

Development of the Technical Foundation for California's Sediment Quality Objectives

Presentation to State Water Resources Control Board

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PRESENTATION TOPICS

- **Scientific foundation**
- **Indicator development activities**
- **Scientific review and communication**

Scientific Foundation

- Two principal modes of exposure and effects
 - Direct exposure through sediment contact and ingestion
 - Aquatic life
 - Indirect exposure through feeding on contaminated organisms
 - Human health
 - Wildlife risk
- Each mode requires a separate assessment method
- Focus has been on assessing effects from direct exposure
 - Assessment methods are better developed
 - Large amount of California data available for validation
 - Indirect effects assessment is a priority of Phase II SQO program

Scientific Foundation

- A multiple line of evidence (MLOE) approach is necessary
 - Sediments are complex and a diverse environments
 - Individual measures of chemistry or biological effects are insufficient to determine sediment contamination effects
 - Evidence of both chemical exposure and effect is needed
- Three types of information (sediment quality triad) needed
 - Sediment chemistry
 - Sediment toxicity
 - Benthic infaunal community condition

Limitations of Individual Lines of Evidence

- **Benthos**
 - Habitat variability
 - Physical disturbance (anchor, dredging)
 - Oxygen stress
- **Toxicity**
 - Confounding factors (ammonia)
 - Laboratory-enhanced bioavailability
 - Species-specific responses
- **Chemistry**
 - Unmeasured chemicals
 - Chemical form (paint chip, tar ball)

Technical Challenges

- The triad has been widely used in site-specific assessments, but has not found its way into most statutory frameworks
 - Most applications are based on best professional judgment
- There are substantial challenges in translating this scientific concept into a regulatory framework
 - Consistency of methods throughout the state
 - Development of a transparent data interpretation and assessment framework
 - Must be feasible for use by individuals with limited technical expertise

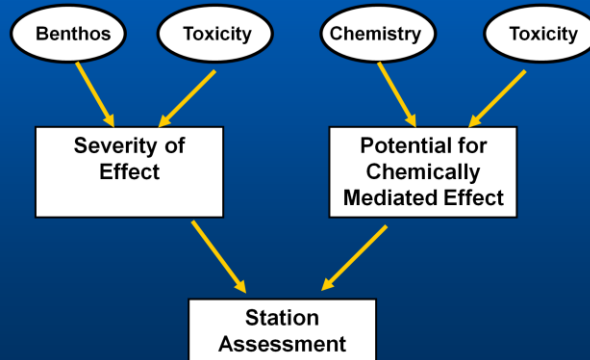
Science Activities to Support Technical Challenges

- **Developing methods/assessment consistency**
 - Evaluated and selected indicators for individual lines of evidence
 - Based recommendations on performance in California
- **Standardizing data interpretation**
 - Established quantitative thresholds for each indicator
 - Developed a framework for integrating across lines of evidence
 - Clear decision points
 - Simple, yet retains scientific content

SQO Assessment Framework

Direct Effects

Information on contaminant exposure and biological effects are needed to assess effects of sediment contamination



Schematic of the MLOE assessment framework proposed for use in California's SQO program. Data integrations follows a two-step process. (1) The three lines of evidence are used to determine the severity of biological effect (based on benthic impacts and toxicity) and the potential for chemically-mediated effects (based on sediment chemistry and toxicity). (2) The station assessment is based on a comparison of the severity of effect and potential for chemically-mediated effect. Note that the benthos is given greater weight for determining effects and the chemistry is given greater weight to determining the potential for a chemically-mediated effect.

Indicator Development Activities

- **Calibrated methods for use in California bays and estuaries**
- **Evaluated indicators and selected best methods**
 - Independent validation with California data
- **Developed numeric thresholds for the recommended indicators**

Science Team

California Organizations:

- Southern California Coastal Water Research Project
- San Francisco Estuary Institute
- Moss Landing Marine Laboratories
- UC Davis Marine Pollution Studies Laboratory

National Organizations:

- NOAA
- US Army Corps of Engineers
- Marine Resources Research Institute, Charleston, SC
- University of Minnesota
- University of South Carolina
- Exa Data and Mapping

Review and Communication

- **Scientific Steering Committee**
 - Top scientists from outside of California
 - Guided and reviewed all phases of project
- **Stakeholder Advisory Committee**
- **Agency Coordination Committee**
- **Scientific Presentations and Publications**
 - Local and National meetings
 - National peer-reviewed journals

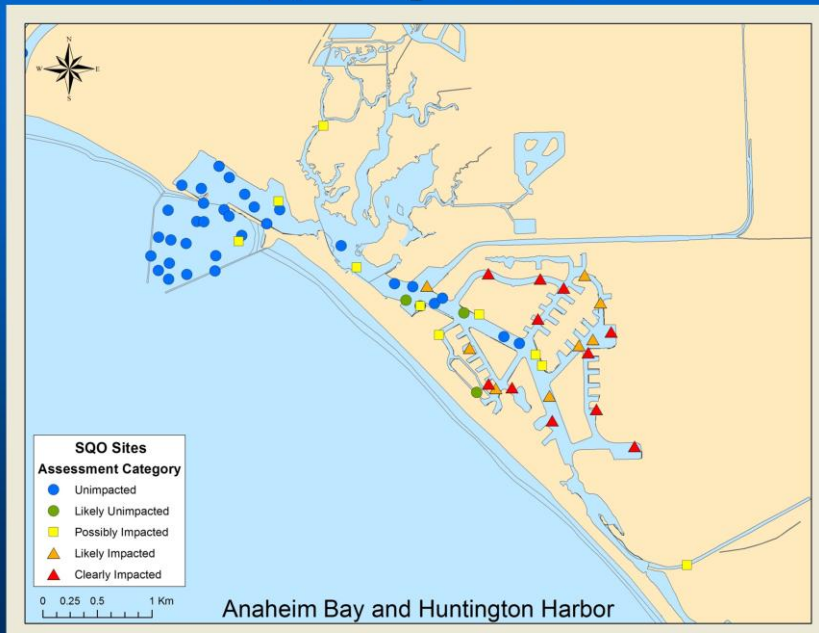
Scientific Steering Committee

- Six nationally recognized experts in all aspects of sediment quality assessment
 - Chemistry, ecology, toxicology
 - Sediment quality guidelines
 - Ecological risk assessment
- National and state perspectives
 - EPA, NOAA, Army Corps of Engineers
 - Washington, South Carolina
- Frequent interactions throughout the project
 - 5 multi-day review meetings
 - Follow-up conference calls
 - Review of technical reports
- SSC has endorsed general approach and methods for direct effects component
 - Still working on indirect effects approach

Acceptance of SQO Approach

- **SQO approach has been communicated to many potential user groups**
 - Regional Boards, SWAMP program, EPA (national and regional)
 - Regulated entities
 - Scientists
- **Approach is already gaining acceptance**
 - Methods being incorporated into monitoring programs
 - Assessment framework is being used in existing programs
 - Provides great opportunity to test approach under realistic conditions
- **Statewide 305(b) assessment of sediment quality**
 - EPA Region 9 and SWAMP program have adopted approach for latest assessment
 - Positive feedback so far

305(b) Sample Results



Summary

- **Incorporation of MLOE approach represents a milestone for sediment assessment policy development**
- **Indicator development and selection incorporated best available methods**
 - Still room for improvement
- **Multiple levels of scientific review and have occurred throughout the project**
 - Highly effective Scientific Steering Committee
 - Have improved the project in many ways