

# Santa Ana Regional Monitoring Program

June 2021 Update

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**CDM  
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# Outline

- QA/QC Sampling
- Updates to Monitoring Plan and QAPP
- Coliphage Update

# QA/QC Sampling Schedule

- Per the current RBMP QAPP, field QA samples are collected during each day of sampling
  - As the program has changed and expanded so the QA sampling expanded alongside it
  - In 2020-21 monitoring year, QA samples were collected at a frequency of 27%
- SWAMP guidance recommends QA samples collected at about 5% of total samples annually

# QA/QC Sampling

- Suggest updating guidance in QAPP to collect QA samples once/week at rotating sites.
- This will reduce annual QAQC sampling rate to about 10%

# Monitoring Plan and QAPP updates

1. Update QAPP per agreed upon Field QA Sampling guidance
2. Incorporate new priority 3 waterbody monitoring sites (San Timoteo Creek, Warm Creek)
3. Move Lake Elsinore sampling location to Elm Grove Beach
4. Extend monitoring for Serrano Creek (priority 3 water) to assess potential improvements from changing watershed land uses
5. Update key players since August 2019

# Coliphage Water Quality Criteria Development



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# Coliphage

- Coliphages are bacteriophages of E.coli
  - Bacteriophage is a virus that infects and replicates within bacteria
- Coliphages are:
  - Of fecal origin/highly concentrated in sewage
  - Physically similar to enteric viruses of concern
  - Similar persistence patterns to enteric viruses
  - No appreciable re-growth in ambient waters
  - Non-pathogenic
- Two types of coliphage being reviewed
  - Male specific (F+)
    - Reacts similarly to mRNA
  - Somatic
    - Reacts similarly to DNA virus

# Coliphage Criteria Derivation to Date

Date	Milestone
2015	Review of Coliphages as Possible Viral Indicators of Fecal Contamination for Ambient Water Quality
2015	Stakeholder webinar
2016/2017	Coliphage Expert Workshop; fact sheet (summer 2016) and proceedings (2017)
2017/2018	Analytical method multi-lab validation and publication
2019/2020	Continued research to better understand coliphage contamination
2021	Draft coliphage criteria; send for external peer review



# Current coliphage status

**Table 23. Attributes of fecal contamination indicators.**

Indicator Attribute	Enterococci (e.g. EPA Method 1600)	<i>E. coli</i> (e.g. EPA Method 1603)	Coliphages (e.g. EPA Method 1602)
Intestinal microflora of warm-blooded animals	Yes	Yes	Yes
Present when pathogens are present and absent in uncontaminated samples	Present when fecal pathogens are present, but may also be present in nonfecally contaminated ambient water.	Present when fecal pathogens are present, but may also be present in nonfecally contaminated ambient water.	Present when fecal pathogens are present, but is likely absent in nonfecally contaminated ambient water.
	Not indicative of viruses in WWTP effluent.	Not indicative of viruses in WWTP effluent.	Better surrogate for viruses than enterococci or <i>E. coli</i> in WWTP effluent.
Present in greater numbers than the pathogen (in this case, human viruses)	Depends on source <sup>a</sup>	Depends on source <sup>a</sup>	In most cases
Equally resistant as pathogens (in this case viruses) to environmental factors	Not as resistant as viruses	Not as resistant as viruses	Under most conditions
Equally resistant as pathogens (in this case viruses) to disinfection in water and WWTPs	Not as resistant as viruses (except for ozone).	Not as resistant as viruses (except for ozone).	Under most conditions. However, adenovirus is more resistant than coliphages and other enteric viruses to UV inactivation.
Should not multiply in the environment	Can multiply in the environment	Can multiply in the environment	Not likely enough to affect criteria levels
Detectable by means of easy, rapid, and inexpensive methods	Yes, but need EPA Method 1611 for rapid enumeration. Other easy and rapid methods are available.	Yes, but EPA method is not considered rapid (requires overnight incubation). Other easy and rapid methods are available.	Yes, but Method 1601 needs validation for quantification. Other easy and rapid methods are available.
Indicator organism should be nonpathogenic	Generally nonpathogenic <sup>b</sup>	Generally nonpathogenic. <sup>c</sup>	Nonpathogenic
Demonstrated association with illness from epidemiological studies	Yes	Yes	Yes
Specific to a fecal source or identifiable as to source of origin	Not EPA Method 1600, but MST methods being developed.	Not EPA Method 1603, but MST methods being developed.	Not EPA Method 1602, but MST methods being developed.

<sup>a</sup> In raw sewage FIB are present in greater numbers than pathogens. Viruses are less vulnerable to treatment processes than bacteria, so could survive treatment in greater numbers than bacteria.

<sup>b</sup> Enterococci can be pathogenic or antibiotic resistant in some settings, like hospitals, but generally not in ambient water.

<sup>c</sup> Enterohemorrhagic *E. coli*, specifically O157:H7, grows poorly at 44°C and is often negative for beta-glucuronidase, so is not detected by Method 1603 (Degnan and Standridge, 2006). Other pathogenic strains could be detected by EPA Method 1603.

- Ongoing debate and research for the ability of coliphages to predict the concentration of human enteric viruses
- Coliphage is currently being used as an indicator in groundwater and reclaimed water
- EPA continuing to work on developing WQ standards