Examples of CMTLs and ALs for Significant Dischargers

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DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

Confirmatory Monitoring Trigger Level (CMTL)

Defintion:95th confidence interval of the *median*.

1. Identify latest 10 data points collected under normal, representative operating conditions for dry weather or wet weather
2. Test for outlier(s)
3. For sample size n≥9 approach utilizes Rank Order Statistics using formula:

$$1 + \frac{n}{2} + \frac{1.96\sqrt{n}}{2}$$

4. Example: n=10 → $1 + \frac{10}{2} + \frac{1.96\sqrt{10}}{2} = 9.1$
5. Rank data from smallest to largest and select 9th value

Reference:
https://epilab.ich.ucl.ac.uk/coursematerial/statistics/non_parametric/confidence_interval.html

Action Level (AL)

Definition: Maximum Projected Effluent Concentration

(Based upon Reasonable Potential Analysis procedures.)

1. Identify latest 10 data points collected under normal, representative operating conditions for dry weather or wet weather
2. Test for outlier(s)
3. Determine the highest value from the data set.
4. Determine the coefficient of variation (CV) of the data set.
5. Determine the appropriate Reasonable Potential Multiplying Factor (RPMF) based on 95% confidence level and 95% probability basis.
6. Multiply maximum effluent value by RPMF to obtain the Maximum Projected Effluent Concentration.

References:

- Technical Support Document for Water Quality-based Toxics Control (EPA, 1991)
- New Jersey Administrative Code 7:14A-13.8

Outlier Test

- "Common Outlier-Normality Test"

  From NJDEP

  - Includes tests for:
    - Normality Test - using the Shapiro - Wilk Test
    - Single Point Outlier Test - using the Extreme Studentized Deviate Test (also called Grubb's Test)

Excel Spreadsheet Incorporating Outlier Test, CMTL and AL Calculations

EFFLUENT DATA

Number of Samples | Last 10 data points | $\log_e$ (Raw Data)

DATE	No	raw data (n=10)	Log RD2
10/23/2010	1	1769.26	7.48
6/30/2011	2	2036.80	7.62
10/24/2011	3	1789.53	7.49
6/28/2012	4	1834.62	7.51
10/14/2012	5	1707.97	7.44
6/23/2013	6	1444.41	7.28
9/29/2013	7	1439.60	7.27
1/30/2014	8	1769.26	7.48
2/28/2014	9	2036.80	7.62
3/29/2014	10	1789.53	7.49

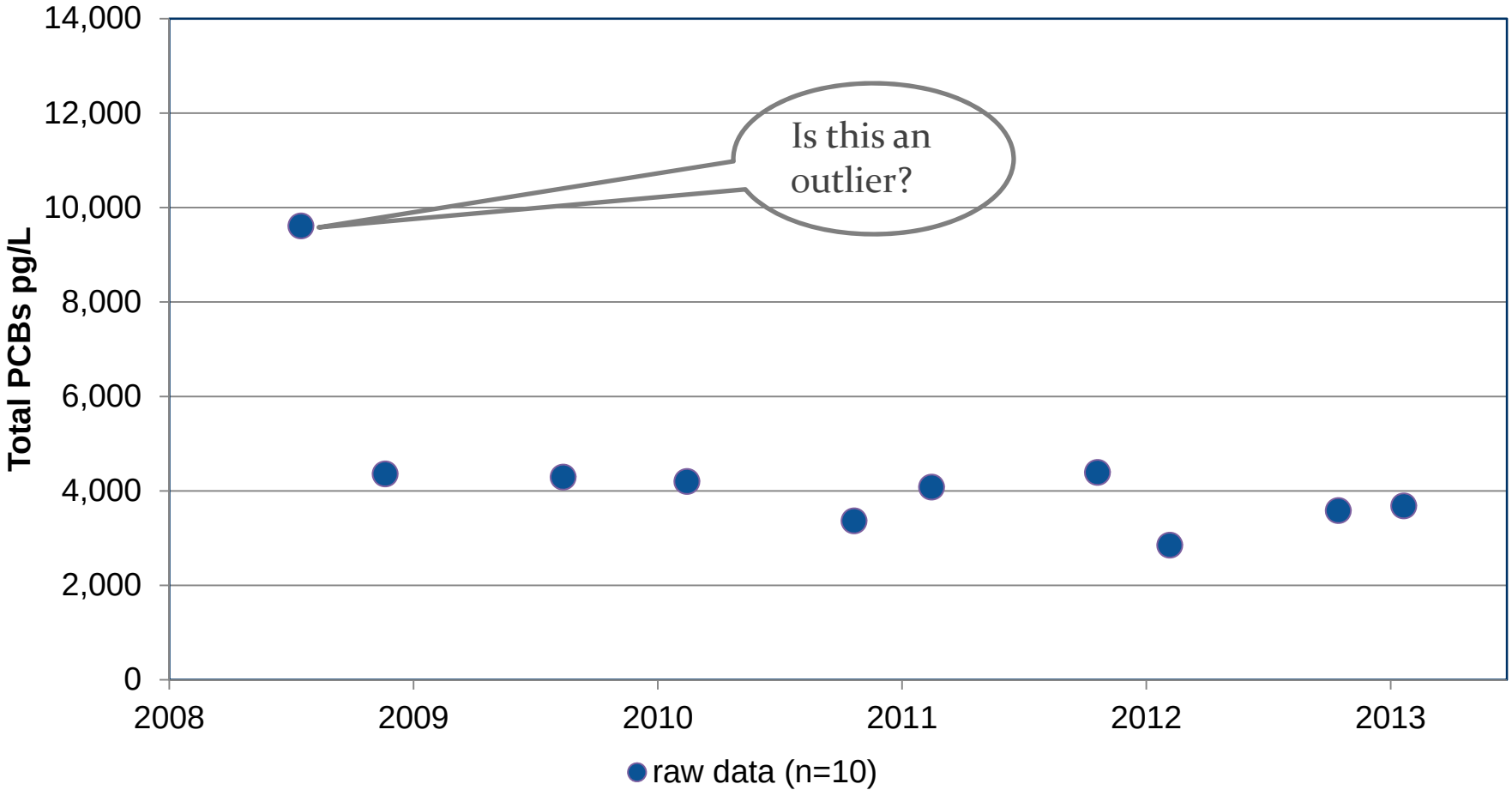
Step1. Check Data for Outlier

Step 2. Calculate CMTL

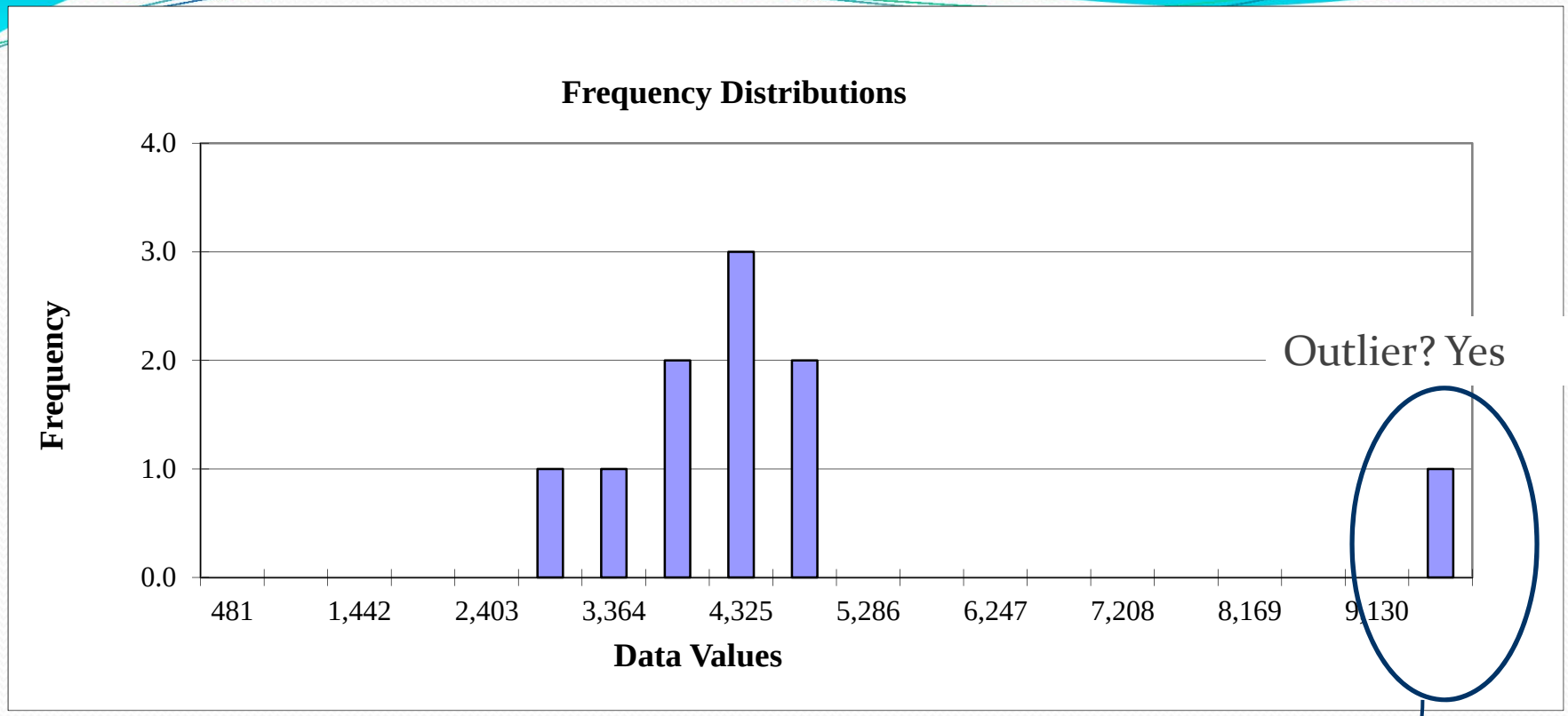
Step 3. Calculate ALs

Example: Municipal System

n=10 Dry Weather Samples



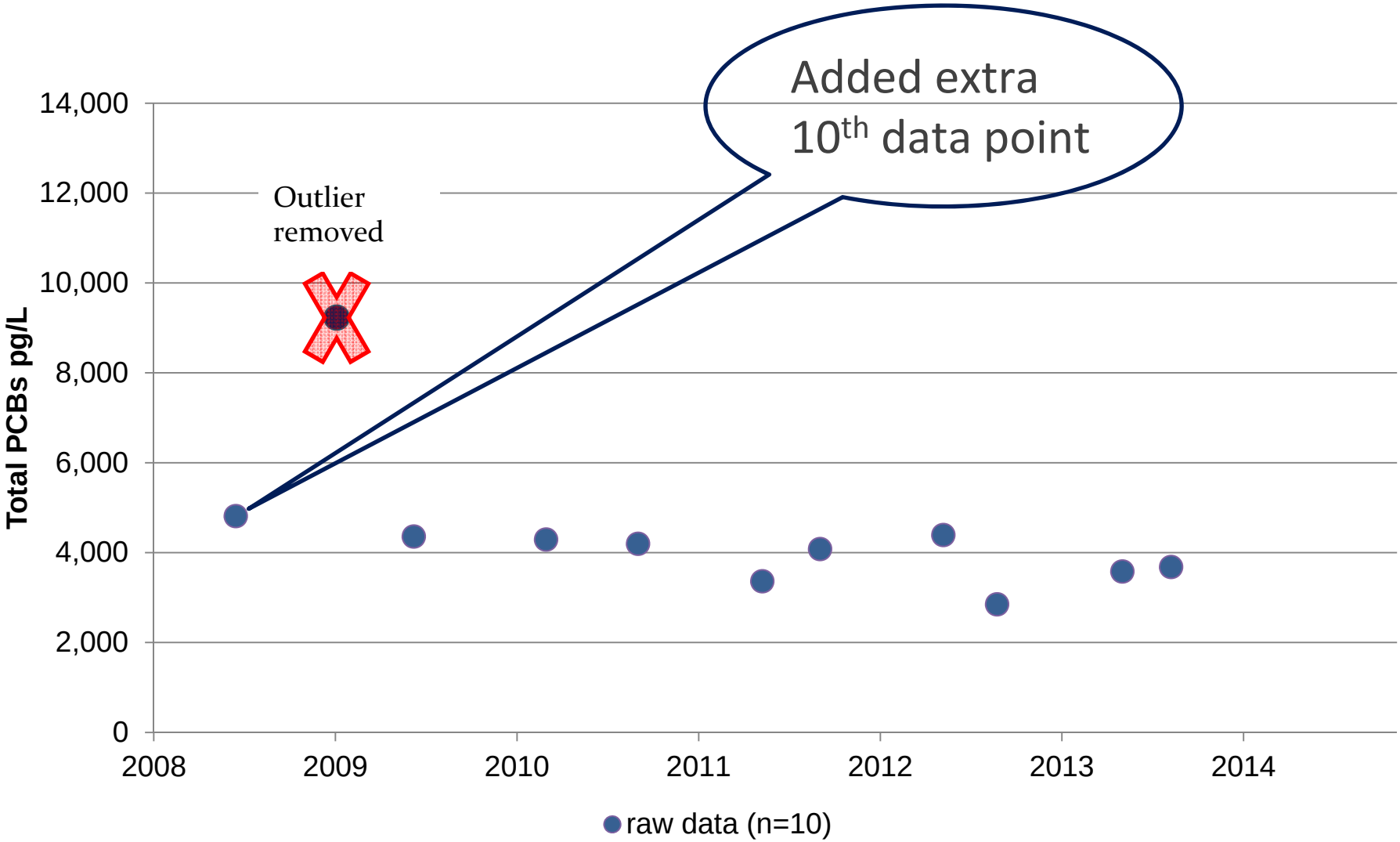
Apply Outlier Test



# of Suspected Outliers: 1 = *k*

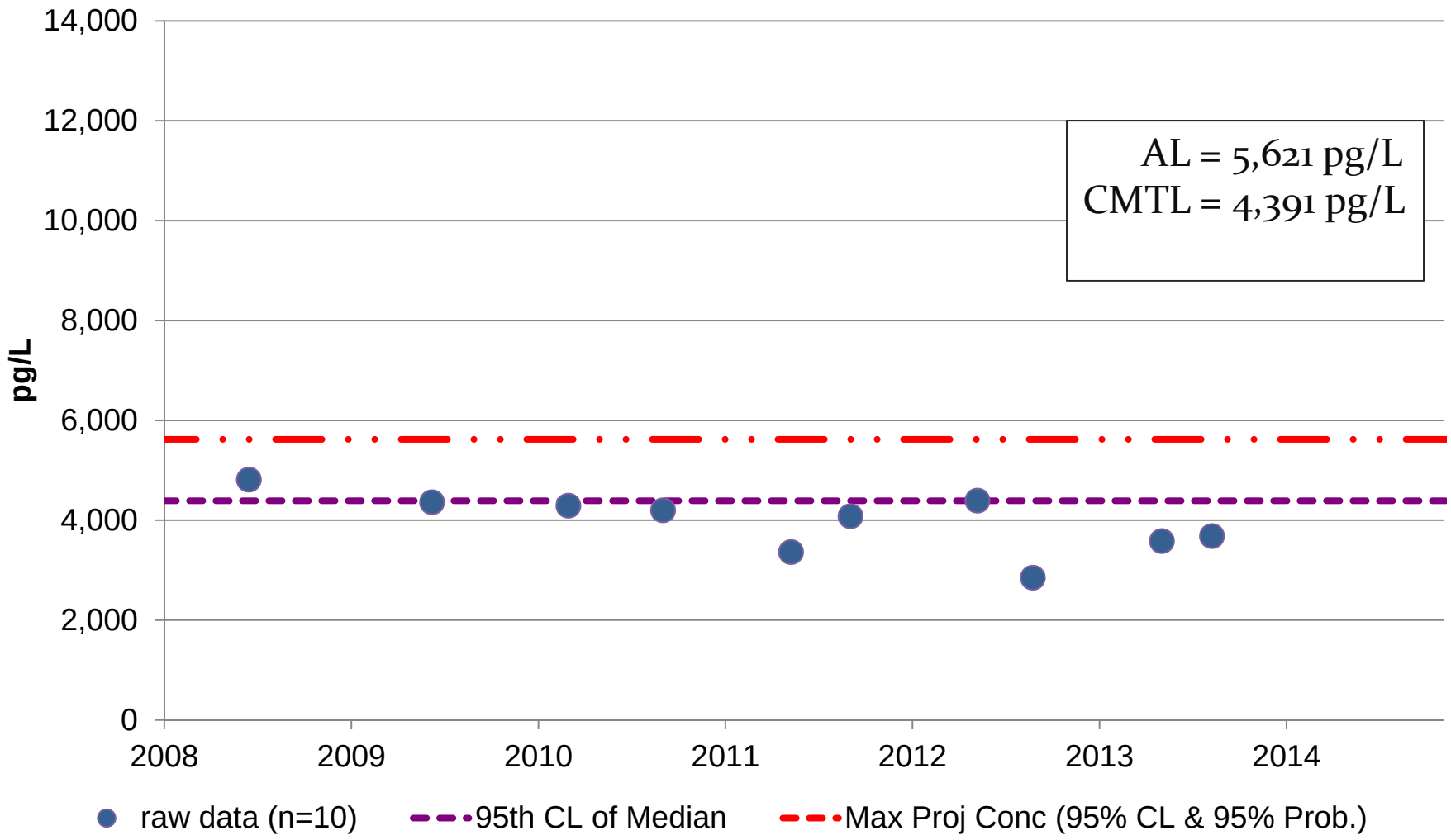
Outlier Analysis for HIGH outliers:	**Normal**	**Log-N**
T Statistic (high)	2.7438	2.5717
Critical Value (95%CI) =	2.1761	2.1761
Critical Value (98%CI) =	2.3221	2.3221
Critical Value (99%CI) =	2.4097	2.4097
Outlier at 95% CI? =	**Yes**	**Yes**
Outlier at 98% CI? =	**Yes**	**Yes**
Outlier at 99% CI? =	**Yes**	**Yes**

Remove Outlier, use Previously Collected Data and Perform Analysis



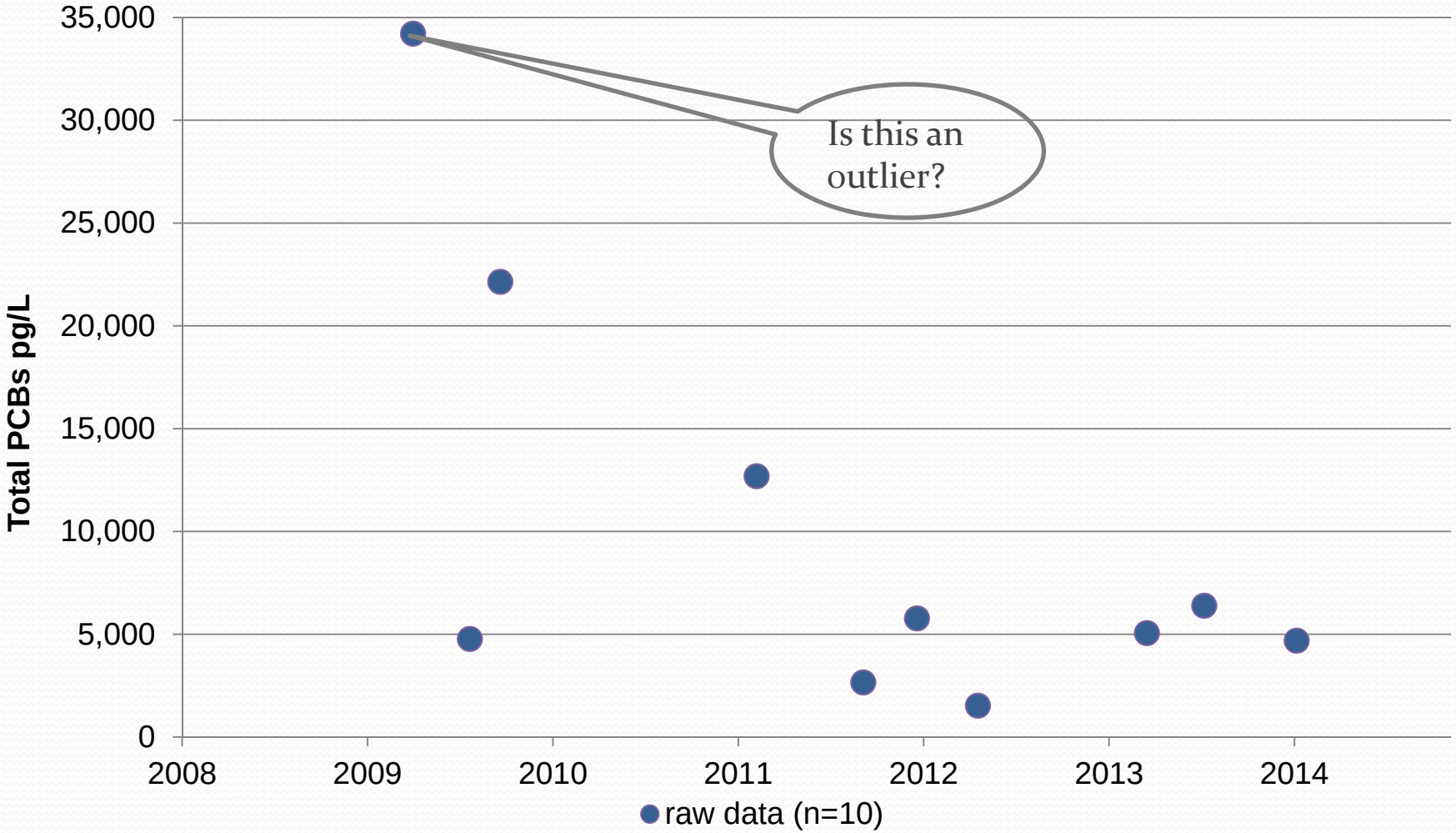
AL using 10 Representative data Points

(Outlier Removed)

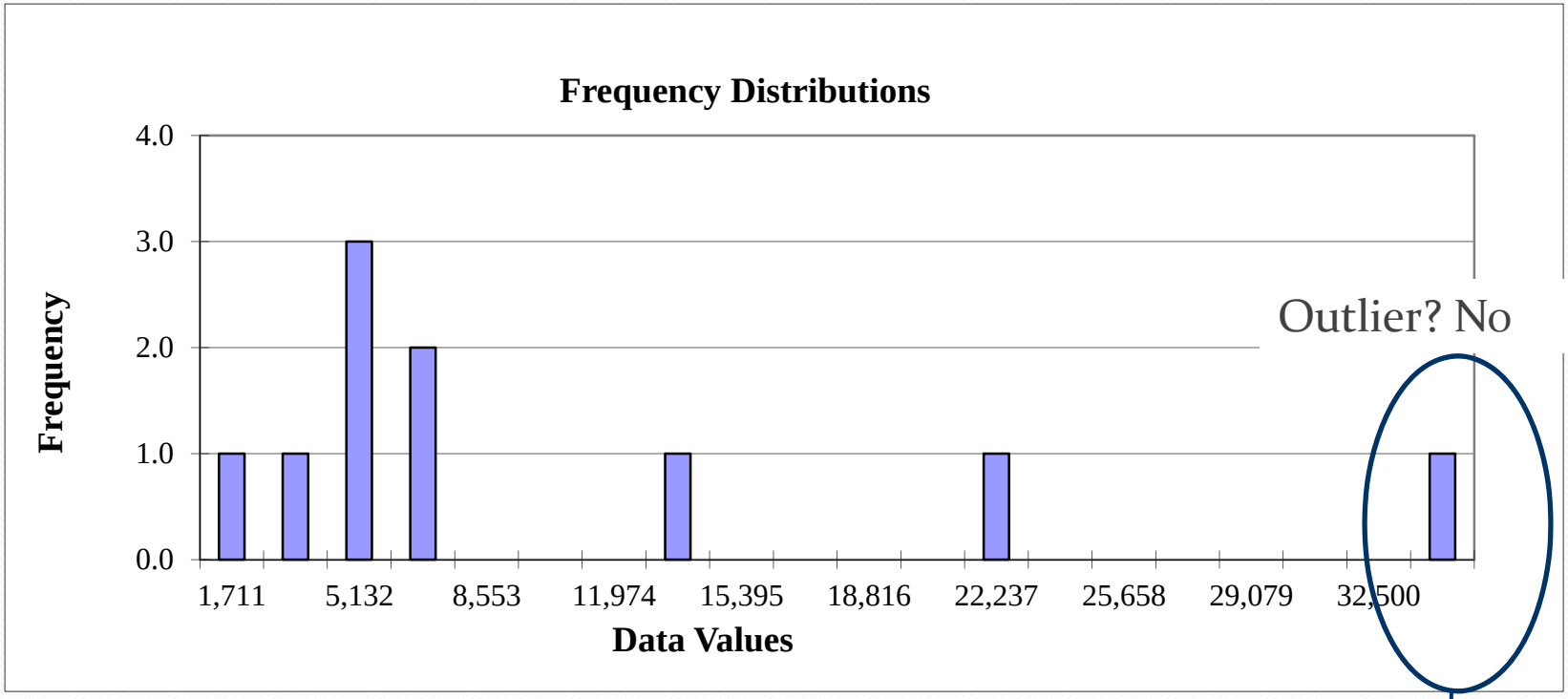


Example: Industrial WWTP

n=10 Dry Weather Samples



Apply Outlier Test

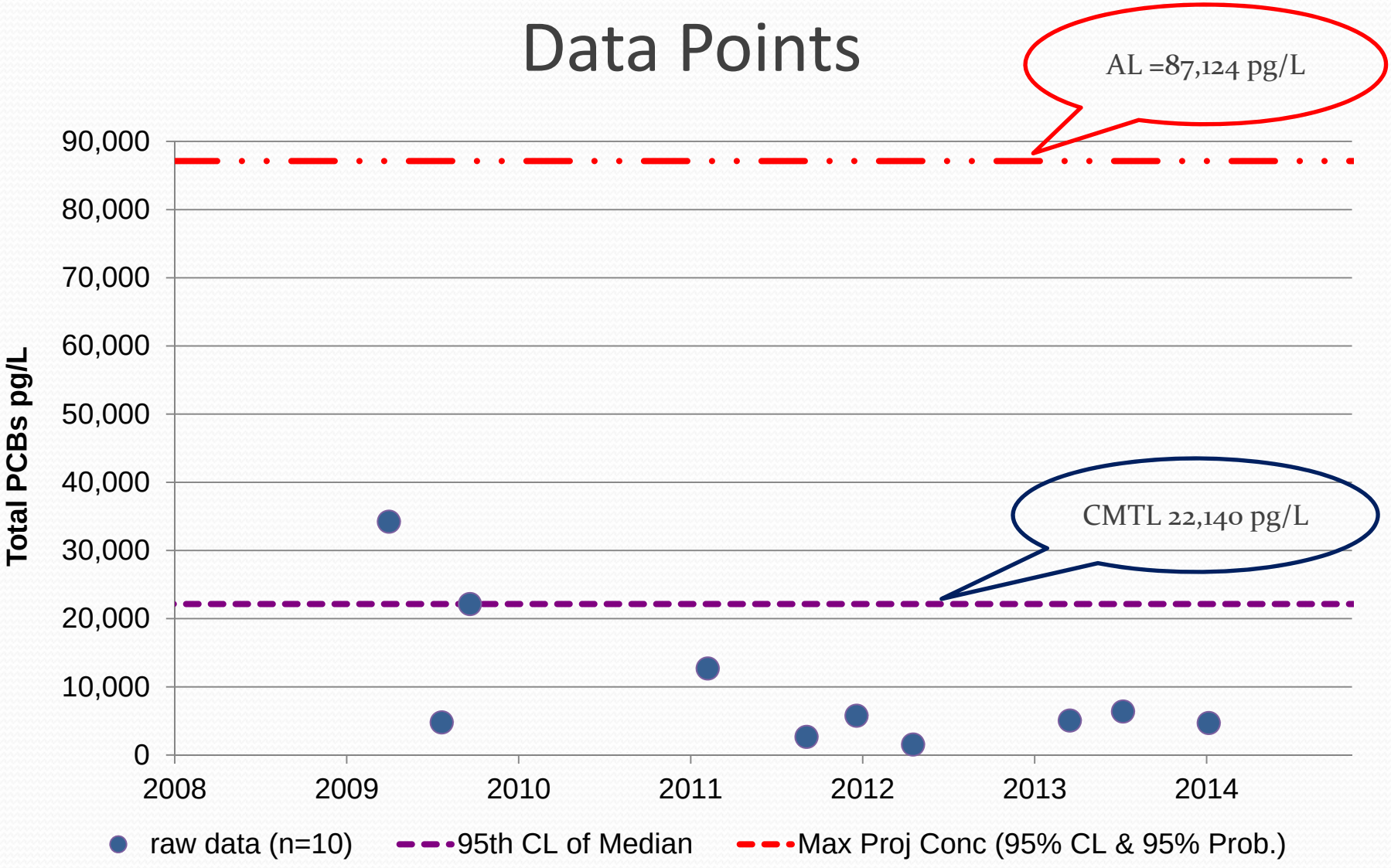


Outlier? No

# of Suspected Outliers: 1 = *k*

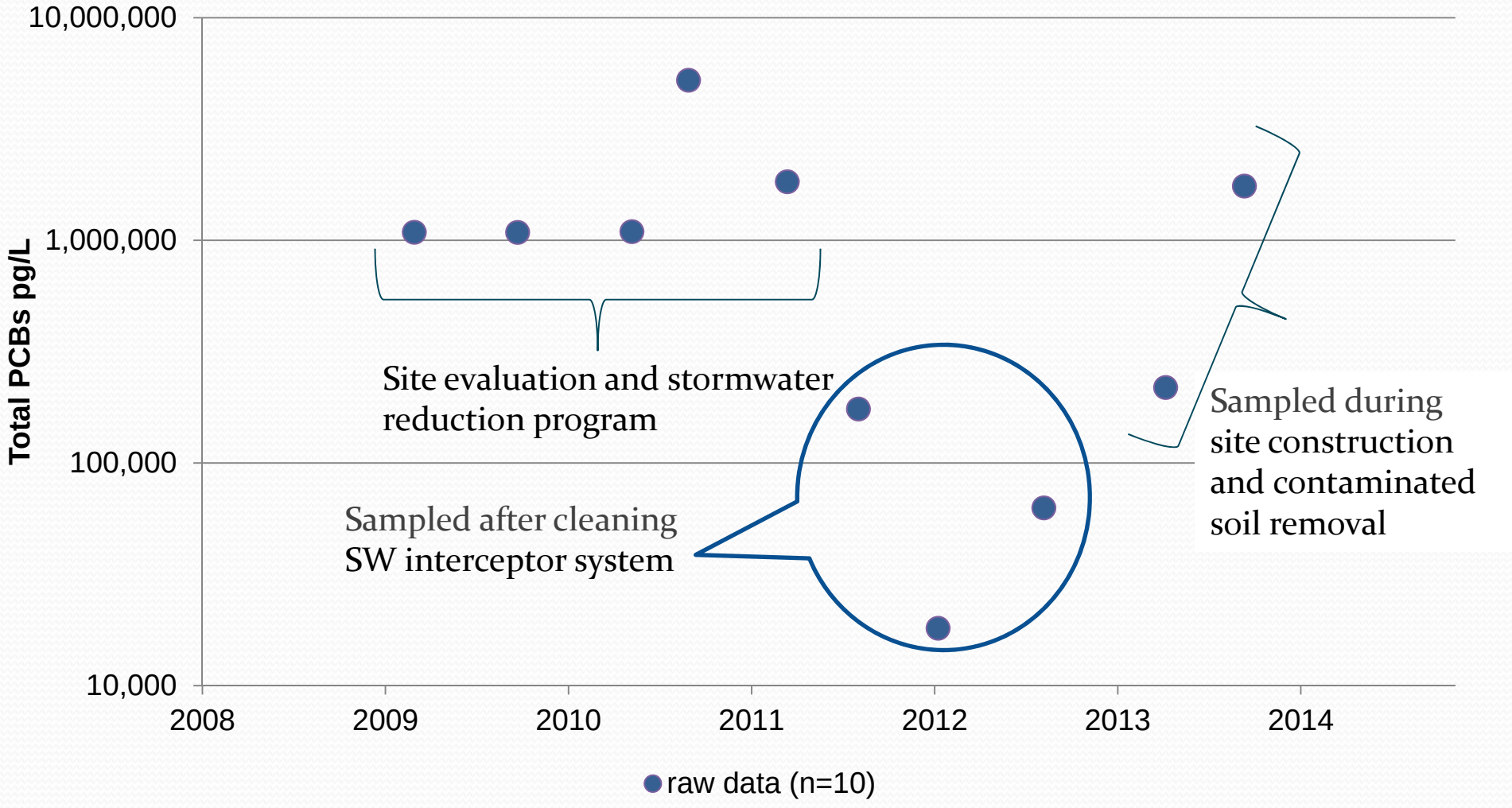
Outlier Analysis for HIGH outliers:	**Normal**	**Log-N**
T Statistic (high)	2.3242	1.7539
Critical Value (95%CI) =	2.1761	2.1761
Critical Value (98%CI) =	2.3221	2.3221
Critical Value (99%CI) =	2.4097	2.4097
Outlier at 95% CI? =	**Yes**	**No**
Outlier at 98% CI? =	**Yes**	**No**
Outlier at 99% CI? =	**No**	**No**

Calculation of CMTL and AL Using Latest 10 Data Points

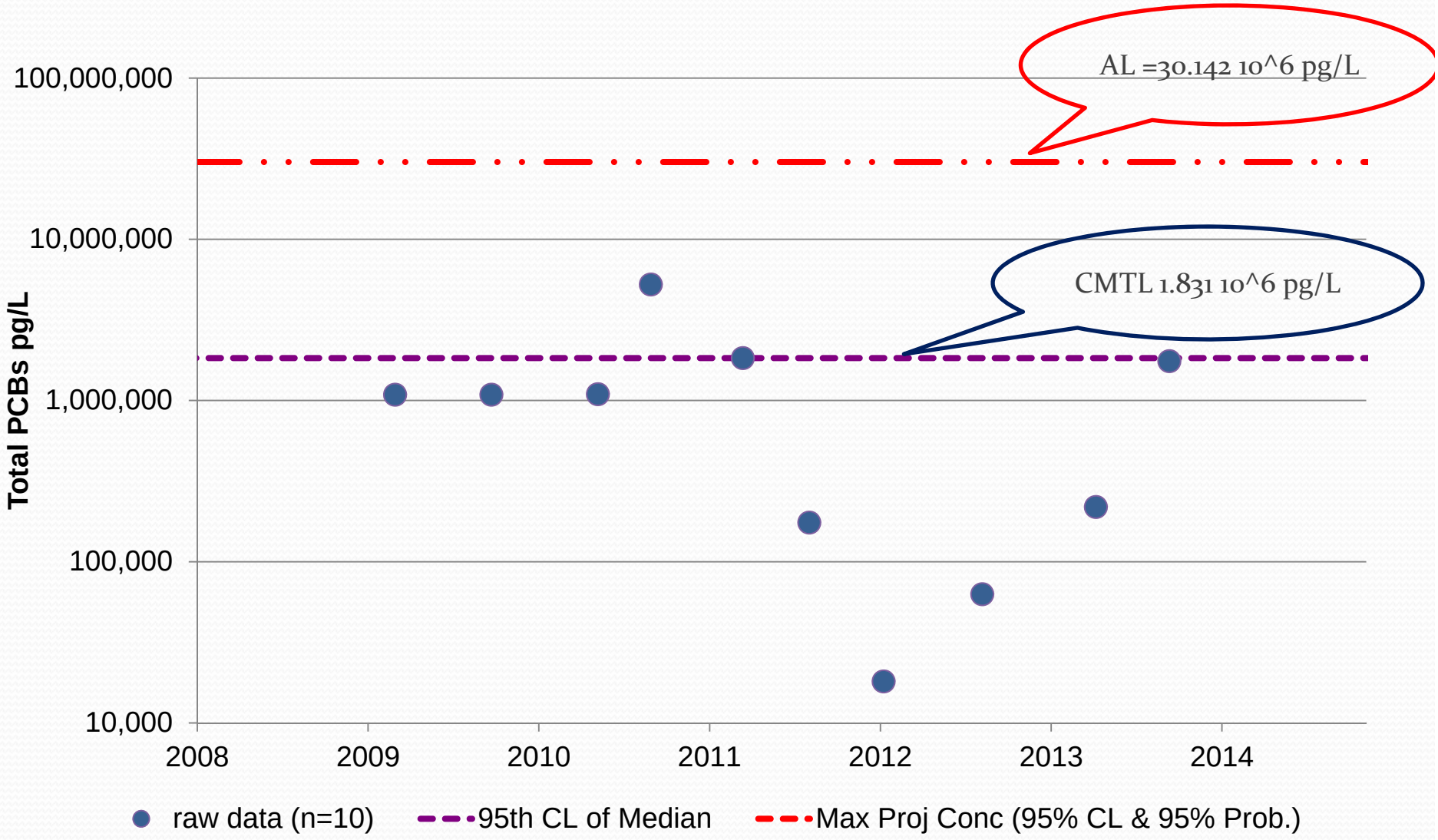


Example: Industrial Stormwater

n=10 Wet Weather Samples



Calculation of CMTL and AL Latest 10 Data Points
(No Outlier Identified)



Conclusions:

- The CMTL and AL are calculated during the permit renewal process.
- Outlier test is applied to the latest 10 data points collected under the representative, normal operating conditions.
- The CMTL and AL are calculated based on the latest 10 data points exclusive of any outliers.
- Outlier test is **not** used to evaluate individual monitoring results in the current permit cycle.