D E L T A W E T L A N D S P R O P E R T I E S

November 18, 2011

Ms. Barbara Evoy, Deputy Director
Division of Water Rights
P.O. Box 2000
Sacramento, CA, 95812-2000

Dear Ms. Evoy:

Subject: Comment Letter – Water Measurement

In response to the State Water Resources Control Board's (SWRCB) Notice of Opportunity to Comment on the Guidance for Complying with Water Diversion Measurement Requirements for Statement Holders (Guidance) and the proposed revisions to the Supplemental Statement of Water Diversion and Use reporting form for 2012 (Statement Forms), Delta Wetlands Properties provides the following comments to inform the SWRCB and Division of Water Rights (Division) staff concerning the local cost effectiveness of implementing measurement practices in the Delta pursuant to Section 5103(e)(1) of the Water Code.

As background, Delta Wetlands owns and operates properties on four Delta islands, Bouldin Island, Webb Tract, Bacon Island and Holland Tract. Diversions to Delta Wetlands properties are made under riparian and pre-1914 water rights through siphons at 90 separate locations. These diversions are documented in statements of water diversion and use on file with the Division. Summer irrigation diversions are also covered under post-1914 appropriative water right licenses held by the reclamation districts for each of the islands.

Delta Wetlands has evaluated the cost effectiveness of installing and maintaining measurement devices at each of its points of diversion in accordance with Section 5103(e)(1). Enclosed is a memorandum prepared by MBK Engineers which has been submitted to the Division to provide documentation that implementation of measurement practices in accordance with Section 5103(e)(1) at the 35 points of diversion on Bouldin Island is not locally cost effective. The memorandum concludes that the benefit to cost ratio of installing and maintaining devices capable of measuring diversions on Bouldin Island is approximately 0.23, well below 1.0, and therefore, implementation of these practices and technologies is not locally cost effective.

1660 Olympic Boulevard, Suite 350
Walnut Creek, CA 94596
Telephone (925) 932-0251 Fax (925) 932-0277

Similar analyses have submitted to the Division by Delta Wetlands identifying that it is not locally cost effective to implement measurement practices on Webb Tract, Bacon Island, and Holland Tract.

As identified in the enclosed memorandum, prior to the 2009 changes to the Water Code, diversions within the Delta were exempt from the measurement and reporting requirements. This was due in large part to the fact that no feasible method has been developed for accurately measuring gravity diversions through siphons and tide gates in tidal channels. In addition, because the elevation of the islands in the in the Delta Lowlands are below the level of the adjacent waterways, significant quantities enter the islands through seepage. This seepage is a major component of water use in the Delta. Measuring and monitoring only diversions through siphons in the Delta does not fully account for the quantities of seepage onto the islands and the amount returned back into Delta Channels from the pumping plants; and therefore, provides little useful information for Delta planning and operational purposes. For these reasons and others, we believe estimates of consumptive use, as have been used historically, provide better information than individual diversion quantities regarding the impacts of water use in the Delta.

Please call if you have any questions.

Sincerely,

David A. Forkel
Assistant General Manager

Enclosure

cc: Mr. Gary Kienlen
MBK Engineers

1660 Olympic Boulevard, Suite 350
Walnut Creek, CA 94596
Telephone (925) 932-0251 Fax (925) 932-0277

MBK ENGINEERS

Resources • Flood Control • Water Rights

MEMORANDUM

DATE: November 14, 2011

TO: Delta Wetlands Properties – Bouldin Island

FROM: Bryan Busch

SUBJECT: Cost Effectiveness of Implementing Flow Measurement Practices on Bouldin Island

Pursuant to the recently updated Water Code Section 5101 (W.C. 5101), all diverters of surface water, including riparian and pre-1914 diverters, with a few exceptions, must file Statements of Water Diversion and Use (Statements), providing monthly records of measured water diversions. The measurements must utilize best available technologies and best professional practices to provide accurate measurement of monthly diversions, unless documentation demonstrates that the implementation of the flow measurement practices are not locally cost effective. (W.C. 5103(e)(1))

The purpose of this memorandum is to document the cost effectiveness of measuring the monthly diversions at each point of diversion on Bouldin Island. The memorandum focuses on determining the local costs and benefits of measurement at each diversion.

Background

Bouldin Island is adjacent to the small community of Isleton, and about 15 miles northwest of Stockton, at the confluence of the San Joaquin and Mokelumne Rivers. It is bounded by Potato Slough, Little Potato Slough, and South Fork Mokelumne River. Elevations range from about ten feet below mean sea level in the peripheral areas to nearly twenty-two feet below mean sea level in the south central part of the island. The land was originally reclaimed in 1871 by surrounding the island with a levee system and installing pumps to remove excess water. Reclamation District 756 (District) was formed in 1904 and is responsible for all levee and pump maintenance on the 6,006 acre island. Water users operate and maintain their own combination irrigation distribution and drainage systems. Drainage from the individual drainage systems, including both runoff and seepage, are routed to centralized drains and pumped off the island by the District.

Irrigation water for a diversified crop mix, including corn, rice, wheat, and fresh market tomatoes is diverted through thirty-five 12-inch to 24-inch siphons from the adjacent rivers and sloughs. Diversions to Delta islands are unique in that most fields have individual diversion points, consisting of siphons over the levee to the adjacent channel. Bouldin Island has 35 diversion points for the approximately 4,678 irrigated acres. Water diverted from the siphons is comingled and distributed over the island through an integrated irrigation canal network. Two

large pump stations provide the infrastructure for six pumps that drain water off the island and into the adjacent Delta channels. The water pumped off of the island is a combination of tailwater from irrigation, seepage, and rainfall runoff.

The island is within the Delta Lowlands; therefore, the entire island is believed to have riparian status according to the 1956 Cooperative Study Program, which was completed by the U.S. Bureau of Reclamation (USBR), the Department of Water Resources (DWR), and the SRDWA as a result of the State Water Resources Control Board (SWRCB) Decision 990. Bouldin Island also claims pre-1914 appropriative water rights. The District, which encompasses all of Bouldin Island, holds License 1405 (Application 2948) for the appropriation of 71.56 cfs from about March 1, to about November 1, to be used within the entire island. All diversions for the months of March through October are reported on Reports of Licensee for License 1405. In accordance with W.C. 5101, diversions during the remainder of the year, November through February, made under riparian and pre-1914 rights are now reported on a Statement initially filed in June 2010. (As of the date of this memorandum, a Statement Number has yet to be assigned by the Division of Water Rights.)

Prior to 2009, diversions in the Delta were exempt by the Water Code from any measurement or reporting requirements. This exemption was largely due to hydraulic and economic problems associated with measurement of gravity diversions through siphons. The Delta Lowlands Service Area Investigations reports prepared by the USBR identify that:

> *However, no feasible method has been developed for accurately measuring net flows in tidal channels, and the combination of hydraulic and economic problems involved in determining the quantities of water diverted through the very large number of tide gates and siphons precluded measurement of the bulk of the water used in the irrigation of the Delta Lowlands. Therefore, water used within the area has historically been estimated by the consumptive-use method utilizing available crop data and results of special studies in selected areas.*

Since Bouldin Island's estimated diversions were included in the consumptive use data for the Delta published by the DWR in its hydrologic data bulletins, measurement and diversion reports were exempted under the Water Code. Changes to the Water Code eliminated the exemption after January 1, 2009. Currently, neither Bouldin Island water users nor the District measures volumes and/or flow rates of diversions. Consumptive use has been and can be estimated based on cropping data and crop water requirements.

In addition to eliminating the exemption, the revisions to the Water Code require accurate diversion flow measurements using best available technologies and best professional practices, beginning January 1, 2012. The Water Code provides an exemption if it can be demonstrated that the implementation of the measurement practices are not locally cost effective. This memorandum is to provide the documentation regarding the cost effectiveness of installing and maintaining flow measurement devices at each of the 35 points of diversion on Bouldin Island.

Measurement Costs

To determine the costs associated with measuring diversions to Bouldin Island, a conceptual measurement program was developed. The program utilizes the minimum technology required to comply with the requirements of W.C. 5103(e)(1). Factors that influence the selection of equipment for the measurement program included: adaptability to site conditions, need for totalized volumetric flow, ability to pass sediments and debris, and installation and maintenance requirements. Potential measurement devices considered included: propeller, venturi, orifice, magnetic, and Doppler flow meters. Only two of these are capable of passing large sediment and debris loads; magnetic and Doppler flow meters. The following is a description of these two devices:

Magnetic Flow Meters. A magnetic flow meter measures flow rates and volumes, and does not have any moving parts, which is ideal for wastewater applications. The operation of a magnetic flow meter is based upon Faraday's Law, which states that the voltage induced across any conductor as it moves at right angles through a magnetic field is proportional to the velocity of that conductor. Magnetic flow meters are ideal for applications where low pressure drop and low maintenance are required. The Siemens Sitrans F M Mag 8000 and the Seametrics AG2000 magnetic flow meters are both powered by a six-year maintenance-free battery, and measure velocity within ±0.4% according to the manufacturer's rating. The flow meters include flow totalizing capabilities which would assist in fulfilling the reporting requirements with minimal visits to the field. Magnetic flow meters have a high initial cost; however, the low maintenance requirements keep the annualized costs to a minimum.

Doppler Flow Meters. Doppler flow meters are capable of measuring flow rate and volume; and do not have any moving parts, which is ideal in wastewater and high debris applications. Doppler flow meters operate by transmitting an ultrasonic (sound) wave into the flow. This sound wave is reflected by acoustically reflective particles (air bubbles, suspended solids) and the instrument detects the reflected frequencies. The difference between the transmitted frequency and the received frequencies is directly proportional to the velocity of the stream flow. The Mace FloSeries3 Agriflow is a Doppler flow meter with pipe insert sensor and comes with an optional solar power source and internal battery. The manufacturer states the accuracy of the device to be better than ±2%. The Mace Doppler meter is designed to measure flow in pipes from 4" to 100" with no difference in cost. The Mace Doppler meter is an inexpensive solution to measuring flow rates in a large diameter pipe.

Based on a cost comparison, it was determined that of the two devices selected for the measurement program, magnetic meters are more cost effective for siphons with 16-inch or smaller diameters; and Doppler flow meters are more cost effective for siphons with diameters greater than 16-inches. Attachment A provides details on the estimated annualized costs for the installation, maintenance, data collection, data analysis, and quality control for 35 flow meters required to measure diversions on Bouldin Island. The labor rate for data management tasks is based on an average labor rate of an engineer or field technician. The installation and maintenance labor costs are assumed to be contractor costs with prevailing wage requirements. The costs of installation and the device are based on a 10-year life at a 6 percent rate. Table 1 summarizes the annualized costs associated with the conceptual measurement program developed for Bouldin Island.

Table 1. Annualized Cost of a Conceptual Measurement Program for Bouldin Island

Meter Type/size	Number of Meters	Annualized Cost per Meter	Total Annualized Cost
Siemens FM MAG 8000 12" Meter	15	$2,010	$30,150
Siemens FM MAG 8000 14" Meter	9	$2,230	$20,070
Siemens FM MAG 8000 16" Meter	6	$2,380	$14,280
Mace Agriflow Ultrasonic Meter	5	$2,480	$12,400
Total	35		$76,900

As shown in Table 1, the total estimated annualized cost for flow measurement at Bouldin Island is $76,900 per year, or approximately $16.44 per irrigated acre per year for the 4,678 irrigated acres.

Measurement Potential Benefits

Measurement in and of itself does not provide a local benefit either to Bouldin Island or the individual water user. That said, many of the diversions to Bouldin Island serve only a few fields; and thus, flow measurement may be useful as a management tool for on-farm irrigation scheduling. While improved on-farm irrigation scheduling can increase on-farm water use efficiency, it does not change the consumptive use on the island.

Excess water diverted onto Bouldin Island has only two possible destinations (1) pumped outflows and (2) evaporation and transpiration. Deep percolation does not occur on Delta islands due to high water tables; and any excess water diverted is pumped back into the Delta channels with minimal losses. Surface evaporation on the island remains relatively constant independent of diversions because most of the time, irrigation, and drainage canals remain wet due to seepage from the high water tables. Further, any changes in crop evapotranspiration will affect yield, so consumption from crops should not change if cropping patterns and production remain relatively constant. Therefore, improved on-farm irrigation efficiency would not increase the water supply downstream of the island.

The following were identified as potential local benefits to Bouldin Island and its water users as a result of measuring of diversions:

- Income from water transfers
- Reduced operation costs

Income from Water Transfers

DWR and the Bureau of Reclamation have raised concerns relative to the transfer of water from Delta Islands. In fact, since the 1992 Drought Water Bank, few, if any, transfers involving Delta Islands have been approved. The Guide to Water Transfers published by the SWRCB (July 1999 draft) state that if a *"water user wanted to apply this saved water to a new place of use, as would be the case in a water right transfer, the "no injury" rule would apply to the requested change. In many cases, surface return flows are captured by downstream users. If*

the requested change for the purposes of the transfer would affect the availability of water for the downstream users, regardless of the water right priority of those users, the water transfer would not be allowed under the "no injury" rule." Further, following the 2009 Drought Water Bank, DWR prepared a set of papers identifying issues that needed to be resolved for future water transfers (Draft Issue Papers). Included in the issues identified by DWR are several related to water transfers from the Delta. Concerns included baseline ETAW for the Delta region from which conserved water from crop idling programs would be measured, high water tables which could result in the need for intensive weed abatement programs and high bare soil evapotranspiration, and other issues. To date, the issues identified in the Draft Issue Papers related to water transfers from within the Delta have yet to be resolved and transfers of conserved water from the Delta region have not been approved. If water cannot be transferred from the Delta, there are no revenues for conserving water.

Reduced Operation Costs

One measureable benefit resulting from increased on-farm efficiency resulting from improved irrigation scheduling is the potential power savings from reduced drain-water pumping. The District estimates annual pumping costs of $125,493 for removing excess water from the island. However, reducing diversions will not decrease the portion of drain-water pumping due to seepage and rainfall runoff. In order to estimate the potential reduction in drain water pumping on Bouldin Island due to the improved irrigation scheduling, data from the "Delta Monthly Water Budgets for Operations Modeling of the Delta Wetlands Project" (Model) contained in the 1995 "Delta Wetlands Draft EIR/EIS" was used. The Model provides the following estimates for the Delta.

- Average Rainfall 16.3 inches per year,
- Seepage of 12 inches per year,
- Diversion for irrigation and leaching 42.1 inches per year
- Evapotranspiration of 31.2 inches, and
- Total drain-water pumping 39.2 inches.

A survey done by U. C. Berkley on the benefits from using the California Irrigation Management Information System (CIMIS) (Eching 2003) estimated the average reduction in applied water due to improved scheduling to be 13%. Based on the above, irrigation scheduling could result in reducing diversions for irrigation of approximately 5.5-inches per acre per year (42.1 inches/acre/year x 13%). Irrigation scheduling will not reduce pumping required to remove excess rainfall runoff or seepage from the Island. Therefore, the maximum reduction in drain-water pumping resulting from diversion measurement and improved irrigation scheduling is estimated to be 5.5 inches per acre per year or approximately 14% of the total drain-water pumping identified in the 1995 EIR/EIS. Reducing Bouldin Island's annual pumping costs of $125,493 by 14% results in an annual savings of approximately $17,796, or about $3.80 per acre, per year for the 4,678 irrigated acres.

Cost Effectiveness

Two potential local benefits from measurement of diversion on Bouldin Island were identified; transfer of conserved water, and reduced costs associated with a reduction in drain-

water pumping. As identified above, although improved irrigation scheduling as a result of measuring diversions may result in a reduction in the quantity of water diverted to Bouldin Island, no reduction in consumptive use will occur. The current rules for transfers involving conserved water require a demonstration that there has been a reduction in consumptive use, not just a reduction in the quantity diverted. Therefore, increases in on-farm efficiency from diversion measurement and irrigation scheduling do not result in transferable water. Irrigation scheduling does, however, have the potential to reduce costs associated pumping drain-water from the island. The estimated costs and benefits of a diversion measurement program for Bouldin Island are summarized in the table below.

The analysis includes only the cost associated with measuring the flow rate and total volume data-logging to comply with W.C. 5103(e)(1). The analysis does not include costs for training water users how to use the measurements and the CIMIS system to improve scheduling, and assumes that irrigation scheduling would improve on-farm irrigation by an average of 13% on all of the irrigated lands on Bouldin Island.

Table 2. Summary of Estimated Annual Benefits and Costs

	Annual	**Per Irrigated Acre**
Power Savings	$17,796	$3.80
Cost of Flow Measurement	$76,900	$16.44
Benefit/Cost Ratio		0.23

As shown in Table 2, the benefit/cost ratio associated with installing and maintaining measurement devices at the 35 points of diversion on Bouldin Island is well below 1.0. Therefore, based on this analysis, implementation of a flow measurement practice for Bouldin Island is not locally cost effective.

Conclusions

Bouldin Island has 35 points of diversion serving 4,678 acres of irrigated land. Diversion measurement equipment is expensive, especially when the cost of installation, maintenance, calibration, administration, and data management is considered. The reduction in power consumed by pumping less drain-water due to reduced operational spills and improved irrigation scheduling does not offset the cost of measuring diversions using best available technologies and best professional practices. As demonstrated in the benefit/cost analysis, implementing the measurement practices on Bouldin Island pursuant to WC§ 5103(e)(1)is not locally cost effective.

Bryan Busch

BB/ps
2530/DELTA WETLANDS PROPERTIES - BOULDIN 2011-11-14.DOCX

Attachment A. Analysis of Annualized Flow Meter Costs

Estimated Expenses for Mace Ultrasonic Flow Meter (4" to 100" Diameter pipe)

Equipment, Installation, and Calibration		
Contact: Ken Hoffman Instrumart Cell: 802-863-0085 Fax: 802-863-1193 khoffman@instrumart.com www.instrumart.com		
MACE Agriflo:		
Mace FloSeries3 AgriFlo Ultrasonic Flow Meter Logger		$1,693
Mace Insert Doppler Ultrasonic Flow Sensor		$1,671
Mace Solar Power Supply		$225
	Subtotal	$3,589
Installation/Setup		
Galvanized Pipe to mount display and solar panel		$200
Pipe fittings; nipple, ball valve, tank flange		$100
PVC fittings; 30' pipe, 90 deg elbow, TA, clamps		$50
Install (8 hours for 2 man crew @ $50/hour)		$800
Set up and test (8 hours for 2 man crew @ $100/hour)		$1,600
	Subtotal	$2,750
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$6,339
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$861
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
General maintenance and downloading (6 hours @ $50/hour)		$300
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (8 hours @ $100/hour)		$800
New battery every 3 years ($60 / battery)		$20
	Subtotal	$1,620
Total Annualized Cost Per Site:		$1,620
Annualized Cost Per Site for Flow Measurement:		**$2,481**

Estimated Expenses for Siemens Mag Flow Meter (24" Diameter pipe)

Equipment, Installation, and Calibration		
Contact: Brian Jensen HD SUPPLY Water Works Phone: 714-292-9480 Fax: 559-421-0399 1122 Joellis Way Sacramento, Ca. 95815		
Siemens Battery Operated Mag Meter:		
24" Siemens SITRANS FM MagFlo MAG 8000		$8,728
tax and shipping		$1,047
	Subtotal	$9,775
Installation/Setup		
Pipe flanges		$800
Hardware; bolts, nuts, washers, gaskets		$300
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$3,500
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$13,275
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$1,804
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$2,918**

Attachment A. Analysis of Annualized Flow Meter Costs

Estimated Expenses for Siemens Mag Flow Meter (18" Diameter pipe)

Equipment, Installation, and Calibration	Contact: Brian Jensen HD SUPPLY Water Works Phone: 714-292-9480 Fax: 559-421-0399 1122 Joellis Way Sacramento, Ca. 95815	
Siemens Battery Operated Mag Meter:		
18" Siemens SITRANS FM MagFlo MAG 8000		$6,382
tax and shipping		$766
	Subtotal	$7,147
Installation/Setup		
Pipe flanges		$700
Hardware; bolts, nuts, washers, gaskets		$300
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$3,400
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$10,547
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$1,433
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$2,547**

Estimated Expenses for Siemens Mag Flow Meter (16" Diameter pipe)

Equipment, Installation, and Calibration	Contact: Brian Jensen HD SUPPLY Water Works Phone: 714-292-9480 Fax: 559-421-0399 1122 Joellis Way Sacramento, Ca. 95815	
Siemens Battery Operated Mag Meter:		
16" Siemens SITRANS FM MagFlo MAG 8000		$5,716
tax and shipping		$686
	Subtotal	$6,402
Installation/Setup		
Pipe flanges		$400
Hardware; bolts, nuts, washers, gaskets		$150
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$2,950
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$9,352
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$1,271
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$2,385**

Attachment A. Analysis of Annualized Flow Meter Costs

Estimated Expenses for Siemens Mag Flow Meter (14" Diameter pipe)		
	Contact: Brian Jensen HD SUPPLY Water Works Phone: 714-292-9480 Fax: 559-421-0399 1122 Joellis Way Sacramento, Ca. 95815	
Equipment, Installation, and Calibration		
Siemens Battery Operated Mag Meter:		
14" Siemens SITRANS FM MagFlo MAG 8000		$4,750
tax and shipping		$570
	Subtotal	$5,320
Installation/Setup		
Pipe flanges		$350
Hardware; bolts, nuts, washers, gaskets		$150
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$2,900
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$8,220
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$1,117
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$2,231**

Estimated Expenses for Siemens Mag Flow Meter (12" Diameter pipe)		
	Contact: Brian Jensen HD SUPPLY Water Works Phone: 714-292-9480 Fax: 559-421-0399 1122 Joellis Way Sacramento, Ca. 95815	
Equipment, Installation, and Calibration		
Siemens Battery Operated Mag Meter:		
12" Siemens SITRANS FM MagFlo MAG 8000		$3,383
tax and shipping		$406
	Subtotal	$3,789
Installation/Setup		
Pipe flanges		$300
Hardware; bolts, nuts, washers, gaskets		$100
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$2,800
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$6,589
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$895
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$2,009**

Attachment A. Analysis of Annualized Flow Meter Costs

Estimated Expenses for Seametrics Mag Flow Meter (10" Diameter pipe)

Equipment, Installation, and Calibration		
Contact: Tony Pereira Advanced Water Products Cell: 559-846-6569 Fax: 559-846-7655 awp4h2o@Kermantel.net www.awpirrigation.com		
Siemens Battery Operated Mag Meter:		
10" Seametrics AG2000 mag flow meter		$1,799
Tax and shipping		$248
	Subtotal	$2,047
Installation/Setup		
Pipe flanges		$200
Hardware; bolts, nuts, washers, gaskets		$100
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$2,700
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$4,747
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$645
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$1,759**

Estimated Expenses for Seametrics Mag Flow Meter (8" Diameter pipe)

Equipment, Installation, and Calibration		
Contact: Tony Pereira Advanced Water Products Cell: 559-846-6569 Fax: 559-846-7655 awp4h2o@Kermantel.net www.awpirrigation.com		
Siemens Battery Operated Mag Meter:		
8" Seametrics AG2000 mag flow meter		$1,496
Tax and shipping		$203
	Subtotal	$1,699
Installation/Setup		
Pipe flanges		$180
Hardware; bolts, nuts, washers, gaskets		$80
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$2,660
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$4,359
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$592
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$1,706**

Attachment A. Analysis of Annualized Flow Meter Costs

Estimated Expenses for Seametrics Mag Flow Meter (6" Diameter pipe)		
	Contact: Tony Pereira Advanced Water Products Cell: 559-846-6569 Fax: 559-846-7655 awp4h2o@Kermantel.net www.awpirrigation.com	
Equipment, Installation, and Calibration		
Siemens Battery Operated Mag Meter:		
6" Seametrics AG2000 mag flow meter		$1,304
Tax and shipping		$168
	Subtotal	$1,472
Installation/Setup		
Pipe flanges		$150
Hardware; bolts, nuts, washers, gaskets		$80
Install (8 hours for 4 man crew @ $50/hour)		$1,600
Set up and test (4 hours for 2 man crew @ $100/hour)		$800
	Subtotal	$2,630
Calibration		
No Calibration Required		
Total Estimated Equipment, Installation, and Calibration Expense:		$4,102
Total Annualized Cost Per Site (based on 10-year life at a 6 percent rate):		$557
Annual Expenses		
Data Analysis and Maintenance		
- Assume 6 visits per year (bi-monthly) with one flow check per year		
Read meter at site (3 hours @ $50/hour)		$150
Flow check (4 hours @ $100/hour)		$400
Travel Expenses		$100
Analysis/Write-up, Review data (4 hours @ $100/hour)		$400
New battery every 3 years ($192 / battery)		$64
	Subtotal	$1,114
Total Annualized Cost Per Site:		$1,114
Annualized Cost Per Site for Flow Measurement:		**$1,671**