Comments on Delta Independent Science Board (DISB) Draft Water Quality Review Proposal:

These comments are submitted on behalf of the United States Geological Survey California Water Science Center.

The DISB proposes to undertake a water quality review because, as stated in the "Motivations" section, "*good water quality will support a healthy Delta ecosystem*" and "*there is no comprehensive contaminants monitoring and assessment program at this time*" in the Delta. The review scope revolves around three "*priority areas*:" chemical contaminants, nutrients, and pathogens; drinking water quality is of lesser interest than ecosystem health and several water quality constituents are excluded from review. Among the "Expected outcomes" of the review are recommendations intended to guide the development of a contaminants monitoring program.

We strongly support a water quality review by the DISB, but are concerned that the proposed narrow scope of the review will limit its utility and impact. Specifically, we believe that:

The problem is larger than what is stated in the motivation section:

- There is no comprehensive, *process-based water quality* monitoring and assessment program at this time. Such a program would include contaminants, but also many other constituents and their interactions and participation in complex environmental processes.
- Without consideration of a full spectrum of constituents and processes and the spatial and temporal scales at which they occur we worry that guidance for new monitoring coming from this review may be limited to a list of priority contaminants instead of a framework for the kind of comprehensive, integrated monitoring program that is needed in the Delta.

The proposed review and the proposal itself could be improved in several ways:

- At a minimum, explain the choice of the three priority areas.
- Consider adding at least a high-level review of additional constituents that are important to achieving the co-equal goals. For example, there is no mention of dissolved organic carbon (DOC) – which is produced in the Delta and is a constituent of concern in the context of drinking water treatment. Exclusion of salinity from consideration excludes a review of bromide – a naturally occurring sea salt, but also a constituent of concern in in the context of drinking water treatment. On the ecological health side, it seems the review could include important ecological health and process indicators such as DO, pH, total suspended sediment, sediment size distribution, light, chlorophyll, blue-green algae, phytoplankton taxonomy and size, toxins produced by harmful algal blooms, metals, water isotopes etc. – i.e. a suite of constituents broad enough to evaluate processes and trends relevant to ecosystem and human health as well as expected future changes, e.g. due to climate change, habitat restoration, and changes in water infrastructure.
- Explain how interactions will be taken into account. Water quality is the result of complex interactions between exogenous inputs, and internal biological and physical processes. As such,

assessments and reviews of water quality must be made in the context of the physical and biogeochemical processes that affect transport, bioavailability and effects.

- Include an assessment of the temporal and spatial resolution of water-quality-data collection needed to understand the timing, magnitude and trends of changes in water quality constituents and processes.
- Evaluate the utility and current state of process-based water quality monitoring where water quality constituents are not considered not considered separately, but as participants in complex environmental processes.
- Include a review of the connections between water quality and habitat quality for species of interest in the estuary.
- Compare Delta water quality monitoring with similar programs elsewhere, and discuss similarities and differences in their design and effectiveness. Examples include programs in the Chesapeake, Everglades, Delaware, Hudson, Mobile, etc.

We recognize that most of these suggestions would likely substantially increase the scope and difficulty of the proposed review. But we believe that this type of comprehensive review is needed to guide the development of a comprehensive and integrated water quality (not just contaminants) monitoring program for the Delta. Only this kind of monitoring program will deliver the data and information needed to manage and improve water quality for all beneficial uses as well as ecosystem health.

Brian Bergamaschi
USGS California Water Science Center
bbergama@usgs.gov

Tamara Kraus
USGS California Water Science Center
tkraus@usgs.gov

Anke Mueller-Solger
USGS California Water Science Center
amueller-solger@usgs.gov