Ag Waiver Waterbody Flow/Discharge Monitoring Issues[1]

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The Central Valley Regional Water Quality Control Board (CVRWQCB) Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Ag Waiver) established that the waterbody (stream/river) monitoring should include measuring the flow (discharge) at the time of grab sampling of the waterbody. Based on the information provided to the Ag Waiver Technical Issues Committee (TIC) members, there are some apparent problems in the CVRWQCB staff's objective of the flow measurements and the accuracy needed for these measurements. The author has been involved in many small and several large (multimillion dollar) water quality monitoring programs conducted in the US and in other countries over the past 46 years, where monitoring of chemical (potential pollutant) concentrations and flow/discharge were conducted at one or more sampling locations. In several of these monitoring programs, studies were conducted on the frequency of sampling for chemicals that are potential pollutants, to estimate the potential impact on water quality at the sampling location and/or the total load of potential pollutant(s) derived from the watershed upstream of the sampling location.

The latter is especially important in achieving the CVRWQCB Ag Waiver requirement of assessing the effectiveness of management programs that are to be implemented by agricultural interests to control exceedance of water quality objectives that are found at a monitoring location. The flow monitoring requirements for characterization of the flow conditions at the time of sampling under the current Ag Waiver monitoring program, and the flow measurement requirements for reliably assessing the total load of a pollutant(s) per unit time derived from the watershed upstream of the sampling location, can have different flow monitoring requirements to be able to provide adequate flow data for assessing water quality impacts at the sampling location at the time of sampling and for assessing the load of pollutants passing a sampling location over a period of time..

One of the issues of discussion in the TIC is whether the potential use of the float (orange) velocity cross-section area method of flow measurement is sufficiently accurate for flow characterization for the currently required grab sampling monitoring program. The CVRWQCB Ag Waiver staff has recently determined that this method of flow measurement is not sufficiently accurate for measurement of flow for the current Ag Waiver monitoring program. Based on my experience, this assessment is inappropriate. There is no need to conduct highly accurate flow measurement in the current Ag Waiver monitoring program. The float velocity cross-section

[1] reference as, Lee, G. F., "Ag Waiver Waterbody Flow/Discharge Monitoring Issues," Submitted to the Central Valley Regional Water Quality Control Board, Rancho Cordova, CA August (2006).

area method is sufficiently accurate for flow characterization at the time of sampling for the current Ag Waiver monitoring program.

Under the current, limited-scope Ag Waiver water quality monitoring program, the flow monitoring requirement of only a few grab samples at a few sampling locations, compared to the frequency and locations that are needed to adequately characterize the potential for agricultural runoff/discharges to cause violations of water quality objectives in the State's waterbodies, only needs to be rough estimates of flow at the time of sampling. Highly accurate flow/discharge measurement is not needed/justified. However, the current monitoring program should not be used to estimate loads of pollutants derived from a watershed. A much more comprehensive monitoring program should be developed, involving many more sampling locations and, most importantly, greater sampling frequency. Based on my experience, in order to reliably estimate pollutant loads, flow measurements should be continuous or no less frequent than twice a week during periods of base flow, and every day during periods of elevated flow.

The CVRWQCB Ag Waiver program staff needs to clearly distinguish between flow measurements for general characterization of flow conditions at the time of grab sampling, and the need for accurate, more frequent monitoring of flow for estimating loads of pollutants passing a sampling location during a period of time, such as a year. This clarification can be incorporated in the revised Monitoring and Reporting Plan (MRP) that I understand will be developed this fall.

In my (Lee 2006) March 13, 2006, "Comments on Revised Tentative CVRWQCB Ag Waiver Monitoring and Reporting Program," I included the following statement with respect to reliably estimating the loads of some potential pollutants:

> *"Page 6, first full paragraph mentions collecting a sufficient number of samples for the '…calculation of the load discharged for every parameter monitored.' It should be pointed out that it is not possible to reliably monitor the constituent load at a particular monitoring point for many of the constituents of concern, since many of them are associated with bedload transport. It is well established from USGS and other studies that bedload transport of potential pollutants in rivers and streams can be the most important part of the total pollutant load passing a monitoring point. The basic problem is that, with very few exceptions, without the implementation of extraordinary monitoring approaches it is not possible to reliably estimate bedload transport, since the sampling of the bedload to determine mass flux is virtually impossible to do reliably."*

Basically, the CVRWQCB needs to recognize that it will not be possible to reliably estimate the impact of management approaches for those pollutants (such as pyrethroid pesticides) that tend to associate with particulates and therefore are transported to some extent with stream bedload.

References

Lee, G. F., "Comments on Revised Tentative CVRWQCB Ag Waiver Monitoring and Reporting Program" submitted to the Central Valley Regional Water Quality Control Board Rancho Cordova, CA March (2006).