SUSTAINABILITY ACTION PLAN 2009
DRAFT

Prepared by
Collaborative Project Consulting

Commissioned by
Environmental Health & Safety
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This document is the product of a multi-stakeholder process where individuals from across the UC Riverside campus came together to provide their working knowledge of the university and offer their vision for a sustainable future. Thanks to the following individuals for giving both their time and insight:

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Letter from the Chancellor

Instructions: Please delete this page from the PDF intended for broad distribution and insert the letter from Chancellor White. The letter is to be one page in length to ensure the Table of Contents is accurate.
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Executive Summary

Stakeholders across the UC Riverside (UCR) campus are diligently working to build sustainability into the university’s culture. Student groups are developing a ballot initiative to fund sustainability projects through a quarterly registration fee. Faculty members have launched a new freshman survey course dedicated to exploring sustainability issues. Staff are incorporating sustainable practices across operational units, and have spearheaded the development of UCR’s Chancellor’s Committee on Sustainability (CCS). A broad range of staff, students and faculty representatives populate this committee, which advises the Chancellor on campus sustainability issues and provides leadership in the development and implementation of sustainability initiatives. The CCS played an instrumental role in the development of this Sustainability Action Plan by providing its expertise concerning campus operations and sharing its vision for a sustainable UCR.

UCR’s Sustainability Action Plan provides a detailed and actionable road map to sustainability that builds on the campus’s successes and presents opportunities to develop new initiatives. Recommendations made in the plan are designed to facilitate UCR’s achievement of goals set forth by the UC Policy on Sustainable Practice (UC Policy) and the American College and University Presidents Climate Commitment (ACUPCC). To that end, the document summarizes salient sustainability work happening across the campus, identifies additional measures the campus should pursue, and sets out implementation steps for achieving these goals. The document also identifies gaps in environmental performance data that UCR must close in order to adequately assess the attainment of its sustainability goals.

This document is sectioned into nine focus areas that correspond to sustainability topics of concern to the university: built environment, energy and climate protection, water, sites, transportation, recycling and waste management, procurement, food, and academics and research. Given the interdisciplinary nature of sustainability issues, all nine focus areas are complimentary and interconnected. Overlap in the content of focus areas is sometimes addressed directly, however these topical categories are not fixed, and many instances occur where a particular goal or initiative could be placed within different focus areas. Because each section is related, all members of the campus community have an obligation to engage one another and collaborate on issues that span across focus areas.

To effectively implement the far-reaching sustainability program contained in this document, UCR must invest in several critical areas. These include:

1. Sustainability program staffing
The collective experience of the UC system demonstrates that staffing critical positions similar to those proposed in this document is an extremely effective, if not requisite, driver of sustainability in a university environment. UCR’s new sustainability leadership positions will be responsible for
implementing the Sustainability Action Plan, achieving sustainability targets on time per UC Policy, implementing the Climate Action Plan, and developing an annual sustainability assessment that reports on the university’s fulfillment of sustainability goals.

2. Sustainability management system
Implementing a sustainability management system will facilitate accurate and consistent data gathering across departments and aid sustainability performance evaluation efforts. This management system will be used to generate annual reports and expedite documentation of UCR’s progress towards meeting systemwide sustainability goals.

3. Sustainability website
UCR’s sustainability website is most likely the first place the campus community looks to for information about UCR’s sustainability goals, initiatives and progress. There is an opportunity to develop the website into a clearinghouse for all sustainability-related information. Additionally, the website can act as the main information portal for all sustainability-related activities and events on campus via a single sustainability calendar.

This Sustainability Action Plan represents a first step in committing UCR’s extensive sustainability agenda to paper. It is a living document that will be updated and modified over time as the university integrates sustainability into its infrastructure, operations, academics and culture. In the next iteration of the plan, UCR will develop a strategic plan framework to support the actionable goals contained in this document. Revisiting the document regularly will allow UCR to maintain a dynamic relationship with emerging sustainability practices and technologies and incorporate current best practices into its programs and standards.
Introduction

Purpose and Goals
This document is designed to be a sustainability action plan. Its purpose is to provide UCR with a clear and actionable road map to sustainability through well-defined goals and practical implementation steps. The document also identifies gaps in environmental performance data that UCR must close in order to adequately assess the attainment of its sustainability goals. The recommendations in this action plan are ultimately intended to facilitate UCR’s achievement of goals set forth by the UC Policy on Sustainable Practices (UC Policy) and the American College and University Presidents Climate Commitment (ACUPCC), as well as foster a university community that embraces sustainability and incorporates its principles throughout academic and operational units.

Scope
In addition to the main campus, UCR has multiple off-site facilities including a 20 acre campus called the Palm Desert Graduate Center. UCR also operates the Coachella Valley Agricultural Research Station, located 80 miles southeast of the main campus, and four reserves. While this Sustainability Action Plan makes primary reference to the main campus, its best practices apply at these off-site locations as well.

Document Structure
The document is sectioned into nine focus areas that correspond to sustainability topics of concern to the university. The focus areas generally mirror the technical workgroups created by UCR’s Chancellor’s Committee on Sustainability (CCS). To provide the additional granularity needed to create a comprehensive sustainability action plan, a few modifications were made to the existing workgroups. First, the Energy and Green Building Design workgroup was split into the Energy and Climate Protection focus area and the Built Environment focus area. Second, a focus area was created for Water. Third, the Landscape workgroup was broadened to the Sites focus area.

The first three sections of each focus area establish the current extent of sustainable practices at UCR. Each focus area begins with an introduction to provide background on the existing conditions at the university as well as the general significance of the focus area in terms of environmental and human health. Relevant policies that are applicable to a particular focus area are also listed in the introductory section. These are primarily taken from the systemwide UC Policy on Sustainable Practices (referred to as “UC Policy”). This is followed by the Current Best Practices section, which highlights actions that UCR presently takes to create a sustainable campus. Next is the Metrics section, which is populated with reliable and verifiable performance data. This document is not intended to be a comprehensive sustainability assessment. Therefore, metrics have been selected to provide a general picture of UCR’s environmental performance in each focus area, rather than an exhaustive account of UCR’s performance. It is noted when data

UCR Sustainability Action Plan 2009
does not exist for an essential metric that UCR intends to begin tracking in order to quantify its environmental performance. Establishing tracking procedures to close gaps in data is then specifically addressed in the goals section.

The next three sections contain sustainability goals divided into short term (0 to 2 years), intermediate (2 to 5 years), and long term (5 to 10 years) time intervals. Implementation steps bulleted beneath each goal provide a road map to facilitate the achievement of each goal. The goals and performance targets are designed to build successively over time to create a clear course of action and a robust vision of sustainability at UCR.

The Demonstration Projects section rounds out each focus area. These projects are intended to produce tangible, and often immediate, environmental benefits. Some projects directly support or expand upon a particular goal in the focus area. Many projects contain an educational component that draws the wider campus community into UCR’s sustainability efforts.

**General Recommendations**

**Sustainability Program Staffing**

The expertise of several individuals will be required to effectively develop, coordinate and deploy UCR’s ambitious sustainability and climate neutrality agenda. A university’s ability to make sweeping changes and implement new sustainable practices depends on this leadership, as witnessed throughout the UC system. The collective experience of other campuses demonstrates that staffing critical positions similar to those proposed here is an extremely effective, if not requisite, driver of sustainability in a university environment. The table below shows the different sustainability positions filled at each UC campus.

<table>
<thead>
<tr>
<th></th>
<th>Sustainability Director</th>
<th>Sustainability Manager</th>
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<th>Recycling Coordinator</th>
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1. Energy and Utilities Manager – Housed in Physical Plant
An Energy Manager is an indispensable position for every university. This individual ensures the safe and efficient delivery of utilities to campus, manages the utilities budget, and is responsible for developing and implementing the campus’s energy and utilities conservation programs. The Energy Manager is responsible for soliciting funding for energy efficiency projects, spearheading the campus’s climate neutrality efforts, and investigating and implementing both renewable energy and emerging technologies. The Energy Manager also optimizes the efficiency of building operating systems to deliver better learning and working environments and to generate operational cost savings. The Energy Manager is the primary spokesperson representing the campus and Physical Facilities in all issues concerning energy and utilities. Finally, the Energy Manager oversees staff involvement in building commissioning activities. This position reports regularly to the Sustainability Director on progress with implementing the Climate Action Plan.

Recommended Responsibilities
- Oversee the development and implementation of the Campus Climate Action plan.
- Provide support to Climate Action Registry reporting activities.
- Solicit rebates for energy efficiency and renewable energy projects.
• Develop long term planning goals for renewable energy projects.
• Develop an energy management team to implement a variety of projects that reduce the campus’s overall utility consumption.
• Develop on-campus demonstration projects consisting of, but not limited to, emerging technologies in the energy field, renewable power, and academic projects produced by students and faculty.
• Evaluate the success of energy conservation measures and communicate the results.
• Provide accurate utility budgeting and develop an annual energy report.
• Oversee the campus’s commissioning practices.
• Record and attribute energy consumption and costs.
• Troubleshoot energy problems and utility billing errors.
• Prioritize energy-related capital investments.
• Participate in new construction projects to ensure campus energy guidelines are met.
• Evaluate UCR’s utilities infrastructure and the impact of future campus growth.
• Provide energy education to the campus.
• Administer incentives for the campus community for energy conservation efforts.
• Provide data and content for the annual sustainability assessment produced by the Sustainability Director.
• Develop, manage and support the implementation of water audits, water efficiency retrofits, and demonstration projects contained in this plan.
• Work with the City of Riverside and other external organizations to develop partnerships that will produce water demonstration projects.
• Inform and facilitate the campuswide adoption of water efficiency standards for fittings and fixtures in new construction and renovation projects.
• Develop accounting methodologies for greenhouse gas emissions associated with water use and disposal with the goal to include this emission source in the campus Climate Action Plan. Quantify emissions avoided through water efficiency projects and include this in future CAP versions.
• Develop water metering and submetering specifications.
• Coordinate with UCOP on energy matters and participate in the monthly UC Energy Manager conference call.
• Participate in the UC Systemwide Sustainability Working Group for Climate Change.

2. Sustainability Manager – Housed in the Office of Design and Construction
The Sustainability Manager oversees the integration of sustainable design in all new construction and renovation projects. This will require close coordination with project managers, building committees, and design teams to ensure that all projects achieve the university’s LEED certification goals. This position is also responsible for piloting the LEED for Existing Buildings: Operations and Maintenance program (LEED EBOM). The Sustainability Manager is charged with developing, analyzing, and implementing campus policies and procedures for sustainable practices. This position works closely with the Campus Energy and Utilities Manager. The
Sustainability Manager also develops demonstration and outreach projects to engage and educate the campus community. This position reports regularly to the Sustainability Director on progress with implementing the Sustainability Action Plan.

**Recommended Responsibilities**

- Manage the campus’s LEED certification efforts.
- Develop a relationship with the USGBC and serve as the campus’s main liaison.
- Coordinate with UCR’s other sustainability positions to ensure policies and programs comply with LEED EBOM and are administered consistently throughout campus.
- Coordinate with Physical Facilities, grounds and custodial staff to ensure proper implementation of sustainable operations program elements and adequate staff training.
- Develop a working relationship with AASHE and administer the STARS program once the campus has achieved the majority of the Sustainability Plan short term goals.
- Inform and facilitate the campuswide adoption of water efficiency standards for fittings and fixtures in new construction and renovation projects.
- Compile and analyze performance data to assess the success of various sustainability programs.
- Provide data and content for the annual sustainability assessment produced by the Sustainability Director.
- Provide education and outreach to the campus community.
- Collaborate with Energy and Utilities Manager to develop energy efficiency and water conservation demonstration projects.

3. **Sustainability Director – Housed in Environmental Health and Safety**

The Sustainability Director is responsible for providing global direction and coordination of UCR’s various sustainability programs. This position is responsible for overseeing the implementation of the Sustainability Action Plan and will implement a sustainability management system (SMS) or develop UCR’s integrated management system (IMS) to facilitate accurate and consistent data gathering across departments and aid sustainability performance evaluation efforts. The Sustainability Director coordinates with UCR’s other sustainability positions to compile performance data and produce an annual sustainability assessment. This position coordinates with the Energy and Utilities Manager to gather data for the California Climate Action Registry, and acts as UCR’s point person for the emissions verification process. This position is responsible for communicating UCR’s sustainability progress clearly and candidly via an annual sustainability assessment report, the UCR sustainability website, and other educational outreach and marketing channels. The Sustainability Director is charged with overseeing development of the UCR sustainability website into a comprehensive sustainability resource and effective communication tool. Finally, this position is responsible for pursuing funding opportunities such as alumni donations.
Recommended Responsibilities

- Oversee implementation of UCR’s Sustainability Action Plan.
- Ensure compliance with the UC Policy on Sustainable Practices.
- Develop an annual sustainability assessment that reports on the university’s fulfillment of goals outlined in the UC Policy on Sustainable Practices, and tracks progress towards achieving goals outlined in the Sustainability Action Plan.
- Compile data, produce documentation and execute annual reporting to the California Climate Action Registry.
- Develop and implement a sustainability management system (SMS) or integrated management system (IMS) to facilitate data gathering and track the campus’s sustainability progress.
- Oversee development of the sustainability website. See the Website Enhancement section of this plan for more information.
- Oversee development of case studies, press releases and other educational and marketing materials designed for campus circulation as well as external media outlets.
- Produce a quarterly campus newsletter that provides resources and campus achievements.
- Perform outreach to campus departments to form partnerships that assist with the campus’s sustainability goals.
- Develop partnerships with local environmental groups.
- Coordinate meetings and provide support to the Chancellor’s Committee on Sustainability.
- Communicate with and provide support to student groups interested in sustainability.
- Coordinate large sustainability events and activities such as Earth Day, Focus the Nation, and Sustainability Week.
- Coordinate with the Sustainability Managers and Coordinators to develop staff sustainability training programs.

4. Housing & Auxiliaries Sustainability Coordinator – Housed in Housing Services

This position oversees all sustainability programs within Housing and Auxiliaries and coordinates these programs to compliment the university’s overall sustainability efforts. Maintaining consistency with programs deployed on the main campus will provide students with continuity and reinforce UCR’s sustainability agenda. The position will support implementation of sustainable food systems in the residential dining program. The position provides education and outreach on recycling, food systems, green operations, energy efficiency, and student sustainability programs. The position will work closely with students on a daily basis.

Recommended Responsibilities

- Implement UCR’s sustainability and climate neutrality goals within the student housing and auxiliaries sectors.
- Collaborate with the Energy and Utilities Manager to implement energy efficiency projects within the housing facilities.
• Contribute to the development of LEED EBOM-compliant operational programs and practices for student housing.
• Assist in the development of food sourcing and food waste education implemented in the residential dining halls.
• Develop waste awareness events for all dormitories and on-campus housing.
• Track sustainability metrics and data for housing and auxiliaries.
• Provide data and content for the annual sustainability assessment produced by the Sustainability Director.
• Develop and implement sustainability outreach to educate students.
• Facilitate student involvement in sustainability by providing information about student programs, including: specifics on existing and planned programs, student sustainability groups, and ways to become involved.

5. Recycling Coordinator – Housed in Physical Plant

Building an effective recycling and waste management program for the many waste streams generated on campus will require a FTE individual. The nature of recycling requires that the position coordinate with several departments to address all waste streams. The Recycling Coordinator oversees the development and implementation of the comprehensive recycling plan. This position designs and deploys educational campaigns to inform all facets of campus about the recycling program’s goals and procedures. Additionally, this position acts as the campus liaison to the contracted waste and recycling hauler.

Recommended Responsibilities

• Develop, implement and maintain an integrated recycling and waste management program.
• Develop procedures and protocol for tracking UCR’s recycling performance. Ensure metrics are tracked consistently.
• Prepare UCR’s Annual Waste Reduction and Recycling Report for the Office of the President.
• Provide data and content for the annual sustainability assessment produced by the Sustainability Director.
• Participate in the UC Systemwide Sustainability Working Group for Waste Reduction and Recycling.
• Spearhead demonstration projects and education outreach campaigns related to recycling and waste management.
Sustainability Program Funding

To implement the far-reaching initiatives proposed in this plan, UCR must develop several distinct funding mechanisms that are tailored to address specific components of its sustainability program. The diverse nature of sustainability projects requires the establishment of a suitably diverse set of funding mechanisms to ensure that the appropriate mechanism is applied to a particular project. For example, energy efficiency projects with a clear expectation of a short term return on investment must be funded differently than the capital expenditures associated with certifying buildings through the LEED program.

UCR will conduct a detailed study of potential funding mechanisms and develop a briefing paper for review by university management. This inventory of best practices will provide an extensive discussion of each potential funding mechanism and the required steps to implementation, allowing university officials to determine the most effective and appropriate mechanisms to formally adopt and develop. The briefing paper will also consider the possibility of hiring a sustainability grant writer that would be charged with securing much needed funding for UCR’s sustainability program.

Sustainability Website Enhancement

UCR’s sustainability website is most likely the first place the campus community looks to for information about UCR’s sustainability goals, initiatives and progress. There is an opportunity develop the website into a clearinghouse for all sustainability-related information. This includes:

- UCR’s sustainable operations and green building policies
- Sustainability Action Plan progress and updates
- Climate Action Plan progress and updates
- Energy conservation initiatives and tips
- Energy and green building case studies
- Student internship and research opportunities both on and off campus
- Links to environmental student group websites
- Course offerings with sustainability-related content
- Quarterly sustainability newsletter
- Recognition and information about sustainability-related research undertaken by campus research units

Additionally, the website can act as the main information portal for all sustainability-related activities on campus. This can be accomplished by hosting a sustainability calendar on which the campus at large can post events, with some oversight via the site webmaster. Broad marketing of events, lectures and meetings on a single calendar will help draw students, faculty and staff together and increase attendance at events. Enhancement opportunities are recommended throughout the focus areas.
Focus Areas

1. BUILT ENVIRONMENT

UCR is currently undergoing a period of rapid growth. The 2005 Long Range Development Plan (LRDP) anticipates that student enrollment will expand to 25,000 by 2015, a 96 percent increase over 2000 levels. The university plans to construct an estimated 8 million square feet of new facilities to accommodate the anticipated growth. To that end, UCR is beginning an aggressive built-out of the West Campus, which will include housing facilities, academic buildings, and a new medical school.

The U.S. Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) program is the de-facto national rating system for sustainable building design and construction. This program has been embraced throughout the UC system as each campus strives to reduce the environmental impact of its capital projects. UCR is adopting an ambitious goal to design and construct all new and renovation projects to a LEED Gold standard at minimum. The campus is committing to certifying all projects through the USGBC to ensure projects meet the rigorous review afforded through third-party verification. While ambitious, UCR is intentionally pushing the envelope to set a high standard for the construction of the West Campus. By adopting Gold as its baseline standard, the university can take a strategic long-term planning approach that uses the LEED rating system to facilitate the development of an energy and resource efficient West Campus.

Relevant Policies

- UC Policy: All new buildings, except for laboratory and acute care facilities, must meet the minimum standard of LEED/UC Equivalent Certified
- UC Policy: All new laboratories must meet the minimum standard of LEED/UC Equivalent Certified and Labs21 Environmental Performance Criteria
- UC Policy: All renovation projects over $5 million must meet the minimum standard of LEED for Commercial Interiors/UC Equivalent Certified and register with the Savings by Design Program if eligible
- UC Policy: Strive to achieve a minimum standard of LEED/UC Equivalent Silver
- UC Policy: Outperform California Energy Code Title 24 by at least 20 percent

1.1 Current Best Practices

New Construction

The campus has implemented five projects under UC Policy, which requires all new buildings with budget approval after July 1, 2004 to meet the minimum standard of LEED or UC Equivalent Certified. UC Equivalent is a parallel rating system developed by UC Office of the President in collaboration with the individual campuses. This internal evaluation and certification program allows projects to benchmark in a similar manner to the LEED system without pursuing external
certification through the USGBC. UCR’s facilities incorporate a variety of sustainable features, earning UC Equivalent Certified and Silver ratings for three and two projects, respectively.

**Operations and Maintenance**
UCR’s Physical Plant uses low-VOC paints and Green Seal cleaning chemicals to enhance the indoor environmental quality of campus buildings and protect student and employee health. Physical Plant also uses environmentally-preferable water treatment chemicals in chiller equipment.

In summer 2008 the campus performed a feasibility study and selected three buildings to undergo LEED for Existing Buildings: Operations and Maintenance (LEED EBOM) certification. These buildings are Chemical Sciences, the Science Library, and Biomedical Sciences. UCR plans to complete certification of its first EBOM project in 2010.

### 1.2 Metrics

**Sustainable New Construction**
UC Policy mandates that all UC buildings except acute care facilities must be designed to a LEED or UC Equivalent Certified level. Table A charts the different levels of certification earned by UCR’s new construction projects.

<table>
<thead>
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<th>Table A. Projects Implemented under UC Policy</th>
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<tr>
<td>UC Equivalent Certified</td>
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<tr>
<td>Silver</td>
</tr>
<tr>
<td>LEED Certified</td>
</tr>
<tr>
<td>Certified</td>
</tr>
<tr>
<td>Silver</td>
</tr>
</tbody>
</table>

**LEED Accredited Staff Members**
Training is an important part of a campus’s integrated green building and operations effort. The LEED rating system is a unique project management tool that facilitates benchmarking the performance of building design, construction and operations. UCR intends to actively training staff in the use of this system so that the campus can implement broad program goals while minimizing the amount of outside consulting overhead.

<table>
<thead>
<tr>
<th>Table B. LEED AP Staff</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Total AP Staff</td>
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1.3 Short Term Goals (0-2 years)

Goal 1: Adopt a written green building policy requiring all projects to pursue LEED Gold certification through the USGBC

Adopt a written green building policy signed by the Chancellor stating that all projects programmed after July 1, 2009 are required to earn LEED for New Construction (LEED NC) Gold and pursue certification through the USGBC. Committing this ambition to paper will formalize UCR’s green building goals.

- Assemble a group of staff to develop the policy for the Chancellor’s commitment, signature and support.
- Develop implementation and funding strategies to ensure the LEED Gold certification policy can be pursued successfully.

Goal 2: Require all new construction projects to surpass California Energy Code Title 24 by 30 percent or better

UCR has committed to exceeding current UC Policy mandates by adopting LEED Gold as its minimum level of certification. Similarly raising the bar with respect to Title 24 is essential in order for the campus to meet its climate neutrality goals and make critical emission reductions. Formalize the campus’s requirement by adopting a written policy signed by the Chancellor stating that all projects programmed after July 1, 2009 are required to surpass Title 24 by at least 30 percent.

- Assemble a group of staff to develop the policy for the Chancellor’s commitment, signature and support.
- To underwrite possible additional costs for energy modeling and energy-efficiency measures, register every eligible project through the investor-owned utilities’ Savings by Design program.
- Explore other potential energy-efficiency incentive programs.
- Develop on-campus energy system assessment, commissioning and energy modeling expertise, particularly in relation to UCR’s current programming.

Goal 3: Complete the campus’s first external LEED NC certification

Completing the campus’s first LEED NC project and successfully pursuing external certification through the USGBC will introduce UCR to the LEED program and pave the way for future certification projects.

- Select architecture and engineering firms that are experienced and committed to sustainable design and have demonstrated success with the LEED program.
- Host an eco-charrette during the schematic design phase with the project team and campus stakeholders to determine the project’s sustainability goals and develop an integrated approach to designing sustainable systems and features. Establish a strategy for achieving sustainable design goals and metrics for achieving them.
- Dundee Residence Hall is most likely candidate to satisfy this goal.
Goal 4: Develop sustainable design guidelines for thermal comfort
Thermal comfort is strongly tied to productivity. Maintaining thermally-comfortable buildings is essential to providing a good working and learning environment.

- Use the LEED NC program to develop design and construction standards for indoor air quality.
- Establish protocol for participation in Center for the Built Environment’s (CBE) occupant indoor environmental quality surveys as part of planned needs assessment for projects as well as post occupancy evaluations one year after occupancy of new or renovated capital projects.
  www.cbe.berkeley.edu/research/survey.htm

Goal 5: Develop a comprehensive indoor air quality (IAQ) policy
Many factors contribute to the level of indoor air quality in a given building. UCR will develop a comprehensive IAQ policy that employs best management practices to maintain air quality and protect the health of building occupants.

- Develop design and construction standards for indoor air quality using the LEED NC program.
- Use the LEED EBOM program to expand the policy to building operations.

Goal 6: Develop a construction waste management plan
Construction and demolition activities generate a significant amount of waste, however much of these materials can be reused or recycled. Develop a Division 1 specification requiring all new construction and renovation projects to recover construction waste and divert materials from landfill. A minimum diversion rate of 75 percent should be required for all campus projects.

- Incorporate the requirements of the LEED-NC program when developing campus guidelines.
- Require that contractors provide a construction waste management plan to the university prior to the start of construction.
- Require that contractors provide quarterly waste diversion reports. Consider requiring contractors to submit the overall project waste diversion report as a prerequisite for final payment.
- Maintain records of the construction waste generated and the quantity diverted from landfills for all projects.
- Identify common types of construction waste and local, licensed haulers and processors of recycled and salvaged construction materials to expedite waste diversion. See the Recycling and Waste Management focus area for more information.
- The EPA has developed a useful resource for construction waste management:
  www.epa.gov/epawaste/conserve/rrr/imr/cdm/index.htm
Goal 7: Formalize an incentives and training program to increase staff LEED Accredited Professionals (LEED AP)

Creating LEED AP support program is an excellent way to invest in staff and create a pool of knowledgeable in-house individuals that can support LEED certification efforts. The USGBC is creating a multi-tier program with accreditation levels appropriate for policy makers, implementers, and experts. Possible components of an incentives and training program include:

- Purchasing several Reference Guides for employees to check out.
- Organize study groups.
- Hosting a one-day, on-campus Technical Review every six months where a larger group of staff receive training at the same time.
- Encouraging staff to attend UCOP-sponsored workshops and conferences by sending out notices of these events. These workshops provide LEED information that can assist those interested in taking the LEED AP exam.
- Subsidizing employees by paying the exam fee for individuals that pass.

Goal 8: Certify an existing building through the LEED EBOM rating system

UCR has all the in-house expertise to complete a LEED EBOM certification.

- Establish a funding source for the first EBOM certification effort.
- Assign a project manager to oversee and manage the process.
- The project team should include the recycling coordinator, a campus HVAC mechanic, the energy manager, and the custodial services manager, and at least one representative of the building’s occupants.
- Host a kick-off meeting with the above individuals to determine which LEED credits the project will strive to achieve.
- Determine the responsible party for each credit and create a timeline with milestone dates and deadlines.
- The project team should meet regularly until the project is complete. Dividing up responsibilities across the different campus departments will facilitate completing a LEED EBOM certification within the short term goals time frame.

Goal 9: Develop written sustainable operations policies

Developing written policies will help ensure sustainable operational procedures are applied consistently throughout campus. Policies should be created for landscape maintenance, green cleaning, purchasing, recycling (see the Waste and Recycling Management section), and integrated pest management (see the Sites section).

- Policies should include a scope, goals, metrics, procedures and strategies, and parties responsible for implementation, per the LEED EBOM program.
- Policies should be written on UCR letterhead.
- Consider hiring a student interested in sustainability to review the LEED EBOM program and help develop policies.
• Many of these operations are partially or fully developed on campus. Consider assigning students to work with UCR staff members responsible for these particular operations to develop the policies while taking UCR’s current best practices into account.
• Distribute policies to the campus and post on the sustainability website.
• Once policies are written according to the LEED EBOM framework and include all EBOM requirements they can be submitted with any EBOM project and expedite the certification process.

Goal 10: Expand use of Green Seal cleaning chemicals to all campus departments
Green cleaning has not been adopted uniformly throughout the UCR campus. A complete phase-in of green cleaning chemicals should be accomplished within the short term goals time frame, to the point that 90 percent of cleaning chemicals used at UCR are Green Seal certified. The aggressive adoption of green cleaning chemicals is necessary to provide high indoor environmental quality to students, faculty and staff, and to protect the health of custodial personnel. This goal is duplicated in the Procurement focus area.
  • Areas of campus that do not use Green Seal certified cleaning products should implement product testing and evaluate performance.
  • Departments should consider adopting some or all of the cleaning chemicals used by Physical Plant to obtain quantity discounts.
  • Provide outreach and education to custodial staff on the human and environmental health benefits and proper use of Green Seal certified chemicals. Training is provided for free as part of the UC systemwide strategic sourcing contract.

Goal 11: Test environmentally preferable floor finish products
Physical Facilities uses the Spartan line for all cleaning products except its floor finish. UCR has not found a product that can match the durability of its current product line.
  • Contact vendors of compliant floor finish products and ask for a sample to test.
  • Gather feedback from custodial staff and building users.
  • Contact other universities and inquire about their floor finish products.

1.4 Intermediate Goals (2-5 years)
Goal 1: Develop a sustainable renovation program
Universities are constantly remodeling and upgrading its facilities. To reduce the environmental impact of these activities, develop a comprehensive green renovation program using the LEED for Commercial Interiors (LEED CI) criteria.
  • A renovation over 5,000 square feet should achieve certification at the Gold level per UCR’s green building policy adopted within the short term goals timeframe.
  • A memo describing the sustainable features is requested by UC Office of the President for renovated spaces under 5,000 square feet.
Goal 2: Enhance LEED EBOM policies as campus practices evolve
As UCR continually makes improvements to its operations and maintenance practices, update written policies to reflect these changes.
  • Post enhanced policies to the sustainability website.

Goal 3: Join the USGBC’s Portfolio Program
The Portfolio Program is a volume-certification program where organizations can use a streamlined certification process to document LEED EBOM operational policies and practices that are consistently applied across multiple buildings.
  • Initiate this program by determining current campuswide compliance with selected LEED credits.
  • Develop a long-term funding source for implementing an ongoing Portfolio Program.

Goal 4: Create UCR green building case studies and post to the sustainability website
Develop case studies that explain the sustainable features, construction waste diversion efforts, energy-efficiency measures, and lessons learned for new construction and renovation projects implemented on campus. Documenting successes, lessons learned and best practices will keep the campus community abreast of UCR’s progress towards creating a sustainable built environment.
  • Create a student internship in the Chancellor’s Committee on Sustainability (CCS) Energy and Green Building Design workgroup. Arrange for interns to interview project managers, contractors, design teams, and campus constituents involved in the process to include in case studies.

1.5 Long Term Goals (5-10 years)
Goal 1: Adopt the goals of the Architecture 2030 Challenge
Architecture 2030 requires each new building project or major renovation to be designed to achieve an energy consumption performance standard of 50 percent below of the regional (or country) average for that project’s building type. For new building projects, this performance standard will increase to 60 percent of the regional (or country) average in the year 2010. Every five years the standard will increase by an additional 10 percent, achieving carbon-neutral buildings in the year 2030. Major renovations are only required to meet the 50 percent target throughout this timeline, but are encouraged to achieve the increased reduction. To accomplish this, Architecture 2030 has issued The 2030 Challenge asking the global architecture and building community to adopt the above targets that culminate in new buildings that use no greenhouse gas-emitting energy to operate.
www.architecture2030.org
• Architecture 2030 targets may be accomplished by implementing innovative sustainable design strategies, generating on-site renewable power, and/or purchasing (20 percent maximum) renewable energy and/or certified renewable energy credits.
• Consider evaluating building performance against Architecture 2030 criteria in the pre-design phase for projects programmed after July 1, 2009 in addition to evaluation via LEED checklist criteria.

**Goal 2: Construct UCR’s first carbon neutral building**
Carbon neutrality refers to achieving zero net carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset. Climate neutrality is highly feasible for building types with relatively low energy use intensity. Achieving a net zero building will require an integrated design process and a willingness to embrace emerging approaches and technologies in the design and construction process.
• Include climate neutrality goals in the project RFP. Ask that firms have demonstrated success with designing and building high performance and climate neutral projects.
• Conduct site visits to net zero buildings that offer guided tours.
• Invite speakers such as architects or building owners to present on carbon neutral projects to Capital & Physical Planning.

**Goal 3: Increase the ecological literacy of the UCR campus community**
Reinforce the ecological literacy of students, faculty and staff by designing and deploying several facilities around campus that teach building users about sustainability. When designed effectively, “buildings that teach” are a useful educational tool that imparts the university’s environmental values and increases the campus community’s awareness and understanding of sustainability issues.

1.6 Demonstration Projects

**Project 1**
Pilot the LEED EBOM program in the Chemical Sciences building, a high-visibility facility on campus. Enlist students to support the effort through the sustainability student service-learning course, short term Goal 2 in the Academics and Research focus area. Through coursework and hands-on projects, students will be trained to implement LEED EBOM requirements and produce documentation for submission to the USGBC. Design an educational outreach component to disseminate information about the project goals and accomplishments through the sustainability website and through the websites for departments housed in the pilot building.

**Project 2**
Create a downloadable database to provide resources, policies and product information online in order to streamline sustainability efforts on campus. Provide a link on the existing UCR
sustainability website. A faculty champion and students can partner to develop the green resource database.

**Project 3**
Partner with an economics course to investigate the feasibility of constructing and operating a one megawatt solar farm at UCR. Facilities will assist students with data collection and analysis, and faculty will oversee the project and assist as needed.

**Project 4**
Partner with an engineering course to implement an in-house commissioning project. Facilities will assist students with the hands-on implementation of commissioning in the field, students will develop the commissioning report, and faculty will oversee the project and assist as needed. Each party that participates in the project will benefit, with Facilities receiving a commissioned building and report, students receiving class credit, and faculty developing a lab module for future classes.

1.7 **Definitions**
Carbon neutral or net zero building – a facility with zero net energy consumption and zero carbon emissions, achieved through onsite renewable energy generation
2. ENERGY AND CLIMATE PROTECTION

In March 2007, the University of California signed the American College and University Presidents Climate Commitment (ACUPCC), pledging that all ten UC campuses will maintain greenhouse gas emission inventories and achieve climate neutrality as soon as possible. The Presidents Climate Commitment is intended to catalyze climate protection research, education and action by universities and colleges, which are uniquely positioned to develop solutions that slow and reverse global warming. All 50 states are represented in the ACUPCC signatory list, which totals 623 institutions of higher education as of April 2009.

In conjunction with joining the ACUPCC, the University of California adopted systemwide interim climate protection targets to reduce greenhouse gas emissions to 2000 levels by 2014, and 1990 levels by 2020. These targets mirror the Global Warming Solutions Act of 2006 (Assembly Bill 32). This law requires the California Air Resources Board to establish a greenhouse gas emissions cap for the state of California and develop regulations and market mechanisms to achieve the mandated reductions.

Each UC campus utilizes the California Climate Action Registry (CCAR or Registry) to measure, third party certify, and publicly report its greenhouse gas emissions. Over 300 corporations, universities, municipalities, government agencies and environmental organizations currently participate in the Registry. UCR first reported and certified its emissions in 2006. At this time, the campus certified carbon dioxide emissions from mobile combustion (campus fleet), stationary combustion (natural gas) and purchased electricity. UCR will begin certifying all six Kyoto greenhouse gases in its fourth reporting year per Registry protocol. The campus is currently developing tools and protocol for tracking emissions from university-sponsored air travel and student and employee commuting, which it will begin reporting to the ACUPCC as soon as possible.

Climate Action Plan (CAP)

UC Policy tasked each campus with developing a Climate Action Plan to provide a framework for achieving UC climate protection goals. The Energy and Climate Protection focus area of this plan serves as UCR’s CAP to support the integration of climate neutrality into the campus’s larger sustainability program. The goals contained in this focus area specifically target strategies for reducing emissions through energy projects, however, countless sustainability initiatives proposed in this document generate greenhouse gas emission reductions.

Relevant Policies

- UC Policy: Reduce systemwide growth-adjusted energy consumption by 10% by 2014 from the year 2000 base consumption level
- UC Policy: Procure 20% of electricity from renewable sources by 2010
- UC Policy: Install 10 Megawatts of local renewable power by 2014 systemwide
• UC Policy & Assembly Bill 32: Reduce greenhouse gas emissions to 2000 levels by 2014
• UC Policy & Assembly Bill 32: Reduce greenhouse gas emissions to 1990 levels by 2020
• Assembly Bill 32: Reduce GHG emissions to 80% below 1990 levels by 2050

Emissions Baselines
Table A shows UCR’s greenhouse gas emissions for the baseline years of 1990 and 2000 by emission source. A description of the backcasting methodology used to derive the baselines is included in the appendix.

Table A. Baseline Greenhouse Gas Emissions, in Metric Tons of Carbon Dioxide Equivalent

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet</td>
<td>1,493</td>
<td>1,811</td>
</tr>
<tr>
<td>Electricity</td>
<td>32,880</td>
<td>51,471</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>16,836</td>
<td>23,934</td>
</tr>
<tr>
<td>Total</td>
<td>51,209</td>
<td>77,216</td>
</tr>
</tbody>
</table>

Emissions Profile
The campus’s historical emissions profile from 1990 through 2008 is derived from a combination of metered data and backcasting. UCR’s forecasted profile to 2030 show the quantity of emissions the campus can expect to produce if it continues “business as usual”. The methodology used to forecast emissions is described in the appendix.

UCR currently does not have systems or protocol in place for quantifying emissions from university-sponsored air travel or employee and staff commuting. This gap in data is addressed in the Transportation focus area short term goals.
UCR Climate Targets
UCR has adopted the emission reduction targets of 2000 levels by 2014 and 1990 levels by 2020, as outlined in UC Policy. The campus may revise its targets under a future CAP edition to reflect accelerated emission reductions achieved through the aggressive pursuit of climate protection programs.

Table B. Emissions Reduction Targets, in Metric Tons of Carbon Dioxide Equivalent

<table>
<thead>
<tr>
<th></th>
<th>2014 Climate Target</th>
<th>2020 Climate Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Emissions</td>
<td>77,216</td>
<td>51,209</td>
</tr>
<tr>
<td>Forecasted Emissions</td>
<td>112,562</td>
<td>127,875</td>
</tr>
<tr>
<td>Reduction Required</td>
<td>35,346</td>
<td>76,666</td>
</tr>
</tbody>
</table>
Mitigation Strategies

1. SEP Projects
UCR completed a Strategic Energy Plan (SEP) in 2008 that identifies a range of potential energy-efficiency retrofit projects for buildings over 50,000 square feet. The plan includes primary lighting, commissioning, and heating ventilation and air conditioning (HVAC) measures. The plan also outlines opportunities for energy efficiency in new construction. UCR has prioritized projects based on the university’s emission reduction targets and its capital programs budget. The SEP project list is separated into two phases, with the first phase planned for implementation in support of the 2014 climate target, and the second phase producing emission reductions in support of the 2020 climate target. The prioritized project list appears in the appendix, along with the anticipated energy savings and greenhouse gas emission reductions achievable by each project.

2. Renewable Energy
Renewable energy is an important component of the UC system’s pursuit of climate neutrality. UC Policy calls for the systemwide installation of ten megawatts of local renewable power by 2014. To contribute to the achievement of this mandate, UCR is actively investigating a one megawatt solar farm, which would reduce the university’s greenhouse gas emissions by roughly 1,000 metric tons.
In 2008, Riverside Public Utilities contracted with the Northwestern Band of Shoshone Nation to purchase 64 megawatts of renewable power from a new 100 megawatt geothermal power plant. UCR is in discussion with the City of Riverside to develop an agreement where the university purchases a portion of the City’s contract. This will allow UCR to accumulate greenhouse emission reductions above what is conferred through RPU’s enhanced renewable energy portfolio.

3. Behavioral/Educational Projects
Properly designed and operated buildings and utility infrastructure are necessary components of an energy-efficient campus. However, building users must also be educated and encouraged to conserve energy if UCR is to meet its climate protection goals. The campus will develop and deploy a variety of educational campaigns to promote energy conservation awareness and behavioral change within the university community.

4. Sustainability Action Plan
Many initiatives proposed in this document reduce the university’s climate impact. For example, the RecycleMania demonstration project included in the Recycling and Waste focus area is recommended by the ACUPCC. By implementing projects contained in this plan, each sector of the university can take responsibility for managing and reducing its greenhouse gas emissions.

Updating the Climate Action Plan
UCR will revisit the CAP regularly to evaluate its progress towards meeting emission reduction targets. This will be especially important as the campus brings new West Campus facilities on-line. The second version of the CAP will contain a more complete greenhouse gas emission profile that contains commuting and air travel emissions. With this information, UCR will select a target date for achieving climate neutrality and identify appropriate actions to support this goal.

2.1 Current Best Practices
Energy Efficiency
UCR has undertaken a variety of energy-efficiency projects in the last five years, including:
- Implementing retro-commissioning on the Science Library and Rivera Library.
- Installing fume hood occupancy sensors in five laboratory buildings to reduce the air flow velocity at unused hoods.
- Adding heat recovery at Chemical Sciences by re-circulating the office exhaust air that was originally once-through air.
- Installing run-around-loop heat recovery at Boyce Hall.
- Installing an economizer on the central plant’s largest boiler, resulting in an efficiency gain of roughly 35 percent.
Renewable Energy
In 2007, UCR completed a photovoltaic installation at the James Reserve, a small field research site located 50 miles east of the campus in the San Bernardino National Forest. The installation allows the facility to be taken completely off the grid. The polycrystalline silicon panels produce roughly 74 kWh per day over a yearly average.

2.2 Metrics
Energy consumption data will be thoroughly and consistently tracked to enable UCR to assess progress towards meeting climate protection goals. The university is required to report emissions from electricity and natural gas use to both the California Climate Action Registry and the American College and University Presidents Climate Challenge.

Energy Use by Fuel Type
UCR has seen a steady increase in its electricity use since 2001. The campus significantly reduced its natural gas consumption between 2003 and 2004 by retrofitting its natural gas fired boilers and installing heat recovery.

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity (MWH)</td>
<td>77,653</td>
<td>96,657</td>
<td>107,213</td>
<td>108,343</td>
<td>114,283</td>
<td>116,596</td>
<td>123,945</td>
<td>124,496</td>
</tr>
<tr>
<td>Natural Gas (MMBtu)</td>
<td>490,000</td>
<td>510,000</td>
<td>620,000</td>
<td>370,000</td>
<td>370,000</td>
<td>380,000</td>
<td>410,000</td>
<td>410,000</td>
</tr>
</tbody>
</table>

Energy Intensity
Table D shows the amount of energy consumed annually to operate a unit of floor space over time. This metric removes the effect of gross square footage growth on total energy consumption, leaving a useful comparison of how efficiently the campus is operating its buildings over time.

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<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Intensity</td>
<td>153.8</td>
<td>160.0</td>
<td>185.9</td>
<td>137.9</td>
<td>132.8</td>
<td>134.6</td>
<td>131.2</td>
<td>128.7</td>
</tr>
</tbody>
</table>

2.3 Short Term Goals (0-2 years)
Goal 1: Hire an Energy and Utilities Manager
The campus Energy and Utilities Manager will be responsible for developing and implementing energy reduction projects, soliciting for grants and rebates, developing monitoring and metering standard for buildings, and spearheading efforts to bring renewable energy to the campus. This
position will also oversee the implementation of the climate neutrality plan and guide the campus in reaching the 2000 and 1990 baselines by 2014 and 2020, respectively. See the General Recommendations section for details on this position.

Goal 2: Require all new construction projects to surpass California Energy Code Title 24 by 30 percent or better
UCR has committed to exceeding current UC Policy mandates by adopting LEED Gold as its minimum level of certification. Similarly raising the bar with respect to Title 24 is essential in order for the campus to make critical emission reductions and meet its climate neutrality goals. Formalize the campus’s requirement by adopting a written policy signed by the Chancellor stating that all projects programmed after July 1, 2009 are required to surpass Title 24 by at least 30 percent.

- Assemble a group of staff to develop the policy for the Chancellor’s commitment, signature and support.
- To underwrite possible additional costs for energy modeling and energy-efficiency measures, register every eligible project through the investor-owned utilities’ Savings by Design program.
- Explore other potential energy-efficiency incentive programs.
- Develop on-campus energy system assessment, commissioning and energy modeling expertise, particularly in relation to UCR’s current programming.

Goal 3: Assemble a Climate Neutrality team responsible for managing implementation of the Climate Action Plan
Cooperation and collaboration between all areas of campus is essential for reducing the UCR’s carbon footprint. The Climate Neutrality team will take a leadership role in managing implementation, identifying and soliciting funding, and reporting progress on the Climate Action Plan. To better manage the many players and programs required to achieve climate neutrality, the team should include the following: staff with a working knowledge of campus operations, including the energy manager; members of high-level management that can get campus buy-in; influential faculty members equipped to convey the importance of climate neutrality to the campus community; a development officer; and student representatives.

- The team will be responsible for providing periodic progress reports to the ACUPCC, which will post and disseminate the reports to make UCR’s progress publicly available.
- The team will provide the campus with quarterly progress reports. Post progress reports on the UCR sustainability website as well.

Goal 4: Perform monitoring-based commissioning (MBCx) on ten state-funded buildings
Buildings that undergo monitoring-based commissioning typically experience a 10 percent reduction in energy use. Complete 10 of the 16 monitoring-based commissioning projects identified for state-funded buildings in the Strategic Energy Plan.

- Apply for utility incentives through the UC/CSU/IOU Energy Efficiency Partnership Program.
Combine monitoring-based commissioning with deferred maintenance for a better payback. See the appendix for a list of project buildings, anticipated energy savings and associated greenhouse gas emission reductions.

Goal 5: Implement heat recovery projects in six state-funded buildings
UCR will be undertaking heat recovery projects for six state-funded buildings beginning in fiscal year 2008/09, with completion by 2010. Greenhouse gas emissions reductions produced by these projects are estimated at roughly 2,100 metric tons.
  - Apply for utility incentives through the UC/CSU/IOU Energy Efficiency Partnership Program.
  - See the appendix for a list of project buildings, anticipated energy savings and associated greenhouse gas emission reductions.

Goal 6: Launch fume hood sash management campaign
 Deploying a “shut the sash” campaign can shape user behavior and save energy. This is a useful program even though many labs have occupancy sensors because training users to do this consistently will help ensure proper occupant behavior at labs that lack sensors.
  - Affix stickers to fume hoods that instruct users to close sashes to save energy.
  - Train laboratory managers and principle investigators in the program’s goals so they may convey the importance of the campaign to students and teacher’s aids.

Goal 7: Procure 20 percent of electricity from renewable sources by 2010 per UC policy
In 2006, 13 percent of Riverside Public Utility’s power mix was derived from eligible renewable sources. The utility is on track to meet the 20 percent goal by 2010, and is scheduled to increase its renewable resources portfolio to 33 percent by 2011 through its purchase of geothermal power.
  - Send a letter of support to RPU for its efforts to increase the amount of power supplied by renewable sources. Encourage the utility to continue its pursuit of renewable energy.

Goal 8: Increase campus participation with the UC Systemwide Sustainability Working Group for Climate Change
The group’s monthly conference serves as a forum for best practice sharing.
  - Assign at least two individuals to regularly join these calls. Select representatives from departments that work on the campus’s greenhouse gas inventory and are involved with executing the climate action plan, such as Transportation and Parking Services, Environmental Health & Safety, and Capital and Physical Planning.
  - Discuss the content of the calls during the appropriate Chancellor’s Committee on Sustainability Workgroup meetings.

Goal 9: Participate in the UC Energy Manager’s monthly conference call
This call is administered by the UC Office of the President to discuss salient energy-related topics, including the Energy Efficiency Partnership Program.
• Assign an individual to join the UC Energy Manager’s call with UC Office of the President. Responsibility to join the call will be assumed by the individual hired to be the campus Energy and Utilities Manager.

**Goal 10: Involve UCR alumni in renewable energy installations**
Conducting effective outreach to UCR alumni may produce funding that will aid the university in achieving its climate protection goals.
• Work with the Office of Development to create an alumni outreach campaign that announces UCR’s climate neutrality goals and solicits funding for innovative renewable energy projects.

**Goal 11: Develop a reference resource for energy efficiency incentives**
Creating a single reference resource for energy efficiency incentives will enable project teams to locate available funding opportunities quickly and effectively.
• Include the Database of State Incentives for Renewables & Efficiency (DSIRE) website, a comprehensive database containing state, local, utility, and federal incentives that promote renewable energy and energy efficiency
  [www.dsireusa.org](http://www.dsireusa.org)
• Include the Southern California Gas Company rebate program.

### 2.4 Intermediate Goals (2-5 years)

**Goal 1: Perform monitoring-based commissioning on the six remaining state-funded buildings identified in the SEP**
Implement monitoring-based commissioning projects identified for the remaining six of the 16 state-funded buildings in the Strategic Energy Plan.
• Evaluate the results and outcomes of the initial monitoring-based commissioning effort. Apply lessons learned when implementing the next round of MBCx projects.
• Apply for utility incentives through the UC/CSU/IOU Energy Efficiency Partnership Program.
• See the appendix for a list of project buildings, anticipated energy savings and associated greenhouse gas emission reductions.
• Develop the next phase of the MBCx program to target buildings that are not state-funded.

**Goal 2: Increase on-site renewable energy capacity to one megawatt (MW) by 2014**
UC Policy calls for the systemwide installation of 10 megawatts of local renewable power by 2014. As one of 10 UC campuses, UCR should install one megawatt by 2014. UCR has begun investigating using a one megawatt solar farm to achieve this goal.
• Perform a feasibility study to determine the potential for installing large photovoltaic (PV) arrays on existing campus buildings.
• Apply for rebate incentives.
• If funding is not available to integrate photovoltaics in new construction projects, specify roof designs that can accommodate PV installations in anticipation of future funding availability.

**Goal 3: Purchase renewable geothermal power**
The City of Riverside has contracted with the Northwestern Band of Shoshone Nation to purchase renewable power from a new 100 megawatt geothermal power plant. The first 32 megawatts will come online in 2010. The City of Riverside will ultimately purchase 64 megawatts.

- Work with the City of Riverside to develop an agreement whereby UCR can purchase a portion of the plant’s output.
- See the appendix for calculations for different carbon emission reduction scenarios where the university is able to purchase 2, 5 or 10 megawatts.

**Goal 4: Investigate energy-saving information technology (IT) projects**
Perform a study to quantify the energy savings potential for implementing cost-effective IT projects across campus, including:

- Replace equipment with Energy Star products, including desktop and laptop computers, printers, monitors and copy machines.
- Implement a personal computer power management program.
- Consolidate servers and investigate opportunities for server virtualization.

**Goal 5: Require that eligible projects utilize the Savings by Design and Labs 21 programs**
Utilizing the Savings by Design and Labs21 programs will generate significant energy savings and reduce operational costs. UCR must take advantage of this program in order to meet its mandate to surpass Title 24 by 30 percent. Formalize the campus’s requirement by adopting a written policy signed by the Chancellor stating that all eligible projects must use these programs.

- Assemble a group of staff to develop the policy for the Chancellor’s commitment, signature and support.

**Goal 6: Develop behavioral/education programs that promote energy conservation**
Properly designed and operated buildings and utility infrastructure are necessary components of an energy-efficient campus. However, building users must also be educated and encouraged to conserve energy if UCR is to meet its climate protection goals.

- Develop a variety of campaigns and educational materials to educate the campus community on the importance of energy conservation.
- Develop useful tips for saving energy in offices, classrooms, laboratories and housing facilities. Post this information to the sustainability website.
- Develop estimates of the energy savings produced through conservation efforts and include this information in future versions of UCR’s climate action plan.
Goal 7: Develop and implement a campus standard retro-commissioning (RCx) protocol

Retro-commissioning applies the commissioning process to existing buildings to improve how building equipment and systems function together. Developing a standard RCx protocol will help UCR achieve cost savings, improve systems operations, and enhance indoor air quality for building occupants. The RCx process should be consistent with LEED standards and applied to energy and water systems of representative campus buildings.

- Develop a plan and scope for each building, including a building equipment list, performance measurement frequency for each equipment item, and steps to respond to deviation from expected performance parameters, per LEED EBOM requirements.
- Encourage or require staff to take commissioning classes offered through local utilities and the Building Operator Certification training and certification program. [www.theboc.info/training.html](http://www.theboc.info/training.html)
- Implement retro-commissioning in five to ten buildings not identified for monitoring-based commissioning projects in the Strategic Energy Plan. Develop a schedule for retro-commissioning all campus buildings outside the scope of the SEP.

Goal 8: Pursue funding from the University of California/California State University/Investor-Owned Utility (UC/CSU/IOU) Energy Efficiency Partnership Program

UCR’s natural gas provider, the Southern California Gas Company, is one of the state’s four major investor-owned utilities. UCR is eligible for energy incentives through the UC/CSU/IOU Energy Efficiency Partnership Program. [www.uccsuiooee.org](http://www.uccsuiooee.org)

- The campus Energy and Utilities Manager will be responsible for submitting funding proposals to the Partnership Program for projects that produce natural gas savings.
- Use the Strategic Energy Plan to prioritize projects.

Goal 9: Reduce greenhouse gas emissions to 2000 levels by 2014

Reassess progress made in achieving the emission reduction targets outlined in the climate action plan, taking into account new campus growth, every two years.

- Complete Phase 1 of the Strategic Energy Plan project list.
- See the appendix for a list of project buildings, anticipated energy savings and associated greenhouse gas emission reductions.

Goal 10: Revise the Climate Action Plan

The second version of the CAP will contain a more complete greenhouse gas emission profile that contains commuting and air travel emissions. With this information, UCR will select a target date for achieving climate neutrality and identify appropriate actions to support this goal.

- Evaluate progress made in reaching the 2014 climate target.
- The current CAP uses projected growth rates to forecast UCR’s emissions through 2030. The second CAP should evaluate this projection and revise it as necessary given actual campus growth projections for future growth.
• Use the emission forecast to develop a new CAP that takes into account the campus’s emission reduction progress.
• Select a target date for climate neutrality and develop strategies for reducing and/or offsetting the campus’s remaining greenhouse gas emissions.
• Submit the revised CAP to UC Office of the President and the ACUPCC.

2.5 Long Term Goals (5-10 years)

Goal 1: Complete monitoring-based commissioning on all buildings that are not state-funded
The Strategic Energy Plan estimates that UCR can save over 1,000 metric tons of greenhouse gases by implementing monitoring-based commissioning in six buildings that are not state-funded.
• Apply for utility incentives through the UC/CSU/IOU Energy Efficiency Partnership Program.

Goal 2: Develop student residence hall energy competitions
Students can develop and implement energy competitions with support from the Energy Manager. The program encourages freshmen students to be aware of energy issues and practice energy conservation throughout their time at UCR. This type of educational outreach program has proven highly successful at many campuses.
• Install low-watt LCD screens in the lobbies of participating residence halls to provide occupants with real-time energy use information and energy saving tips.
• Foster a spirit of friendly competition.
• Offer incentives to occupants of the residence hall with the largest reduction in energy consumption.

Goal 3: Develop energy intensity standards for the campus’s major space usage types
Based on UCR’s historical energy intensity and the campus’s preferred level of energy use, develop energy intensity standards for the major space usage types on campus, such as administrative/classroom and laboratory. Use the energy intensity standards to target energy use at the building or departmental level and promote conservation.
• Use the energy intensity standards to develop realistic energy budgets for each campus department.
• Create an energy “bill” to increase awareness of energy consumption and guide smart energy use.
• Provide departments with seasonal tips for reducing energy use.
• Consider holding competitions between buildings of the same usage type, similar to the student residence hall competitions described in Goal 2.
Goal 4: Adopt a consistent integrative approach to project delivery

Typical design and construction methods do not encourage realization of cross-discipline synergies that result in more energy-efficient and environmentally-responsive buildings. A consistent process will help project stakeholders effectively manage the optimization of complex systems while pursuing sustainable practices in design and construction. This process will require that all projects record clearly stated, measurable project requirements for energy using systems.

- Utilize the America National Standards Institute/Institute for Market Transformation to Sustainability (ANSI/MTS) Whole Systems Integrated Process Guide (WSIP) for Sustainable Buildings and Communities to develop a campus-specific building project delivery process that utilizes whole building design principles.
- For each project, create a Basis of Design that is directly responsive those requirements prior to proceeding with design. The Basis of Design will address building siting, building envelope design, and the use of "free" resources such as daylight and natural ventilation prior to describing energy using system design (such as HVAC and lighting systems and their controls).

Goal 5: Investigate emerging technologies

To meet its climate neutrality goals, UCR must investigate emerging energy efficiency technologies that can be applied in campus buildings. The campus must pilot appropriate technologies to develop a working knowledge of new systems.

- Attend conferences and workshops dedicated to emerging technologies.
- Conduct site visits to projects that make use of innovative technologies and building systems. Discuss system performance with building owners and operators.

Goal 6: Establish a climate-friendly investing policy

Per ACUPCC recommendation, establish a climate-friendly investing policy or a campus committee that supports climate and sustainability shareholder proposals at companies where UCR’s endowment is invested.

- Form a committee to research and draft a policy for climate-friendly investing.
- Contact other universities who have successfully adopted a similar policy.
- Utilize the Sustainable Endowment Institute and the Responsible Endowment Coalition as resources.
  
  [www.endowmentinstitute.org](http://www.endowmentinstitute.org)
  [www.endowmentethics.org](http://www.endowmentethics.org)
- Bring the policy to the Chancellor for his or her commitment, signature and support.
Goal 7: Reduce greenhouse gas emissions to 1990 levels by 2020
Reassess progress made in achieving the emission reduction targets outlined in the climate action plan. Develop and implement additional projects as necessary to achieve 1990 levels by 2020.
  • Complete Phase 2 of the Strategic Energy Plan project list. See the appendix for a list of project buildings, anticipated energy savings and associated greenhouse gas emission reductions.
  • Implement initiatives developed for the second version of the Climate Action Plan.

2.6 Demonstration Projects

Project 1
Submit exceptional energy-efficiency projects into the UC/CSU Best Practice Awards program, offered annually in conjunction with the UC/CSU/CCC Sustainability Conference. Winning a Best Practice Award will publicize UCR’s innovative energy-efficiency projects and integrate the university into a program in which many UC and CSU campuses are actively involved.
www.greenbuildings.berkeley.edu/best_practices.htm

Project 2
Develop and launch an online building dashboard that enables the campus community to see much energy various buildings consume both historically and in real-time. Develop the dashboard to allow users to compare buildings against one another. Funding assistance can be provided through The Green Initiative Fund (TGIF) student fee referendum. See UC Berkeley’s building dashboard for information.
www.demandless.org/building

Project 3
Create a webpage within the UCR sustainability website dedicated to energy. Use the site to offer energy conservation tips, provide information on UCR’s current energy efficiency projects, detail the campus’s involvement in the California Climate Action Registry, and address frequency asked questions. The building dashboard developed in Project 2 should be linked to this page.
3. WATER

UCR is located in a semi-arid climate and receives about ten inches of rain annually. Potable water is supplied to the campus by the City of Riverside, which takes most of its water from underground aquifers in the San Bernardino/Riverside area. Historically, 60 percent the potable water used at UCR is applied to landscaping. A significant amount of new landscaping is anticipated as UCR develops the West Campus. Both the 2005 Long Range Development Plan (LRDP) and this Sustainability Action Plan recommend that drought-tolerant and native and/or adapted plants, in conjunction with low-water landscape design strategies and technologies, be standard practice for new development to reduce irrigation potable water use.

A large portion of the campus’s building stock is 1960s vintage, when the UCR experienced a boom in construction and enrollment. For the two decades following little construction occurred until the university’s next growth spurt in the 1990s. This pattern of growth means that numerous campus buildings are equipped with plumbing fixtures and fittings that meet less stringent water efficiency standards than those required by current building code.

UCR is now anticipating another surge in enrollment, which will have a significant impact on potable water use. The campus is planning for the student population to swell to 25,000 by 2015, a 96 percent increase in enrollment as compared to 2000. The 2005 Long Range Development Plan sets a goal to house 50 percent of students on campus by 2015. Adding thousands of beds will unavoidably drive up UCR’s potable water consumption. Additionally, academic and staff employment levels will need to be augmented to support the added students. The LRDP projects potable water demand in 2015 to be 3.0 million gallons per day on the East Campus and 1.2 million gallons on the West Campus. These figures factor in sustainable water use practices and policies. In 2005, the East Campus used 2.1 million gallons daily and the West Campus used less than 0.2 million gallons daily.

As the strain on potable water resources grows with each passing year, the need for aggressive water conservation efforts and the deployment of new water-saving technologies heightens. The U.S. Environmental Protection Agency reports that “at least 36 states are anticipating local, regional, or statewide water shortages by 2013, even under non-drought conditions”. California is most certainly among these 36 states. A fundamental change in the way water resources are valued and used is essential in the face of this chronic shortage.

Water consumption is also strongly tied to greenhouse gas emissions. A 2005 report by the California Energy Commission entitled “California’s Water-Energy Relationship” states that “water-related energy use consumes 19 percent of the state’s electricity, 30 percent of its natural gas, and 88 billion gallons of diesel fuel every year.” Additionally, “water conveyance requires more than 50 times the energy for Southern California than it does for Northern California,” which is “five times the national average”. This is because most of the state’s rain falls in the north,
which requires that water be pumped hundreds of miles over varying elevations changes before its delivery to end-users. In essence, saving water means saving energy. To accomplish its climate neutrality goals, UCR must address its water use and the associated emissions.

The Water focus area covers both landscape irrigation and indoor water use issues. Given that irrigation is a site concern that shapes many landscape design and maintenance decisions, outdoor water issues are covered here as well as the Sites section. Stormwater issues are discussed exclusively in the Sites section.

### 3.1 Current Best Practices

In 1980 UCR installed a computer-based irrigation system to manage its water use. To capitalize on developments in irrigation technology since then, the campus is converting the original system to a Toro Sentinel weather-based irrigation system. The Sentinel system adjusts the irrigation schedule based on local atmospheric data collected by the onsite weather station and the water needs of plants located near irrigation controllers placed throughout campus. Matching delivered water to actual conditions on the ground helps eliminate the potential for over and under watering. With irrigation historically comprising 60 percent of UCR’s total potable water demand, the Toro Sentinel system is an important mechanism for achieving judicious water use at UCR. Currently, about 60 percent of the campus has been converted to the new irrigation system, 35 percent uses the old system, and 5 percent is controlled manually.

UCR converted a soccer field on the East Campus to artificial turf in July 2007, eliminating water and fertilizer use and reducing maintenance requirements. This project saves an estimated one million gallons of water per year, and has been well-received by students. The campus plans to convert additional athletic fields in the future.

The campus drops grass clippings on freshly-mowed turf areas to reduce irrigation requirements and improve soil health. This practice creates a protective layer that obstructs direct sunlight and helps the soil retain moisture. Dropped clippings also return nutrients and organic matter to the soil, creating a healthier lawn that is better able to resist drought.

### 3.2 Metrics

**Water Use**

UCR reconstructed its gross water use back to 2001 using billing records and meter readings. These values are the university’s best estimate at the time of writing this plan, and may be revised in the future. The campus does not have separate metering for domestic and irrigation water. UCR used yearly evapotranspiration rates for its landscaped areas to estimate its annual irrigation water use.
Table A. Water Use in Millions of Gallons

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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<tbody>
<tr>
<td>Total Water</td>
<td>522.9</td>
<td>525.1</td>
<td>521.4</td>
<td>517.7</td>
<td>502.7</td>
<td>515.4</td>
<td>557.3</td>
<td>540.1</td>
</tr>
<tr>
<td>Purchases</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td>291.7</td>
<td>301.5</td>
<td>287.3</td>
<td>305.2</td>
<td>284.3</td>
<td>302.2</td>
<td>309.7</td>
<td>311.9</td>
</tr>
<tr>
<td>Water Use</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Capita</td>
<td>.03136</td>
<td>.02877</td>
<td>.02685</td>
<td>.02638</td>
<td>.02600</td>
<td>.02599</td>
<td>.02705</td>
<td>.02499</td>
</tr>
<tr>
<td>Water Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Greenhouse Gas Emissions
A significant amount of electricity is required to convey, treat and distribute water, and to treat wastewater. The California Energy Commission reports that the energy intensity of water used by Southern California communities is 12,700 kWh per million gallons. UCR’s water-related greenhouse gas emissions are calculated using this value and the Climate Action Registry’s default emission factor for the CALI – WECC eGRID Subregion.

Table B. Greenhouse Gas Emissions in Metric Tons of CO₂ Equivalent

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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</thead>
<tbody>
<tr>
<td>GHG Emissions</td>
<td>2,423</td>
<td>2,434</td>
<td>2,416</td>
<td>2,399</td>
<td>2,330</td>
<td>2,389</td>
<td>2,583</td>
<td>2,503</td>
</tr>
</tbody>
</table>

3.3 Short Term Goals (0-2 years)

Goal 1: Set a per capita water use goal for 2015
Setting a 2015 goal for per capita water use will provide UCR with a roadmap for measuring water performance over a long term horizon. UCR should populate the campus’s per capita water use metric each year from 2009 through 2015 to continually evaluate how aggressive its pursuit of water conservation projects must be to reach the 2015 goal. This will enable course correction and help ensure that UCR stays on track to optimize its use of water resources.

• The LRDP plans for the student population to reach 25,000 by 2015. Based on this figure, project academic and staff appointments for 2015. Using this per capita figure and the projected water use figures from the LRDP, set a per capita water use goal for 2015.
• The Institutional Planning unit of the Academic Planning and Budget department compiles student headcounts and academic and staff full time employee appointments on an annual basis. Obtain figures from this department to calculate per capita water use.

Goal 2: Reduce potable water used to irrigate landscape by 10 percent
Many different strategies must be employed over the long term to achieve reductions in potable water used for landscape irrigation. However, pursuing a variety of water conservation projects simultaneously will produce the larger intended effect.
• Convert water-intensive turf areas that are not programmatically necessary to drought-tolerant plantings. See the Sites section for a detailed discussion.
• Design landscaping for the West Campus with few grassy malls, placing emphasis on drought-tolerant and Southern California native plants.
• Design landscaping with plantings grouped based on water needs, a practice known as hydrozoning. This best practice strategy reduces the amount of water that must be delivered to a given area because one high-water use species is not dictating the overall level of irrigation. Grouping plants according to preferred microclimate also improves the efficiency of the weather-based irrigation system.
• Create a plan and timetable for installing flow sensors on the Toro Sentinel weather-based irrigation system. These devices detect leaks by determining when a flow exists where none should. This feature will immediately alert staff of any leaks, expediting maintenance activities that prevent irrigation runoff and save potable water. This goal is also listed in the Sites short term goals section.
• Pilot gray water systems in new student housing projects to offset some potable water used for irrigation. See the intermediate goals of the Sites section for a detailed discussion.

Goal 3: Conduct building water audits
UCR has a large number of older buildings that were designed under building codes that required less-efficient plumbing fixtures and fittings. These buildings provide a good opportunity to implement low-cost water conservation devices. Water audits performed in these buildings will support certifying buildings through the LEED EBOM program, which requires water efficiency calculations for indoor plumbing fixtures and fittings as a prerequisite to certification.
  • Identify five to ten buildings of different building types, e.g. academic/administrative, housing, light research, heavy research, performing arts/theater, and gymnasium, to analyze the effect of conservation activities in a representative sample of campus buildings.
  • Conduct water audits in these buildings. Catalogue all installed fixtures and determine flow rates for each fixture type, using manufacturer’s product literature or measured flow rates.
  • Calculate each building’s baseline water usage. See the LEED EBOM Reference Guide, Water Efficiency prerequisite 1, for instructions.
  • Recruit students to assist with audits through a service learning course or internship project.
  • Install low-cost water saving devices such as sink faucet aerators that meet or surpass the Energy Policy Act of 2005.
  • Repair all broken fixtures or fittings identified through the audit.
  • Calculate water usage with the new devices and compare to the building baseline to determine water savings.

Goal 4: Establish minimum flow standards for all water-using fixtures
Establishing minimum flow standards will guarantee that high-efficiency fixtures will be installed in all new construction and retrofit projects.
  • Adopt standards that exceed code requirements.
• The fixtures included in this goal are kitchen faucets, restroom faucets, showers, urinals, and toilets.
• Test plumbing fixtures new to campus including waterfree urinals and dual flush toilets. Adopting the flow rate of these devices as UCR’s minimum standard will produce significant water savings.

Goal 5: Pilot high-efficiency and dual flush toilet fixtures
High-efficiency toilets use just 1.28 gallon per flush (GPF). Dual flush toilets generate substantial water savings by providing different amounts of water to dispose of liquid or solid waste.
• Replace several older fixtures that are over 1.6 GPF, or specify water-saving toilets in new construction.
• Test different brands and products with the intent of creating a water-saving toilet specification for inclusion in campus design standards for both new buildings and restroom retrofits.
• Test UpperCut™ flushometers on existing toilets that are relatively new. This dual-flush handle provides a reduced flush when pushed up and a full flush when pushed down. The device retrofits to most existing valves. www.sloanvalve.com/index_3036_ENU_HTML.htm
• Install educational signage to encourage proper use of dual flush fixtures.
• Gather feedback from the campus on performance and ease of use.
• Gather feedback from maintenance and custodial workers.

Goal 6: Design an educational component to water conservation efforts
Building user’s understanding of water issues can hugely impact the amount of water consumed in a building. Inspiring behavioral change is an important component to any water conservation effort. A simple and clear educational outreach campaign should be designed for UCR and implemented consistently throughout campus in all water conservation projects.
• Create a signage campaign that is simple, clear and can be easily installed in existing buildings of any architectural style.
• Where appropriate, include facts about the impacts of water usage on California’s environment, the energy required to convey and dispose of potable water, and regional water shortages. As water conservation on campus improves, include metrics to keep the campus community motivated to continue water saving efforts.
• As waterfree urinals are installed, post semi-permanent educational signage that identifies new units and UCR’s water saving goals. Installed signage or stickers is preferable to posted paper fliers.
• Install appropriate signage as new water saving technologies are adopted, such as dual flush toilets or gray water.
Goal 7: Apply for water rebates through the Save A Buck program
UCR is eligible for water rebates through the Metropolitan Water District’s commercial program called Save A Buck. This program is administered in Riverside County through the Western Municipal Water District. Cash rebates are available for a variety of water-saving technologies including high-efficiency toilets and urinals, weather-based irrigation controllers, and synthetic turf. www.mwdsaveabuck.com/members_02.php?id_agncy=29
- Rebate funds are available on a first-come, first-serve basis until rebate funds are depleted. Consider the rebate cycle and time retrofit projects accordingly.

Goal 8: Develop a water efficiency retrofit program
Developing a list of water efficiency projects will allow the campus to strategically prioritize implementation of cost-effective projects. The list can be modeled off the Strategic Energy Plan (SEP), a comprehensive list of energy efficiency projects developed to guide the campus in its energy and emission reduction efforts.
- Use the water audit results to develop the project list.
- Use rebates offered through the Save A Buck program to help fund projects. Include rebates in project analysis to obtain accurate paybacks and prioritize projects.
- Contact vendors of water-saving technologies the campus is interested in testing. Vendors may be willing to donate fixtures and partner with UCR to implement projects from the water efficiency list.

3.4 Intermediate Goals (2-5 years)
Goal 1: Reduce potable water use per square foot of building space
AASHE’s STARS program determines in-building water use performance based on a percent reduction per gross square footage of building space measured against a baseline year of 2000-2001. This metric does not penalize universities for physical growth.
- Operations credit 3 in the STARS program awards up to three points for a 10, 25 or 50 percent reduction. Consider taking strategic action to reduce UCR’s building potable water use in line with this credit in anticipation of joining the STARS program.
- Calculate UCR’s percent reduction and execute water conservation projects outlined in this document to achieve additional in-building water savings.

Goal 2: Reduce potable water used to irrigate landscape by 20 percent
Many different strategies must be employed over the long term to achieve reductions in potable water used for landscape irrigation. However, pursuing a variety of water conservation projects simultaneously will produce the larger intended effect.
- Incrementally install flow sensors on the Toro Sentinel weather-based irrigation system as funding is secured per the roadmap created in the short term goals. Equip the majority of the irrigation system with sensors within the timeframe of the intermediate goals.
- Convert unnecessary turf to sustainable landscaping.
• Work with the City of Riverside to devise a long term plan for extending municipal reclaimed water lines to the campus. Consider focusing on West Campus, where upcoming construction activities can incorporate reclaimed water piping projects more easily than the established East Campus.
• Use untreated, non-potable agricultural water flowing through the Gage Canal to irrigate the West Campus.

Goal 3: Install sub-metering for irrigation water
Collecting reliable data on irrigation water use is the first step to developing water management practices that reduce overall consumption. Metering is necessary to populate irrigation water use metrics with accurate data.
• Installing meters on individual existing buildings may be costly. Consider installing meters at representative locations and then interpolating data.
• Research rebate opportunities with the Metropolitan Water District’s Save A Buck program.

Goal 4: Pilot water-saving urinals
A waterfree urinal saves roughly 45,000 gallons of potable water per year. The touch-free feature improves restroom sanitation, and waterfree urinals eliminate odors with proper care. Installing waterfree urinals also reduces sewage costs. Low-flow urinals that use 1/8 gallon per flush (GPF) also hold tremendous water-saving potential and may find broader user acceptance than waterfree urinals.
• Combine water-saving urinal installations and retrofits with LEED certification efforts.
• Install waterfree and 1/8 GPF urinals in high-use restrooms to introduce a larger percent of the campus to the technology and create a larger pool of individuals from which to solicit feedback.
• Waterfree urinals are often disliked by users due to improper maintenance. Train all custodial workers on new urinal maintenance, even those that do not regularly clean buildings with waterfree urinals. This will allow proper care to continue should crew member substitutions or other unforeseen crew changes occur.
• Contact other universities that use waterfree urinals to discuss their experience and product recommendations.
• Contact waterfree urinal manufacturers and inquire about receiving a free urinal to install and test.

Goal 5: Formally adopt water-saving toilet specifications
Adopting design specifications will provide for the uniform adoption of low volume fixtures in all new construction and restroom retrofit projects. After testing dual flush products in the short term goals timeframe, UCR can use performance data to determine if this technology is a reliable, cost effective way to conserve water. Alternately, UCR may choose to adopt low volume, 1.28 GPF toilets as the campus standard.
• Evaluate feedback gathered from campus community and maintenance and custodial workers from the pilot dual flush fixture testing completed in the short term goals timeframe.
• Consider the first cost and the operational savings that will be generated over the lifetime of different low volume fixtures, using appropriate escalation factors for potable water prices.
• Formally adopt water-saving toilet specifications.

Goal 6: Demonstrate best practices in landscape water conservation
Over half of the potable water consumed at UCR is applied to landscaping. Planned campus growth lends many opportunities to demonstrate landscaping water conservation best practices in new construction.

• Consider combining water-conserving landscaping with projects pursuing LEED certification.
• Select drought-tolerant species with water requirements that are appropriate to the semi-arid climate.
• Select native and/or adapted vegetation that is suited to the local climate and requires little active maintenance such as pest protection, irrigation or fertilization once root systems are established.
• Design landscaping with grouped plantings based on water needs. This best practice strategy, known as hydrozoning, reduces the amount of water that must be delivered to a given area because one high-water use species is not dictating the overall level of irrigation.
• Connect all new building landscapes to UCR’s water-efficient Toro Sentinel irrigation system.
• Work with the Office of Development to solicit donor funding for natural landscape installations.
• Enlist volunteer groups of students, staff and faculty to install and/or maintain water-efficient gardens as a demonstration and teaching effort.

Goal 7: Commit to a minimum point threshold in the LEED Water Efficiency credit category
Part of the appeal of the LEED program is that projects have the freedom to choose from a range sustainability issues and pursue those that are important to the project team, as well as feasible with respect to budget, location and other project-specific factors. UCR can demonstrate that it places a high value on the judicious use of water by voluntarily adopting a minimum point threshold in the Water Efficiency for all LEED certified projects.

• Given the importance of installing fixtures and technologies that facilitate water conservation over a building’s lifetime, UCR should voluntarily commit to earning at least three of five available points in the LEED for New Construction program.
• To ensure that existing buildings achieve ongoing water savings, UCR should voluntarily commit to earning at least four of ten available points in the LEED for Existing Buildings: Operations and Maintenance program.
• UCR has voluntarily adopted minimum LEED standards in the past. Committing to a minimum point threshold in the Water Efficiency category will require that UCR staff champion this idea and bring it to UCR’s senior management for formal adoption.
• Hiring a campus Sustainability Manager under the Office of Design and Construction would provide UCR with an individual to champion this goal and ensure it is met on all projects.

Goal 8: Pilot gray water technology
Using gray water for purposes that do not require drinking-quality water, such as irrigation, is an environmentally responsible way to offset some potable water consumption. Using gray water also reduces burdens on municipal sewer systems. By piloting gray water technologies on campus, UCR can mitigate some of its upcoming future growth and model a best practice for the region. The City of Riverside does allow the installation of gray water systems, which removes an important barrier currently preventing other campuses from piloting gray water systems using municipal gray water lines.
• New student housing projects present UCR with a good opportunity to install gray water systems, as domestic water use is higher in these buildings than other campus building types.

3.5 Long Term Goals (5-10 years)

Goal 1: Achieve the per capita water use 2015 goal set in the short term goals
Water-efficiency retrofits, wise landscape design and maintenance choices, innovative technologies, water-efficient new buildings, and educational outreach all influence UCR's per capita water use. UCR will need to implement a variety of water conservation projects to achieve the 2015 per capita water use goal set in the short term goals.
• Calculate the campus’s per capita water use each year to evaluate UCR’s progress towards reaching the 2015 goal.
• Design and implement appropriate retrofit projects and adopt design standards that will enable UCR to reach the 2015 goal.
• Create an educational outreach campaign that effectively inspires water users to make behavioral changes in favor of water conservation.

Goal 2: Reduce potable water used to irrigate landscape by 50 percent on the East campus, and irrigate 100 percent of the West campus with non-potable water
Using reclaimed water for irrigation is an excellent way to offset some potable water use. This is dependent, however, on UCR and the City of Riverside partnering to co-develop a project to extend reclaimed water lines to the campus. The university may also use untreated, non-potable agricultural water flowing via the Gage Canal for irrigation.
• Reclaimed water
  • Work with the City of Riverside to devise a long term plan for extending municipal reclaimed water lines to the campus. Consider focusing on West Campus, where
upcoming construction activities can incorporate reclaimed water piping projects more easily than the established East Campus.

- UCR and the City of Riverside hold monthly meetings to discuss matters that affect both entities. These meetings can be used as a forum for regularly discussing the economics and logistics of bringing reclaimed water to the UCR campus.
- Select two staff members to be responsible for placing this item on the meeting agenda at least three times per year and for issuing progress reports.

- Agricultural water
  - Utilization of Gage Canal water for landscape irrigation will require a dual water delivery system or other special infrastructure.
  - Create a workgroup to develop a plan for bringing agricultural water to the West Campus, and incrementally to the East Campus.

**Goal 3: Require water sub-metering in all new construction projects**

Water use cannot be reduced effectively without measured data. Providing new buildings with sub-metering for irrigation, indoor plumbing fixtures and fittings, domestic hot water, and/or other process water will allow the university to track performance over time, document and understand consumption patterns, and identify opportunities for water savings.

- Installing building-level metering and at least one water subsystem can earn a project two points under the LEED EBOM program.

**Goal 4: Expand use of gray water**

Continue to install gray water technologies in new buildings using lessons learned from the university’s pilot gray water systems.

- Install gray water systems in new housing projects to take advantage of the high domestic water use in these buildings.
- Keep abreast of emerging technologies and regional best practices.

### 3.6 Demonstration Projects

**Project 1**

UCR will be piloting several different types of water-saving fixtures in the near future. Retrofitting a single restroom to exclusively feature water efficient fixtures can create an effective demonstration project. The university can perform active outreach by inviting the campus community to test the dual-flush toilets, waterfree urinals and other water-saving devices. Or, UCR can simply install signage identifying the restroom as a demonstration space for new technologies. Targeting a high-use restroom will allow a larger portion of the campus population to test the technologies and generate more opportunities for feedback.
Project 2
Dundee Residence Hall is a student housing development project in the pre-design phase. UCR is committed to pursuing external certification and delivering a LEED Silver-rated building. This building-type, with high domestic water use from showers, sinks and washing machines, provides an excellent opportunity to pilot a gray water tank storage and treatment system. Offsetting potable water use with a gray water system can help the building reach Silver. Additionally, Dundee Residence Hall is likely to be among UCR’s first set of LEED certified projects. Piloting gray water in this potentially high-profile building makes for a good demonstration site before possible implementation in additional projects. This project also appears in the Sites focus area.

Project 3
Projects that employ water-saving technologies new to UCR should be showcased in a “buildings that teach” spirit to educate building users and bring attention to the university’s water conservation efforts. With the right educational campaign, such as permanently-installed signage or tours of innovative systems, UCR can demonstrate how it is turning sustainability policy on paper into real-world projects that save water resources. The first gray water system implemented on campus is a good match for this demonstration project.

Project 4
UCR will have many opportunities to demonstrate water-efficient landscaping design as the West Campus is built-out. Targeting the landscaping of one new building to include a variety of strategies and plantings that substantially reduce irrigation water use can provide UCR with a good demonstration project. Signage should be installed to educate passers-by and building users on the landscaping best practices employed at the site.

Project 5
Where there are projects requiring significant excavation, consider opportunities to install relatively large scale cisterns as part of the stormwater infrastructure. Cisterns could be used to collect filtered water from a gray water system and provide localized irrigation water to appropriate sites. Cisterns could be networked to optimize stormwater and irrigation efficiency along a campus greenbelt.

3.7 Definitions
Adapted vegetation – plants that are adapted to the local climate and are not considered invasive species or noxious weeds. Adapted plants grow reliably in a given habitat with minimal attention from humans (e.g. pest protection, irrigation, or fertilization) once root systems are established.

Gray water – wastewater that is collected from clothes washers, bathtubs, showers or bathroom sinks
Native vegetation – plants that are indigenous to a locality; plants in America that evolved in a given area prior to the time of settlement by people of European descent

Potable water – high-quality water suitable for drinking

Reclaimed water – treated wastewater that can be used for purposes other than drinking, such as irrigation, fire suppression, and industrial processes
4. SITES

The Sites focus area covers a range of topics that speak to the design and maintenance of UCR’s grounds, landscaping, and hardscape. The content for this section is based on the U.S. Green Building Council’s LEED program, which emphasizes a core set of site issues within the Sustainable Sites credit category. Maintaining continuity with the LEED program provides UCR with a framework for considering site topics that is consistent with a well-established and nationally-recognized program. Structuring the Sites focus area to mirror LEED should also simplify updating the Sustainability Plan to reflect new programs and practices that are adopted during future LEED certification efforts.

The Sites section addresses the following specific topics:

- landscape design
- plant selection
- landscape maintenance practices and equipment
- open space
- integrated pest management
- stormwater management
- building exterior and hardscape maintenance
- heat island reduction
- light pollution
- irrigation water

Irrigation water use is an important facet of site maintenance, and many landscaping decisions are made with the intent of conserving water. However, given the semi-arid regional climate and Southern California’s susceptibility to water shortages, water use was deemed an environmental issue with enough import to warrant its own dedicated section in the Sustainability Plan. To acknowledge this overlap, irrigation water use, reclaimed water and other site water use issues are addressed here as well as in the Water focus area. For other water-related discussions please see the Water section of this plan.

Site Characteristics

The UCR campus is set at the base of the Box Spring Mountains, a semi-arid chaparral and sage scrub ecosystem. The typical weather pattern consists of hot summers with high temperatures that exceed 100 degrees in July and August, and pleasant spring and fall seasons. The region receives little rain, averaging about ten inches annually. The steep slopes of the adjacent mountains create considerable runoff during rainstorms.

UCR has two distinct areas defined by their relationship to the I-215/SR-60 freeway that transects the university – the West Campus and East Campus. The majority of UCR’s facilities and housing
are located on the East Campus, while the West Campus is home to hundreds of acres of agricultural research fields. The landscape of the East Campus is characterized by open, grassy malls designed to contrast the semi-arid environment and provide students with places to study and socialize. In addition to these turf areas, UCR has an abundance of naturalistic open spaces, landscaped courtyards, structural landscaping adjacent to buildings, thematic gardens, and natural plant communities located in the south east hills.

4.1 Current Best Practices

Landscape Design & Maintenance

In 1980 UCR installed a computer-based irrigation system to manage its water use. To capitalize on developments in irrigation technology since then, the campus is converting the original system to a Toro Sentinel weather-based irrigation system. The Sentinel system adjusts the irrigation schedule based on local atmospheric data collected by the onsite weather station and the water needs of the plants found at irrigation controllers placed throughout campus. Matching delivered water to actual conditions on the ground helps eliminate the potential for over and under watering. With irrigation historically comprising 60 percent of UCR’s total potable water demand, the Toro Sentinel system is an important mechanism for achieving judicious water use at UCR. Currently, about 60 percent of the campus has been converted to the new irrigation system, 35 percent uses the old system, and 5 percent is controlled manually.

UCR converted a soccer field on the East Campus to artificial turf in July 2007, eliminating water and fertilizer use and reducing maintenance requirements. This project saves roughly one million gallons of water and 3,500 pounds of fertilizer per year, and has been well-received by students. The campus plans to convert additional athletic fields in the future.

To reduce irrigation requirements and improve soil health, UCR drops grass clippings on turf areas and uses mulch throughout the campus. This also reduces the volume of fertilizer that must be applied. About 90 percent of turf areas do not receive any fertilizer due to this practice.

The campus operates a very successful landscape waste recycling program that diverts 99 percent of green waste from landfills. With the exception of palm fronds and stumps, all green waste generated on the main campus is composted at Agricultural Operations, a field station dedicated to plant sciences research that occupies over 500 acres on the West Campus. In fiscal year 2007/08 the main campus generated 554 tons of landscape waste, providing Agricultural Operations with a sizeable source of compost to apply to its teaching and research fields.

New landscaping equipment purchases are evaluated on their sustainability merits to improve the health of maintenance workers and to protect local air quality. UCR purchases quieter and less-polluting equipment per the recommendations of the South Coast Air Quality Management
District. The campus is working to replace each piece of equipment that reaches the end of its useful life with an environmentally-preferable unit.

UCR’s Campus Design Guidelines contain a plant material palette of species that are approved for use on campus. Species are clearly highlighted as drought tolerant or California native to facilitate the selection of sustainable plantings. Fifty percent of the plants included in the palette are marked drought tolerant, providing UCR with an extensive variety of species that are well-suited to the arid region and require less water to maintain.

**Infrastructure Design & Maintenance**

Building exteriors and hardscapes – including pathways, sidewalks, patios and other pavement – are steam cleaned or pressure washed as needed, which is generally no more than once annually. Eliminating chemical use and reducing the frequency of cleaning activities limit the environmental impact of maintaining UCR’s infrastructure.

UCR uses stormwater best management practices to reduce the pollutant load transported via stormwater into local waterways. Good housekeeping practices, structural controls, and educational outreach are used to reduce potential impacts to water quality during construction projects. UCR uses a variety of means to address on-campus pollutant sources, and carefully manages its two major Arroyos and their tributaries, which treat rainwater naturally and act as the primary drainage systems serving the university.

Every subject area in UCR’s Design Guidelines, from parking lots to building materials to site lighting, contains a dedicated section for sustainability recommendations. Referenced often by campus planners, the guidelines facilitate wise day-to-day decision making that enhances UCR’s identity while making it more sustainable.

The Campus Safety Escort Service partners with the Women’s Resource Center to perform a nighttime “safety walk” every quarter. Areas of campus with insufficient lighting or burnt-out lamps are identified and reported to UCR management. The university has committed to keep energy efficiency and light pollution impacts in mind when installing new site lighting.

**Open Space**

UCR has identified several areas of campus that will remain undeveloped in perpetuity. The Box Spring Mountain foothills on the southeastern part of campus are designated in the 2005 Long Range Development Plan (LRDP) as a Natural Open Space Reserve. These 130.5 acres of undisturbed, mountainous sage scrub habitat provide the university with a sense of place within the semi-arid regional environment. Several naturalistic open spaces, including the Arroyo System, will also remain undeveloped. While no longer truly undisturbed, these areas are being maintained and restored to a historically-appropriate natural state. Found throughout the campus,
naturalistic open spaces will provide wildlife habitat, aid stormwater management, and reduce the campus’s contribution to the heat island effect for UCR’s long term future.

4.2 Metrics

Fertilizer Purchases
UCR uses both synthetic and organic fertilizers to provide landscaping, turf areas and athletic fields with nutrients. The figures below are derived from purchasing records. Years with anomalous fertilizer quantities have been double-checked for accuracy. In 2006, UCR bought synthetic fertilizer for two years, resulting in zero purchases for 2007. UCR also verified the large organic fertilizer purchase in 2004. To reduce the documentation burden of tracking this metric over time, and to ensure a high level of accuracy, UCR will continue to keep records of fertilizer purchases rather than applied quantities. Since the campus cannot apply fertilizer it does not purchase, reducing the quantity of synthetic fertilizer purchases is a reasonable metric for measuring UCR’s performance.

Table A. Fertilizer Purchases in Pounds

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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<tbody>
<tr>
<td>Total Fertilizer</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthetic</td>
<td>26,700</td>
<td>32,000</td>
<td>20,000</td>
<td>1,100</td>
<td>20,500</td>
<td>52,800</td>
<td>0</td>
<td>12,000</td>
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<tr>
<td>Organic</td>
<td>21,778</td>
<td>10,278</td>
<td>8,444</td>
<td>69,667</td>
<td>9,167</td>
<td>8,611</td>
<td>3,000</td>
<td>14,667</td>
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<tr>
<td>Fertilizer per Acre</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Synthetic</td>
<td>226</td>
<td>271</td>
<td>169</td>
<td>9</td>
<td>174</td>
<td>447</td>
<td>0</td>
<td>102</td>
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<tr>
<td>Organic</td>
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<td>87</td>
<td>72</td>
<td>590</td>
<td>78</td>
<td>73</td>
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<td>124</td>
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<td>Percent of Purchases</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthetic</td>
<td>55.08</td>
<td>75.69</td>
<td>70.31</td>
<td>1.55</td>
<td>69.10</td>
<td>85.98</td>
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</tr>
</tbody>
</table>

Irrigation Water
Like many universities, UCR is not connected to municipal reclaimed water lines and uses potable water to irrigate its landscaping and sports fields. The campus achieves considerable water savings through the use of computer-controlled irrigation systems that serve 95 percent of its irrigated landscaping area. A significant amount of new landscaping is anticipated as UCR develops the West Campus. The 2005 LRDP, Campus Design Guidelines, and this Sustainability Action Plan recommend that drought-tolerant and native and/or adapted plants, in conjunction with low-water landscape design strategies and technologies, be standard practice for new development to reduce irrigation potable water use.

The campus does not have separate metering for domestic and irrigation water. UCR used yearly evapotranspiration rates for its landscaped areas to estimate its annual irrigation water use.
<table>
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<tr>
<td>Irrigation Water Use</td>
<td>291.7</td>
<td>301.5</td>
<td>287.3</td>
<td>305.2</td>
<td>284.3</td>
<td>302.2</td>
<td>309.7</td>
<td>311.9</td>
</tr>
</tbody>
</table>

### 4.3 Short Term Goals (0-2 years)

**Goal 1: Test organic fertilizers and reduce synthetic fertilizer purchases**

Synthetic fertilizer products are less desirable than organic fertilizers from an environmental, plant health and soil health standpoint. Over the last nine years, synthetic fertilizer purchases average roughly half of UCR’s total fertilizer purchases. To promote the long term health of UCR’s landscaping, the campus will test organic alternatives with the intent of reducing synthetic fertilizer purchases to 30 percent of total yearly purchases by the end of the short term goals timeframe.

- Consult with local businesses, campuses and municipalities that have converted to organic fertilizers.
- Inquire about fertilizer used at other UC campuses through the UC Systemwide Workgroup for Sustainable Operations conference calls.
- Attend educational classes or conferences hosted by horticultural societies that are designed for organizations with large landscaped site areas to learn about best practices and network with other institutions that are practicing sustainable site maintenance.
- Partner with Agricultural Operations or other campus research units to research organic fertilizer products.
- Test different organic fertilizer products across campus and monitor the results over several seasons.

**Goal 2: Reduce potable water used to irrigate landscape by 10 percent**

Many different strategies must be employed over the long term to achieve reductions in potable water used for landscape irrigation. However, pursuing a variety of water conservation projects simultaneously will produce the larger intended effect.

- Convert water-intensive turf areas that are not programmatically necessary to drought-tolerant plantings. See the Sites section for a detailed discussion.
- Design landscaping for the West Campus with few grassy malls, placing emphasis on drought-tolerant and Southern California native plants.
- Design landscaping with plantings grouped based on water needs, a practice known as hydrozoning. This best practice strategy reduces the amount of water that must be delivered to a given area because one high-water use species is not dictating the overall level of irrigation. Grouping plants according to preferred microclimate also improves the efficiency of the weather-based irrigation system.
- Create a plan and timetable for installing flow sensors on the Toro Sentinel weather-based irrigation system. These devices detect leaks by determining when a flow exists where
none should. This feature will immediately alert staff of any leaks, expediting maintenance activities that prevent irrigation runoff and save potable water. This goal is also listed in the Sites short term goals section.

- Pilot gray water systems in new student housing projects to offset some potable water used for irrigation. See the intermediate goals of the Sites section for a detailed discussion.

**Goal 3: Research and test cordless, electric blowers**

Gas-powered blowers are noisy and generate emissions that impact local air quality and worker health. Electric blowers are an environmentally-preferable alternative that do not create local emissions and are much quieter. UCR requires a cordless electric substitute for its gas blowers because maintenance workers often clear more than an acre hardscape acre at a time. Maneuvering around such large areas requires more mobility than a corded unit can afford. Stray cords are a safety issue, and unplugging and re-plugging an extension cord would place an unreasonable time burden on maintenance staff. The LEED EBOM Sustainable Sites credit 2 requires a phase out of gas-powered blowers, making this an important component of a low-impact site maintenance program.

- Research the maintenance equipment used by universities with a strong LEED program and are likely to have tested electric blowers that use batteries. Other campuses that have large quantities of hardscape probably encountered the same challenges facing UCR.
- Inquire about the equipment used at other UC campuses through the Sustainable Operations Working Group conference calls.
- Purchase and test units that meet UCR’s requirements.
- Create a purchasing plan and timeline for replacing all gas-powered units.

**Goal 4: Finalize the Stormwater Management Plan (SMP)**

While UCR currently follows best management practices for stormwater, the campus Stormwater Management Plan has not been finalized or officially adopted by the university. Given the runoff volume from the Box Spring Mountains, the potential for pollutant-laden stormwater to damage local water bodies, and regulatory requirements, a formal stormwater management plan is necessary. Additionally, UCR plans construct an estimated 8 million square feet of new facilities to accommodate anticipated growth through 2015, making this an important item to complete within the short term goals timeframe.

- Integrate the latest low impact development (LID) practices into the SMP to ensure compliance with upcoming LID MS4 Permit requirements being developed by the Santa Ana Regional Water Quality Control Board.
- Consult the LEED Reference Guide before finalizing the Stormwater Management Plan to help ensure that construction projects following UCR’s plan are LEED compliant. Incorporate LEED requirements to the fullest extent possible to support future building certifications and eliminate the need for duplicative efforts on each LEED project.
Goal 5: Identify potential projects to test pervious paving materials
Pervious paving materials have permeable voids that water drains through, which allows rain to recharge groundwater and reduces stormwater runoff and pollutant loads. The use of pervious concrete is a stormwater best management practice recommended by the EPA. Many hardscape applications including sidewalks, courtyards, fire access roads, and parking lots can be constructed with pervious pavers. UCR will analyze the potential for implementing pervious concrete in upcoming construction or restoration projects with the intent of analyzing factors such as cost, maintenance requirements, and infiltration capabilities, in order to find suitable products for various applications.

- Early in the short term goals timeframe, initiate conversations with UC campuses that have implemented pervious paving to discuss their experiences and lessons learned.
- Research local permeable paving installations. Perform site visits, ask owners about performance and traffic on the space, and determine if the application is suitable for UCR.

Goal 6: Draft and adopt “cool roof” guidelines
Cool roofs use high-albedo materials that reflect rather than absorb sunlight. This reduces the heat island effect, a phenomenon where urban areas experience higher temperatures compared to rural areas due to the replacement of vegetation by buildings, pavement and other heat-absorbing materials. Many plants and animals, including humans, are negatively impacted by local climate disruptions caused by heat islands. Roofs with a high solar reflectance index (SRI) also reduce cooling energy use by lowering a building’s internal heat gain. These roofs can be installed in both new and existing buildings at no cost premium, and do not command higher maintenance or repair costs. To limit UCR’s contribution to the heat island effect and reduce energy costs, UCR shall adopt cool roof guidelines for new construction and renovation projects where new roofing is required.

- Cool roof guidelines should be synchronized with the LEED program to support future building certification efforts.
- Visit the Energy Star and Cool Roof Rating Council websites for additional information and rated products. Products listed on these websites may not meet SRI thresholds set by the LEED program; however both are useful reference resources for developing compliant roof specifications.

Goal 7: Formalize the integrated pest management (IPM) program
UCR has contracted with the same pest control companies for nearly a decade: Pacific Green Horticultural Services for outdoor pests, and Western Exterminator Company for indoor pests. Both contractors informally follow many central tenets of integrated pest management, a strategy that promotes using a range of preventative and least-toxic chemical approaches to control pest populations and prevent infestation. However, UCR has not officially adopted a written IPM policy that clearly defines the strategies and pesticide products approved for use at the university. To ensure that the appropriate preventative practices are used and chemical pesticides are always a last resort, UCR shall create and adopt a formal IPM policy.

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• Any toxic chemicals that are currently used by contractors should be phased out and replaced with least-toxic alternatives.
• Involve the pest control companies in this effort to help ensure contractors are receptive to the new policy and are informed of any new responsibilities or obligations.
• Update existing pest control contracts to require contractor compliance with the IPM policy. The contract should clearly state the university’s preferred performance metric and outline contractor responsibilities for recordkeeping.
• The policy should incorporate the elements of the LEED EBOM program, Sustainable Sites credit 3 and Indoor Environmental Quality credit 3.9, to support future building certification efforts. In addition to earning two points for EBOM projects, a LEED-compliant policy will earn an Innovation in Design credit under the LEED for New Construction program.

Goal 8: Provide IPM information via the UCR sustainability website
Departments and individuals are not responsible for or encouraged to perform pest control or eradication activities. However, the university’s IPM policy, strategies and goals should be available to the campus community to educate employees and students on the best practices adopted by UCR. Creating an IPM page on the sustainability website will provide information about an important program that reduces toxics and improves health and safety on campus. Furthermore, it may prevent individuals from attempting to control pests, such as ants, with toxic chemicals that are commonly available in supermarkets but not endorsed under IPM.
  • Parties responsible for creating the IPM policy should generate content for the sustainability website and supply the formal policy to the site webmaster.
  • Post contact information for the UCR staff that oversees the IPM program so that questions and comments can be directed to the appropriate persons.

4.4 Intermediate Goals (2-5 years)
Goal 1: Reduce synthetic fertilizer purchases to 20 percent of total yearly purchases
Synthetic fertilizer products are less desirable than organic fertilizers from an environmental, plant health and soil health standpoint. To promote the long term health of UCR’s landscaping, the campus will reduce synthetic fertilizer purchases to 20 percent of total yearly purchases.
  • Consult with local business, campuses and municipalities that have converted to organic fertilizers.
  • Attend educational classes or conferences hosted by horticultural societies that are designed for organizations with large site areas to learn about best practices and network with other institutions that are practicing sustainable site maintenance.
  • Re-landscape areas that require heavy fertilizer applications as appropriate.
Goal 2: Reduce potable water used to irrigate landscape by 20 percent
Many different strategies must be employed over the long term to achieve reductions in potable water used for landscape irrigation. However, pursuing a variety of water conservation projects simultaneously will produce the larger intended effect.

- Incrementally install flow sensors on the Toro Sentinel weather-based irrigation system as funding is secured per the roadmap created in the short term goals. Equip the majority of the irrigation system with sensors within the timeframe of the intermediate goals.
- Convert unnecessary turf to sustainable landscaping.
- Work with the City of Riverside to devise a long term plan for extending municipal reclaimed water lines to the campus. Consider focusing on West Campus, where upcoming construction activities can incorporate reclaimed water piping projects more easily than the established East Campus.
- Use untreated, non-potable agricultural water flowing through the Gage Canal to irrigate the West Campus.

Goal 3: Begin incremental installation of irrigation flow sensors
UCR plans to replace the remaining 35 percent of campus served by the original irrigation system with the Toro Sentinel weather-based system roughly within the same timeframe as the Sustainability Plan short term goals. The new system supports the use of flow sensors that detect leaks by determining when a flow exists where none should. This feature will immediately alert staff of any leaks, expediting maintenance activities that prevent irrigation runoff and save potable water.

- After installation of the Toro Sentinel system is finished, incrementally install flow sensors throughout the campus, with the goal to equip the majority of the irrigation system with sensors within the intermediate goals timeframe.

Goal 4: Convert unnecessary turf
UCR’s East Campus is organized around linear, grassy malls. The lawns provide space for students to study and socialize, create a sense of place and identity, and are an important organizational element around which the campus was designed. There is some opportunity, however, to convert turf that is not programmatically essential. Instead, these irrigation-intensive areas can be re-landscaped with drought-tolerant species and ecologically appropriate plants. If gravel, mulch or other non-plant alternatives are appropriate in some applications, these may also be a reasonable way to reduce water and fertilizer use.

- Identify unnecessary turf areas and prioritize re-landscaping of these spaces.
- Select native and/or adapted vegetation that is suited to the local climate and requires little active maintenance such as pest protection, irrigation or fertilization once root systems are established.
- Many opportunities exist to form partnerships under this item, some of which may generate funding sources. Contact local horticultural societies to develop a partnership project.
Goal 5: Develop a campus greenbelt
Following the LRDP and Campus Design Guidelines, define and protect vegetated areas across and through the campus to encourage and support stormwater management goals while also providing for natural passageways that promote biodiversity.

- Identify opportunities to link existing planted areas and minimize or reduce the amount of impervious hardscape on the campus.

Goal 6: Implement pervious paving materials
Execute pervious concrete in one or more of the projects identified in under the short term goals section. For each application and product, maintain a record of general performance and wear, maintenance activities, and infiltration capabilities to determine whether a particular product is suitable for additional use.

- Research pervious paving products on the market.
- Contact organizations using pervious materials for performance information.
- Install an area large enough to determine if the product is suitable for installation at other locations on campus.
- Test and observe performance for at least six months.

Goal 7: Adopt a plan for energy-efficient and night sky-friendly lighting enhancements
UCR's Campus Design Guidelines put forth many sustainability considerations for site lighting that address energy efficiency and light pollution. These include full cut-off shades; high-efficiency luminaries; directing light downward; reducing glare and uneven lighting; and using contrast ratios rather than footcandles to judge lighting requirements. Commission a study that advises energy-saving technologies and night sky-friendly strategies specific to areas that require lighting enhancements.

- Assess each area for its unique challenges and opportunities.
- Select a consultant with both technical and artistic skills that can provide sustainability recommendations and enhance the nighttime character of the UCR campus.
- Evaluate adopting best practice exterior lighting that achieves security and the desired aesthetic affect primarily through appropriate brightness ratio and selection of high color rendering index (CRI) lamps.
- Having a roadmap for future retrofits will expedite projects as funding becomes available.

Goal 8: Test “cool roofs” products in both new construction and existing building applications
Implement cool roof materials on at least five new construction projects and/or existing buildings. This will allow the university to begin analyzing various products based on first cost, ease of installation, maintenance requirements and energy saving potential.

- Use the requirements created under the short term goals.
- Install cool roofs on projects pursuing LEED certification.
- Research rebates offered through Riverside Public Utilities.
Goal 9: Pilot gray water technology
Potable water is a scarce resource that is likely to experience significant price increases in the future. Using gray water for purposes that do not require drinking-quality water, such as irrigation, is an environmentally responsible way to offset some potable water consumption. Using gray water also reduces burdens on municipal sewer systems. By piloting gray water technologies on campus, UCR can mitigate some of its upcoming future growth and model a best practice for the region. The City of Riverside allows the installation of gray water systems, which removes an important barrier currently preventing other campuses from piloting gray water systems using municipal water lines.
- New student housing projects present UCR with a good opportunity to install gray water systems, as domestic water use is higher in these buildings than other campus building types.

4.5 Long Term Goals (5-10 years)

Goal 1: Reduce synthetic fertilizer purchases to 10 percent of total yearly purchases
Synthetic fertilizer products are less desirable than organic fertilizers from an environmental, plant health and soil health standpoint. In the first year of the long term goals timeframe, UCR will evaluate the potential to drive synthetic fertilizer purchases down to 10 percent of total yearly purchases, and shall adopt this goal if feasible.
- Only install plantings that do not require fertilizer.
- Re-landscape areas that require fertilizer applications.

Goal 2: Reduce potable water used to irrigate landscape by 50 percent on the East campus, and irrigate 100 percent of the West campus with non-potable water
Using reclaimed water for irrigation is an excellent way to offset some potable water use. This is dependent, however, on UCR and the City of Riverside partnering to co-develop a project to extend reclaimed water lines to the campus. The university may also use untreated, non-potable agricultural water flowing via the Gage Canal for irrigation.
- Reclaimed water
  - Work with the City of Riverside to devise a long term plan for extending municipal reclaimed water lines to the campus. Consider focusing on West Campus, where upcoming construction activities can incorporate reclaimed water piping projects more easily than the established East Campus.
  - UCR and the City of Riverside hold monthly meetings to discuss matters that affect both entities. These meetings can be used as a forum for regularly discussing the economics and logistics of bringing reclaimed water to the UCR campus.
  - Select two staff members to be responsible for placing this item on the meeting agenda at least three times per year and for issuing progress reports.
• Agricultural water
  ▪ Utilization of Gage Canal water for landscape irrigation will require a dual water delivery system or other special infrastructure.
  ▪ Create a workgroup to develop a plan for bringing agricultural water to the West Campus, and incrementally to the East Campus.

Goal 3: Convert unnecessary turf
Continue turf conversion efforts with the intent to reduce water and fertilizer use while maintaining and enhancing UCR’s character.
• Identify unnecessary turf areas and prioritize re-landscaping of these spaces.
• Partner with local horticultural societies to develop partnership projects.
• Develop a module for a future student service learning course, or partner with students managing the community garden that will break ground in summer 2009.

Goal 4: Carefully manage installation of turf on the West Campus
Limit the amount of turf installed in the build-out of the West Campus. The campus LRDP supports this effort and suggests using The Grove as a central unifying theme to celebrate the university’s citrus heritage, rather than promulgating the mall.
• Use the campus Plant Materials Palette to select drought-tolerant and California native plants.
• Design landscaping with plantings grouped based on water needs, a practice known as hydrozoning. This best practice strategy reduces the amount of water that must be delivered to a given area because one high-water use species is not dictating the overall level of irrigation. Grouping plants according to preferred microclimate also improves the efficiency of the weather-based irrigation system.

Goal 5: Expand use of gray water
Continue to install gray water technologies in new buildings using lessons learned from the university’s pilot gray water systems. Explore additional opportunities to capture and reuse campus stormwater, building, and process water flows.
• Keep abreast of emerging technologies and regional best practices.
• Create a demonstration cistern retention project.

Goal 6: Require “cool roofs” in all new construction projects and retrofit existing roofs
Continue installing cool roofs in new construction projects. Begin treating existing roofs with high-reflectance paints or coatings that meet LEED standards to reduce the building stock’s contribution to the heat island effect.
• Retrofit or treat existing roofs on projects pursuing LEED EBOM certification.
4.6 Demonstration Projects

Project 1
Installing pervious concrete in concert with bioswales, detention basins or other best management practices (BMP) for improved stormwater management can provide UCR with a low impact development (LID) demonstration site. Use simple signage to incorporate an educational outreach component into the project. Incorporate water quality monitoring to determine effectiveness of the LID project.

Project 2
Installing pervious pavers in a heavy use area, such as a pathway or outdoor dining plaza, can provide UCR with a testing ground for new materials. Solicit feedback from maintenance workers to assess the maintenance requirements. EH&S should assess the product’s ability to aid stormwater management and analyze any safety issues. Monitor flows upstream and downstream of the site to determine the effectiveness of porous pavement on reducing peak flows. Finally, gather reactions from users for their perspective and experience.

Project 3
Dundee Residence Hall is a student housing development project in the pre-design phase. UCR is committed to pursuing external certification and delivering a LEED Silver-rated building. This building-type, with high domestic water use from showers, sinks and washing machines, provides an excellent opportunity to pilot a gray water tank storage and treatment system. Offsetting potable water use with a gray water system can help the building reach Silver. Additionally, Dundee Residence Hall is likely to be among UCR’s first set of LEED certified projects. Piloting gray water in this potentially high-profile building makes for a good demonstration site before possible implementation in additional projects. This project also appears in the Water focus area.

Project 4
Many different landscaping opportunities are available to UCR as it identifies turf areas that can be converted to more sustainable plantings. A potential project is to create a demonstration site that showcases plants native to the Riverside region. This complements UCR’s use of thematic gardens to exhibit distinctive plant collections, and directly supports the Campus Design Guideline’s call for the creation of new gardens. Depending on its location and size, installing such a garden may support local bird, reptile and insect populations. Installing signage that identifies and describes local plant species can foster interest and pride in Riverside’s regional plant heritage. The project can also demonstrate water conservation technologies and strategies, and should have accompanying signage that addresses this component.

Project 5
The California Lighting Technology Center (CLTC), housed on the UC Davis campus, has a program called the UC/CSU PIER Demonstration Project, which brings emerging lighting
technologies directly to the UC and CSU campuses. Through this program, the CLTC is able to test new products in a real-world environment, and campus staff gain familiarity with next-generation technologies that can improve lighting and save money. The CLTC is developing a number of new lighting technologies that are appropriate for site applications, from parking lot lighting to bi-level exterior lighting.

http://cltc.ucdavis.edu

4.7 Definitions

Adapted vegetation – plants that are adapted to the local climate and are not considered invasive species or noxious weeds. Adapted plants grow reliably in a given habitat with minimal attention from humans (e.g. pest protection, irrigation, or fertilization) once root systems are established.

Brightness ratio – the ratio of maximum to minimum level of brightness for a given area

Color rendering index (CRI) – a measure of light quality as compared with sunlight, which is assigned the maximum color rendition index value of 100

Cool roof – a roof constructed with high-albedo materials or vegetation that mitigates the heat island effect

Heat island effect – the phenomenon where developed urban areas experience higher temperatures than nearby rural or open areas due to the replacement of vegetation with roads, buildings, and other infrastructure

Gray water – wastewater collected from clothes washers, bathtubs, showers or bathroom sinks

Integrated pest management (IPM) – a pest control strategy that promotes using a range of preventative and non-chemical or least-toxic approaches to control pests and prevent infestation

Least-toxic pesticide – any pesticide product that meets San Francisco’s Tier 3 hazard criteria per the LEED program

Low impact development (LID) – a collection of stormwater best management practices designed to work together to reduce targeted pollutants, peak flow volumes and flooding impacts, as well as recharge local groundwater aquifers

Native vegetation – plants that are indigenous to a locality; plants in America that evolved in a given area prior to the time of settlement by people of European descent

Organic fertilizer – fertilizer made from naturally-occurring animal matter, plant matter, or mineral deposits

Potable water – high-quality water suitable for drinking
Reclaimed water – treated wastewater that can be used for purposes other than drinking, such as irrigation, fire suppression, and industrial processes

Stormwater best management practices (BMP) – site amenities such as oil/grease traps, bioswales or cisterns designed to collect and filter stormwater to mitigate pollutants

Synthetic fertilizer – fertilizer made by chemically processing raw materials
5. TRANSPORTATION

Riverside County is faced with unique air quality concerns due to the regional topography. Air pollution that would be normally be dispelled by prevailing winds is instead locked in by bordering mountain ranges. Riverside County often exceeds federal and state standards for ozone and particulates, with the City of Riverside experiencing the greatest particulate concentration in the entire basin. Given the importance of preserving and improving regional air quality, UCR has established a variety of alternative transportation programs for the campus community. These are discussed in the Current Best Practices section.

UCR is managed by the South Coast Air Quality Management District (SCAQMD), whose jurisdiction extends to nearly 11,000 square miles and over 16 million people. This agency is charged with regulating air pollution and reducing emission levels to bring the region into compliance with state and national clean air standards. SCAQMD requires large employers to assess its employees’ commuting patterns and reduce mobile source emissions generated from employee commutes. UCR performs an annual Average Vehicle Ridership (AVR) survey to demonstrate compliance with this mandate. This has provided the campus with a comprehensive understanding of employee commute habits over the past decade.

While the SCAQMD sets out a clear methodology for surveying employees, no standard methodology exists for the collection of student commute data. Students have a wider range of commuting behavior than employee populations, and tend to utilize multiple modes of transportation on a regular basis, complicating survey methodology. UCR is actively researching and developing a methodology that will accurately capture student commute patterns.

UCR’s Long Range Development Plan (LRDP) recommends several changes to the university’s infrastructure to improve circulation and facilitate the use of alternative transportation. The LRDP’s long term sustainable transportation vision includes:

- Reducing vehicle traffic in the campus core, and emphasizing pedestrian, bike and buses as transportation options.
- Constructing multi-level parking structures on the campus perimeter to reduce vehicle traffic in the campus core and improve circulation.
- Creating transportation hubs at campus gateways where campus shuttles and Riverside Transit Authority (RTA) buses coordinate service. These hubs will help individuals make use of different alternative transportation modes to move through the campus and city by facilitating transfers, providing service information, trimming redundant service, and offering secure bicycle storage.
- Expanding and upgrading the campus’s bicycle path network to improve continuity and navigability.
- Connecting campus bicycle paths with existing city bicycle paths to create a smooth transition for bicycle commuters.
• Constructing new housing facilities to accommodate 50 percent of students on campus by 2015. This will significantly reduce the number of individuals that must commute to campus. For comparison, 74 percent of the student body lived in off-campus housing in fall 2002.

**Relevant Policies**
- UC Policy: Collect data annually on average vehicle ridership (AVR) of commuters
- UC Policy: Collect and report fuel consumption annually to the Office of the President
- UC Policy: Include emissions from university-sponsored air travel and commuting by students, faculty, and staff in greenhouse gas emission inventories by September 2008
- UC Policy: Implement a pre-tax transit pass program to facilitate the purchase of transit passes by University employees, or establish a universal access transit pass program for employees by January 2009

### 5.1 Current Best Practices

**Alternative Transportation Programs**

Vanpool ridership is very strong at UCR. In just two years the campus nearly doubled the number of vans, which currently carry about 200 passengers daily. Members of senior management support the vanpool not just in rhetoric; many utilize it every day of the week. Students are eligible to join vanpools at the same fare rates offered to staff and faculty.

Another highly successful program is UPASS, a partnership between the campus and the Riverside Transit Authority (RTA). The UPASS program allows students to ride any RTA bus in Riverside County for free with the swipe of their student ID card. All buses use compressed natural gas (CNG), a clean-burning fuel that produces significantly lower particulate emissions than conventional diesel-powered buses. The number of unique student riders in the UPASS program has more than doubled since its inception in 2006. UCR expects student ridership to continue to increase as incoming freshman are introduced to the program’s advantages.

The university operates a shuttle service called the Highlander Hauler which has three routes serving the nearby student residential housing and apartment communities. Two of these routes, the Braveheart Loop and the Trolley Express, are equipped with tracking equipment that provides the location of shuttles online in real-time to simplify trip planning.

Southern California’s regional commuter rail system, called Metrolink, is utilized by 45,000 passengers each weekday across seven lines and 56 stations. The university offers Metrolink ride vouchers at a 25 percent discount to students, and a 15 percent discount to staff and faculty. RTA operates a connecting shuttle that runs between the downtown Riverside Metrolink station and the UCR campus.
UCR offers several additional incentives that help lower common barriers to alternative transportation. The Guaranteed Ride Home program is offered to carpoolers and vanpoolers should an emergency situation arise. The Drop Off program provides 24 complimentary days of parking per year to faculty, staff and graduate students who are dropped off at campus each day by a carpool partner that parks a vehicle at an off-campus place of employment. Participants in the Cyclist and Walker program are eligible to use the locker and shower facilities at the Physical Education building for free.

**Maintenance**

Cleaning chemicals used to maintain UCR's fleet do not contain hydrocarbons per California Air Resources Board and Environmental Protection Agency regulations. UCR also has a preventative maintenance program for its vehicles which ensures optimal operation, fuel efficiency and pollution prevention.

**Outreach**

UCR promotes the use of alternative transportation through several different venues. An updated website was launched in fall 2007 to provide the campus community with a one-stop alternative transportation resource. Transportation and Parking Services (TAPS) staffs a booth during Welcome Week to provide students with information about alternative transportation programs. The booth was visited by over 800 students in fall 2008. At the beginning of the fall and spring quarters, TAPS engages the community about bicycle safety and promotes its free bicycle registration program by speaking at student orientations and staffing bicycle registration booths at various locations on campus.

The university also participates in California’s annual Bike to Work and Rideshare Weeks. Held during the second week of May, Bike to Work Week promotes bicycle commuting as a healthy and economical form of transportation. In partnership with local bicycle shops, TAPS sponsors a station to educate the community and perform complimentary bicycle tune-ups. California Rideshare Week is held during the first week in October. UCR participates with the Inland Empire Commuter Services’ campaign to promote all means of alternative transportation. Each year, commuters are asked to pledge to try some form of ridesharing.
5.2 Metrics

Fleet Composition

In 2006 the UCR campus fleet was recognized as one of the UC system’s most sustainable for having a large percentage of alternatively-fueled vehicles.

Table A. Fleet Composition by Fuel Type

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>Vehicle Count</td>
<td>302</td>
<td>342</td>
</tr>
<tr>
<td></td>
<td>Percent of Fleet</td>
<td>77.84</td>
<td>77.55</td>
</tr>
<tr>
<td>Compressed Natural Gas</td>
<td>Vehicle Count</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Percent of Fleet</td>
<td>4.12</td>
<td>3.63</td>
</tr>
<tr>
<td>Hybrid Electric</td>
<td>Vehicle Count</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Percent of Fleet</td>
<td>1.55</td>
<td>3.63</td>
</tr>
<tr>
<td>Electric</td>
<td>Vehicle Count</td>
<td>64</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Percent of Fleet</td>
<td>16.49</td>
<td>15.19</td>
</tr>
</tbody>
</table>

Fleet Vehicle Miles

Table B lists the number of miles traveled by vehicle fuel type, providing additional information on UCR’s fleet performance. This table shows that while gasoline-powered vehicles comprise the majority of miles traveled, this amount is declining while the miles traveled by alternatively-fueled vehicles are increasing.

Table B. Fleet Vehicle Miles

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>Miles Driven</td>
<td>2,069,844</td>
<td>1,939,553</td>
</tr>
<tr>
<td></td>
<td>Percent of Total Miles</td>
<td>96.75</td>
<td>90.83</td>
</tr>
<tr>
<td>Compressed Natural Gas</td>
<td>Miles Driven</td>
<td>13,907</td>
<td>51,708</td>
</tr>
<tr>
<td></td>
<td>Percent of Total Miles</td>
<td>0.65</td>
<td>2.42</td>
</tr>
<tr>
<td>Hybrid Electric</td>
<td>Miles Driven</td>
<td>55,660</td>
<td>144,164</td>
</tr>
<tr>
<td></td>
<td>Percent of Total Miles</td>
<td>2.60</td>
<td>6.75</td>
</tr>
<tr>
<td>Electric</td>
<td>Miles Driven</td>
<td>No data available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent of Total Miles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average Vehicle Ridership

The South Coast Air Quality Management District requires large employers to perform a transportation survey and report their average vehicle ridership (AVR) annually. UCR surveys its employees every April to determine how faculty and staff travel to campus during the five day workweek. The SCAQMD has a regional mandate requiring that UCR meet or exceed a 1.5 AVR
for employees arriving to campus between 6 and 10 AM. In the AVR metric, a value of 1.0 means that a vehicle contains a single driver; a 2.0 designates that there are two individuals in a vehicle.

Table C. Average Vehicle Ridership

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AVR</td>
<td>1.37</td>
<td>1.31</td>
<td>1.52</td>
<td>1.54</td>
<td>1.50</td>
<td>1.57</td>
<td>1.50</td>
<td>1.51</td>
<td>1.53</td>
</tr>
</tbody>
</table>

**Employee Modal Split**

UCR is able to obtain its employee modal split using the data gathered for the SCAQMD survey. The modal split shows the proportion of people that use each type of transportation.

Table D. Employee Modal Split by Commute Mode, in Percent of Surveyed Commuters

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Alone</td>
<td>56.95</td>
<td>56.42</td>
</tr>
<tr>
<td>Carpool</td>
<td>10.16</td>
<td>8.50</td>
</tr>
<tr>
<td>Vanpool</td>
<td>0.53</td>
<td>1.72</td>
</tr>
<tr>
<td>Bus</td>
<td>0.96</td>
<td>2.15</td>
</tr>
<tr>
<td>Rail</td>
<td>0.48</td>
<td>0.42</td>
</tr>
<tr>
<td>Walk</td>
<td>12.22</td>
<td>10.85</td>
</tr>
<tr>
<td>Bicycle</td>
<td>5.71</td>
<td>5.77</td>
</tr>
<tr>
<td>Telecommute</td>
<td>0.39</td>
<td>0.91</td>
</tr>
<tr>
<td>Compressed Work Week</td>
<td>0.21</td>
<td>0.22</td>
</tr>
<tr>
<td>Not Working</td>
<td>7.34</td>
<td>8.44</td>
</tr>
<tr>
<td>Off Peak Trips</td>
<td>5.05</td>
<td>4.60</td>
</tr>
</tbody>
</table>

**UPASS Ridership**

The UPASS program is a partnership between the Riverside Transit Authority and UCR. The program launched in winter 2006 and has seen a steady increase in ridership since its inception.

Table E. UPASS Ridership

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Boardings</td>
<td>21,095</td>
<td>93,861</td>
<td>170,126</td>
</tr>
<tr>
<td>Unique Students</td>
<td>2,980</td>
<td>4,264</td>
<td>7,052</td>
</tr>
</tbody>
</table>

**Vanpool Ridership**

All members of the university community are eligible to participate in the Vanpool Program. Over the last two years UCR has promoted the program and steadily added buses and routes, leading to a doubling in the number of participating individuals.
Table F. Vanpool Ridership, as of December 31

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Routes</td>
<td>14</td>
<td>19</td>
<td>25</td>
</tr>
<tr>
<td>Number of Participants</td>
<td>99</td>
<td>143</td>
<td>196</td>
</tr>
<tr>
<td>Occupancy</td>
<td>80%</td>
<td>85%</td>
<td>88%</td>
</tr>
</tbody>
</table>

**Bicycle Registrations**

All bicycles operated or parked at UCR are required to have a current California Bicycle License. TAPS provides free bicycle license registration to members of the campus community and maintains records of new registrations.

Table G. New Bicycle Registrations, as of December 31

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Registrations</td>
<td>213</td>
<td>334</td>
<td>456</td>
</tr>
</tbody>
</table>

### 5.3 Short Term Goals (0-2 years)

**Goal 1: Develop a map for bicycle commuters**

Developing and distributing a map for bicyclists will help individuals navigate the campus and encourage commuting by bike.

- The map should include: highlighted bike paths; secure bike parking areas; the number of bicycles that can be parked at each area; locker and showering facilities.
- Update the map regularly as changes are made to the bike path network and parking corrals.
- Upload the map to the transportation and sustainability websites.
- Distribute maps at freshmen orientation events.

**Goal 2: Increase the number of vanpools to 30**

There are currently 25 campus vanpools carrying over 200 passengers and traveling 8,550 miles each week between UCR and Riverside, Orange, San Bernardino and Los Angeles counties. Based on current employee data, some areas within San Bernardino and Los Angeles counties are underserved and would benefit from the creation of new routes.

- Review employee demographics to determine the cities and areas employees commute from.
- Target areas that are 20 miles or more from the campus.
- Market the potential of starting a new route to the campus community and develop a list of interested individuals.

**Goal 3: Adopt a vehicle procurement policy**

Develop and implement a formal policy that provides criteria for environmentally-preferable vehicle procurement. Use this policy to optimize the composition of the fleet.
• Consider using the American Council for an Energy-Efficient Economy’s (ACEEE) Green Book to develop the policy. This third-party program rates the environmental friendliness of vehicles and offers an online database of the greenest models in each vehicle class. Specify vehicles that achieve an ACEEE score of 40 per LEED NC guidelines. www.greenercars.org/greenbook.htm

• Define classes of vehicles that are required for different campus uses and develop environmental criteria for each class.

• Downsize vehicles as appropriate.

Goal 4: Develop a data collection methodology for student commuting patterns
No standard methodology exists for collecting student commute data. This population has wider range of commuting behavior than employee populations, and tends to utilize multiple modes of transportation on a regular basis. Reporting student, staff and faculty commuting emissions, to the extent possible, is required by the American College and University Presidents Climate Commitment (ACUPCC) starting in 2008.

• Research other campus’s practices to develop a rigorous methodology.

• Discuss methodology and resources on the UC Systemwide Sustainability Workgroup for Sustainable Transportation.

• Report best estimates for student, staff and faculty commuting emissions to the ACUPCC as soon as possible.

Goal 5: Enhance systems and protocol for populating fleet performance metrics
An electronic system for tracking fleet performance will be developed to expedite the population of metrics, help ensure complete and accurate data is compiled, and allow for in-depth performance analysis. Metrics that will be monitored are listed below. The third metric will streamline carbon emissions reporting activities to the California Climate Action Registry.

• Percentage of vehicles by fuel type

• The number and percentage of vehicle miles traveled by vehicle type

• The quantity and percentage of fuel volumes consumed by vehicle fuel type

Goal 6: Develop a mechanism for tracking department-owned vehicles fuel use
Department-owned vehicles are outside the control of the Fleet Manger. UCR currently does not have a mechanism for tracking the amount of fuel purchased off-campus for these vehicles. However, the emissions from these vehicles should be reported to the Climate Action Registry.

• Create a workgroup of campus stakeholders to collaborate on the development of a system for tracking department-owned vehicles.

Goal 7: Develop an estimate for carbon emissions from university-sponsored air travel
The ACUPCC requires that signatories report estimated air travel emissions starting in 2008.

• Contact departments and staff responsible for travel reimbursement to determine the total mileage for university-sponsored air travel in 2008.
• Use the tools outlined in short term goal 8 to calculate associated emissions.
• Report best estimates for air travel emissions to the ACUPCC as soon as possible.

Goal 8: Develop a system for tracking university-sponsored air travel
A campuswide system for tracking air travel will need to be developed and deployed before UCR can begin reporting these emissions to the Climate Action Registry. Track air travel for faculty, staff and student programs such as sports.
• The UC Systemwide Sustainability Workgroups for Climate Change and Sustainable Transportation recommends using the website Web Flyer to calculate distances between airports. [www.webflyer.com/travel/milemarker](http://www.webflyer.com/travel/milemarker)
• The UC Systemwide Sustainability Workgroups for Climate Change and Sustainable Transportation recommends using the Clean Air Cool Planet Campus Carbon Calculator to calculate air travel emissions. [www.cleanair-coolplanet.org](http://www.cleanair-coolplanet.org)

Goal 9: Research and apply for alternative transportation funding
Many funding opportunities are available for alternative transportation programs.
• New sustainability positions are proposed under the General Recommendations section of this plan. Notify the appropriate position when filled of relevant calls for grant proposals for assistance with soliciting funding.
• Use the following resources to locate funding:
  [www.cleantransportationfunding.org](http://www.cleantransportationfunding.org)
  [www.afdc.energy.gov/afdc/progs/view_all.php/CA/0](http://www.afdc.energy.gov/afdc/progs/view_all.php/CA/0)
  [http://hydrogenhighway.ca.gov/policy_funding/policy_funding.htm](http://hydrogenhighway.ca.gov/policy_funding/policy_funding.htm)

5.4 Intermediate Goals (2-5 years)

Goal 1: Collect commuting data for students
Collect student commute data to get a more comprehensive understanding of the campus’s average vehicle ridership and modal split. Understanding student travel patterns will enable UCR to target alternative transportation programs where additional services are required.
• Incorporate student data collection activities within the current annual transportation survey.

Goal 2: Report employee and student commuting emissions to the Climate Action Registry
Including employee and student commuting emissions in UCR’s Scope 3 emissions will create a more real and robust picture of the campus emissions profile. Doing so will also help UCR develop reduction targets and track performance in this area.
• Develop a methodology for determining student commuting patterns. Calculate emissions associated with the different modes of transportation used by student commuters.
• Use the annual transportation survey to quantify emissions associated with employee commuting.
• Contact UCR’s third party emission verifier to discuss reporting methodologies for commuting emissions.

Goal 3: Report air travel emissions to the Climate Action Registry
Reporting this Scope III emission will greatly impact the campus emissions profile and create a more real and robust picture of the campus emissions profile. Air travel emissions must be included and addressed in future versions of UCR’s climate neutrality plan.
• Participate in the UC Systemwide Sustainability Workgroup for Sustainable Transportation to learn about best practices for complete and accurate tracking and reporting of this emission source.
• Contact UCR’s third party emission verifier to discuss reporting methodologies for air travel emissions.

Goal 4: Review the methodology for the projected parking inventory in the 2005 Long Range Development Plan (LRDP)
The UCR campus currently has about 8,500 parking spaces. The 2005 LRDP calls for the parking stall supply to increase to 15,686 spaces by 2025, based on UCR’s capital planning and development projections. An opportunity exists to revisit the methodology for calculating parking spaces to account for alternative transportation programs deployed at UCR. Reducing the number of parking spaces will lessen the site impacts of parking lot and structure development, and will encourage use of alternative modes of transportation.
• Develop a working group comprised of representatives from Capital & Physical Planning and Transportation and Parking Services.
• Review the methodology used in the LRDP to project parking stall supply.
• Determine a way to incorporate the effect of alternative transportation programs into the methodology, or develop an alternate method for projecting parking requirements.

Goal 5: Facilitate bicycle use by creating a bicycle paths master plan
Developing a master plan will help ensure that both the existing East Campus and new West Campus are bicycle-friendly. Designing a safe, interconnected network of bike paths will encourage bicycle use among both UCR students and employees.
• Gather a group of campus stakeholders to study the current bicycle infrastructure and develop a long-term vision and goals for an integrated bikeway system.
• Design and build safe bike paths that connect the East and West Campuses to increase the number of commuters who bike to work and school. Connect campus paths to existing city bike paths to facilitate commuting.
• Develop a bicycle education program that nurtures a bike-friendly culture on campus.
Goal 6: Increase the number of secure bicycle corrals
Bicycle corrals should be safe and secure with appropriate levels of nighttime lighting and clear visibility for evening commuters.
  • Perform time and motion studies to identify bicycling patterns throughout the day and determine where additional bike parking is needed. Distribute surveys to the campus to aid this effort.

Goal 7: Retrofit the existing compressed natural gas refueling stations
Increasing the capacity and output of UCR’s compressed natural gas refueling stations will allow the university to purchase additional CNG vehicles.
  • Perform a study to determine the level of output UCR requires, given its preferred fleet composition.
  • Investigate and apply for grants to help fund the project.

Goal 8: Research opportunities to implement a bike share program
Developing a free bike rental program will facilitate commuter travel between existing modes of public transportation. With the right sponsor, UCR can create a program that is free to the university.
  • Model the bike share program on SmartBike.
    www.smartbike.com

Goal 9: Exceed the SCAQMD’s mandated AVR by 5 percent
UCR currently exceeds the SCAQMD’s mandate of a 1.50 AVR. The university would like to attain an AVR of 1.575 within the intermediate goals timeframe, reflecting a 5 percent increase over its current AVR.
  • Implement additional vanpool buses and routes.
  • Incentivize alternative transportation by maintaining low fees and fares. Advertise the potential cost savings to the campus community.
  • Perform active outreach and provide ongoing education to the campus community about both the university’s and regional alternative transportation programs.

5.5 Long Term Goals (5-10 years)

Goal 1: Reduce business air travel by developing programs and technologies for remote conferencing
Develop and enhance UCR’s information technology infrastructure to support remote conferencing.
  • Provide all departments with the capability to support teleconferencing, videoconferencing and webconferencing.
  • Develop travel approval protocol whereby remote conference options are explored and exhausted before air travel is approved.
Goal 2: Exceed the SCAQMD’s mandated AVR by 10 percent
UCR would like to attain an AVR of 1.65 within the long term goals timeframe, reflecting a 10 percent increase over its current AVR of 1.50.

- Continue to enhance existing alternative transportation programs and create new transportation demand management programs where additional service is required.
- Contact other large employers in the Riverside area to discuss strategies and programs that have been employed with success.
- Continue to partner with RTA and the City of Riverside to develop integrated alternative transportation systems.

Goal 3: Petition the City of Riverside to develop live/work communities downtown
Work with master planners for the City of Riverside to bring live/work developments to the downtown Riverside area. Providing housing and amenities near the university can draw faculty and staff closer to their place of employment and reduce commute distances.

- Open a dialogue with the City on opportunities and strategies to incentivize live/work development projects that increase density near the campus.

5.6 Demonstration Projects

Project 1
Providing space for a student-run bicycle repair shop can help UCR build a bicycle culture on campus. The Commons has been identified as an appropriate location for a bicycle repair shop. This student-funded building is centrally located on campus and already sees heavy student use. Funding assistance can be provided through The Green Initiative Fund (TGIF) student fee referendum.

Project 2
Certify the fleet maintenance shop through the Model Pollution Prevention Shop Program. Administered by the California Department of Toxic Substances Control, this program recognizes automotive repair shops that implement their free technical training program to eliminate or reduce waste generation. Earning green certification for UCR’s maintenance shop can help increase compliance with environmental regulations; reduce hazardous waste, water and air emissions; reduce operating costs; and improve employee health and safety. Additionally, the program is useful promotional tool. Model shops can use the program’s logo to show it is recognized for excellence by the State of California. There are four steps to certification:

- Do a shop assessment, make needed changes.
- Implement required pollution prevention opportunities.
- Provide Pollution Prevention training for shop employees.
- Score at least 100 points on the Model Shop Pollution Prevention Checklist.
UC Santa Barbara and UC San Diego have certified their maintenance shops through this program. For more information, visit the Model Pollution Prevention Shop Program website: www.dtsc.ca.gov/PollutionPrevention/VSR/VSR_P2Model.cfm

**Project 3**
As part of a future service learning course, students can create a comprehensive regional public transit map or online tool that targets places that students commonly want to go and provides directions using alternative transportation modes of travel. The project should include creation of a web-based clearinghouse to match rideshare needs for students and staff.

**5.7 Definitions**

Average vehicle ridership (AVR) – the figure derived by dividing the total number of employees for the five-day survey week who report to work between 6 AM and 10 AM by the total number of employee vehicle trips to the work site for the survey week

Transportation demand management (TDM) – programs, strategies and policies that reduce the use of single occupancy vehicles in favor of a variety of alternative transportation options, including public transit, vanpools, bicycling, walking, ridesharing and telecommuting
6. RECYCLING AND WASTE MANAGEMENT

UCR sends roughly 2,500 tons of refuse to landfills annually. In March 2009 the university selected Athens Services, Inc. to be its new recycling vendor. The company is charged with implementing a new comprehensive waste and recycling program that will reinvent the campus’s diversion programs and collection infrastructure. The university will also start diverting food waste, which currently mixes with general refuse. Goals for food waste diversion are reproduced in this section as well as the Food focus area.

To further enhance existing recycling efforts, the university is submitting a Beverage Container Recycling Grant proposal to the California Department of Conservation in spring 2009. The potential funds awarded through this grant would provide the crucial financial support UCR requires to implement a campuswide cans and bottles recycling program.

Relevant Policies

- UC Policy: 50% diversion rate by June 30, 2008
- UC Policy: 75% diversion rate by June 30, 2012
- UC Policy: Zero waste by 2020

6.1 Current Best Practices

Materiel Management runs a very successful Excess Surplus Program. The operation recycled 1,890 items in fiscal year (FY) 07/08, including furniture, equipment and computers. These items are sold to campus departments and the general public to divert functioning items from landfill disposal. All departments are invited to provide Materiel Management with a “wanted” list, which allows Materiel Management to notify interested parties when items are received.

The Shredding Program, a service offered by Equipment Management, recycled 3,334 forty-pound boxes of paper in FY07/08.

A range of programs implemented by Mail Services have produced a significant reduction in the amount of paper sent to landfills. Mail Services placed blue recycling containers in every department for magazines and advertisements that would otherwise be discarded in the trash. In 18 months the program diverted over 65 tons of paper at a cost of just $400. Mail Services also recycles all phone books and catalogs that are not distributed, totaling about two tons annually. To prevent paper waste, Mail Services evaluates all incoming standard mail to ensure former employees are removed from commercial mailing lists. This effort reduces the campus’s mail by 125 pounds per day or roughly 13 tons per year.

UCR’s hazardous materials program manages the transport and disposal of laboratory chemicals. The university also has a chemical sharing program where unwanted chemicals are collected, stored and redistributed in order to reduce disposal of hazardous materials.
6.2 Metrics

Landfill Waste
UCR has reliable data for the quantity of waste disposed in landfills beginning in FY04/05. However, it is likely that not all construction and demolition waste is reflected in these figures because contractors have not been required to report this information to the university. New procedures to ensure complete and consistent accounting for this waste stream are included in the goals sections.

Table A. Landfill Waste in Tons

<table>
<thead>
<tr>
<th></th>
<th>FY04/05</th>
<th>FY05/06</th>
<th>FY06/07</th>
<th>FY07/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Landfill Waste</td>
<td>2,250</td>
<td>2,348</td>
<td>2,341</td>
<td>2,463</td>
</tr>
</tbody>
</table>

Waste Diversion Rate
UCR began calculating its waste diversion rate in FY06/07. In March 2007, the UC system adopted important waste diversion goals that culminate in zero waste by 2020. UCR will now track this metric consistently each year to demonstrate its progress towards achieving policy goals. UCR’s contract with Athens Services sets the campus’s waste diversion requirement at 50 percent by FY08/09 and 75 percent by FY11/12, per UC Policy.

Table B. Waste Diversion Rate

<table>
<thead>
<tr>
<th></th>
<th>FY06/07</th>
<th>FY07/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversion Rate</td>
<td>29.81%</td>
<td>37.86%</td>
</tr>
</tbody>
</table>

6.3 Short Term Goals (0-2 years)

Goal 1: Develop a written comprehensive recycling and waste management plan
Work with Athens Services to develop a written campuswide recycling plan that includes the following elements per the LEED EBOM program: scope, goals, performance metrics, procedures and strategies. The plan should identify the department or individual responsible for implementing different sections of the plan and provide contact information.

- Distribute the plan to all staff, students and faculty via email and the sustainability website to ensure the entire campus community is aware of the policy, procedures, and goals of the new program. Community participation is crucial to realizing a successful plan that produces high diversion rates.
- Address the following waste streams in the plan:
  1. On-going consumables – mixed paper, newspaper, glass, plastic, metals, cardboard and toner cartridges
  2. Durable goods – office equipment (computers, monitors, copiers, printers, scanners, fax machines), appliances (refrigerators, dishwashers, water coolers), electronics, laboratory equipment, audiovisual equipment and televisions
3. Landscape waste  
4. Food waste  
5. Mercury-containing lamps  
6. Batteries (see short term Goal 9)  
7. Construction waste (see short term Goal 6)

**Goal 2: Develop a marketing program for the recycling and waste management plan**

Deploying a clear and compelling marketing program will help UCR brand its recycling program and achieve buy-in from the campus community. Marketing efforts should target the entire campus – staff, faculty and students – to educate all sectors on UCR’s new recycling infrastructure and procedures.

- Use consistent signage on recycling infrastructure throughout the campus.  
- Perform outreach to departments, faculty, students, and custodial staff.  
- Launch a one-stop recycling webpage that is designed to provide quick answers to common recycling questions (see short term Goal 3).

**Goal 3: Implement uniform outdoor cluster recycling**

UCR currently has some outdoor recycling bins that capture common recyclable items such as glass, plastic, aluminum and newspaper. However, these containers do not have a uniform appearance. As part of the new comprehensive recycling program being developed in concert with Athens Services, UCR will institute a new collection bin system that is consistent throughout the entire campus grounds. Maintaining consistency in the size, shape and signage of outdoor collection receptacles will help the campus community become familiar with the system and dispose of wastes properly, thus improving UCR’s diversion rates.

- Perform a time and motion study to determine the most effective locations for collection receptacles. This process will not only assist in the placement of bins, but provide UCR with a better idea of the quantity of containers required for a successful outdoor recycling program.  
- Purchase one type of collection bin for the entire campus and apply identical labels to maintain the consistency needed to effectively educate the campus community.  
- Consider working with students to identify where bins should be located and the materials that should be captured.  
- The California Integrated Waste Management Board has compiled a list of companies that manufacture recycling containers.  
  [www.ciwmb.ca.gov/Recycle/Tools/Containers.htm](http://www.ciwmb.ca.gov/Recycle/Tools/Containers.htm)

**Goal 4: Create a recycling webpage as part of the larger UCR sustainability website**

The recycling website is an important component of the larger marketing program. Usability and clarity are highly important, as individuals are more likely to recycle items properly if information can be located quickly.
• The recycling webpage should address all campus waste streams so that visitors can quickly and easily access information on any waste material.
• Provide a campus map that highlights locations of all recycling clusters and identifies what materials can be recycled.
• Post the university’s comprehensive recycling and waste management plan to the website.
• Harvard University has developed a comprehensive website that includes photos of container types, a list of acceptable materials, and answers to common recycling questions: www.uos.harvard.edu/fmo/recycling.

Goal 5: Adopt the Environmental Protection Agency’s (EPA) Recycling Measurement tool
In order for UCR to achieve UC Policy diversion rates, the campus must adopt a clear methodology for calculating waste diversion. The EPA’s Recycling Measurement tool can help UCR standardize its methodology for measuring recycling rates for the university’s different waste streams from year to year. Using this resource consistently will facilitate accurate data collection, streamline the measurement process, and help UCR evaluate the success of its programs. UCR will also be able to fairly compare its diversion rate to other entities that similarly choose to adopt this tool.
www.epa.gov/epawaste/conserve/tools/recmeas/index.htm

Goal 6: Develop a construction waste management plan
Construction and demolition activities generate a significant amount of waste, however much of these materials can be reused or recycled. Develop a Division 1 specification requiring all new construction and renovation projects to recover construction waste and divert materials from landfill. A minimum diversion rate of 75 percent should be required for all campus projects.
• Incorporate the requirements of the LEED-NC program when developing campus guidelines.
• Require that contractors provide a construction waste management plan to the university prior to the start of construction.
• Require that contractors provide quarterly waste diversion reports. Consider requiring contractors to submit the overall project waste diversion report as a prerequisite for final payment.
• Maintain records of the construction waste generated and the quantity diverted from landfills for all projects.
• Identify common types of construction waste and local, licensed haulers and processors of recycled and salvaged construction materials to expedite waste diversion. See short term Goal 7.
• The EPA has developed a useful resource for construction waste management: www.epa.gov/epawaste/conserve/rrr/imr/cdm/index.htm
Goal 7: Require all new construction and renovation projects to divert at least 75 percent of waste from landfill disposal
Diverting construction waste will help UCR raise its overall waste diversion rate. Adopting a campuswide policy and requiring contractors to comply with the university’s construction waste management plan will enable UCR to achieve high diversion rates.

- Establish and implement a standard deconstruction specification for campus renovations (in lieu of demolition). Include list of regional resources for accepting and reusing construction products.
- Obligate contractors to comply with this policy by including it in contractual documents.
- Require that contractors provide a construction waste management plan to the university prior to the start of construction.
- Require that contractors provide quarterly waste diversion reports.
- Make the construction and demolition material hauler/processor database available to contractors. See short term Goal 7.

Goal 8: Create a construction and demolition material hauler/processor database
As UCR formalizes its construction waste management program these materials will be diverted from landfills in greater quantities. To aid this effort, the university should compile a database that documents where different materials are accepted. Assembling this information into a single database will facilitate materials diversion in future projects.

- Compile a list of local, licensed haulers and processors of recycled and salvaged construction materials.
- Include a list of the materials accepted by each company.
- Include contact information and websites.

Goal 9: Create a battery recycling program
An important program to offer universally throughout all campus buildings is battery recycling. Currently, UCR recycles cell phone and regular batteries collected at the dormitories, but has not extended this service to the rest of campus.

- Provide at least one dedicated battery recycling container per building.
- Select one color for battery containers that is different from other recyclable material bins.
- Affix clear signage that includes a list of acceptable materials and pick-up schedule.
- Assign responsibility and develop protocol for battery collection activities. Collect batteries at least once per month.
- Observe the quantity of batteries collected at each location to determine if additional containers are needed.
- Inform facility managers and/or human resource managers of the new program. Notify business officers so that information can be disseminated through the departments.
- Advertise the battery recycling program on the sustainability website.
Goal 10: Divert 25 percent of food waste
Once the food waste diversion program is in place it will take some time for students to grow familiar with the new program and utilize bins consistently and properly. With clear signage and an educational outreach component, UCR should be able to achieve a 25 percent diversion rate within the short term goals time frame.
- Use clear signage to identify the materials accepted in each food waste bin. The idea of recycling food waste may be new to many students; clarity and simplicity in signage will be crucial for achieving high diversion rates.

Goal 11: Achieve a 50 percent waste diversion rate by FY08/09
UC policy adopted in March 2007 sets each campus's waste diversion goal at 50 percent by June 30, 2008. UCR has taken the first step towards meeting this goal by contracting with a new recycling vendor and including policy diversion requirements in the contract language. UCR currently diverts 37 percent of its waste from landfills.
- New recycling and waste infrastructure should be consistent throughout campus. Bin styles and sizes, colors, and graphics should mirror the infrastructure and signage in place at the housing residences to provide students with a clear and uniform program. Similarly, indoor recycling should be consistent from building to building.

6.4 Intermediate Goals (2-5 years)
Goal 1: Work with vendors to reduce unnecessary packaging
UCR has tremendous purchasing power, enabling it to exercise a great deal of influence over how vendors package products that are purchased by the university.
- Identify products UCR purchases frequently that use excessive amounts of packaging materials and/or materials that are not reusable or recyclable. Contact the manufacturers or suppliers of these products to discuss alternative packaging materials.
- Work with large vendors to develop a comprehensive plan for reducing packaging waste generated by the family of products UCR purchases.
- Encourage all vendors to reduce packaging, catalog distribution, and paper advertisements by contacting sales associates and including sustainability language in new vendor contracts.

Goal 2: Perform waste audits for five buildings
Conducting waste audits in five different building types after the comprehensive recycling program is established will allow UCR to determine what recyclable items are not being diverted correctly. UCR can then target its outreach and educational efforts.
- Select five diverse building types to get a broader understanding of how building users and occupants are using the recycling bins.
• Discuss partnering with Athens Services to conduct the audit. The project will allow the company to see the progress made with their recycling and waste program, and reveal opportunities for improvement.
• Consider conducting some or all of the audits in conjunction with LEED EBOM certification efforts. Performing the audit per LEED requirements will satisfy Materials and Resources credit 6: Solid Waste Management – Waste Stream Audit.

**Goal 3: Provide support for zero waste events**

Once UCR has established its recycling program and is equipped to divert food waste, the campus can begin hosting zero waste events. Campus events can be hugely wasteful and comprehensive guidelines will be crucial to help event planners utilize the recycling and food waste diversion infrastructure effectively.

- Collaborate with Commons Event Scheduling Office to create an informational packet with guidelines for hosting zero waste events.
- Upload the guidelines to the Event Planning Tools website as well as the sustainability website.

**Goal 4: Establish a toner cartridge take-back program**

Work with campus vendors and UCR purchasing units to establish a take-back program for used toner cartridges.

- Partner with UCR purchasing units to negotiate the take-back program with vendors. This is a short term goal in the Procurement focus area.
- Deploy toner collection bins in all buildings.
- Inform facility managers, business officers, and human resource managers of the new program. Advertise the toner take-back program on the sustainability website.
- Identify a single, central receiving area where the vendor can pick up all cartridges, or develop a mail-in program.

**Goal 5: Divert 90 percent of construction waste**

With the implementation of a construction waste management plan, UCR will be able to achieve a 90 percent diversion rate or higher within the intermediate goals time frame.

- Amend the campuswide policy to require all new construction and renovation projects divert at least 90 percent of waste.
- Continue to expand the construction and demolition material hauler/processor database.
- Create additional guidelines or supplemental documents as necessary to help contractors raise diversion rates.
Goal 6: Divert 75 percent of food waste
As new students cycle into the university and older students cycle out, the proportion of students that are familiar with the food waste diversion program will increase. Each year, more students will be accustomed to using the bins and the diversion rate will steadily rise.
• Educate all incoming freshman and transfer students on the food waste diversion program goals, through welcome week activities and clear signage in the dining halls.

Goal 7: Achieve a 75 percent waste diversion rate by FY11/12
UC policy adopted in March 2007 sets each campus’s waste diversion goal at 75 percent by June 30, 2012. UCR has taken the first step towards meeting this goal by contracting with a new recycling vendor and including policy diversion requirements in the contract language.
• Increase participation in the UC Systemwide Sustainability Working Group for Waste Reduction and Recycling. The group’s monthly conference calls are an excellent forum for best practice sharing.

6.5 Long Term Goals (5-10 years)

Goal 1: Require all events to be zero waste
All events hosted at UCR will need to be zero waste if the campus is to meet the 2020 waste diversion goal. The university will need to institutionalize a mechanism for ensuring that all events follow the campus’s zero waste events guidelines.
• Provide zero waste training for events planning staff.
• Develop a zero waste event policy and implement appropriate penalties for events that do not comply. Ensure adequate support and training is available.

Goal 2: Divert 100 percent of construction waste
With the implementation of a construction waste management plan and the development of a construction and demolition material hauler database, UCR will be able to achieve a 100 percent diversion rate or higher within the long term goals time frame.
• Amend the campuswide policy to require all new construction and renovation projects divert 100 percent of waste.

Goal 3: Divert 100 percent of food waste
For UCR to meet the 2020 zero waste policy target, the entire food waste stream will need to be captured and diverted. Within the long term goals time frame, enough students will be accustomed to the food diversion program that a 100 percent diversion rate will be achievable.
• Educate all incoming freshman and transfer students on the food waste diversion program goals, through welcome week activities and clear signage in the dining halls.
Goal 4: Achieve zero waste by 2020
UC policy adopted in March 2007 sets each campus’s waste diversion goal at 100 percent by 2020. UCR has taken the first step towards meeting this goal by contracting with a new recycling vendor and including policy diversion requirements in the contract language.

- As UCR’s recycling program matures, the campus will be able to identify new areas for improvement and divert additional materials.
- Initiate conversations with other universities that have adopted a zero waste goal to learn about the innovative strategies these institutions will use to meet the mandate.
- Continue to participate in the UC Systemwide Sustainability Working Group for Waste Reduction and Recycling.

6.6 Demonstration Projects

Project 1
Participate in the RecycleMania competition, administered by the National Recycling Coalition. Over 500 universities from all 50 states, including seven UC campuses, participate in the ten week contest that promotes waste reduction activities through friendly competition. Everyone at a participating campus – staff, faculty and students – band together as a part of the same team to win in the following recycling metrics: largest amount of recyclables per capita, the largest amount of total recyclables, the least amount of trash per capita, and the highest recycling rate. The competition is an excellent outreach mechanism, assists with marketing campus sustainability, and will allow UCR to benchmark waste diversion rates against other college campuses. The goals of RecycleMania are:

1. Have a fair and friendly recycling competition
2. Increase recycling participation by students and staff
3. Heighten awareness of schools’ waste management and recycling programs
4. Expand economic opportunities while addressing environmental issues in a positive way
5. Lower waste generated on-campus by reducing, reusing and recycling
6. Organize this event successfully so it can be repeated and possibly expanded to other campuses in the future

The American College and University Presidents Climate Commitment (ACUPCC) recommends that colleges that signed the Presidents Climate Commitment participate in the RecycleMania competition. Visit the RecycleMania website for details: www.recyclemania.org.

Project 2
Waste audits are used to expose a facility’s waste production patterns and reveal the types and quantities of waste generated by building users. Performing a waste audit in a central quad area with students leading the project can be a valuable educational outreach tool. The audit will show the campus community its current waste stream and serve as a catalyst for communicating how the comprehensive recycling plan can improve waste diversion. Leaving the separated waste in the quad for a few days in see-through, covered canisters will allow a larger portion of the
campus to get a snapshot of the campus waste stream. Provide signage and posters describing the project, audit results, and recycling tips to enhance the educational component. Athens Services is a potential partner for this demonstration project.

Consider integrating this demonstration project with a LEED EBOM certification. Performing the audit per LEED requirements will satisfy Materials and Resources credit 6: Solid Waste Management – Waste Stream Audit.

**Project 3**

Students and universities alike often have great ideas but lack funding to implement them. To generate extra money for recycling projects, create a student internship under the Chancellor's Committee on Sustainability Recycling and Waste Management Workgroup and task interns with locating and applying for recycling grants with the help of UCR staff. For potential recycling grant opportunities, visit www.ciwmb.ca.gov/Schools/Funding/default.htm#Reduce
7. PROCUREMENT

UCR completes approximately 65,000 transactions annually totaling $85 million. Roughly 90 percent of these purchases are executed through the campus’s online procurement system, UCR eBuy. This system is capable of tracking product characteristics and generating custom reports, a feature that will be enhanced in the future to populate UCR’s chosen sustainable procurement metrics. This will provide the university with a robust understanding of its purchasing behavior and enable it to observe the effect of new procurement policies.

Departmental procurement transactions represent roughly 95 percent of the university’s procurement actions, which makes the success of any sustainable procurement program at UCR dependent upon the committed participation by departments and end users. The eBuy system is used for 90 percent of these purchases. The remaining 10 percent are low dollar product and services transactions placed through UCR’s ProCard program. At this time the environmental characteristics of ProCard purchases cannot be tracked and therefore are not reflected in performance metrics.

The remaining 5 percent of UCR’s procurement actions are executed by seven campus buyers. Campus buyers use the eBuy system, which allows their purchases to be tracked and included in performance metrics.

The UCR Storehouse is a major produce supply source for campus departments, with 95 percent of office supply purchases executed through it. The Storehouse holds a strategic source agreement with OfficeMax, which helps the university negotiate competitive prices for products with desirable sustainability characteristics. To help customers practice sustainable procurement the Storehouse is developing a dedicated green section that highlights products with environmental benefits. This feature will be expanded to its virtual storefront in the form of a green ordering channel on the Storehouse website.

Relevant Policies

- UC Policy: Preferential purchase of Energy Star appliances and office equipment
- UC Policy: Phase-in Green Seal certified cleaning products
- UC Policy: Phase out virgin paper; adopt a minimum standard of 30% post consumer waste recycled content paper
- UC Policy: All desktop computers, laptops, and computer monitors must achieved Bronze registration or higher under the Electronic Products Environmental Assessment Tool (EPEAT)

7.1 Current Best Practices

The Materiel Management department runs a very successful Excess Surplus Program. The operation recycled 1,890 items in fiscal year (FY) 2007/08, including furniture, equipment and computers. These items are sold to campus departments and the general public to divert
functioning items from landfill disposal. All departments are invited to provide Materiel Management with a “wanted” list, which allows Materiel Management to notify interested parties when items are received.

Ninety percent of UCR’s copy paper purchases contain 30 percent recycled content, totaling $194,885 in FY07/08. UCR’s copier program uses 30 percent recycled content paper exclusively and has defaulted all copiers to the duplex functionality.

UCR aggressively pursues rebates offered by the City of Riverside for the procurement of Energy Star products. Over a two year period, UCR earned $19,700 for purchasing 195 refrigerators and four dishwashers.

Materiel Management conducted a campuswide refrigerator assessment to replace aging units with Energy Star models. The department negotiated aggressive pricing from a local appliance dealer that was extended to all departments.

The university has undertaken a campaign to remove excessive beverage vending machines. In conjunction with this effort, UCR’s Purchasing department developed a new contract with its vending machine company to purchase Energy Star units exclusively when old units need to be replaced. These vending machines are 50 more energy efficient than standard models.

UCR has a strategic sourcing coordinator that is charged with incorporating sustainability requirements in all strategic source agreements. This position will help ensure that language promoting sustainable practices, products and services is included in solicitations for goods and services as well as vendor agreements and contracts.

Printing & Reprographics has a strong sustainable procurement program that includes water-based, environmentally-preferable solvents; Forest Stewardship Council (FSC) certified products for roughly 80 percent of its total paper purchases; and the exclusive use of soy-based inks, totaling about 2,500 pounds per year.

7.2 Metrics
While UCR has many successes in sustainable procurement it does not currently track any performance metrics. The university will begin developing and tracking metrics for the following product categories within the short term goals time frame:

- Energy Star appliances
- Green Seal certified cleaning products
- Green Guard certified office furniture
- EPEAT computers, laptops and monitors
- Recycled content office paper
7.3 Short Term Goals (0-2 years)

Goal 1: Adopt a written sustainable procurement policy
Codifying UCR’s green purchasing practices in a written policy will better communicate the campus’s goals and help ensure the appropriate products are purchased across campus.

- Develop the policy using the LEED EBOM program to support all future LEED EBOM certification efforts.
- Upload the policy to the sustainability website to publicize the university’s green purchasing program to the campus community.
- Useful resources for policy development include:
  - State of California Environmentally Preferable Purchasing Manual
    www.green.ca.gov/EPP/Introduction/default.htm
  - Responsible Purchasing Network
    www.responsiblepurchasing.org
  - International Green Purchasing Network
    www.igpn.org

Goal 2: Enhance the UCR eBuy procurement system to support sustainability metric tracking
UCR uses an online procurement system called UCR eBuy for all department authorized orders and central purchasing department purchase orders. The system can be enhanced to include features that will assist in the collection of data to populate UCR’s chosen sustainability metrics.

- Bring campus stakeholders together to discuss how to optimize the eBuy system’s usability. Develop a clear and simple user interface.
- When a user performs a product search, list sustainable products first to direct the user to environmentally preferable options.
- Develop a feature where monthly reports can be generated by department. This will enable departments to review purchases regularly and assess performance.
- Include sustainability criteria met by each item in reports. Highlight non-sustainable items that violate UC Policy goals so that changes to procurement practices can be developed.

Goal 3: Develop a dedicated green procurement section in the Storehouse
Creating a dedicated section for sustainable items will simplify sustainable product procurement by isolating and clearly displaying these products.

- Work with campus vendors to provide a list of sustainable items that are offered through the Storehouse, following UCR’s definition of “sustainable” for each product type.
- Provide vendors with the relevant LEED EBOM Materials and Resources credits to educate them on the campus’s purchasing goals.
• Make green purchasing clear and simple by promoting the section through signage and customer service outreach. Create a logo and use it consistently to designate green products.
• Add a wide variety of products to the dedicated green section and clearly advertise product benefits.
• Notify the campus of the dedicated green section via the Storehouse website.
• Host a sustainable products fair where companies can present their latest green products. Ask vendors to only display products that meet the campus’ and UC Policy requirements to avoid greenwashing.

Goal 4: Develop a green ordering channel as part of the Storehouse’s new “store front” website
• Work with campus stakeholders and system users to identify goals and features of the green procurement channel.
• Conduct user testing to ensure that goals are met and the website functions with high usability.
• Use a web analytics program in conjunction with data on products procured through the site to see how visitors utilize the green ordering channel and identify features to optimize.

Goal 5: Purchase Energy Star appliances and electronics for 100 percent of items covered by this standard
UC Policy calls for campuses to procure products with an Energy Star rating for all product categories where Energy Star rated products are available. The American College and University Presidents Climate Commitment (ACUPCC) also includes Energy Star product procurement in its implementation guidelines for colleges that signed the Presidents Climate Commitment.
• Pull all products from the Storehouse that are not Energy Star rated but belong to a product category where Energy Star rated products are available.
• Require written justification for exceptions to this mandate.
• Implement a feature in UCR’s online procurement systems that require buyers to provide written justification when purchasing a non-Energy Star product before the transaction is approved.

Goal 6: Adopt a sustainable carpet policy
Sustainable carpet products contain recycled content, require fewer resources to manufacture, and improve indoor air quality. Use of carpet tiles can also significantly extend the useful life of a carpet installation project. The UC system has strategic sourcing agreements with companies that produce high-quality, sustainable carpet at a lower rate than conventional carpet.
• Work with the Office of Design and Construction to develop a campuswide policy that restricts the purchase and installation of carpet products to those that meets the requirements of the Carpet and Rug Institute’s Green Label Plus program.
Goal 7: Work with campus vendors to negotiate favorable prices for sustainable products
Price is often the lynchpin that convinces departments to adopt environmentally preferable purchasing practices. UCR has considerable purchasing power that it can levy to obtain favorable prices on products with sustainable attributes.
- Work with vendors such as OfficeMax to make sustainable products cost comparable, or competitive, to standard products.

Goal 8: Purchase EPEAT-registered products for 100 percent of items covered by this standard
Purchasing desktop computers, notebooks and monitors that are certified through the Electronic Product Environmental Assessment Tool (EPEAT) will allow UCR to be certain it procures products with quantifiable environmental benefits. Over thirty manufacturers have registered over 1,000 products with EPEAT. The EPEAT has three environmental performance tiers: Bronze, Silver and Gold. UC’s systemwide contract with Hewlett Packard requires Gold certification for all desktop computers, notebooks and monitors sold to the university.
- Require all campus departments to purchase products listed in the EPEAT database.
- Issue a campuswide announcement regarding EPEAT criteria to ensure the campus is aware of this policy. Target announcements and outreach to information technology (IT) groups around the campus.
- Develop a tracking system that helps guarantee the goal is being met.
- Track purchases annually to demonstrate achievement of this goal.

Goal 9: Establish a toner cartridge take-back program
Work with campus vendors and UCR recycling units to establish a take-back program for used toner cartridges.
- Negotiate the take-back program with vendors. A take-back program is already included in UC’s systemwide contract with Hewlett Packard.
- Identify a single, central receiving area where the vendor can pick up all cartridges, or develop a mail-in program.
- Deploy toner collection bins in all buildings. This is an intermediate goal in the Recycling and Waste Management focus area.
- Inform facility managers and/or human resource managers of the new program. Advertise the toner take-back program on the sustainability website.

Goal 10: Expand use of Green Seal cleaning chemicals to all campus departments
Green cleaning has not been adopted uniformly throughout the UCR campus. A complete phase-in of green cleaning chemicals should be accomplished within the short term goals time frame, to the point that 90 percent of cleaning chemicals used at UCR are Green Seal certified. The aggressive adoption of green cleaning chemicals is necessary to provide high indoor...
environmental quality to students and to protect the health of custodial staff. This goal is duplicated in the Built Environment focus area.

- Areas of campus that do not use Green Seal certified cleaning products should implement product testing and evaluate performance.
- Departments should consider adopting some or all of the cleaning chemicals used by Physical Plant to obtain quantity discounts.
- Provide outreach and education to custodial staff on the human and environmental health benefits and proper use of Green Seal certified chemicals. Training is provided for free as part of the UC systemwide strategic sourcing contract.

### 7.4 Intermediate Goals (2-5 years)

**Goal 1: Develop a comprehensive system for tracking purchases across campus**

To develop metrics and enable benchmarking, UCR must implement a comprehensive tracking system for all campus procurement activities. Having a tracking system will allow the campus to quantify successes and identify opportunities for improvement. It can also be used when working with vendors to negotiate lower prices for green items.

- Use the LEED EBOM and AASHE STARS programs to determine items the campus will track and to define “sustainable” for each product category.
- Stay up-to-date on new procurement tracking technologies by attending conferences and webinars on sustainable purchasing. Organizations like AASHE, Energy Star, EPA, California Integrated Waste Management Board (CIWMB), and the UC/CSU/CCC Sustainability Conference provide educational seminars related to purchasing operations.
- Bring campus stakeholders together to discuss how to optimize the usability and functionality of the system’s product tracking and report generation capabilities.
- Develop a clear and simple user interface.
- Research programs used by other universities and municipalities to track purchasing activities.
- Develop a feature where monthly reports can be generated by department. This will enable departments to review purchases regularly and assess performance.
- Include sustainability criteria met by each item in reports. Highlight non-sustainable items that violate UC Policy goals so that changes to procurement practices can be developed.

**Goal 2: Continue to enhance the Storehouse sustainable product offerings**

Expanding the sustainable products available through the Storehouse, and limiting the availability of conventional products, will provide the campus with a range of green options and encourage sustainable purchasing habits.

- Thoroughly vet each product’s environmental claims to prevent green washing.
- Work towards offering at least one sustainable alternative for each product category.
Goal 3: Purchase EPEAT products registered at the Silver level or higher for 100 percent of items covered by this standard

Purchasing desktop computers, notebooks and monitors that are certified through the Electronic Product Environmental Assessment Tool (EPEAT) will allow UCR to be certain it procures products with quantifiable environmental benefits. Over thirty manufacturers have registered over 1,000 products with EPEAT. The EPEAT has three environmental performance tiers: Bronze, Silver and Gold. Purchasing Silver-rated products ensures that products meet higher environmental performance standards. Silver-rated products not only meet all required criteria, but also meet 50 percent of the program’s optional criteria.

- Require all campus departments to purchase products to that earn a Silver EPEAT rating, at minimum.
- Develop a tracking system that helps guarantee the campus is meeting this goal.
- Track purchases annually to demonstrate achievement of this goal.

Goal 4: Switch all hand soap to an environmentally preferable product, excluding handwashing products used in UCR’s commercial kitchens

Using a hand soap product that contains no antimicrobial agents or is Green Seal certified is healthier for building users and the environment.

- The LEED EBOM program has sustainable hand soap guidelines that should be referenced before UCR adopts a new product. This will eliminate the need to procure and stock a different brand of hand soap in buildings that pursue LEED certification.
- Test products and deploy selected hand soap in all campus restrooms.

Goal 5: Encourage the use of 50 percent recycled content paper

UCR currently purchases 30 percent recycled content printer and copy paper for 90 percent of its total paper purchases. As the industry standard moves to 30 percent recycled content paper, UCR can improve its performance in this area by procuring paper with 50 percent recycled content.

- Partner with OfficeMax to make 50 percent recycled content paper cost comparable, or competitive, to 30 percent recycled content paper. This negotiation effort is crucial to eliminate price as a barrier to adoption.
- Allow departments to test paper for brightness and copier jams by providing free ream to each department.
- Adopt a campuswide policy forbidding purchases of virgin paper to eliminate the remaining 10 percent of paper purchases that do not contain 30 percent recycled content.
7.5 Long Term Goals (5-10 years)

Goal 1: Manage a mature sustainable procurement program
A strong sustainable procurement program will require that the appropriate resources, both human and system, are working together towards the same goals. The program will also benchmark well against other university procurement programs. Achieving this goal will include the creation of a comprehensive sustainable purchasing policy, a savvy electronic purchasing system and a commitment from the campus to track products and criteria.

Goal 2: Update purchasing policies to reflect industry advancements in sustainable products and services
As manufacturers develop more and better sustainable products are developed, update UCR’s purchasing policies to reflect these market transformations.

Goal 3: Adopt the cradle-to-cradle principle in purchasing activities
Cradle-to-cradle, or “ecologically intelligent design”, minimizes the environmental impact of products by taking the full lifecycle of a product into account, from production to operation and finally disposal. Under the cradle-to-cradle philosophy, products are evaluated for sustainability and efficiency in manufacturing processes, material properties, and toxicity as well as potential to reuse materials through recycling or composting. Cradle-to-cradle purchasing will support UCR’s goal to achieve zero waste by 2020.
www.mcdonough.com/cradle_to_cradle.htm

7.6 Demonstration Projects

Project 1
Create a “green” dorm room to demonstrate green procurement and sustainable living to freshmen and transfer students. Install energy-efficient appliances, showcase green cleaning supplies, and display environmentally-preferable personal care products. Consider requiring all new students to tour the green dorm as part of orientation. This demonstration project will provide students with ideas on how to use their purchasing power to buy healthful, environmentally-preferable products and avoid green washing. Partnerships will need to be forged with both the Residence Halls and Student Life to establish the green dorm. Consider recruiting students to live in the green dorm and give tours. UC Berkeley has created very successful green living areas that provide a useful model.
www.ocf.berkeley.edu/~grc

Project 2
Stock sustainable office supplies at the campus bookstore to model environmental preferable purchasing to students. Providing economical products and clear signage will help steer students to practice sustainable purchasing.
Project 3
Host a Green Vendor Fair where companies set up booths and provide information on their sustainable supplies and services. The fair will allow vendors to market green items to the campus and provide a catalyst for discussions about sustainable procurement. The fair should be designed to target all campus constituents: staff, faculty and students.

7.7 Definitions
Greenwash – a practice where a product is marketed as environmentally beneficial without substantiated claims; deceptive or misleading marketing that inflates the environmental claims of a product
8. FOOD

Dining Services produces over 11,000 meals on a typical weekday through UCR’s nineteen food outlets. It also operates two catering services, Arroyo Vista Catering and Citrus Grove Catering. In January 2009 the university selected SYSCO Food Services of Los Angeles, Inc. to be its primary food vendor for the next three years. The agreement with SYSCO includes an important sustainability provision that will help UCR begin tracking product information such as growing region and carbon footprint. Assistance from SYSCO will help UCR develop menus that incorporate more local, sustainable and organic food products, educate consumers about their dining choices, and track progress towards meeting the goals outlined in this section.

Supporting sustainable food systems is an important undertaking because food purchasing choices touch on a number of environmental issues. Industrialized food production relies heavily on fertilizer, herbicides and pesticides to sustain crops in a monoculture environment. These materials can leach into groundwater and cause severe disruption to aquatic habitats. Food choices are also directly tied to energy consumption. Each stage in a product’s journey from the farm to the plate – growing, harvesting, processing, packaging and transporting – requires energy inputs. Both farming practices and sourcing location drive the embodied energy of a food product. UCR is working to expand its local sourcing and sustainable procurement to support food systems that nurture bodies as well as the environment at a smaller carbon cost.

The definition of sustainable food and local food varies with institution. UC is anticipating the adoption of a new systemwide food policy in spring 2009 that defines these terms so that all campuses share a common language for discussing sustainable food issues. UCR has adopted the definition of sustainable food from in the draft policy document. The policy recognizes the varying regional constraints between campuses and invites each to develop its own boundary for local food, providing that it does not exceed 500 miles. UCR developed its definition of local food by considering the requirements of the LEED and STARS programs and its proximity to the state’s major agricultural centers. Definitions for sustainable and local food are listed in the Definitions section along with other terms that are encountered in this focus area.

UCR does not currently have a food waste diversion program, however the campus’s new recycling vendor, Athens Services, Inc., has been tasked with capturing this waste stream starting in spring 2009. The program will also address compostable food service products such as napkins, plates and cutlery. UCR expects to redirect several hundred tons of waste from landfill disposal, which will have a substantial impact on the university’s overall waste diversion rate. Additionally, the program will allow Dining Services to assume its role in the university’s efforts to achieve the UC 2020 zero waste mandate.

In the absence of a diversion program, Dining Services has taken steps to determine if it could address food waste factors within its control. Staff measured post-consumer food waste
generated at the Aberdeen-Inverness and Lothian residential dining halls over one week in 2003. Finding that 2,000 pounds of waste were created daily, Dining Services devised a food waste reduction program to help students better-manage their dining habits. A combination of smaller plates and removing trays, which requires that students take reasonably-sized first portions and return for a second serving, produced a noticeable drop in food waste. A second food waste assessment was conducted in 2008 at the same dining halls to quantify the program’s success. Dining Services collected 48,000 pounds of plate waste over nine weeks, averaging out to just 762 pounds created daily.

**Relevant Policies**
- UC Policy: 50% waste diversion rate by June 30, 2008
- UC Policy: 75% waste diversion rate by June 30, 2012
- UC Policy: Zero waste by 2020
- UC Policy: Preferential purchase of Energy Star appliances
- UC Policy: Phase-in Green Seal certified cleaning products
- UC Policy: (formal adoption pending, April 2009): 20% sustainable food by 2020

### 8.1 Current Best Practices

**Procurement**
UCR procures limited quantities of local food stuffs including citrus sourced from fields located just across the freeway and eggs produced by hens at Agricultural Operations. All paper napkins are unbleached, and 45 percent of all disposable food service products are compostable and made from renewable resources. Dining Services partnered with its food vendor, Freshpoint Produce, to pilot a small farmer’s market at Scotty’s Convenience Store and Grill. Students can use the balance on their meal plans to purchase local and organic produce. The program has proven to be very successful with students living at the Glen Mor Apartments, and will be expanded in the future.

**Waste Reduction**
Waste reduction is addressed by UCR on several fronts. The campus successfully eliminated trays and switched to smaller plates to reduce food waste. Dining Services uses the FoodPro management system to plan menus and food purchasing activities, which reduces waste by creating a more effective food service operation. The campus prepares properly-sized meals using the just-in-time method to further reduce waste and maximize quality. Dining Services offers a 10 cent discount to individuals that bring their own cup to its coffee venues to discourage use of disposable cups. The campus recycles all of its used cooking oil through Baker Commodities, which uses this waste product to produce pet food, biodiesel fuel and cosmetics. Surplus food is donated to Inland Harvest, an organization that distributes donated food to local homeless shelters. UCR sent nearly 24,000 pounds of food to Inland Harvest in 2005.
**Green Operations**

Dining Services purchases Green Seal certified cleaning chemicals through Waxie Sanitary Supply, and uses products as appropriate to ensure food safety. UCR and Waxie are currently collaborating to develop a system for tracking purchases so that Dining Services can evaluate and expand its use of sustainable cleaning chemicals. The campus has also proactively reduced the amount of water consumed by its food service equipment. All kitchens are outfitted with low-flow pre-rinse spray valves to minimize water consumption and water heating energy. All preparation, utility and hand sink faucets are equipped with low-flow aerators. The campus also retrofitted five walk-in refrigerators and one freezer at the Aberdeen-Inverness residential restaurant, producing 9,000 gallons of water savings per day. The project involved replacing aging water-cooled refrigeration systems with air-cooled compressors. Going trayless has impacted water usage as well, saving roughly 8,000 gallons each week.

**8.2 Metrics**

**Compostable Products Procurement**

UCR’s Dining Services makes a considerable effort to practice environmentally-preferable purchasing for disposable paper products, utensils and food packaging supplies. Almost half of the purchases made in 2007 were compostable, biodegradable and/or made from renewable sources such as corn, potato starch, and sugar cane bagasse. While the university is not currently equipped to send these materials to a commercial composting facility, it is using its purchasing power to support the compostable products industry. Developing a strong compostables purchasing program also situates the campus to begin immediately diverting this waste stream when the food waste diversion program is implemented.

Comprehensive data collection for compostable dining service products began in late 2007. The university’s first full year of data is listed in Table A.

Table A. Compostable Products Procurement in Dollars

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Purchases</td>
<td></td>
</tr>
<tr>
<td>Compostable</td>
<td>161,138</td>
</tr>
<tr>
<td>Non-compostable</td>
<td>194,724</td>
</tr>
<tr>
<td>Percent of Purchases</td>
<td></td>
</tr>
<tr>
<td>Compostable</td>
<td>45%</td>
</tr>
</tbody>
</table>

**Sustainable Food Procurement**

The university does not collect data for sustainable food procurement. SYSCO Food Services has agreed to help populate this metric, and UCR is actively researching providers and produce that will enable it to reach the sustainable food procurement goals outlined in this document.
Food Waste
UCR does not have a food waste recycling program or collection infrastructure at this time. Food waste is disposed of in trashcans with other refuse, preventing the university from estimating the quantity landfilled annually with confidence. Populating this metric will begin in spring 2009 when Athens Services begins diverting, quantify and recycling food waste.

8.3 Short Term Goals (0-2 years)

Goal 1: Implement a food waste diversion program and educational campaign
Implement a diversion program for both pre- and post-consumer food waste, as well as biodegradable/compostable disposable products.

- Work with Athens Services to develop a food waste program that services the University’s Commons, Aberdeen-Inverness residence hall, Lothian residence hall, Barn, and auxiliary food service locations within the campus.
- Develop clear and consistent signage that provides instructions on use of new collection containers.
- Notify the campus community of the new program through mass emails and/or a press release.

Goal 2: Divert 25 percent of food waste
Once the food waste diversion program is in place it will take some time for students to grow familiar with the new program and utilize bins consistently and properly. With clear signage and an educational outreach component, UCR should be able to achieve a 25 percent diversion rate within the short term goals time frame.

- Use clear signage to identify the materials accepted in each food waste bin. The idea of recycling food waste may be new to many students; clarity and simplicity in signage is crucial to achieving high diversion rates.

Goal 3: Establish a tracking system for both sustainable and non-sustainable food purchases
Implementing a simple, expedient and comprehensive system for tracking food purchases will allow UCR to quantify its performance in sustainable food procurement.

- Work with SYSCO and other food suppliers to develop a system for identifying and tabulating the dollar amount spent on sustainable food purchases. A product must meet at least one of the criteria listed in UCR’s definition of sustainable food to qualify as sustainable.
- Work with SYSCO and other food suppliers to develop a system for recording the distance products travel from source to campus. Hold quarterly meetings with a SYSCO representative.
- Hold quarterly meetings with a SYSCO representative to evaluate the tracking system and procedures for enhancement and improvement opportunities.
Goal 4: Begin populating food procurement metrics
To measure UCR’s progress towards its goals, Dining Services must regularly compile performance data for food and service items procurement.
  • Collaborate with various campus buyers to develop procedures and protocols for tracking UCR’s chosen food metrics.
  • Develop quarterly reports to assess progress in sustainable procurement.

Goal 5: Procure sustainable foods for 5 percent of total food purchases
Sustainable produce often come with a higher price tag than foods produced using industrial farming practices. UCR will work to identify cost-effective ways to raise sustainable purchases to 5 percent of total food purchases.
  • Collaborate with SYSCO to identify low-cost organic products.
  • Investigate opportunities to utilize vendors serving large supermarkets. UCR may be able to piggyback on supermarket contracts and take advantage of food prices negotiated by these large organizations.
  • Work with local farmers and farmers markets to find produce available at the quantities and price points required by UCR. Utilize the online local food guide created the Community Alliance with Family Farmers (CAFF), and the Growers Collaborative, a local foods distributor that is part of CAFF.
    www.caff.org
    www.growerscollaborative.org

Goal 6: Create a culinary herb garden
Creating a culinary herb garden at a residential restaurant can inspire students to think about the source of their food and the intricacies of food systems.
  • The Chancellor’s Committee on Sustainability Food Workgroup can recruit interested students to champion the herb garden.
  • Assign a Dining Services staff member to oversee the project.

Goal 7: Create a campus community garden
Plans for a community garden at UCR are well underway, with planners hoping to break ground in summer 2009. The American Community Gardening Association is a useful resource that includes tip sheets, horticultural best practices and sample garden rules: communitygarden.org/index.php.
The following implementation steps will be taken to ensure a safe, fun and productive garden.
  • February 2009 – June 2009:
    ▪ Confirm designated location
    ▪ Design garden layout
    ▪ Prepare soil and beds
• Publicize the garden’s mission and recruit participants from the campus and outside community
• Establish guidelines for sustainable practices, including a composting program and an integrated pest management policy

- July 2009 – July 2010
  • Establish a student internship to manage the garden
  • Install an efficient irrigation system
  • Expand garden production to provide produce for the UCR farmer’s market
  • Incorporate the garden into UCR course curriculum

Goal 8: Develop sustainability guidelines for kitchen equipment
Target energy and water use in the kitchen by creating guidelines for new equipment and upgrades/replacements. Having food service equipment guidelines in place that are regularly updated as technology advances will facilitate the purchase of resource-efficient equipment.

- Adopt maximum water flow and usage specifications for all kitchen equipment based on industry best practices.
- Test the latest energy-saving commercial kitchen equipment technologies at the Food Service Equipment Center, a learning facility located at the Energy Resource Center in Downey, California. This facility is managed by the Southern California Gas Company. Visitors are invited to bring their own recipes and ingredients to test and compare over 150 pieces of equipment. UCR’s Southern California Gas Company representative can evaluate UCR’s kitchens and coordinate a visit to the Energy Resource Center. www.socalgas.com/business/foodService
- Revisit the guidelines as manufacturers develop new technologies.

Goal 9: Expand the use of sustainable cleaning chemicals, ware washing products, and hand soaps in all dining operations
Food service outlets are operated and maintained according to high health and safety standards. With this in mind, UCR Dining Services will maximize its use of Green Seal cleaning chemicals that are approved for use in food service operations.

- Inventory all cleaning chemicals and hand soaps used at UCR’s food outlets, both Green Seal compliant and non-compliant.
- Research the availability of sustainable products that are approved for food service operations.

Goal 10: Increase participation in the UC Systemwide Sustainability Working Group for Food Systems
Involving more individuals in the monthly conference calls will facilitate best practices sharing and open channels of dialogue other campuses.

- Designate two regular UCR representatives to join the conference call and one alternate so that UCR will have two individuals participating in each call.
• Report back to the Chancellor’s Committee on Sustainability Food Technical Workgroup with the call minutes.

8.4 Intermediate Goals (2-5 years)

Goal 1: Divert 75 percent of food waste
As new students enter the university and older students cycle out, the proportion of students that are familiar with the food waste diversion program will increase. Each year, more students will be accustomed to using the bins and the diversion rate will steadily rise.

• Educate all incoming freshman and transfer students on the food waste diversion program goals, through welcome week activities and clear signage in the dining halls.

Goal 2: Procure sustainable foods for 20 percent of total food purchases
Sustainable produce often come with a higher price tag than foods produced using industrial farming practices. UCR will work to identify cost-effective ways to raise sustainable purchases to 20 percent of total food purchases.

• Collaborate with SYSCO to identify low-cost organic products.
• Investigate opportunities to utilize vendors serving large supermarkets. UCR may be able to piggyback on supermarket contracts and take advantage of food prices negotiated by these large organizations.
• Work with local farmers and farmers markets to find produce available at the quantities and price points required by UCR. Utilize the online local food guide created the Community Alliance with Family Farmers (CAFF), and the Growers Collaborative, a local foods distributor that is part of CAFF.
  www.caff.org
  www.growerscollaborative.org

Goal 3: Reduce use of food stuffs with a large carbon footprint
Some food items inherently have a high carbon footprint, such as meat and dairy. While UCR cannot eliminate these from its menus completely, the campus can identify such items and work with its food vendor to substitute preferable products.

• Review menus for opportunities to reduce energy-intensive food stuffs.
• Substitute local meat and dairy products, preferably organic, into the menu as economically feasible.
• Consider adopting one “meat free” day per week across all residential dining halls.

Goal 4: Create a seasonal menu that uses local and sustainable foods
Creating a seasonal menu that takes advantage of regionally-sourced, in-season fruits and vegetables will provide customers with fresh foods that are transported fewer miles than out-of-season items.
• Coordinate with food vendors and use the Natural Resource Defense Council’s Eat Local website to develop a seasonal menu appropriate to Southern California.  
www.nrdc.org/health/foodmiles

Goal 5: Investigate the economic feasibility of purchasing sustainable food for 30 percent of total food purchases
UCR has set an ambitious goal to procure 30 percent sustainable food by the end of the long term goals. Given the cost increase associated with sustainable food procurement, the campus will need to take a strategic approach to produce selection.

• UCR can enlist students to analyze sustainable options for cost and availability, allowing the campus to target cost-effective produce.
• Consider establishing an internship position under the Chancellor’s Committee on Sustainability Food Technical Workgroup.

Goal 6: Partner with Panda Express to green their operations
After UCR establishes best practices for compostable product procurement and food waste recycling, Panda Express should be expected to follow suit. The university should explore the possibility of amending the contract with Panda Express to include environmental practices and goals. Defining UCR’s expectations through contractual obligations will help UCR achieve accountability and the desired sustainability results as opposed to non-binding recommendations and requests.

• Open a dialogue with Panda Express management to discuss UCR’s goals and determine the most appropriate way to proceed.
• Discuss with other UC campuses how they have compelled outside food vendors to support their zero waste goals.

Goal 7: Partner with any current or future corporate entities that provide food on campus
Corporate restaurant contracts can be an important revenue stream for a campus. However, failing to require companies to implement sustainable operations may provide them with a competitive advantage over campus-owned dining facilities. Additionally, UCR’s attainment of sustainability goals such as zero waste could be compromised.

• Include sustainability requirements in all new contracts with outside food vendors.
• Discuss with other UC campuses how they have compelled outside food vendors to support their zero waste goals.

Goal 8: Replace the aging dish washing machine at the Aberdeen-Inverness Residential Restaurant
UCR can save up to 323,000 gallons of water annually by replacing aging dishwashing machine at Aberdeen-Inverness with a water-saving Hobart FT900. Installing this model would also result in significant energy savings.
• Perform a cost analysis to determine the annual price of operating the old dishwasher versus the resource-efficient model.
• Determine the simple payback for the product.
• Present this information in conjunction with background on UCR’s sustainability goals to the appropriate parties to support purchasing the new equipment.

Goal 9: Create a labeling system to highlight sustainable food choices for diners
UCR is currently developing a Green Eating Program that will help diners make informed meal choices. The campaign will include signs at point of service; color coding based on relative distance items traveled to get to the campus; and different markers for organic, locally grown, vegetarian, and vegan options.
  • Work with food vendors to develop a system for calculating the miles traveled and carbon footprint of foods served at UCR.
  • Use this information to label the different food choices and highlight sustainable options.
  • Implement this program consistently throughout all campus-operated dining facilities.
  • Develop marketing material to educate the campus about the program, especially students living in the residence halls.

Goal 10: Use the community garden to establish an agroecology program
Student gardens provide an excellent opportunity for hands-on learning about ecology and agricultural production. UCR can enhance its course offerings by developing the community garden into a larger agroecology program.
  • UC Santa Cruz established a residential living/learning program called the Program in Community and Agroecology (PICA). PICA presents a model for sustainable living with a student garden serving as the central demonstration site. Students and faculty interested in developing a program for UCR can visit the garden, sit in on a PICA seminar, and learn about UCSC’s experience with implementing this type of program.
  ucscpica.org

8.5 Long Term Goals (5-10 years)
Goal 1: Achieve zero food waste by 2020
For UCR to meet the UC 2020 zero waste target, the entire food waste stream will need to be captured and diverted. Within the long term goals time frame, enough students will be accustomed to the food diversion program that a 100 percent diversion rate will be achievable.
  • Educate all incoming freshman and transfer students on the food waste diversion program goals, through welcome week activities and clear signage in the dining halls.
  • Gather feedback from diners to determine how the program could be improved.
Goal 2: Procure sustainable foods for 30 percent of total food purchases

New UC Policy pending adoption in spring 2009 will stipulate that campuses procure 20 percent sustainable food by 2020. UCR has set an ambitious goal to purchase 30 percent by 2020. Sustainable produce often come with a higher price tag than foods produced using industrial farming practices. UCR will work to identify cost-effective ways to raise sustainable purchases to 30 percent of total food purchases.

- Maintain active participation in the UC Systemwide Sustainability Working Group for Food Systems and adopt a range of best practices and programs that have proven successful at other UC campuses.
- Develop a strategic approach to increasing sustainable food procurement within the campus’s budget.
- Maintain a dialogue with farmers markets, local food organizations and nonprofits to keep pressure on vendors for sustainable products.

Goal 3: Replace aging kitchen equipment with Energy Star appliances

Use the sustainability guidelines created in the intermediate goals time frame. When kitchen equipment is due for replacement, purchase Energy Star appliances exclusively.

- Use the Food Service Technology Center for cost calculators and rebate programs to help evaluate replacement kitchen equipment and guide resource efficient purchasing decisions. www.fishnick.com
- Continue to test new kitchen equipment at the Southern California Gas Company’s Food Service Equipment Center, located at the Energy Resource Center in Downey, California. Select models that meet UCR performance requirements, are Energy Star rated, and are eligible for rebates.

Goal 4: Incorporate social justice guidelines in food procurement decisions

Social justice is a highly important component of a sustainable food system. Verifying the social justice attributes of food is difficult, however many organizations and individuals are involved in this issue and are pushing forward with new ideas and ways to effectively incorporate social concerns into food procurement decisions.

- Stay abreast of progress in this area by urging all members of the UC Systemwide Sustainability Working Group for Food Systems to devote energy to developing methods for identifying producers with socially responsible labor policies and practices.
- Develop a definition of sustainable food that includes human and animal rights, and incorporates third-party certification programs that verify socially just and humane practices.
8.6 Demonstration Projects

Project 1
UCR can create a useful resource from food waste generated on campus by partnering with students to create a vermicomposting, or worm bin program. The campus will need to provide a safe area for bins and the tools students require to construct them. Students will be responsible for picking up coffee grounds and other food scraps from the campus dining outlets. Students will also provide general care for the worms. The resulting vermicompost, or worm castings, can be sold by students or given to various gardens that UCR is planning to create, such as the culinary herb garden and the community garden. The Entomology Department is a good resource for both faculty oversight and interested students.

Project 2
Develop a pilot program at Spinelli’s To Go where diners are provided with a reusable to-go container rather than a disposable one. Students will take food as usual and bring back the reusable container at their convenience to be washed by Dining Services, after which it can be used again for another to go meal. A small deposit can be charged to student meal cards and refunded at the end of the year if all containers are returned. The University of Florida has had great success with this program:
ufsustainability.blogspot.com/2009/01/gator-dinings-green-takeout.html

Project 3
Develop a program to reduce the use of disposable plastic bags at Spinelli’s To Go and LoGo Café by offering reusable bags and charging a small fee for a disposable bag. Over 173,000 disposable bags were used at these two grab-n-go operations in 2008. Consider selling an appropriately-sized canvas tote with a UC Riverside logo, or otherwise making reusable bags attractive for students to use.

Project 4
Certify one of UCR’s food service facilities using a third-party green business certification program. Earning certification will provide UCR with a sustainable dining operation that meets specific criteria for energy and water conservation, waste reduction and recycling, green cleaning, pollution prevention and education. Potential third-party certifiers include the Green Restaurant Association and Green Seal’s Restaurants and Food Services Operations (GS-46) certification program.
www.dinegreen.com
www.greenseal.org/certification/gs46_food_service_operations.cfm

Project 5
Join the Real Food Challenge, a campaign designed to use the purchasing power of colleges and universities to transform the food system into a more sustainable and just system. The
challenge calls for participating campuses to redirect 20 percent of all food purchases towards “real food” by 2020. Real food falls under four categories: local, fair, ecologically sound, and humane. See the Real Food Challenge website for details.
realfoodchallenge.org

8.7 Definitions

Local food (LEED) – food grown and harvested within 100 miles

Local food (STARS) – food grown and harvested within 150 miles

Local food (UCR) – food grown and harvested within 250 miles

Sustainable food – food that meets one or more of the following criteria per pending UC Policy: Grown within 500 miles; Fair Trade Certified; Domestic Fair Trade Certified; Shade-Grown or Bird Friendly Coffee; Rainforest Alliance Certified; Food Alliance Certified; USDA Organic; AGA Grassfed; Pasture Raised; Grass-finished/100% Grassfed; Certified Humane Raised & Handled; Cage-free; Protected Harvest Certified; Marine Stewardship Council; Seafood Watch Guide “Best Choices” or “Good Alternatives”; Biodynamic certification; Farm/business is a cooperative or has profit sharing with all employees; Farm/business social responsibility policy includes (1) union or prevailing wages, (2) transportation and/or housing support, and (3) health care benefits

Compostable product – a product that will degrade in a commercial composting facility in 180 days or less according to American Society for Testing and Materials (ASTM) International Standards 6400 or 6868

Biodegradable product – a product that will break down completely by microorganisms into carbon dioxide, water and biomass; no food service industry standard for this term exists at this time
9. ACADEMICS AND RESEARCH

The responsibility to educate students to think critically about sustainability issues and solutions is embedded within the mission of the University of California. Fully understanding these issues is an increasingly interdisciplinary exercise, requiring that faculty and students from all academic backgrounds incorporate and address sustainability concerns into their area of study.

Sustainability within the realm of academics and research is blossoming at UCR. New programs and courses are cropping up, including a sustainable design certificate program and a freshman seminar on sustainability. UCR is also developing educational campaigns to cultivate a campus community interested in improving the quality of the environment both on and off campus. In 2008 the campus hosted a very successful Earth Week. This event was a collaborative effort by student groups, various campus departments, and faculty members. Outreach and education about environmental issues took the form of several different events, including:

- environmental lectures by professors and guest speakers, including a presentation on climate change given by a speaker trained by Al Gore
- electronic waste drive open to the campus and the Riverside community; this event netted 30,000 pounds of e-waste in just five hours
- plant sale fundraiser organized by the student group Sustainable UCR
- recycled paper notebook making workshop organized by Sustainable UCR
- visit from the BioTour, a sustainability movement on wheels: biotour.org
- showing of the movie Who Killed the Electric Car

As UCR explores and develops opportunities to incorporate sustainability across curriculums, the goals outlined in this section will help draw participants from around the campus into the conversation. This section also touches on measures UCR will establish to gauge its progress towards introducing students of all academic backgrounds to sustainability.

9.1 Current Best Practices

Course Offerings

A preliminary survey of UCR’s course offerings indicates that a range of environmental science and study topics are available to students. While there is some inherent uncertainty in identifying courses that address sustainability given the broad and interdisciplinary nature of the subject, the following courses directly address one or more of the following areas: environmental science, study or management; environmental quality; natural resource use; wildlife ecology or management; environmental policy or law; or other directly-relevant environmental topic as related through the online course description.
Thirty courses have been identified in the initial cull of the online schedule of courses. This should not be considered an exhaustive list of courses at UCR with sustainability content until a thorough examination of course offerings and content analysis is completed.

<table>
<thead>
<tr>
<th>Course Number</th>
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<tr>
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<td>Introduction to Environmental Science</td>
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<td>ENSC 002</td>
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<td>Contemporary Issues in Environmental Science</td>
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<td>Intro to Environmental Economics</td>
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<td>Exploring Environmental Sciences</td>
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<td>Introduction to Soil Science</td>
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<td>Water Resources</td>
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<td>ENSC 102</td>
<td>Introductory Atmospheric Science</td>
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<td>ENSC 104</td>
<td>Environmental Soil Chemistry</td>
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<td>ENSC 127</td>
<td>Fate and Transport of Contaminants in Soil</td>
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<tr>
<td>ENSC 134</td>
<td>Soil Conditions and Plant Growth</td>
</tr>
<tr>
<td>ENSC 135</td>
<td>Chemistry of the Clean and Polluted Atmosphere</td>
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<td>ENSC 141</td>
<td>Public Health Microbiology</td>
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<td>Environmental Economics</td>
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<td>Natural Resource Economics</td>
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<tr>
<td>ENSC 155</td>
<td>Principles and Applications of Bioremediation</td>
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<tr>
<td>ENSC 163</td>
<td>Hydrology</td>
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<td>ENSC 172</td>
<td>Environmental Impact Analysis</td>
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<td>ENSC 174</td>
<td>Law, Institutions and the Environment</td>
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<td>ENSC 191</td>
<td>Seminar in Professional Development in Environmental Sciences</td>
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<td>ENSC 197</td>
<td>Undergraduate Research in Environmental Science</td>
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<td>ENSC 207</td>
<td>Surface Water Quality Modeling</td>
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<td>ENSC 232</td>
<td>Biogeochemistry</td>
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<td>ENSC 227</td>
<td>Global Change and the Earth System</td>
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<td>ENVE 133</td>
<td>Fundamentals of Air Pollution Engineering</td>
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<td>Fate and Transport of Environmental Contaminants</td>
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<td>Water Quality Engineering</td>
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<td>ENVE 160C</td>
<td>Environmental Engineering Laboratory</td>
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<tr>
<td>GEO 011</td>
<td>Global Climate Change</td>
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</table>
Sustainable Design Certificate Program
In fall 2008 UCR launched a new professional certificate program in Sustainable Development and Green Design. It is one of ninety certificate programs offered through UCR Extension, the university’s continuing education division. Students of the fourteen unit program will learn the principles of economic, environmental and social sustainability, and how to execute these principles in building and energy projects.

Freshman Seminar: Exploring Sustainability at UCR
UCR’s first course dedicated to sustainability launched in winter 2009. Championed by faculty members Dr. Yolanda Moses and Assistant Professor Ertem Tuncel, the course introduces first year students to sustainability issues in a small-group, highly interactive format. The course is currently offered once per year, with the goal to offer it every quarter after it is established.

Student Groups
Several student groups actively meet to discuss and promote sustainability.

- Sustainable UCR – This group of about 15 students works to develop sustainable practices for the UCR campus and outside community.
- CalPIRG – With roughly 40 students, this group works on national activist campaigns.
- Climate Change Action Group – About 10 students work to communicate scholarly work about climate change to the student body.
- Bliss and Wisdom – This group of about 15 members focuses on healthy food choices and consumer awareness.
- Emerging Green Builders – The U.S. Green Building Council’s Inland Empire chapter hosted the first Emerging Green Builders meeting in February 2009.

Campus Research Units
UCR has a wealth of research centers that are dedicated to exploring sustainability and environmental issues.

<table>
<thead>
<tr>
<th>Research Center</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Experiment Station</td>
<td>agops.ucr.edu/home.html</td>
</tr>
<tr>
<td>Air Pollution Research Center</td>
<td><a href="http://www.aprc.ucr.edu/index.html">www.aprc.ucr.edu/index.html</a></td>
</tr>
<tr>
<td>Biotechnologies Impact Center</td>
<td>genomics.ucr.edu/centers/bic/index.php</td>
</tr>
<tr>
<td>Center for Conservation Biology</td>
<td><a href="http://www.ccb.ucr.edu/">www.ccb.ucr.edu/</a></td>
</tr>
<tr>
<td>Bourns College of Engineering - Center for Environmental Research &amp; Technology (CE-CERT)</td>
<td><a href="http://www.cert.ucr.edu">www.cert.ucr.edu</a></td>
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<tr>
<td>Center for Invasive Species Research</td>
<td>cisr.ucr.edu</td>
</tr>
<tr>
<td>Center for Plant Cell Biology</td>
<td><a href="http://www.cepceb.ucr.edu/about/about.htm">www.cepceb.ucr.edu/about/about.htm</a></td>
</tr>
</tbody>
</table>
9.2 Metrics

Developing metrics that accurately quantify sustainability components within the UCR’s academics and research programs is a complex undertaking. The Chancellor’s Committee on Sustainability Academics Workgroup will confer in the near future to develop a set of performance metrics and procedures for populating these metrics. AASHE’s STARS program is an excellent resource for developing goals and benchmarking performance. [www.aashe.org/stars](http://www.aashe.org/stars)

9.3 Short Term Goals (0-2 years)

**Goal 1: Offer a student-run colloquium series on sustainability**

This type of course brings speakers from different backgrounds to discuss a broad range of topics related to sustainability. Both student instructors and student attendees earn credit for participating in the colloquium series.

- Encourage the development of student-led courses by identifying and rewarding faculty champions that are willing to act as program sponsors.
- Faculty may want to provide students with a training course on effective teaching methods, project and student management, and time budgeting. This could be done in conjunction with existing teacher’s aid training programs offered through the Graduate Division, or by setting up a training program through the Office of Undergraduate Studies and Student Affairs.

**Goal 2: Offer a sustainability service-learning course**

Service-learning courses are an excellent way to develop sustainability programs, practices and policies for the UCR campus. In this type of course, students perform useful research and projects directed under faculty supervision. Projects could include LEED EBOM support and building audits to help UCR certify its existing building stock and meet UC green building policy. The course could be offered centrally, or through each of the colleges to focus the course goals and tie the experience more directly with students’ majors.

- There is currently no campuswide service learning program underway. Implementing this program will require an institutional investment in faculty training.
Goal 3: Offer an Education for Sustainable Living Program course
Have students work with other UC campuses and bring the Education for Sustainable Living Program (ESLP) to UCR. This seminar series is an interdisciplinary effort to realize a sustainable community throughout the University of California. Students form action research teams and partner with guest lecturers, faculty, administrative staff, and community members to affect campus-specific issues.
daviswiki.org/Education_For_Sustainable_Living_Program
decalberkeley.nfshost.com/937

Goal 4: Pass The Green Initiative Fund (TGIF)
The Green Initiative Fund is a student fee referendum that generates a pool of grant money for sustainability projects. The student bodies of campuses across the nation have assessed themselves a TGIF fee to pay for energy and sustainability projects and programs that would otherwise go unfunded. Passing this referendum would increase student, staff, and faculty collaboration and participation in finding sustainable solutions for the UCR campus.
- Contact campuses that have successfully passed this ballot initiative and discuss campaign strategies.
- Meet with prospective committee members.
- Collaborate with UCR departments that will be responsible for executing and managing the program.
- Finalize the TGIF bylaws and quarterly fee amount.
- Begin campaigning using a variety of outreach methods including flyers, listservs, classroom announcements, special events, tabling, T-shirts, and Facebook.

Goal 5: Develop metrics for the Academics and Research focus area
Measuring performance in the area of academics and research is difficult, yet necessary to judge whether or not students are receiving adequate training and exposure to sustainability during their time at UCR.
- The CCS Academics Workgroup will confer in the near future to develop a set of performance metrics and procedures for populating these metrics.
- AASHE’s STARS program is an excellent resource for developing goals and benchmarking performance.
www.aashe.org/stars

Goal 6: Enhance outreach on the UCR sustainability website
UCR’s sustainability website should be the main hub for all sustainability-related activities on campus. The website should act as a clearinghouse for all relevant events, lectures and meetings that pertain to sustainability.
- Continue to populate the site with student internship and research opportunities both on and off campus and sustainability course offerings.
• Host a sustainability calendar that the campus at large can post events on (with some oversight via the site webmaster) to draw students and faculty together and increase attendance at events.
• Include links to all environmental student group websites.
• Recognize the work of campus research units as it relates to sustainability.

Goal 7: Advertise sustainability courses on the UCR sustainability website
Improve advertising for sustainability courses by providing visibility on the sustainability website.
• A student environmental group or volunteer could work with the CCS Academics Workgroup to define this term, review UCR’s course offerings, and provide a list of courses to the site webmaster.
• AASHE’s STARS program can be used to help define what constitutes a sustainability-focused or sustainability-related course, and how to turn the information gathered for the website into a performance metric.

Goal 8: Create an active California Student Sustainability Coalition (CSSC) chapter
The CSSC is a state-wide student group that unites students, campuses and campaigns to transform the higher education system into a model of sustainability.

sustainabilitycoalition.org
• UCR can designate a staff person or faculty member to facilitate this process.
• Chapter members should hold regular meetings, select CSSC campaigns to deploy on campus, and attend the next Student Sustainability Convergence.
• Post information about upcoming meetings on the sustainability website calendar.
• Consider creating a Facebook group and using the website to recruit additional members.

Goal 9: Create a Chancellor’s Committee on Sustainability (CCS) Student Internship Program
Developing a student sustainability internship program will enable students to become actively involved in the different CCS work groups. The program will help lessen the burden on the staff as well as the university’s budget, and would provide students with hands on experience with sustainability in their field of focus.
• Create an internship position within each CCS technical workgroup.
• Student interns can be charged with gathering data for metrics outlined in this plan.
• Consider funding internship positions to provide students with an added incentive to commit to performing internship duties. The positions could be tied to campus work-study to ensure that students can afford to take time to participate in the program.

Goal 10: Submit UCR as a spotlight campus with the Association for the Advancement of Sustainability in Higher Education (AASHE)
Developing and adopting a Sustainability Action Plan and Climate Action Plan of this scope is a great achievement. Spread the word about this development by submitting UCR as an AASHE
spotlight campus. A new member university is selected each week and is highlighted on both AASHE’s homepage and email bulletin.

www.aashe.org/membership/member_spotlight.php

• Work with the Office of Strategic Communications to craft the submission.

9.4 Intermediate Goals (2-5 years)

Goal 1: Develop an Environmental Literacy or Sustainability General Education graduation requirement

Educating students is the primary function of higher education, and UCR can be a leader in teaching about sustainability as it relates to our changing society by creating an explicit sustainability requirement that applies to the entire UCR student body.

• The CCS Academics Workgroup will work with the Academic Senate Educational Policy Committee to craft and implement a sustainability graduation requirement.

Goal 2: Highlight sustainability issues through student-written publications

Student publications are an effective way to engage the campus community in sustainability issues, relate UCR’s progress to the student body, and communicate topical sustainability issues to a wide audience.

• Create a new student-written publication that highlights current research on campus, regional sustainability issues, student successes in the field, and campus progress towards sustainability goals.
• Collaborate with the student newspaper to develop a weekly or monthly column dedicated to sustainability. Piggybacking on an established publication that already has a wide readership will provide a solid platform for communicating sustainability issues to the student body.
• Include a sustainability theme as a strand in the annual Undergraduate Research conference and journal, which are currently run out of the Office of Undergraduate Education.

Goal 3: Create an Environmental Chair in the Associated Students UCR (ASUCR) Senate

The Environmental Chair would represent the student body in sustainability and environmental issues. The chair would update the Senate with the campus’s sustainability progress, goals and weaknesses, as well as advocate for sustainability projects and policies. The Environmental Chair should attend CCS Workgroup meetings and report back and forth between CCS and ASUCR.

• Engage the ASUCR Executive Director in a discussion about this goal and the benefits of developing an Environmental Chair.
• Submit a written bylaw to the ASUCR Constitution and Bylaws Committee. This committee will review the bylaw and present it to the Senate for a vote if satisfactory.
• Reference existing ASUCR bylaws for examples at www.asucr.ucr.edu.
9.5 Long Term Goals (5-10 years)

Goal 1: Have 100 percent of undergraduates take at least one sustainability-related course before graduating

This can be achieved by working with faculty to articulate the importance of sustainability issues in all classes, and to express that importance in classes that range from freshman seminars to senior capstone courses. This work must be led by faculty and students and will have to take place at the department level as well as in interdisciplinary forums.

- Develop data collection/survey methodology that will accurately capture performance in this goal.
- Enlist the future CCS Academic Technical Workgroup internship position to spearhead development and implementation of the graduating senior survey.
- Work with faculty to create a variety of topical sustainability modules that can be included in lectures given by professors from different academic fields.
- Implement the Environmental Literacy or Sustainability General Education graduation requirement from the Intermediate Goals time frame to ensure all students are exposed to sustainability.

Goal 2: Inspire students in different areas of study to become involved in sustainability

Offer a series of interdisciplinary programs at both the undergraduate and graduate levels that allow students in any field of study to understand the complexity of sustainability issues from a variety of points of view both at the theoretical, policy and experiential levels.

- Offer sustainability internships, study abroad programs, and service learning opportunities as integral part of the student’s experience and not as add-ons.
- Publicize the interdisciplinary nature of sustainability issues by fulfilling the related goals included in this plan, such as highlighting research achievements related to sustainability on the website, expanding sustainability course offering, and creating a general education requirement.

9.6 Demonstration Projects

Project 1

Designate an annual Sustainability Week with high-visibility events that draw the campus community into the discussion about sustainability and social and environmental justice. Use Sustainability Week to draw attention to resource use and conservation; highlight academic course offerings and research; opportunities to join student organizations; and partnership opportunities across departments/colleges and with outside community.

Project 2

Develop Welcome Week events that draw new students and their parents into a discussion about the university’s philosophy, mission and approach to sustainability. This early introduction to the
university’s mission will enable students to be proactive about sustainability issues from the beginning of their time at UCR.

**Project 3**
Host an annual global sustainability forum where speakers offer insight and potential solutions to environmental and social justice issues that are global in nature.
Appendices
Chancellor’s Committee on Sustainability - Policy

UCR’s Sustainability Policy commits the university to leadership in:

1. environmental research and education
2. environmentally responsible operations and infrastructure
3. environmental stewardship in the community

The University of California, Riverside seeks to attain and maintain a place of leadership in all that we do. This includes leadership in environmental stewardship and sustainability on our campus and in our community. We will bring vision, intellect, and high ethical standards to our pursuit of environmental leadership in research and teaching, institutional operations, campus infrastructure, and our relationship with the community.

Academics

UCR will continue as a leader in environmental research and education and will use our institutional capability to constructively affect environmental policy throughout the world. We are committed to supporting interdisciplinary environmental scholarship and research, disseminating information about environmental research and policy, increasing faculty and student awareness of environmental issues, and enhancing environmental educational offerings.

Operations and Infrastructure

UCR will achieve and exceed compliance by integrating the values of sustainability, stewardship, and resource conservation into our activities and services. We will make decisions to improve the long-term quality and regenerative capacity of the environmental, social, and economic systems that support the University’s activities and needs. We will engage in pollution prevention activities and develop and promote practices that maximize beneficial effects and minimize harmful effects of operations, research, and activities on the surrounding environment. We are committed to ongoing assessment of the environmental impacts associated with our activities and services, will develop and track measures of our progress, and accomplish continuous improvement. We will accomplish LEED Silver certification of all new buildings and LEED EB certification for a majority of existing buildings. We will design, build, and maintain the infrastructure and grounds to reduce the environmental impact, to preserve native, sustainable vegetation, and to maximize efficiencies in energy and water use.

Community

UCR is committed to playing a constructive and collaborative role as a responsible environmental citizen in the life of the surrounding community. We will maintain a positive and proactive role in communicating with the surrounding community, especially the Riverside community, regarding our environmental activities and performance.
## STRATEGIC ENERGY PLAN PROJECTS

### STATE FUNDED BUILDINGS

<table>
<thead>
<tr>
<th>Priority</th>
<th>SEP Project ID</th>
<th>Building Name</th>
<th>Project Name</th>
<th>Total Purchased Electricity Savings (kWh/yr)</th>
<th>Associated MTCO2e</th>
<th>Total Purchased Gas Savings (th/yr)</th>
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<th>Net Simple Payback (yrs)</th>
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**SUBTOTAL - State Funded MBCx Projects**

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<th>Total Purchased Electricity Savings (kWh/yr)</th>
<th>Associated MTCO2e</th>
<th>Total Purchased Gas Savings (th/yr)</th>
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### New Construction Projects

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<th>Building Name</th>
<th>Project Name</th>
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<th>Net Simple Payback (yrs)</th>
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<td>8.3</td>
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<td>1</td>
<td>E3020</td>
<td>BACHELOR</td>
<td>SBD, New/Renov - Batchelor Hall Building Systems Renewal</td>
<td>280,040</td>
<td>169</td>
<td>16,399</td>
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<td>1</td>
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<td>ENGINEERING BUILDING UNIT 3</td>
<td>SBD, New/Renov - Engineering Building Unit 3</td>
<td>1,032,570</td>
<td>625</td>
<td>61,504</td>
<td>326</td>
<td>8.3</td>
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<tr>
<td>1</td>
<td>E3034</td>
<td>W. CAMPUS GRAD AND PROFESS CTR</td>
<td>SBD, New/Renov - West Campus Graduate and Professional Center Phase 1</td>
<td>299,700</td>
<td>181</td>
<td>35,100</td>
<td>186</td>
<td>8.2</td>
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<td>1</td>
<td>E3035</td>
<td>CAMPUSWIDE</td>
<td>SBD, New/Renov - Academic Facilities Renewal Step 1</td>
<td>71,898</td>
<td>43</td>
<td>8,420</td>
<td>45</td>
<td>8.2</td>
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<tr>
<td>1</td>
<td>E3055</td>
<td>CAMPUSWIDE</td>
<td>SBD, New/Renov - Campus Approved Projects Under $5 Million</td>
<td>2,817</td>
<td>2</td>
<td>330</td>
<td>2</td>
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<td>1</td>
<td>E3056</td>
<td>CAMPUSWIDE</td>
<td>SBD, New/Renov - Campus Approved Projects Under $5 Million</td>
<td>3,380</td>
<td>2</td>
<td>396</td>
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<tr>
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<td>E3057</td>
<td>CAMPUSWIDE</td>
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<td>3,380</td>
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**SUBTOTAL - State Funded New Construction Projects**

<table>
<thead>
<tr>
<th>Total Purchased Electricity Savings (kWh/yr)</th>
<th>Associated MTCO2e</th>
<th>Total Purchased Gas Savings (th/yr)</th>
<th>Associated MTCO2e</th>
<th>Net Simple Payback (yrs)</th>
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<td>2,945,261</td>
<td>1,781</td>
<td>197,283</td>
<td>1,046</td>
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### HVAC Projects

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<tr>
<th>Priority</th>
<th>SEP Project ID</th>
<th>Building Name</th>
<th>Project Name</th>
<th>Total Purchased Electricity Savings (kWh/yr)</th>
<th>Associated MTCO2e</th>
<th>Total Purchased Gas Savings (th/yr)</th>
<th>Associated MTCO2e</th>
<th>Net Simple Payback (yrs)</th>
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<tr>
<td>1</td>
<td>E2001</td>
<td>BIOLOGIC SCI</td>
<td>LAB HOODS &amp; AHU'S - CV TO VAV CONVERSION</td>
<td>672,807</td>
<td>407</td>
<td>40,850</td>
<td>216</td>
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<td>1</td>
<td>E2002</td>
<td>BOURNS</td>
<td>LAB HOODS &amp; AHU'S - CV TO VAV CONVERSION</td>
<td>1,420,664</td>
<td>859</td>
<td>58,388</td>
<td>309</td>
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<td>1</td>
<td>E2003</td>
<td>RIVERA LIB</td>
<td>AHU'S - CV TO VAV RETROFIT</td>
<td>407,851</td>
<td>247</td>
<td>54,425</td>
<td>289</td>
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<td>E2004</td>
<td>SPIETH</td>
<td>MZDDAHU'S - CV TO VAV RETROFIT</td>
<td>181,943</td>
<td>110</td>
<td>17,063</td>
<td>90</td>
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<td>E2005</td>
<td>SPIETH</td>
<td>LAB HOODS &amp; AHU'S - CV TO VAV CONVERSION</td>
<td>1,150,551</td>
<td>696</td>
<td>46,438</td>
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<td>E2006</td>
<td>PE</td>
<td>AHU'S - CV TO VAV RETROFIT</td>
<td>228,983</td>
<td>139</td>
<td>28,850</td>
<td>154</td>
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<td>E2007</td>
<td>GEOLOGY</td>
<td>LABHOODS &amp; AHU'S - CV TO VAV CONVERSION</td>
<td>1,232,445</td>
<td>745</td>
<td>69,950</td>
<td>371</td>
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<td>E2008</td>
<td>BOYCE</td>
<td>LAB FUMEHOOD &amp; DDAHU'S - CV TO VAV CONVERSION</td>
<td>1,554,589</td>
<td>940</td>
<td>126,988</td>
<td>674</td>
<td>16.5</td>
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<td>Project ID</td>
<td>Project Name</td>
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<td>Costs</td>
<td>Qty</td>
<td>Unit Cost</td>
<td>Subtotal</td>
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<td>E2009</td>
<td>WEBBER</td>
<td>FUMEHOOD &amp; MZAHU - CV TO VAV CONVERSION</td>
<td>575,565</td>
<td>348</td>
<td>1,684</td>
<td>803,468</td>
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<tr>
<td>E2011</td>
<td>CAMPUS SURGE</td>
<td>Replace (E) Pkg AC Units w/ VAV AHU's &amp; Connect to CHW &amp; Steam</td>
<td>867,568</td>
<td>525</td>
<td>1,674</td>
<td>1,000,734</td>
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<tr>
<td>E2014</td>
<td>HINDERAKER</td>
<td>DDMZAHU - CV TO VAV RETROFIT</td>
<td>308,272</td>
<td>186</td>
<td>1,654</td>
<td>523,068</td>
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<td>E2015</td>
<td>OLMSTED</td>
<td>DDMZAHU'S - CV TO VAV RETROFIT</td>
<td>305,743</td>
<td>185</td>
<td>1,646</td>
<td>515,453</td>
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<td>E2016</td>
<td>BATECHLOR</td>
<td>FUMEHOOD &amp; AHU'S - CV TO VAV CONVERSION</td>
<td>1,273,825</td>
<td>771</td>
<td>1,671</td>
<td>2,125,000</td>
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<td>E2018</td>
<td>PHYSICS</td>
<td>LAB FUMEHOODS &amp; DDMZAHU'S - CV TO VAV CONVERSION</td>
<td>936,030</td>
<td>566</td>
<td>1,654</td>
<td>1,564,854</td>
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<td>E2019</td>
<td>PHYSICS</td>
<td>AHU (S-8) - CV TO VAV RETROFIT</td>
<td>155,734</td>
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<td>1,661</td>
<td>250,880</td>
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<td>E2020</td>
<td>PIERCE</td>
<td>LAB FUMEHOODS &amp; DDMZAHU'S - CV TO VAV CONVERSION</td>
<td>2,666,824</td>
<td>1,613</td>
<td>1,655</td>
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<td>E2022</td>
<td>SPROUL</td>
<td>DDAHU'S - CV TO VAV RETROFIT</td>
<td>793,391</td>
<td>480</td>
<td>1,655</td>
<td>1,315,154</td>
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<td>E2023</td>
<td>STAT COMP</td>
<td>DDAHU'S - CV TO VAV RETROFIT</td>
<td>332,266</td>
<td>201</td>
<td>1,655</td>
<td>545,830</td>
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<tr>
<td>E3053</td>
<td>CAMPUSWIDE</td>
<td>UC Riverside Energy Recovery System</td>
<td>28,416</td>
<td>17</td>
<td>1,655</td>
<td>47,750</td>
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**SUBTOTAL - State Funded HVAC Projects**

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Project Name</th>
<th>Costs</th>
<th>Qty</th>
<th>Unit Cost</th>
<th>Subtotal</th>
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<tbody>
<tr>
<td>E3104</td>
<td>BOURNS</td>
<td>Replace LAB HiDs with new, linear fluorescent industrials; replace existing corridor HID recessed cans with new CFL cans</td>
<td>268,266</td>
<td>162</td>
<td>-</td>
</tr>
<tr>
<td>E3105</td>
<td>UCR EXTN CT</td>
<td>Replace fire stair fixtures with bi-level fixtures; retrofit classroom fixtures with 28W T8 lamps and RLO ballasts; retrofit shop fixtures with CFL; install occupancy sensors where appropriate</td>
<td>173,573</td>
<td>105</td>
<td>-</td>
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<tr>
<td>E3106</td>
<td>CAMPUSWIDE</td>
<td>Retrofit existing HPS walkway pole lights with Pulse Start Metal Halide (PSMH) lamps and MH electronic ballasts</td>
<td>157,154</td>
<td>95</td>
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<tr>
<td>E3107</td>
<td>PE</td>
<td>Replace Gym MH high bays with fluorescent high bays plus occupancy sensors</td>
<td>132,149</td>
<td>80</td>
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<tr>
<td>E3108</td>
<td>CNTRL UTL PL</td>
<td>Retrofit or replace 2F96T12 SL industrials and strips with 4F32T8 3rd gen lamps and RLO premium ballasts</td>
<td>10,249</td>
<td>61</td>
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<tr>
<td>E3113</td>
<td>BELLTOWER</td>
<td>Retrofit T12 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts</td>
<td>8,844</td>
<td>5</td>
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<tr>
<td>E3114</td>
<td>ANDERSON 1</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts</td>
<td>23,013</td>
<td>14</td>
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<tr>
<td>E3115</td>
<td>ANDERSON 2</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts</td>
<td>11,979</td>
<td>7</td>
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<tr>
<td>E3116</td>
<td>BATCHELOR</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install daylighting controls where appropriate</td>
<td>111,102</td>
<td>67</td>
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<tr>
<td>E3117</td>
<td>CAMPUS SURGE</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors and daylighting controls where appropriate</td>
<td>76,273</td>
<td>46</td>
<td>-</td>
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<tr>
<td>E3118</td>
<td>ENTOMOLOGY</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install additional occupancy sensors where appropriate</td>
<td>82,299</td>
<td>50</td>
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<tr>
<td>E3119</td>
<td>HINDERAKER</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors and daylighting controls where appropriate</td>
<td>82,130</td>
<td>50</td>
<td>-</td>
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<tr>
<td>E3120</td>
<td>HUMANITIES</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install additional occupancy sensors where appropriate</td>
<td>50,724</td>
<td>31</td>
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<tr>
<td>E3122</td>
<td>LIFE SCIENCE</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors where appropriate</td>
<td>56,776</td>
<td>34</td>
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<tr>
<td>E3123</td>
<td>OLMSTED</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install additional occupancy sensors and daylighting controls where appropriate</td>
<td>130,510</td>
<td>79</td>
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**Lighting Projects**

- **4 E3104** BOURNS
- **5 E3105** UCR EXTN CT
- **6 E3106** CAMPUSWIDE
- **4 E3107** PE
- **4 E3108** CNTRL UTL PL
- **6 E3113** BELLTOWER
- **4 E3114** ANDERSON 1
- **4 E3115** ANDERSON 2
- **4 E3116** BATCHELOR
- **6 E3117** CAMPUS SURGE
- **4 E3118** ENTOMOLOGY
- **4 E3119** HINDERAKER
- **6 E3120** HUMANITIES
- **4 E3122** LIFE SCIENCE
- **4 E3123** OLMSTED
<p>| 4  | E3139 | PHYSICS | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install additional occupancy sensors and daylighting controls where appropriate | 120,553 | 73 | - | - | 13.6 |
| 3  | E3140 | PIERCE  | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install additional occupancy sensors where appropriate | 155,571 | 94 | - | - | 11.8 |
| 2  | E3141 | RIVERA LIB | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install additional occupancy sensors and daylighting controls where appropriate | 311,360 | 188 | - | - | 14.3 |
| 4  | E3142 | SCIENCE LAB1 | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install additional occupancy sensors where appropriate | 53,154 | 32 | - | - | 12.4 |
| 2  | E3143 | SCIENCE LIB | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install additional occupancy sensors and daylighting controls where appropriate | 254,148 | 154 | - | - | 15.2 |
| 4  | E3144 | SPIETH  | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install additional occupancy sensors where appropriate | 121,350 | 73 | - | - | 12.8 |
| 4  | E3145 | SPROUL  | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install additional occupancy sensors and daylighting controls where appropriate | 122,818 | 74 | - | - | 15.3 |
| 4  | E3146 | STAT COMP | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install daylighting controls where appropriate | 42,032 | 25 | - | - | 13.5 |
| 4  | E3148 | BOYCE   | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors where appropriate | 157,182 | 95 | - | - | 12.2 |
| 4  | E3149 | WATKINS | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors and daylighting controls where appropriate | 107,093 | 65 | - | - | 15.4 |
| 4  | E3150 | WEBBER | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors where appropriate | 61,716 | 37 | - | - | 12.1 |
| 3  | E3152 | HUM &amp; SOC SC | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors and daylighting controls where appropriate | 248,756 | 150 | - | - | 12.0 |
| 1  | E3154 | EAST I&amp;Q FAC | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors where appropriate | 56,301 | 34 | - | - | 7.9 |
| 5  | E3155 | FALKIRK STUDENT APTS | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; incandescents with compact fluorescents; and install occupancy sensors where appropriate | 174,717 | 106 | - | - | 12.9 |
| 6  | E3157 | BIOLOGIC SCI | Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts | 13,461 | 8 | - | - | 12.0 |
| 5  | E3163 | BANNOCK F | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; incandescent with compact fluorescents; and install occupancy sensors where appropriate | 9,107 | 5 | - | - | 14.1 |
| 5  | E3164 | BANNOCK G | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; incandescent with compact fluorescents; and install occupancy sensors where appropriate | 8,952 | 5 | - | - | 14.0 |
| 5  | E3165 | BANNOCK H | Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; incandescent with compact fluorescents; and install occupancy sensors where appropriate | 9,198 | 6 | - | - | 14.2 |</p>
<table>
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<tr>
<th></th>
<th>E3166</th>
<th>BANNOCK I</th>
<th>Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors where appropriate</th>
<th>7,740</th>
<th>5</th>
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<tr>
<td>5</td>
<td>E3178</td>
<td>CA MUS PHOTO</td>
<td>Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors and daylighting controls where appropriate</td>
<td>17,787</td>
<td>11</td>
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<td>-</td>
<td>14.3</td>
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<td>3</td>
<td>E3180</td>
<td>UNIV LAB BLD</td>
<td>Retrofit T12 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors where appropriate</td>
<td>35,221</td>
<td>21</td>
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<td>-</td>
<td>5.2</td>
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<tr>
<td>3</td>
<td>E3181</td>
<td>UNIV OFC BLD</td>
<td>Retrofit T12 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; and install occupancy sensors where appropriate</td>
<td>66,218</td>
<td>40</td>
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<td>-</td>
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<tr>
<td>2</td>
<td>E3184</td>
<td>BOOKSTORE</td>
<td>Bookstore-Retrofit all 4-foot T12 fixtures with T8 lamps and reduced light output (RLO) electronic ballasts (28W T8 lamps in the 4-foot fixtures); Install occupancy sensors in offices.</td>
<td>37,998</td>
<td>23</td>
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<td>-</td>
<td>7.1</td>
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**SUBTOTAL - State Funded Lighting Projects** | 3,567,974 | 2,210 | - | - | 12.4 |

### Other Energy Saving Projects

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<tr>
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<th>E3001</th>
<th>CAMPUSWIDE</th>
<th>Solar Pool Water Heater - UCR Pool</th>
<th>-</th>
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<th>12,998</th>
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<th>10.8</th>
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<tr>
<td>5</td>
<td>E3002</td>
<td>CAMPUSWIDE</td>
<td>Pool Covers - UCR Pool</td>
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<td>31,580</td>
<td>168</td>
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<td>4</td>
<td>E3065</td>
<td>CAMPUSWIDE</td>
<td>Refrigerators Phase 1 of 3: 100 Energy Star Refrigerator Replacements</td>
<td>224,300</td>
<td>136</td>
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<td>-</td>
<td>5.8</td>
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<tr>
<td>4</td>
<td>E3066</td>
<td>CAMPUSWIDE</td>
<td>Refrigerators Phase 2 of 3: 100 Energy Star Refrigerator Replacements</td>
<td>224,300</td>
<td>136</td>
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<td>-</td>
<td>5.8</td>
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<tr>
<td>6</td>
<td>E3063</td>
<td>CAMPUSWIDE</td>
<td>Lab Freezers Phase 1 of 2: 20 Lab Freezer Replacements</td>
<td>177,280</td>
<td>47</td>
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<td>67.0</td>
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<tr>
<td>6</td>
<td>E3064</td>
<td>CAMPUSWIDE</td>
<td>Lab Freezers Phase 2 of 2: 9 Lab Freezer Replacements</td>
<td>34,776</td>
<td>21</td>
<td>-</td>
<td>-</td>
<td>67.0</td>
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<tr>
<td>5</td>
<td>E3067</td>
<td>CAMPUSWIDE</td>
<td>Refrigerators Phase 3 of 3: 9 Energy Star Refrigerator Replacements</td>
<td>20,187</td>
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<td>LCD Phase 4 of 4: 630 Verdiem (PC Power Management) Installations and 25 CRT Replacements</td>
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<td>Variable Speed Circulation Pump</td>
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**SUBTOTAL - State Funded Other Projects** | 2,601,685 | 1,573 | 90,745 | 482 | 8.5 |

### Savings By Design - Deferred Maintenance & Capital Renewal Projects

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<th>CAMPUSWIDE</th>
<th>First Electric Savings Component of DM &amp; CR Projects 2009</th>
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**SUBTOTAL** | 2,601,685 | 1,573  | 90,745 | 482 | 8.5 |
### HOUSING FUNDED BUILDINGS

#### MBCx

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<th>#</th>
<th>E3011 ABER INVER</th>
<th>Monitoring-Based Commissioning</th>
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<td>E3021 LOTHIAN HALL</td>
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#### New Construction

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<td>SBD, New/Renov - Canyon Crest Dining Commons, Phase 1</td>
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<td>SBD, New/Renov - Canyon Crest Residence Halls, Phase 1</td>
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#### HVAC Projects

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<th>DDMZAHU'S - CV TO VAV RETROFIT</th>
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#### Lighting Projects

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<td>PENTLAND L</td>
<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install occupancy sensors where appropriate</td>
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<td>PENTLAND O</td>
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<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install occupancy sensors where appropriate</td>
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<td>Retrofit T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts, and install occupancy sensors where appropriate</td>
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<td>BANNOCK N Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; incandescent with compact fluorescents; and install occupancy sensors where appropriate</td>
<td>3,781</td>
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<td>BANNOCK P Retrofit T12 and T8 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts; incandescent with compact fluorescents; and install occupancy sensors where appropriate</td>
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**Other Energy Saving Projects**

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<th>Years</th>
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<td>LOTHIAN HALL UC Riverside LOTHIAN Hall Kitchen Hood Controls</td>
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<td>ABER INVER UC Riverside Aberdeen Inverness Kitchen Hood Controls</td>
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<tr>
<td></td>
<td></td>
<td><strong>SUBTOTAL - Housing Funded Other Projects</strong></td>
<td>74,425</td>
<td>45</td>
<td>2,344</td>
<td>12</td>
</tr>
</tbody>
</table>

**SUBTOTAL - ALL HOUSING FUNDED PROJECTS**

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,614,799</td>
<td>2,789</td>
<td>246,380</td>
<td>1,306</td>
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</table>

**OTHER FUNDED BUILDINGS**

**MBCx**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Description</th>
<th>Cost</th>
<th>Hours</th>
<th>Savings</th>
<th>Years</th>
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<tbody>
<tr>
<td>3</td>
<td>E3024</td>
<td>STU REC CTR Monitoring-Based Commissioning</td>
<td>66,257</td>
<td>40</td>
<td>11,294</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SUBTOTAL - Other Funding MBCx Projects</strong></td>
<td>66,257</td>
<td>40</td>
<td>11,294</td>
<td>60</td>
</tr>
<tr>
<td>New Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------</td>
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</tr>
<tr>
<td>4 E3059 CAMPUSWIDE - OTHER</td>
<td>SBD, New/Renov - Campus Approved Projects Under $5 Million</td>
<td>3,380</td>
<td>2</td>
<td>396</td>
<td>2</td>
<td>8.2</td>
</tr>
<tr>
<td>4 E3060 CAMPUSWIDE - OTHER</td>
<td>SBD, New/Renov - Campus Approved Projects Under $5 Million</td>
<td>3,943</td>
<td>2</td>
<td>461</td>
<td>2</td>
<td>8.2</td>
</tr>
<tr>
<td>4 E3061 CAMPUSWIDE - OTHER</td>
<td>SBD, New/Renov - Campus Approved Projects Under $5 Million</td>
<td>3,943</td>
<td>2</td>
<td>461</td>
<td>2</td>
<td>8.2</td>
</tr>
<tr>
<td>4 E3062 CAMPUSWIDE - OTHER</td>
<td>SBD, New/Renov - Campus Approved Projects Under $5 Million</td>
<td>3,943</td>
<td>2</td>
<td>461</td>
<td>2</td>
<td>8.2</td>
</tr>
<tr>
<td>SUBTOTAL - Other Funding New Construction</td>
<td>15,209</td>
<td>8</td>
<td>1,780</td>
<td>8</td>
<td>8.2</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>HVAC Projects</th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>3 E2021 STU REC CTR</td>
<td>AHU'S - CV TO VAV RETROFIT</td>
<td>1,121,747</td>
<td>678</td>
<td>1,220</td>
<td>6</td>
<td>6.2</td>
</tr>
<tr>
<td>SUBTOTAL - Other Funding HVAC Projects</td>
<td>1,121,747</td>
<td>678</td>
<td>1,220</td>
<td>6</td>
<td>6.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lighting Projects</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3 E3109 STU REC CTR</td>
<td>Replace MH high bays with fluorescents and occupancy sensors in gym and racquetball courts</td>
<td>308,347</td>
<td>187</td>
<td>-</td>
<td>-</td>
<td>4.9</td>
</tr>
<tr>
<td>3 E3179 GERMPLASM</td>
<td>Retrofit T12 fixtures with 28W T8 lamps and reduced light output (RLO) ballasts</td>
<td>71,940</td>
<td>44</td>
<td>-</td>
<td>-</td>
<td>4.9</td>
</tr>
<tr>
<td>SUBTOTAL - Other Funding Projects</td>
<td>380,287</td>
<td>231</td>
<td>-</td>
<td>-</td>
<td>4.9</td>
<td></td>
</tr>
</tbody>
</table>

| SUBTOTAL - OTHER FUNDING SOURCE PROJECTS             | 1,583,500 | 957    | 14,294 | 74     | 5.8    |   |

| TOTAL - SEP PHASE 1 (Priority 1-3)                   | 27,802,329 | 16,816 | 1,627,831 | 8,629 |   |
| TOTAL - SEP PHASE 2 (Priority 4-6)                   | 10,501,662 | 6,401  | 357,941  | 1,897 |   |
| TOTAL - ALL SEP PROJECTS                             | 38,303,991 | 23,217 | 1,985,772 | 10,526 |   |

The SEP project list was developed by UCR and the engineering consulting firm Newcomb Anderson McCormick (NAM). Emissions reductions were calculated using the Climate Action Registry's CARROT tool. Riverside Public Utility's 2005 emission factor was used to calculate emissions reductions for electricity-saving projects.
The proposed climate action project list was developed by UCR. Emissions reductions were calculated using the Climate Action Registry's CARROT tool. Riverside Public Utility’s 2005 emission factor was used to calculate emissions reductions for electricity-saving projects.
4. Climate Action Plan Data Sources & Methodology

Baseline

Campus fleet
Fleet fuel use for 2008 and 2007 was provided by Fleet Services, which has reliable and complete consumption data from purchase and pump records for those years. Fuel consumption was projected back to 1990 from 2008 values by applying two growth factors. The first is employee population, which affects fuel use because fleet vehicles are utilized by employees. This data was obtained from Institutional Planning. The second is vehicle fuel efficiency, which was obtained from the Bureau of Transportation Statistics. The average annual growth in fuel efficiency was adjusted to reflect the fleet's basic proportion of passenger vehicles to other vehicle types (these two vehicle categories have seen efficiency gains at slightly different rates). Emission factors were then applied to the resulting fuel quantities for compressed natural gas (CNG), diesel and gasoline. (In 1990, no fleet vehicles used CNG or diesel. In 1993 UCR began operating diesel buses and CNG vehicles, and emissions resulting from use of these fuel types are reflected accordingly in the 1990 and 2000 baselines). All emission factors applied to fleet fuel types are taken from the California Climate Action Registry's CARROT tool. While today's fuel mix today is different than in 1990 due to the addition of ethanol, emission factor for California's gasoline could not be located.

Electricity
Physical Plant used utility bills to determine actual electricity usage for 1991 through 2008. The year 1990 was estimated with a linear model. Electricity emission factors for 1990 and 2000 are not available from Riverside Public Utilities (RPU). UCR used RPU's 2005 emission factor for its Climate Registry 2007 reporting year. This emission factor is higher than the default CARROT value – 1.33345 lb CO₂/kWh versus .81 lb CO₂/kWh. Conversations with RPU revealed that the power mix in 1990 was coal-heavy. Both of these factors indicate that the CARROT default is too low. Instead, the 1990 and 2000 baselines are calculated using the 2005 RPU emission factor, as this is the most accurate figure available.

Natural Gas
Physical Plant used utility bills to determine natural gas use for 2001 through 2008. Consumption was projected back to 1990 using two growth rates. The first is student and employee population, which was obtained from Institutional Planning. The second is gross square footage, which was obtained from Capital Planning. The default CARROT emission factor for natural gas was then used to determine the emissions for the 1990 and 2000 baselines.
Forecast

Campus Fleet
Fleet emissions were forecasted to 2030 using growth projections for staff population and vehicle fuel efficiency, provided by Institutional Planning and Fleet Services. The average annual increase in FTE staff population (1.49%) and the average annual increase in vehicle fuel efficiency (1.68%) were averaged to arrive at an aggregate growth factor of 1.58%. Since future vehicle efficiency is difficult to estimate with any accuracy, the same growth rate used in the baseline calculations is applied in the forecast model. This value is derived from data provided the Bureau of Transportation Statistics, as described in the baseline methodology description. All emission factors applied to fleet fuel types are taken from the California Climate Action Registry's CARROT tool.

Electricity and Natural Gas
Emissions were forecasted to 2030 using growth projections for staff and student population and gross square footage (GSF) growth, provided by Institutional Planning and Capital Planning. The average annual increase in full-time equivalent (FTE) population (1.43%) and the average annual increase in GSF (2.89%) were averaged to arrive at an aggregate growth factor of 2.16%. This assumes that population and GSF have an equal impact on energy use, an assumption that was also applied to the baseline calculation. All electricity calculations use Riverside Public Utilities’ 2005 emission factor of 1.33345 lb CO₂/kWh.