

The Certified Laboratory Quality Assurance - Quality Control

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DCNR/NDEP/BSDW/LCP

Acknowledgements: J. K. Taylor Ph.D.

Quality Assurance of Chemical Measurements

Images: the World Wide Web & Carolyn A. Thomas



What is a Certified Laboratory ?

A Certified Laboratory is a laboratory that commits to a set of predetermined rules and practices that ensure that the data produced is of known and documented quality.

Certified laboratories generate data that is scientifically valid and legally defensible by following EPA approved methods that have been tested and proven to be accurate (to some degree) and precise.

**Environmental Laboratory analyses is only an estimate.
QA uses QC to know how close the estimate is, to the
actual amount of material thats present in the sample.**



What is Quality Assurance (QA) ??
***QA is comprised of administrative
and procedural activities
implemented in a quality system so
that the quality requirements for a
product, service or activity is
fulfilled.*** J.k. Taylor

QA is an overall system of activities whose purpose is to control the quality of a product (data) so it meets the needs of the customer. It is a system of activities whose purpose is to provide the assurance that the data meets a defined standard of quality, with a stated level of confidence.

QA consists of two separate but related activities: Quality Control and Quality Assessment.

Both must be operational and coordinated.

What is Quality Control (QC) ? ?

Quality Control (QC) begins with sample collection and ends with sample disposal.

QC is achieved through control of analytical performance via a system of checks and balances.



Systematically defined checks at specified intervals. Analyzing blanks, calibration standards, calibration verification standards (2nd source QC samples), matrix spikes, quality control check samples, proficiency test samples and certified reference materials.

This must be performed to establish the precision & accuracy of the data. These checks help certify that the methodology is in control and is measuring what's in the sample.

What is QC ?

QC samples are built into the routine operations of the laboratory. There are other QC practices in the lab, such as checking refrigerator & incubator temperatures, balance checks, reagent water, fume hood velocities, etc. All these checks must be documented.

QC samples are analyzed at specific intervals.

BLANK SAMPLES

A Blank sample is analyzed every 10 samples to check for contamination or carry over.

QA Umbrella



Quality Assurance an Overall System of Checks and Balances

QC-Blanks

Checks

Balances

QC- 2nd Source

QC-CCS

QC-CVS

QC-LCS

QC-MS

QC-MSD

QC-PT Samples

QC-CRMs

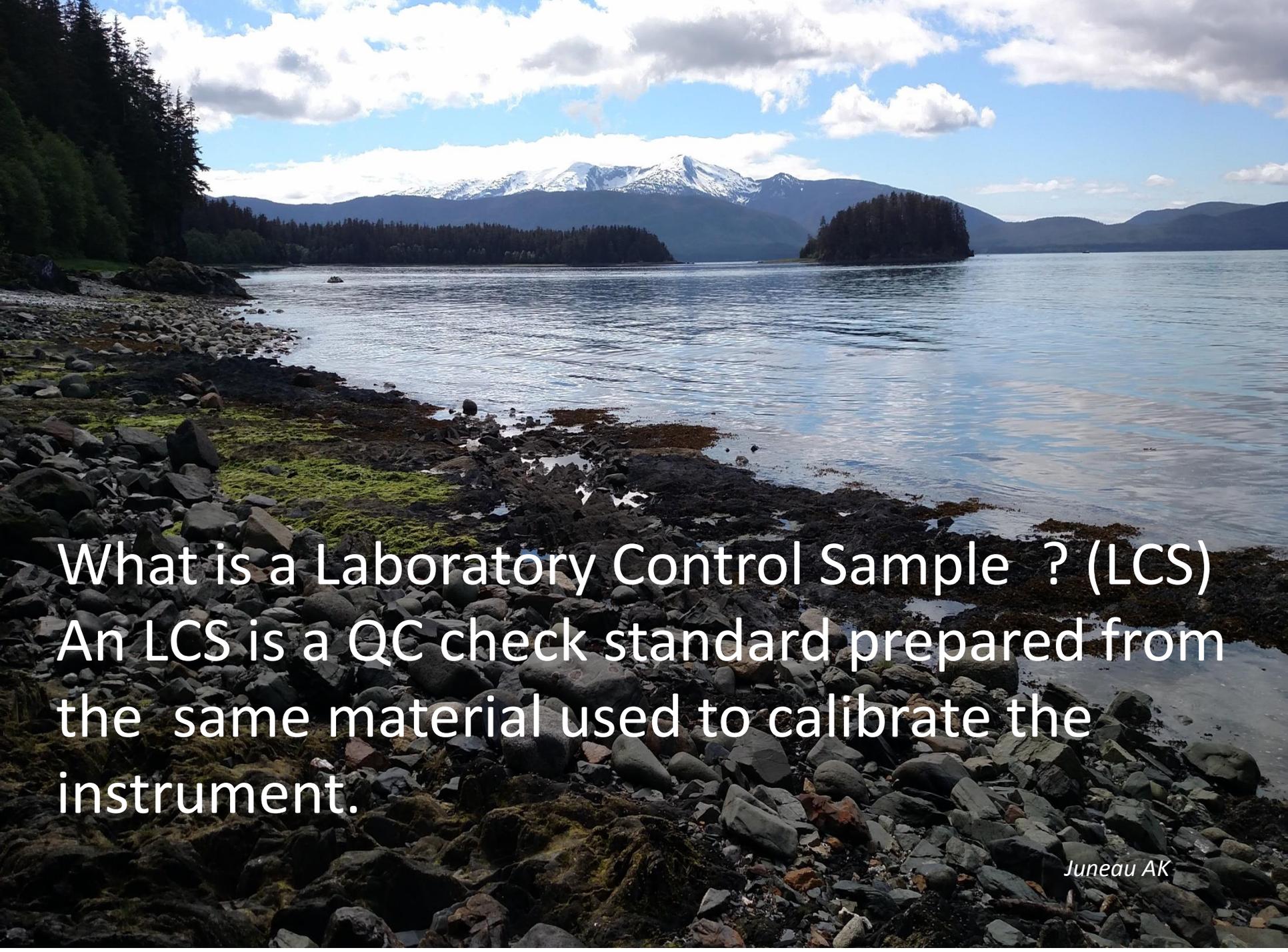
All analytical batches must start
& end with QC

Calibration Check Standard (CCS) is “run” to verify that the instrument is still in calibration.



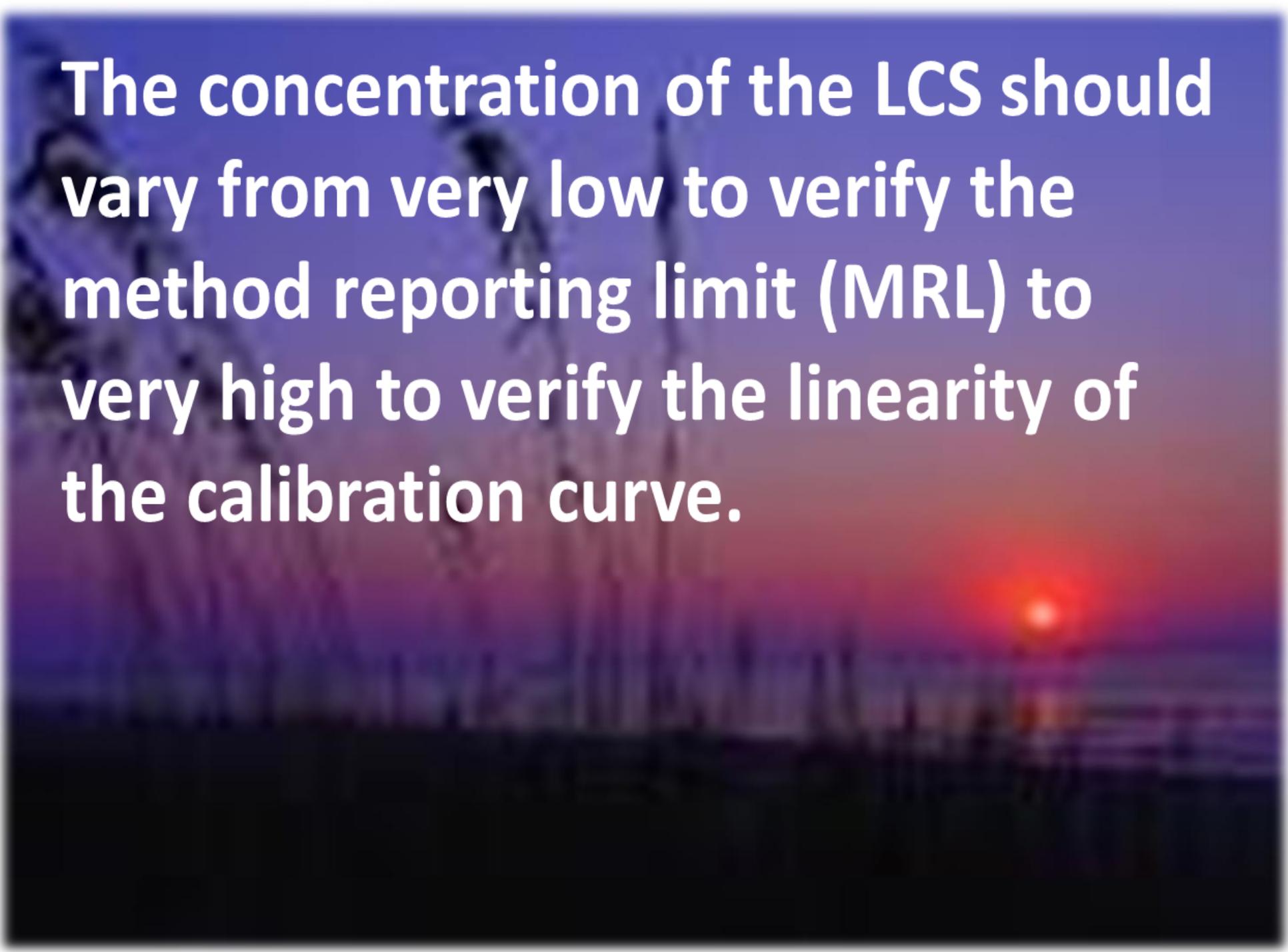


Calibration Verification Standard (CVS) is a standard from a source other than what was used for calibration. A 2nd source standard is required because verifying the calibration with the same materials used to calibrate will always give you “the right wrong answer” Reginal Lang BSDW .

A scenic landscape of a rocky shoreline with a forested island and snow-capped mountains in the background. The foreground is dominated by dark, jagged rocks and patches of green moss. The middle ground shows a calm body of water reflecting the sky and the distant mountains. The background features a range of mountains with significant snow cover under a blue sky with scattered white clouds.

What is a Laboratory Control Sample ? (LCS)
An LCS is a QC check standard prepared from
the same material used to calibrate the
instrument.

Juneau AK

A sunset over a body of water with a silhouette of a person in the foreground. The sun is a bright red orb on the horizon, casting a glow across the sky. The water is dark, and the foreground shows the silhouette of a person standing on a pier or dock.

The concentration of the LCS should vary from very low to verify the method reporting limit (MRL) to very high to verify the linearity of the calibration curve.

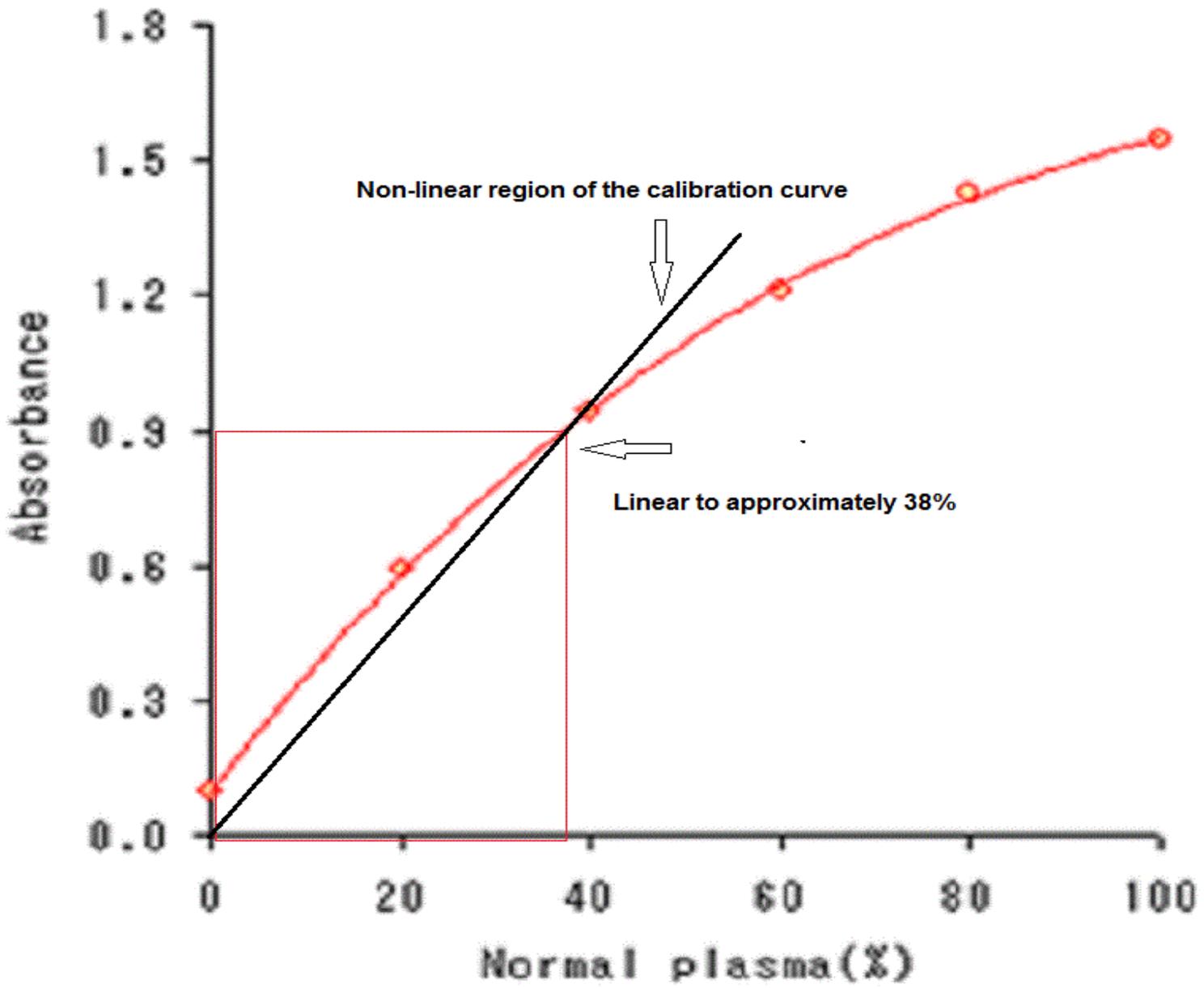


Fig. 1a Calibration curve

What is a Matrix Spike (MS) and why is analyzed in duplicate (MSD) ?

A matrix spike is an aliquot of sample that is spiked with target analytes.



The matrix spike is a QC that tells the analyst if there are any target analytes or other substances in the sample that are interfering with the measurement.

MS-MSD are run in duplicate so the precision between the duplicates can be calculated.



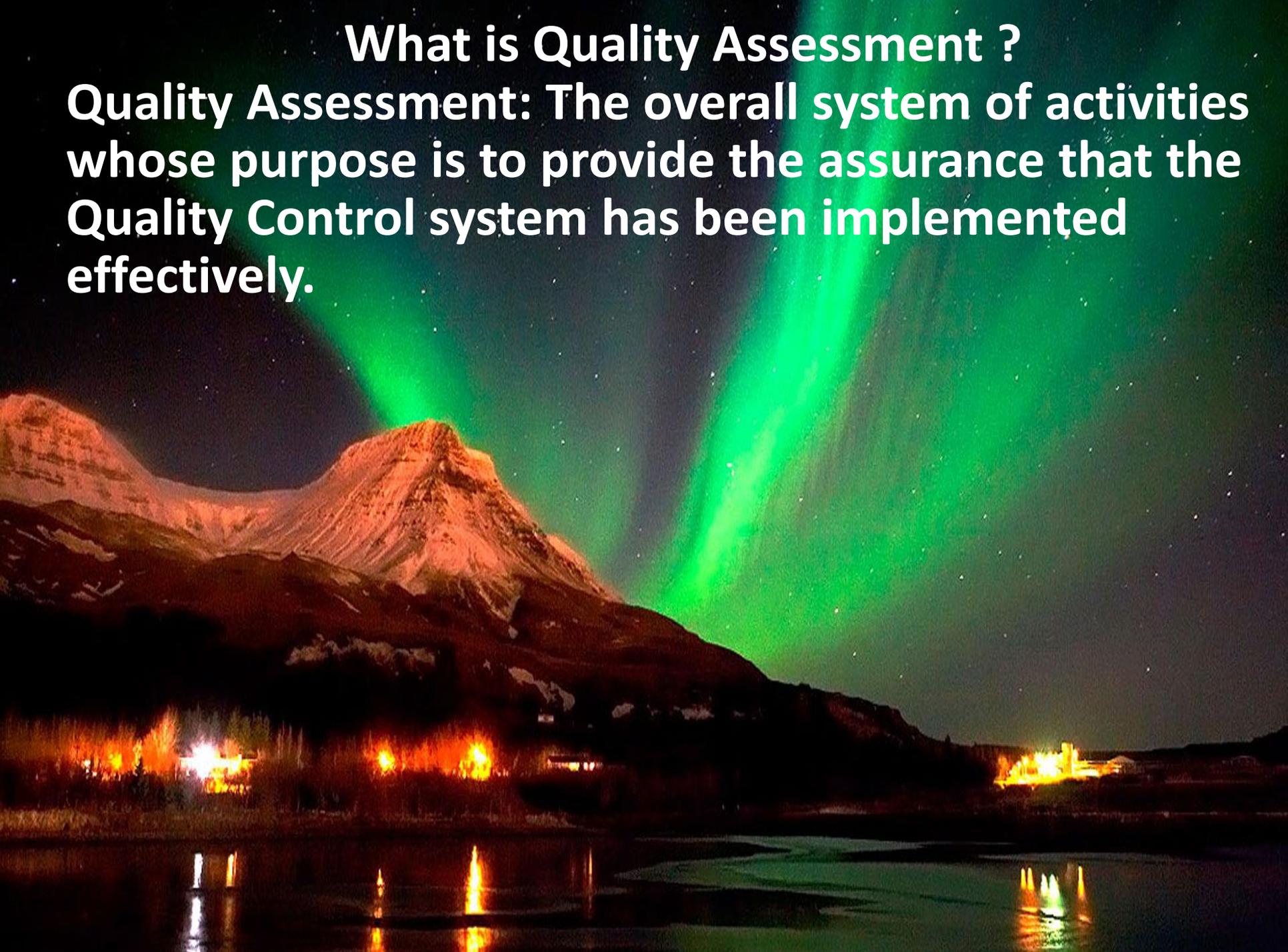
Whats the difference between the method detection limit (MDL) and a method reporting limit (MRL) ?

The MDL is a calculated value based upon the deviation between replicate measurements.

The MRL is the lowest value that a method- instrument- Analyst can actually see with 99% confidence.

What is Quality Assessment ?

Quality Assessment: The overall system of activities whose purpose is to provide the assurance that the Quality Control system has been implemented effectively.



Quality assessment involves continuous monitoring and evaluation of the products produced (data) and the performance of the analyst and the analytical system. The quality of the analyst's QC efforts can vary depending on their training and professional pride.



Barrow AK

Quality Control Results

Chlorinated Herbicides

Analyte	Result	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualification
Batch: W6C1414 - EPA 515.3										
Blank (W6C1414-BLK1)				Prepared: 03/23/16 Analyzed: 03/28/16						
2,4,5-T	ND	0.070	ug/l							
2,4,5-TP (Silvex)	ND	0.090	ug/l							
2,4-D	ND	0.070	ug/l							
2,4-DB	ND	0.070	ug/l							
3,5-Dichlorobenzoic acid	ND	0.090	ug/l							
Acifluorfen	ND	0.060	ug/l							
Bentazon	ND	0.11	ug/l							
Dalapon	ND	0.10	ug/l							
DCPA	ND	0.070	ug/l							
Dicamba	ND	0.12	ug/l							
Dichloroprop	ND	0.080	ug/l							
Dinoseb	ND	0.14	ug/l							
Pentachlorophenol	ND	0.040	ug/l							
Picloram	ND	0.050	ug/l							
Surrogate(s)										
2,4-DCAA			9.98 ug/l	10.0		100	70-130			



Western Environmental Testing Laboratory
3230 Polaris Ave., Ste 4
Las Vegas NV, 89102

Date Received: 03/22/16 10:10
Date Reported: 04/01/16 15:29

6C22017-01 1603548-001

Sampled: 03/17/16 07:30

Sampled By: Client

Matrix: Water

Chlorinated Herbicides

Method: EPA 515.3

Batch: W6C1414

Prepared: 03/23/16 08:42

Analyst: par

Batch: W6C1414 - EPA 515.3 **CCS @ 20 ug/L** CCV032316-B-124

Analyte	Result	Units	Limits +/- 10%	Recovery (90-110%)
2,4,5-T	18.6	ug/l	18-22 ug/L	93%
2,4,5-TP	19.1	ug/l		96%
2,4-D	21.3	ug/l		107%
2,4-DB	20.5	ug/l		103%
3,5-Dichlorobenzoic acid	17.5	ug/l	FAIL	88%
Acifluorfen	20.0	ug/l		100%
Bentazon	19.6	ug/l		98%
Dalapon	18.7	ug/l		94%
DCPA	20.2	ug/l		101%
Dicamba	19.7	ug/l		99%
Dichloroprop	18.9	ug/l		95%
Dinoseb	21.1	ug/l		106%
Pentachlorophenol	19.9	ug/l		99%
Picloram	20.3	ug/l		102%
<i>Surrogate</i>		<i>Result</i>	<i>True Value</i>	<i>%Rec</i>
2,4,-DCAA		10.1	10.0	101

Quality Control Results

(Continued)

Chlorinated Herbicides (Continued)

Analyte	Result	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W6C1414 - EPA 515.3 (Continued)										
Matrix Spike (W6C1414-MS1)	Source: 6C18085-01			Prepared: 03/23/16 Analyzed: 03/28/16						
2,4,5-T	3.93	0.070	ug/l	4.00	ND	98	70-130			
2,4,5-TP (Silvex)	4.07	0.090	ug/l	4.00	ND	102	70-130			
2,4-D	7.16	0.070	ug/l	8.00	ND	89	70-130			
2,4-DB	15.3	0.070	ug/l	16.0	ND	96	70-130			
3,5-Dichlorobenzoic acid	7.97	0.090	ug/l	8.00	ND	100	70-130			
Acifluorfen	3.92	0.060	ug/l	4.00	ND	98	70-130			
Bentazon	15.9	0.11	ug/l	16.0	ND	99	70-130			
Dalapon	7.23	0.10	ug/l	8.00	ND	90	70-130			
DCPA	4.14	0.070	ug/l	4.00	ND	103	70-130			
Dicamba	7.04	0.12	ug/l	8.00	ND	88	70-130			
Dichloroprop	7.42	0.080	ug/l	8.00	ND	93	70-130			
Dinoseb	4.18	0.14	ug/l	4.00	ND	104	70-130			
Pentachlorophenol	4.03	0.040	ug/l	4.00	ND	101	70-130			
Picloram	3.79	0.050	ug/l	4.00	ND	95	70-130			
<i>Surrogate(s)</i>										
2,4-DCAA			9.91 ug/l	10.0		99	70-130			

	Result	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Matrix Spike Dup (W6C1414-MSD1)	Source: 6C18085-01		Prepared: 03/23/16 Analyzed: 03/29/16						
2,4,5-T	4.04	0.070	ug/l	4.00	ND	101	70-130	3	30
2,4,5-TP (Silvex)	4.19	0.090	ug/l	4.00	ND	105	70-130	3	30
2,4-D	7.78	0.070	ug/l	8.00	ND	97	70-130	8	30
2,4-DB	16.6	0.070	ug/l	16.0	ND	104	70-130	8	30
3,5-Dichlorobenzoic acid	8.25	0.090	ug/l	8.00	ND	103	70-130	3	30
Acifluorfen	4.18	0.060	ug/l	4.00	ND	105	70-130	6	30
Bentazon	16.3	0.11	ug/l	16.0	ND	102	70-130	3	30
Dalapon	7.48	0.10	ug/l	8.00	ND	94	70-130	4	30
DCPA	4.29	0.070	ug/l	4.00	ND	107	70-130	4	30
Dicamba	7.41	0.12	ug/l	8.00	ND	93	70-130	5	30
Dichloroprop	7.60	0.080	ug/l	8.00	ND	95	70-130	2	30
Dinoseb	4.28	0.14	ug/l	4.00	ND	107	70-130	2	30
Pentachlorophenol	4.14	0.040	ug/l	4.00	ND	103	70-130	3	30
Picloram	4.10	0.050	ug/l	4.00	ND	102	70-130	8	30
<i>Surrogate(s)</i>									
2,4-DCAA			10.1 ug/l	10.0		101	70-130		



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Sampled By: Client

Matrix: Water

Chlorinated Herbicides

Method: EPA 515.3

Batch: W6C1414

Prepared: 03/23/16 08:42

Analyst: par

Sample: 1603548-001, Alias: North Well - NV0000038 Sampled: 03/17/16 @ 7:30a by Client

Chlorinated Herbicides Final Report

Method: **EPA 515.3** Batch ID: W6C1414 Prepared: 03/23/16 08:42 Analyst: par

Date

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Picloram	0.18	0.050	0.60	ug/l	1	3/29/16 2:54p	J

Date

Surrogate	Result	True Value	% Rec	Acceptance Range	Analyzed
2,4-DCAA	9.78	10.0	98%	70-130	3/29/16 2:54p

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Source	Sample that was matrix spiked or duplicated.
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ) and Detection Limit for Reporting (DLR)
MDA	Minimum Detectable Activity
NR	Not Reportable
TIC	Tentatively Identified Compound (TIC) using mass spectrometry. The reported concentration is relative concentration based on the nearest internal standard. If the library search produces no matches at, or above 85%, the compound is reported as unknown.

Any Questions ?



Juneau AK

Sky on Fire Juneau AK



CAT 12-8-86