

Criteria for the Assessment of Sediment Quality in Quebec and Application Frameworks: Prevention, Dredging and Remediation

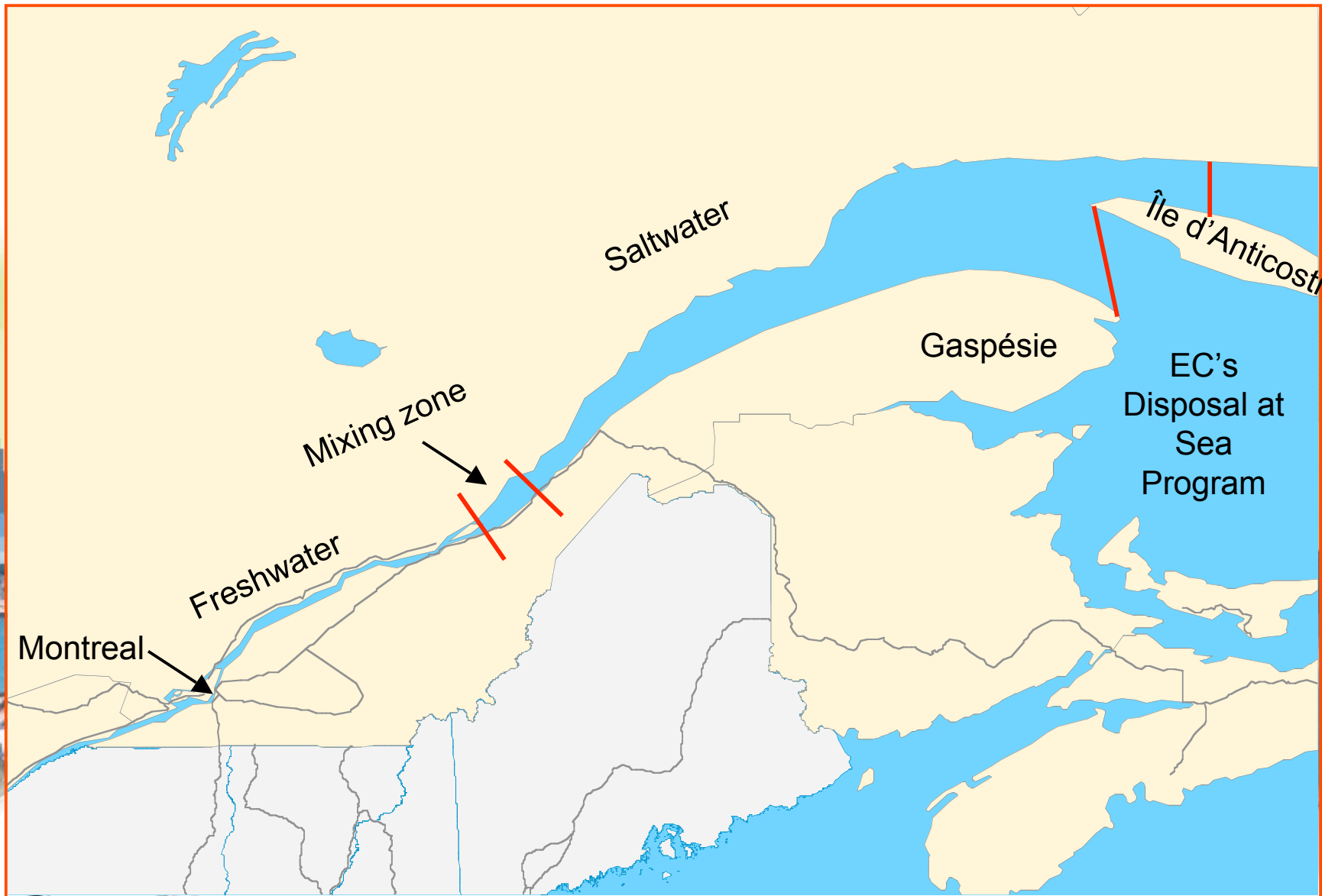
Presented by :
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Vancouver, April 30, 2008

Outline

- St. Lawrence Plan
- Problems in applying interim quality criteria (1992)
- Objectives of the criteria review
- Overview of interim quality criteria
- Selected approach
- Recommended additions to the criteria
- Application context and selected thresholds
- Consideration of Natural and ambient levels
- Conclusion
- Effective date and transition period

St. Lawrence River, Quebec



St. Lawrence Plan (phase III and phase IV) :

- **Navigation** : Sustainable Navigation Strategy (2004) and Orientation Document on Integrated Management of Dredging (2004)
- Developed jointly by Environment Canada and the Ministère du Développement durable, de l'environnement et des Parcs du Québec
- Collaboration with consultants
- Consultations

Why Review the Interim Quality Criteria?

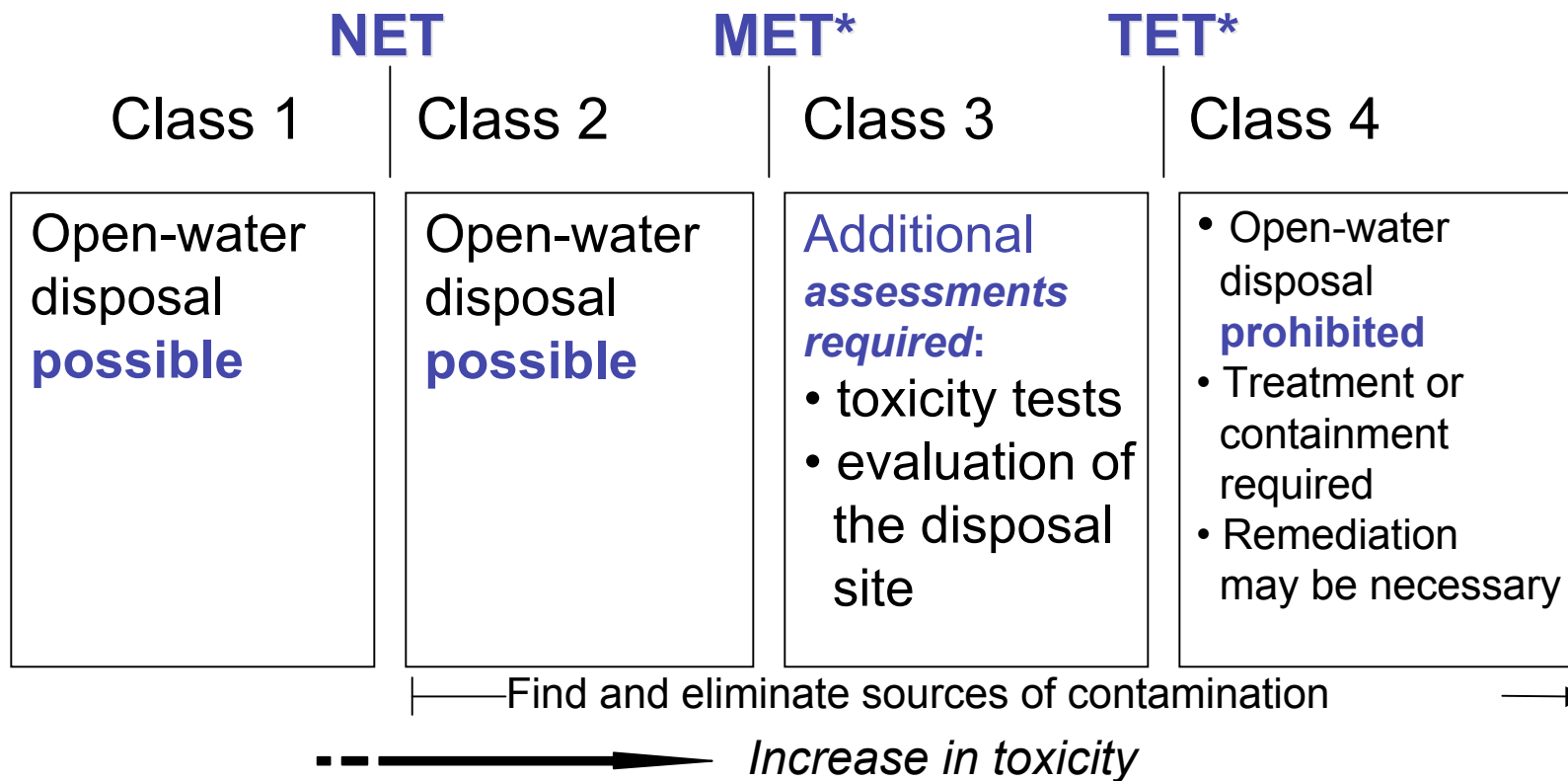
- Two workshops (1996 and 2000)
- Problems in applying the interim quality criteria (1992) :
 - Background concentrations naturally elevated for some metals
 - In some cases : background > criteria
 - Need information on how to use natural levels



The Working Group on the Integrated Management of Dredging and Sediments (WGIMDS 2004) recognized the need to review the criteria to consider the specific characteristics of the St. Lawrence

Overview of Interim Quality Criteria (1992)

Interim Criteria for Quality Assessment of St. Lawrence River Sediment
(Environment Canada & MENVIQ 1992)



* Screening Level Concentration Approach : Presence or absence of benthic organisms with various concentrations of contaminants measured in sediments

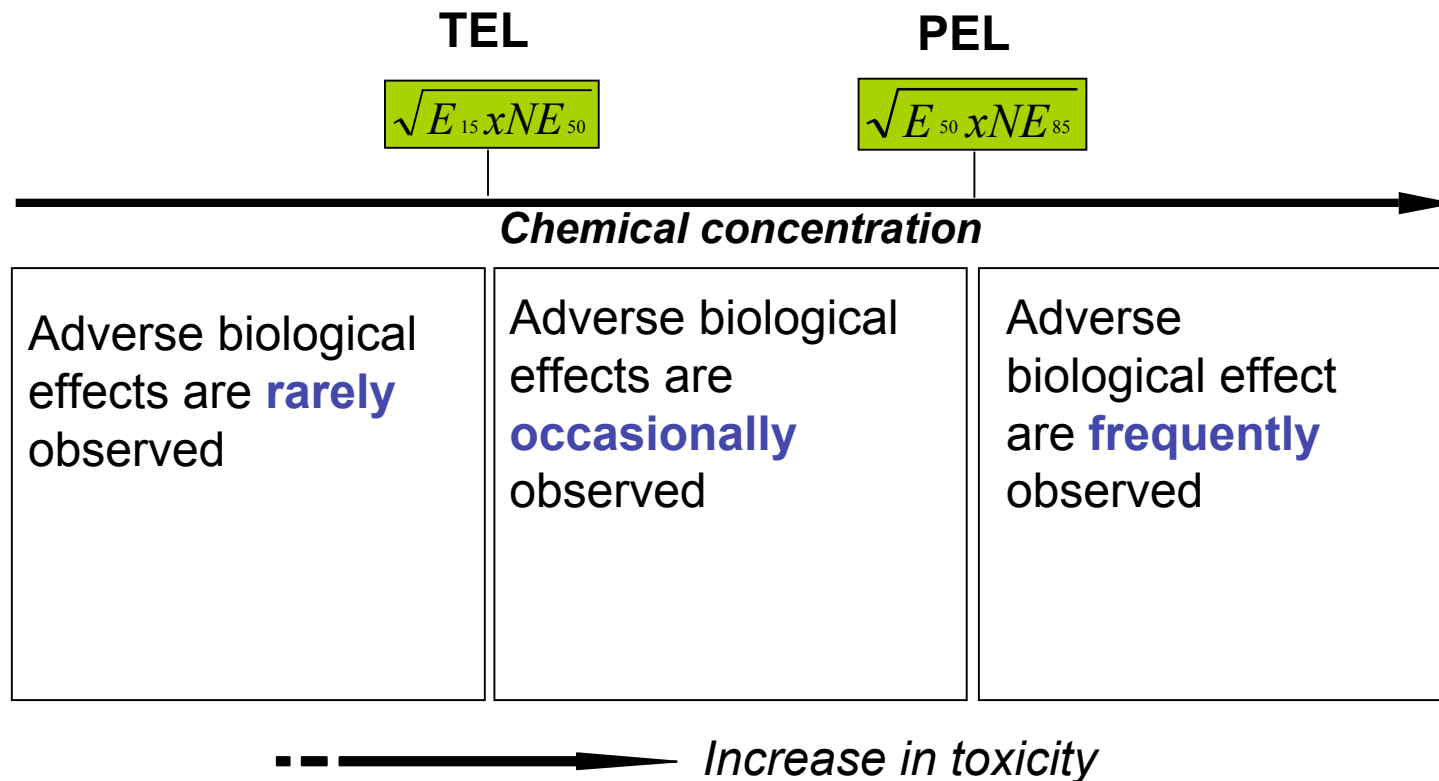
Objectives of the Quality Criteria Review

- Better consider the specific characteristics of the St. Lawrence River
 - Increased knowledge of natural levels (postglacial clays, pre-industrial sediments) and ambient levels
 - New toxicity data (natural levels, postglacial clays and others)
- Integrate the new toxicity data available for chemicals of concern (COC)
- Assess the need to derive specific criteria for the marine and estuarine environments

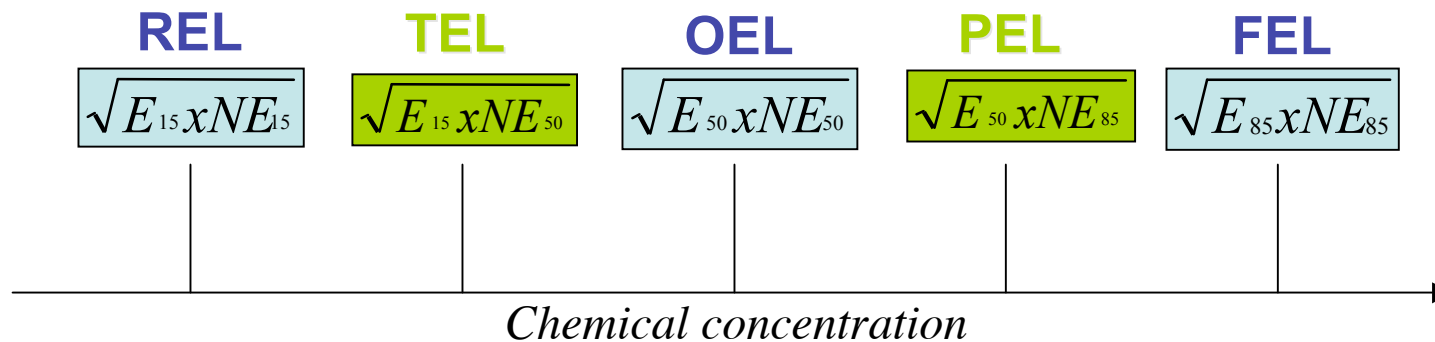
Result of the Review: Selection of the CCME Approach

- The CCME toxicological database (BEDS) is more complete and is updated on a regular basis
- Specific values available for freshwater environments and for marine and estuarine environments
- Harmonization with the other Canadian provinces that are already using the CCME guidelines
- Consistency with EC's Disposal at Sea Program (application of the London Convention on Disposal of Waste at Sea)

Canadian Sediment Quality Guidelines (CCME)



Recommended Threshold Values to Supplement CCME Values



FEL: Frequent effect level

PEL: Probable effect level

OEL: Occasional effect level

TEL: Threshold effect level

REL: Rare effect level

New Management Framework

- Three application contexts for quality criteria:
 - **Prevention** of sediment contamination from new industrial discharges into a watercourse
 - **Management** of dredged sediment
 - **Remediation** of contaminated aquatic sites
- Use of threshold values specific to each context
- For each of the three application contexts:
Two threshold values determine three management classes

Quality criteria		Prevention of sediment contamination caused by industrial discharges	Management of sediments resulting from dredging operations*	Remediation of contaminated sites
	Biological effects frequently observed**		The probability of detecting adverse biological effects is very high. Open-water disposal is prohibited. The sediments must be treated or safely contained.	Sediment contamination is considered a serious problem. Identify the sources and take action targeting the parties responsible, if applicable, in order to eliminate inputs of contaminants. Site remediation is desirable. Biological evaluations should be carried out to determine the feasibility of a remedial process, set the priorities for action and identify the environmental gains. The remediation target is the OEL or the ambient concentration.
5. FEL $\sqrt{(E85 \times NE85)}$				
	Biological effects occasionally observed**	The probability of detecting adverse effects increases with the concentration measured. Examine the problem: carry out investigations to identify the source or sources of contamination and take action targeting the parties responsible in order to prevent an increase in contamination or new inputs of contaminants.	The probability of detecting adverse biological effects is relatively high and increases with the concentration. Open-water disposal can be considered a valid option only if toxicity tests demonstrate that the sediments will not adversely affect the receiving environment and if the disposal does not contribute to the deterioration of the receiving environment.	Identify the sources and take action targeting the parties responsible, if applicable, in order to eliminate inputs of contaminants. Environmental studies may be necessary to supplement the evaluation of the contaminants, assess the risk and determine the remediation requirements. The remediation target is the OEL or the ambient concentration.
4. PEL $\sqrt{(E50 \times NE50)}$				
	Biological effects rarely observed**	The probability that the sediments will have an impact on the environment is low. Monitoring measures may be instituted in order to verify any changes in the situation over time.	The probability of detecting adverse biological effects is relatively low. The sediments can be disposed of in open water or may be used for other purposes, provided the disposal does not contribute to the deterioration of the receiving environment.	Although adverse biological effects may be anticipated, the level of contamination alone does not justify initiation of site remediation.
3. OEL $\sqrt{(E50 \times NE50)}$				
2. TEL $\sqrt{(E15 \times NE50)}$				
	Biological effects rarely observed**	The sediments are considered not to have an impact. No action is required, except in the case where there is a risk that persistent, bioaccumulative toxic substances discharged in water bodies will accumulate in sediments and in the tissues of organisms.		
1. REL $\sqrt{(E15 \times NE15)}$				

Prevention of Contamination

Concentration

Class 3

- The probability of detecting adverse effects increases with the concentrations measured.
- Identify the source or sources of contamination and take action, if applicable, in order to prevent an increase in contamination.

TEL

Class 2

- The probability that the thresholds measured will have an impact on the environment is low.
- Monitoring measures may be instituted in order to verify any changes in the situation over time.

REL

Class 1

- The thresholds measured are considered not to have an impact.
- No action is required, except in the case of persistent, bioaccumulative toxic substances.



Management of Dredged Sediment

Concentration

Class 3

- Probability of detecting adverse biological effects: very high.
- Open-water disposal prohibited. The sediments must be treated or safely contained.

FEL

Class 2

- Probability of detecting adverse biological effects: average to high.
- Sediments must not adversely affect the receiving environment and the disposal must not contribute to the deterioration of the receiving environment.

OEL

Class 1

- Probability of detecting adverse biological effects: low.
- Use of sediments for beneficial purposes or disposal in open water, provided the disposal does not contribute to the deterioration of the receiving environment.

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Management of Dredged Sediment

- The sediment disposal option selected must be the one with the least environmental impact, and must be economically feasible regardless of the level of sediment contamination.
- When studying options, consideration should be given to the beneficial use of sediments in terrestrial or aquatic environments.

Remediation of Contaminated Sites

Concentration

Class 3

- Contamination considered a serious problem.
- Assess the feasibility of a remediation.
- Set the priorities for action.

FEL

Class 2

- Identify the sources and take action, if applicable, in order to eliminate inputs of contaminants.
- Supplemental evaluation (including a risk assessment) may be necessary to determine the remediation requirements.

PEL

Class 1

- Although adverse biological effects may be anticipated, the level of contamination alone does not justify initiation of site remediation.

Consideration of Background and Ambient Levels

Context: *Prevention of contamination*

- If the natural level is $>$ TEL or
- If there are no quality criteria for a substance
 - *The natural level can replace the **TEL***

Context: *Management (disposal) of sediments*

- If the natural level is $>$ OEL
 - *The natural level can replace the **OEL***

Context: *Remediation of contaminated aquatic sites*

- *The ambient levels can be used as a remediation objective*

Conclusion

- Distinct values for the freshwater environment and the marine environment
- Possibility of using natural and ambient levels
- BEDS : more date and regularly updated
- St. Lawrence geology and CCME approach are taken into account
- Toxicity tests carried out using concentrations deemed more adequate
- OEL values compared to current MET values:
 - **Metals**: + permissive (saltwater and freshwater)
 - **PCBs and PAHs**: + protective (saltwater and freshwater)
- Criteria used together with other contamination assessment tools (such as toxicity tests and the study of communities)

Effective Date and Transition Period

April 2008:

- Public dissemination:
 - St. Lawrence Plan Web site :
http://www.planstlaurent.qc.ca/index_e.htm
 - EC Web site and MDDEP Web site
- Application: adjustment period between former and new criteria

Thank you!

