

# Appendix B2: Valuing Water Use Foregone

## INTRODUCTION

It is difficult to identify the precise value of the water lost to municipal and agricultural users as a result of programs that increase freshwater flows to the San Francisco Bay-Delta. Water is not an actively traded commodity, such as a farm crop or gasoline, where market transactions provide clear market prices. Information is available, however, that can be used to approximate water values. This appendix discusses available evidence and makes an estimate of expected water values.

Identifying water value translates into answering the question, “How much would water agencies be willing to pay today to secure permanent water supplies of delta surface waters?” To answer this question EPA investigated both what water users are currently paying for delta surface waters delivered by the California State Water Project (SWP) and recent California water market transactions.

### APPENDIX CONTENTS

B2-1	State Water Project . . . . .	B2-1
B2-2	Water Market Transactions . . . . .	B2-2
B2-3	Summary . . . . .	B2-4

## B2-1 STATE WATER PROJECT

The SWP is the largest state-built, multipurpose water project in the nation. Its main purpose is water supply — to store surplus water during wet periods and distribute it to areas of need throughout California. Construction began after passage of a \$1.75 billion public bond issue in 1960. The main storage reservoir is Lake Oroville in northern California. Water is transported through the Feather and Sacramento rivers and a system of canals, pipelines, pumping plants, and power plants for use by agricultural and urban users (29 water agencies). It is likely that SWP water deliveries will be lowered to increase delta flows, in the same manner that Central Valley Project (CVP) diversions already have been reduced.

Table B2-1 shows what SWP water customers currently pay for SWP water. Water costs vary widely by geographic region largely because of differences in conveyance costs. SWP water is least expensive in the San Joaquin and Feather River areas, between \$65 and \$69 per acre foot (AF) of entitlement, or between \$83 and \$88 per AF for water delivered (assuming 78 percent of entitlement is delivered in an average year). The delivered price of SWP water to coastal areas (e.g., Santa Barbara) is as great as \$986/per AF.<sup>1</sup> The average weighted cost of delivered SWP water is \$182/AF.

These costs provide information on the lower bound of water value. The 29 purchasing water agencies value the water by at least the amount they pay for the water, or else they would dispose or sell their interest in the SWP. The \$83/AF cost estimate provides a firm lower bound of the value of water to its current buyers (users). Most of the water used in the San Joaquin area is used for agriculture. Hence, the \$83/AF estimate provides a firm lower bound for agricultural water. In other words, if CALFED offered to buy SWP users’ entitlement rights at \$83/AF of delivered water (\$65/AF of entitlement water), there would be very few, if any, sellers. Thus, EPA applied a range of from \$100 to \$200 per AF as the value of water to agricultural users, given that it costs these users at least \$83/AF to obtain the water.

<sup>1</sup> This is only the SWP cost. Many users pay additional costs to transport water from SWP facilities to their location. For example, Santa Barbara pays the Central Coast Water Authority to move water to their service area. Additional costs are also associated with treating water.

<b>Service Area</b>	<b>Cost of Entitlement (\$/AF)<sup>a</sup></b>	<b>Effective Cost for Water Delivered (\$/AF)<sup>b</sup></b>	<b>Entitlement (AF/yr)<sup>a</sup></b>	<b>% Entitlement</b>
San Joaquin	\$65	\$83	1,178,937	50.2%
Feather River	\$69	\$88	1,421	0.1%
South Bay Area	\$113	\$145	147,186	6.3%
North Bay Area	\$180	\$231	37,871	1.6%
Southern California	\$233	\$299	973,254	41.5%
Coastal Area	\$769	\$986	8,538	0.4%
Average/Total	\$142	\$182	2,347,207	100.0%

<sup>a</sup> Information from Davis et al., 1999. Excludes other deliveries.

<sup>b</sup> Adjusted to reflect actual delivery of entitlement averages of 78 percent (e.g.,  $\$65/0.78 = \$83$ ).

The SWP water costs also indicate that an offered water price would have to be high for municipal users to surrender their SWP water entitlements. In the central coast counties of San Luis Obispo and Santa Barbara, the offer would need to exceed \$986/AF, the effective price that this area is currently willing to pay for SWP water. That is, municipal users in some portions of California are paying nearly \$1,000/AF for water from the SWP. The value of water is high in this area because of the limited and expensive alternative water supply options (e.g., desalination). The acceptance price might be lower for other municipal agencies that have other, less expensive alternative water supplies.

## **B2-2 WATER MARKET TRANSACTIONS**

Another approach that can be used to estimate the value of water is to review recent California water transactions. EPA identified 20 transactions in California from January 1998 to March 2000 (see Table B2-2). Most of the transactions (14) involved municipal agencies purchasing water supplies to serve growing populations. The water price associated with these municipal transactions ranged from \$90 to \$412/AF, averaging \$267/AF. Every transaction had unique circumstances and conditions that may affect the transaction price (e.g., reliability of water yield, water quality, duration of the purchase agreement). The water transactions involving groundwater in West Coast Basin, Central Basin, and the Main San Gabriel Basin showed municipal users selling water in the \$300 to \$320/AF range.

Four transactions involved municipal users purchasing SWP water. These transactions included a one-time payment of \$1,000/AF entitlement (1,000 AF per year, indefinitely), plus assumption of SWP expenses. This translates into an average price of \$290/AF on an annual AF basis.

From this information, EPA estimated the approximate value of water for municipal agencies to be at least \$300/AF. The SWP deliveries to southern California cost about \$299/AF delivered. Given expected future water shortages, EPA surmises that not many municipal customers (e.g., Metropolitan Water District of Southern California) would sell their interests in SWP water for \$300. Hence, the value is most likely much higher.

No.	\$/AF <sup>a</sup>	AF/yr	Use <sup>b</sup>	Source	Transaction	Date	Acquirer	Supplier	Comments
1	\$45	1,000	I	Surface	Lease	1998	Garfield WD	Madera Irrigation District	Ag transfer of surplus water supplies
2	\$90	5,000	M	Surface	Lease	1998	Alameda County FCWCD#7	Byron Bethany ID	15-year lease near S.F.
3	\$177	8,000	M	Surface	Purchase	1998	Western Hills WD	Berrenda Mesa Water District	Transfer of SWP entitlement; \$1,000/AF + SWP costs
4	\$300	4,531	M	Ground	Purchase	7/98 - 6/99	Various	Various	2 adjudicated basins in Southern CA
5	\$150	10,000	M	Ground	Lease	Feb-99	Orange County	San Bernardino Valley	1-year lease Bunker Hill Basin near L.A.
6	\$320	2,748	M	Ground	Purchase	7/98 - 6/99	Various	Various	Main San Gabriel Basin near L.A.
7	\$241	15,000	M	Surface	Purchase	Oct-99	Alameda County FCWCD#7	Lost Hills Water District (Ag)	Transfer of SWP entitlement; \$1,000/AF + SWP costs
8	\$164	54,352	M	Ground	Lease	7/98 - 6/99	Various	Various	2 adjudicated basins in Southern CA
9	\$200	5,950	M	Surface	Lease	1998	City of Inglewood	Western Water Company	5-year lease near L.A.
10	\$240	23,416	M	Ground	Lease	7/98 - 6/99	Various	Various	1-year lease; Main San Gabriel Basin near L.A.
11	\$361	4,000	M	Surface	Purchase	Jun-99	Palmdale WD	Belridge WD	Transfer of SWP entitlement; \$1,000/AF + SWP costs
12	\$297	13,697	M	Surface	Lease	1998	Mojave Water Agency	CA Dept of Water Resources	Reduce aquifer overdraft in Southern CA
13	\$380	41,000	M	Surface	Purchase	May-99	Castaic Lake WA	Wheeler Ridge WD	Transfer of SWP entitlement; \$1,150/AF + SWP costs
14	\$409	20,000	M	Surface	Lease	Oct-99	City of San Diego	Western Water Company	1-year lease in Southern CA
15	\$412	10,000	M	Surface	Lease	Jun-99	Santa Margarita WD	Western Water Company	1-year lease in Southern CA
16	\$55	30,000	M & I	Surface	Lease	Nov-99	Stockton East Water District	Oakdale & South San Joaquin Ids	10-year lease of Stanislaus River water
17	\$30	10,000	PT	Surface	Lease	2000	Bureau of Rec	Semitropic Water Storage District	1-year lease for San Joaquin Valley Wildlife Refuges
18	\$60	50,000	PT	Surface	Lease	Oct-99	Bureau of Rec	Oakdale & South San Joaquin Ids	1-year lease to augment San Joaquin River flows
19	\$60	30,000	PT	Surface	Lease	Jun-99	Bureau of Rec	Vernalis Adaptive Management IDs	San Joaquin River augmentation
20	\$65	10,000	PT	Both	Lease	2000	Bureau of Rec	San Luis Canal Company	1-year lease for San Joaquin Valley Wildlife Refuges
Average Price \$/AF			All	203					
Average Price \$/AF			M	267					
Average Price \$/AF			PT	54					

<sup>a</sup> Price for purchases are converted into \$/AF terms using an infinite time horizon and a 10 percent annual discount rate. Dollars are current for the year of the transaction (1998, 1999, or 2000).

<sup>b</sup> I = irrigation, M = municipal, PT = public trust.

## B2-3 SUMMARY

Our review indicates that the value to agricultural and municipal users of water use foregone is at least \$100 and \$300/AF, respectively. These estimates are probably biased downward, and we therefore show an upper bound value of \$200/AF and \$1,000/AF for agricultural and municipal users, respectively.

For the purposes of this project, we need to identify a weighted average value of water lost because of enhancements in water flows in the delta for environmental purposes. We weighed the value per AF estimates based on the assumption of a proportional cutback in water supplies between agricultural and municipal users. We used CVP and SWP water uses as a basis for our weighting. Table B2-3 shows the results and a weighted value of water from \$155/AF to \$425/AF. Applying these values to 3 to 4 million AF per year, the opportunity cost of the water use foregone is in the range of \$465 million to \$1.7 billion annually.

<b>Water User Type</b>	<b>SWP and CVP Water Delivered (AF/yr)</b>	<b>% of Use</b>	<b>Estimated Value to Users (\$/AF)</b>
Municipal	2,569,328	28%	\$300 to \$1000
Agricultural	6,697,256	72%	\$100 to \$200
Total	9,266,584	100%	\$155 to \$425

Source: Davis et al., 1999.