

**Progress on Wet Deposition  
Sample Analysis: An Update  
from the Lab**

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# Commonly Used Units for Trace and Ultra Trace Components

<i>Name of concentration unit</i>	<i>Part per thousand</i>	<i>Part per million</i>	<i>Part per billion</i>	<i>Part per trillion</i>	<i>Part per quadrillion</i>	<i>Part per quintillion</i>	<i>Part per sextillion</i>
Volume/volume concentration	vpth (ppth v/v)	vpm (ppm v/v)	vpb (ppb v/v)	vpt (ppt v/v)	vpq (ppq v/v)	vpq <sub>ui</sub> (ppq <sub>ui</sub> v/v)	vps (pps v/v)
Mass-mass concentration	ppth	ppm	ppb	ppt	ppq	ppq <sub>ui</sub>	pps
Percentage (%)	10 <sup>-1</sup>	10 <sup>-4</sup>	10 <sup>-7</sup>	10 <sup>-10</sup>	10 <sup>-13</sup>	10 <sup>-16</sup>	10 <sup>-19</sup>
Amount of analyte in 1 g sample	1 milligram (1 mg)	1 microgram (1 µg)	1 nanogram (1 ng)	1 picogram (1 pg)	1 femtogram (1 fg)	1 attogram (1 ag)	1 zeptogram (1 zg)

**Concentration of major ions in rainwater.**

**Concentration of Hg in rainwater and ambient air.**

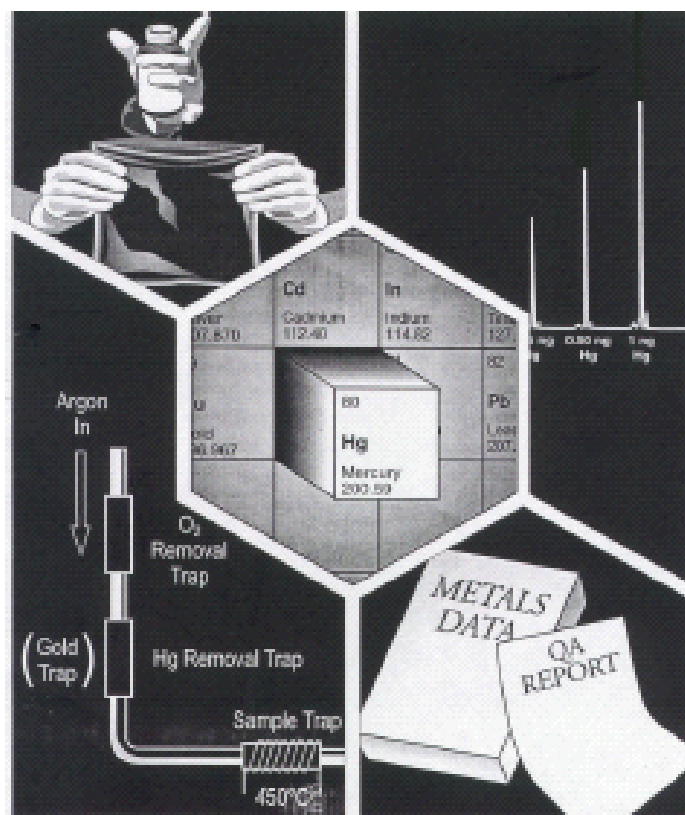
# Analytical Methods and Detection Levels

Method Source	Method Number	Media Name	Instrumentation	Detection level
EPA-NERL	245.1	WATER	CVAA	0.2 ug/L
EPA-NERL	245.2	WATER	CVAA	0.2 ug/L
EPA-OSW	7470A	VARIOUS	CVAA	0.2 ug/L
USGS	I-2462	WATER	CVAA	0.1 ug/L
USGS	I-1462	WATER	CVAA	0.5 ug/L
USGS	I-5462	OTHER	CVAA	0.5 ug/L
USGS	I-7462	WATER	CVAA	0.5 ug/L
USGS	I-3462	WATER	CVAA	0.5 ug/L
NOAA_NST	131.01	ANIMAL TISSUE	CVAA	0.012 ug/L
NOAA_NST	131	SOIL/SEDIMENT	CVAA	0.012 ug/L
EPA-EAD	1631	WATER	CVAFS	0.0002 ug/L
EPA-OSW	6010 C	VARIOUS	ICP-AES	17 ug/L
EPA-NERL	200.7	WATER	ICP-AES	7 ug/L
EPA-NERL	200.8	WATER	ICP-MS	0.2 ug/L
ASTM	D6502	WATER	XRF	1 ug/L

CVAFS: Cold Vapor Atomic Fluorescence Spectrometry

# Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

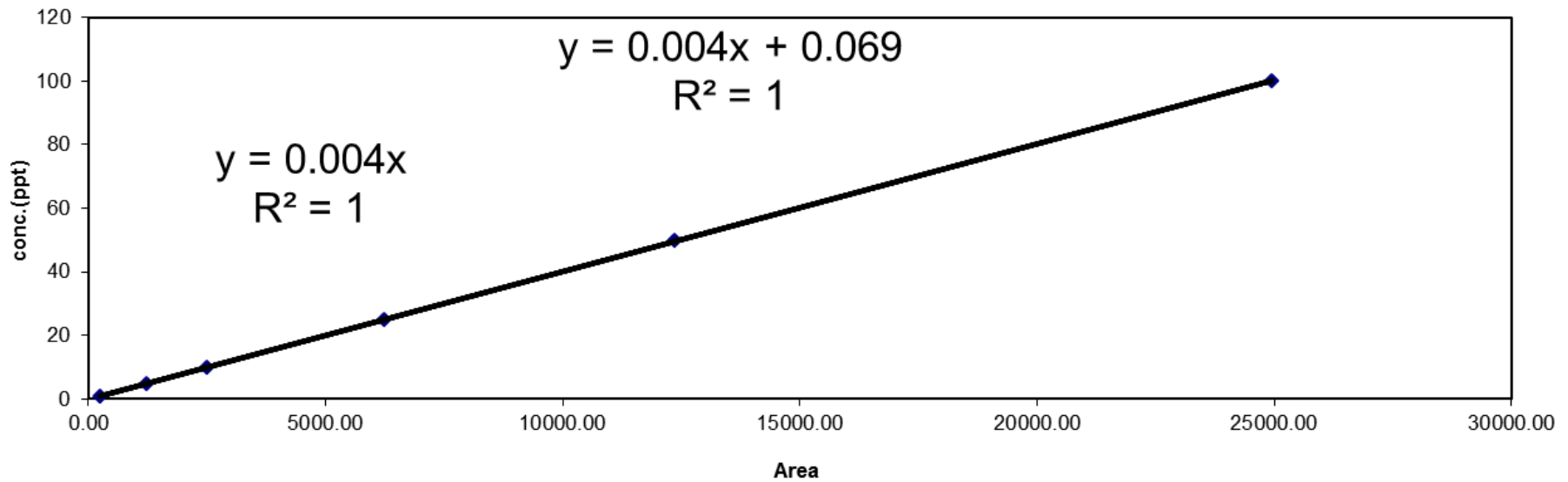
August 2002



The detection limit and minimum level of quantitation in this Method usually are dependent on the level of interferences rather than instrument limitations. The method detection limit (MDL; 40 CFR 136, Appendix B) for Hg has been determined to be 0.2 ng/L when no interferences are present. The minimum level of quantitation (ML) has been established as 0.5 ng/L. An MDL as low as 0.05 ng/L can be achieved for low Hg samples by using a larger sample volume, a lower BrCl level (0.2%), and extra caution in sample handling.

MDL of my lab is 0.16 ng/L

$R^2$  of standard curve  $> 0.999$



## Quality Control Acceptance Criteria for Performance Tests in EPA Method 1631

Acceptance Criteria	Section	Limit (%)
Initial Precision and Recovery (IPR)	9.2.2	
Precision (RSD)	9.2.2.3	21
Recovery (X)	9.2.2.3	79-121
Ongoing Precision and Recovery (OPR)	9.5.2	77-123
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	9.3	
Recovery	9.3.4	71-125
Relative Percent Difference (RPD)	9.3.5	24

	Results of 2014
Duplicate analysis	0.0% - 5.4%
Matrix spike	98.0 – 117.5%

	Frequency	Mean (ng L <sup>-1</sup> )	Min. (ng L <sup>-1</sup> )	Max. (ng L <sup>-1</sup> )	1631 rev. E
Transport blank	8	0.40	0.00	0.98	
System blank	39	0.06	0.00	0.22	< 0.5 ng L <sup>-1</sup>
Bottle blank	39	0.10	0.00	0.38	< 0.5 ng L <sup>-1</sup>



Table 3

Precision and Recovery for Reagent Water, Fresh Water, Marine Water, and Effluent Water Using Method 1631

Matrix	*Mean Recovery (%)	*Precision (% RSD)
Reagent Water	98.0	5.6
Fresh Water (Filtered)	90.4	8.3
Marine Water (Filtered)	92.3	4.7
Marine Water (Unfiltered)	88.9	5.0
Secondary Effluent (Filtered)	90.7	3.0
Secondary Effluent (Unfiltered)	92.8	4.5

\*Mean percent recoveries and RSDs are based on expected Hg concentrations.

Mean recovery of ORMS-5 (Elevated Hg in river water,  $26.2 \pm 1.3$  ng/L) is  $89 \pm 4\%$

# Wet Deposition Samples from Vietnam

Site	Sample	Date	Date	Date
	Name	On	Off	Analyzed
Vietnam	1	10/31/2014	11/25/2014	12/09/2014
Vietnam	1	10/31/2014	11/25/2014	12/09/2014
Vietnam	2	12/23/2014	12/30/2014	01/13/2015
Vietnam	3	01/20/2015	01/27/2015	02/05/2015
Vietnam	3	01/20/2015	01/27/2015	02/05/2015
Vietnam	3	01/20/2015	01/27/2015	02/05/2015
Vietnam	4	03/10/2015	03/17/2015	03/24/2015
Vietnam	4	03/10/2015	03/17/2015	03/24/2015
Vietnam	5		04/14/2015	04/21/2015
Vietnam	5		04/14/2015	04/21/2015
Vietnam	6	04/27/2015	05/04/2015	05/12/2015
Vietnam	6	04/27/2015	05/04/2015	05/12/2015
Vietnam	6	04/27/2015	05/04/2015	05/12/2015

# Samples from Thailand

Site	Sample Name	Date On	Date Off	Date Analyzed
Thailand	1			2015/2/5
Thailand	1			2015/2/5
Thailand	2	01/22/2015	01/30/2015	2015/2/5
Thailand	2	01/22/2015	01/30/2015	2015/2/5
Thailand	3	01/14/2015	01/22/2015	2015/2/5
Thailand	3	01/14/2015	01/22/2015	2015/2/5
Thailand	4			2015/2/5
Thailand	4			2015/2/5
Thailand	5	03/10/2015	03/01/2015	2015/4/30
Thailand	6	03/17/2015	03/24/2015	2015/4/30
Thailand	7	03/24/2015	03/27/2015	2015/4/30
Thailand	8	03/31/2015	04/07/2015	2015/4/30
Thailand	9	04/07/2015	04/13/2015	2015/4/30

10 samples received before leaving for Jeju Hg Conference

**THANK  
YOU!**



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