California Department of Water Resources
Water Use and Efficiency Branch

Cost Analysis for Proposed Agricultural Water Measurement Regulation in Support of Economic and Fiscal Impact Statement

April 22, 2011

1.0 Summary

Statewide costs to comply with proposed agricultural water measurement regulation were estimated. Potentially affected irrigated acreage was estimated to be nearly 2.9 million acres. This value excludes agricultural water suppliersô less than 25,000 acres, CVP contractors with an accepted water management plan and suppliers that signed the Quantification Settlement Agreement (QSA).

Significant uncertainty associated with data and assumptions suggest that the range of potential cost is large. The mid-range estimates of total present value of costs are $333 million over 20 years, and $420 million over 40 years. About $70 million of that would be initial assessments and capital improvements while the remainder is the present value of annual operation and maintenance (O&M), administration and capital replacement. Costs could be as little as half that amount or as much as twice that amount. Average costs per acre potentially affected were estimated and used to calculate average costs per farm potentially affected. Costs to individual farms are likely to vary significantly. As an example, costs were also calculated for a very small farm of 20 acres if it were required to pay for replacement of a single measuring device. Benefits were briefly described but not quantified.

2.0 Introduction

The Economic and Fiscal Impact of a regulation is a requirement of the Office of Administrative Law, and requires the Department of Water Resources (DWR) to complete and submit Form 399 with its proposed regulation. The form includes the following sections and categories of analysis:

- Economic impacts on private businesses and individuals, including costs and benefits (if they might occur)
- Fiscal impacts on local governments
- Fiscal impacts on state government

Costs of the regulation would fall directly on agricultural water suppliers, the vast majority of which are special districts (public agencies). They, in turn, will recover the costs through their water charges and assessments, so all costs would immediately be passed on to the customers (nearly all being private businesses and individuals). Therefore, the following conventions were used to organize and display estimates in Form 399:

- All costs were shown as private sector costs (economic impacts on businesses or individuals).
- Customers were assumed to be businesses. No attempt was made to divide costs into those imposed on businesses versus individuals ï for purposes of this analysis all were assumed to fall on businesses. DWR recognizes that some affected customers are not commercial businesses, but has not estimated the number of non-commercial customers.
- As a result of the above conventions, no additional fiscal impacts on local government are shown. This section of the Form 399 refers the reader back to the previous sections on private sector impacts.

DWR staff, assisted by the Agricultural Water Measurement Project Team and its consultants, has prepared an analysis of costs based on a combination of existing studies, new information provided by Agricultural Stakeholder Committee (ASC) members and other assumptions as needed to generate a reasonable estimate of costs or range of costs. This memorandum describes the methods, data and assumptions and results of the analysis.

3.0 Methods

The following process was used to develop reasonable data, assumptions, and results:

- Compile and review existing information and studies related to costs of measuring water delivery to customers.
- Prepare information requests for ASC members and review responses.
- Use available data to construct a spreadsheet model of costs of measurement. The spreadsheet included the following categories of information or estimates:
    - A list of potentially affected agricultural water suppliers, including irrigated acres of each.
    - Assignment of affected suppliers into regions, and an assessment of whether they already comply with U.S. Bureau of Reclamation (USBR) Water Management Plan (WMP) criteria or are exempt as QSA signatories.
    - For each region:
        - Number of delivery points affected and the number of acres affected, based on the 2003 CALFED report, the 2010 Cooperative Study and information provided by the ASC.
        - Cost for the supplier to conduct an initial assessment based on estimates provided by ASC members.
        - The representative cost of converting or adjusting the current measurement to one that will meet the regulation based on the 2010 Cooperative Study and other information provided by ASC members.
        - Representative cost of O&M, based on the 2010 Cooperative Study and other information provided by ASC members.
        - Representative cost of administration and reporting based on information provided by ASC members.
    - Use the representative cost estimates and the number of potentially affected suppliers, irrigated acres and delivery points to create an estimate of the total cost by region, supplier size category and cost item. Also, calculate the present discounted value of total costs.
- Convert the total costs into costs per representative business (farm) and small business (farm) using information on average and median farm size from the 2007 Census of Agriculture.
- Discuss uncertainties in data, assumptions and results.

4.0 Data Sources

4.1 Existing Studies

Several existing studies were relied on for specific information and cost estimates or as general reference.

The Final Report of the Independent Panel on Appropriate Measurement of Agricultural Water Use was prepared for the California Bay-Delta Authorityôs Water Use Efficiency Program (CALFED, 2003). This report included a statewide assessment, by region, of existing agricultural water measurement and the potential effects of installing or upgrading water measurement. The report addressed measurement at a number of locations within the system, including regional-level estimates of the existing measurement of water delivered at farm turnouts, number of turnouts, and average irrigated acreage per turnout. In addition, the report assessed the costs of installing, operating, and maintaining measurement for three levels of measurement accuracy. The costs in that 2003 report are now outdated, but other information on the number of turnouts and average acreage per turnout was the most comprehensive available for use in this analysis.

The Sacramento River Settlement Contractors, in cooperation with the USBR, commissioned the Cooperative Water Measurement Study Report (SRSC, 2010). The study assessed the costs, benefits, and other technical issues associated with measuring water at the district, lateral, and farm turnout levels in the Sacramento Valley. The study provides estimates of the capital, operation, maintenance, and data collection costs associated with measurement at these different levels. This is the most recent study available to DWR for estimating costs of installing the kinds of measurement devices typical of what suppliers might use, if needed to comply with the proposed regulation. In addition, the report provided consistent estimates for both turnout-level and lateral-level measurement. This economic and fiscal impact analysis relied on the estimates from this report.

Imperial Irrigation District (IID) is currently in the process of planning and implementing its System Conservation Plan, a component of its Efficiency Conservation Definite Plan (IID, 2007). As part of the Plan implementation, IID has evaluated the cost and performance of a range of turnout measurement devices. This information was reviewed during the development of the proposed regulation and again during the compilation of cost estimates. Cost estimates developed for the Plan were used as an alternative source of information in the discussion of uncertainties in Section 6.6.

4.2 Information Requests to ASC

DWR staff made two requests to the ASC members for information to assist in the estimation of economic and fiscal impacts. The initial request for information asked them to identify categories of costs (including but not limited to out-of-pocket costs), and to provide any existing information or studies that would assist DWR in estimating the local economic and fiscal impacts. This request for information is attached as Exhibit 1, and focused on the following categories of potential costs to local water suppliers and growers:

- Initial assessment of existing measurement devices
- Installation of new devices or repair/adjustment of existing devices, as needed
- On-going O&M of upgraded measurement devices (the incremental change in cost compared to what the supplier would have spent in the absence of the regulation)
- Record-keeping, reporting and other administrative costs.

DWR received specific numerical estimates from three ASC members that responded directly to the information request. In addition, several other ASC members provided written or verbal responses.

DWR staff also solicited additional information or advice on assumptions that it needed for preparing the quantitative estimates. It requested assistance from selected ASC members. These included members from the academic institutions (Cal Poly, San Luis Obispo and California State University at Fresno) and private consultants who had a range of knowledge and experience with different water suppliers and regions. Their informal suggestions were considered in the analytical assumptions.

5.0 Data and Assumptions Used in the Analysis

5.1 Regions

Estimates and calculations used in this economic and fiscal impact analysis split the State into regions. This allows for a more detailed analysis than would result from a single set of statewide average numbers. Regions differ substantially in their existing measurement devices and their potentially affected acreage. Regions can be defined in many different ways, but for purposes of this impact analysis, the regional definitions used in the CALFED report (2003) were adopted, but with some modification. The following are the definitions of regions used for this analysis. The assignment of suppliers to these regions

is only for purposes of deriving the cost estimates and has no other policy or implementation implication.

Sacramento Valley: This area is bounded by the American River and the legal Delta in the south and Lake Shasta in the north. The primary rivers in this area are the American, Sacramento, Yuba, Bear and Feather. In addition, these rivers have numerous tributaries.

Delta: This is the legal Delta that incorporates portions of Contra Costa, Sacramento, San Joaquin, Solano and Yolo Counties.

Eastside San Joaquin Valley: This area is bounded by the American River and legal Delta to the north, Fresno County to the south and the San Joaquin River to the west.

Westside San Joaquin Valley: This area is bounded by the San Joaquin River on the east, the coast range on the west, Kings County to the south and the legal Delta to the north. This region is heavily dependent on imported water and incorporates the CVP Delta Mendota and San Luis Unit service areas.

Southern San Joaquin Valley: This area is bounded by the San Joaquin River to the north and the Tehachapi Mountains to the south. It excludes the CVP San Luis Unit service area. Major rivers in the region include the Kings, Kern, Kaweah and Tule.

Other California: This region covers agricultural areas outside of the Central Valley. This region includes the Napa and Sonoma Valleys, the Central and North Coast, the South Coast, Klamath, and desert regions. Note, this includes both the Coachella and Imperial Valleys, but the large suppliers there are currently excluded from the analysis because they are QSA signatories.

5.2 Agricultural Water Suppliers and Irrigated Acreage Potentially Affected

DWR staff compiled a list of agricultural water suppliers for purposes of water measurement, reporting of aggregate deliveries, agricultural water management planning, and other purposes. The list included the supplierôs name and its reported irrigated acreage served. For purposes of this analysis, each supplier is identified by its region, including whether the supplier is a USBR contractor with an accepted Water Management Plan that meets the conditions in the proposed regulation, and whether the supplier is a signatory of the QSA for Colorado River water rights holders.

DWR staff attempted to compile a comprehensive list of suppliers that could potentially be affected by the proposed regulation. However, several difficulties must be acknowledged in the list:

- Suppliers have not been required in the past to report or register their location, irrigated acreage, and other characteristics in a consistent manner. Suppliers include retail agencies (special districts), investor-owned water companies, mutual water companies, and various forms of wholesale distributors. Therefore, simply compiling a comprehensive list was a challenge. It is nearly certain that some potentially affected suppliers have been inadvertently omitted from the list. It is also possible that acreage served by suppliers that have recently merged or changed name could be double-counted.
- Irrigated acreage varies from year to year, and it is difficult to assign some suppliers definitively to a size class to determine if they would be subject to the proposed regulation. Many suppliers are sufficiently larger than 25,000 irrigated acres that the yearly variation does not matter. Perhaps a dozen suppliers fall within about 3,000 acres above or below the 25,000 acre threshold and could be greater or less than the threshold in any reporting year.
- Suppliers may not report their irrigated acreage in a consistent manner. Definitions of irrigated acreage used by suppliers could include: acreage developed for and potentially served by the supplierôs water delivery system; acres of land actually irrigated in a given year or averaged over a number of years; or total acres of crops (counting each different crop in a rotation or double-cropping system) irrigated in a given year or averaged over a period of years. Some suppliers may include areas within their service area that use private groundwater wells. In addition, suppliers could report the gross acreage or the net acreage of an irrigated parcel. The net acreage could exclude the portion occupied by farm roads, irrigation facilities, drainage ditches, equipment turnaround areas, etc.

These suppliers have been assigned to regions of the state using the same regional breakdown developed for the CALFED (2003) analysis. Table 1 summarizes the number of potentially affected suppliers and their total irrigated acreage by region, for purposes of this economic and fiscal impact analysis.

5.3 Number of Water Measurement Devices (Delivery Points) Potentially Affected

Three sources of information were used to estimate the number of measurement sites potentially affected by the proposed regulation. The CALFED report (2003) estimated the average number of irrigated acres per turnout, or irrigation water delivery point, by region. This information was compared with data provided by ASC members in response to DWRôs request for information. In addition, the Cooperative Water Measurement Study Report (SRSC, 2010; see Tables E-1 and E-3) provided estimates of the typical irrigated acreage served by field turnouts and lateral-level measurement sites.

All of this information was considered in developing the estimates of representative acreage served per turnout or lateral measurement site. These estimates in turn were used with the total potentially affected acreage to estimate the number of potentially affected measurement devices at turnouts and laterals. Table 1 summarizes the estimates by region.

Table 1

Affected Acreage, Measurement Sites, and Number of Suppliers

Regions	Acres per Turnout	Potentially Affected Irrigated Acres	Potentially Affected Turnouts	Potentially Affected Lateral Sites	Potentially Affected Suppliers
		---------- Suppliers >25,000 Acres ----------			
Sacramento Valley	80	595,629	7,445	317	13
Delta	50	25,760	515		1
East San Joaquin Valley	40	558,387	13,960		7
West San Joaquin Valley	100	60,108	601		2
Southern San Joaquin Valley	60	1,452,402	24,207		20
Southern California, Coast, Other	70	187,840	2,683		3
Total		2,880,126	49,411		46
		---------- Suppliers 10,000-25,000 Acres ----------			
Sacramento Valley	80	161,684	2,021	86	12
Delta	50	43,002	860		3
East San Joaquin Valley	40	40,258	1,006		3
West San Joaquin Valley	100	68,914	689		4
Southern San Joaquin Valley	60	125,216	2,087		8
Southern California, Coast, Other	70	112,760	1,611		7
Total		551,835	8,274		37

See text for description of data. Potentially affected suppliers exclude those subject to CVP WMPs and signatories of the QSA. Lateral sites would be affected instead of (not in addition to) the turnouts.

5.4 Unit Costs of Measurement

Installing New Measurement Devices. Recent published estimates of unit equipment, installation, and operation and maintenance (O&M) costs were used to the extent possible. The SRSC (2010) report (Cooperative Study) described above was used for unit cost estimates when possible. This included the costs per device for capital and O&M (including meter reading) costs for turnout-level and lateral-level devices. After discussion with experts on the ASC, the high cost estimate for the lateral-level device was selected. Replacement costs for capital equipment were included using the 7-year expected life from the Cooperative Study. The capital costs at time of replacement were adjusted to reflect replacement rather than initial installation.

Repair or Modification of Existing Devices. It is anticipated that some fraction of existing devices that do not meet the proposed measurement requirements may be able to meet the requirement after repair or modification rather than full replacement by a new device. Generally applicable cost estimates are not available for such actions because of the very wide range of potential devices and repair or modification costs. After consultation with ASC experts, DWR staff made what it believes to be a reasonable estimate of the unit costs of repair or modification for purposes of this impact analysis.

Initial Assessment of Existing Measurement Devices. One of the ASC members provided an estimate of $1,000 per measurement device as a cost of initial assessment. Other experts on the ASC agreed that this was a reasonable estimate for purposes of this impact analysis. This cost was applied to the number of devices sampled in the initial assessment. The proposed regulation allows suppliers an option for calculating sample size, and a sample of 10 percent of total devices was used for purposes of this analysis.

Reporting and Administration. Two members of the ASC provided estimates of total additional administrative costs to gather, maintain, and report information on the accuracy of measurement devices. In order to apply the estimates to other suppliers and to the total potentially affected acreage, the estimates were converted into annual costs per irrigated acre, and a value within the range, $1.50 per acre, was selected as representative for purposes of this impact analysis.

Table 2 summarizes the unit costs used for the economic and fiscal impact analysis.

Table 2
Unit Costs of Measurement Devices

	Capital	O&M
Replacement of existing devices		
Turnout	$5,500	$1,100/yr
Lateral	$50,000	$10,000/yr
Repair and recalibration of existing devices		
Turnout	$1,500	$300/yr
Lateral	$15,000	$3,000/yr
Capital replacement factor [a]		
Turnout	80%	
Lateral	50%	

See text for description of data.
[a] The cost, as a percent of original capital, to replace components of a device every 7 years during the analysis period.

5.5 Current Condition of Measurement Devices

The total cost required for water suppliers to comply with the proposed regulation depends to a large degree on whether existing measurement devices meet the proposed measurement accuracy standard. No comprehensive survey has been completed to assess the current condition. The CALFED report (2003) faced the same problem, and asked a team of consultants with experience in different regions of California to develop a reasonable estimate of the current (at the time) condition. Their estimate is dated and not directly applicable for this impact analysis. DWR staff developed an assessment of the current condition of measurement devices, with input and review by ASC experts.

Existing measurement devices were grouped into three categories by region. The categories correspond directly to the required cost that would be needed to replace versus repair/modify devices. Table 3 summarizes the resulting judgments about current condition of devices. In each region, the numerical values in the table represent staffôs judgment about the proportion of devices that meet the proposed regulation, can meet it with repair or modification, or cannot meet it and require replacement.

5.6 Proportion of Area Using Turnout-level Measurement

The proposed regulation allows suppliers to measure deliveries upstream of delivery points to customers under defined conditions. These conditions are expected to occur for substantial areas within the Sacramento Valley. DWR staff developed its own estimate with input and review by ASC experts. For purposes of this impact analysis, it is assumed that half of the potentially affected irrigated acreage in the Sacramento Valley region would be measured at the lateral level. It is assumed for purposes of this analysis that suppliers in other regions use only turnout-level measurement.

5.7 Other Data and Assumptions

A 6% real discount rate was used when needed to convert annual costs to present value or up-front costs to annual costs. This rate is consistent with State guidelines for evaluating water resource projects and policies.

Both a 20-year and a 40-year time horizon were used for the cost analysis. The analysis is intended to represent the additional costs to suppliers and their customers relative to the costs that would be incurred in the absence of the proposed regulation. It is expected that existing measurement devices would be replaced over time with devices that would be likely to meet the proposed regulation. Reasons for this expectation include the new legislative requirement for pricing based in part on volume, and the range of local conditions of water cost and scarcity faced by suppliers. These will induce suppliers to improve measurement accuracy over time even in absence of the proposed regulation. The proposed regulation would not impose an unending cost burden on water suppliers, but it is uncertain how long the additional cost might last. Therefore, both a 20-year and a 40-year time horizon of additional cost were included.

Table 3

Assumed Current Condition of Measurement

Regions	Proportion of acreage already meeting the standard	Proportion that can meet standard with repair/modif. of existing device	Proportion requiring new devices
	For Measurement at Farm Turnouts		
Sacramento Valley	0.2	0.3	0.5
Delta	0.1	0.3	0.6
East San Joaquin Valley	0.4	0.4	0.2
West San Joaquin Valley	0.5	0.3	0.2
Southern San Joaquin Valley	0.7	0.2	0.1
Southern California, Coast, Other	0.4	0.3	0.3
	For Measurement at Laterals		
Sacramento Valley	0.2	0.4	0.4
Delta	na	na	na
East San Joaquin Valley	0	0.1	0.9
West San Joaquin Valley	0.1	0.3	0.6
Southern San Joaquin Valley	0.4	0.3	0.3
Southern California, Coast, Other	na	na	na

See text for process used to develop assumptions.

6.0 Results of Analysis

This section summarizes the results of the cost analysis used to support the Economic and Fiscal Impact Analysis for the proposed regulation. First, a set of best estimate costs are shown, expressed as the discounted present value of all costs and also as costs per irrigated acre. Both regional and statewide costs are shown, and the statewide cost estimates are used in Form 399: Economic and Fiscal Impact Statement. Second, the sensitivity of the results to some key assumptions is discussed. Finally, a brief discussion of benefits is presented.

6.1 Number of Measurement Sites Potentially Requiring Action

These estimates were derived using the estimated number of measurement sites shown in Table 1 and the assumed condition of those sites displayed in Table 3. Table 4 summarizes the results.

Based on the estimates and assumptions, suppliers serving more than 25,000 irrigated acres would need to repair or modify nearly 12,700 turnout measurement devices and install new devices on about 8,300 more. About 60 lateral-level measurement devices would need repair or modification, and another 60 would need new devices.

6.2 Estimated Regional and Statewide Costs

Table 5 summarizes the total costs by cost category, region, and supplier size. These estimates make use of the unit cost estimates discussed earlier, the number of existing devices needing repair/modification, and the number of new devices. So for example, the capital cost for a region includes the number of devices needing repair times the unit capital cost of repair, plus the number of sites needing new measurement devices times the unit cost of new devices.

Table 4

Estimated Number of Measurement Sites by Action Needed

Regions	Turnouts needing repair/ modif.	Turnouts needing new devices	Lateral sites needing repair/ modif.	Lateral sites needing new devices
	---------- Suppliers >25,000 Acres ----------			
Sacramento Valley	1,117	1,861	63	63
Delta	155	309		
East San Joaquin Valley	5,584	2,792		
West San Joaquin Valley	180	120		
Southern San Joaquin Valley	4,841	2,421		
Southern California, Coast, Other	805	805		
Total	12,682	8,308	63	63
	---------- Suppliers 10,000-25,000 Acres ----------			
Sacramento Valley	303	505	17	17
Delta	258	516		
East San Joaquin Valley	403	201		
West San Joaquin Valley	207	138		
Southern San Joaquin Valley	417	209		
Southern California, Coast, Other	483	483		
Total	2,071	2,052	17	17

Assumes 50% of Sacramento Valley acreage measured at the lateral and 50% at the turnout

Table 5

Estimated Regional and Statewide Costs to Comply with Proposed Regulation

Regions	Initial Assessment ($)	Capital ($)	O&M ($/yr)	Reporting and Admin. ($/yr)
	---------- Suppliers >25,000 Acres ----------			
Sacramento Valley ï Turnout-level	372,268	11,912,589	2,382,518	446,722
Sacramento Valley ï Lateral-level	158,412	4,118,714	823,743	446,722
Delta	51,520	1,932,000	386,400	38,640
East San Joaquin Valley	1,395,966	23,731,429	4,746,286	837,580
West San Joaquin Valley	60,108	931,667	186,333	90,161
Southern San Joaquin Valley	2,420,670	20,575,697	4,115,139	2,178,603
Southern California, Coast, Other	268,343	5,635,200	1,127,040	281,760
Total	4,727,288	68,837,296	13,767,459	4,320,189
	---------- Suppliers 10,000-25,000 Acres ----------			
Sacramento Valley ï Turnout-level	101,053	3,233,681	646,736	121,263
Sacramento Valley ï Lateral-level	43,001	1,118,028	223,606	121,263
Delta	86,004	3,225,141	645,028	64,503
East San Joaquin Valley	100,645	1,710,965	342,193	60,387
West San Joaquin Valley	68,914	1,068,171	213,634	103,371
Southern San Joaquin Valley	208,694	1,773,897	354,779	187,824
Southern California, Coast, Other	161,086	3,382,806	676,561	169,140
Total	769,397	15,512,688	3,102,538	827,751

All costs are in 2010 $. Initial assessment and capital costs occur once, and O&M and reporting and administration are annual costs. Capital replacement costs are not shown in this table but are included in subsequent total cost estimates.

6.3 Summary of Costs to Suppliers Greater than 25,000 Irrigated Acres

Table 6 provides a statewide summary of all anticipated costs based on the data, assumptions and calculations described above. It includes only costs for the water suppliers serving more than 25,000 acres. These are the costs that the suppliers are expected to bear and they would pass the costs onto growers and landowners in the form of higher water rates and assessments.

The average farm costs represent a statewide average and would not apply to every acre or farm in the State.

- Costs and acreage account only for potentially affected acreage. Lands in unaffected areas (suppliers less than 25,000 acres, individual groundwater or surface diverters, suppliers with CVP Water Management Plans, and QSA signatories) are not included. Farms in these unaffected areas would not bear any of the costs estimated above.
- Even within affected suppliers, the cost estimates account for a range of conditions, including: measurement devices that already meet the standard (and so require no additional cost), devices that need repair or modification and new devices. Costs and acreage in all three categories are added and shown as a total cost, average per-acre cost and average per-farm cost.
- Water suppliers may choose to recover these costs in different ways. The summary costs per-acre and per-farm are averages and do not include any assumption about how suppliers will recover costs ï that is beyond the intent of this analysis. For example, a supplier could recover costs from all growers and landowners regardless of the condition of the measurement device on any particular turnout. Alternatively, a supplier could recover costs by assessing only those landowners whose turnout has a measurement device needing replacement or repair. In this latter case, the capital cost per farm could range from zero up to a large amount to replace a number of measurement devices. Table 2 summarizes the cost per device.

The example 20-acre farm costs in Table 6 are calculated using the median farm size in California reported in the 2007 Census of Agriculture (U.S. Department of Agriculture, 2009). The median farm is substantially smaller than the average farm because of the large number of very small farms in the state. The census definition of a farm is ñany place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census yearò. In other words, a farm does not even need to sell a product commercially. As a result, a large number of very small agricultural holdings are considered farms, even though they account for a relatively small portion of total irrigated acreage. Nevertheless, small farms could be affected by the proposed regulation if they receive water from a potentially affected agricultural water supplier.

The example is for a 20-acre farm served by one turnout and billed by the water supplier for the cost of the initial assessment, replacement with a new measurement device, and ongoing operation and maintenance of the new device. In addition, the farm would pay its proportionate share of administrative and reporting costs. This example is provided only to illustrate how costs of the proposed regulation could affect a very small farm. Actual costs to small farms would vary significantly, depending on a farmôs water supplier, its number of turnouts, condition of existing measurement devices and the cost recovery policies of its water supplier.

Table 6
Summary of Statewide Costs,
Suppliers greater than 25,000 irrigated acres

Present Value (PV) of Cost ($)	20-Year Horizon	40-Year Horizon
PV of capital and initial assessment	66,668,000	69,668,000
PV of annual O&M, capital replacement, administration and reporting	263,703,000	359,874,000
Total PV	333,371,000	429,542,000
Costs for average-sized farm		
Total affected acres	2,880,126	2,880,126
Initial cost per affected acre ($)	24.20	24.20
Annual ongoing cost per affected acre ($)	8.00	8.30
Average farm size	313	313
Average initial cost per affected farm ($)	7,570	7,570
Average annual ongoing costs per affected farm ($)	2,500	2,600
Costs for example 20-acre farm		
Initial cost per affected acre ($)	325.00	325.00
Annual ongoing cost per affected acre ($)	58.20	58.50
Example farm size	20	20
Average initial cost per affected farm ($)	6,500	6,500
Average annual ongoing costs per affected farm ($)	1,165	1,170

6% discount rate; Assumes capital costs are Incurred up front and replaced as needed.

Average farm size in California from 2007 Census of Agriculture.

Costs for average-sized farm are averaged over all potentially affected acres and farms. Costs to individual businesses could vary substantially from the average.

Costs for example 20-acre farm assume it would be assessed the cost of initial assessment, replacement, and O&M for one turnout measurement device.

6.4 Summary of Costs to Suppliers between 10,000 and 25,000 Irrigated Acres

Water suppliers serving between 10,000 and 25,000 irrigated acres are not required to meet the proposed measurement requirements unless they are provided with sufficient funding. If the State were to provide such funding, Table 7 provides the estimates of the total costs. Costs per acre and per farm are not included because the costs would not be passed on to individual farms.

Table 7
Summary of Statewide Costs
Suppliers between 10,000 and 25,000 irrigated acres
Assume Capital Costs Are Incurred Up Front

Present Value (PV) of Cost ($)	
PV of capital and initial assessment	15,404,000
PV of annual O&M, capital replacement, administration and reporting	57,694,000
Total PV	73,098,000

6% discount rate; 20-year time horizon over which regulation imposes significant additional cost.

6.5 Other potential costs

Other categories of costs could be required of some suppliers and have not been estimated here. These include:

- Costs to finance capital expenditures. These could include costs to conduct bond feasibility studies and costs to issue and insure bonds
- Costs to revise the supplierôs capital improvement plans to incorporate new spending
- Costs to modify other aspects of the supplierôs delivery system to accommodate new or modified measurement devices
- Costs to hold an approval vote for increased rates or assessments as may be required by Proposition 218.

6.6 Uncertainty in Data, Assumptions and Results

As the description of the data, assumptions, and calculations presented above should make clear, the cost estimates presented in this analysis are highly uncertain and therefore very approximate. Key uncertainties and implications include the following:

Affected Suppliers and Acreage. The list and irrigated acreage of affected suppliers is likely incomplete. DWR continues to modify the list with new information. In particular, the list probably excludes some wholesale suppliers that may be subject to the proposed

regulation. The list may double count some acreage in cases where suppliers have merged in the last few years. Finally, the estimates of irrigated acreage are not consistently defined across suppliers. Overall, the list and sizes of potentially affected suppliers needs further improvement but it is accurate enough to provide decision makers with a reasonable assessment of economic and fiscal impacts.

Number of Potentially Affected Measurement Sites. The estimated number of affected measurement sites is based largely on earlier estimates from the 2003 CALFED report and not on any recent survey. The estimates could be too high or too low. Also, the assessment of the current condition of measurement devices (Table 3) represents no more than a set of educated guesses by staff and selected experts on the ASC. Again, no survey information is available to provide more accurate data. Also, the affected acreage that might be served by lateral-level measurement devices is not known. In order to provide a conservatively higher estimate of costs, only a portion of the Sacramento Valley region was assumed to use lateral-level measurement.

Costs for New Devices. Unit costs to install, operate, and maintain measurement devices are based on a recent study, but are nevertheless rough estimates. Costs are highly dependent on site conditions, local labor costs, choice of measurement device, materials costs and other factors. As an example of other measurement cost estimates, IID (2007) developed costs to upgrade its existing meter gates to support greater measurement accuracy and to verify water conservation. The cost to install, for example, a magnetic flow meter in an existing turnout structure was estimated to cost $14,000, with additional O&M of $420 per year. Expected life of the equipment was estimated to be twenty years. IID further refined those costs during the implementation phase of its System Conservation Plan (IID, 2009). Capital plus installation costs for turnout upgrades sufficient to meet the proposed accuracy standard, but without SCADA or full automation, ranged from $7,300-$10,000 per turnout. Using the higher cost estimate ($14,000 initial cost and $420 per year O&M), with capital replacement after 10 years to be conservative, raises the 20-year present value of cost slightly from $333 million (see Table 6 above) to $341 million. The small increase is the combination of a higher initial capital cost but a longer useful life and a much lower annual O&M.

Initial Assessment. Costs of initial assessment are also highly uncertain and vary depending on water supplier circumstances. For example, some suppliers have suggested that they will need to assess all existing measurement devices even though the proposed regulation specifies that only a sample is required.

Accounting for Net Changes in Costs. Some suppliers may already have reporting mechanisms, data control, and administrative processes that will easily support the requirements of the proposed regulation at little additional cost. Further, suppliers would incur costs of measurement, device O&M, and capital replacement even in the absence of the proposed regulation. Some of the cost components included here, such as for O&M on new devices, are totals for the new device rather than the net increase for the new device relative to the existing device. Finally, suppliers are likely to develop cost-saving ideas as they assess and implement capital improvements.

Time Pattern of Implementation. Costs are discounted to the present using the Stateôs 6% real discount rate for water project evaluation. Discounting means that the timing of costs (i.e., when they are incurred during the planning horizon) can have a large influence on the present value. The cost estimates above assume that all needed capital expenditures occur at the beginning of the horizon ï within the first year of implementation. If instead the capital costs could be phased in over a longer period, the present value of costs would decline significantly. The additional O&M on new devices would also be delayed.

Overall Range of Uncertainty. Given such a range of uncertainties, any ñrigorousò method to develop a range of costs would require as many or more assumptions as developing a single cost estimate. The high level of uncertainty and judgment used to develop the cost estimate suggests a wide range around the 20-year present value cost of $333 million. Consistent with the AACE (1997) standard classification for a Class 5 estimate, a +100%/-50% uncertainty band is appropriate for such a screening-level estimate.

6.7 Benefits of Water Measurement Regulation

Benefits are not estimated quantitatively, and are even difficult to describe in a way that focuses solely on the water measurement regulation. The regulation does not require measurement per se; agricultural water suppliers were already required to measure and report aggregate water deliveries. The regulation is mandated by SBx7-7 to provide for a range of options that suppliers may use to measure water delivered to customers. More accurate measurement also can enable the implementation of volumetric water pricing, therefore providing the potential for price-induced reductions in farm water use and possibly off-setting the cost of compliancy with the regulation.

In general terms, the benefit of the proposed regulation is to support both statewide and local objectives to improve water management and to support the specific goals of reporting of aggregate deliveries and enabling pricing in part by volume. More accurate measurement provides better information for water suppliers, their customers, and the State.

References

AACE (Association for the Advancement of Cost Engineering), 1997. AACE Cost Estimate Classification System. Recommended Practice No. 17R-97. Morgantown, WV.

CALFED, 2003. Final Report of the Independent Panel on Appropriate Agricultural Water Measurement. California Bay-Delta Authority, Sacramento, CA.

DWR (California Department of Water Resources). Unpublished information compiled on the number and size of agricultural water suppliers potentially affected.

Glenn Colusa ID, 2011. Cost information submitted in response to DWR request to Agricultural Stakeholder Committee.

Imperial Irrigation District, 2007. Efficiency Conservation Definite Plan. Appendix 1.c - Improved Delivery Measurement. Imperial, CA.

Imperial Irrigation District, 2009. System Conservation Plan (information provided to Agricultural Stakeholder Committee by IIDôs representative). Imperial, CA.

Oakdale ID, Modesto ID, and Turlock ID (joint response), 2011. Cost information submitted in response to DWR request to Agricultural Stakeholder Committee.

Richvale ID, 2011. Cost information submitted in response to DWR request to Agricultural Stakeholder Committee.

SRSC (Sacramento River Settlement Contractors) and USBR, 2010. Cooperative Water Measurement Study Report. Report prepared by CH2MHILL and MBK Engineers.

U.S. Department of Agriculture. 2009. 2007 Census of Agriculture. Washington, D.C.

EXHIBIT 1

MEMORANDUM

To: ASC members
From: CCP on behalf of DWR, Water Use and Efficiency Branch
Date: February 2, 2011
Subject: Request for Information on Economic and Fiscal Impacts

DWR is required to prepare and submit an Economic and Fiscal Impact Statement for its proposed regulation on agricultural water measurement options. Staff is beginning to compile information on the costs that may be required to implement, and would like your assistance in identifying some initial information. Staff is not asking suppliers or others to make their own assessment of impacts, although if any have done that, DWR would like that information to consider. DWR also recognizes that some impacts will depend on the final language in the proposed regulation. However, based on the measurement options and approach that are taking shape in recent meetings, please provide the following: any reports, studies, plans, or formal documents that include costs of design, measurement device, installation, maintenance, and operations. The information provided will be part of the information record. So, be cautious not to provide proprietary information. The categories of costs we would be interested to receive are:

- Categories of costs that might be imposed on local governments. The major categories would include:
    - Initial assessment of measurement devices
    - Installation of new devices or repair/adjustment of existing devices, as needed
    - On-going O&M of upgraded measurement devices (the incremental change in cost compared to what the supplier would have spent in the absence of the regulation)
    - Periodic re-testing and certification
    - Record-keeping, training, other administrative costs.

  Are there other categories DWR should include? Are there levels of local government other than the water suppliers that might incur costs?
- Categories of costs that might be imposed on private individuals and businesses. Obviously, costs imposed on water suppliers will be passed on to their individual customers. Aside from these, are there additional out-of-pocket costs or other restrictions on operations that DWR should consider?

- Other information on the kinds of workers, training, and annual cost per worker for those you anticipate could be needed to meet the measurement regulations. Consider time required for engineers, maintenance technicians, ditch riders, administrative staff, etc. (Note: consider only those categories that might be needed to support the measurement requirement itself ï not volumetric pricing or annual reporting of aggregated delivery).
- Your recommendations on level of detail for the cost analysis. It is unlikely that DWR will have the time or information to evaluate every water supplier that might be affected, so a more aggregated approach will be used. What level of aggregation would be sufficient? Consider geographic regions and categories of suppliers (for example, based on existing delivery system and measurement devices)
- Any specific study or other information that documents quantitative benefits from agricultural water measurement.

Please submit your information by February 17, to:

Baryohay Davidoff
Department of Water Resources
Statewide Integrated Water Management
Water Use & Efficiency Branch
901 P Street, Room 313-A
Sacramento, CA 95814-6431

Or you may e-mail any materials to:
agwue@water.ca.gov

If you would like to discuss the cost issues with DWR staff, you may call DWR Economist Lorraine Marsh at (916) 653-6414.