Purpose of the Workshop

- Provide an overview of the Staff Report Appendices:
    - Appendix J. Evaluating Laboratory Performance with the Chronic *Ceriodaphnia dubia* Reproduction Toxicity Test
    - Appendix K. Survey of Laboratory Toxicity Testing Logistical Capacities
- Answer questions about the Staff Report Appendices

Appendix J: Overview

200 μm

Purpose:

- Discuss recent research and information on how laboratory performance affects the pass or fail result of the chronic *Ceriodaphnia dubia* reproduction toxicity test when using the Test of Significant Toxicity (TST) and No Observed Effect Concentration (NOEC) statistical approaches

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Appendix J: Overview

5 Sections:

- Key findings
- Summary of key statistical concepts
- Analysis of laboratory performance and its effects on the acceptable false positive probabilities
- Assessment of actual permit compliance data
- Probabilities of violations or a toxicity reduction evaluation (TRE) based on a TST fail ≤10% effect

Key Statistical Concepts

- Percent effect (or mean percent effect): the difference between the control mean and sample mean divided by the control mean

- Coefficient of variation (CV): measures the relative variation of a data set

- False positive: when the sample is declared toxic (fail) but the sample is in fact not toxic
  - In the TST statistical approach, the acceptable false positive probability is the 5% probability of a fail ≤10% effect

Appendix J: Key Finding #1

- When within-test variability is low and percent effect is low, the NOEC is more likely to declare a sample toxic than the TST

- When within-test variability is high and percent effect ≥ 25%, the NOEC is less likely to declare a sample toxic, while the TST will always declare the sample toxic

Appendix J: Key Finding #2

- Fox et al. 2019 shows 4 out of 6 laboratories had low within-test variability and can attain the acceptable 5% false positive probability of a fail at ≤ 10% effect using 10 replicates (N=10)

- If the number of replicates were increased to 20 (N=20), then 5 out of 6 laboratories would meet the acceptable false positive probability

Table J-1

Laboratory	Time Period	Number of Tests	Median Control CV	False Positive Probability met with 10 Replicates	False Positive Probability met with 10 – 20 Replicates
A-Commercial Laboratory	2012-2015	43	0.23	no	no
B-Commercial Laboratory	2012-2015	18	0.15	yes	yes
C-Commercial Laboratory	2012-2015	20	0.20	no	yes
D-2 LACSD Municipal Laboratory	2012-2015	57	0.10	yes	yes
E-Commercial Laboratory	2012-2015	22	0.11	yes	yes
F-San Jose Santa Clara Municipal Laboratory	2012-2015	20	0.11	yes	yes

Appendix J: Key Finding #3

- State Water Board staff analysis indicates 3 out of 4 laboratories had low within-test variability and can attain the acceptable 5% false positive probability of a fail at ≤ 10% effect using 10 replicates (N=10)

- If the number of replicates increases to 20 (N=20), then all 4 laboratories would meet the acceptable false positive probability
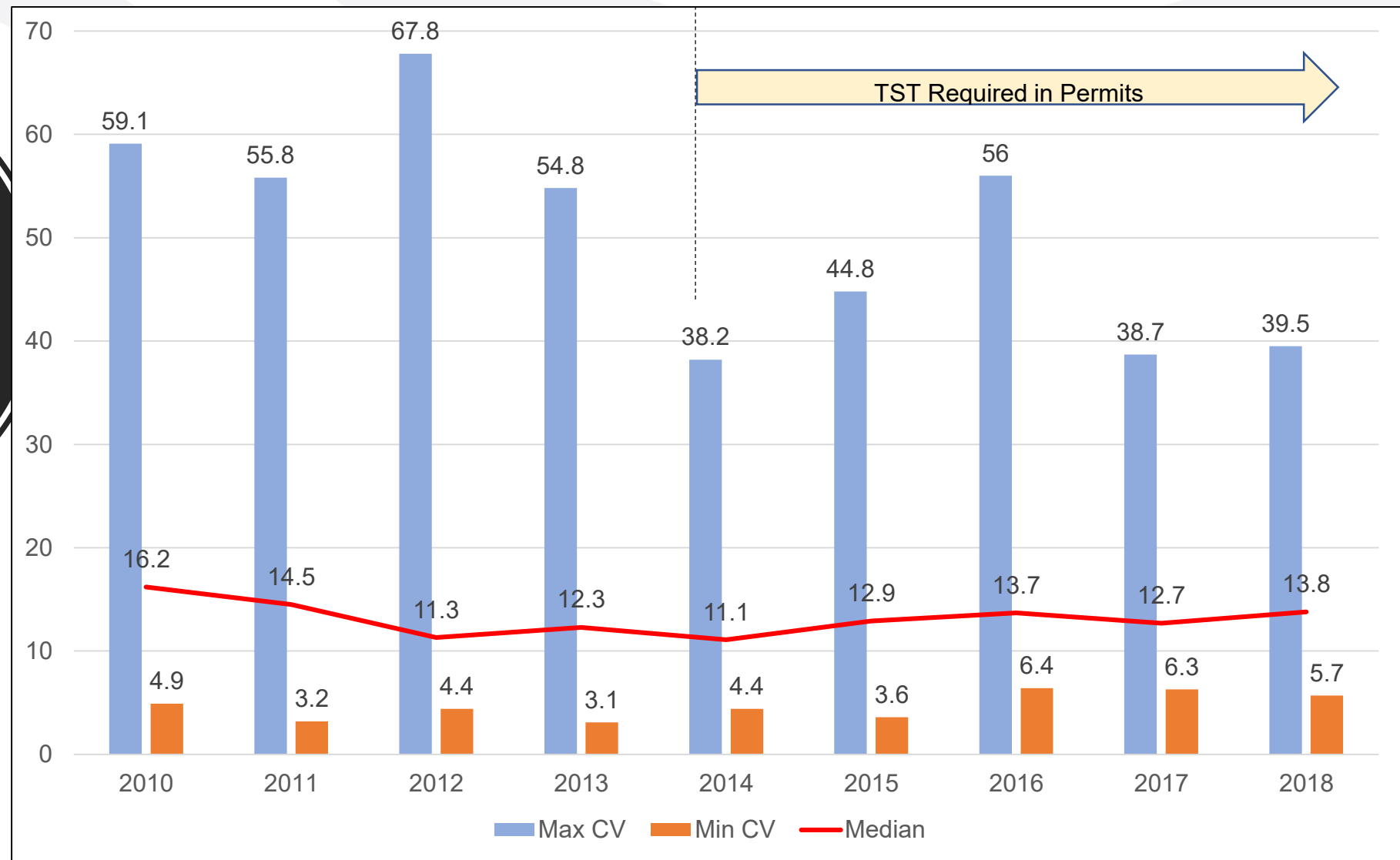
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Table J-2

Laboratory	Time Period	Number of Tests	Median Control CV	False Positive Probability met with 10 Replicates	False Positive Probability met with 10 – 20 Replicates
Commercial Laboratory #1	2018-19	75	0.08	yes	yes
Commercial Laboratory #2	2019	75	0.12	yes	yes
Commercial Laboratory #3	2019	100	0.16	no	yes
LACSD Municipal Laboratory	2017-18	203	0.13	yes	yes

Appendix J: Key Finding #4

- The TST statistical approach incentivizes laboratories to produce more precise data and increase statistical power

- Examples:

  A. Los Angeles County Sanitation District (LACSD) San Jose Creek Laboratory

  B. Commercial Laboratory #3

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Example A: LACSD San Jose Creek Lab

Figure J-4

Example B: Commercial Laboratory #3

Table J-3

Laboratory	Time Period	Number of Tests	Median Control CV	Acceptable False positive Probability met at N=10	Acceptable False positive Probability met at N=10–20
LACSD Municipal Laboratory	Pre-2012 TST Test Drive	30	0.17	no	yes
LACSD Municipal Laboratory	2012-2015	57	0.10	yes	yes
LACSD Municipal Laboratory	2017-2018	203	0.13	yes	yes
Commercial Laboratory #3	2017	93	0.24	no	yes
Commercial Laboratory #3	2018	142	0.19	no	yes
Commercial Laboratory #3	2019	100	0.16	no	yes

Appendix J: Key Finding #5

- The TST statistical approach:
  - Is less likely than the NOEC to identify a sample as toxic when biological effects are negligible (≤ 10% effect)
  - Will always identify a sample as toxic when percent effect is ≥ 25% effect

- Based on 984 California laboratory results reviewed,
  - No fails ≤ 10% effect level
  - No passes ≥ 25% effect level

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Figure J-6

Test Drive NPDES Facilities
TST Pass/Fail Results *C. dubia* Reproduction (N=209 tests)

Figure J-7

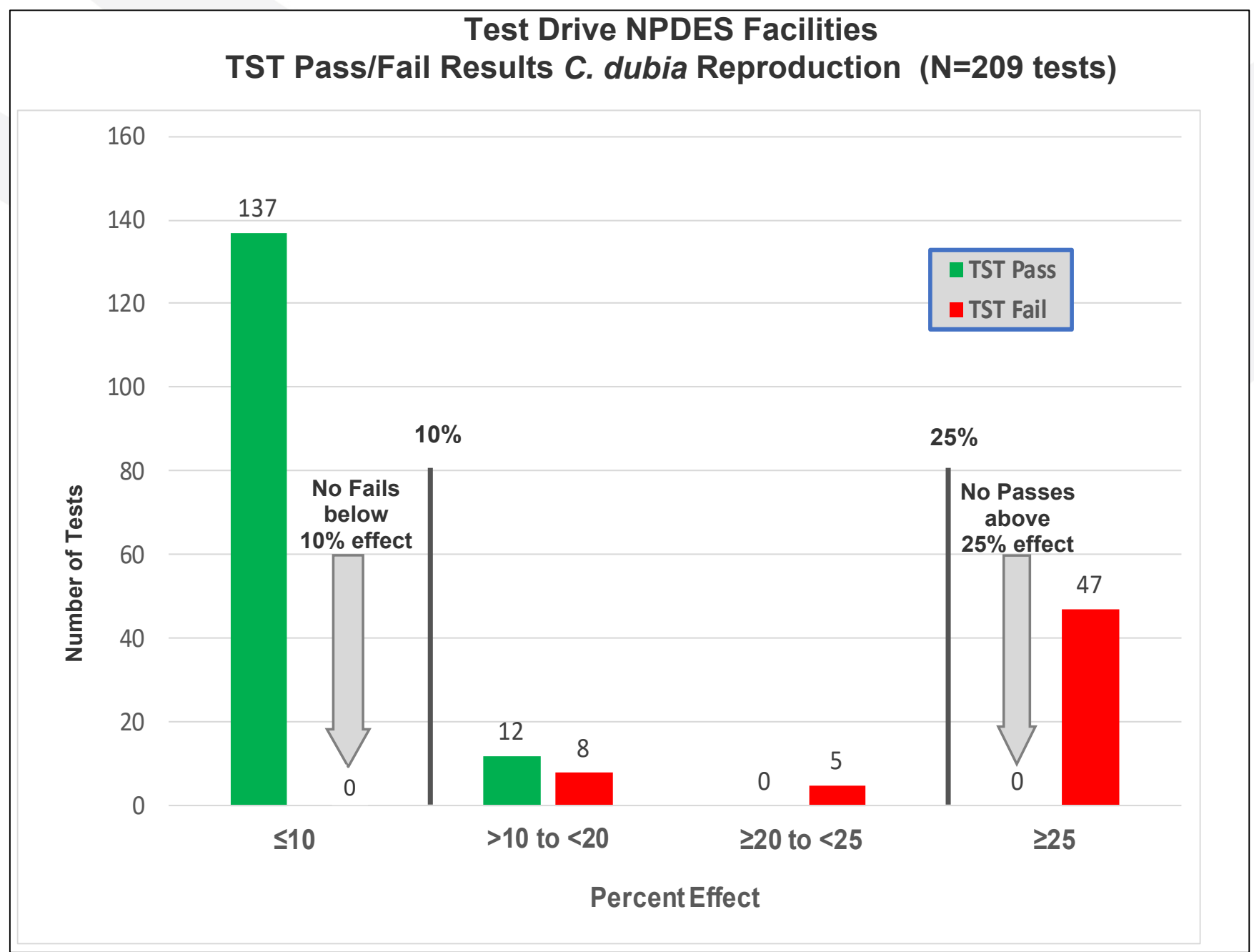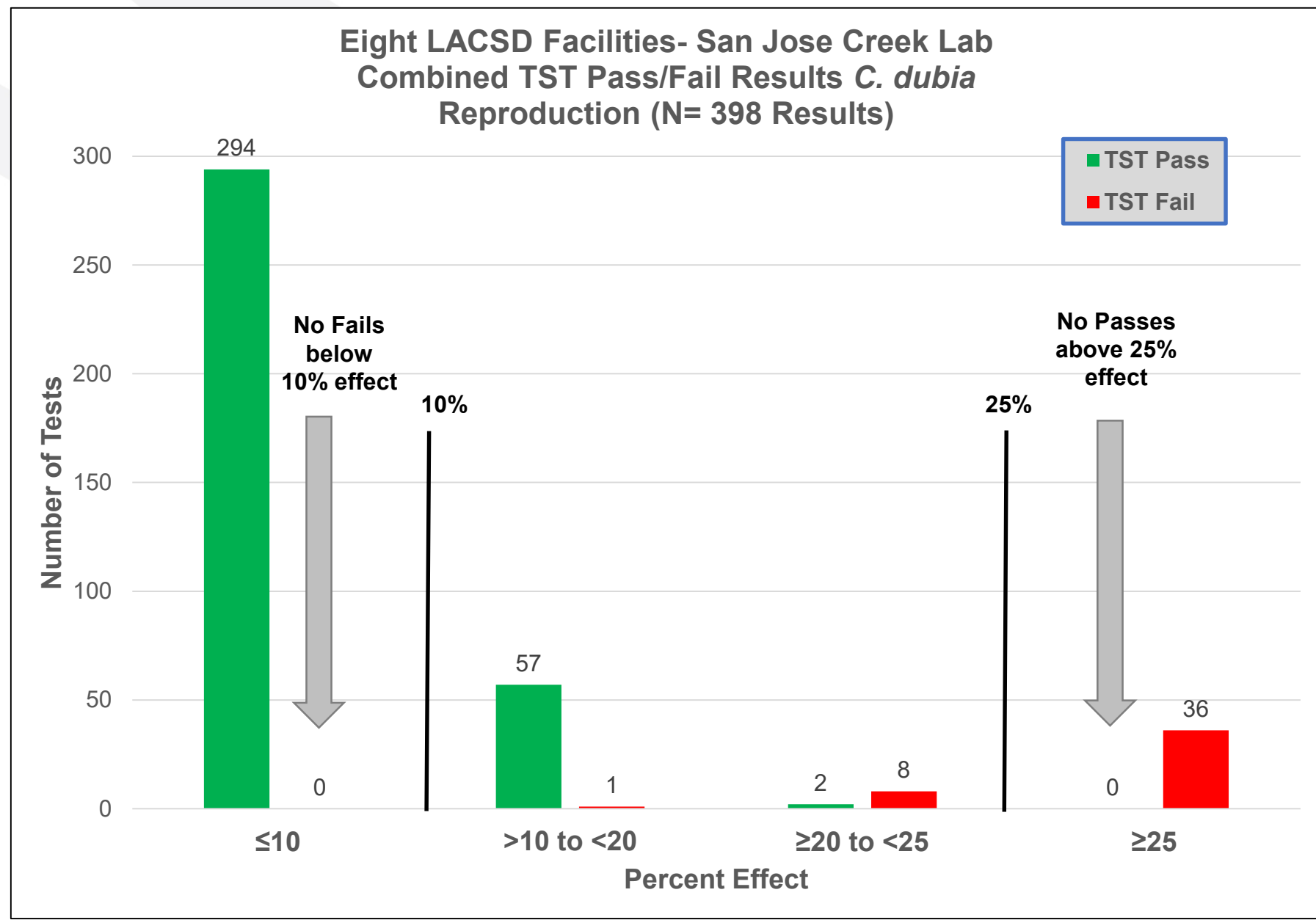Eight LACSD Facilities- San Jose Creek Lab Combined TST Pass/Fail Results *C. dubia* Reproduction (N= 398 Results)

Appendix J: Key Finding #6

- Fox 2019 Memo found:
  - The probability of determining a single median monthly effluent limitation (MMEL) violation based on TST fails ≤ 10%is very low
  - The probability of being required to conduct a TRE based on TST fails ≤ 10% is even lower

Probabilities from Fox 2019 Memo

With control CV=0.15 and N=10 replicates:

- The probability of the TST statistical approach resulting in a fail ≤ 10% is 4.8%
- The probability of a MMEL violation is 0.49%
- The probability of a TRE is 0.00238%

Appendix K: Survey of Laboratory Toxicity Testing Logistical Capacities

- State Water Board staff contacted 23 laboratories accredited by the Environmental Laboratory Accreditation Program (ELAP)

- 20 out of 23 laboratories responded to the survey

- 3 main topics of survey questions:
  1. Laboratory logistics of conducting toxicity tests
  2. Contingency plans when toxicity tests cannot be conducted
  3. Costs of toxicity tests

Appendix K: Summary Findings

Table K-1. Practicable Timeframe for Initiating MMEL Compliance Tests

	Test Initiation Starts On:	Test Results Available On:
MMEL Routine Monitoring Test	Day 1	Day 7 to 10
1st MMEL Compliance Test	Day 8 to 17	Day 15 to 27
2nd MMEL Compliance Test	Day 16 to 28*	Day 23 to 38

*If required, the second MMEL compliance test must be initiated by the end of the calendar month, which will range from 28 to 31 days in length.

Appendix K: Summary Findings

- There is sufficient time to initiate 3 toxicity tests within the same calendar month, if the routine monitoring test is initiated at or near the beginning of the calendar month

- Good communication and coordination between the dischargers and their laboratories is important

- The size of the laboratory and staff availability may impact the feasibility of conducting multiple toxicity tests in a calendar month

Project Timeline

February 10, 2020	End of Limited-Scope Public Comment Period
Spring 2020	Release of Response to Comments and 2nd Revised Draft Provisions and Staff Report
Summer 2020	State Water Board Consideration (Tentative)

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Documents & Additional Information Available at:

https://www.waterboards.ca.gov/water_issues/programs/state_implementation_policy/tx_ass_cntrl.html

Questions?

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