Central Contra Costa Sanitary District

CCCSD Comments on: SWRCB Draft Policy for Toxicity Assessment and Control

By

Margaret P. Orr, P.E.

Director of Plant Operations

CCCSD

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Central Contra Costa Sanitary District

CCCSD Comments:

The intent of the Policy

(to reduce the false negative rate)

is **good**, but the proposed approach is **flawed**.

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CCCSD Comments:

The recommended Statistical Method has much lower Statistical Power (~0.6) than the nominal (0.9).

The Statistical Power of the Method represents its ability to distinguish “toxic” (fail) from “non-toxic” (pass) effluent.

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CCCSD Comments:

Consequences of low statistical power:

1. It will lead to Faulty regulatory decisions
   - “Non-toxic” samples will be declared “toxic” up to **40%** (normally 5%) of the time resulting in

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CCCSD Comments:

Consequences of low statistical power

2. It will lead to Inequitable regulatory decisions
   - Two discharges discharging same effluent quality
     - One will be declared out of permit compliance
     - The other in full compliance

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CCCSD Comments:

Consequences of low statistical power

3. It will lead to Waste of public resources
   - Unjustified fines ($)
   - Unneeded additional monitoring ($$)
   - Unneeded toxicity identification evaluations ($$$)

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CCCSD Comments:

Illustrations

(Case examples from the proposed Policy)

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CCCSD Comments:

Illustration No. 1

Chronic Ceriodaphnia Reproduction Test

Day 1

Replicate/Statistic	Control	Treatment
1	27	32
2	38	28
3	27	25
4	34	28
5	37	20
6	35	15
7	30	27
8	31	26
9	36	31
10	39	31
Mean	33.4	26.7
Std. deviation	4.402	3.417
N (# of replicates)	**10**	**10**

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CCCSD Comments:

Chronic Ceriodaphnia Reproduction Test

Day 2

Replicate/Statistic	Control	Treatment
1	29	31
2	28	28
3	31	25
4	34	28
5	36	22
6	35	21
7	30	27
8	31	26
9	36	29
10	34	30
Mean	33.4	26.7
Std. deviation	2.989	3.268
N (# of replicates)	**10**	**10**

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CCCSD Comments:

Chronic Ceriodaphnia Reproduction Test

Plugging the above statistics in the Policy's proposed Statistical Test Method the sample is declared "toxic" (fail) on Day 1, and "non-toxic" (pass) on Day 2

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CCCSD Comments:

Illustration No. 1

Chronic Ceriodaphnia Reproduction Test

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Central Contra Costa Sanitary District

CCCSD Comments:

Chronic Ceriodaphnia Reproduction Test

Day 2

Replicate/Statistic	Control	Treatment
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3	31	25
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CCCSD Comments:

Illustration No. 1

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CCCSD Comments:

Chronic Ceriodaphnia Reproduction Test

Day 2

Replicate/Statistic	Control	Treatment
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6	35	21
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9	36	29
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Mean	**33.4**	**26.7**
Std. deviation	2.989	3.268
N (# of replicates)	**10**	**10**

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CCCSD Comments:

Note that:

- Ceriodaphnia mean reproduction in effluent on day 1 (26.7 youngs per female) is identical to the reproduction on day 2. Same is true for control.

  i.e. The projected effluent impact on the biological resources of the receiving water is identical on both days

  and

  The effluent is in compliance with the Policy's stated toxicity numeric limit on both days (the reproduction rate (26.7) in effluent is better than the numeric limit of 25 (0.75x33.4)
- However, on day 1, the effluent is declared "toxic" (fail) and on day 2 (same effluent reading) declared "non-toxic" (pass).

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CCCSD Comments:

Illustration No. 2

Effluent is split between two Laboratories

Chronic Fish Growth Test

Laboratory "A"

Replicate/Statistic	Control	Treatment
1	0.366	0.303
2	0.399	0.379
3	0.354	0.311
4	0.422	0.236
Mean	0.385	0.307
Std. deviation	0.031	0.0588
N (# of replicates)	**4**	**4**

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Chronic Fish Growth Test

Laboratory "B"

Replicate/Statistic	Control	Treatment
1	0.366	0.303
2	0.399	0.379
3	0.354	0.311
4	0.422	0.236
5	0.343	0.364
6	0.407	0.247
Mean	0.382	0.307
Std. deviation	0.032	0.058
N (# of replicates)	**6**	**6**

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CCCSD Comments:

Once again note that:

- The mean fish growth (weight) in Laboratory “A” (0.307 units) is identical to Laboratory “B”
- i.e. The projected effluent impact on the biological resources of the receiving water is identical in both cases

  and

  the effluent is in compliance with the Policy’s stated toxicity numeric limit (the fish growth in effluent (0.307 units) is better than the numeric limit 0.288 (0.75x0.385)

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CCCSD Comments:

Illustration No. 2

Effluent is split between two Laboratories

Chronic Fish Growth Test

Laboratory "A"

Replicate/Statistic	Control	Treatment
1	0.366	0.303
2	0.399	0.379
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4	0.422	0.236
Mean	0.385	0.307
Std. deviation	0.031	0.0588
N (# of replicates)	**4**	**4**

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CCCSD Comments:

Chronic Fish Growth Test

Laboratory "B"

Replicate/Statistic	Control	Treatment
1	0.366	0.303
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Mean	0.382	0.307
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CCCSD Comments:

Once again note that:

- The mean fish growth (weight) in Laboratory “A” (0.307 units) is identical to Laboratory “B”
- i.e. The projected effluent impact on the biological resources of the receiving water is identical in both cases

  and

  the effluent is in compliance with the Policy’s stated toxicity numeric limit (the fish growth in effluent (0.307 units) is better than the numeric limit 0.288 (0.75x0.385)
- However, laboratory “A” declared the effluent “toxic” (fail) and Laboratory “B” declared the same effluent “non-toxic.”

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CCCSD Comments:

Illustration

Chemical Test vs. Toxicity Test Compliance Analogy

Chemical Test
(Copper Measurement)

Test Date	Concentration µg/L	Effluent Limit µg/L	Compliance Status
1	14	15	Pass
2	14	15	Pass

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CCCSD Comments:

Illustration

Chemical Test vs. Toxicity Test Compliance Analogy

Toxicity Test (Chronic Ceriodaphnia Reproduction Test)

Test Date	Reproduction Rate In		Toxicity Numeric Limit	Compliance Status
	IWC (effluent)	Control		
1	26.7	33.4	25*	Pass
2	26.7	33.4	25*	Fail

* According to the proposed Policy.

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CCCSD Comments:

Illustration

Chemical Test vs. Toxicity Test Compliance Analogy

In chemical tests the measurement of 14 µg/L is always 14 µg/L

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Illustration

Chemical Test vs. Toxicity Test Compliance Analogy

In chemical tests the measurement of 14 µg/L is always 14 µg/L

However, in toxicity tests the reproduction rate of 26.7 is not always going to be 26.7 using the Policy's proposed Statistical Method (control remaining constant).

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Toxicity Test (Chronic Ceriodaphnia Reproduction Test)

Test Date	Reproduction Rate In		Toxicity Numeric Limit	Compliance Status
	IWC (effluent)	Control		
1	26.7	33.4	25*	Pass
2	26.7	33.4	25*	Fail

* According to the proposed Policy.

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CCCSD Comments:

Illustration

Chemical Test vs. Toxicity Test Compliance Analogy

In chemical tests the measurement of 14 µg/L is always 14 µg/L

However, in toxicity tests the reproduction rate of 26.7 is not always going to be 26.7 using the Policy's proposed Statistical Method (control remaining constant).

i.e. The reproduction of 26.7 is "pass" on day 1 and "fail" on day 2.

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CCCSD Comments:

Bottom Line:

As you have seen above

- Effluent quality remaining acceptable, the use of the proposed Statistical Method will jeopardize the compliance record of a discharger and result in waste of public resources.

That is *wrong* from a discharger's point of view and the public we serve.

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CCCSD Comments:

Recommendation:

Do not adopt the policy in its current form

Allow more time for comments