



Determination of a Southern California Regional Background Arsenic Concentration in Soil

Bill Bosan, Ph.D.
Staff Toxicologist
State of California

Department of Toxic Substances Control



Background Metals

- ◆ May be problematic for risk assessment
 - Naturally occurring
 - Regional anthropogenic contribution
 - Site-specific release
- ◆ Arsenic is especially problematic
 - Risk-based soil concentration is 100-times below typical ambient levels

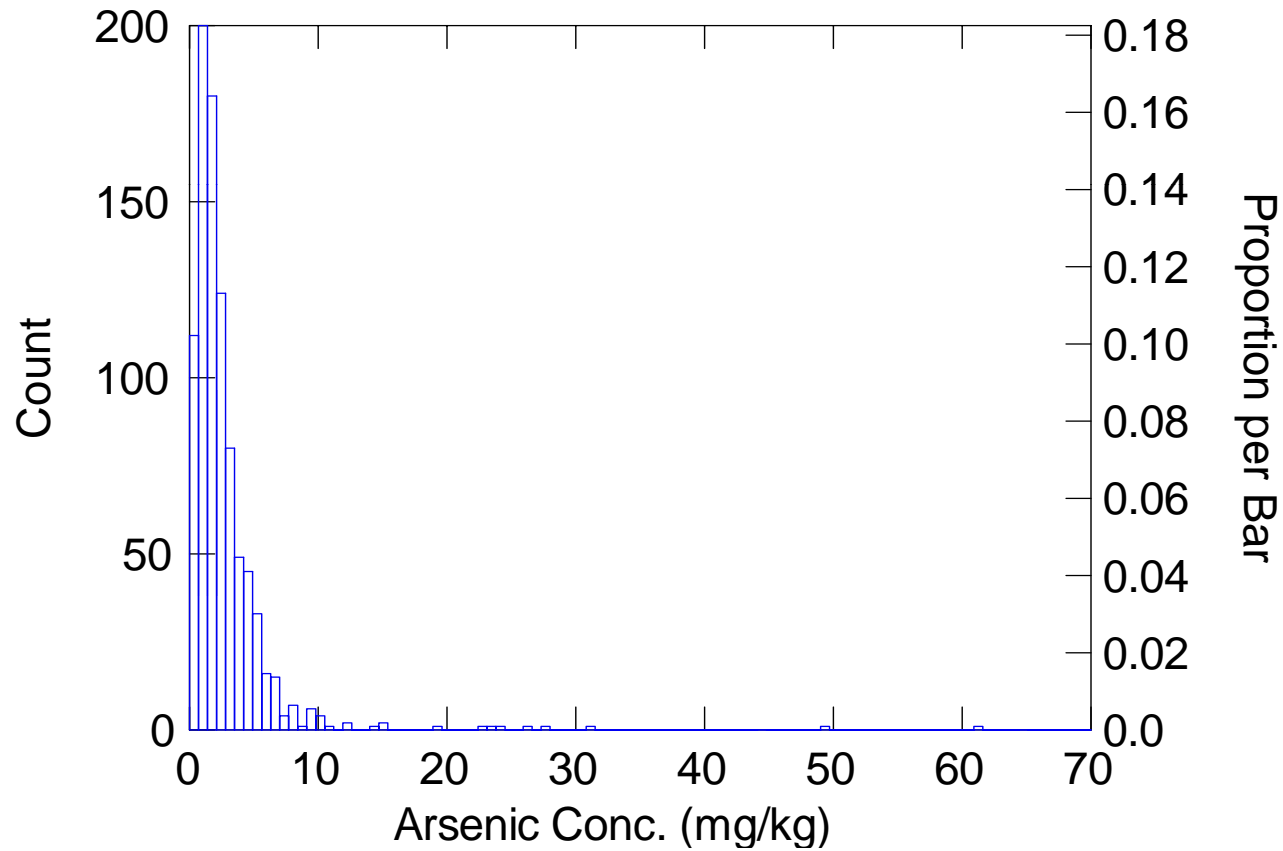


Evaluation of Arsenic Data

- ◆ “Background” collectively refers to naturally occurring and anthropogenic concentrations in shallow soil and will be referred to as “Ambient”
- ◆ Los Angeles Unified School District (LAUSD) Sites
 - 1097 data points from 19 schools across Los Angeles County



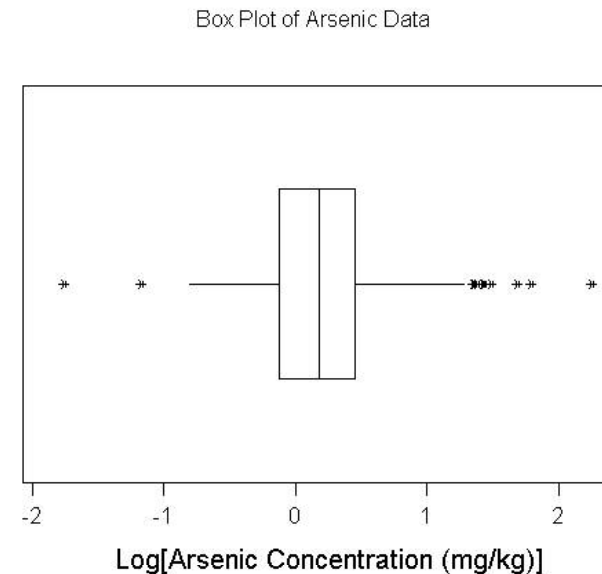
Evaluation of Arsenic Data





Evaluation of Arsenic Data

- ◆ Evaluate outliers
 - Box Plot or “Fourth Spread”
- ◆ Identify 11 outliers
 - Exclude from further analysis





Summary Statistics

DESCRIPTIVE STATISTIC	VALUE
Sample Size (n)	1086
Mean (μ)	0.1788 (1.51 mg/kg)
Median	0.1761 (1.50 mg/kg)
Standard Deviation	0.3646
Standard Error of the Mean ¹	0.0111
Minimum Concentration	-0.8125 (0.15 mg/kg)
Maximum Concentration	1.2930 (19.63 mg/kg)
Lower Quartile (Q ₁)	-0.1249
Upper Quartile (Q ₃)	0.4472



Statistical Evaluation of Data

- ◆ The upper limit of the data set:

$$UL_{1-\alpha}(x_p) = \bar{x} + sK_{1-\alpha,p}$$

- ◆ 95% Confidence Limit of the 99th Quantile [$UL_{0.95}(X_{0.99})$] of the LAUSD arsenic data set was 11.32 mg/kg



Statistical Evaluation of Data

- ◆ Non-parametric analysis of arsenic data

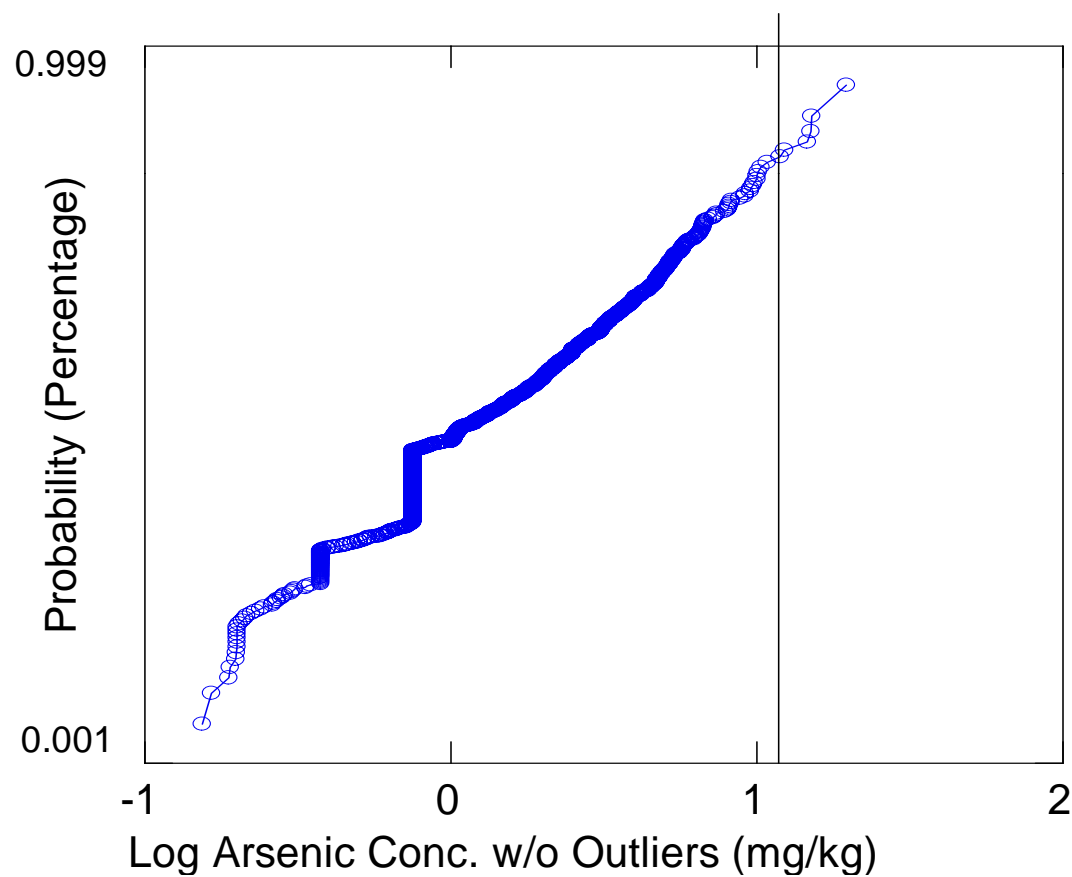
$$\text{Rank of } UL_{0.95}(X_{0.99}) = p(n+1) + Z_{1-\alpha} [np(1-p)]^{1/2}$$

- ◆ $UL_{0.95}(X_{0.99}) = 12 \text{ mg/kg}$



Graphical Analysis

Upper-Bound Arsenic Background Conc., 12 mg/kg



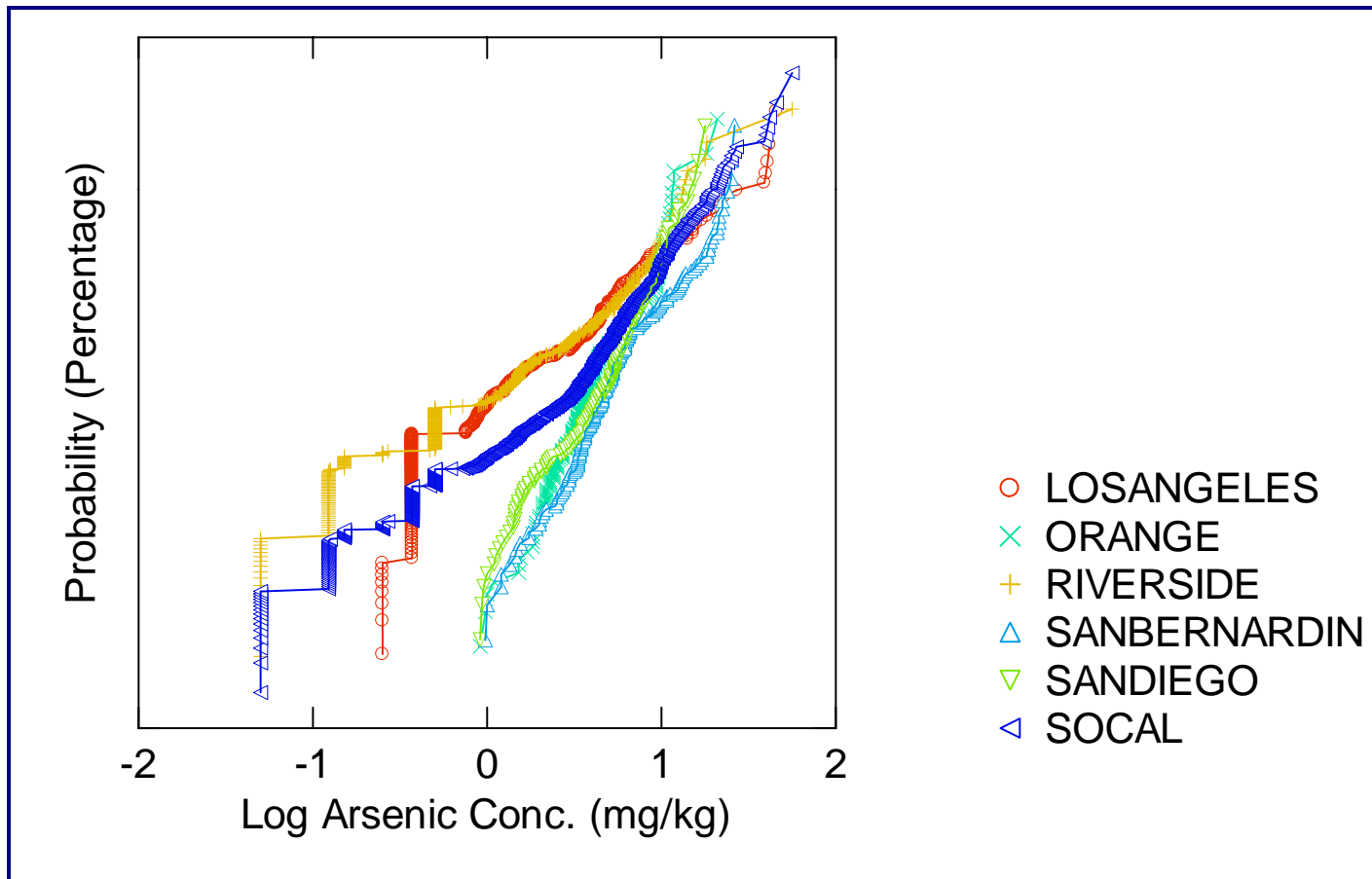


Southern California Regional Analysis

- ◆ Los Angeles County – 19 sites
- ◆ Riverside County – 15 sites
- ◆ Orange County – 7 sites
- ◆ San Bernardino County – 6 sites
- ◆ San Diego County – 3 sites



Southern California Regional Analysis





Conclusions

- ◆ This finding suggests that in Southern California, 12 mg/kg maybe a useful, risk management screening number for evaluating arsenic as a chemical of potential concern.
 - Evaluation is on-going
 - This is not DTSC Policy or Guidance



Questions & Answers

Department of Toxic Substances Control