Summary of Review Panel Comments for CALFED Water Quality Program, Stage 1 Final Assessment

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Based upon Reviews by:
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Charge to review committee

1. Review CALFED Water Quality Program Stage 1 Final Assessment (Final Draft, October 2007) document

2. Provide feedback around 8 targeted topics and associated questions

- Presentation today attempts to focus on most significant deficiencies identified by the review panel

Overall Comments – I

- Stage 1 represents a major effort that has been worthwhile and productive

- TOC/DOC and salinity/bromide occurrence throughout the Delta is presented comprehensively

- Stage 1 Final Assessment document does require some targeted revisions & clarifications to serve as a stand alone document. These include:

Overall Comments – II

1. Improve the risk assessment approach and basic *Equivalent Level of Public Health Protection (ELPH)* interpretation
2. Chapter 6 requires significant revisions
3. Inconsistencies exist between main text and numerous appendices; report is difficult to read and follow given the formatting of the appendices
4. Recommendation for Stage 2 should be revised to address reviewers' comments that will help achieve the CALFED Water Quality Program objectives
5. Stage 2 should define the target balance between science, implementation activities and effort needed to comply with legal decisions

Equivalent Level of Public Health Protection (ELPH) – I

- *In the CALFED Bay-Delta Program Record of Decision (2000) the goal of the WQP is to provide "safe, reliable, and affordable drinking water in a cost-effective way," with a target to "achieve either: (a) average concentrations at Clifton Court Forebay and other southern and central Delta drinking water intakes of 50 µg/L bromide and 3.0 mg/L total organic carbon, or (b) an equivalent level of public health protection using a cost-effective combination of alternative source waters, source control, and treatment technologies."*

- It seems plausible that ELPH would encompass a risk assessment from multiple water contaminants.

- Introductory material should discuss why DBP's, rather than pathogens, arsenic or other pollutants, are the driver for risk reduction.

Equivalent Level of Public Health Protection (ELPH) – II

- Consideration should be given to development of risk indices based on simple additivity for cancer and a hazard index for non-cancer endpoints. This would be more comprehensive and include non-THM and HAA constituents.

- Tracking THM4 and HAA5 levels alone were not seen as providing an ELPH

- Inadequate attention / data collection focused on DBP levels "at the tap" where public is exposed to the water

1. Information Gathering

- Data on many relevant water quality parameters exist, but have not been reported or reporting is inadequate:
  - Inorganics: arsenic, iodide, nitrate
  - Organics: UVA254, DON, pesticides, algal toxins
  - Pathogens: Giardia, Cryptosporidium
  - Emerging DBPs: NDMA & other N-DBPs, iodinated DBPs
  - Aesthetics: Threshold odor number, MIB, Geosmin
  - Reviews indicate such data exists
- TOC is a regulatory framework tool for Enhanced Coagulation, but DOC (and UV254) really drives DBP formation. DOC should be emphasized as a more important metric since POC is easily removed.
- There was no attempt to validate data from multiple labs, on-line sensors or other sources
- Insufficient DBP data "at the tap"; too much emphasis on DBP data at the point of entry to the distribution system
- Better land-use delineation and tracking over time is needed (satellite imaging perhaps)
- WQP would benefit greatly from developing an integrated data management system (GIS-based)
- *Report requires more information on validation of "fingerprinting" model (DSM2)*

DBP Basics Should be Included

Source water
Conveyance
Treatment

Regulations μg/L

Mechanisms moles/L

THM ($CHCl_3$, $CHCl_2Br$, $CHClBr_2$, $CHBr_3$)

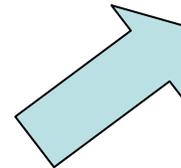HAA5 (HAA9 includes more Br-DBPs
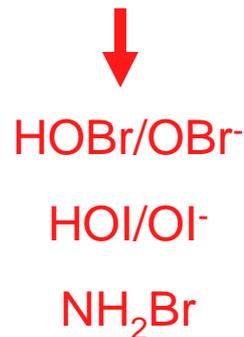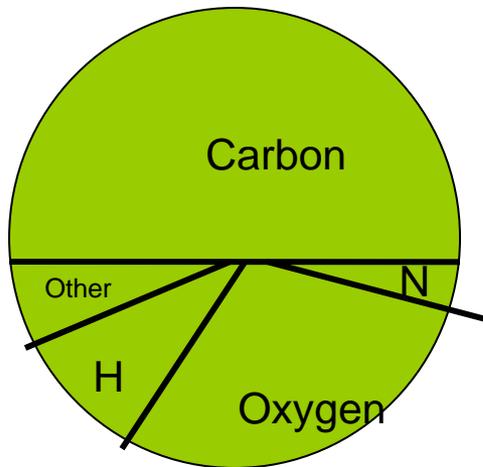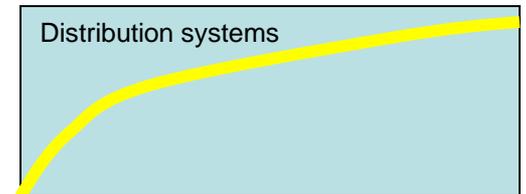
I-DBPs

Bromate

Halogenated N-DBPs

Non-halogenated N-DBPs

Dissolved organic matter

Carbon

Other

N

H

Oxygen

$HOBr/OBr^-$

HOI/OI^-

NH_2Br

Distribution systems

Models exist to predict DBP formation in water treatment plants
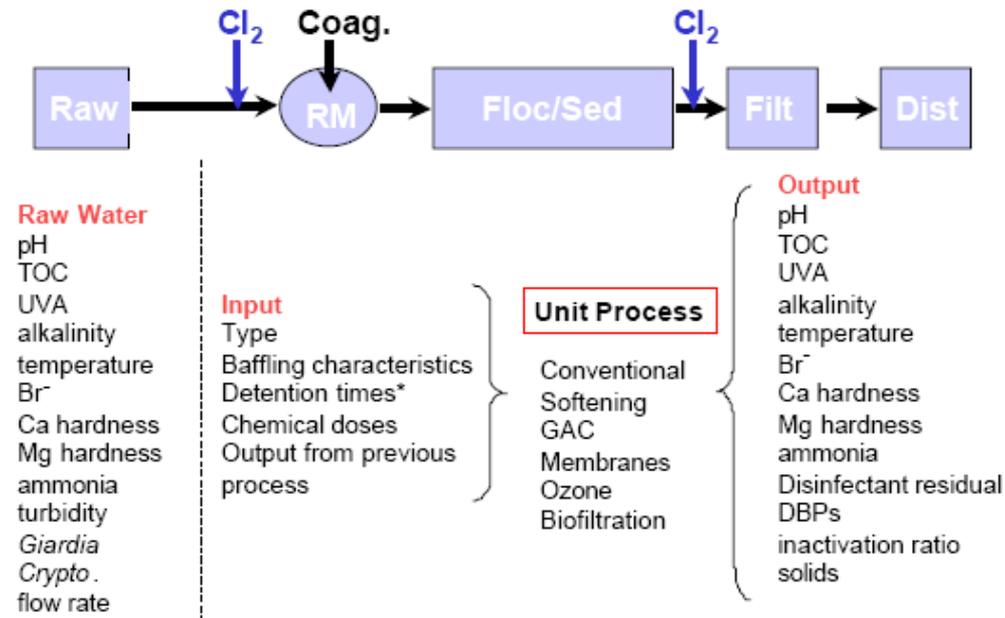
Figure 1-1 Water Treatment Plant Model Schematic

Potential significance of Br-DBPs & N-DBPs are crucial

DBP Chemical Class
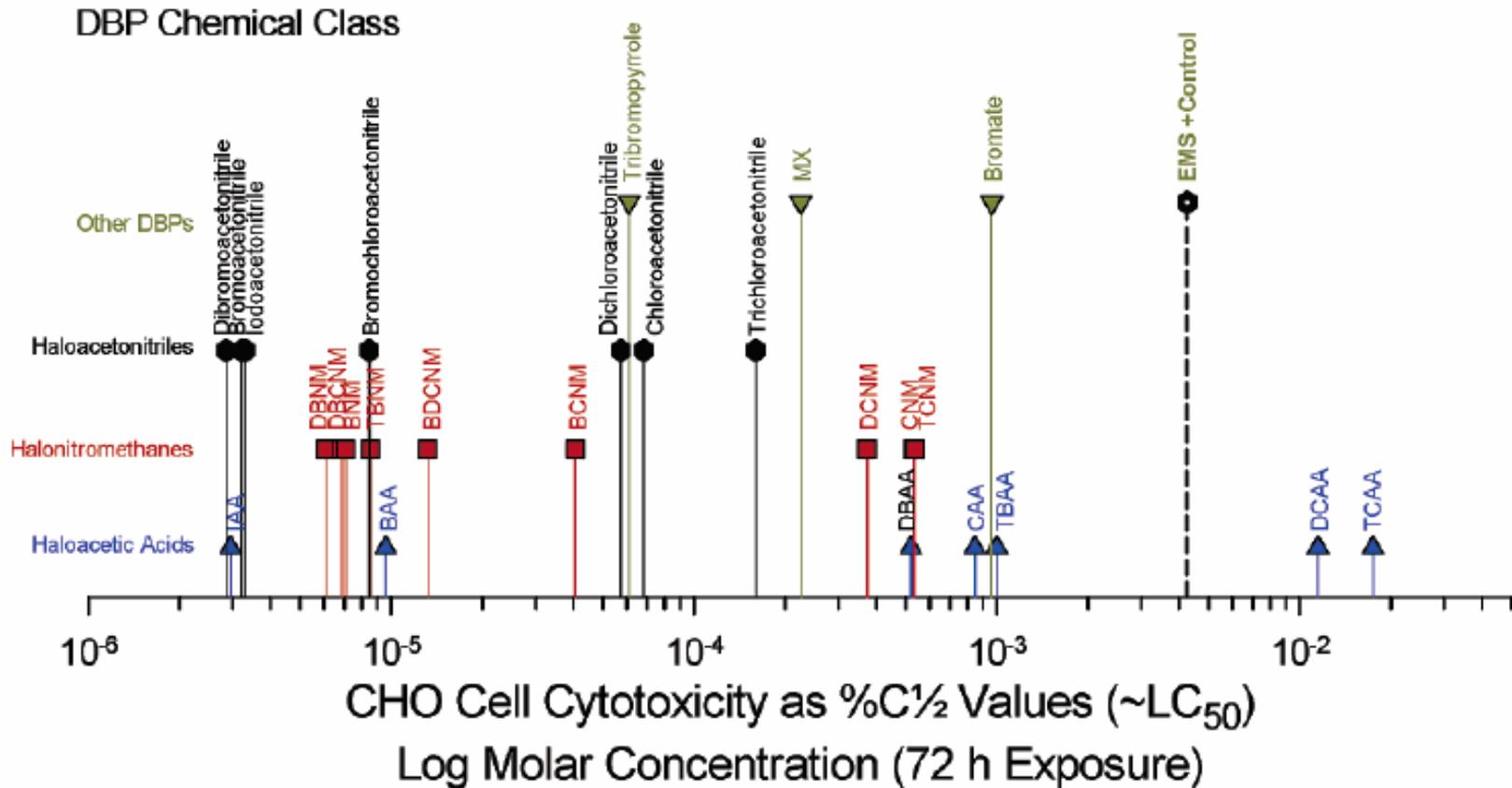
2. Information Analysis and Results

- *Have processes and methodologies (e.g. analyses of data) been used that are understandable, scientifically defensible, fully documented and appropriate?*

  – More information on individual DBPs, rather than DBP classes, is required

  – Use of box and whisker plots or running averages to correlate TOC or DBP concentrations is mis-used; how did this evolve from the ROD?

  – Analysis should consider TOC & Br co-occurring *together*, and not as separate statistical parameters. Their combination affects DBP formation.

  – Source water quality is only ONE determinant of finished water quality; the other is treatment

  – Analysis of treatment factors (chapter 6) was poorly executed

- *Are the modeling and risk analysis approaches employed defensible and consistent with other large scale projects elsewhere in the nation and internationally?* *NO*

- *The reviewers did not think the report contained adequate, if any, actual risk assessment*

- *The linkage between THM & HAA5 and ELPH was never established*

3. Findings and Recommendations

- *ELPH* must be operationally defined and stated. Here it appears to be 40 ug/L TTHM, 30 ug/L HAA5 and 5 ug/L bromate. Page 7-3 states more fitting measures should be identified; this should be done.

- Recommendations were based upon a series of performance metrics developed. The performance metrics suggested are not really performance metrics. Some alternative performance measures might be:
  - How much have DBPs been reduced as a result of various actions?
  - How much has the DOC and bromide concentration been reduced at Delta intakes by various actions?
  - How many plants are exceeding the ELPH conditions of 40 ug/L TTHM, 30 ug/L HAA5 and 5 ug/L bromate?

- The report is heavily weighted on watershed processes rather than treatment or distribution which equally impact exposure and consequently human health risk

An Alternative Approach to the ELPH Conundrum

- How does one assess the overall public health risk associated with what is acknowledged to be a "soup" of constituents?
- The risk posed by a given compound can be expressed as the potency multiplied by the concentration at which this constituent occurs:

Risk = Potency x Concentration

- Cumulative risks from exposures to carcinogens have been widely assumed to be additive.
- A numeric index can be developed to compare different waters containing varying levels of constituents. A similar analysis can be done non-cancer endpoints (a Hazard Index based on reference doses).

4. Conveyance

- *Are the findings and recommendations regarding the role of conveyance in meeting the water quality objective valid?*
- The Delta by-pass option would dramatically reduce health risk
- Inadequate validation of Delta model makes it difficult to assess related recommendations
- Decisions are being made based upon a maximum of 17 years of data. Uncertainty into the future should be a concern. Consider secondary, longer-term data sources and associated correlations (streamflow, snowpack, temperature, etc).
- CALFED should be concerned & responsible for changes in water quality during conveyance – report currently implies this is up to municipalities. If ELPH is applied in the ROD, then CALFED must take more ownership of what happens during conveyance. Nutrients from the Delta may be impacting water quality during conveyance, or selective timing of Delta water diversions may improve water quality
- More in-situ monitors are needed

5. Stage 2 Priorities

- Most priorities were viewed as valid
- Defining ELPH targets must be done
- Better understanding of organic carbon quality relative to treatment and DBP formation is important, but DBP FP testing is not necessary (use surrogates & models)
- Multiple barriers are good, and should *all* be modeled (including conveyance, WTP and distribution systems)
- A specific goal should be "reducing TOC"
- Demonstrating alternative technologies is under emphasized as a Stage 2 goal. These could include mobile pilot plants, novel technologies, and novel management options (bank filtration)
- Stage 2 should define the target balance between science, implementation activities and effort needed to comply with legal decisions
- Dedicated funding for research (not only implementation) is needed to collect critical monitoring and scientific data

6. Approach for "equivalent level of public health protection"

- *Is the approach taken to determining if an "equivalent level of public health protection" has been achieved appropriate? Are there other ways to evaluate progress towards this goal? NO*

- *See previous slides*

7. Treated water quality

- *Are the conclusions about linkage between source water quality and treated water quality valid? Are additional treated water quality data and analysis needed?*

- All reviewers agreed this was the <u>weakest</u> chapter and must be revised.

- Specifics are in the detailed comments

- Treatment is as important a determinant for DBP exposure as source water quality

8. Performance Measures

- *Are the identified performance measures sufficient and appropriate for the stated goals of the program?*

- All reviewers had concerns regarding the performance measures

  - *As stated, the performance measures are not really metrics but recommendations*

  - *These are listed on page 7-12 & Appendix C. The final Stage 1 report must develop appropriate metrics, justify their selection, and prioritize them.*

Questions

- Reviewers:
  - Phillippe Daniel / CDM (Walnut Creek, CA)
  - David Reckhow / Univ. of Massachusetts at Amherst
  - Philip Singer / Univ. of North Carolina at Chapel Hill
  - Paul Westerhoff / Arizona State University