

Comparison of Lilley Findings to State of Hawaii Water Quality Standards

Water Quality Parameter	River: Lilley Concentration (mg/kg = ppm)	Bay: Lilley Concentration (mg/kg = ppm)
Arsenic	29	18
Barium	19	7
Chromium ¹	120	65
Lead	2.4	1.3

Comparison of Lilley Findings to State of Hawaii Natural Background Concentrations of Metals in Soils

<http://hawaii.gov/health/environmental/hazard/eal2005.html> (Volume 1, Table K)

Water Quality Parameter	Range (mg/kg)	Upper Bound (mg/kg)	Background Threshold Value (mg/kg)	Selected Action Level (mg/kg)	River: Lilley Concentration (mg/kg = ppm)	Bay: Lilley Concentration (mg/kg = ppm)
Arsenic	0.5 – 50	24	50	24	29	18
Barium	4.5-926	690	930	690	19	7
Chromium (Total)	8.52-3,180	1100	3200	1100	120	65
Lead	0.76-73	73	73	73	2.4	1.3

Notes:

- Upper Bound concentration selected based on evaluation of univariate sample data plots.
- Background Threshold Value set to maximum-reported concentration, excluding samples with suspected anthropogenic contamination.
- Selected action level based on Upper Bound concentration unless otherwise noted.
- BTV for arsenic based on profession judgment (widespread use as herbicide; clear break from anticipated, natural background not apparent on univariate graphs)

The samples collected by Lilley are assumed to be soil (mud) samples, and not samples collected in the waters of the Hanalei River, estuary or bay. This assumption based on the article dated May 29 , 2012 in The Garden Island paper. Per Test America metals samples collected from soils are reported as Total, and not dissolved fraction. Samples collected in water can be reported as total and/or dissolved, which is a fraction of the total. Comparison of metal concentrations collected from soil to water quality standards is not valid. In general metal concentrations in soils are higher relative to concentrations found in water. The chemistry of metals toxicity in soils is fairly complex, and the percentage of their total available to organisms and plant varies due to chemical interactions and other environmental variables.

Note that 1 mg/kg is equal to 1 ppm. We could not find a direct conversion of mg/kg to mg/liter. HRS 11-54 WQS are reported in ug/l and thus we could not compare the samples to WQS, as stated above the comparison is not valid.

Chromium VI is naturally occurring in igneous rocks, with concentrations that can vary based on age of lithology, and pedologic process such as the rate of soil development.

Arsenic is also naturally occurring element found in numerous minerals associated with volcanic rock. Arsenic levels in Hawaii soils have been elevated above background in some areas where sugar cane was cultivated. The mean natural soil concentration is 5 mg/kg, and it ranges from about 1 to 40 mg/kg.

Lead is found naturally, usually in the form of four isotopes. Similar to the other elements the concentrations may represent natural background concentrations .

It is unknown if the concentrations reported are toxic to aquatic organisms in both the fresh and salt water environments. It is unknown if the concentrations reported are representative of naturally occurring levels on Kauai. It is unknown if the concentrations warrant additional sampling. The river mud sample for Arsenic exceeds the selected action level. Selected action may include conducting additional samples, and investigation into potential sources. All other metals concentration reported are below selected action levels and no further sampling is necessary.

We reviewed the February 12, 2003 USGS 2003 CERC 8335-FY03-31-01 and CERC 8335-FY02-32-14 Final Reports, Survey of Persistent Organic Contaminants and Elements in Water, Sediments, and Biota of the Hanalei River, Island of Kauai. These reports determined the presence and concentrations of various persistent chemical pollutants in water, sediment, and biota of the Hanalei River. Metals sampled for included: chromium, iron, nickel, copper, zinc, arsenic, lead, and selenium. All metals collected were found to be below probable effect levels. Please note that the samples used were collected a decade ago and activities and land uses in the contributing watershed area may have changed since that time. Thus the samples while showing no issues concerning metals at that time may not represent metal concentrations at present. However, we are not aware of any activities that have occurred over the past decade resulting in an increase of metal presence and concentrations.

[↓](#) HDOH WQS is for Chromium VI