California Water Quality Monitoring Collaboration Network Webinar

Water Quality Goals

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How do we select numerical limits to protect water resources?

- Porter-Cologne Water Quality Control Act
- Water quality standards
- State & Regional Water Board plans & policies
What Will We Cover Today?

- Statutes, regulations plans & policies relating to water quality standards
- Implementing narrative water quality objectives
  - Using numeric thresholds from other organizations and the peer reviewed literature
- Water quality goals
  - Report
  - Database and on-line resources
- Algorithms to select water quality assessment thresholds
Water Quality Standards

Federal Clean Water Act—

- Provisions of state or federal law
- **Designated use** or uses for waters of the United States and
- **Water quality criteria** for such waters based upon such uses

[40 CFR 130.2(c) and 131.3(i)]
Water Quality Standards In California

- Found in the Water Quality Control Plans (Basin Plans)
- Adopted by the State and Regional Water Boards
Water Quality Standards In California

Water Quality Standards include

- Beneficial Use designations for each water body or portion thereof
- Water Quality Objectives (criteria) to protect uses
- Implementation Programs to achieve the objectives
“Beneficial uses” of the waters of the state that may be protected against water quality degradation include, but are not necessarily limited to,

- domestic, municipal, agricultural and industrial supply;
- power generation;
- recreation;
- esthetic enjoyment;
- navigation; and
- preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.
Water Quality Objectives
Water Code §13050(h)

“Water quality objectives” means

- Limits or levels of water quality constituents or characteristics established for the
  - Reasonable protection of beneficial uses of water or the
  - Prevention of nuisance within a specific area
Water Quality Objectives

Come in two forms

- Numeric
  - Specifies a concentration limit

- Narrative
  - Describes a requirement or prohibits a condition harmful to beneficial uses
Chemical Constituents - General

- Waters shall **not** contain chemical constituents in concentrations that adversely affect beneficial uses
Chemical Constituents - MCLs

- At a minimum, waters designated for use as domestic or municipal supply shall not contain concentrations of chemical constituents in excess of California drinking water Maximum Contaminant Levels (MCLs)
- To protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs
Narrative Water Quality Objectives
language from the Central Valley Region Basin Plans

- **Toxicity**
  - All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.
  - This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.
Tastes & Odors

- Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors
  - to domestic or municipal water supplies or
  - to fish flesh or other edible products of aquatic origin or
  - that cause nuisance or
  - otherwise adversely affect beneficial uses
# Toxicity vs. Taste & Odor

<table>
<thead>
<tr>
<th>Compound</th>
<th>California Primary MCL</th>
<th>Taste &amp; Odor Threshold</th>
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<tbody>
<tr>
<td>Ethylbenzene</td>
<td>300 ug/L</td>
<td>29 ug/L</td>
</tr>
<tr>
<td>Toluene</td>
<td>150 ug/L</td>
<td>42 ug/L</td>
</tr>
<tr>
<td>Xylenes</td>
<td>1750 ug/L</td>
<td>17 ug/L</td>
</tr>
<tr>
<td>MTBE</td>
<td>13 ug/L</td>
<td>5 ug/L</td>
</tr>
</tbody>
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California Toxics Rule (CTR)

- Federal Clean Water Act
  - All States required to have enforceable numerical water quality criteria for priority toxic pollutants in surface waters

- National Toxics Rule (NTR) USEPA
  - Numerical NTR criteria for many states’ waters

- California Toxics Rule USEPA
  - Promulgated 18 May 2000 (amended Feb 2001)
  - NTR criteria still in effect
  - Numerical CTR criteria for California waters
Enforceable Water Quality Standards

- Two scenarios in California

Water Quality Objectives
+ Basin Plan Beneficial Use Designations

CTR and NTR Criteria
+ Basin Plan Beneficial Use Designations
Policy for Application of Water Quality Objectives

from the Implementation Chapter of the Central Valley Region Basin Plans

- **Narrative Objectives**
  - Implement with numeric limits in orders
  - Evaluate compliance by considering
    - Direct evidence of beneficial use impacts
    - All material and relevant information submitted by the discharger and other interested parties
    - Relevant numeric criteria and guidelines from other agencies and organizations
      - see “A Compilation of Water Quality Goals”
Application of Water Quality Objectives
from the Implementation Chapter of the SF Bay Region Basin Plan

To evaluate compliance with water quality objectives, Board will consider
- All relevant and scientifically valid evidence
- Including numerical criteria and guidelines developed and/or published by other agencies and organizations
  - Summarized in “A Compilation of Water Quality Goals”
Minimum & Maximum Levels

■ Water Quality Objectives
  + CTR & NTR Criteria
  define the least stringent limits
  imposed on ambient water quality

■ Natural Background
  defines the most stringent limits
  imposed on ambient water quality
  ◆ Antidegradation Policy (68-16)
  ◆ Site Assessment and Cleanup Policy (92-49)
Appropriate Range of Water Quality to Protect Beneficial Uses

Water Quality Standards

- Numerical Objectives
- CTR and NTR Criteria
- MCLs
- No Toxicity
- No Taste or Odor
- No Beneficial Use Impacts

Natural Background Levels

“Zero”
Selecting Assessment Thresholds

Site- and Pollutant-Specific Discharge Information

What bodies of water may be or have been affected?
Selecting Assessment Thresholds

Site- and Pollutant-Specific Discharge Information

What bodies of water may be or have been affected?

What are the beneficial uses of those bodies of water?

Water Quality Standards from the applicable Water Quality Control Plans plus CTR & NTR Criteria

What are the water quality objectives & criteria to protect those beneficial uses?
Selecting Assessment Thresholds

Site- and Pollutant-Specific Discharge Information

What bodies of water may be or have been affected?

What are the beneficial uses of those bodies of water?

What are the water quality objectives & criteria to protect those beneficial uses?

Applicable Numerical Objectives & Criteria

Applicable Narrative Objectives

Water Quality Standards from the applicable Water Quality Control Plans plus CTR & NTR Criteria
Selecting Assessment Thresholds

- Applicable Numerical Objectives & Criteria
- Applicable Narrative Objectives
Selecting Assessment Thresholds

Applicable Numerical Objectives & Criteria

Applicable Narrative Objectives
Selecting Assessment Thresholds

Applicable Numeric Objectives & Criteria

Applicable Narrative Objectives

Numeric Thresholds that implement each Narrative Objective

Choose the most limiting of these values to implement all applicable water quality objectives & criteria

Select less restrictive of these

Assessment Threshold

Water Quality Based Numeric Thresholds from Other Agencies and Organizations

Site-Specific Natural Background Level
Sources of Numeric Thresholds
Used to Implement Narrative Objectives

Chemical Constituents objective

- California Drinking Water MCLs  
  - Primary MCLs based on human health  
  - Secondary MCLs based on human welfare  
  - Technology & Economics of water use at the tap

- Federal Drinking Water MCLs  
  - Only if lower than California MCLs

- Water Quality for Agriculture  
  - SWRCB

- Water Quality Criteria (McKee & Wolf)  
  - e.g., industrial use criteria
Sources of Numeric Thresholds
Used to Implement Narrative Objectives

Toxicity objective
no “detrimental physiological responses…”

- California Public Health Goals OEHHA
- Federal MCL Goals USEPA
  - non-“zero” limits only
- California Notification (Action) Levels DHS
- Integrated Risk Information System USEPA
  - Reference Doses for non-cancer effects
  - Cancer Risk Estimates
- Cancer Risk Estimates OEHHA, NAS
Sources of Numeric Thresholds
Used to Implement Narrative Objectives

Toxicity objective

- Drinking Water Health Advisories
  - USEPA & NAS

- Proposition 65 Regulatory Levels
  - OEHHA
  - Carcinogens at 1-in-100,000 ($10^{-5}$) risk level
  - Reproductive Toxins at 1/1000 of NOAEL
  - Intent of statute
    - Public Notice prior to exposure
    - Prohibit Discharge to drinking water sources
    - Not establishment of levels considered “safe”
Sources of Numeric Thresholds
Used to Implement Narrative Objectives

Toxicity objective

- National Recommended (Ambient) Water Quality Criteria
  - Human Health protection
    - Assume ingestion of aquatic organisms
    - Apply to surface waters only
  - Aquatic Life protection

- Pesticide Hazard Assessments
  - Aquatic Life Protective Limits

USEPA

CDFG
for CDPR
Sources of Numeric Thresholds
Used to Implement Narrative Objectives

Tastes & Odors objective

- Secondary MCLs  CDPH & USEPA
- National Recommended  USEPA
  (Ambient) Water Quality Criteria
- Drinking Water  USEPA & NAS
  Health Advisories
- Taste and Odor Thresholds  USEPA & others
A Source of Numeric Thresholds

Available on the Internet at

www.waterboards.ca.gov/water_issues/programs/water_quality_goals/
Water Quality Goals Online

Database Demonstration

www.waterboards.ca.gov/water_issues/programs/water_quality_goals/
Assessment Threshold
Selection Algorithms
Selecting Defensible Numbers
Water Quality Limit Selection

- To be defensible, water quality limits should be chosen to apply each applicable water quality objective and promulgated water quality criterion.
- Assessment threshold = most stringent of above limits.
Algorithms – Main Steps

Step 1. Select a single **numeric threshold** to satisfy each applicable water quality objective and promulgated criterion or relevant portion thereof

Step 2. To satisfy all applicable objectives select the lowest threshold from Step 1 as the **assessment threshold**

Step 3. Adjust for natural background levels
    - Uncontrollable factors
Algorithms – Guiding Principles for Step 1

- Use purely risk-based numeric thresholds instead of risk management-based thresholds to implement narrative water quality objectives
  - Toxicity-based limits instead of MCLs
  - Risk management-based limits may contain irrelevant information and constraints
    - e.g., Proposition 65 limits

- Use California numeric thresholds when available
  - Instead of federal numeric thresholds or thresholds from other sources
  - Consistency with other California agencies
Algorithms – Guiding Principles for Step 1

- Use numeric thresholds that reflect peer-reviewed science
  - Avoid using draft or provisional thresholds unless nothing else is available
- Use thresholds that reflect current science
  - Check dates
- Use relevant limits
  - Check intent
    - Compare with language of narrative objective
  - Check exposure routes
Assessment Threshold Algorithms

Water Body Types

- Water Quality Goals, 13\textsuperscript{th} Edition (2003)
  - Groundwater
  - Inland Surface Waters

- Water Quality Goals, 16\textsuperscript{th} Edition (2011)
  Added
  - Enclosed Bays & Estuaries
  - Ocean Waters