RESL CUSTOMER EXPORT CONTROL AGREEMENT

It is the Radiological and Environmental Sciences Laboratory's (RESL) policy to conduct business in accordance with all applicable U.S. export control laws and regulations. It is also RESL's policy that its Customers comply with U.S. export control laws and regulations. Therefore, Customer agrees to the following:

1. Because products, technical data, and technical assistance (i.e., services) provided to Customer by RESL may be subject to U.S. export control laws and regulations, (i) transactions with certain persons and companies and (ii) the export or reexport of certain types and levels of products, technical data, and services are prohibited or restricted.

2. Customer acknowledges that it is responsible for its own compliance with U.S. export control laws and regulations. Customer further agrees that it assumes the responsibility to obtain all necessary U.S. export licenses or other U.S. governmental authorizations, as well as all liability for the failure to do so.

3. Customer acknowledges that export control requirements may change and that the export or reexport of RESL products, technical data, and services without an export license or other appropriate governmental authorization may result in criminal and/or civil liability.

4. The obligations and requirements described herein shall survive the expiration or termination of any agreement or contract between RESL and Customer.

MaSF49 Participating Laboratories

Lab Code	Lab Name	Matrix Code
AFOH01	USAFSAM/OEA	MaF
FDHE01	Florida Dept of Health Environmental Laboratory	MaF
FDOH01	Florida Dept. of Health, Mobile Environmental Radiological Lab	MaF
GENE01	GEL Laboratories, LLC	MaF
HCAL01	Lawrence Livermore National Laboratory	MaF
RQCT01	INL Radiobioassay Quality Control Testing	MaF
WIPP01	WIPP Laboratories	MaF
WSHL01	Wisconsin State Laboratory of Hygiene	MaF

Laboratories Not Reporting

Lab Code	Lab Name	Matrix Code
HPAL01	Los Alamos National Laboratory	MaF
STRL01	South Texas Project Radiological Laboratory	MaF

Study Reference Values

MAPEP-23-MaSF49

Radiological Reference Date: 08/01/2023

Analyte	Ref Value	Ref Unc
Radiological	Units: (Bq/sample)	
Americium-241	2.03	0.05
Cesium-134	0.546	0.014
Cesium-137	9.5	0.2
Cobalt-57	2.43	0.06
Cobalt-60	8.2	0.2
Manganese-54	2.89	0.07
Plutonium-238	0.0052	0.0006
Plutonium-239/240	0.0174	0.0011
Plutonium-241	17.3	0.5
Uranium-234		
Uranium-238		
Zinc-65	2.16	0.05
Zirconium-95	2.89	0.05

Sample Statistical Summary

MAPEP-23-MaSF49

Radiological Reference Date: 08/01/2023

Analyte	T(1)	A(2)	Grand(3) Mean	Std Dev	Ref Value	Ref Unc	Acceptance Range
Radiological							Units: (Bq/sample)
Americium-241	8	7	2.07	0.21	2.03	0.05	1.42 - 2.64
Cesium-134	7	6	0.531	0.085	0.546	0.014	0.382 - 0.710
Cesium-137	7	6	9.4	0.4	9.5	0.2	6.7 - 12.4
Cobalt-57	7	6	2.55	0.17	2.43	0.06	1.70 - 3.16
Cobalt-60	7	6	8.4	0.4	8.2	0.2	5.7 - 10.7
Curium-244	3	3					False Positive Test
Manganese-54	7	6	3.06	0.38	2.89	0.07	2.02 - 3.76
Neptunium-237	2	2					False Positive Test
Plutonium-238	6	5			0.0052	0.0006	Sensitivity Evaluation
Plutonium-239/240	6	6	0.0218	0.0191	0.0174	0.0011	Sensitivity Evaluation
Plutonium-241	1	1			17.3	0.5	12.1 - 22.5
Strontium-90	5	5					False Positive Test
Uranium-234	5						
Uranium-238	5						
Zinc-65	7	7	2.19	0.41	2.16	0.05	1.51 - 2.81
Zirconium-95	4	4			2.89	0.05	2.02 - 3.76

Note: (1) T = Total number of laboratories reporting analyte.
(2) A = Number of laboratories with 'Acceptable' performance.
(3) Mean excludes values derived as total metals and values indicated as "Not Acceptable".

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

Mixed Analyte Performance Evaluation Program

Flag Summary Report

MAPEP-23-MaSF49

Radiological				
Analyte	**A**	**W**	**RW**	**N**
Americium-241	6	1		1
Cesium-134	5	1		1
Cesium-137	6			1
Cobalt-57	6			1
Cobalt-60	6			1
Curium-244	3			
Manganese-54	5	1		1
Neptunium-237	2			
Plutonium-238	5			1
Plutonium-239/240	6			
Potassium-40	1			
Strontium-90	5			
Zinc-65	5	2		
Zirconium-95	4			
Plutonium-241	1			

Mixed Analyte Performance Evaluation Program
Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49
(AFOH01) USAFSAM/OEA
2510 Fifth Street, Area B
Wright-Patterson AFB, OH 45433-7913

Radiological								Units: (Bq/sample)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	2.0	2.03	A		-1.5	1.42 - 2.64	0.1	A
Cesium-134	NR	0.546				0.382 - 0.710		
Cesium-137	NR	9.5				6.7 - 12.4		
Cobalt-57	NR	2.43				1.70 - 3.16		
Cobalt-60	NR	8.2				5.7 - 10.7		
Curium-244	NR					False Positive Test		
Manganese-54	NR	2.89				2.02 - 3.76		
Neptunium-237	NR					False Positive Test		
Plutonium-238	0.0043	0.0052	A			Sensitivity Evaluation	0.0010	
Plutonium-239/240	0.015	0.0174	A			Sensitivity Evaluation	0.002	
Plutonium-241	NR	17.3				12.1 - 22.5		
Strontium-90	0.01		A			False Positive Test	0.01	
Uranium-234	0.002			(6)			0.002	
Uranium-238	0.0001			(6)			0.0002	
Zinc-65	NR	2.16				1.51 - 2.81		
Zirconium-95	NR	2.89				2.02 - 3.76		

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

Notes:

(6) = Not Evaluated

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49

(FDHE01) Florida Dept of Health Environmental Laboratory
2100 All Childrens Way
Orlando, FL 32818-5271

Radiological

Units: (Bq/sample)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	2.253	2.03	A		11.0	1.42 - 2.64	0.112	A
Cesium-134	0.487	0.546	A		-10.8	0.382 - 0.710	0.029	A
Cesium-137	9.993	9.5	A		5.2	6.7 - 12.4	0.205	A
Cobalt-57	2.43	2.43	A		0.0	1.70 - 3.16	0.078	A
Cobalt-60	8.185	8.2	A		-0.2	5.7 - 10.7	0.136	N
Curium-244	NR					False Positive Test		
Manganese-54	3.008	2.89	A		4.1	2.02 - 3.76	0.106	A
Neptunium-237	NR					False Positive Test		
Plutonium-238	0.044	0.0052	N	(4)		Sensitivity Evaluation	0.01	
Plutonium-239/240	0.06	0.0174	A	(17)		Sensitivity Evaluation	0.02	
Plutonium-241	NR	17.3				12.1 - 22.5		
Strontium-90	-0.16		A			False Positive Test	0.22	
Uranium-234	0.056			(6)			0.56	
Uranium-238	0.0095			(6)			0.095	
Zinc-65	2.338	2.16	A		8.2	1.51 - 2.81	0.153	A
Zirconium-95	3.023	2.89	A		4.6	2.02 - 3.76	0.121	A

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

Notes:

(4) = Sensitivity Evaluation
(6) = Not Evaluated
(17) = NOT DETECTED - reported a statistically zero result

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49

(FDOH01) Florida Dept. of Health, Mobile Environmental Radiological Lab
2100 All Childrens Way
Orlando, FL 32818-5271

Radiological — Units: (Bq/sample)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	2.05	2.03	A		1.0	1.42 - 2.64	0.06	A
Cesium-134	0.46	0.546	A		-15.8	0.382 - 0.710	0.03	A
Cesium-137	9.8	9.5	A		3.2	6.7 - 12.4	0.26	A
Cobalt-57	2.37	2.43	A		-2.5	1.70 - 3.16	0.08	A
Cobalt-60	8.15	8.2	A		-0.6	5.7 - 10.7	0.15	N
Curium-244	NR					False Positive Test		
Manganese-54	3.01	2.89	A		4.2	2.02 - 3.76	0.1	A
Neptunium-237	NR					False Positive Test		
Plutonium-238	NR	0.0052				Sensitivity Evaluation		
Plutonium-239/240	NR	0.0174				Sensitivity Evaluation		
Plutonium-241	NR	17.3				12.1 - 22.5		
Strontium-90	NR					False Positive Test		
Zinc-65	2.44	2.16	A		13.0	1.51 - 2.81	0.14	A
Zirconium-95	3.05	2.89	A		5.5	2.02 - 3.76	0.13	A

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49
(GENE01) GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407

Radiological

Units: (Bq/sample)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	1.88	2.03	A		-7.4	1.42 - 2.64	0.179	A
Cesium-134	0.602	0.546	A		10.3	0.382 - 0.710	0.148	W
Cesium-137	9.35	9.5	A		-1.6	6.7 - 12.4	0.457	A
Cobalt-57	2.44	2.43	A		0.4	1.70 - 3.16	0.175	A
Cobalt-60	8.95	8.2	A		9.1	5.7 - 10.7	0.554	A
Curium-244	0.00625		A			False Positive Test	0.00887	
Manganese-54	3.21	2.89	A		11.1	2.02 - 3.76	0.255	A
Neptunium-237	0.0000001		A			False Positive Test	0.00137	
Plutonium-238	0.005	0.0052	A			Sensitivity Evaluation	0.000831	
Plutonium-239/240	0.0168	0.0174	A			Sensitivity Evaluation	0.0016	
Plutonium-241	16.65	17.3	A		-3.8	12.1 - 22.5	0.6327	A
Strontium-90	0.0111		A			False Positive Test	0.0156	
Uranium-234	-0.000217			(6)			0.00101	
Uranium-238	5.01E-5			(6)			0.000972	
Zinc-65	2.80	2.16	W		29.6	1.51 - 2.81	0.359	A
Zirconium-95	3.01	2.89	A		4.2	2.02 - 3.76	0.537	W

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

Notes:

(6) = Not Evaluated

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49
(HCAL01) Lawrence Livermore National Laboratory
Analytical Services and Instrumentation Analytical Lab
Livermore, CA 94550

Radiological

Units: (Bq/sample)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	1.95e+00	2.03	A		-3.9	1.42 - 2.64	8.60e-02	A
Cesium-134	4.22e-01	0.546	W		-22.7	0.382 - 0.710	1.64e-01	N
Cesium-137	9.26e+00	9.5	A		-2.5	6.7 - 12.4	3.85e-01	A
Cobalt-57	2.64E+00	2.43	A		8.6	1.70 - 3.16	3.42e-01	A
Cobalt-60	7.94E+00	8.2	A		-3.2	5.7 - 10.7	2.42e-01	A
Curium-244	2.61e-05		A			False Positive Test	3.28e-05	
Manganese-54	2.68e+00	2.89	A		-7.3	2.02 - 3.76	4.39e+00	N
Neptunium-237	NR					False Positive Test		
Plutonium-238	5.52e-03	0.0052	A			Sensitivity Evaluation	4.63e-04	
Plutonium-239/240	1.64e-02	0.0174	A			Sensitivity Evaluation	1.03e-03	
Plutonium-241	NR	17.3				12.1 - 22.5		
Strontium-90	NR					False Positive Test		
Zinc-65	1.88e+00	2.16	A		-13.0	1.51 - 2.81	3.23e-01	W
Zirconium-95	NR	2.89				2.02 - 3.76		

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49
(RQCT01) INL Radiobioassay Quality Control Testing
PO Box 1625, MS 2114
Idaho Falls, ID 83415

Radiological								Units: (Bq/sample)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	1.89E+00	2.03	A		-6.9	1.42 - 2.64	1.08E-01	A
Cesium-134	5.96E-01	0.546	A		9.2	0.382 - 0.710	1.75E-01	W
Cesium-137	8.84E+00	9.5	A		-6.9	6.7 - 12.4	4.96E-01	A
Cobalt-57	2.59E+00	2.43	A		6.6	1.70 - 3.16	2.55E-01	A
Cobalt-60	8.58E+00	8.2	A		4.6	5.7 - 10.7	6.33E-01	A
Curium-244	1.00E-06		A			False Positive Test	1.22E-03	
Manganese-54	2.72E+00	2.89	A		-5.9	2.02 - 3.76	3.30E-01	A
Neptunium-237	-9.99E-04		A			False Positive Test	1.03E-03	
Plutonium-238	5.81E-03	0.0052	A			Sensitivity Evaluation	8.03E-04	
Plutonium-239/240	1.58E-02	0.0174	A			Sensitivity Evaluation	1.51E-03	
Plutonium-241	NR	17.3				12.1 - 22.5		
Strontium-90	1.37E-02		A			False Positive Test	1.36E-02	
Uranium-234	1.26E-03			(6)			1.02E-03	
Uranium-238	-1.85E-03			(6)			8.33E-04	
Zinc-65	2.07E+00	2.16	A		-4.2	1.51 - 2.81	4.55E-01	W
Zirconium-95	3.21E+00	2.89	A		11.1	2.02 - 3.76	9.66E-01	N

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

Notes:

(6) = Not Evaluated

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49
(WIPP01) WIPP Laboratories
1400 University Drive
Carlsbad, NM 88220

Radiological

Units: (Bq/sample)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	2.46E+000	2.03	W		21.2	1.42 - 2.64	1.86E-001	A
Cesium-134	6.21E-001	0.546	A		13.7	0.382 - 0.710	1.18E-001	W
Cesium-137	9.01E+000	9.5	A		-5.2	6.7 - 12.4	2.34E-001	A
Cobalt-57	2.83E+000	2.43	A		16.5	1.70 - 3.16	9.29E-002	A
Cobalt-60	8.75E+000	8.2	A		6.7	5.7 - 10.7	2.80E-001	A
Curium-244	NR					False Positive Test		
Manganese-54	3.73E+000	2.89	W		29.1	2.02 - 3.76	1.79E-001	A
Neptunium-237	NR					False Positive Test		
Plutonium-238	3.13E-004	0.0052	A	(17)		Sensitivity Evaluation	1.21E-003	
Plutonium-239/240	6.58E-003	0.0174	A	(17)		Sensitivity Evaluation	1.32E-002	
Plutonium-241	NR	17.3				12.1 - 22.5		
Strontium-90	-1.44E-003		A			False Positive Test	4.18E-003	
Uranium-234	5.28E-004			(6)			9.66E-004	
Uranium-238	4.88E-004			(6)			9.31E-004	
Zinc-65	2.26E+000	2.16	A		4.6	1.51 - 2.81	3.21E-001	A
Zirconium-95	NR	2.89				2.02 - 3.76		

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

Notes:

(6) = Not Evaluated
(17) = NOT DETECTED - reported a statistically zero result

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-23-MaSF49

(WSHL01) Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive
Madison, WI 53718

Radiological

Units: (Bq/sample)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Americium-241	0.891	2.03	N		-56.1	1.42 - 2.64	0.171	W
Cesium-134	0.293	0.546	N		-46.3	0.382 - 0.710	0.0163	A
Cesium-137	6.02	9.5	N		-36.6	6.7 - 12.4	0.176	A
Cobalt-57	1.52	2.43	N		-37.4	1.70 - 3.16	0.047	A
Cobalt-60	5.11	8.2	N		-37.7	5.7 - 10.7	0.284	A
Curium-244	NR					False Positive Test		
Manganese-54	1.90	2.89	N		-34.3	2.02 - 3.76	0.087	A
Neptunium-237	NR					False Positive Test		
Plutonium-238	NR	0.0052				Sensitivity Evaluation		
Plutonium-239/240	NR	0.0174				Sensitivity Evaluation		
Plutonium-241	NR	17.3				12.1 - 22.5		
Strontium-90	NR					False Positive Test		
Zinc-65	1.52	2.16	W		-29.6	1.51 - 2.81	0.124	A
Zirconium-95	NR	2.89				2.02 - 3.76		

Radiological Reference Date: August 1, 2023

Results Flags:

A = Result acceptable.....|Bias| ≤ 20%

W = Result acceptable with warning.....20% < |Bias| ≤ 30%

N = Result not acceptable.....|Bias| > 30%

RW = Report Warning

NR = Not Reported

Uncertainty Flags:

NOT ACCEPTABLE.....RP < 2%

ACCEPTABLE.....2% ≤ RP ≤ 15%

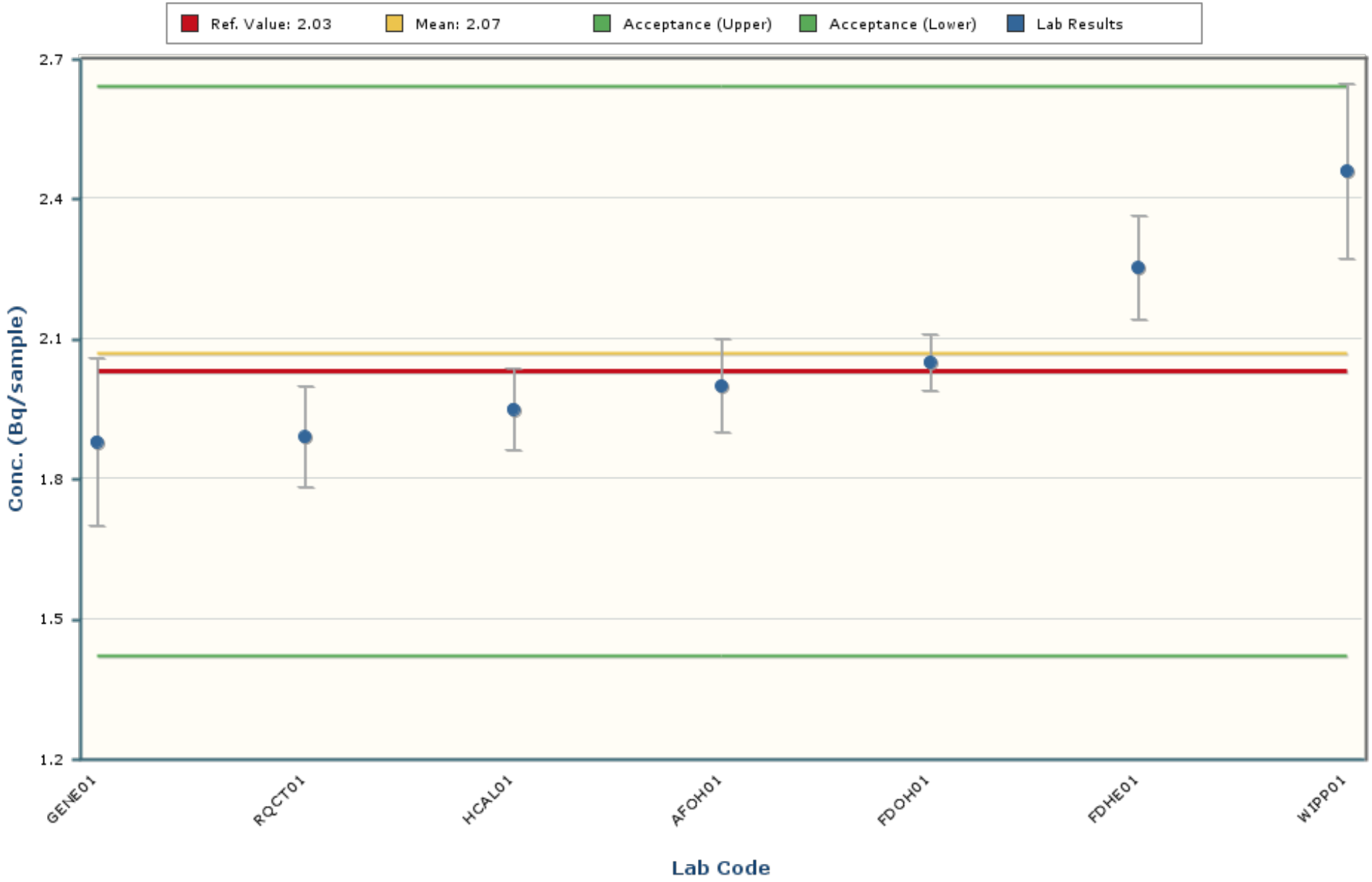
ACCEPTABLE WITH WARNING.....15% < RP ≤ 30%

NOT ACCEPTABLE.....RP > 30%

Relative Precision (RP) = (Reported Uncertainty / Reported Result) x 100

Americium-241

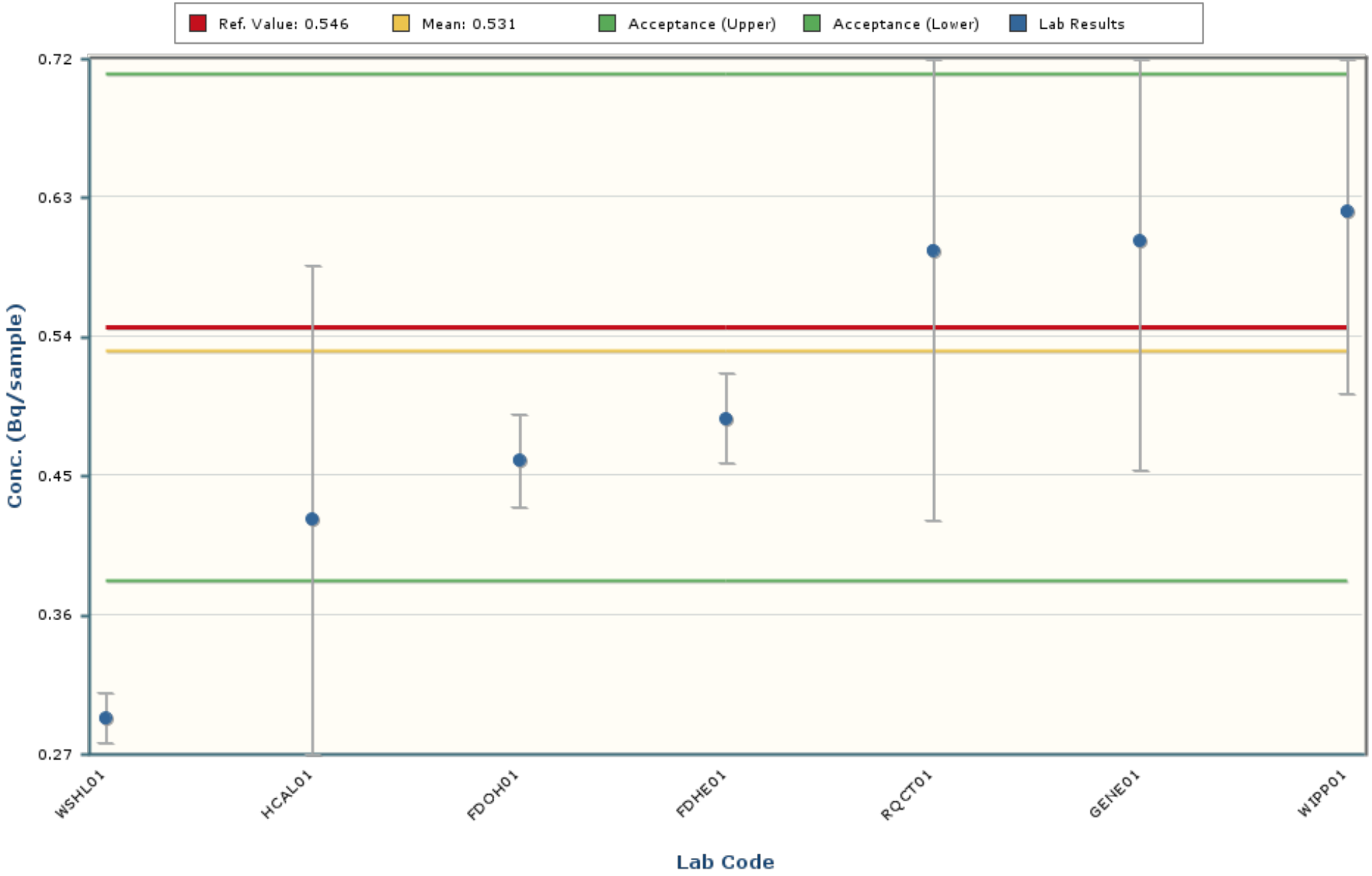
MAPEP-23-MaSF49



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 1.00 and 3.14 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

Cesium-134

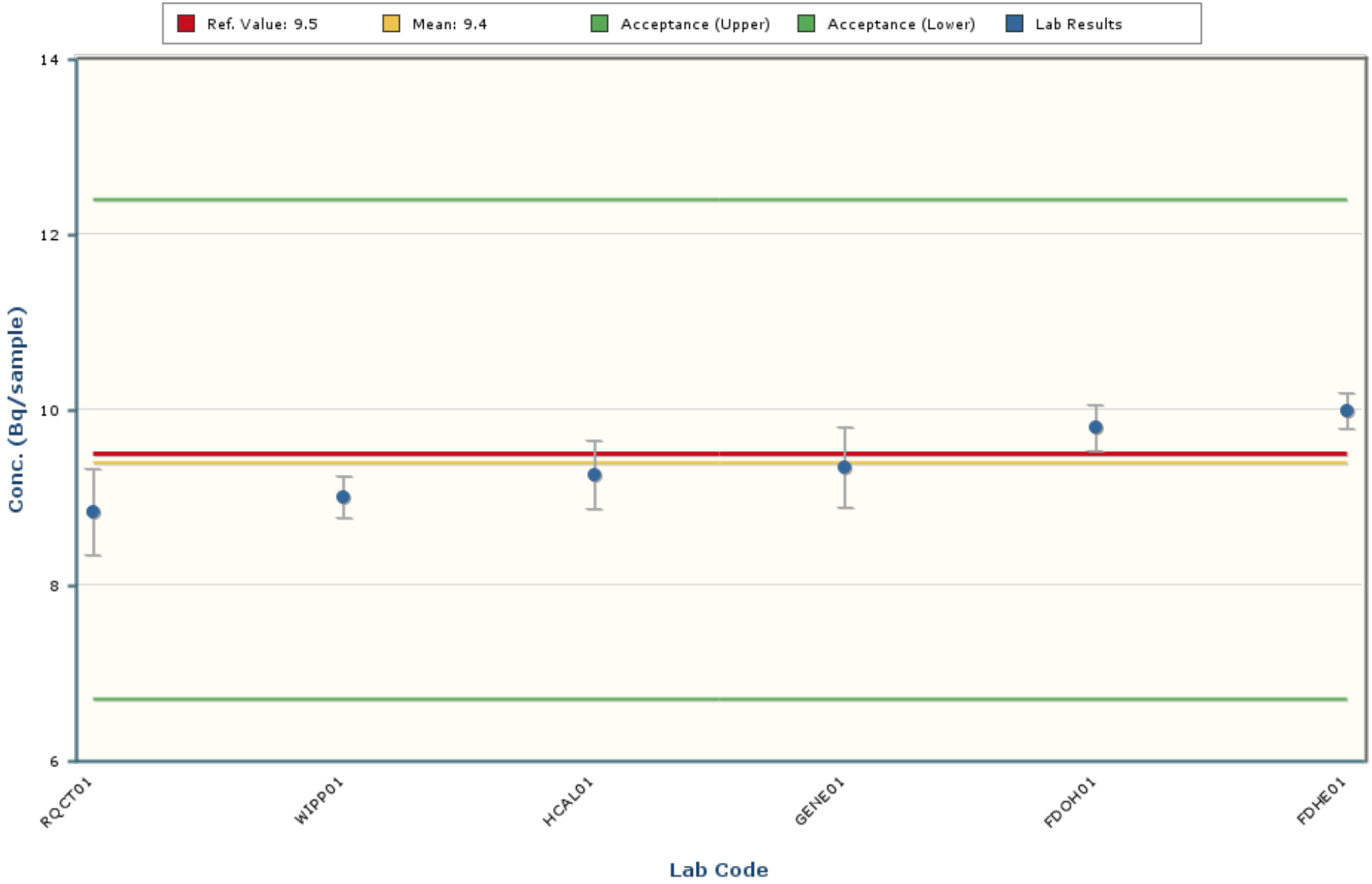
MAPEP-23-MaSF49



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 0.106 and 0.957 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

Cesium-137

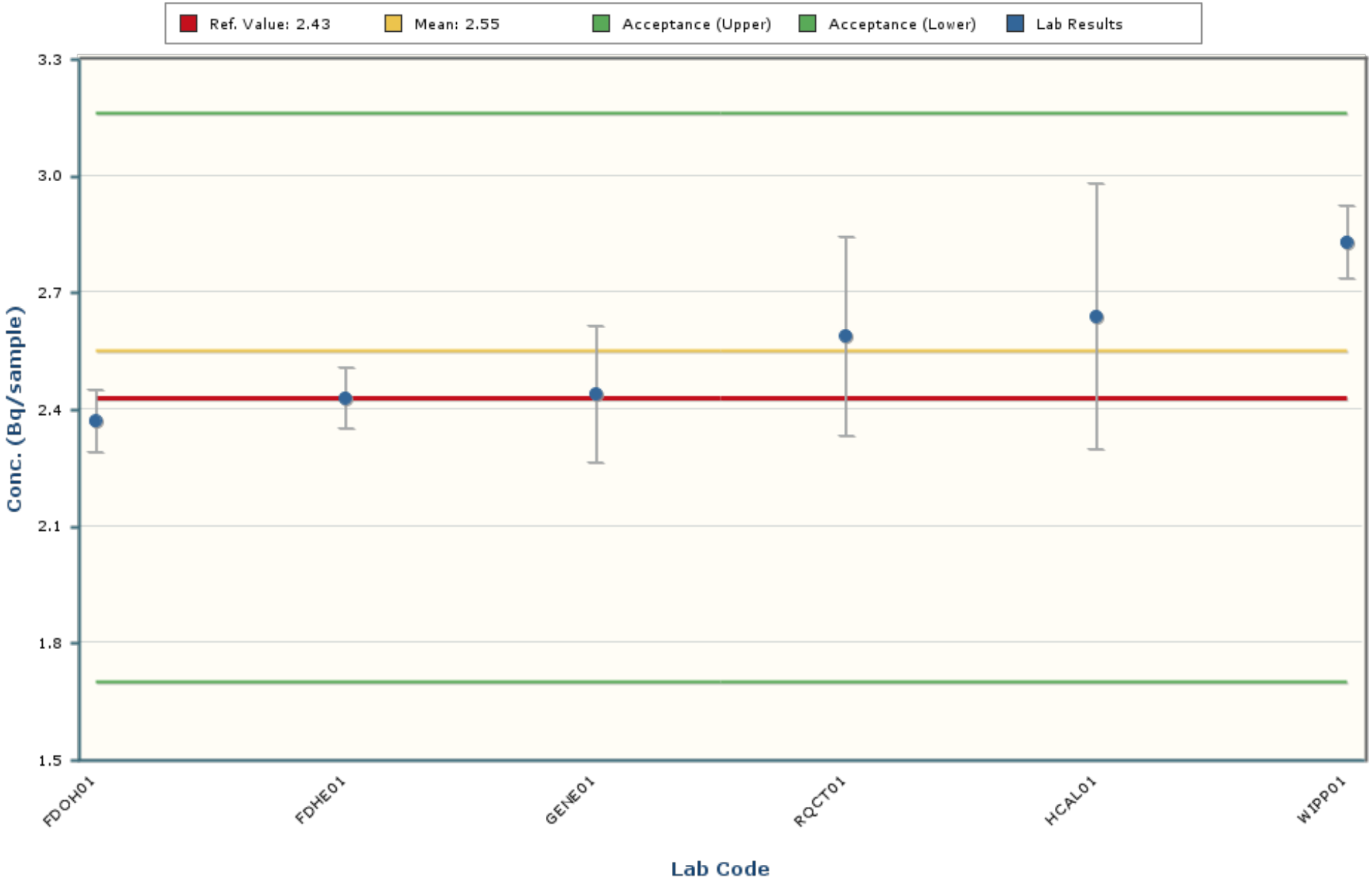
MAPEP-23-MaSF49



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 7.1 and 11.6 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

Cobalt-57

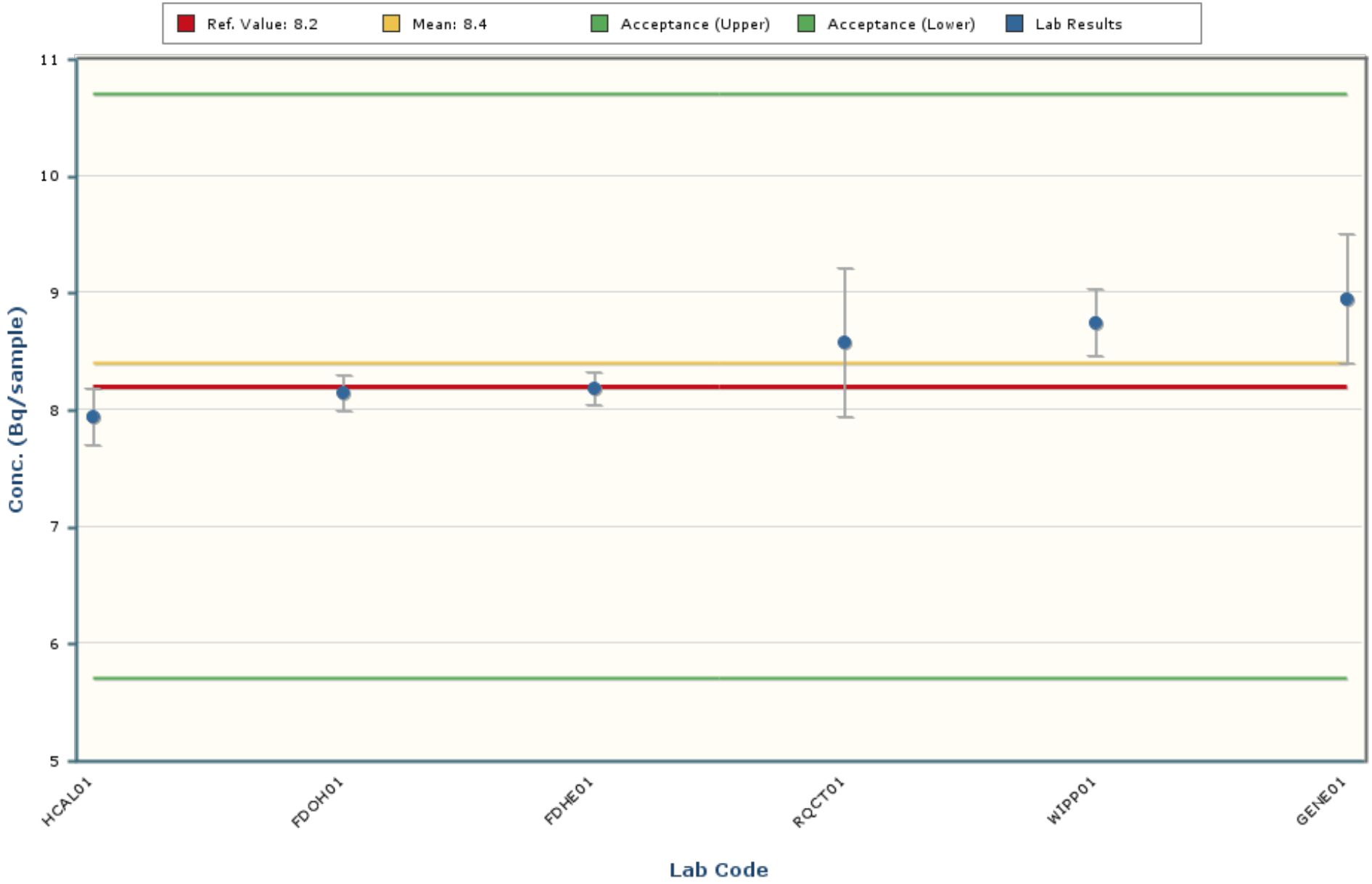
MAPEP-23-MaSF49



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 1.69 and 3.41 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

Cobalt-60

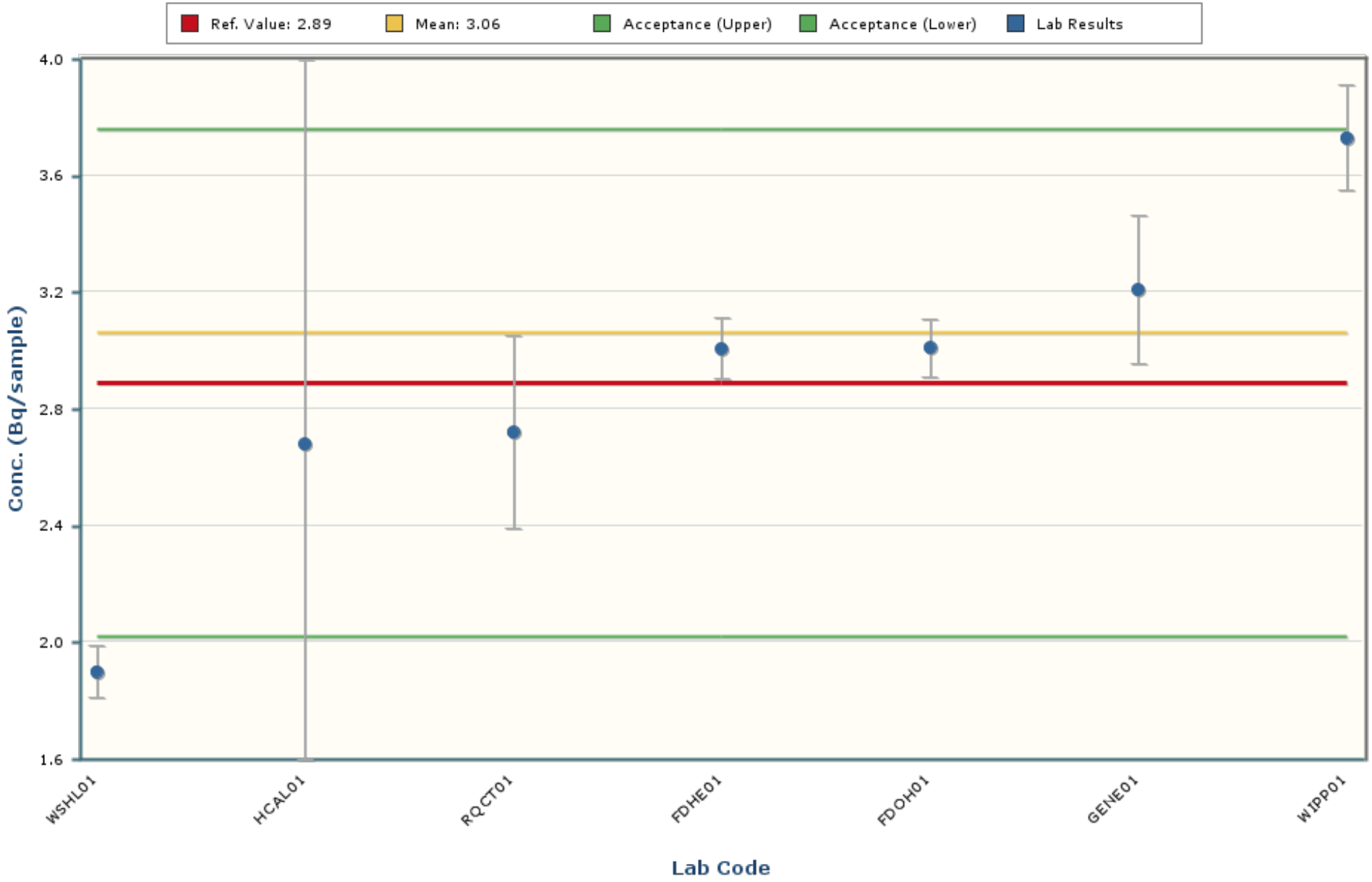
MAPEP-23-MaSF49



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 6.5 and 10.4 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

Manganese-54

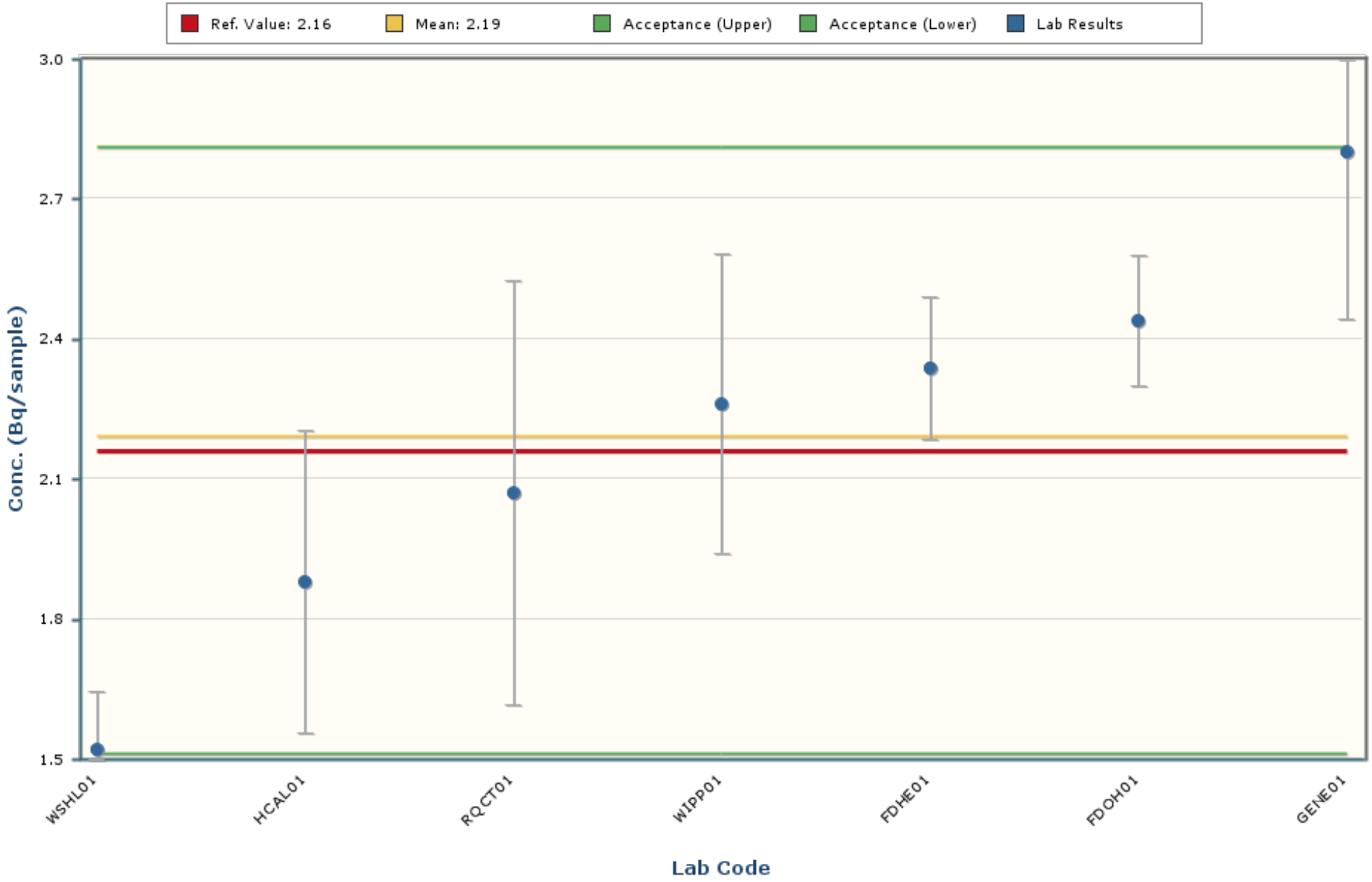
MAPEP-23-MaSF49



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 1.14 and 4.98 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

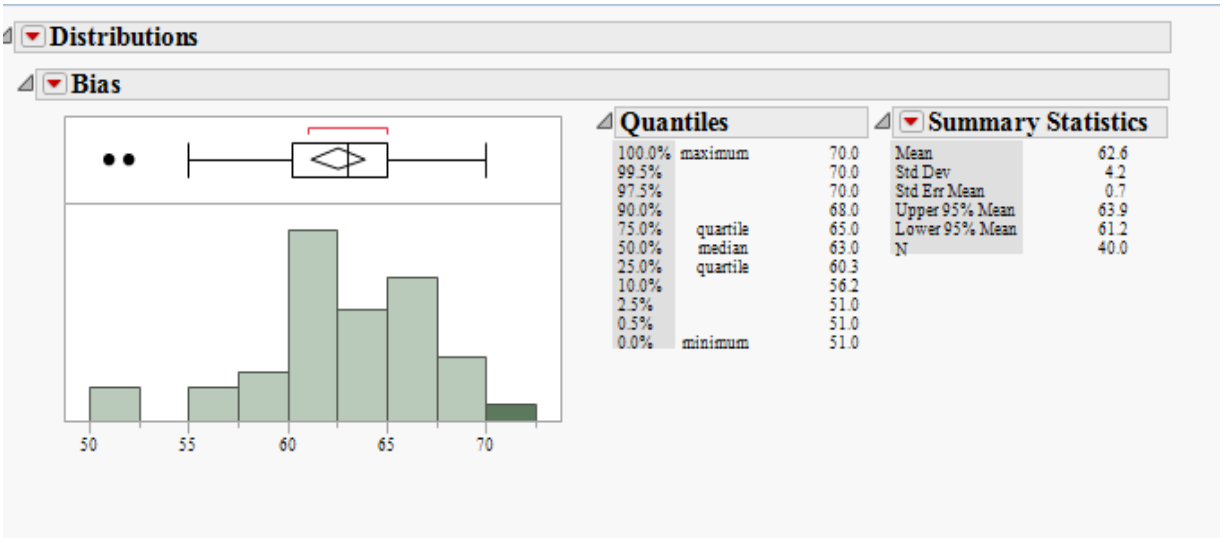
Zinc-65

MAPEP-23-MaSF49



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 0.12 and 4.25 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

The intent of the distribution graphs contained within this report is to graphically demonstrate to users how % Bias data within the current MAPEP Series appears when examined by matrix, by analyte, by method of sample preparation or by method of detection. Biases greater than +/- 100% have been screened from the data. The box plot of the bias data points and the mean visually illustrate the breadth of the distribution and where potential outliers in the distribution might lie. The statistics for the distribution plot are provided adjacent to the Bias plot. In some cases, N becomes very small and thus developed statistics may not accurately reflect estimates of the population if N were a significantly larger value.

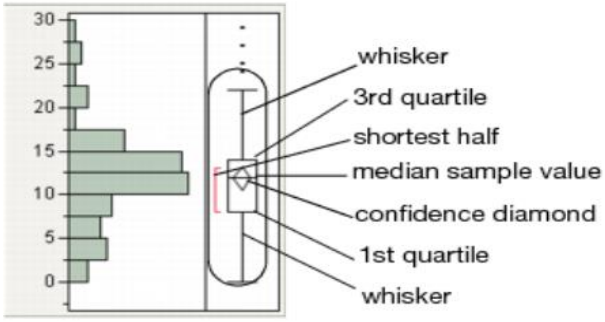


Outlier Box Plot

The BLACK small vertical line inside the small rectangle at the top of the data distribution graph is the median of the population of the bias shown for that analyte in the matrix. The confidence diamond contains the mean and the upper and lower 95% of the mean. If you drew a line through the middle of the diamond, you would have the mean. The top and bottom points of the diamond represent the upper and lower 95% of the mean. The ends of the box represent the 25th and 75th quantiles, also expressed as 1st and 3rd quartile. The difference between the 1st and 3rd quartiles is called the interquartile range. Each box has lines that extend from each end, sometimes called whiskers. The whiskers extend from the ends of the box to the outermost data point that falls within the distances computed as follows:

3rd quartile + 1.5*(interquartile range)

1st quartile - 1.5*(interquartile range)



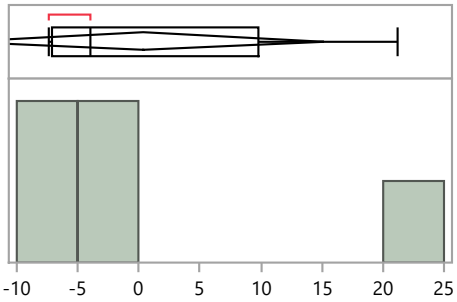
If the data points do not reach the computed ranges, then the whiskers are determined by the upper and lower data point values (not including outliers). The bracket outside of the box identifies the *shortest half*, which is the most dense 50% of the observations (Rousseuw and Leroy 1987).

Ref. "SAS Institute Inc. 2016. JMP® 13 Basic Analysis. Cary, NC: SAS Institute Inc."

MaF Distribution by Detection Method

Distributions Analyte_Detection=Americium-241 Alpha Spectrometry

Bias

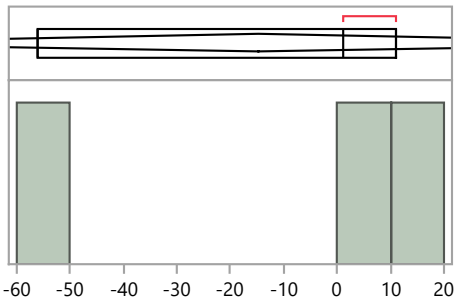


Quantiles		
100.0%	maximum	21.2
99.5%		21.2
97.5%		21.2
90.0%		21.2
75.0%	quartile	9.9
50.0%	median	-3.9
25.0%	quartile	-7.2
10.0%		-7.4
2.5%		-7.4
0.5%		-7.4
0.0%	minimum	-7.4

Summary Statistics	
Mean	0.3
Std Dev	11.9
Std Err Mean	5.3
Upper 95% Mean	15.1
Lower 95% Mean	-14.5
N	5.0

Distributions Analyte_Detection=Americium-241 Gamma Spectrometry

Bias

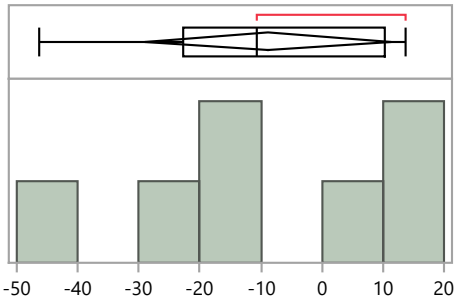


Quantiles		
100.0%	maximum	11.0
99.5%		11.0
97.5%		11.0
90.0%		11.0
75.0%	quartile	11.0
50.0%	median	1.0
25.0%	quartile	-56.1
10.0%		-56.1
2.5%		-56.1
0.5%		-56.1
0.0%	minimum	-56.1

Summary Statistics	
Mean	-14.7
Std Dev	36.2
Std Err Mean	20.9
Upper 95% Mean	75.2
Lower 95% Mean	-104.6
N	3.0

Distributions Analyte_Detection=Cesium-134 Gamma Spectrometry

Bias



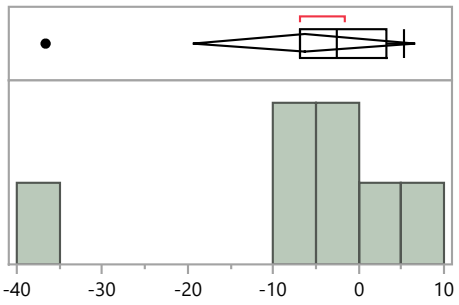
Quantiles		
100.0%	maximum	13.7
99.5%		13.7
97.5%		13.7
90.0%		13.7
75.0%	quartile	10.3
50.0%	median	-10.8
25.0%	quartile	-22.7
10.0%		-46.3
2.5%		-46.3
0.5%		-46.3
0.0%	minimum	-46.3

Summary Statistics	
Mean	-8.9
Std Dev	21.8
Std Err Mean	8.2
Upper 95% Mean	11.2
Lower 95% Mean	-29.1
N	7.0

MaF Distribution by Detection Method

Distributions Analyte_Detection=Cesium-137 Gamma Spectrometry

Bias

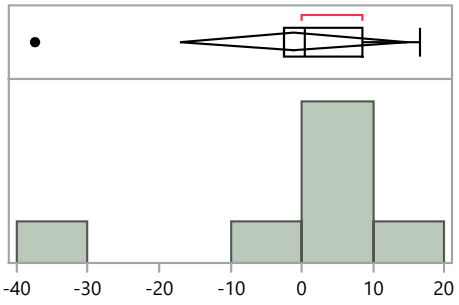


Quantiles		
100.0%	maximum	5.2
99.5%		5.2
97.5%		5.2
90.0%		5.2
75.0%	quartile	3.2
50.0%	median	-2.5
25.0%	quartile	-6.9
10.0%		-36.6
2.5%		-36.6
0.5%		-36.6
0.0%	minimum	-36.6

Summary Statistics	
Mean	-6.3
Std Dev	14.0
Std Err Mean	5.3
Upper 95% Mean	6.6
Lower 95% Mean	-19.3
N	7.0

Distributions Analyte_Detection=Cobalt-57 Gamma Spectrometry

Bias

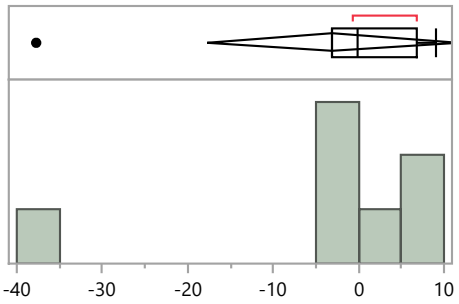


Quantiles		
100.0%	maximum	16.5
99.5%		16.5
97.5%		16.5
90.0%		16.5
75.0%	quartile	8.6
50.0%	median	0.4
25.0%	quartile	-2.5
10.0%		-37.4
2.5%		-37.4
0.5%		-37.4
0.0%	minimum	-37.4

Summary Statistics	
Mean	-1.1
Std Dev	17.3
Std Err Mean	6.5
Upper 95% Mean	14.8
Lower 95% Mean	-17.1
N	7.0

Distributions Analyte_Detection=Cobalt-60 Gamma Spectrometry

Bias



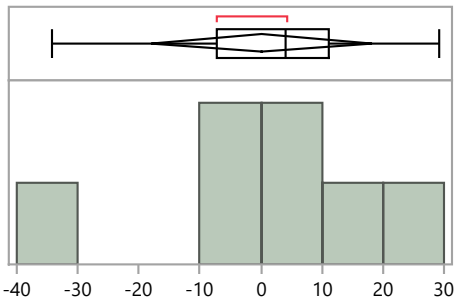
Quantiles		
100.0%	maximum	9.1
99.5%		9.1
97.5%		9.1
90.0%		9.1
75.0%	quartile	6.7
50.0%	median	-0.2
25.0%	quartile	-3.2
10.0%		-37.7
2.5%		-37.7
0.5%		-37.7
0.0%	minimum	-37.7

Summary Statistics	
Mean	-3.0
Std Dev	15.9
Std Err Mean	6.0
Upper 95% Mean	11.7
Lower 95% Mean	-17.7
N	7.0

MaF Distribution by Detection Method

Distributions Analyte_Detection=Manganese-54 Gamma Spectrometry

Bias

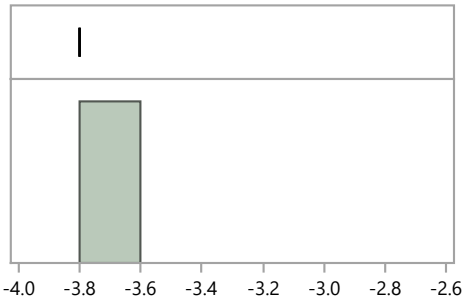


Quantiles		
100.0%	maximum	29.1
99.5%		29.1
97.5%		29.1
90.0%		29.1
75.0%	quartile	11.1
50.0%	median	4.1
25.0%	quartile	-7.3
10.0%		-34.3
2.5%		-34.3
0.5%		-34.3
0.0%	minimum	-34.3

Summary Statistics	
Mean	0.1
Std Dev	19.4
Std Err Mean	7.3
Upper 95% Mean	18.1
Lower 95% Mean	-17.8
N	7.0

Distributions Analyte_Detection=Plutonium-241 Liquid Scintillation Counter

Bias

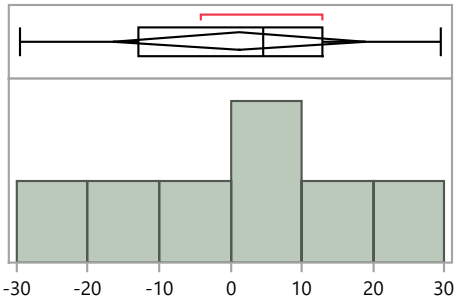


Quantiles		
100.0%	maximum	-3.8
99.5%		-3.8
97.5%		-3.8
90.0%		-3.8
75.0%	quartile	-3.8
50.0%	median	-3.8
25.0%	quartile	-3.8
10.0%		-3.8
2.5%		-3.8
0.5%		-3.8
0.0%	minimum	-3.8

Summary Statistics	
Mean	-3.8
Std Dev	.
Std Err Mean	.
Upper 95% Mean	.
Lower 95% Mean	.
N	1.0

Distributions Analyte_Detection=Zinc-65 Gamma Spectrometry

Bias



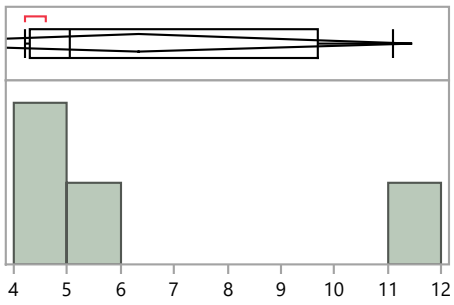
Quantiles		
100.0%	maximum	29.6
99.5%		29.6
97.5%		29.6
90.0%		29.6
75.0%	quartile	13.0
50.0%	median	4.6
25.0%	quartile	-13.0
10.0%		-29.6
2.5%		-29.6
0.5%		-29.6
0.0%	minimum	-29.6

Summary Statistics	
Mean	1.2
Std Dev	19.1
Std Err Mean	7.2
Upper 95% Mean	18.9
Lower 95% Mean	-16.4
N	7.0

MaF Distribution by Detection Method

Distributions Analyte_Detection=Zirconium-95 Gamma Spectrometry

Bias



Quantiles

100.0%	maximum	11.1
99.5%		11.1
97.5%		11.1
90.0%		11.1
75.0%	quartile	9.7
50.0%	median	5.1
25.0%	quartile	4.3
10.0%		4.2
2.5%		4.2
0.5%		4.2
0.0%	minimum	4.2

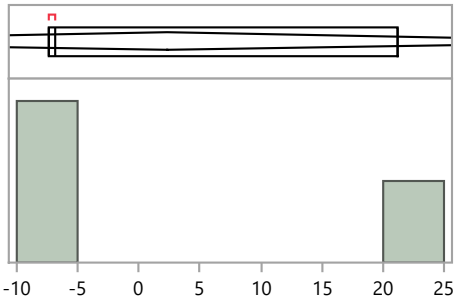
Summary Statistics

Mean	6.4
Std Dev	3.2
Std Err Mean	1.6
Upper 95% Mean	11.5
Lower 95% Mean	1.2
N	4.0

MaF Distribution by Preparation Method

Distributions Analyte_Method=Americium-241 Acid dissolution with hydrofluoric acid

Bias

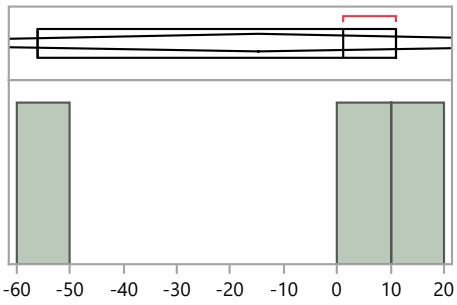


Quantiles		
100.0%	maximum	21.2
99.5%		21.2
97.5%		21.2
90.0%		21.2
75.0%	quartile	21.2
50.0%	median	-6.9
25.0%	quartile	-7.4
10.0%		-7.4
2.5%		-7.4
0.5%		-7.4
0.0%	minimum	-7.4

Summary Statistics	
Mean	2.3
Std Dev	16.4
Std Err Mean	9.5
Upper 95% Mean	43.0
Lower 95% Mean	-38.4
N	3.0

Distributions Analyte_Method=Americium-241 No preparation - analyzed as received

Bias

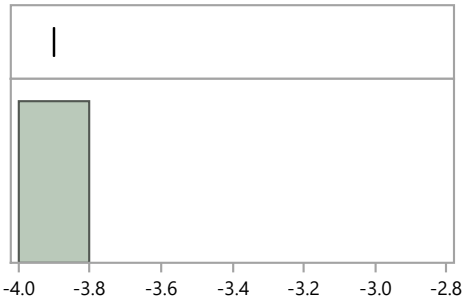


Quantiles		
100.0%	maximum	11.0
99.5%		11.0
97.5%		11.0
90.0%		11.0
75.0%	quartile	11.0
50.0%	median	1.0
25.0%	quartile	-56.1
10.0%		-56.1
2.5%		-56.1
0.5%		-56.1
0.0%	minimum	-56.1

Summary Statistics	
Mean	-14.7
Std Dev	36.2
Std Err Mean	20.9
Upper 95% Mean	75.2
Lower 95% Mean	-104.6
N	3.0

Distributions Analyte_Method=Americium-241 Other

Bias



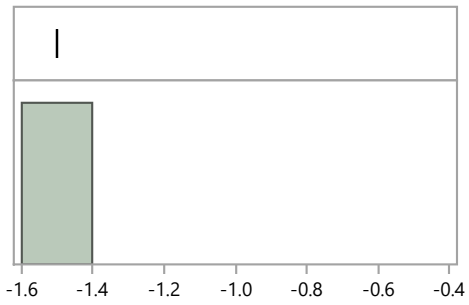
Quantiles		
100.0%	maximum	-3.9
99.5%		-3.9
97.5%		-3.9
90.0%		-3.9
75.0%	quartile	-3.9
50.0%	median	-3.9
25.0%	quartile	-3.9
10.0%		-3.9
2.5%		-3.9
0.5%		-3.9
0.0%	minimum	-3.9

Summary Statistics	
Mean	-3.9
Std Dev	.
Std Err Mean	.
Upper 95% Mean	.
Lower 95% Mean	.
N	1.0

MaF Distribution by Preparation Method

Distributions Analyte_Method=Americium-241 Total dissolution by fusion

Bias

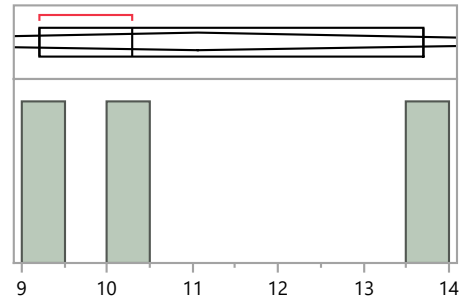


Quantiles		
100.0%	maximum	-1.5
99.5%		-1.5
97.5%		-1.5
90.0%		-1.5
75.0%	quartile	-1.5
50.0%	median	-1.5
25.0%	quartile	-1.5
10.0%		-1.5
2.5%		-1.5
0.5%		-1.5
0.0%	minimum	-1.5

Summary Statistics	
Mean	-1.5
Std Dev	.
Std Err Mean	.
Upper 95% Mean	.
Lower 95% Mean	.
N	1.0

Distributions Analyte_Method=Cesium-134 Acid dissolution with hydrofluoric acid

Bias

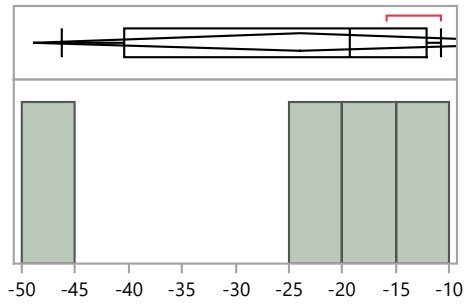


Quantiles		
100.0%	maximum	13.7
99.5%		13.7
97.5%		13.7
90.0%		13.7
75.0%	quartile	13.7
50.0%	median	10.3
25.0%	quartile	9.2
10.0%		9.2
2.5%		9.2
0.5%		9.2
0.0%	minimum	9.2

Summary Statistics	
Mean	11.1
Std Dev	2.3
Std Err Mean	1.4
Upper 95% Mean	16.9
Lower 95% Mean	5.2
N	3.0

Distributions Analyte_Method=Cesium-134 No preparation - analyzed as received

Bias



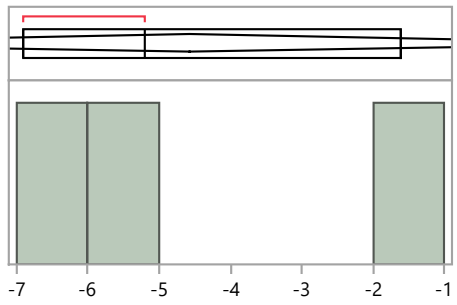
Quantiles		
100.0%	maximum	-10.8
99.5%		-10.8
97.5%		-10.8
90.0%		-10.8
75.0%	quartile	-12.1
50.0%	median	-19.3
25.0%	quartile	-40.4
10.0%		-46.3
2.5%		-46.3
0.5%		-46.3
0.0%	minimum	-46.3

Summary Statistics	
Mean	-23.9
Std Dev	15.7
Std Err Mean	7.9
Upper 95% Mean	1.1
Lower 95% Mean	-48.9
N	4.0

MaF Distribution by Preparation Method

Distributions Analyte_Method=Cesium-137 Acid dissolution with hydrofluoric acid

Bias

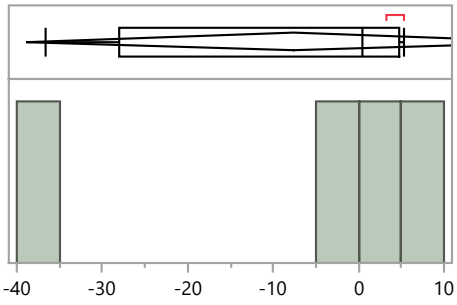


Quantiles		
100.0%	maximum	-1.6
99.5%		-1.6
97.5%		-1.6
90.0%		-1.6
75.0%	quartile	-1.6
50.0%	median	-5.2
25.0%	quartile	-6.9
10.0%		-6.9
2.5%		-6.9
0.5%		-6.9
0.0%	minimum	-6.9

Summary Statistics	
Mean	-4.6
Std Dev	2.7
Std Err Mean	1.6
Upper 95% Mean	2.2
Lower 95% Mean	-11.3
N	3.0

Distributions Analyte_Method=Cesium-137 No preparation - analyzed as received

Bias

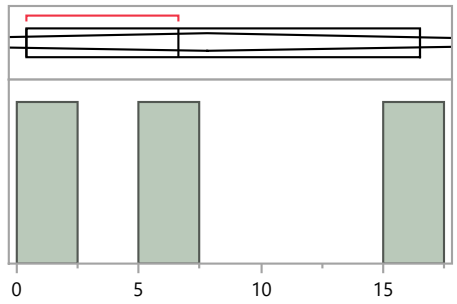


Quantiles		
100.0%	maximum	5.2
99.5%		5.2
97.5%		5.2
90.0%		5.2
75.0%	quartile	4.7
50.0%	median	0.4
25.0%	quartile	-28.1
10.0%		-36.6
2.5%		-36.6
0.5%		-36.6
0.0%	minimum	-36.6

Summary Statistics	
Mean	-7.7
Std Dev	19.6
Std Err Mean	9.8
Upper 95% Mean	23.4
Lower 95% Mean	-38.8
N	4.0

Distributions Analyte_Method=Cobalt-57 Acid dissolution with hydrofluoric acid

Bias



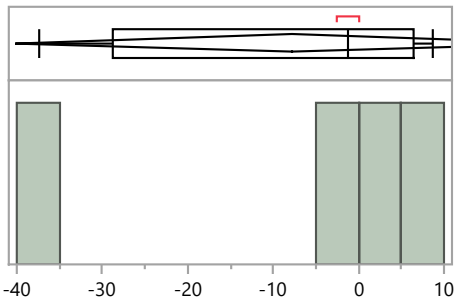
Quantiles		
100.0%	maximum	16.5
99.5%		16.5
97.5%		16.5
90.0%		16.5
75.0%	quartile	16.5
50.0%	median	6.6
25.0%	quartile	0.4
10.0%		0.4
2.5%		0.4
0.5%		0.4
0.0%	minimum	0.4

Summary Statistics	
Mean	7.8
Std Dev	8.1
Std Err Mean	4.7
Upper 95% Mean	28.0
Lower 95% Mean	-12.3
N	3.0

MaF Distribution by Preparation Method

Distributions Analyte_Method=Cobalt-57 No preparation - analyzed as received

Bias

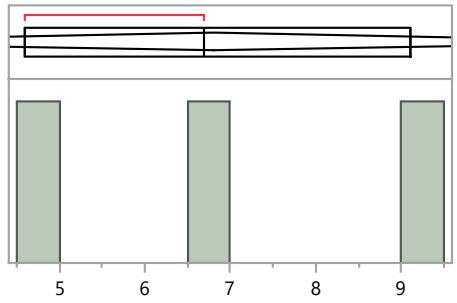


Quantiles		
100.0%	maximum	8.6
99.5%		8.6
97.5%		8.6
90.0%		8.6
75.0%	quartile	6.5
50.0%	median	-1.3
25.0%	quartile	-28.7
10.0%		-37.4
2.5%		-37.4
0.5%		-37.4
0.0%	minimum	-37.4

Summary Statistics	
Mean	-7.8
Std Dev	20.3
Std Err Mean	10.1
Upper 95% Mean	24.4
Lower 95% Mean	-40.1
N	4.0

Distributions Analyte_Method=Cobalt-60 Acid dissolution with hydrofluoric acid

Bias

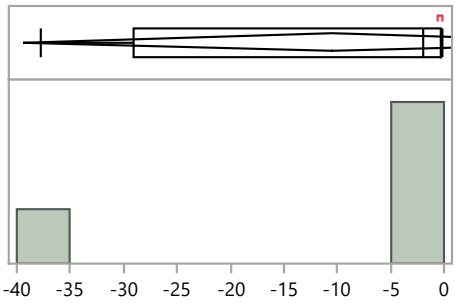


Quantiles		
100.0%	maximum	9.1
99.5%		9.1
97.5%		9.1
90.0%		9.1
75.0%	quartile	9.1
50.0%	median	6.7
25.0%	quartile	4.6
10.0%		4.6
2.5%		4.6
0.5%		4.6
0.0%	minimum	4.6

Summary Statistics	
Mean	6.8
Std Dev	2.3
Std Err Mean	1.3
Upper 95% Mean	12.4
Lower 95% Mean	1.2
N	3.0

Distributions Analyte_Method=Cobalt-60 No preparation - analyzed as received

Bias



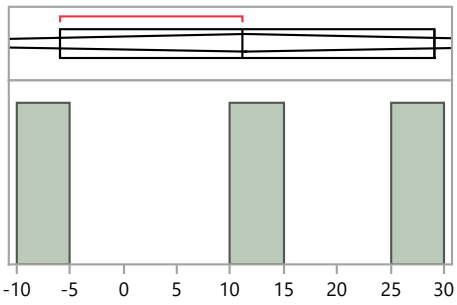
Quantiles		
100.0%	maximum	-0.2
99.5%		-0.2
97.5%		-0.2
90.0%		-0.2
75.0%	quartile	-0.3
50.0%	median	-1.9
25.0%	quartile	-29.1
10.0%		-37.7
2.5%		-37.7
0.5%		-37.7
0.0%	minimum	-37.7

Summary Statistics	
Mean	-10.4
Std Dev	18.2
Std Err Mean	9.1
Upper 95% Mean	18.6
Lower 95% Mean	-39.4
N	4.0

MaF Distribution by Preparation Method

Distributions Analyte_Method=Manganese-54 Acid dissolution with hydrofluoric acid

Bias

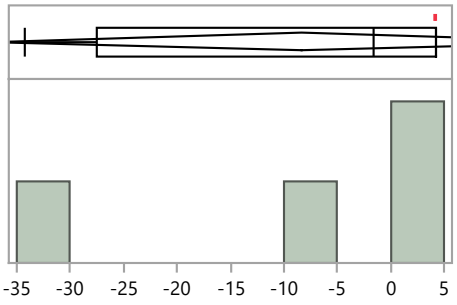


Quantiles		
100.0%	maximum	29.1
99.5%		29.1
97.5%		29.1
90.0%		29.1
75.0%	quartile	29.1
50.0%	median	11.1
25.0%	quartile	-5.9
10.0%		-5.9
2.5%		-5.9
0.5%		-5.9
0.0%	minimum	-5.9

Summary Statistics	
Mean	11.4
Std Dev	17.5
Std Err Mean	10.1
Upper 95% Mean	54.9
Lower 95% Mean	-32.0
N	3.0

Distributions Analyte_Method=Manganese-54 No preparation - analyzed as received

Bias

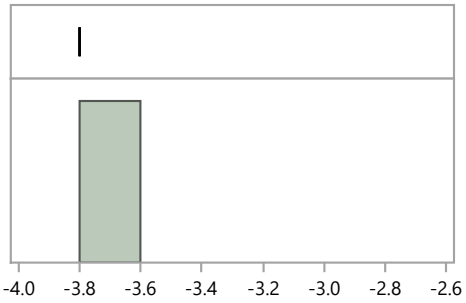


Quantiles		
100.0%	maximum	4.2
99.5%		4.2
97.5%		4.2
90.0%		4.2
75.0%	quartile	4.2
50.0%	median	-1.6
25.0%	quartile	-27.6
10.0%		-34.3
2.5%		-34.3
0.5%		-34.3
0.0%	minimum	-34.3

Summary Statistics	
Mean	-8.3
Std Dev	18.1
Std Err Mean	9.1
Upper 95% Mean	20.5
Lower 95% Mean	-37.2
N	4.0

Distributions Analyte_Method=Plutonium-241 Acid dissolution with hydrofluoric acid

Bias



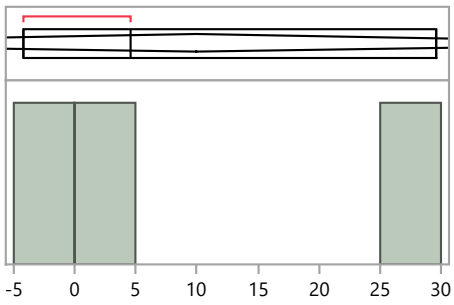
Quantiles		
100.0%	maximum	-3.8
99.5%		-3.8
97.5%		-3.8
90.0%		-3.8
75.0%	quartile	-3.8
50.0%	median	-3.8
25.0%	quartile	-3.8
10.0%		-3.8
2.5%		-3.8
0.5%		-3.8
0.0%	minimum	-3.8

Summary Statistics	
Mean	-3.8
Std Dev	.
Std Err Mean	.
Upper 95% Mean	.
Lower 95% Mean	.
N	1.0

MaF Distribution by Preparation Method

Distributions Analyte_Method=Zinc-65 Acid dissolution with hydrofluoric acid

Bias

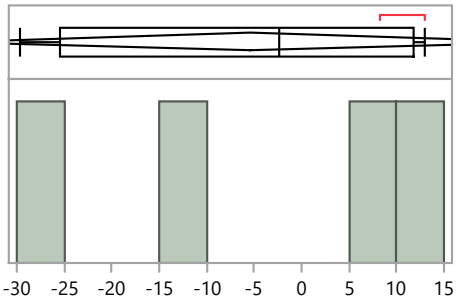


Quantiles		
100.0%	maximum	29.6
99.5%		29.6
97.5%		29.6
90.0%		29.6
75.0%	quartile	29.6
50.0%	median	4.6
25.0%	quartile	-4.2
10.0%		-4.2
2.5%		-4.2
0.5%		-4.2
0.0%	minimum	-4.2

Summary Statistics	
Mean	10.0
Std Dev	17.5
Std Err Mean	10.1
Upper 95% Mean	53.6
Lower 95% Mean	-33.6
N	3.0

Distributions Analyte_Method=Zinc-65 No preparation - analyzed as received

Bias

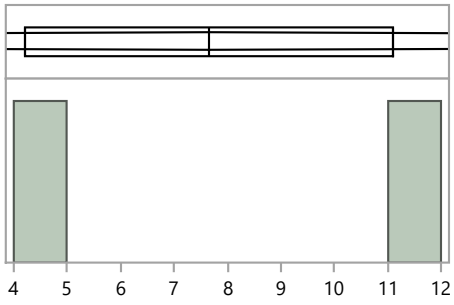


Quantiles		
100.0%	maximum	13.0
99.5%		13.0
97.5%		13.0
90.0%		13.0
75.0%	quartile	11.8
50.0%	median	-2.4
25.0%	quartile	-25.5
10.0%		-29.6
2.5%		-29.6
0.5%		-29.6
0.0%	minimum	-29.6

Summary Statistics	
Mean	-5.4
Std Dev	19.7
Std Err Mean	9.9
Upper 95% Mean	26.0
Lower 95% Mean	-36.7
N	4.0

Distributions Analyte_Method=Zirconium-95 Acid dissolution with hydrofluoric acid

Bias



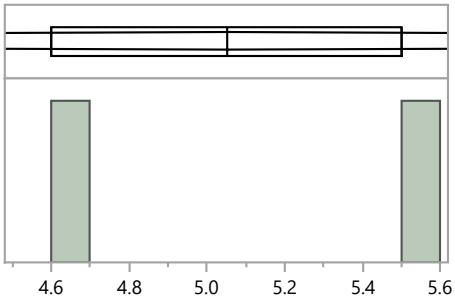
Quantiles		
100.0%	maximum	11.1
99.5%		11.1
97.5%		11.1
90.0%		11.1
75.0%	quartile	11.1
50.0%	median	7.7
25.0%	quartile	4.2
10.0%		4.2
2.5%		4.2
0.5%		4.2
0.0%	minimum	4.2

Summary Statistics	
Mean	7.7
Std Dev	4.9
Std Err Mean	3.5
Upper 95% Mean	51.5
Lower 95% Mean	-36.2
N	2.0

MaF Distribution by Preparation Method

Distributions Analyte_Method=Zirconium-95 No preparation - analyzed as received

Bias



Quantiles

100.0%	maximum	5.5
99.5%		5.5
97.5%		5.5
90.0%		5.5
75.0%	quartile	5.5
50.0%	median	5.1
25.0%	quartile	4.6
10.0%		4.6
2.5%		4.6
0.5%		4.6
0.0%	minimum	4.6

Summary Statistics

Mean	5.1
Std Dev	0.6
Std Err Mean	0.5
Upper 95% Mean	10.8
Lower 95% Mean	-0.7
N	2.0