DELTA TRIBUTARIES MERCURY COUNCIL
Thursday, September 26, 2019

DWR's West Sac. Conf. Room 106
3500 Industrial Blvd., West Sacramento, CA 95691

Facilitator: Stephen McCord, McCord Environmental, Inc. (MEI)
Meeting Summary by: Stephen McCord, MEI

Attendees

In Person

Stephen McCord, MEI
Greg Reller, Burleson Consulting
Tara Fitzgerald, USEPA
Paul Work, USGS
Zackary Leady, Bureau of Reclamation
Dan Deeds, Bureau of Reclamation
Carol DiGiorgio, DWR
Erik Ringelberg, The Freshwater Trust

Via Teleconference

Yumiko Henneberry, Delta Science Program
Heidi Oriol, Regional San
Lindsay Whalin, SF Bay RWQCB
Todd Muelhoefer, Kinder Morgan, Inc.
Charlie Alpers, USGS
Joe Domagalski, USGS
Heidi Oriol, Regional San
Debbie Webster, CVCWA
Wes Heim, MLML
Stefanie Helmrich, UC Merced
Nicki Sandu, DWR
Eric Byous, USEPA
Holly Jorgensen, SRWP
Brian Laurenson, LWA
Gary Gill, Pacific Northwest Nat. Lab.
Mark Seelos, SCVWD
Neeta Bijoor, SCVWD
Reed Harris, RHE

I. Introductions and Agenda Review

No comments on the summary of the May 20, 2019 meeting.

II. Project Updates & Upcoming Events

Announcements are attributed to Stephen McCord (MEI) unless otherwise noted.

Mine Site Cleanups

- Tuleyome's project proposal last March to continue work at the Corona and Twin Peaks Mines was not awarded.
- The Brownfields Coalition Assessment Project remains in progress, preparing cleanup plans for two mine sites, supporting a Phase II ESA by others, and drafting an area-wide plan. See presentation summary below.

Mercury Studies and Monitoring Activities

- The Delta Regional Monitoring Program continues to sample fish annually, water 8x/year and sediments 4x/yr at 8 sites throughout the Delta. The Steering Committee decided this week to add a component for monitoring fish mercury accumulation in restored wetlands.
- The Delta Science Program's 2020 Sea Grant Science Fellowship call for proposals has been posted. It will be a 2-year fellowship for a Masters, Ph.D. or post-doc student to conduct research in the Delta. The requirement is they need an external mentor, be it an agency representative or non-profit, etc. The deadline is December 20, 2019. For more information, please visit: https://caseagrant.ucsd.edu/fellowships/delta-science-fellowship

Regional and Statewide Mercury Regulation

- Yumiko Henneberry (Delta Stewardship Council): The DSC's Independent Scientific Review Panel completed a "letter" review of the control and characterization control study reports by wastewater and stormwater utilities. A second review phase will address forthcoming study reports by DWR on open water modeling and tidal wetlands methylmercury production. The review web page is http://deltacouncil.ca.gov/science-program/2019-independent-science-review-and-advice-delta-mercury-control-program.
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- The statewide reservoirs mercury TMDL has stalled, pending staff assignment at the State Board.

Recent & Upcoming Conferences

- The 14th International Conference on Mercury as a Global Pollutant (ICMGP 2019) was held recently in Krakow, Poland, September 8-13, 2019. https://www.mercury2019krakow.com/gb/
- The CALMS conference will be held Oct. 10-11 in San Diego. Presentation abstracts, including topics on mercury control studies, are being solicited. For more information: https://www.california-lakes.org/calms-conference.
- The Sierra Fund's conference "Sierra 2019: Headwater Mercury Source Reduction" will be held October 17-18 in Grass Valley. https://www.sierrafund.org/reclaiming-the-sierra-conference/
- The State of the Estuary Conference will be held in Oakland, Oct. 21-22. https://www.sfestuary.org/state-of-the-estuary-conference/.
- CA Water Policy Conference will be held in Davis, April 2-3, 2020. Workshops will include topics such as forest fires and water management.

Other News & Updates

- OEHHA recently issued new fish advisories with safe eating advice for several lakes statewide: Coyote Lake, Lake Perris, and Lake Spaulding.
- Yocha Dehe has prioritized mercury improvement projects in the Cache Creek watershed for funding, including cleanup of two mine sites on private property and monitoring

stratification and associated dissolved oxygen dynamics in Indian Valley Reservoir. No decisions have been made.

- The annual call for proposals for brownfields assessment and cleanup grants will be published in October, providing a great opportunity to fund work on mercury contaminated sites that improve rural environments and downstream water quality.
- USGS is starting a 5-year project at the Sulphur Bank Mercury Mine to evaluate total and methyl mercury isotopes in lake fish to quantify relative sources.

III. Presentations

Five presentations were given:

1. A Mechanistic Model Analysis of Mercury in the Yolo Bypass and the Sacramento/San Joaquin River Delta (Reed Harris, RHE Ltd.)
2. (a) Patterns of Mercury Cycling in the Profundal Zone of Hodges Reservoir, California (Marc Beutel, UC Merced); (b) Mercury Cycling in a Eutrophic Reservoir: Consequences of inorganic mercury, organic carbon, and microbial inhibitors on mercury methylation in profundal sediment of Hodges Reservoir (Byran Fuhrmann, UC Merced)
3. Brownfields Project Update – Updates and Path Forward (Stephen McCord, MEI); Erik Ringelberg, The Freshwater Trust; Greg Reller, Burleson Consult.)
4. Discussion of key DTMC Strategic Plan elements and relevant activities (Stephen McCord, MEI)

1 – A Mechanistic Model Analysis of Mercury in the Yolo Bypass and the Sacramento/San Joaquin River Delta (Reed Harris, RHE Ltd.)

To address the Delta MeHg Control Program requirement for control studies of open water, DWR contracted Reed Harris Environmental to use two mechanistic mercury cycling models to simulate conditions in open waters: (1) An existing model of mercury cycling (D-MCM) taking TUFLOW hydrodynamics output for the Yolo Bypass, and (2) Added mercury cycling routines to DWR existing model of hydrodynamics and water quality (DSM2). Both models provide time-dependent tracking of the mass of inorganic and methyl mercury, in both dissolved and particulate forms, in the water column and surface sediments.

The Yolo Bypass is divided into 47 cells in D-MCM based on 10 uniform land uses. Vegetation appears to be a key factor in MeHg cycling in the Bypass. DSM2 is a one-dimensional (only varying in the current direction, not vertically or laterally) model. Simulations are being performed for years 1997-2012. USGS' PEST software to being used to help assess uncertainty and estimate confidence in model results.

The model can realistically be expected to correctly simulation whether areas are sources or sinks of total and methyl mercury, and whether operational changes in will cause MeHg supply to increase or decrease. The model accounts for atmospheric deposition, although input data are limited.

Preliminary results for the Yolo Bypass indicate that the Fremont Weir is, as expected, the largest external source of water, solids, and MeHg in the long term (e.g., decadal). "Trapping" (e.g. settling and photochemical losses) through the Bypass is found for solids and inorganic Hg, whereas the Bypass is predicted to be a net source for MeHg in almost every year simulated (as

was reported by Foe et al., 2008). Predicting solids and MeHg concentrations in specific cells at specific times is more challenging due to significant natural short-term temporal and small-scale spatial variability. Model simulations predict higher MeHg concentrations in areas with vegetation. DSM2 simulations for years 2000-2006 are likewise reasonably representing the magnitudes of concentrations, but warrant improvement to better represent MeHg concentrations in specific sites at specific times.

Both models are in the final stages of calibration/validation, and sensitivity analysis is well underway. Remaining work with involve scenario testing and uncertainty analysis.

For more information: Reed Harris, reed.harris100@gmail.com.

2 – (a) Patterns of Mercury Cycling in the Profundal Zone of Hodges Reservoir, California (Marc Beutel, UC Merced); (b) Mercury Cycling in a Eutrophic Reservoir: Consequences of inorganic mercury, organic carbon, and microbial inhibitors on mercury methylation in profundal sediment of Hodges Reservoir (Byran Fuhrmann, UC Merced)

The City of San Diego is implementing an oxygenation project (installed in 2019) in hyper-eutrophic Hodges Reservoir (37 million m^3 volume; 20 m max depth) as part of a comprehensive water quality improvement program. The oxygenation system consists of on-shore liquid oxygen storage, and a Speece Cone distributing 8 tons of high-concentration oxygen per day. UC Merced is performing field studies to assess the effects of oxygenation on water quality in general and mercury cycling in particular. This pilot study could support the statewide mercury control program for reservoirs still in development (Hodges is listed as mercury-impaired).

Sediment chamber incubations from two sites were evaluated monthly during the stratified period for oxic and anoxic overlying water conditions. In almost all replicates, phosphate, ammonia, manganese and sulfide flux increased under anoxic conditions. Dissolved methylmercury (MeHg) flux also increased initially, but then declined as anoxia progressed, which may correspond with high Hg(II) bioavailability and low demethylation. Additional incubation treatments dosed various bacterial-control additives and found different bacteria types were most active at different times and conditions.

The key conclusion is that oxic conditions near the sediment-water interface must be maintained to minimize MeHg flux, as well as flux of other anoxic byproducts (nutrients and metals), especially in deeper regions. However, reductions in sulfide and organic matter, as well as oxidative dissolution, could counteract benefits. Dissolved, reduced manganese provided a useful surrogate for MeHg. An article about this study in the journal *Water Research* is forthcoming.

For more information: Marc Beutel, 209-228-2229, mbeutel@ucmerced.edu; Byran Fuhrmann, bfuhrmann@ucmerced.edu.

3 – Brownfields Project Update – Updates and Path Forward (Stephen McCord, MEI); Erik Ringelberg, The Freshwater Trust; Greg Reller, Burleson Consult.)

This presentation provided a recap of a project begun in 2016 and presented to the DTMC that year. The project area focuses on the Cache and Putah creeks watersheds, although sites within the 5 counties (Colusa, Yolo, Napa, Lake, and Solano) were considered eligible. Key project activities including (1) compiling mine site information from existing databases and prioritizing

sites as brownfields for assessment, (2) contacting landowners and conducting site assessments, (3) developing cleanup plans for high-priority sites, and (4) writing an area-wide plan recapping project findings and laying out future goals.

Over 120 sites were identified initially, however many were determined to be redundant (compiled from different databases) to the point that about 50 sites were pursued. A total of 7 sites were assessed to some extent, and 2 of those now have cleanup plans. Primary challenges included obtaining landowner cooperation; competing with other regional priorities (drought, flood, fire); addressing a diffuse, legacy contamination issue; and no ability to promise anything post-assessment. Positive messages included (1) funding for cleanup projects is available from many sources, (2) site work is easier on fire-scarred land, (3) a broad group of stakeholders share the common goal of cleaning up contaminated sites, (4) techniques and experts are available to address the contamination, and (5) the rich history of mining could be touted.

Remaining tasks before project close-out include supporting an ongoing Phase II ESA for Winters WWTP, presenting a poster at the national brownfields conference in Los Angeles, and publishing the Area-Wide Plan. The Coordinating Committee plans to propose for another assessment grant this fall, and several prospective sites to assess have already been identified.

For more information: Stephen McCord, 530-220-3165, sam@mccenv.com; Erik Ringelberg, Erik@thefreshwatertrust.org; Greg Reller, gr@burlesonconsulting.com. Project website is http://www.westsideirwmbrownfields.org/.

4 – Discussion of key DTMC Strategic Plan elements and relevant activities (Stephen McCord, MEI)

The objectives for the Strategic Plan were clarified in the previous meeting: produce a concise plan applicable to the entire Delta and its watershed, for DTMC members but supporting other efforts. Members previously contributed to a Strengths-Weaknesses-Opportunities-Threats worksheet to add context to the DTMC's character. Key roles for the DTMC were (1) guide development, implementation, and synthesis, and (2) maintain, update and share our knowledge base.

Helpful input on the draft material has been provided by Greg Reller, Peter Graves, and Jacob Fleck. The plan development process calls for clarifying the DTMC's role, tracking relevant projects, and drafting specific recommendations. The schedule calls for the plan to be completed by early 2020.

The DTMC and its interests are described on the DTMC website (update is in progress to http://www.sacriver.org/aboutwatershed/mercury/dtmc), as well as a new Strategic Plan fact sheet. Next steps are to solicit DTMC member input on the Strategic Plan and to update the projects tracking table of recent, ongoing, and upcoming mercury-related activities.

For more information: Stephen McCord, 530-220-3165, sam@mccenv.com.

IV. Meeting Wrap-Up

Future agenda item:

- Lake Mercury improvement projects—Klau & Buena Vista Mines Superfund site, and Sulphur Bank Mercury Mine Superfund site (Carter Jessup, USEPA)

- Monitoring and modeling effects of forest fires on mercury loadings and methylation, Cache Creek watershed (Charlie Alpers, USGS)
- Combie Reservoir sediment removal—sediment treatment for Hg removal (Jason Muir, NVS)
- US Forest Service mine remediation projects (Rick Weaver, USFS)
- ICMGP 2019 recap (any attendees)
- MeHg control via low-impact development features (Lester McKee, SFEI)
- Recently published paper "Wetland Management Strategy to Reduce Mercury in Water and Bioaccumulation in Fish"Josh Ackerman et al. (USGS)
- "Recently published Open-File Report as part of a series of studies focused on mercury cycling in reservoirs located in arid-land environments (Naftz et al.).
- DTMC Strategic Plan final draft (Stephen McCord, MEI)

Next Meeting

- **Date**: Looking at early January 2020.
- **Location**: DWR in West Sacramento, Room 106