

State of Oregon  
Department of Environmental Quality

---

**Industrial Stormwater Advisory Committee  
Meeting 10- July 20, 2010**

**Paula Calvert, Stormwater Coordinator  
Surface Water Management Section, Water Quality Division**

**Subject: Sample size evaluation of compiled ambient water quality data to determine geographic scale of benchmarking exercise**

**Background:**

DEQ is using a risk based modeling approach to develop industrial stormwater benchmarks for copper, lead, and zinc. The model is a simple dilution equation that utilizes Monte Carlo simulations to produce stochastic, or variable, receiving body background conditions as input to the dilution equation. The Monte Carlo simulations rely on statistical characterizations of in-stream, background conditions. To represent the frequency of occurrence of the varying background concentrations, an adequate amount of ambient, surface water quality data are needed. The sample size, or data quantity, is also a determining factor in whether the benchmarking exercise is conducted at a larger, regional scale or at a smaller, basin scale.

Surface water quality data for total copper, total lead, total zinc and hardness were extracted from DEQ's Laboratory Analytical Storage and Retrieval (LASAR) database and the US Geological Survey's National Water Information System (NWIS) database.

DEQ did not extract total suspended solids data, which would have been used to develop translator values. DEQ's water quality criteria are based on totals rather than dissolved, which alleviates the need to model translator values to convert stormwater concentrations from totals to dissolved to compare against water quality criteria.

**Search criteria:**

A broad search criteria was used to extract water quality data from LASAR and NWIS. The data were then filtered to remove the following data that not representative of ambient conditions:

- Information related to evaluations of water quality impairments was not included so as not to bias the data sets. For example, the large amount of data from the Hood River pesticide study was omitted due to the potentially higher concentrations of metals from legacy pesticides.
- Data from impaired waters that have or need a TMDL for the particular metal of interest. Including higher concentrations from these impaired waters may result in overly conservative benchmarks.

In addition to data from ambient monitoring projects, DEQ included data from samples collected upstream of a point source as part of a mixing zone evaluation because the upstream sampling location constitutes a baseline condition.

**Sample sizes of monitoring data:**

The sample size required to adequately characterize background receiving body conditions is dependent on the variability of the data set and the portion of data with concentrations below detection limits. The geographic distribution of water quality information is shown in Table 1. To statistically conclude the sufficiency of the sample sizes the non-detect data must be

properly incorporated into the data set. Statistical approaches will be evaluated and applied to account for data that are below detection limits in order to determine the strength of the data sets and the summary statistics such as mean, median and standard deviation. In several instances, sample sizes are likely large enough to represent receiving waterbody conditions. For example, sample sizes for Western Oregon parameters are near or over 1000. These sample sizes are likely sufficient even taking into account that the portion of detection levels are around 50%.

**Table 1. Geographic distribution of water quality data which will be used to statistically characterize receiving waterbodies for the Monte Carlo simulation portion of the benchmark modeling exercise. "n" is the sample size.**

				Western Oregon	
		Eastern Oregon	Western Oregon	Willamette Basin	Other Western Basins
Total Copper	n	275	1132	798	334
	Portion detected	41%	49%	57%	30%
Total Lead	n	244	961	697	264
	Portion detected	9%	41%	55%	3%
Total Zinc	n	344	1273	846	427
	Portion detected	43%	61%	68%	46%
Hardness	n	543	2291	1377	914

**Recommendation on geographic scale of benchmark development:**

Based on the sample sizes and portion of detected concentrations, DEQ is recommending the following geographic scale for developing the benchmarks:

- Copper and Zinc: Given that there are enough total copper and zinc data, DEQ is proposing to develop separate benchmarks for the Willamette Basin, the Other Western Basins and Eastern Oregon.
- Lead: Given that this not enough total lead data, DEQ is proposing to only develop separate benchmarks for Western and Eastern Oregon.
  - There is not enough data to develop separate lead benchmarks for Western Oregon and Other Western Basins because there is a small amount of detected concentrations for total lead in the Other Western Basins
  - There are also a small number of detected concentrations for Eastern Oregon. DEQ is evaluating whether this data will be sufficient to characterize lead background concentrations for Eastern Oregon. If more data is needed to adequately characterize total lead concentrations, the data from Eastern and Western Oregon will be combined into one data set to simulate lead background concentrations for Eastern Oregon.