Planning
& Management Consultants, Ltd.

Rt 9 Box 15 (Hwy 51 S) • P.O. Box 1316 • Carbondale, IL 62903
(618) 549-2832
Fax (618) 529-3188

August 25, 1992

Mike Shaughnessey
U.S. Army Garrison
Director of Engineering and Housing
Fort Huachuca, AZ 85613-6000

Dear Mr. Shaughnessey:

Please find the enclosures regarding the proposed conservation measures for Fort Huachuca Military Reservation. Five conservation measures will be analyzed based on your selection of potential conservation programs. Enclosure 1 includes the general conservation algorithms for evaluating the effectiveness of each conservation measure. Enclosure 2 contains the description, coverage and reduction factor for each measure. Enclosure 3 lists a summary of the sectors covered by each conservation measure and their ranges of coverage and reduction factors. Please use these recommended ranges as a guide to determine the values for your installation. If you specify coverage or reduction factor values that are not in the recommended range, please provide an explanation to support your justification.

Please note that the conservation measures affect different IWRAPS© sectors and cells not considered applicable to a specific measure have been shaded. Enclosure 4 includes the blank forms for you to report about your installation. A single value between 0.00 and 1.00 (representing 0 through 100 percent) should be provided for each applicable cell.

If you have questions about any of these materials, please feel free to call me at (618) 549-2832.

Sincerely,

Uday K. Derhgawen
Research Analyst

Enclosures

Enclosure 1 - GENERAL CONSERVATION ALGORITHM

DETERMINATION OF EFFECTIVENESS

There are three important parameters in the analysis of effectiveness of each measure: (1) fraction reduction in water use (R); (2) coverage (C); and (3) unrestricted water requirement (Q). These parameters are more precisely defined below.

(1) R_{ij}, is the fraction reduction in the use of water for sector *j* (e.g., barracks), expected as a result of implementing measure i (e.g., conservation-oriented plumbing retrofit).

(2) C_{ijt}, is the coverage of measure *i* in use sector *j* at time *t* expressed as a fraction of sectoral water use, e.g., if the plumbing retrofit program was implemented at the installation on January 1, 1991, then the coverage value for barracks sector (*j*) in the future year (*t*) is defined as the proportion of the barrack sector use occurring in retrofitted units since the implementation date. This can be approximated by the ratio of the retrofitted barracks to the total number of barracks for that year.

(3) Q_{jt}, is the projected unrestricted water use in sector *j* at time *t* in quantity per unit time (million gallons per day or acre-feet per year). The unrestricted water use is obtained from IWRAPS estimates by sector in each time period.

Effectiveness, or the expected reduction in water use, is calculated as the product of the above three quantities:

$$E_{ijt} = R_{ij} * C_{ijt} * Q_{jt}$$

Again, the term E_{ijt} measures the effectiveness of measures *i* (e.g., retrofit) in use sector *j* (e.g., barracks) at time *t* (e.g., year 2000).

A precise evaluation of each of the three parameters for each community, user sector, and time period is critically important for the proper evaluation of the expected water savings (E_{ijt}) upon the implementation of each measure.

The required information to determine precise estimates of effectiveness includes the prevailing habits and patterns of water use in the study area. Water-using activities inside and outside residential and nonresidential buildings must be known in order to compare the anticipated reduction in water use for a typical nonconserving sector.

Enclosure 2 - CONSERVATION MEASURE PROFILES

I. PLUMBING RETROFIT

DESCRIPTION

A plumbing retrofit program consists of replacing or modifying nonconserving sanitary/hygienic fixtures with fixtures that reduce water consumption for the same time or number of uses. This program is usually phased in by scheduling specific sectors of water users over time versus attempting to retrofit all devices within a short time period. Generally, the retrofit program is combined with other conservation measures. A conservation education program is highly complementary to the implementation of a plumbing retrofit program.

Low-flow conservation devices include shallow trap toilets, dual flush toilets, toilet inserts, adjustable toilet floats, flow restrictors, aerators, low-flow showerheads and/or hose attachments, and pressure-reducing valves. Changes in consumers' habits are generally not required upon the installation of these devices, since they are designed to operate like conventional equipment.

The reduction in water use due to retrofitting is not always equal to the maximum engineering reduction due to decreasing the flow (or usage) rate of devices. For example, water required for some residential uses such as drinking and cooking would not be affected by the plumbing retrofit program. Therefore, this measure is assumed to affect only sanitary and hygienic water use.

COVERAGE

Water use sectors applicable for plumbing retrofit are:

- Bachelor enlisted (and NCO) quarters
- Bachelor officers quarters
- Family housing
- Guest housing
- Gyms

These sectors are also illustrated in Enclosure 3. The coverage of retrofitting plumbing fixtures for a specific sector is derived by determining the proportion of existing fixtures that will be replaced in the first year and the cumulative percent replacement in successive years. The general formula is:

$$C_{st} = 1.00/N * n$$

where

C_{st} = coverage of sector *s* (e.g., BEQ) at time *t* (e.g., 2000)
N = number of years required to retrofit 100 percent of sector *s*
n = the current year of the retrofit program for sector *s*

In a relatively small sector like guest housing, the retrofit process may be completed within one year, thus the coverage factor for this sector would be 1.00 (i.e., 100 percent). However, a large water use sector like family housing may require more than one year to complete the retrofit program. In this case the completion of a retrofit program may be phased in over two or three years. On a three-year schedule the coverage would then be 100/3 * 1 = 0.33 = 33 percent for the first year. In successive years the coverage would be 100/3 * 2 = 67 percent for the second year, and 100/3 * 3 = 100 percent in the third year.

Once begun, all sanitary and hygienic fixtures within the selected sectors on the installation should be scheduled for retrofitting to assure equability.

REDUCTION

The reduction in water use as a result of plumbing retrofitting is calculated as a percent by dividing the amount of water reduction by the previous water use from the same device and multiplying the resultant device reduction by the percent of water use that the device contributes to total sector usage. Table 1 illustrates the results of a CERL study that estimated indoor residential water use by device. The percent will vary from one installation to another, therefore the analyst should estimate the correct proportion for each device for his/her particular installation.

The general formula for determining the reduction due to retrofitting is:

$$R_s = [(Q_u - Q_r/Q_u)] * Q_d/Q_s$$

where

R_s = reduction in sector *s*
Q_u = quantity, unrestricted
Q_r = quantity, restricted
Q_d = quantity of water used by device *d*
Q_s = quantity of water used in sector *s*

For example, if a toilet dam is installed such that the toilet will use 3.5 gallons per flush versus the standard 5.5 gallons per flush, then the percent reduction would be (5.5-3.5)/5.5 = 0.36 = 36 percent in toilet water use and 0.36 * (32/70) = 0.36 * 0.45 =.162 = 16.20 percent reduction in total household use.

Similarly, assuming that the time of water flow for bathing and personal hygiene does not change, then the savings from low-flow nozzles (3.0 gpm v. the standard 5.0 gpm) would result in a 13.20 percent decrease ((5.0-3.0)/5.0 * 0.30) in total household consumption. See Enclosure 3 for estimated ranges of reduction factors for each sector. If both devices were retrofitted, then the percent reduction in water use would be the sum of the percent savings from each device: 16.20 + 13.20 percent = 29.40 percent.

TABLE 1[1]
Distribution of Residential Water Use

Indoor Water Consumption	Percent	Typical Usage, gpcpd*
Toilets	45	32
Bathing and Personal	30	21
Laundry and Dishes	20	14
Drinking and Cooking	5	3
Total	100	70

* gpcpd = gallons per capita per day.

[1] Water Conservation Methods for U.S. Army Installations: Volume I, Residential Usage Management. Technical Report N-146, CERL, April 1983.

II. CONSERVATION EDUCATION

DESCRIPTION

A conservation education program is essentially an information dissemination program that promotes the importance of reducing water consumption. The program should be designed to inform consumers of water use activities that promote efficiency in household water use.

COVERAGE

All water users in all water use sectors are affected by educational programs, thus the coverage of educational programs is 100 percent for all sectors. Refer to Enclosure 3 for affected sectors.

REDUCTION

The expected reduction in water consumption due to the implementation of a conservation education program in noncrisis periods is dependent upon the scope and duration of the program as well as the attitudes and beliefs of water users. Nationwide, reduction factors for educational programs range from 2.3 to 9.2 percent (COE, 1984). Region-specific analysis should exhibit a smaller range of reduction. For example, in a California study the educational programs' reduction was estimated to be 3.5 to 5.0 percent. Refer to Enclosure 3 for the recommended range of reductions.[2]

A survey of consumer attitudes, beliefs, and current conservation practices is normally undertaken in order to estimate the reduction for a specific installation. The survey should focus on determining the level of awareness of the need and reasons to conserve water. The reduction in water use resulting from the educational program will be higher if consumers believe that their actions contribute significantly to conservation and that others are also making an effort to conserve water, and the current level of water-conserving behavior is low.

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[2] Dziegielewski, Benedykt, Eva M. Opitz, William Y. Davis, and D. Baumann. Water Conservation Evaluation for the Phoenix Water Service Area. Volume 1: Technical Report. Carbondale, IL: Planning and Management Consultants, Ltd., 1986.

Education Campaign—Supplement Information

The campaign should convey that water is a scarce resource and that each individual that conserves a little in the course of daily activities can result in a significant impact over time. The secondary message should stress that aggregate water reduction (i.e., annual basewide consumption) will be significant. The context of the educational program should stress that many personnel are doing their part to reduce water consumption and that additional efforts will benefit everyone (e.g., "if everyone helps conserve water, then restrictions or bans on water use will not have to implement or will be less severe.")

Conservation education can utilize many types of communication. Appropriate media forms are:

- Armed Forces magazines
- Base newspaper(s)
- Billboards
- Classes
- Community events
- Flyers posted on bulletin boards
- Formations
- Housing bulletins and/or indoctrination literature
- Mail
- Radio (public service announcements, news, advertisements)
- Television (public service announcements, news, advertisements)

The education program emphasizes ways in which an individual can reduce water consumption. Commonly emphasized methods are:

- Take shorter showers.
- Use a basin of water when shaving.
- Use proper irrigation techniques.
- Do not allow children to waste water.
- Turn the water off when brushing teeth.
- Promptly repair leaky toilets, showers, faucets, and/or joints.
- Wash only full loads of laundry and/or use appropriate water level.
- Use a hose with an adjustable nozzle for POV washing and turn it off when soaping.

III. SYSTEM LEAK DETECTION AND REPAIR

DESCRIPTION

Leakage in water transmission and distribution lines are, to some extent, unavoidable. Leak detection programs, however, should be a basic part of a water utility's operations and maintenance schedule. Leakages have been reported to lose from one-tenth to as much as one-third of the water treated in some systems. A leak of one gallon per minute will waste 525,600 gallons of water per year. However, leakages are usually larger that one gallon per minute. For example, a leak on a pump line or main may discharge at a rate of 60-300 gallons per minute, a rate of 31.5 to 157.7 million gallons per year.

A leak detection program can indicate undiscovered breaks or blown joints in water mains and also could bring about the discovery of unauthorized users and/or wasteful consumption. Insufficient metering at fixed Army installations contribute to a lack of knowledge about the severity of leakage and consequently results in delayed maintenance and/or replacement programs that can cost thousands of gallons of water and increased costs for raw water, treatment chemicals and manpower.

The benefits of a leak detection program are:[3]

(1) Water consumption is reduced because waste is reduced.

(2) Treatment costs are reduced due to lower chemical requirements.

(3) Energy costs are reduced due to energy saved in the treatment and distribution process.

(4) Minimum capacity requirements are reduced, resulting in a larger population served or an increase in emergency capacity without major system modification.

(5) Capital expenses are reduced because the "increase" in available water supply may ease expansion problems or defer planned construction activities.

(6) Operation and maintenance will improve due to a greater knowledge of the distribution system.

(7) Property damage from leaks will be decreased, providing benefits in terms of reduced inconvenience, lawsuits, insurance claims, material, energy, and public relations.

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[3] WATERPLAN, Benefit/Cost Analysis Software for Water Management Planning, Water Conservation Assumptions. Department of Water Resources, State of California, October 1989.

(8) More accurate leak location will reduce leak repair crew time.

(9) There will be less wear on the distribution system and pumping and treatment facilities.

(10) Contamination risk is reduced.

Forced smoke, aerial reconnaissance, and electronic amplifying equipment are some of the methods used to detect leaks. Electronic amplification is particularly effective and is conducted by listening for particular types of sounds along all water mains and at valves, hydrants, and meters. All suspected leakages should be investigated and repaired as rapidly as possible. If leaks are noticed on the customers side of a meter (especially for reimbursable accounts), then the customer should be notified as quickly as possible.

COVERAGE

The coverage of an infrastructure leak detection program should be 100 percent. However, manpower and monetary constraints may require a large installation to complete the leak detection program in phases. To determine the appropriate coverage factor, divide 100 percent by the number of years that the completed program should take and multiply by the number of years for which the program has been in effect.

$$C_{st} = 1.00/N * n$$

where

C_{st} = coverage of sector *s* at time *t*
N = number of years required to retrofit 100 percent of sector *s*
n = the current year of the retrofit program for sector *s*

On a three-year schedule the coverage would then be 100/3 * 1 = 0.33 = 33 percent for the first year. In successive years the coverage would be 100/3 * 2 = 67 percent for the second year, and 100/3 * 3 = 100 percent in the third year.

REDUCTION

The reduction in water consumption attributed to a leak detection program is a function of several factors. Pipe sizes and lengths, flow rates, age of pipes and/or joints, and the type of pipe all affect the longevity of flow integrity. Estimated percent reductions from prior studies have yielded a reduction in water use of 0.3 to 50 percent.[4]

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[4] Economic Feasibility Analysis of Centralized Tactical Vehicle Wash and Scheduled Maintenance Facilities, Fort Sill, Oklahoma. Planning Division, U.S. Army Engineer District, Tulsa, June 1986.

IV. LANDSCAPE RESTRICTIONS

DESCRIPTION

Landscape restrictions are aimed at reducing the need for irrigation by regulating irrigable lawn size of new residential construction. The nonirrigable area is then xeriscaped.

COVERAGE

Coverage is calculated as the percent of new building square footage affected by the regulation to total building square footage in the same period. The general equation is:

$$C_{st} = N_s / (S_s + N_s)$$

where

C_{st} = coverage in sector *s* at time *t*
N_s = new square footage in sector *s*
S_s = previous square footage in sector *s*

Therefore, if an additional 100,000 square feet of buildings were constructed to supplement the existing 900,000 square feet, then the coverage would be 100,000/(900,000+100,000) = 100,000/1,000,000 = 0.10 = 10 percent.

REDUCTION

Irrigation water reduction is calculated as the relative proportion of irrigable area to the area that would normally be irrigated at similar buildings.[5] The product of this calculation must then be multiplied by the proportion of sector water use that irrigation represents. The general equation would be:

$$R_s = (N_s / E_s) * P_s$$

where

R_s = reduction in sector *s*
N_s = allowable irrigable square footage per new building in sector *s*

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[5] Water Conservation for Domestic Users: With Special Reference to Warm Desert Climates. University of Arizona, 1977.

E_s = allowable irrigable square footage per existing building in sector *s*
P_s = percent of water used for irrigation in sector *s*

For example, if an average residential lawn irrigated 1,000 square feet, then new residential buildings with a 50 percent landscape restriction for allowable irrigable area would be allowed (1,000 * 0.50) = 500 square feet of irrigable area. The reduction factor for water used for irrigation (assuming 50 percent of household water is used for irrigation) would be calculated as:

$$R_s = (1{,}000 - 500) / 1{,}000 * 0.50 = 0.25 = 25\%$$

V. PRESSURE REDUCTION

DESCRIPTION

Installation of pressure-reducing valves can help conserve water. Reduction of water supply pressure causes a decrease in maximum water flow from a given fixture since the rate of water flow is related to the square root of pressure reduction. First, the waste of water is reduced as consumer receives less of it. Second, a reduction in pressure ensures decrease in water loss due to leakages. Although this device allows the user to adjust the water pressure, minimum pressure standards must be maintained.

COVERAGE

The user may identify the coverage of the area as a percent of total area by sector where the pressure reducing values will be installed. For instance, if a military installation chooses to reduce the water pressure in all of the schools at the base, then the coverage factor is 1.0 for schools.

REDUCTION

The water use reduction factor varies in a range of 0.05 to 0.30. A final rank-weighted average value of the reduction factor was computed to be 0.138 (U.S. Army Corps of Engineers, Technical Report EL-84-3)[6].

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[6] Algorithm for Determining the Effectiveness of Water Conservation Measures. Technical Report EL-84-3, U.S. Army Corps of Engineers, March 1984.

VI. EVAPOTRANSPIRATION SPRINKLER TRIGGER

DESCRIPTION

An evapotranspiration sprinkling trigger is a mechanism that attaches to the sprinkling system and automates irrigation based on a preset moisture deficit (i.e., "dryness") of the soil. This method of irrigation increases the efficiency of water application by matching the timing and amount of evapotranspiration and rainfall. The system is used in conjunction with a timed irrigation program. If the moisture deficit is greater than the preset level, then the system overrides the irrigation cycle - effectively turning the irrigation cycle off until the soil moisture deficit is greater than the predetermined level.

Improved grounds, where not xeriscaped, require regular care, mowing, and irrigation (in many areas) for establishing and maintaining attractive turf. There are two types of improved areas: lawn-type plantings and recreational areas and parade grounds. Lawn-type plantings include lawns, cemeteries, and adjacent areas receiving moderate foot traffic and requiring moderate care and maintenance. Recreational areas and parade grounds include athletic fields, golf courses, playgrounds, and similar areas of heavy foot traffic.[7]

The implementation of evapotranspiration sprinkler triggers should be combined with proper irrigation techniques. The education program should also emphasize good irrigation management practices which can reduce irrigation water waste at little or no cost to the installation. Sprinklers should be placed so that the irrigation water does not fall on undesired surfaces such as sidewalks and driveways and such that there is not any significant overlap from two or more separate sprinkler heads. Additionally, early morning watering is more effective and efficient than watering during the day and less damaging to the turf than watering in the evening or at night.

COVERAGE

Evapotranspiration sprinkler triggers would be most cost-effective if used on areas such as parade grounds, athletic fields, golf courses, and other large turf areas. Since the implementation of evapotranspiration sprinkling triggers could be mandated, the coverage for this measure would be 100 percent in the appropriate sectors.

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[7] Water Conservation Methods for U.S. Army Installations: Volume II. Irrigation Management, Technical Report N-146, CERL, April 1983.

REDUCTION

The reduction in water usage resulting from the implementation of this measure has been estimated at 25 percent if an automatic sprinkling system is already installed and up to 50 percent if an automatic sprinkling system is not on line.[8] However, if a manual sprinkling system is combined with physical moisture deficit readings then the reduction in irrigation water usage would range from 5 to 15 percent.

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[8] Distribution of Water Use at Fixed Army Installations, Technical Report N-157, CERL, August 1983.

Enclosure 3

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

IWRAPS Sectors Affected by Selected Measures

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	CONSERVATION MEASURES					
		Education	Plumbing Retrofit	Landscape Restriction	Leak Detection	Pressure Reduction	E.T. Sprinkler Trigger
ADMINISTRATION/OPERATIONS	A	X				X	
USAF RESERVE/NATIONAL GUARD	AR	X				X	
BARRACKS	B	X	X			X	
BOWLING CENTER	BC	X				X	
BANKS/CREDIT UNIONS	BK	X				X	
BACHELOR OFFICER QUARTERS	BOQ	X	X			X	
COMMUNITY	C	X				X	
COMMISSARY	COM	X				X	
DINING	D	X				X	
FAMILY HOUSING	F	X	X	X		X	
GOLF COURSE	GC	X				X	X
GYMS	G	X	X			X	
GUEST HOUSING	GH	X	X			X	
HEALTH/DENTAL CLINICS	HDC	X				X	
HOSPITALS	HOS	X				X	
LAUNDRY/DRY CLEANING	L	X				X	
MAINTENANCE	M	X				X	
RESEARCH AND DEVELOPMENT	RD	X				X	
RESTAURANT/CAFETERIA	R	X				X	
SCHOOLS (DEPENDENT)	S	X				X	
SERVICE STATIONS	SS	X				X	
VEHICLE WASH FACILITIES	VW	X				X	
WAREHOUSE	W	X				X	
EXCHANGE FACILITIES	X	X				X	
SWIMMING POOLS	P	X				X	

X: Conservation measure applicable in the sector

Enclosure 3 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Recommended Range of Reduction for IWRAPS Sectors Affected by Selected Measures

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	CONSERVATION MEASURES					
		Education	Plumbing Retrofit	Landscape Restriction	Leak Detection	Pressure Reduction	E.T. Sprinkler Trigger
ADMINISTRATION/OPERATIONS	A	0.03–0.05				0.05–0.30	
USAF RESERVE/NATIONAL GUARD	AR	0.03–0.05				0.05–0.30	
BARRACKS	B	0.03–0.05	0.20–0.40			0.05–0.30	
BOWLING CENTER	BC	0.03–0.05				0.05–0.30	
BANKS/CREDIT UNIONS	BK	0.03–0.05				0.05–0.30	
BACHELOR OFFICER QUARTERS	BOQ	0.03–0.05	0.20–0.40			0.05–0.30	
COMMUNITY	C	0.03–0.05				0.05–0.30	
COMMISSARY	COM	0.03–0.05				0.05–0.30	
DINING	D	0.03–0.05				0.05–0.30	
FAMILY HOUSING	F	0.03–0.05	0.20–0.40	0.50–0.58		0.05–0.30	
GOLF COURSE	GC	0.03–0.05				0.05–0.30	0.05–0.50
GYMS	G	0.03–0.05	0.20–0.40			0.05–0.30	
GUEST HOUSING	GH	0.03–0.05	0.20–0.40			0.05–0.30	
HEALTH/DENTAL CLINICS	HDC	0.03–0.05				0.05–0.30	
HOSPITALS	HOS	0.03–0.05				0.05–0.30	
LAUNDRY/DRY CLEANING	L	0.03–0.05				0.05–0.30	
MAINTENANCE	M	0.03–0.05				0.05–0.30	
RESEARCH AND DEVELOPMENT	RD	0.03–0.05				0.05–0.30	
RESTAURANT/CAFETERIA	R	0.03–0.05				0.05–0.30	
SCHOOLS (DEPENDENT)	S	0.03–0.05				0.05–0.30	
SERVICE STATIONS	SS	0.03–0.05				0.05–0.30	
VEHICLE WASH FACILITIES	VW	0.03–0.05				0.05–0.30	
WAREHOUSE	W	0.03–0.05				0.05–0.30	
EXCHANGE FACILITIES	X	0.03–0.05				0.05–0.30	
SWIMMING POOLS	P	0.03–0.05				0.05–0.30	

Enclosure 4

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

IWRAPS Sectors Affected by Selected Measures (Reported)

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	PROPOSED APPLICATION OF CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					

Please use check mark (x) wherever the proposed conservation measure is applicable.

Enclosure 4 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Reported Reduction Factors for IWRAPS Sectors Affected by Selected Measures

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	SELECTED CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					

Enclosure 4 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Reported Coverage Factors for IWRAPS Sectors Affected by Selected Measures (FY 1995)

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	SELECTED CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					

Enclosure 4 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Reported Coverage Factors for IWRAPS Sectors Affected by Selected Measures (FY 2000)

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	SELECTED CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					

Enclosure 4 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Reported Coverage Factors for IWRAPS Sectors Affected by Selected Measures (FY 2005)

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	SELECTED CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					

Enclosure 4 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Reported Coverage Factors for IWRAPS Sectors Affected by Selected Measures (FY 2010)

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	SELECTED CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					

Enclosure 4 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Reported Coverage Factors for IWRAPS Sectors Affected by Selected Measures (FY 2015)

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	SELECTED CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					

Enclosure 4 (Continued)

WATER CONSERVATION AT FORT HUACHUCA MILITARY RESERVATION

Reported Coverage Factors for IWRAPS Sectors Affected by Selected Measures (FY 2025)

BUILDING SECTOR DESCRIPTION	IWRAPS CODE	SELECTED CONSERVATION MEASURES				
		#1 Landscape Restrictions	#2 Plumbing Retrofit	#3 Leak Detection	#4	#5
ADMINISTRATION/OPERATIONS	A					
USAF RESERVE/NATIONAL GUARD	AR					
BARRACKS	B					
BOWLING CENTER	BC					
BANKS/CREDIT UNIONS	BK					
BACHELOR OFFICER QUARTERS	BOQ					
COMMUNITY	C					
COMMISSARY	COM					
DINING	D					
FAMILY HOUSING	F					
GOLF COURSE	GC					
GYMS	G					
GUEST HOUSING	GH					
HEALTH/DENTAL CLINICS	HDC					
HOSPITALS	HOS					
LAUNDRY/DRY CLEANING	L					
MAINTENANCE	M					
RESEARCH AND DEVELOPMENT	RD					
RESTAURANT/CAFETERIA	R					
SCHOOLS (DEPENDENT)	S					
SERVICE STATIONS	SS					
VEHICLE WASH FACILITIES	VW					
WAREHOUSE	W					
EXCHANGE FACILITIES	X					
SWIMMING POOLS	P					