking Service Department collects data on the commute modes taken by faculty and staff to UC Riverside. According the 2008 commute survey, the majority, or 65 percent, of campus faculty and staff drive alone to work. Almost 10 percent of faculty and staff carpool, and over 12 percent walk to work. Figure 6-1 on the following page shows the mode split for 2008.

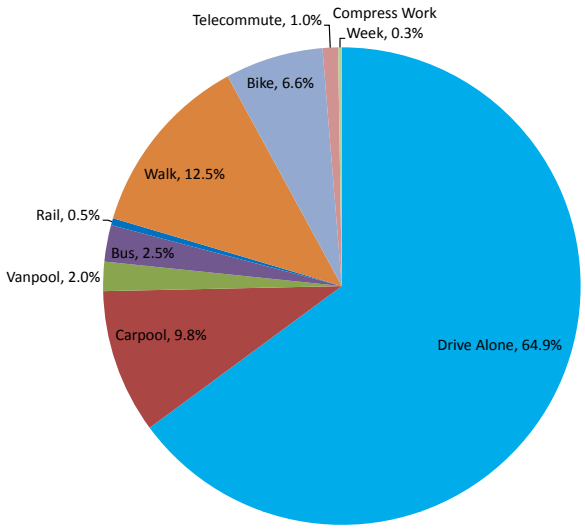
Alternative transportation modes are presented in the following section. For each mode, we have calculated the annual costs, revenues, fees per commuter and the number of users.

Walking and Bicycling

A clearly defined network of pedestrian ways, linking all campus functions together and to the broader community, is a critical component in the shift to a pedestrian-oriented campus core. Currently, 12.5% of staff and faculty walk to campus and 6.6% bike to campus.

The LRDP emphasizes developing and improving pedestrian and bicycle connections between the East and West Campuses as well as updating facilities to accommodate higher volumes of walkers

Figure 6-1 2008 Mode Split for Faculty and Staff



and bikers. Of particular importance is connecting the City of Riverside bikeway system and regional trail network thus ensuring direct routes to primary destinations both on and off-campus. Further development of the campus bicycle system is another important step in reducing vehicle trips to the campus.

In terms of bicycle facilities, costs are relatively small. Bicycle lockers cost approximately $820 per bicycle stored, and have an expected useful life span of 15 years, resulting in a life cycle cost estimate for this capital cost of $79 per year per locker.[1] Maintenance cost is estimated at $12 per locker per year, assuming a maintenance cost of 1.5% of original construction cost per year (a typical rule of thumb for facilities maintenance costs). The resulting total life cycle cost is approximately $91 per locker per year. If the campus were to charge an annual fee of $15 for each locker, those revenues would help offset costs. Figure 6-2 summarizes the results of the cost analysis assuming a scenario in which the campus installed eight bike lockers, finding a net cost per bicycle locker user per year of $76 (given a $15 fee). A similar analysis of bicycle racks, which have a capital cost of $75 per bicycle space, results in a life cycle cost of $8 per bicycle rack space per year.

Figure 6-2 Bicycling Costs

Investments in Bicycle Lockers	Total Costs
A. Annual life cycle cost per locker	$91
B. Number of lockers	8
C. UCR cost per year (C = A * B)	$730
D. UCR revenue per year (D = $15 * B)	$120
E. UCR net cost per year (E = C-D)	$610
F. Number of lockers occupied	8
G. UCR net cost per commuter (G = E/F)	$76

1 This life cycle cost assumes a 5% interest rate over 15 years.

UPASS Program

All UC Riverside undergraduates may ride any Riverside Transit Agency (RTA) bus for free through the campus's UPASS program. In the 2008-2009 academic year the campus spent $350,000 on the UPASS program and RTA Route 51, known as the Crest Cruiser, which was recently expanded to serve larger portions of the UC Riverside campus and surrounding areas.

Under the Preferred Scenario, we anticipate the expansion of the UPASS program to cover all faculty and staff. According to the expected boarding data for faculty and staff, one can expect faculty and staff transit ridership to peak at 319 transit riders by 2020. This number of riders will generate an annual cost of $100,056, assuming two boardings per day for the entire academic year at a cost of 90 cents per boarding. This equates to a cost of $314 per transit rider. The cost of the student UPASS program would increase slightly due to an increase in the student population. Currently, the University pays $0.90 per boarding up to a maximum of $120,800 per year. Based on current boarding data, the total cost per student per academic year is $3.78. Using 2020 student population projections, the total cost of the student UPASS program in 2020 would be $94,484. This is an increase of $23,493 from the current cost of $65,992.

Figure 6-3 Faculty/Staff UPASS Cost

Investments in transit	Total Costs
A. UCR cost per year	$100,056
B. UCR revenue per year	$0
C. UCR net cost per year (C = A-B)	$100,056
D. Number of transit riders	319
E. UCR net cost per commuter (E = C/D)	$314

COST AND REVENUE COMPARISON BY TRANSPORT MODE

This section provides a comparison of the current net cost to UC Riverside to accommodate a commuter via different transportation modes. It is imperative that a cost comparison by mode be made in order to determine the most effective mix of transportation investments. However, it should be noted that certain factors, such as peaks in localized demand, may necessitate more expensive parking construction. This section summarizes the results of the life cycle cost analyses for the transit, carpool, shuttle, and bicycle programs described in the previous section, and then compares these costs to the life cycle cost of several recent and proposed parking facilities.

- The parking facility examined is the parking structure proposed built on Lot 24. Examining the life cycle cost for this facility helps provide an understanding of the *marginal cost* for parking (i.e., the cost to add one more parking space to the campus parking supply).
- For UC Riverside's transit, carpool, bicycle, and pedestrian programs, this analysis examines *average cost per commuter*, because the available data did not permit an analysis of the marginal cost for these transportation modes. However, examining the current average cost per commuter for each of these programs helps to reveal whether the current programs are providing good value for the money invested, and is useful for identifying where additional investment may be cost- effective.

Figure 6-4 summarizes the results of the life cycle cost analysis for structured and surface spaces if a parking structured listed were built on Lot 24. Under annual cost, the "Debt Service" column shows the annual debt service payments that would be created if repayment of the capital cost was extended over the lifetime of the facility. The "Total Cost per Space Gained" column shows the annual, monthly, and daily cost of each net space once all costs (construction, operations, maintenance) have been included.

Figure 6-4 Projected Garage Costs

Assumptions

Variables	Input Value	Comments
Parking structure construction cost per space	$20,000	Source: TAPS
Surface lot construction cost per space	$5,000	Source: Victoria Transport Policy Institute
Expected loan cycle of structure:	30	years
Expected useful life of lot:	20	years
Projected soft costs	27%	Source: Carl Walker Inc. research, taking design, architects, internal administrative and management costs into account
Long-term interest rate:	5.00%	Source: TAPS
Maintenance cost and operation for surface lot:	$75	Source: Walker Parking Consultants
Maintenance cost and operation for parking structure:	$300	Source: Walker Parking Consultants
Insurance cost:	0.20%	of original construction cost per year. Source: standard S.U. charge levied by Risk Management Office. Earthquake insurance not included.
Enforcement/security costs for surface lot per space:	$54	Source:2005 Data from Cal Poly
Enforcement/security costs for structure per space:	$54	Source: 2005 Data from Cal Poly
Workdays per month:	21.72	workdays per month
Schooldays per year:	174	schooldays per year
Number of surface parking spaces per acre	145	Assumes 300 sq. ft. per space, includes circulation. Based on the dimensions of Lot 24
Number of structured parking spaces per acre	124	Assumes 350 sq. ft. per space, includes circulation. Based on the dimensions of proposed SOM garage.

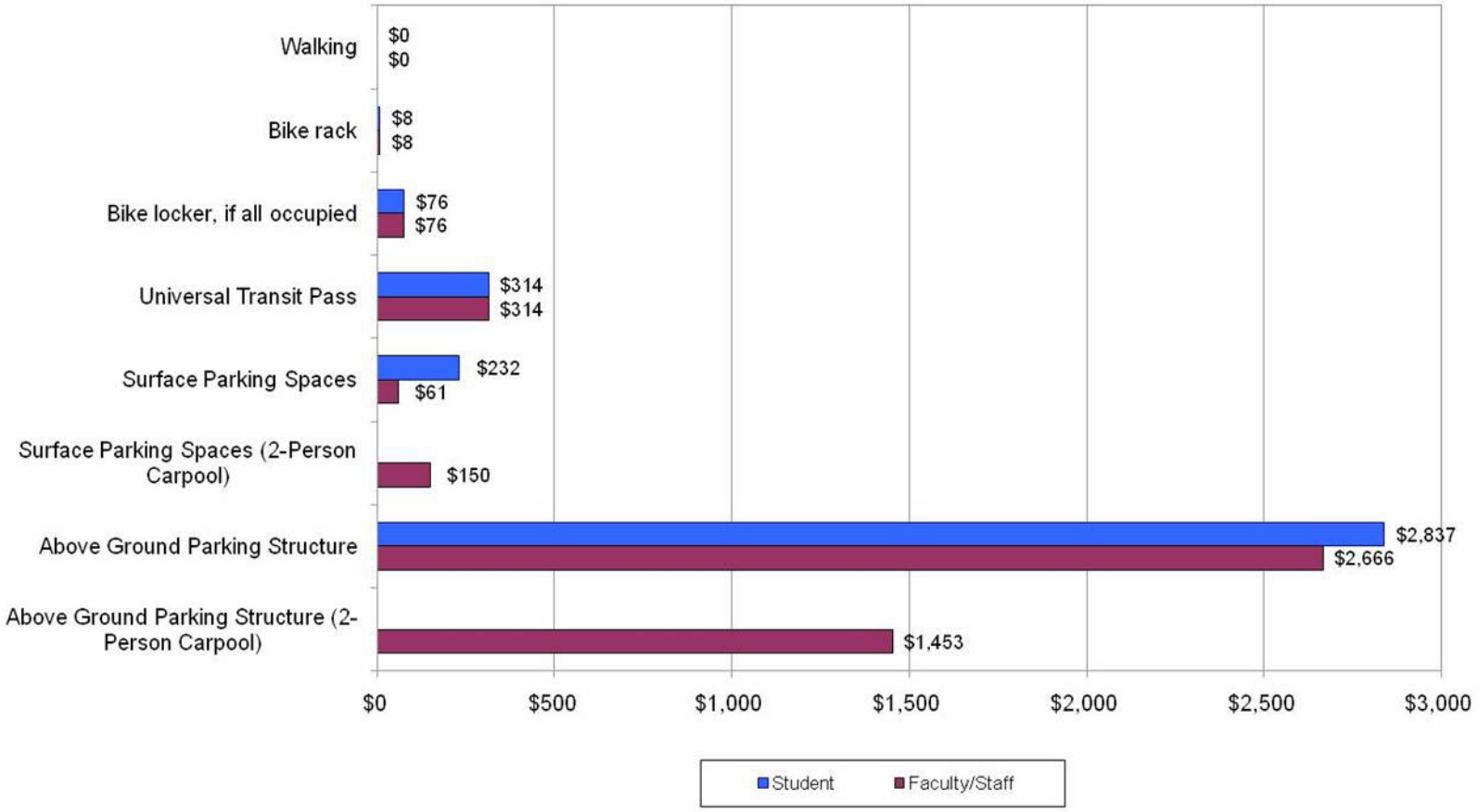
Capital Costs

Parking	Spaces Built	(Land Occupied Garage Footprint)	Spaces Displaced	Net Spaces Gained	Construction Cost in Current Dollars	Total Cost in Current Dollars	Cost Per Space Gained in Current Dollars: Construction	Cost Per Space Gained in Current Dollars: Total
Structured Spaces	1070	2.1	417	653	$21,400,000	$27,178,000	$20,000	$41,620
Surface Spaces	6241	43.0	0	6241	$31,205,000	$31,205,000	$5,000	$5,000
TOTAL	**7311**	**45**	**417**	**6894**	**$2,605,000**	**$58,383,000**	**$7,195**	**$10,360**

Resulting Costs Per Space Per Year

		ANNUAL COSTS PER SPACE GAINED				TOTAL COST PER SPACE GAINED			
Parking Structure	Project Cost Per Space Gained	Debt Service	Operation & Maintenance	Insurance	Security/ Enforcement	Per Year	Per Month	Per Workday	Total Cost Per Year
Structured Spaces	$41,620	$2,707	$300	$83	$54	$3,145	$262	$12.07	$3,364,824
Surface Spaces	$5,000	$401	$75	$10	$54	$540	$45	$2.07	$3,371,469
TOTAL	**$10,360**	**$739**	**$108**	**$21**	**$54**	**$921**	**$77**	**$3.54**	**$6,736,293**

Figure 6-5 Net Cost To UCR to Accommodate a Commuter Student Depending on Type of Alternative Transportation And Parking*



* This chart assumes a $15 annual bicycle locker fee. In addition, the graph assumes there is no reimbursement from an Alternative Transportation fee to offset the costs of the UPASS. Student and faculty/staff parking costs vary due to differences in current permit prices

Figure 6-5 summarizes the life cycle cost estimates for UC Riverside's alternative transportation programs (described in the Existing Conditions Report) and for the parking facility described above. The figures show the net cost to UC Riverside to accommodate each commuter, whether by alternative transportation or different types of parking. As described earlier, the net cost to UC Riverside of a transportation program or facility is defined as the total cost for the program incurred by the campus less any user fees received. The estimates assume current policies, including current prices for parking and current fees for alternative transportation services.

All of the life cycle cost estimates provided here are snapshots of the current net cost to UC Riverside *given current policies and prices*. Any change in policies (e.g., a price hike to cover new parking structure costs, or an increase in price for transit riders) will change these estimates. The primary purpose in providing this snapshot is to help inform decision-making, as potential transportation investments and/or policy changes are considered.

SUMMARY

As noted above, projected parking demand in 2020 can be met with construction of a parking structure on Lot 24 in both the Baseline and Preferred scenarios while moderately increasing permit prices.[2] The key difference between the two scenarios is in the allocation of funding. By expanding TDM options for all campus affiliates and implementing an Alternative Transportation fee to cover a portion of these costs in the Preferred Scenario, the campus can keep demand at reasonable levels and keep parking permit fees 18% below the Baseline Scenario. The analysis demonstrates that the right blend of alternative mode incentives can greatly decrease parking demand, but that new development can cause localized peaks in demand, necessitating parking structure construction.

Disabled Parking

As a final note to the parking assessment, it is important to note the adequacy of disabled parking. According to the 2005 UCR Disabled Parking Plan, there are four zones in which spaces are divided (Northwest, South, East, and Corporation Area). Since disabled parking spaces are so few in individual lots, it is important to examine the availability of disabled parking based on zone so it does not give the false impression that certain disabled lots are entirely full or empty simply for having two parking spaces. Data in Figure 6-6 reveal that at peak hour roughly one-third of disabled spaces are occupied with roughly equal occupancy rates for each zone of campus. As such, there does not appear to be any shortage or need to redistribute disabled parking supplies.

Figure 6-6 Disabled Parking Supply & Occupancy by Zone*

Zone	Disabled Parking Supply	October 15, 2008 Disabled Demand	Occupancy Rate
Northwest	83	31	37%
South	34	13	38%
East	69	23	33%
Corporation Area	6	1	17%
Total	192	68	35%

* The following lots are included in each zone: Northwest – Bannockburn, Falkirk, Highlander, Lots 19, 2, 24, 25, 26, 4, Sproul, Stonehaven, University Plaza; South – AGSM, EH&S, Entomology, Fawcett, Lots 3, 6, 7, 9, Rivera; East – Aberdeen & Inverness, Botanic Gardens, Boyce, Engineering, Geology, Glass Houses, Insectary, Life Sciences, Lots 10, 13, 14, 15, 21, 22, Pentland, Statistics; Corporation Area – Child Development, Corp Yard, TAPS.

2 Both scenarios envision Lot 24 to close in 2014 and a parking structure to be built in 2016, but these dates may change based on the construction schedule of the Bannockburn development. A change in dates may cause prices to increase or decrease based on the construction cost index and inflation.

ENVIRONMENTAL IMPACTS

CHAPTER 7

ENVIRONMENTAL IMPACTS

INTRODUCTION

The following section evaluates the potential vehicle trip and carbon emissions reduction resulting from the Baseline and Preferred scenarios described earlier in the report in comparison to the existing number of daily vehicle trips. This quantification is important in helping the campus meet the mitigation requirements detailed in the LRDP EIR and air quality standards set by the South Coast Air Quality Management District.

BACKGROUND

As part of the 2005 Long Range Development Plan process an Environmental Impact Report was conducted that evaluated the projected traffic impacts resulting from the campus's planned expansion. The traffic impact analysis compared existing conditions to two future scenarios; 2015 without the LRDP project and 2015 with the LRDP project. The results of the analysis showed that the proposed expansion would result in a net increase of 53,582 daily vehicle trips and several freeway and roadway segments level of service would degrade to an LOS E or LOS F[1]. The EIR study proposes a number of mitigation measures to address the transportation impacts including roadway improvements, bicycle and pedestrian facility improvements, shuttle network expansion, and restructuring parking pricing.

UC Riverside falls under the jurisdiction of the South Coast Air Quality Management District, the agency that is charged with monitoring and meeting state and federal air quality standards for the south coast region.

With regards to the environmental impacts of transportation, the EIR states the campus "shall continue to implement a Transportation Demand Management program that meets or exceeds all trip reduction and AVR requirements of the SCAQMD. The TDM program may be subject to modification as new technologies are developed or alternate program elements are found to be more effective."[2]

URBEMIS ANALYSIS

To determine the impact of the Baseline and Preferred scenarios on vehicle trip generation and carbon emissions, the URBEMIS software model was utilized. URBEMIS is a program developed for the California Air Resources Board to calculate emissions resulting from new developments. This program is an industry standard air emissions calculator for CEQA documents and is also used in calculating trip generation rates.

1 Page 5-4 March 18, 2004 – this includes a 10% reduction applied to both resident trips and commuter trips to account for the impacts of TDM programs

2 UCR LRDP EIR Volume 3, November 2005, Page D-34

The URBEMIS model is designed to quantify the impact of a development's location, residential and employment density, physical characteristics, mix of uses, the presence of local serving retail, amount and cost of parking, transit, pedestrian and bicycle facilities, and some transportation demand management programs.

For this analysis, the scenarios assume that the campus has reached full build-out and the projected population growth for the year 2020. The Baseline Scenario assumes only the existing TDM plan is in place while the Preferred Scenario assumes the TDM measures detailed under that plan earlier in this report are in effect.

Area Inputs

In addition to requiring the transportation modeler to input the basic land use components of the proposed project (i.e. the number of square feet of each land use), URBEMIS also factors in other area-specific characteristics to determine accurate trip rates. The number of trips generated by a development depends not only on the characteristics of the project itself, but also on the nature of the surrounding area. For example, neighborhood characteristics such as a good balance of housing and jobs, the presence of frequent transit service, and a highly-connected, walkable street network are strongly associated with lower vehicle trip rates. High-density housing added to an existing central city neighborhood, where many shops, services and transit lines already exist, will normally generate fewer trips than the same housing located close to a freeway interchange and surrounded by only low-density housing subdivisions. For this reason, URBEMIS requires data about the area within approximately a half-mile radius from the center of the project, or for the entire project area, whichever is larger. Essentially, the smaller the development, the more important the role the development's context plays. Figure 7-1 shows the inputs that have been used to complete the URBEMIS analysis for the baseline scenario, along with data sources.

Taking all of the above mentioned factors into consideration, the URBEMIS model results in a trip reduction of up to 10.3% (see Figure 7-2) with the implementation of the Preferred Scenario when compared to the Baseline Scenario. The

Figure 7-1 URBEMIS Data Inputs – Baseline Scenario

Factor	Input Value	Source
Housing units on campus[1]	6,607	LRDP
Project Acreage	1,127 acres	LRDP
Net residential density[2]	Not applicable	LRDP
Below-market-rate units within development	Not applicable	LRDP
Number of housing units within ½ mile radius	6,607	LRDP
Number of jobs located within ½ mile radius	5,390	Census Transportation Planning Package (2000)
Local serving retail within ½ mile radius	Yes	Site observation
Transit service	266 daily buses stop within ¼ mile (existing) 123 daily shuttle stops within ¼ mile (existing)	UC Riverside Alternative Transportation website RTA schedule
Intersection density within ½ mile radius[3]	152 valences	Street plan
Sidewalk completeness within ½ mile radius	90% have sidewalk on both sides	Site observation
Bike lane completeness within ½ mile radius	80% direct parallel routes exist	Site observation

[1]Assumes an average of two beds per unit

[2]Net residential data excludes land not devoted to residential uses, prorating mixed-use sites by the percentage square footage of each use.

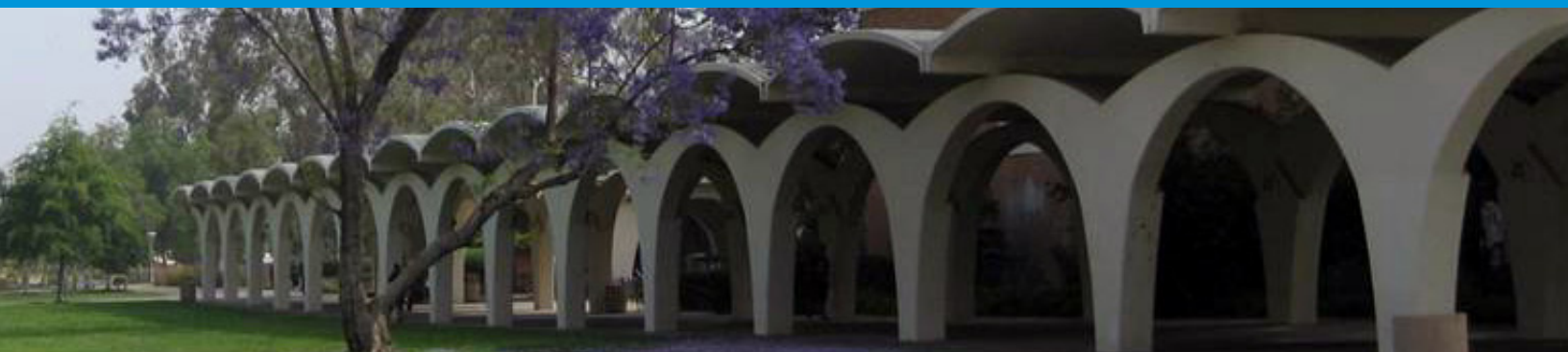
[3]Calculated from existing street network, based on the number line segment terminations, or each "valence". Intersections have a valence of 3 or higher - a valence of 3 is a "T" intersection, 4 is a four-way intersection, and so on.

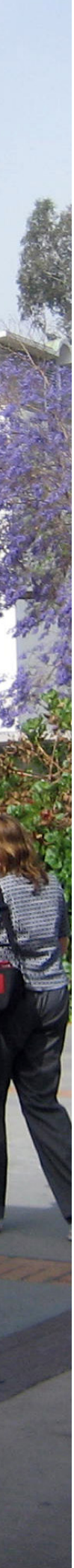
implementation of a fully subsidized UPASS for faculty and staff as well as increased parking rates and a carsharing program have a significant impact in the number of vehicle trips. In addition, the Preferred Scenario has a profound impact on emissions. Figure 7-2 shows the reductions for a variety of greenhouse gases with a median reduction of 10.5%.

Figure 7-2 URBEMIS Mitigated Trip Generation with TDM

		Emissions in Annual Tons						
Scenario	Vehicle Trips	ROG	NOX	CO	SO2	PM10	PM25	CO2
Baseline	57,651	105	111	871	1	135	26	74,961
Preferred	51,737	98	99	780	1	121	24	67,117
Percent Reduction	10.3%	6.7%	10.5%	10.5%	10.8%	10.5%	10.4%	10.5%

CONCLUSIONS





CHAPTER 8

CONCLUSIONS

In this study, Nelson\Nygaard worked in close cooperation with UCR staff to look comprehensively at the campus's transportation program. Throughout our analysis, this study has been guided by the goals established by the campus in its 2005 LRDP. That is, the clear purpose of this work has been to define a campus transportation strategy that meets the following goals:

- Provides good access to campus whether through driving, carpooling, bicycling, walking or using public transportation
- Maintains a sufficient supply of parking on campus and provides effective transportation services
- Maintains the financial integrity of the parking and transportation system for the campus
- Manages parking and transportation costs for campus commuter students, faculty and staff
- Supports the campus's mission as an environmental steward and "green" university

Through close collaboration with campus staff, the use of up-to-date parking counts and survey data provided by the campus, and a thorough parking and environmental analysis, we have been able to evaluate the costs and benefits of numerous potential parking, transit, and alternative transportation programs for the campus. The alternative transportation program expansion strategies presented in this study provide cost-effective options to the campus as an operational blueprint.

By implementing the Preferred Scenario, UCR will be able to further develop the campus as a friendly, walkable environment, preserve land for academic uses, conserve funds and promote equal access to all modes of transportation.

PROPOSED ALTERNATIVES

With the invaluable assistance of UCR Transportation and Parking Services staff, the study was able to develop accurate parking demand figures from comprehensive parking counts performed by the campus as well as detailed descriptions of existing programs. The study was also informed by transportation surveys of campus employees. These data were essential in providing a contemporary picture of the campus's mobility strengths and weaknesses.

The scenarios presented in the report are the culmination of wide-ranging consideration of potential solutions that were informed by the experience of successful transportation demand management programs at other universities, and the essential facts about UC Riverside gleaned from the data and background information supplied by the campus. The solutions in these scenarios have been adapted through close collaboration with campus staff after careful examination of scenario alternatives (see Appendix A for other considered scenarios).

As noted above, both the Baseline and Preferred scenarios show that the projected parking demand

for the campus in 2020 is far below estimates listed in the LRDP due to the increasing effectiveness of the campus's alternative transportation program and the projected impact of permit fee increases. In addition, the Baseline and Preferred scenarios produce very similar outcomes in terms of parking demand estimates in 2020. However, the two scenarios vary in the number of programs designed to encourage alternative mode use and their funding plans. If an alternative transportation fee is available (as is under the Preferred Scenario), the campus can lower the burden placed on its parking supply, which in turn makes certain price increases to handle excess demand unnecessary. As a result, 2020 real permit prices under the Preferred Scenario are 18% lower than those of the Baseline Scenario.

It is important to note that these price levels could change dramatically if new housing or academic developments cause peaks of localized demand and trigger the need for a new parking structure. The future replacement of surface lots on the East Campus may result in fewer parking spaces and high levels of parking demand in particular corners of campus. Detailed plans developed by the University show that future parking structures will be located at the periphery of the academic core and strategically placed at entrances to the campus. The proposed location of future parking structures is based on the assumption that over time, the surface lots will cease to exist as higher and better academic uses are identified. The identified structure sites represent land banking for parking into the future.

COST-EFFECTIVENESS

This analysis has shown that investing in expanded TDM strategies using funds derived from parking user or alternative transportation fees can be a cost-effective means of reducing the overall number of people who drive to campus. For students, faculty, and staff, the plan provides new transportation choices, offering new alternatives to the high cost of commuting by car. For the members of the campus community who already carpool, walk, bicycle or take transit to the campus, expanding TDM programs will provide new services, and for some, important financial relief. For those who will continue to need to drive alone to campus, investing in better transportation demand management programs actually results in lower costs.

The modeling conducted for this study indicates that although there are higher costs under the Preferred Scenario, it is important to note that these costs represent a significant upgrade to the campus's shuttle system and are defrayed by the Alternative Transportation fee. The Baseline Scenario anticipates current levels of shuttle service, which would essentially provide little to no service to the West Campus.

Beyond the financial benefits quantified in this study, the non-quantified benefits, such as reductions in auto congestion, pollution, and energy use, reductions in auto-related infrastructure needs, preservation of the campus's land resources and maintaining the walkability of the campus provide additional support for expanding transportation demand management programs under the Preferred Scenario.

GENERAL CONCLUSIONS

The transportation challenges imposed by growing enrollment are an important concern across the entire UC system and at many other universities in the United States. This growth raises a number of challenges, including the need to plan additional buildings and facilities while addressing an increase in demand for parking and transportation services for the campus, in an environment of constrained parking supply and diminishing surface parking facilities.

At the same time, growth in campus enrollment presents a number of opportunities, including the potential to build a more livable and sustainable campus. Campus growth also provides an opportunity to implement comprehensive TDM strategies, significantly reduce campus parking demand and strengthen the overall alternative transportation programs of the campus.

The success of parking and transportation programs is affected by a number of key factors, including the current transportation profile, the culture and objectives of the campus and local community, the interests of different stakeholders within the campus community, the availability of relevant data and the availability of land. Given that commuter

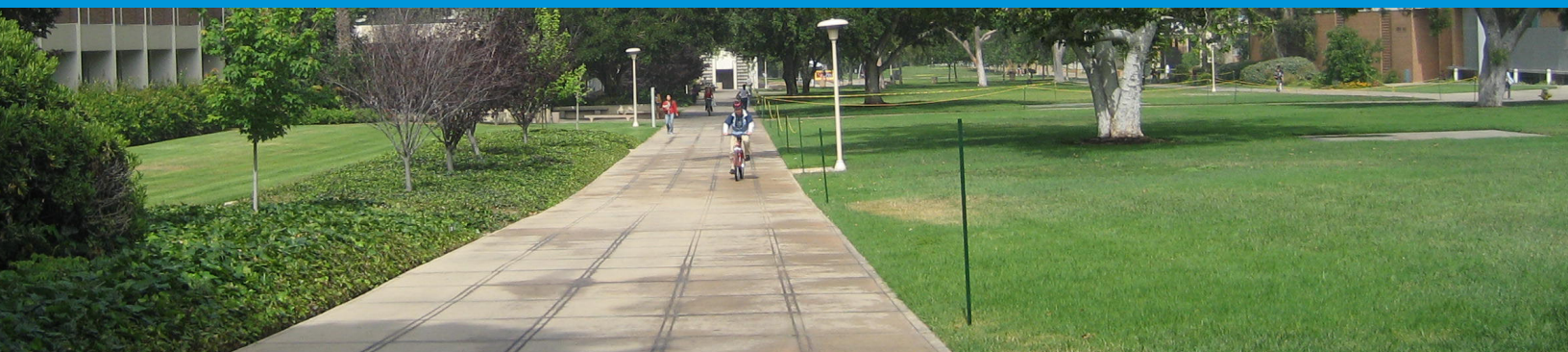
students, staff and faculty must travel from outside the boundaries of campus it is critical that the University work with the City of Riverside, Riverside Transit Agency, and other regional transportation providers to develop an alternative transportation system that is integrated with and complementary to other available transit services. By creating a more seamless interaction between these services, using alternative modes becomes a more pleasant and feasible option for students, staff and faculty.

The overall results of the analysis provide strong evidence that there are attractive opportunities for UCR to invest more in alternative transportation programs as a cost-effective means of reducing parking demand, traffic congestion and pollution. The beneficiaries of such strategies will include:

a. Parking users, who will benefit from both UCR's ability to minimize increases in parking user fees, and a less congested commute to campus.
b. Alternative transportation users, who will benefit from expanded and enhanced options to travel to campus without needing to rely on their own car.
c. The overall campus community, which will benefit from the improved campus design that can be achieved if less parking need be accommodated on campus.
d. The greater surrounding community, which will benefit from the reduced auto traffic and reduced environmental impacts.
e. The transit provider, which will benefit from increased ridership and dedicated revenue from the U-Pass program.

From an economic standpoint, alternative transportation programs become increasingly more attractive for campuses with growing enrollment, because they translate into lower parking demand, parking prices, and associated traffic costs. Alternative transportation programs become still more attractive when environmental and social objectives, and wider economic costs (such as costs associated with traffic congestion in the surrounding street network) are taken into account. Whatever accounting framework is used, the Preferred Scenario should be taken as the optimal package for the horizon year of 2020 that will allow the campus to both meet its transportation needs and provide flexibility as the West Campus expansion takes place.

APPENDICES



APPENDIX A

FALL 2009 PARKING DATA ANALYSIS

INTRODUCTION

This appendix analyzes the Fall 2009 parking occupancy data provided by campus staff following completion of the report's administrative draft. The occupancy counts were conducted on October 14, 2009.

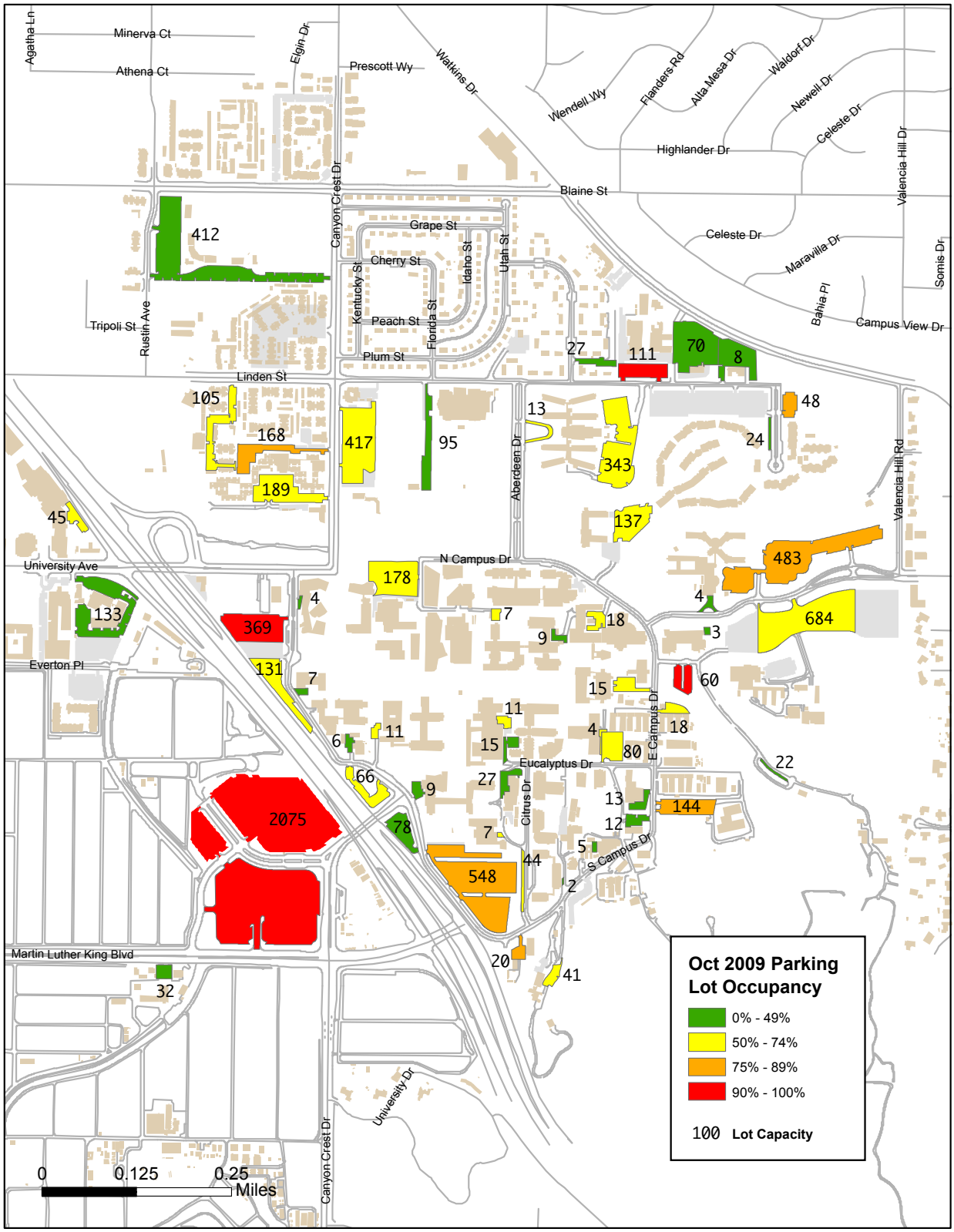
PARKING ANALYSIS

The occupancy counts reveal that parking demand peaks at 4,881 spaces, or 71.6% of the total 6,817 spaces available. Figure 9 1 shows the parking supply and demand figures by lot. Figure 9 2 graphically illustrates these data. For the purposes of this analysis, residential students have not been included in the calculations of supply and demand, since their parking ratios are set by the UCR Long Range Development Plan. Certain lots that are mixed residential student/other user parking areas are shown in the maps, but only the non-resident spaces are shown. Lots that are entirely reserved for resident students have been excluded.

Figure A-1 Current Parking Supply & Demand by Lot and Service/Loading Dock

Lot	Supply	October 14, 2009 Demand	October 14, 2009 Occupancy
Aberdeen & Inverness	13	9	69%
AGSM East	6	2	33%
AGSM West	2	0	0%
Alumni & Visitors Center	15	7	47%
Arts Service	4	1	25%
Bannockburn North	64	36	56%
Bannockburn South	97	13	13%
Bannockburn South - Dock	2	2	100%
Barn Service	6	2	33%
Batchelor Service	4	2	50%
Biological Medicine	13	6	46%
Bookstore Service	4	4	100%
Botanic Gardens	22	2	9%
Boyce Hall Service	5	3	60%
Canyon Crest Housing	27	7	26%
Career/Counseling Centers - Dock	3	0	0%
Chemical Science - Dock	3	1	33%
Child Development Center – North	50	18	36%
Child Development Center – South	39	22	56%
Corp Yard	70	34	49%
EH&S	20	16	80%
Engineering Building Unit 2 Service	8	2	25%
Entomology Service	4	1	25%
Fawcett	13	5	38%
Fleet	100	77	77%
Geology Service	9	4	44%
Glass Houses	18	11	61%
Grounds	12	2	17%
Highlander Hall	133	53	40%
Highlander Union Building	2	1	50%
Hinderaker Service	7	2	29%
Humanities & Social Sciences Service	2	1	50%
Insectary	5	1	20%
Life Sciences	15	3	20%
Lot 1	369	337	91%
Lot 10	60	58	97%
Lot 11	80	53	66%
Lot 11A	31	22	71%
Lot 13	684	482	70%
Lot 14	26	7	27%
Lot 15	137	91	66%
Lot 19	178	105	59%
Lot 2	131	86	66%
Lot 20	48	38	79%
Lot 22	15	2	13%
Lot 23	111	108	97%
Lot 24	417	250	60%
Lot 25	95	46	48%
Lot 26	412	108	26%
Lot 3	41	26	63%
Lot 30	2,075	1,964	95%
Lot 31	32	13	41%
Lot 4	66	45	68%
Lot 5	78	31	40%
Lot 6	548	421	77%
Lot 7	44	23	52%
Lot 9	144	128	89%
Lothian Residential Service	4	0	0%
Mail Services	4	1	25%
Medical Entomology	2	0	0%
Pentland Way	24	5	21%
Physics Service	18	12	67%
Pierce Hall Service	7	4	57%
Psychology Bldg Service/Dock	7	4	57%
Rivera Library Service	11	6	55%
Science Library Service	3	3	100%
Sproul Hall Service	11	6	55%
Statistics and Computing	15	8	53%
Steam Plant	27	7	26%
TAPS	8	0	0%
Theater Service	9	1	11%
University Plaza	3	0	0%
University Village	45	30	67%
Total	6,817	4,881	72%

Figure A-2 Parking Lot Occupancy – October 14, 2009



Nelson|Nygaard consulting associates

GIS Data Source: UC Riverside

Although the total number of vehicles parked on-campus during peak periods is an important function to quantify, it is also necessary to identify which user groups are occupying those spaces. We have used two simple group identifications – commuter students and faculty/staff. We have categorized the two groups by parking space type (e.g. commuter students using gold permits, faculty/staff using red and blue permits, etc). This methodology includes visitor vehicles in the commuter student group since there is no mechanism in place to decipher campus affiliate from visitor vehicles. As such, there may be some limited inaccuracies in using this method as multiple user groups may use a single space type (e.g. disabled spaces), but those should be minor considering the number of parked vehicles in these areas. Figure A-3 shows parking demand by user group.

Based on the peak parking demand of each group and their respective population figures (i.e. potential number of parkers), we can derive basic demand ratios. In Fall 2009, there were 15,554 commuter students and visitors, and 4,130 faculty/staff. Using the demand figures from Figure A-3, we can establish that the peak parking demand rates for these two groups are .15 and .61 vehicles per person, respectively (.25 for the two groups combined).[1] During the same academic year, the numbers of parking permits sold to each group were 5,745, and 3,029, respectively. Parking occupancy counts show that the peak demands for commuter students (gold permits) and faculty/staff (blue, red, and X permits) were 2,065 and 2,192 (with peak permit parking rates are .36 and .72), respectively. The peak permit parking rate for both groups combined is .49. See Figure A-4 for data.

If we use these ratios to project future parking demand, it is important to account for campus affiliates who park in areas immediately off-campus to avoid paying parking fees. The Director of Transportation and Parking Services, Mike Delo, has estimated that roughly 485 commuter vehicles are "spilling over" onto these off-campus residential streets and retail centers. In the future, these motorists may park on campus if proper enforcement comes into effect. If the full number of commuters were to park on-campus and purchase permits accordingly, a higher peak parking ratio would result. Figure A-5 shows that peak parking demand (column b) would increase to 5,366 vehicles taking this spillover into account.

1 Although ITE parking demand rates are drawn from generalized national studies, it is useful to note here that UCR's overall peak parking ratio of .25 closely corresponds with that of suburban university sites surveyed by ITE, which show a rate of .30.

Figure A-3 Current Parking Supply & Demand by User Group*

User	Supply	October 14, 2009 Demand	October 14, 2009 Occupancy
Commuter Students & Visitors	3,118	2,372	76%
Faculty & Staff	3,699	2,509	68%
Total	6,817	4,881	72%

* Note: User groups are arranged by the following parking data space types: Commuter Student – Disabled, Dispenser, Gold, Medical, Meter, Motorcycle, Time-Controlled, Two-Hour; Faculty/Staff – Blue, Carpool, Delivery, Department, Red, Service, X

Figure A-4 Parking Ratios by User Group

User (Pass)	Population (a)	Peak Parking Demand (b)	Peak Parking Ratio (c) = (b/a)	Permits Sold (d)	Permitted Parking Demand (e)	Permit Parking Ratio (f) = (e/d)
Commuter Student s (Gold) & Visitors	15,554	2,372	.15	5,745	2,065	.36
Faculty & Staff (Blue, Red, X)	4,130	2,509	.61	3,029	2,192	.72
Total	19,684	4,881	.25	8,774	4,257	.49

Figure A-5 Parking Ratios Accounting for Spillover Effect

User (Pass)	Population (a)	Peak Parking Demand + Spillover (b)	Peak Parking Ratio (c) = (b/a)	Permits Sold (d)	Permitted Parking Demand (e)	Permit Parking Ratio (f) = (e/d)
Commuter Students (Gold) & Visitors	15,554	2,857	.18	6,383	2,294	.36
Faculty & Staff (Blue, Red, X)	4,130	2,509	.61	3,029	2,192	.72
Total	19,684	5,366	.27	9,412	4,486	.48

Using these parking ratios in combination with population growth estimates, we can calculate future parking demand. By 2020, the overall peak parking demand ratio is anticipated to rise from .25 to .33. Total peak-period demand is expected to rise from 4,881 to 7,587 spaces. It should be noted that these figures are strictly based on current parking demand rates, and do not take into account changes in parking behavior due to higher permit price increases or highly incentivized transportation demand management measures.

Given the current and future peak parking demand figures, we can develop an estimate for the appropriate supply of parking. This study uses an "effective parking supply factor" of 95%. Effective supply is defined as the total number of parking spaces, less the percentage of spaces that the parking operator wishes to have vacant even at the typical peak hour. Choosing an effective parking supply factor of 95% means that the operator wishes to have 5% of the parking supply vacant at the peak hour. This provides a cushion of spaces to reduce the search time for the last few available parking stalls and to allow for the dynamics of vehicles moving in to and out of parking stalls during peak periods. This cushion also allows for unanticipated variations in parking activity as well as the temporary loss of spaces due to improperly parked vehicles, construction, and other factors. The effective supply cushion also compensates for the loss of utilization and efficiency due to the segregation of spaces for various user groups (e.g. special events). For example, there are currently 6,817 spaces supplied for all commuter students, faculty, staff, and visitors with 4,881 spaces being occupied at peak hour. An appropriate amount of parking for this demand would be 5,138 spaces (4,881 ÷ 95%). Since there are 6,817 spaces currently built, there is presently a parking oversupply of 1,679 spaces. By applying this 5% "cushion" in 2020, we can estimate the amount of necessary total parking to be 7,986 spaces (see Figure A-7).

Figure A-6 Projected Parking Demand in 2020

User	2008 Population (a)	Peak Parking Demand (b)	Peak Parking Ratio (c) = (b/a)	2020 Population (d)	Peak Parking Ratio + Spillover (e)	Peak Parking Demand (f) = (d*e)
Commuter Students & Visitors	15,554	2,372	.15	15,124	.18	2,778
Faculty & Staff	4,130	2,509	.61	7,916	.61	4,809
Total	**19,684**	**4,881**	**.25**	**23,040**	**.33**	**7,587**

Figure A-7 Projected Parking Supply in 2020

User	2008 Population (a)	2008 Peak Parking Demand (b)	2008 Appropriate Parking Supply (c) = (b/.95)	2020 Population (d)	2020 Peak Parking Demand + Spillover (e)	2020 Appropriate Parking Supply (f) = (e/.95)
Commuter Students & Visitors	15,554	2,372	2,497	15,214	2,778	2,924
Faculty & Staff	4,130	2,509	2,641	7,916	4,809	5,062
Total	**19,684**	**4,881**	**5,138**	**23,040**	**7,587**	**7,986**

APPENDIX B

TRANSPORTATION DEMAND MANAGEMENT SCENARIOS

INTRODUCTION

This appendix reviews the transportation demand management measures that were considered as part of the overall study. Elements of each scenario were ultimately incorporated into the Preferred Scenario after close deliberations with campus staff. The only strategy descriptions listed below are those that vary from the Preferred Scenario.

TDM EXPANSION PACKAGES

The Moderate Scenario adds additional and more extensive transportation demand management strategies to what is currently offered by UC Riverside. The High Scenario adds additional measures to the Moderate Scenario. Each of these scenarios can be analyzed and compared to the existing alternative transportation program.

MODERATE SCENARIO

The moderate category includes all existing strategies, and builds on those with expanded incentives, services and infrastructure support to provide a wider variety of mode choices.

Additional core strategies include:

- Expand the UPASS program to cover faculty, staff, and graduate students at a 100% subsidy.
- Continue to adjust parking rates to cover the full cost of providing parking spaces[1]

Additional support strategies include:

- Establish a carsharing service on-campus which will be available to students, faculty, and staff.[2]
- Introduce a moderate upgrade in shuttle service to serve the West Campus.
- Implement a moderate student alternative transportation fee that will be used to support alternative modes of transportation.
- Improve bicycle facilities and programs by introducing a bike sharing program, installing more bicycle racks in high-demand locations, and improving the bicycle connection between the East and West campuses along University Avenue.
- Introduce on-campus services such as a dry cleaner, convenience store, grocery store, post

1 UC Riverside currently charges parking rates to cover the full cost of providing parking spaces. This core strategy is included in the Moderate package to note that rates will need to be adjusted in the future to cover the higher costs of providing more parking.

2 UC Riverside will introduce a minimum of five Zipcar vehicles for campus affiliate use beginning in Fall 2009. Affiliate enrollment fees in the carsharing program will be allowed to be applied to future vehicle rentals.

office, and other amenities that will serve the needs on-campus residents.

HIGH SCENARIO

Additional strategies suggested in the High Scenario build on existing strategies and those listed in the Moderate Scenario.

Core strategies include:

- Expand the UPASS program to cover faculty, staff, and graduate students at a 100% subsidy.
- Continue to adjust parking rates to cover the full cost of providing parking spaces
- Adjust permit prices to encourage those within a certain distance of campus to use alternative transportation.
- Prohibit on-campus parking for freshmen resident students.

Additional support strategies include:

- Introduce a significant upgrade in shuttle service to serve the West Campus.
- Encourage a student vote on an alternative transportation fee that will be used to support a more robust alternative transportation program.

STRATEGY DESCRIPTIONS

The following section details the components of some of the strategies included in the Moderate and High scenarios. Several of the strategies listed above were incorporated into the Preferred Scenario and are described in Chapter 4.

Parking Permit Restrictions

Freshmen resident students could be prohibited from parking on campus. This measure could have a profound effect by reducing the on-campus parking demand by roughly 500 vehicles. In order for this to be feasible, a robust carsharing program must be established to enable students to reach services, jobs, and other activities beyond the immediate area. Additionally, on-campus services would need to be greatly increased to allow students to access services such as a convenience store, post office, or grocery store, without always having to rely on a private vehicle. Teaching students good transportation habits in their first year could have ongoing benefits throughout their time at the campus if a significant number realize that car free living is no hardship, and would thus over time lead to greater reductions in parking demand.

Shuttle Service

UC Riverside operates a shuttle service called the Highlander Shuttle. The shuttle operates on three routes: Braveheart Loop, Bear Runner, and Trolley Express.

The Braveheart Loop runs daily between 6:30 AM and 10:00 PM on a continuous 30-minute loop between the City/UCR Sports Center, Student Recreation Center, Bannockburn Village, and Lot 30. The Bear Runner operates Monday through Thursday from 6:20 PM to 12:45 AM on a 30-minute continuous loop covering both northern and southern portions of the East Campus. The Trolley Express runs daily between 6:30 AM and 10:00 PM on a continuous 15-minute service between Grand Marc Apartments and A&I Dorms. These shuttle services only operate during the academic year. In the 2008-09 academic year, there were a total of 132,943 boardings on the Braveheart Loop shuttle and a total of 251,731 boardings on the Trolley Express.

Under the Moderate plan, the Bear Runner service would be rerouted at the corner of Chicago Avenue and Martin Luther King Boulevard so that it would run through the West Campus to serve the School of Medicine and new campus housing. This rerouting would not extend the length of the shuttle route, but it would marginally increase costs as two new stops would be introduced along Iowa Avenue to accommodate the West Campus.

Under the High plan, the Trolley Express line would be extended from the Grand Marc to run south along Iowa Avenue through the West Campus to serve the new academic uses, campus housing, and parking structures. This extension would add 1.05 miles to the Trolley Express route and would add two new stops.

Alternative Transportation Fee

The development of high quality and affordable alternative transportation options is key to encouraging campus affiliates to reduce the number of trips they make by private vehicle, which in turn reduces the total number of vehicle trips, vehicles miles travelled, and green house gas emissions. As the campus works towards continually improving its alternative transportation program and environmental sustainably, more fiscal investment in these programs will be necessary.

The implementation of an "alternative transportation fee" is one tool that the campus can utilize to help it achieve its sustainability and transportation goals. This fee would require a vote of the student body in order to be implemented.

The difference between the Moderate and High scenarios would be the amount of the fee, with the higher fee going to fund more robust alternative transportation options for the campus. For example, a moderate fee may fund an extension of current shuttle routes whereas a high fee may fund the creation of new routes.

APPENDIX C

UC PEER HOUSING REVIEW

PARKING RATIOS

As part of the peer review, parking ratios for five other on-campus residential uses were evaluated (see C-1). UC Los Angeles has the lowest parking ratio for residential halls at 4 parking spaces per 100 beds or 0.04 spaces per bed. UC Davis has the highest parking ratio, 0.75 spaces per bed for residential halls and apartments.[1] Generally speaking, those campuses with lower parking ratios have set higher parking fees (see Figure C-2).

Parking Fees

The structure of parking fees varies from campus to campus (see Figure C-2). Some campuses offer monthly, quarterly, and annual parking permits while others such as UC Merced only offer yearly passes. The categories of permits vary as well. All the peer universities examined have student and faculty/staff specific categories, however some differentiate between student commuter and student resident or student and graduate student, such as UC San Diego.

All the campuses reviewed, except UC San Diego, offer carpool specific parking permits, typically at a cost lower than student or faculty and staff parking permits. Motorcycle parking permits were available at all the campuses except UC Davis and UC Los Angeles.

Of those campuses offering monthly parking pricing, UC Riverside has the lowest parking rates for student commuter parking permits at $32 per month. UC Los Angeles has the highest monthly parking rate for commuter and resident student parking permits at $63 per month and $79 dollars per month respectively. UC Los Angeles also has the highest quarterly parking rates for commuter and resident students and while they do not offer an annual permit to students if the cost for 3 quarters was summed it would total $567 which is the second highest annual rate behind UC San Diego.

UC San Diego has the highest annual rate for students and faculty and staff, $732 and $1,116, respectively. UC Riverside has the lowest annual rate for commuter students ($252) while UC Merced has the lowest annual rate for faculty and staff ($360), both of which are almost three times lower than UC San Diego's rates.

1 It should be noted that UC Davis does not have an established parking ratio policy. The ratio is set on a development basis with .75 spaces per bedroom being the latest built residential development.

Figure C-1 Parking Ratios

University	Use	Parking Ratio	Unit
UC Riverside	• Residential Halls	0.25 spaces	per bed
	• Apartments	0.5 spaces	per bed
	• Family Housing	1.5 spaces	per unit
UC Davis	• Residential Halls • Apartments	0.75 spaces	per bedroom
UC San Francisco	• Mission Bay Campus	None – residential parking is mixed with general parking	
	• Parnassus Campus (Altea Housing Complex)	1.25 spaces	per unit
UC Merced	• Residential Halls • Apartments • Family Housing	0.7 spaces	per unit
UC San Diego	• Residential Halls	0.5 spaces	per bed
	• Apartments	0.25 spaces	
	• Family Housing	0.33 spaces	
UC Los Angeles	• Undergraduate Housing	0.04 spaces	per bed
	• Single Graduate Housing	0.65 spaces	

Figure C-2 On-Campus Parking Fee

University	Parking Rates Monthly	Quarter	Academic Annual	Annual
UC Riverside				
Student Commuter	$32	$84	$252	$336
Student Motorcycle	NA	$42	$126	$168
Faculty/Staff	$40 - $50	$105 - $147	$315 - $441	$420 - $588
Faculty/Staff Carpool	Per person	NA	$157.50 - $220.50	$210 - $294
Faculty/Staff Motorcycle	NA	$42	$126	$168
UC Davis				
Student	$44 – 5 months or less $39 - 6 months or longer	$127	NA	$468
Student Resident	$44 – 5 months or less $39 - 6 months or longer	$127	NA	$468
Student Carpool	$12 – 5 months or less $10 - 6 months or longer	NA	NA	$168 (2 person) $144/$120 (3 person)
Faculty	$53 – 5 months or less $48 - 6 months or longer	$154	NA	$576/$468
Faculty Carpool	$53 – 5 months or less $48 - 6 months or longer	NA	NA	$216/$168 (2 person) $144/$120 (3 person)
UC Irvine				
Student & Faculty Commuter	$53			
Student & Faculty Motorcycle	$31			
Student & Faculty Reserved	$71			
Student Resident	$80			
Carpool	$18 (2-3 person) Free (4+ persons)			
UC Los Angeles				
Student Commuter	$63	$189	NA	NA
Student Resident	$79	$237	NA	NA
Carpool	$52 (2 person) $33 (3 person)	$156 (2 person) $99 (3 person)	NA	NA
Faculty/Staff	$36		NA	$432
UC Merced				
Student Commuter	NA	NA	$270	NA
Student Resident	NA	NA	$270	NA
Student Carpool	NA	NA	$216	NA
Student Motorcycle	NA	NA	$216	NA
Faculty/Staff	NA	NA	NA	$360
Faculty/Staff Carpool	NA	NA	NA	$288
Faculty/Staff Motorcycle	NA	NA	NA	$288
UC San Diego				
Student	$61	NA	NA	$732
Graduate Students	$81	NA	NA	$972
Student Motorcycle	$22	$66	NA	$264
Faculty/Staff	$93/$81	NA	NA	$1,116/$972
Faculty/Staff Motorcycle	$22	NA	NA	$264

APPENDIX D

UC PEER SHUTTLE REVIEW

INTRODUCTION

As part of the shuttle analysis, we examined five other UC shuttle systems to offer a comparison to the service operated by UC Riverside. The organizational and financing structure for intra-campus shuttle services vary greatly amongst the University of California campuses, ranging from student-operated and financed shuttle to shuttles operated by outside vendors. In addition, several universities have established agreements with local transit agencies that enable students and/or faculty and staff to ride transit for free or at discounted rates.

CASE STUDIES

UC Davis

UC-Davis is served by Unitrans, a student run bus transit system that is both managed and operated by students. Unitrans is funded through a variety of revenue sources. All UCD undergraduates pay a fee of $33 each quarter along with their registration fees that makes them eligible to ride Unitrans and YoloBus (operated by Yolo County Transportation District) free by showing their registration card. Students voted to have this mandatory charge included in their standard student fees in order to fund the service.

Based on the FY 2005 projected budget, the largest income source for Unitrans is the transit fee paid by UCD undergraduate students (58.7% of total revenue). State and federal sources, through a combination of TDA and Section 5307 make up another 32% of revenues. Passenger cash fares (3%), other campus agreements (3%), parking fees (2.1%), and advertising (1%) make up the remainder of funding for Unitrans.

The campus has an agreement with YoloBus, such that the campus pays an annual payment of $85,000 to enable undergraduate students to ride for free.[1]

UC Berkeley

UC Berkeley operates Bear Transit, a campus shuttle service that is free to all campus affiliates with a current campus ID. Persons without a campus ID may also use the service for a nominal fee. The campus runs and operates Bear Transit with hired staff and vehicles leased from AC Transit, the local transit agency. Shuttle service is funded with student fees and parking revenue.

The campus also offers a “Class Pass” for all students, which provides free unlimited rides on

1 This payment accounts for roughly 3% of Unitrans’ expenses.

AC Transit. Students receive free bus rides by placing a bus sticker on their campus ID card. The Class Pass is funded by student registration fees; $58.50 of every student's registration fees goes to this program. Of the funds generated by the student registration fees 2/3 of the funds is paid to AC Transit and 1/3 goes to the campus.

UC San Francisco

UC San Francisco offers a free shuttle service for campus affiliates that provides connections between the campus's various sites. There are 10 separate routes linking the sites with roughly 19 shuttles departing each hour at the main Parnassus Avenue campus at peak time. This service is extremely popular, with the Parnassus Avenue shuttle stop averaging 2,377 shuttle boardings per weekday. This is more than double that of the two local transit providers' (Muni) routes stopping at the same location. The campus operates the service while maintenance is contracted to an outside vendor.

UC Merced

CatTracks is UC Merced's shuttle service, offering intra-campus service as well as connections to downtown Merced and select locations in north Merced, with a total of four routes. The campus contracts with an outside vendor to operate and manage the service and pays the vendor a base rate plus an hourly rate for service hours. Funding for CatTracks comes from a student fee of $87.50 per semester as well as parking revenues.

The campus does not currently have an agreement with Merced County Transit, the local transit operator, to provide discounted or free rides to students. However, the two organizations have implemented a demonstration route from campus to local community college and UC Merced works with transit agency on routing.

UC San Diego

The campus provides several free on- and off-campus shuttles. The shuttles are operated by the campus, utilizing both campus employees and students to manage and operate the service. The campus also subsidizes free, unlimited Metropolitan Transit System (MTS) bus rides on 7 routes near campus as well as unlimited use of North County Transit District's (NCTD) Route 101. Students receive free bus rides by placing a UCSD bus sticker on their campus ID card. The campus is charged per ride ($0.87 for MTS, $1.10 for NCTD), rather than a flat fee. Thus, as ridership and use of the program has increased, the campus is charged more by MTS and NCTD.

All bus passes and rideshare programs are funded by parking permits for faculty, staff and students as well as parking citations. The campus is also considering implementing a student transit fee which would help fund shuttle and transit service. The fee will be voted on in the coming academic year, and if passed would be implemented in 2010-11.

For a comparison of all of the shuttle and transit services described, see Figure D-1 below.

Figure D-1 Shuttle Services for University of California Campuses

Campus	Shuttle Service				Local Transit Agency	
	Name	Organizational Structure	Staffing	Funding	Name	Service Agreement
UC Riverside	Highlander	Routes operated through contracted service and RTA service	Contracted and RTA staff	• Parking Revenue	RTA	Free undergraduate use of RTA routes
UC Davis	Unitrans	Student Union/Student Government operated	Students manage and perform maintenance	• Undergraduate Student Fees ($33/quarter) • FTA • TDA • Parking Fees • Cash Fares • Advertising	Yolo Transit	Free undergraduate use of YoloBus
UC Berkeley	Bear Transit	• Campus runs and operates service • Vehicles leased from and maintained by AC Transit	Hired Staff	• Student Fees • Parking Revenue	AC Transit	Campus transit pass 2/3 funds go to AC Transit, 1/3 goes to UC
UC San Francisco		• Campus runs and operates service • Maintenance by an outside vendor	Hired Staff		MUNI	No agreement
UC Merced	CatTracks	• Operated by an outside vendor • Campus pays a base rate plus an hourly rate for service hours	Vendor hires staff	• Student Fee ($87.50 per semester • Parking Revenue	Merced County Transit	• Demonstration route from campus to local community college • UC Merced works with transit agency on routing
UC San Diego		• Campus operated • Provides intra-campus, neighborhood, and hospital service • 7 shuttles at the peak hour	• 13 career Staff • 150 student staff (including drivers)	• Citations • Parking Revenue • Considering Student Transit Fee (voting on in 2009 for 2010-11 academic year	Metropolitan Transportation System (MTS)	Campus is charged a set amount for the “Free Bus Zone” which allows students, faculty and staff to travel for free on specific routes