

NJ DWQI Testing Subcommittee

**Report on the Development of a
Practical Quantitation Level (PQL)
for Perfluorooctanoic acid (PFOA)
in Drinking Water**

PQL Report on Perfluorooctanoic acid (PFOA)

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Definitions

- **Practical Quantitation Limit (PQL)** is the minimum concentration for which an analyte can be reliably quantitated within an acceptable limit of uncertainty.
- **Reporting Limit (RL)** is the minimum concentration by which an analyte is reliably quantitated by an individual laboratory.
- **Method Detection Limit (MDL)** is a measurement used by a laboratory to determine specific minimum detection capabilities for a particular method.
- **Minimum Reporting Level (MRL)** is the minimum concentration that can be reported as a quantitated value for a method analyte in a sample following analysis.
- **Lowest Concentration MRL (LCMRL)** is the lowest spiking concentration at which recovery of between 50 and 150% is expected 99% of the time by a single analyst.
- **Bootstrap Estimate of a Confidence Interval of the Mean** is an statistical technique that has been used most recently by the USEPA and is applied to generate a normal distribution and associated 95 % upper and lower confidence intervals from the skewed mean (not median) values for the inter-laboratory MDLs and RLs.

Due to the limited number of laboratories performing analyses for PFOA in the NJDEP PFC database, the Testing Subcommittee reviewed analytical information from other laboratories performing PFC analyses. In considering other sources of PFOA data, the following criteria were established by the Testing Subcommittee:

- 1) Laboratories that analyzed water samples for PFOA for NJDEP PFC studies (2006 and 2009) and as requested by water systems;
- 2) Laboratories that are certified for the analysis of PFOA in drinking water by the NJDEP Office of Quality Assurance (OQA); and
- 3) National laboratories that have obtained US Environmental Protection Agency (EPA) approval to analyze six PFCs under the Unregulated Contaminant Monitoring Rule 3 (UCMR3) program using EPA Method 537 and that have demonstrated that they are capable of reporting PFOA lower than the required UCMR3 minimum reporting level (MRL) of 20 ng/L.

Laboratories Used for PQL Calculation in order of Increasing MDL Values

Laboratory	Analytical Method	MDL (ng/L)
Eurofins Eaton Analytical CA	EPA 537	0.23
Columbia Analytical Services	Modified EPA 537	0.27
American Water Central Laboratory	EPA 537	0.382
Eurofins Eaton Analytical CA	Proprietary MWH PFC EXTRA	0.550
Pace Analytical Services, Inc.	S-FL-O-045 Rev.00	0.67
Test America-Sacramento	Proprietary WS-LC-0025 Rev 1.2	0.748
Eurofins Lancaster Laboratories Environmental	EPA 537	1
Test America-Denver	DV-LC-0012 Rev 8	1.1
Weck Laboratories	Modified EPA 537	1.81
Test America-Denver	DV-LC-0012 Rev 4	2
Underwriters Laboratory	L400	2.9
SGS Accutest – Orlando	EPA 537	8
Test America-Denver	DV-LC-0012 Rev 12	9.79
Median of the MDLs		1
PQL = Median of MDLs x 5		5

PQL for PFOA Developed by Using Mean of Reporting Limits

Laboratory	State	Method	Reporting Limit (ng/L)	Lowest Calibration Standard (ng/L)
Eurofins Eaton Analytical	IN	EPA 537	<u>20</u>	20
SGS Accutest- Orlando	FL	EPA 537	<u>20</u>	20
Test America-Sacramento	CA	EPA 537	<u>20</u>	20
American Water Central Laboratory	IL	EPA 537	<u>10</u>	NA
Orange County Water District Advanced Water Quality Assurance Lab	CA	EPA 537	20	<u>10</u>
State Hygienic Laboratory Coralville	IO	EPA 537	15	<u>6</u>
Eurofins Eaton Analytical	CA	MWH-PFC	<u>5</u>	5
Weck Laboratories	CA	Modified EPA 537	<u>5</u>	5
Underwriters Laboratory	IN	L400	10	<u>5</u>
Test America-Denver	CO	DV-LC-0012 REV 12	20	<u>4</u>
Test America-Denver	CO	DV-LC-0012 REV 8	15	<u>4</u>
Test America-Denver	CO	DV-LC-0012 REV 4	10	<u>4</u>
Eurofins Eaton Analytical	CA	EPA 537	<u>2.5</u>	2.5
Columbia Analytical Services	WA	EPA 537	<u>2</u>	2
Eurofins Lancaster Laboratories Environmental	PA	EPA 537	<u>2</u>	2
Pace Analytical Services	FL	S-FL-O-045 Rev.00	<u>2</u>	2
Test America-Sacramento	CA	WS-LC-0025 Rev 1.2	2	<u>1</u>
Mean of underlined values	7.2			
Median of underlined values	5			

[11](#) The underlined values are the lower of the reporting limit or MRL and the lowest calibration standard that was used in the 17 lab-method combinations to determine the mean and the median.

Bootstrap Estimate of a Confidence Interval of a Mean

generated using the inter-laboratory MDLs :

Lower Confidence Limit (ng/L)	Mean (ng/L)	Upper Confidence Limit (ng/L)	Confidence Level Range	Number of Randomly Selected Values
0.5	0.9	1.3	95%	2000

The upper confidence limit of the mean MDL x 5 =
 $1.3 \text{ ng/L} \times 5 = 6.5 \text{ ng/L}$

Bootstrap Estimate of a Confidence Interval of a Mean

generated using the inter-laboratory Reporting Limits :

Lower Confidence Limit (ng/L)	Mean (ng/L)	Upper Confidence Limit (ng/L)	Confidence Level Range	Number of Randomly Selected Values
3.4	4.6	6.0	95%	2000

Summary of approaches for Calculating a PQL for PFOA

Approach	Value (ng/L)
Median MDL x 5	5
Mean of RLs/Lowest Calibration Standards	7.2
Median of RLs/Lowest Calibration Standards	5.0
Bootstrap Upper Confidence Limit MDL x 5	6.5
Bootstrap RL Upper Confidence Limit	6.0

The mean of the above values is **5.9 ng/L**.

Calculating a PQL for PFOA Using Only the RLs or Lowest Calibration Standards Data

Approach	Value (ng/L)
Mean of RLs/Lowest Calibration Standards	7.2
Median of RLs/Lowest Calibration Standards	5.0
Bootstrap RL Upper Confidence Limit	6.0

The mean of the above values is **6.1 ng/L**.

The Testing Subcommittee decided to use the method for deriving the PFOA PQL that takes into consideration both the precision and accuracy of the analytical method. Therefore the Testing Subcommittee relied on the actual reporting limits from laboratories currently performing PFOA analyses for determining its recommendation. Therefore, the Testing Subcommittee recommends a **PQL of 6 ng/L** for PFOA to the DWQI.