



3140 Gold Camp Drive, Suite 160  
Rancho Cordova, CA 95670  
(916) 853-9293  
Fax (916) 853-9297

September 6, 2011

Mr. Stephen F. Heringer, President  
Reclamation District 999  
38563 Netherlands Rd,  
Clarksburg, CA 95612

**SUBJECT: WATER DIVERSION MEASUREMENT PROPOSALS AND PRACTICES-  
Document Review: Measurement of Delta Agricultural Diversions, July 2011 by  
Watermark Engineering, Inc.**

Dear Mr. Heringer:

BSK Associates, Inc. is pleased to provide a technical response to the "Water Diversion Measurement Proposals and Practices" report prepared by Watermark Engineering, dated July 2011, pertaining to methods of compliance for water diversion measurement requirements, that will soon apply to Delta diverters.

In summary, while the Watermark Report is based on well-understood principles and summarizes existing information already developed by the State Water Resources Quality Control Board (Board), it does not take account of the site-specific considerations that the District and other water users in the Delta face in attempting to comply with the new measurement requirements. Those considerations include the relative cost of water within the Delta, the high degree of existing Delta water use efficiency, the relative locations of the diversions, and the remote nature of the diversions. Ultimately this is not a technical question *per se*, it is a social question about where to put limited funds. Given that Delta inflow-outflow is already well-modeled, -monitored and -understood, it seems obvious that and additional monitoring would be much better directed at cost-effective remote sensing technologies.

If you have any questions regarding this analysis, please contact the undersigned at (916) 853-9293.

Sincerely,  
**BSK ASSOCIATES, INC.**

A handwritten signature in black ink, appearing to read "Kurt Balasek".

Kurt Balasek  
Senior Hydrogeologist, Sacramento Office Manager

A handwritten signature in black ink, appearing to read "Erik Ringelberg".

Erik Ringelberg  
Ecological Services Group Manager

## ***General Observations Regarding the Watermark Engineering Report***

The Water Diversion Measurement Proposals and Practices report (Watermark Report) does not disclose who requested the analysis other than “water districts that regularly measure their water diversions,” and the submission contains substantially the same information as has already been prepared by the Delta Water Master in his report. The Watermark Report is reasonably well-detailed and covers the major categories of water measurement, although it does not cite readily available documents or provide any substantiation for key conclusions.

### ***Discussion***

- ◆ The Watermark Report’s technical purpose and funders are undisclosed.
- ◆ No direct estimates of cost are presented in the Watermark Report.
- ◆ The Watermark Report conflates the water use and reporting by Water Districts with the statutory changes that include all water users. In the Delta, individual intakes for farm operations use riparian water and siphons for users on sloughs, or the water is provided by individual Districts and already measured and reported.

The following sections describe the shortcomings of the Watermark Report as they pertain to the degree of challenge to meet the new measurement requirements.

### ***Relative Measurement Costs as Compared with Other Geographic Areas***

According to the Watermark Report, “Measuring diversions is no more complicated or costly than any other area of the State.” (Pg. 1) This statement is immediately contradicted by the identification of the siphon issue (discussed later in this review) and the power needs for diversion monitoring at these installations, which are the norm for farm gate installations in the Delta. The cost discussion concludes with the opinions statement that: “However, that cost should be considered part of the expense of using water, similar to what most diverters throughout California are required to bear.”

BSK can provide a detailed analysis of the expenses (both subsidized and unsubsidized) associated with water collection and delivery for the regions that have apparently supported the new diversion measurement requirements and the districts who apparently requested this report (when disclosed) in a future document. BSK’s letter report submitted to the Board on June 29, 2011 responds to the Water Master’s recent “Review of Water Diversion Measurement Proposals and Practices” report and explains that the incremental cost of monitoring for Delta diverters is in many cases greater than the cost of water delivery itself (BSK, 2011). Specifically, consideration of potential metering of water use in the Delta must take into account that the estimated additional (incremental) *annual* cost of monitoring is \$36.12/affected acre.<sup>1</sup> This water monitoring cost is far greater than the cost of the water itself. This is one of several reasons, including: (1) short return flow paths; (2) limited groundwater use; (3) availability of inflow and outflow data to accurately estimate the region’s water use; (4) the existing suite of

---

<sup>1</sup> Table 4.6 Regional Incremental Costs of Measurement by Location. Independent Panel on Appropriate Measurement of Agricultural Water Use Convened by the California Bay-Delta Authority FINAL REPORT, SEPTEMBER 2003, available at: [http://calwater.ca.gov/content/Documents/meetings/WaterUseEfficiency/FinalReport\\_Sept03.pdf](http://calwater.ca.gov/content/Documents/meetings/WaterUseEfficiency/FinalReport_Sept03.pdf)

high accuracy flow models, and (5) the high water use efficiency in the Delta, that in-Delta water use was not historically required to be reported.

The costs and economic sustainability of farming in the Delta is associated with factors, including: (1) the region's senior water rights (pre-1914, riparian, and contract); (2) adjacency to significant natural water supplies as well as large expanses of Class 1 soils; (3) high value of the specialty crops; and (4) the correspondingly low costs associated with production. In contrast, the costs associated with farming on low quality or chemically impaired soils with contract and junior water rights, even with direct and indirect State and Federal subsidies (including water delivery through the CVP and SWP, price stabilization and buy back programs), are much greater. As a result, the cost to measure water in those areas is lower on a relative percentage basis than in the Delta.

An additional issue related to the difference between Delta farming and other regions, also undiscussed in the Watermark Report, is that the size of the Delta agricultural holdings are often much smaller than other regions due to their high soil quality and efficiencies. That larger number of individual diversions per given area, means that the monitoring and reporting burden is much larger than other regions.

#### *Special Issues Pertaining to Siphons*

Siphons are very problematic for cost effective flow measurement. Siphons are constructed in a variety of configurations (typically in the 2" diameter range). A typical installation includes a couple dozen of these pipes, which are moved by hand as needed. Small scale siphon measurement, while technically possible, would require significant infrastructure several orders of magnitude beyond the current costs of the equipment and is therefore not cost effective (BSK, 2011).

#### *Power Supply Issues*

BSK agrees in principle with the Watermark Report, that power monitoring can be an effective means of assessing diversion volumes. However, reporting the power bill itself is a vastly more accurate, reliable, independent, and cost effective than the Watermark Report's proposed hand clamp units for the power source. The power meter clamps suffer from several common problems that all onsite technological solutions have: power supply; security, data logging, downloading and data management, and cost.

Power supply is often not available at diversions in the Delta. Power interruptions and low quality (voltage drops, massive and unresolvable electrical "noise" are common). Security is also exceptionally challenging in the Delta. Data logging appears simple in the abstract, but the reality is that most data loggers are fragile, commodity grade electronics that are difficult to set up and even more challenging to download data from. Downloading requires a separate field-grade laptop computer and the associated software. Data management is often complex depending on the vendor's software, and can lead to documentation errors.

The cost in each case is considerably higher than estimated in the exhibits to the Watermark Report. These costs per farmer would include: field grade laptop and basic software (approximately \$3,000) and a home computer (which is often not compatible with current

communication protocols), etc. The Report's assertion that a farm laborer would be qualified or even capable of providing calibration, software or hardware maintenance is unsupported without extensive and expensive training. A typical technician rate for these services, is approximately \$90-125/hr, assuming one hour on site and one hour each way for travel time, which is typical for the Delta.

#### *Security and Flood Protection Costs*

The Watermark Report does not address one of the largest and most unpredictable costs of water monitoring at the farm-gate: avoidance of theft and vandalism. A solar panel, battery backup and a meter, logger and a IP6 case, and mounting pole are the minimum theoretical installation elements for a remote/unpowered location. Yet there is no economically feasible way to protect this equipment in the Delta.

Delta installations also have to be completely water proofed, or raised above the flood elevation, which are pose significant additional costs. Installations require a prepared concrete pad security fencing and a gate to protect the equipment from theft and vandalism, which is on the rise in the Delta. This still would not be protective from bullet damage, fire, and more sophisticated cutting and vehicular assaults, which also are known to occur. To put the challenge of protecting Delta infrastructure into perspective, Districts have recently had razor wire protected, live 3-phase power lines and pumps stolen for copper and other high value metals.

These additional security costs would likely range from \$2,000 to well over \$10,000 per location, and still may not be fully protective of the necessary equipment.

#### *The Role of Reasonableness in Determining an Appropriate Approach to Measurement*

The matter of reasonableness is central to the discussion and implementation of new measurement requirements. While virtually any technical solution can work in a given monitoring situation, the District and individual farmers have cost and capacity constraints. A meter and a datalogger is likely not a practicable response to the state's interest in better water use data.

While a monitoring system that may make sense in a lab or industrial facility when operated directly by a qualified systems technician, such a system may be too fragile, sophisticated and complex for use in the field. In the Delta, it is essential that any new system works effectively for the specific types of diversions and takes into account the availability of power and special security needs for the installations. Otherwise, such systems pose a significant cost without any value to the farmer, and are unlikely to be implementable.

The Watermark Report appears to assert that reasonableness of cost is not a relevant factor in the determination of utility by stating that: "However, that cost should be considered part of the expense of using water, similar to what most diverters throughout California are required to bear." This statement directly contradicts the relevant regulations pertaining to water measurement. Water Code section 10608.4 (j) requires the state to "Support the economic productivity of California's agricultural, commercial, and industrial sectors," and subdivision (k) defines "Locally cost effective" as "the present value of the local benefits of implementing an agricultural efficiency water management."

The expense of providing water in the Delta currently is the cost of the siphon or pump and other associated equipment and water delivery infrastructure, power and ongoing maintenance of those facilities. The expense is currently reasonable because these farmers had the wisdom and foresight to locate in an area with an adequate natural water supply for their crops. Comparing that to farms that have permanently depleted their local water supplies, such as the Tulare Lake basin (formerly the largest lake in California), that now have massive water delivery costs, is specious at best. Such an argument also fails to note that the Delta farmers have amortized initial costs to provide water and flood protection to their farms, and that is one of the other reasons why their water costs are now comparatively low. Another factor not recognized in the Watermark Paper, or in much of the political discussion that surrounds this issue in the Delta in particular, is that the irrigation system and water use efficiency improvements that could be accomplished by the same expenditure that would otherwise go into monitoring would maximize agricultural efficiency well beyond the point of diminishing returns, obviating any logical need to monitor water use.

BSK's analysis is the District continue to coordinate with the Water Board and the Delta Watermaster to approve and develop a standardized remote sensing system that is comparable between locations, regions and State programs. Given their almost 50-year history of use by the US Government and widespread application to agriculture, remote sensing techniques are a robust, cost effective method<sup>2</sup> for assessing water use.

---

<sup>2</sup> Independent Panel on Appropriate Measurement of Agricultural Water Use Convened by the California Bay-Delta Authority FINAL REPORT, SEPTEMBER 2003