



Chris Linneman
Summers Engineering, Inc.
887 N. Irwin St
Hanford, CA 93230

May 20, 2022

Chris:

I have enclosed our report “Evaluation of the Toxicity of Grasslands Bypass Project Ambient Water: Event 85” for the sample that was collected April 18, 2022. The results of this testing are summarized below.

Toxicity summary for the Grasslands Bypass Project ambient water sample.			
Sample Station	Toxicity relative to the Lab Water Control treatment?		
	<i>Selenastrum capricornutum</i>	<i>Daphnia magna</i>	Fathead Minnow
	Growth	Survival	Survival
GBP-85-D-TE	No	No	No

Chronic Toxicity of Grasslands Bypass Project Ambient Water to *Selenastrum capricornutum*

There was **no** significant reduction in growth in the Site D ambient water sample.

Acute Toxicity of Grasslands Bypass Project Ambient Water to *Daphnia magna*

There was **no** significant reduction in survival in the Site D ambient water sample.

Acute Toxicity of Grasslands Bypass Project Ambient Water to Fathead Minnows

There was **no** significant reduction in survival in the Site D ambient water sample.

If you have any questions regarding the performance and interpretation of these tests, feel free to contact us at (707) 207-7760.

Sincerely,

Digitally signed by Stevi Vasquez
Date: 2022.05.20 14:29:51 -07'00'

Stevi Vasquez
Project Manager



Pacific EcoRisk is accredited in accordance with NELAP (ORELAP ID 4043). Pacific EcoRisk certifies that the test results reported herein conform to the most current NELAP requirements for parameters for which accreditation is required and available. Any exceptions to NELAP requirements are noted, where applicable, in the body of the report. This report shall not be reproduced, except in full, without the written consent of Pacific EcoRisk. This testing was performed under Lab Order 22166.



Chris Linneman
Summers Engineering, Inc.
887 N. Irwin St
Hanford, CA 93230

July 1, 2022

Chris:

I have enclosed our report “Evaluation of the Toxicity of Grasslands Bypass Project Ambient Water: Event 86” for the sample that was collected May 26, 2022. The results of this testing are summarized below.

Toxicity summary for the Grasslands Bypass Project ambient water sample.			
Sample Station	Toxicity relative to the Lab Water Control treatment?		
	<i>Selenastrum capricornutum</i>	<i>Daphnia magna</i>	Fathead Minnow
	Growth	Survival	Survival
GBP-86-D-TE	No	No	No

Chronic Toxicity of Grasslands Bypass Project Ambient Water to *Selenastrum capricornutum*

There was **no** significant reduction in growth in the Site D ambient water sample.

Acute Toxicity of Grasslands Bypass Project Ambient Water to *Daphnia magna*

There was **no** significant reduction in survival in the Site D ambient water sample.

Acute Toxicity of Grasslands Bypass Project Ambient Water to Fathead Minnows

There was **no** significant reduction in survival in the Site D ambient water sample.

If you have any questions regarding the performance and interpretation of these tests, feel free to contact us at (707) 207-7760.

Sincerely,

Digitally signed by Stevi Vasquez
Date: 2022.07.01 12:03:55 -07'00'

Stevi Vasquez
Project Manager



Pacific EcoRisk is accredited in accordance with NELAP (ORELAP ID 4043). Pacific EcoRisk certifies that the test results reported herein conform to the most current NELAP requirements for parameters for which accreditation is required and available. Any exceptions to NELAP requirements are noted, where applicable, in the body of the report. This report shall not be reproduced, except in full, without the written consent of Pacific EcoRisk. This testing was performed under Lab Order 22166.



Chris Linneman
Summers Engineering, Inc.
887 N. Irwin St
Hanford, CA 93230

July 28, 2022

Chris:

I have enclosed our report “Evaluation of the Toxicity of Grasslands Bypass Project Ambient Water: Event 87” for the samples collected on June 23, 2022. The results of this testing are summarized below.

Toxicity summary for the Grasslands Bypass Project ambient water samples.			
Sample Station	Toxicity relative to the Lab Water Control treatment?		
	<i>Selenastrum capricornutum</i>	<i>Daphnia magna</i>	Fathead Minnow
	Growth	Survival	Survival
GBP-87-D-TE	No	No	No
GBP-87-B3-TE ^a	No	No	No
GBP-87-F-TE	No	No	No
GBP-87-R-TE	No	No	No

a – As the pH of this sample was >9.0, and as per Section 8.8.8 of the chronic toxicity testing manual (EPA-821-R-02-013) and Section 9.1.9 of the acute toxicity testing manual (EPA-821-R-02-012), parallel testing was performed (one at the ambient (unadjusted) pH and one with the pH adjusted to pH7).

Chronic Toxicity of Grasslands Bypass Project Ambient Water to *Selenastrum capricornutum*

There were **no** significant reductions in algal growth in any of the ambient water samples.

Acute Toxicity of Grasslands Bypass Project Ambient Water to *Daphnia magna*

There were **no** significant reductions in survival in any of the ambient water samples.

Acute Toxicity of Grasslands Bypass Project Ambient Water to Fathead Minnows

There were **no** significant reductions in survival in any of the ambient water samples.

SUMMERS ENGINEERING

887 N. Irwin St. – PO Box 1122
Hanford, CA 93232

MEMORANDUM

TO: The Files of the Grassland Bypass Project

FROM: Chris Linneman

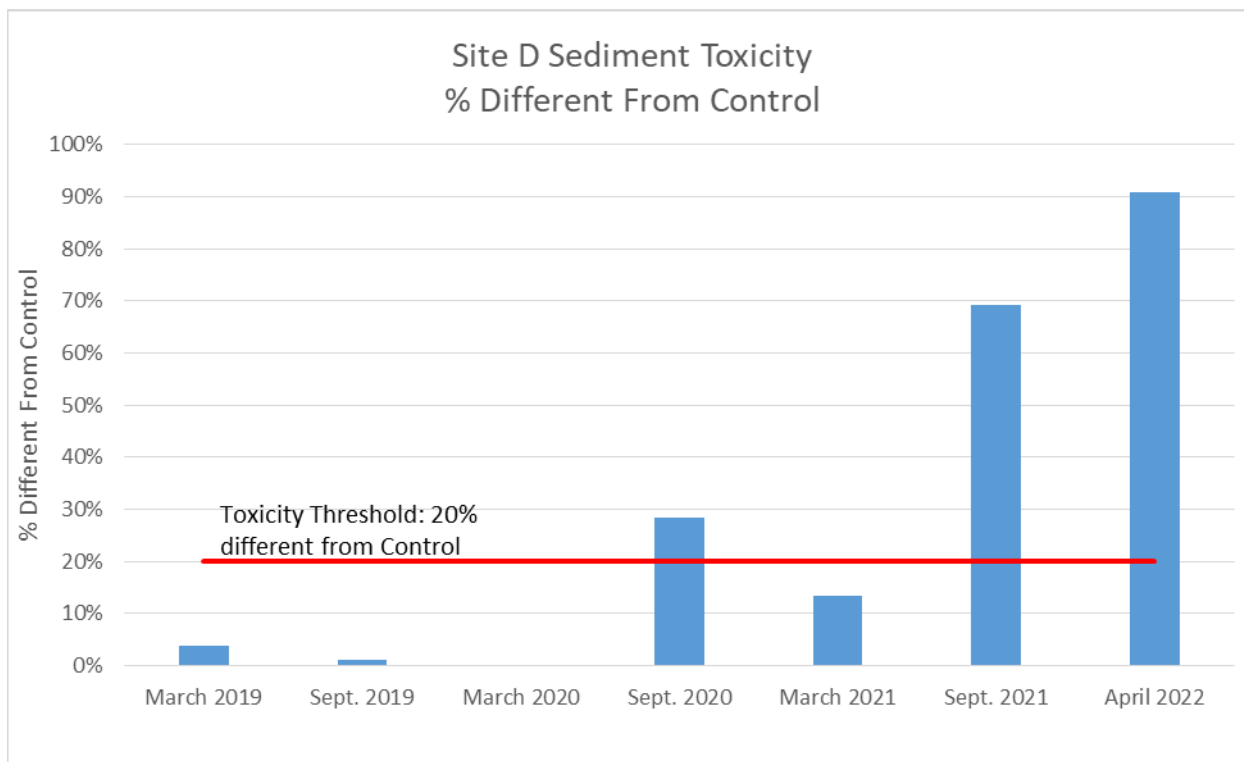
DATE: January 24, 2022 (Updated 8/18/22)

SUBJECT: Sediment Toxicity at Site D and follow up

Site D, located in Mud Slough at the bridge downstream of the San Luis Drain outlet, is measured for aquatic toxicity monthly and sediment toxicity twice a year, typically March and September. Historically, sediment toxicity issues are rare, with only one toxic event for sediment from 2015 to 2020. However, after 2020, sediment toxicity issues have become more frequent at Site D, with statistically significant toxicity occurring three times between the September 2020 event and the April 2022 event.

<u>Date</u>	<u>% Survival (% difference from Control)</u>	<u>Statistical Result</u>
March 23, 2020	98.8% (0% different from Control)	Not Toxic
Sept. 26, 2020	68.8% (28.5% different from Control)	Toxic
March 21, 2021	81.2% (13% different from Control)	Not Toxic
Sept 19, 2021	30.0% (69% different from Control)	Toxic
April 5, 2022	7.5% (91% different from Control)	Toxic

Although the statistical analysis is more complicated, a sediment sample is usually considered to be “toxic” if the percent difference from control is greater than 20%. Since 2020, both the frequency and severity of sediment toxicity at Site D has increased.



When toxicity is observed, the sample is further tested for pesticides that are typically associated with sediment toxicity, mostly in the pyrethroid category of pesticides. Follow up pesticide analyses for each of the three event with observed toxicity did not reveal a cause. No pesticides were detected for the September 2020 and April 2022 events, and only a small amount of bifenthrin (0.33j ng/g) was detected in the September 2021 sample¹. As a result, the cause of the recurring sediment toxicity is unknown.

The next step in determining the cause of toxicity is a phased approach to toxicity identification and would be performed if the initial sample was toxic again. This would include:

- Porewater toxicity and chemistry analysis. This process would extract the porewater from the sediment sample and test it for both toxicity to *Hyaella azteca* and for chemical constituents that are likely to contribute to toxicity.
- Depending on the results of the porewater analysis, a second step would be a Phase 1 Toxicity Identification Evaluation (TIE), which would identify the “class” of contaminant (i.e. organic pesticide or metal) that is causing the toxicity. This could be done on the bulk sediment or extracted porewater or both, depending on the previous results.

The cost for this additional follow up would range from \$10,000 to \$14,000, depending on the level of analysis required.

¹ The detected amount of bifenthrin is well below LC50 for bifenthrin (9.1 ng/g) and substantially lower than what would have caused the observed toxicity.