

Technical Memorandum

Date: 3/7/2005
To: Central Valley Drinking Water Policy Workgroup
From: Karen Larsen
RE: Drinking Water Policy Constituent Prioritization Summary

Introduction

The Central Valley Drinking Water Policy Work Group is tasked with obtaining the technical information the Regional Board needs to develop a drinking water policy to protect source water in the Central Valley. Because the list of constituents of concern in drinking water supplies is long and the available resources are limited, the Work Group recognized that the initial policy effort would have to focus only on a few, high priority constituents. This memo summarizes the process the Work Group utilized to evaluate and prioritize constituents on which to focus future work (i.e., conceptual modeling, water quality monitoring, etc.).

Prioritization Process

The Work Group developed the initial list of constituents to consider. Figure 1 shows the process by which the initial list of constituents was evaluated to produce a refined list of constituents for conceptual modeling. The final list that will be the focus of the policy will be determined using the conceptual models.

Tier 1

The first step in the process was to assess the initial list of constituents against the Work Group's tier 1 criteria: 1) constituent occurs at drinking water intakes at concentrations of concern to drinking water and 2) the constituent poses a public health or aesthetic concern¹. In order for a constituent to be included on the tier 1 list of constituents, it had to meet both

¹ The public health or aesthetic concern criteria was split into three categories: 1) public health concern, referring to whether there is an established maximum contaminant level or public health goal, for the constituent, 2) aesthetic concern referring to whether the constituent causes taste, odor, or appearance problems in the finished water, and 3) the constituent appears on US EPA's candidate contaminant list.

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of these criteria. Table 1 shows how the tier 1 criteria were applied to the initial list of constituents. Note that some constituents were grouped with others because they are surrogate measures (e.g., electrical conductivity is a surrogate measure for total dissolved solids).

Tier 2

The Work Group then used the report that summarizes available data [1] to evaluate the tier 1 list of constituents. If the available data for a constituent was sufficient both temporally and spatially, the constituent was included on the tier 2 list. In addition, upon applying the tier 2 criteria, the Work Group consolidated the constituents into categories where it made sense to do so. For example, rather than listing all types of nutrients that could be measured (i.e., ammonia, total Kjeldahl nitrogen, nitrate, etc.), the category of nutrients was included on the tier 2 list. The categories of pathogens and indicator organisms and dissolved minerals were grouped in the same manner.

Tier 3

Finally, the tier 2 list was reviewed to determine if Basin Plan objectives already exist for the constituents and, if so, whether the objectives are adequate to protect drinking water supplies. The constituents for which no adequate Basin Plan objectives exist were included on the tier 3 list of constituents. Table 2 summarizes how the tier 2 and 3 criteria were applied to the tier 1 list of constituents. Table 3 summarizes the definition of the numbers listed in the "Extent of Knowledge/Data" column.

Next Steps

The next step is to develop conceptual models for the tier 3 groups of constituents. Conceptual models are a compilation of existing information on constituents in a system (i.e., sources, fate and transport, measurement techniques, etc.). Likely there is not enough information about one or more of the tier 3 constituent groups to develop a policy (e.g., lack of methods for directly measuring virus concentrations). The conceptual models will provide the information necessary to establish the final list of constituents that will be the focus of the policy development work.

Although many constituents will not be considered for this first policy development effort, the Work Group and others will continue to track all constituents of potential concern in drinking water supplies. As new information emerges, constituents not considered during this initial effort may be evaluated in the future. The Regional Board will strive to develop a policy that allows for other constituents to be considered as more information becomes available.

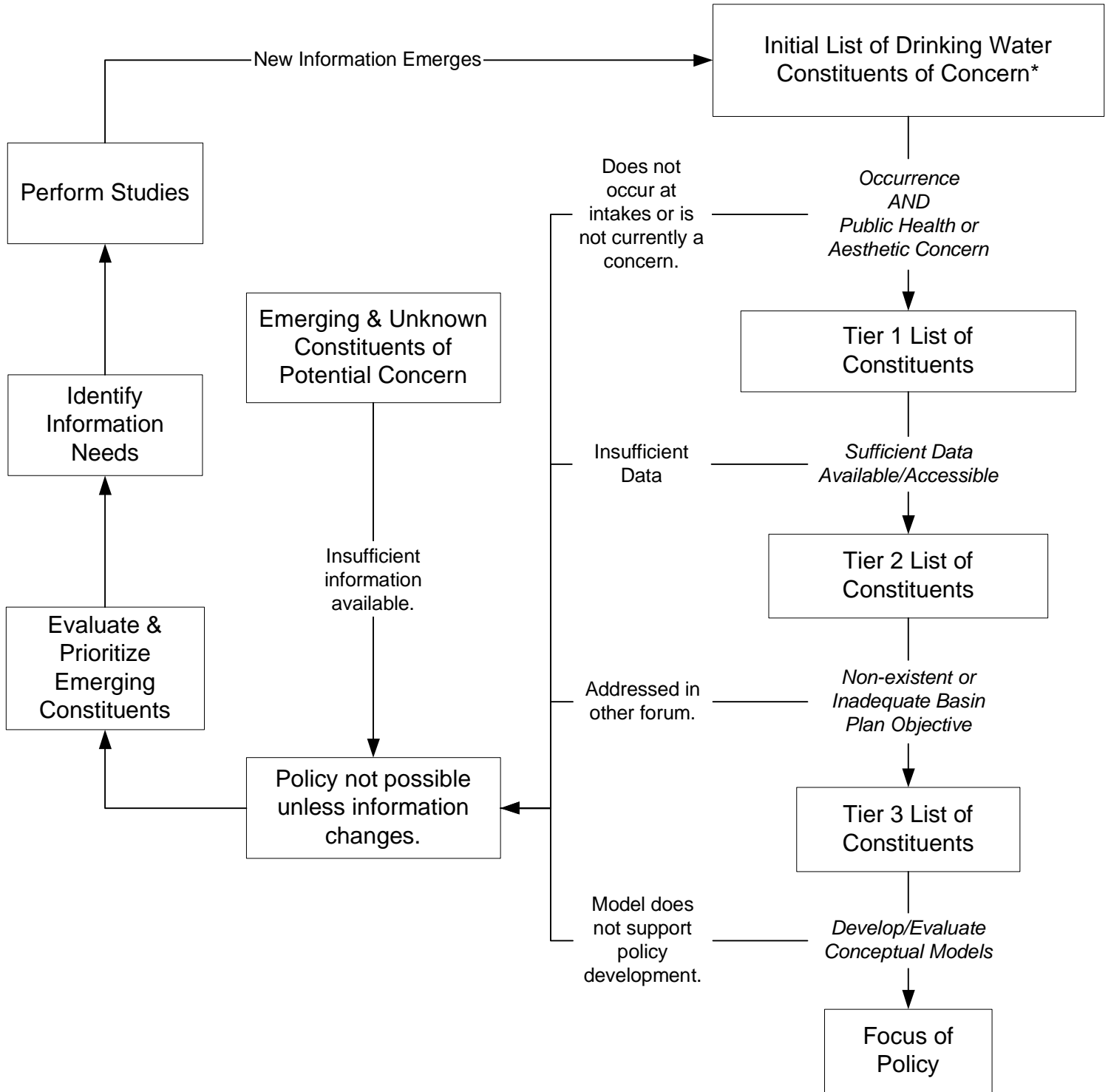
The triennial review of the Basin Plan is one process designed to identify emerging water quality problems. Every three years the Regional Board holds workshops to gather input from stakeholders on water quality problems. Staff then evaluates the issues to determine whether it is a regulatory problem that should be addressed through a Basin Plan amendment or a water quality problem that can be addressed through another Regional Board program (i.e., the Clean Water Act §303(d) listing process, the Watershed Management Initiative, permitting, waivers, monitoring and assessment, etc.). The

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regulatory problems are prioritized and, as resources become available, the Regional Board initiates Basin Planning work on the highest priority issues. Water quality problems are prioritized through the appropriate program and incorporated into work plans as resources allow.

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- 1 LWA. 2004. Technical Analysis to Support Development of Drinking Water Policy for the Central Valley Basin Plan: Identification of Existing Data and Planned Monitoring. Prepared for the Central Valley Drinking Water Policy Workgroup, Sacramento, CA.

Figure 1. Schematic showing the process used to prioritize drinking water constituents for future drinking water policy work.



*Based on metadata report [LWA, 2004]

Table 1. Summary of how tier 1 criteria were applied to the initial list of constituents of concern for drinking water policy development.

Constituents ¹	Occurrence ³	Public Health or Aesthetics?			Explanation	Tier 1 List ⁷
		Public Health Concern ⁴	Aesthetics Concern ⁵	On EPA's CCL ⁶		
Conventional						
Cyanide		NA			None identified in the Central Valley	
Temperature		NA				
Dissolved oxygen (DO)		NA				
pH		NA				
Hardness		NA				
Salinity	Y				surrogate, data interpretation	
Percent sand/silt/clay		NA				
Turbidity/TSS	Y	Y			shields pathogens from treatment, localized	Turbidity/TSS
Dissolved Minerals						
Total dissolved solids (TDS)	Y		Y		water mgmt issue, public perception	Total dissolved solids (TDS)
Chloride	Y		Y		taste, public perception	Chloride
Conductivity		NA			surrogate, data interpretation	
Nutrients²						
Ammonia	Y		Y		Contribute to increased algal biomass.	Ammonia
Total nitrogen	Y		Y		Contribute to increased algal biomass.	Total nitrogen
Total Kjehdahl nitrogen (TKN)	Y		Y		Contribute to increased algal biomass.	Total Kjehdahl nitrogen (TKN)
Organic nitrogen	Y		Y		Contribute to increased algal biomass.	Organic nitrogen
Nitrate	Y		Y		Contribute to increased algal biomass.	Nitrate
Nitrite	Y		Y		Contribute to increased algal biomass.	Nitrite
Phosphorus	Y		Y		Contribute to increased algal biomass.	Phosphorus
Orthophosphate	Y		Y		Contribute to increased algal biomass.	Orthophosphate
Taste/Odor Producing Compounds						
MIB	Y		Y			MIB
Geosmin	Y		Y			Geosmin
Algal Toxins						
	Y			Y	On EPA candidate contaminant list.	Algal Toxins
Disinfection Byproducts Precursors						
Total organic carbon (TOC)		NA			surrogate, data interpretation	
Dissolved organic carbon (DOC)		NA			surrogate, data interpretation	
Organic carbon	Y	Y			DBP precursor	Organic carbon
Bromide	Y	Y			DBP precursor	Bromide
Ultraviolet Absorbance at 254 nm (UVA ₂₅₄)		NA			surrogates, data interpretation	
Specific UVA (SUVA)		NA			surrogates, data interpretation	
Trihalomethane Formation Potential (THMFP)		NA			surrogates, data interpretation	
Chlorophyll a ⁽³⁾		NA			surrogates, data interpretation	
Pathogens and Indicator Organisms						
<i>Giardia</i>	Y	Y			Occurs and is a public health concern	<i>Giardia</i>
<i>Cryptosporidium</i>	Y	Y			Occurs and is a public health concern	<i>Cryptosporidium</i>
Total coliform	Y	Y			Occurs and is a public health concern	Total coliform
Fecal coliform	Y	Y			Occurs and is a public health concern	Fecal coliform
Enterococcus	Y	Y			Indicator in brackish water and recreational waters.	Enterococcus
<i>E. coli</i>	Y	Y			Occurs and is a public health concern	<i>E. coli</i>
Enterovirus	Y	Y			Occurs and is a public health concern	Enterovirus
F specific coliphage		NA			surrogate, data interpretation	
Trace Elements						
Arsenic	Y	Y			MDL higher than PHG - regs may get more stringent	Arsenic
Hydrology						
Flow		NA			Important for policy, but not COC.	
Pesticides						
Chlorpyrifos	N				Not detected at intakes at levels of concern.	
Diazinon	N			Y	Not detected at intakes at levels of concern.	
Molinate	Y		Y	Y	Caused taste/odor problems at City of Sac. Intake.	Molinate
Thiobencarb	Y		Y		Caused taste/odor problems at City of Sac. Intake.	Thiobencarb
2,4-D	N				Not detected at intakes at levels of concern.	
Azoxystrobin	N				Not detected at intakes at levels of concern.	
Bensulfuron	N				Not detected at intakes at levels of concern.	
Carbaryl	N				Not detected at intakes at levels of concern.	
Carfentrazone	N				Not detected at intakes at levels of concern.	
Copper sulfate	N				Not detected at intakes at levels of concern.	
Cyhalofop-butyl	N				Not detected at intakes at levels of concern.	
Cyhalothrin	N				Not detected at intakes at levels of concern.	

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<i>Constituents</i> ¹	<i>Occurrence</i> ³	<i>Public Health or Aesthetics?</i>			<i>Explanation</i>	<i>Tier 1 List</i> ⁷
		<i>Public Health Concern</i> ⁴	<i>Aesthetics Concern</i> ⁵	<i>On EPA's CCL</i> ⁶		
Difluebenzuron	N				Not detected at intakes at levels of concern.	
Fenoxaprop	N				Not detected at intakes at levels of concern.	
Glyphosate	N				Not detected at intakes at levels of concern.	
Malathion	N				Not detected at intakes at levels of concern.	
MCPA	N				Not detected at intakes at levels of concern.	
Methyl parathion	N				Not detected at intakes at levels of concern.	
Pendimethalin	N				Not detected at intakes at levels of concern.	
Propanil	N				Not detected at intakes at levels of concern.	
Triclopyr	N				Not detected at intakes at levels of concern.	
Trifluralin	N				Not detected at intakes at levels of concern.	

¹Constituents list is based on Table 1 of Technical Analysis to Support Development of Drinking Water Policy for the Central Valley Basin (LWA, 2004).

²Both nitrogen and phosphorus nutrient parameters are important to understanding nutrient enrichment (Pers Comm, Rich Losee, MWD).

³Occurrence refers to whether the constituent is detected at drinking water intakes at levels that cause a public health concern or aesthetics problem.

⁴Public Health Concern refers to whether there is an established criterion, standard, or public health goal for the constituent.

⁵Aesthetics refers to whether the constituent causes taste, odor, or appearance problems in finished drinking water.

⁶EPA's Candidate Contaminant List (CCL) is a list of contaminants that are not subject to proposed or promulgated national primary drinking water regulations but are known or anticipated to occur in public water system and may require regulations under the SDWA.

⁷Tier 1 List of constituents in this list must have a "y" for "Occurrence" and at least one "y" in one of the three categories under "Public Health or Aesthetics".

Table 2. Summary of how the tier 2 and 3 criteria were applied to the tier 1 list of constituents.

Constituent	Surrogate(s)	Extent of Knowledge/Data (from Tables 4-10 in LWA, 2004)¹	Sufficient Data? (Y/N)	Tier 2 List	Existing & Adequate Basin Plan Objective?	Tier 3 List
Conventional						
Turbidity/TSS		1	Y	Turbidity/TSS	Y	
Dissolved Minerals						
Total dissolved solids (TDS)	salinity, conductivity	1 (salinity in set 7)	Y (grouped)	Dissolved Minerals	N	Dissolved Minerals
Chloride		1				
Nutrients						
Ammonia		1				
Total nitrogen		3				
Total Kjeldahl nitrogen (TKN)		1				
Organic nitrogen		1	Y (grouped)	Nutrients	N	Nutrients
Nitrate		1				
Nitrite						
Phosphorus		1 (dissolved phosphorus in set 3)				
Orthophosphate		1				
Taste/Odor Producing Compounds						
MIB		Added after report final.	N			
Geosmin		Added after report final.	N			
Algal Toxins						
Algal Toxins		Added after report final.	N			
DBP Precursors						
Organic carbon	TOC, DOC, UVA ₂₅₄ , SUVA, THMFP, chlorophyll a	1 (SUVA, UVA ₂₅₄ in set 2, chlorophyll a in set 3)	Y	Organic carbon	N	Organic carbon
Bromide		6	Y (locally)	Bromide	N	Bromide
Pathogens & Indicator Organisms						
<i>Giardia</i>		4				
<i>Cryptosporidium</i>		4				
Total coliform		4	Y (grouped)	Pathogens & Indicator Organisms	Y (but only protects recreation beneficial use)	Pathogens & Indicator Organisms
Fecal coliform		2				
Enterococcus		4				
<i>E. coli</i>		4				
Enterovirus	F specific coliphages	Virus in set 7				
Trace Elements						
Arsenic		3	Y	Arsenic	Y	
Pesticides						
Molinate		5	Y	Molinate		
Thiobencarb		5	Y	Thiobencarb	Y (prohibition of discharge)	

Table 3. Summary of definitions of numbers in "Extent of Knowledge/Data" column in Table 2.

Set Number	Definition
1	Monitoring in all defined San Joaquin and Sacramento River mainstem reaches
	Monitoring in all Sacramento River and San Joaquin River major tributaries
	Monitoring in both Delta major tributaries (except for ammonia)
	"Representative" monitoring in lesser tributaries and drains (generally > 33% of total sampled basins or drains)
2	Monitoring in all defined Sacramento River mainstem reaches
	Monitoring in all Sacramento River major tributaries
	Gaps in San Joaquin River mainstem reach coverage (1-3 of 5 defined reaches)
	OR gaps in San Joaquin River or Delta major tributary coverage (less than 100% of major tributaries)
3	Monitoring in all defined San Joaquin River mainstem reaches
	Monitoring in all San Joaquin River major tributaries
	Some gaps in Sacramento River mainstem reach coverage (fewer than 7 out of 7 defined reaches)
	OR gaps in monitoring of San Joaquin River or Delta major tributaries (less than 100% of major tributaries)
4	Monitoring in most defined Sacramento River mainstem reaches above the Delta (at least 5 of 6)
	Monitoring in all Sacramento River major tributaries
	Gaps in coverage of mainstem Sacramento River reaches within Delta (below Cache Slough) and above Colusa
	Gap in coverage of mainstem San Joaquin River within Delta (below Calaveras River) or some gaps in coverage of mainstem San Joaquin River above Calaveras R (0-80% coverage of mainstem reaches)
	Little or no monitoring of drains or tributaries within Delta
	OR gaps in San Joaquin River or Delta major tributary coverage (less than 100% of major tributaries)
5	Gaps in coverage of defined Sacramento River or San Joaquin River mainstem reaches
	Monitoring in most major Sacramento River or San Joaquin River tributaries (missing at most one major tributary)
	Some monitoring of Sacramento River and San Joaquin River lesser tributaries and drains (less than 33% of total monitored basins and drains)
	Little or no monitoring of major Delta tributaries or lesser tributaries and drains within Delta
6	Missing 2 or more defined Sacramento River or San Joaquin River mainstem reaches
	Varying degrees of coverage of Sacramento River, San Joaquin River, and Delta major tributaries (0-100% of possible tributaries)
	Little or no monitoring of Sacramento River and San Joaquin River lesser tributaries or drains (less than or equal to 33% of total sampled basins and drains)
	Varying degrees of coverage of Delta lesser tributaries and drains (0-75% of total sampled basins and drains)
7	Little or no monitoring in any defined mainstem reaches of the Sacramento River or San Joaquin River
	Little or no monitoring in major tributaries, lesser tributaries, or drains