Statement of Mary Ann Dickinson

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regarding

Water Efficiency Research Needs

For the Record of the Hearing of October 30, 2007

on H.R. 3957

Subcommittee on Energy and Environment

House Science Committee

November 13, 2007

The Alliance for Water Efficiency is pleased to offer its views on the establishment of a water efficiency research program within the Environmental Protection Agency. The Alliance is a non-profit organization composed of diverse stakeholders with significant experience in water conservation programs and policies, and dedicated to furthering the efficient and sustainable use of water in North America. It is the only national organization devoted solely to this purpose.

We commend Representative Matheson for introducing this important legislation and for the Subcommittee on Energy and Environment for granting it a prompt hearing. With drought gripping much of the country and with water supplies in shortage conditions, the time is right for the federal government to carefully assess water efficiency as a beneficial strategy. Although many water-efficient products, technologies, and programs already exist, more research and development is needed. To date, funding has been limited and has been insufficient given the chronic need. In Appendix A (attached) we offer the subcommittee an illustrative list of potential high-value research topics to advance our knowledge and help speed the commercialization of water-efficient products and practices.

The most critical need at this stage, however, is for the R&D program envisioned by H.R. 3957 to be carefully structured to ensure measurable results. The Alliance's priority is for a well-grounded and well-organized R&D program to get firmly established, rather than for any particular research project to get funded. The program must be framed with well thought-out criteria for setting priorities and screening proposals.

H.R. 3957 could be greatly strengthened by the addition of four important elements. First, there should be a clear definition of conservation and/or water use efficiency. With states, communities, and EPA itself all facing enormous exposure to the rising costs of water and wastewater infrastructure over the coming decades, an appropriate focal point for research would seem to be the measures and practices that have the greatest potential to make significant reductions in the volumes of treated drinking water deliveries and the associated volumes of wastewater requiring treatment. A quantitative goal of water savings and/or infrastructure dollars avoided may also be useful as an organizing tool for the program. In any event, definitions of end use efficiency, efficiency of potable water distribution systems, and on-site capture and re-use would be most helpful. It is essential that this research program have a focus, and that focus should be articulated in the authorizing legislation.

Secondly, as the Department of Energy has learned from years of experience with its energy efficiency R&D programs, road-mapping with industry partners is quite crucial for identifying research agendas that are well-grounded in the real world and focused upon overcoming specific barriers to more efficient technologies and practices. Partners will tend to bring a range of concerns – beyond simply reducing water consumption – to the table, and help identify research directions that have multiple benefits for stakeholders. We recommend that the legislation contain more explicit delineation of road-mapping requirements.

Thirdly, the issue of cost-sharing should be carefully considered. It may be appropriate for governments to fully fund basic research in fundamental sciences, but a water conservation and efficiency R&D program will also consist of applied research. Cost-sharing can help identify research partners who are serious and capable, and technologies that have been validated by non-federal financial support. The closer that such technologies are to being market-ready, the greater the non-federal contribution for should be for the remaining research. Thus, a sliding scale for cost-sharing contributions may be most appropriate.

Finally, the research program should build in an assessment function that can document measurable results. It should be understood that a research portfolio will include a range of measures, some of which may pay off big and some pay off little if at all. We should not shy away from frank assessment of results; indeed, we should build it into the program from the beginning. The Department of Energy's entire energy efficiency research program was in serious jeopardy in the mid 1990's until the General Accounting Office identified five technologies out of the hundreds that DOE had funded that more than paid for the whole program in energy savings for consumers. EPA ought to be doing that kind of assessment from the beginning of this program.

Thank you for the opportunity to present our views on this important issue. We look forward to the opportunity to respond to any questions from Mr. Matheson or the Members and staff of the Subcommittee regarding any of the suggestions offered in this statement.

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Appendix A

Water Efficiency Research Needs

We have divided our discussion of water efficiency research needs into four groupings:

1. Indoor plumbing product and appliance performance testing and savings measurement;
2. Outdoor water use management and improved landscape irrigation efficiency;
3. Integrative research in multiple topic areas; and
4. Opportunities for innovation in green building.

1. Indoor plumbing product and appliance performance testing and savings measurement.

This research, largely funded to date by individual water utilities, has been very successful in results achieved even though modestly budgeted. The principal purpose of the testing is to verify that the flow rate or flush volume of the fixtures is at the proper standard, that it can be sustained over time, and that the product performs properly under all conditions. Many independent studies have been completed or are underway, funded by dozens of water utilities and municipalities in U.S. & Canada. Initially undertaken because these utilities wished to test the products they were offering in rebate programs, the studies added value by ranking products for consumers and in identifying needed areas of change for manufacturers. As a result, new specifications have been drawn and products developed; the high-efficiency 1.28 gallon per flush toilet is an example of a product that evolved based on this work. Another example is the 1.6 gallon per minute pre-rinse spray valve used in food preparation establishments. Only five years ago pre-rinse spray valves were the subject of prototype research at the Food Service Technology Center. After testing, and then successful field installation, they proved successful are now a national standard in the 2005 revisions to the Energy Policy Act.

Attached is a spreadsheet of research needs. Some research projects are already underway, but most remain unfunded as of this date and need sponsorship. More work is needed in this area to ensure that products perform well as the water efficiency of those products is improved. The consumer needs that performance assurance to make smart investments in water efficiency. The projects total $508,800 over two years.

Some examples of this work from the attached spreadsheet:

a) Evaluating new commercial food steamers that are boiler-less and connection-less;
b) Testing the transport of waste in drain lines connected to water efficient plumbing;
c) Testing the flow rates of showerhead and multiple shower systems;
d) Testing the performance and rating of 460 toilet fixture models; and
e) Quantifying the savings, if any, of sensor activated faucets and flush valves.

Here are some additional research ideas for the indoor water use sector:

a) **Reduce the waste of water in hot water lines.** This waste is both a water and energy problem. A hot water distribution field study is needed to assess the solutions for reducing water waste in new construction as well as in designs for retrofitting existing household and commercial buildings. (Estimated budget: $350,000.)

b) **Test the water factor ratings of water using appliances such as dishwashers and clothes washers** in a lab setting and in the field. Since the water factor rating (or amount of water needed to complete an appliance cycle) is a measure of a machine's water efficiency, it should be tested the same as plumbing fixtures have been tested. Another consideration is the performance of these machines over their life cycle, looking at factors like customer satisfaction, reliability, and cost. (Estimated budget: $300,000.)

2. Outdoor water use management and improved landscape irrigation efficiency.

According to NASA, turf grass is the largest irrigated crop in the U.S, irrigating three times the area of any other crop. As a result, in most areas of the U.S., outdoor irrigation of landscapes is the largest single category of average and peak water use in the urban environment. To determine the water needs of their landscape, Americans have historically relied on the research of agricultural scientists to determine the water needs of plants – even those grown in urban landscapes. This is problematic as the goals of agriculture (maximizing growth and yield) are often different from the goal of urban irrigation (maximizing appearance while minimizing maintenance and water use). Defining the water needs of plants for American urban environments is a huge challenge, but one that must be tackled in order to increase outdoor water efficiency.

Despite droughts and water supply shortages, outdoor water use in this country is steadily increasing. Formerly a fraction of household water use, in some areas of the country it approaches 80% of the water consumed by the average American household. (The national average is likely between 50%). Water conservation programs have been very successful indoors; retrofitting a home with water efficient fixtures saves roughly 30% of a household's indoor water use, as studies have shown. The nation needs to be as effective with outdoor water use. More research and development is needed to better understand not only where the best efficiency improvements lie in irrigation system design, installation, and management, but also to understand what motivates the consumer and to identify educational and marketing needs.

Here are some research ideas for the outdoor water use sector:

a) **Optimize urban irrigation efficiency: minimize water use while maximizing appearance.** This study would measure the water needs of key urban crops such as turf grass and popular ornamental plants under a variety of climatic and soil conditions, in order to develop evapotranspiration (ET) crop coefficients that can be

used to minimize unnecessary supplemental water use. This data is particularly important as advances in irrigation technology make it possible to take advantage of this information. In addition, this study would identify the extent of deficit and surplus irrigation practices in the U.S. and the implication of these practices for optimizing irrigation efficiency. (Estimated budget: $5,000,000.)

b) **Development of regional plant water use lists.** In order to create landscapes that would have differing levels of drought tolerance, it is necessary to develop plant lists that consumers can use to develop water efficient landscapes with or without the use of permanent in-ground irrigation systems. This issue is particularly critical in new growth areas where land grant colleges have historically focused on agricultural research only. (Estimated budget: $1,000,000.)

c) **Develop irrigation product protocols for installation and management standards** to eliminate inefficient irrigation systems from the marketplace and to encourage consumer retrofit. (Estimated budget: $1,000,000.)

d) **Design effective landscape marketing programs** in a technology transfer approach to the customer. The best solution for reducing outdoor water use will not be effective if the consumer doesn't participate. (Estimated budget: $500,000.)

e) **Designing irrigation systems for efficient application rates.** Most in-ground irrigation systems are designed for convenience, not efficiency. Even those designed to use reclaimed water are often inefficient. Many water utilities start their programs for the reuse of domestic wastewater believing that reused water should be free or very inexpensive in order to sell the product, and therefore it doesn't matter how much recycled water is applied to the landscape. Times have changed. Reuse water now needs to be conserved as well, both from a shortage management perspective and cost of service perspective. Regardless of the source of water,

research is needed to create high efficiency examples that can be utilized as "model" designs that can be adopted by utilities, contractors, and homeowners. (Estimated budget: $1,000,000.)

f) **Evaluate the reliability of projected savings from irrigation restriction ordinances.** Many communities are restricting the number of days per week that irrigation is allowed. Some field experience is suggesting that restricting the number of days may actually increase water use, as customers tend to over-irrigate on their designated days. This study would empirically evaluate the extent that consumers are overcompensating, thereby estimating true water savings potential of ordinance-based strategies. (Estimated budget: $300,000.)

g) **Encourage as federal policy separate, dedicated metering and measurement of water used for landscape irrigation.** When landscape water use is accurately measured and separately billed to the customer, opportunities for incentivizing efficiency emerge. Experience has shown that water budgets applied to these irrigated areas are a successful strategy in getting consumer response. Unless the customer knows how much water is being applied annually to the landscape, efficiency practices cannot be effectively marketed.

h) **Establish testing facilities for independent evaluation of conventional as well as alternative irrigation systems.** Third party testing is critical to maintaining credibility, and at present no independent testing facilities for irrigation exist except small installations at selected universities. This is a significant issue for the proposed WaterSense label on irrigation equipment, whereas plumbing products bearing the WaterSense label have been third-party certified as to efficiency standards and performance. We need to build an independent third party irrigation testing and certification facility. (Estimated budget: $2,000,000.)

i) **Evaluate the suitability of rain water harvesting to reduce water use and reduce storm water runoff impacts.** This option has been proven successful where rainfall is regular. However, it can also be successful in more arid regions. A nationwide study can identify geographic locations where rain water harvesting would be cost-effective, and can assess any potential side effects of rain water harvesting or regulatory barriers that may exist. (Estimated budget: $200,000.)

3. Integrative Research on Selected Topics.

This research is not directly tied to any specific water efficiency product or program, but instead assesses overall effectiveness, reliability of savings, or consumer responses. This research is critical to evaluating beneficial water use efficiency strategies from a policy as well as program planning perspective.

a) **Quantify the water and energy connection on a national basis.** The California Energy Commission has conducted research into the embedded value of energy in the state's water supplies. 19% of the State's electric energy demands are related to the pumping, treatment, distribution of drinking water and the collection, treatment and disposal of waste water. 32% of the State's natural gas demands are related to the heating of domestic water. Saving water therefore saves energy and therefore reduces greenhouse gas emissions. It has been quantified in California. But what is the relationship nationally? Regionally? How can water and energy efficiency programs be optimally paired? A national assessment is needed. (Estimated budget: $350,000.)

b) **Develop models for state and regional analysis of the water-energy connection**. More and more cities, regions, and states are adopting very challenging goals to reduce the emission of greenhouse gases. State "Climate Action Plans" call for up to 80% reduction in emissions by 2050. Success will require close attention to all of the human activities associated with the production of greenhouse gases, including

water. Creating databases and assessment models for the relationship between water withdrawal, transport, treatment, distribution, end use, and eventual wastewater treatment would aid jurisdictions all over the country in determining what the most cost effective local measures are to implement in programs to reduce climate change impacts. (Estimated budget: $250,000.)

c) **Re-examine baseline data, both residential and non-residential.** Our best, most recent baseline end use data in the U.S. is now 10 years old. In order to plan conservation programs and to forecast future demand it is critical to understand where and how people use water. What potential exists for water conservation? Which end uses should be targeted? What is the saturation rate of efficient fixtures? This fundamental data needs to be collected on a regular basis. This study will quantify where water is used in homes and businesses across the U.S., identifying key opportunities for conservation savings. (Estimated budget: $3,000,000 residential; $3,000,000 commercial/industrial.)

d) **Maximize urban drought response and demand reductions.** Drought may be a defining feature of the American landscape in the coming decade. When a drought occurs, urban water providers need reliable information on how to achieve rapid and quantifiable demand reductions. Many of the most sophisticated drought response tools must be implemented in advance (such as automatic meter reading and water budgets) through integrated water shortage planning, but others (such as emergency drought pricing and irrigation restrictions) can be implemented quickly when a drought occurs through a similar planning process. Water providers need a toolkit for maximizing drought response over a wide range of scenarios including long-term supply shortages. This study will identify a broad range of effective drought response and demand reduction measures and implementation regimes that are applicable to water providers across the United States. (Estimated budget - $1,500,000.)

e) **Minimize the economic costs associated with drought response.** Water curtailments due to shortage conditions can result in severe economic damages to both residential and business users. Economic impacts can affect the ways in which urban water providers implement and prioritize management measures. More research is needed to understand the economic costs of coping with water restrictions and the implications for long-term investment in water efficiency and supply development. This study will survey coping behaviors and the range of economic impacts that are likely to be realized during water shortages of various frequencies and durations. The study will assist water providers in properly phasing their drought response plans and will provide and demonstrate criteria for assessing needs for long-term investments in water efficiency for the purposes of increasing water supply reliability. (Estimated budget - $3,000,000.)

f) **Analyze water billing data: Making the Most of an Under-Utilized Resource.** American water utilities typically read water meters and bill their customers once a monthly or every two months. Once this is done, the consumption data is usually stowed away and forgotten. Yet utility billing data is a tremendously rich resource that can be used in a wide variety of ways to target water efficiency efforts, track changes in water use, identify potential leakage, and help with infrastructure and conservation planning. This study will tackle the subject of water billing data from top to bottom, developing a set of best management practices for classifying water customers and storing, maintaining, and utilizing these data to their maximum potential. (Estimated budget $750,000.)

g) **Analyze the true impacts of "Demand Hardening."** Demand hardening is a theory that puts a negative spin on water conservation efforts. According to this theory, as an area's water conservation potential is maximized there is less that can be done in times of a water shortage or drought. In other words, it is perceived that water conservation may impact a water system's flexibility in times of a water shortage.

Field experience suggests that as technology changes and new products appear in the marketplace, there will always be additional conservation potential. However, research should be undertaken to determine if demand hardening is indeed a negative side effect of water conservation and what can be done to deal with it in times of a water shortage. Metrics also need to be established to determine what constitutes efficient water use to avoid penalizing already efficient water users when drought occurs. (Estimated budget: $400,000.)

h) **Assess the Benefit of Water Conservation on a National Level.** How does water conservation fit within the broader social, economic, environmental and other policy trends facing the country today? Water conservation on a National level and the resulting economic and environmental benefit needs to be studied and well articulated. Why should we conserve water and what is the national benefit as opposed to the local or regional benefit? An in depth study that assesses multiple regions of the United States in regards to fresh water resources, political issues and water rights, Federal policies regarding water supply subsidy, regional water conflicts, current water treatment/delivery infrastructure, current water demands, future water demands, energy implications, and conservation potential will help strengthen our collective understanding of freshwater resources and raise awareness for the need for water conservation. (Estimated Budget: $600,000.)

i) **Opportunities to better utilize waste heat among commercial and industrial water users.** Many businesses need to discharge waste heat from a variety of cooling and process water applications. This waste heat could be better utilized to pre-heat water for other applications by that business or other nearby businesses. Research is needed into opportunities and barriers to the creation of public/private "hot water utilities". These utilities would purchase waste heat and in turn sell hot water or generate energy. These new utilities would help conserve both water and energy by better utilization of industrial waste heat. (Estimated budget $300,000.)

j) **Analyze the Effectiveness of Consumer Outreach and Education.** It is currently difficult to estimate the savings associated with water conservation outreach and education programs. There is a need for research in this area that will help planners estimate the impact of outreach efforts. What exactly do outreach and education programs provide in regards to social capital and water savings? Actual case studies can be followed and impacts of outreach and education can be determined using qualitative analysis and sophisticated modeling to isolate the actual water savings. (Estimated Budget: $300,000.)

4. Opportunities for Innovation in Green Building.

The Brookings Institution estimates that of all the homes that will exist in the US by 2030, a full half of them have not yet been built. This is a significant opportunity: to build that half as sustainably as we can. The trend is unfortunately the reverse. New homes that are now being built use 12-20% more water, as studies have shown. In one development the homes used 60% more water than their neighbors. Research and development needs to take place in this critical area, to foster water-efficient designs alongside specifications for green building materials and energy efficiency.

Here are some research ideas in this area:

a) **Design more effective residential hot water distribution systems.** The designs and specifications should include manifold systems, hot water re-circulating and on-demand systems. (Estimated budget: $400,000.)

b) **Incentivize new building comfort systems and technologies** that will focus on water efficiency. Cooling towers in air conditioning systems are a significant opportunity for water savings. (Estimated budget: $300,000.)

c) **Assess the cost-effectiveness of centralized automatic monitoring systems** for managing water demand. The consumer appears to respond to such systems for managing their energy demands. Would the same be true for water? (Estimated budget: $400,000.)

d) **Analyze the water quality implications of joint use of landscapes for infiltrating storm water and reuse water**. What do we need to know before this strategy gets too prevalent? Are there water quality and health risks? Local Health Department barriers? (Estimated budget: $700,000.)

e) **Develop small scale graywater reuse systems for residential and small commercial use.** One of the best opportunities for conserving water in America is the re-use of graywater for flushing toilets and watering plants. Economically, it often makes sense to accomplish this at the customer level. There are currently numerous barriers to using graywater ranging from western water law to local health codes. This study will examine the issue of graywater and will propose a set of federal regulations that can help clear the way for widespread implementation of small-scale graywater reuse. This study will help Americans to take advantage of one of the easiest and best water saving opportunities available. (Estimated budget: $3,000,000.)

f) **Develop a simple method for the consumer to evaluate water conservation options**. This goes beyond the applicable water saving technologies to get at the cost and benefit issues of water conservation at the consumer level. Simple evaluation techniques need to be developed to help water customers understand life cycle benefits of conservation and therefore the benefits of investing in alternative retrofits or new construction options. This research could result in an educational curriculum, report, and/or instructional website that would provide

guidance on determining relevancy and estimating costs and benefits from water efficiency. (Estimated budget: $250,000.)

g) **Create green building guidelines for landscapes that emphasize minimal or no irrigation once established**. The purpose of these guidelines would be to develop model standards that could be adopted by utilities and local governments. (Estimated budget: $500,000.)

Proposed Research Projects: Estimated Budget Summary		
1	Indoor plumbing products research (separate sheet)	$508,800
2	Reduce hot water waste	$350,000
3	Test water factor ratings of appliances	$300,000
4	Develop ET crop coefficients	$5,000,000
5	Regional plant water use lists	$1,000,000
6	Irrigation product protocols/standards	$1,000,000
7	Effective landscape marketing programs	$500,000
8	Efficient systems for irrigation application	$1,000,000
9	Study of irrigation restriction ordinances	$300,000
10	Testing facilities for irrigation technology	$2,000,000
11	Evaluate rainwater harvesting	$200,000
12	Quantify water/energy nationally	$350,000
13	Models for analysis of water/energy	$250,000
14	Baseline data: residential	$3,000,000
15	Baseline data: commercial	$3,000,000
16	Drought response & demand reductions	$1,500,000
17	Economic effects of drought response	$3,000,000
18	Analyze water billing data	$750,000
19	Analyze demand hardening	$400,000
20	Benefits of conservation	$600,000
21	Utilizing waste heat	$300,000
22	Effectiveness of consumer outreach	$300,000
23	Design new hot water distribution systems	$400,000
24	New building comfort systems	$300,000
25	Evaluate consumer real time water monitoring	$400,000
26	Water quality of storm water/reuse water	$700,000
27	Small scale graywater systems	$3,000,000
28	Consumer cost/benefit methods	$250,000
29	Green Building guidelines for minimal landscape watering	$500,000
	TOTAL	**$31,158,800**

WATER EFFICIENCY TECHNICAL COMMITTEE: Projects & Studies - Costs in US$

Item No.		Fiscal Year 2007	Fiscal Year 2008	Issues to be Addressed	Deliverables	Status
1	**Plumbing Standards - U.S. and Canada** **(ONGOING WORK)**			STANDARDS: Plumbing standards form the basis for many of the plumbing code provisions. As such, standards are continually evolving as new products and technologies are developed for the marketplace. Today, new water-efficient products and technologies are being developed by the plumbing industry and creative individuals that need to be addressed by standards and permitted by the plumbing codes. The plumbing standards committees are currently addressing the following topics related to water-efficiency and water conservation programs: (1) Completed & ANSI approved: standard ASME A112.19.19 for non-water urinals that will further enable these products to be permitted within the plumbing codes; (2) Completed: amended ANSI standard ASME A112.19.5 to cover flapper durability and flapper identification and marking for ease of replacement; (3) Currently underway: harmonizing the plumbing standards of the U.S. and Canada to create a single standard that will ultimately result in more water-efficient products in the marketplace; and (4) about to commence: amendment of the existing ANSI standards for toilets and urinals to fully transition to HETs and HEUs by 2014.	1) Twice annual status reports to participating (funding) organizations 2) Periodic standards updates on selected water efficiency websites 3) New standards for toilet flush valves and flappers, non-water urinals, high-efficiency urinals (with significantly reduced flush volumes), high-efficiency toilets, high tech faucets, and other plumbing fixtures and fittings.	1) Focused on non-water urinal standards for vitreous china in U.S. in 2005-2006. ASME A112.19.19-2006 for that product is published. 2) Ongoing work to harmonize standards with Canada (toilets, urinals, and other plumbing fixtures & fittings covered by ASME A112. 3) New Flapper standards completed for durability and marking. Approved by ANSI in 2005 and ASME A112.19.5 standard published. 4) Currently working toward an additional water-efficiency threshold in the A112.19.2 standard that would cover 0.5-gpf/1.9-lpf urinals (high-efficiency urinals - HEUs). 5) About to begin addressing an amended standard to cover high-efficiency toilets (HETs). 6) Showerhead standards (A112.18.1) and efficiency currently being addressed by U.S.-Canadian harmonization group. 7) Additional water-efficient technologies and plumbing products will be introduced in the coming years and may need to be addressed within the national standards. 8) Increased participation by water utilities in the standards development process is needed. 9) **Alliance for Water Efficiency** representation on the various standards committees will be continued.
	Labor	$12,000	$16,000			
	Travel & other expenses	$4,000	$5,000			

WATER EFFICIENCY TECHNICAL COMMITTEE: Projects & Studies - Costs in US$

Item No.		Fiscal Year 2007	Fiscal Year 2008	Issues to be Addressed	Deliverables	Status
2	**Plumbing & Building Codes (Residential & Commercial)** **(ONGOING WORK)**			CODES: Plumbing codes are the means by which new standards are implemented and maintained. For example, the need for the the Uniform Plumbing Code to fully address and permit non-water urinals is critical. Many jurisdictions do not currently permit these urinals because building officials will not make an exception to the current code provisions requiring a "washing" action in a urinal.	1) Twice annual status reports to participating water utilities 2) Periodic standards updates on selected water efficiency websites 3) Adoption of water-efficient technologies into prevailing plumbing codes and building codes (non-water consuming urinals, hot water demand systems, and others)	1) Uniform Plumbing Code (UPC) is about to fully address non-water urinals; previous efforts to incorporate them into IAPMO's code language were not successful, but 2007 saw changes to this position. 2) **Alliance for Water Efficiency** representation on the UPC Technical Committee will be continued. 3) Additional representation by water-efficiency interests is needed.
	Labor	$6,000	$8,000			
	Travel & other expenses	$2,500	$2,500			
3	**UNAR Development & Implementation (Res. & Commercial Toilet Fixtures)** **(ONGOING WORK)**			UNAR (Uniform North American Requirements) for toilet fixtures: Water utilities implement toilet replacement programs without assurance that predicted water savings will materialize (flapper failure, incorrect flapper replacement, customer tampering with the toilet, etc.). Furthermore, some toilet fixtures are not stellar performers and generate complaints from or tampering by the customer. UNAR provides information re: which toilet fixtures assure long-term water savings AND meet customers' flush performance expectations. UNAR provides for testing toilet fixtures against its own performance and water savings sustainability requirements. Toilets that meet UNAR requirements are being listed/posted on a public website to which any water utility may link (site to include data on physical characteristics of toilet and trim, performance level, photographs, etc.). Water utilities may use the web "list" as criteria for toilet rebate or voucher programs, or for guiding toilet purchases for giveaways or direct install programs. A UNAR for flushometer type toilet fixtures is	1) UNAR qualified toilet lists - documented and posted for public use 2) Periodic progress reports to participating water utilities posted on the web	UNAR for toilets is a combination of MAP testing and the Los Angeles Supplementary Purchase Specification (SPS). A full specification (version 1.2 - posted on the CUWCC website) has been developed and has been addressed by stakeholder representatives. (Stakeholders include water utilities and plumbing manufacturers.) UNAR is being used by water utilities in the U.S. and Canada as the specification-of-choice for their toilet replacement programs. The list of UNAR-compliant toilet fixtures is posted on the CUWCC website (and others). The UNAR specification for HETs was the basis for the WaterSense specification for HETs. As such, with minimal exception, the two specifications are identical. (NOTE: Ultimately, the WaterSense specification and listings will replace UNAR as more fixtures become WaterSense-certified and are labeled with the WaterSense logo.) The next step for the UNAR for toilet fixtures process is to address commercial flushometer valve toilets.
	Labor	$3,000	$20,000			
	Travel & other expenses	$800	$4,000			

WATER EFFICIENCY TECHNICAL COMMITTEE: Projects & Studies - Costs in US$

Item No.		Fiscal Year 2007	Fiscal Year 2008	Issues to be Addressed	Deliverables	Status
4	**Flushometer Valve and Toilet Testing (ICI)** **(COMPLETED WORK)**			FLUSHOMETER VALVE TOILET FIXTURES: Although the industry has recognized the potential for lost water savings in gravity-fed toilets as a result of tampering with or replacing OEM flappers, a similar issue regarding flush-valve (flushometer) toilets has been largely overlooked. Increasing the flush volume of a toilet flush-valve is sometimes as easy as turning a single screw. What's more, because, unlike gravity-flush toilets, there is no 'Water Line' on a flush valve, it is difficult to ensure that the valve is operating properly when first installed or later after maintenance. This study is expected to identify flush volumes 'out-of-the-box', maximum adjustability, effects of varying pressure on flush volumes, effects of installing valves on different bowl models, etc.	1) Periodic progress reports to participating water utilities posted on the web 2) Final report - documented and posted on the web for public use	Phase 1 testing completed, report published and posted for free download from various websites. Phase 2 has commenced (separate project).
	Labor	$0	$0			
	Expenses (includes field test equipt., meters, and misc.)	$0	$0			
5	**Sensor-Operated Faucet & Toilet Testing (ICI)** **(work began in late-2006 and is to be completed in 2008)**			SENSOR-OPERATED TOILETS & FAUCETS: It is accepted that sensor-operated faucets are more hygienic; however, there is currently no independently developed scientific evidence that they save water. Furthermore, it is a commonly held opinion among water-efficiency professionals that sensor-activated toilet flush valves actually increase water use over manually activated flush valves. Unfortunately, many "green building" documents and media articles tout sensor-operated valves for water conservation. Likewise, the U.S. Green Building Council's LEED program encourages the use of sensor-operated valves to achieve water efficiency. Because some water utilities are considering these devices as candidates for their commercial-institutional water conservation programs, it is critical that resolution be brought to this lingering issue. A "before" and "after" study of the actual efficiencies achieved would achieve that resolution.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	The study encompasses both toilet and urinal fixtures, as well as commercial lavatory faucets, installed within a mid-rise office building. Pre-monitoring has been completed. Although the flush valves and fixtures were physically marked as being efficient (i.e., 1.6-gpf /6-Lpf), the efficient diaphragms actually installed within the valves had been replaced with inefficient units (e.g., 3.5-gpf/13-Lpf). We re-installed efficient diaphragms. The new sensor-operated faucets have been delivered to the site and will be installed in July 2007. We are installing the faucet valves first (followed by post-monitoring), then the urinal valves (followed by post-monitoring), and finally the toilet sensor-operated valves (followed by post-monitoring). Completion of the first phase (faucets) and the first report are scheduled for early 2008. Coordinating efforts with funding agency: Hillsborough County, Florida. Building(s) selected for the study are located in that County. Work underway. Additional funding required for completion of the work.
	Labor	$40,000	$5,000			
	Expenses (includes field test equipt., meters, and misc.)	$5,000	$0			

WATER EFFICIENCY TECHNICAL COMMITTEE: Projects & Studies - Costs in US$

Item No.		Fiscal Year 2007	Fiscal Year 2008	Issues to be Addressed	Deliverables	Status
6	**Conventional, Sensor-Operated and Non-Water Urinal Testing (ICI) (WORK PARTIALLY FUNDED; SCHEDULED FOR COMPLETION IN 2008)**			URINALS: The existing standard for urinals provides for a maximum 1.0-gpf (3.8-lpf) flush volume. Several plumbing manufacturers currently offer 0.5-gpf (1.9-lpf) within their product line, defined as high-efficiency urinals (HEUs). Furthermore, the non-water urinal has also gained a presence in the marketplace. Finally, 2 plumbing manufacturers have developed and are marketing urinals that flush on as little as 1.0-pint (less than 1/2 litre). It would appear that all of these low-volume and non-water urinals would save water when compared to the installed base of older urinals (2 to 5 gallons per flush - 8 to 19 litres per flush). However, no authoritative data currently exists on the real world magnitude of the water savings that accrues from the replacement of these older fixtures with the newer models. Nor is independently developed information available on the special maintenance requirements (if any) for these HEUs. The lack of data is hindering the development of water conservation programs and rebates directed at these types of installations. This work	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use 3) Continually updated listing of various types of urinals and their flush volumes and features	Manufacturers of flushing urinals indicate a strong desire to participate by contributing the product needed for the study. High-efficiency flushing and non-water urinals are being included. The site in the U.S. is at the University of Washington. After some delay, the sites in Canada have been selected (two sites in the Region of Peel, just north of Toronto). There is an adequate pipe chase behind each of the washrooms selected in the Canadian facilities. Both Canadian sites are Regional office buildings with a constant number of users. The project will build on previous work already completed at the University of Washington (which was not a part of this project). Intend to include both flushing and non-water high-efficiency urinals (HEUs). Monitoring equipment is expected to be installed within a few weeks. Monitoring (which will include monitoring the urinals themselves and the drain piping behind the walls) will be conducted for at least one year.
	Labor	$45,000	$15,000			
	Expenses (includes field test equipt., meters, counters, and misc.)	$25,000	$0			
7	**Flapper Identification and Listings (ONGOING WORK)**			TOILET FLAPPERS: Toilet flappers are subject to periodic degradation and failure during the life of a gravity-fed fixture and, as a consequence, can lead to leakage and loss of expected water savings. It is critical that the end-user (customer) be equipped with the information needed to identify and locate the correct replacement flapper for the toilet. Tampa Bay Water developed and made public a substantial database on ULF toilets and their flappers - see website: www.toiletflapper.org Using this database, customers will be more likely to install a replacement flapper that maintains the original 1.6-gpf/6.0-L design flush volume. Database needs information "gaps" filled in and must be continually updated as new toilet fixtures are introduced into the marketplace.	1) The database has been posted by Tampa Bay Water on www.toiletflapper.org and will be periodically updated as new information is added. This is an ongoing process and will not be the subject of a "final report" per se.	Needs to be done in conjunction with UNAR for new fixtures. Research required for older fixtures. UNAR flapper durability spec (and new ASME plumbing std) eliminate flapper durability issue. Up-to-date listing of flappers to be completed annually.
	Labor	$5,000	$5,000			
	Expenses	$2,000	$2,000			

WATER EFFICIENCY TECHNICAL COMMITTEE: Projects & Studies - Costs in US$

Item No.		Fiscal Year 2007	Fiscal Year 2008	Issues to be Addressed	Deliverables	Status
8	**Ice-Makers (WORK BEGUN IN 10-2005; TO BE COMPLETED IN 2007)**			ICE MAKERS: Ice-makers (ice machines) within hospitality and food service operations are either water-cooled or air-cooled. The two types have significantly different efficiency profiles; air-cooled machines are more water efficient and water-cooled machines are more energy inefficient. Thus, there is a trade-off between water and energy efficiency. Without information on relative efficiencies and, specifically, water savings under various operating scenarios, water utilities are not able to create conservation incentives for the more water-efficient machines. This task would involve both field and laboratory measurements of water use by the different technologies, such that efficiency thresholds may be established.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Currently funded by 3 water agencies (Seattle, EBMUD, Eugene) and PG&E. EBMUD and PG&E's Food Service Technology Center doing field testing. Sites have been identified for the field work and measurements are underway. Study to be completed in 2007 at 6 to 10 sites. Will have actual data on water and energy efficiency of water versus energy cooled ice makers. Requires additional funding support in order to add more study sites.
	Labor (includes energy portion, which is funded by PG&E)	$80,000	$0			
	Expenses (includes field test equipt., meters, and misc.)	$5,000	$0			
9	**Commercial Dishwashers (WORK YET TO BE FUNDED AND SCHEDULED)**			COMMERCIAL DISHWASHERS: Commercial dishwashers in food service operations are significant water users, sometimes involving more than one-half of all water consumed by such an establishment. Both water-efficient and inefficient machines are available. No independently verified field data exists, however, that would yield meaningful performance and efficiency thresholds. This task would involve specification research and a limited amount of field study to provide the needed data.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Funding to be secured. Program would be run through PG&E Food Service Technology Center.
	Labor	$0	$47,000			
	Expenses (includes field test equipt., meters, and misc.)	$0	$7,000			
10	**Toilet Certification Test Media (COMPLETED WORK)**			TOILET CERTIFICATION TEST MEDIA: Performance testing using the ASME-CSA test media indicated that there is very little repeatability with this media and that results may not, in fact, be indicative of flushing performance. Results of the completed study may help to move certification agencies towards a more indicative set of tests.	1) Final report outlining results of testing	Tests indicate sponges and other media don't work well and do not have a low range of standard deviation. Currently using a new media for MaP/UNAR in order to raise the bar for certification. Completed report is available for download from the CUWCC website.
	Labor	$0	$0			
	Expenses	$0	$0			

WATER EFFICIENCY TECHNICAL COMMITTEE: Projects & Studies - Costs in US$

Item No.		Fiscal Year 2007	Fiscal Year 2008	Issues to be Addressed	Deliverables	Status
11	**UNAR for Showerheads (WORK PARTIALLY FUNDED; WORK TO BE FULLY FUNDED AND COMPLETED BY 2007)**			UNAR (Uniform North American Requirements) for Showerheads: The proliferation of residential showerheads and shower systems that are non-compliant with Federal regulations OR skirt the intent of the law is of significant concern to water and energy utilities and their regulatory organizations. In addition, the development of showerhead products that flow below the 2.5-gpm maximum is to be encouraged, provided customer satisfaction is achieved. Stakeholders (manufacturers, water and energy utilities) have requested that UNAR specifications be developed for showerheads and systems that address water consumption AND shower performance. A UNAR for showerheads will be developed in a manner similar to that followed for toilet fixtures (see Item 3 above).	1) UNAR qualified showerhead lists - documented and posted for public use 2) Periodic progress reports to participating water utilities posted on the web	Project commenced in 2005 with discussions with manufacturers and other interested stakeholders. Overall study of market completed by Lawrence Berkeley Nat'l Labs. Standards committee currently developing performance specs for water-efficient product. WaterSense working with standards committee on defining appropriate performance and flow rate thresholds for efficient produt. Funding for this project yet to be secured.
	Labor	$4,000	$20,000			
	Expenses (includes field test equipt., meters, and misc.)	$1,000	$6,000			
12	**UNAR for Urinals (WORK TO BE FUNDED AND SCHEDULED)**			UNAR (Uniform North American Requirements) for Urinals: (Refer to Item 6 above) Stakeholders (manufacturers of urinals and water utilities) have requested that urinal fixtures be addressed with a UNAR specification similar to that of toilet fixtures (refer to Item 3 above), covering urinal performance, sustainability, and water savings. UNAR for urinals would yield new standards that can be used by green building programs and water utilities to encourage the reduction in water use by urinal fixtures. Given the recent technological developments in these fixtures, it appears that efficiencies will be significantly improved over the current 1.0-gpf products.	1) UNAR qualified urinal lists - documented and posted for public use 2) Periodic progress reports to participating water utilities posted on the web	Project commenced in 2005 with discussions with manufacturers regarding changes to the national standard (ASME A112.19.2-2003). At that time, this stakeholder group showed a preference for an initiative by the water utilities to measure performance and water use through the UNAR approach. Later, the standards committee decided that it would attempt to develop a water-efficiency threshold in the A112.19.2 standard. Work to begin in 2007 in conjunction with the work undertaken Item 6 above IF standards committee fails to perform its commitment.
	Labor	$0	$20,000			
	Expenses	$0	$4,000			
13	**Ice Cream Soft-Serve Machines (WORK TO BE FUNDED AND SCHEDULED)**			ICE CREAM SOFT-SERVE MACHINES: Refrigerated ice-cream soft-serve machines are another food service industry product that requires field study as to energy and water-efficiency in order to provide food service industry with data on which machines are the most cost-effective to operate. Further, these products are being considered for inclusion in Federal programs such as Energy Star and Water Star. Without accurate operating data, performance thresholds cannot be developed.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Project to commence when funding becomes available. Lower-priority.
	Labor	$0	$20,000			
	Expenses (includes field test equipt., meters, and misc.)	$0	$12,000			

WATER EFFICIENCY TECHNICAL COMMITTEE: Projects & Studies - Costs in US$

Item No.		Fiscal Year 2007	Fiscal Year 2008	Issues to be Addressed	Deliverables	Status
14	**Field Study - High-Efficiency Toilets (Pressure-Assist and Gravity-Fed only)** **(WORK TO BE FUNDED AND SCHEDULED)**			HIGH EFFICIENCY TOILETS (HETS): Currently, the only HETs that have been field measured to establish **"real world" water savings** are dual-flush fixtures. Programs currently encouraging the installation of the pressure-assist (1.0-gpf) fixtures in residential and commercial applications have no authoritative data available on water savings achieved through replacement of 5.0-, 3.5, and 1.6-gpf fixtures. Instead, "engineered calculations" are used to estimate water use. These calculations do not reflect any changes in user habits as a result of replacing a gravity-fed with a pressure-assist fixture (changing flush frequency, double-flushing, etc.). This study would be the first to yield some important data for the water suppliers implementing HET programs.	1) Periodic progress reports to participating water utilities 2) Final report - documented and posted for public use	Project to commence in 2007 dependent upon funding. This project is of high priority.
	Labor	$20,000	$25,000			
	Expenses (includes field test equipt., meters, and misc.)	$5,000	$0			
	TOTALS	**$265,300**	**$243,500**			

Note: All of the above project descriptions are subject to change as new study elements are proposed and existing study elements are completed or modified.