Sampling and Analysis of Dredged Material: A Proposal for Assessing Oil Contamination

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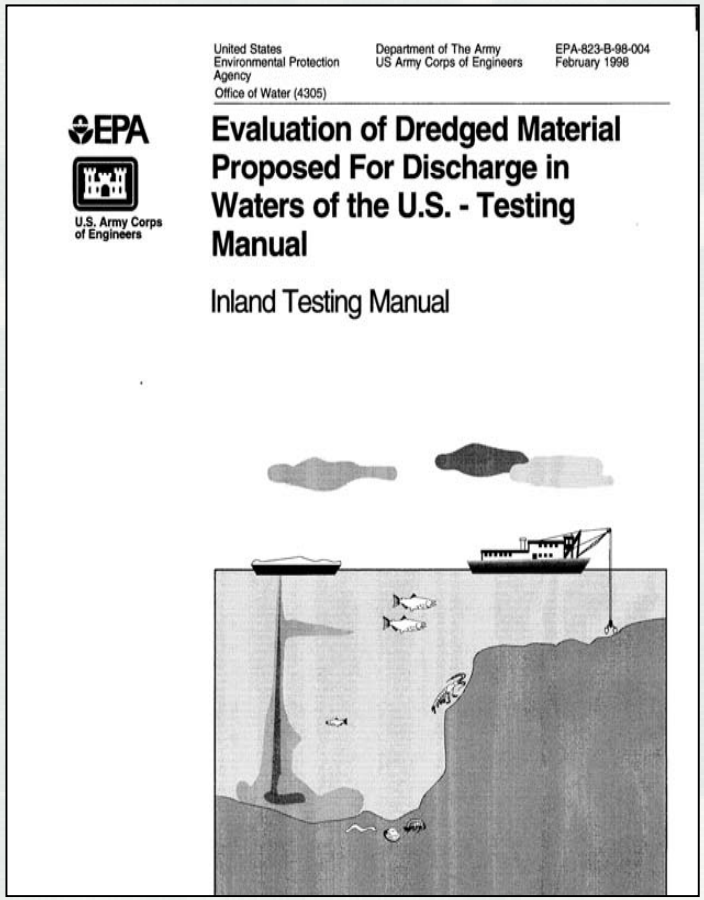
Overview

- Existing Guidance
- Regional Guidance
- Step-Wise Consideration of Oil Contamination

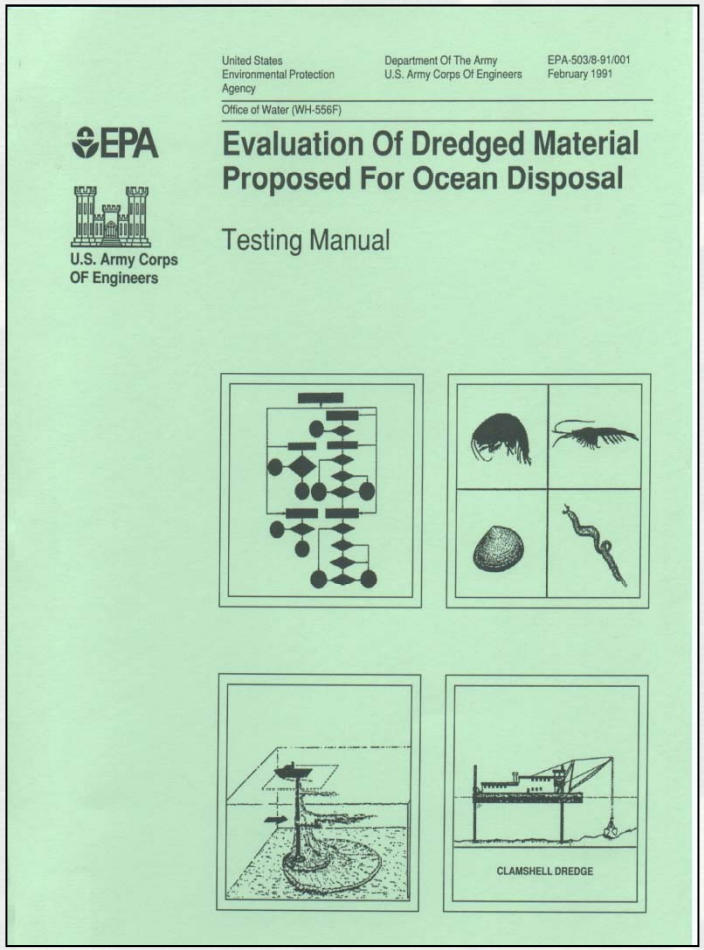
Inland Testing Manual



- Addresses CWA
- Interim guidance in 1976, updated in 1998
- Included:
  - Effects-based testing
  - Sequenced > Tiered

DM placement *"will not cause an unacceptable adverse impact"*

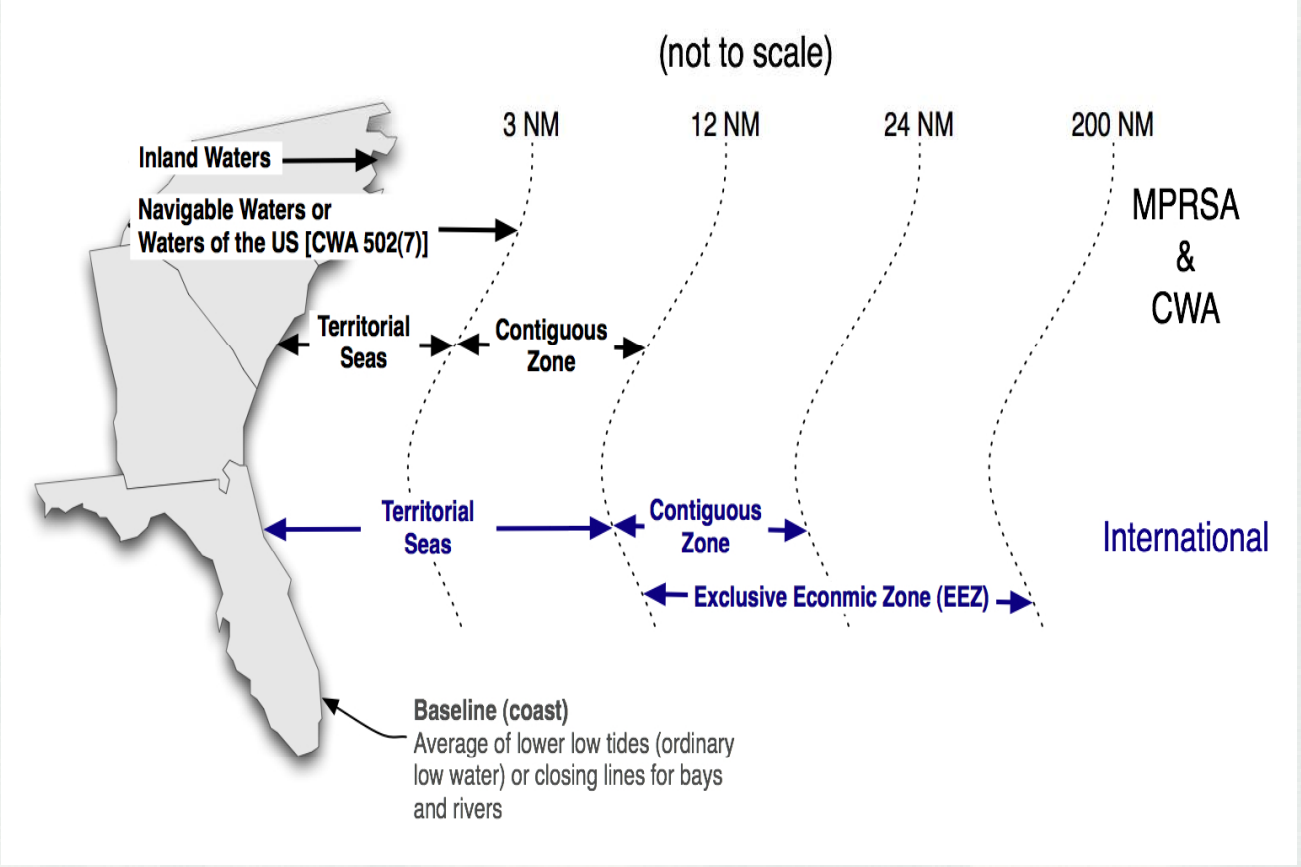
Ocean Testing Manual



- Addresses MPRSA
- Originally developed in 1977, updated in 1991
- Included:
  - Effects-based testing
  - Bioaccumulation
  - Sequenced >Tiered

DM placement in ocean will not *"unreasonably degrade or endanger: human health, welfare, or amenities, marine environment, ecological systems, or economic potentialities"*

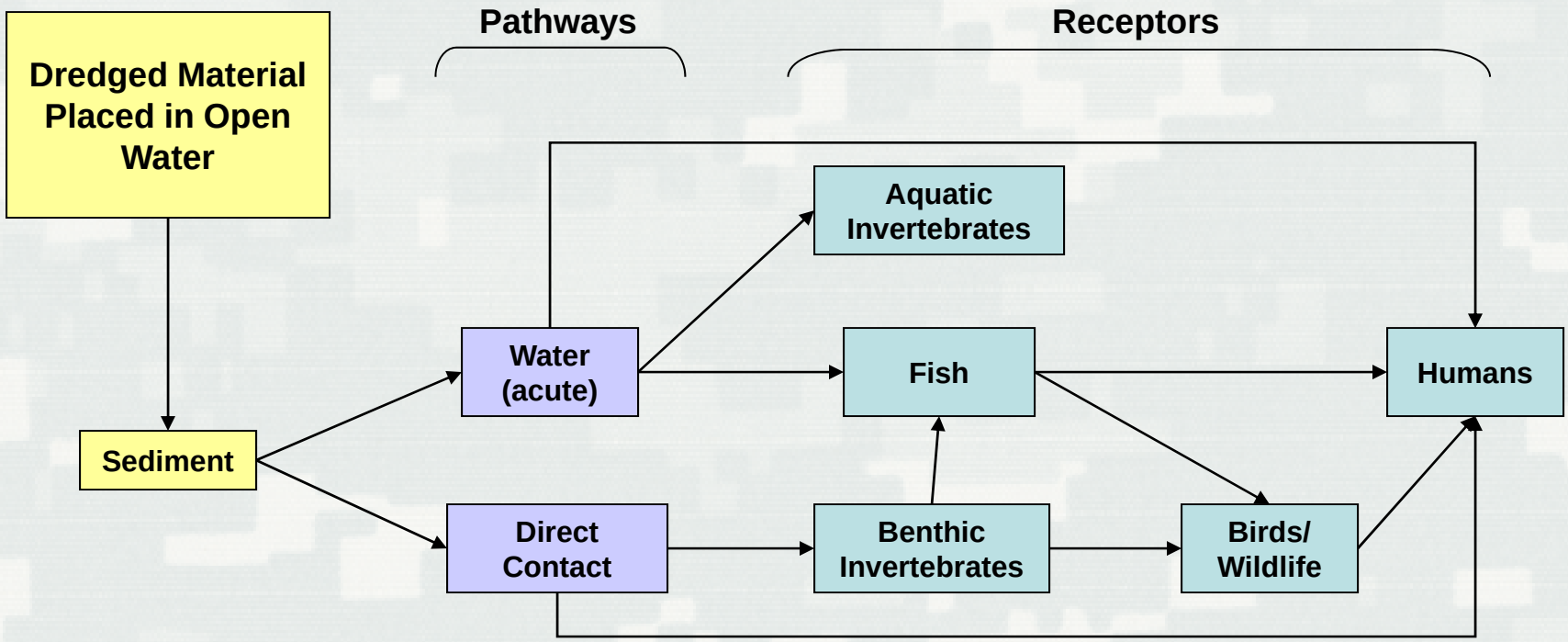
Where do MPRSA and CWA Apply?



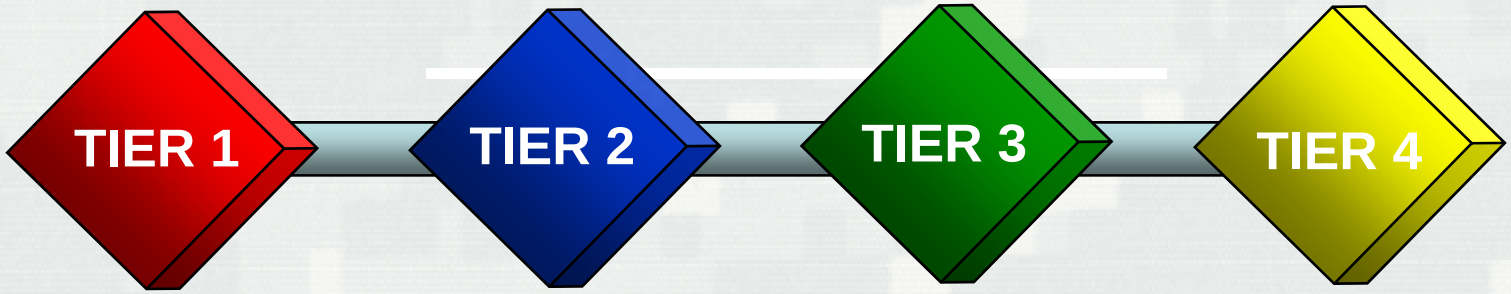
Dredged Material Testing Manuals

- Tiered testing and evaluation
- Testing procedures (elutriate, benthic, and bioaccumulation)
- Computer models for mixing
- Statistical tools, QA/QC, and data interpretation
- Case-specific evaluations

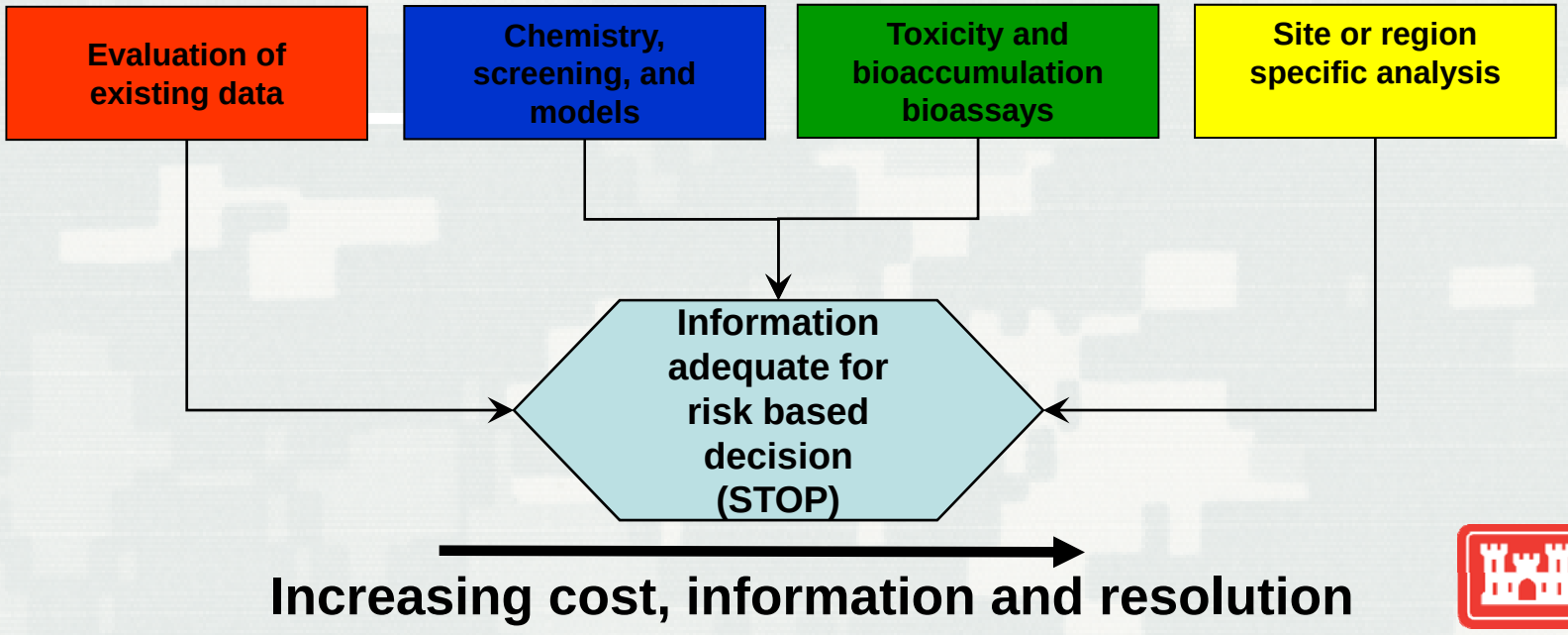
Conceptual Model: Open Water Placement of DM



Guidance Manuals: 4 Tiered Procedure



Tiered process → follow as far as necessary to make decision



Tier I

- Examine existing information
  - Contaminant sources
    - Pathways of contaminant sources
    - Spill information
  - Physical characteristics of site
    - Bathymetry, currents, deposition, time since last dredging was required
  - Prior physical monitoring

Tier I

- Exclusions from testing
  - MPRSA
    - Predominantly sand, gravel, rock and high energy environment (or)
    - Beach nourishment material (or)
    - Substantially the same as disposal and “far removed” from sources of contamination
  - CWA
    - Not a carrier of contaminants (e.g. sand)
    - Far removed from sources of contaminants
    - Adjacent to placement site
    - If constraints are available to manage sediments

Tier I

- Identify Contaminants of Concern
  - Presence in sediment
  - Chemical properties
    - Water solubility
    - Persistence
  - Toxicological significance
  - Propensity to bioaccumulate

Other Tiers

- Tier II
  - Water column screen
  - Thermodynamically based bioaccumulation potential (TBP)
- Tier III
  - Elutriate, Sediment Toxicity, and Bioaccumulation Bioassays
- Tier IV
  - Site specific studies

Regional Guidance

- Region 4 Regional Implementation Manual
  - http://www.epa.gov/region4/water/oceans/documents/SERIM_Final_August%202008.pdf
- Region 6 Regional Implementation Agreement
  - http://www.epa.gov/region6/water/ecopro/em/ocean/ria.pdf
- Provide Region/Division specific administrative process agreements.

Regional Guidance

- Two regional guidance documents recommend that a Tier 1 exclusion of additional testing can be made
  - ► Existing data are less than 5 years old
  - ► Conditions of the sediment have not changed since the previous evaluation.
- In the case of the Deepwater Horizon oil contamination, confirmation may be required to demonstrate the site has not been contaminated with sufficient levels of oil to result in a different outcome from the previous testing.

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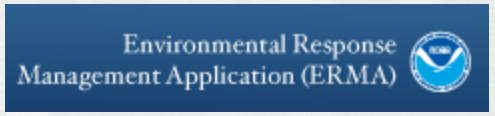
Oil Contamination Assessment

- Goals
  1. Has the sediment changed from previous testing?
  2. Are the testing results different from previous results?
- Part of Tier 1 process
- Stepwise process
  - ► Intended to provide a screening level assessment
  - ► Rapid analysis, short turn around for decision making
  - ► May lead to a re-evaluation of sediments
- Near-term evaluation process (next 1-3 years)

Oil Contamination Assessment: Tier 1

- Evaluate existing data
  - Historical data (previous testing and baseline)
  - Recovery/Post Spill data ERMA



- Screening level analysis of sediments
  - Collect small number of samples from site using gravity corer or similar device
  - Analyze using fluorescence, ELISA, or similar method to determine TPH to level around ½ of agreed upon screening value
- Analysis
  - Compare existing pre/post spill data for region (if post spill data are available)
  - Compare screening results to conservative total oil value protective of benthic effects
  - If pre/post data are substantially different and measured levels exceed a screening level, confirmatory chemistry is required.

Oil Contamination: Step 2

- Samples analyzed using comprehensive spill response list:
  - TPH, ORO, GRO, DRO
  - 34 priority PAH and alkylated PAH
  - Fingerprinting of DH oil
- Compare results to a relevant screening level
  - Regional value
  - Total oil
  - Total PAH (ESB)
- If chemistry results exceed a relevant sediment screening value (i.e., predicts potential for biological effects), then bioassays should be conducted to confirm prediction.

Oil Contamination: Step 3

- Bioassay used to determine substantial change in toxicity as compared to that measured in previous data.
- Can be conducted with traditional 10-day bioassay as outlined in current guidance, or
- Conducted using an alternative rapid bioassay calibrated to 10-day bioassay.
- Compare results of historical data and evaluate using existing national/regional guidance.

Questions to Resolve

- Chemistry and Sampling
  - How (grab/core) and when (frequency, project planning, other events) should sampling be done?
  - What analysis for oil? dispersants?
- Reference sites?
- Appropriate chemistry screening methods?
- How to compare chemistry and biological results (pre/post spill)?
- What are relevant screening values?
- What bioassays are relevant? Short term? Sensitive bioassays?