

**Data Validation Report  
Tennessee Valley Authority  
Johnsonville Fossil Plant  
Environmental Investigation Plan  
Biota Samples  
Chain-of-Custody: JOF\_MF\_20190612\_1A**

This quality assurance (QA) review is based upon an examination of the data generated from the analyses of the 12 biota samples collected on June 12, 2019, at the Tennessee Valley Authority (TVA) Johnsonville Fossil Plant facility. These samples were collectively analyzed by Pace Analytical Services, Inc. (Pace), of Green Bay, Wisconsin, for total metals by SW-846 Method 6020; for total mercury by SW-846 Method 7473; and for percent moisture by American Society for Testing and Materials (ASTM) Method D2974-87.

This review was performed in accordance with the Environmental Investigation Plan for the Tennessee Valley Authority Johnsonville Fossil Plant Environmental Investigation (JOF EIP, Revision 4, December 2018). This review was performed with guidance from the National Functional Guidelines for Inorganic Data Review (US EPA, October 2004); the US EPA Region IV Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (November 2001); and the US EPA Region IV Data Validation Standard Operating Procedures. These validation guidance documents specifically address analyses performed in accordance with the Contract Laboratory Program (CLP) analytical methods and are not completely applicable to the type of analyses and analytical protocols performed for the SW-846 and ASTM Methods utilized by the laboratory for these samples. Environmental Standards, Inc. (Environmental Standards), used professional judgment to determine the usability of the analytical results and compliance relative to the SW-846, ASTM, and Pace Methods.

### **Summary**

The analytical results and associated laboratory QA/QC samples were reviewed to determine the integrity of the reported analytical results and to ensure that the data met the established data quality objectives. This QA review includes all samples in Pace Work Order 40193369.

The samples that have undergone Stage 4 data validation are listed below:

Sample Identification	Laboratory Sample Identification	Job Number	Matrix	Date Sample Collected	Parameters Examined
JOF-MFA-TRU-MI-20190612	40193369001	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-TRA-MI-20190612	40193369002	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-TRD-MI-20190612	40193369003	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-BH-MI-20190612	40193369004	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-IC-MI-20190612	40193369005	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-TRU-FI-20190612	40193369006	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-TRA-FI-20190612	40193369007	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-TRD-FI-20190612	40193369008	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-BH-FI-20190612	40193369009	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-IC-FI-20190612	40193369010	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-DUP01-20190612 (Field Duplicate of JOF-MFA-BH-MI-20190612)	40193369011	40193369	Biota	6/12/19	M, Hg, PM
JOF-MFA-DUP02-20190612 (Field Duplicate of JOF-MFA-IC-MI-20190612)	40193369012	40193369	Biota	6/12/19	M, Hg, PM

Parameters Examined

M - Total Metals by SW-846 Method 6020.

Hg - Mercury by SW-846 Method 7473.

PM - Percent Moisture by ASTM Method D2974-87.

Items Reviewed	
Holding Times	Instrument Tuning and Calibrations
Sample Preservation	Reporting Limit (RL) Standard Recoveries
Chain-of-Custody (COC) Record and Case Narratives	Internal Standard Recoveries
Blank Results	Serial Dilution Analysis
Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results	Post-Digestion Spike Results
Laboratory Control Sample (LCS) Results	Sample Preparation
Field and Laboratory Duplicate Results	Analytical Sequence
Quantitation of Positive Results	

### Comments and Exceptions

- All analyses performed for the sampling event were in compliance with the requirements set forth in the EIP.

### Qualifier Summary

Analyte	Job Number	Samples	Validation Qualifier	Reason for Qualification
total calcium	40193369	All samples	J	M+

Unless otherwise qualified, all positive results reported between the method detection limit (MDL) and quantitation limit (QL) should be considered estimated and have been flagged "J" on the data tables. (Reason Code: RL)

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Review performed by: Amanda E. Harvey, Quality Assurance Chemist  
 Review reviewed by: Thomas H. Weinmann, Senior Quality Assurance Chemist  
 Review approved by: Andrew L. Piasecki, Senior Quality Assurance Chemist  
 Review approved by: Rock J. Vitale, CEAC, Technical Director of Chemistry/Principal  
 Date review completed: 1/17/2020

## **SECTION 2**

### **ANALYTICAL RESULTS**

## **INORGANIC DATA QUALIFIERS**

- U\* This result should be considered "not-detected" because it was detected in a rinsate blank or laboratory blank at a similar level.
- UR Unreliable reporting limit; analyte may or may not be present in sample.
- R Unreliable positive result; analyte may or may not be present in sample.
- J Quantitation is approximate due to limitations identified during data validation.
- UJ This analyte was not detected, but the reporting limit may or may not be higher due to a bias identified during data validation.



## REASON CODES AND EXPLANATIONS

<b>Reason Code</b>	<b>Explanation</b>
BE	Equipment blank contamination. The result should be considered "not-detected."
BF	Field blank contamination. The result should be considered "not-detected."
BL	Laboratory blank contamination. The result should be considered "not-detected."
BN	Negative laboratory blank contamination.
C	Initial and/or Continuing Calibration issue, indeterminate bias.
C+	Initial and/or Continuing Calibration issue. The result may be biased high.
C-	Initial and/or Continuing Calibration issue. The result may be biased low.
FD	Field duplicate imprecision.
FG	Total versus Dissolved Imprecision.
H	Holding time exceeded.
I	Internal standard recovery outside of acceptance limits.
L	LCS and LCSD recoveries outside of acceptance limits, indeterminate bias.
L+	LCS and/or LCSD recoveries outside of acceptance limits. The result may be biased high.
L-	LCS and/or LCSD recoveries outside of acceptance limits. The result may be biased low.
LD	Laboratory duplicate imprecision.
LP	LCS/LCSD imprecision.
M	MS and MSD recoveries outside of acceptance limits, indeterminate bias.
M+	MS and/or MSD recoveries outside of acceptance limits. The result may be biased high.
M-	MS and/or MSD recoveries outside of acceptance limits. The result may be biased low.
MP	MS/MSD imprecision.
P	Post-digestion spike recoveries outside of acceptance limits, indeterminate bias.
P+	Post-digestion spike recovery outside of acceptance limits. The result may be biased high.
P-	Post-digestion spike recovery outside of acceptance limits. The result may be biased low.
Q	Chemical Preservation issue.
R	RL standards outside of acceptance limits, indeterminate bias.
R+	RL standard(s) outside of acceptance limits. The result may be biased high.
R-	RL standard(s) outside of acceptance limits. The result may be biased low.
RL	Reported result between the MDL and the QL.
T	Temperature preservation issue.
SD	Serial Dilution imprecision.
X	Percent solids < 50%.
Y+	Chemical Yield outside of acceptance limits. The result may be biased high.
Y-	Chemical yield outside of acceptance limits. The result may be biased low.
Z	ICP or ICP/MS Interference.
ZZ	Other.

Lab Sample ID	40193369001										
Sys Sample Code	JOF-MFA-TRU-MI-20190612										
Sample Name	JOF-MFA-TRU-MI-20190612										
Sample Date	6/12/2019 12:50:00 PM										
Location	JOF-TRU										
Sample Type	N										
Parent Sample											
n	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
	%	73.0			0.10	0.10	0.10	Y	Yes	1	NA
	MG/KG		U		0.021	0.021	0.099	N	Yes	1	FreezeDry
	MG/KG		U		0.030	0.030	0.099	N	Yes	1	FreezeDry
	MG/KG	0.16			0.030	0.030	0.099	Y	Yes	1	FreezeDry
	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	MG/KG		U		0.69	0.69	2.3	N	Yes	1	FreezeDry
	MG/KG	0.17			0.011	0.011	0.099	Y	Yes	1	FreezeDry
	MG/KG	324	J	M+	25.3	25.3	84.2	Y	Yes	1	FreezeDry
	MG/KG	0.11	J	RL	0.088	0.088	0.29	Y	Yes	1	FreezeDry
	MG/KG	0.52			0.019	0.019	0.099	Y	Yes	1	FreezeDry
	MG/KG	6.0			0.28	0.28	0.94	Y	Yes	1	FreezeDry
	MG/KG		U		0.030	0.030	0.099	N	Yes	1	FreezeDry
	MG/KG		U		0.021	0.021	0.099	N	Yes	1	FreezeDry
	MG/KG	0.10	J	RL	0.036	0.036	0.12	Y	Yes	1	FreezeDry
	MG/KG		U		0.041	0.041	0.14	N	Yes	1	FreezeDry
	MG/KG	0.84			0.050	0.050	0.17	Y	Yes	1	FreezeDry
	MG/KG	0.023	J	RL	0.011	0.011	0.050	Y	Yes	1	FreezeDry
	MG/KG	0.25	J	RL	0.16	0.16	0.54	Y	Yes	1	FreezeDry
	MG/KG		U		0.013	0.013	0.099	N	Yes	1	FreezeDry
	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	MG/KG	26.2			1.4	1.4	4.6	Y	Yes	1	FreezeDry
	MG/KG	0.025			0.0075	0.0075	0.025	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369002									
				<b>Sys Sample Code</b>	JOF-MFA-TRA-MI-20190612									
				<b>Sample Name</b>	JOF-MFA-TRA-MI-20190612									
				<b>Sample Date</b>	6/12/2019 10:20:00 AM									
				<b>Location</b>	JOF-TRA									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	72.5			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.19			0.031	0.031	0.10	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.70	0.70	2.3	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.23			0.011	0.011	0.10	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	324	J	M+	25.4	25.4	84.6	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	3.3			0.088	0.088	0.29	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.29			0.019	0.019	0.10	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	6.3			0.28	0.28	0.95	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.098	J	RL	0.036	0.036	0.12	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG	0.049	J	RL	0.041	0.041	0.14	Y	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.93			0.051	0.051	0.17	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.022	J	RL	0.011	0.011	0.050	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG	0.21	J	RL	0.16	0.16	0.54	Y	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.013	0.013	0.10	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	24.6			1.4	1.4	4.7	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.017	J	RL	0.0072	0.0072	0.024	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369003									
				<b>Sys Sample Code</b>	JOF-MFA-TRD-MI-20190612									
				<b>Sample Name</b>	JOF-MFA-TRD-MI-20190612									
				<b>Sample Date</b>	6/12/2019 12:05:00 PM									
				<b>Location</b>	JOF-TRD									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	71.8			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.16			0.030	0.030	0.10	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.69	0.69	2.3	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.26			0.011	0.011	0.10	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	244	J	M+	25.3	25.3	84.3	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.27	J	RL	0.088	0.088	0.29	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.31			0.019	0.019	0.10	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	6.8			0.28	0.28	0.95	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.094	J	RL	0.036	0.036	0.12	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.041	0.041	0.14	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.65			0.050	0.050	0.17	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.024	J	RL	0.011	0.011	0.050	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG	0.23	J	RL	0.16	0.16	0.54	Y	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.013	0.013	0.10	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	25.6			1.4	1.4	4.6	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.023	J	RL	0.0074	0.0074	0.025	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369004									
				<b>Sys Sample Code</b>	JOF-MFA-BH-MI-20190612									
				<b>Sample Name</b>	JOF-MFA-BH-MI-20190612									
				<b>Sample Date</b>	6/12/2019 11:30:00 AM									
				<b>Location</b>	JOF-BH									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	71.1			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.029	0.029	0.095	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.18			0.029	0.029	0.095	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.032	0.032	0.10	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.66	0.66	2.2	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.29			0.010	0.010	0.095	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	315	J	M+	24.2	24.2	80.6	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.13	J	RL	0.084	0.084	0.28	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.44			0.018	0.018	0.095	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	6.6			0.27	0.27	0.90	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.029	0.029	0.095	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.10	J	RL	0.034	0.034	0.11	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.039	0.039	0.13	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.76			0.048	0.048	0.16	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.020	J	RL	0.011	0.011	0.048	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG	0.24	J	RL	0.15	0.15	0.51	Y	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.012	0.012	0.095	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.032	0.032	0.10	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	27.3			1.3	1.3	4.4	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.024	J	RL	0.0074	0.0074	0.025	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369005									
				<b>Sys Sample Code</b>	JOF-MFA-IC-MI-20190612									
				<b>Sample Name</b>	JOF-MFA-IC-MI-20190612									
				<b>Sample Date</b>	6/12/2019 10:50:00 AM									
				<b>Location</b>	JOF-IC									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	71.4			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.021	0.021	0.099	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.030	0.030	0.099	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.18			0.030	0.030	0.099	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.69	0.69	2.3	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.27			0.011	0.011	0.099	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	311	J	M+	25.0	25.0	83.4	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.13	J	RL	0.087	0.087	0.29	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.48			0.019	0.019	0.099	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	6.3			0.28	0.28	0.94	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.030	0.030	0.099	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.021	0.021	0.099	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.11	J	RL	0.035	0.035	0.12	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.041	0.041	0.14	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.83			0.050	0.050	0.17	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.020	J	RL	0.011	0.011	0.049	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG	0.25	J	RL	0.16	0.16	0.53	Y	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.013	0.013	0.099	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG	0.033	J	RL	0.033	0.033	0.11	Y	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	27.4			1.4	1.4	4.6	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.023	J	RL	0.0071	0.0071	0.024	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369006									
				<b>Sys Sample Code</b>	JOF-MFA-TRU-FI-20190612									
				<b>Sample Name</b>	JOF-MFA-TRU-FI-20190612									
				<b>Sample Date</b>	6/12/2019 12:50:00 PM									
				<b>Location</b>	JOF-TRU									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	65.0			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.078	J	RL	0.030	0.030	0.10	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.69	0.69	2.3	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.21			0.011	0.011	0.10	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	509	J	M+	25.3	25.3	84.3	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.13	J	RL	0.088	0.088	0.29	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.62			0.019	0.019	0.10	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	4.5			0.28	0.28	0.95	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.12			0.036	0.036	0.12	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.041	0.041	0.14	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.91			0.050	0.050	0.17	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.016	J	RL	0.011	0.011	0.050	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG		U		0.16	0.16	0.54	N	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.013	0.013	0.10	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	75.3			1.4	1.4	4.6	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.026			0.0070	0.0070	0.023	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369007									
				<b>Sys Sample Code</b>	JOF-MFA-TRA-FI-20190612									
				<b>Sample Name</b>	JOF-MFA-TRA-FI-20190612									
				<b>Sample Date</b>	6/12/2019 10:20:00 AM									
				<b>Location</b>	JOF-TRA									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	63.5			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.021	0.021	0.098	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.030	0.030	0.098	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.12			0.030	0.030	0.098	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.032	0.032	0.11	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.68	0.68	2.3	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.23			0.011	0.011	0.098	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	709	J	M+	24.9	24.9	83.0	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.17	J	RL	0.087	0.087	0.28	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.62			0.019	0.019	0.098	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	4.3			0.28	0.28	0.93	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.029	0.029	0.098	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.021	0.021	0.098	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.13			0.035	0.035	0.12	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.040	0.040	0.14	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	1.2			0.050	0.050	0.17	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.015	J	RL	0.011	0.011	0.049	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG	0.18	J	RL	0.16	0.16	0.53	Y	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.013	0.013	0.098	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG	0.054	J	RL	0.033	0.033	0.11	Y	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	90.8			1.4	1.4	4.6	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.022	J	RL	0.0074	0.0074	0.025	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369008									
				<b>Sys Sample Code</b>	JOF-MFA-TRD-FI-20190612									
				<b>Sample Name</b>	JOF-MFA-TRD-FI-20190612									
				<b>Sample Date</b>	6/12/2019 12:05:00 PM									
				<b>Location</b>	JOF-TRD									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	63.1			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.029	0.029	0.095	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.094	J	RL	0.029	0.029	0.095	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.032	0.032	0.10	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.66	0.66	2.2	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.25			0.010	0.010	0.095	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	495	J	M+	24.2	24.2	80.6	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.12	J	RL	0.084	0.084	0.28	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.44			0.018	0.018	0.095	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	5.1			0.27	0.27	0.90	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.029	0.029	0.095	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.11			0.034	0.034	0.11	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.039	0.039	0.13	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.77			0.048	0.048	0.16	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.018	J	RL	0.011	0.011	0.048	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG		U		0.15	0.15	0.51	N	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.012	0.012	0.095	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.032	0.032	0.10	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	77.4			1.3	1.3	4.4	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.021	J	RL	0.0075	0.0075	0.025	Y	Yes	1	FreezeDry

				<b>Lab Sample ID</b>	40193369009									
				<b>Sys Sample Code</b>	JOF-MFA-BH-FI-20190612									
				<b>Sample Name</b>	JOF-MFA-BH-FI-20190612									
				<b>Sample Date</b>	6/12/2019 11:30:00 AM									
				<b>Location</b>	JOF-BH									
				<b>Sample Type</b>	N									
				<b>Parent Sample</b>										
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	62.8			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.098	J	RL	0.031	0.031	0.10	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.70	0.70	2.3	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.28			0.011	0.011	0.10	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	466	J	M+	25.3	25.3	84.5	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.15	J	RL	0.088	0.088	0.29	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.62			0.019	0.019	0.10	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	5.0			0.28	0.28	0.95	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.030	0.030	0.10	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.021	0.021	0.10	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.11	J	RL	0.036	0.036	0.12	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.041	0.041	0.14	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.89			0.051	0.051	0.17	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.016	J	RL	0.011	0.011	0.050	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG		U		0.16	0.16	0.54	N	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.013	0.013	0.10	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.033	0.033	0.11	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	81.7			1.4	1.4	4.6	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.019	J	RL	0.0070	0.0070	0.023	Y	Yes	1	FreezeDry

		<b>Lab Sample ID</b>	40193369010											
		<b>Sys Sample Code</b>	JOF-MFA-IC-FI-20190612											
		<b>Sample Name</b>	JOF-MFA-IC-FI-20190612											
		<b>Sample Date</b>	6/12/2019 10:50:00 AM											
		<b>Location</b>	JOF-IC											
		<b>Sample Type</b>	N											
		<b>Parent Sample</b>												
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	62.3			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.029	0.029	0.095	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.11			0.029	0.029	0.095	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.031	0.031	0.10	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.66	0.66	2.2	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.23			0.010	0.010	0.095	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	632	J	M+	24.1	24.1	80.4	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.10	J	RL	0.084	0.084	0.28	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.65			0.018	0.018	0.095	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	4.6			0.27	0.27	0.90	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.028	0.028	0.095	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.13			0.034	0.034	0.11	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.039	0.039	0.13	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	1.1			0.048	0.048	0.16	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.013	J	RL	0.011	0.011	0.047	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG		U		0.15	0.15	0.51	N	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.012	0.012	0.095	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.032	0.032	0.10	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	81.2			1.3	1.3	4.4	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.019	J	RL	0.0076	0.0076	0.025	Y	Yes	1	FreezeDry

<b>Lab Sample ID</b>	40193369011
<b>Sys Sample Code</b>	JOF-MFA-DUP01-20190612
<b>Sample Name</b>	JOF-MFA-DUP01-20190612
<b>Sample Date</b>	6/12/2019 12:00:00 AM
<b>Location</b>	JOF-BH
<b>Sample Type</b>	FD
<b>Parent Sample</b>	JOF-MFA-BH-MI-20190612

Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	71.6			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.020	0.020	0.096	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.029	0.029	0.096	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.17			0.029	0.029	0.096	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.032	0.032	0.11	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.67	0.67	2.2	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.32			0.011	0.011	0.096	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	227	J	M+	24.5	24.5	81.6	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.10	J	RL	0.085	0.085	0.28	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.41			0.018	0.018	0.096	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	6.9			0.27	0.27	0.92	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.029	0.029	0.096	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.020	0.020	0.096	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.10	J	RL	0.035	0.035	0.12	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.040	0.040	0.13	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.72			0.049	0.049	0.16	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.021	J	RL	0.011	0.011	0.048	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG	0.26	J	RL	0.16	0.16	0.52	Y	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.013	0.013	0.096	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG		U		0.032	0.032	0.11	N	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	26.9			1.3	1.3	4.5	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.020	J	RL	0.0070	0.0070	0.023	Y	Yes	1	FreezeDry

	<b>Lab Sample ID</b>	40193369012												
	<b>Sys Sample Code</b>	JOF-MFA-DUP02-20190612												
	<b>Sample Name</b>	JOF-MFA-DUP02-20190612												
	<b>Sample Date</b>	6/12/2019 12:00:00 AM												
	<b>Location</b>	JOF-IC												
	<b>Sample Type</b>	FD												
	<b>Parent Sample</b>	JOF-MFA-IC-MI-20190612												
Analytic Method	Chemical Name	CAS Rn	Fraction	Result Unit	Final Result	Final Qual	Reason code	Final MDL	Final RL	Final QL	Final Detect	Final Report	DF	Basis
ASTM D2974-87	Percent Moisture	MOISTURE	N	%	70.8			0.10	0.10	0.10	Y	Yes	1	NA
SW-846 6020A	Antimony	7440-36-0	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Arsenic	7440-38-2	T	MG/KG		U		0.029	0.029	0.095	N	Yes	1	FreezeDry
	Barium	7440-39-3	T	MG/KG	0.17			0.029	0.029	0.095	Y	Yes	1	FreezeDry
	Beryllium	7440-41-7	T	MG/KG		U		0.031	0.031	0.10	N	Yes	1	FreezeDry
	Boron	7440-42-8	T	MG/KG		U		0.66	0.66	2.2	N	Yes	1	FreezeDry
	Cadmium	7440-43-9	T	MG/KG	0.32			0.010	0.010	0.095	Y	Yes	1	FreezeDry
	Calcium	7440-70-2	T	MG/KG	399	J	M+	24.0	24.0	80.1	Y	Yes	1	FreezeDry
	Chromium	7440-47-3	T	MG/KG	0.14	J	RL	0.084	0.084	0.27	Y	Yes	1	FreezeDry
	Cobalt	7440-48-4	T	MG/KG	0.61			0.018	0.018	0.095	Y	Yes	1	FreezeDry
	Copper	7440-50-8	T	MG/KG	7.1			0.27	0.27	0.90	Y	Yes	1	FreezeDry
	Lead	7439-92-1	T	MG/KG		U		0.028	0.028	0.095	N	Yes	1	FreezeDry
	Lithium	7439-93-2	T	MG/KG		U		0.020	0.020	0.095	N	Yes	1	FreezeDry
	Molybdenum	7439-98-7	T	MG/KG	0.12			0.034	0.034	0.11	Y	Yes	1	FreezeDry
	Nickel	7440-02-0	T	MG/KG		U		0.039	0.039	0.13	N	Yes	1	FreezeDry
	Selenium	7782-49-2	T	MG/KG	0.73			0.048	0.048	0.16	Y	Yes	1	FreezeDry
	Silver	7440-22-4	T	MG/KG	0.018	J	RL	0.011	0.011	0.047	Y	Yes	1	FreezeDry
	Strontium	7440-24-6	T	MG/KG	0.29	J	RL	0.15	0.15	0.51	Y	Yes	1	FreezeDry
	Thallium	7440-28-0	T	MG/KG		U		0.012	0.012	0.095	N	Yes	1	FreezeDry
	Vanadium	7440-62-2	T	MG/KG	0.041	J	RL	0.031	0.031	0.10	Y	Yes	1	FreezeDry
	Zinc	7440-66-6	T	MG/KG	28.0			1.3	1.3	4.4	Y	Yes	1	FreezeDry
SW-846 7473	Mercury	7439-97-6	T	MG/KG	0.020	J	RL	0.0074	0.0074	0.025	Y	Yes	1	FreezeDry

## **SECTION 3**

### **SUPPORTING DOCUMENTATION FOR QUALIFIERS**



# INORGANIC ANALYSIS SUPPORT DOCUMENTATION

ESI project name: JOF EI Biota  
Sample Collection Dates: 6/12/19  
Job Number: 20188360.A000  
Project Manager:  
Laboratory: Pace-Green Bay

Reviewed by: Amanda Harvey  
Approved by: TBW  
Completion Date: 1/2020

**Applicable Sample No's ( X )**

Refer to Table 1 in the Quality Assurance Review

	<u>Sample No.</u>	<u>Lab Control No.</u>
Deliverable:	CLP (Full)      ( )	40193369
	Level IV (Full)    (X)	
	Limited            ( )	
	Other:	

The following table indicates criteria that were examined, the identified problems, and support documentation attachments

Comments: All results are acceptable unless otherwise qualified.

SAMPLE NO.

FORM V INORGANIC-2  
MATRIX SPIKE SAMPLE RECOVERY

1925396MSD

Lab Name: Pace Analytical - Green Bay SDG No. : 40193369 Contract: 426803 JOHNSONVILLE

Matrix: Tissue Basis: Wet Parent Sample ID: JOF-MFA-TRU-MI-20190612

Percent Moisture: \_\_\_\_\_

Analyte	Units	Control Limit %R	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R
Antimony	mg/kg	75-125	5.6	<0.021	5.0	113
Arsenic	mg/kg	75-125	5.3	<0.030	5.0	106
Barium	mg/kg	75-125	5.4	0.16	5.0	105
Beryllium	mg/kg	75-125	4.7	<0.033	5.0	95
Boron	mg/kg	75-125	9.3	<0.69	9.9	93
Cadmium	mg/kg	75-125	5.5	0.17	5.0	107
Calcium	mg/kg	75-125	672	324	248	140*
Chromium	mg/kg	75-125	5.3	0.11J	5.0	104
Cobalt	mg/kg	75-125	5.7	0.52	5.0	104
Copper	mg/kg	75-125	10.9	6.0	5.0	99
Lead	mg/kg	75-125	5.2	<0.030	5.0	105
Lithium	mg/kg	75-125	4.5	<0.021	5.0	91
Molybdenum	mg/kg	75-125	5.2	0.10J	5.0	102
Nickel	mg/kg	75-125	5.2	<0.041	5.0	104
Selenium	mg/kg	75-125	6.2	0.84	5.0	109
Silver	mg/kg	75-125	2.4	0.023J	2.5	94
Strontium	mg/kg	75-125	5.4	0.25J	5.0	103
Thallium	mg/kg	75-125	5.2	<0.013	5.0	106
Vanadium	mg/kg	75-125	5.2	<0.033	5.0	105
Zinc	mg/kg	75-125	48.8	26.2	19.9	114

USL M+  
#1-13

\* Spike Recovery outside QC Limits

09/11/2019 06:47

40193369

## **SECTION 4**

### **CASE NARRATIVE AND CHAIN-OF-CUSTODY RECORD**

## SAMPLE SUMMARY

Project: 426803 JOHNSONVILLE FOSSIL PLA  
 Pace Project No.: 40193369

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40193369001	JOF-MFA-TRU-MI-20190612	Tissue	06/12/19 12:50	08/21/19 08:00
40193369002	JOF-MFA-TRA-MI-20190612	Tissue	06/12/19 10:20	08/21/19 08:00
40193369003	JOF-MFA-TRD-MI-20190612	Tissue	06/12/19 12:05	08/21/19 08:00
40193369004	JOF-MFA-BH-MI-20190612	Tissue	06/12/19 11:30	08/21/19 08:00
40193369005	JOF-MFA-IC-MI-20190612	Tissue	06/12/19 10:50	08/21/19 08:00
40193369006	JOF-MFA-TRU-FI-20190612	Tissue	06/12/19 12:50	08/21/19 08:00
40193369007	JOF-MFA-TRA-FI-20190612	Tissue	06/12/19 10:20	08/21/19 08:00
40193369008	JOF-MFA-TRD-FI-20190612	Tissue	06/12/19 12:05	08/21/19 08:00
40193369009	JOF-MFA-BH-FI-20190612	Tissue	06/12/19 11:30	08/21/19 08:00
40193369010	JOF-MFA-IC-FI-20190612	Tissue	06/12/19 10:50	08/21/19 08:00
40193369011	JOF-MFA-DUP01-20190612	Tissue	06/12/19 00:00	08/21/19 08:00
40193369012	JOF-MFA-DUP02-20190612	Tissue	06/12/19 00:00	08/21/19 08:00
40193369013	PREP BLANK 40193369-013-B	Tissue		08/26/19 12:59

## REPORT OF LABORATORY ANALYSIS

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Page 3 of 31



## CASE NARRATIVE - METALS ANALYSIS

Lab Report Number (SDG): 40193369

Client: TENNESSEE VALLEY AUTHORITY

Project Name: JOHNSONVILLE FOSSIL PLANT

Project Number: 426803

### 1. RECEIPT

Samples were received frozen on dry ice. Sample PREP BLANK 40193369-013-B was generated in the laboratory by rinsing the equipment used to stir the tissue samples with deionized water.

### 2. HOLDING TIMES

- A. **Sample Preparation:** The samples, with the exception of PREP BLANK 40193369-013-B, were kept frozen prior to analysis, therefore the sample hold-time criteria is not applicable.
- B. **Sample Analysis:** All method required holding times were met.

### 3. METHOD

**Preparation:** SW846 3050B, 7473

**Analysis:** SW846 6020, 7473

### 4. PREPARATION

Sample preparation proceeded normally. Although sample PREP BLANK 40193369-013-B consists of deionized water, the sample was prepared in a manner consistent with the other tissue samples in this SDG (i.e., as if it were a tissue sample).

### 5. ANALYSIS

- A. **Calibration:**
  - 1. **Initial verification:** All method acceptance criteria were met.
  - 2. **Continuing verification:** All method acceptance criteria were met.
  - 3. **Reporting limit verification (CRDL):** All method acceptance criteria were met. Due to software limitations, the percent recovery for Calcium and Strontium are based on the water reporting limits rather than the tissue reporting limits and appear to recover two (Ca) and five (Sr) times higher than the true value.
- B. **Blanks:**
  - 1. **Initial calibration:** All method acceptance criteria were met.
  - 2. **Continuing calibration:** All method acceptance criteria were met.
  - 3. **Method:** All project specific acceptance criteria were met.
  - 4. **Chicken:** A chicken blank is prepared and analyzed with each sample batch to determine the background contamination levels of the chicken used for the laboratory control spike (LCS). The chicken blank is analyzed down to the laboratory MDL. Calcium, Copper, Selenium, and Zinc were detected at a level above the MDL in the chicken blank. The chicken blank results for these analytes were subtracted from the associated LCS results prior to calculating the percent recovery of the spike.
- C. **Spikes:**
  - 1. **Lab Control Spike (LCS):** The associated LCS met all in-house accuracy criteria.
  - 2. **SRM:** A Standard Reference Material was analyzed with this analytical batch. The in-house accuracy criteria were met.
  - 3. **Matrix Spike / Duplicate (MS/MSD):** Sample JOF-MFA-TRU-MI-20190612 was designated as the 6020 and 7473 matrix spike sample for this SDG. All in-house accuracy and precision criteria were met with the following exception. The recovery of Calcium was above control criteria in the MSD. The "M0" data qualifier was applied to the final report.
- D. **Sample Duplicates:** Not applicable.



- E. **Internal Standards:** All in-house acceptance criteria were met for the internal standards used for quantification.
- F. **ICPMS Interference Check Samples:** All acceptance criteria were met.
- G. **ICPMS Serial Dilution:** All applicable acceptance criteria were met.
- H. **Samples:** Sample analyses proceeded normally.
- I. **Dilutions:** None required for this SDG.
- J. **Reanalysis:** None required for this SDG.
- K. **Comments:** Samples were reported on a wet weight basis.

I certify that this data package is in compliance, with the terms and conditions agreed to by **Pace Analytical Services, LLC** and by the client, both technically and for completeness, except for the conditions detailed above. The Laboratory Manager or his designee, as verified by the following signature, has authorized release of the data contained in this completed data package:

Signed: Jill A. Duranceau Date: 09/11/19  
Name: Jill A Duranceau Position: Quality Assurance Auditor

## PROJECT NARRATIVE

Project: 426803 JOHNSONVILLE FOSSIL PLA  
Pace Project No.: 40193369

**Method:** EPA 6020

**Description:** 6020 MET ICPMS

**Client:** TENNESSEE VALLEY AUTHORITY

**Date:** September 10, 2019

### General Information:

13 samples were analyzed for EPA 6020. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

### Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

### Sample Preparation:

The samples were prepared in accordance with EPA 3050B with any exceptions noted below.

### Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

### Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

### Internal Standards:

All internal standards were within QC limits with any exceptions noted below.

### Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

### Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

### Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 331833

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 40193369001

M0: Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

- MSD (Lab ID: 1925396)
- Calcium

### Additional Comments:

## REPORT OF LABORATORY ANALYSIS

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Page 6 of 31

## PROJECT NARRATIVE

Project: 426803 JOHNSONVILLE FOSSIL PLA  
Pace Project No.: 40193369

**Method:** EPA 7473  
**Description:** 7473 Mercury, Tissue  
**Client:** TENNESSEE VALLEY AUTHORITY  
**Date:** September 10, 2019

### General Information:

13 samples were analyzed for EPA 7473. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

### Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

### Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

### Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

### Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

### Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

### Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

### Additional Comments:

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Page 7 of 31

## PROJECT NARRATIVE

Project: 426803 JOHNSONVILLE FOSSIL PLA  
Pace Project No.: 40193369

**Method:** ASTM D2974-87

**Description:** Percent Moisture Reportable

**Client:** TENNESSEE VALLEY AUTHORITY

**Date:** September 10, 2019

**General Information:**

12 samples were analyzed for ASTM D2974-87. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**

The samples were analyzed within the method required hold times with any exceptions noted below.

**Initial Calibrations (including MS Tune as applicable):**

All criteria were within method requirements with any exceptions noted below.

**Continuing Calibration:**

All criteria were within method requirements with any exceptions noted below.

**Internal Standards:**

All internal standards were within QC limits with any exceptions noted below.

**Surrogates:**

All surrogates were within QC limits with any exceptions noted below.

**Method Blank:**

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**

All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

**Duplicate Sample:**

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

**Additional Comments:**

This data package has been reviewed for quality and completeness and is approved for release.

## REPORT OF LABORATORY ANALYSIS

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Page 8 of 31



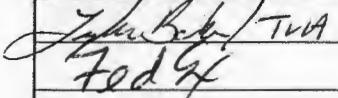
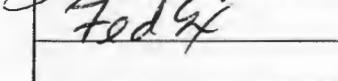
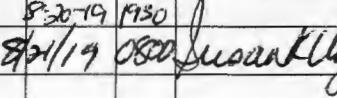
Tennessee Valley Authority

## TVA Environmental Investigations

40193369

Chain-of-Custody / Analytical Request Document	
Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed and accurate	

COOLER No.:	1	of	1
COC No.:	JOF_MF_20190612_1A		
1 of 1 Pages			
Task Desc:	JOF_MF		

Required Ship to Lab:			Required Project Information:			Required Sampler Information									
Lab Name:	Pace Analytical Green Bay	Site ID #:	JOHNSONVILLE FOSSIL PLANT		Sampler:	Tyler Baker									
Lab Address:	1241 Bellevue Street Suite 9 Green Bay, WI 54302	Project #:	426803		Sampling Company:	TVA									
		Site Address:	535 Steam Plant Road New Johnsonville		Address:	TVA Chickamauga Power Service Center, 4801 N. Access Road Chattanooga, TN									
		City:	State, Zip:	37134	City/State:	Phone:	423-876-6733								
Lab Manager Contact Information			Site PM Name:	Roy Quinn		Sampling Team Number:	1								
Lab PM:	Tod Noltemeyer	Phone/Fax:	423-751-3753		Send EDD/Hard Copy to:	tva-si@envsld.com									
Phone/Fax:	920-469-2436	Site PM Email:	tquinn@tva.gov												
Lab Email:	ted.noltemeyer@pacelabs.com														
Analysis Turnaround Time															
<input type="checkbox"/> CALENDAR DAYS <input checked="" type="checkbox"/> WORKING DAYS TAT if different from below _____															
<input type="checkbox"/> 24 Hours <input type="checkbox"/> 3 Business Days <input type="checkbox"/> 5 Business Days <input checked="" type="checkbox"/> 10 Business Days (Standard)															
ITEMS #	SAMPLE ID Samples IDs MUST BE UNIQUE	SAMPLE LOCATION	Start Depth	End Depth	MATRIX CODE G= GRAB C=COMP	SAMPLE TYPE	SAMPLE DATE	SAMPLE TIME	# OF CONTAINERS	Comments/ Lab Sample I.D.	INSM/MSD				
1	JOF-MFA-TRU-MI-20190612	JOF-TRU	NA	NA	MFA C	N	6/12/2019	12:50	1	001	<input type="checkbox"/>				
2	JOF-MFA-TRA-MI-20190612	JOF-TRA	NA	NA	MFA C	N	6/12/2019	10:20	1	002	<input type="checkbox"/>				
3	JOF-MFA-TRD-MI-20190612	JOF-TRD	NA	NA	MFA C	N	6/12/2019	12:05	1	003	<input type="checkbox"/>				
4	JOF-MFA-BH-MI-20190612	JOF-BH	NA	NA	MFA C	N	6/12/2019	11:30	1	004	<input type="checkbox"/>				
5	JOF-MFA-IC-MI-20190612	JOF-IC	NA	NA	MFA C	N	6/12/2019	10:50	1	005	<input type="checkbox"/>				
6	JOF-MFA-TRU-FI-20190612	JOF-TRU	NA	NA	MFA C	N	6/12/2019	12:50	1	006	<input type="checkbox"/>				
7	JOF-MFA-TRA-FI-20190612	JOF-TRA	NA	NA	MFA C	N	6/12/2019	10:20	1	007	<input type="checkbox"/>				
8	JOF-MFA-TRD-FI-20190612	JOF-TRD	NA	NA	MFA C	N	6/12/2019	12:05	1	008	<input type="checkbox"/>				
9	JOF-MFA-BH-FI-20190612	JOF-BH	NA	NA	MFA C	N	6/12/2019	11:30	1	009	<input type="checkbox"/>				
10	JOF-MFA-IC-FI-20190612	JOF-IC	NA	NA	MFA C	N	6/12/2019	10:50	1	010	<input type="checkbox"/>				
11	JOF-MFA-DUP01-20190612	-	NA	NA	MFA C	FD	6/12/2019	NA	1	011	<input type="checkbox"/>				
12	JOF-MFA-DUP02-20190612	-	NA	NA	MFA C	FD	6/12/2019	NA	1	012	<input type="checkbox"/>				
13										31/06/2019	<input type="checkbox"/>				
Additional Comments/Special Instructions:			RELINQUISHED BY / AFFILIATION			DATE	TIME	ACCEPTED BY / AFFILIATION		DATE	TIME	Sample Receipt Conditions			
 			8/20/19	1930								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
 			8/21/19	0800								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SHIPPING METHOD:			SAMPLER NAME AND SIGNATURE												
Fedex			Tyler Baker												

Client Name: TVA

### Sample Preservation Receipt Form

Project # 40193369

All containers needing preservation have been checked and noted below:  Yes  No  N/A

Lab Lot# of pH paper:

Lab Std #ID of preservation (if pH adjusted):

Initial when completed:

Date/  
Time:

Pace Lab #	Glass				Plastic				Vials				Jars				General				VOA Vials (>6mm) *	H2SO4 pH ≤	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤	pH after adjusted	Volume (mL)	
	AG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BP1U	BP2N	BP2Z	BP3U	BP3B	BP3N	BP3S	DG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	WGFU	WPFU	SP5T	ZPLC	GN			
001																												2.5 / 5 / 10
002																												2.5 / 5 / 10
003																												2.5 / 5 / 10
004																												2.5 / 5 / 10
005																												2.5 / 5 / 10
006																												2.5 / 5 / 10
007																												2.5 / 5 / 10
008																												2.5 / 5 / 10
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014																												2.5 / 5 / 10
015																												2.5 / 5 / 10
016																												2.5 / 5 / 10
017																												2.5 / 5 / 10
018																												2.5 / 5 / 10
019																												2.5 / 5 / 10
020																												2.5 / 5 / 10

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other:

Headspace in VOA Vials (>6mm) :  Yes  No  N/A \*If yes look in headspace column

AG1U	1 liter amber glass	BP1U	1 liter plastic unpres	DG9A	40 mL amber ascorbic	JGFU	4 oz amber jar unpres
AG1H	1 liter amber glass HCL	BP2N	500 mL plastic HNO3	DG9T	40 mL amber Na Thio	WGFU	4 oz clear jar unpres
AG4S	125 mL amber glass H2SO4	BP2Z	500 mL plastic NaOH, Znact	VG9U	40 mL clear vial unpres	WPFU	4 oz plastic jar unpres
AG4U	120 mL amber glass unpres	BP3U	250 mL plastic unpres	VG9H	40 mL clear vial HCL		
AG5U	100 mL amber glass unpres	BP3B	250 mL plastic NaOH	VG9M	40 mL clear vial MeOH	SP5T	120 mL plastic Na Thiosulfate
AG2S	500 mL amber glass H2SO4	BP3N	250 mL plastic HNO3	VG9D	40 mL clear vial DI	ZPLC	ziploc bag
BG3U	250 mL clear glass unpres	BP3S	250 mL plastic H2SO4			GN:	



Document Name:  
Sample Condition Upon Receipt (SCUR)

Document Revised: 25Apr2018  
Document No.: F-GB-C-031-Rev.07  
Issuing Authority: Pace Green Bay Quality Office

1241 Bellevue Street, Green Bay, WI 54302

### Sample Condition Upon Receipt Form (SCUR)

Project #:

WO# : 40193369



40193369

Client Name: TVA

Courier:  CS Logistics  Fed Ex  Speedee  UPS  Waltco

Client  Pace  Other:

Tracking #: 7892 10685 6166

Custody Seal on Cooler/Box Present:  yes  no Seals intact:  yes  no

Custody Seal on Samples Present:  yes  no Seals intact:  yes  no

Packing Material:  Bubble Wrap  Bubble Bags  None  Other

Thermometer Used SR - Type of Ice: Wet Blue  Dry None  Samples on ice, cooling process has begun

Cooler Temperature Uncorr: 0 /Corr: -5

Temp Blank Present:  yes  no

Biological Tissue is Frozen:  yes  no

Temp should be above freezing to 6°C.

Biota Samples may be received at ≤ 0°C.

Person examining contents:

Date: 8-21-19 *801*  
Initials: *8-21-19*

Chain of Custody Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody Filled Out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody Relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler Name & Signature on COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time: - VOA Samples frozen upon receipt	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Date/Time:
Short Hold Time Analysis (<72hr):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	6.
Rush Turn Around Time Requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	7.
Sufficient Volume: For Analysis: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No MS/MSD: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	8.	
Correct Containers Used: -Pace Containers Used: -Pace IR Containers Used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9.
Containers Intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10.
Filtered volume received for Dissolved tests	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	12.
Trip Blank Present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	13.
Trip Blank Custody Seals Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution:  
Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_ If checked, see attached form for additional comments

Comments/ Resolution: \_\_\_\_\_

Project Manager Review:

An for TM

Date:

8/21/19

Page *2* of *31*