

Contra Costa Water District

Residential Audit Program

Contra Costa Water District (CCWD) is a retail and wholesale water provider serving communities in northern, central, and eastern Contra Costa County, CA. CCWD provides water directly to 230,000 people, and indirectly to another 220,000 people through other local utilities. As of the 2000 Census, the 1999 median household income in Contra Costa County was \$63,675, which is higher than the statewide median of \$47,493.¹

UTILITY DEMOGRAPHICS

As of 2004, CCWD had 59,080 connections, 88.5% of which were residential. Of their total connections, 52,313 were single family residential, 2,482 were multifamily residential, 2,707 were commercial, 6 were industrial, 218 were institutional, 1,282 were irrigation, 72 were raw water customers. CCWD also provides wholesale water to the cities of Antioch, Bay Point (Cal Cities Water), Oakley (Diablo Water District), Pittsburg, and Martinez.

CCWD's retail service area includes Concord, Clayton, Clyde, Pacheco, Port Costa, and parts of Martinez, Pleasant Hill, and Walnut Creek.

The total service area is 214.26 square miles. The total amount of treated water use in 2004 was 38,314 acre-feet. Based on the estimated population of 230,000 people, the average per capita water use was 149 gallons per capita per day as of 2004.

SINGLE FAMILY AUDIT PROGRAM	
Type of Program:	Audit
Indoor or Outdoor:	Both
Eligible Customers:	SF
Customers Analyzed:	SF
Program Years:	1991-present
Years Analyzed:	1999, 2000, 2001

UTILITY RATE STRUCTURE AND PRICES

CCWD has a uniform rate structure. The 2004 daily service demand charges are \$0.55 per day (\$16.50 per month) for 5/8" meters, which includes zero gallons of water. The charge per hundred cubic feet (ccf) of water is \$2.16 per ccf (\$2.89 per 1,000 gallons). There is also a variable energy surcharge, which ranges from \$0.07 per ccf to \$0.51 per ccf (\$0.10 to \$0.68 per 1,000 gallons), depending on the elevation of the customer's dwelling.

CURRENT CAPACITY AND WATER SOURCES

CCWD's primary source of water is its Central Valley Project (CVP) contract for 195,000 acre-feet per year. CCWD receives its water from the Sacramento-San Joaquin Delta. Water is pumped from the Delta into the Contra Costa Canal, where it is transported to the Bollman Water Treatment Plant and then into the distribution system. The plant is able to treat up to 75 million gallons of water per day.

¹ US Census Bureau. QuickFacts.

FUTURE PLANS TO MEET DEMAND

The population within CCWD's service area grew by 37% between 1985 and 2001, during which time overall water use decreased by 3%. Water conservation, water transfers, and water reuse are the main components of the CCWD's future plans to meet demand.

OTHER CCWD CONSERVATION PROGRAMS

Public education, *1980-present*
Multifamily Indoor Audits, *1990-present*
Large Landscape Audits, *1990-present*
Showerhead/Aerator Replacement, *1990-present*
ICI Indoor Audits, *1991-present*
Toilet Replacement Program, *1994-present*
ICI Equipment & Irrigation Upgrade Rebates, *1994-present*
Green Business Program, *2000-present*
Large Landscape Water Budgets, *2000-present*
Washing Machine Rebates, *2001-present*
Pre-rinse Spray Nozzle Rebates, *2003-present*

AUDIT PROGRAM— DESCRIPTION

CCWD's Single Family Residential Audit Program is an indoor and outdoor audit program initiated in 1991. During the indoor portion of the survey, the surveyor checks for leaks, tests flow volumes, and provides any necessary devices. During the outdoor portion, the surveyor checks the irrigation system, conducts precipitation

tests on stations, programs a monthly irrigation schedule into the controller, and teaches the customer how to operate the system.

The audit takes about 1 to 1½ hours. CCWD targets high summer water users for this program, however, about 30% of the audits performed are referrals from the Customer Service Department, and are not necessarily high water users.

The program has evolved significantly over time. From 1991 to 1994 the emphasis was on toilets and other indoor areas, with only a quick look outside. Between 1994 and 1999 the emphasis shifted to outdoor areas, and in 2000 the indoor component of the audit was reduced to 15 minutes and the landscape and irrigation became the focus of the survey. Marketing strategies were also changed in 2000 to more closely target high water using customers.

METHODOLOGY

Please see the General Methodology for the specific procedures and techniques used for all ECoBA analyses.

The analysis includes only single family households that were surveyed during the years 1999, 2000, and 2001. The water savings were calculated and a cost benefit analysis was performed for the years 1999, 2000, and 2001. The findings refer to these three years only, not to the ongoing program. The lifespan of the audits, which is used as the period of analysis, was assumed to be five years.

All quantified costs and benefits have been discounted to the first year of the analysis (1999) and inflated to 2004 dollars. The discount rate used in this analysis was 4.8%. The CPI values that were used in this analysis were the 2004 value of 188.9 and the 1999 value of 166.6.

286 usable participants out of 899 total participants in 1999, 376 out of 568 in 2000, and 379 out of 496 in 2001, for a total of 1,041 usable participants out of 1,963. Forty-seven percent, or 922, of the possible participants were unusable because they moved during the period of the analysis.

1999 audits: average water savings/year	2.8AF
2000 audits: average water savings/year	13.0AF
2001 audits: average water savings/year	24.0AF

The utility was able to refine its audit protocol, showing a marked increased in water savings and greater efficiency in use of their fiscal resources each successive year.

All CCWD single family residential households that were not participants in this analysis were used as the control group. However, the average pre-measure water use of the participants (174,895 gallons) was higher than that of the weighted annual pre-measure average of the control group (120,330 gallons). This is most likely due to the fact that the program was designed to target high-water using customers.

- For 1999 audits, the control group consisted of 50,087 households in 1997, 50,340 in 1998, 50,696 in 1999, 51,061 in 2000, and 51,249 in 2001.
- For 2000 audits, the control group consisted of 50,250 households in 1998, 50,606 in 1999, 50,971 in 2000, 51,159 in 2001, and 51,476 in 2002.
- For 2001 audits, the control group consisted of 50,603 households in 1999, 50,968 in 2000, 51,156 in 2001, 51,473 in 2002, and 51,829 in 2003.

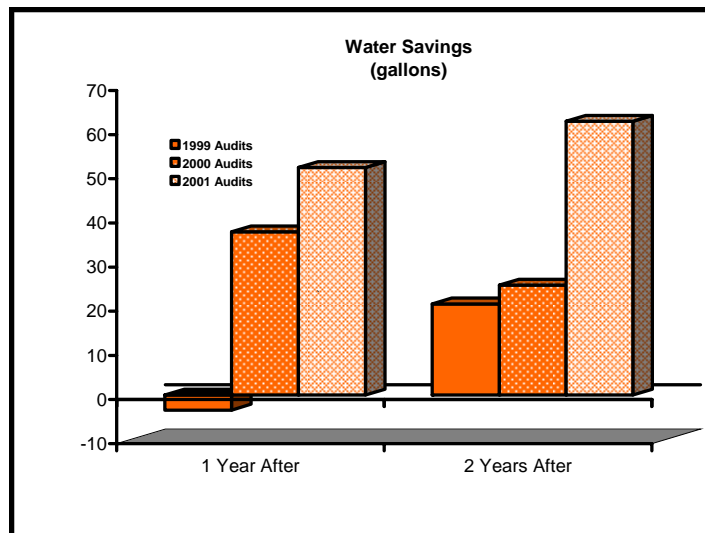
ASSUMPTIONS

Please see the General Assumptions for the specific conditions and rules underlying all ECoBA analyses.

The number of single family connections used in the analysis (to form the control group) is from December of the year in question.

The discount rate used in this analysis was 4.8%.

The CPI values that were used in this analysis were the 2004 value of 188.9 and the 1999 value of 166.6.

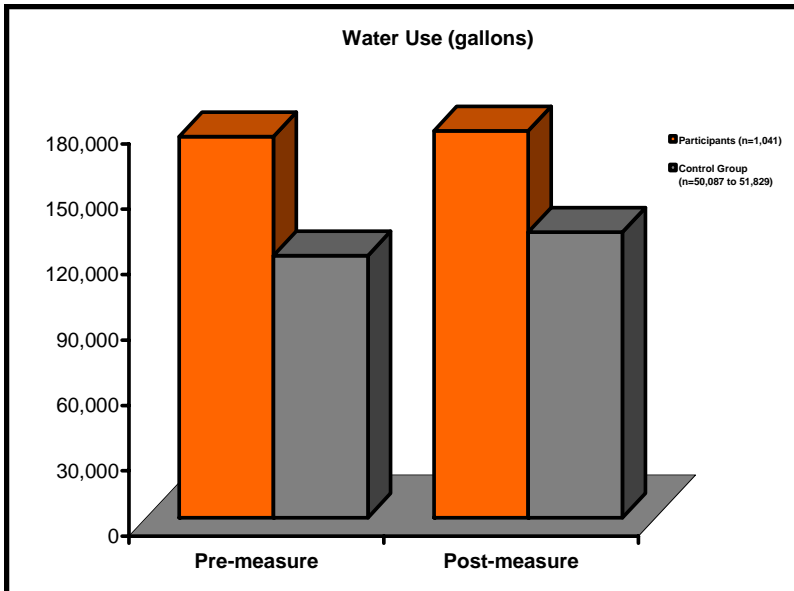


The price of water used in determining the benefits to customers from reduced water bills is the variable portion of the utility's price of water. \$2.63/1,000 gallons in 2000, \$2.69/1,000 gallons in 2001, \$2.75/1,000 gallons in 2002, \$2.81/1,000 gallons in 2003, \$2.89/1,000 gallons in 2004 and the balance of the lifespan.

RESULTS—WATER SAVINGS

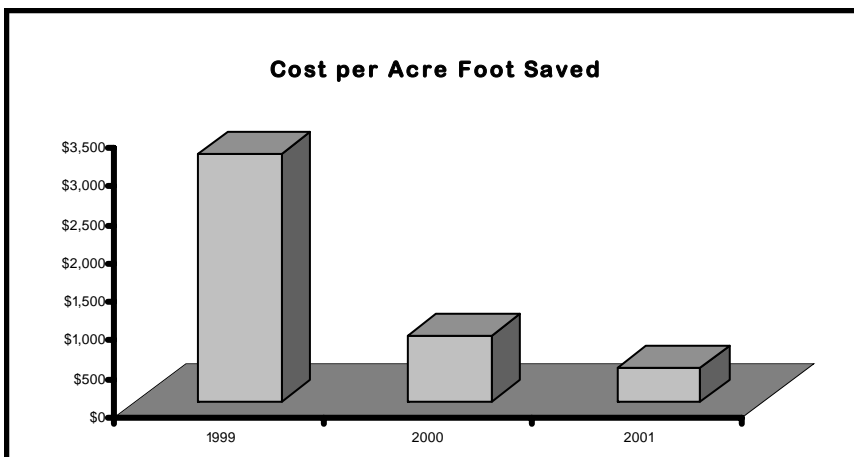
In the first year after the 1999 audits, no water savings occurred. There was an increase in participant water use, relative to control group water

use, of 351,076 gallons, or 1,228 gallons per participant per year (gppy) (0.7% of pre-measure water use). The second year after the audits, the water savings was 2,157,103 gallons, or 7,542 gppy (4.3% of pre-measure water use). The average savings per year was 903,013 gallons (2.8 AF), or 3,157 gppy (1.8% of pre-measure water use).² The total savings over the five year assumed lifespan of the audits was 4,515,067 gallons (13.9 AF), or 15,787 gallons per participant.



The first year after the 2000 audits, water savings amounted to 5,077,989 gallons, or 13,505 gppy (8.8% of pre-measure water use). The second year, water savings was 3,423,908 gallons, or 9,106 gppy (5.9% of pre-measure water use). The average savings per year was 4,250,948 gallons (13.0 AF), or 11,306 gppy (7.4% of pre-measure water use). The total savings over the five year assumed lifespan was 21,254,742 gallons (65.2 AF), or 56,529 gallons per participant.

The first year after the 2001 audits, water savings amounted to 7,132,709 gallons, or 18,820 gppy (9.6% of pre-measure water use).



² This value approximates the water savings per audit, but not perfectly. Of the 1,041 participants, 59 received more than one audit. Most of the successive audits were follow-up to the first.

The second year after, water savings amounted to 8,579,938 gallons, or 22,638 gppy (11.5% of pre-measure water use). The average savings per year was 7,856,323 gallons (24.1 AF), or 20,729 gppy (10.5% of pre-measure water use). The total savings over the five year assumed lifespan was 39,281,617 gallons (120.6 AF), or 103,645 gallons per participant.

Total water savings for the three years studied amounted to 11,859,622 gallons, or 11,393 gppy (6.5% of weighted pre-measure water use) during the first year after and 14,160,948 gallons, or 13,603 gppy (7.8% of weighted pre-measure water use) during the second year after the audits. **The total water savings over the five year assumed lifespan of the audits was 65,051,426 gallons (199.6 AF), or 62,489 gallons per participant.**

During the two years before participating in the audit program, participants' water use was 145.0% of the control group's use, on average. During the two years after participating in the audit program, their water use was 136.0% of the control group's use, on average. The participants' water use increased by 1.6% from pre-measure to post-measure, whereas the control group's use increased by 9.0%. **The resulting overall water savings attributed to this program was 7.4%.**

1999 Quantified Costs and Benefits					
Utility				Participants	
Costs		Benefits		Costs	Benefits
Materials	\$6,846	Not Quantified	Not Quantified	Water Bill Savings	\$12,839
Labor	\$38,914			Total	\$12,839
Total	\$45,400				

RESULTS—COST BENEFIT ANALYSIS

Costs and benefits listed below represent the entire lifespan of the program (five years).

1999 AUDITS

- The quantified cost to the utility was \$45,400, including materials (\$6,486), and labor (\$38,914). This translates to a cost of \$159 per participant: \$23 for materials, \$136 for labor.
- The quantified benefit to the utility was \$0. This is a benefit of \$14 per participant.
- The quantified cost to the participants was \$0.
- The quantified benefit to the participants was \$12,839. This includes water bill savings, \$12,839. This is a benefit of \$45 per participant.

UTILITY PERSPECTIVE - 1999

Results of the cost benefit analysis show a net benefit (net present value) of -\$45,400 from the utility perspective. This is a net benefit of -\$159 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot of water saved from the utility perspective was \$3,276.**

PARTICIPANT PERSPECTIVE - 1999

Results of the cost benefit analysis show a net benefit (net present value) of \$12,839 from the participant perspective. This is a net benefit of \$45 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$0 as there were no costs to the participants.**

OVERALL PERSPECTIVE - 1999

Results of cost benefit analysis show a net benefit (net present value) of -\$32,560 from an overall perspective. This is a net benefit of -\$114 per participant. The quantified costs to the participants and utility were greater than the quantified benefits to the participants and utility. **The cost per acre-foot of water saved from an overall perspective was \$3,276.**

2000 AUDITS

- ◆ The quantified cost to the utility was \$59,952. This includes the cost of materials, \$8,136, and the cost of labor, \$48,816. This is a cost of \$152 per participant, including \$22 for materials and \$130 for labor.
- ◆ The quantified benefit to the utility was \$0.
- ◆ The quantified cost to the participants was \$0.
- ◆ The quantified benefit to the participants was \$59,284. This includes water bill savings, \$59,284. This is a benefit of \$158 per participant.

2000 Quantified Costs and Benefits					
Utility			Participants		
Costs		Benefits	Costs	Benefits	
Materials	\$8,136	Not Quantified	Not Quantified	Water Bill Savings	\$59,284
Labor	\$48,816			Total	\$59,284
Total	\$56,952				

UTILITY PERSPECTIVE - 2000

Results of the cost benefit analysis show a net benefit (net present value) of -\$59,952 from the utility perspective. This is a net benefit of -\$151 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot of water saved from the utility perspective was \$873.**

PARTICIPANT PERSPECTIVE - 2000

Results of the cost benefit analysis show a net benefit (net present value) of \$59,284 from the participant perspective. This is a net benefit of \$158 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$0 as there were no costs to the participants.**

OVERALL PERSPECTIVE - 2000

Results of cost benefit analysis show a net benefit (net present value) of \$2,332 from an overall perspective. This is a net benefit of \$6 per participant. The quantified costs to the participants and utility were less than the quantified benefits to the participants and utility. **The cost per**

2001 AUDITS

- ◆ The quantified cost to the utility was \$54,777. This includes the cost of materials, \$7,825, and the cost of labor, \$46,952. This is a cost of \$145 per participant, including \$21 for materials and \$124 for labor.
- ◆ The quantified benefit to the utility was \$0.
- ◆ The quantified cost to the participants was \$0.
- ◆ The quantified benefit to the participants was \$105,744. This includes water bill savings, \$105,744. This is a benefit of \$279 per participant.

UTILITY PERSPECTIVE - 2001

Results of the cost benefit analysis show a net benefit (net present value) of -\$54,777 from the utility perspective. This is a net benefit of \$145 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot of water saved from the utility perspective was \$454.**

PARTICIPANT PERSPECTIVE - 2001

Results of the cost benefit analysis show a net benefit (net present value) of \$105,744 from the participant perspective. This is a net benefit of \$279 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$0 as there were no costs to the participants.**

OVERALL PERSPECTIVE - 2001

Results of cost benefit analysis show a net benefit (net present value) of \$50,966 from an overall perspective. This is a net benefit of \$134 per participant. The quantified costs to the participants and utility were less than the quantified benefits to the participants and utility. **The cost per acre-foot of water saved from an overall perspective was \$454.**

2001 Quantified Costs and Benefits					
Utility			Participants		
Costs		Benefits	Costs	Benefits	
Materials	\$7,825	Not Quantified	Not Quantified	Water Bill Savings	\$105,744
Labor	\$46,952			Total	\$105,744
Total	\$54,777				

ALL YEARS - COMBINED ANALYSIS

- The quantified cost to the utility was \$157,129. This includes the cost of materials, \$22,447, and the cost of labor, \$134,682. This is a cost of \$151 per participant, including \$22 for materials and \$129 for labor.
- The quantified benefit to the utility was \$0.
- The quantified cost to the participants was \$0.
- The quantified benefit to the participants was \$177,805. This includes water bill savings, \$177,805. This is a benefit of \$171 per participant.

ALL YEARS Quantified Costs and Benefits					
Utility			Participants		
Costs		Benefits	Costs		Benefits
Materials	\$22,447	Not Quantified	Not Quantified	Water Bill Savings	\$177,805
Labor	\$134,682			Total	\$177,805
Total	\$157,129				

UTILITY PERSPECTIVE - ALL YEARS

Results of the cost benefit analysis show a net benefit (net present value) of -\$157,129 from the utility perspective. This is a net benefit of -\$151 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot of water saved from the utility perspective was \$787.**

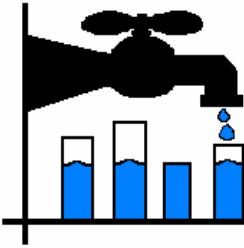
PARTICIPANT PERSPECTIVE - ALL YEARS

Results of the cost benefit analysis show a net benefit (net present value) of \$177,805 from the participant perspective. This is a net benefit of \$171 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$0 as there were no costs to the participants.**

UNQUANTIFIED COSTS AND BENEFITS
<p>Costs</p> <ul style="list-style-type: none"> • Customers' time spent during the audit. <p>Benefits</p> <ul style="list-style-type: none"> • Financial savings on sewer bill for participants. • Avoided cost of acquisition and distribution of water saved. • Environmental benefits of reduced water use. • Increased public awareness of the need to conserve water. • Increased customer satisfaction with the utility. • Reinforcing the need to conserve. • Water saved for future utility use. • Customers received new fixtures.

OVERALL PERSPECTIVE - ALL YEARS

Results of the cost benefit analysis show a net benefit (net present value) of \$20,675 from the overall perspective. This is a net benefit of \$20 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the overall perspective was \$787.**



Contra Costa Water District

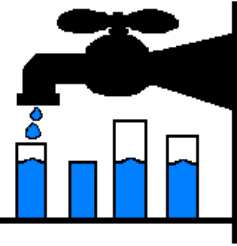
Residential Audit Program

Results of Cost Benefit Analysis-Lifespan (5 Years)		1999	
	UTILITY	PARTICIPANT	OVERALL
<u>Present Value Costs</u>			
Costs to Utility	45,400	NA	45,400
Costs to Participants	NA	0	0
Costs to Others	NA	NA	0
Total Costs	\$45,400	\$0	\$45,400
<u>Present Value Benefits</u>			
Total Water Savings	13.86 AF	13.86 AF	13.86 AF
Total Benefits to Utility	0	NA	0
Total Benefits to Participants	NA	12,839	12,839
Benefits to Others	NA	NA	0
Total Benefits	\$0	\$12,839	\$12,839
<u>Cost Benefit Calculations</u>			
Net Present Value (NPV) (Total Benefits - Total Costs)	-\$45,400	\$12,839	-\$32,560
Cost Effectiveness Analysis (CEA) (Total Costs ÷ Total Water Savings)	\$3,276 /AF		\$3,276 /AF

Results of Cost Benefit Analysis-Lifespan (5 Years)		2000	
	UTILITY	PARTICIPANT	OVERALL
<u>Present Value Costs</u>			
Costs to Utility	56,952	NA	56,952
Costs to Participants	NA	0	0
Costs to Others	NA	NA	0
Total Costs	\$56,952	\$0	\$56,952
<u>Present Value Benefits</u>			
Total Water Savings	65.23 AF	65.23 AF	65.23 AF
Benefits to Utility	0	NA	0
Benefits to Participants	NA	59,284	59,284
Benefits to Others	NA	NA	0
Total Benefits	\$0	\$59,284	\$59,284
<u>Cost Benefit Calculations</u>			
Net Present Value (NPV) (Total Benefits - Total Costs)	-\$38,482	\$59,284	\$2,332
Cost Effectiveness Analysis (CEA) (Total Costs ÷ Total Water Savings)	\$873 /AF		\$873 /AF

Contra Costa Water District

Residential Audit Program



2001		Results of Cost Benefit Analysis-Lifespan (5 Years)		
	UTILITY	PARTICIPANT	OVERALL	
<u><i>Present Value Costs</i></u>				
Costs to Utility	54,777	NA	54,777	
Costs to Participants	NA	0	0	
Costs to Others	NA	NA	0	
Total Costs	\$54,777	\$0	\$54,777	
<u><i>Present Value Benefits</i></u>				
Total Water Savings	120.55 AF	120.55 AF	120.55 AF	
Benefits to Utility	0	NA	0	
Benefits to Participants	NA	105,744	105,744	
Benefits to Others	NA	NA	0	
Total Benefits	\$0	\$105,743	\$105,744	
<u><i>Cost-Benefit Calculations</i></u>				
Net Present Value (NPV) (Total Benefits - Total Costs)	-\$54,777	\$105,743	\$50,966	
Cost Effectiveness Analysis (CEA) (Total Costs ÷ Total Water Savings)	\$454 /AF		\$454 /AF	

ALL YEARS		Results of Cost Benefit Analysis-Lifespan (5 Years)		
	UTILITY	PARTICIPANT	OVERALL	
<u><i>Present Value Costs</i></u>				
Costs to Utility	157,129	NA	157,129	
Costs to Customers	NA	0	0	
Costs to Others	NA	NA	0	
Total Costs	\$157,129	\$0	\$157,129	
<u><i>Present Value Benefits</i></u>				
Total Water Savings	199.64 AF	199.64 AF	199.64 AF	
Benefits to Utility	0	NA	0	
Benefits to Customers	NA	177,805	177,805	
Benefits to Others	NA	NA	0	
Total Benefits	\$0	\$177,805	\$177,805	
<u><i>Cost Benefit Calculations</i></u>				
Net Present Value (NPV) (Total Benefits - Total Costs)	-\$102,134	\$177,805	\$20,675	
Cost Effectiveness Analysis (CEA)	\$787 /AF		\$787 /AF	

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