TOTAL MAXIMUM DAILY LOAD FOR BACTERIAL INDICATORS IN MIDDLE SANTA ANA RIVER WATERSHED

Bill Rice

Regional Water Quality Control Board

Santa Ana Region

February 3, 2005

Presentation Outline

1. Characteristics of the Middle Santa Ana River Watershed and 303(d)–Listed Waterbodies
2. Bacterial Indicators, Pathogens, and WQOs
3. Problem Statement and Proposed Numeric Targets
4. Source Evaluation and Monitoring Program
5. Proposed TMDLs and Allocations
6. Proposed Implementation and Monitoring Plan
7. Economic Analysis
8. CEQA Analysis
9. Next Steps

MIDDLE SANTA ANA RIVER WATERSHED

MIDDLE SANTA ANA RIVER WATERSHED

Three Sub–Watersheds

1. Chino Basin Watershed
2. Riverside Watershed
3. Temescal Canyon Watershed

Approximate Land Use	Acreage	Sq. Mileage
1. Urban	201,000	314
2. Agriculture	37,000	58
3. Open Space	73,800	115
TOTAL	312,200	487

Map of MSAR Watershed

Middle Santa Ana River Watershed Waterbodies 303(d) Listed for Bacterial Indicators

1. **Waterbodies**
   - A. **Santa Ana River – Reach 3**
   - B. **Chino Creek – Reach 1**
   - C. **Chino Creek – Reach 2**
   - D. **Mill Creek (Prado Area)**
   - E. **Cucamonga Creek – Reach 1**
   - F. **Prado Park Lake**
2. **Beneficial Uses – All of the 303(d)–listed waterbodies are designated for REC1 and REC2 beneficial uses, as well as other beneficial uses.**

Map of MSAR Waterbodies

Santa Ana River, Reach 3
@ Mission Blvd Overpass

Santa Ana River, Reach 3
@ Van Buren Overpass

Chino Ck, Reach 2 Confluence with San Antonio Channel @ Chino Ave Overpass

Chino Ck, Reach 2 @ Chino Ave.

Chino Ck, Reach 1 @ Central Ave. – 3/10/04

Chino Ck, Reach 1 @ Central Ave.
(During recent storm events – 1/10/05)

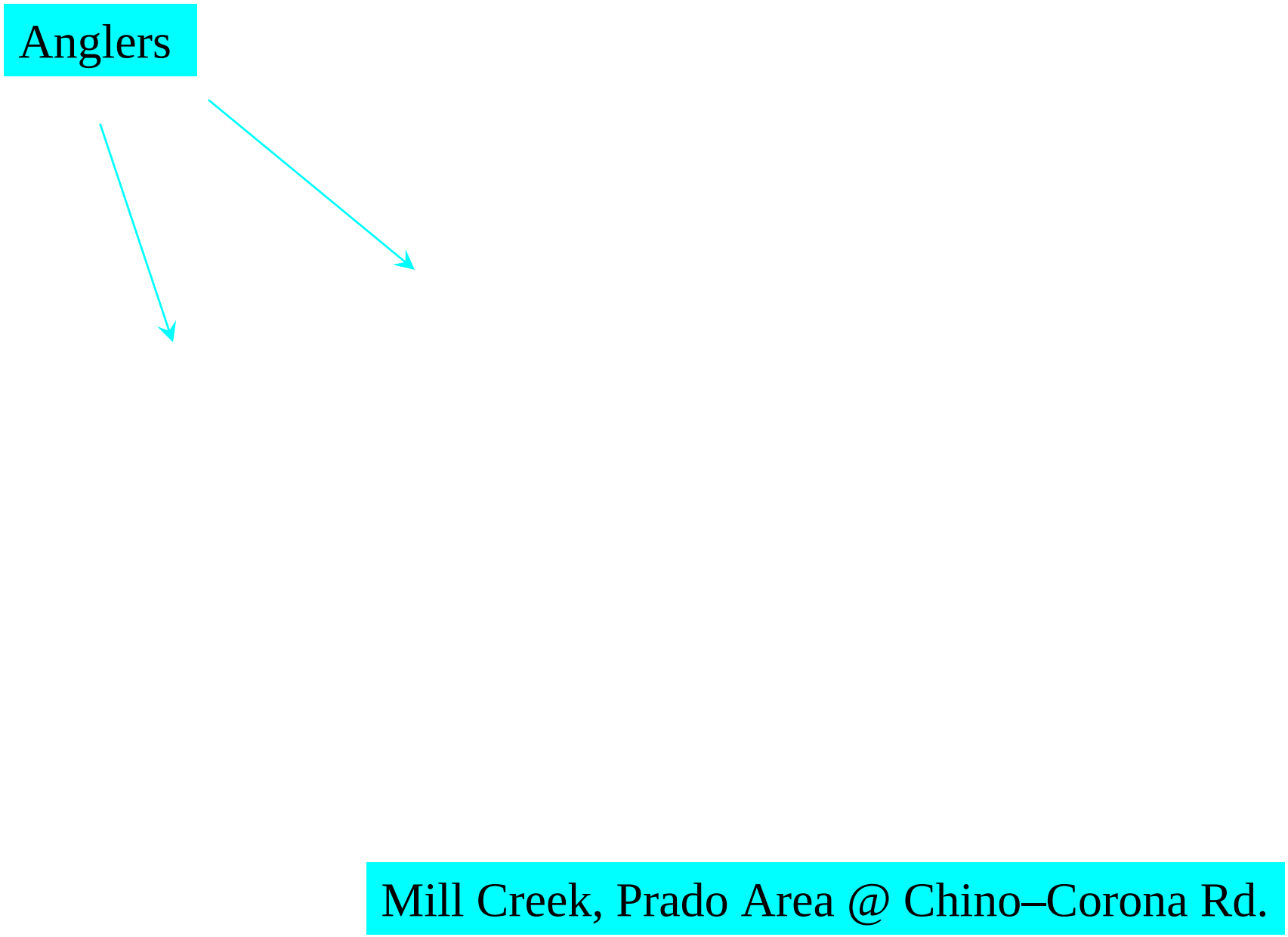
Chino Ck., Reach 1 in Prado Basin area

Cucamonga Creek, Reach 1 @ RP–1

End of Concrete Lining

Transition of Cucamonga Creek, Reach 1 to Mill Creek, Prado Area @ Hellman Ave.

Mill Creek, Prado Area
@ Chino–Corona Rd


Anglers
Mill Creek, Prado Area @ Chino–Corona Rd.

Prado Park Lake

Prado Park Lake Outlet Structure

BACTERIAL INDICATORS,

PATHOGENS,

and

WATER QUALITY OBJECTIVES

BACTERIAL INDICATORS

Bacterial Indicators: Selected microorganisms used to represent wide variety of waterborne microorganisms that cause adverse health effects in humans.

These microorganisms are commonly labeled “pathogens” and include various species of the following:

1. Bacteria
2. Viruses
3. Protozoa
4. Fluke worms
5. Tapeworms
6. Roundworms

BACTERIAL INDICATORS

Considering the number and variety of pathogens, why are bacterial indicators used instead of specific pathogens?

1. Time–consuming and expensive to test each water quality sample for each of the various types of pathogens that might be present.
2. Significant variation in the number and type of pathogens present at any given time.
3. Frequency of occurrence of specific pathogens is highly variable.
4. Technological limitations in testing for some pathogens.

Pathogen Sources

What are the originating sources of waterborne pathogens?

1. Human feces
2. Animal feces, urine, other animal wastes
3. Domestic sewage, compost
4. Food and food waste
5. Shellfish and crustaceans
6. Raw fish, beef, pork
7. Re–growth

PATHOGEN EXPOSURE

Humans are exposed to pathogens through the following pathways

1. Ingestion
2. Inhalation
3. Body Surface Contact

HOW DO PATHOGENS AFFECT HUMANS?

ADVERSE HEALTH EFFECTS INCLUDE

1. Gastroenteritis and gastrointestinal infections
2. Respiratory and other diseases and infections (eye, ear, nose, throat, lungs)
3. Dizziness, nausea, pain, loss of appetite, skin rash
4. Organ dysfunction (kidney, liver, spleen, heart, etc.)
5. Hearing and visual loss, mental retardation, seizures
6. Meningitis, Giardiasis, Poliomyelitis
7. Dysentery, Cholera, Schistosomiasis

Water Quality Objectives

To Protect REC1 Beneficial Use Regional Board Uses Bacterial Indicator:

Fecal Coliform:

Logarithmic mean less than 200 organisms/100ml based on five or more samples per 30–day period, and not more than 10% of the samples exceed 400 organisms/100ml for any 30–day period.

PROBLEM STATEMENT

AND

PROPOSED

NUMERIC TARGET

Problem Statement

Why were the MSAR waterbodies placed on the 303(d) list?

1. High densities of bacterial indicators in MSAR waterbodies.

   1993 Monitoring

   1996-98 Monitoring

2. Other Effects

   a. Observable waste-laden discharge of storm water runoff from agricultural areas.

   b. Fish kills in Prado Park Lake 1979, 1983, 1989, and 1998.

3. Water Quality Standards are not being met.

Proposed Numeric Target

Development of TMDL includes the requirement to specify a Numeric Target

Fecal Coliform*:

Logarithmic mean less than 200 organisms/100ml based on five or more samples per 30–day period, and not more than 10% of the samples exceed 400 organisms/100ml for any 30–day period.

*Note: This is the existing Basin Plan Water Quality Objective.

SOURCE EVALUATION

Source Evaluation

Approach: TMDL Workgroup convened in August 2001. Workgroup members included:

1. San Bernardino Co. Flood Control District
2. Riverside Co. Flood Control District
3. Chino Basin Watermaster
4. Orange County Water District
5. Inland Empire Utilities Agency
6. Milk Producers Council
7. Western United Dairymen
8. City of Riverside
9. City of San Bernardino
9. City of Corona
10. SAWPA (Facilitator)

Source Evaluation

1. Were the 303(d) listings appropriate for the MSAR waterbodies?
2. How are land uses associated with pathogens entering MSAR waterbodies?

Response: Evaluated 1993, 1996–98 data. No other data was available.

Conclusion: There was insufficient bacterial indicator water quality data to adequately answer the source evaluation questions.

SOURCE EVALUATION

MSAR WATERSHED

TMDL WORKGROUP

MONITORING PROGRAM

Source Evaluation

TMDL Monitoring Program Elements

1. Developed in Fall 2001, initiated sampling activities in February 2002, and ended in April 2004.
2. Sampling locations evaluated impairment status and 3 land uses – Urban, Agricultural, and Open Space.
3. Samples collected at 11–13 locations by stakeholder personnel.
4. Samples collected on a weekly basis.
5. Samples collected during nine 30–day sampling periods.
6. Samples tested for Fecal Coli, Total Coli, E. Coli and Enterococcus

Map of Sampling Locations

Sampling Location S1 (Impairment Evaluation): SAR @ MWD Crossing

Sampling Location C2 (Urban):
Chino Ck @ Schaeffer Ave.

Sampling Location C1
(Open Space):
Icehouse Cyn Ck.

Sampling Location M3 (Agriculture):
Bon View Ave @ Merrill Ave.

SOURCE EVALUATION

MONITORING

PROGRAM

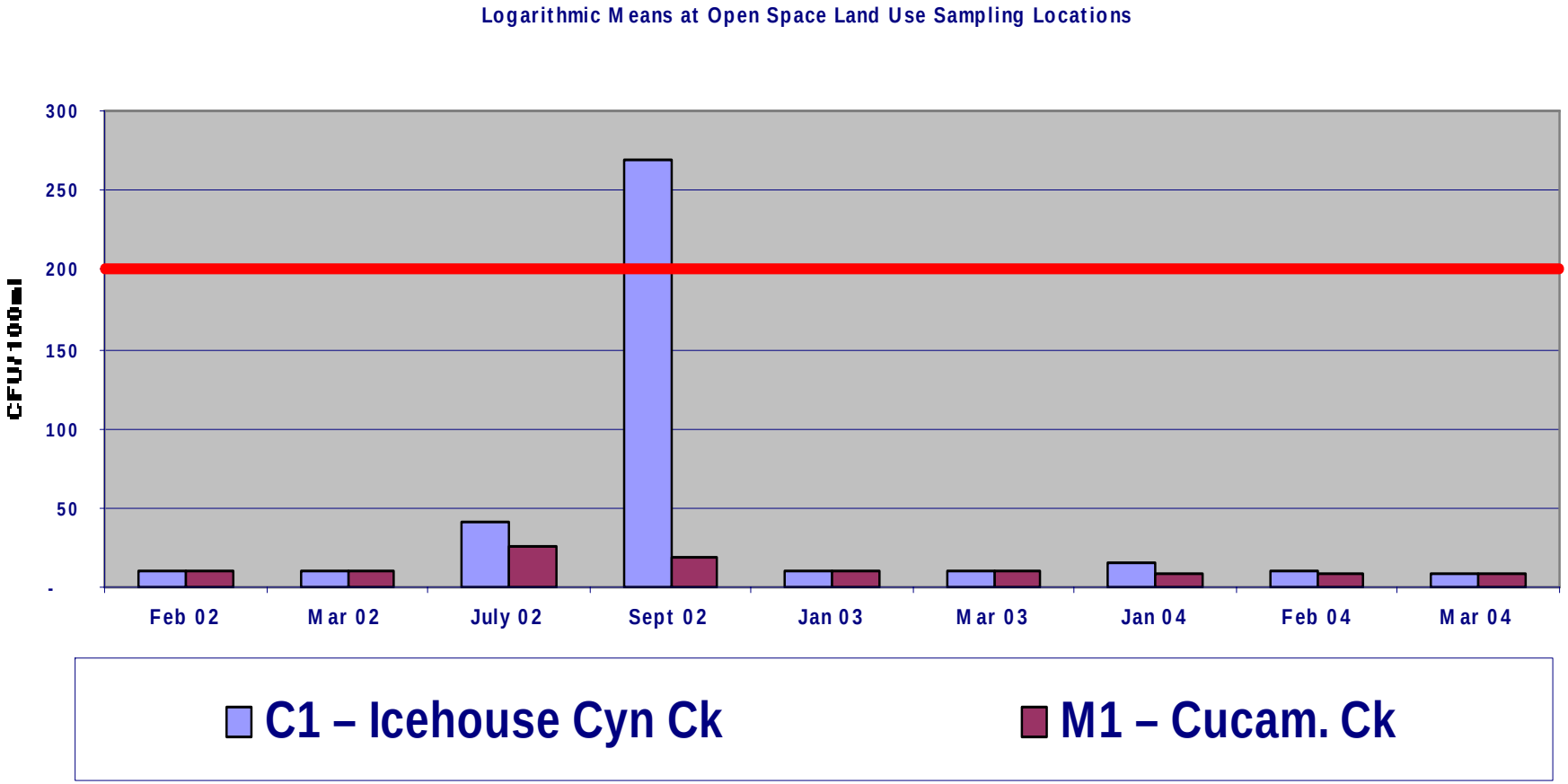
RESULTS

Source Evaluation

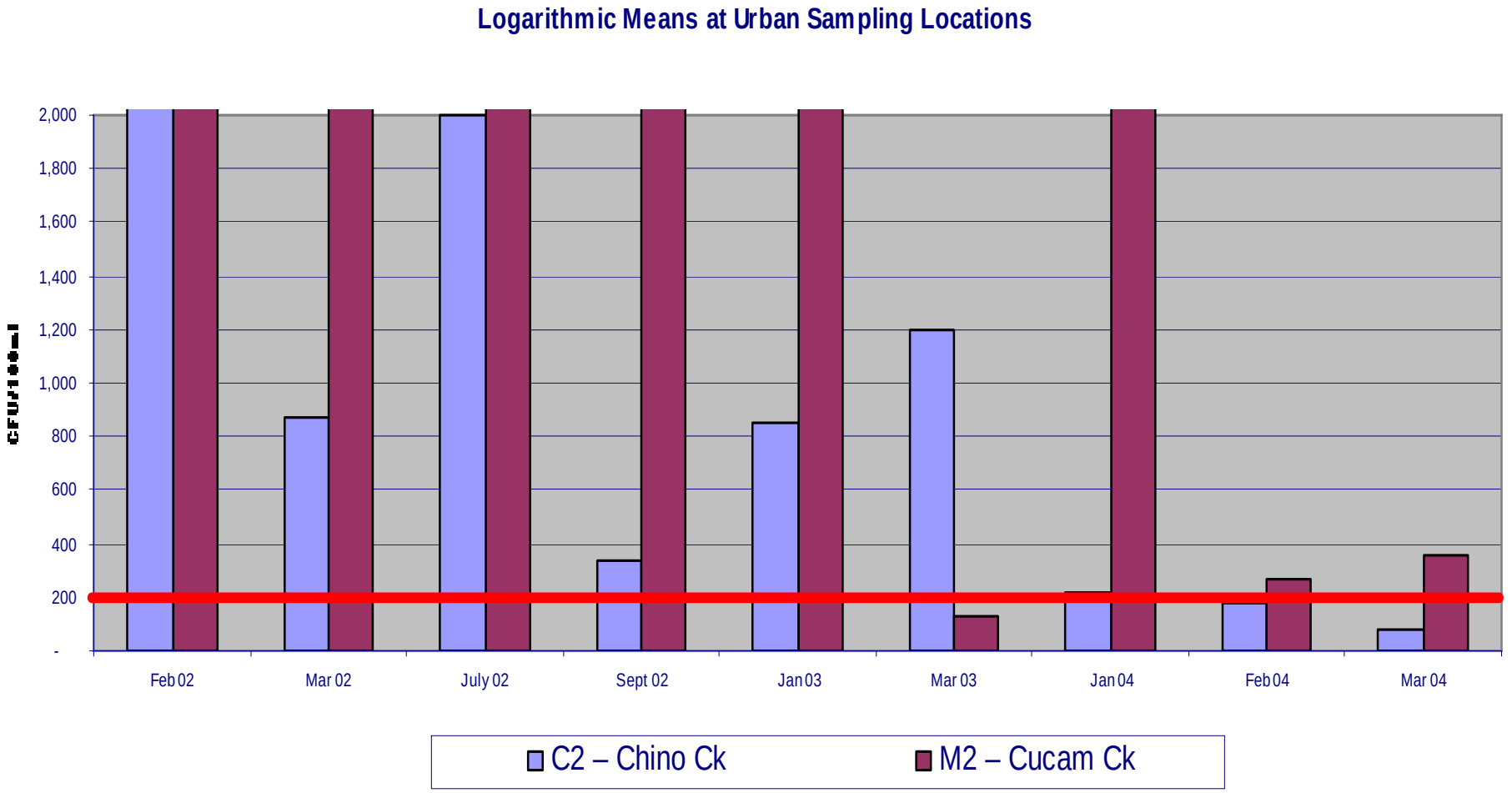
Nine 30–Day Sampling Periods

1.	February 2002	Winter Season
2.	March/April 2002	Winter Season
3.	July/August 2002	Summer Season
4.	September/October 2002	Summer Season
5.	January/February 2003	Winter Season
6.	March/April 2003	Winter Season
7.	January/February 2004	Winter Season
8.	February/March 2004	Winter Season
9.	March/April 2004	Winter Season

Source Evaluation



Source Evaluation



Source Evaluation

Bulleted summary slide for remaining information.

Source Evaluation

POTW Contributions

Status: 10 POTWs discharge to SAR–R3 or its tributaries.

These POTWs must meet bacterial indicator requirements stated in their discharge permits. All have the following requirements:

1. Total Coli: 7–day average of 2.2 MPN/100ml
2. Total Coli: Instantaneous maximum of 240 MPN/100ml

Evaluation: Examination of Facility Violation History indicates that 2 violations occurred during 2002–2004. However, there is insufficient data to determine with any confidence whether these violations affected the TMDL monitoring results. Otherwise, POTW discharges do not appear to be a significant source of bacterial indicators.

Source Evaluation

Seasonal Variations

Evaluation of Data:

1. 1993, 1996–98 Monitoring: Sampling during storm events indicates elevated levels of bacterial indicators.

2. 2002–04 TMDL Monitoring: Intermittent sampling frequency. Weather conditions were dry during sampling events. Bacterial indicator levels were elevated, but varied without discernible pattern.

Determination: Available data indicates that elevated bacterial indicator levels occur during wet, dry, hot, and cool weather conditions. No seasonal variations in bacterial indicator levels can be discerned with existing data.

PROPOSED

BACTERIAL INDICATOR

TMDLs, WLAs, and LAs

Bacterial Indicator TMDL Load Allocation

Total Maximum Daily Load

is the

Sum of WLA (point sources) +

Sum of LA (non–point sources) +

Margin of Safety

WLAs = CAFO WLA + Urban (MS4) WLA

LA = agriculture LA + open/forest LA

Delete the TMDL table on following slide and use a bullet point summary for information found in the table.

Proposed Total Maximum Daily Load, Waste Load Allocations, and Load Allocations for Fecal Coliform in Middle Santa Ana River Waterbodies

Total Maximum Daily Load in Middle Santa Ana River Waterbodies	Waste Load Allocation for Fecal Coliform in Urban Runoff, including stormwater, Discharges to Middle Santa Ana River Waterbodies	Waste Load Allocation for Fecal Coliform in Confined Animal Feeding Operations Discharges to Middle Santa Ana River Waterbodies	Load Allocation for Fecal Coliform in Agricultural Runoff Discharges to Middle Santa Ana River Waterbodies	Load Allocations for Fecal Coliform from Natural Sources in all Discharges to Middle Santa Ana River Waterbodies
5–sample/30days Logarithmic Mean Less than 200 organisms/100ml, and not more than 10% of the samples exceed 400 organisms/100ml for any 30–day period	5–sample/30days Logarithmic Mean Less than 200 organisms/100ml, and not more than 10% of the samples exceed 400 organisms/100ml for any 30–day period	5–sample/30days Logarithmic Mean Less than 200 organisms/100ml, and not more than 10% of the samples exceed 400 organisms/100ml for any 30–day period	5–sample/30days Logarithmic Mean Less than 200 organisms/100ml, and not more than 10% of the samples exceed 400 organisms/100ml for any 30–day period	5–sample/30days Logarithmic Mean Less than 200 organisms/100ml, and not more than 10% of the samples exceed 400 organisms/100ml for any 30–day period

To be achieved as soon as possible, but no later than December 31, 2020

Margin of Safety discussion

Critical Conditions and Seasonal Variations

REC1 must be protected year–round as stated in BP

Proposed TMDL Implementation and Monitoring Plan

TMDL Implementation

Task 1: Regional Board

Review and/or Revise Existing Discharge Requirements (within 9 months of this TMDL's effective date)

A. San Bernardino County Flood Control District MS4 Permit

B. Riverside County Flood Control District MS4 Permit

C. Concentrated Animal Feeding Operations (CAFOs) Permit

TMDL Implementation

Task 2: Regional Board

Identify Agricultural Operators (within one month of this TMDL's effective date)

The Regional Board will develop a list of all known agricultural owners and operators in the Middle Santa Ana River watershed that will be responsible for implementing requirements of this TMDL.

TMDL Implementation

Task 3: Watershed Stakeholders

Watershed–Wide Bacterial Indicator Water Quality Monitoring Program (within three months of this TMDL's effective date)

A. Watershed stakeholders, including cities, counties, agricultural owners/operators, and US Forest Service must develop a watershed–side monitoring program to evaluate compliance with this TMDL.

B. Collect weekly samples at 11 locations, and collect storm event samples at these 11 locations plus an additional 4 locations.

C. Analyze samples for bacterial indicators and general parameters.

D. Submit quarterly water quality monitoring reports.

TMDL Implementation

Task 4: Subtasks for Urban Discharge Managers

Subtask 4.1: Urban Source Evaluation Plans (USEP)

Subtask 4.2: Revise San Bernardino Co. Municipal Storm Water Management Program (MSWMP)

Subtask 4.3: Revise Riverside Co. Drainage Area Management Plan (DAMP)

Subtask 4.4: Revise San Bernardino Co Water Quality Management Plan (WQMP)

Subtask 4.5: Revise Riverside Co. Water Quality Management Plan (WQMP)

TMDL Implementation

Task 5: Subtasks for Agricultural Discharge Managers

Subtask 5.1: Agricultural Source Evaluation Plans

Subtask 5.2: Develop and Implement a Bacterial Indicator Agricultural Source Management Plan (BASMP)

TMDL Implementation

Task 6: Regional Board

Review/Revise the Bacterial Indicator TMDL

The Regional Board is committed to review this TMDL every three years to coincide with the triennial review process.

ECONOMIC ANALYSIS

Economic Analysis

Regional Board Responsibility: Three statutory triggers require Regional Board to consider economics in basin planning:

A. Adoption of Ag WQ Control Program (CWC 13141)

B. Adoption of treatment req't or performance std.(CEQA)

C. Adoption of new or revised WQOs (CWC 13241)

Evaluation: Adoption of this TMDL does not constitute adoption of new or revised WQOs, so **trigger C does not apply.**

However, this TMDL will likely result in changes to agricultural operations and changes for urban discharge managers for controlling bacteria runoff quality. So, **triggers A and B apply.**

Economic Analysis

Components and Estimated Cost of Agricultural Water Quality Control Programs

Components: AGSEP and Ag BMPs

1. **AGSEP** **Cost:** $450,000 to $650,000
2. **Ag BMPs** could be similar to urban BMPs (Urban BMPs will be discussed shortly)

Economic Analysis

Potential Funding Sources for Agricultural Water Quality Control Programs

Funding sources could include:

A. Private Financing by Individuals

B. Government Bonded Indebtedness or Loans

C. State and Federal Grants and Loans

D. Federal or State Single–Purpose Appropriations

Economic Analysis

Components and Estimated Costs for Urban Water Quality Control Program

Components: USEP and BMPs

1. **USEP**

   Cost: $450,000 to $650,000

2. **BMPs:** Subsurface Wetlands, Runoff Diversion and Treatment, Street Sweeping, and Public Education.

Economic Analysis

BMPs

1. **Subsurface Wetlands:**

   Construction Costs: $50,000 to $200,000 per acre

   Op & Maint Costs: Minimal; once/year plant reductions

Economic Analysis

BMPs

2. **Runoff Diversion and Treatment:**

   Construction/Setup Costs: $60,000 to $1,405,000

   Op & Maint Costs: $1,100 to $4,500 per month

Economic Analysis

BMPs

3. Street Sweeping:

Costs: Annual Sweeping = $18/curb–mile/year

Monthly Sweeping = $216/curb–mile/year

Weekly Sweeping = $946/curb–mile/year

Chino Basin Sub–Watershed: ~7,000 to 8,000 curb–miles

Economic Analysis

BMPs

4. Public Education:

A. Seeks to reduce pollutant loads by changing people's behavior

Program Costs: $50,000 to $300,000 per year

Economic Analysis

Proposed Monitoring Program

Requirement: Implement Task 3 Monitoring Program

Annual Costs: $175,000 to $240,000

CEQA ANALYSIS

CEQA Analysis

Secretary of Resources Certification: Basin Planning process is equivalent to preparation of EIR or Negative Declaration

Provision: RB required to prepare TMDL Staff Report, Basin Plan Amendment, Environmental Checklist, and CEQA Scoping Meeting.

Status:

1. TMDL Staff Report completed
2. Basin Plan Amendment – Staff Report Attachment A
3. Environmental Checklist – Staff Report Attachment B
4. This RB Workshop serves as CEQA Scoping Meeting

CEQA Analysis

Consideration of Alternatives

1. **No Project Alternative:** No action on TMDL by RB

   Consequences: Does not meet purpose of proposed action; continuing violations; beneficial uses impaired.

CEQA Analysis

Consideration of Alternatives

2. Other Alternatives:

A. Alternative Numeric Targets

Factors: Proposed numeric targets are based on existing WQOs in RB's Basin Plan. Proposal is already consistent with purpose of TMDL.

B. Alternative Compliance Schedule

Factors: Longer schedule would prolong non–attainment of water quality standards. Proposed schedule allows sufficient time for implementation activities.

CEQA Analysis

Consideration of Alternatives

3. Proposed Alternative

Included in TMDL Staff Report Attachment A

Factors: Recommended TMDL reflects a reasoned and reasonable approach to achieving water quality standards. Proposed schedule provides realistic time frame.

ALMOST DONE

Other Important Factors

1. Storm Water Quality Standards Task Force
   A. Evaluating Beneficial Use Designations
   B. Evaluating Bacterial Indicator Criteria

2. Regional Board Triennial Review Process: New Bacterial Indicators Considered For Adoption In Near Future. E. Coli and Enterococcus are the likely candidates.

NEXT STEPS

1. Receive and Respond to Comments
2. Peer Review of TMDL Staff Report
3. Revise BPA as needed
4. Workshop/Hearing

FINIS