

Detection Limits and Quantitation Limits

What are they?

Every measuring device has limits. If you put one penny on a digital bathroom scale, the scale still reads zero. If you keep adding pennies, you eventually see a number at 0.1 lb (one tenth of a pound). That means 0.1 lb is the detection limit for that scale. Anything less is not detected. Tests for air, water, and soil contamination methods also have detection limits, below which a contaminant can't be detected. They also have quantitation limits, below which they can detect a contaminant, but the amount can't be accurately measured ("quantified").



How are they used?

Detection and quantitation limits are called by different names on test results:

- instrument detection limit (IDL)
- method detection limit (MDL)
- practical quantitation limit (PQL)
- limit of quantification (LOQ)
- minimum quantitation limit (MQL)

When test results are below detection limits, you may see ND, meaning "Not Detected" or U ("Under the detection limit") or an * or < symbol. In each case, there should be a note somewhere on the page showing the detection limit. Sometimes the number will appear in the results themselves, like "<5," meaning "less than five."

How are they determined?

Detection limits are determined by the equipment and methods used for testing. A lab should choose equipment and methods that will detect contamination well below health-based standards. If 50 µg/L might be hazardous, but the the detection limit is 100 µg/L, then a "not detected" won't tell you whether or not you're at risk. It's better to set detection limits at 5 µg/L, one-tenth the level of concern. However, very sensitive tests are expensive, and not always necessary. If the screening level is 5,000 µg/kg, you don't need a test that can find as little as 1 µg/kg. Also, a very sensitive instrument might not work for high levels of contamination – your bathroom scale wouldn't work to weigh an elephant or a truck!

How are they related to human health?

Detection limits aren't directly related to health or safety. If you have test results, it's more important to compare levels to a health-based standard, like a screening level or legal limit. Detection limits are only a problem if they're set too high, and risky results are undetectable.

Monitoring Well 16' BGS	Units	Baseline 1/2/2008		04/01/2008		07/07/2008		10/01/2008	
		Result	Limit	Result	Limit	Result	Limit	Result	Limit
VOLATILE ORGANICS									
Vinyl Chloride	ug/L	530	25	100	1.0	100	5.0	16	10
1,1-Dichloroethene	ug/L	<	25	1.1	1.0	<	5.0	<	10
trans-1,2-Dichloroethene	ug/L	70	25	20	1.0	<	5.0	19	10
cis-1,2-Dichloroethene	ug/L	6,800	25	2,100	1.0	160	5.0	2,300	100
Trichloroethene	ug/L	1,200	25	2,500	1.0	82	5.0	2,300	100
Tetrachloroethene	ug/L	1,800	25	4,100	1.0	330	5.0	2,900	100

Here, for each testing date the results appear next to a "Limit." But this isn't a legal limit, it's the detection limit. Notice how the detection limit changes each month as the lab tries to find a limit that will detect the contamination, but won't be far more sensitive than is needed.