

Detection Limit/Quantitation Limit Summary Table

	DETECTION LIMIT (e.g., MDL, PLD, DL, LOD)	QUANTITATION LIMIT (e.g., ML, PLQ, MRL, LLOQ)	COMMENTS	UNCERTAINTY	REFERENCES
PROGRAM					
OST - Office of Water (Wastewater)	MDL(40 CFR Part 136)	ML (40 CFR Part 136)	As of 06-21-2010, OST is reevaluating Detection and Quantitation in CWA programs.		40 CFR Part 136
OGWDW - Office of Water (Drinking Water)	MDL (40 CFR Part 136)	MRL. - LCMRL values from individual laboratories are used to generate the MRL.	Note: Ongoing effort to reduce the use of DL.	MQOs as targets for method development and approval. Organic methods bias (recovery) should be $\pm 30\%$ for levels $>$ MRL and $\pm 50\%$ for levels \leq MRL. The method precision should be $\leq 20\%$ RSD. For inorganic analyses bias targets of $\pm 20\%$ are used.	40 CFR Part 136

<p>OLEM – Solid Waste (SW-846 Methods)</p>	<p>The LLOQ is the lowest concentration at which the laboratory has demonstrated target analytes can be reliably measured and reported with a certain degree of confidence.</p> <p>The LLOQ must be greater than or equal to the lowest point in the calibration curve. The laboratory shall establish the LLOQ at concentrations where both quantitative and qualitative requirements can consistently be met. The laboratory shall verify the LLOQ at least annually, and whenever significant changes are made to the preparation and/or analytical procedure, to demonstrate quantitation capability at lower analyte concentration levels. The verification is performed by the extraction and/or analysis of an LCS (or matrix spike) at 0.5 – 2 times the established LLOQ.</p> <p>Additional LLOQ verifications may be useful on a project-specific basis if a matrix is expected to contain significant interferences at the LLOQ. The verification may be accomplished with either clean control material (e.g., reagent water, solvent blank, Ottawa sand, diatomaceous earth) or a representative sample matrix, free of target compounds. Optimally, the LLOQ should be less than the desired decision level or regulatory action level based on the stated DQOs.</p>	<p>Remove suggested MDLs and MDL determination from SW-846 methods, and use only LLOQ.</p>	<p>The verification of LLOQs using spiked clean control material represents a best-case scenario because it does not evaluate the potential matrix effects of real-world samples. For the application of LLOQs on a project-specific bases, with established DQOs, a representative matrix-specific LLOQ verification may provide a more reliable estimate of the lower quantitation limit capabilities.</p> <p>The LLOQ verification, when performed, should be analyzed after the ICAL. The LLOQ check is carried through the same preparation and analytical procedures as environmental samples and other QC samples. It is recommended to analyze the LLOQ verification on every instrument where data is reported; however, at a minimum, the lab should rotate the verification among similar analytical instruments such that all are included within three years.</p> <p>Recovery of target analytes in the LLOQ verification should be within established in-house limits or within project-specific acceptance limits to demonstrate acceptable method performance at the LLOQ.</p>		
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OLEM - CLP	MDL(40 CFR Part 136)	CRQL : Minimum level of quantitation acceptable under the contract Statement of Work (SOW)	For inorganic SOW ILM05.4, ISM01.2, and organic SOM01.2		40 CFR Part 146; USEPA CLP SOW for Inorganic Analysis Multi-Media, Multi-Concentration, and Inorganic Superfund Methods, and Organics Analysis Multi-Media, Multi-Concentration
OLEM - Office of Emergency Management, Env. Response Laboratory Network (ERLN)	MDL (40 CFR Part 136)	LOQ - Based on Lowest Calibration Standard.			
ORD - Water Methods	DL - Determination of a detection limit is optional and only required if results below the lowest concentration calibration standard are used. Laboratory fortified blanks (LFBs) are prepared at a concentration to give a S/N of 2/5. The samples are prepared and analyzed. The DL is the Student t value for the 99% confidence level at n-1 degrees of freedom, times the standard deviation of the replicate measurements.	MRL - is a concentration that is no lower than the lowest level calibration standard and is determined from analysis of seven replicate LFBs. The MRL is confirmed if the upper and lower limits of the half range of the prediction interval, calculated as the standard deviation of the replicate LFBs times 3.963, are within 50% of the mean result for the seven replicates.	For Methods 332.0, 521, and 535, the MDL or DL can be calculated from the minimum reporting level (MRL) confirmation data set. The MRL conc.is determined from the analysis of 7 replicate LFB's and is not lower than the lowest level calibration standard. For Method 528, 529, 556.1, the procedure described for the determination mirrors that given in Method 332.0 and Method 521, except that use of the MRL confirmation data set is not offered as an alternative to the preparation and analysis of seven LFBs over three days.		40 CFR Part 136
ORD - NERL	LOD - The LOD is calculated by multiplying the standard deviation of results from 10 injections of low concentration samples by 3.	LOQ - The LOQ is determined using water samples spiked at a low concentration to give a coefficient of variation of less than 15%. The quality control limit used for the coefficient of variation is 20%.		LOQ - The LOQ is determined using water samples spiked at a low concentration to give a coefficient of variation of less than 15%. The quality control limit used for the coefficient of variation is 20%.	

ORD - NHEERL Analytical Chemistry Core	MDL - DQFAC Single Laboratory DL-QL Procedure (ver. 2.4)(FACDQ10-13): 3 x std dev of 7 low concentration replicates analyzed over 3 days.	LOQ (LRL) - 10 x std dev obtained in MDL study		± 25% to ± 15% with 95% confidence	NHEERL Analytical Chemistry Core Operating Procedures
ORD - Marine Methods	MDL (40 CFR Part 136)		Performed during initial demonstration of proficiency using 40 CFR 136 Appendix B with replicates distributed throughout a group of typical samples.		ORD Marine Methods
OCSPP - Office of Pesticide Programs BEAD/Analytical Chemistry Branch (ACB)	LOD - Samples fortified with analytes at "low" concentrations are prepared and analyzed. S/N is calculated and LOD is 3 x S/N	LOQ -Samples fortified with analytes at "low" concentrations are prepared and analyzed. S/N is calculated and LOQ is 10 x S/N	Alternative LOD: The concentration of the lowest calibration standard is treated as the LOQ and the LOD is often assumed to be 1/3 of the LOQ. The lowest possible LOD and LOQ values are not critical in these cases. The rationale of this approach is that the expected analyte concentrations in the samples are high and above the lowest calibration concentration and knowledge of the actual LOD/LOQ is not necessary.		

OCSPP - Office of Pesticide Programs BEAD/ACB USDA IR-4 Project	LOD - 10% below the smallest concentration within the standard curve				
OCSPP – Office of Pesticide Programs BEAD/ACB Pesticide Multiresidue method in water samples	MDLs (40 CFR Part 136)	MDLs (40 CFR part 136)			
OAR - Stationary Source	LOD – 3x the standard deviation [S ₀] at the blank level	An estimate of the limit of quantitation [3x LOD] is considered when setting emission standards			Method 301 (40 CFR 63, Appendix A)
OECA - Office of Criminal Enforcement, Forensics, and Training/ National Enforcement Investigations Center	LOD/MDL - A variety of methods are employed to calculate the LOD/MDL, depending on the technique, matrix, and data quality objectives. These may be applied for a technique, or for a set of analysis. Methods include, but are not limited to a.) Calculating the MDL by determined the standard deviation and multiplying this value by the Student-t value for a 95% confidence interval for n-1 samples. b) Using 40 CFR Part 136, Appendix B as guidance, but determine the MDL as applicable to procedure.	LOQ - Similar to the LOD/MDL, a variety of methods are employed for the determination of the quantitation limit, based on technique and sample matrix. Methods include, but are not limited to a) setting the LOQ to the calibration standard with the lowest concentration; b) LOQ may be determined by basing the level of 10x the standard deviation of method blanks to compensate for the matrix effects.	LOD and LOQ are estimates for lowest concentration detected and reported for the analyses, however it is necessary to assess and interpret of the uncertainty at these limits to predict the quality of the value of these limits.	Uncertainty is based on an assessment of the contributions of all the sources of uncertainty for an analysis and presented as a data quality statement. Uncertainty based on control charting or statistical analysis of laboratory control samples are examples of the components of the overall uncertainty statement, however each component is weighed for each set of analysis to determine the overall uncertainty of the analysis.	40 CFR Part 136

