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401/402 deferral.

DRAFT MEMORANDUM

To: Keith Smith February 14, 2000

From: Doug Henderson / Linda Logan 556-2912-01 (61)

Subject: Update on the Status of the Site-Specific WQC for Copper

This memorandum summarizes our efforts to date to develop a site-specific water quality criterion for copper in Miller, Walker, and Des Moines Creeks. The need for such development is based on the assumption that the quality of stormwater from the third runway will be similar to that currently discharged from SDS-3.

Prior to collecting any dat[redacted] was proposed to prevent unnecessary data collection (Figure 1). The two recommended methods for developing a site-specific WQC were the Water-Effect Ratio (WER) and the site-specific metals translator. The WER approach uses toxicity tests to evaluate the relative toxicity of copper-spiked site water compared to copper-spiked laboratory water. The ratio of these results is used to adjust the state water quality criterion, which is based on copper-spiked laboratory tests. The site-specific metals translator approach uses in-stream monitoring data to estimate the ratio of dissolved to total copper in the receiving water. This ratio is then used to calculate a new total copper permit limit based on the dissolved state WQC.

Although the site-specific metals translator is quicker and less expensive to develop than a WER, it is a less accurate estimate of copper bioavailability, as the bioavailable fraction of a metal is generally less than the dissolved fraction. Therefore, a WER will likely result in higher permit limits than a site-specific metals translator. For example, if the dissolved copper concentrations are half of the total copper concentrations, then the site-specific metals translator would be 0.5. As the current metals translator for copper is 0.96, the resulting permit limit would approximately double (total permit limit = dissolved criterion / translator). A WER, on the other hand, has the potential to raise the WQC two to ten fold.

Given the relatively higher costs associated with developing a WER, the phased approach was developed to spare the Port the expense of developing a WER if:

1. Initial toxicity screening results indicated that the WER was infeasible, or
2. Range-finding results indicated that the WER would not be robust enough to provide higher permit limits than the site-specific metals translator, or

3. Negotiations with the Department of Ecology (Ecology) indicated that they would not allow the use of a WER to adjust the permit limits.

Initial Toxicity Screening

The first phase of the approach determined whether site water would be suitable for conducting toxicity tests (i.e., was it toxic?). If site water is toxic, a WER would not be feasible. On 14 January 1999, samples were collected from Miller, Walker and Des Moines Creeks during a storm event. Screening level bioassays using *Ceriodaphnia dubia* indicated [redacted] streams, with 100% survival in each sample [redacted]

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Range-Finding Studies ~ Round 1. Assumed MZ.

On 23 February 1999, receiving water samples from Miller, Walker and Des Moines Creeks were collected during a storm event. In addition, storm water discharge from SDS3 was collected. In the laboratory, the SDS3 storm water sample was diluted with the receiving water samples to represent the concentrations that would be expected in the streams based on flows. These mixtures represented the hypothetical site waters that would exist after the construction of the third runway.

To determine the approximate magnitude of the WERs, range-finding WER studies were conducted using the simulated site water samples. The objective was to determine if the final WERs would be robust enough to warrant the expense of conducting definitive studies. The range-finding studies consisted of concurrent acute toxicity tests with copper-spiked site water and copper-spiked laboratory water. Unlike a definitive WER study, exposure concentrations were not analytically verified, and the resulting LC50s were 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 range-finding studies indicated that the WERs probably would provide higher permit limits than the site-specific metals translator. Based on nominal concentrations for total copper, copper WERs for [redacted] for the definitive WER study.

WER Workplan

In March 1999, an outline for the WER Workplan was developed. On 10 May 1999, the outline was presented to Gary Bailey of Ecology, and his initial reaction was positive. A few weeks later Gary Bailey provided us with a copy of Ecology's Water Effect Ratio guidance (Draft) from the Permit Writer's Manual. This guidance was followed in developing the draft *Workplan for Developing a Site-Specific Water Quality Standard for Copper (July 13, 1999)*. This Workplan is complete expect for a few sections, including:

- Introduction. Requires input from someone familiar with the overall scope of the project and how the WER fits in to the overall objective of constructing the third runway.
- Critical Conditions: Need to resolve.
- Sampling: Need to determine sample locations. Also need input from Scott Tobiason on sampling procedures.
- Quality Assurance: Partially complete. Requires input from Scott Tobiason relating to sampling.

Pretty major items.

Negotiations with Ecology

Subsequent meetings with Ecology have revealed that they are open to the possibility of developing a site-specific WQC for copper. Initially, Gary Bailey recommended that prior to considering developing a WER, the Port use [redacted] when collecting samples for determining a reasonable potential to exceed WQC (as specified in the WER guidance document). In response, Scott Tobiason forwarded the Port's sampling procedure manual to Gary Bailey for review. [redacted]

Ecology has also responded positively to another Parametrix project for the City of Chehalis to develop site-specific WQC for copper, silver and zinc in the Chehalis River. However, negotiations on both projects have indicated that there are several issues that need to be resolved. These include:

Doug's client.

Point of compliance: Typical WER methodology for continuous discharges simulates the edge of the mixing zone as the site water. The Port is still exploring the feasibility of mixing zones for the existing and future stormwater discharges (~~see attached memorandum~~). Additionally, although the Northwest Ponds are considered waters of the state and Lake Reba is not, the point of compliance has not been determined for either.

AKART: Before Ecology can grant the Port a mixing zone, the requirements for AKART must be fulfilled (WAC 173-201A-100(2)). Although the Port is applying BMPs to minimize impacts from stormwater discharges, Ecology has to agree that these meet "all known, available, and reasonable methods of prevention, control and treatment". [redacted] Additionally, the language in Ecology's [redacted]

Assume AKART met?

Critical conditions: According to the Ecology WER guidance document, the WER "should be measured three times at the time of critical conditions and once at a time of non-critical condition." The critical condition is defined in Washington's Water Quality Standards (WAC 173-201A-020) as [redacted]

[redacted] The Ecology WER guidance document states that the two periods most likely to be the time of critical condition for metals in freshwater whose criteria are hardness dependent are:

1) at the time of lowest water hardness (usually wintertime), or
2) at the time of lowest dilution (typically summer low flow).

[redacted] is unique in that increased stormwater discharge correlates with increased receiving water flow (for small streams like Miller and Des Moines Creeks). In addition, [redacted] As with the mixing zone, before developing a WER Ecology needs to promulgate a design storm. As far as we know, nothing has been finalized. However, an internal discussion paper developed at Ecology (DOE 1995) proposed the 2-year, 2-hour event and the 2-year, 72-hour event peak flow for the acute and chronic design storms, respectively.

does the guidance actually say this - can critical conditions be determined w/o design storm

Receiving Water Bioassessment: The Ecology WER guidance document states that before granting a WER this may be required in [redacted]s. Some bioassessment work has been initiated in Miller and Des Moines Creeks. Preliminary results indicate that these streams are representative of urban streams in this region. More data may be needed to assess seasonal variability. Given that we do have a complex discharge situation for stormwater at STIA, such data may be useful as part of the weight-of-evidence in determining compliance with water quality standards.

we clearly have

See "next steps"

WET Testing: Although the Port's Whole Effluent Toxicity (WET) characterization results meet Ecology's performance criteria for exemption from compliance testing, Ecology's WER guidance document requires the use of WET testing as a monitoring tool if a site-specific WQC for copper is adopted.

urge - this is

Next Steps

Note - Gary Conley mentioned WQC based on benthic values - what does that mean. (2 yrs)

1. Continue to explore compliance (with water quality standards) issues with Ecology (i.e., given recent BMG decision).
2. Determine what data should be / can be collected now while issue #1 is underway.
3. Confirm compliance with AKART (needed before a mixing zone or WER can be granted).
4. ~~For example~~, in the event that the Port is not granted mixing zones in Miller, Walker and Des Moines Creeks, the Port should consider conducting range-finding WERs using upstream water only. Under such circumstances, compliance with water quality standards would have to be end-of-pipe. The magnitude of the WER may be less

did this in 4/00

without the suspended solids and organic matter contribution from the stormwater. Range-finding WERs using upstream water only would help to determine if this approach would still provide favorable results for developing a site-specific WQC for copper.

IO not commit to full SWEF study.

5. Rather than attempt to apply a methodology developed for steady-state continuous discharges to intermittent and variable discharges (i.e., stormwater), we recommend [redacted] This approach would include topics mentioned above such as WET tests, WER studies, and bioassessments, as well as *in situ* bioassays. Use of *in situ* bioassays is gaining acceptance as an additional means of validating WET test and bioassessment results (Sasson-Brickson and Burton 1991, Ireland et al. 1996, Chappie and Burton 1997).

recently gave presentation that EPA Region X0 interested in.

Chappie, D.J, and G.A. Burton, Jr. 1997. Optimization of in situ bioassays with *Hyalella azteca* and *Chironomus* tentans. Environmental Toxicology and Chemistry 16(3):559-564.

DOE 1995. An analysis of regulatory issues raised by application of the NPDES permit program to municipal and industrial stormwater discharges. Washington State Department of Ecology. Discussion paper in partial fulfillment of Grant No. X-000645-01.

Ireland, D.S., G.A. Burton, Jr., and G.G. Hess. 1996. In situ toxicity evaluations of turbidity and photoinduction of polycyclic aromatic hyrdrocarbons. Environmental Toxicology and Chemistry 15(4):547-581.

Sasson-Brickson, G. and G.A. Burton, Jr. 1991. In situ and laboratory sediment toxicity testing with *Ceriodaphnia dubia*. Environmental Toxicology and Chemistry 10:201-207.