



DELTA TRIBUTARIES MERCURY COUNCIL

Tuesday, January 14, 2020

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, Burlison Consulting

Carrie Monohan, The Sierra Fund

Jason Muir, NV5

Carter Jessop, USEPA

Karen Jurist, USEPA

Charlie Alpers, USGS

Joe Domagalski, USGS

Jay James, Picoyune

Nick Graham, The Sierra Fund

Kendra Zamzow, CSP2

Via Teleconference

Lindsay Whalin, SF Bay RWQCB

Jennifer Fuller, CV RWQCB

Peter Graves, BLM

Nicole Hadler-Marsden, CSU Chico

Alicia Gilbreath, SFEI

I. Introductions and Agenda Review

No comments on the summary of the Sept. 26, 2019 meeting.

II. Project Updates & Upcoming Events

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

Mine Site Cleanups

- The Brownfields Coalition Assessment Project has been completed. The final report is posted on the project website (<http://www.westsideirwmbrownfields.org/>).
- The Westside Sac Coordinating Committee applied for another brownfields coalition assessment grant to continue identifying and assessing abandoned mine sites, and plan for site cleanups.
- Greg Reller (Burlison Cons.): Homestake's Reed Mine cleanup project will begin in summer 2020.
- Carter Jessop (USEPA): USEPA is evaluating the possibility of a non-time-critical removal action at the Sulphur Bank Mercury Mine Superfund site. This action would entail

removal of a waste rock pile from a wetlands area adjacent to the Elem Indian Colony's tribal lands and is proposed for 2020 to 2021.

- Carrie Monohan (The Sierra Fund): An engineering evaluation for Malakoff Diggins State Historic Park by Golder Assoc. is due in April 2020. The project continues to be constrained by conflicting objectives (environmental quality vs. cultural heritage). Work completion is planned by 2027 to comply with a Waste Discharge Requirement.

Mercury Studies and Monitoring Activities

- The Delta Regional Monitoring Program continues to sample fish annually, throughout the Delta. Water and sediments sampling will be discontinued due to budget constraints. All data through mid-2019 has been submitted to the Regional Water Board for use in the TMDL review. A new component for monitoring fish mercury accumulation in restored wetlands will begin this spring.
- The article "The assessment and remediation of mercury contaminated sites: A review of current approaches" was recently published in *Science of the Total Environment* by several DTMC participants. Read or download at: <https://authors.elsevier.com/c/1aGHQB8cckYiN>
- Nick Graham (The Sierra Fund): A real-time monitoring system at Combie Reservoir is being used to develop TDS, turbidity, and FDOM as surrogates for total and methyl mercury concentrations.
- Charlie Alpers (USGS): Monitoring for mercury loads by USGS continues in its eleventh year for inflows and outflows of the Cache Creek Settling Basin near Woodland., and the sixth year 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.
- Charlie Alpers (USGS): USGS has published a data release on water quality in Clear Lake, sampled during July 2019: <https://doi.org/10.5066/P9EK748U>

Regional and Statewide Mercury Regulation

- Jennie Fuller (RWQCB): (1) AB52 letters have been sent to consult tribes about the upcoming Delta MeHg TMDL revisions. (2) The Delta Stewardship Council's Independent Scientific Review Panel's second review phase will address recent study reports by DWR on open water modeling and tidal wetlands methylmercury production. The review web page is <https://deltacouncil.ca.gov/delta-science-program/independent-science-review-and-advice-of-the-delta-mercury-control-program>. (3) DSC's Advisory Panel will review the draft revised TMDL as well as provide advice on remaining information gaps. (4) Staff will perform a CEQA review of the TMDL proposed revisions in summer 2020.
- The statewide reservoirs mercury TMDL has stalled, pending staff assignment at the State Board.

Recent & Upcoming Conferences

- The CALMS conference held Oct. 10-11 in San Diego included a presentation on mercury control via a new hypolimnetic oxygenation system in Lake Hodges. For more information: <https://www.california-lakes.org/calms-conference>.

- The Sierra Fund’s conference “Sierra 2019: Headwater Mercury Source Reduction” was held October 17-18 in Grass Valley. <https://www.sierrafund.org/reclaiming-the-sierra-conference/>.
- The State of the Estuary Conference was held in Oakland, Oct. 21-22. <https://www.sfestuary.org/state-of-the-estuary-conference/>.

Other News & Updates

- OEHHA recently issued new fish advisories with safe eating advice for several lakes in southern California: Diamond Valley Lake, Ferguson Lake, and Taylor Lake.
- Yocha Dehe Wintun Nation 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.
- Charlie Alpers (USGS): USGS is starting a 5-year project at the Sulphur Bank Mercury Mine to evaluate total and methyl mercury isotopes in Clear Lake fish to quantify relative sources. See presentation below.
- Carrie Monohan (The Sierra Fund): The Sierra Fund will host one-day workshops and one-day tours to further its Headwaters Mercury Source Reduction Strategy in May (on hydraulic mine sites and forests) and October 2020 (on reservoirs and fish consumption). Contact info@sierrafund.org for more information.

III. Presentations

Six presentations were given.

1 – Mercury removal through Green Stormwater Infrastructure: Results from case studies around the SF Bay (Alicia Gilbreath, SFEI)

Existing rain gardens in urban Bay Area sites were monitored to determine removal efficiencies for mercury (as well as other stormwater contaminants). These systems receive diverted road runoff, passing water through an engineered soil mix into an underdrain, which discharges to the storm drain system.

Removals measured over 3 years of storms at one site were good for MeHg, but showed no removal of THg (filtered or unfiltered). Similar results were found at 10 sites sampled 4 times in one year. In fact, some sites exhibited increases in THg total and dissolved. For MeHg, the key design component appears to be minimizing wet zones. Most of the removal occurs in the first several inches of soil depth, indicating that the gardens could be very shallow without a loss in performance. Likewise, most of the mercury load is carried in the first flush, indicating that the initial runoff is most important to capture and treat.

Hg removal appeared to be primarily a physical filtering of particulate material rather than chemical adsorption process, but because Hg is preferentially associated with smaller particles removal was negligible. Biochar applied at one site showed no benefit.

Flow rate was measured at some sites, but was not assessed for load estimates or reported.

ref: Gilbreath, A.N, McKee, L.J., Shimabuku, I., Lin D., Werbowski, L.M., Zhu, X., Grbic, J., Rochman, C., 2019. “Multi-year water quality performance and mass accumulation of PCBs,

mercury, methylmercury, copper and microplastics in a bioretention rain garden.” *Journal of Sustainable Water in the Built Environment*. 5 (4). SFEI Contribution No. 872.

For more information: Alicia Gilbreath, alicia@sfei.org, 510-746-7334.

2 – Picayune Runabout (Jay James, Picoyune)

The newly developed Picoyune Runabout is a portable (the furnace and detector each weight ~5 pounds) mercury vapor analyzer. It can be operated on battery for up to 8 hours and requires no compressed gasses or consumables. The sensor is highly sensitive and selective to mercury. The analyzer uses a novel spectroscopic method, plasmonic sensing, based on changes in visible light transmission of a gold amalgam nanoparticle film. 1.5-mL samples of tissue, air, solid, or liquid can be measured in 3-5 minutes over a wide range of environmentally relevant concentrations. The unit is operated by and readings viewable by cell phone.

Compared to an XRF “gun”, the Runabout has advantages in terms of a wider range in detection limits, ability to measure wet solids and vapor samples, Hg selectivity, and lower price. Picoyune is seeking opportunities to deploy the Runabout at contaminated sites.

For more information: Jay James, jay@picoyune.com, 510-915-0152.

3 – Headwaters Mercury Source Reduction Strategy (Carrie Monohan, The Sierra Fund)

The Sierra Fund’s Headwater Mercury Source Reduction began in 2006. In 2018, the Strategy was completed, although it remains a “living” document in the spirit of adaptive management. The Strategy—and ongoing work to implement it—focuses on four targets: hydraulic mines, forests, reservoirs, and fish consumption. Key actions are ascribed to address each target.

Hydraulic mine actions include inventorying hydraulic mines and their features with detailed LIDAR mapping and other ground-truthing of mine sites and debris basins (focusing on one watershed per year) to assess physical and chemical hazards. Cultural evaluations are warranted to identify where mercury was used and lost. Pilot remediation projects are also developed, leading to recommended best-management practices.

For forested lands, the focus is on inventorying and ground-truthing mine-impacted forests, prioritizing fuel reduction forests, and again piloting and developing best management practices for land management that will minimize mercury-laden sediment transport.

For mercury-contaminated reservoirs, the actions include developing a database of contaminated reservoirs in the region, conducting baseline sampling, prioritizing reservoirs for remediation and pilot projects, and monitoring implementation of recommended best-management practices.

Mercury exposure from fish consumption is addressed with actions to survey anglers, monitor fish mercury levels, identify high-risk reservoirs, post consumption advisories, and use the data to inform outreach and regulatory actions.

Evaluation criteria are articulated to quantify successful actions for each target. The Technical Advisory Committee will meet in May and October for all-day workshops and one-day field trips.

For more information: Carrie Monohan, carrie.monohan@sierrafund.org, 530-265-8454.

4 – Combie Reservoir Sediment and Mercury Removal Project (Jason Muir, NV5)

The Dept. of Water Resources and Nevada Irrigation Dist. funded a multi-year sediment removal project at Combie Reservoir (aka Lake Combie) on the Bear River in the Sierra Nevada foothills. Removal was necessary to restore reservoir capacity (for multiple uses) in a way that was permissible given the associated mercury. The project included extensive monitoring to evaluate system performance, regulatory compliance, and environmental changes in the reservoir. Post-project monitoring is underway to evaluate possible benefits such as lower mercury or methylmercury concentrations in water, sediment, and biota. The project included public outreach and education on the importance of reservoir maintenance and mercury load reduction, and developed replicable processes for removing sediment in other Hg-impaired reservoirs.

Dredging in an upper area (approximately 50,000 cubic yards, to depths up to 15 feet) of the reservoir was performed both in the dry in 2018 (when reservoir level was low) and wet in 2019 (by a suction dredge). The work successfully complied with all applicable county, state, and federal permit conditions.

Material (totaling 50,000 cubic yards) was removed from the reservoir and a portion of the removed material was processed on a site adjacent to the reservoir. A Knelson concentrator was used to separate out heavy minerals including gold and mercury. Soils surveying did not find any liquid mercury in the dredged material, and processing did not remove significant quantities of elemental mercury (all of which was amalgamated with gold recovered). Wash water was settled out in ponds (with an added flocculant) and the water infiltrated or evaporated (never discharged). Some soil has been sold as aggregate while the remainder is stockpiled locally.

For more information: Jason Muir, Jason.Muir@nv5.com, 530-362-2776.

5 – Sulphur Bank Mercury Mine Superfund Site Remediation (Carter Jessop & Karen Jurist, USEPA)

Sulphur Bank Mine was operated for over 90 years extracting mercury (cinnabar) as well as other materials (boron and sulfur). Bradley Mining Corp was identified as the responsible party. Over 7 million pounds of mercury were produced. The site represents a major source of mercury to Clear Lake. Site work focuses on two “operable units”: (1) the mine site and soils, and (2) the lake and north wetlands. The Superfund “remedial process” started nearly 30 years ago and, in conjunction with emergency-response work at the site, EPA has spent about \$70 million, and is now approaching the stage of producing a Proposed Plan for the mine property and soils portion of the Site. The emergency actions at the site to have reduced mercury exposure and contributions of contaminants from the site to Clear Lake. Extensive evaluations over the course of the Site’s history have led to improved understanding of the site’s (and lake’s) mercury conceptual model.

For the revised treatment approach, consolidation and capping contaminated soils remains the first step. Mine-influenced stormwater runoff will be reduced and diverted away from Herman Impoundment, which is expected to reduce acid generation and mercury leaching. Ongoing investigations and site work are estimating groundwater flux rates, estimating background levels, and working with local tribal communities on fish consumption advisories.

Input from the local community and subject matter experts regarding how EPA might best communicate the fish advisory to the public is requested as EPA begins to expand its public outreach at the Site.

Unfortunately, for the Clear Lake portion of the Site, there are still no firm answers as to what benefits EPA could or should expect in response to two of the main clean up approaches to be evaluated – capping or dredging of contaminated sediments within Clear Lake. USGS scientists will be doing various studies of mercury in the lake and at the mine site with the main goal of quantifying the proportion of mercury in the food web of Clear Lake that is derived from the mine site using mercury isotope methods. The work will be done in collaboration with ongoing studies by UC Davis on Clear Lake hydrodynamics and nutrient cycling, and in coordination with the Blue Ribbon Committee for the Rehabilitation of Clear Lake (<http://resources.ca.gov/clear-lake/>).

For more information: Carter Jessop, jessop.carter@epa.gov, 415-972-3815.

6 –DTMC Strategic Plan completion (Stephen McCord, MEI)

Over the past year, several DTMC participants have provided useful input on the strategy and activities tracking. Partial funding was provided by Regional San and Teichert Construction. The objectives of the planning effort were to: produce a concise, dynamic plan; apply to entire Delta and its watershed; address DTMC members (i.e., tell what the DTMC will do), and support / guide other efforts.

The DTMC website was updated, particularly listing current participants. The site now contains 6 pages of minutes and 12 pages of presentations. Future updates will add the strategic plan brochure, reference the activities tracking table, and provide a list of mercury-related websites.

The strategic plan is encapsulated in a concise 2-page brochure. Everyone is encouraged to view, share, and use the plan at: <http://www.sacriver.org/aboutwatershed/mercury/dtmc>. Activities relevant to the strategic plan are tracked online as completed, underway, and planned/proposed. View the activities tracking table at: <https://docs.google.com/document/d/1EzeDOiS-vrMIMsjfNZC18Zoz9XWOSiorPSI3RJxrS9s/edit#heading=h.3f2uqo9jdvту>

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 wildfires on mercury loadings and methylation, Cache Creek watershed (Charlie Alpers, USGS)
- Recently published USGS Open-File Report as part of a series of studies focused on mercury cycling in reservoirs located in arid-land environments (Naftz et al., USGS).
- The assessment and remediation of mercury contaminated sites: A review of current approaches (Lindsay Whalin, SFB RWQCB)
- Real-time monitoring of mercury surrogates for settling process optimization (Nick Graham, The Sierra Fund)

Next Meeting

- **Date:** Looking at April-May 2020, but may push to fall.
- **Location:** DWR in West Sacramento, Room 106