



Mercury Pollution in Northern California
Delta Tributaries Mercury Council



DELTA TRIBUTARIES MERCURY COUNCIL

Tuesday, February 9, 2021

Via GoToMeeting virtual meeting (<https://www.gotomeet.me/McCordEnv/dtmc>)

Facilitator: Stephen McCord, McCord Environmental, Inc. (MEI)

Meeting Summary by: Stephen McCord, MEI

Attendees

Stephen McCord, MEI
Lindsay Whalin, SF Bay RWQCB
Joe Domagalski, USGS
Jon Miller, Albemarle
Heidi Oriol, Regional San
Carol DiGiorgio, DWR (retired)
Petra Lee, DWR
Nicholas Graham, The Sierra Fund
Carrie Monohan, The Sierra Fund
Debbie Webster, CVCWA
Chris Eckley, USEPA
Carter Jessup, USEPA
Carolyn Yee, USEPA
Carrie Austin, SF Bay RWQCB

Lauren Smitherman, CV RWQCB
Jordan Hensley, CV RWQCB
Robin Merod, CV RWQCB
Peggy O'Day, UC Merced
Mark Seelos, UC Merced
Marc Beutel, UC Merced
Stefanie Helmrich, UC Merced
Shelby Defeo, UC Merced
Brett Albert Poulin, UC Davis
Danielle Jones, UC Merced
Dimitri Vlassopoulos, Anchor QEA
Maia Singer, Stillwater Sci.
Brenda Bachman
Bryn Thoms

I. Introductions and Agenda Review

No comments on the summary of the September 15, 2020 meeting.

II. Project Updates & Upcoming Events

Announcements are attributed to Stephen McCord (MEI) unless otherwise noted. Our “live” table of mercury-related projects in the region: <https://docs.google.com/document/d/1EzeDOiS-vrM1MsjfNZC18Zoz9XWOSiorPSI3RJxrS9s/edit?usp=sharing>.

Mine Site Cleanups

- The Westside Sac IRWMP Coordinating Committee applied for another brownfields coalition assessment grant in October 2020 to continue identifying and assessing abandoned mine sites, and plan for site cleanups. Awards have not yet been announced.
- USEPA’s newly created Office of Mountains, Deserts and Plains located in USEPA’s office in Lakewood, CO, is clarifying its mission and structure. Ideally, the office will support consistency and collaboration. The office’s website is: <https://www.epa.gov/mountainsdesertspains>.

- Albemarle, working with MEI and Burleson Consulting, recently started field trials of proprietary treatments for mercury-rich soils on a mercury mine site on private property in rural Sonoma County.
- Carrie Monohan (The Sierra Fund): (1) Grizzly Creek Diggins Hydraulic Mine, TSF applied for a Wood Innovations Grant from USDA to make biochar onsite from fuels reduction efforts and apply onsite to evaluate effectiveness at soil structure regeneration and sequestering mercury and other contaminants. (2) Stormwater monitoring at Grizzly Creek Diggins and Malakoff Diggins (3) Tahoe National Forest approved planning project concept for three sites, seeking funding now to complete environmental permitting.
- Lindsay Whalin (SF RWQCB): Completed Hillsdale Mercury Mine in San Jose. Site is largely hydraulically disconnected from downstream waters, so primary driver was remediation for cleanup. XRF supported rapid investigation and cleanup. Also used SSE to set cleanup goals. Report is available on GeoTracker.
- Carter Jessop (USEPA): Sulphur Bank Mercury Mine continuing progress for site cleanup plan by end of 2021. Klau/Buena Vista Mine received 16 inches of rain in 72 hours—USEPA aims to fund repairs.

Mercury Studies and Monitoring Activities

- Mark Seelos and colleagues recently published “Effects of hypolimnetic oxygenation on fish tissue mercury in reservoirs near the new Almaden Mining District, California, USA” *Environmental Pollution*, 268 (2021) 115759.
- Jay Davis (SFEI): The Delta Regional Monitoring Program’s plans to continue to sample fish annually, throughout the Delta, in fall, has been delayed. An interpretive report on the first three years of mercury monitoring remains in progress.
- Joe Domagalski (USGS): (1) Two more years of monitoring is planned for mercury loads by USGS for inflows and outflows of the Cache Creek Settling Basin near Woodland and at Rumsey. Results from the first ten years (2010-2019) will be compiled in 2020 to support DWR’s report to the CV-RWQCB for the Delta MeHg TMDL. (2) USGS is undertaking a 5-year project at the Sulphur Bank Mercury Mine to evaluate total and methyl mercury isotopes in Clear Lake fish and zooplankton to quantify relative sources. Coordinating with Clear Lake nutrients study by UC Davis with co-located sampling of mercury, zooplankton and fish. (3) Working on proposal for Clear Lake watershed model of nutrients and mercury, with sediment “fingerprinting.” Pope and Scotts creeks drainages will also be monitored.
- Petra Lee and Carol DiGiorgio (DWR): DWR’s final reports for MeHg characterization studies of tidal wetlands and open waters of the Yolo Bypass and Delta have been submitted and are posted along with Independent Scientific Review Panel reports on the Delta Stewardship Council’s website (<https://deltacouncil.ca.gov/delta-science-program/independent-science-review-of-the-delta-mercury-control-program>). A second panel report of all characterization and control studies is due February 26, 2021.

Regional and Statewide Mercury Regulation

- Lauren Smitherman (CV RWQCB): A CEQA scoping meeting for Phase 2 of the Delta MeHg TMDL is being planned for February 24, 2021. For meeting information and to subscribe to the Delta TMDL email list, visit https://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/.
- The statewide reservoirs mercury TMDL remains stalled, pending staff assignment at the State Board.
- The draft 2018 integrated report (a.k.a. the 303(d) list) is posted at https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2018_integrated_report.html. It remains in draft form.
- The State Board released a proposed statewide Suction Dredge Mining General Permit for public comment (https://www.waterboards.ca.gov/water_issues/programs/npdes/suction_dredge_mining.html). Staff conducted two virtual public workshops to demonstrate the draft Suction Dredge Mining mapping application on January 13 and 28, 2021. Maps available were not legible to identify areas to be allowed/excluded and will be updated. Comments can be submitted until early March.

Recent & Upcoming Conferences

- The CALMS conference was held Oct. 19-23 online. Mark Seelos presented “Slow Progress with Quicksilver: Lowering Fish Mercury in Mine Impacted Reservoirs using Hypolimnetic Oxygenation”. The recording is available at <https://www.california-lakes.org/copy-of-2019-presentations>.
- The Sierra Fund’s conference “Sierra 2020: Headwater Mercury Source Reduction” was held on Nov. 12, online only. <https://www.sierrafund.org/reclaiming-the-sierra-conference/>. [More workshops are being planned for 2021.](#)

Grant Funding Opportunities

- None noted.

Other News & Updates

- OEHHA recently issued new fish advisories with safe eating advice for several lakes: Alondra Park Lake (Los Angeles County) and Lopez Lake (San Luis Obispo County). OEHHA also released an updated fish consumption advisory for multiple water bodies in the Guadalupe River Watershed (Alamitos Creek, Almaden Reservoir, Calero Reservoir, Guadalupe Creek, Guadalupe Reservoir, Guadalupe River), with the addition of Almaden Lake and Calero Creek. <https://oehha.ca.gov/fish/advisories>.
- Henry DeBey (Delta Council): The 65 Top Delta Management Questions have been identified as part of the update to the 2022-2026 Science Action Agenda (SAA), from an initial list of 1,279 questions (including several provided by the DTMC). Review the top questions at <https://scienceactionagenda.deltacouncil.ca.gov/pdf/2021-1-13-mqs-tops-questions-list.pdf>.

- SRWP's new website (including the DTMC website) is now live at <http://www.sacriver.org/>.

III. Presentations

Four presentations were given.

1 – A Biogeochemical Framework for Assessing Methylmercury Productivity and Expression in Aquatic Sediments (Dimitri Vlassopoulos, Anchor QEA)

Recognizing the high importance of MeHg production in sediments yet poor relationship to total Hg in sediments, this work sought a conceptual model to rank sediment contamination sites and set meaningful cleanup goals. The project's, Berry's Creek Study Area, NJ, exhibited 10-fold decreases in THg downstream, but only two-fold decreases in MeHg.

The study focused on the two primary factors of available inorganic Hg for methylation, and microbial activity to methylate (and demethylate) it. Sequential extraction and X-ray absorption near edge structure (XANES) of Hg and sulfur compounds provided data on solid phase Hg and sulfur speciation.

A bioreactor model based on the ratio of first-order reaction rates for MeHg and inorganic Hg provided a "methylation intensity index" with an upper limit to MeHg concentrations in sediment due to HgS solubility. The model proved useful in open fresh and marine waters, in riverine and marsh sediments, both locally and for a western US dataset. The model has potential applications to contaminated sediment management for mapping areas where net Hg methylation is high as targets for remediation. Ongoing work by others (Helmrich, UC Merced) will incorporate mechanistic model of (de)methylation linked to speciation, biogeochemical redox processes and microbial activity.

Some material in the presentation was included in an appendix to the Berrys Creek Remedial Investigation report. Dimitri is also planning to publish these results.

For more information: Dimitri Vlassopoulos, 503-688-5057, dVlassopoulos@anchoragea.com.

2 – Real-Time Monitoring of the Lake Combie Reservoir Sediment and Mercury Removal Project: Mercury Proxy for Adaptive Management Capabilities (Nick Graham, The Sierra Fund)

The Bear River watershed in the Sierra Nevada is severely impacted by hydraulic mining and mercury contamination. Nevada Irrigation District's Combie Reservoir, which is on the river, needs dredging to remove accumulated sediments to maintain its useful function. Dredging in 2003 was halted because it was stirring up mercury and violating Clean Water Act standards. Studies began about a decade ago to test lake conditions and treatment options. The ancillary goals were to measure ecological effects of MeHg concentrations in Combie before and after dredging, and to develop an efficient, compliant, sustainable and replicable combination of processes for sediment removal.

Dry excavation of ~38,000 cubic yards during low reservoir water levels in 2018 was efficient and produced no discharge to be treated. Wet excavation of ~10,000 CY in 2019 was treated with flocculant and settling basins. Real-time monitoring using upstream and downstream YSI EXO2 water quality sensors was set up to track discharges from the treatment system; however, infiltration in the unlined basins was faster than the operation. Thus, no water was ever

discharged. Nonetheless, well-correlated proxies for total and dissolved Hg were developed based on easily-measurable fluorescent dissolved organic matter, turbidity, total dissolved solids. Similar proxies could be established to monitor other dredging/restoration operations to minimize the potential for mercury in discharges.

For more information: Nick Graham, nick.graham@sierrafund.org.

3 – Evaluating mercury methylation rates in Lake Nacimiento (Chris Eckley, US EPA)

The highest MeHg production in lakes tends to be found just below the oxic/anoxic boundary. Seasonal lake stratification affects those zones of MeHg production. A study at mercury-contaminated Lake Nacimiento in the southern Coast Range, aimed to quantify stratification and oxygen status to optimize MeHg controls. Water and sediment samples were collected (and ancillary measurements taken) throughout an annual cycle covering both mixed and stratified periods. A side-study found spiking with lake water (vs. DI water) led to higher methylation rates in sediment samples; however, the time before injection (~4 hours) may have affected those results.

The study found higher methylation rates in the hypolimnion, and higher demethylation rates in the epilimnion. In contrast, profundal sediments had much lower MeHg content (and higher demethylation rates), likely related to higher sulfide concentrations for complexation there vs higher sulfate concentrations in the littoral sediments that experience annual wetting and drying.

Effectively, MeHg accumulated in the hypolimnion was about half from water column conditions and half from sediment flux. Important variables for remediation include: relationship of hypolimnetic MeHg mass to biotic exposure; uptake of MeHg into the base of the foodweb; and biota foraging behavior.

For more information: Chris Eckley, Eckley.Chris@epa.gov.

4 – Mercury Cycling in Seasonal Wetlands of the Los Banos Wildlife Area (Danielle Jones, UC Merced)

Wetlands in the Grasslands Ecological Area, including the Los Banos Wildlife Area (LBWA), may contribute Hg and MeHg, in addition to salts and nutrients, to the SJR, and potentially act as sites for mercury methylation and bioaccumulation. This study aimed to improve understanding of seasonal variation, export, and transport of Hg and MeHg from managed wetlands in LBWA to the San Joaquin River; characterize the composition of exported particulate matter; develop and test real-time monitoring proxies for Hg and MeHg; and develop management practices. Two ponds were sampled water weekly and had continuous sensors installed during flood-up (end of August through October) in 2019 and 2020.

A key confounding factor was the wide variability in inflowing THg and MeHg concentrations. Nonetheless, the general pattern portrayed decreased THg and MeHg concentrations over the floodup periods. The two ponds, which different vegetation, exhibited different percentages of filter-passing fractions. The partitioning different was likely related to differences in suspended material and sulfide concentrations. Additional analyses underway will explore correlations with other constituents and field measurements. Future work may include sediment sampling.

For more information: Danielle Jones, djones47@ucmerced.edu.

IV. Meeting Wrap-Up

Key follow-up activities:

- None noted.

Future agenda item suggested:

- CEQA scoping on the Delta MeHg TMDL Review; updated linkage analysis (Lauren Smitherman & Robin Merod, CV RWQCB)
- Collective findings from mercury characterization and control studies in wetlands managed by DWR (Carol DiGiorgio and others)
- Lake Mercury improvement projects—Sulphur Bank Mercury Mine Superfund site remediation plan (Carter Jessup, USEPA)
- MnO soil coating for Hg control (John Collins, AquaBlok)
- Measuring mercury loads across a tidal wetland inlet (Petra Lee, DWR)
- MnO treatment for mercury-laden soil stabilization (Peggy O’Day and Marc Beutel, UC Merced) [anytime]
- State government response to abandoned mines (Frank Jimenez and Eunice Roh, Legislative Affairs Office) [anytime]
- Delta RMP Mercury monitoring update (Jay Davis, SFEI; Wes Heim, MLML)

Next Meeting

- **Date:** Tentatively May 2021; 2nd or 3rd Tuesday?
- **Location:** likely online only