

RMP Emerging Contaminant Workgroup Meeting
June 1, 2006
San Francisco Estuary Institute
Meeting Minutes

In attendance:

Dave Crane (CDFG)
Jennifer Field (Oregon State University)
Dane Hardin (AMS)
Jennifer Jackson (EBMUD)
Derek Muir (Environment Canada)
Karin North (City of Palo Alto)
David Sedlak (UC-Berkeley)
Karen Taberski (Regional Board)
Dave Tucker (City of San Jose)
Mike Connor (SFEI)
Jay Davis (SFEI)
Meg Sedlak (SFEI)
Saskia van Bergen (EBMUD)
Don Yee (SFEI)

1. Introductions

Meg Sedlak began with introductions. Jay Davis gave a short presentation on the bathymetry and hydrology of the Bay, sources and sinks of pollutants to the Bay, and implications of the identification of contaminants in the Bay. Meg Sedlak gave a brief overview of the RMP including: the RMP budget, elements of the annual Status and Trends monitoring program, the Pilot and Special Studies program, and previous and current studies conducted on emerging contaminants. Much of this information was presented in the discussion paper that was sent to the workgroup members prior to the meeting.

2. Presentations from the Science Advisory Panel: Identifying New Persistent Chemicals in the Great Lakes (Derek Muir)

Derek Muir, Project Chief of Aquatic Ecosystem Protection Research Branch of Environment Canada, presented strategies for identifying emerging contaminants, results of analyses of emerging contaminants in Hamilton Harbor, and a top ten list of emerging contaminants.

Strategies for identifying emerging contaminants. Dr. Muir suggested one strategy might be to review current regulatory lists of chemicals such as TSCA (USEPA), TRI (USEPA), OECD (EU), ICCA, PRTR (Japan), Pollutant Inventory (Australia). Under TSCA, USEPA is required to provide approval/rejection of a chemical within 90-days based on limited information provided under the premanufacturing notices. A substantial number of chemicals (~70,000) were

grandfathered in when TSCA was promulgated including chemicals such as PBDEs. Environment Canada has a domestic substance list/process which screens and bans persistent, bioaccumulative, and toxic substances. There are currently more than 11,000 chemicals on this list. Dr. Muir indicated that in contrast to the USEPA, Environment Canada uses the precautionary principle (i.e., if insufficient information exists the chemical will not be approved).

Criteria for evaluation of emerging contaminants. In the Great Lakes, chemicals are evaluated on the potential for bioaccumulation (e.g., BCF/BAF > 5,000), persistence (e.g., half life in soil > six months), toxicity (using QSAR), potential for long range atmospheric transport, and quantity/use. Drs. Muir and Howard are working on a model to evaluate 11,300 chemicals (similar to Oasis model, see Dimitrov et al. 2002).

Many of the chemicals that are ranked highly are hydrophobic, halogenated compounds that are amenable to standard methods for analysis. However, for many chemicals, little information is available on bioaccumulation or physical/chemical properties (e.g., Kows) and standards are not readily available.

Case studies in Hamilton Harbor. Dr. Muir presented the results of studies of emerging contaminants (e.g., PBDEs, musks, triclosan, fluorinated compounds, methyl siloxanes) in Hamilton Harbor. Many of the compounds showed a dramatic decrease with distance from the harbor and into Lake Ontario.

Top ten chemicals. Dr. Muir indicated that the cyclic methyl siloxanes represent a concern. Studies in Scandinavia (Kaj et al. 2005) indicate very high concentrations in marine fish. This compound is exceedingly difficult to analyze. Other priority chemicals included: perfluorinated compounds; brominated compounds (e.g. PBDEs); chlorinated paraffins (e.g., Dechlorane Plus); chlorinated naphthalenes; musks; pharmaceuticals; current use pesticides; and phenolics (e.g., triclosan and bisphenol A).

3. **Presentations from the Science Advisory Panel: Perfluorinated Compounds Occurrence and Mass Flows of Fluorochemicals during Municipal Wastewater Treatment (Jennifer Field)**

Dr. Field presented a case study of the loads and fate of perfluorinated compounds in a wastewater treatment plant in Corvallis, Oregon. She emphasized that perfluorinated compounds consisted of a whole class of compounds, not just PFOS and PFOA. Fluorinated compounds have R-groups, such as acrylate, alkyl, alcohols, carboxylates, ethoxylates, that vary tremendously in terms of chemical/physical properties. In addition, as a result of the manufacturing process, there are numerous by-products. The C-8 compounds have been phased out; however, numerous other perfluorinated compounds remain in use (e.g., fluoropolymer intermediate – methylacrylate is used to treat carpets).

Dr. Field stated that a recent ES&T paper had highlighted sources and sinks of perfluorinated compounds. Fluorinated compounds have been identified in humans (Danish study evaluating concentrations in 4,000 individuals). Human health effects are seen at the 5 ug/g level. It is a suspect carcinogen but not a lot is known about its toxicity. It is seen in the ppm range in higher level trophic animals such as polar bears and dolphins; however, it has a huge species to species variability. Human health effects such as a higher incidence of cancer was observed in a community in West Virginia where perfluorinated compounds were identified in soil and groundwater; however, causality was not established.

Dr. Field presented a mass balance of flows through a wastewater treatment plant. Carboxylates and sulfonates were not associated with sludge and largely passed through the plant. Sulfonamides, however, were largely associated with the sludge.

4. Presentations from the Science Advisory Panel: Chemical Contaminants and Endocrine Disruption in Fish

Sex reversal in fish was observed in the early 1990s in the England. The causes of the reversal are not known and may be the result of legacy contamination (e.g., DDT) or nonionic detergents/pesticide adjuvants (e.g., nonylphenol) or steroid hormones. Effects in fish (e.g., vitellogenin induction) are seen at the 1 ng/l for estrogenic compounds which is in the range that is likely to be present in wastewater effluent. This suggests that in order to see effects, the receiving waters need to be largely effluent dominated. While estrogens are removed during wastewater treatment, progesterone concentrations remain largely unchanged. Sources of endocrine disrupting compounds (EDCs) include POTWs as well as cattle range lands, dairy farms, and wildlife.

EDCs can cause pheromonal disruption in fish which is critical for communication. The binding of EDCs in fish receptors causes spawning behavior (aggressiveness) and triggers changes in sperm.

The USGS examined streams for 139 compounds (Koplin et al. 2002). Many of the compounds observed do not have significant ecological effects. Of interest to the RMP may be carbamazepine (see Oetkin et al. 2005), estrodials, and triclosan.

5. Afternoon Open Discussion by Group

Jay Davis opened the afternoon discussion by explaining the process by which emerging contaminants would be included into the RMP. First, the workgroup would need to develop a list of emerging contaminants of concern and a list of criteria for evaluating compounds. As part of this process, it would be helpful to review sources of emerging contaminant information (e.g., experts, other groups, literature review, etc.). Once the chemicals are identified, the workgroup would need to recommend whether they should be included into Status and Trends

program (e.g., adding on a chemical to an existing study) or whether a new Pilot and Special Study should be developed (e.g., new matrices, methods, bioassays, etc.). The workgroup would be expected to review the results of these studies and to assist in program adjustments. One recommendation made by Dr. Muir in the morning was that the RMP needed to develop a strategy for archiving samples. Dave Tucker pointed out that the process needed to be iterative and needed to incorporate lessons learned. The amount available for EC studies is likely to be on the order of \$100,000 per year.

With regard to criteria, the following criteria were considered important: persistence, bioaccumulation, toxicity, risk, and public perception. Karin North mentioned that the public perceives a risk from pharmaceuticals in effluents and that it would be useful to have a study of pharmaceuticals in the Bay to quantify the risk. The City of Palo Alto would be interested in supplement RMP funds for this type of a project. There was some discussion whether the USGS list was the most appropriate list of compounds and whether it was an appropriate use of limited resources to look for all of these pharmaceuticals when some such as aspirin may not have an appreciable risk. The study could be focused on those where it is believed that there is an ecological impact such as the steroid hormones, carbamezipine (anti-seizure drug), or triclosan (an antibacterial). Karin North indicated that the 2007 Pilot and Special study that she was working on with Daniel Oros would include 25 effluent samples, 25 influent samples, and 5 Bay locations. Based on the proposal submitted, it was not clear if AXYS would conduct this work pro bono. The workgroup recommended that this project be conducted (i.e., reviewed by the TRC); however, the workgroup requested a more detailed budget description.

David Sedlak indicated that a cheaper alternative to determine the concentration of pharmaceuticals in the Bay would be to use total iodine as a proxy to determine the dilution ratio for Bay. This information could be used to assess whether there was a risk. There was some concern whether there were adequate standards for all of the pharmaceuticals and also whether sea water would present an analytical challenge. Several individuals mentioned the work on pharmaceuticals in drinking water that Shane Snyder is conducting at Southern Nevada Water Authority. Martin Rheinhard at Stanford University is also conducting research on pharmaceuticals in streams. Karin North indicated that the Santa Clara Valley Water District is funding some of his research.

Dr. Muir pointed that some chemicals that are not known to bioaccumulate; nonetheless, these compounds might be of ecological concern because organisms might be exposed to a constant elevated source (e.g. POTW effluent discharge).

There was some discussion if it made more sense to look for biological effects and then tease out the chemical that was causing the effect (e.g., the work currently being conducted in the Southern California Bight on the starry flounder that observed feminization of fish).

The workgroup discussed the Pilot and Special Study proposal for 2007 on perfluorinated compounds. This included the analysis of water, sediment, fish, and seal samples; however, the workgroup recommended that it focus on seals as they are the apex of the food chain.

With regard to the Pilot and Special study proposal for 2007 on pyrethroids, the workgroup recommended that this proposal be sent to the episodic toxicity workgroup for review and possible inclusion into that program. Jennifer Field asked whether Diron (sp?) was an issue for the Bay and indicated that Tom Young of UC-Davis was conducting research on this.

A question was asked about semi-permeable membrane devices (SPMD) and their utility. The workgroup thought that it did not give much of an advantage over resins and had the disadvantage that it is difficult to interpret the data (e.g., hard to quantify). It was mentioned that Bob Spies of AMS and Katie Springman of UC-Davis are working on a project using SPMD in the Bay. Dave Crane indicated that he would have chemical results from the Spies/Springman study shortly.

Derek Muir asked whether the program had considered the metals platinum and palladium.

The next meeting was set for Monday, October 30.

9. Action items:

The following action items were identified:

- Contact NWQMC and WERF to find out about the work that they are conducting on emerging contaminants
- Develop a strategy for archiving samples.
- Contact Martin Rheinhard at Stanford to better understand the research being conducted.
- Review the TRI list for the Bay Area to identify major polluters and sources.
- Revise the white paper to reflect the workgroup meeting.
- Develop a list of potential emerging contaminants for the next meeting.

The meeting was adjourned at 3:15 pm.