

Review of the Potential Impacts of the California
Toxics Rule on Dredging of the Sacramento River,
the Sacramento River Deep Water Ship Channel,
and the Port of Stockton Deep Water Channel

and

Beneficial Uses of Dredged Sediment for
Delta Levee Enhancement and
Shallow Water Habitat Development

G. Fred Lee, PhD, DEE

Presentation to the

Delta Levees and Habitat Advisory Committee

November 7, 1997

- What Is the California Toxics Rule (CTR)?
- What Is New in the CTR That Could Change Current Approaches to Water Quality Management?
- How Could the CTR Impact Delta Dredging?
- General Impressions of Regulatory Approaches for Delta Dredging Projects
- Regulating Beneficial Uses of Dredged Sediments
- New Areas of Regulatory Concern
Sediment Quality Criteria

HANDBOOK OF DREDGING ENGINEERING

John B. Herbich, Ph.D., P.E.

*W. H. Bauer Professor of Dredging Engineering
Ocean Engineering Program
Department of Civil Engineering
Texas A&M University*

Lee, G. F., and Jones, R. A., "Water Quality Aspects of Dredging and Dredged Sediment Disposal," IN: Herbich, J. (ed), *Handbook of Dredging Engineering*, McGraw-Hill, NY, pp. 9-23 - 9-59 (1992).

WATER QUALITY ASPECTS OF DREDGING AND DREDGED SEDIMENT DISPOSAL*

G. Fred Lee, Ph.D., P.E.
*President, G. Fred Lee & Associates
El Macero, Calif.*

R. Anne Jones, Ph.D.
*Vice-President, G. Fred Lee & Associates
El Macero, Calif.*

BACKGROUND

The dredging of U.S. waterways and harbors is recognized by Congress to be highly beneficial to the country as a whole. It is further recognized that dredging and dredged sediment disposal practices as part of waterway and harbor navigation depth maintenance will have some impact on beneficial uses and water qual-

*References for this chapter section are at the end of the section.

G. Fred Lee's Expertise and Experience in Contaminated Sediment, Dredging, and Dredged Sediment Disposal

Academic Degrees

BA, Environmental Science, San Jose State College,
1955

MS in Public Health, University of North Carolina, 1957

PhD, Environmental Engineering, Harvard University,
1960

30 Years of University Graduate-Level Teaching and
Research in Wisconsin, Texas, Colorado, New Jersey

Over \$5 Million in Research

Published Over 500 Papers and Reports on Research

Contaminated Sediment Investigations \$2 Million

\$1 Million with Corps of Engineers Dredged Material
Research Program

Developed the Biological Effects-Based Approach for
Dredged Sediment Disposal Criteria That Is Being
Used Today to Regulate Open-Water Disposal of
Dredged Sediments

Since 1989, Full-Time Consultant in Impact-Evaluation and
Management of Water Quality, and Solid and Hazardous
Waste

For 22 Years Presented Short-Course on Managing
Contaminated Sediments Associated with Dredging Projects
at the Texas A&M University Dredging Engineering Workshop

Worked on Water Quality Criteria Development and
Implementation Since the Mid-1960s

US EPA Peer Reviewer for the Agency's Water Quality Criteria
Development Approach as Well as Several Criterion
Documents for Heavy Metals and Ammonia

Web Site:

(<http://home.pacbell.net/gfredlee/index.html>)

Published in: *Dredging '94: Proceedings of the
Second International Conference on Dredging
and Dredged Material Placement*, American
Society of Civil Engineers, New York, pp. 121-
130 (1994).

Contaminated Dredged Sediment Disposal Criteria

G. Fred Lee, PhD, PE, DEE (Member)¹ and Anne Jones-Lee, PhD (Member)²

Abstract

Regulatory agencies are developing chemical concentration-based sediment quality criteria for use in the regulation of dredging projects. Gaining popularity in criteria development is any of a number of "co-occurrence" approaches, such as the AET, the Long and Morgan ER-L and ER-M values, and the MacDonald PEL values. These approaches are founded in the compilation of data on the total concentrations of selected contaminants measured in a group of sediments and some measure of a biological "effect" associated with those sediments, irrespective of the cause of the "effect." The US EPA has developed an equilibrium partitioning-based sediment quality criteria approach for some types of contaminants. It assumes that the concentration of a contaminant in the interstitial water of a sediment can be reliably estimated based on the chemical characteristics of the sediments and that the estimated concentration in the interstitial water can be related to water quality. There are significant deficiencies in the technical foundations and implementation of these and other chemical concentration-based approaches for establishing sediment quality criteria for the regulation of dredging projects. The technical foundation, assumption, and implementation issues associated with currently proposed chemical concentration-based sediment quality criteria development approaches are critically reviewed.

Introduction

In the early 1970's the Federal Water Quality Administration, an agency preceding the US EPA, developed the "Jensen criteria" for regulating dredging projects. Those criteria specified maximum bulk sediment content of a few selected parameters that are sometimes measured in domestic wastewater sludges.

¹ President, G. Fred Lee & Associates, 27298 E. El Macero Dr., El Macero, CA 95618-1005

² Vice-President, G. Fred Lee & Associates

Clean Water Act Requirements

Clean Water Act (CWA) Requires US EPA to Develop Water Quality Criteria to Protect Designated Beneficial Uses

States Must Use US EPA Criteria to Develop Water Quality Standards (Objectives)

Water Quality Standard is a Water Quality Criterion and a Designated Beneficial Use

States Issue NPDES Permits Which Establish Maximum Concentrations of Constituents That May Be Discharged from a Permitted Source

Must Meet Ambient Water Quality Objectives at the Edge of Mixing Zone

Discharge Shall Not Be Acutely or Chronically Toxic to Aquatic Life

In 1991, the Water Resources Control Board (WRCB) Adopted Water Quality Objectives for Inland Waters, Enclosed Bays and Estuaries.

Several Cities and One Company Filed Suit Against the Board for Failing to Incorporate Porter-Cologne-Required Economic Considerations—Court Overturned Water Quality Plans and Objectives

1987 Revisions of the Clean Water Act Require That the US EPA Force All States to Adopt Water Quality Standards for Selected Toxics Constituent - Priority Pollutants

Basic Problem Has Been That US EPA's Development of Water Quality Criteria is Based On Worst-Case Assumptions with Respect to Impacts on Aquatic Life

Utilize Lake Superior's Water Characteristics and 100% Available Forms of Toxic Chemicals

In the Real World, Few Waterbodies Have Characteristics of Lake Superior (Where the US EPA Duluth Lab That Develops Freshwater Criteria is Located) and Rarely Are the Constituents of Concern in 100% Toxic/Available Forms

Particulate Forms of Constituents Are Non-Toxic/Unavailable

Part of the Dissolved Forms of Some Constituents are Non-Toxic/Unavailable

There Is No Reliable Way to Estimate the Toxic/Available Forms Based on Chemical Measurements

US EPA Water Quality Criteria Including the CTR Proposed Criteria, Are Generally Over-Protective

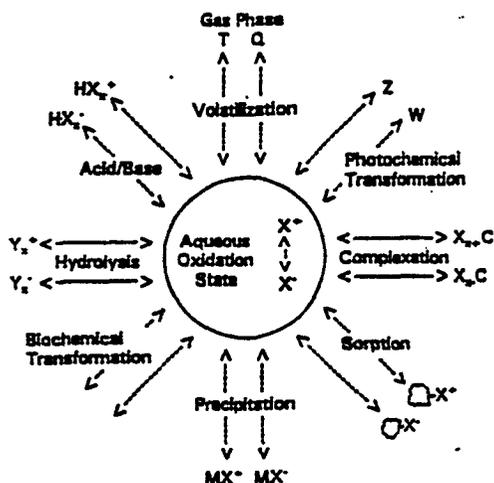
US EPA Water Quality Control Criteria Are Developed for Extended Exposures of Aquatic Life to Toxicants But They Are Implemented Based on a Four-Day Average and One-Hour Average for Acute and Chronic Toxicity

The One-Hour (Acute) and Four-Day (Chronic) Averages Were Arbitrarily Developed and Tend to Significantly Over-Regulate Most Chemical Constituents.

Much Longer Periods of Time of Exposure to Toxic/Available Forms Can Occur without Adverse Impacts

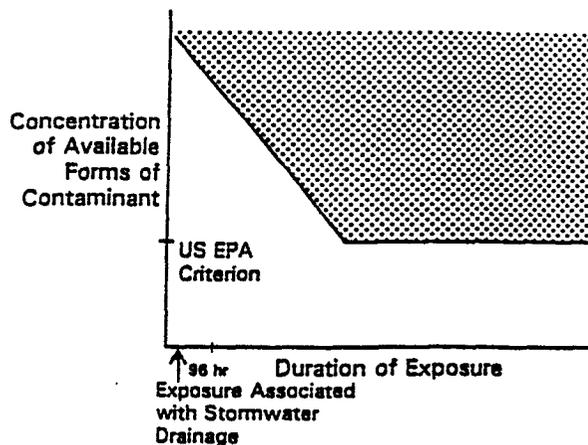
Aquatic Toxicology

Aquatic Chemistry of Chemical Contaminants



Distribution Depends on Kinetics & Thermodynamics of Reactions in a Particular Aquatic System

Each Chemical Species Has Its Own Toxicity Characteristics
Many Forms Are Non-Toxic



US EPA Criteria List 1-hr-Average Maxima and 4-day-Average Maxima

Not Valid for Assessing Potential Impacts of Urban Stormwater Drainage

US EPA's Implementation of the Clean Water Act through its Independent Applicability Policy Attempts to Ease the Administrative Burden of Water Quality Regulations

Leads to Administrative Exceedances of Water Quality Standards (Objectives) Where No Adverse Impacts on the Numbers, Types and Characteristics of Desirable Forms of Aquatic Life Occur, etc.

Requires Meeting Numeric Chemical-Specific Water Quality Objectives for Potentially Toxic Chemicals, Such as Heavy Metals, Even Though Properly Conducted Toxicity Tests Show That the Constituents of Concern Are in Non-Toxic Forms

US EPA Washington D.C. Recognizes This Problem and Has Proposed, as Part of its Announced Proposed Rule Making (ANPRM) for Water Quality Standards, to Try to Address This Issue

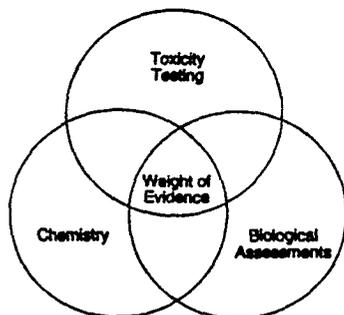
Environmental Groups Will Vigorously Oppose US EPA Efforts Since It Would Complicate Their Ability to Take Action against a Discharger Associated with Exceedance of a Water Quality Standard

The Agency Focuses on Regulating Chemicals Rather Than Chemical Impacts

Potentially Toxic Chemicals vs. Measured Toxicity Can Readily Lead to Massive Waste of Public and Private Funds

Should Be Using Best Professional Judgement, Weight of Evidence Approach in Which Appropriate Use of Chemical, Biological Impact and Organism Assemblage Information to Determine Whether Excessive Discharges of Constituents from a Regulated Source Could Occur or Are Occurring

APPROACHES TO WATER QUALITY-BASED TOXICS CONTROL



California Toxics Rule

Since the State of California Has Not Developed Water Quality Objectives (CA is the Only State That Does Not Have Standards) US EPA Must, in Accord with the Clean Water Act, Develop State Water Quality Standards for California

US EPA Region 9 Promulgates California Toxics Rule Based on US EPA 1986 "Gold Book" Criteria With 1995 Update

US EPA and WRCB Agreed That the US EPA Would Develop California Water Quality Criteria/Objectives for Implementation of the National Toxics Rule - Became California Toxics Rule

Independent Applicability of Chemical and Biological Criteria/Standards and Effluent Toxicity Testing

G. Fred Lee, Ph.D., P.E. and Anne Jones-Lee, Ph.D. • G. Fred Lee & Associates/EnviroQual • El Macero, CA

The National Environmental Journal
5(1):60-63 (1995)



1985 the U.S. Environmental Protection Agency (EPA) advocated a two-part approach for water pollution control

involving chemical concentration-based effluent limits for those parameters for which water quality criteria had been developed and toxicity test-based effluent limitations. The chemical-specific component was designed to prevent exceedances of water quality criteria values in ambient waters receiving point and non-point source discharges or runoff; the water quality criteria were, in large part, developed to be chronic-exposure, safe concentrations for sensitive aquatic organisms. The toxicity test component was designed to indicate potential toxicity effects associated with an activity, to account for the possible presence of a toxic constituent that did not have a water quality criterion, and to provide the opportunity for site-specific tuning of the chemical-specific criteria for synergism, antagonism, chemical availability, and exposure duration.

EPA has since expanded its recommended approaches to include a direct measure of biological characteristics (biological criteria) of surface waters. The biological criteria focus on the numbers, types and characteristics of organisms present downstream of a discharge or runoff compared with the numbers, types and characteristics expected based on the aquatic life habitat characteristics. A number of states have developed biological criteria and have been using them in water pollution control programs.

At a 1982 EPA workshop on water quality criteria and standards, EPA representatives revealed that the Agency would soon be releasing a position paper announcing the policy of "Independent Applicability." The June 1982 issue of EPA's Newsletter "Water Quality Criteria & Standards," however, stated that Independent Applicability is EPA's present position, and it is detailed in several documents. That inconsistency notwithstanding, the policy and/or practice of independent applicability and its ramifications for water pollution control in the country truly deserves a thorough examination.

The Problem with Independent Applicability

According to EPA in 1982, the three above-mentioned regulatory approaches for the regulation of toxics would be applicable to all waters, and the approach that was most "sensitive," (most limiting) for a particular waterbody would guide management. This led to many questions about how the policy would handle a situation in which:

- Biological studies of the receiving waters showed healthy and wholesome fish and other aquatic life populations, the same as those that would be expected based on habitat characteristics, and

- Short-term chronic toxicity testing of the waters in the region showed no adverse life effects, but
- Numerical water quality criteria (or standards equivalent to them) were exceeded.

At that time, EPA stated that even under such circumstances, the discharger or source of runoff would have to implement control programs to eliminate the exceedances of the water quality criteria or standards, or change the standards. It was expected to be EPA's position under the policy of independent applicability to require that site-specific water quality criteria or standards be developed in order to justify not complying with EPA's water quality criteria, or more properly, state standards equivalent to those criteria.

It is appropriate to question the appropriateness of requiring dischargers and state regulatory agencies to develop site-specific water quality standards in response to that scenario (i.e., a situation in which it had been shown that there was no aquatic life toxicity in the receiving waters for the discharge/runoff and the populations of biota in the region of expected impact were what would be expected based on habitat characteristics). There have been few attempts to develop site-specific water quality standards as outlined in EPA's Water Quality Criteria Handbook. As a consequence of the state of California Water Resources Control Board's adoption of EPA criteria as state water quality objectives (standards) in April 1991, a number of studies have been undertaken in California in an effort to develop site-specific objectives. More than \$300,000 were spent in such effort in the San Francisco Bay area; more than \$1.1 million were spent in efforts to develop site-specific criteria/standards for the Santa Ana River in southern California. However, as discussed below, the times spent in trying to develop site-specific water quality objectives for copper in San

WRCB Is to Develop an Implementation Approach for the California Toxics Rule

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Supplement Issued October 16, 1997
Hearings to Be Held on November 17, 1997 in Sacramento
Scheduled for Adoption Spring 1998

Water Quality Criteria-Objectives That Will Be Developed as Part of the California Toxics Rule Will Continue to Significantly Over-Regulate the Discharge of Contaminants Associated with Dredging Operations and Dredged Sediment Disposal Overflow Waters

Many of the Chemicals of Concern in Dredged Sediment in Non-Toxic/Unavailable Forms

Aquatic Organism Exposure Conditions That Occur in a Water Column Associated with Dredging and Dredged Sediment Disposal Operations Are Short Compared to Those Used in Developing the Acute and Chronic Critical Concentrations for Aquatic Life Criteria