Groundwater Quality Monitoring:

Studying Pollution Removal in Stormwater Drywells and Monitoring the Spatial and Temporal Effects of Stormwater Drywells on Local Groundwater Quality

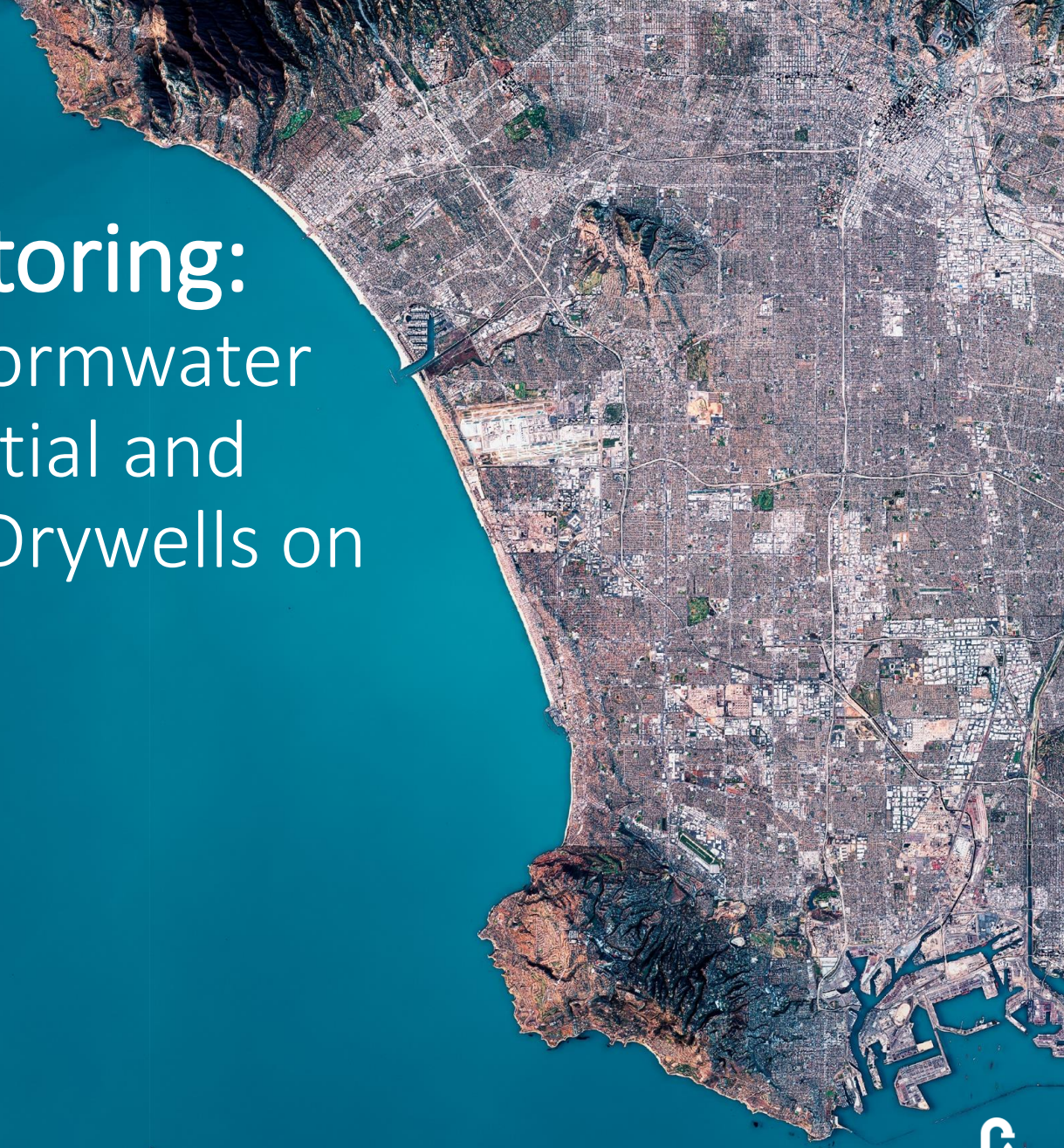
Scientific Studies Program

California State Polytechnic University, Pomona

Ali Sharbat, PhD, PE

Scott Kindred, PE, LHG

Seema Shah-Fairbank, PhD, PE



Our Team

- Cal Poly Pomona
  - Ali Sharbat, PhD, PE (Water Quality)
  - Seema Fairbank, PhD, PE (Hydrology and Hydraulics)
  - Mehrad Kamalzare, PhD, PE (Geotechnical Engineering)
- LA Sanitation & Environment
- LA County Public Works
- Univ. of Cali. Santa Barbara
  - Dr. Hugo Loaiciga (Surface / Groundwater Hydrology)
- The University of Minnesota, St. Anthony Falls Lab.
  - Dr. John Gulliver (Stormwater Treatment)
- Virginia Tech University
  - Dr. Mark Widdowson (Geochemistry)
- Future Workforce
  - Undergraduate and Graduate Students
- Private Consultants
  - Scott Kindred, PE, LHG (Hydrogeologist, Stormwater Infiltration) (Kindred Hydro, Inc.)
  - Mark Kram, PhD (Groundwater Monitoring) (Groundswell Technologies, LLC)
- Local Drywell Experts
  - Geologists and Well Contractors

Study Overview

To study pollution removal in stormwater drywells and monitor the effects of drywells on local groundwater quality spatially and temporally

Study Overview

Summary of Study:

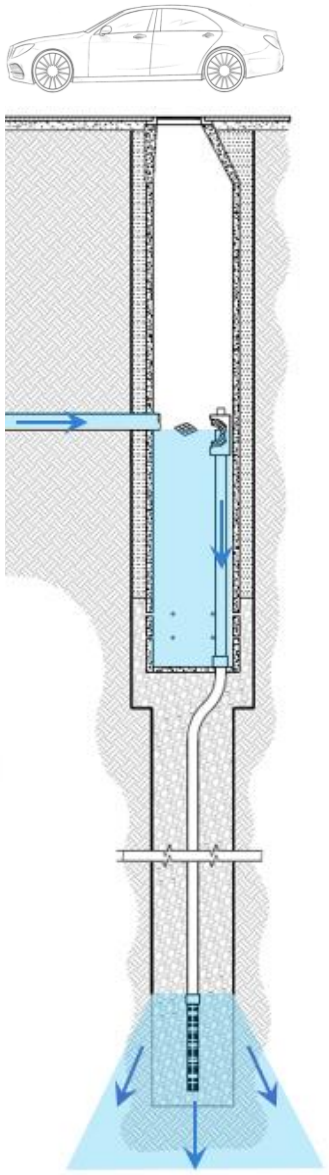
- Quantify removal of contaminants in drywell pre-treatment systems
- Characterize the mechanism of pollutants' removal in native soil during infiltration
- Monitor local groundwater quality and level near infiltration drywells spatially and temporally over a period of 4 years
- Track the infiltration capacity of the drywells and potential for clogging

Why?

- Uncertainties in drywell performance in regards to removing contaminants
- Drywell systems and natural soil may be under-estimated in removing pollution constituents

Nexus to Stormwater, & Urban Runoff Capture, & Pollution Reduction

- Stormwater infiltration is critical to the region's stormwater management, water quality, and water supply goals
- Stormwater drywells provide an efficient means of reducing urban runoff
- Stormwater infiltration treats stormwater at the source, which protects groundwater



Study Location

- **Watershed to be Studied:**
  - Upper Los Angeles River Watershed
- **Study Location:**
  - Locations will be further chosen from under-construction drywell locations in sites of the City or County of LA. Communications are underway to choose the right location
- **Benefits for the entire LA County:**
  - Evaluate the performance of infiltration systems in removing contaminants that will benefit the entire LA County

Study Details

Study Objectives

- Quantify removal of pollutants in drywell pre-treatment systems
- Quantify removal of pollutants in the soil column
- Characterize mechanisms of pollutant removal in native soil
- Monitor local groundwater quality and level changes near infiltration drywells over 4 years
- Track the infiltration capacity of the drywells over 4 years and evaluate the potential for clogging

Watershed Benefits

- Reduce potential for groundwater contamination
- Identify appropriate level of pre-treatment for drywells

Need for Study (Problem Statement)

- Water districts, municipalities, and the public are concerned that stormwater infiltration could degrade groundwater quality
- Although stormwater infiltration provides significant benefits, we need to ensure that it preserves and/or improve groundwater quality
- Agencies need to determine the appropriate level of pre-treatment to protect groundwater and ensure long-term drywell performance

City of LA (North Hollywood)
full-scale drywell test

Similar Studies

- A number of older studies, but limited in duration, contaminants, and scientific rigor
- Geosyntec March 2020 report provides excellent literature review and identifies data-gaps
- City of Elk Grove drywell study provided groundwater monitoring results, but relatively small amount of runoff during the study period

Cost & Schedule

Phase	Description	Cost	Completion Date
Task 1	Site Selection	$85,349	2023
Task 2	Literature Review	$138,433	2024
Task 3	Site Preparation and Field Planning	$321,173	2023
Task 4	Installing Groundwater Monitoring Wells	$274,952	2023
Task 5	Installing the Auto-Sampler and Flow Monitoring Systems	$173,188	2023
Task 6	Monitoring Influent, Effluent, and Groundwater Quality and Level Over the Extent of Project	$543,904	2027
Task 7	Outreach and Engagement	$66,840	2027
Task 8	Documentation and Reporting	$87,349	2027
TOTAL	**Total Direct Cost + Indirect Cost**	**$1,691,188**	

Funding Request

WASC	Year 1	Year 2	Year 3	Year 4	Year 5
CSMB	-	-	-	-	
LLAR	-	-	-	-	
LSGR	-	-	-	-	
NSMB	-	-	-	-	
RH	-	-	-	-	
SCR	-	-	-	-	
SSMB	-	-	-	-	
ULAR (Alternative)	$598,172 ($97,933)	$361,091 ($498,261)	$364,294 ($338,417)	$367,631 ($389,033)	($367,544)
USGR	-	-	-	-	
TOTAL (ALTERNATIVE)	**$598,172 ($97,933)**	**$361,091 ($498,261)**	**$364,294 ($338,417)**	**$367,631 ($389,033)**	**($367,544)**

Summary of Benefits

Benefits to Technical Community:

- Evaluate drywell pre-treatment systems and native soil performance in removing contaminants
- Characterize contaminant removal in drywell systems

Benefits to LA County Taxpayers:

- Municipalities will be assured that drywell projects will effectively recharge groundwater and remove runoff water contamination
- Helping the community meet stormwater management and water-supply objectives
- Serving local Disadvantaged Communities by improving the existing stormwater infrastructure

Summary of Benefits

Broader Impacts of the Scientific Study for Regional Workforce Development:

- Developing technical skills of underserved minority students at Cal Poly Pomona
- Offering Senior Project (EGR 4810/4820/4830) in fall & spring cohorts focused on stormwater engineering
- Developing a new graduate course and a new undergrad technical elective course focused on Low Impact Development and Green Infrastructure (Fall 2024 implementation)
- Developing of a certificate program focused on stormwater engineering through CPP Extended University
- Hosting minority students sponsored by NSF and Department of Education in our scientific study project
- More than 75 students directly involved

Central L.A. County
Questions?

Regional Pathogen Reduction Study

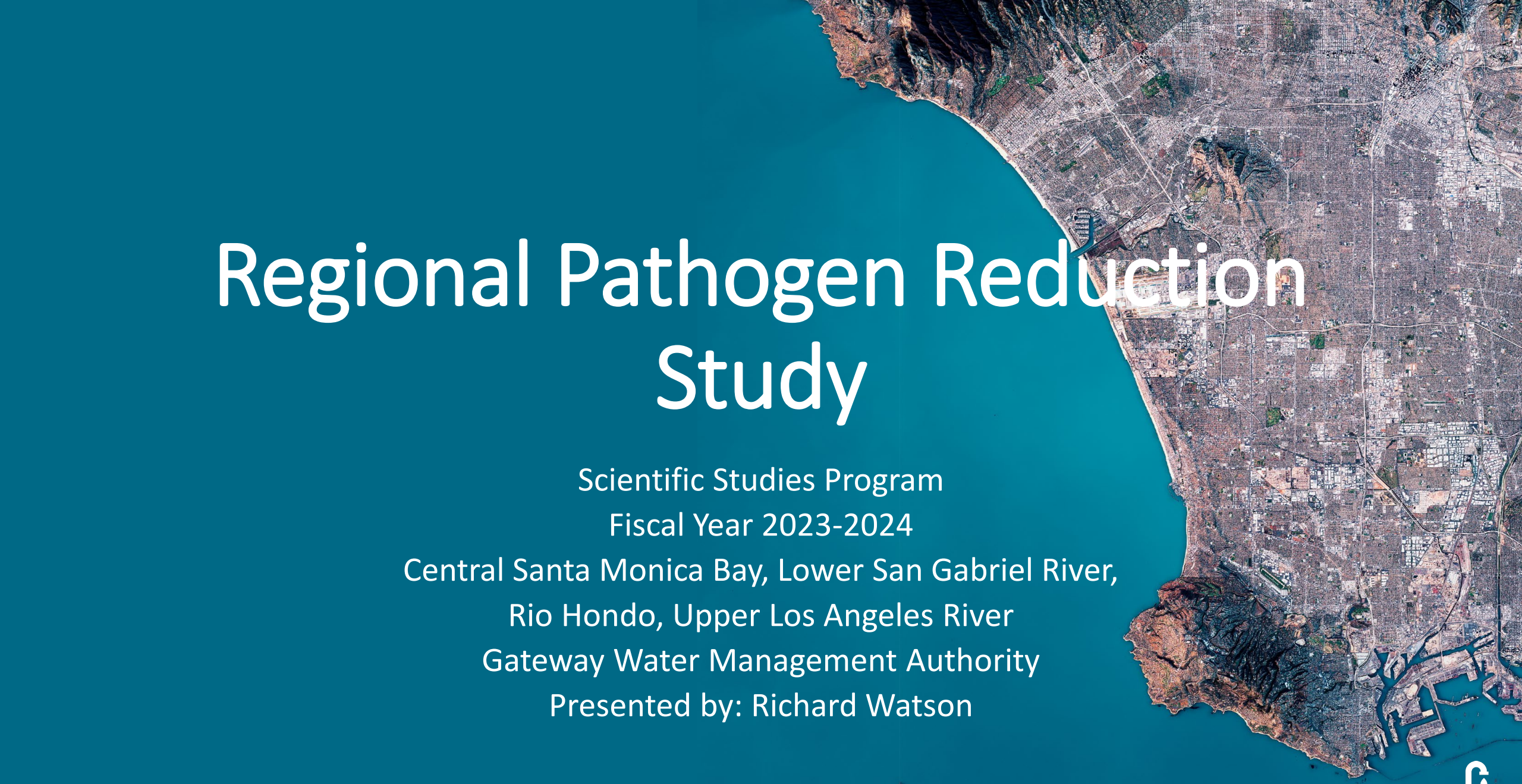
Scientific Studies Program

Fiscal Year 2023-2024

Central Santa Monica Bay, Lower San Gabriel River,
Rio Hondo, Upper Los Angeles River

Gateway Water Management Authority

Presented by: Richard Watson



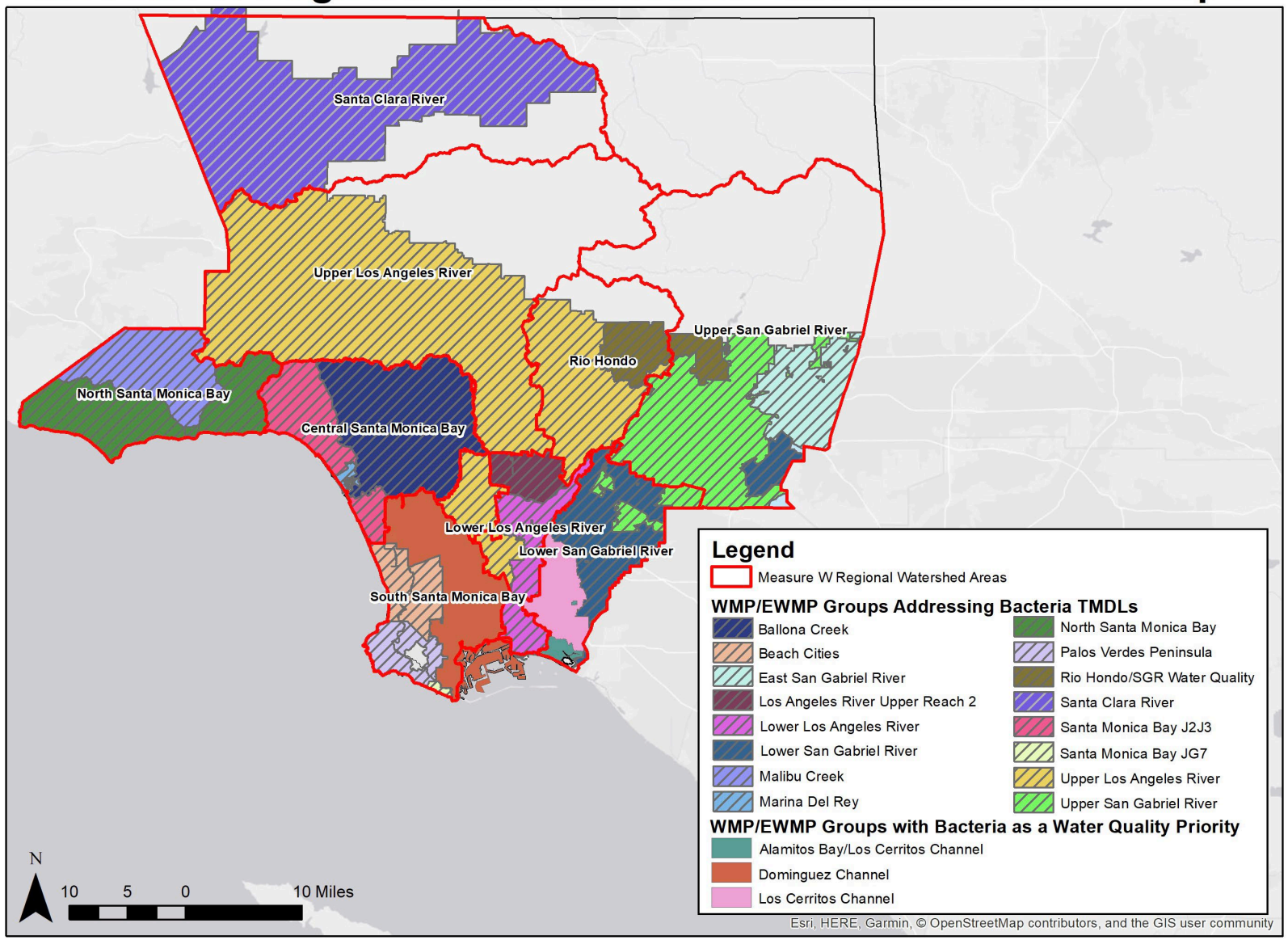
Study Overview

The Study will collect samples from waterbodies within urbanized areas of participating WAs and analyze them for bacterial indicators, viruses, and human markers.

- Describe nexus to Stormwater and Urban Runoff capture and pollution reduction.
  - Study will facilitate improved targeting of pathogen sources and water to capture and/or treat
  - Study may reduce level of stormwater capture for bacteria compliance purposes through the identification of non-MS4 sources of risk thereby improving the protection of human health
  - Study will likely lead to partnering with various parties, such as wastewater agencies and homeless services agencies, to address human sources of pathogens.

Study Location

Measure W Regional Watershed Areas and WMP/EWMP Groups



$5 B

Study Team

- Gateway Water Management Authority will manage the project and select the Study Team, which is expected to consist of a team of local and national experts and academia.

- The study team will be selected based on qualifications to address the Work Plan developed by stakeholders, including study sponsors, interested stakeholders, an independent Technical Advisory Committee, and regulators.

- Members of the Study Team are expected to include engineers, scientists, and statisticians with experience in similar studies, such as the San Diego Surfer Health Study.

Study Details

Problem Statement:

- Waterborne pathogens represent the most significant potential threat to the health of people recreating in and around the ocean and inland waters of Los Angeles County.

- Current standards are based on FIB (fecal indicator bacteria), which are used as proxies for pathogens.
  - FIB are ubiquitous; a vast network of structural control measures would need to be implemented to provide adequate control – projected cost over $5 billion.
  - USEPA and academics agree that human sources of pathogens pose the greatest risk.
  - Unless high-risk sources are targeted, water capture projects may receive large FIB loads, but miss the highest risk human sources.

(Continued)

Study Details (Continued)

Methodology:

- Study work plan will be developed through a stakeholder-led process with the input of technical experts, including academics.
  - Stakeholder engagement is at the forefront of the study to ensure that diverse viewpoints are incorporated.

- Study will collect samples from beaches and waterbodies. Samples will be analyzed for traditional bacterial indicators, viruses, and human markers during wet and dry weather.
  - Identify areas with highest risk to support a focus on those areas
  - Identify the sources causing the highest risk to focus on those sources

- Study will assess control measure effectiveness and efficiency
  - Identify the best BMPs to address the sources
  - Support planning, applying municipal funds, requests for SCWP funding, and actions by other parties

(Continued)

Study Details (Continued)

Regional collaboration efforts:

- Small Group Initiated Discussions and built a scope for a Safe, Clean Water Regional Program project
- Presented Approach to E/WMP Groups
- Discussed with proponents of watershed-specific studies
- Discussed with Regional Board staff

- Revised study three times to address concerns
  - Clearly focused on human pathogens
  - Clarified that study is a component of overall strategy to protect human health
  - Clarified that implementation continues during the study
  - Recognized that we do not need to wait until the end of the study to take action
  - Reduced first year cost of study

Cost & Schedule

Phase	Description	Cost	Completion Date
Task 1	Stakeholder Process	$490,000	7/22 – 6/27
Task 2	Health Risk Assessment	$5,880,000	7/22 – 9/26
Task 3	Risk Management	$1,734,600	4/23– 3/27
Task 4	Application of Study Findings	$490,000	1/26 – 6/27
TOTAL		**$8,594,600**	

Funding Request

WASC	Year 1	Year 2	Year 3	Year 4	Year 4
CSMB	$47,109.15	$329,764.06	$282,654.91	$307,364.38	$107,432.50
LLAR	$33,843.21	$236,902.50	$203,059.29	$220,810.57	$77,179.51
LSGR	$44,169.54	$309,186.78	$265,017.24	$288,184.85	$100,728.71
NSMB	$4,748.60	$33,240.22	$28,491.61	$30,982.33	$10,829.20
RH	$30,413.67	$212,895.68	$182,482.01	$198,434.45	$69,358.42
SCR	$15,866.36	$111,064.53	$95,198.17	$103,520.32	$36,183.27
SSMB	$48,654.33	$340,580.32	$291,925.99	$317,445.93	$110,956.29
ULAR	$102,094.95	$714,664.67	$612,569.72	$666,120.09	$232,827.71
USGR	$49,973.39	$349,813.71	$299,840.33	$326,052.14	$113,964.40
TOTAL	**$376,873.21**	**$2,638,112.47**	**$2,261,239.26**	**$2,458,915.06**	**$859,460.00**

Summary of Benefits

- By developing a better understanding of pathogens present in the region's watersheds, the relative risk to human health they pose, and the effectiveness of various control measures, new or adapted BMPs can be established that improve water quality and reduce human health risks at our beaches and inland waterbodies.

- Short-term: results could be used to protect people from health risks that aren't currently known.

- Long-term: results will enable the targeted placement of BMPs in locations where they can maximize the prevention or treatment of key sources of human pathogens.

Questions?
Richard Watson