ATTACHMENT - CONSIDERATION OF REFERENCE SYSTEM/ANTIDEGRADATION APPROACH

To determine if a reference system approach using the new STV objectives would be appropriate for this TMDL, the allowable exceedances for Los Cerritos Channel and Alamitos Bay were analyzed. The two reference systems that were relied upon were: (1) a collection of freshwater reference system data (as established for the Los Angeles River Bacteria TMDL and the San Gabriel River Bacteria TMDL) and (2) the Leo Carrillo Beach reference system (as established for the beach bacteria TMDLs in the Los Angeles Region). In previous Los Angeles Region Bacteria TMDLs, the reference system approach was based on the Single Sample Maximum (SSM) objectives. Since the SSM objectives are no longer used in the 2018 Statewide Bacteria Provisions, staff used the STV objectives instead of the SSM objectives for the purpose of this analysis.

Staff calculated the allowable exceedance frequencies for both the reference system and targeted waterbodies using the following objectives:

1. SSM Objective included in the 2010 Bacteria Objectives of the Los Angeles Region Basin Plan

2. STV Objective included in the 2018 Statewide Bacteria Provisions

Following the methods of previous bacteria TMDLs in the Los Angeles Region, when, on any given day, one or more of the applicable SSM objectives was exceeded, that day was counted as an “exceedance day.” If the “exceedance day” was on a wet-weather day, the exceedance was considered a wet-weather exceedance, otherwise the exceedance was considered a dry-weather exceedance. Wet-weather days were days of more than 0.1 inch of rain and the three days following rain days. The exceedance probabilities for both wet and dry weather were calculated by dividing the total number of “exceedance days” (wet or dry) by the total number of wet or dry sample days.

The STV objective is considered exceeded if the samples collected exceed the STV number more than 10 percent of the time within a calendar month. When, on any given month, the STV objective was exceeded, that month was counted as an “exceedance month.” A month was considered a wet-weather month if the month had any wet-weather exceedance days, and a month was considered a dry-weather month if the month had any dry-weather exceedance days. So, a month could be considered a dry-weather and wet-weather month simultaneously. The exceedance probabilities for wet and dry weather were calculated by dividing the total number of “exceedance months” (wet or dry) by the total number of months that had wet or dry samples.

The exceedance probability was also calculated for seasonality. Summer was defined as April 1-October 31, and Winter as November 1-March 31.

The reference approach considers the critical condition of wet weather by determining the 90th percentile storm year in terms of wet days. The storm year is defined as November 1-October 31. The 90th percentile storm year was identified by constructing a cumulative

frequency distribution of annual wet weather days (0.1 inch of rain and the three days following) using historical rainfall data from the Long Beach Airport Meteorological Station. 2011 was identified as the 90th percentile storm year and used as the "reference year" for the Los Cerritos Channel Watershed. The "reference year" has 294 dry days, 71 wet days, 214 summer days, and 151 winter days. Generally, sampling occurs under a "weekly sampling regime"; therefore, the number of days in the "reference year" was adjusted to weekly and resulted in 42 weeks for dry weather, 11 weeks for wet weather, 31 weeks for summer, and 22 weeks for winter. An example of the calculation to adjust to a "weekly sampling regime" is seen below for the dry weather condition:

$$\frac{294\ days}{365\ days} = \frac{x}{52\ weeks}, x = 41.9$$

To calculate the allowable exceedances, the lowest exceedance probability between the reference system and the target waterbody was selected (the exceedance probability for the reference system was always lower than that of the target waterbody) and multiplied by the number of weeks (dry, wet, summer, or winter) in the reference year. Results were rounded up where the fractional remainder equals or exceeds 1/10th (e.g., 16.1 is rounded up to 17).

An example of the allowable exceedance calculation using the dry-weather condition and the SSM is seen below:

$$1.6\% \times 41.9 = 0.67 \text{ (rounded up = 1 day)}$$

An example of the allowable exceedance calculation using the dry weather condition and the STV is seen below:

$$2.6\% \times 41.9 = 1.09 \text{ (rounded down = 1 month)}$$

A summary of the reference system analysis for the two target waterbodies is discussed below.

a. Los Cerritos Channel

Staff analyzed *E. coli* data from the San Gabriel River Bacteria TMDL's reference system from the fall of 2004 to the spring of 2007. Staff analyzed *E. coli* data from the MS4 receiving water station in Los Cerritos Channel (LCC1) from 2000-2019. A 1:1 fecal coliform to *E. coli* ratio was used to translate fecal coliform data to *E. coli* for the purpose of analysis.

Results for the exceedance frequencies and the allowable exceedances are shown in Table 1 and Table 2 for the dry-weather and wet-weather condition, and in Table 3 and Table 4 for the summer and winter condition.

Table 1: SSM Allowable Exceedances for Dry- and Wet-Weather Condition

Waterbody	2010 Basin Plan SSM Objective (235/100 mL)	
	Dry	Wet
Freshwater Reference System Exceedance Probability	1.6%	19%
Los Cerritos Channel Exceedance Probability	75%	100%
Allowable Exceedance Days (Weekly Sampling)	1	2

Table 2: STV Allowable Exceedances for Dry- and Wet-Weather Condition

Waterbody	2018 Statewide Bacteria Provision STV (320/100 mL)	
	Dry	Wet
Freshwater Reference System Exceedance Probability	2.6%	37%
Los Cerritos Channel Exceedance Probability	69%	96%
Allowable Exceedance Months (Weekly Sampling)	1	4

Table 3: SSM Allowable Exceedances for Summer and Winter Condition (All Samples)

Waterbody	2010 Basin Plan SSM Objective (235/100 mL)	
	Summer	Winter
Freshwater Reference System Exceedance Probability	3.8%	4.0%
Los Cerritos Channel Exceedance Probability	80%	100%
Allowable Exceedance Days (Weekly Sampling)	2	1

Table 4: STV Allowable Exceedances for Summer and Winter Condition (All Samples)

Waterbody	2018 Statewide Bacteria Provision STV (320/100 mL)	
	Summer	Winter
Freshwater Reference System Exceedance Probability	5.2%	8.1%
Los Cerritos Channel Exceedance Probability	79%	95%
Allowable Exceedance Months (Weekly Sampling)	2	2

b. Alamitos Bay

Staff analyzed *Enterococcus* data from the Leo Carrillo Beach reference system and Alamitos Bay from Storm Year 2005-2017.

Results for the exceedance frequencies and the allowable exceedance are shown in Table 5 and Table 6 for the dry-weather and wet-weather condition, and in Table 7 and Table 8 for the summer and winter condition.

Table 5: SSM Allowable Exceedances for Dry- and Wet-Weather Condition

Waterbody	2010 Basin Plan SSM Objective (104/100 mL)	
	Dry	Wet
Leo Carrillo Reference System Exceedance Probability	6%	18%
Alamitos Bay Exceedance Probability	11%	55%
Allowable Exceedance Days (Weekly Sampling)	3	2

Table 6: STV Allowable Exceedances for Dry- and Wet-Weather Condition

Waterbody	2018 Statewide Bacteria Provision STV (110/100 mL)	
	Dry	Wet
Leo Carrillo Reference System Exceedance Probability	15%	23%
Alamitos Bay Exceedance Probability	30%	65%
Allowable Exceedance Months (Weekly Sampling)	7	3

Table 7: SSM Allowable Exceedances for Summer and Winter Condition (All Samples)

Waterbody	2010 Basin Plan SSM Objective (104/100 mL)	
	Summer	Winter
Leo Carrillo Reference System Exceedance Probability	6%	11%
Alamitos Bay Exceedance Probability	11%	25%
Allowable Exceedance Days (Weekly Sampling)	2	3

Table 8: STV Allowable Exceedances for Summer and Winter Condition (All Samples)

Waterbody	2018 Statewide Bacteria Provision STV (110/100 mL)	
	Summer	Winter
Leo Carrillo Reference System Exceedance Probability	13%	32%
Alamitos Bay Exceedance Probability	38%	65%
Allowable Exceedance Months (Weekly Sampling)	4	7

As stated previously, the SSM reference system approach would allow for a daily allowable exceedance and the STV reference system approach would allow for a monthly allowable exceedance. Comparing the reference system approach results for Los Cerritos Channel and Alamitos Bay yielded similar results in that the STV allows for a greater number of exceedances.

To illustrate the potential ramifications of using the STV reference system approach, a scenario is analyzed below:

Scenario: In the winter period under a weekly sampling regime, there are five *E. coli* samples above 320/100ml in three separate months

Under this scenario, the SSM objective would be exceeded five times and the STV would be exceeded three times because under a weekly sampling regime, exceeding a minimum of one out of four samples (total samples in a month) would exceed the allowable 10 percent exceedance frequency. Looking at Table 3 and Table 4, the SSM reference system approach allows one exceedance day and the STV reference system approach allows two exceedance months. Under the SSM reference approach, one of the five exceedances are allowed, resulting in four violations, but under the STV reference system approach, two of the five exceedances are allowed, resulting in three violations.

This scenario shows that, unlike the SSM reference system approach, the STV reference system approach would allow for multiple exceedances within a month but not result in multiple violations. As a result, a reference system approach with a monthly objective would not sufficiently protect the REC-1 beneficial use. Therefore, staff recommends the Numeric Targets be consistent with the current Statewide Bacteria Provisions instead of using a reference system/antidegradation approach as has been used previously in the Los Angeles Region.