

2004 Water Use Efficiency Proposal Solicitation Package

APPENDIX A: Project Information Form

Applying for:

Urban

Agricultural

1. (Section A) **Urban or Agricultural Water Use Efficiency Implementation Project**

(a) implementation of Urban Best Management Practice, # _____

(b) implementation of Agricultural Efficient Water Management Practice, # _____

(c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit # or Quantifiable Objective #, if applicable _____

(d) Specify other: _____

2. (Section B) **Urban or Agricultural Research and Development; Feasibility Studies, Pilot, or Demonstration Projects; Training, Education or Public Information; Technical Assistance**

(e) research and development, feasibility studies, pilot, or demonstration projects

(f) training, education or public information programs with statewide application

(g) technical assistance

(h) other

3. Principal applicant (Organization or affiliation):

The Regents of the University of California, Division of Agriculture and Natural Resources on behalf of UCCE San Bernardino County

4. Project Title:

Conserving Water & Improving Plant Health in Large Southern California Landscapes

5. Person authorized to sign and submit proposal and contract:

Name, title

Lynn Deetz, Principal

Mailing address

Contracts and Grants Analyst
UC DANR

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(510) 987-0042

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Lynn.Deetz@ucop.edu

6. Contact person (if different):	Name, title.	Janet Hartin, Principal Investigator
	Mailing address.	UC Cooperative Extension San Bernardino County
	Telephone	
	Fax.	(951)313-2023
	E-mail	(909)387-3306 jshartin@ucdavis.edu

7. Grant funds requested (dollar amount): <i>(from Table C-1, column VI)</i>	\$390,026
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8. Applicant funds pledged (dollar amount):	\$119,622
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9. Total project costs (dollar amount): <i>(from Table C-1, column IV, row n)</i>	\$509,648
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10. Percent of State share requested (%) <i>(from Table C-1)</i>	77%
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11. Percent of local share as match (%) <i>(from Table C-1)</i>	235%
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12. Is your project locally cost effective? <i>Locally cost effective means that the benefits to an entity (in dollar terms) of implementing a program exceed the costs of that program within the boundaries of that entity.</i>	<input checked="" type="checkbox"/> (a) yes
<i>(If yes, provide information that the project in addition to Bay-Delta benefit meets one of the following conditions: broad transferable benefits, overcome implementation barriers, or accelerate implementation.) Broad transferable benefits</i>	<input type="checkbox"/> (b) no

11. Is your project required by regulation, law or contract?

If no, your project is eligible.

If yes, your project may be eligible only if there will be accelerated implementation to fulfill a future requirement and is not currently required.

Provide a description of the regulation, law or contract and an explanation of why the project is not currently required.

- (a) yes
- (b) no

12. Duration of project (month/year to month/year):

1/01/06 to 12/31/08

13. State Assembly District where the project is to be conducted:

**SOUTHERN CALIFORNIA
61-78**

14. State Senate District where the project is to be conducted:

**SOUTHERN CALIFORNIA
17-40**

15. Congressional district(s) where the project is to be conducted:

**SOUTHERN CALIFORNIA
30-41**

16. County where the project is to be conducted:

**LOS ANGELES, SAN
BERNARDINO, RIVERSIDE**

17. Location of project (longitude and latitude)

18. How many service connections in your service area (urban)?

N/A UNIVERSITY PROJECT

19. How many acre-feet of water per year does your agency serve?

N/A UNIVERSITY PROJECT

20. Type of applicant (select one):

- (a) City
- (b) County
- (c) City and County
- (d) Joint Powers Authority
- (e) Public Water District
- (f) Tribe
- (g) Non Profit Organization
- (h) University, College
- (i) State Agency
- (j) Federal Agency

(k) Other

(i) Investor-Owned Utility

(ii) Incorporated Mutual Water Co.

(iii) Specify _____

21. Is applicant a disadvantaged community? If 'yes' include annual median household income.

(Provide supporting documentation.)

(a) yes, _____ median household income

✓ (b) no

**2004 Water Use Efficiency Proposal Solicitation Package
APPENDIX B: Signature Page**

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form has the legal authority to submit the proposal on behalf of the applicant;

There is no pending litigation that may impact the financial condition of the applicant or its ability to complete the proposed project;

The individual signing the form read and understood the conflict of interest and confidentiality section and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant;

The applicant will comply with all terms and conditions identified in this PSP if selected for funding; and

The applicant has legal authority to enter into a contract with the State.

Lynn E. Deetz, Principal Contracts and Grants Analyst

Signature

Name and title

Date

APPENDIX C: Project Costs and Benefits Tables

Table C- 1: Project Implementation Costs (Budget)

Table C- 2: Annual Operations and Maintenance Costs

Table C- 3: Total Annual Project Costs

Table C-4: Capital Recovery Factor

Table C- 5: Project Annual Physical Benefits (Quantitative and Qualitative Description of Benefits)

Table C- 6: Project Annual Local Monetary Benefits

Table C- 7: Project Local Monetary Benefits and Project Costs

Table C- 8: Applicant's Cost Share and Description

**APPENDIX C
PROJECT IMPLEMENTATION COSTS TABLE**

**APPLICANT: The Regents of the University of California, UCCE San Bernardino County
Project Title: Conserving Water and Improving Plant Health in Large Southern California Landscapes**

If using the excel tables on DWR website, complete shaded areas only.

Section A projects must complete Life of Investment, column VII and Capital Recovery Factor, column VIII. Do not use 0.

Table C-1: Project Costs (Budget)

	Category	Project Costs \$	Contingency % (ex. 5 or 10)	Project Cost + Contingency \$	Applicant Share \$	State Share \$	Life of investment (Years)	Capital Recovery Factor (Table C-4)	Annualized costs \$
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
	Administration (for initiation of project)								
	Salaries, wages	17,855			77,865				
	Fringe benefits	858			14,886				
	Supplies	2,500			4,800				
	Equipment	4,800							
	Consulting services	260,000							
	Travel	4,000			500				
	Other								
(a)	Total Administration Costs ¹								
(b)	Planning/Design/Engineering								
(c)	Equipment Purchases/Rentals/Rebates/Vouchers	22,500							
(d)	Materials/Installation/Implementation								
(e)	Implementation Verification								
(f)	Project Legal/License Fees								
(g)	Monitoring and Assessment								
(h)	Report Preparation								
(i)	Structures								
(j)	Land Purchase/Easement								
(k)	Environmental Compliance/Mitigation/Enhancement								
(l)	Construction								
(m)	Other (Specify)	77,513			21,571				
(n)	TOTAL (=a+...+m)	390,026	NA		119,622		NA	NA	
(o)	Cost Share Percentage	NA	NA	NA	(row n, column V/IV) x 100	(100 - row o, column V)	NA	NA	NA

¹ (Excludes administration O & M costs)

Table C-2: Annual Operations and Maintenance Costs

Operations (1) (I)	Maintenance (II)	Other (III)	Total (IV) (I + II + III)
			0

(1) Include annual O&M administration costs here.

Table C-3: Total Annual Project Costs

Annual Project Costs (1) (I)	Annual O & M Costs (2) (II)	Total Annual Project Costs (III) (I + II)

(1) From Table C-1, row (n) column (IX)

(2) From Table C-2, column (IV)

Table C-4: Capital Recovery Factor

(for a discount rate of 6%)

Life of Project (in years)	Capital Recovery Factor
1	1.0600
2	0.5454
3	0.3741
4	0.2886
5	0.2374
6	0.2034
7	0.1791
8	0.1610
9	0.1470
10	0.1359
11	0.1268
12	0.1193
13	0.1130
14	0.1076
15	0.1030
16	0.0990
17	0.0954
18	0.0924
19	0.0896
20	0.0872
21	0.0850
22	0.0830
23	0.0813
24	0.0797
25	0.0782

Life of Project (in years)	Capital Recovery Factor
26	0.0769
27	0.0757
28	0.0746
29	0.0736
30	0.0726
31	0.0718
32	0.0710
33	0.0703
34	0.0696
35	0.0690
36	0.0684
37	0.0679
38	0.0674
39	0.0669
40	0.0665
41	0.0661
42	0.0657
43	0.0653
44	0.0650
45	0.0647
46	0.0644
47	0.0641
48	0.0639
49	0.0637
50	0.0634

Table C-5: Project Annual Physical Benefits (Quantitative and Qualitative Description of Benefits)

QUALITATIVE DESCRIPTION - REQUIRED OF ALL APPLICANTS ¹				QUANTITATIVE BENEFITS –(where data are available) ²
Description of physical benefits (in-stream flow and timing, water quantity and water quality) for:	Time Pattern and Location of Benefit	Project Life: Duration of Benefits	Direct ³ , Indirect ⁴	Quantified Benefits (in-stream flow and timing, water quantity and water quality)
<p>Bay-Delta: Approximately 90% of direct benefits from this project involve Bay-Delta water. Scheduling large landscape irrigations according to a water budget of 80% Eto is estimated to reduce water use by 40-60%, largely due to the necessity for increased DU's (which averaged less than 50% at comparable sites previously measured through a MWD grant where losses at select Southern CA parks and school district sites were measured and estimated) to maintain high quality sites within the available water budget. Additional physical benefits expected to occur due to the implementation of best management practices stressing irrigating trees independently from turf on separate valves, hydrozoning, use of 3" of organic mulch around ornamentals, and allowing soils to dry down between irrigations are reduced rates of phytophthora and other water-borne fungi and overall improved plant health.</p>	<p>First year: project participants will realize water savings of an expected 40-60% after completion of site audits and the correction of common hardware problems. These savings will be greater the second year when first year best management practice data are evaluated and recommendations for improvements made. By the end of the third and final year of the project, results will be presented at a large educational program and online on UCCE and DWR websites.</p>	<p>This project will increase its usefulness over time, due to its pilot project nature. Results will be relevant to large landscaped areas in major metropolitan areas of CA, including the Bay area. (Please refer to Benefits/Cost Section of grant for additional details)</p>	<p>While this project is being conducted in Southern CA, due to statewide Eto data available from over 100 strategically located stations, project outcomes are relevant statewide. Irrigation scheduling based on Kcs of .6 and .8, respectively for warm and cool season turfgrasses coupled with distribution uniformities of 80% or greater is a statewide goal of UCCE for recreational turfgrass sites, both from a water conservation and plant health perspective. This project is important for determining the efficacy of maintaining high quality landscapes at these Kc rates and will provide crucial benchmark data in actual field settings.</p>	

Local: (SAME AS ABOVE)	(IMMEDIATE DUE TO LOCATION OF PROJECT)	(PLEASE REFER TO ABOVE DESCRIPTION AND BENEFITS/COST SECTION OF PROPOSAL)	Not Applicable	
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¹The qualitative benefits should be provided in a narrative description. Use additional sheets to describe the benefits.

²The project benefits that can be quantified (i.e. volume of water saved or mass of constituents reduced) should be provided.

³Direct benefits are project outcomes that contribute to a CALFED objective within the Bay-Delta system during the life of the project.

⁴Indirect benefits are project outcomes that help to reduce dependency on the Bay-Delta system. Indirect benefits may be realized over time.

Table C-6. Project Annual Local Monetary Benefits

ANNUAL LOCAL BENEFITS	ANNUAL QUANTITY ⁴	UNIT OF MEASUREMENT	ANNUAL MONETARY BENEFITS (Thousands \$/yr)
(a) Avoided Water Supply Costs (Current or Future Sources)			
(b) Avoided Energy Costs			
(c) Avoided Waste Water Treatment Costs			
(d) Avoided Labor Costs			
(e) Other (describe)			
(f) Total [(a)+(b)+(c)+(d)+(e)]	NA	NA	

⁴Examples include avoided cost of current water supply (or future supply if available), energy savings, labor savings, waste water treatment.

Table C-7: Project Local Monetary Benefits and Project Costs

(a) Total Annual Monetary Benefits (Table C-6, row(f))	\$
(b) Total Annual Project Costs (Table C-3, column III)	\$

Table C-8: Applicant's Cost Share and Description

Applicant's cost share (%): (from Table C-1, row o, column V)

Describe how the cost share (based on relative balance between Bay-Delta and Local benefits) is derived (see Section A-7 for description). Provide description in a narrative form.



*California Department of Water Resources
Office of Water Use Efficiency
P.O. Box 942836
Sacramento, CA 94236-0001*

Conserving Water and Improving Plant Health in Large Southern California Landscapes

Submitted January 10, 2005 to:

*California Department of Water Resources
Office of Water Use Efficiency*

Principal Investigators:

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STATEMENT OF WORK

Section 1: Relevance and Importance

Increasing the use of practices leading to greater water use efficiency of large-acreage landscapes is consistent with goals of the CALFED Bay-Delta program to maximize existing water resources for assuring a steady and reliable water source for the future of California. While much progress has been made, a report issued by the California Urban Water Agencies entitled '*Water Conservation in Landscaping Act: A Statewide Implementation Review*' indicated that maintenance was "the weakest link in the design, installation and maintenance scenario". The report recommended on-site auditing and greater education for contractors.

An estimated 40-60% of applied irrigation water intended for landscape plants is wasted by runoff, soil evaporation and deep percolation. Studies have shown that incorporating measures such as conducting catchment tests regularly to improve irrigation system distribution uniformity (DU) in large turf plantings, hydrozoning plants with similar water requirements together, irrigating trees separately from turf, and applying mulches around ornamental plantings can significantly reduce these water losses. These recommendations are in accord with best management practices promoted by University of California Cooperative Extension (UCCE) and the California *Water Conservation in Landscaping Act*.

This project offers a comprehensive and cost-effective approach to reducing landscape water waste at large sites by leveraging and building on results of a current grant from the Elvenia J. Slosson Foundation to conduct *Landscape Water Conservation* workshops in May 2005 for 300 – 500 landscapers employed in the public and private sector in Los Angeles and desert areas of Southern California. Interested participants attending these workshops will be selected for two years of follow-up hands-on training under guidelines specified in this grant. The first year will consist of full-day site assessments where specific irrigation schedules and best management practices will be recommended for each site, followed by quarterly visits and field assessments of plant performance under irrigation schedules based on 80 percent ETo and a minimum of 62 percent DU (recommended by the *Water Conservation in Landscapes Act*). The second and third years will focus on follow-up training, initially in weekly informal workshop settings intended for participating landscapers, water district and city and county personnel, and culminating the third year in a large workshop at the 2008 *Turf and Landscape Institute* at the Ontario Convention Center.

Background Information

Over the past fifteen years, a voluminous amount of objective, research-based information has been published by UC scientists in myriad formats, including UC Agriculture and Natural Resources publications, journal articles, technical reports and papers, field day proceedings, and research report summaries. Accessing this information by landscape clientele not familiar with the UC system often results in frustration, inefficiency and low adoption rates of recommended best management practices.

Due to frequent requests from public and private landscapers for this UC information to be edited and compiled in a readily accessible comprehensive format and made available in booklets and on CD ROMs, the Co-principal Investigators of this proposal obtained an Elvenia J. Slosson grant through UC to rewrite, package, and disseminate the information at accompanying workshops for landscapers, water district personnel and other stakeholders on May 11 and 12, 2005 at Los Angeles and desert venues.

Examples of specific University of California information rewritten, edited and available on CD ROMs and in hardcopy from Slosson funding that will be made available to landscapers and water district personnel attending the May workshops and receiving assistance from this project include: **UC Agricultural and Natural Resources Publications:** *Abiotic Disorders of Landscape Plants, A Diagnostic Guide; Pests of Landscape Trees & Shrubs - An Integrated Pest Management Guide; Managing Turfgrasses During Drought; Interpreting Turfgrass Irrigation Water Test Results; Lawn Watering Guide for California; The UC Guide to Healthy Lawns; Water Penetration Problems in California Soils - Prevention, Diagnosis and Solutions; California's Groundwater Resource; Evaluating Turfgrass Sprinkler Irrigation Systems; Estimating Water Requirements of Landscape Plantings; The Landscape Coefficient Method; Water Quality - Its Effects on Ornamental Plants; Effluent Water for Turfgrass Irrigation; Managing Turfgrasses During Drought; and Turfgrass Irrigation Scheduling.*

Presentations scheduled for the Slosson-funded May 11 and 12 *Water Conservation in the Landscape Workshops* include: *Overview of Booklet and CD ROM Contents; Accessing University of California Irrigation Management Information on the Internet; Nexus between Science, Technology, Management and Politics; Update on Irrigation Hardware and ET Controllers; Use of the California Irrigation Management Information System (CIMIS) for Scheduling Turfgrass Irrigation; Scheduling Turfgrass Irrigations using the Irrigation Scheduling Guidelines; Reducing Landscape Water Waste through Best Management Practices; Irrigating Mixed Landscapes Successfully; and, Considerations When Using Reclaimed Water for Landscape Irrigation.*

Next step: Workshop attendees responsible for maintaining 75 parks, school districts and golf courses will be selected to participate in this three year DWR grant commencing January 1, 2006 and concluding December 31, 2008. (An expected 400 – 500 landscapers are expected to attend the workshops allowing an adequate selection pool).

Section 2: Technical/Scientific Merit/Feasibility

In Southern California, nearly \$2 billion has been invested in conservation, water recycling and ground water storage programs, leading to a 700,000-acre-feet reduction in reliance on imported water annually. However, mainstream adoption of best management practices related to irrigation hardware, scheduling, and plant material selection and maintenance at large landscape sites has lagged behind many other more successful water conservation efforts.

Our DWR proposal supports objectives of the *Water Conservation in Landscaping Act* and focuses on a ‘hands-on’ approach where recommended best management practices such as catchment tests to improve irrigation system distribution uniformity, irrigation scheduling based on plant evapotranspiration (ET), hydrozoning, use of mulch and soil amendments, and adoption of other recommended best management practices will be implemented on-site. A major goal of the project is assess plant performance and water savings at large landscape sites irrigated at a maximum of 80 percent ETo, consistent with long-range standards set by the *Water Conservation in Landscaping Act* advisory committee.

The 1995 *Urban Water Management Plan Review Summary* requiring California urban water suppliers to submit water management plans reported that only 46 percent of 315 reporting suppliers implemented water audits and incentives for large landscapes. A major goal of our project is to significantly decrease water waste at parks, school districts and golf courses by promoting the use of on-site water audits through hands-on training, incentives (providing auditing kits to participating clientele) and strong follow-up. Results of this intensive education are expected to reduce overall maintenance and water costs and improve plant health. Previous work by Co-principal Investigator Hartin under a multi-year Metropolitan Water District of Southern California (MWD) contract determined that the average DU of sprinkler systems used to irrigate 50 parks, school district and golf course sites in the greater Los Angeles basin was approximately 45 percent, resulting in a water requirement twice as high as would be required with a DU of 90 percent. Increasing the DU of sprinkler systems irrigating large turf areas used for recreational purposes is the single most important best management practice available to conserve large amounts of urban water.

Our project will be conducted in the most populous county of Southern California, Los Angeles, and two of the fastest growing counties in Southern California, San Bernardino and Riverside, each with over 100% growth rate increases projected between 1995 and 2020. Results of this Southern California project are applicable on a much larger scale to all urban areas of California due to the network of over 100 California Irrigation Management Information System (CIMIS) weather stations monitoring real-time ETo at climatically-diverse sites. Water-use, related costs and plant health assessments measured ‘pre’ and ‘post’ project implementation derived from this study will assist decision-makers charged with developing equitable urban water budgets.

Key elements of this project include:

1) providing on-site irrigation scheduling training over a one year period (January 1 - December 31, 2006) to professional landscapers, groundskeepers, and golf course superintendents at respective 75 park, school district and golf course sites they are employed or contracted to maintain. Recipients will be volunteers selected from a pool of 400 – 500 professional horticulturists expected to attend the May, 2005 *Water Conservation in the Landscape Workshops*.

- 2) hosting weekly informal second year workshops at geographically convenient venues provided gratis by project participants and open to all interested stakeholders (landscapers, water district personnel and city and county personnel) the second year (January 1 - December 31, 2007) to allow for information exchange and dialogue related to progress and challenges at the 75 sites.
- 3) Assessing 'pre' and 'post' plant health and quality associated with irrigating the 75 multi-acre landscape sites (which will likely include sizable plantings of warm and cool season turfgrass) at *Water Conservation in Landscaping Act's* recommended 80 percent ETo and 62 percent minimum distribution uniformity over a two year period (January 1, 2006 – December 31, 2007).
- 4) Assessing 'pre' and 'post' landscape water use (in acre feet) and associated costs, including those related to the implementation of water efficient landscape best management practices over a two year period (January 1, 2006 - December 31, 2007) at each site. (This economic assessment will be finalized by September, 2008).
- 5) Presenting comprehensive findings of the multi-year study at a full day breakout session targeting landscapers, water district personnel and city and county decision makers at the annual *Turf and Landscape Institute* to be conducted at the Ontario, California Convention Center in December 2008. Plant health, economics, and associated best management practices (including proper plant selection based on local climate; hydrozoning; proper irrigation hardware selection and maintenance; catchment tests to determine precipitation rate and system uniformity; irrigation scheduling practices based on historical and real time (CIMIS) (ETo); water cycling ; irrigating non-turf areas with drip systems; and, the proper use of soil amendments and mulch) will be included.

Section 3: Monitoring and Assessment

TIMELINE

Year One (January 1 - December 31, 2006)

On-site hands-on irrigation scheduling and best management practices training based on principles and practices consistent with the *Water Conservation in Landscaping Act* will be provided to landscapers, groundskeepers and golf course superintendents responsible for maintaining the selected 75 parks, school districts, and golf courses located in Los Angeles, San Bernardino, and Riverside Counties. Irrigation schedules based on a maximum 80 percent ETo and 62 percent or greater distribution uniformity will be developed and regularly monitored at each site.

January and February 2006:

- One-day site assessments of all 75 sites including thorough irrigation system evaluations (catchment tests for determining precipitation rates and uniformity) and plant health surveys will take place. Comprehensive evaluation reports with irrigation schedules and best management practice recommendations will be prepared for each site.

A catchment test will be used to determine both irrigation distribution uniformity (DU) and actual system precipitation rate.

Checklist for each site

- Are plants suited to the climatic zone, microclimate, and soil conditions?
- Are plants hydrozoned appropriately?
- Are slopes exceeding 33 percent irrigated with drip systems with precipitation rates of .85 inches/hour or less?
- Are landscape plants appropriately mulched 3-4 inch deep with mulch placed several inches from tree trunks?
- Is irrigation equipment working properly? Are there buried, broken or non-vertical sprinkler heads? Is vegetation blocking or growing around heads?
- Are automatic controllers capacited for multiple program and repeat cycles?
- Are automatic rain shut-off devices installed?
- Does each valve irrigate areas with similar slopes and soil condition and are plants hydrozoned within zones?
- Are turf and non-turfed areas irrigated on separate valves?
- Are drip systems and sprinklers on separate valves?
- Do sprinklers have matched precipitation rates within each valve?
- Are there pressure compensating valves where significant variation in water pressure could occur and when static water pressure exceeds manufacturers maximum recommended operating pressure?

Quarterly:

- Half-day visits to all sites will include catchment tests, plant health surveys and follow up best management practices assessments and recommendations. In addition, any concerns and questions the respective landscapers have will be addressed.

Year Two (January 1 – December 31, 2007):

- Weekly half-day informal workshops will be conducted at locations convenient to clusters of site managers to enable specific landscape maintenance and irrigation issues to be addressed. Discussions of specific findings and challenges at various sites will be discussed and highlighted. All levels of landscape management and water district personnel will be invited to participate. Locations will be supplied gratis by participants. (EXPECTED AVERAGE ATTENDANCE PER WORKSHOP: 15; EXPECTED TOTAL ATTENDANCE: 750)

Year Three (January 1 – December 31, 2008):

- Assessment reports regarding plant health and quality for each of the 75 sites will be prepared (January 1 – August 31).

FINAL PLANT HEALTH REPORT WILL BE SUBMITTED TO DWR BY SEPTEMBER 1, 2008.

- ‘Pre’ and ‘post’ landscape water use (in acre feet) and associated cost reports will be prepared for each site including expenses related to the implementation of water efficient landscape best management practices over the two year period.

FINAL WATER USE AND COST REPORT WILL BE SUBMITTED TO DWR BY SEPTEMBER 1, 2008.

- Results of the project will be presented at a full day breakout session targeting landscapers, water district personnel and city and county decision makers at the annual *Turf and Landscape Institute* to be conducted at the Ontario, California Convention Center in December 2008. Plant health, economics, and associated best management practices (including proper plant selection based on local climate; hydrozoning; proper irrigation hardware selection and maintenance; catchment tests to determine precipitation rate and system uniformity; irrigation scheduling practices based on historical and real time (CIMIS) (ETo); water cycling ; irrigating non-turf areas with drip systems; and, the proper use of soil amendments and mulch) will be included. CD ROMs containing this information will be presented.

EXPECTED ATTENDANCE: 200-300

Expected Project Participation

In all, an estimated 1,125 -1,500 landscapers, water district personnel and city and county stakeholders will directly benefit from this project over the course of the three year grant:

Number
225-400

Location
On-site (landscapers, grounds personnel and golf course superintendents employed or contracted to maintain the 75 selected parks, school district and golf course sites) (year one)

700-800 Landscapers, grounds personnel and golf course superintendents, water district and city and county personnel attending weekly informal workshops conducted in geographic clusters near sites (year two)

200-300 Landscapers, grounds personnel and golf course superintendents, water district and city and county personnel attending the *Turf and Landscape Institute* breakout session where project results will be presented (year three: December 2008)

Expected Indirect Project Outreach/Education

In addition to direct participation, an expected 10,000-15,000 additional stakeholders are expected to benefit indirectly from the results of this study, which will be electronically available on the University of California Cooperative Extension Agricultural and Natural Resources website. Additionally, an estimated 5,000- 8,000 stakeholders attending future UCCE, UCR UNEX and DWR conferences and workshops where project information will be discussed and disseminated will also benefit from project data over the next five years.

Qualifications of the Principal Investigators and Contracted Cooperator

Our project team consists of Janet Hartin and Karl McArthur, University of California Cooperative Extension academics with assignments in environmental horticulture and natural resources, respectively, and William (Bill) Baker, President of William Baker and Associates. Ms. Hartin has been employed by UCCE for 20 years with a concentration on water efficient and sustainable landscape education and applied research applicable to professional public and private landscapers employed in San Bernardino and Los Angeles Counties. Previous funded projects include a five year grant (with UCCE colleagues assigned to Los Angeles, Orange, Riverside and San Diego Counties) from the Metropolitan Water District of Southern California to conduct irrigation system audits of large multi-acre landscape sites and make recommendations for improving irrigation uniformity, water efficiency and improved plant health; a contract from the *California Integrated Waste Management Board* to author three greenwaste and sustainable landscape publications and conduct accompanying workshops in San Bernardino and Riverside Counties and serve as chair of the education committee of the *Inland Empire Landscape Management Outreach Program*; an Elvenia J. Slosson grant (with UCCE colleagues assigned to Los Angeles County) to author and co-author fact sheets on landscape water use, use of mulch and soil amendments and a lawn watering guide based on 80 percent DU and cool and warm season turfgrass crop coefficients (Kcs) of .8 and .6, respectively, for Los Angeles County nursery and garden centers; an Elvenia J. Slosson grant (with Karl McArthur) to consolidate and edit 15 years of UC research-based information on water efficient landscapes and make the information available to professional landscapers in both CD ROM and written formats and conduct

accompanying workshops; and a contract from the *United States Golf Association* to author a 150 page book capitulating 10 years of funded objective research entitled: *Golf Course Turfgrass and the Environment: Management Opportunities for the New Millennium in Southern California*. Janet has presented over 400 talks on water efficient landscaping, sustainable landscaping, use of compost and soil amendments, arboriculture, turfgrass management, and landscape integrated pest management to professional green industry clientele throughout the state, nationally and internationally. She serves as UC chairperson of the *Turf and Landscape Institute*, which attracts 500-600 professional landscapers annually.

Janet Hartin's role in this project will be to coordinate the overall work plan and to actively participate in all facets and provide technical assistance as needed; to schedule regular project meetings with Mr. Baker and Mr. McArthur; select the 75 parks, school district and golf course sites for the study; prepare and submit quarterly and annual reports to DWR from site data provided by Mr. Baker and Mr. McArthur; coordinate site visits and workshops; and organize and chair the 2008 *Turf and Landscape Institute* at the Ontario Convention Center where comprehensive findings from the study will be presented to 200-300 targeted landscapers, water district personnel and city and county decision makers. Plant health, economics, and associated best management practices (including proper plant selection based on local climate; hydrozoning; proper irrigation hardware selection and maintenance; catchment tests to determine precipitation rate and system uniformity; irrigation scheduling practices based on historical and real time (CIMIS) (ETo); water cycling; irrigating non-turf areas with drip systems; and, the proper use of soil amendments and mulch) will be included.

Bill Baker is a highly respected and sought-after consultant and industry leader with over 25 years of field experience in all areas of landscape maintenance. He has served as president of four green industry professional associations and as an officer or director of many others. He has authored over 50 articles for industry publications and has participated as a guest speaker, trainer, and facilitator at numerous seminars and conferences. He teaches turf and landscape management classes at University of California Extension at Riverside (UNEX), and is the consultant for all UNEX green industry certification programs, one of which is '*Irrigation Management*'. Classes that Bill teaches that focus on irrigation and sustainable landscapes include: '*Principles and Practices of Landscape Management*' and '*Foundations of Turfgrass Management*'. In the past year (2004) Bill developed and coordinated two seminars for UNEX that attracted over 150 professional horticulturists and directly addressed water use efficiency and water quality management. Mr. Baker earned a Bachelor of Arts degree in Environmental Studies from University of Redlands and is a certified arborist, certified California pest control advisor and also has a qualified pesticide applicator's license.

Mr. Baker's relevant project management experience includes The *Capitol Park Resource Efficient Landscape Project* (Sacramento), funded by the *California Integrated Waste Management Board*. The project included a landscape assessment, recommendations for improvements, and staff training. In addition to reports and other submitted materials, Bill co-authored the *Capitol Park Training Manual – descriptions*

and guidelines for horticultural practices. He also served as the field project manager for the ***Inland Empire Landscape Management Outreach Program***, a joint venture of public agencies and private entities that provided outreach and educational programs for landscape operations or facilities. The project assessed the level of resource efficiency in the landscapes by conducting site audits, and then providing subsequent staff training for the various operations, which included those in both the public and private sectors. Bill also serves as co-chair annually of the arboriculture session of the ***Turf and Landscape Institute***.

In our DWR project, Mr. Baker will:

- 1) provide on-site irrigation scheduling training over a one- year period (January 1 - December 31, 2006) to professional landscapers, groundskeepers, and golf course superintendents at 75 respective park, school district and golf course sites they are contracted or employed at. (Recipients will be volunteers selected from a pool of 400 – 500 professional horticulturists expected to attend the May 11 and 12, 2005 *Water Conservation in the Landscape Workshops*).
- 2) host weekly informal workshops at geographically convenient venues provided gratis by project participants open to all interested stakeholders (landscapers, water district personnel and city and county personnel) the second year (January 1 -December 31, 2007) to allow for information exchange and dialogue related to progress and challenges at the 75 sites.
- 3) Assess ‘pre’ and ‘post’ plant health and quality associated with irrigating the 75 multi-acre landscape sites (which will likely include sizable plantings of warm and cool season turfgrass) at ***Water Conservation in Landscaping Act’s*** recommended 80 percent ETo and 62 percent minimum distribution uniformity over a two year period (January 1, 2006 – December 31, 2007).

Karl McArthur has been employed as the UCCE Natural Resource Advisor for desert areas of San Bernardino, Riverside and Imperial Counties since 2002, with programmatic emphasis on the interface between human populations and the natural environment. He is actively involved with the ***Alliance for Water Awareness and Conservation (AWAC)*** which includes local high desert cities and water suppliers, as well as other entities concerned with water conservation in the local high desert. Current AWAC emphasis is on potential water savings through conservation in landscape. The high and low elevation desert areas are also targeted geographical areas for this proposal, in addition to urban Los Angeles and inland San Bernardino County. Mr. McArthur’s prior experience includes serving as an Economics Instructor, a Research Assistant in the Department of Political Science at University of Nevada, Reno, and a Research Associate in the Department of Agricultural Economics, University of Nevada, Reno. Projects included tribal and community business analysis, the economics of water-related recreation, water transfers and water banking in Truckee, Walker and Carson River Drainages. Tasks included collecting, compiling and analyzing primary and secondary socioeconomic data,

economic research design, implementation, and presentation, interfacing with federal, state, and local agencies, tribes and general public, and writing technical reports.

Karl McArthur brings over nine years of experience in the area of water-related economic study. His contribution will involve an understandable and socially meaningful economic interpretation of the study data. Where the data permits, analysis will include discussion of the dynamics of water supply, demand, and social implications of change.

In this project, Mr. McArthur will be tracking and evaluating changes in the actual water used and associated costs as well as assessing and providing an overall summary of economic and sociopolitical factors discovered to be involved in implementing best management practices resulting from the on-site training that Mr. Baker will be providing over the two year period at the 75 sites. Karl will work closely with Bill during the field implementation of the study, using results of Bill's irrigation scheduling and best management practices recommendations to determine economics and potential ramifications for statewide adoption. Reduced direct costs from water saved, avoided costs from possible use of reclaimed water, supply constraints and capital investments, social multipliers, effects of community economics/industry effects (competitiveness), quality of life issues (parks and recreation use), marginal costs, and step functions (technology adaptation ---and capital investment) will be assessed. In addition, Mr. McArthur will determine costs and related effectiveness of refresher measures, benefits and cost-effectiveness of on-site auditing and educational workshops for project participants, water district personnel and city and county decision-makers.

Outreach, Community Involvement, and Acceptance

The hands-on nature of this project offers strong industry outreach (on-site visits and direct communication with a projected 225 - 400 green industry employees and contracted personnel responsible for maintaining 75 parks, school district and golf course sites; follow-up weekly workshops; and, a breakout session at the 2008 *Turf and Landscape Institute*) and community involvement (local water districts and city and county decision makers are invited to all weekly workshops and to the 2008 *Turf and Landscape Institute*). Many local and statewide groups and associations have indicated strong interest and support for this project since it will provide on-site assessments of plant quality and health resulting from irrigation scheduling according to a maximum 80 percent ETo and related economic data. Specific groups that have expressed support include: the *Inland Empire Utilities Agency* (IEUA), the *California Integrated Waste Management District* (CIWMB), the *California Landscape Contractor's Association*, and the *Southern California Turfgrass Council* (SCTC). Other collateral groups that are impacted by results of this project that will be notified and involved if funding is provided are: resource conservation districts; water districts and suppliers; the Irrigation Association; and golf course superintendents' associations. Principal Investigators and the contractor involved in this study are respected by and work regularly with these groups and have and will continue to serve on their advisory boards and enlist their input as appropriate. There are no known opponents of this project.

Innovation

This project offers a comprehensive and cost-effective approach to reducing landscape water waste at large sites by leveraging and building on results of a current grant from the Elvenia J. Slosson Foundation to conduct ***Landscape Water Conservation*** workshops in May 2005 for 300 – 500 landscapers employed in the public and private sector in Los Angeles and desert areas of Southern California. Interested participants attending these workshops will be selected for two years of follow-up hands-on training under guidelines specified in this grant. The first year will consist of full-day site assessments where specific irrigation schedules and best management practices will be recommended for each site, followed by quarterly visits and field assessments of plant performance under irrigation schedules based on 80 percent ETo and a minimum of 62 percent DU (recommended by the ***Water Conservation in Landscapes Act***). The second and third years will focus on follow-up training, initially in weekly informal workshop settings intended for participating landscapers, water district and city and county personnel, and culminating the third year in a large workshop at the 2008 ***Turf and Landscape Institute*** at the Ontario Convention Center.

Developing a comprehensive plan to encourage adoption of water efficient best management practices by providing a strong educational component coupled with hands-on field assistance and follow-up will provide a working model for other large metropolitan areas of the state to follow and build upon. The uniqueness of this project lies in the fact that both ‘pre’ and ‘post’ water-use and plant health data will be tracked at a large number of sites over a multiple year period by a team of physical and social scientists and an respected consultant with over 25 years of green industry experience.

Benefits and Costs

An estimated 40-60% of applied irrigation water intended for landscape plants is wasted by runoff, soil evaporation and deep percolation. Studies have shown that incorporating measures such as conducting catchment tests regularly to improve irrigation system distribution uniformity in large turf plantings, hydrozoning plants with similar water requirements together, irrigating trees separately from turf, and applying mulches around ornamental plantings can significantly reduce these water losses. These recommendations are in accord with best management practices promoted by the ***Water Conservation in Landscapes Act*** and form the basis for this project. While much progress has been made, a report issued by the California Urban Water Agencies entitled ‘***Water Conservation in Landscaping Act: A Statewide Implementation Review***’ indicated that maintenance was “the weakest link in the design, installation and maintenance scenario”. The report recommended on-site auditing and greater education for contractors.

The cost of this project is a sound investment for ensuring future water conservation at large landscapes throughout California. Results are a crucial step in defining the relative importance of specific best management practices involved in reducing water waste and improving plant help and in assessing the efficacy of the recommended ***Water Conservation in Landscapes Act’s*** 80 percent ETo to irrigate recreational sites planted largely with turf. Data derived from the study is adaptable to all areas of California due to

the network of more than 100 CIMIS stations strategically placed throughout the state reporting ETo regularly.

An estimated 1,400 landscapers, water district and city and county stakeholders will directly benefit from this project. In addition to direct participation, an expected 10,000-15,000 additional stakeholders are expected to benefit indirectly from the results of this study, which will be electronically available on the University of California Cooperative Extension Agricultural and Natural Resources website. Additionally, an estimated 5,000-8,000 stakeholders attending future UCCE, UCR UNEX and DWR conferences and workshops where project information will be discussed and disseminated will also benefit from project data over the next five years.

Hartin/McArthur: Conserving Water and Improving Plant Health in Large Southern California Landscapes (DWR Grant Application)

Explanation of Costs (from Appendix C: Project Implementation Costs Table)

Salaries and wages (UC share): \$77,865 includes pro-rated academic salaries of Janet Hartin (20%) and Karl McArthur (25%) for University work-time allocated to this project averaged over the three year period

Requested salary of \$17,855 covers expenses for a 10 hr/week clerical position to be assigned to duties pertaining to the conductance of this grant.

Equipment request includes the purchase of one LCD projector (\$3,300 and one laptop computer (\$1,500) and 75 \$300 field assessment kits (one per site).

‘Supplies’ request includes funding for printing relevant training materials, purchasing and burning CDs, and for promoting and mailing brochures for the 2008 Turf and Landscape Institute

Consulting services for William Baker and Associates were assessed at a rate of \$100/hour for a total of 2,600 hours (2400 hours for field assessments during year one and 200 hours for 50 4-hour workshops year two)

A mandatory 22% University of California overhead was assessed on all budget items excluding consulting services, of which only the initial \$25,000 was assessed at the 22% rate