

10,714

Reasonable Potential & Effluent Limitations

BACWA Permit Workshop

June 20, 2006

RPAs and Final Limits: Water Quality-Based

- Part 1 – Reasonable Potential Analysis:
for what pollutants are limitations needed?
- Part 2 – Calculation of Final Effluent
Limits
- *Also: Data Quality Issues*

NPDES Permit Limitations

	Technology-Based Effluent Limitations	Water Quality Based Effluent Limitations (WQBEL)
POTWs	2°-level treatment Basin Plan Table 4-2	Local WQS
Industry	BAT, BCT BP Table 4-2 (<i>selectively</i>)	Local WQS
Municipal Stormwater	Maximum Extent Practicable (MEP) pollutant removal	Local WQS (narrative; optional with state)

Reasonable Potential Analysis: Basis

Federal regulations: Each permit shall include limitations necessary to ...*achieve water quality standards* ...

- (i) *Limitations must control all pollutants ... which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard,....*
[40 CFR 122.44 (d) (1) (i)]

RPA Procedures:

Inland & Bays, Estuaries

Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California

- **AKA:** State Implementation Policy or SIP
- **Section 1.3:** Determination of Priority Pollutants Requiring Water Quality-Based Effluent Limitations
- Posted on the internet at:
<http://www.swrcb.ca.gov/iswp/docs/final.pdf>

State Implementation Policy (SIP): Scope

- EPA's *California Toxics Rule* (CTR) and NTR - *priority pollutant criteria*
- Basin Plan toxic pollutant objectives; for SF Basin Plan:
 - Table 3.3 Marine Water Quality Objectives
 - Table 3.4 Freshwater Water Quality Objectives
- *Also addresses:* monitoring requirements for dioxins; chronic toxicity control provisions; and, other special provisions

SIP Reasonable Potential Analysis: Factors

- Objectives and criteria - *minimum*
- Effluent data - *maximum effluent concentration*
- Ambient background data - *maximum background concentration*
- Nature of facility operations

Typically detailed in Appendix A of the permit Fact Sheet

Note: RPA doesn't apply if TMDL developed

Not SIP RPA Factors

- Dilution
- Data variability (*standard deviation*)
- Local background (*for SF Bay, ambient background from selected sites is used*)

SIP Reasonable Potential: Triggers

1. Maximum effluent concentration
(MEC) > than the lowest criteria/objective.

$$\text{MEC} \geq \text{WQO} \Rightarrow \text{WQBEL}$$

2. Maximum ambient background
(B) > lowest criteria/objective, if pollutant
present in effluent

$$\text{B} > \text{WQO} + \text{pollutant present} \Rightarrow \text{WQBEL}$$

3. Permit writer assessment

$$\textit{Identified threat to beneficial uses} \Rightarrow \text{WQBEL}$$

Reasonable Potential Trigger 1: MEC \geq WQO

Sources of water quality standards used in RPA

- California Toxics Rule (CTR) includes NTR: *criteria*
- Basin Plan Table 3-3 and 3-4, plus toxicity: *objectives*
- CTR posted at:
<http://www.epa.gov/ost/standards/ctr/toxic.pdf>

Reasonable Potential Trigger 1:

MEC \geq WQO

Objectives/criteria & ambient background & effluent data may need to be “adjusted” (SIP 1.2)

- Use discharger-specific *Water Effect Ratios* for metals, where approved
- Discard inappropriate or insufficient data
 - sample erroneously reported
 - not representative of effluent or ambient water quality
 - questionable QA/QC
 - varying seasonal conditions (??)
- Adjust for hardness or pH, as appropriate
- Use translators for dissolved metals (*next slide*)

Reasonable Potential Trigger 1:

MEC \geq WQO

Translators for objectives/criteria for metals expresses as “dissolved”

- “Dissolved” objective needs to be translated to “total recoverable”
- Translators in SIP Appendix 3 (*or site specific*)

Example:

Lead (dissolved) objective converted to lead (total rec.)
(8.1 ug/l dissolved) / (0.951) = 8.52 [adjusted WQO, saltwater]

Reasonable Potential Trigger 1: $MEC \geq WQO$

Source of *Maximum Effluent Concentration (MEC)*

- Typically 3 years discharger effluent data – **highest (valid) value**
- Ensure it's not an outlier
- Non-detects may trigger additional monit.
- Regional Board discretion on rejecting data

Reasonable Potential Trigger 2: B > WQO

Source of *Maximum Ambient Background*

For Bay Dischargers: SFEI - Regional Monitoring Program & BACWA SF Bay Ambient Water Monitoring Interim Report

- Highest value of all background data – back to **1993**; *includes estimated values*
- Measured as total recoverable
- Data from designated “background” sites – 3 historic monitoring stations

- Yerba Buena Island (BC10) (and Richardson Bay?)
- Dumbarton Bridge (BA30)
- Sacramento River (BG20)
- Posted at:

<http://www.sfei.org/rmp/2003/06%20Appendix%20A.pdf>

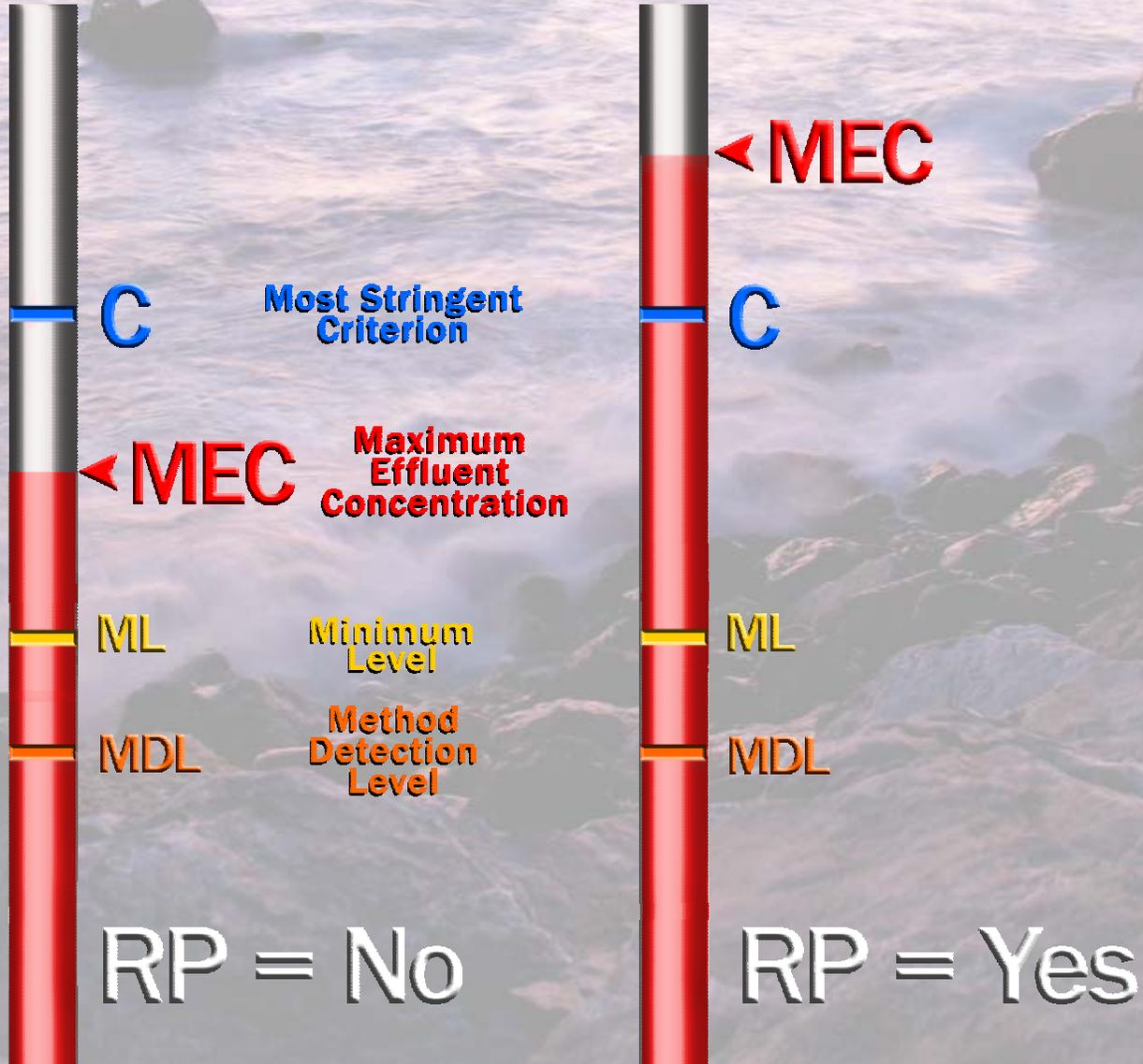
SF Bay

Ambient Background Locations (B)

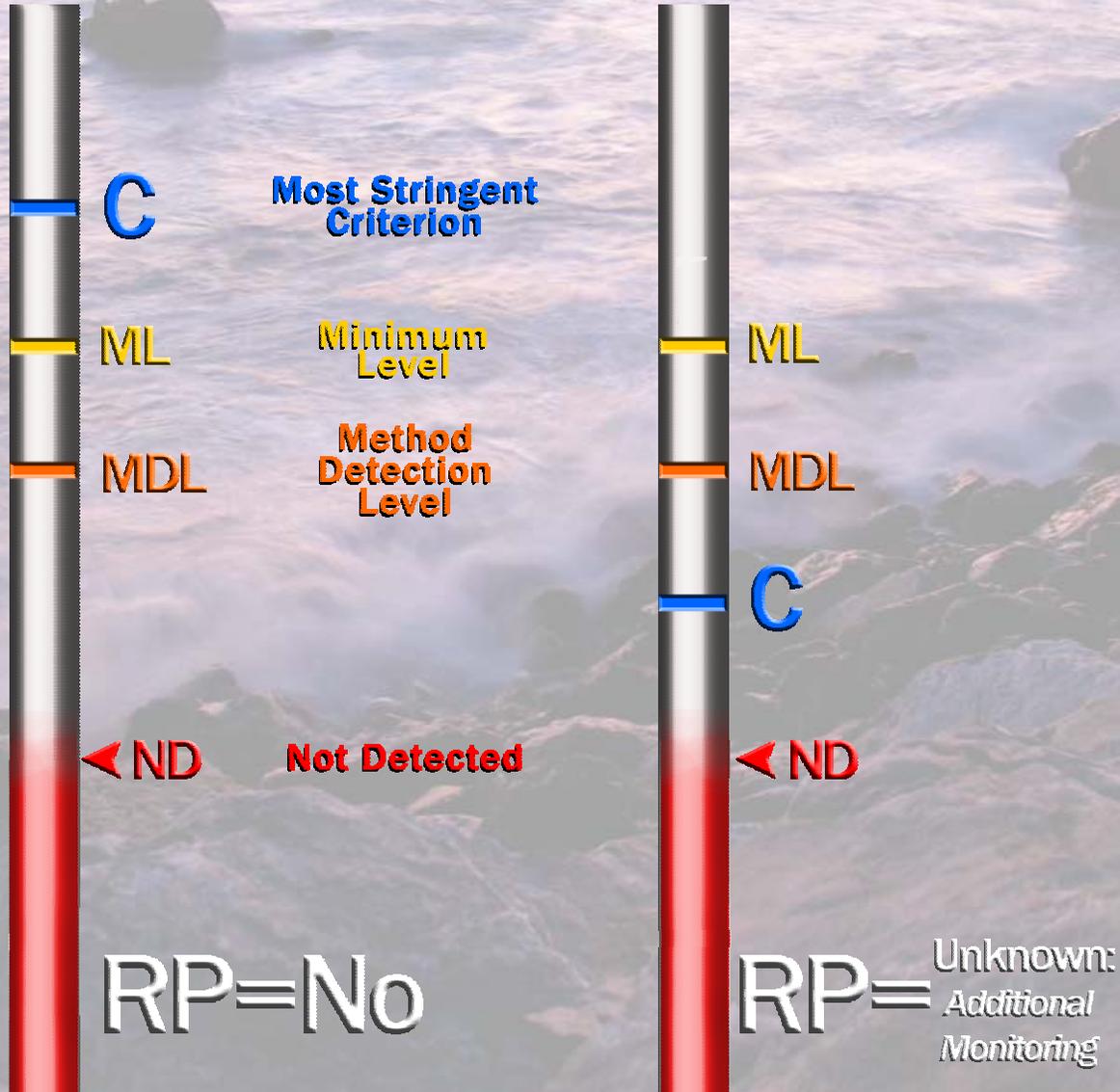


SIP Trigger #1:

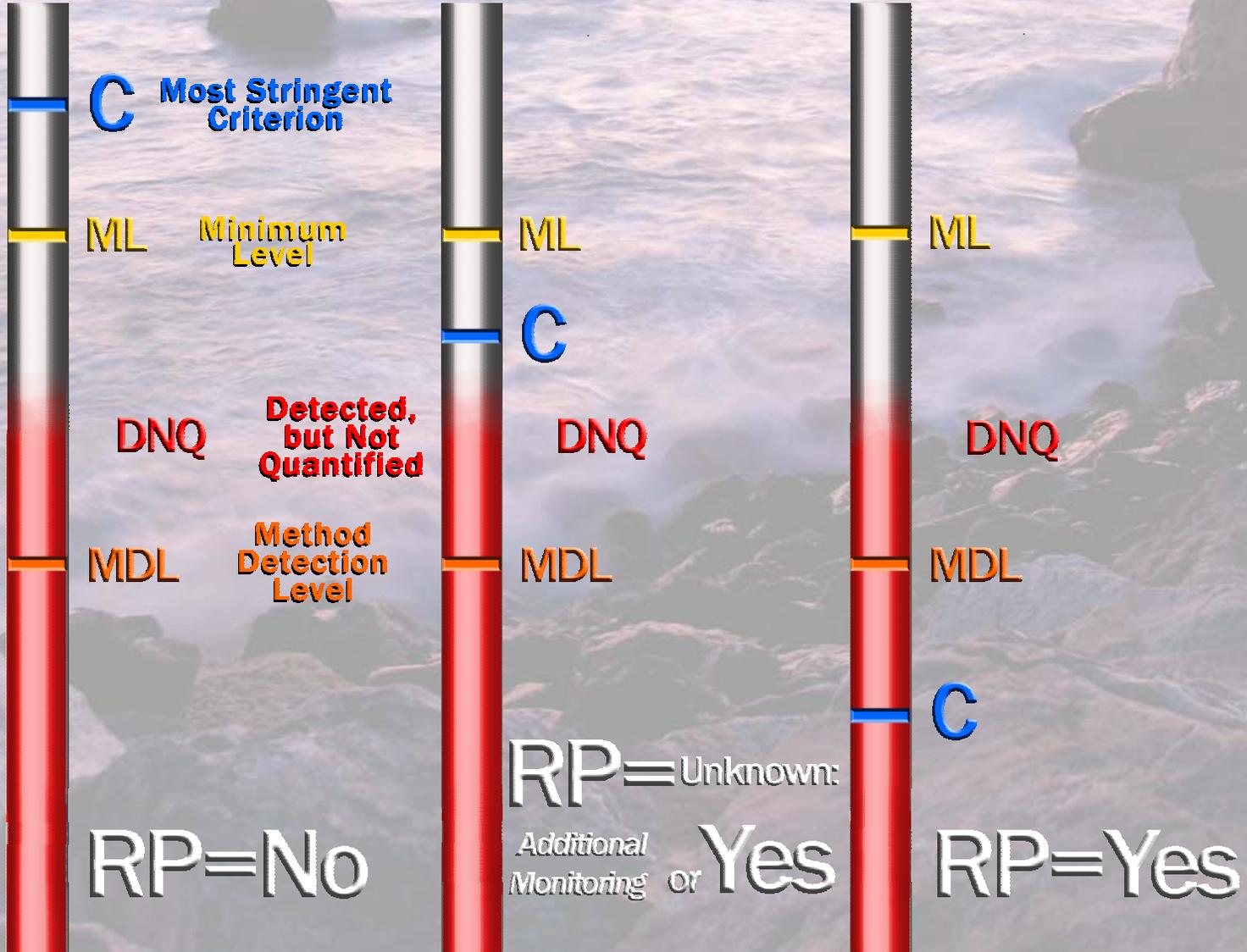
Comparison with Lowest Criterion



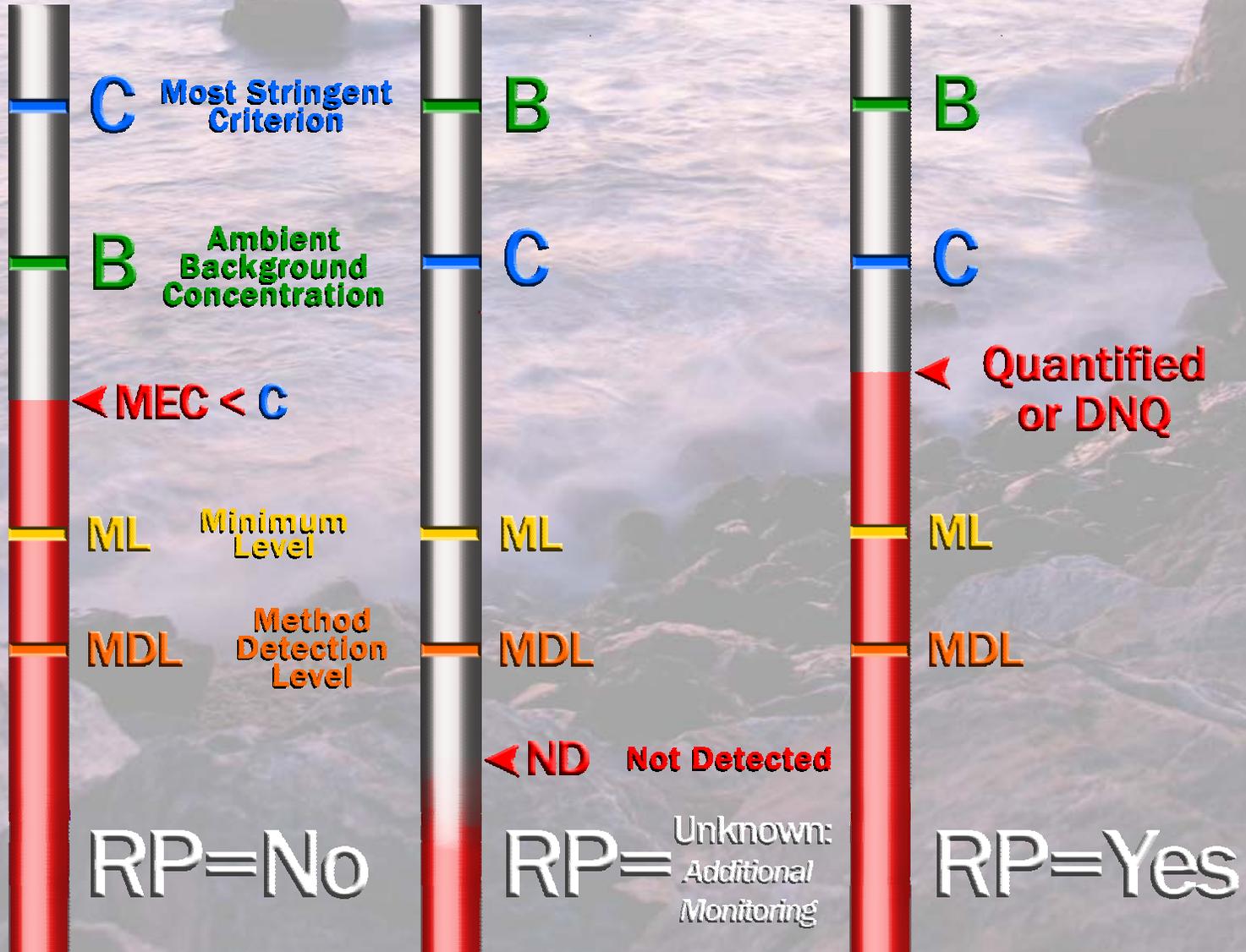
Trigger #1: All Non-Detects



Trigger #1 (Implied): Detected but not Quantified



SIP Trigger #2: Comparison with the Background



Trigger 3:

Other threats to beneficial uses

Information that can be used:

- Facility & discharge type
- Lack of dilution
- History of compliance problems
- Potential toxic impact of discharge
- Fish tissue residue data
- 303(d) listing for the pollutant
- Endangered species; critical habitat

Reasonable Potential for Other Parameters

- Non-toxic parameters (*assessed outside of SIP by permit writer*)
- Toxicity may be assumed to have RP based on trigger 3

Reasonable Potential for Ocean Waters

- Described in Ocean Plan – Appendix VI (added 4/2005)
- Based on EPA's TSD – *updated for “censored” data*
- Takes into account:
 - Mean and standard deviation
 - Dilution
 - “Shape” of the data (e.g., lognormal distribution)
 - ND and DNQ values
 - Number of samples
 - Background seawater (not max)
- Eventually will be used for inland waters

Calculation of Effluent Limitations

Inland Waters, Bays & Estuaries

(per SIP Section 1.4)

- Applies to Toxic Pollutants (and toxicity) with RP
- Several methods possible
- Yields WQBELs

Options for WQBELs *per SIP*

- a. TMDL-based: assigned portion of the loading capacity of the receiving water
- b. Steady-state model statistical procedure: *discussed in following slides*
- c. Dynamic model: 3 techniques recommended by EPA (*may give less restrictive WQBELs*)
- d. Consideration of intake water pollutants (per SIP section 1.4.4: *background >C; same water body*)

SIP Calculation Approach

Key factors:

- All pollutant criteria/objectives
- Dilution factor, *if allowed (not bioaccumulatives)*
- Effluent data *including historical variability*
- # data points
- Frequency of compliance sampling
- Pollutant background concentrations

Step 1: Criteria/Objectives

- Identify applicable criteria/objectives:
 - acute aquatic life
 - chronic aquatic life
 - human health
- Adjust for pH, hardness; convert dissolved to total recoverable
- If data insufficient \Rightarrow *set interim requirements (per SIP 2.2.2.)*

Step 2: Calculate Effluent Concentration Allowance (*ECA*)

$$ECA = C + D (C - B)$$

C = criterion/objective (adjusted & translated)

D = dilution credit (capped at 10:1 for Bay)

B = the ambient background concentration (*maximum*)

Exceptions:

- when **C** is Human Health (carcinogen) criterion, **B** = average background)
- when background **B** \geq criterion **C**, then **ECA = C**

Dilution / Background: Tradeoff for SF Bay

- Dilution factors overly restrictive (*capped*)
 - RB insists on traditional 10:1 although SIP allows site-specific
- Background under restrictive – distant rather than local background
- Background: *long-term monitoring - since 1993*

Step 3: Adjust for Effluent Data Variability

Calculate long-term average discharge condition (LTA)

$$\text{LTA} = (\text{ECA})(\text{ECA multiplier})$$

- Applies to aquatic life criteria – chronic and acute, separately
- Takes into account effluent variability (CV) - more variable the data, the lower the multiplier
- Multiplier taken from table or determined by formula
- \Rightarrow ECA met 99 days out of 100.

Step 4: Lowest LTA

Select lowest (most limiting) of:

- LTA_{acute}

or

- LTA_{chronic}

Step 5: Calculate WQBELs for aquatic life

AMEL - average monthly effluent limitation

MDEL - maximum daily effluent limitation

$$\text{AMEL} = (\text{LTA})(\text{AMEL multiplier})$$

$$\text{MDEL} = (\text{LTA})(\text{MDEL multiplier})$$

Multipliers taken from table or calculated – *factors*:

- Coefficient of variation (data variability)
- Future sampling frequency (i.e., samples per month)

Step 6: Calculate human health-based WQBEL

$$\text{AMEL} = \text{ECA} [\textit{Effluent Concentration Allowance from step 2}]$$

Recall: $\text{ECA} = C + D (C - B)$

$$\text{MDEL} = (\text{ECA}) \frac{(\text{MDEL multiplier})}{(\text{AMEL multiplier})}$$

Step 7: Final WQBEL

- Take lowest AMEL (*aquatic life or human health*)
- Take lowest MDEL (*aquatic life or human health*)
- Regional Board can impose more restrictive limitations:
 - Protect beneficial uses
 - Implement state/federal antidegradation policies
 - Implement anti-backsliding requirements

Ocean Plan

- Similar but different objectives (e.g., dioxin)
 - Aquatic Life – 6-mo. median, daily max., instant. max.
 - Human health – 30 day average
- Statistical approach for *Reasonable Potential*
- Non-statistical approach to calculate WQBELs

Calculate effluent limitations for Ocean Plan

$$C_e = C_o + D_m (C_o - C_s)$$

C_e = the effluent concentration limit

C_o = water quality objective

C_s = background seawater concentration
(not highest background)

D_m = minimum probable initial dilution
(*defined conservatively*)

Data Issues

- Missing data or partial results - no MDL, ML
- Data inconsistent - DNQ numeric results significantly higher than quantified data
- Wrong analytical technique
- Sampled at wrong time

Difficult to address 3 years later

Spreadsheets (*RPA, Effluent Limits*) and Data Summaries

- Request from Board – *permit writer*
- Use recent permits
 - Regional Board home page, right side:
Tentative Orders for Public Comment
 - Some meeting agendas

10,714



Adapted from a picture © Kurt Jones

Questions, comments, corrections: **Fred Krieger 510 843-7889, fkrieger@msn.com**