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DRAFT MEMORANDUM

To: Keith Smith February 28, 2000

From: Doug Henderson / Linda Logan 556-2912-001 (61)

Subject: Range-Finding WERs

Background

This memorandum provides a scope and budget for conducting range-finding Water-Effect Ratios (WERs) using just receiving water from Miller and Des Moines Creeks. Recall that such testing is necessary in the event that the Port is not granted a mixing zone. The budget only includes costs associated with conducting the tests, and does not include additional consulting time that may be required (e.g., meetings with the Port or with DOE or responding to Port comments). The objective of the range-finding WERs is to determine if the final WERs would be robust enough to warrant the expense of conducting definitive studies. The range-finding studies consist of concurrent acute toxicity tests with copper-spiked site water and copper-spiked laboratory water. A median lethal concentration (LC50) is then determined for each water, and the two LC50s are compared to generate a WER:

$$\frac{\text{LC50 Site Water}}{\text{LC50 Laboratory Water}} = \text{WER}$$

The WER is then applied to the generic water quality standard to derive a site-specific standard:

$$\text{WER} * \text{Generic WQS} = \text{Site-specific WQS}$$

For example, if the water quality standard for a chemical is 3 µg/L, and a WER of 3 is derived for a particular site, the resulting site-specific water quality standard would be 9 µg/L.

Unlike a definitive WER study, exposure concentrations in a range-finding WER study are not analytically verified, and the resulting LC50s are based on nominal concentrations only. Although this approach does not fulfill the requirements associated with proposing a site-specific criterion to the state and federal agencies, it does provide an inexpensive estimate of the magnitude of the WER that would be obtained from a definitive study.



Results of the 23 February 1999 range-finding studies indicated that the WERs probably would provide sufficiently higher permit limits to warrant the cost of developing a definitive WER. Based on nominal concentrations for total copper, copper WERs for Miller, Walker and Des Moines Creeks were approximately 16, 7 and 15, respectively. However, these WERs were conducted assuming that a mixing zone would be granted. Therefore, the site waters were a mixture of SDS3 stormwater and receiving water to represent the edge of a hypothetical mixing zone. Given that mixing zones may be unattainable, additional range-finding studies using just receiving water are recommended, as the magnitude of the WER may be different without the stormwater contribution expected at the edge of the mixing zone. Therefore, this round of range-finding WERs will help determine whether the magnitude of the WERs (without mixing zones) is likely to be large enough to warrant the cost of conducting definitive WER studies.

Recommended Tests

Downstream receiving water samples should be collected during a qualifying rain event. Ideally, samples would be collected from Miller, Des Moines and Walker Creeks. However, due to the sampling requirements for dissolved oxygen monitoring, sampling equipment may not be available for Walker Creek. Therefore, one-liter (minimum) samples for Miller and Des Moines Creeks will come from the equipment already in place for the dissolved oxygen monitoring. To determine the WER for each site, acute definitive *Ceriodaphnia dubia* tests using copper-spiked receiving water and copper-spiked laboratory water will be conducted. Costs to conduct these tests on a time-and-materials (not to exceed) basis, including statistical analyses and a memorandum summarizing the results, are provided in Table 1 below:

Table 1. Estimated costs to conduct definitive acute *Ceriodaphnia dubia* tests as part of the range-finding WER study.

Item	# of Units	Unit Cost	Total Cost
<i>Testing</i>			
Culturist	4	\$45	\$180
Technician	8	\$45	\$360
<i>Reporting</i>			
Tech Aid	2	\$55	\$110
Toxicologist	8	\$65	\$520
Senior Reviewer	4	\$100	\$400
Total Cost			\$1,570

Since more than one site is being evaluated for copper, the copper-spiked laboratory water test can be used to compare to the results of both copper-spiked site water tests. Therefore, to calculate the total cost to conduct range-finding WERs for one site (two acute tests), the testing costs would double, for a total of \$2,110. To calculate the costs to conduct range-finding WERs for two sites (three acute tests), the testing costs would triple, for a total cost of \$2,650.

The above costs are an estimate based on previous experience in conducting range-finding WERs. Actual costs may be higher or lower, depending on circumstances. For example, Culturist's time for "false starts" may be billed (if the organisms cannot be used for other tests), and Technician's rates will be 50 percent higher if the tests must be set up after hours to meet holding time requirements. The above costs also assume that Port personnel will ship or deliver the samples.

Please let me know if you have any questions or concerns. Thank you.

cc: J. Laughlin
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