



# MICHIGAN STATE UNIVERSITY

## How to interpret a PFAS Laboratory Report

**Authored by: A. Daniel Jones, Michigan State University, Professor in the Department of Biochemistry and Molecular Biology**

Reports of PFAS levels generated by testing laboratories may be lengthy and difficult to interpret. This document aims to provide assistance for understanding what the reported results mean. Different laboratories may use a variety of methods, procedures, and protocols to measure PFAS, and their report formats may differ depending on what their standard procedures or what they believe the client or customer had requested. Making accurate measurements of tiny amounts of PFAS chemicals can be very challenging and requires knowledgeable and skilled laboratory staff and expensive lab infrastructure. Most laboratory reports may include a lot of information about data quality control (QC) measures that can provide useful information about how well the analytical methods performed. Results that may be affected by the QC measures may have a Qualifier attached to warn the customer regarding how the data should be used. A few key points are described here:

- Laboratories may use different procedures for different sample types, and these methods may measure different groups of PFAS chemicals.
- PFAS levels in water are often reported in units of nanograms per liter (ng/L), also described as parts-per-trillion. Typical levels in soil, food, and blood samples are reported in micrograms per liter ( $\mu\text{g/L}$ ) or nanograms per gram (ng/g, both considered parts-per-billion).
- Other methods may be needed to measure PFAS in soils, foods, and blood. Detection limits are usually lower in water samples because laboratories usually process larger samples of water than samples of soils, foods, or blood.

PFAS chemicals may be referred to by the chemical name, an abbreviation of the name (e.g. PFOS), and a Chemical Abstracts Service (CAS) reference number. Relevant abbreviations: MDL is the Method Detection Limit (the lowest level that can be detected with 99% confidence that the substance is present); LOQ is the Limit of Quantitation, which is the lowest level of a PFAS standard used to calibrate the instrument's response. A partial example report from two soil samples (XXXX94 and XXXX95) is provided below.

Most laboratory reports will also have a section dedicated to evaluation of data quality. This involves performing additional analyses to demonstrate that the detected molecules did not result from contamination from the laboratory, and to assess how well the laboratory generates accurate results when known amounts of PFAS chemicals are added to a portion of the sample or a reference material. Laboratory staff should be checking the results of these tests and including a summary in the report of sample analysis results. The list of results may include some qualifiers that indicate when caution should be taken when interpreting the results. Most laboratory reports should have a list of qualifier abbreviations that reflect the limitations of PFAS measurements. In some cases, the laboratory may recommend

repeating the analysis (if enough sample was provided) or to collect additional samples to establish how widespread estimated contamination may be.

**Compound and CAS # identify which compound was measured and reported**

**MDL is the Method Detection Limit -- the smallest level that can be reliably detected. Some labs may use a reporting limit (RL) instead.**

**LOQ is the Limit of Quantitation, the lowest level used to calibrate the instrument**

**Units is the measure used to report the level. In this case, ng/g means part-per-billion**

Analyte measurements					Sample ID: XXXX94		XXXX95	
Compound	CAS #	MDL	LOQ	Units	Result	Qualifiers	Result	Qualifiers
PFBA	375-22-4	0.68	2.0	ng/g	1.2	J	1.2	J
PFBS	375-73-5	0.16	0.5	ng/g	0.4	J	0.3	J
PFDA	335-76-2	0.18	0.5	ng/g	0.2	J	0.2	J
PFDoS	79780-39-5	0.19	0.5	ng/g	0.2	J	ND	U
PFDS	335-77-3	0.26	0.5	ng/g	0.3	J	ND	U
PFHpA	375-85-9	0.14	0.5	ng/g	0.3	J	0.2	J
PFHpS	375-92-8	0.23	0.5	ng/g	1.1		0.7	
PFHxA	307-24-4	0.19	0.5	ng/g	33.5		31.7	
PFNA	375-95-1	0.15	0.5	ng/g	ND	U	ND	U
PFOA	335-67-1	0.13	0.5	ng/g	1.0		1.0	
PFOS_sum	1763-23-1	0.48	0.5	ng/g	ND	U	ND	U
PFPeA	2706-90-3	0.27	1.0	ng/g	1.0		0.9	

**A few of the PFAS chemicals consist of mixtures of chemical forms called isomers. The term "sum" is used to indicate that the lab combined the isomers (in this case, for PFOS) into a single measurement.**

**The level of PFHxA in this sample is above the LOQ, so the result is considered reliable and no Qualifiers are indicated.**

**The Qualifier "J" indicates that the level was below the lowest amount used to calibrate the instrument. Though the detection is considered reliable, there is more uncertainty in the reported level.**

**The abbreviation ND indicates the chemical was not detected in this sample. Qualifier U further confirms that the level was below the MDL.**