Final Report

Statewide Study of the Retention of Measures Installed Under the Direct Assistance Program (DAP)

Submitted to Southern California Edison Company
(PO No. K1078010)
and the CADMAC committee for
the DAP Retention Study:
Pacific Gas & Electric Company
San Diego Gas & Electric Company
Southern California Gas Company

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Table of Contents

Executive Summary

Background

The California Demand Side Management Advisory Committee (CADMAC) measurement and evaluation (M&E) Protocols require Retention Studies at specific retention years depending on the program. The purpose of the Retention Study is to collect data to determine the effective retention for the primary measures in the program. This involves measuring the proportion of measures still in place, operational, and effective.

This study is the Statewide Retention Study for the 1994, 1995, and 1996 Residential Direct Assistance Programs (DA) operated by Southern California Edison Company (SCE), Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Gas Company (SCG). These programs served the residential dwellings of low-income customers. There are six primary measures offered through the DA programs that are included in this study. These are:

- Evaporative cooling (with unit provision in one utility and covers provided at the other utilities),
- Attic and ceiling insulation,
- Low flow showerheads,
- Door weather stripping,
- Caulking, and
- Water heater blankets.

Overview of Methodology

Direct observation of measure retention and its operational status was obtained through 253 site visits conducted by trained auditors. The Study's approach and protocols were designed to meet the challenges presented in obtaining visits years after participation, and in low-income communities, where residents may be more reluctant to agree to site visits and where the participant population may be more transitory. At the same time, this was performed ensuring a high quality of customer service and data collection. This was accomplished through the use of recruiters and auditors with many years of experience in providing utility customer services. Training and a complete Surveyor's Guidebook helped support meeting these objectives.

The sampling plan was designed to ensure representation across measures, utilities, and years. All measures installed were examined at each site, regardless of the measure for which the site was selected. This provided the maximum possible measure sample sizes.

The site survey instrument and the analysis were designed to be straight forward. This allows a greater ease in interpreting the results and for others in reviewing the study and its findings. The primary measurement is the proportion of measures that are in place and operational. This is derived from survey information by analyzing frequencies and means of the site visit data by measure.

Findings

The sample sizes for the retention estimates are provided in Table ES.1.

Table ES.1[1] Sample Sizes for Retention Findings

	1994	1995	1996	Overall
Evaporative coolers	1	10	9	19
Evaporative cooler covers	17	14	10	41
Attic and ceiling insulation	23	31	34	88
Low flow showerheads	46	45	50	174
Door weather stripping	75	76	81	232
Caulking	63	62	71	196
Water heater blankets	25	35	30	91

* The sample size counts are the number of sites (homes) treated for almost all measures. The proportion retained at a site was used in the analyses for evaporative coolers, low flow showerheads, and water heater blankets, measures where more than one could have been installed at a site and a count of those retained was gathered by the survey. The figures for evaporative cooler covers are the number of covers examined in the survey.

The measure retention estimates range from a high of 100 percent to a low of 52 percent. Most of the measures show quite high retention, as would be expected given that many are weatherization measures which are not readily accessible to the occupants. One of the lowest (70%) retention rates is found for evaporative cooler covers, an item that can easily be lost by the occupant.

Low flow showerheads can be a retention concern as their performance may be seen as less desirable by some customers and they are easily removable. This study, however, found a very respectable retention rate for low flow showerheads given these characteristics, with a retention rate of 86 percent.

[1] This table is the same as Table 3.3 and is further described in Section 3.

All of the retention findings are presented in Table ES.2.

Table ES.2 DAP Measure Retentions

	1994 Installations	1995 Installations	1996 Installations	Overall Retention
Evaporative coolers	100.0%	100.0%	100.0%	**100.0%**
Evaporative cooler covers	53.8%	90.0%	69.7%	**70.1%**
Attic and ceiling insulation	100.0%	97.7%	92.6%	**96.9%**
Low flow showerheads	84.2%	90.7%	84.1%	**85.5%**
Door weather stripping	93.4%	91.3%	96.0%	**93.6%**
Caulking	44.6%	56.2%	54.2%	**51.7%**
Water heater blankets	76.0%	83.0%	87.5%	**81.6%**

1.0 Introduction

1.1 Project Background

Standardized protocols for demand-side management (DSM) evaluation were developed in California through the cooperative efforts of utility DSM evaluation experts, interested parties, regulatory staff, and outside consultants working through the California Demand Side Management Advisory Committee (CADMAC). These measurement and evaluation (M&E) protocols are the standardized expectations for DSM evaluation which serve as the basis for the measurement of ex-post energy savings caused by energy efficiency programs, whose measurement determines the shareholder incentives to be received by the utility due to the utility's performance in obtaining these savings.

The M&E Protocols' require Retention Studies at specific retention years depending on the program. The purpose of the Retention Study is to collect data to determine the effective rate of retention for the primary measures in the program. This involves measuring the proportion of measures still in place, operational, and effective.

This study is the Statewide Retention Study for the 1994, 1995, and 1996 Residential Direct Assistance Programs (DA) operated by Southern California Edison Company (SCE), Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Gas Company (SCG). These programs served the residential dwellings of low-income customers. There are six primary measures offered through the DA programs that are included in this study. These are:

- Evaporative cooling (with unit provision in one utility and covers provided at the other utilities),
- Attic and ceiling insulation,
- Low flow showerheads,
- Door weather stripping,
- Caulking, and
- Water heater blankets.

This study meets the requirements of the M&E Protocols. As given in the revised M&E Protocols:

> "9. *Measure Retention Study – Residential Direct Assistance Programs*: A one-time statewide study will be conducted to assess the

> retention of evaporative cooling measures, attic and ceiling insulation, low flow showerheads, door weather stripping, caulking, and water heater blankets. This study will replace all other previously specified persistence studies for all utility Residential Direct Assistance Programs and will be completed by March 1, 1999."[2]

The utilities and regulatory staff selected the basic methodology for this study to consist of 250 site visits. These site visits were selected to be representative of the program participants for the state as a whole. A sampling plan was designed to ensure representation across measures, utilities, and years. At the same time, all sampled participants were surveyed for all measures installed (regardless of the measure for which they were pulled into the sample). This allowed the sample sizes for the measures to be maximized.

Experience has taught that reaching and recruiting program participants for studies two and three years after their participation is considerably more difficult than in standard one-year post-participation studies, particularly residential customers. This difficulty was exacerbated by the nature of the population being studied, low-income customers. Besides the reluctance of low-income customers to accept the site visit, there is often a proportion of these customers that are more transitory than other groups of customers.

The approach of this study was designed to meet these challenges. This was done through the use of experienced recruiters and offering an incentive for study participation to minimize difficulties in recruiting study participants. Reliable experienced auditors were used that are knowledgeable about the service territories and the communities where these participants live. This not only aids the customer-friendly attitude of the site visits (through reliability and professionalism), but also helped assure that there are not large biases introduced by inexperienced recruiters/auditors selecting who to visit.[3]

Quality control procedures were developed and used to assure the accuracy of the data collected and analyzed. Protocols were also established and used to

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[2] Prepared Testimony of Kevin C. McKinley, Chair, California DSM Measurement Advisory Committee (CADMAC) in the 1998 Annual Earnings Assessment Proceeding (AEAP), September 8, 1998, Application Nos: 98-05-001, 98-05-005, 8-05-013, 98-05-018, page 21, Amending Appendix B, V. 9 of the M&E Protocols.

[3] The primary focus for the retention study is on the treated sites rather than the participating customers, i.e., if the customer has moved we still are interested in the retention at the site. It is important, however, to insure there is no bias in the sites visited. This could occur due to how interactions occur between auditors and customers if this varies by neighborhood. Biased selection of site visits are much more likely by inexperienced individuals who chose larger areas of low-income communities as being "too dangerous" to visit. On the other hand, experienced individuals who know the communities well were more able to properly sample and gain safe access to the sites.

ensure proper customer service and efficient working relationships with the utilities sponsoring the study.

Both the survey instrument and the analysis plan were designed to be simple and straight forward. This enables this report to describe all of the analysis steps and findings in a succinct manner while still being clear as to what the findings are and how they were derived.

1.2 Program Overview

The Direct Assistance Program (DAP) is designed to help low income residential customers control energy costs by providing free weatherization, education, and appliance services. First authorized by the California Public Utilities Commission in 1982 in response to state legislation, the program's goal is to assist residential customers financially unable to participate in other residential conservation programs.

Each utility's DAP program includes: weather stripping, low flow showerheads, caulking, attic insulation, water heater blankets, and minor home repair. The utilities also offer additional services. Across these utilities, these additional services include: attic venting; evaporative cooler covers; evaporative coolers; outlet gaskets; water heater pipe wrapping; reusable furnace filters; energy efficient refrigerators; recycling of old refrigerators and freezers; compact fluorescent light bulbs; gas furnace adjustment, repair or replacement; and educational services.

Customers are qualified for DAP participation based upon the California Alternate Rate for Energy (CARE) income guidelines, with income adjustments for household family size, senior citizen status, and status as a disabled person.

Many of the programs work with local social service agencies and offer program services to outreach to low income customers that may be physically challenged, elderly, or with little or no English-speaking capability.

1.3 Report Overview

Section 1 has provided an overview of the project, being completed with this overview of the report itself. Section 2 presents the methodology of the study. The last section, Section 3, presents the study findings including information on the sample, measure retention estimates, and confidence levels for the measure retention estimates. This is followed by appendices that contain material from the Surveyor's Guidebook; the site visit instrument; the site survey responses; the frequencies, cross-tabulations, means and statistics used for the retention

analyses; and the datasets and documentation for the study (in accordance with the M&E Protocols).

2.0 Methodology

2.1 Measurement Issues

The primary objective of this study was to answer the questions: "Is the measure still in place?; Is it operational?; and Is it still effective?". This is in accordance with the M&E Protocols' definition of a Measure Retention Study:

> "An assessment of (a) length of time the measure(s) installed during the program year are maintained in operating condition; and (b) the extent to which there has been a significant reduction in the effectiveness of the measure(s)."[4]

The methodology selected was based upon these needs, understanding the differences between a measure retention study and a persistence study, and developing a workable methodology for conducting 250 site visits to gather the data to answer this question.

This study was designed only as a measure retention study and not a persistence study. Only a few practitioners with significant experience in conducting persistence studies understand the differences between these two types of studies. One of the primary differences after the studies are conducted lies in their acceptable uses. Given that this study is a measure retention study, the results should only be used as a measure retention study (unless further adjustments and examinations are made).

An example of an improper use of a measure retention study would be to use its results along with prior impact evaluation. This improper use of the retention results could yield a double-counting of losses. As an example, suppose a program database indicated that 100 low flow showerheads should have been installed. Then an impact evaluation is conducted one year post-participation. This impact evaluation finds 97 showerheads installed (or implicitly accounts for this loss in a lower realization rate in a billing analysis such as a 97% realization rate). Then suppose two years later a retention study is done and finds 90 showerheads in place and operational. If the study were conducted as a measure retention study only, using as its baseline the program database, the retention study would find a loss of 10 showerheads (100-90) or a 90% retention. This could be an accurate measure retention estimate. However, if the retention study results were applied to the impact evaluation's savings to estimate savings still being achieved, there would be a double-count of the 3%

[4] Measure Retention Study definition from page A-7 of the March 1998 edition of the California Measurement & Evaluation (M&E) Protocols.

loss. The persistence retention rate would need to be re-estimated as 93% (90/97) in order to be applied to the impact savings estimate. Of the 10 showerheads not in place at the time of the retention study, three are in the program database but were never actually installed and seven were the retention loss in the form of persistence from the impact evaluation.

As this study is a measure retention study, and not a persistence study, it did not gather data on usage or analyze data measuring potential long-term participant spillover (market transformation for participants), as doing so could cause confusion to readers of the report. (The latter data on subsequent actions by participants was collected by the study per the request of program administrators for use in future program planning. This information is presented along with the other data analysis in Appendix C.)

2.2 Survey Instrument and Protocols

An understanding of the program measures and consistent measurements across utility program databases was discussed in the kick-off/working meeting. This led to a discussion of what was the logical way in which to examine retention for each measure, an extension of which is the question posed in the survey instrument. The initial draft survey instrument was sent to the Utility Study Managers to review with the draft of the Research Plan.

A Surveyor's Guidebook was developed to enable a consistently high quality of effort in the recruiting and data collection phases of the project. This Guidebook was used to develop mutually agreed upon protocols, as a training tool for the auditors, and as a procedure manual for the fielding of this project. The material from the Surveyor's Guidebook is included in this report as Appendix A.

After finalizing the Research Plan and the Surveyor's Guidebook, the draft survey instrument was pre-tested along with a pre-test of the recruiting protocols and data collection protocols. The first page of the instrument includes information from the program database and contact information verified as part of the recruiting process. The next two pages are the data collection forms. These were kept simple and straight forward in order to ensure the collection of meaningful information. Each measure of interest has its own small section. The auditors only observed/asked those sections that were applicable to the site as indicated by the program database information from the first page.

The site visit instrument is included as Appendix B.

The sampling, as discussed in Section 2.3, was applied uniformly and yet separately by utility. This minimized the database changing and cleaning issues, as the creation of one giant program population database was avoided. It also seemed more reasonable to apply the same programming procedure to sample each utility database.

A project tracking number was assigned to each customer in the sample prior to the sampling dataset moving to the Recruiting, Scheduling, and Data Collection Database. This tracking number was used for data collection efforts, and for datasets without customer contact information where this number could be used to match back to the customer identification information. (The final datasets provided with this project are without customer identification. This maintains customer confidentiality while providing all the data used in this project's analyses and are provided in accordance to the Protocols.)

Protocols for data collection and entry are provided in the Surveyor's Guidebook in order to assure the highest quality data collection effort.

The sequence of data processing for sampling and for analysis was conducted step-by-step in order to provide a systematic approach to save and document each step. In this way, quality control was implemented and, the preparation of the evaluation databases and documentation, as required by the Protocols, was performed alongside the work effort.

2.3 Sampling

Random sampling is the easiest way to insure generalizability of the results to the overall population. It is also the easiest to use and to explain. Given this, random sampling is an important part of the sampling plan.

There is some possible improvement (i.e., removal of a potential selection bias) in surveying dwellings randomly whether the current occupant was the participant or whether a new occupant had moved into the dwelling. It was determined during the project's kick-off/working meeting that obtaining the current occupants' name and phone number could be done for the three largest utilities in this study (all but San Diego Gas & Electric) with relative ease via matching databases electronically. Given this, it was decided that this would be done for these utilities. The group also decided that the small size of the sample from the one utility where this effort would be much more time-consuming (in that manual look-up would be required) made it acceptable not to perform this extra step for the few (if any) sites where this might be applicable for this one utility's customers.

Measure numbers, percentages, and alternative allocation schemes were presented and discussed in the kick-off/working meeting. It was decided that a proportional allocation of the 250 sites across the utilities by co-funding percentages should yield approximately the same results as a pure random sample of the entire population statewide. Doing a random sample for each utility with this allocation would be much easier to perform while ensuring the expected proportional representation in the statewide sample.

Table 2.1 presents the number of measures installed (for evaporative cooler measures, low flow showerheads, and water heater blankets) and dwellings served (for attic or ceiling insulation, door weather stripping, and caulking) for each utility by year.

Table 2.2 provides total population by measure and year across the four utilities. From this, it can be easily seen that some measures are an order of magnitude smaller in their participation numbers than others. This means that pure random sampling across measures might have provided few or no dwellings where these measures were installed. Given the need to obtain a retention estimate for each of the six measures, stratified sampling by measure was required.

Given the study was a measure retention study, rather than a persistence study, the six measures are equally important (rather than being important based upon estimated savings). This means that the preference for the stratified sampling was to ensure a similar minimum number of sites for each measure. Taking the total of 250 sites and dividing by the number of measures provided the sampling goal of obtaining a minimum of 42 sites per measure. Desiring an equal representation by program year (which should also have been obtained if random sampling occurred given the equal proportions generally seen in Table 2.2), provided a sampling goal of obtaining a minimum of 14 sites per measure per year.

The sampling plan is presented in Table 2.3. The samples pulled were at least twelve times these goals to ensure an adequate sampling pool for recruitment. The necessary customer and dwelling information were matched for the measure installations drawn in the sampling. This dataset was then purged for multiple occurrences of a dwelling (to ensure proper customer service by not having any customer recruited more than once). The next step was appending indicators and quantities (for the appropriate measures) for each of the installed measures at that dwelling that are among the six measures of interest to this study. A consolidated sampling pool by utility was created containing all program years, with indicators for program year participation, as a customer level flat data file.

Table 2.1 Measure Populations by Utility and Program Year

	1994	1995	1996	
Pacific Gas & Electric				
Evaporative cooler	2,717	2,249	3,280	
Attic or ceiling insulation	7,708	8,305	6,802	
Low flow shower heads	34,063	34,975	41,790	
Door weather stripping	39,946	39,222	43,317	
Caulking	39,323	38,541	42,993	
Water heater blankets	9,030	5,639	6,118	
Total by Year	132,787	128,931	144,300	
Residents Served	42,184	42,102	45,173	129,459
Southern California Gas				
Evaporative cooler	950	696	521	
Attic or ceiling insulation	5,715	4,875	5,410	
Low flow shower heads	20,576	19,675	21,617	
Door weather stripping	20,550	18,905	21,510	
Caulking	11,668	14,809	18,295	
Water heater blankets	4,991	6,387	7,116	
Total by Year	64,450	65,347	74,469	
Residences served	20,550	18,905	21,510	60,965
Southern California Edison				
Evaporative cooler	3,944	1,977	2,073	
Attic or ceiling insulation	98	43	43	
Low flow shower heads	964	1,509	852	
Door weather stripping	1,147	2,451	2,449	
Caulking	783	2,276	2,252	
Water heater blankets	39	319	335	
Total by Year	6,975	8,575	8,004	
Residences served	5,091	4,940	4,526	14,557
San Diego Gas & Electric				
Evaporative cooler	-	-	-	
Attic or ceiling insulation	939	620	466	
Low flow shower heads	5,404	5,144	6,382	
Door weather stripping	8,295	7,180	7,659	
Caulking	7,815	6,410	6,904	
Water heater blankets	705	693	445	
Total by Year	23,158	20,047	21,856	
Residences served	9,453	7,395	9,824	26,672

* Most counts are the number of sites (homes) treated. The number of measures, where more than one could have been installed at a site, is provided as the count for evaporative coolers, evaporative cooler covers, low flow showerheads, and water heater blankets.

Table 2.2 Measure Installation by Year and Comparison

	1994	1995	1996	Total	Ratio to Largest #	% of Total
Evaporative cooler	7,611	4,922	5,874	18,407	0.09	2.6%
Attic or ceiling insulation	14,460	13,843	12,721	41,024	0.19	5.9%
Low flow shower heads	61,007	61,303	70,641	192,951	0.91	27.6%
Door weather stripping	69,938	67,758	74,935	212,631	1.00	30.4%
Caulking	59,589	62,036	70,444	192,069	0.90	27.5%
Water heater blankets	14,765	13,038	14,014	41,817	0.20	6.0%
Percent by Year						
Evaporative cooler	41%	27%	32%			
Attic or ceiling insulation	35%	34%	31%			
Low flow shower heads	32%	32%	37%			
Door weather stripping	33%	32%	35%			
Caulking	31%	32%	37%			
Water heater blankets	35%	31%	34%			
250/ 6 measures	41.7	Per Year	13.9			

* Most counts are the number of sites (homes) treated. The number of measures, where more than one could have been installed at a site, is provided as the count for evaporative coolers, evaporative cooler covers, low flow showerheads, and water heater blankets.

The initial sampling by utility was used to create an extract of premise identifiers by utility. These were provided to the utilities that performed electronic look-up. From this, the utilities then provided current customer name and telephone number. This helped to ensure that no bias would be produced by obtaining visits only for those sites where the occupancy had not changed since program participation. This is a particularly important enhancement to the procedures of this study since occupancy turnover tends to be highest among the low-income population.

The final samples, with the current occupant name and telephone number, were randomly sorted prior to becoming part of the Recruiting, Scheduling, and Data Collection Database.

All measures installed, from the six measures of interest, at the randomly sampled sites were examined in the retention study. Given the large number of multiple measures per dwelling, the final measure counts are much higher than the minimum sampling goals. This also means that the final stratification weighting achieved accuracy by being developed based upon the sample proportions achieved rather than those in the sampling plan. The final stratification was dependent on a comparison of the overall count of measures

examined in the study versus that found in the overall statewide population. (The weighting is described in further detail in Section 3.1.)

Table 2.3 Sampling Plan

	1994	1995	1996	Totals	
Overall				250	
Pacific Gas & Electric					
Evaporative cooler	0	0	0		
Attic or ceiling insulation	7	7	7		
Low flow shower heads	7	7	7		
Door weather stripping	7	6	7		
Caulking	7	6	7		
Water heater blankets	7	7	7	% of total	
Measure Total	35	33	35	103	41%
Southern California Gas					
Evaporative cooler	3	3	3		
Attic or ceiling insulation	5	4	4		
Low flow shower heads	5	4	4		
Door weather stripping	5	4	4		
Caulking	5	4	4		
Water heater blankets	5	4	4	% of total	
Measure Total	28	23	23	74	30%
Southern California Edison					
Evaporative cooler	11	11	11		
Attic or ceiling insulation		2	2		
Low flow shower heads		2	2		
Door weather stripping		2	2		
Caulking		2	2		
Water heater blankets		2	2	% of total	
Measure Total	11	21	21	53	21%
San Diego Gas & Electric					
Evaporative cooler	0	0	0		
Attic or ceiling insulation	2	1	1		
Low flow shower heads	2	1	1		
Door weather stripping	2	1	1		
Caulking	2	1	1		
Water heater blankets	2	1	1	% of total	
Measure Total	10	5	5	20	8%

With an emphasis on measure retention statewide, sampling occurs randomly across dwelling type. This means that some of the dwellings visited were single family homes, some were multi-family units, and a few were mobile homes. With random sampling, these occur in proportion to their representation of measures installed. The results are reported overall, as discussed above. Given

the random sampling and proper weighting for the measure, utility, and year of participation stratification, the overall results are generalizable to the overall program participation population.

2.4 Analysis Plan

There are generally two types of retention measurements in the survey instrument. These are:

1. Those measures where an operational measure is either there or not.
2. Measures that can be in place, operational, and may have partial effectiveness.

The first of these are generally either there and operational, or they are not. This means that any one measure is either "100%" retained or "0%" retained. The retention rate for these measures only require a sum of those in place and operational as compared to how many measures the program database said was installed for these customers. Measures of this first type (as they were measured in the survey) include:

- Evaporative cooler covers and evaporative cooler equipment installed;
- Low flow showerheads (in place and passing the calibrated measure as still being low flow); and
- Water heater blankets.

The other three measures studied are of the second type, where their retention may be such that they can have varying levels of effectiveness – rather than all or nothing. These measures have survey questions that ask if the measure is in place, is it operational, and is it effective. The effectiveness is observed as being on average fully, mostly, half, less than half, or having none of its effectiveness. These measures include:

- Attic/ceiling insulation;
- Door weather stripping; and
- Caulking.

Each of the type two measures was measured as: 100%, 75%, 50%, 25%, and 0% retention (in place, operational, and effective) for the respected survey observations: fully, mostly, half, less than half, and none, respectively. The overall measure retention estimate then becomes the sum of the percentages of observed retention and functionality compared to the sum of the number of measures (dwellings receiving these measures) in the site visits.

An example of the calculation for a type two measure would probably be helpful here. Let us assume that the site visit observed five dwellings with caulking. The observations for each of the five houses were: 75%, 100%, 50%,

100%, and 100%. The sum of these is 4.25 (425%). The total number of dwellings with these measures according to the program database is 5. The retention measurement is 4.25/5 or 85% in this example.

3.0 Findings and Results

3.1 Sample Disposition

The samples were drawn, checked, and provided for recruitment as planned. The recruiting occurred according to the protocols resulting in the necessary number of sites being recruited. Though procedures were used at three of the four largest utilities to obtain names and telephone numbers of current occupants, there were still a large percentage of wrong or disconnected numbers. The site visit goals were completed, but a greater number of calls were required to do so than originally anticipated.

Each utility was provided with their own call disposition report when the site visits were completed in their territory. The overall call disposition is provided in Table 3.1.

Table 3.1 Call Disposition

	Pacific Gas & Electric	San Diego Gas & Electric	Southern California Edison	Southern California Gas
Scheduled Survey	116	19	31	96
Scheduled Call Back	51	17	0	43
Left Message	0	0	1	0
Busy	91	5	1	11
Answering Machine	86	7	1	26
No answer	217	16	10	66
Call back later	31	4	0	0
Over Quota	0	0	0	0
Not Qualified	0	0	0	0
Wrong Number	46	19	17	94
Initial Refusal	1	4	1	5
Mid-Terminate	8	2	0	2
Business fax	0	0	0	4
Disconnected Number	61	35	26	98
Language Barrier	5	4	2	7
Moved Out	0	4	1	4
% Scheduled	16%	14%	34%	21%
% Wrong #/Disconn.	14%	40%	47%	43%

3.2 Characteristics of the Sample and Weighting

The study required 250 site visits. Due to re-scheduling, back-up sites being scheduled, and conducting site visits at multiple utilities simultaneously, 253 site visits were actually conducted. This provides slightly larger sample sizes than anticipated.

As discussed in Section 2, the sampling plan was designed to ensure representation across utilities, measures and years. Yet, all measures were examined that were installed by the program at each site when a site was selected in the sample and recruited. This provides sample sizes for measures often orders of magnitude greater than the minimum used in the sampling plan.

This procedure worked quite successfully, obtaining measure sample sizes from 20 to 232 for each measure category in the sampling plan.[5] The obtained sample sizes are provided in Table 3.2.

Table 3.2 Sample Sizes Achieved

	1994	1995	1996	Overall
Evaporative coolers	1	10	9	20
Evaporative cooler covers	17	14	10	41
Attic and ceiling insulation	23	31	34	88
Low flow showerheads	67	70	76	213
Door weather stripping	75	76	81	232
Caulking	63	62	71	196
Water heater blankets	28	36	31	95

* Most sample size counts are the number of sites (homes) treated. The number of measures, where more than one could have been installed at a site, is provided as the count for evaporative coolers, evaporative cooler covers, low flow showerheads, and water heater blankets.

The sampling plan used a stratified random sample with strata by utility, year, and measure. Given this sampling, weights had to be used with the survey results so the analysis results would represent the state as a whole. The weights

[5] The sampling plan was established for a strata for evaporative coolers. At the time, the analysis was not expected to be subdivided between evaporative coolers and evaporative cooler covers. According to this original design the sample size achieved for evaporative cooler measures was 61. The smaller sample sizes shown here represent the sample sizes that resulted from the decision made during the analysis phase of the study that the two types of evaporative cooler measures had to be analyzed separately given the significant differences in their characteristics and their retention rates.

were derived in a three step process. These were:

1. Calculating the proportion of actual measures in each cell (count by utility, measure, and year) as compared to the statewide total for that measure.
2. Calculating the proportion of the sample count for each cell (count by utility, measure, and year) as compared to the statewide sample total for that measure.
3. Dividing the actual proportion in each cell by that cell's sample proportion.

This created a weight for every utility, measure, and year cell. These weights were used for all measure analyses.

3.3 Retention Findings

The complete site visit dataset (including site visit results and program database indicators for measures) was cleaned into an Excel© spreadsheet. This was read into a SAS© dataset for further analysis. SAS© was used to compute frequencies for the questions with ranges, and percent retained and means for those questions with counts. (These frequencies and means are provided in Appendix C.) The SAS© results were then entered into spreadsheets to produce the final retention findings and calculate averages, where necessary, and confidence levels.

There are two types of SAS© analyses used to derive the retention estimates, means of retention rates at a site and frequencies.

The first type was used when more than one measure could have been examined at a site and the survey asked for counts of these. This first type of measures included evaporative cooler equipment (Southern California Edison's program only), low flow showerheads, and water heater blankets. The survey gathered number of measures at the site as well as whether those measures were operational. The number observed and found operational was compared to the number expected at that site via the SAS© analysis. This provided the retention rate for that site. The average of this rate across sites provides the measure retention estimate.

The second type of analysis used frequencies for questions where retention was measured in categories such as fully in place and operational, mostly in place and operational, half, less than half, and none (or all, some, and none for evaporative cooler covers found). The results from these frequencies calculated in SAS© were placed in a spreadsheet. The spreadsheet used the retention weights, as described in the Analysis Plan in Section 2.4, to calculate the measure retention estimates.

The final retention findings are based upon sample sizes as provided below in Table 3.3. (The evaporative cooler measure category has been divided into two categories, evaporative cooler equipment and evaporative cooler covers, for the purpose of analyses. Table 3.3 represents the "Ns" for the analysis. Recall, the sample counts in Table 3.2, as in the total count tables and sampling plan, represent quantity installed for evaporative coolers, evaporative cooler covers, low flow showerheads and water heater blankets. The counts in Table 3.3, however, represent number of sites for all measures except evaporative cooler covers. This is because the analysis for evaporative coolers, low flow showerheads and water heater blankets was based on percent retained per site. This was not done for evaporative cooler covers as the survey responses were categorical: all, some, or none, rather than obtaining a count of cooler covers retained.)

Table 3.3 Sample Sizes for Retention Findings

	1994 Installations	1995 Installations	1996 Installations	Overall
Evaporative coolers	1	10	8	19
Evaporative cooler covers	17	14	10	41
Attic and ceiling insulation	23	31	34	88
Low flow showerheads	46	45	50	174
Door weather stripping	75	76	81	232
Caulking	63	62	71	196
Water heater blankets	25	35	30	91

* The sample size counts are the number of sites (homes) treated for almost all measures. The proportion retained at a site was used in the analyses for evaporative coolers, low flow showerheads, and water heater blankets, measures where more than one could have been installed at a site and a count of those retained was gathered by the survey. This difference due to how the data was used in the analysis is why the sample size counts for the retention findings (in this table) are slightly lower than in sample size achieved (Table 3.2) for evaporative coolers, low flow showerheads, and water heater blankets. The figures for evaporative cooler covers are the number of covers examined in the survey, the basis used in the analysis.

The measure retention estimates range from a high of 100 percent to a low of 52 percent. Most of the measures show quite high retention, as would be expected given that many are weatherization measures which are not readily accessibility to the occupants. One of the lowest retention rates (70%) is found for evaporative cooler covers, an item that can easily be lost by the occupant.

Low flow showerheads can be a retention concern as their performance may be seen as less desirable by some customers and they are easily removable. This study, however, found a very respectable retention rate for low flow showerheads given these characteristics, with retention being 86 percent.
All of the retention findings are presented in Table 3.4.

Table 3.4 DAP Measure Retentions

	1994 Installations	1995 Installations	1996 Installations	Overall Retention
Evaporative coolers	100.0%	100.0%	100.0%	**100.0%**
Evaporative cooler covers	53.8%	90.0%	69.7%	**70.1%**
Attic and ceiling insulation	100.0%	97.7%	92.6%	**96.9%**
Low flow showerheads	84.2%	90.7%	84.1%	**85.5%**
Door weather stripping	93.4%	91.3%	96.0%	**93.6%**
Caulking	44.6%	56.2%	54.2%	**51.7%**
Water heater blankets	76.0%	83.0%	87.5%	**81.6%**

The lowest retention rate was 52%, found for caulking. The study does not provide clear information as to why such a low rate appears for this measure, particularly as it is inconsistent with the other findings. Investigation indicates that the most likely explanations are that while the auditors performed the site visits as instructed, there may have been measurement error in the designing of the survey protocols with regard to this measure.

One of the difficult component of conducting a retention study is in cost-effectively determining retention of what was actually installed by the program, particularly for measures that are not "all or nothing" cases. As part of developing the Research Plan for this study, it was decided that if a window had some caulking then the auditor was to assume that all sides of that window was caulked. The proportion of the sides caulked would be the retention measurement. The average retention across all windows showing caulking would be recorded as the caulking retention for that residence. As such, windows were checked for caulking.

A significant percentage of the residences with program-installed caulking, as provided in program databases, were not found to have any caulking on their windows. Site surveys for these residences show that none of the caulking remains in place and operational (0% retention rate). In hindsight, it was found that several of the utilities' programs may have caulked only the doors, baseplates, or under the sink, without caulking windows. Since only windows were checked for caulking, retention rates for caulking could be grossly biased downward.

An alternative explanation might be that a lack of double-checks could have led to many homes not having caulking installed though it had been noted in the database. If this were the case, savings from these were never achieved and the post-installation impact should have been lower than program estimates. Yet, this is not really a retention loss issue.

A third explanation could be that windows may have been only partially caulked as needed at the time of the program. The older caulking not needing replacement as of 2-5 years ago, may have since fallen out, though the caulking installed through the program remains in place.

The retention rate for caulking is presented along with the other findings. Given the above discussion, however, we do not believe that the retention rate for caulking is reasonably accurate. We recommend that with the low incremental cost of caulking in a weatherization program and the inconclusiveness of the retention findings for caulking, caulking should still be considered, with the assumption that its real retention rate would be in the range of the other measures, when using this study for policy decisions.

3.4 Confidence Levels

This subsection presents the confidence intervals for this analysis. These are confidence intervals measuring sampling error, how adequate the sample is in estimating the results for the population from which the sample is drawn. In other words, if the exact same measurement tool is used, the confidence level provides us the probability of falling within the interval in repeated samples or, similarly, the probability that the results for the population as a whole would be within the interval around the results found for the sample. This is the standard measurement and use of confidence intervals.

A measurement of the confidence interval does not measure the overall accuracy of the estimate. This is because there are generally two types of possible errors. These are:

1. Sampling error
2. Measurement error

The confidence interval allows us to measure possible sampling error. There is no readily available and accepted measurement to assess measurement error. (Measurement error is the error from the tool or technique used for the measurement or that the hypothesized model is not the one and only true model for the process being examined.)

The site visit technique used was a visual inspection by experienced auditors. The survey instrument was set to minimize bias that could result from differences between auditors in assessing retention. This was accomplished by asking the auditors to round their estimates of retention into the categories on the instrument: All, Most, Half, Less than Half, and None. These categories also represent our professional assessment of the accuracy possible for a visual inspection, i.e., an approximation of the inherent measurement error.

There are well-accepted formulas that are used to estimate confidence intervals for sampling error. Recall, there are two types of SAS© analyses performed to obtain the information for the measure retention estimates, means and frequencies. Means are a point estimate. As such, the calculation of the confidence level is straight forward based on the formula for confidence intervals for point estimates.[6] This formula is as follows:

$$\text{Mean} - t\,(sd/\sqrt{N}) < \text{Mean} < \text{Mean} + t\,(sd/\sqrt{N})$$

where:

t	=	score representing desired level of statistical significance
sd	=	standard deviation
N	=	sample size

Statistical analysis for frequencies often use the chi-square statistic. This statistic can measure whether each of the category cells are statistically different than would occur randomly. However, this representation of the category cells does not match how they are being used in this study.

The derivation of the retention rate in the second type of analysis uses the different categories only to capture field measurement easily. Then each category is assigned an approximate retention percentage, such as 100 percent for fully and 50 percent for half. Then the measure retention rate is the appropriate weighted average of these frequencies and their assigned retention rates. The result of this technique is a point estimate of the retention rate for the measure. The desired confidence level is not whether or not the cell frequencies are statistically related but a confidence interval around this final point estimate. Given this, the confidence level is calculated around the created point estimate similar to the calculation of the confidence intervals around the other point estimates.

The techniques used by measure are provided in Table 3.5.

---

[6] Evaporative coolers, evaporative cooler covers, low flow showerheads, and water heater blankets could occur with 1, 2 or 3 units installed in a home. Multiples per household were seen for each of these measures in the sampling performed for recruitment. The survey (as in Appendix B) was designed to count the number found at a site (home). In the analysis, using the number installed at a site (from the program database) compared to the number found in place and operational provided a proportion retained per site. Often this was 0% or 100%, a binary. However, the rate could also be 50%, 33% or 67%. Allowing for this possibility, means were calculated on the site retention rate. An alternative might have been to use a binary for each installation creating multiple observations for those sites where more than one measure was installed. Yet, in some ways doing this assumes that these retention measures are independent even though some are within the same house. We chose to use the retention rate per site and its mean as this study's approach in order to allow the partials while maintaining independence between measurements.

Confidence intervals for the alternative binary approach were tested. The differences between the two types of confidence intervals showed either no difference or were only one percentage point different.

Table 3.5 Technique Used for Confidence Intervals

	Point Estimate from Mean	Created Point Estimate
Evaporative coolers	NA*	
Evaporative cooler covers		x
Attic and ceiling insulation		x
Low flow showerheads	x	
Door weather stripping		x
Caulking		x
Water heater blankets	x	

* Not applicable, no variance in survey. All 19 surveyed found to be in place and operational.

The standard deviation is used to calculate the confidence interval, as shown in the formula above. Given weighted frequencies and means constitute the point estimates, weighted standard deviations must be used to calculate the confidence intervals. The weighted standard deviations were automatically provided by SAS© in the procedure that produces the averages. A weighted standard deviation was also produced from SAS© using the univariate procedure for the questions where frequencies were used to create the simulated point estimate. The standard deviations for these questions were then adjusted to the calculated mean derived from estimating procedure.[7]

Estimates that were derived from a combination of more than one set of frequencies (door weather stripping, and insulation) required a few more steps to calculate their standard deviations. The principle relies upon the fact that the overall variance of a summary variable is the sum of the individual variances plus the covariances among them. This is written as:

$$\text{Variance}(V + W) = \text{Variance}(V) + \text{Variance}(W) + 2*\text{Covariance}(V,W)$$

SAS© was used to produce the weighted variances and covariances for survey questions concerning door weather stripping and insulation (those measures where more than one frequency question was used to derived the retention rate). The weighted standard deviation for the derived retention rate is then the square root for the combined weighted variance. With these standard deviations, the confidence interval was calculated as given in the formula above.

[7] This procedure is simpler than obtaining variances and covariances across each of the frequencies. At the same time, it maintains accuracy as the assigned values for the frequencies are a uniform distribution so the difference between the assignments and SAS's use of responses in the form of 1, 2, 3, and 4 is only one of scale.

An 80% confidence interval (for sampling error) was calculated around each of the retention measurements. These confidence intervals are presented in Table 3.6.

Table 3.6 80% Confidence Intervals

	Retention Estimate	+/-	At least	Within
Evaporative coolers	100%	NA*		
Evaporative cooler covers	70%	11%	60%	81%
Attic and ceiling insulation	97%	5%	92%	100%
Low flow showerheads	85%	4%	82%	89%
Door weather stripping	94%	5%	89%	99%
Caulking	52%	5%	47%	57%
Water heater blankets	82%	5%	77%	87%

* Not available, no variance in survey. All 19 surveyed found to be in place and operational.

Due to the difficulty in assessing measurement error, energy efficiency program evaluations seldom examine it. In the case of our use of categories (All, Most, Half, Less than Half, and None) for attic and ceiling insulation; door weather stripping; and caulking, however, it is possible to estimate the effect of incorporating the maximum likely measurement error into the confidence interval. This can be done (as pointed out by study reviewers) by measuring the confidence interval with an assumption that the real values within each category are uniformly distributed within that category. This broad type of distribution provides wide variation, giving us confidence that the measurement error will probably be no greater than this estimate. Adding this assumption to the sampling error confidence interval calculations generally doubles the +/- percentages for the interval. This means that an estimate of the confidence interval including both sampling error and measurement error for attic and ceiling insulation, and door weatherstripping should be less than twice the estimates in column 3 of Table 3.6.[8]

[8] 1. Evaporative cooler covers also had category responses on the survey: All, Some, and None. Yet, the possibilities that existed were based on their being one of one, one of two, one of three, or other combinations of this very limited set. Therefore, a uniform distribution of percentage retained is impossible for covers.

8 2. The primary measurement error for the retention rate for caulking as measured in this study is more from the technique employed than from the use of categories. See page 15 for a discussion of the measurement error thought to have occurred in the technique.

Appendices

A. Material from Surveyor's Guidebook

Guidebook Introduction

Megdal & Associates and ASW Engineering have teamed together to conduct the Statewide Study of Retention of Measures Installed Under the Direct Assistance Program. This team combines the evaluation expertise and experience in performing retention studies of Dr. Lori Megdal with the engineering and site audit experience offered by ASW Engineering. This outstanding team has developed an approach that can ensure a high quality, defensible persistence study for this special population that will be performed on schedule and in the most cost-effective manner.

This Surveyors Guidebook contains protocols and guidelines for recruiting, site visits, data collection and utility marketing representative communications. Use of these guidelines will facilitate the successful completion of high quality work.

Objective

The purpose of this project is to conduct a Statewide Retention Study for the 1994, 1995, and 1996 Residential Direct Assistance Programs (DA) operated by Southern California Edison Company (SCE), Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Gas Company (SCG). These programs served the residential dwellings of low-income customers.

Utility Approach

The protocols and strategies presented herein are consistent from utility territory to utility territory. With the exception of the specific utility information sheets, all other information applies for all utility territories.

Content of Each Protocol Section in Surveyor's Guidebook

The Surveyors Guidebook was divided into four sections, Recruiting Protocols, Site-Visit Protocols, Utility Marketing Rep. Protocols and Data Collection Strategies. Separate sections were provided in the Guidebook for each type of protocols: recruiting, site visit, utility marketing representative contacts, and data collection. This was done so that project personnel performing different tasks could easily use the Guidebook as an easy reference tool after their initial training. This meant that some of

the protocol items were repeated in each section. In order not to be repetitive in this documentation, only the overall content contained in the protocols is repeated here.

General Courtesy

ASW uses former utility employees who are well versed on the courtesies to offer customers as a representative of their respective utility. All telephone solicitations and personal contact will be conducted with courtesy and professionalism.

Using Utility Reference Sheet for Services the Customer May Need

It has been the experience of ASW that once a representative of a utility is available to a customer, requests for assistance in billing or complaints result. As such, ASW will provide the recruiter and surveyors with Utility Information Sheets which list the numbers of importance to help the customer and maintain the positive relationship of the utility.

Assurance That No Penalty Will Occur If Measures Are Missing

The Customer may be hesitant to participate in the program if they feel they may be penalized for removing the measure. The recruiter and the surveyor shall provide every assurance possible that this is not the case. A local utility number will be provided to the recruiter if the customer chooses to check the initial phone solicitation.

Professional Badge and Letter of Introduction

ASW will provide each surveyor with a utility specific contract badge and a formal Letter of Introduction from the specific utility.

Utility Marketing Representatives Communication Protocols

ASW will provide a central point of contact for all Utility Marketing Reps to maximize all communications. Status reports will be transmitted on a bi-weekly basis.

The Surveyor's Guidebook provided contact information for each step in the recruiting, site visit, and data process. All of the utility study managers were listed along with their contract information. An Appendix in the Surveyor's Guidebook provided the list of utility contacts for ASW's provision of appropriate contacts to assistance with other customer service issues.

Incentives

ASW will offer each household the option of a $5 coupon for Blockbuster Video or a $5 coupon to McDonalds for participating in the program. These coupons will be issued on site after the survey is complete.

Unusual Questions

All unanticipated questions or concerns should be immediately brought to the program managers attention.

Specialized Recruiting Protocols

ASW will utilize a qualified recruiter with 20 years experience to make initial phone calls describing the project. The recruiter, with the use of a generalized script, will request an on site visit. The recruiter will solicit or provide the following information:

- Verification of address and current residents name,
- Explanation of the project and the need for tracking measures,
- Description of $5 Blockbuster coupon or $5 McDonalds coupon offered as an incentive,
- Guidance on the expected on-site length of the survey,
- Procedures on-site surveyor will use, i.e., visual,
- Assurance that the removal of a measure will not have a penalty,
- Best time of day to provide survey.

If a site visit is agreed to, an estimated week and hour of day will be established. The recruiter will then group multiple sites together to minimize travel time for the surveyors. All surveyor will verify the exact time approximately 24 hours prior to the site visit.

The purpose of this script is to provide a general procedure for recruitment. ASW understands the level of experience our recruiter has and as such provides this as a guideline only. The guideline recruiting script is as follows:

> "Good Morning, may I speak to Mr./Mrs. _____?
>
> My name is _____ and I represent ASW Engineering who is on contract to _____ [FILL IN APPROPRIATE UTILITY], your utility.
>
> Several years ago, _____ [FILL IN APPROPRIATE UTILITY], along with other utilities in the State of California conducted the Residential Direct Assistance Program whereby certain energy efficient products were installed in residential homes and apartments.
>
> These products include any of the following:
- Attic/ceiling insulation,
- Low-flow showerheads,

- Door weather stripping and/or caulking,
- Water heater blankets, or
- Evaporator coolers and covers.

The utilities are required to verify the effectiveness of this program and ascertain whether or not these products are still in place. We are aware that there have been times when a problem occurred with the use of these products, so if the equipment had to be removed, we would like to note that also. And for your information, there is no penalty for removal of this equipment.
The whole verification along with several questions and answers should take no longer than a half an hour. We would like to be able to schedule an on-site survey to accomplish this and will compensate your cooperation with your choice of a $5 coupon for use at Blockbuster Video or $5 McDonald's coupon.

If you will give me the best time of day for the appointment and which week will be best for you, a surveyor from ASW will be calling you to schedule an appointment within the next 2 weeks.

Do you have any questions that I may be able to answer at this time?

Thank you very much for your cooperation."

Further guidelines for recruiting were:

- Each contact made with the customer will be recorded in the Data Collection Database. Any problems or difficulties will be noted and reported to the Project Manager. Entry of this information into the Database will allow easy tracking and automatic disposition of logs.
- ASW will contact each household 4 times before discontinuing attempts to include household. Efforts shall be made to contact at different times of day and possibly weekends to maximize opportunities for recruitment.

Specialized Site Survey Protocols

Each surveyor will provide an introduction showing identification badge and reference the recruiting interview, explanation of the purpose of the survey, and mention of the energy information incentive. The letter of introduction is also available if needed.

Each surveyor should explain to the customer the equipment that will be brought to the home for certain measures (measuring tool for low flow shower heads[9] and step-ladder

[9] The measuring tool for testing whether shower heads were operational as low flow showerheads was obtained from the Metropolitan Water District of Southern California (MWD), the tool used in their water conservation programs. This tool is originally from Niagara Conservation of Cedar Knolls, New Jersey, a national leader in water conservation since 1974. Niagara had the bags

for attic insulation). An estimate on the length of time the survey will take will also be provided.

calibrated by a reputable engineering firm to conform to low flow standards established by the American Water Works Association (AWWA). Low flow for shower heads is considered to be 2.2 to 2.5 gallons per minute. ASW followed the instructions printed on the bag. "Place the bag over the shower head, quickly turn on the water full flow and time it for five seconds. If the water level exceeded the 2.5 gallon mark, it was considered non-low flow."

Example of Utility Letter of Introduction

Utility Letter Head Here

July 13, 1998

Dear Edison Customer,

Several years ago, Southern California Edison, along with other utilities in the State of California conducted the Residential Direct Assistance Program whereby certain energy efficient products were installed in residential homes and apartments. On behalf of Southern California Edison, _____ is conducting a retention study to survey the equipment to see if it is still in place or if the equipment has been removed. (There is no penalty for removal of equipment). ASW Engineering a respected consulting firm based in California is administering the survey.

We at Edison appreciate your cooperation and assistance in the survey implementation. The information we gather will help us to continue to work with our customers to provide efficient and appropriate energy services. The whole verification along with several questions and answers should take no longer than a half an hour.

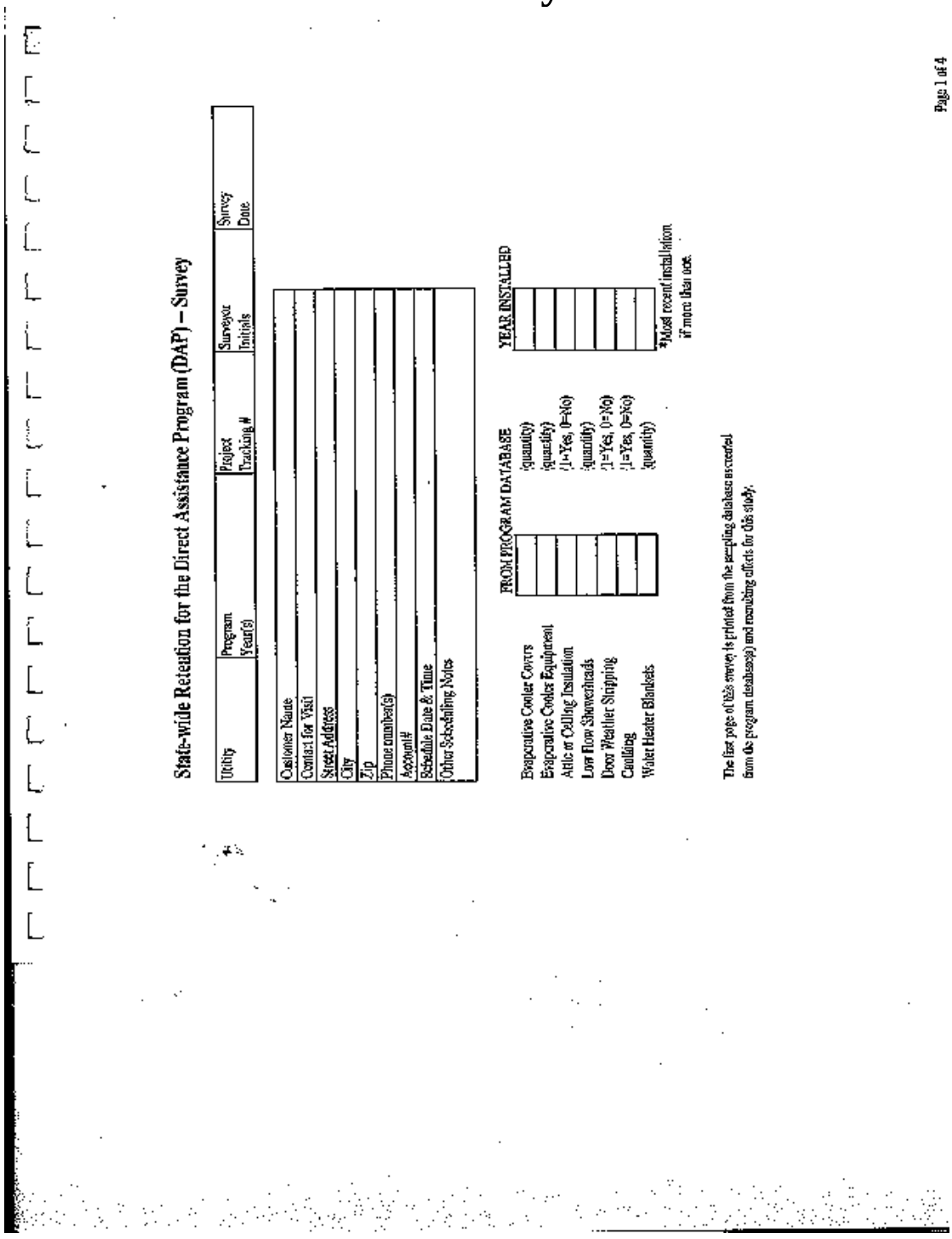
If you have any questions about the survey that have not been addressed previous contacts with ASW, please feel free to call Mr. David Wiley of ASW at 714-731-8193, or call _____ here at xxx-uuu-okok.

Thank you for your valuable time and cooperation.

Sincerely,

Name
Utility title
Utility Division

B. Site Visit Survey Instrument



State-wide Retention for the Direct Assistance Program (DAP) – Survey

Utility	Program Year(s)	Project Tracking #	Surveyor Initials	Survey Date

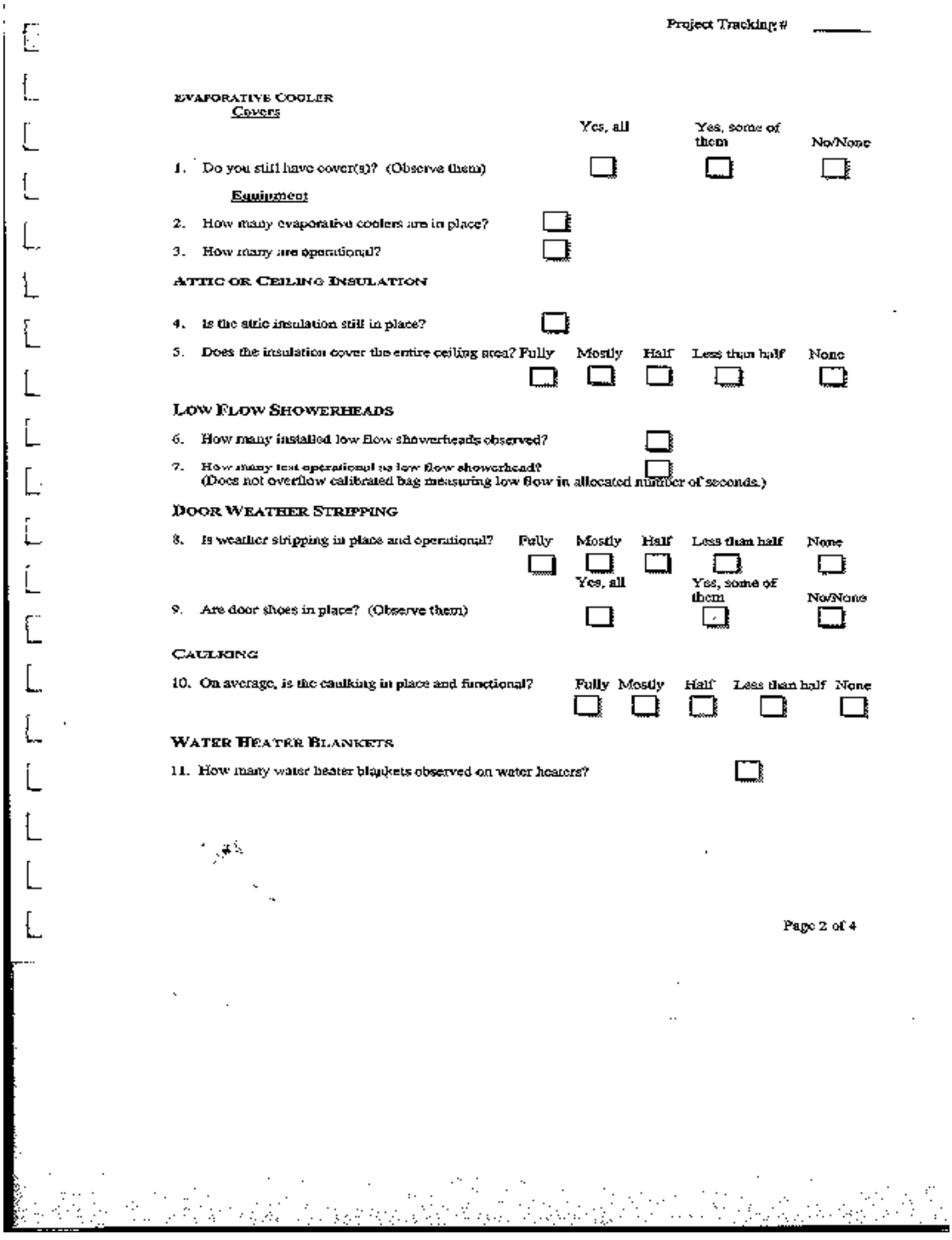
Customer Name	
Contact for Visit	
Street Address	
City	
Zip	
Phone number(s)	
Account#	
Schedule Date & Time	
Other Scheduling Notes	

	FROM PROGRAM DATABASE	YEAR INSTALLED
Evaporative Cooler Covers	(quantity)	
Evaporative Cooler Equipment	(quantity)	
Attic or Ceiling Insulation	(1=Yes, 0=No)	
Low flow Showerheads	(quantity)	
Door Weather Stripping	(1=Yes, 0=No)	
Caulking	(1=Yes, 0=No)	
Water Heater Blankets	(quantity)	

*Most recent installation if more than one.

The first page of this survey is printed from the sampling database as created from the program database(s) and recruiting efforts for this study.

Page 1 of 4



Project Tracking #: _____

EVAPORATIVE COOLER
Covers

	Yes, all	Yes, some of them	No/None
1. Do you still have cover(s)? (Observe them)	☐	☐	☐

Equipment

2. How many evaporative coolers are in place? ☐
3. How many are operational? ☐

ATTIC OR CEILING INSULATION

4. Is the attic insulation still in place? ☐
5. Does the insulation cover the entire ceiling area?

Fully	Mostly	Half	Less than half	None
☐	☐	☐	☐	☐

LOW FLOW SHOWERHEADS

6. How many installed low flow showerheads observed? ☐
7. How many test operational as low flow showerhead? ☐
(Does not overflow calibrated bag measuring low flow in allocated number of seconds.)

DOOR WEATHER STRIPPING

8. Is weather stripping in place and operational?

Fully	Mostly	Half	Less than half	None
☐	☐	☐	☐	☐

	Yes, all	Yes, some of them	No/None
9. Are door shoes in place? (Observe them)	☐	☐	☐

CAULKING

10. On average, is the caulking in place and functional?

Fully	Mostly	Half	Less than half	None
☐	☐	☐	☐	☐

WATER HEATER BLANKETS

11. How many water heater blankets observed on water heaters? ☐

Page 2 of 4

Project Tracking # _____

POST-PARTICIPATION INFORMATION FOR PROGRAM PLANNERS

For participant occupants:

12. Did your participation in the energy efficiency program teach you about energy efficiency actions you could take that you were unaware of before participation?

Yes	Some	No	Don't Know	N/A
☐	☐	☐	☐	☐

For occupants that moved in after the residence was retrofitted:

13. Were you aware of the energy efficiency measures installed in your home by the program?

Yes	Some	No	Don't Know	N/A
☐	☐	☐	☐	☐

14. Did their presence help make you more conscious of energy efficiency actions you might do?

Yes	Some	No	Don't Know	N/A
☐	☐	☐	☐	☐

For all occupants:

15. Have you taken any additional energy efficiency actions since _____ (2 year post-participation – if 1994 participant then ask "since 1996")?

Yes	No	Don't Know
☐	☐	☐

(If Yes): What were these?

16. Additional caulking
17. Additional weather stripping
18. Pipe insulation
19. Compact fluorescent lighting
20. Reduced usage of heating equipment
21. Reduced usage of cooling equipment
22. Fewer lights left on
23. Replaced heating equipment with high efficiency equipment
24. Replaced cooling equipment with high efficiency equipment
25. Replaced water heating equipment with high efficiency equipment
26. Other (specify): _____

☐☐☐☐☐☐☐☐☐

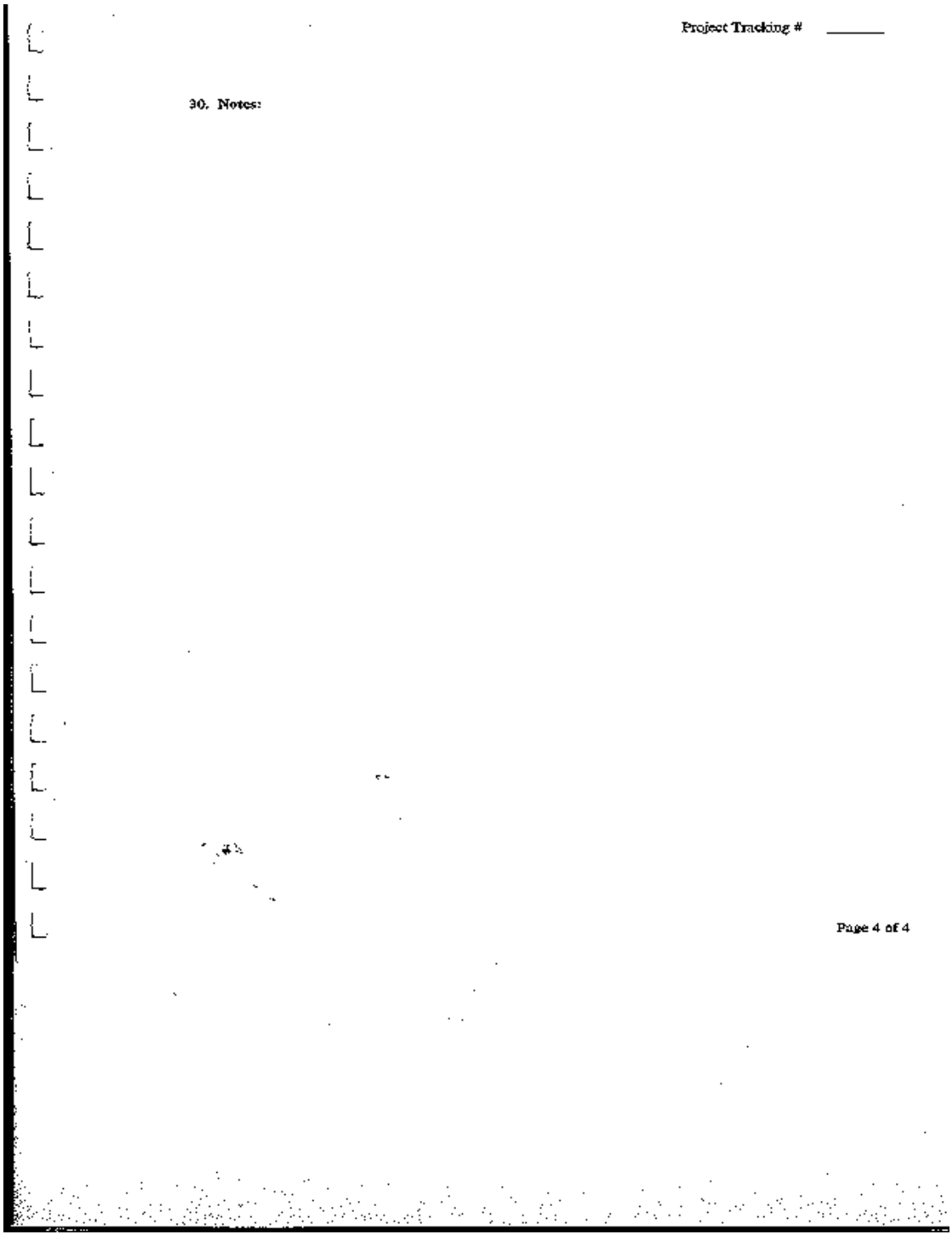
27. How much did the program contribute to your taking these actions?

	Completely. I wouldn't have done it without what was done in the program.
	The program helped me to know about or have confidence in doing this.
	A very small effect.
	No impact.
	Don't Know

28. What type of dwelling is this? (Observed)

Single Family Detached	1-unit of 2-4 unit structure	1-unit of multi-family 5 or more	1-unit in MF housing authority	Mobile Home
☐	☐	☐	☐	☐

Other (describe): 29. _____



Project Tracking # _____

30. Notes:

Page 4 of 4

C. Site Survey Findings

Evaporative Cooler Covers 1

Q1 Evaporative cooler covers in place?

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes, all	25.08	70.1	25.08	70.1
No, none	10.69	29.9	35.77	100.0

Frequency Missing = 23.44

Evaporative Coolers 2

Variable	Label	N	Mean	Std Dev
Q2	Q2 How many evap. coolers in place?	52	1.0108229	0.1060635
Q3	Q3 How many are operational?	52	0.9763015	0.2169261

Variable	Label	Minimum	Maximum
Q2	Q2 How many evap. coolers in place?	1.0000000	2.0000000
Q3	Q3 How many are operational?	0	2.0000000

Attic or Ceiling Insulation 3

Q4 Is the attic insulation in place?

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	80.66	99.2	80.66	99.2
No	0.69	0.8	81.35	100.0

Frequency Missing = 5.14

Q5 Attic insulation cover ceiling area?

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Fully	74.97	93.4	74.97	93.4
Mostly	3.23	4.0	78.2	97.4
Half	2.1	2.6	80.3	100.0

Frequency Missing = 6.19

Low Flow Showerheads 4

Variable	Label	N	Mean
Q6	Q6 How many installed low flow shwhrds?	176	1.0826072
Q7	Q7 How many shwrhds test as low flow?	176	0.9908400

Variable	Label	Std Dev	Minimum
Q6	Q6 How many installed low flow shwhrds?	0.4913436	0
Q7	Q7 How many shwrhds test as low flow?	0.5514914	0

Variable	Label	Maximum
Q6	Q6 How many installed low flow shwhrds?	2.0000000
Q7	Q7 How many shwrhds test as low flow?	2.0000000

Door Weather Stripping 5

Q8 Weather stripping in place and op?

Q8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Fully	197.38	86.0	197.38	86.0
Mostly	24.91	10.8	222.29	96.8
Half	4.38	1.9	226.67	98.7
Less than half	1.56	0.7	228.23	99.4
None	1.38	0.6	229.61	100.0

Frequency Missing = 1.07

Q9 Are door runners in place?

Q9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes, all	200.18	87.8	200.18	87.8
Yes, some of them	19.22	8.4	219.4	96.2
No, none	8.62	3.8	228.02	100.0

Frequency Missing = 2.66

Caulking 6

Q10 Is the caulking in place and op?

Q10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Fully	42.38	23.5	42.38	23.5
Mostly	47.15	26.2	89.53	49.7
Half	19.43	10.8	108.96	60.5
Less than half	22.64	12.6	131.6	73.1
None	48.48	26.9	180.08	100.0

Frequency Missing = 15.68

Water Heater Blankets 7

Analysis Variable : Q11 Q11 How many water heater blankets?

N	Mean	Std Dev	Minimum	Maximum
99	0.8245831	0.3619499	0	2.0000000

Planning Information 8

Q12 Program taught about energy effic

Q12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	72.7	33.8	72.7	33.8
Some	62.4	29.0	135.1	62.7
No	63.73	29.6	198.83	92.3
Do not know	10.61	4.9	209.44	97.3
N/A	5.91	2.7	215.35	100.0

Frequency Missing = 37.39

Q13 Aware of program measures?

Q13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	18.18	15.8	18.18	15.8
Some	6.09	5.3	24.27	21.1
No	27.97	24.3	52.24	45.4
Do not know	1.6	1.4	53.84	46.7
N/A	61.33	53.3	115.17	100.0

Frequency Missing = 137.57

Q14 Helped to know of other actions?

Q14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	16.57	12.9	16.57	12.9
Some	20.12	15.7	36.69	28.6
No	29.73	23.2	66.42	51.8
Do not know	5.25	4.1	71.67	55.9
N/A	56.53	44.1	128.2	100.0

Frequency Missing = 124.54

Q15 You taken any additnl energy effic?

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	95.9	37.9	95.9	37.9
No	147.87	58.5	243.77	96.5
Do not know	8.97	3.5	252.74	100.0

Planning Information 9

Q16 Additional caulking

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	6.15	2.6	6.15	2.6
No	228.23	97.4	234.38	100.0

Frequency Missing = 18.36

Q17 Additional weather stripping

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	6.6	2.8	6.6	2.8
No	226.25	97.2	232.85	100.0

Frequency Missing = 19.89

Q18 Additnl pipe installation

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	1.7	0.7	1.7	0.7
No	231.15	99.3	232.85	100.0

Frequency Missing = 19.89

Q19 Compact fluorescent lighting

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	34.91	14.8	34.91	14.8
No	201	85.2	235.91	100.0

Frequency Missing = 16.83

Q20 Reduced usage of heating equipment

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	19.03	8.2	19.03	8.2
No	213.82	91.8	232.85	100.0

Frequency Missing = 19.89

Q21 Reduced usage of cooling equipment

Q21	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	11.64	5.0	11.64	5.0
No	221.21	95.0	232.85	100.0

Frequency Missing = 19.89

Q22 Fewer lights left on

Q22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	41.14	17.3	41.14	17.3
No	196.3	82.7	237.44	100.0

Frequency Missing = 15.3

Q23 Repl. heating equip with high effic

Q23	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	9.96	4.2	9.96	4.2
No	224.42	95.8	234.38	100.0

Frequency Missing = 18.36

Q24 Repl. cooling equip with high effic

Q24	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	232.85	100.0	232.85	100.0

Frequency Missing = 19.89

Q25 Repl. water htg equip w high effic

Q25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	3.3	1.4	3.3	1.4
No	229.55	98.6	232.85	100.0

Frequency Missing = 19.89

Q26 Other

Q26	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	38.75	16.6	38.75	16.6
No	194.1	83.4	232.85	100.0

Frequency Missing = 19.89

Q27 How did the program contribute?

Q27	Frequency	Percent
Completely, Would not have done it without the program	12.71	9.6
Program helped me know about or have confidence	52.43	39.6
A very small effect	29.94	22.6
No impact	29.1	22.0
Do not know	8.07	6.1

Q27 How did the program contribute?

Q27	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely, Would not have done it without the program	12.71	9.6	12.71	9.6
Program helped me know about or have confidence	52.43	39.6	65.14	49.3
A very small effect	29.94	22.6	95.08	71.9
No impact	29.1	22.0	124.18	93.9

Q27 How did the program contribute?

Q27	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Do not know	8.07	6.1	132.25	100.0

Frequency Missing = 120.49

Q28 What type of dwelling is this?

Q28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Single Family Detached	180.98	71.8	180.98	71.8
1-unit of 2-4 unit structure	33.05	13.1	214.03	85.0
1 unit of multi-family 5 or more	20.36	8.1	234.39	93.0
Mobile Home	17.55	7.0	251.94	100.0

Frequency Missing = 0.8

D. Frequencies, Cross-Tabulations, Means, and Statistics for Retention Analysis

Overall Evaporative Cooler, SCE

Variable	Label	N	Mean	Std Dev
EVP_RET	IN PLACE AND OPERATIONAL	19	1.0000000	0
EVP_PLC	IN PLACE ONLY	19	1.0000000	0

Variable	Label	Minimum	Maximum
EVP_RET	IN PLACE AND OPERATIONAL	1.0000000	1.0000000
EVP_PLC	IN PLACE ONLY	1.0000000	1.0000000

1994 Evaporative Cooler, SCE

Variable	Label	N	Mean	Std Dev	Minimum
EVP_RET	IN PLACE AND OPERATIONAL	1	1.0000000	.	1.0000000
EVP_PLC	IN PLACE ONLY	1	1.0000000	.	1.0000000

Variable	Label	Maximum
EVP_RET	IN PLACE AND OPERATIONAL	1.0000000
EVP_PLC	IN PLACE ONLY	1.0000000

1995 Evaporative Cooler, SCE

Variable	Label	N	Mean	Std Dev	Minimum
EVP_RET	IN PLACE AND OPERATIONAL	10	1.0000000	0	1.0000000
EVP_PLC	IN PLACE ONLY	10	1.0000000	0	1.0000000

Variable	Label	Maximum
EVP_RET	IN PLACE AND OPERATIONAL	1.0000000
EVP_PLC	IN PLACE ONLY	1.0000000

1996 Evaporative Cooler, SCE

Variable	Label	N	Mean	Std Dev	Minimum
EVP_RET	IN PLACE AND OPERATIONAL	8	1.0000000	0	1.0000000
EVP_PLC	IN PLACE ONLY	8	1.0000000	0	1.0000000

Variable	Label	Maximum
EVP_RET	IN PLACE AND OPERATIONAL	1.0000000
EVP_PLC	IN PLACE ONLY	1.0000000

Overall Low Flow Showerhead

Variable	Label	N	Mean	Std Dev
LF_RET	IN PLACE AND OPERATIONAL	174	0.8545576	0.3950758
LF_PLC	IN PLACE ONLY	174	0.9402927	0.3408314

Variable	Label	Minimum	Maximum
LF_RET	IN PLACE AND OPERATIONAL	0	2.0000000
LF_PLC	IN PLACE ONLY	0	2.0000000

1994 Low Flow Showerhead

Variable	Label	N	Mean	Std Dev	Minimum
LF_RET	IN PLACE AND OPERATIONAL	46	0.8424023	0.3826105	0
LF_PLC	IN PLACE ONLY	46	0.9731963	0.3902806	0

Variable	Label	Maximum
LF_RET	IN PLACE AND OPERATIONAL	1.0000000
LF_PLC	IN PLACE ONLY	2.0000000

1995 Low Flow Showerhead

Variable	Label	N	Mean	Std Dev	Minimum
LF_RET	IN PLACE AND OPERATIONAL	45	0.9069523	0.3947899	0
LF_PLC	IN PLACE ONLY	45	0.9628229	0.3213677	0

Variable	Label	Maximum
LF_RET	IN PLACE AND OPERATIONAL	2.0000000
LF_PLC	IN PLACE ONLY	2.0000000

1996 Low Flow Showerhead

Variable	Label	N	Mean	Std Dev	Minimum
LF_RET	IN PLACE AND OPERATIONAL	50	0.8411107	0.4401009	0
LF_PLC	IN PLACE ONLY	50	0.9398380	0.3347949	0

Variable	Label	Maximum
LF_RET	IN PLACE AND OPERATIONAL	2.0000000
LF_PLC	IN PLACE ONLY	2.0000000

Overall Water Heater Blanket Retention

Analysis Variable : WH_RET

N	Mean	Std Dev	Minimum	Maximum	
					91
0.8163024	0.3792143	0	1.0000000		

1994 Water Heater Blanket Retention

Analysis Variable : WH_RET

N	Mean	Std Dev	Minimum	Maximum
25	0.7598909	0.4721243	0	1.0000000

1995 Water Heater Blanket Retention

Analysis Variable : WH_RET

N	Mean	Std Dev	Minimum	Maximum
35	0.8299581	0.3447888	0	1.0000000

1996 Water Heater Blanket Retention

Analysis Variable : WH_RET

N	Mean	Std Dev	Minimum	Maximum
30	0.8752131	0.3323521	0	1.0000000

E. Datasets and Documentation

This study was specifically designed to be as simple and straight forward as possible. As the analysis progressed, the steps and programs were continually refined in order to accomplish this goal. The result was the development of small set of concise data analysis steps. The use of these steps, and copies of the programs are provided in this Appendix. The datasets, SAS© programs, and Excel© spreadsheets are provided on diskette at the end of this Appendix. Following the description contained below, the work should be easily replicable.

Flow of Datasets and Analysis Programs

A step-by-step schematic of the use of datasets and analysis programs is presented in Figure E.1. This diagram also indicates the complete flow of the material provided and the type of material (dataset and type, program and type). This diagram can be used with the datasets and programs provided on diskette to replicate all of the results discussed in this report.

Printed copies of each of the SAS programs are provided in the pages following the flow chart. They are provided in the order that they are used.

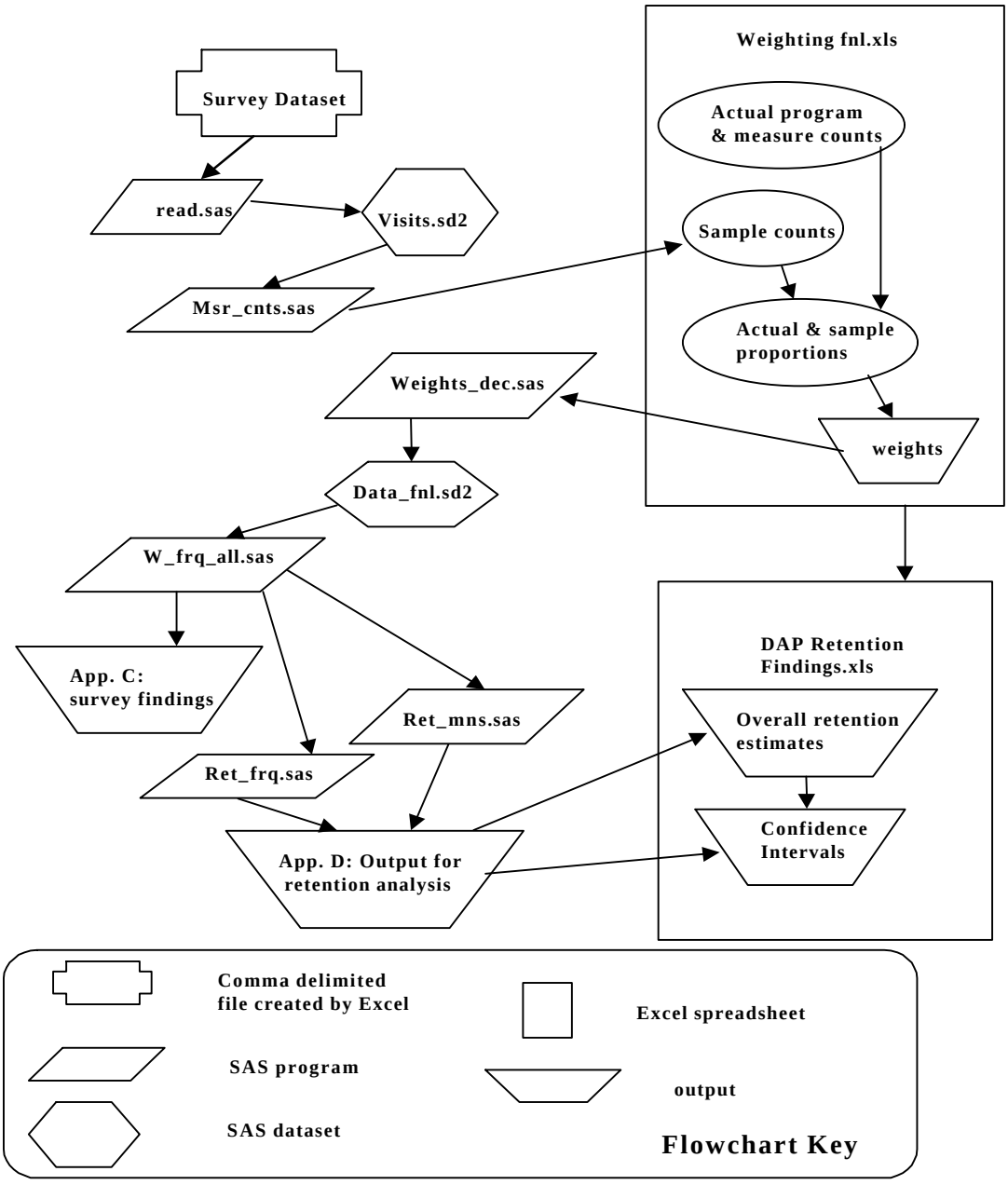
Set-Up Reminders for Replication

The SAS© and Excel© programs are the exact ones used for this study. A few minor changes will need to be made to replicate the work.

The Excel© spreadsheets are linked. Links in Excel© use the spreadsheet locations and names. This linkage may need to be changed to match the folder names used in the replication.

Similarly, SAS© programs contain LIBNAME statements and FILENAME statements in the beginning of the programs to tell the program where to find datasets and where to place datasets. These will need to be changed to reflect the folder set-up being used in the replication.

Figure E.1


Weighting fnl.xls
Survey Dataset
Actual program & measure counts
read.sas
Visits.sd2
Sample counts
Msr_cnts.sas
Actual & sample proportions
Weights_dec.sas
weights
Data_fnl.sd2
W_frq_all.sas
DAP Retention Findings.xls
App. C: survey findings
Ret_mns.sas
Overall retention estimates
Ret_frq.sas
Confidence Intervals
App. D: Output for retention analysis
Comma delimited file created by Excel
Excel spreadsheet
SAS program
output
SAS dataset
Flowchart Key

[read.sas]

```
LIBNAME DAP 'C:\LORI\SCE_RET\ANALYSIS\DEC_ANLY';

FILENAME RAW 'C:\LORI\SCE_RET\ANALYSIS\DEC_ANLY\4_SAS.CSV';


DATA DAP.VISITS;
  INFILE RAW DSD;
  INPUT ASW_NO Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13
     Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29
     EVPCL94 INSL94 DOOR94 WH94 LF_SHW94 CAULK94 EVPCL95 INSL95
     DOOR95 WH95 LF_SHW95 CAULK95 EVPCL96 INSL96 DOOR96 WH96
     LF_SHW96 CAULK96 SDG_E SCE SCG PG_E;
RUN;

PROC PRINT;
RUN;
```

[msr_cnts.sas]

```
LIBNAME DAP 'C:\LORI\SCE_RET\\ANALYSIS\DEC_ANLY';

OPTIONS PS=59 LS=80 NODATE PAGENO=1;

DATA SURVEY;
   SET DAP.DATA_FNL;
RUN;

PROC FORMAT;
   VALUE UTILITY        1='San Diego Gas & Electric'
                        2='Southern California Edison'
                        3='Southern California Gas'
                        4='Pacific Gas & Electric';
RUN;

PROC FREQ;
  TABLES (EVPCL94 EVPCL95 EVPCL96 INSL94 INSL95 INSL96 DOOR94 DOOR95
DOOR96
        WH94 WH95 WH96 LF_SHW94 LF_SHW95 LF_SHW96 CAULK94 CAULK95
CAULK96)*UTILITY;
  FORMAT UTILITY UTILITY.;
  TITLE 'MEASURE COUNTS';
RUN;
```

[weights_dec.sas]

```
LIBNAME DAP 'C:\LORI\SCE_RET\\ANALYSIS\DEC_ANLY';

OPTIONS PS=59 LS=80 NODATE PAGENO=1;

DATA DAP.DATA_FNL;
   SET DAP.VISITS;
   IF ASW_NO=1 OR ASW_NO=2 THEN UTILITY=2;
   IF 1000<=ASW_NO<2000 THEN UTILITY=1;
   IF 2000<=ASW_NO<4000 THEN UTILITY=2;
   IF 4000<=ASW_NO<5000 THEN UTILITY=3;
   IF ASW_NO>=5000 THEN UTILITY=4;
   ARRAY MSRS(18) EVPCL94 INSL94 DOOR94 WH94 LF_SHW94 CAULK94 EVPCL95
INSL95 DOOR95
      WH95 LF_SHW95 CAULK95 EVPCL96 INSL96 DOOR96 WH96 LF_SHW96 CAULK96;
   DO i=1 TO 18;
      IF MSRS(i)=0 THEN MSRS(i)=.;
   END;
   IF UTILITY=4 AND EVPCL94>0 THEN EVP_WGT=0.64;
   IF UTILITY=4 AND EVPCL95>0 THEN EVP_WGT=1.24;
   IF UTILITY=4 AND EVPCL96>0 THEN EVP_WGT=1.21;
   IF UTILITY=3 AND EVPCL94>0 THEN EVP_WGT=1.05;
   IF UTILITY=3 AND EVPCL95>0 THEN EVP_WGT=0.29;
   IF UTILITY=3 AND EVPCL96>0 THEN EVP_WGT=1.73;
   IF UTILITY=2 AND EVPCL94>0 THEN EVP_WGT=13.07;
   IF UTILITY=2 AND EVPCL95>0 THEN EVP_WGT=0.66;
   IF UTILITY=2 AND EVPCL96>0 THEN EVP_WGT=0.76;
   IF UTILITY=4 AND INSL94>0 THEN INS_WGT=1.65;
   IF UTILITY=4 AND INSL95>0 THEN INS_WGT=1.27;
   IF UTILITY=4 AND INSL96>0 THEN INS_WGT=0.69;
   IF UTILITY=3 AND INSL94>0 THEN INS_WGT=1.53;
   IF UTILITY=3 AND INSL95>0 THEN INS_WGT=1.05;
   IF UTILITY=3 AND INSL96>0 THEN INS_WGT=1.05;
   IF UTILITY=2 AND INSL96>0 THEN INS_WGT=0.05;
   IF UTILITY=1 AND INSL94>0 THEN INS_WGT=0.40;
   IF UTILITY=1 AND INSL95>0 THEN INS_WGT=0.19;
   IF UTILITY=4 AND LF_SHW94>0 THEN LF_WGT=1.39;
   IF UTILITY=4 AND LF_SHW95>0 THEN LF_WGT=1.48;
   IF UTILITY=4 AND LF_SHW96>0 THEN LF_WGT=1.28;
   IF UTILITY=3 AND LF_SHW94>0 THEN LF_WGT=0.73;
   IF UTILITY=3 AND LF_SHW95>0 THEN LF_WGT=0.59;
   IF UTILITY=3 AND LF_SHW96>0 THEN LF_WGT=0.88;
   IF UTILITY=2 AND LF_SHW94>0 THEN LF_WGT=0.27;
   IF UTILITY=2 AND LF_SHW95>0 THEN LF_WGT=0.56;
   IF UTILITY=2 AND LF_SHW96>0 THEN LF_WGT=0.10;
   IF UTILITY=1 AND LF_SHW94>0 THEN LF_WGT=1.19;
   IF UTILITY=1 AND LF_SHW95>0 THEN LF_WGT=1.42;
   IF UTILITY=1 AND LF_SHW96>0 THEN LF_WGT=1.76;
   IF UTILITY=4 AND DOOR94>0 THEN DR_WGT=1.06;
   IF UTILITY=4 AND DOOR95>0 THEN DR_WGT=1.38;
   IF UTILITY=4 AND DOOR96>0 THEN DR_WGT=1.07;
   IF UTILITY=3 AND DOOR94>0 THEN DR_WGT=0.93;
   IF UTILITY=3 AND DOOR95>0 THEN DR_WGT=0.63;
   IF UTILITY=3 AND DOOR96>0 THEN DR_WGT=0.94;
   IF UTILITY=2 AND DOOR94>0 THEN DR_WGT=0.31;
   IF UTILITY=2 AND DOOR95>0 THEN DR_WGT=0.67;
   IF UTILITY=2 AND DOOR96>0 THEN DR_WGT=0.33;
   IF UTILITY=1 AND DOOR94>0 THEN DR_WGT=1.51;
```

```
   IF UTILITY=1 AND DOOR95>0 THEN DR_WGT=0.98;
   IF UTILITY=1 AND DOOR96>0 THEN DR_WGT=2.09;
   IF UTILITY=4 AND CAULK94>0 THEN CLK_WGT=0.96;
   IF UTILITY=4 AND CAULK95>0 THEN CLK_WGT=1.40;
   IF UTILITY=4 AND CAULK96>0 THEN CLK_WGT=1.04;
   IF UTILITY=3 AND CAULK94>0 THEN CLK_WGT=0.79;
   IF UTILITY=3 AND CAULK95>0 THEN CLK_WGT=0.63;
   IF UTILITY=3 AND CAULK96>0 THEN CLK_WGT=0.98;
   IF UTILITY=2 AND CAULK94>0 THEN CLK_WGT=0.80;
   IF UTILITY=2 AND CAULK95>0 THEN CLK_WGT=0.58;
   IF UTILITY=2 AND CAULK96>0 THEN CLK_WGT=0.33;
   IF UTILITY=1 AND CAULK94>0 THEN CLK_WGT=1.59;
   IF UTILITY=1 AND CAULK95>0 THEN CLK_WGT=1.09;
   IF UTILITY=1 AND CAULK96>0 THEN CLK_WGT=2.35;
   IF UTILITY=4 AND WH94>0 THEN WH_WGT=1.47;
   IF UTILITY=4 AND WH95>0 THEN WH_WGT=1.16;
   IF UTILITY=4 AND WH96>0 THEN WH_WGT=0.73;
   IF UTILITY=3 AND WH94>0 THEN WH_WGT=1.26;
   IF UTILITY=3 AND WH95>0 THEN WH_WGT=0.85;
   IF UTILITY=3 AND WH96>0 THEN WH_WGT=1.47;
   IF UTILITY=2 AND WH95>0 THEN WH_WGT=0.36;
   IF UTILITY=2 AND WH96>0 THEN WH_WGT=0.76;
   IF UTILITY=1 AND WH94>0 THEN WH_WGT=0.32;
   IF UTILITY=1 AND WH95>0 THEN WH_WGT=0.26;
RUN;
```

[w_frq_all.sas]

```
LIBNAME DAP 'C:\LORI\SCE_RET\\ANALYSIS\DEC_ANLY';

OPTIONS PS=59 LS=80 NODATE PAGENO=1;

DATA SURVEY;
   SET DAP.DATA_FNL;
   LABEL Q1='Q1 Evaporative cooler covers in place?';
   LABEL Q2='Q2 How many evap. coolers in place?';
   LABEL Q3='Q3 How many are operational?';
   Label Q4='Q4 Is the attic insulation in place?';
   Label Q5='Q5 Attic insulation cover ceiling area?';
   Label Q6='Q6 How many installed low flow shwhrds?';
   Label Q7='Q7 How many shwrhds test as low flow?';
   Label Q8='Q8 Weather stripping in place and op?';
   Label Q9='Q9 Are door runners in place?';
   Label Q10='Q10 Is the caulking in place and op?';
   Label Q11='Q11 How many water heater blankets?';
   Label Q12='Q12 Program taught about energy effic';
   Label Q13='Q13 Aware of program measures?';
   Label Q14='Q14 Helped to know of other actions?';
   Label Q15='Q15 You taken any additnl energy effic?';
   Label Q16='Q16 Additional caulking';
   Label Q17='Q17 Additional weather stripping';
   Label Q18='Q18 Additnl pipe installation';
   Label Q19='Q19 Compact fluorescent lighting';
   Label Q20='Q20 Reduced usage of heating equipment';
   Label Q21='Q21 Reduced usage of cooling equipment';
   Label Q22='Q22 Fewer lights left on';
   Label Q23='Q23 Repl. heating equip with high effic';
   Label Q24='Q24 Repl. cooling equip with high effic';
   Label Q25='Q25 Repl. water htg equip w high effic';
   Label Q26='Q26 Other';
   Label Q27='Q27 How did the program contribute?';
   Label Q28='Q28 What type of dwelling is this?';
RUN;

PROC FORMAT;
   VALUE ANSR_A   1='Yes, all'
                  2='Yes, some of them'
                  3='No, none';

   VALUE ANSR_B   1='Yes'
                  2='No';

   VALUE ANSR_C   1='Fully'
                  2='Mostly'
                  3='Half'
                  4='Less than half'
                  5='None';

   VALUE ANSR_D   1='Yes'
                  2='Some'
                  3='No'
                  4='Do not know'
                  5='N/A';

   VALUE ANSR_E   1='Yes'
```

```
                  2='No'
                  3='Do not know';

   VALUE ANSR_F  1='Completely, Would not have done it without the
program'
                 2='Program helped me know about or have confidence'
                 3='A very small effect'
                 4='No impact'
                 5='Do not know';

  VALUE ANSR_G   1='Single Family Detached'
                 2='1-unit of 2-4 unit structure'
                 3='1 unit of multi-family 5 or more'
                 4='1-unit in MF in housing authority'
                 5='Mobile Home';
RUN;

PROC FREQ;
  TABLES Q1;
  FORMAT Q1 ANSR_A.;
  WEIGHT EVP_WGT;
  TITLE 'Evaporative Cooler Covers';
RUN;

PROC MEANS;
  VAR Q2 Q3;
  WEIGHT EVP_WGT;
  TITLE 'Evaporative Coolers';
RUN;

PROC FREQ;
  TABLES Q4 Q5;
  FORMAT Q4 ANSR_B. Q5 ANSR_C.;
  WEIGHT INS_WGT;
  TITLE 'Attic or Ceiling Insulation';
RUN;

PROC MEANS;
  VAR Q6 Q7;
  WEIGHT LF_WGT;
  TITLE 'Low Flow Showerheads';
RUN;

PROC FREQ;
  TABLES Q8 Q9;
  FORMAT Q8 ANSR_C. Q9 ANSR_A.;
  WEIGHT DR_WGT;
  TITLE 'Door Weather Stripping';
RUN;

PROC FREQ;
  TABLES Q10;
  FORMAT Q10 ANSR_C.;
  WEIGHT CLK_WGT;
  TITLE 'Caulking';
RUN;

PROC MEANS;
  VAR Q11;
```

```
  WEIGHT WH_WGT;
  TITLE 'Water Heater Blankets';
RUN;

DATA PLNG_QS;
   SET SURVEY;
   IF ASW_NO=1 OR ASW_NO=2 THEN PLNG_WGT=0.45;
   IF 1000<=ASW_NO<2000 THEN PLNG_WGT=1.53;
   IF 2000<=ASW_NO<4000 THEN PLNG_WGT=0.45;
   IF 4000<=ASW_NO<5000 THEN PLNG_WGT=0.80;
   IF ASW_NO>=5000 THEN PLNG_WGT=1.22;
RUN;

PROC FORMAT;
   VALUE ANSR_A   1='Yes, all'
                  2='Yes, some of them'
                  3='No, none';

   VALUE ANSR_B   1='Yes'
                  2='No';

   VALUE ANSR_C   1='Fully'
                  2='Mostly'
                  3='Half'
                  4='Less than half'
                  5='None';

   VALUE ANSR_D   1='Yes'
                  2='Some'
                  3='No'
                  4='Do not know'
                  5='N/A';

   VALUE ANSR_E   1='Yes'
                  2='No'
                  3='Do not know';

   VALUE ANSR_F  1='Completely, Would not have done it without the
program'
                 2='Program helped me know about or have confidence'
                 3='A very small effect'
                 4='No impact'
                 5='Do not know';

  VALUE ANSR_G   1='Single Family Detached'
                 2='1-unit of 2-4 unit structure'
                 3='1 unit of multi-family 5 or more'
                 4='1-unit in MF in housing authority'
                 5='Mobile Home';
RUN;
PROC FREQ;
  TABLES Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27
Q28;
  FORMAT Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 ANSR_B. Q12 Q13 Q14
ANSR_D.
       Q15 ANSR_E. Q27 ANSR_F. Q28 ANSR_G.;
  WEIGHT PLNG_WGT;
  TITLE 'Planning Information';
RUN;
```

[ret_mns.sas]

```
LIBNAME DAP 'C:\LORI\SCE_RET\ANALYSIS\DEC_ANLY';

OPTIONS PS=59 LS=80 NODATE NONUMBER;

DATA SURVEY;
   SET DAP.DATA_FNL;
   LABEL Q1='Q1 Evaporative cooler covers in place?';
   LABEL Q2='Q2 How many evap. coolers in place?';
   LABEL Q3='Q3 How many are operational?';
   Label Q4='Q4 Is the attic insulation in place?';
   Label Q5='Q5 Attic insulation cover ceiling area?';
   Label Q6='Q6 How many installed low flow shwhrds?';
   Label Q7='Q7 How many shwrhds test as low flow?';
   Label Q8='Q8 Weather stripping in place and op?';
   Label Q9='Q9 Are door runners in place?';
   Label Q10='Q10 Is the caulking in place and op?';
   Label Q11='Q11 How many water heater blankets?';
   Label Q12='Q12 Program taught about energy effic';
   Label Q13='Q13 Aware of program measures?';
   Label Q14='Q14 Helped to know of other actions?';
   Label Q15='Q15 You taken any additnl energy effic?';
   Label Q16='Q16 Additional caulking';
   Label Q17='Q17 Additional weather stripping';
   Label Q18='Q18 Additnl pipe installation';
   Label Q19='Q19 Compact fluorescent lighting';
   Label Q20='Q20 Reduced usage of heating equipment';
   Label Q21='Q21 Reduced usage of cooling equipment';
   Label Q22='Q22 Fewer lights left on';
   Label Q23='Q23 Repl. heating equip with high effic';
   Label Q24='Q24 Repl. cooling equip with high effic';
   Label Q25='Q25 Repl. water htg equip w high effic';
   Label Q26='Q26 Other';
   Label Q27='Q27 How did the program contribute?';
   Label Q28='Q28 What type of dwelling is this?';
RUN;

PROC FORMAT;
   VALUE ANSR_A   1='Yes, all'
                  2='Yes, some of them'
                  3='No, none';

   VALUE ANSR_B   1='Yes'
                  2='No';

   VALUE ANSR_C   1='Fully'
                  2='Mostly'
                  3='Half'
                  4='Less than half'
                  5='None';

   VALUE ANSR_D   1='Yes'
                  2='Some'
                  3='No'
                  4='Do not know'
                  5='N/A';

   VALUE ANSR_E   1='Yes'
```

```
                  2='No'
                  3='Do not know';

   VALUE ANSR_F  1='Completely, Would not have done it without the
program'
                 2='Program helped me know about or have confidence'
                 3='A very small effect'
                 4='No impact'
                 5='Do not know';

  VALUE ANSR_G   1='Single Family Detached'
                 2='1-unit of 2-4 unit structure'
                 3='1 unit of multi-family 5 or more'
                 4='1-unit in MF in housing authority'
                 5='Mobile Home';
RUN;

/*EVAPORATIVE COOLER COVERS (Q1) RETENTION BY FREQUENCY
  EVAPORATIVE COOLERS (Q2 AND Q3) RELEVANT FOR SCE ONLY
  EVAPORATIVE COOLER RETENTION=HOW MANY OPERATIONAL (Q3) divided by
PROGRAM # BY SITE
  FOR INFO ONLY: HOW MANY IN PLACE (Q2) divided by PROGRAM # BY SITE*/

/*SHOWERHEAD RETENTION=HOW MANY TEST LOW FLOW (Q7) divided by PROGRAM #
BY SITE
  FOR INFO ONLY: HOW MANY INSTALLED (Q6) divided by PROGRAM # BY SITE*/

/*WATER HEATER BLANKET RETENTION=HOW MANY OBSERVED (Q11) divided by
PROGRAM # BY SITE*/



DATA NUM_RET;
  SET SURVEY;
  IF EVPCL94 NE . THEN EVP=EVPCL94;
  IF EVPCL95 NE . THEN EVP=EVPCL95;
  IF EVPCL96 NE . THEN EVP=EVPCL96;
  IF UTILITY=2 THEN DO;
     EVP_RET=Q3/EVP;
     EVP_PLC=Q2/EVP;  END;
  LABEL EVP_RET='IN PLACE AND OPERATIONAL';
  LABEL EVP_PLC='IN PLACE ONLY';
  IF LF_SHW94 NE . THEN LF_SHW=LF_SHW94;
  IF LF_SHW95 NE . THEN LF_SHW=LF_SHW95;
  IF LF_SHW96 NE . THEN LF_SHW=LF_SHW96;
  LF_RET=Q7/LF_SHW;
  LF_PLC=Q6/LF_SHW;
  LABEL LF_RET='IN PLACE AND OPERATIONAL';
  LABEL LF_PLC='IN PLACE ONLY';
  IF WH94 NE . THEN WH=WH94;
  IF WH95 NE . THEN WH=WH95;
  IF WH96 NE . THEN WH=WH96;
  WH_RET=Q11/WH;
RUN;


PROC MEANS;
  VAR EVP_RET EVP_PLC;
  WEIGHT EVP_WGT;
```

```
  TITLE 'Overall Evaporative Cooler, SCE';
RUN;

DATA EVP94;
  SET NUM_RET;
  IF EVPCL94=1;
RUN;

PROC MEANS;
  VAR EVP_RET EVP_PLC;
  WEIGHT EVP_WGT;
  TITLE '1994 Evaporative Cooler, SCE';
RUN;

DATA EVP95;
  SET NUM_RET;
  IF EVPCL95=1;
RUN;

PROC MEANS;
  VAR EVP_RET EVP_PLC;
  WEIGHT EVP_WGT;
  TITLE '1995 Evaporative Cooler, SCE';
RUN;

DATA EVP96;
  SET NUM_RET;
  IF EVPCL96=1;
RUN;

PROC MEANS;
  VAR EVP_RET EVP_PLC;
  WEIGHT EVP_WGT;
  TITLE '1996 Evaporative Cooler, SCE';
RUN;



PROC MEANS DATA=NUM_RET;
  VAR LF_RET LF_PLC;
  WEIGHT LF_WGT;
  TITLE 'Overall Low Flow Showerhead';
RUN;

DATA LF94;
  SET NUM_RET;
  IF LF_SHW94=1;
RUN;

PROC MEANS;
  VAR LF_RET LF_PLC;
  WEIGHT LF_WGT;
  TITLE '1994 Low Flow Showerhead';
RUN;

DATA LF95;
  SET NUM_RET;
  IF LF_SHW95=1;
RUN;
```

```
PROC MEANS;
  VAR LF_RET LF_PLC;
  WEIGHT LF_WGT;
  TITLE '1995 Low Flow Showerhead';
RUN;

DATA LF96;
  SET NUM_RET;
  IF LF_SHW96=1;
RUN;

PROC MEANS;
  VAR LF_RET LF_PLC;
  WEIGHT LF_WGT;
  TITLE '1996 Low Flow Showerhead';
RUN;

PROC MEANS DATA=NUM_RET;
  VAR WH_RET;
  WEIGHT WH_WGT;
  TITLE 'Overall Water Heater Blanket Retention';
RUN;

DATA WH_BL94;
  SET NUM_RET;
  IF WH94=1;
RUN;

PROC MEANS;
  VAR WH_RET;
  WEIGHT WH_WGT;
  TITLE '1994 Water Heater Blanket Retention';
RUN;

DATA WH_BL95;
  SET NUM_RET;
  IF WH95=1;
RUN;

PROC MEANS;
  VAR WH_RET;
  WEIGHT WH_WGT;
  TITLE '1995 Water Heater Blanket Retention';
RUN;

DATA WH_BL96;
  SET NUM_RET;
  IF WH96=1;
RUN;

PROC MEANS;
  VAR WH_RET;
  WEIGHT WH_WGT;
  TITLE '1996 Water Heater Blanket Retention';
RUN;
```

[ret_frq.sas]

```
LIBNAME DAP 'C:\LORI\SCE_RET\ANALYSIS\DEC_ANLY';

OPTIONS PS=59 LS=80 NODATE PAGENO=1;

DATA SURVEY;
   SET DAP.DATA_FNL;
   LABEL Q1='Q1 Evaporative cooler covers in place?';
   LABEL Q2='Q2 How many evap. coolers in place?';
   LABEL Q3='Q3 How many are operational?';
   Label Q4='Q4 Is the attic insulation in place?';
   Label Q5='Q5 Attic insulation cover ceiling area?';
   Label Q6='Q6 How many installed low flow shwhrds?';
   Label Q7='Q7 How many shwrhds test as low flow?';
   Label Q8='Q8 Weather stripping in place and op?';
   Label Q9='Q9 Are door runners in place?';
   Label Q10='Q10 Is the caulking in place and op?';
   Label Q11='Q11 How many water heater blankets?';
   Label Q12='Q12 Program taught about energy effic';
   Label Q13='Q13 Aware of program measures?';
   Label Q14='Q14 Helped to know of other actions?';
   Label Q15='Q15 You taken any additnl energy effic?';
   Label Q16='Q16 Additional caulking';
   Label Q17='Q17 Additional weather stripping';
   Label Q18='Q18 Additnl pipe installation';
   Label Q19='Q19 Compact fluorescent lighting';
   Label Q20='Q20 Reduced usage of heating equipment';
   Label Q21='Q21 Reduced usage of cooling equipment';
   Label Q22='Q22 Fewer lights left on';
   Label Q23='Q23 Repl. heating equip with high effic';
   Label Q24='Q24 Repl. cooling equip with high effic';
   Label Q25='Q25 Repl. water htg equip w high effic';
   Label Q26='Q26 Other';
   Label Q27='Q27 How did the program contribute?';
   Label Q28='Q28 What type of dwelling is this?';
RUN;

PROC FORMAT;
   VALUE ANSR_A   1='Yes, all'
                  2='Yes, some of them'
                  3='No, none';

   VALUE ANSR_B   1='Yes'
                  2='No';

   VALUE ANSR_C   1='Fully'
                  2='Mostly'
                  3='Half'
                  4='Less than half'
                  5='None';

   VALUE ANSR_D   1='Yes'
                  2='Some'
                  3='No'
                  4='Do not know'
                  5='N/A';

   VALUE ANSR_E   1='Yes'
```

```
                  2='No'
                  3='Do not know';

   VALUE ANSR_F  1='Completely, Would not have done it without the
program'
                 2='Program helped me know about or have confidence'
                 3='A very small effect'
                 4='No impact'
                 5='Do not know';

  VALUE ANSR_G   1='Single Family Detached'
                 2='1-unit of 2-4 unit structure'
                 3='1 unit of multi-family 5 or more'
                 4='1-unit in MF in housing authority'
                 5='Mobile Home';
RUN;

PROC FREQ;
  TABLES (EVPCL94 EVPCL95 EVPCL96)*Q1;
  FORMAT Q1 ANSR_A.;
  WEIGHT EVP_WGT;
  TITLE 'Evaporative Cooler Covers';
RUN;

PROC FREQ;
  TABLES Q1;
  FORMAT Q1 ANSR_A.;
  WEIGHT EVP_WGT;
  TITLE 'Evaporative Cooler Covers';
RUN;

PROC UNIVARIATE;
  VAR Q1;
  WEIGHT EVP_WGT;
  TITLE 'SD for Evaporative Cooler Covers';
RUN;

PROC FREQ;
  TABLES (INSL94 INSL95 INSL96)*(Q4 Q5);
  FORMAT Q4 ANSR_B. Q5 ANSR_C.;
  WEIGHT INS_WGT;
  TITLE 'Attic or Ceiling Insulation by Year';
RUN;

PROC FREQ;
  TABLES Q4 Q5;
  FORMAT Q4 ANSR_B. Q5 ANSR_C.;
  WEIGHT INS_WGT;
  TITLE 'Attic or Ceiling Insulation';
RUN;

PROC UNIVARIATE;
  VAR Q4 Q5;
  WEIGHT INS_WGT;
  TITLE 'Variances for Insulation';
RUN;

PROC CORR COV;
  VAR Q4 Q5;
```

```
  WEIGHT INS_WGT;
  TITLE 'Covariances Between Insulation Questions';
RUN;

PROC FREQ;
  TABLES (DOOR94 DOOR95 DOOR96)*(Q8 Q9);
  FORMAT Q8 ANSR_C. Q9 ANSR_A.;
  WEIGHT DR_WGT;
  TITLE 'Door Weather Stripping by Year';
RUN;

PROC FREQ;
  TABLES Q8 Q9;
  FORMAT Q8 ANSR_C. Q9 ANSR_A.;
  WEIGHT DR_WGT;
  TITLE 'Door Weather Stripping';
RUN;

PROC UNIVARIATE;
  VAR Q8 Q9;
  WEIGHT DR_WGT;
  TITLE 'Variances for Door Weather Stripping';
RUN;

PROC CORR COV;
  VAR Q8 Q9;
  WEIGHT DR_WGT;
  TITLE 'Covariances Between Door Weather Stripping Questions';
RUN;

PROC FREQ;
  TABLES (CAULK94 CAULK95 CAULK96)*Q10;
  FORMAT Q10 ANSR_C.;
  WEIGHT CLK_WGT;
  TITLE 'Caulking by Year';
RUN;

PROC FREQ;
  TABLES Q10;
  FORMAT Q10 ANSR_C.;
  WEIGHT CLK_WGT;
  TITLE 'Caulking';
RUN;

PROC UNIVARIATE;
  VAR Q10;
  WEIGHT CLK_WGT;
  TITLE 'SD for Caulking';
RUN;
```