Information Item – Establishing Effluent Limits in NPDES Permits

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Overview

- NPDES Program background
- Technology-Based Effluent Limits
- Water Quality-Based Effluent Limits
  - Water Quality Standards
  - Determining need for WQBELs
    - Reasonable Potential Analysis
  - Calculating WQBELs
    - Considering Mixing Zones

NPDES Program

- Federal Program
- Applies to Waters of the United States (surface waters)
  - Does not apply to groundwater
- Statutory Authority from Clean Water Act

NPDES Program

- Implementing Regulations, Policies, and Plans
  - Code of Federal Regulations
  - Porter-Cologne Water Quality Control Act
  - California Water Code
  - Water Quality Control Plan (Basin Plan)
  - Antidegradation Policy
  - Source of Drinking Water Policy
  - State Implementation Policy (SIP)

NPDES Program

- State Implementation Policy (SIP)
  - Adopted by State Board in 2000
  - Policy for NPDES Permits in CA
  - For California Toxics Rule (CTR) priority toxic pollutants
  - Applies to entire State

NPDES Program

- SIP provides procedures for:
  - Reasonable Potential Analysis
    - i.e., are effluent limits are needed?
  - Calculating WQBELs
  - Granting Mixing Zones

NPDES Program

- Basin Plan
  - Establishes beneficial uses
  - Establishes water quality objectives
  - Contains implementing programs and policies
    - Including SIP
  - Only applies to our Region

Technology-Based Effluent Limits

- Minimum standards, based on technology
- Performance-based level of pollutant control
- Economics considered
- Provide equity among dischargers within categories

Technology-Based Effluent Limits

- TBELs developed by USEPA
  - Included in federal regulations
- Effluent guidelines for categorical industrial dischargers
- Site-specific TBELs based on BPJ

Technology-Based Effluent Limits

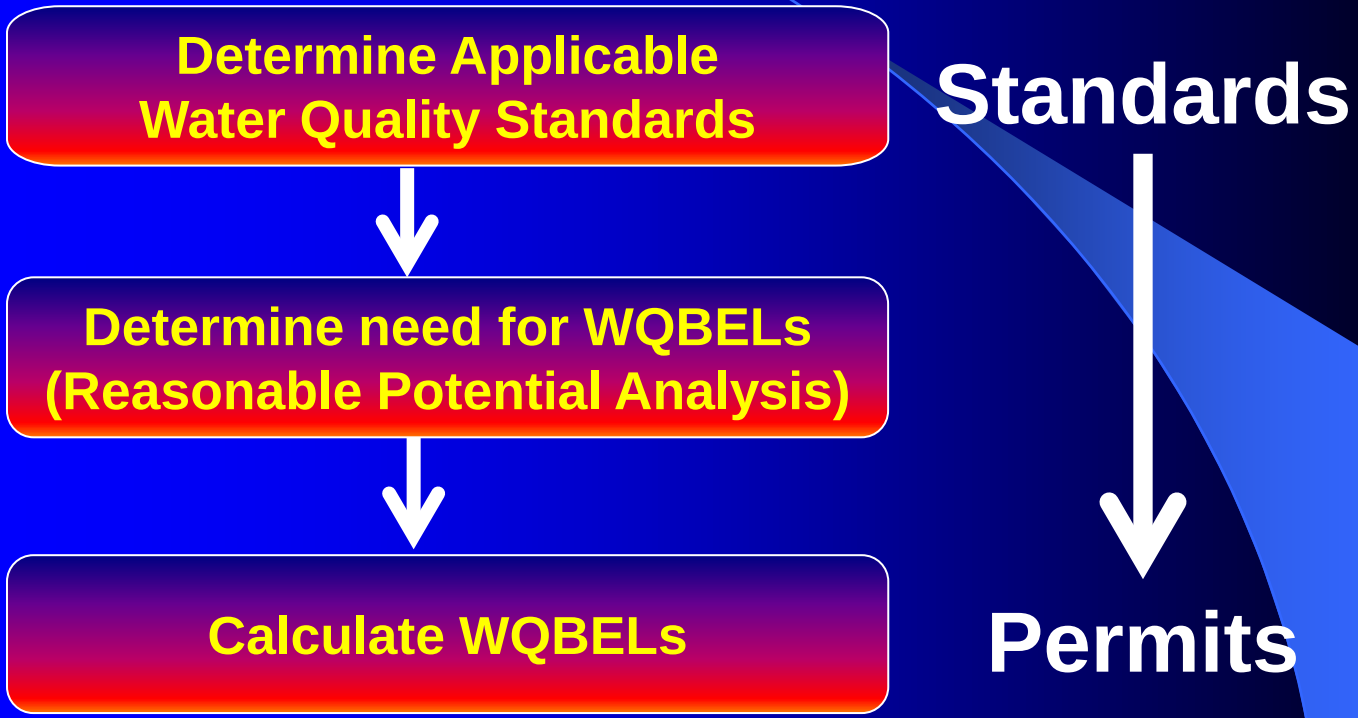
- Secondary standards for POTWs
  - Minimum treatment standards
  - Physical and Biological treatment
- Most POTWs treat to tertiary-level
  - Filtration
  - Nitrogen removal

Upper Sacramento River

TBELs vs WQBELs

Technology-Based Effluent Limits (TBELs)	Water Quality-Based Effluent Limits (WQBELs)
Water quality impacts not considered	Addresses water quality impacts of discharge
Economics considered	Economics cannot be considered
Based on technology	Based on Water Quality Standards

Water Quality-Based Effluent Limits



Water Quality Standards

- Water Quality Standards composed of three parts:
  - Designated/Beneficial Uses
  - Water Quality Criteria/ Objectives
  - Antidegradation Policy
- All included in Basin Plan

Water Quality Standards
Beneficial Uses

- Designated/Beneficial Uses
  - Aquatic life
  - Recreation
  - Municipal Supply
  - Agricultural Supply

Water Quality Standards
Beneficial Uses

- Beneficial Uses designated in Basin Plan
  - For specific identified water bodies
  - "Tributary Rule" for unidentified water bodies
- Sources of Drinking Water Policy
  - State Board Resolution 88-63
  - Municipal Supply for all waters

Water Quality Standards
Beneficial Uses

TABLE II-1

SURFACE WATER BODIES AND BENEFICIAL USES

	SURFACE WATER BODIES (1)	HYDRO UNIT NUMBER	MUN	AGRI-CULTURE		INDUSTRY			RECREATION			FRESHWATER HABITAT (2)		MIGRATION		SPAWNING		WILD	NAV
				AGR		PROC	IND	POW	REC-1		REC-2	WARM	COLD	MIGR		SPWN			
			MUNICIPAL AND DOMESTIC SUPPLY	IRRIGATION	STOCK WATERING	PROCESS	SERVICE SUPPLY	POWER	CONTACT	CANOEING (1) AND RAFTING	OTHER NONCONTACT	WARM	COLD	WARM (3)	COLD (4)	WARM (3)	COLD (4)	WILDLIFE HABITAT	NAVIGATION
1	McCLOUD RIVER	505.	E					E	E	P	E		E				E	E	
2	GOOSE LAKE	527.20		E	E				E		E	E	E					E	
	PIT RIVER																		
3	NORTH FORK, SOUTH FORK, PIT RIVER	526.00	E	E	E				E	P	E	E	E			E	E	E	
4	CONFLUENCE OF FORKS TO HAT CREEK	526.35	E	E	E			E	E	E	E	E	E			E		E	
5	FALL RIVER	526.41	E	E	E			E	E	E	E	E	E					E	
6	HAT CREEK	526.30		E				E	E		E	E	E				E	E	
7	BAUM LAKE	526.34						E	E		E		E				P	E	
8	MOUTH OF HAT CREEK TO SHASTA LAKE	526.	E	E	E			E	E	E	E	P	E			E	E	E	
	SACRAMENTO RIVER																		
9	SOURCE TO BOX CANYON RESERVOIR	525.22		E	E				E		E		E					E	
10	LAKE SISKIYOU	525.22							E		E	E	E				P	E	

Water Quality Standards
Beneficial Uses

- Water Quality Criteria/Objectives Included in Basin Plan

"...the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area“

(Porter-Cologne Water Quality Control Act)

Water Quality Standards
Criteria/Objectives

- Two types of objectives:
  - Numeric Objectives
  - Narrative Objectives

Water Quality Standards
Criteria/Objectives

- Numeric Objectives
  - Scientifically derived, promulgated criteria
  - No discretion with numeric objectives
  - must implement in NPDES permits

Water Quality Standards
Criteria/Objectives

- Common Numeric Objectives
  - California Toxics Rule
  - National Toxics Rule
  - Primary and Secondary MCLs
  - Basin Plan Site-specific objectives

Water Quality Standards
Criteria/Objectives

TABLE III-1
TRACE ELEMENT WATER QUALITY OBJECTIVES

CONSTITUENT	MAXIMUM CONCENTRATION [a] (mg/l)	APPLICABLE WATER BODIES
Arsenic	0.01	Sacramento River from Keswick Dam to the I Street Bridge at City of Sacramento (13, 30); American River from Folsom Dam to the Sacramento River (51); Folsom Lake (50); and the Sacramento-San Joaquin Delta.
Barium	0.1	As noted above for Arsenic.
Boron	2.0 (15 March through 15 September) 0.8 (monthly mean, 15 March through 15 September)	San Joaquin River, mouth of the Merced River to Vernalis
	2.6 (16 September through 14 March) 1.0 (monthly mean, 16 September through 14 March)	
	1.3 (monthly mean, critical year[b])	
	5.8 2.0 (monthly mean, 15 March through 15 September)	Salt Slough, Mud Slough (north), San Joaquin River from Sack Dam to the mouth of Merced River
Cadmium	0.00022 [c]	Sacramento River and its tributaries above State Hwy 32 bridge at Hamilton City

Water Quality Standards
Criteria/Objectives

- Narrative Objectives
  - Chemical Constituents Objective
    "Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses."
  - Toxicity Objective
    "All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life."

Water Quality Standards
Criteria/Objectives

- Narrative Objectives
  - Must be Interpreted
    - Criteria recommendations from USEPA, Fish and Game, Public Health, etc
    - Consider site-specific conditions
    - Regional Board has discretion

Water Quality Standards
Criteria/Objectives

- Narrative Objectives
  - Aluminum is good example of how discretion may be used
  - USEPA Criteria may be used for aluminum, but may not be applicable
  - Need to consider site-specific conditions

Water Quality Standards

Criteria/Objectives

Example: Selenium

Beneficial Use Protected	Water Quality Objective/ Criterion
Recreation	None
Municipal Supply	Primary MCL = 50 µg/L
Agricultural Supply	Ag Goal = 20 µg/L
Aquatic Life	Calif. Toxics Rule = 5 µg/L

Water Quality Standards
Antidegradation Policy

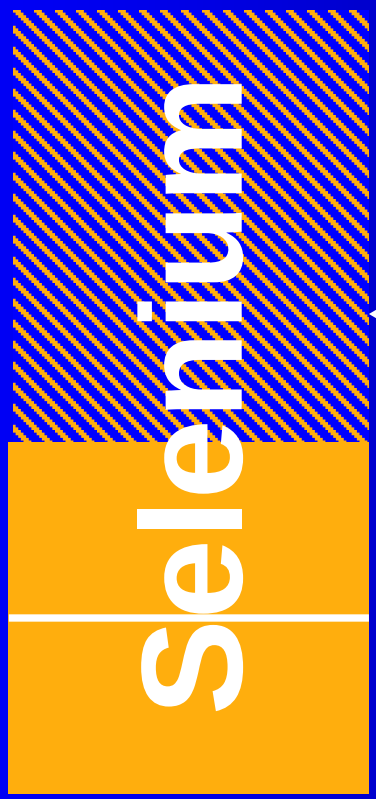
- State Water Board Resolution 68-16

  Existing high quality water shall be maintained unless it is demonstrated that any change is consistent with the maximum benefit to the people of the State and will not unreasonably affect beneficial uses

Water Quality Standards

Antidegradation Policy

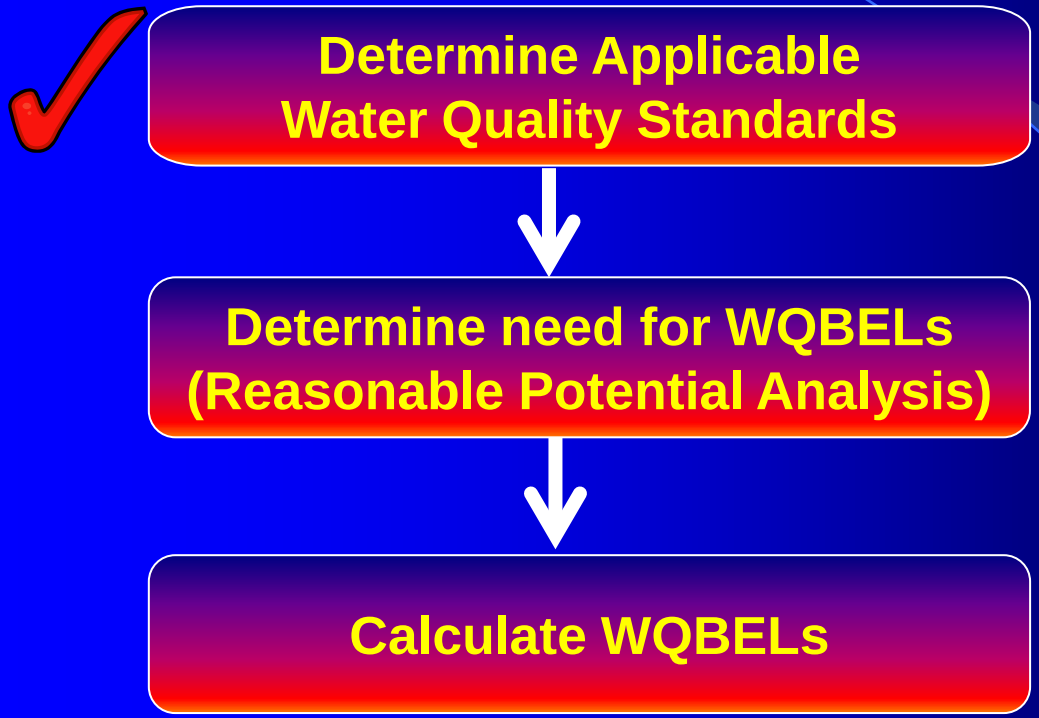
5 µg/L Water Quality Objective



Antidegradation Policy applies

1 µg/L Existing Water Quality

Water Quality-Based Effluent Limits



Standards

Permits

Reasonable Potential Analysis

- Process for determining need for WQBELs
- SIP includes RPA procedures
  - Must use for CTR constituents
  - Typically use for all constituents

Reasonable Potential Analysis

Does the Discharge:

1) cause,

2) have a reasonable potential to cause, or

3) contribute to…

an excursion above the applicable water quality criterion/objective?

Reasonable Potential Analysis

Determine the lowest (most stringent) Water Quality Criterion/Objective

Reasonable Potential Analysis

Most Stringent Criterion, C

Beneficial Use Protected	Water Quality Objective/ Criterion
Recreation	None
Municipal Supply	Primary MCL = 50 µg/L
Agricultural Supply	Ag Goal = 20 µg/L
Aquatic Life	Calif. Toxics Rule = 5 µg/L

Reasonable Potential Analysis

SIP includes 3 Thresholds to Trigger Reasonable Potential:

Trigger 1: Effluent ≥ Criterion (C)

Trigger 2: RW > Criterion (C)

Trigger 3: Other Considerations

Reasonable Potential Analysis

Trigger 1: Effluent

Determine the maximum effluent concentration or MEC and compare to C

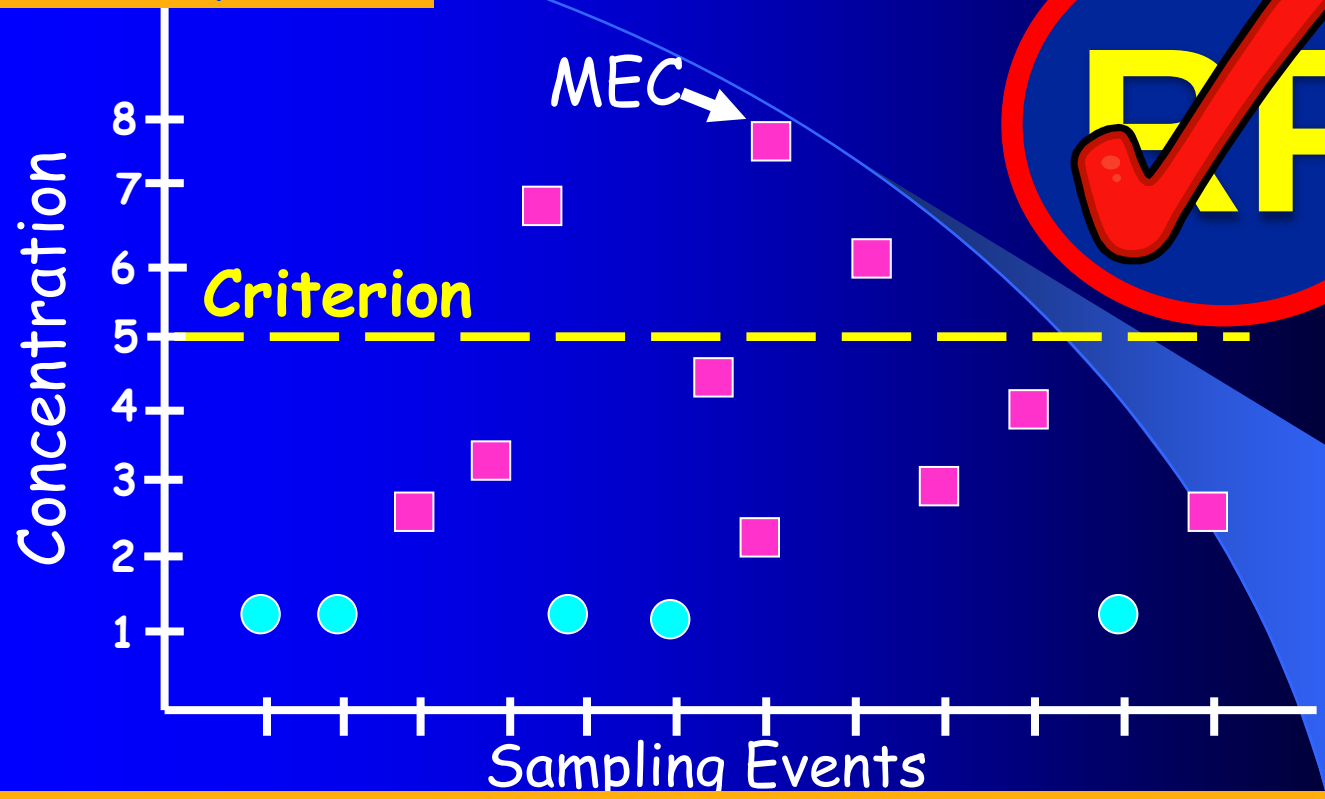
Trigger 1: Effluent

- Identify Effluent Dataset
  - Use all available,
  - valid,
  - relevant,
  - representative data

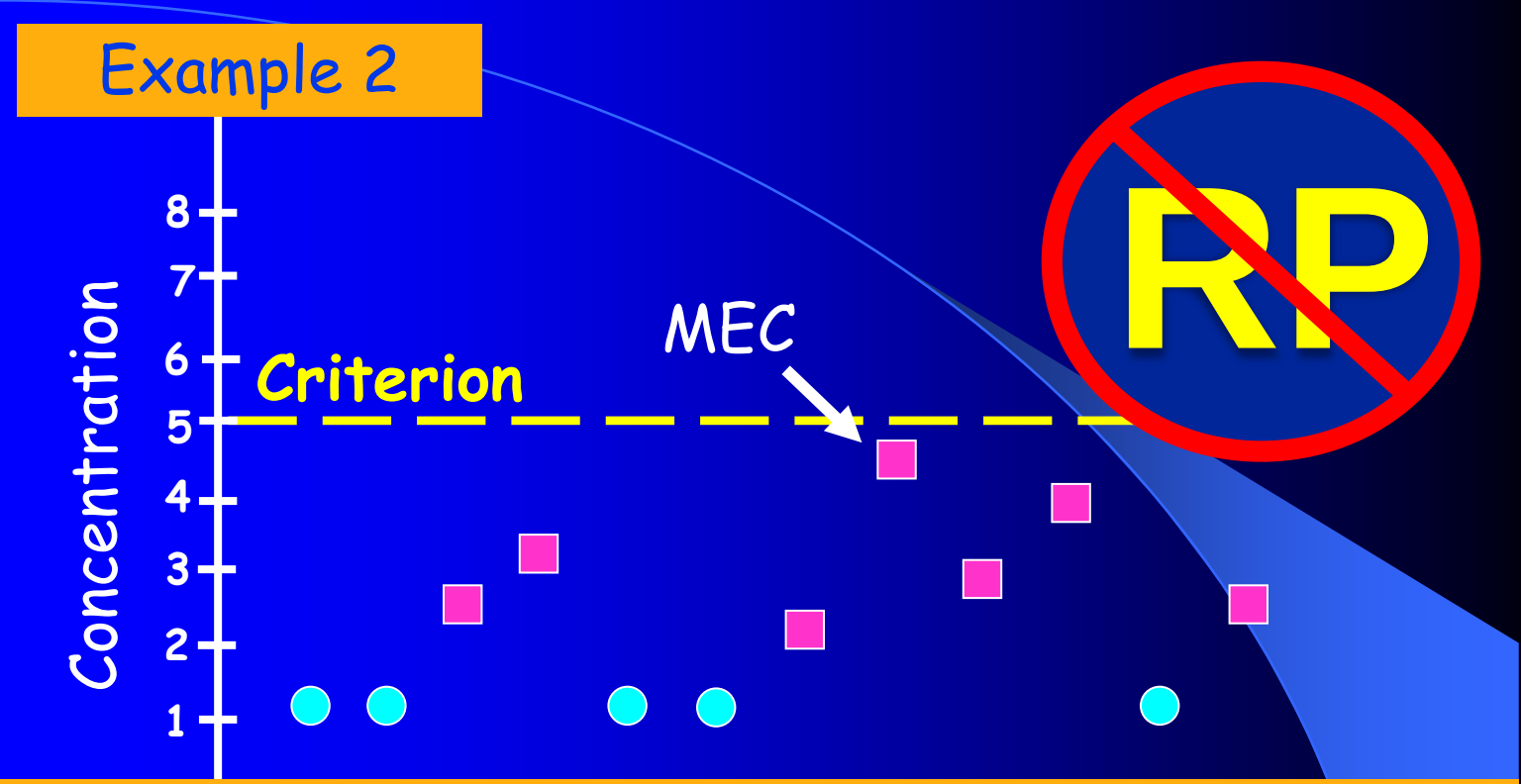
Trigger 1: Effluent

- Notes about Datasets
  - Numbers don't tell entire story
  - Analytical Variability
  - Lab or Sampling Errors
  - Need to consider other factors
  - Need sufficient dataset

Example 1

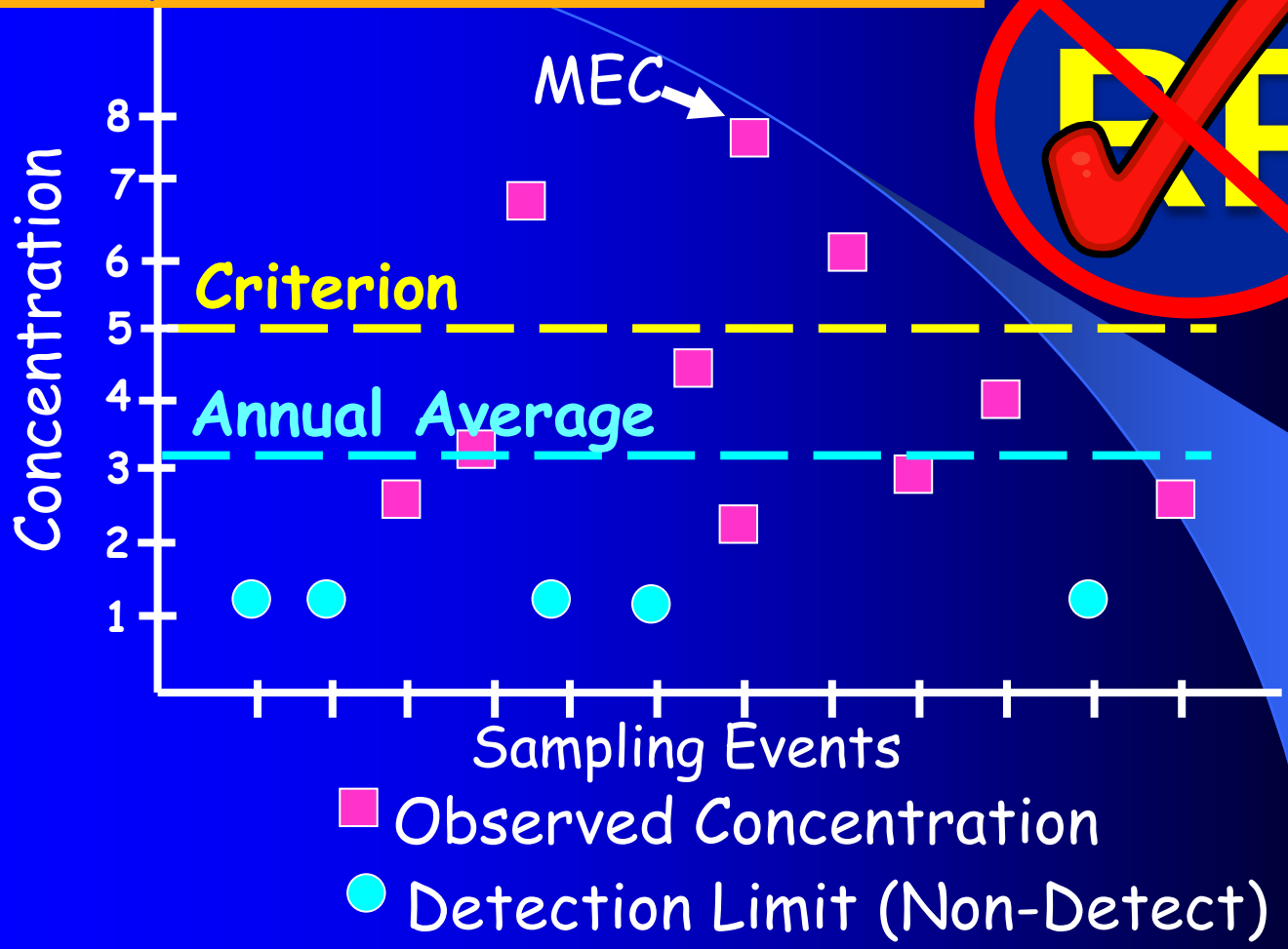


MEC > C - Reasonable Potential and WQBELs Required

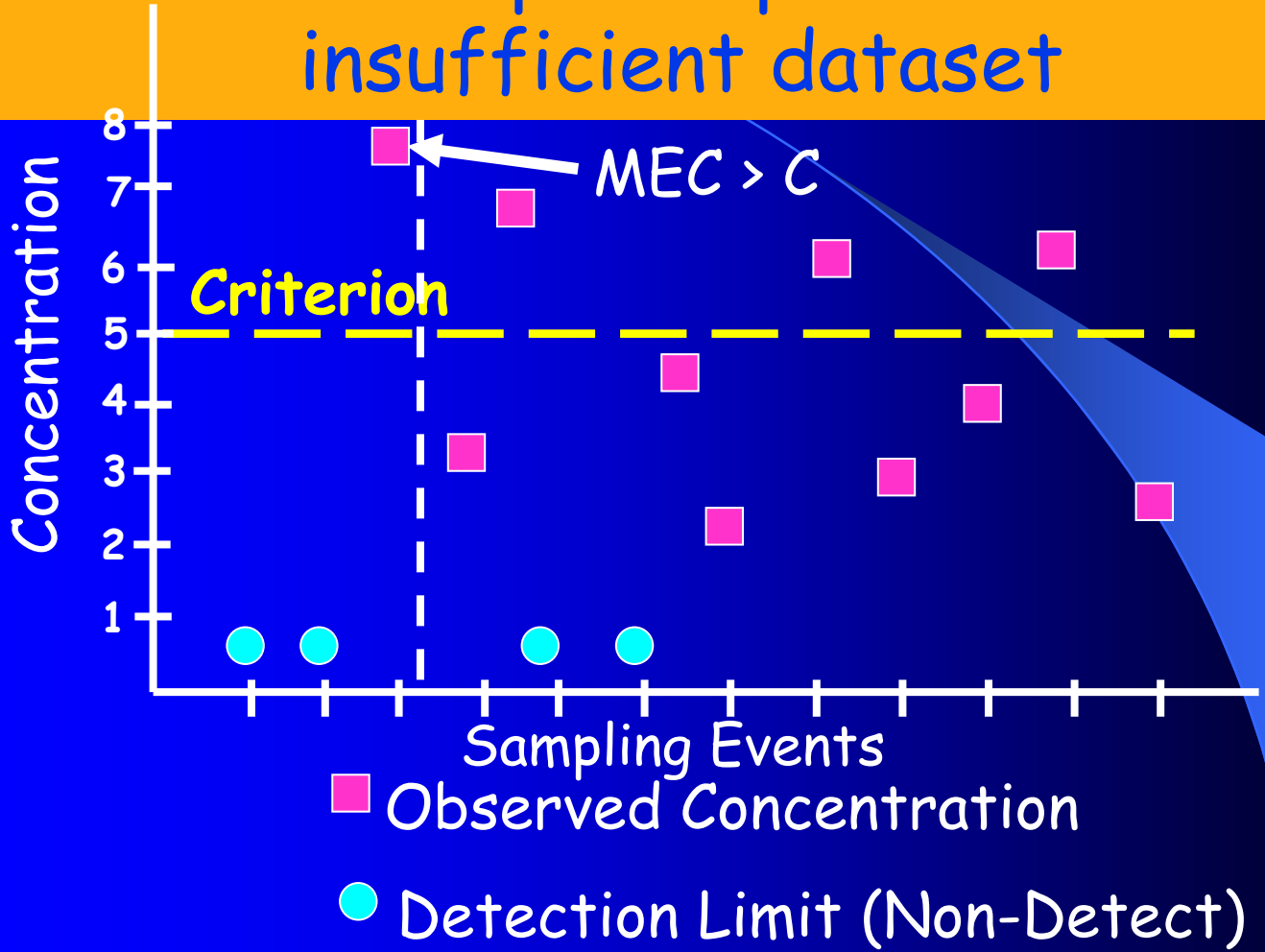


MEC < C - No Reasonable Potential based on Trigger 1 (still need to check Trigger 2)

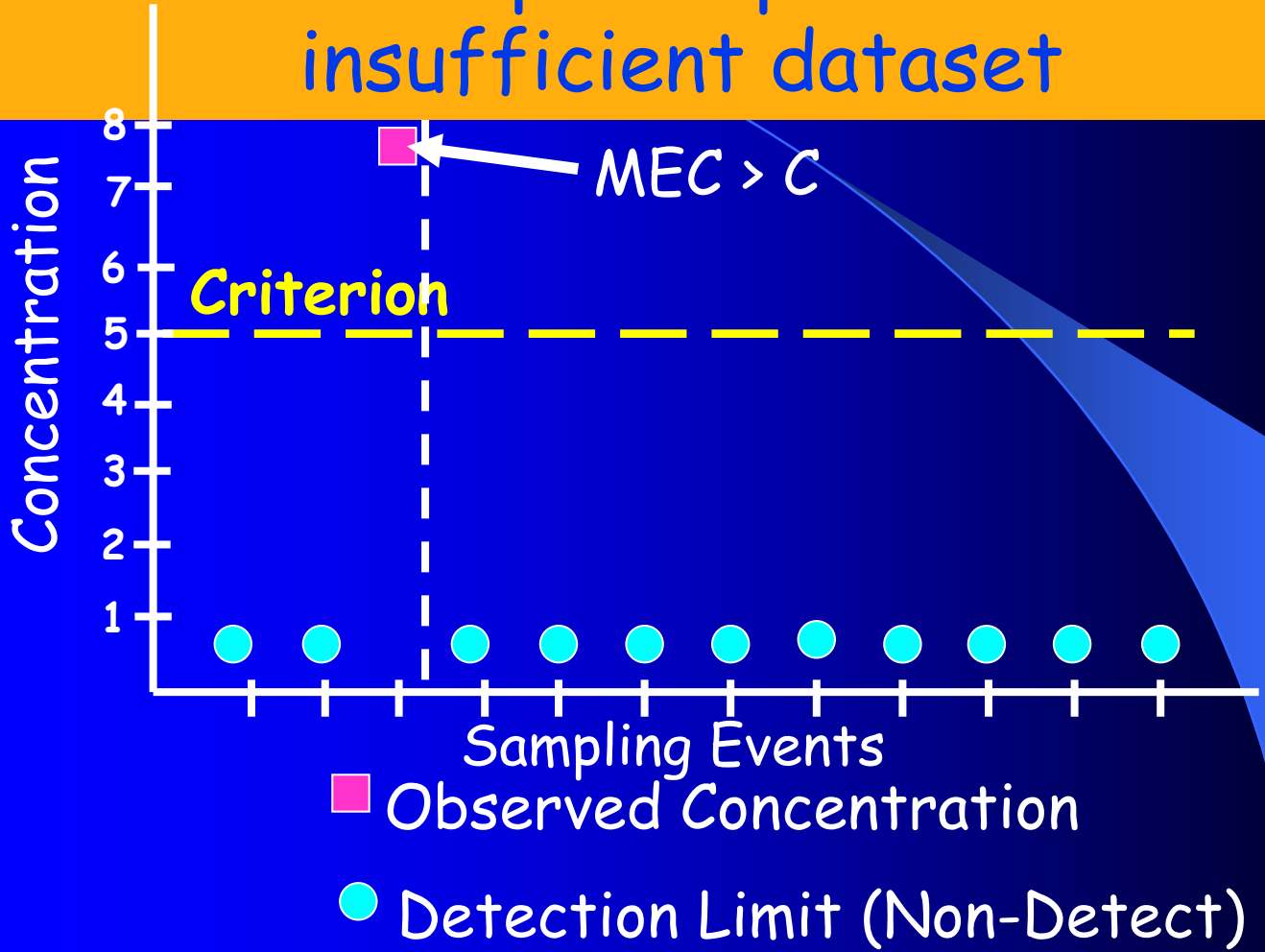
Example for non-CTR constituent



Example of possible insufficient dataset



Example of possible insufficient dataset

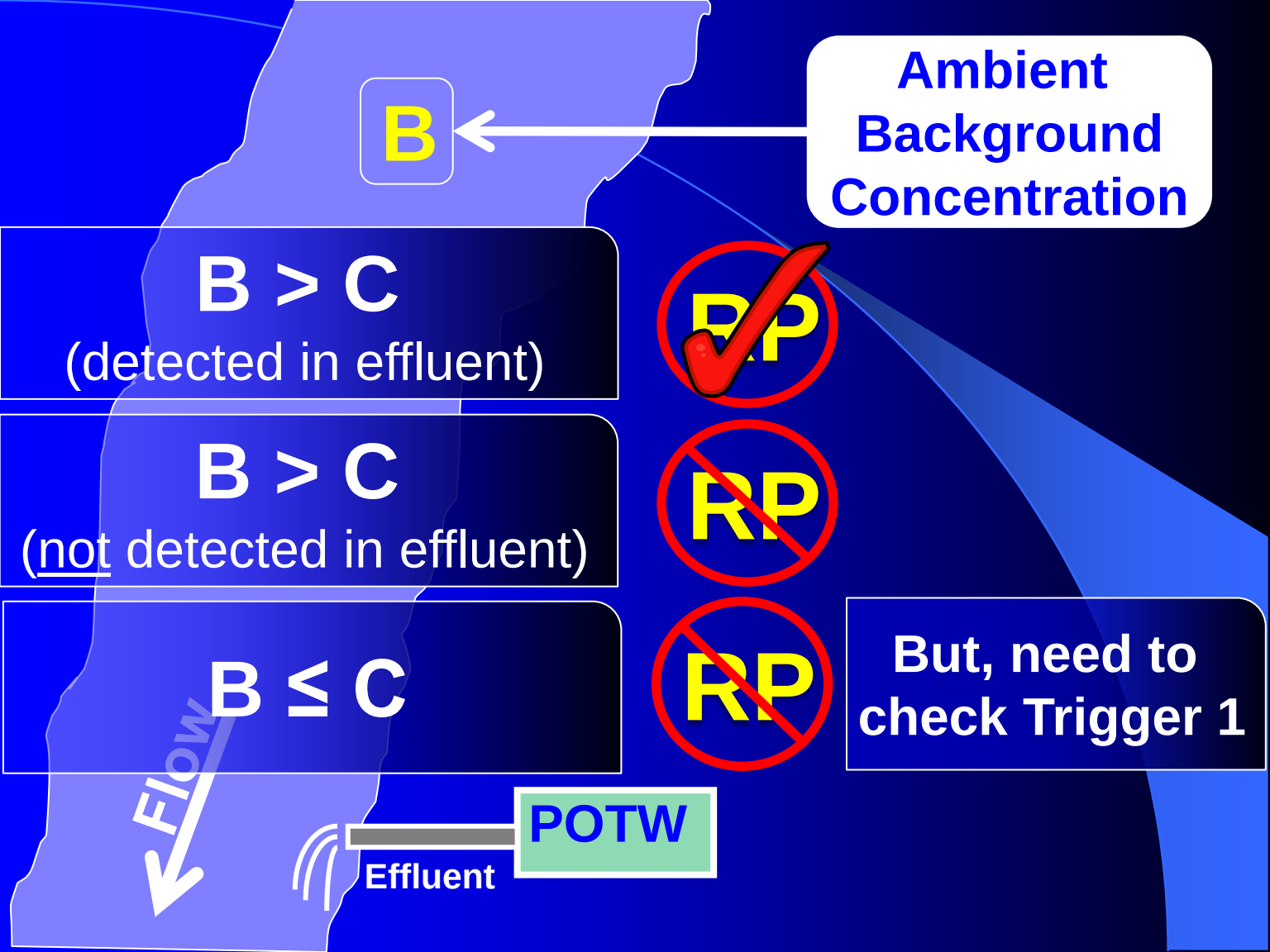


Sacramento-San Joaquin Delta

Reasonable Potential Analysis

Trigger 2: Ambient Background

Determine the maximum ambient background concentration or B and compare to C


B
Ambient Background Concentration
B > C
(detected in effluent)
RP
B > C
(not detected in effluent)
RP
B ≤ C
RP
But, need to check Trigger 1
Flow
POTW
Effluent

Reasonable Potential Analysis

Trigger 3: Other Considerations

Other information can be considered for finding discharge has Reasonable Potential

Facility or Discharge Type

303(d) Listing

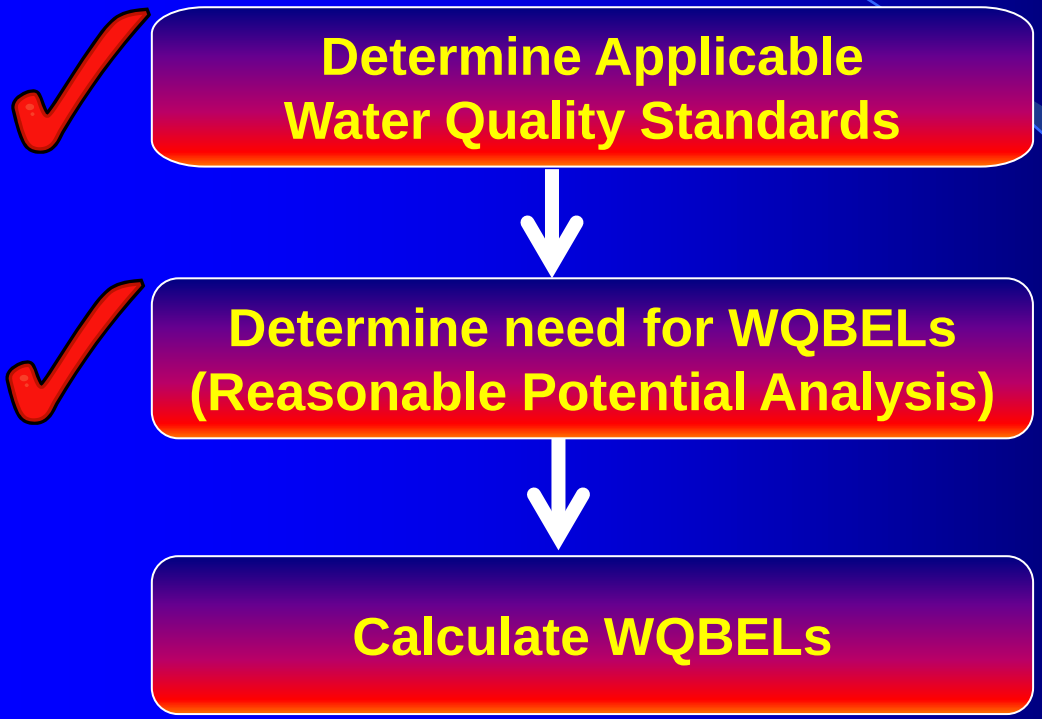
Fish Tissue Data

Compliance Problems

Solids Loading

Endangered or Threatened Species or Critical Habitat

Water Quality-Based Effluent Limits



Standards

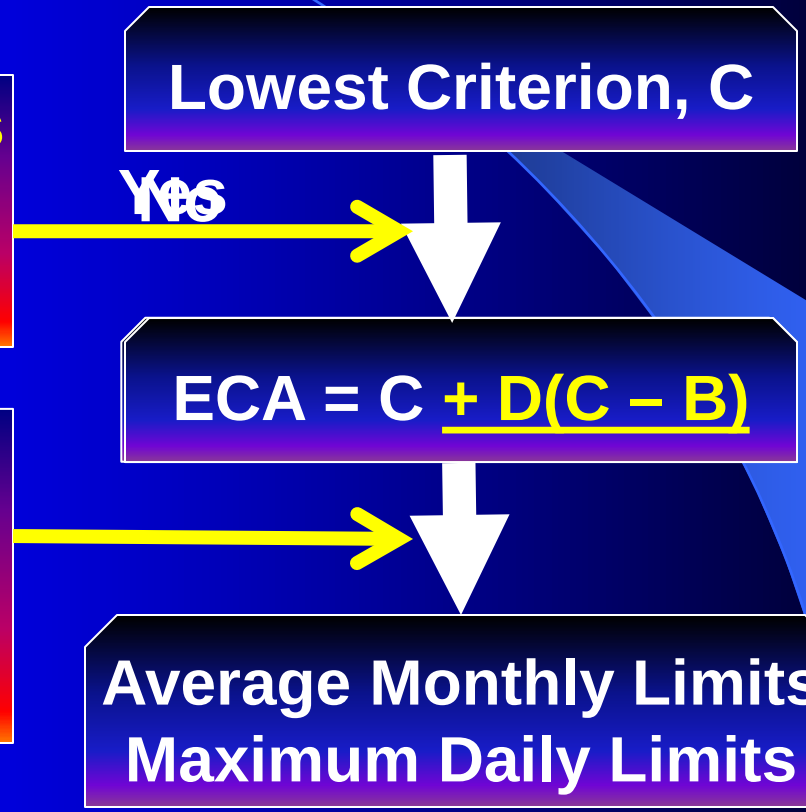
Permits

Calculating WQBELs

- Statistical Procedure Used to Calculate WQBELs
  - Start with the lowest criterion/objective
  - Calculate Effluent Concentration Allowance (ECA)
  - Set Effluent Limits
    - Monthly Average
    - Daily Maximum

Calculating WQBELs

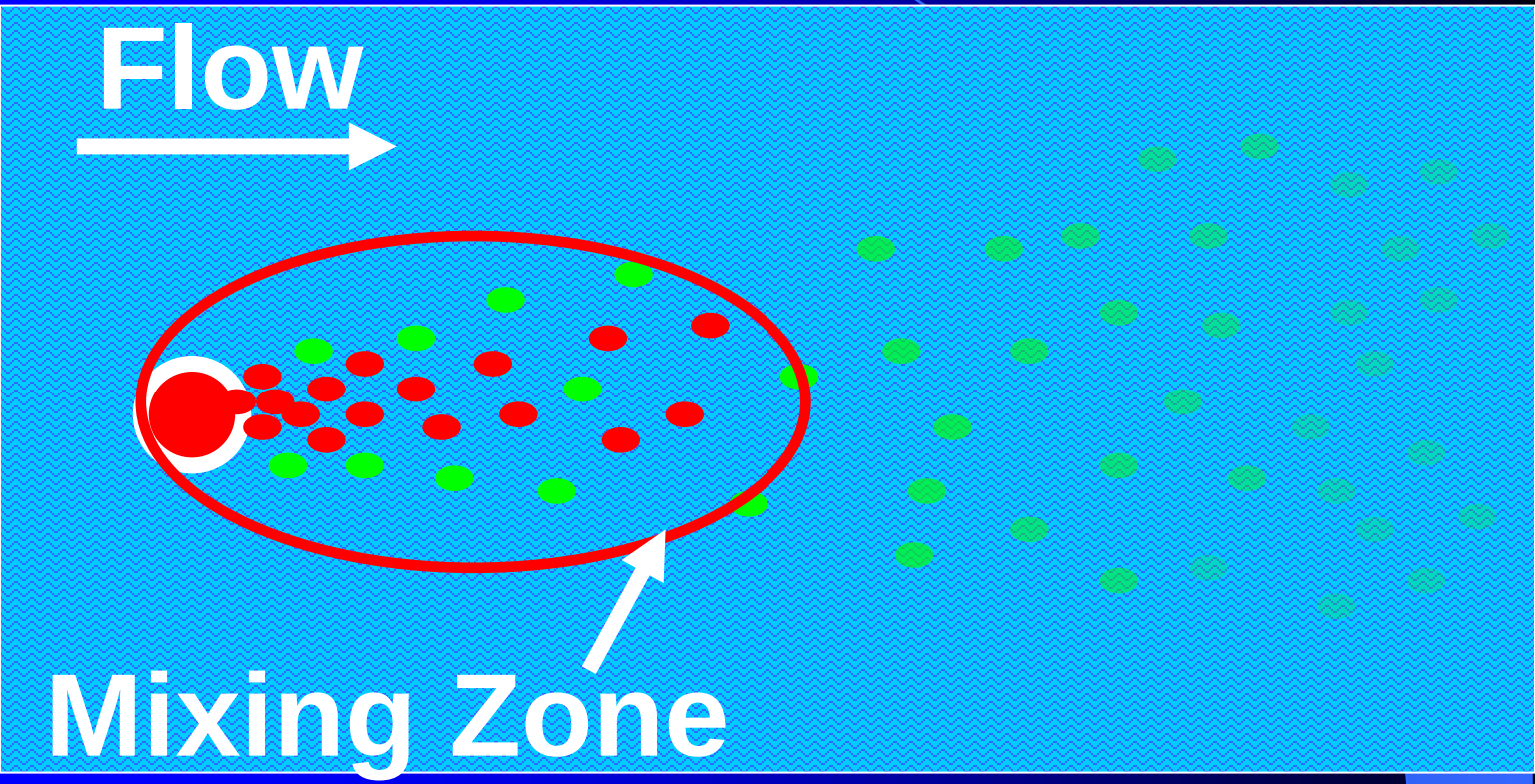
- **Dilution credits assimilative capacity**
- **Effluent data statistics**
- **Frequency of monitoring**



Mixing Zones

A Mixing Zone is a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Mixing Zone Basics



Mixing Zones

Mixing Zones

Mixing Zones

- Mixing zones can be considered when:
  - Sufficient flow in river
  - Assimilative capacity available
  - Beneficial uses not impacted
  - No lethality

Mixing Zones

- Mixing zones provide regulatory relief
- Lower level of treatment needed
- Lower treatment costs

Mixing Zones

- State Implementation Policy (SIP) is governing policy
- SIP includes
  - mixing zone conditions
  - provides guidance for acceptance/denial

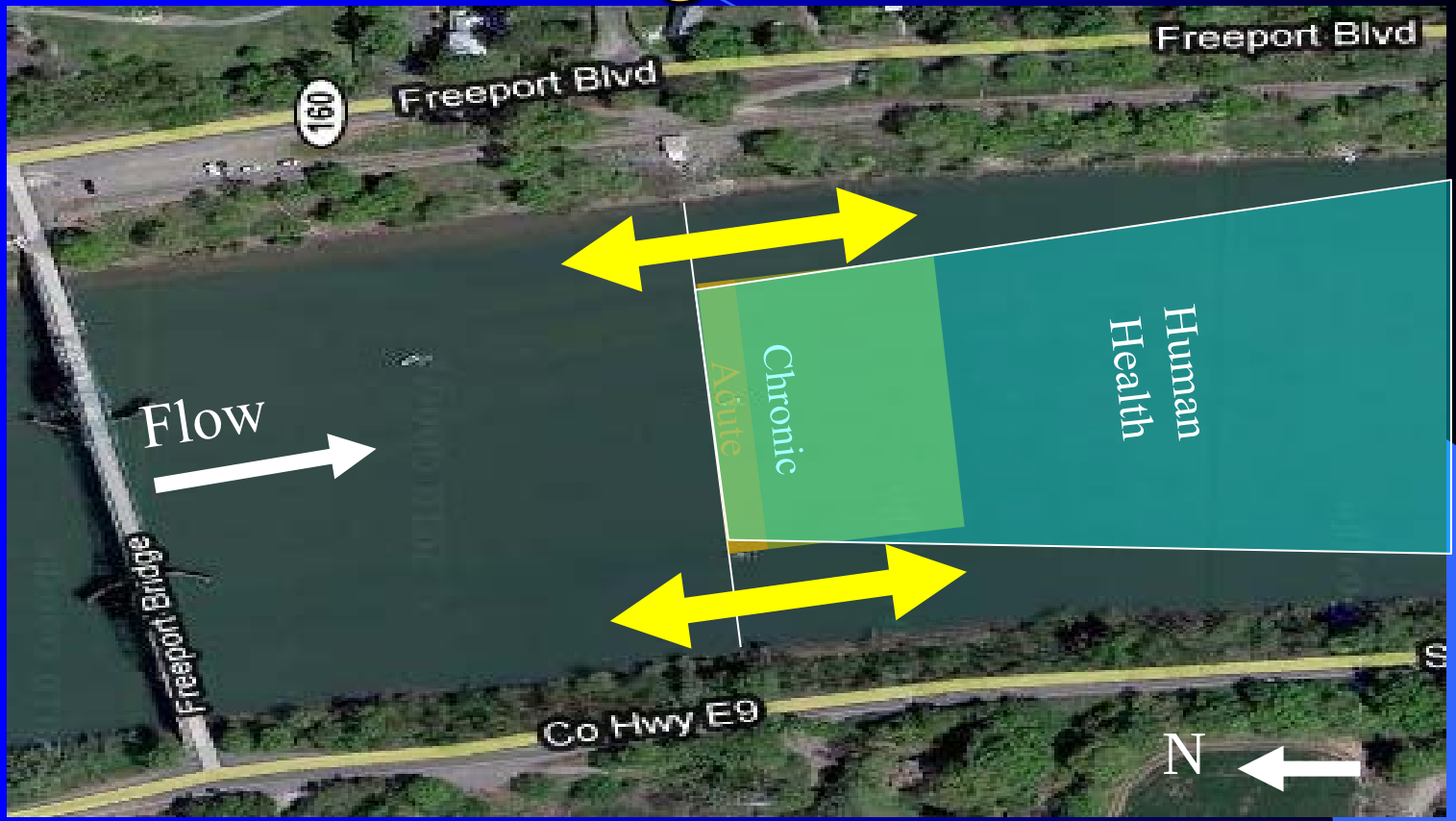
Mixing Zones

- SIP Mixing Zone Conditions
  - Comprise integrity of entire water body
  - Cause acutely toxic conditions to passing organisms
  - Restrict passage of aquatic life
  - Dominate receiving water
  - Overlap other mixing zones
  - Away from drinking water intakes

Mixing Zones

- Aquatic Life Criteria
  - Short-term exposures
  - Acute (1-hour average)
  - Chronic (4-day average)
- Human Health Criteria
  - Long-term exposure, e.g., 70 years

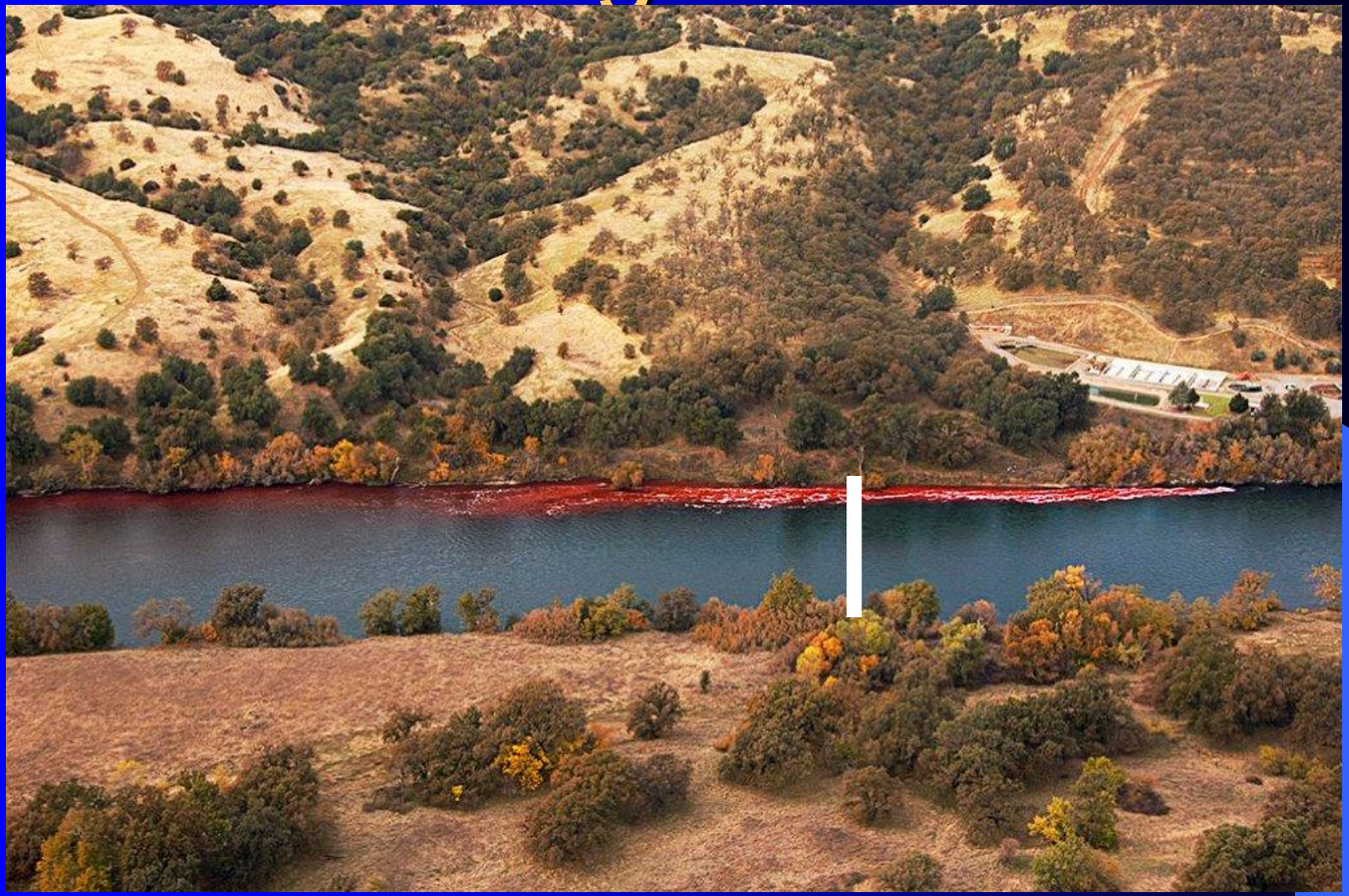
Mixing Zones



Mixing Zones

- Completely- and Incompletely-Mixed
- Defined in SIP
- SIP requires mixing zone study for incompletely-mixed discharges
- Most discharges are incompletely-mixed

Mixing Zones



Mixing Zones

Mixing Zones

- Discretionary
- Determined discharge-by-discharge
- Small as practicable
- Mixing zones can be denied or limited
  - To protect beneficial uses
  - Comply with other regulatory requirements

Mixing Zones

- Compliance with Antidegradation Policy
  - Does not apply within mixing zone
  - Must consider increased pollutant loading
  - Must comply with Antidegradation Policy

Mixing Zones

- Summary
  - SIP governing Policy for mixing zones
  - Allows zone where criteria are exceeded
  - Must not impact beneficial uses
  - Mixing zones discretionary and can be limited by Regional Board
  - Must be considered pollutant-by-pollutant
  - Must comply with Antidegradation Policy

Questions?