DATA VALIDATION REPORT

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam
CV 23F0104

SDG: 580-127600-1
Eurofins Savannah

Prepared by

ENVIRONMENTAL DATA SERVICES, LTD.

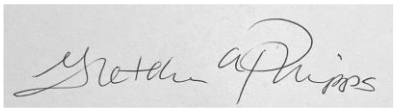
Prepared for

AECOM Environmental

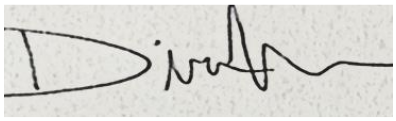
Released: 06/14/23

Data Validators and Peer Reviewers:

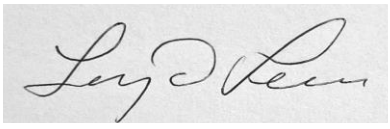
Diane Waldschmidt



Gretchen Phipps



Dina Manov



Larry Lewis

Paloma Hoelzle

5 Brilliant Avenue, Pittsburgh, PA 15215
412.408.3288 I www.eds-pa.com

ENVIRONMENTAL DATA SERVICES, LTD.

EXECUTIVE NARRATIVE

Sample Delivery Groups: 580-127600-1
Laboratory: Eurofins, Savannah
Site: Red Hill Bulk Storage Facility, CV 23F0104
Sampling dates: 05/18/2023 and 05/19/2023
Number of Samples: 7
Test Method: SW-846 8015C
Analysis: 2-(2-Butoxyethoxy)ethanol

Quality Assurance Project Plan: Sampling and Analysis Plan, Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, O'ahu, Hawai'i (Revision 01, April 2017); PFAS-Specific Sampling and Analysis plan, Red Hill Bulk Fuel Storage Facility, Adit 6, Joint Base Pearl Harbor-Hickam, O'Ahu, Hawai'i (November 30, 2022) (SAP).

Validation Guidelines: United States Department of Defense Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC, Environmental Data Quality Workgroup, March 9, 2021; United States Department of Defense (DOD) General Data Validation Guidelines Environmental Data Quality Workgroup (EDQW), November 2019. United States Department of Defense Data Validation Guidelines Modules 1, 2, 3, and 4 Revised Table for Sample Qualification in the Presence of Blank Contamination, February 09, 2022.

Client Sample Identification	Laboratory Sample Identification	Matrix	Validation Stage
AF-RHMW02-WGN01LF-2305W3	580-127600-1	water	S2BVEM
AF-RHMW03-WGN01LF-2305W3	580-127600-2	water	S2BVEM
AF-RHMW17-WGN01LF-2305W3	580-127600-3	water	S2BVEM
AF-RHMW17S-WGN01LF-2305W3	580-127600-4	water	S2BVEM
AF-RHMW17S-WQEB01-2305W3	580-127600-5	equipment blank	S2BVEM
AF-RHMW17D-WGN01LF-2305W3	580-127600-6	water	S2BVEM
af-RHMW17D-WQFB01-2305W3	580-127600-7	field blank	S2BVEM

Table 1 provides a summary of the major and minor data quality issues identified in this data set. All data are acceptable except those results which have been qualified with "X", rejected. Data validation qualifiers along with associated descriptions are provided in Table 2. All data qualification related to this group of samples is detailed on the attached sheets.

All data users should note two facts. First, an "X" flag means that the associated value is unusable due to significant quality control (QC) problems, the data is invalid and provides no information as to whether the compound is present or not. "X" values should not appear on any data tables even as a last resort. Second, no analyte concentration, even if it passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

DATA ASSESSMENT

1. NARRATIVE AND COMPLETENESS REVIEW

The case narrative was reviewed, and the data package was checked for completeness. No discrepancies were noted.

2. SAMPLE DELIVERY AND CONDITION

The samples arrived at the laboratory in acceptable condition. Proper custody was documented.

3. HOLDING TIME

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detect results will be flagged as not detected at an estimated quantitation limit, "UJ", unless the holding time is grossly exceeded (by more than two times the holding time specified), in which case non-detect results are flagged "X", rejected. Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

4. CALIBRATION

Satisfactory instrument calibration is established to ensure that the instrument can produce acceptable quantitative data. An initial calibration demonstrates that the instrument can give acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

Percent Relative Standard Deviation and Percent Difference

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent difference is a measure of the instrument's daily performance. If the %D exceeds 20% for any analyte, qualify all associated positive results "J" and non-detects "UJ". If %RSD and %D grossly exceed QC criteria, non-detect data may be qualified "X".

A multi-point initial calibration curve was used for the target analyte. The initial calibration demonstrated instrumental linearity. The %RSD was within validation guidelines.

Continuing calibrations were analyzed at the proper frequencies and the observed %D values met quality control criteria.

5. BLANK CONTAMINATION

Quality assurance (QA) blanks, i.e., method, trip, field, or rinse blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Field, equipment and rinse blanks measure cross-contamination of samples during field operations.

A) Method blank contamination

No problems were found for this criterion.

B) Field/Equipment blank contamination

Sample AF-RHMW17D-WQFB01-2305W3 was submitted as a field blank in association with the samples in this sample delivery group (SDG). No problems were found for this criterion.

Sample AF-RHMW17S-WQEB01-2305W3 was submitted as an equipment blank in association with the samples in this sample delivery group (SDG). No problems were found for this criterion.

6. SURROGATES / SYSTEM MONITORING COMPOUNDS

All samples are spiked with surrogate/system monitoring compounds (SMC) prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate/SMC concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

No surrogates were used for this analysis.

7. COMPOUND IDENTIFICATION

The retention times (RTs) of reported compounds must fall within the calculated retention time windows for chromatographic column.

Retention Time

Target compound identifications were reviewed at the Stage 4 level. No anomalies were detected.

Relative Percent Difference (RPD)

Positive results were reported for samples in this SDG. Results were reported from a single column, therefore, RPD evaluation was not applicable.

8. COMPOUND QUANTIFICATION

Analyte quantitation was reviewed at the Stage 4 level. No anomalies were detected.

Manual integrations were reviewed at the Stage 4 level. No anomalies were detected.

9. MATRIX SPIKE / MATRIX SPIKE RECOVERY

Matrix spike / matrix spike duplicate (MS/MSD) data is generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD data may be used in conjunction with other quality control criteria for additional qualification of data.

Sample AF-RHMW17D-WGN01LF-2305W3 was submitted for MS/MSD pair evaluation in association with this SDG. Upon evaluation all precision and accuracy indicators were favorable.

10. LABORATORY CONTROL SAMPLES

The Laboratory Control Sample (LCS) serves as a monitor of the overall performance of each step during the analysis, including the sample preparation. Aqueous/water, soil/sediment, wipe, and filter LCSs shall be analyzed for each analyte utilizing the same sample preparations, analytical methods, and quality assurance/quality control (QA/QC) procedures as employed for the samples. All LCS percent recoveries must fall within the control limits. Qualifications were applied to the samples and analytes as shown below.

Upon evaluation all precision and accuracy indicators were favorable with the following exception. The observed precision for 2-(2-Butoxyethoxy)ethanol was outside the acceptance limit. Positive results for 2-(2-Butoxyethoxy)ethanol have been qualified "J" on this basis.

11. INTERNAL STANDARDS PERFORMANCE:

Internal standard performance criteria are meant to ensure that the gas chromatograph (GC) sensitivity and response are stable during every experimental run.

The internal standard area count must not vary by more than a factor of two from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ±10 seconds from the associated continuing calibration standard. The area count must be within a (50-200%) range of the associated standard. If the area count is greater than 200%, non-detected results are not qualified and positive results are flagged as estimated with potential negative bias, "J-". If the area count is less than 50%, positive results are flagged as estimated with potential positive bias, "J+", and non-detected results are flagged "UJ". If the area count is less than 20%, positive results and non-detected results will be classified as unusable "X". Qualifications were applied to the samples and analytes as shown below.

No problems were found for this criterion.

12. FIELD DUPLICATE

Field duplicates may be taken and analyzed as an indication of overall precision. These analyses measure both field and laboratory precision. A control limit of 30% for the Relative Percent Difference (RPD) shall be used for original and duplicate sample values greater than the LOQ. A control limit of a difference between results no more than the LOQ shall be used if either the sample or duplicate value is less than the LOQ. For field duplicate analyses that do not meet the technical criteria, the action was applied to only the parent sample and its duplicate.

No samples submitted as a field duplicate pair in association with this SDG.

13. DILUTIONS, RE-EXTRACTIONS & REANALYSIS

Samples may be re-analyzed for dilution, re-extraction and for other QC reasons. In such cases, the best result values are used.

No dilutions, re-extractions, or other re-analyses were performed. The level of quantitation (LOQ) specified in the SAP for the analytes reported has been achieved.

14. OTHER PROBLEMS

None.

Table 1 Major and Minor Findings

	Were acceptance criteria met?		
	Yes	No	
2-(2-Butoxyethoxy)ethanol		Major	Minor
Holding Time	x		
Calibration	x		
Method Blank	x		
Field/Equipment Blank	x		
Surrogates/System Monitoring Compounds	NA		
Compound Identification	x		
Compound Quantitation	x		
Matrix Spike/Matrix Spike Duplicate	x		
Internal Standards	x		
Field Duplicate	NA		
Laboratory Control Samples			x
Other Quality Control Data out of Specification	x		

Major = Major data quality issue identified resulting in rejection of data.
Minor = Minor data quality issue identified resulting in the qualification of data. Data qualification should be used to inform the data users of data limitations.
NA = Not applicable

Table 2 Data Validation Qualifiers

Data Qualifier	Definition
U	The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
X	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analyte was tentatively identified, and the associated numerical value represents its approximate concentration.

Data Qualification Reason Codes	
Reason Code	**Reason Code Description**
A	**Serial dilution**
A1	**Ambient Blank**
B	**The analyte was found in an associated blank as well as in the sample.**
B2	**CCB**
B3	**CCB - Neg**
B4	**Grinding Blank**
C	**LCS Recovery**
C1	**Reference Recovery**
C2	**Reference Recovery RPD**
D	**MS RPD**
D1	**Lab Replicate RPD**
D2	**No precision available**
D3	**Field Duplicate RPD**
D4	**Field Triplicate RSD**
D5	**Laboratory Triplicate RSD**
F	**Field Blank**
F1	**Hydrocarbon pattern does not match standard**
G1	**Initial Calibration RRF**
G2	**Initial Calibration RSD/r^2/r**
G3	**ICV RRF**
H1	**Test Hold Time**
H2	**Prep Hold Time**
I	**Surrogate recovery outside project limits.**
J	**CRA/CRI Recovery**
K	**An analyte (non-common laboratory artifact) was detected in the sample at a concentration less than 5X the concentration detected in the associated method blank.**
L	**Lab Blank**
L1	**Lab Blank - Neg**
M	**MS Recovery**
M2	**Post Spike**
N	**Blank - No Action**
O	**ICS**
P	**Sample preservation/collection requirement not met.**
P1	**Column RPD**
P2	**Improper preparation/extraction**
Q	**Encore sample holding time exceeded by more than 2X.**
Q1	**Material Blank**

Q2	**Encore sample holding time exceeded by less than 2X.**
R	**Exceeds LinearCalibration Range**
S	**Internal standard**
T	**Trip Blank**
TI	**Tentatively Identified Compound**
TR	**Trace Level Detect**
U	**Receipt Temperature**
V	**Equipment Blank**
V1	**ICV**
V2	**CCV**
V3	**CCV RRF**
V4	**Sample Receipt Condition**
V5	**Ending Continuing Calibration Verification**
V6	**Low Level Calibration Verification**
V7	**Interference Check Sample A**
V8	**Interference Check Sample AB**
V9	**Interference Check Sample A - Negative**
W	**Column breakdown (pesticides/8270)**
X	**Raised reporting limit**
Y	**Cooler temperature greater than 10 degreec C.**
Y1	**False Positive**
Y2	**Data rejected due to radiological anomolies**
Y3	**Non-accredited analyte/compound. Accreditation not offered at time of analyses for the analyte/compound by the stated method and matrix.**
Y4	**Performance Check - Degradation of DDT**
Y5	**Extracted Internal Standard**
Y6	**Analyte not confirmed on second column.**
Y7	**Signal to Noise Ratio not met**
Z	**LCS RPD**
Z1	**Non-accredited analyte/compound**
Z1	**Data rejected, more valid data available.**
Z2	**Detection Level not met uncertainty greater than DL**
Z4	**MDA Greater than RDL.**
Z5	**Ion Ratio**
Z6	**Samples were analyzed past the 12 hour time period from the Tune or opening CCV.**

Calculation Documentation

Internal Standard Initial Calibration and Calculation Worksheet

Lab: Eurofins Savannah
Method: 8015 DAI
Instrument: CVGG2
Curve Date: 5/25/2023
Compound: 2-(2-Butoxyethoxy)ethanol
Internal Standard: n-Heptyl Alcohol

Initial Calibration Model Worksheet

Compound Area Ax	ISTD Area Ais	Compound Conc Cx	ISTD Conc Cis	Y-Values Ax/Ais	X-Values Cx/Cis	X^2 $(Cx/Cis)^2$	RF (Ax*Cis)/(Ais*Cx)
69395	5921007	2	50	0.011720135	0.04	0.0016	0.2930034
299944	5819670	5	50	0.051539692	0.1	0.01	0.5153969
605325	5430611	10	50	0.111465358	0.2	0.04	0.5573268
1134437	5271112	20	50	0.215217776	0.4	0.16	0.5380444
2565864	5246894	50	50	0.489025317	1	1	0.4890253
4347182	4932229	80	50	0.881382839	1.6	2.56	0.5508643
4802118	5157056	100	50	0.931174298	2	4	0.4655871
SUM OF EACH COLUMN :				2.6915	5.34	7.7716	3.4092

CALIBRATION MODELS:

Average Response Factor:
Cx = Ax*Cis/Ais/RF

Average RF	0.4870	AVERAGE(RF)
RSD	18.8432%	STDEV(RF)/(AveRF)

Linear Regression:

y = mx + b
Cx = (((Ax/Ais)-b)/m)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
Slope (m)	0.49280	0.50843	0.54167	SLOPE(RatioY,RatioX)
Intercept (b)	0.00857	-0.00336	-0.008570	INTERCEPT(RatioY,RatioX)
CC (R)	0.99357	0.99587	0.99391	CORREL(RatioY,RatioX)
COD (R^2)	0.98719	0.99176	0.98786	POWER(R,2)

Quadratic Regression:

$y = ax^2 + bx + c$
Cx=(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis

Weighting	Equal	1/X	$1/X^2$	Equation
x^2 Coefficient (a)	-0.06030	0.01766	0.07676	LINEST(RatioY,RatioX:RatioX^2,1,1)
x Coefficient (b)	0.61086	0.45823	0.38296	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,2)
Intercept (c)	-0.01455	0.01534	0.00714	INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),1,3)
COD (R^2)	0.99029			INDEX(LINEST(RatioY,RatioX:RatioX^2,1,1),3,1)

Sample Concentration Calculations

Sample ID	File ID	Compound Response Ax	ISTD Response Ais	ISTD Conc Cis	Ave RF On-column Conc	Linear Cal On-column Conc Equal Weighting	Linear Cal On-column Conc 1/X Weighting	Linear Cal On-column Conc $1/X^2$ Weighting	Quadratic Cal On-column Conc Equal Weighting	Quadratic Cal On-column Conc 1/X Weighting	Quadratic Cal On-column Conc $1/X^2$ Weighting	
Equations:					Ax*Cis/Ais/RF	((Ax/Ais-b)/m)*Cis			(SQRT(b^2-(4*a*(c-(Ax/Ais))))-b)/(2*a)*Cis			reported on column
ICV		1155733	5703498	50	20.803	19.690	20.258	19.496	18.449	20.125	23.340	18.4
CCV		1214743	5299124	50	23.534	22.389	22.873	21.951	20.809	22.934	26.237	20.8
MB		0	6018705	50	0.000	-0.869	0.330	0.791	1.194	-1.676	-0.936	ND
LCS		2252266	5296729	50	43.654	42.274	42.147	40.042	38.999	43.281	46.075	39.0
LCSD		1290217	5694658	50	23.260	22.118	22.611	21.705	20.571	22.653	25.949	20.6
580-127600-1		7764	5564252	50	0.143	-0.728	0.467	0.920	1.309	-1.523	-0.752	1.31

Final Sample Result Calculation
Red Hill
PFAS
method 8015 DAI
Eurofins Savannah

on column result (ug/ml) x (final volume(ml)/initial sample amount (mL)) x dilution factor = calculated result

Sample	Analyte	On column results (ug/ml)	Final Prep Volume (ml)	Initial Sample amount (mL)	Dilution Factor	Calculate result (mg/L)	Reported Result (mg/L)
580-127600-1	2-(2-Butoxyethoxy)ethanol	1.31	1	1	1	1.31	1.3J
580-127600-2	2-(2-Butoxyethoxy)ethanol	1.32	1	1	1	1.32	1.3J
580-127600-3	2-(2-Butoxyethoxy)ethanol	0	1	1	1	0	3.0U
580-127600-4	2-(2-Butoxyethoxy)ethanol	0	1	1	1	0	3.0U
580-127600-5	2-(2-Butoxyethoxy)ethanol	0	1	1	1	0	3.0U
580-127600-6	2-(2-Butoxyethoxy)ethanol	0	1	1	1	0	3.0U
580-127600-7	2-(2-Butoxyethoxy)ethanol	0	1	1	1	0	3.0U
LCS	2-(2-Butoxyethoxy)ethanol	39	1	1	1	39	39

Low standard Calculation		
Sample calculation for results in Column G		
Sample ID	AF-RHMW17-WGN01LF-2305W3	
Compound	2-(2-Butoxyethoxy)ethanol	
Low standard conc. (ng/ml)	5	
Sample amount (mL)	1	
Extraction Volume (ml)	1	
Dilution	1	
AECOM calculated conc. (mg/L)	5.000	%D=
Lab reported conc. (mg/L)	5	0.0

AF-RHMW17-WGN01LF-2305W3			
COMPOUND	CONC. of Low Cal Std and ISC Std (ug/ml)	LOQ (mg/L)	Calculated LOQ (mg/L)
2-(2-Butoxyethoxy)ethanol	5.00	5.0	5.000

Data Validation Worksheet

DATA VALIDATION GC (8015C)

DOD

Validator: KB

Date Validated: 06/06/2023

Reviewer: LL

Date Reviewed: 6/14/23

Project: Red Hill Bulk Storage Facility, CV 23F0104

SDG: 580-127600-1

LAB: Eurofins, Savannah

Samples Collected: 5/18-19/2023

Sample Receipt and Case Narrative Review

- ✓ Traffic reports, chain-of-custody forms or SDG narrative do not indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data.

  No problems found

Holding Times

- ✓ Aqueous samples extracted within 7 days of collection and analyzed within 40 days of extraction
- ✓ Solid samples extracted within 14 days of collection and analyzed within 40 days of extraction
- ✓ There is no specific holding time for PCB samples
- ✓ If temp of receipt is >6◦ but ≤15% qualify J-/UJ
- ✓ If temp >15◦C qualify X
- ✓ If holding time is exceeded qualify J-/UJ
- ✓ If holding time is grossly exceeded (>2X) qualify J-/X

  14-day holding time used for 8015C DAI

  Samples collected on 5/18-19/23
  Samples analyzed on 5/26/23 all ok

ICAL (Form VI)

- ✓ %RSD ≤ 20% or r >0.995 or R2>0.990
- ✓ minimum 5 standards for linear; minimum 6 standards for quadratic
- ✓ 5-pt calibration for multicomponent analytes
- ✓ If %RSD >20% or r<0.995 or r2<0.990 qualify J/UJ
- ✓ If %RSD >40% or r<0.95 or r2<0.90 qualify X

Inst: CVGG2
IC 680-780505/4 05/25/2023 19:53 1 GE25010.D

All ok

ICV/CCV (from VII/Analysis Run Log)

- ✓ ICV after ICAL; all %Ds within ± 20%
- ✓ CCVs before sample, every 10 samples
- ✓ all ICV/CCV %D ± 20%
- ✓ RTs within established window
- ✓ if %D is high then qualify J+
- ✓ if %D is low then qualify J-/UJ
- ✓ if %D is >50% then qualify X

Inst: CVGG2

ICV 680-780505/11 CCV05/25/2023 23:20
CCV 680-780505/32 05/26/2023 07:28
CCV 680-780505/50 05/26/2023 15:59 1 GE25058.D
All OK

Surrogate (Form II)

- ✓ if acceptance criteria is not defined by project, use limits in Table C below
- ✓ RTs within range of 5 pt
- ✓ do not evaluate for if diluted out
- ✓ if surrogate recovery <10% then qualify J-/X
- ✓ if surrogate recovery is low but >10% then qualify J-/UJ
- ✓ if surrogate recovery is high then qualify J+

No surrogate used

LCS (Form III)

- ✓ one per prep batch
- ✓ used QAPP 50-150, RPD 50
- ✓ if recovery low then qualify J-/X
- ✓ if recovery is high then qualify J+
- ✓ if LCS/LCSD RPD is out then qualify detects J, do not qualify NDs

LCS 680-780505/12 **LCSD 680-780505/13**

	LCS	LCSD	RPD	
2-(2-Butoxyethoxy)ethanol	ok	ok	OUT	Q J (Z) sample 1 & 2 all others ND no Q;

results agree with EDD

MS/MSD (Form III)

- ✓ one per prep batch
- ✓ used QAPP 50-150, RPD 50
- ✓ MS/MSD RPD ≤ 30%
- ✓ if MS recovery <10% then qualify J-/X
- ✓ if MS recovery is low but >10% then qualify J-/UJ
- ✓ if MS recovery is high then qualify J+
- ✓ if MS/MSD RPD is out then qualify detects J, do not qualify NDs

AF-RHMW17D-WGN01LF-2305W3

	MS	MSD	RPD
2-(2-Butoxyethoxy)ethanol	ok	ok	OK

Blanks (Form IV/Form1)

- ✓ method blank – analyzed one per prep batch

Method Blank

MB 680-780505/16 ND

Field/Equipment Blank

AF-RHMW17D-WQFB01-2305W3 ND
AF-RHMW17S-WQEB01-2305W3 ND

Internal Standard Areas and RTs (Form VIII)

- ✓ areas within -50% to +100% of ICAL midpoint standard
- ✓ RTs within 30 seconds of midpoint standard
- ✓ if IS recovery is >200% then detects qualify J (do not qualify NDs)
- ✓ if IS recovery is <50% but >20% then qualify J/UJ
- ✓ if IS recovery is <20% or RT out then qualify X

Internal standard used – n-Heptyl Alcohol all ok

Identification Summary / Second Column Confirmation (Form X)

- ✓ present for all positive results
- ✓ RTs within range for both columns (not applicable for single column 8015C)
- ✓ RPD ≤ 40% Single col analyses NA
- ✓ if RPD >40% then qualify J Single col analyses NA

All ok

Sample Data (Form I)

- ✓ Chromatogram acceptable
- ✓ manual integrations acceptable

All ok

Field Duplicates

- ✓ no criteria per QSM; use project specific criteria when available in QAPP
- ✓ per Module 4: if RPD > QAPP limit qualify J, no Q for non-detects
- ✓ See field duplicate worksheet

use 30% for aqueous and solids

None

Data Validation Report for 5801276001

Facility:	RH Fire Suppression System
Event:	AFFF Assessment Sampling GW 2023 May
SDG:	5801276001
Guidance Document:	RHS PFAS UFP-QAPP
Prime Contractor:	AECOM, Honolulu, HI
Project Manager:	
Contract Laboratory(ies):	Eurofins Environment Testing TestAmerica, Savannah, GA
Data Review Contractor:	
Data Review Level:	
Primary Data Reviewer:	,
Date Submitted:	

Field Sample ID	Lab Sample ID	Matrix	Type/Type Code	SW8015C
AF-RHMW02-WGN01LF-2305W3	580-127600-1	Water	Field Sample/N	X
AF-RHMW03-WGN01LF-2305W3	580-127600-2	Water	Field Sample/N	X
AF-RHMW17D-WGN01LF-2305W3	580-127600-6	Water	Field Sample/N	X
AF-RHMW17D-WQFB01-2305W3	580-127600-7	Water	Ambient Blank/AB	X
AF-RHMW17S-WGN01LF-2305W3	580-127600-4	Water	Field Sample/N	X
AF-RHMW17S-WQEB01-2305W3	580-127600-5	Water	Equipment Blank/EB	X
AF-RHMW17-WGN01LF-2305W3	580-127600-3	Water	Field Sample/N	X

This report assesses the analytical data quality associated with the analyses listed on the preceding cover page at data validation level. This assessment has been made through a combination of automated data review (ADR) and supplemental manual review, the details of which are described below. The approach taken in the review of this data set is consistent with the requirements contained in the RHS PFAS UFP-QAPP and the additional guidance documents incorporated by reference to the extent possible. Where definitive guidance is not provided, results have been evaluated in a conservative manner using professional judgment.

Sample collection was managed and directed by AECOM, Honolulu, HI; analyses were performed by Eurofins Environment Testing TestAmerica, Savannah, GA and were reported under sample delivery group (SDG) 5801276001. Data have been evaluated electronically based on electronic data deliverables (EDDs) provided by the laboratory, and hard copy data summary forms have also been reviewed during this effort and compared to the automated review output by the reviewers whose signatures appear on the following page. Findings based on the automated data submission and manual data verification processes are detailed in the ADR narrative and throughout this report.

All quality control (QC) elements associated with this SDG have been reviewed by a project chemist in accordance with the requirements defined for the project. This review is documented in the attached Data Review Checklists. The QC elements listed below were supported by the electronic deliverable and were evaluated using ADR processes.

- Ambient Blank
- Continuing Calibration Verification
- Equipment Blank
- Lab Blank
- LCS Recovery
- LCS RPD
- MS Recovery
- MS RPD
- Prep Hold Time
- Surrogate
- Test Hold Time

Results of the ADR process were subsequently reviewed and updated as applicable by the data review chemists identified on the signature page. Quality control elements that were not included in the electronic deliverable were reviewed manually and findings are documented within this report. Summaries of findings and associated qualified results are documented throughout this report.

A total of 2 results (28.57%) out of the 7 results (sample and field QC samples) reported are qualified based on review and 0 results (0.00%) have been rejected or deemed a serious deficiency (X qualifier). Trace values, defined as results that are qualified as estimated because they fall between the detection limit and the reporting limit/limit of quantitation, are not counted as qualified results in the above count. The qualified results are detailed throughout this report and discussed in the narrative below, where appropriate.

Narrative Comments

Analytical Method	Data Reviewer Comment

Reviewed by , ,

As the Reviewer, I certify that I have performed a data review process in accordance with the requirements of the project guidance document, and have compared the electronic data to the laboratory's hard copy report and have verified the consistency of the reported sample results and method quality control data between the two deliverables.

Quality Control Outliers for test method SW8015C, LCS RPD

The objective of laboratory control sample/laboratory control sample duplicate (LCS/LCSD) RPD analysis is to demonstrate acceptable method precision by the laboratory at the time of analysis. LCS/LCSD analyses are also performed to generate data that determines the long-term precision of the analytical method on various matrices. Non-homogenous samples can impact the apparent method precision. Summary forms were evaluated and compared to electronic data deliverables. Laboratory control sample/laboratory control sample duplicate RPD results that were outside of the acceptance criteria are listed below.

Sample ID/ Lab Sample ID	Analyte	Result	Warning Limits	Control Limits	Units	Qualifier	Reason Code	Comment
LCSD68078050513 (BD)	2-(2-Butoxyethoxy)ethanol	61.7	< 50	< 50	rpd	J/None	Z	

Where two qualifiers are listed, such as 'J/UJ', the first applies to positive results, and the second to non-detect results.
Upper and Lower Warning and Control Limits are abbreviated UWL, LWL, UCL, and LCL in the Comment field.

Qualified Results associated with the LCS RPD for SW8015C

FieldSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
AF-RHMW02-WGN01LF-2305W3580-127600-1	N	2-(2-Butoxyethoxy)ethanol	5.00	1.30 J Q	1.30 J		mg/l	TR/Z
AF-RHMW03-WGN01LF-2305W3580-127600-2	N	2-(2-Butoxyethoxy)ethanol	5.00	1.30 J Q	1.30 J		mg/l	TR/Z

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOD) or (LOQ) based on the sample concentration and the validation guidance. In instances where no LOD is provided, results are reported down to the LOQ.

Table of All Qualified Results

Test Method: SW8015C		**Extraction Method: METHOD**						
FieldSample ID / LabSample ID	Type	Analyte	LOQ	Lab Result	Qualified Result	Bias	Units	Reason
AF-RHMW02-WGN01LF-2305W3 580-127600-1	N	2-(2-Butoxyethoxy)ethanol	5.00	1.30 J Q	1.30 J		mg/l	TR/Z
AF-RHMW03-WGN01LF-2305W3 580-127600-2	N	2-(2-Butoxyethoxy)ethanol	5.00	1.30 J Q	1.30 J		mg/l	TR/Z

Analytes not found in project samples are reported as not detected at the limit of detection (LOD) unless blank contamination occurs and then the sample may be reported as not detected at the (LOQ) based on the sample concentration.
In instances where no LOD is provided, results are reported down to the LOQ.
Trace values are not included in the qualified results table unless additional reason codes are associated.

Results with Modified Qualifiers

No qualifiers associated with this sample delivery group were modified manually.

Reason Code Definitions

Code	Definition
TR	Trace Level Detect
Z	LCS RPD

Flag Code and Definitions

Flag	Definition
J	Estimated Value
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a tentative identification.
NJ	The analyte has been tentatively identified or presumptively as present and the associated numerical value was the estimated concentration in the sample.
R	The data are rejected due to deficiencies in meeting QC criteria and may not be used for decision making.
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
X	Result may require rejection; PDT attention required

Bias

-	The result may be biased low
+	The result may be biased high

Note - The bias field is a separate field; however, it is an integral part of the final flag (qualifier) on the sample result

Review Questions