

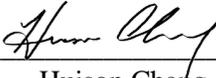


**Data Validation Report  
SDG 160-18640-1**

**Characterization of Structures, Items, Solutions, and Soil at the  
Proposed Outfall 200 Treatment System Sites  
Y-12 National Security Complex**

Revision 0

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## SCOPE

This report contains Level 3 data validation results for analytical data for SDG 160-18640 for two water samples and two field QC samples (one equipment blank and one trip blank) collected at the Proposed Outfall 200 Mercury Treatment Facility located at the Y-12 National Security Complex, Oak Ridge, Tennessee. The evaluation covers analyses for volatiles, semivolatiles, chlorinated pesticides, PCBs, metals (ICPMS), mercury, total suspended solids, hexane extractable material (HEM), anions, total recoverable phenols, cyanide (total and amenable), total organic carbon, acidity, gross alpha and gross beta radioactivity, cesium 137 and other gamma emitters, strontium-90, americium 241, isotopic neptunium, isotopic thorium, isotopic uranium, and technetium-99.

## REFERENCES

The analytical data were validated using the following guidelines:

- Sampling and Analysis Plan / Quality Assurance Project Plan for Geotechnical and Waste Characterization of the Outfall 200 Mercury Treatment Facility Area at the Y-12 National Security Complex, Oak Ridge, Tennessee (November, 2015)
- *Guidance on Environmental Data Verification and Data Validation - EPA QA/G-8, EP A/240/R-02/004*, United States Environmental Protection Agency, Washington D.C
- National Functional Guidelines for Superfund Organic Methods Data Review (August 2014)
- National Functional Guidelines for Inorganic Superfund Data Review (August 2014)
- Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation. ANSI/ANS-41.5-2012. (February, 2012)
- Multi-Agency Radiological Laboratory Analytical Protocols Manual (July, 2004)

## VERIFICATION AND VALIDATION RESULTS

### Completeness

Results for four water samples (two field and two field QC samples) were evaluated. All analyses were performed by TestAmerica in Earth City, Missouri (TA-St. Louis), with the exception of total recoverable phenols, acidity, and HEM analyses which are performed by TestAmerica in Arvada, Colorado (TA-Denver). The following lists analytical methods and sample numbers for reported results.

Project Sample ID	Laboratory Sample ID	Analysis
YMTFA81 9404 L	160-18640-1	VOCs SVOCs Pesticides/PCBs Metals/mercury Cyanide Anions TSS Total phenols HEM Acidity TOC Radionuclides
YMTFA 9404 TB-1	160-18640-3	VOCs

Project Sample ID	Laboratory Sample ID	Analysis
YMTFA93 9404-8L	160-18640-3	VOCs SVOCs Pesticides/PCBs Metals/mercury Cyanide Anions TSS Total phenols HEM Acidity TOC Radionuclides
YMTFA 9404 EB	160-18640-4	VOCs SVOCs Pesticides/PCBs Metals/mercury Cyanide Anions TSS Total phenols HEM Acidity TOC Radionuclides

### Holding times

Based on evaluation of the date of sample collection (08/15/16) and date of sample analyses, all recommended holding times per the analytical methods were met with the following exception: Nitrite analysis for sample YMTFA 9404 EB was re-analyzed outside the holding times. Since the re-analysis data was reported, the result was qualified as estimated (J).

### Preservation and Laboratory Sample Receipt

All samples arrived at TA-St. Louis and TA-Denver intact and in good condition under valid chain of custody (COC). The COC was signed indicating the samples were appropriately relinquished by the field personnel and accepted by the analytical laboratory.

The samples arrived at TA-St. Louis facility at cooler temperature of 1.1° C, 1.8° C and 3.0° C. The laboratory sample receipt checklist noted "NA" under the checklist item "Containers requiring zero headspace have no headspace or bubble is < 6mm (1/4)". Since the water samples required VOC analyses, headspace information should have been provided.

### Analytical Methods, Reporting Units, and Detection Limits

All analytical methods specified (or equivalent to those specified) on the COC (COC No. 160-4416-2171.1) were utilized for the analyses. All results were reported in appropriate units except for gross alpha, gross beta, cesium-137, and strontium-90 which were reported in pCi/L instead of Bq/L listed in SAP. The detection limits were appropriate for all methods.

## **Trip Blank**

One trip blank was included in the cooler with the samples. A detect for tetrahydrofuran was reported in the trip blank. Tetrahydrofuran is not a target analyte for the field samples.

## **Equipment Blanks (EB)**

One equipment blank was collected. The following detects were noted in the equipment blank: nitrite, chloride, barium, calcium, and zinc. The sample results were either nondetects or at concentrations greater than 10X the concentration in the equipment blank with the exception of zinc in sample YMTFA93 9404-8L which was qualified as a nondetect (U).

## **Field Blank (FB)**

Not applicable.

## **Field Duplicates**

Not applicable.

## **Laboratory Case Narratives**

The following issues were noted in the case narratives:

### Sample Receipt

- Sample ID for trip blank was changed to YMTFA 9404 TB-1 from YMTFA 9404 TB per client instruction.

### VOCs:

- CCV %D above the limit for Freon-114.
- CCV low bias for 2-chloroethyl vinyl ether.
- CCV RRF did not meet minimum for acetone, methyl acetate, 2-butanone, n-butanol, 1,4-dioxane, and 2-hexanone.
- Due to insufficient sample volume, no MS/MSD analyses were performed.
- Due to high concentration of target analytes, sample YMTFA81 9404 L was analyzed at a reduced volume. The reporting limits have been adjusted.

### SVOCs:

- Due to insufficient sample volume, no MS/MSD analyses were performed.
- LCS and LCSD recoveries were above the QC limits for 3,3'-dichlorobenzidine and 4-nitrophenol. These analytes were not detected in the samples; therefore, no qualifications were required.

### Chlorinated Pesticides

- Due to insufficient sample volume, sample YMTFA91 9404 L was prepared with lower sample volume resulting in elevated reporting limits.
- Due to insufficient sample volume, no MS/MSD analyses were performed.
- ICV %D was above the QC limit for toxaphene on the primary column. Toxaphene %D was within QC limits on the secondary column.

#### PCBs:

- Due to insufficient sample volume, no MS/MSD analyses were performed.
- Surrogate and internal standard eluted outside the retention time window for a CCV. This retention time shift was taken into account when reviewing the samples for target compounds.

#### Metals (ICPMS) and Mercury:

- The method blank exceeded the acceptance limits for copper.
- No analytical or quality issues were noted for mercury analyses.

#### Total Suspended Solids

- No analytical or quality issues were noted.

#### HEM/SGT

- No MS/MSD analyses were performed due to insufficient sample volume.
- No analytical or quality issues were noted.

#### Anions

- Sample YMTFA81 9404 L was analyzed at a dilution to bring target analyte concentrations within the calibration range. Elevated reporting limits are reported.
- MS recovery for nitrite and ortho phosphate was outside QC limits. Sample matrix interference is suspected.
- CCV bracketing the MS analysis recovered below the limit for nitrite.
- Sample YMTFA 9404 EB was originally analyzed for Nitrite within holding time, but was bracketed by a CCV with low recovery. The sample was re-analyzed outside the holding time with the acceptable CCV. Since the re-analysis reported a detect for nitrite but was a non-detect in the original analysis, reanalysis data was reported.

#### Total Recoverable Phenols

- No analytical or quality issues were noted.

#### Cyanide

- No analytical or quality issues were noted.

#### Total Organic Carbon

- No analytical or quality issues were noted.

#### Acidity

- No analytical or quality issues were noted.

#### Radionuclides:

- The gross alpha detection goal was not met due to a reduction of the sample size attributed to high residual mass.
- Due to insufficient sample volume, no duplicate was analyzed for Strontium-90
- No analytical or quality issues were noted for alpha spectrometry and liquid scintillation counting methods.

#### **Verification/Validation Checklists, Data Qualifiers, and Qualifier Definitions**

Verification and validation checklists are presented in Appendix A and Appendix B. Applicable validation qualifier codes are defined in the table below.

<b>Qualifier</b>	<b>Definition</b>
U	analyte is not detected at or above the stated reporting limit
UJ	analyte is not detected but there is uncertainty about the reporting limits.
J	result is estimated
R	result is rejected

### **Volatiles by GC/MS**

Two water samples, one equipment blank, and one trip blank were analyzed for volatile organic compounds (VOCs) by SW-846 Method 8260C. Holding times, batch QCs (blank and LCS/LCSD) and sample specific QCs (internal standards, surrogates) were acceptable with the exception of the following outliers:

- CCV outliers (high bias) were noted for Freon-114 and chloroethane, low bias for 2-chloroethyl vinyl ether. 2-Chloroethyl vinyl ether results were qualified as UJ.
- The case narrative noted low RRF for acetone, methyl acetate, 2-butanone, n-butanol, 1, 4-dioxane, and 2-hexanone in CCVs. The average RRFs and CCV RRFs were below 0.05 for the following analytes: acrolein, acetone, methyl acetate, acetonitrile, acrylonitrile, ethyl acetate, tetrahydrofuran, 2-butanone, propionitrile, isobutanol, 1-butanol, 1,4-dioxane, 2-chloroethyl vinyl ether, 2-nitropropane, and cyclohexanone. Non-detects for these analytes are qualified as unusable (R).

### **Semivolatiles by GC/MS**

Two water samples and one equipment blank were extracted and analyzed for SVOCs by EPA Method 625. Holding times, initial and continual calibrations, batch QCs (blank, LCS, MS/MSD) and sample specific QCs (internal standards, surrogates) were acceptable except for high bias noted for 3,3-dichlorobenzidine and 4-nitrophenol in the LCS and LCSD analyses. Since these analytes were not detected in the affected samples, no qualification of data was required.

### **Chlorinated Pesticides by GC**

Two water samples and one equipment blank were extracted and analyzed for Pesticides by EPA Method 608. Holding times, initial and continual calibrations, batch QCs (blank, LCS, MS/MSD) and sample specific QCs (internal standards, surrogates) were acceptable.

### **Polychlorinated Biphenyl by GC**

Two water samples and one equipment blank samples were extracted and analyzed for PCBs by EPA Method 608. Holding times, initial and continual calibrations, batch QCs (blank, LCS, MS/MSD) and sample specific QCs (internal standards, surrogates) were acceptable.

### **Metals (ICPMS) and Mercury**

Two water samples and one equipment blank sample were extracted and analyzed for Metals (ICPMS) and mercury by SW-846 Method 6020A and 7470A. Holding times, initial and continual calibrations, batch QCs (blank, LCS, MS/MSD) were acceptable. Method blank had detects for aluminum, boron, copper, lithium, and sodium. Lead was detected in one of the CCBs. Boron and lithium in sample

YMTFA81 9404 L; aluminum, boron, copper, in sample YMTFA93 9404-8L; aluminum, boron, lithium, and lead and sodium in sample YMTFA 9404 EB were qualified as nondetects (U) as a result.

Zinc was detected in the equipment blank YMTFA 9404 EB; zinc in sample YMTFA94 9404-9L was qualified as a nondetect (U) due to an equipment blank contamination.

### **General Chemistry Analyses**

Two water samples and one equipment blank sample were extracted and analyzed for Anions, TSS, HEM, Total recoverable phenols, cyanide, TOC, and acidity analyses.

Anions: MS %Rs were outside QC limits for nitrite and orthophosphate. Nitrite and orthophosphate results were qualified as estimated (UJ or J).

No analytical or quality issues were noted for the TSS, HEM, Total recoverable phenols, cyanide, TOC, and acidity analyses.

### **Radionuclides**

Two water samples and one equipment blank were analyzed for the following radionuclides analyses: gross alpha and gross beta radioactivity, cesium-137 and other gamma emitters, strontium-90 by GFPC, isotopic neptunium, americium 241, isotopic plutonium, isotopic thorium, isotopic uranium, and technetium-99. Holding times, applicable instrument calibrations, and sample and batch QCs were acceptable for all methods. Traceable standard certificates were acceptable.

#### Gross Alpha and Gross Beta Radioactivity

Gross alpha and beta results were reported in pCi/L instead of Bq/L listed in the SAP.

Although the case narrative noted that the gross alpha detection goal was not met due to reduced sample size, the RL met the recommended RL in the SAP.

#### Alpha Spectrometry

Isotopic Americium (Am-241), isotopic neptunium (Np-237 and Np-239), isotopic plutonium (Pu-238 and Pu-239/240), isotopic thorium (Th-228, Th-230, Th-232) and isotopic uranium (U-233/234, U-235/235, U-238) analyses were performed by Alpha Spectroscopy. The LCS and LCSD had acceptable percent recoveries. The laboratory duplicate analyses had acceptable relative percent difference (RPD) and relative error ratio (RER) results. Chemical recoveries and yields were within acceptable limits with the following exception: Thorium-229 tracer recovery was below the QC limit in sample UMTFA73SE001. All thorium isotopes were qualified as estimated (J) in this sample. Method blank results were less than the MDAs. No other qualification of data was required.

#### Gas Flow Proportional Counter

Strontium-90 analysis was performed by gas flow proportional counter. The laboratory duplicate analysis was not performed due to insufficient sample volume. LCSD was performed instead. The LCS/LCSD had acceptable percent recoveries and percent difference (RPD) and relative error ratio (RER) results. Chemical recoveries and yields were within acceptable limits. Method blank results were less than the MDAs. No qualification of data was required.

#### Liquid Scintillation Counter

Technetiums (Tc-99) were analyzed by liquid Scintillation counter. The Laboratory Control Sample (LCS) had acceptable percent recoveries. The laboratory duplicate analyses had acceptable relative percent difference (RPD) and relative error ratio (RER) results. Chemical recoveries and yields were

within acceptable limits. Method blank results were less than the MDAs. No qualification of data was required.

### Summary

- Nondetect results for 1,4-dioxane, 2-butanone, 2-chloroethyl vinyl ether, 2-nitropropane, acetone, acetonitrile, acrolein, acrylonitrile, cyclohexanone, ethyl acetate, isobutanol, methyl acetate, 1-butanol, and propionitrile in Trip Blank (YMTFA 9404 TB-1) were qualified as unusable (R) due to low RRFs in the initial and continuing calibration standards.
- Nondetect results for 2-chloroethyl vinyl ether, acrolein, and acrylonitrile in samples YMTFA81 9404L, YMTFA93 9404-8L, and YMTFA 9404 EB were qualified as unusable (R) due to low RRFs in the initial and continuing calibration standards.
- Boron and lithium in sample YMTFA81 9404 L, aluminum, boron, copper, in sample YMTFA93 9404-8L Aluminum, boron, lithium, and lead and sodium in sample YMTFA 9404 EB were qualified as nondetects (U) due to method blank or calibration blank contaminations.
- Zinc in sample YMTFA94 9404-9L was qualified as a nondetect (U) due to an equipment blank contamination.
- Nitrite (as N) in sample YMTFA 9404 EB was qualified as J for holding times.
- Thorium-230 in samples YMTFA 93 9404-8L and YMTFA 9404 EB were qualified as a nondetect (U) due to method blank contamination.

### Summary of Result Qualifiers

Sample No.	Parameter	Laboratory Result	Qualified Result	Units	Laboratory Qualifier	Validation Qualifier
YMTFA 9404 TB-1	Acetone	0.55	2.0	ug/L	U	R
YMTFA 9404 TB-1	1,4-Dioxane	11	80		U	R
YMTFA 9404 TB-1	Methyl acetate	0.76	25	ug/L	U	R
YMTFA 9404 TB-1	2-Butanone	0.47	5.0	ug/L	U	R
YMTFA 9404 TB-1	2-Chloroethyl vinyl ether	0.24	2.0	ug/L	U	R
YMTFA 9404 TB-1	2-Nitropropane	0.40	10	ug/L	U	R
YMTFA 9404 TB-1	Acetonitrile	3.7	10	ug/L	U	R
YMTFA 9404 TB-1	Acrolein	2.8	10	ug/L	U	R
YMTFA 9404 TB-1	Acrylonitrile	0.73	10	ug/L	U	R
YMTFA 9404 TB-1	Cyclohexanone	5.8	20	ug/L	U	R
YMTFA 9404 TB-1	Ethyl ether	0.18	2.0	ug/L	U	R
YMTFA 9404 TB-1	Isobutanol	8.3	80	ug/L	U	R
YMTFA 9404 TB-1	1-Butanol	12	50	ug/L	U	R
YMTFA 9404 TB-1	Propionitrile	1.4	10	ug/L	U	R
YMTFA81 9404 L	2-chloroethyl vinyl ether	0.24	2.0	ug/L	U	R
YMTFA81 9404 L	Acrolein	2.8	10	ug/L	U	R
YMTFA81 9404 L	Acrylonitrile	0.73	10	ug/L	U	R
YMTFA93 9404 8L	2-chloroethyl vinyl ether	0.24	2.0	ug/L	U	R

<b>Sample No.</b>	<b>Parameter</b>	<b>Laboratory Result</b>	<b>Qualified Result</b>	<b>Units</b>	<b>Laboratory Qualifier</b>	<b>Validation Qualifier</b>
YMTFA93 9404 8L	Acrolein	2.8	10	ug/L	U	R
YMTFA93 9404 8L	Acrylonitrile	0.73	10	ug/L	U	R
YMTFA 9404 EB	2-chloroethyl vinyl ether	0.24	2.0	ug/L	U	R
YMTFA 9404 EB	Acrolein	2.8	10	ug/L	U	R
YMTFA 9404 EB	Acrylonitrile	0.73	10	ug/L	U	R
YMTFA81 9404 L	Boron	0.046	0.10	mg/L	J	U
YMTFA81 9404 L	Lithium	0.0048	0.0050	mg/L	JB	U
YMTFA 93 9404 8L	Aluminum	0.054	0.054	mg/L	B	UJ
YMTFA 93 9404-8L	Boron	0.043	0.10	mg/L	J	U
YMTFA 93 9404-8L	Copper	0.0021	0.0021	mg/L	B	U
YMTFA 93 9404-8L	Zinc	0.056	0.056	mg/L		U
YMTFA 9404 EB	Lead	0.00021	0.0030	mg/L	JB	U
YMTFA 9404 EB	Sodium	0.095	0.095	mg/L	B	U
YMTFA 9404 EB	Nitrite as N	0.032	0.032	mg/L	H	J
YMTFA 93 9404-8L	Thorium-230	0.201	1.0	pCi/L		U
YMTFA 9404 EB	Thorium-230	0.215	1.0	pCi/L		U

**Appendix A**  
**Verification Summary Tables**

<b>Data Verification</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>	<b>Comment</b>
<b>Custody of Samples</b>				
Are samples traceable through inspection of signature records on field and laboratory chains of custody (COCs)?	x			
Has contractual turn-around time been met for all samples?	x			
Have all samples been preserved correctly and pertinent documentation included?	x			
Is the laboratory log in sample receipt checklist present	x			
Are any sample receipt non-conformances noted?	x			
<b>Standard Traceability</b>				
Have certificate(s) been included for the LCS and MS?	x			
Standards have not exceeded the certificate expiration date	x			
Are chemical standards and reference materials traceable to a reliable source? (Reagent traceability summary)	x			
<b>Analytical Completeness</b>				
Are all COC samples and associated analytical results reported in the laboratory data package?	x			
<b>Data Summaries</b>				
The case narrative is present and summarizes the sample receipt and analysis information including any analytical anomalies for all methods reported in the data package.	x			
Other data summary forms are present as applicable (detection, sample results, surrogate, tracer/carrier, QC results and association, prep and analysis chronicle, method and sample summaries)	x			
<b>Sample Data</b>				
Is the Sample Data included for each COC requested analytical method?	x			
Is the calibration data included for each method? (ICAL, ICV, CCAL as required for each method)	x			
Are the QC summary forms included for each method? (MB, ICS/CCB, LCS/LCSD, MS/MSD, surrogates, internal standards, serial dilution as required and applicable for each method)	x			
Are the method run logs and/or bench sheets included for each method?	x			

<b>Data Verification</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>	<b>Comment</b>
Are the method preparation/extraction logs included for each applicable method?	x			
Is the sample and QC raw data included for each method?	x			
Is the internal Laboratory Review documented by checklists and included in the data package?	x			

**Appendix B**  
**Validation Summary Tables**

<b>Volatile Organic Compounds by GC/MS (SW8260C)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples properly preserved?	x				
Have the samples been analyzed within holding times?	x				
<b>Detection Limits</b>					
Do all laboratory RLs <= recommended reporting limits in the SAP?		x			Vinyl chloride RL did not meet the recommended RL. The MDL was below the recommended RL.
<b>GC/MS Instrument Performance Tuning</b>					
Was BFB tune performed at the beginning of 12-hour analytical sequence?	x				
Did the BFB tunes meet instrument performance criteria?	x				
<b>Initial Calibration</b>					
Are minimum calibration curve with minimum 5 points analyzed prior to sample analysis?			x		
Are average RRFs greater than minimum RRF criteria?		x		R	1,4-dioxane, 2-butanone, 2-chloroethyl vinyl ether, 2-nitropropane, acetone, acetonitrile, acrolein, acrylonitrile, cyclohexanone, ethyl acetate, isobutanol, methyl acetate, 1 butanol, and propionitrile RRFs below criteria. Nondetects qualified as unusable (R).
Are %RSDs within the criteria?			x		
<b>Calibration Verification</b>					
Are calibration verification standard analyzed at the beginning of the analytical sequence immediately after BFB tuning?	x				

<b>Volatile Organic Compounds by GC/MS (SW8260C)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
RRT within 0.006 of the average RRT of the initial calibration?			x		No RRTs reported.
Are RRFs greater than 0.05?		x		R	1,4-dioxane, 2-butanone, 2-chloroethyl vinyl ether, 2-nitropropane, acetone, acetonitrile, acrolein, acrylonitrile, cyclohexanone, ethyl acetate, isobutanol, methyl acetate, 1 butanol, and propionitrile RRFs below criteria. Nondetects qualified as unusable (R).
Are %D (difference or drift) within appropriate control criteria?	x				
<b>Method Blank</b>					
Is the Method Blank analyzed for each analytical batch of up to 20 samples?	x				
Is the Method Blank Summary form present?	x				
Is the method blank the same matrix as the samples in the reporting batch?	x				
Is the blank at similar (low, medium, or trace) concentration level?	x				
Does the blank have any detects above MDL?		x			
<b>Surrogate Recovery</b>					
Are all samples and QCs spiked with surrogate compounds?	x				
Are percent recoveries within the method criteria results?	x				
<b>LCS/LCSD</b>					
Has at least one LCS been prepared for each preparation batch containing up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?	x				
Is the LCS spiked with all target analytes listed in the SAP?	x				
Are the LCS %RECs within the applicable QC criteria?	x				

<b>Volatile Organic Compounds by GC/MS (SW8260C)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Are the LCS/LCSD RPDs within the applicable QC criteria?	x				
<b>Matrix Spike/Matrix Spike Duplicate</b>					
Has at least one MS/MSD pair been prepared for a batch with sample counts up to 20 samples?		x			Insufficient sample volume to perform MS/MSD.
Are the MS/MSD spiked with all target analytes listed in the SAP?			x		
MS and MSD %RECs within the applicable QC limits?			x		
MS/MSD RPDs within the applicable QC limits?			x		
<b>Internal Standards</b>					
Were internal standards added to all samples and QCs?	x				
Are internal standard retention times within method criteria?	x				
Are internal standard areas within method criteria?	x				
<b>Target Analyte Identification</b>					
Do the mass spectra of the positively identified compound meet the mass criteria?			x		
Are the RRTs of the positively identified target analytes within $\pm 0.06$ of the same analyte in the associated opening CCV?			x		
<b>Target Analyte Quantitation and Reported Quantitation Limit</b>					
Are the results for all positively identified analytes are calculated correctly?			x		
Are the reporting limits calculated for the non-detects and reported correctly?			x		

<b>Semivolatile Organic Compounds by GC/MS (EPA625)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples properly preserved?	x				
Have the samples been analyzed within holding times?	x				
<b>Target Analytes and Detection Limits</b>					
Are all the SAP target analytes reported	x				
Do all laboratory RLs <= recommended reporting limits in the SAP?	x				
<b>GC/MS Instrument Performance Tuning</b>					
Was DFTPP tune performed at the beginning of 12-hour analytical sequence?	x				
Did the DFTPP tunes meet instrument performance criteria?	x				
<b>Initial Calibration</b>					
Are minimum calibration curve with minimum 5 points analyzed prior to sample analysis?	x				
Are average RRFs greater than minimum RRF criteria?	x				
Are %RSDs within method criteria?	x				
<b>Calibration Verification</b>					
Are calibration verification standard analyzed at the beginning of the analytical sequence immediately after DFTPP tuning?	x				
RRT within 0.006 of the average RRT of the initial calibration?			x		
Are RRFs greater than minimum RRF criteria?	x				
Are %D (difference or drift) within the appropriate control criteria?	x				
<b>Method Blank</b>					
Is the Method Blank extracted and analyzed for each analytical batch of up to 20 samples?	x				
Is the Method Blank Summary form present?	x				
Is the method blank the same matrix as the samples in the reporting batch?	x				
Is the blank at similar (low, medium, or trace) concentration level?	x				
Does the blank have any detects above MDL?		x			
<b>Surrogate Recovery</b>					
Are all samples and QCs spiked with surrogate compounds?	x				
Are percent recoveries within the method criteria results?	x				
<b>LCS/LCSD</b>					

<b>Semivolatile Organic Compounds by GC/MS (EPA625)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Has at least one LCS been prepared for each preparation batch containing up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?	x				
Is the LCS spiked with all target analytes listed in the SAP?	x				
Are the LCS %RECs within the applicable QC criteria?	x				
Are the LCS/LCSD RPDs within the applicable QC criteria?	x				
<b>Matrix Spike/Matrix Spike Duplicate</b>					
Has at least one MS/MSD pair been prepared for a batch with sample counts up to 20 samples?		x			Insufficient sample volume to perform MS/MSD
Are the MS/MSD spiked with all target analytes listed in the SAP?			x		
MS and MSD %RECs within the applicable QC limits?			x		
MS/MSD RPDs within the applicable QC limits?			x		
<b>Internal Standards</b>					
Were internal standards added to all samples and QCs?	x				
Are internal standard retention times within method criteria?	x				
Are internal standard areas within method criteria?	x				
<b>Target Analyte Identification</b>					
Do the mass spectra of the positively identified compound meet the mass criteria?			x		
Are the RRTs of the positively identified target analytes within $\pm 0.06$ of the same analyte in the associated opening CCV?			x		
<b>Target Analyte Quantitation and Reported Quantitation Limit</b>					
Are the results for all positively identified analytes calculated correctly?			x		
Are the reporting limits calculated for the non-detects and reported correctly?			x		

<b>Chlorinated Pesticides/Polychlorinated Biphenyls (EPA608)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples properly preserved?	x				
Have the samples been analyzed within holding times?	x				
<b>Target Analytes and Detection Limits</b>					
Are all the SAP target analytes reported?	x				
Do all laboratory RLs <= SAP recommended reporting limits?	x				
<b>Instrument Performance Check</b>					
Are the %resolutions in the resolution check standard greater than 80%?	x				
Are the % resolutions in the Performance evaluation mixture greater than 90%	x				
Are the individual % breakdown ≤ 20% for DDT and endrin and combined % breakdown ≤ 30%?	x				
<b>Initial Calibration</b>					
Are minimum calibration curve with minimum 5 points analyzed prior to sample analysis?		x			5 pt. for single component pesticides and toxaphene. 6 point for PCB1016/1260 and PCB1221/1254 Single point used for all other PCBs.
Are %RSDs (r-squared for linear regression) within method criteria?	x				For PCB1221/1254. Linear regression r-squared above 0.990 for PCB1016/1260
<b>Calibration Verification</b>					
Are calibration verification standard analyzed at the appropriate frequency?	x				
RT within RT windows established by initial calibration?	x				
Are %D (difference or drift) within 20% of the average initial calibration?	x				No closing CCV analyzed after samples.
<b>Method Blank</b>					
Is the Method Blank extracted and analyzed for each analytical batch of up to 20 samples?	x				
Is the Method Blank Summary form present?	x				

<b>Chlorinated Pesticides/Polychlorinated Biphenyls (EPA608)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Is the method blank the same matrix as the samples in the reporting batch?	x				
Is the blank at similar (low, medium, or trace) concentration level?	x				
Does the blank have any detects above MDL?		x			
<b>Surrogate Recovery</b>					
Are all samples and QCs spiked with surrogate compounds?	x				
Are percent recoveries within the method criteria results?	x				
<b>Internal Standard</b>					
Were internal standards added to all samples and QCs?	x				
Are internal standard retention times within method criteria?	x				
Are internal standard areas within method criteria?	x				
<b>LCS/LCSD</b>					
Has at least one LCS been prepared for each preparation batch containing up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?	x				
Is the LCS spiked with all target analytes listed in the SAP?		x			For PCB analyses, PCB1016/1260 mix was used as spiking compounds.
Are the LCS %RECs within the applicable QC criteria?	x				
Are the LCS/LCSD RPDs within the applicable QC criteria?	x				
<b>Matrix Spike/Matrix Spike Duplicate</b>					
Has at least one MS/MSD pair been prepared for a batch with sample counts up to 20 samples?		x			Insufficient sample volume for MS/MSD analyses.
Are the MS/MSD spiked with target analyte specified in the SAP?			x		
MS and MSD %RECs within the applicable QC limits?			x		
MS/MSD RPDs within the applicable QC limits?			x		
<b>Target Analyte Identification</b>					
Do the positively identified compounds meet the identification criteria?			x		

<b>Chlorinated Pesticides/Polychlorinated Biphenyls (EPA608)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Are the RTs of the positively identified target analytes within RT window established by initial calibration standards?			x		
<b>Target Analyte Quantitation and Reported Quantitation Limit</b>					
Are the results for all positively identified analytes are calculated correctly?			x		
Are the reporting limits calculated for the non-detects and reported correctly?			x		
Are RPDs between primary and confirmation column results for detects within QC limit?			x		

<b>Metals by ICPMS (SW6020A) Mercury by CVAA (SW7470A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples properly preserved?	x				
Are sample preparation sheets present and account for all extractions and digestions for reported samples?	x				
Have the samples been prepared and analyzed within holding times?	x				
<b>Detection Limits and Target Analytes</b>					
Do all samples show RLs <= the SAP Recommended Reporting Limits?	x				
Are all the SAP target analytes reported?	x				
<b>ICPMS Tuning</b>					
Was a tuning solution containing elements representing all of the mass regions of interest at least four times?	x				
Were the mass calibrations within 0.1 amu of the true value?					
Were the mass resolution verified at < 0.9 amu full width at the 10% of the peak height?	x				
Were the %RSDs < 5% for all elements in tuning solution?	x				
<b>Initial Calibration</b>					
Was the Calibration within acceptance criteria?	x				
<b>Calibration Verification</b>					
Was a second source ICV analyzed after calibration with recoveries within acceptance criteria?	x				
Were CCVs analyzed at the required frequency with recoveries within acceptance criteria? For ICP, CCVs and low level CCVs (CCVL) as applicable.	x				
Are the ICV and CCV/CCVL Summary forms present?	x				
Was the ICP CRQL Check Standard analyzed with recoveries within acceptance criteria?	x				
<b>Method Blank and ICB/CCBs</b>					
Has at least one method blank been prepared For each batch of up to 20 samples?	x				
Is the method blank the same matrix as the samples in the reporting batch?	x				

<b>Metals by ICPMS (SW6020A) Mercury by CVAA (SW7470A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Were target analytes detected in the method blank above the MDL?	x			U	Al, Pb, Li, Na, Cu were detected in the method blank. Cu was detected above the RL and was re-prepped with sample YMTFA93 9404-8L with Cu detect in the blank result < RL. Li in sample YMTFA81 9404L, Al in sample YMTFA93 9404 8L, and Pb and Na in YMTFA 9404 EB were qualified U at the RL or at the level of detection. Cu detected in sample YMTFA81 9404L was greater than 10x the level in the blank and no qualification was required. Cu in YMTFA93 9404 8L was qualified U at the level of detection.
Were the ICB and CCBs analyzed at the required frequency with results within acceptance criteria?		x		U	Cu, Pb, or B were detected in CCBs. B in sample YMTFA81 9404L was qualified U at the RL.
Are the Method Blank and ICB/CCB Summary forms present?	x				
Was field blank or equipment blank collected and analyzed?	x				
Were target analytes detected in the field or equipment blank above the MDL					Ba, Ca, and Zn were detected in the equipment blank. Zn was qualified (U) in sample YMTFA81 9404 L.
<b>ICP Interference Check Samples</b>					
Were the ICP ICSA/ICSAB interference check standards analyzed as required with results within acceptance criteria?	x				

<b>Metals by ICPMS (SW6020A) Mercury by CVAA (SW7470A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>LCS/LCSD</b>					
Has at least one LCS been prepared for each preparation batch containing up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?	x				
Is the LCS spiked with all target analytes listed in the SAP?	x				
Are the LCS %RECs within the applicable QC criteria?	x				
Are the LCS/LCSD RPDs within the applicable QC criteria?			x		No LCSD
<b>Matrix Spike/Matrix Spike Duplicate</b>					
Has at least one MS/MSD pair been prepared for a batch containing up to 20 samples?	x				MS/MSD performed on sample YMTFA93 9404-8L (RE) for Cu only. The MS in the original prep batch was performed on sample not in this SDG.
Are the MS/MSD spiked with all target analytes listed in the SAP?	x				
Are MS and MSD %RECs within the applicable QC limits?	x				
Are MS/MSD RPDs within the applicable QC limits?	x				
<b>Duplicates</b>					
Has a laboratory duplicate been prepared for a batch containing up to 20 samples? (If an MS/MSD pair has been prepared, the laboratory duplicate is not required.)		x			
If a laboratory duplicate was analyzed, were the RPDs within acceptance criteria?			x		
Was a field duplicate analyzed?		x			
If a field duplicate was analyzed, were the RPDs within the 50% acceptance criteria?			x		
<b>Serial Dilution</b>					
Was the Serial Dilution within acceptance limits?	x				
<b>Sample Quantitation and Documentation</b>					
Are reported sample concentrations within the instrument linear range?			x		
Have sample reporting limits and reported concentrations been adjusted for analytical dilutions?			x		

<b>Metals by ICPMS (SW6020A)</b> <b>Mercury by CVAA (SW7470A)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Are instrument runlogs present and account for all reported sample results?	x		x		
Have all Laboratory Case Narrative comments and findings been addressed in the data validation process?	x				

<b>General Minerals/Wet Chemistry analyses:</b> Anions (EPA300.0) Cyanide(SW9012) Total Suspended Solids (EPA160.2) Acidity (SM2310B) HEM/SGT-HEM(EPA1664A) Total phenols (EPA420.1) TOC(SW9060)	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples properly preserved?	x				
Are sample preparation sheets present and account for all extractions and digestions for reported samples?	x				
Have the samples been prepared and analyzed within holding times?		x			Nitrite was re-analyzed outside the holding times for sample YMTFA 9404 EB. It was qualified as estimated (J).
<b>Detection Limits and Target Analytes</b>					
Do all samples show RLs <= the SAP Recommended Reporting Limits?	x				
Are all the SAP target analytes reported?	x				
<b>Initial Calibration</b>					
Was the Calibration within acceptance criteria?	x				
<b>Calibration Verification</b>					
Was a second source ICV analyzed after calibration with recoveries within acceptance criteria?	x				
Were CCVs analyzed at the required frequency with recoveries within acceptance criteria?	x				
Are the ICV and CCV Summary forms present?	x				
<b>Method Blank and ICB/CCBs</b>					
Has at least one method blank been prepared For each batch of up to 20 samples?	x				
Is the method blank the same matrix as the samples in the reporting batch?	x				
Were target analytes detected in the method blank above the MDL?	x				
Were the ICB and CCBs analyzed at the required frequency with results within acceptance criteria?	x				
Are the Method Blank and ICB/CCB Summary forms present?	x				
<b>LCS/LCSD</b>					
Has at least one LCS been prepared for each preparation batch containing up to 20 samples?					

<b>General Minerals/Wet Chemistry analyses:</b> <b>Anions (EPA300.0)</b> <b>Cyanide(SW9012)</b> <b>Total Suspended Solids (EPA160.2)</b> <b>Acidity (SM2310B)</b> <b>HEM/SGT-HEM(EPA1664A)</b> <b>Total phenols (EPA420.1)</b> <b>TOC(SW9060)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Is the LCS the same matrix as the samples in the reporting batch?	x				
Is the LCS spiked with all target analytes listed in the SAP?	x				
Are the LCS %RECs within the applicable QC criteria?	x				
Are the LCS/LCSD RPDs within the applicable QC criteria?	x				LCSD prepared for HEM/SGT analysis only.
<b>Matrix Spike</b>					
Has at least one MS been prepared for a batch containing up to 20 samples?		x			MS/MSD for Anions and MS for TOC were performed. MS and/or MSD performed for CN and Phenols were performed on a sample not in this SDG. MS/MSD not performed for HEM.
Are the MS/MSD spiked with all target analytes listed in the SAP?	x				
Are MS and MSD %RECs within the applicable QC limits?	x				
Are MS/MSD RPDs within the applicable QC limits?	x				
<b>Duplicates</b>					
Has a laboratory duplicate been prepared for a batch containing up to 20 samples? (If an MS/MSD pair has been prepared, the laboratory duplicate is not required.)	x				Duplicate performed for TOC. Duplicate for TSS, CN, and acidity analyses were done on a sample not in this SDG. No duplicate performed for HEM.
If a laboratory duplicate was analyzed, were the RPDs within acceptance criteria?	x				
Was a field duplicate analyzed?		x			

<b>General Minerals/Wet Chemistry analyses:</b> <b>Anions (EPA300.0)</b> <b>Cyanide(SW9012)</b> <b>Total Suspended Solids (EPA160.2)</b> <b>Acidity (SM2310B)</b> <b>HEM/SGT-HEM(EPA1664A)</b> <b>Total phenols (EPA420.1)</b> <b>TOC(SW9060)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
If a field duplicate was analyzed, were the RPDs within the 50% acceptance criteria?			x		
<b>Sample Quantitation and Documentation</b>					
Are reported sample concentrations within the instrument linear range?	x				
Have sample reporting limits and reported concentrations been adjusted for analytical dilutions?	x				
Are instrument runlogs present and account for all reported sample results?	x				
Have all Laboratory Case Narrative comments and findings been addressed in the data validation process?	x				

<b>Radiological Analyses:</b> <b>Gross Alpha and Beta (EPA 900.0)</b> <b>Alpha Spectrometry (DOE A-01-R)</b> <b>Gas Flow Proportional Counting (EPA 905)</b> <b>Liquid Scintillation Counting (DOE TC-02-RC)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
<b>Preservation and Holding Times</b>					
Were samples preserved correctly?	x				
Were samples analyzed within holding times?	x				
<b>Standard Traceability</b>					
Were all certificates included for the LCS and MS samples?	x				
Were all standards and reference materials traceable to reliable source material?	x				
<b>Calibration Verification</b>					
Are efficiencies within tolerance limits?	x				
Are energies within tolerance limits?	x				
Are background performance check count rates within tolerance limits?			x		
Are appropriate peak resolution within appropriate control criteria?	x				
<b>LCS</b>					
Has at least one LCS been prepared for up to 20 samples?	x				
Is the LCS the same matrix as the samples in the reporting batch?	x				
Are LCS %D (or %R) within QC acceptance limit?	x				
<b>Laboratory Duplicate</b>					
Has at least one laboratory duplicate been prepared for up to 20 samples?		x			Duplicate performed for Technetium-99 (LSC) only. Due to insufficient sample volume, LCSD was performed instead of lab duplicates.
Are RPD and DER within QC acceptance limit?	x				
<b>Matrix Spike</b>					
Has at least one MS been prepared for up to 20 samples?		x			No MS performed due to insufficient sample volume.
Is MS %D (or %R) within QC acceptance limit?			x		
<b>Method Blank</b>					
Has at least one method blank been prepared for up to 20 samples?	x				

<b>Radiological Analyses:</b> <b>Gross Alpha and Beta (EPA 900.0)</b> <b>Alpha Spectrometry (DOE A-01-R)</b> <b>Gas Flow Proportional Counting (EPA 905)</b> <b>Liquid Scintillation Counting (DOE TC-02-RC)</b>	Y	N	N/A	Qualifier	Comment or Reason Code
Is the method blank the same matrix as the samples in the reporting batch?	x				
Are the results less than 1.65 * CSU or within control limits?		x			Th-230 and U-233/234 detected in the method blank above the MDC. Th-230 in samples YMTFA93 9404-8L and YMTFA 9404 EB were qualified U at RL. U-233/234 detections in the samples were high enough level and no qualifications were required.
<b>Chemical Yield - Tracers and Carriers</b>					
Is yield reported for all samples and QC samples in the reporting batch?	x				
Are percent recovery criteria satisfied for all yield results?	x				

## Analytical Data Review Verification Checklist

Laboratory:	TestAmerica	SOW or Contract No.:	Outfall 200
Verifier Name:	JD Milloway	Date Verified:	10/19/16
SDG No(s).	18640-1		

Item No.	Criteria	Acceptable?				Comments
		Yes	No	NA	NR	
1.	Case Narrative Present	X				
2.	Lab Qualifiers Present	X				
3.	Methods Specified in SAP or Equivalent Methods were Used	X				
4.	Data is Complete for All Requested Analytes with All Samples	X				
5.	Units are as Specified in SOW/Contract or Otherwise are Appropriate	X				
6.	Detection Limits Meet Contract Required Detection Limits or Other Project Defined Limits (e.g., regulatory limits)	X				
7.	Samples IDs and Analytes Agree with those on COCs	X				COC was incomplete. The trip blank ID YMTFA 9404 TB was changed to YMTFA 9404 TB-1
8.	Samples IDs Agree Throughout Report	X				
9.	Raw Data Results Agree with Data Reports and Electronic Data	X				
10.	COCs – Samples Traceable	X				
11.	All Samples Preserved Correctly	X				
12.	Samples Arrived Intact	X				
13.	Custody Seals on Samples			X		COC seals on coolers only
14.	Holding Times Met	X				
	-Metals other than Mercury ≤ 180 days	X				
	-Mercury ≤28 days	X				
	-TCLP Metals other than Mercury to TCLP Extraction ≤180 days			X		
	-TCLP Metals other than Mercury TCLP Extraction to Analysis ≤180 days			X		
	-TCLP Mercury to TCLP Extraction ≤28 days			X		
	-TCLP Mercury TCLP Extraction to Analysis ≤28 days			X		
	-VOAs to Extraction/Analysis ≤14 days	X				

## Analytical Data Review Verification Checklist

Laboratory:	TestAmerica	SOW or Contract No.:	Outfall 200
Verifier Name:	JD Milloway	Date Verified:	10/19/16
SDG No(s).	18640-1		

Item No.	Criteria	Acceptable?				Comments
		Yes	No	NA	NR	
	-SVOAs to Extraction ≤7 days (liquids), ≤14 days (solids)	X				
	-SVOAs Extraction to Analysis ≤40 days	X				
	-Pesticides to Extraction ≤7 days (liquids), ≤14 days (solids)	X				
	-Pesticides Extraction to Analysis ≤40 days	X				
	-Herbicides to Extraction ≤7 days (liquids), ≤14 days (solids)			X		
	-Herbicides Extraction to Analysis ≤40 days			X		
	PCBs - none	X				
	-TCLP VOAs to TCLP Extraction ≤14 days			X		
	-TCLP VOAs TCLP Extraction to Analysis ≤14 days			X		
	-TCLP SVOAs to TCLP Extraction ≤14 days			X		
	-TCLP SVOAs TCLP Extraction to Prep Extraction ≤7 days			X		
	-TCLP SVOAs Prep Extraction to Analysis ≤40 days			X		
	-TCLP Pesticides to TCLP Extraction ≤14 days			X		
	-TCLP Pesticides TCLP Extraction to Prep Extraction ≤7 days			X		
	-TCLP Pesticides Prep Extraction to Analysis ≤40 days			X		
	-TCLP Herbicides to TCLP Extraction ≤14 days			X		
	-TCLP Herbicides TCLP Extraction to Prep Extraction ≤7 days			X		
	-TCLP Herbicides Prep Extraction to Analysis ≤40 days			X		
	TOC ≤28 days	X				

## Analytical Data Review Verification Checklist

Laboratory:	TestAmerica	SOW or Contract No.:	Outfall 200
Verifier Name:	JD Milloway	Date Verified:	10/19/16
SDG No(s).	18640-1		

Item No.	Criteria	Acceptable?				Comments
		Yes	No	NA	NR	
	-Hexane Extractable Material, Oil and Grease ≤28 days	X				
	-Chloride, Fluoride, Nitrate, Sulfate ≤28 days	X				
	-Cyanide ≤14 days	X				
	-Sulfide ≤7 days			X		
	-pH – immediately		X			Needs to be done in the field
	-Specific Conductance - immediately			X		
	-Radionuclides 180 days (best practice)	X				