

THANK YOU FOR JOINING US

**WaterReuse Orange County
Chapter Meeting**

WILL BEGIN SHORTLY

Agenda

- ▶ **Call to order** – 12:00 PM
- ▶ **Welcome** (Scott Lynch, Chapter Vice-President)
- ▶ **Presentations**
 - Amber Baylor, Director of Environmental Compliance, South Orange County Wastewater Authority
 - Dr. Phillip Gedalanga, Assistant Professor in Department of Public Health, CSU-Fullerton

 - Hannah Greenwald, PhD student, UC-Berkeley
- ▶ **Standing Items**
 - Regulatory Updates: DDW/OCHCA
 - State Section Update: Joone Lopez, MNWD
 - Legislative and Regulatory Matters: Frank Prewoznik, IRWD
 - Potential Funding for Projects
- ▶ **Conferences/Webcasts**
- ▶ **Roundtable** (using “Raise Hand” feature to be called on)
- ▶ **Adjournment**

Q&A

Have a question?

Select the “Raise Hand Zoom” button or
select *9 on your telephone.

We will get to your questions after each presenter.

Discrimination of viable *Bacteroides* by PMA-qPCR and it's application to environmental monitoring

Presented by Amber Baylor (SOCWA) and Dr. Phillip Gedalanga (CSU-Fullerton) at OC WateReuse

August 19, 2021

PRESENTATION OUTLINE

- Objectives
- Background
 - ***Bacteroides*** as an indicator for fecal pollution
 - Regulatory context
 - EPA Method 1696 and HF183 genetic marker
 - Need for discriminating between live vs dead ***Bacteroides***
- Development of PMA-qPCR method for ***Bacteroides*** HF183 marker
 - HF183 PMA-qPCR Optimization
 - Environmental Monitoring: HF183 PMA-qPCR on Treated Effluent and REC-I waterbodies
- Summary/Conclusions

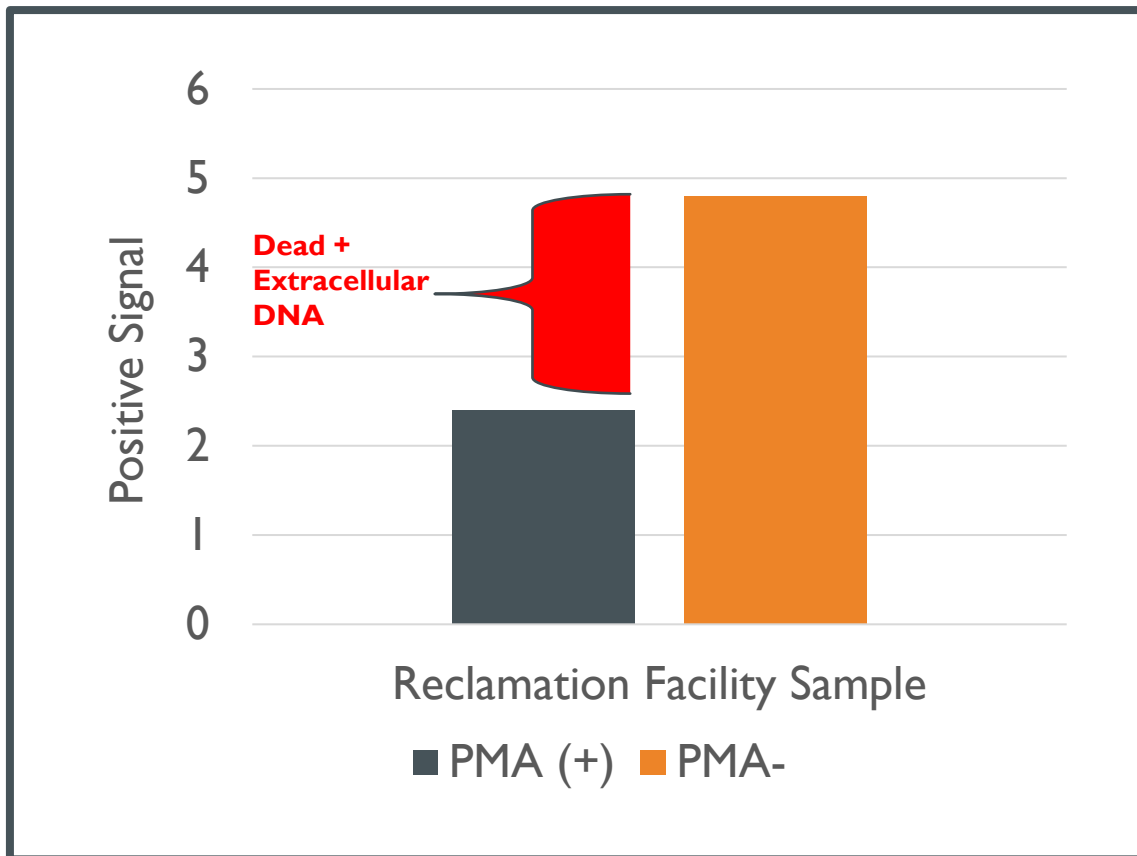
STUDY OBJECTIVES

- Modify a validated MST method to differentiate positive signals from live and dead human fecal sources.
- Understand the percent removal of live and dead signals in secondary and tertiary wastewater treatment
- Determine if DNA from live and/or dead sources are responsible for positive HFI83 signals indicating human fecal pollution in water environments.
- Establish evidence related to signal input to REC-I waters during wet and dry periods with comparative fecal indicator bacteria methods (*in progress*).

MICROBIAL SOURCE TRACKING: *Bacteroides*

- *Bacteroides dorei* is a Gram-negative, obligate anaerobic bacterium.
- Makes up 0.5% of microbiome colonic flora.
- Categorized by all three types of virulence.
- HF183 is the DNA sequence in the *Bacteroides* group used in polymerase chain reaction (PCR).
- Best available human-specific fecal marker.
- Limited cross-reactivity with other mammals.

LIVE VS. DEAD – MOLECULAR REVIEW & SAMPLE RESULTS



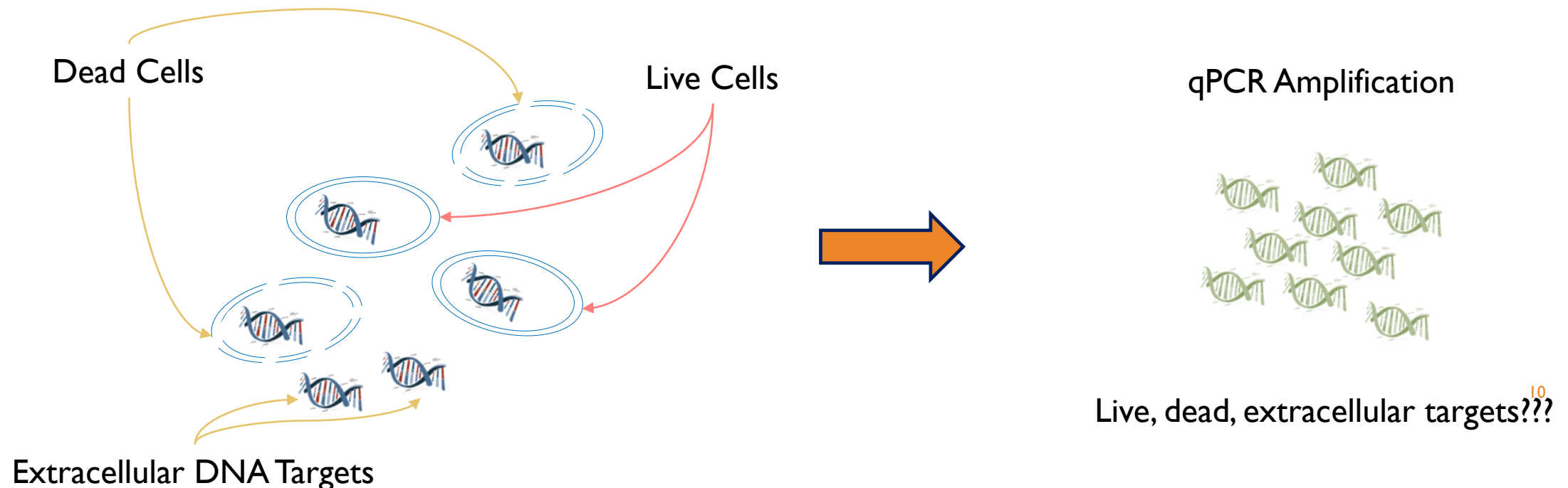
- Molecular methods help us understand microbial water quality.
 - Molecular research methods are establishing the basis for live vs. dead differentiation.
 - PMA + is the live bacterium only.
 - PMA - is the live bacterium, dead bacterium, and extracellular DNA.
 - Difference between PMA – and PMA+ are dead bacterium and extracellular DNA.

REGULATORY ENVIRONMENT

- HF183 Proposed Water Quality Objective (WQO) by San Diego Regional Water Quality Control Board
 - Tentative Time Schedule Order R9-2021-0028 (TTSO) establishes HF183 Risk Based Thresholds (RBT)
 - 60 copies per 100 mL as a geometric mean and 130 copies per 100mL as a statistical threshold value for beach waters
 - 240 copies per 100mL as a geometric mean and 510 copies per 100mL as a statistical threshold value for inland surface waters to control illness rates of 32 per 1000 in REC-1 waters.
-
- Recycled water is considered illicit discharge to the MS4 and is therefore a potential source of exceedance of the proposed WQOs.
 - HF183 in the tertiary effluent of several facilities would contribute to the proposed threshold values.

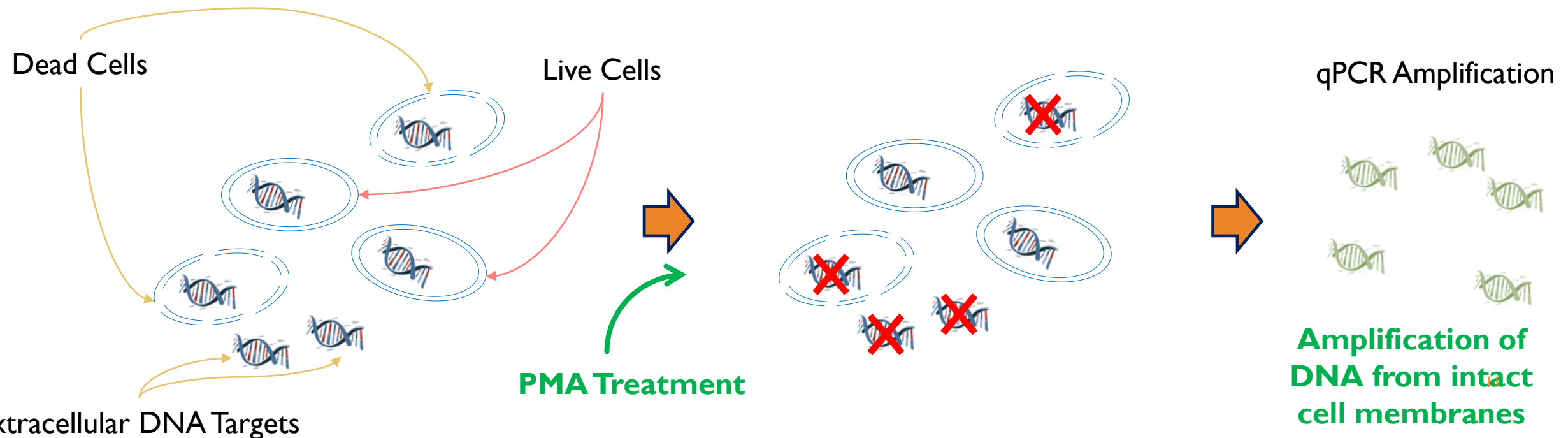
BACKGROUND – LIVE VERSUS DEAD

- EPA Method 1696 established a qPCR method (HF183) for *Bacteroides sp.*
 - Used in water samples to identify human fecal contamination
 - Provides information on the presence, absence, and abundance of HF183 gene targets
 - qPCR on DNA alone is unable to differentiate between live and dead cells



BACKGROUND CONT'D HFI 83-PMA APPLICATION

- SOLUTION:** PMA Modified qPCR Assay (HFI 83 PMA-qPCR)



PROJECT DESCRIPTION

I. PMA Optimization

- PMA Treatment Strategy – Resuspended Biomass Method
 - Non-target DNA (ntDNA) and live cell (LC) controls
- PMA Concentration – 100 μ M
- Incubation Time – 10 min
- Environmental Matrix Effects:
 - Tertiary effluent, San Juan Creek, Aliso Creek
 - Pre- vs Post- chlorination

Resuspended Method

1. Collect Sample
2. Membrane filtration
3. Wash filter and transfer to tube and add:
 - ntDNA control
 - LC control
4. Add PMA to the tube
5. Extract DNA from filter
6. qPCR: HF183, sketa22, *fliC*

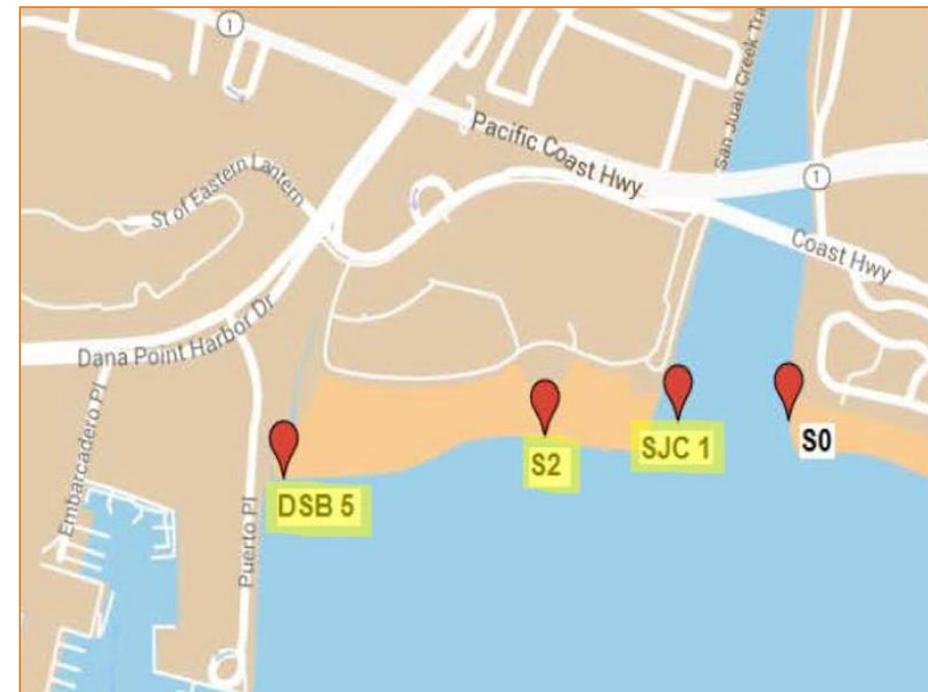
ENVIRONMENTAL MONITORING WITH HFI 83 PMA-QPCR

- Environmental Matrices:
 - **Aliso Creek (ACMI)**
 - San Juan Creek (Doheny Beach; DSB5)
 - Secondary vs Tertiary Effluents (Pre- vs Post- chlorination)
 - Tertiary effluent
 - Chiquita Water Reclamation Plant
 - Regional Treatment Plant
 - Coastal Treatment Plant
 - Nichols Water Reclamation Plant
 - Oso Creek Water Reclamation Plant



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ENVIRONMENTAL MONITORING WITH HF183 PMA-QPCR

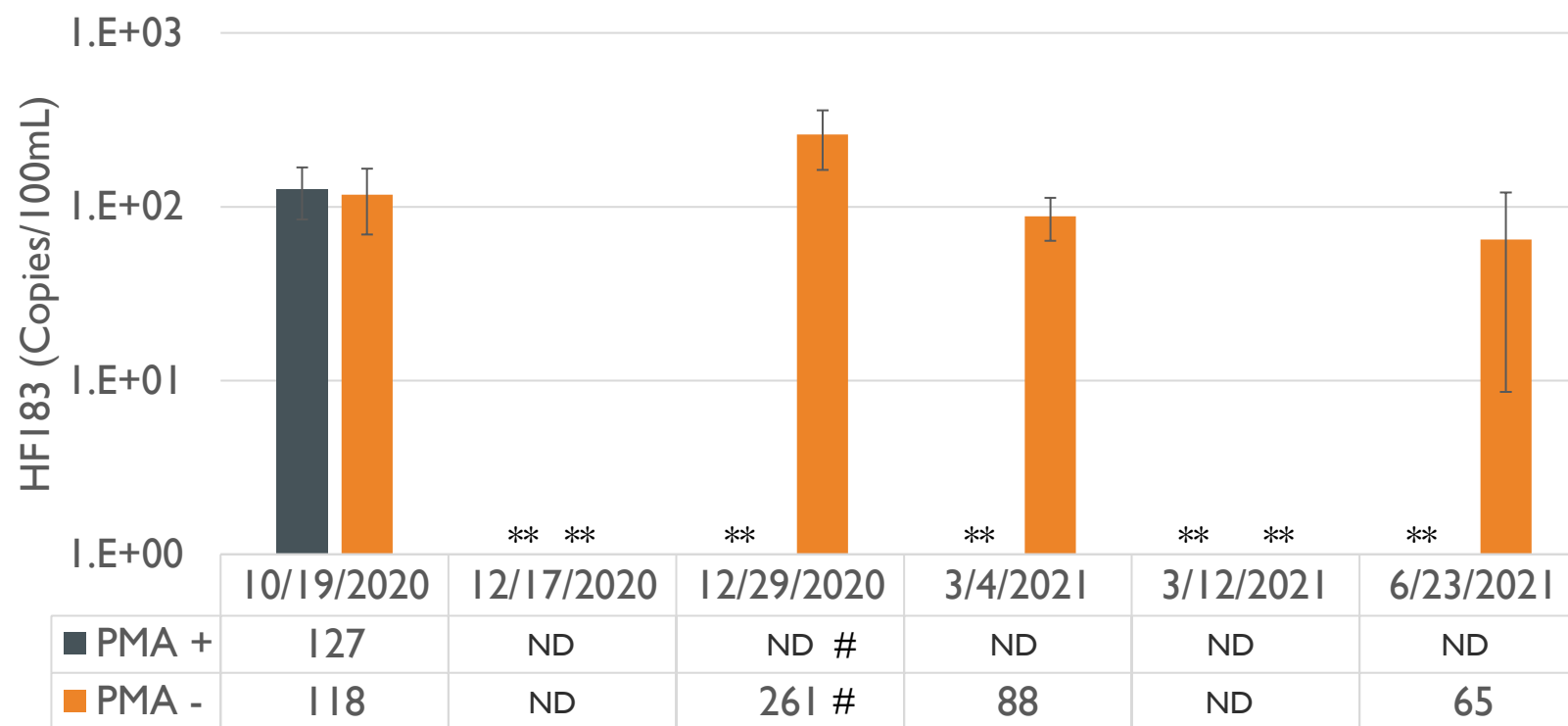
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ALISO CREEK (ACMI) REPEATED SAMPLING



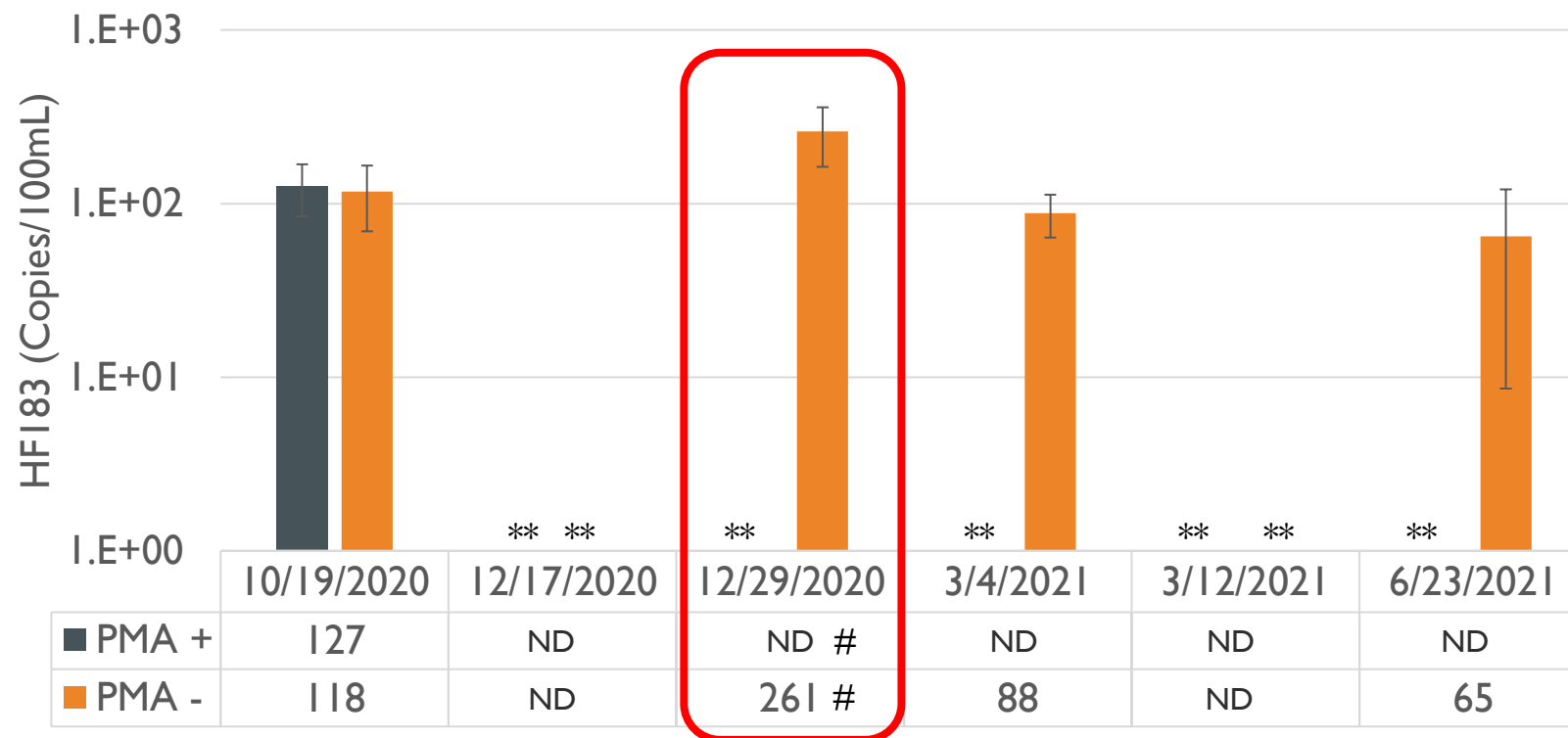
LLOQ = 152 copies/100mL



Signal Reduction
PMA+ vs PMA- (%)

Controls	ntDNA	LC
ACMI	98.75%	13.50%

ALISO CREEK (ACMI) REPEATED SAMPLING



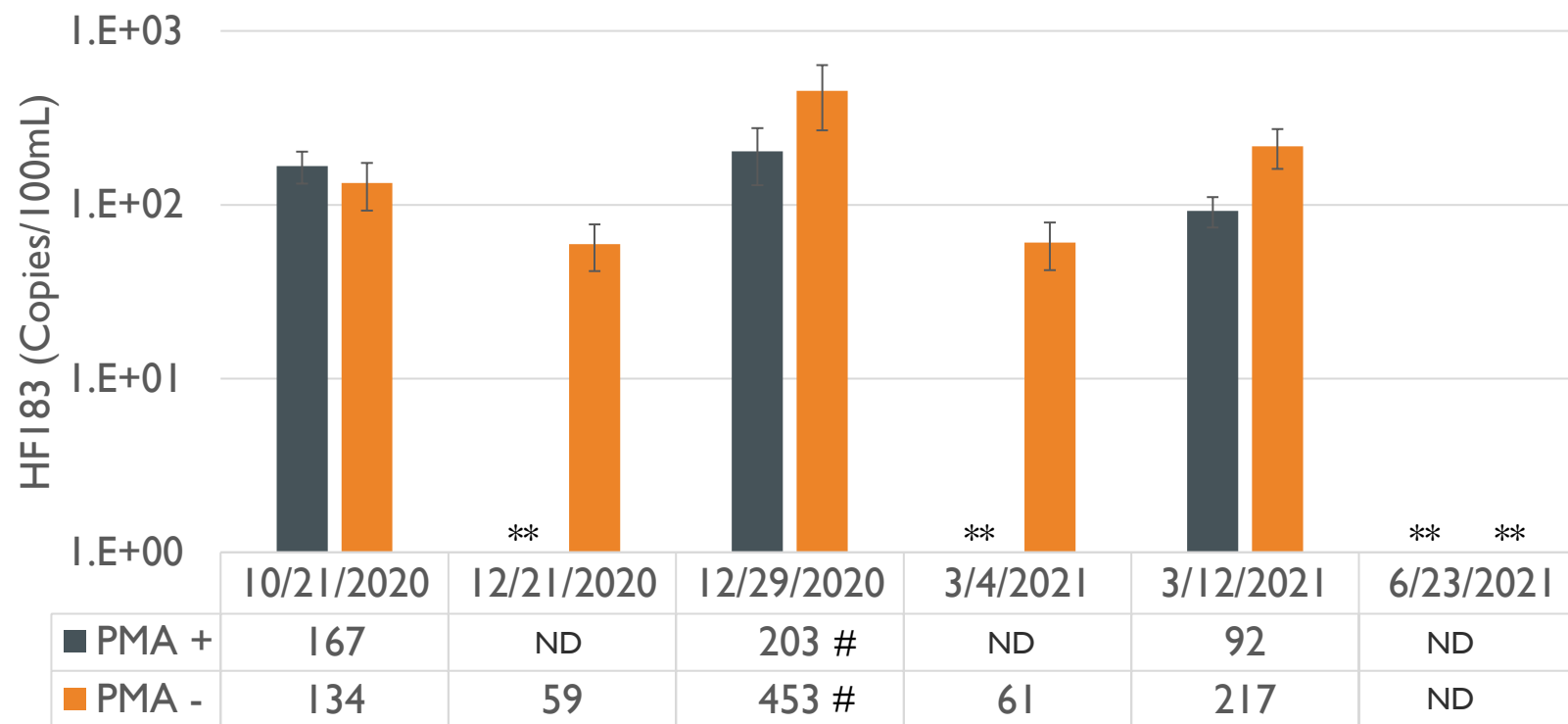
LLOQ = 152 copies/100mL

- Overall, low levels of HF183 detected in ACMI
- HF183 > LLOQ only during a rain event (12/29)
- Dead cells or environmental DNA is responsible for the most of the HF183 detections

Denotes a rain event within 72h

**Denotes Non-Detect

SAN JUAN CREEK (DSB5) REPEATED SAMPLING



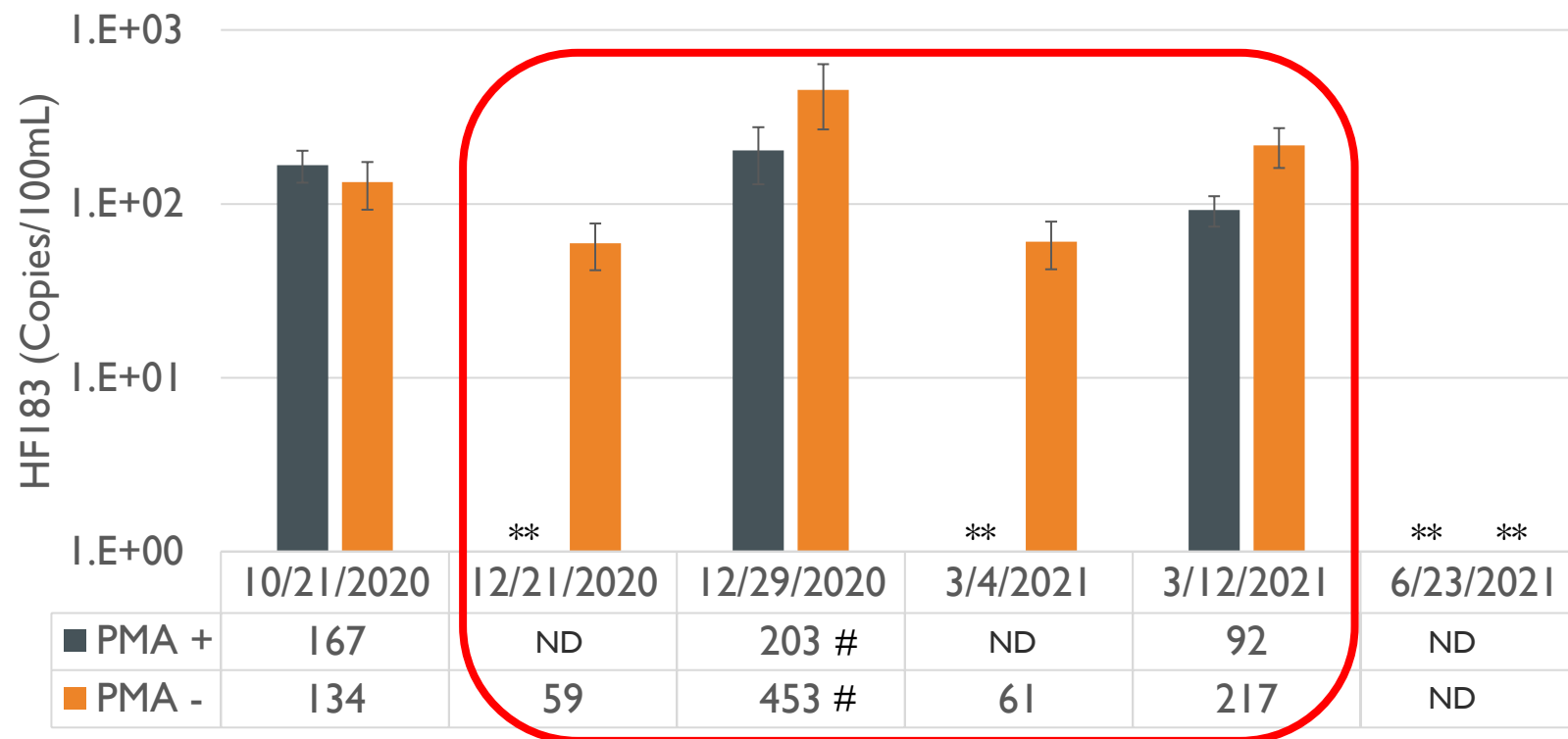
LLOQ = 152 copies/100mL



Signal Reduction
PMA+ vs PMA- (%)

Controls	ntDNA	LC
DSB5	93.38%	21.65%

SAN JUAN CREEK (DSB5) REPEATED SAMPLING




LLOQ = 152 copies/100mL

- HF183 at or below the LLOQ
- Dead cells or environmental DNA is responsible for the most of the HF183 detections
- Rain event had elevated HF183

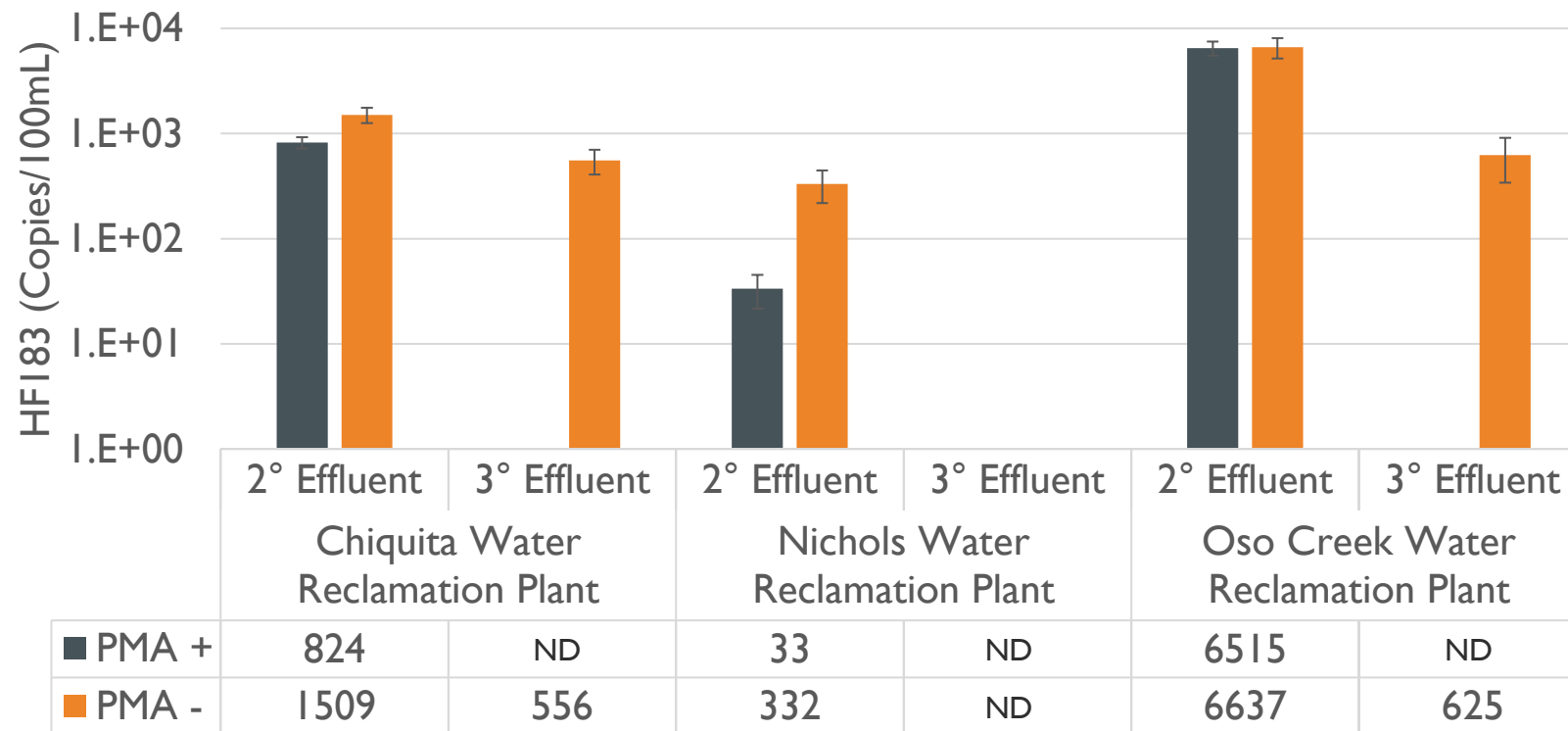
Denotes a rain event within 72h of collection

**Denotes Non-Detect



What is the influence of wastewater
treatment on HFI83?

PRE- & POST- CHLORINATION

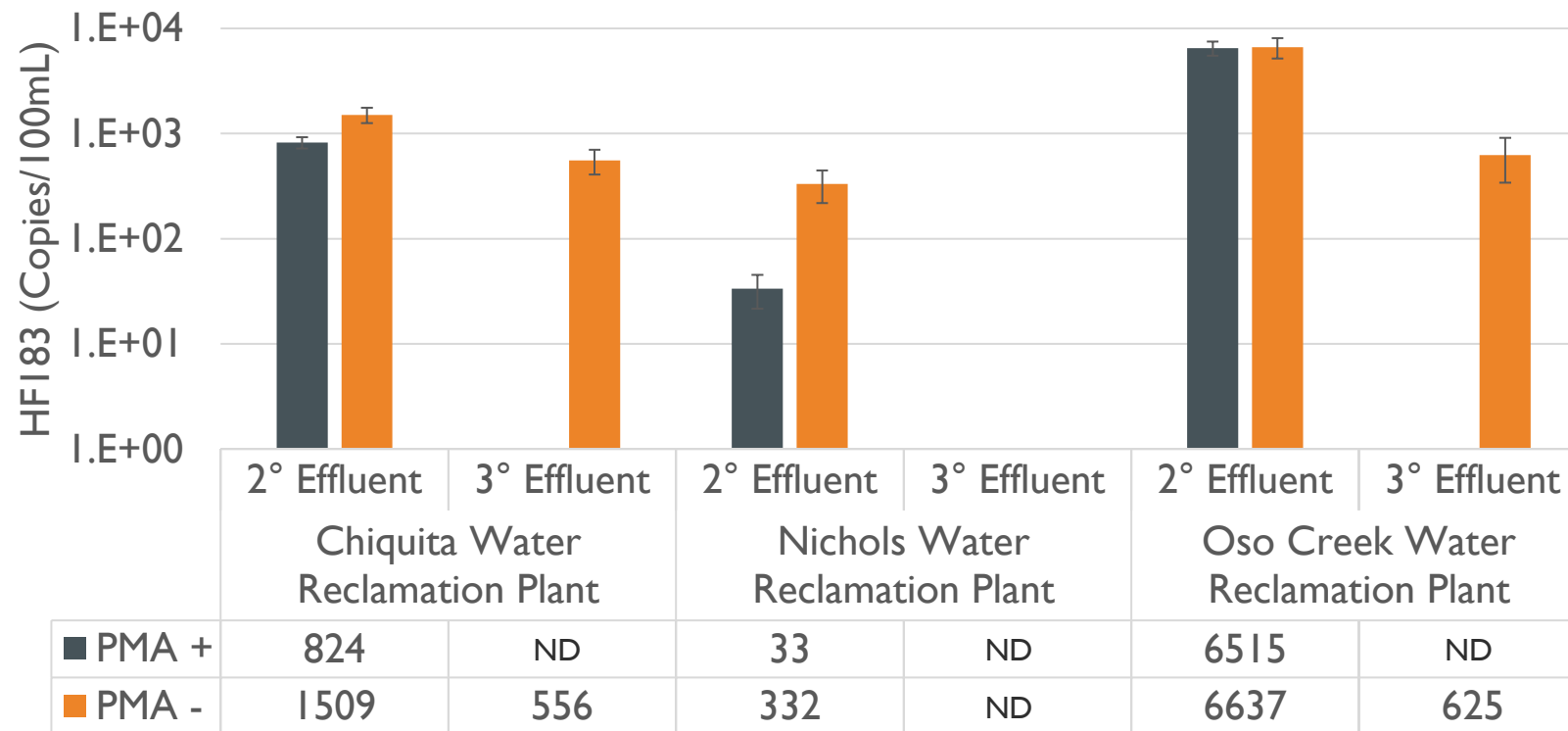


Signal Reduction PMA+ vs PMA- (%)

Controls	ntDNA	LC
All WRP	99.09%	32.6%

LLOQ = 152 copies/100mL

PRE- & POST- CHLORINATION



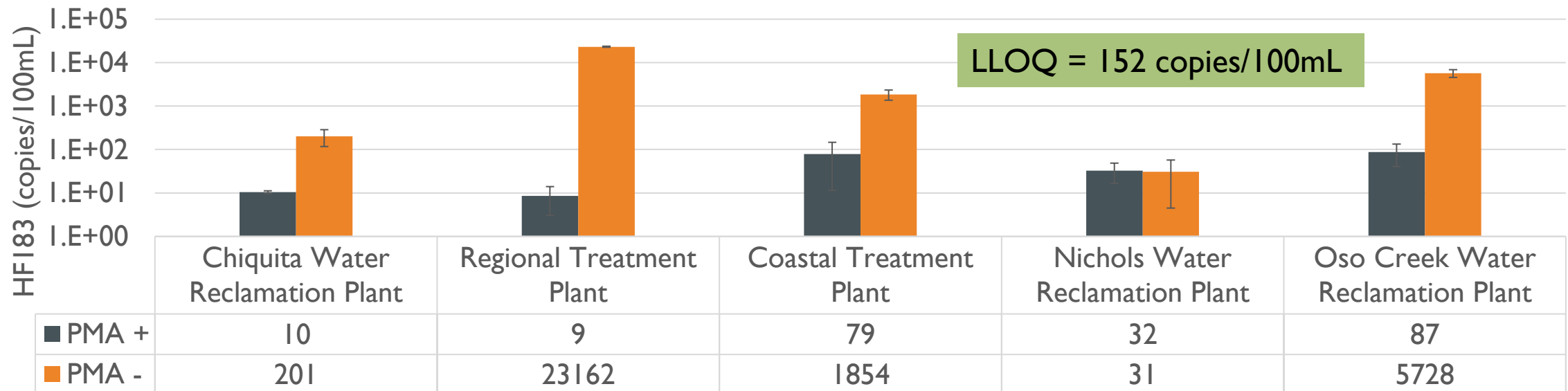
- Chlorination strongly decreases HF183 down to the detection limit
 - Dependent on treatment facility
- Only NWRP was negative for HF183 in tertiary effluent
- ntDNA control failure for 2° effluent of OCWRP
- DNA persists through chlorination

LLOQ = 152 copies/100mL

TERTIARY EFFLUENT

Signal Reduction
PMA+ vs PMA- (%)

Controls	ntDNA	LC
All WRP	99.09%	32.6%

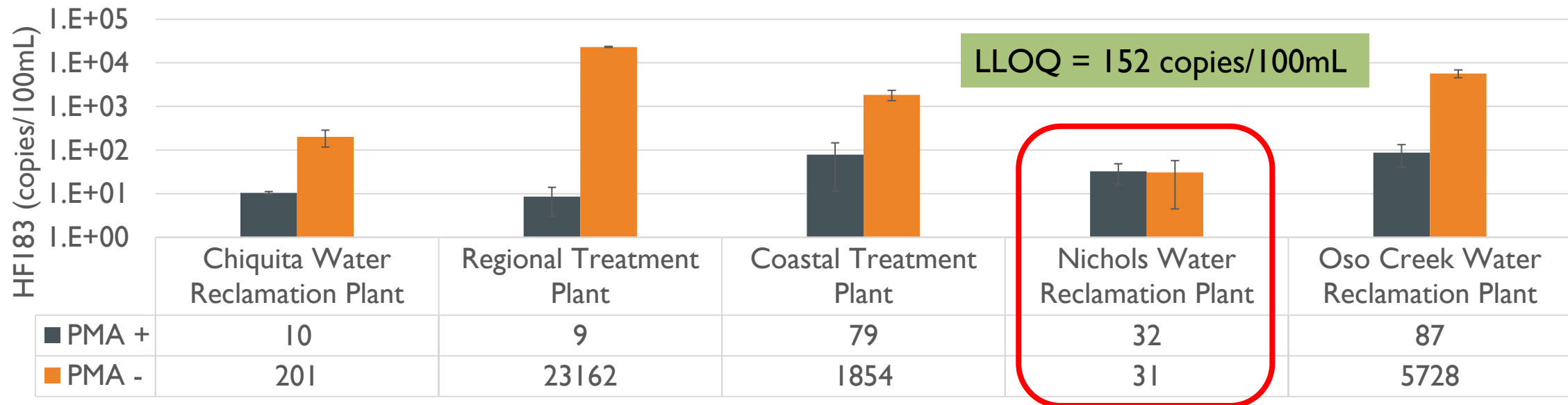


TERTIARY EFFLUENT

Signal Reduction
PMA+ vs PMA- (%)

Controls	ntDNA	LC
All WRP	99.09%	32.6%

- HF183 is present in tertiary clarifier effluent
- DNA persists beyond tertiary treatment
- Dead cells from disinfected tertiary effluent is a potential source of HF183 environmental DNA
- PMA treatment decreases the concentration detected



SUMMARY

- DNA from dead bacteria were responsible for most of the HF183 detections at Aliso and San Juan Creek suggesting a lower risk to the public.
- HF183 concentrations in recycled water is influenced by DNA from live and dead sources.
 - Recycled water is not contributing to the proposed public health water quality objective exceedances directly through illicit discharge when PMA treatment is applied.
- Limitations
 - PMA effectiveness is limited to microorganisms with compromised cell membranes
 - PMA must be validated for each target microorganism
 - Additional sample processing steps increases risk for sample loss or mishandling

ACKNOWLEDGEMENTS

- South Orange County Wastewater Authority
- SOCWA Project Committee 12
 - SMWD, MNWD, TCWD, SCWD, CSJC
- Science Advisory Board
 - Donna Ferguson, PhD
 - Joe Guzman (OCHCA)
 - Mohammad Karim, PhD
 - Orin Shanks, PhD
 - Roy Wolfe, PhD
- CSUF Staff & Students
 - Arriel Alvarez, Gretchen Alviar, Jessica Bernabe, Megan Enciso, Marcus Lynam, Daniella Roscelli-Valer, Tony Zapata

QUESTIONS?

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Q&A

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Wastewater-based Epidemiology in the San Francisco Bay Area during the COVID-19 Pandemic

Hannah Greenwald

Phd student

Civil and Environmental Engineering
University of California, Berkeley

August 19, 2021



Wastewater-based epidemiology in the San Francisco Bay Area during the COVID-19 pandemic

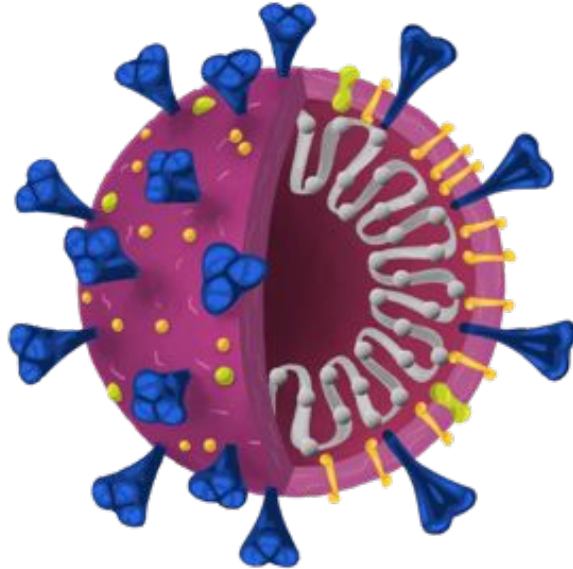
Hannah Greenwald
Civil and Environmental Engineering
University of California, Berkeley



Team: **Prof. Kara Nelson, Dr. Rose Kantor, Dr. Sasha Harris-Lovett**, Dr. Lauren Kennedy, Adrian Hinkle, Dr. Alex Crits-Cristoph, Oscar Whitney, Vinson Fan, **Matthew Metzger**, Melissa Thornton, Justin Paluba, Joaquin Bradley Silva, Lauren Liao, Alma Bartholow, Liwen Wang, Aliya Ehde, Mira Chaplin, Anmol Seth, Constance Chiang, Christina Lang, Christina Baily, Karen Lee, Amita Muralidharan, Sohyun Cho, Farheen Jamshed, Lauder Fairchok, Avery Parks, Sofia Mireles, Jazmine Ramos, Annesha Ghosh, Owen Zuidema, Emna Sellami

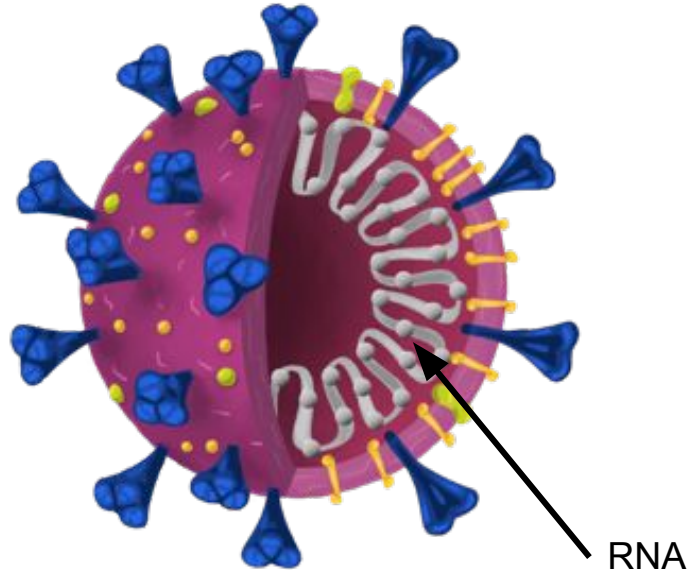
Orange County WaterReuse Chapter meeting
August 19, 2021

SARS-CoV-2 in Wastewater



SARS-CoV-2 infects the
intestinal tract and is
excreted in feces

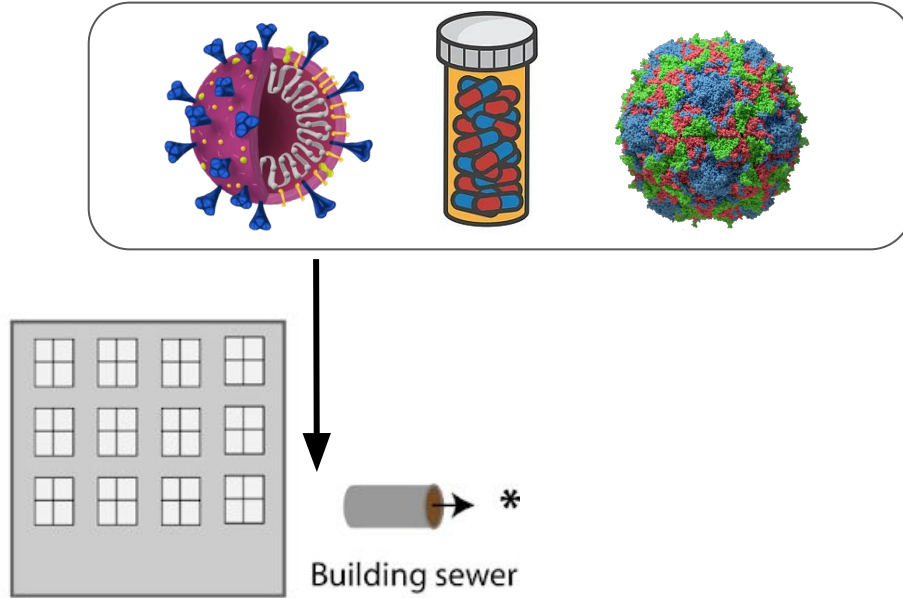
SARS-CoV-2 in Wastewater



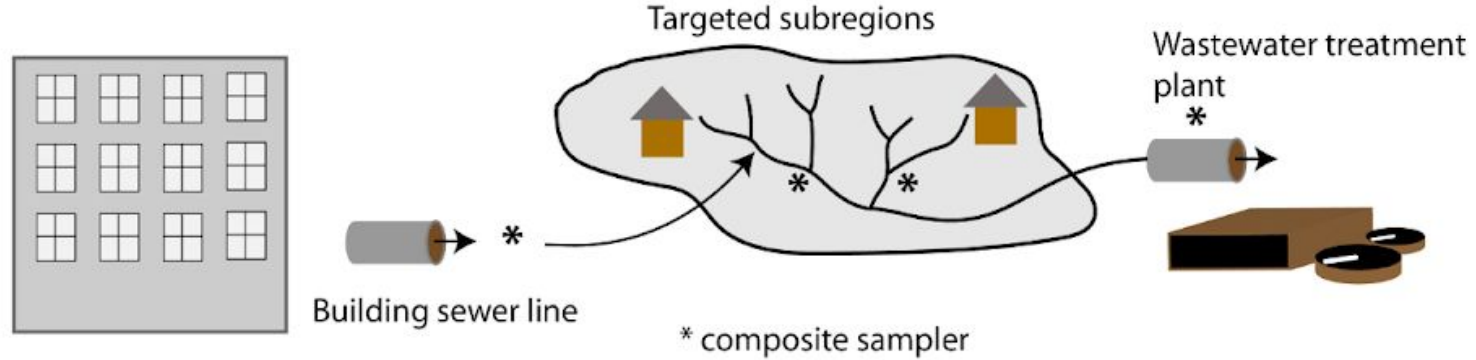
SARS-CoV-2 infects the
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excreted in feces

SARS-CoV-2 is removed
and inactivated by
standard wastewater
treatment

What is Wastewater-Based Epidemiology (WBE)?

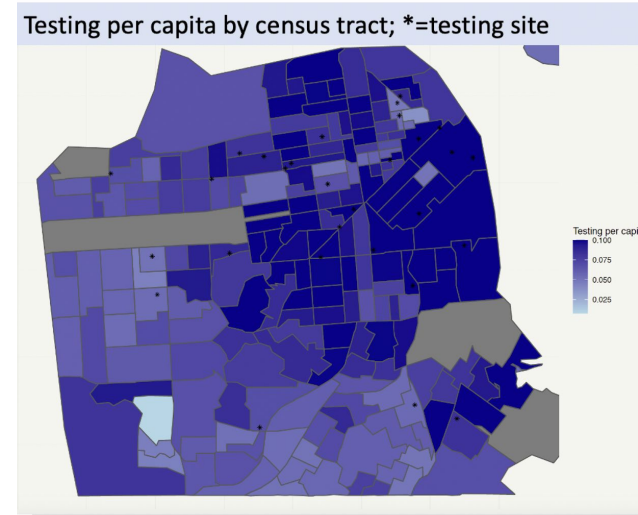


What is Wastewater-Based Epidemiology (WBE)?



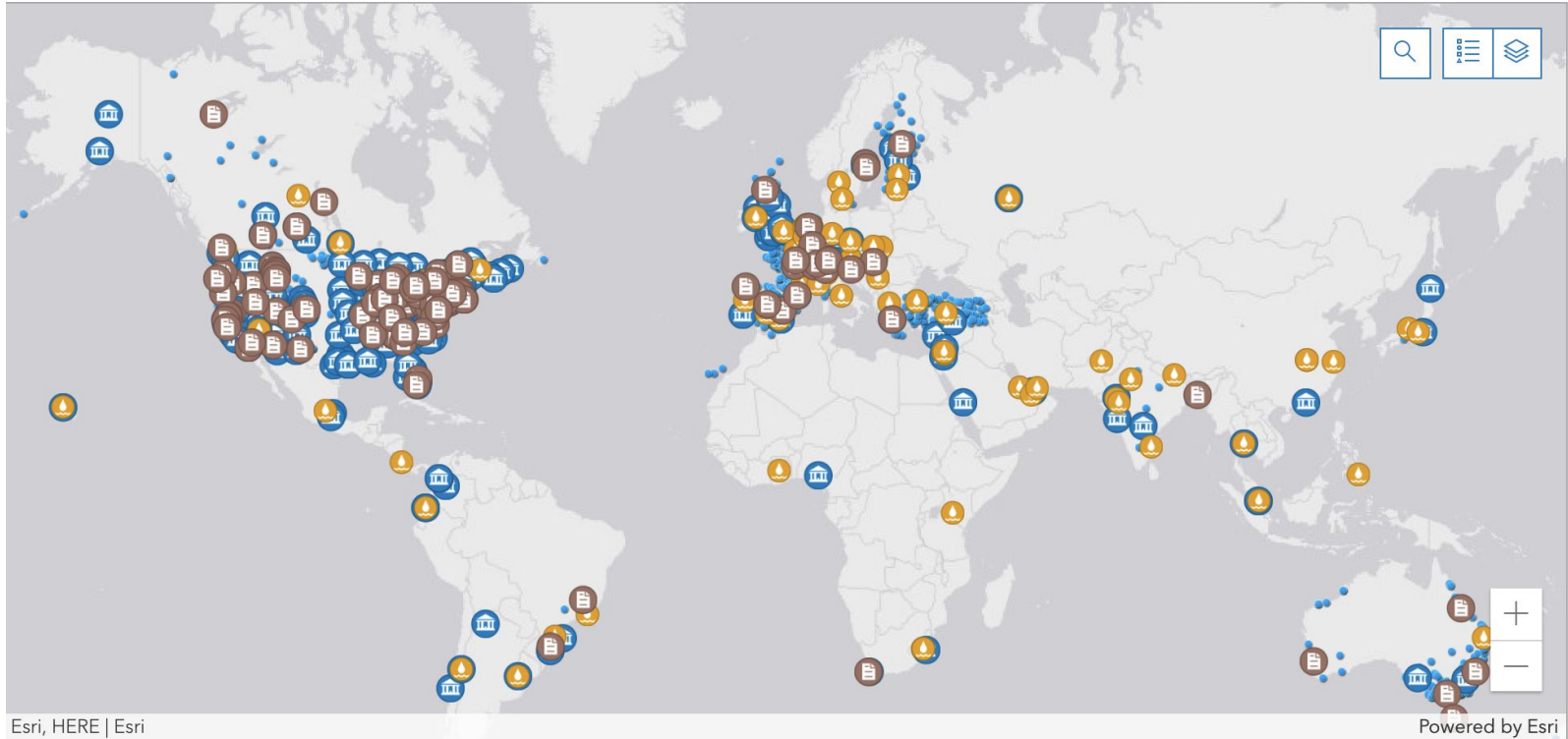
WBE Potential Advantages

- Inherently pooled sample
- Less biased than individual clinical case data (not everyone gets tested!)
- Less costly than clinical surveillance in some settings
- Can provide an earlier signal



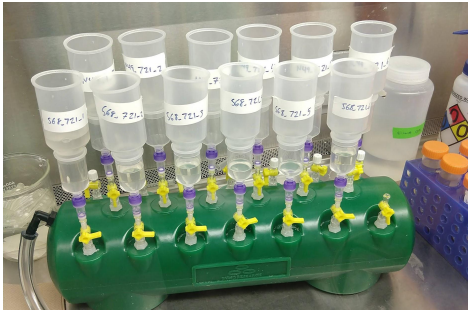
Individual testing rate varies widely across populations

COVID-19 WBE around the world



Research

- Methods to measure SARS-CoV-2 in wastewater
- Methods to distinguish specific viral strains



Interpretation of
wastewater data
for public health
decision making

Implementation

- High throughput testing lab
- Regional monitoring program
- Data dashboard

Covid-WEB
Wastewater Epidemiology for the Bay Area

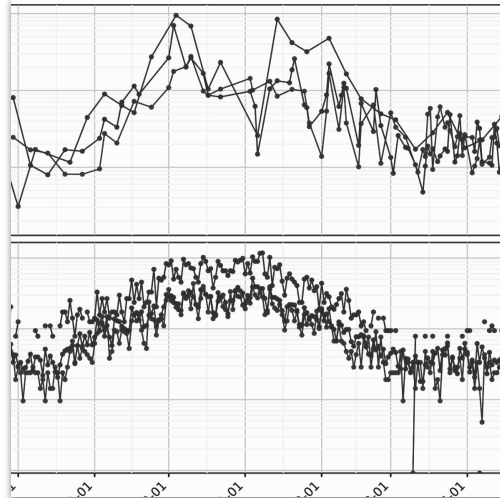


COVID-WEB timeline

Methods Development



Data Interpretation



Current functionality

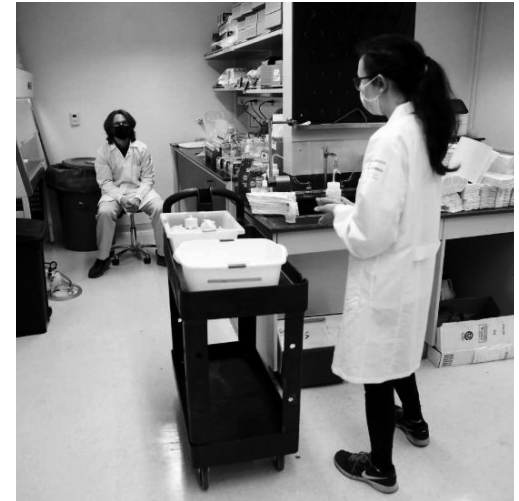
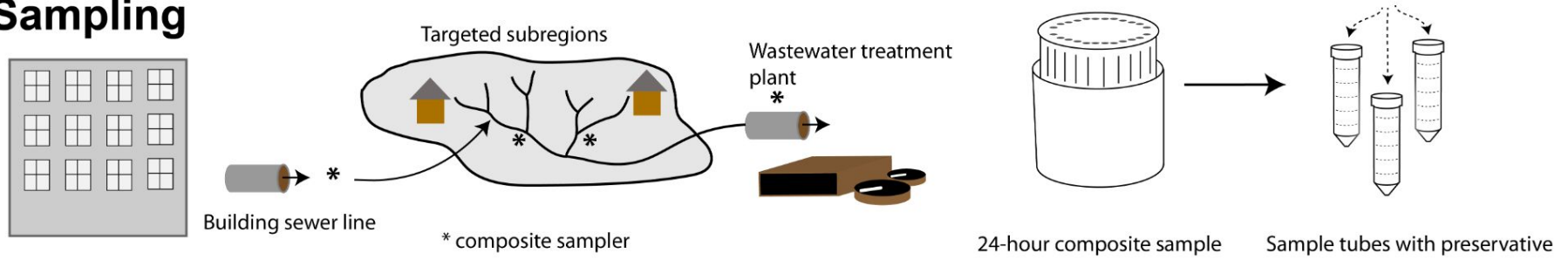
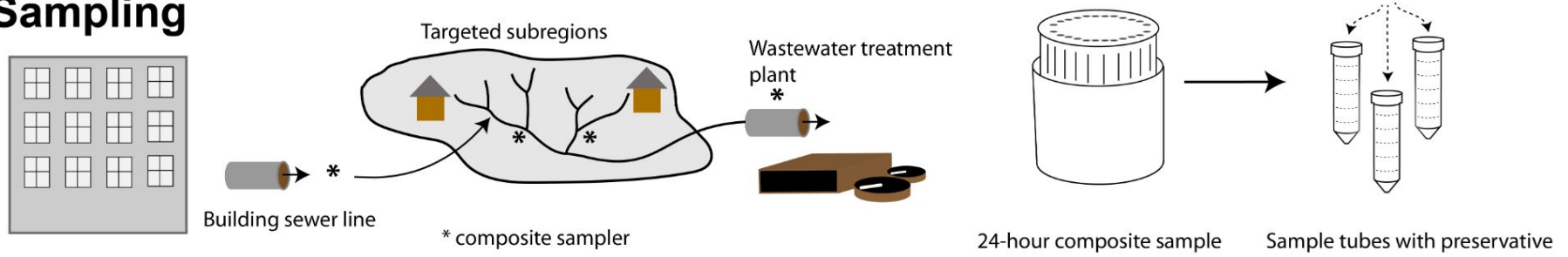


Image credit: SF Chronicle

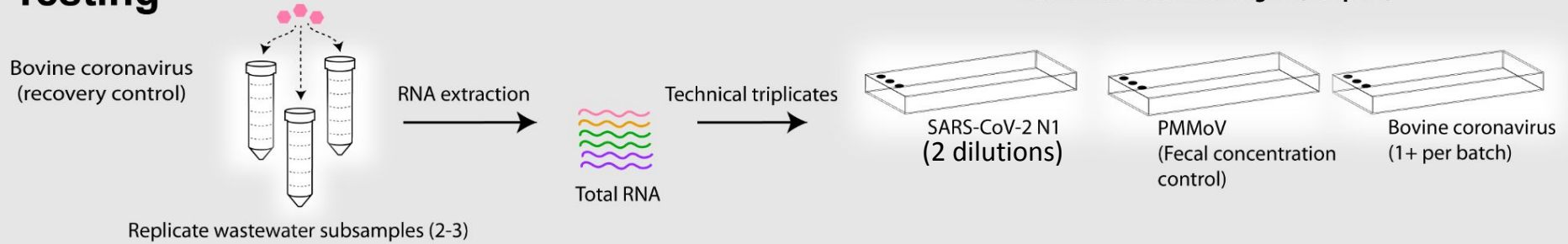
Sampling



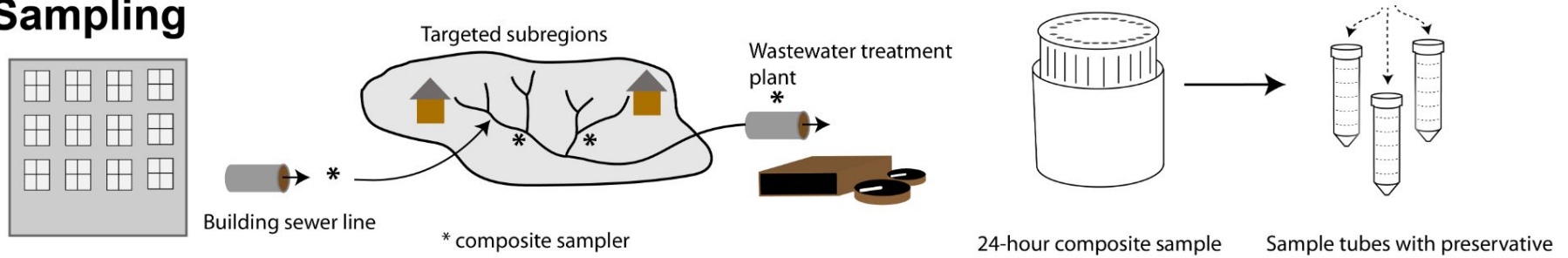
Sampling



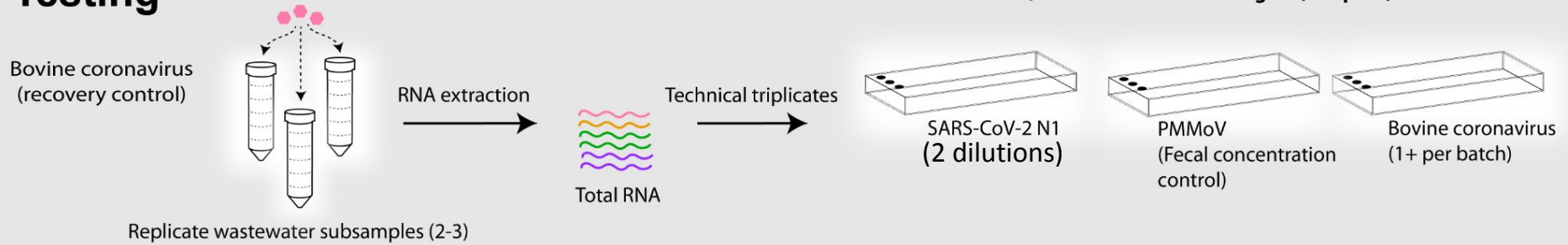
Testing



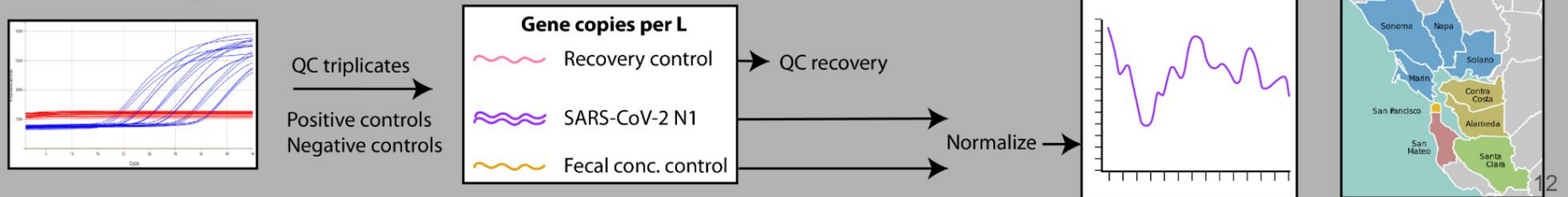
Sampling



Testing



Data analysis

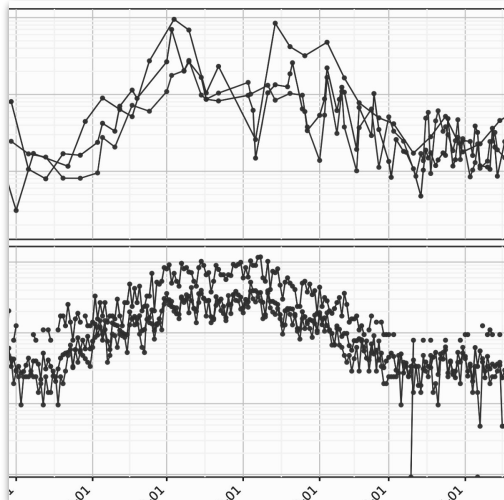


Covid-WEB timeline

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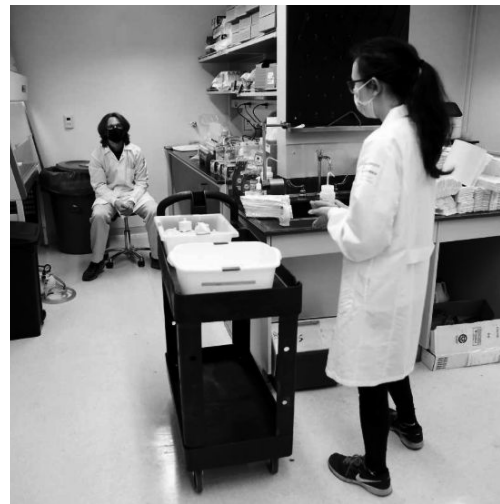


Image credit: SF Chronicle

SARS-CoV-2 Signal Normalization for fecal content

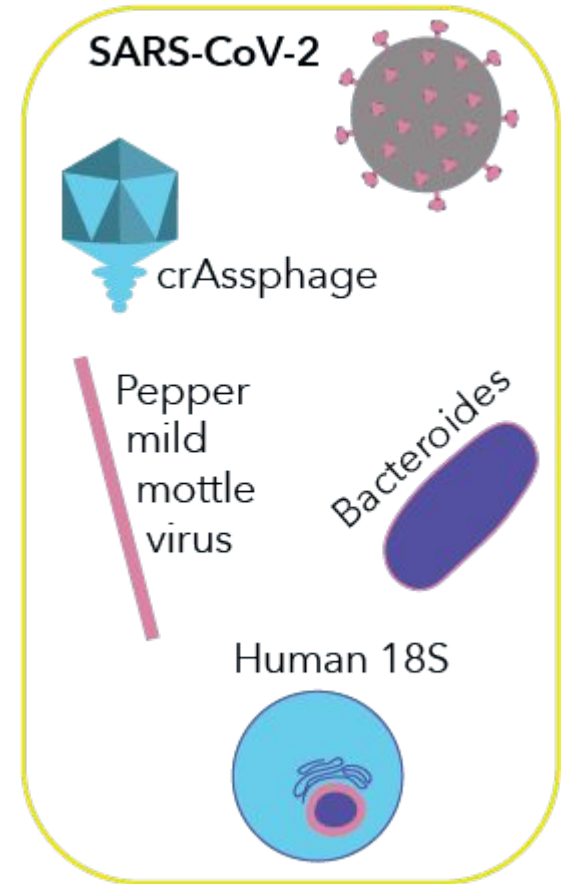
Fecal content may vary based on water usage, rainfall, etc. and concentrations won't reflect COVID-19 levels in feces.

Physicochemical options

- Daily flow
- Chemical biomarkers (e.g., TSS or BOD)

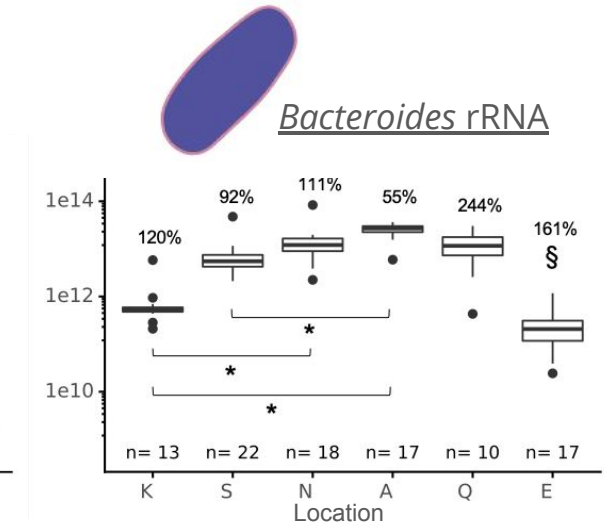
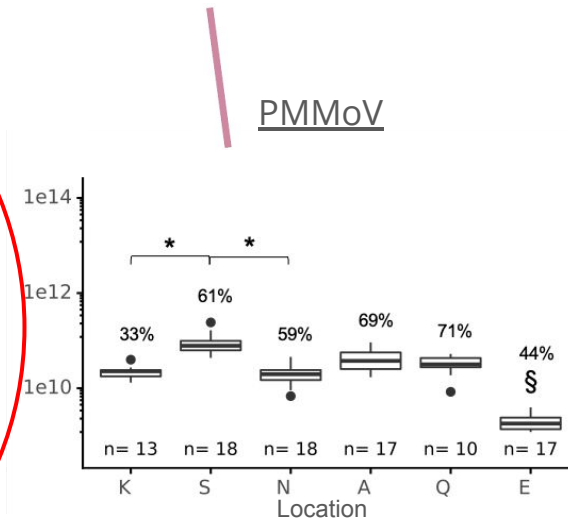
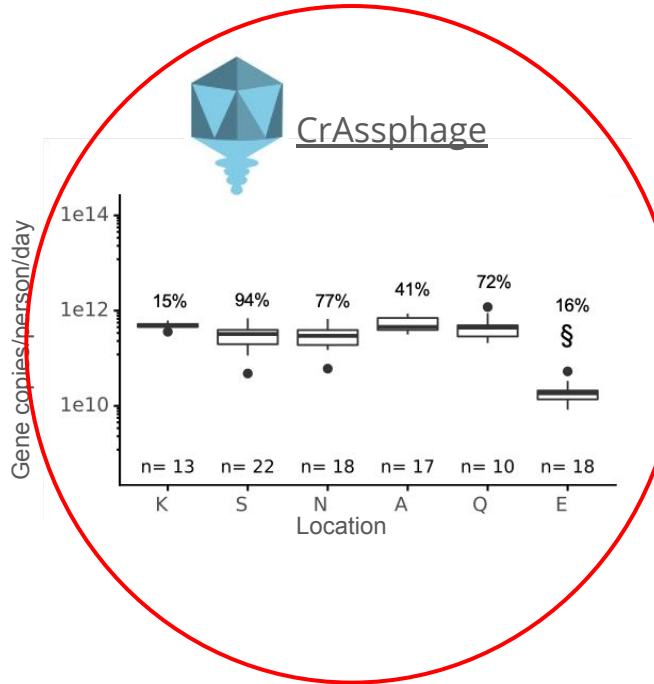
Endogenous Biological Biomarkers

- Pepper mild mottle virus (PMMoV)
- crAssphage
- *Bacteroides* HF183 rRNA
- Human 18S rRNA



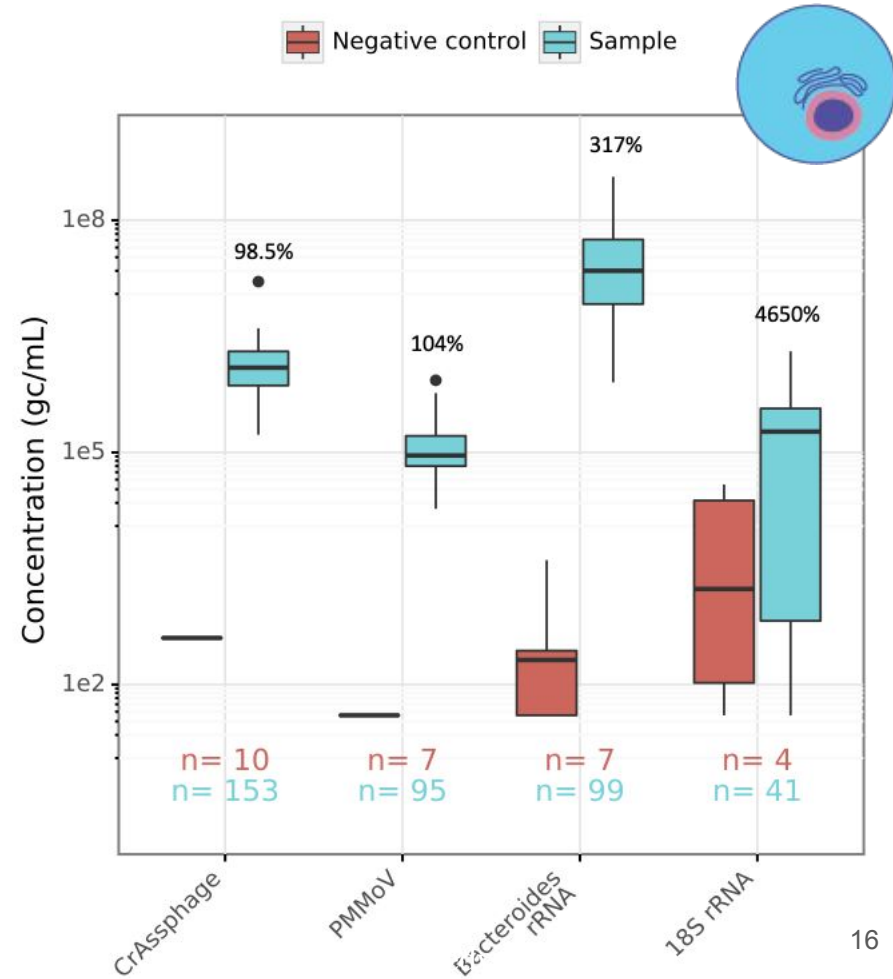
Normalization biomarkers, cont.

- For a biomarker to indicate fecal content, should be consistently shed in feces across locations and seasons
- No precipitation during study period → minimal variation is desired

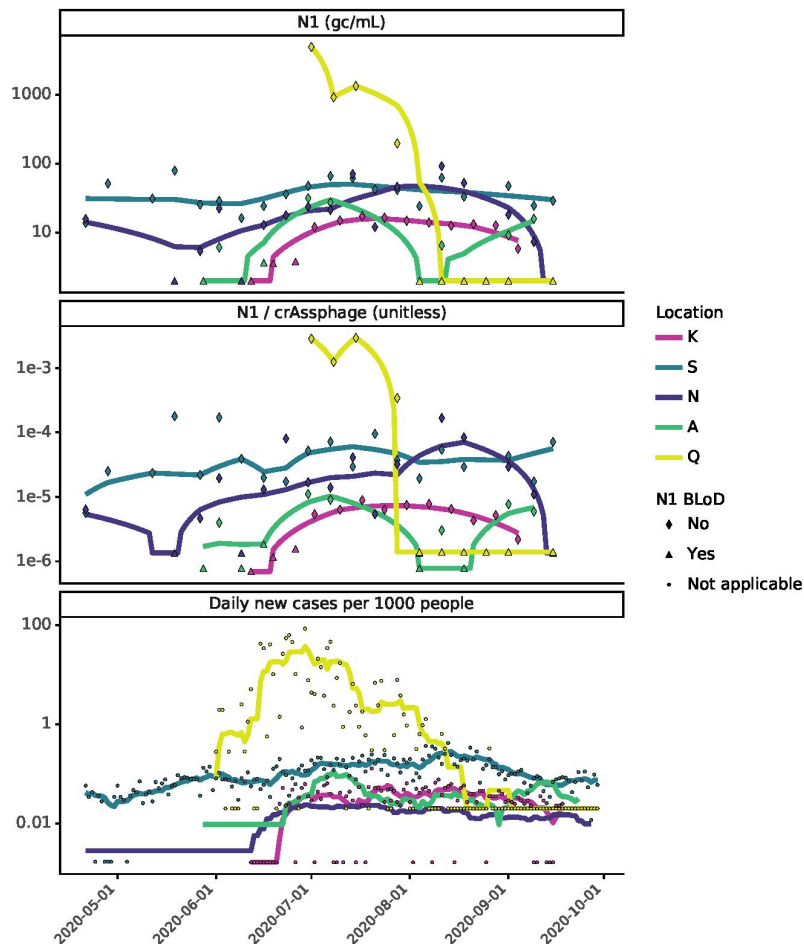


Human 18S rRNA

- High variability
- Higher degradation than other biomarkers and SARS-CoV-2
- Common laboratory contaminant
- Not suitable as a normalization biomarker



Wastewater signal moderately correlated to clinical cases



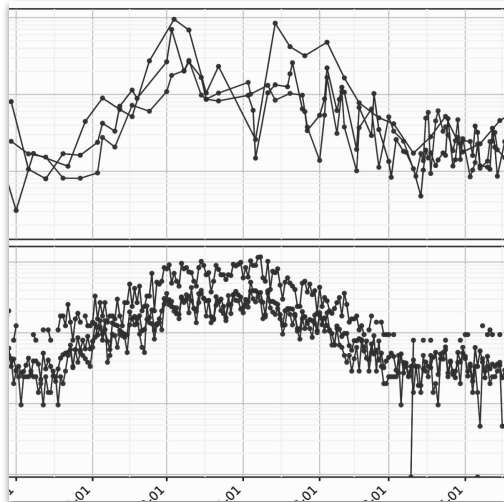
Normalization	Kendall's τ correlation
None	0.43
Per capita flow rate	0.45
<i>Bacteroides</i>	0.35
crAssphage	0.38
PMMoV	0.18
18S	Not significant
TSS	Not significant

Covid-WEB timeline

Methods Development



Data Interpretation



Current functionality

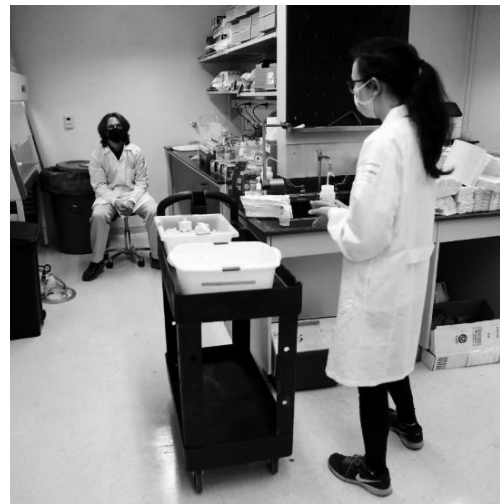


Image credit: SF Chronicle

Wastewater Epidemiology for the Bay Area

- 3 Peer-reviewed publications
- 2 methods protocols
- 1 opinion piece
- Contributions to WBE slack and webinars



Research

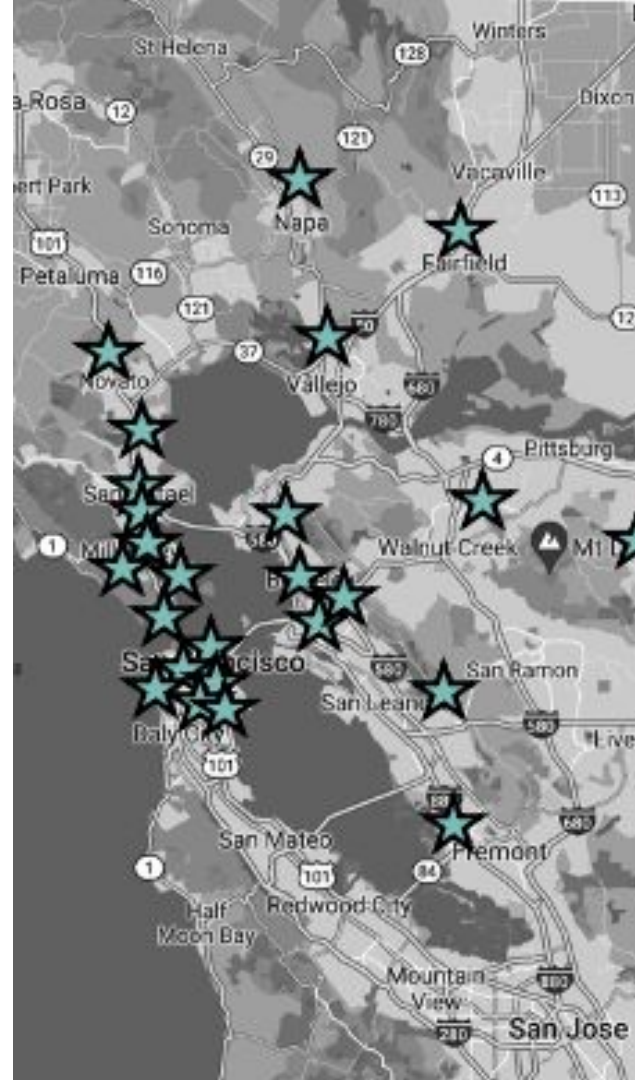
April 2020- Present

- 38 Sampling sites (1-4x/week)
- 19 Wastewater agencies
- 6 County PH agencies
- Reporting to CA DPH
- Coordinate with CA Water Board
- Participating in pilot with CDC-NWSS

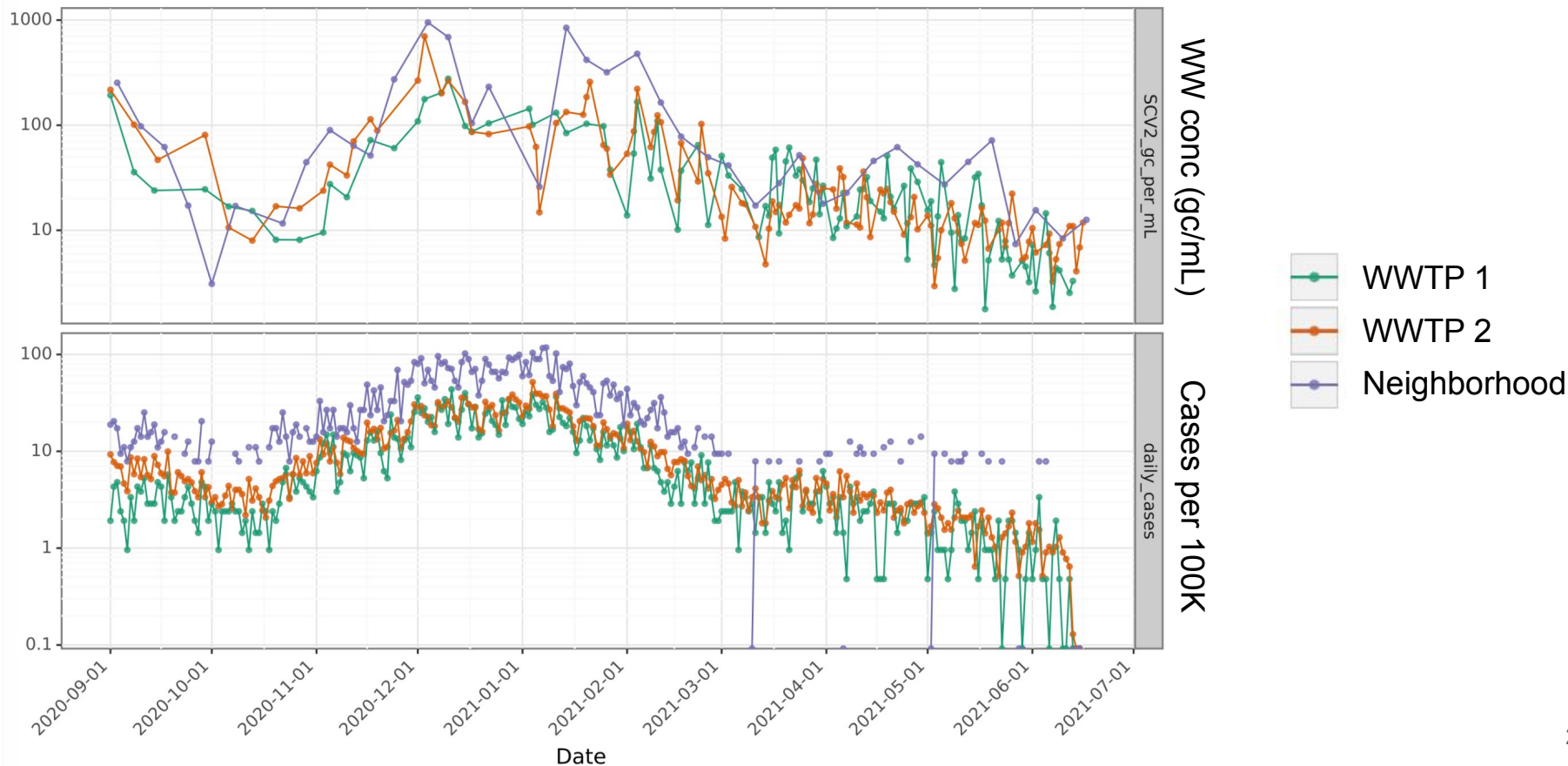


Pop-up laboratory

October 2020- Present



Example dashboard time series from one city



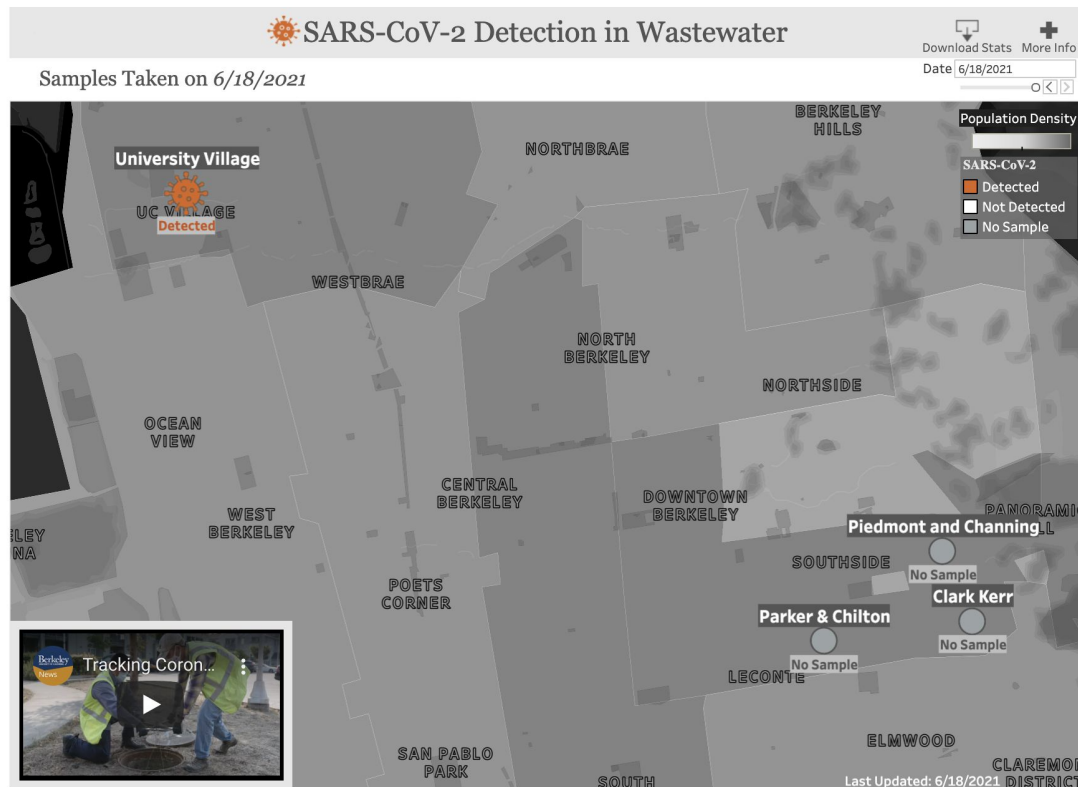
Wastewater testing at UC Berkeley

University Village

Detected on 6/18/2021

Recent Activity


Mar							20
	21	22	23	24	25	26	27
	28	29	30	31			
Apr					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	
May						1	
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31					
Jun			1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	



COVID-19 Tiers in California, USA

WIDESPREAD	SUBSTANTIAL	MODERATE	MINIMAL
<ul style="list-style-type: none">• More than 10.0 daily new cases (per 100k)*• More than 8.0% positive test for entire county**	<ul style="list-style-type: none">• 6.0 – 10.0 daily new cases (per 100k)*• 5.0 – 8.0% positive tests for entire county**• Less than 8.1% positive tests for health equity quartile**	<ul style="list-style-type: none">• 2.0 – 5.9 daily new cases (per 100k)*• 2.0 – 4.9% positive tests for entire county**• Less than 5.3% positive tests for health equity quartile**	<ul style="list-style-type: none">• Less than 2.0 daily new cases (per 100k*)• Less than 2.0% positive tests for entire county**• Less than 2.2% positive tests for health equity quartile**

Image credit:
California Department of Public Health
<https://covid19.ca.gov/safer-economy/#county-status>


Wastewater methods appear sensitive enough
to distinguish between “minimal” and
“moderate” tiers

What's Next?

- COVID WBE will **continue** to be used (together with case data) for
 - Confirming that cases remain low or early warning if cases start to increase
 - Where vaccination rates are lower
 - New more contagious variants arise
 - Vaccine breakthrough occurs
- COVID WBE has the **potential** to be used for
 - Tracking mutations, evolution, spread of SARS-CoV-2 variants
- **Future** wastewater monitoring applications
 - WBE for other pathogens or health markers (epidemiology)
 - Tracking antibiotic resistance
 - Ensuring the safety of potable reuse (water security)



Thank you!

Public Health Partners

- San Francisco Dept of Public Health
- Contra Costa County Dept of Public Health
- Marin County Dept of Public Health
- Alameda County Dept of Public Health
- Napa County Dept of Public Health
- Berkeley Public Health Dept
- California Department of Public Health
- U.C. Berkeley, COVID-19 response team
- UC Berkeley Functional Genomics Lab and Genomic Sequencing Lab (Justin Choi)

Funders: CITRIS, IGI, Catena Foundation, CDPH, U.C. Berkeley

Wastewater Agency Partners

- Sanitary District No.5 of Marin County
- Central Marin Sanitation Agency
- East Bay Municipal Utility District
- San Francisco Public Utilities Commission
- Las Gallinas Sanitary District
- Sausalito-Marín City Sanitary District
- Sewerage Agency of Southern Marin
- Novato Sanitary District
- Central Contra Costa Sanitary District
- Delta Diablo Sanitary District
- West County Water District
- City of Yountville
- City of American Canyon
- Dublin-San Ramon Services District
- Union Sanitary District
- City of Vacaville
- UC Berkeley EH&S

Questions?



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Dr. Rose Kantor, rkantor@berkeley.edu, twitter: @RoseKantor
Dr. Kara Nelson, karanelson@berkeley.edu
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Standing Items

▶ Regulatory Updates

- DDW
- OCHCA

▶ State Section Update:

- Joone Lopez (MNWD)

▶ Legislative and Regulatory Matters:

- Frank Prewoznik (IRWD)

▶ Potential Funding for Projects

Local, State and Federal Funding Opportunities

PROGRAM	Total allocation	Funding available this Round	Purpose	Eligible Projects	Status	Anticipated Timeline	Notes
On-Site Retrofit Program (OSRP)	\$2M per year		Provides financial incentives directly to customers	Public and private owners to convert potable water irrigation or industrial water systems to utilize recycled water.	SOLICITATIONS OPEN	First come first serve basis starting 7/1 through 6/30 or until funds are exhausted.	Contact: Jessica Arm, Assistant Resource Specialist II (213) 217-6819 http://www.bewaterwise.com/on-site-retrofit-program.html
MWD Local Resource Program (LRP)			Provides financial incentives for the development of water recycling, groundwater recovery, and seawater desalination projects.	Projects can include: <ul style="list-style-type: none"> • Water recycling • Groundwater recovery • Seawater desalination Three incentive payment options: <ul style="list-style-type: none"> • Sliding scale incentives up to \$340/AF over 25 years, • Sliding scale incentives up to \$475/AF over 15 years, or • Fixed incentive up to \$305/AF over 25 years. 	SOLICITATIONS OPEN	First come first serve basis starting 7/1 through 6/30 or until funds are exhausted.	Contact: Kira Alonzo Senior Engineer (213) 217-6489 http://www.mwdh2o.com/AboutYourWater/Planning/Funding-Programs/Local-Resource-Program-Funding
Water Savings Incentive Program			Open to all commercial, industrial, agricultural, institutional and large Landscape customers	Project examples: <ul style="list-style-type: none"> • Replacement of older, less water-efficient equipment, • Comprehensive changes to industrial processes that reduce water consumption, • Improvements to existing irrigation systems and landscaping to improve water use efficiency. 	SOLICITATIONS OPEN	Payment amount is up to \$0.60 per 1,000 gallons saved per year over the project live, up to a maximum of 10%. Incentives are limited to 50% of eligible project costs	

Local, State and Federal Funding Opportunities

PROGRAM	Total allocation	Funding available this Round	Purpose	Eligible Projects	Status	Anticipated Timeline	Notes
SoCal WaterSmart		Dependent on type of project	Business and residential rebates to help encourage water efficiency and conservation	Commercial Projects: Plumbing Fixtures Landscaping Equipment Food and HVAC Equipment Medical and Dental Equipment Residential Projects: Turf Removal Residential Devices	SOLICITATION OPEN		https://socalwatersmart.com/en/commercial https://socalwatersmart.com/en/residential
MWD Stormwater for Direct Use Pilot Program	\$5M		Beginning early 2020, The MWD will evaluate local stormwater capture projects to better understand their performance and regional water supply benefits. This program will financial incentives to develop, monitor and assess up to 10 new or existing stormwater recharge projects across the district's service area.	To be eligible, project must: <ul style="list-style-type: none"> • Include meter(s) for measurement of capture and use • Offset potable or reclaimed water use • Be within Metropolitan's service area • Have an estimated minimum design capture and use of one acre-foot per year • Have completed CEQA documents, if needed • Submit project schedule • Submit original project construction cost at the time of application (for retrofit projects only) 	SOLICITATIONS OPEN	First come first serve basis starting 7/1 through 6/30 or until funds are exhausted.	Matt Hacker Senior Resource Specialist (213) 217-6756 http://www.mwdh2o.com/AboutYourWater/stormwater
MWD Stormwater for Recharge Pilot Program	\$7.5M		Beginning early 2020, The MWD will evaluate local stormwater capture projects to better understand their performance and	To be eligible, project must: <ul style="list-style-type: none"> • Measure capture and recharge • Demonstrate how stored water recharges usable groundwater • Describe how the project will increase groundwater production 	SOLICITATIONS OPEN	First come first serve basis starting 7/1 through 6/30 or until funds are exhausted.	Matt Hacker Senior Resource Specialist (213) 217-6756 http://www.mwdh2o.com/AboutYourWater/stormwater

Local, State and Federal Funding Opportunities

PROGRAM	Total allocation	Funding available this Round	Purpose	Eligible Projects	Status	Anticipated Timeline	Notes
			regional water supply benefits. This program will financial incentives to develop, monitor and assess up to 10 new or existing stormwater recharge projects across the district's service area.	<ul style="list-style-type: none"> or decrease Metropolitan demand • Possess the right to capture and recharge stormwater in the area of the proposed project and not impact downstream users • Have an estimated design capture of at least 40 acre-feet per year • Be located within Metropolitan's service area • Create new water supply by increasing total recharge to a groundwater basin and decreasing stormwater flows to the ocean • Submit a minimum of three annual monitoring reports 			
DWR Water Use Efficiency: CalConserve Revolving Fund (Proposition 1)	\$10M	\$10M	Sustainable funding source for urban water use efficiency projects.	Projects including but not limited to: <ul style="list-style-type: none"> • Dish/clothes washer upgrades • Water-saving plumbing fixtures • Hot-water recirculating pumps • Leak detection & repair • Landscape irrigation upgrades • Commercial, institutional, and industrial water efficiency 	Solicitation Open and proposal accepted through GRanTS application	Continuously	Funding will be split: <ul style="list-style-type: none"> • \$1.75 million is to be loaned out for water use efficiency upgrades • \$5 million is to be loaned out for fixing expensive and difficult to repair customer leaks
DWR IRWM Grant Program Implementation (Proposition 1, Round 2)	\$418M statewide \$98M for LA Region	TBD	Projects and programs that support IRWM.	<ul style="list-style-type: none"> • Water reuse & recycling • Water conservation • Surface storage/GW recharge • Conjunctive use • Water conveyance 	DWR released of DRAFT Proposal Solicitation Package (PSP) for Public	Open	See link below for website: https://www.water.ca.gov/Work-With-Us/Grants-And-

Local, State and Federal Funding Opportunities

PROGRAM	Total allocation	Funding available this Round	Purpose	Eligible Projects	Status	Anticipated Timeline	Notes
				<ul style="list-style-type: none"> Watershed restoration and protection SW resource management Desalination WQ improvements 	Comment Period (45-day minimum)		Loans/IRWM-Grant-Programs/Proposition-1
DWR IRWM Grant Program Planning (Proposition 1, Round 2)	\$5M	TBD	Projects and programs that support IRWM.	Planning projects that accomplish: <ul style="list-style-type: none"> Development of an IRWM plan that meets the IRWM Plan Standards Compliance with recent legislation Improvement of an existing IRWM plan. 	DWR released of DRAFT Proposal Solicitation Package (PSP) for Public Comment Period (45-day minimum)	Open	See link below for website: https://www.water.ca.gov/Work-With-Us/Grants-And-Loans/IRWM-Grant-Programs/Proposition-1
DWR IRWM Grant Program DAC Involvement (Proposition 1)	\$51M statewide \$9.8 M for LA Region	\$9.8M for LA Region	Projects and programs that support IRWM.	Projects ensuring DAC involvement in IRWM planning efforts, including but not limited to eligible projects described in the Implementation Grant list.	Solicitations Continuously Open	SOLICITATION OPEN	
USEPA Water and Infrastructure Finance and Innovation Act (WIFIA) Program	\$20M minimum project size for large communities \$5M minimum project size for small communities (<25,000)	Funding available now 49% maximum portion of eligible project costs that WIFIA can fund	<ul style="list-style-type: none"> Local, state, tribal and federal government entities Partnerships and joint ventures Corporations and trusts CWSRF and DWSRF programs 	<ul style="list-style-type: none"> Wastewater conveyance and treatment projects Drinking water treatment and distribution projects Enhanced energy efficiency projects at drinking water and wastewater facilities Desalination, aquifer recharge and water recycling projects A combination of eligible projects secured by a common security pledge or submitted under one application by an SRF program. 	EPA announces WIFIA funding availability and application process details in the Federal Register and on its website (www.epa.gov/wifia)	CLOSED	NEPA, Davis-Bacon, American Iron and Steel and all federal cross-cutter provisions apply. Includes acquisition of property if it is integral to the project or will mitigate the environ. impact of a project.

Local, State and Federal Funding Opportunities

PROGRAM TITLE	Description	Eligible Applicants	Federal/Non-Federal Cost Share	Current Status
WaterSMART Grants – FY 2022 Drought Resiliency Projects	Purpose: To support projects that will increase reliability of water supplies, improve water management, and provide benefits for fish, wildlife, and the environment to mitigate impacts caused by drought.	Eligible Project Types: Projects that build long-term resilience to drought and reduce need for emergency response actions. Drought resilience is the capacity of a community to cope with and respond to drought. Projects may increase reliability of water supplies or improve water management and should improve the ability to continue to deliver water and power during a drought. Projects must go provide on-going benefits to build long-term resilience to drought, even if they address immediate drought concerns.	Total Funding Available: \$16.5M Funding Request: <u>Funding Group I:</u> Up to \$500,000 per agreement for smaller, on-the-ground projects that should be completed within 2 years <u>Funding Group II:</u> Up to \$2,000,000 per agreement for larger, phased on-the-ground projects that may take up to 3 years to complete Non-Federal Cost Share: 50% or greater.	Applications due: Wednesday November 3, 2021 at 3:00 PM (PST) via www.Grants.GOV For more information: https://www.grants.gov/web/grants/view-opportunity.html?oppld=335035
WaterSMART Grants – FY 2022 Water and Energy Efficiency Grants	Purpose: To support projects that seek to conserve and use water more efficiently; increase the production of renewable energy; mitigate conflict risk in areas at a high risk of future water conflict; enable farmers to make additional on-farm improvements in the future; and accomplish other benefits that contribute to sustainability in the western United States.	Eligible Project Types: Water conservation and renewable energy projects are eligible for funding. Eligible water conservation projects are those that result in quantifiable and sustained water savings or improved water management. Eligible renewable projects are those that increase the use of renewable energy sources in managing and delivering water and/or projects that upgrade existing water management facilities resulting in quantifiable and sustained energy generation and/or savings.	Total Funding Available: \$15.0M Funding Request: <u>Funding Group I:</u> Up to \$500,000 per agreement for smaller, on-the-ground projects that should be completed within 2 years <u>Funding Group II:</u> Up to \$2,000,000 per agreement for larger, phased on-the-ground projects that may take up to 3 years to complete Non-Federal Cost Share: 50% or greater.	Applications due: Wednesday November 3, 2021 at 3:00 PM (PST) via www.Grants.GOV For more information: https://www.grants.gov/web/grants/view-opportunity.html?oppld=335103

Local, State and Federal Funding Opportunities

<p>WaterSMART Grants – FY 2022</p> <p>Environmental Water Resources Projects</p>	<p>Purpose: To support water conservation and efficiency projects that result in quantifiable and sustained water savings and benefit ecological values; water management or infrastructure improvements to mitigate drought-related impacts to ecological values; and watershed management or restoration projects benefitting ecological values that have a nexus to water resources or water resources management.</p>	<p>Eligible Project Types: Projects must benefit ecological values that have a nexus to water resources management, including projects that benefit plant and animal species, fish and wildlife habitat, riparian areas, and ecosystems that are supported by rivers, streams, and other water sources, or that are directly influenced by water resources management.</p>	<p>Total Funding Available: \$2.0M per agreement for a project that can be completed within 3 years.</p> <p>Eligible Organizations:</p> <p>Category A: States, Indian Tribes, irrigation districts, and water districts; State, regional, or local authorities, the members of which include one or more organizations with water or power delivery authority; and other organizations with water or power delivery authority.</p> <p>Category B: Nonprofit conservation organizations that are acting in partnership with and with the agreement of an entity described in Category A.</p> <p>Category C: Nonprofit conservation organizations submitting an application for a project to improve the condition of a natural feature such as wetlands on Federal land where entities in Category A within the applicable service area have been notified and do not object to the project.</p> <p>Cost-Share: 25% or more of total project costs.</p>	<p>Applications due: Thursday December 9, 2021 at 3:00 PM (PST) via www.Grants.GOV</p> <p>For more information: https://www.grants.gov/web/grants/view-opportunity.html?oppld=335081</p>
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Local, State and Federal Funding Opportunities

PROGRAM TITLE	Description	Eligible Applicants	Federal/Non-Federal Cost Share	Current Status
Cooperative Watershed Management Program FY19: \$2.25M FY20: \$2.25M FY21: \$4.25M	Phase I Watershed group development, watershed restoration planning, and watershed management project design.	<p>States, Indian tribes, local and special districts (e.g., irrigation and water districts), local governmental entities, and non-profit organizations that are located in the Western United States or Territories.</p> <p>Established watershed groups that represent a diverse group of stakeholders, have completed a watershed restoration plan, are capable of promoting sustainable use of water resources located in the Western United States or Territories.</p>	<p>Up to \$100,000 may be awarded to an applicant per year, for a period of up to two years.</p> <p>Non-Federal Cost Share: No Non-Federal cost-share required.</p>	<p>FY21 Funding Opportunity was posted on November 18, 2020.</p> <p>Applications received by January 19, 2021 are currently under review.</p>
Cooperative Watershed Management Program FY19: \$2.25M FY20: \$2.25M FY21: \$4.25M	Phase II Implementation of on-the-ground watershed management projects collaboratively developed by watershed groups.	<p>States, Indian tribes, local and special districts (e.g., irrigation and water districts), local governmental entities, and non-profit organizations that are located in the Western United States or Territories.</p> <p>Established watershed groups that represent a diverse group of stakeholders, have completed a watershed restoration plan, are capable of promoting sustainable use of water resources located in the Western United States or Territories.</p>	<p>Up to \$300,000 per project</p> <p>Non-Federal Cost Share: 50% or greater.</p>	<p>FY21 Funding Opportunity was posted on September 16, 2020. Applications received by the November 17, 2020, deadline are currently under review.</p> <p>Selections are expected late Spring 2021.</p>

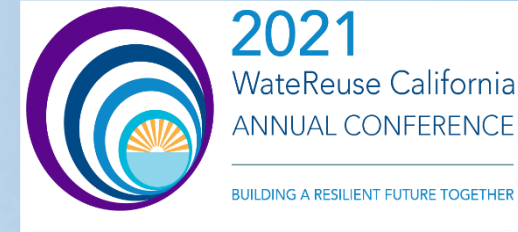
Local, State and Federal Funding Opportunities

PROGRAM TITLE	Description	Eligible Applicants	Federal/Non-Federal Cost Share	Current Status
Title XVI Program FY19: \$58.6M FY20: \$63.6M FY21: \$63.6M	Title XVI Authorized Projects Funding for planning, design, and construction of specific congressionally authorized water recycling and reuse projects	Sponsors of water reclamation and reuse projects specifically authorized for funding under Title XVI of P.L. 102-575.	Typically, between \$1 million and \$6 million per applicant. Non-Federal Cost Share: 75% or greater.	FY21 selections were announced January 19, 2021.
	Title XVI WIIN Water Reclamation and Reuse Projects Funding for planning, design, and construction of WIIN Act water recycling and reuse projects	Sponsors of water reclamation and reuse projects with completed feasibility studies that have been submitted to Reclamation for review.	Typically, between \$1 million and \$6 million per applicant. Non-Federal Cost Share: 75% or greater.	Schedule for next Funding Opportunity is currently under development.
	Title XVI Feasibility Studies Funding for development of new Title XVI water reclamation and reuse project feasibility studies	Entities with water delivery authority, all located in the Western United States or Territories (except Alaska).	Up to \$150K for studies to be completed in 18 months; up to \$450K for those to be completed within 3 years. Non-Federal Cost Share: 50% or greater.	No funding opportunity is planned this year.
Desalination Construction FY19: \$12M FY20: \$12M FY21: \$12 M	Funding for planning, design, and construction of WIIN brackish groundwater and ocean desalination projects	Sponsors of desalination projects located in the Western United States or Territories (except Alaska and Hawaii) with completed feasibility studies that have been submitted to Reclamation for review.	Typically, between \$1 million - \$6 million per applicant. Non-Federal Cost Share: 75% or greater.	Schedule for next Funding Opportunity is currently under development.

PROGRAM TITLE	Description	Eligible Applicants	Federal/Non-Federal Cost Share	Current Status
Basin Study Program FY19: \$5.2M FY20: \$5.2M FY21: \$9.4M (\$3M for Priorities TBD)	Applied Science Grants Projects to develop hydrologic information and water management tools and to improve modeling and forecasting capabilities. (\$2M)	States, Indian tribes, irrigation districts, water districts, universities, non-profit research institutions, organizations with water or power delivery authority, or non-profit organizations located in the Western United States or Territories.	Up to \$200,000 per agreement for a project that can be completed within two years. Non-Federal Cost Share: 50% or greater.	FY21 Funding Opportunity was closed on April 21, 2021.

2021 WaterReuse California Conference

September 19-21 | Los Angeles



Advance registration closes Wednesday, September 1

2021 WaterReuse Annual Conference – At a Glance

- 48 Technical Sessions (including virtual)
- 5 Panel Presentations
- 2 Tours
- Networking opportunities

Location



JW Marriott Hotel Los Angeles at L.A. LIVE
900 West Olympic
Los Angeles, CA 90015, US



2021 WaterReuse California Annual Conference

Sunday (9/19) Topics

RO Concentrate and
Minimization and Disposal
(4)

Declining Flows
(3)

2021 WaterReuse California Annual Conference

Monday (9/20) Topics

Direct Potable
Reuse
(2)

Planning and
Implementation
(5)

Non-Potable Reuse
(5)

Potable Reuse
Challenges and
Solutions
(8)

Artificial Intelligence
and Real-Time
Monitoring
(5)

Groundwater
Replenishment
(5)

2021 WaterReuse California Annual Conference

Tuesday (9/21) Topics

Outreach and
Communication
(4)

Treatment
(4)

MBR in IPR Projects
(3)

Regulatory and
Permitting
(3)

2021 WaterReuse California Annual Conference

Panel Discussions

**Transforming Utilities,
Sustaining our Assets –
How Advanced Analytics
can Guide Better O&M of
Water Recycling Systems
(Mon)**

**Multi-Pronged Approach
to Make Technology Work
for Regulatory Success of
DPR
(Mon)**

**Same but Different - 3 CA
Utilities Share What's
Most Important for Reuse
Projects
(Mon)**

**Partnerships for Success
with the Regional
Recycled Water Program
(Tues)**

**LA Water Reuse Future
Panel Discussion
(Tues-Lunch)**

**Water Reuse
Communications in 2021
and Beyond:
Developments and Best
Practices
(Tues)**

**Bioanalytical Screening in
Recycled Water – Current
Status, Challenges, and
Opportunities – Panel
Discussion
(Virtual)**

2021 WaterReuse California Annual Conference

Facility Tours



Albert Robles Center for Water Recycling and Environmental Learning

In-Person Tour

Sunday, September 19, 12:00 pm

Capacity: Limited to 50 people

Fee: Included in registration



Regional Recycled Water Advanced Purification Center

Live Hosted Virtual Tour

Sunday, September 19, 1:00 pm

Fee: Included in registration

Upcoming Webcasts & Conferences/Meetings

➤ Webcasts:

- **Discussion on Desalination – Treatment, Research and the Future**
August 11, 2021 (11 am PT)

➤ Conferences/Meetings

- **2021 WaterReuse California Conference** | September 16-21, 2021 | Los Angeles, CA
- **2022 Annual WaterReuse Symposium** | March 6-9, 2022 | San Antonio, TX

See www.watereuse.org to register and for more information.

Roundtable: What's going on - All



Looking for hosts
& presentation topics
for 2021

Have a question?

Select the “Raise Hand Zoom” button or
select *9 on your telephone.

THANK YOU

Meeting Adjourned