

LABORATORY DATA CONSULTANTS, INC.

2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

AECOM March 4, 2022

1001 Bishop Street Suite 1600 Honolulu, HI 96813 ATTN: Ms. Alethea Ramos alethea.ramos@aecom.com

SUBJECT: Red Hill Bulk Storage Facility, CTO 18F0126 - Data Validation

Dear Ms. Ramos.

Enclosed is the final validation report for the fraction listed below. This SDG was received on December 30, 2021. Attachment 1 is a summary of the samples that were reviewed for analysis.

LDC Project #53054:

SDG # Fraction

97984, 97943, 98278, 98285, 98299, 98300, 98556, 98566

Volatiles, Polynuclear Aromatic Hydrocarbons, Gasoline Range Organics, Total Petroleum Hydrocarbons As Extractables, Total Organic Carbon, 2-(2-Methoxyethoxy)-ethanol, Wet Chemistry

The data validation was performed under Stage 2B & 4 validation guidelines. The analysis was validated using the following documents and variances, as applicable to method:

- Work Plan/Scope of Work, 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 02, January 2017)
- 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)
- Sampling and Analysis Plan, Addendum 01, 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 00, September 2017)
- Sampling and Analysis Plan, Addendum 03, 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 00, June 2018)
- U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019)
- DoD General Validation Guidelines (November 2019)
- U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020)
- U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021)
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014; update VI, July 2018

Please feel free to contact us if you have any questions.

Sincerely,

Stella Cuenco

Alle auno

Operations Manager/Senior Chemist

scuenco@lab-data.com

Attachment 1 598 pages-DL LDC# 53054 (AECOM - Honolulu, HI / Red Hill Bulk Storage Facility, CTO 18F0126) 90/10 2B/4 EDD (3)PAHs SGCU CI,SO, NO₃/ Fe II (8270D GRO TPH-E TPH-E DATE DATE BTEX 2,2-MEE Alk. NO₃-N, NO₃-N, NO₂-N (3500-TOC LDC SDG# REC'D DUE (8260B) -SIM) (8270D-M) (8260B) (8015B) (8015B) (2320B) (300.0)(300.0)(353.2)(9060A) Fe B) W W W S W W S W S W S Matrix: Water/Soil S S W S S W S W S S W S W S W S W S 12/30/21 3 0 2 0 3 2 2 0 97984 01/17/22 7 В 97943 12/21/21 01/06/22 8 0 4 0 8 0 7 0 0 4 0 С 12/28/21 01/13/22 0 0 0 98278 0 0 0 12/28/21 01/13/22 2 2 0 0 3 2 0 D 98285 0 0 F 12/28/21 01/13/22 0 2 0 2 0 2 0 2 0 98299 F 12/28/21 01/13/22 0 2 0 0 2 0 2 0 2 98300 4 0 12/30/21 01/17/22 Н 98556 2 0 98566 12/30/21 01/17/22 1 0 98566 12/30/21 01/17/22 1 0 T/SC

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Volatiles

Validation Level:

Stage 4

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 97984

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1858	BA44378	Water	10/26/21
ERH1859	BA44379	Water	10/26/21
ERH1861	BA44380	Water	10/26/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) which are Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- (Estimated, Low Bias): The analyte was analyzed for and positively identified by Jthe laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- (Estimated, Bias Indeterminate): The analyte was analyzed for and positively J identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory: however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- (Exclusion of data recommended): The sample results (including non-detects) X were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- (Not Applicable): The non-conformance discovered during data validation NA demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits. Т
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the ٧ problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample ERH1858 was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples ERH1859 and ERH1861 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

All target analyte quantitations met validation criteria.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Laboratory Blank Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Field Blank Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

		/ -1
LDC #: 53054A1a VALI	DATION COMPLETENESS WORKSHEET	Date: ///8/22
SDG #: <u>97984</u>	Stage 4	Page: <u>/</u> of <u></u> /
Laboratory: APPL, Inc., Clovis, CA		Reviewer:
		2nd Reviewer: /
METHOD: CC/MS Valatiles (RTEX) (EDA S.W. 946 Mathod 9260D)	•

METHOD: GC/MS Volatiles (BTEX) (EPA SW-846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
<u>l.</u>	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	Δ	,
III.	Initial calibration/ICV	A,A	1/0 PSD = 15 /cy = 20
IV.	Continuing calibration	A	1/0 PSD = 15 /cy = 20 cev = 20/5V
V.	Laboratory Blanks	Д	
VI.	Field blanks	ND	TB= /
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	es
IX.	Laboratory control samples	A	Lesin
X.	Field duplicates	M	17 = 2, 3
XI.	Internal standards	Δ	
XII.	Target analyte quantitation	A	
XIII.	Target analyte identification	Ą	
XIV.	System performance	A	
XV.	Overall assessment of data	\wedge	

Note:	A = Acceptable	ND = No compounds detected	D = Duplicate	SB=Source blank
	N = Not provided/applicable	R = Rinsate	TB = Trip blank	OTHER:
	SW = See worksheet	FB = Field blank	EB = Equipment blank	

	Client ID	Lab ID	Matrix	Date
1-	ERH1858 てら	BA44378	Water	10/26/21
2	ERH1859 D	BA44379	Water	10/26/21
3	ERH1861 12	BA44380	Water	10/26/21
4				
5				
6				
 7				
 3				
)				

211102 AM				

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT

Method: Volatiles (EPA SW 846 Method 8260 P)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	\			
Was cooler temperature criteria met?				
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	\			
Were all samples analyzed within the 12 hour clock criteria?				
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	\			
Were all percent relative standard deviations (%RSD) \leq 15% and relative response factors (RRF) within method criteria?	_			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of \geq 0.990?			_	
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?				
Were all percent differences (%D) ≤ 20% ?				
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	_	-		
Were all percent differences (%D) \leq 20% and relative response factors (RRF) within method criteria? Were all percent differences (%D) \leq 50% in the ending CCV?	/			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?				
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	_			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation findings worksheet.		_		
VI. Field blanks				
Were field blanks were identified in this SDG?	_	-		
Were target analytes detected in the field blanks?				
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	_			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			_	
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			/	

LDC#: 53054A

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: FT

Validation Area	Yes	No	NA	Findings/Comments
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per analytical batch?	/			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	/			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		-		
Were target analytes detected in the field duplicates?				
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	/			
Were retention times within <u>+</u> 30 seconds of the associated calibration standard?				
XII. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	/			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the target analyte?	/			
Were target analyte quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?				
XIII. Target analyte identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	/			
Did analyte spectra meet specified EPA "Functional Guidelines" criteria?	_			
Were chromatogram peaks verified and accounted for?	/			
Were manual integrations reviewed and found acceptable?	/	_	-	
Did the laboratory provide before and after integration printouts?				
XIV. System performance				_
System performance was found to be acceptable.	/			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	/			

TARGET COMPOUND WORKSHEET

METHOD: VOA

METTIOD. VOA			·	
A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butyibenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. lodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1. 2-Propanol
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 53054A1a

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page: _1	of1	
Reviewer:	FT	

METHOD: GCMS 8260B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)

Where:

Ax = Area of compound

average RRF = sum of the RRFs/number of standards

Cx = Concentration of compound S = Standard deviation of the RRFs

%RSD = 100 * (S/X)

X = Mean of the RRFs

Ais = Area of associated internal standard Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 5ug/L std)	Recalculated (RRF 5 ug/L std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/15/2021	V	0.4345	0.4345	0.4384	0.4384	4.3	4.3
	MAX		EE	0.7106	0.7106	0.6860	0.6860	8.1	8.1

LDC#: 53054A/a

VALIDATION FINDINGS WORKSHEET Continuing Calibration Results Verification

Page:_	1	_of_	_1_
Reviewer:_		FT	

METHOD: GC/MS VOA (EPA SW 846 Method 8260 /3)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF

Where:

ave. RRF = initial calibration average RRF

RRF = continuing calibration RRF

 $RRF = (A_x)(C_{is})/(A_{is})(C_x)$

 A_x = Area of target analyte

A_{is} = Area of associated internal standard

 C_x = Concentration of target analyte C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Target Analyte (Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	ceV	11/2/2/	У	0.4384	0.4201	0.420/	4.2	4.2
	LEN 1102M03	1001	EÉ	0.6860	0.6948	0.6948	/.3	/:3
2								
				, <u></u>				
				was some				
3								
			,					
4								

LDC #: 530547/a

VALIDATION FINDINGS WORKSHEET Surrogate Results Verification

Page:_	1	_of_	1
Reviewer:_	FT		

METHOD: GC/MS VOA (EPA SW 846 Method 8260 /3

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found

SS = Surrogate Spiked

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	25.0	26.76	F7 103 107	107	0
1,2-Dichloroethane-d4		26.09	10/ 10/3	104.3	1
Toluene-d8		25.5X	98.2 102	102	
Bromofluorobenzene	J J	24.76	95.4 99.1	99.)	\mathcal{L}

Comments: _						

LDC#: 33054A/a

VALIDATION FINDINGS WORKSHEET Laboratory Control Sample Results Verification

Page:_	<u>1of</u>	1
Reviewer:_	FT	

METHOD: GC/MS VOA (EPA SW 846 Method 8260 💍

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate (if applicable) were recalculated for the target analytes identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration

SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration

LCSDC = Laboratory control sample duplicate concentration

LCS ID: 211102 AM LOS 10

Compound	A	Spike Spiked Sample LCS Added Concentration (ug /L) (ug /L) Percent Recov		Concentration			L CSD Percent Recovery		I CS/I CSD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
1,1-Dichloroethene										
Trichloroethene										
Benzene	10.0	10.0	9.58	8.71	95.8	95.8	87./	<i>\&7./</i>	9-5	9.5
Toluene	10. Ū	10.0	9.33	9.33	105	105	93.3	93-3	11-8	11-8
Chlorobenzene			10.5							

Comments:				

LDC #: 330 54A /av

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	1	of_	1
Reviewer:		FT	

METHOD: GC/MS VOA (EPA SW 846 Method 8260 /3)

The concentration of the sample was calculated for the target analytes identified below using the following calculation:

Concer	ntratio	on = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$
A_{x}	=	Area of the characteristic ion (EICP) for the target analyte to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
l _s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:	
Sample I.D. 2/1/02 AM, (Les)10	/
Conc. = (6/699) (75) (367/44) (0.4384)	
(367/44) (0.4384)	
_ //	
= 9.58 ug/L	

Sample ID	Compound	Reported Concentration	Calculated Concentration	Qualification
LCS	У	9.58	9.5B	-
	·			
			Sample ID Compound (ug/l/)	Sample ID Compound (ug/b) (ug/b)

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Polynuclear Aromatic Hydrocarbons

Validation Level:

Stage 4

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 97984

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1859	BA44379	Water	10/26/21
ERH1861	BA44380	Water	10/26/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work. 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) which are 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene by Environmental Protection Agency (EPA) SW 846 Method 8270D in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples ERH1859 and ERH1861 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

All target analyte quantitations met validation criteria.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary -SDG 97984

No Sample Data Qualified in this SDG

	: <u>53054A2b</u> VALIDATIO : <u>97984</u>		PLETENESS Stage 4	S WORKSHEE	ET	Date: 1 18 Page: 1 of 1
	atory: APPL, Inc., Clovis, CA		- 0		F	Reviewer:
·•=TU	CD COME Deligination Aromatic Hydr	rhone (/ DA CIMI_8/16	4-45-04 0270D_S		Reviewer: r*
VIETE	OD: GC/MS Polynuclear Aromatic Hydro	onouis (EPA SVV-040 IV	/lethou oziob-o	-IIVI)	
	amples listed below were reviewed for ea	ach of the f	ollowing validat	tion areas. Valid	ation findings are	noted in attached
√alidati	tion findings worksheets.					
F	Γ		T			
<u> </u>	Validation Area	+		Cor	mments	
l.	Sample receipt/Technical holding times	ΑΙΔ				
II.	GC/MS Instrument performance check	A	0/ 2			
111.	Initial calibration/ICV	A,A	1 % P.	3D =15	1c/ = 20 = 20/50	
IV.	Continuing calibration /enoling	A		CU	= 20/50	
V.	Laboratory Blanks	A				
VI.	Field blanks	N				
VII.	Surrogate spikes	54V				
VIII.	Matrix spike/Matrix spike duplicates	N	S.			
IX.	Laboratory control samples	Α	100 17			
X.	Field duplicates	NP	0=1,2			
XI.	Internal standards	A				
XII.	Target analyte quantitation	Α				
XIII.	Target analyte identification	Α				
XIV.	System performance	A				
XV.	Overall assessment of data	厶				
Note:	N = Not provided/applicable R = Rin	No compounds insate Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipment ե	OTHER:	rce blank
C	Client ID			Lab ID	Matrix	Date
1- E	ERH1859 <i>9</i>			BA44379	Water	10/26/21
- $-$	ERH1861 /			BA44380	Water	10/26/21
3						

	Client ID		 	···		Lab ID	Matrix	Date
1-	ERH1859	2	 			BA44379	Water	10/26/21
2	ERH1861	2	 			BA44380	Water	10/26/21
3			 					
4			 					
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7			 					
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9_								
lotes:								
	211028A	-BIK						
$\neg \uparrow$								

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT

Method: Semivolatiles (EPA SW 846 Method 8270 ?)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	/			
Was cooler temperature criteria met?				
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	\			
Were all samples analyzed within the 12 hour clock criteria?	/			
Illa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	/			
Were all percent relative standard deviations (%RSD) ≤ 15% and relative response factors (RRF) within method criteria?				
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of \geq 0.990?				
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	/			
Were all percent differences (%D) ≤ 20%?				
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	_			
Were all percent differences (%D) \leq 20% and relative response factors (RRF) within method criteria? Were all percent differences (%D) \leq 50% for closing calibration verification?	/			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	_			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	_			
Was there contamination in the laboratory blanks? If yes, please see the blanks validation findings worksheet.		/		
VI. Field blanks				
Were field blanks were identified in this SDG?		_		
Were target analytes detected in the field blanks?				
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?				
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			_	
If any percent recoveries (%R) was less than 10%, was a reanalysis performed to confirm %R?				
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?				

LDC#: 53054A26

VALIDATION FINDINGS CHECKLIST

Page:_	_2_	_of_	_2_
Reviewer:	F	-T	

Validation Area	Yes	No	NA	Findings/Comments
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
IX. Laboratory control samples				
Was an LCS analyzed per extraction batch?	/			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	/	-,		
Were target analytes detected in the field duplicates?				
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	\			
Were retention times within ± 30 seconds of the associated calibration standard?				
XII. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	/			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the target analyte?				
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	\			
XIII. Target analyte identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?				
Did compound spectra meet specified EPA "Functional Guidelines" criteria?				
Were chromatogram peaks verified and accounted for?	/			
Were manual integrations reviewed and found acceptable?	_			
Did the laboratory provide before and after integration printouts?		<u></u>		
XIV. System performance				
System performance was found to be acceptable.		-		
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.				

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	CC. Dimethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	GGGG. C30-Hopane	I1. Methyl methanesulfonate
B. Bis (2-chloroethyl) ether	DD. Acenaphthylene	FFF. Di-n-octylphthalate	HHHH. 1-Methylphenanthrene	J1. Ethyl methanesulfonate
C. 2-Chlorophenol	EE. 2,6-Dinitrotoluene	GGG. Benzo(b)fluoranthene	IIII. 1,4-Dioxane	K1. o,o',o"-Triethylphosphorothioate
D. 1,3-Dichlorobenzene	FF. 3-Nitroaniline	HHH. Benzo(k)fluoranthene	JJJJ. Acetophenone	L1. n-Phenylene diamine
E. 1,4-Dichlorobenzene	GG. Acenaphthene	III. Benzo(a)pyrene	KKKK. Atrazine	M1. 1,4-Naphthoquinone
F. 1,2-Dichlorobenzene	HH. 2,4-Dinitrophenol	JJJ. Indeno(1,2,3-cd)pyrene	LLLL. Benzaldehyde	N1. N-Nitro-o-toluidine
G. 2-Methylphenol	II. 4-Nitrophenol	KKK. Dibenz(a,h)anthracene	MMMM. Caprolactam	O1. 1,3,5-Trinitrobenzene
H. 2,2'-Oxybis(1-chloropropane)	JJ. Dibenzofuran	LLL. Benzo(g,h,i)perylene	NNNN. 2,6-Dichlorophenol	P1. Pentachlorobenzene
I. 4-Methylphenol	KK. 2,4-Dinitrotoluene	MMM. Bis(2-Chloroisopropyl)ether	OOOO. 1,2-Diphenylhydrazine	Q1. 4-Aminobiphenyl
J. N-Nitroso-di-n-propylamine	LL. Diethylphthalate	NNN. Aniline	PPPP. 3-Methylphenol	R1. 2-Naphthylamine
K. Hexachloroethane	MM. 4-Chlorophenyl-phenyl ether	OOO. N-Nitrosodimethylamine	QQQQ. 3&4-Methylphenol	S1. Triphenylene
L. Nitrobenzene	NN. Fluorene	PPP. Benzoic Acid	RRRR. 4-Dimethyldibenzothiophene (4MDT)	T1. Octachlorostyrene
M. Isophorone	OO. 4-Nitroaniline	QQQ. Benzyl alcohol	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	U1. Famphur
N. 2-Nitrophenol	PP. 4,6-Dinitro-2-methylphenol	RRR. Pyridine	TTTT. 1-Methyldibenzothiophene (1MDT)	V1. 1,4-phenylenediamine
O. 2,4-Dimethylphenol	QQ. N-Nitrosodiphenylamine	SSS. Benzidine	UUUU 2,3,4,6-Tetrachlorophenol	W1. Methapyrilene
P. Bis(2-chloroethoxy)methane	RR. 4-Bromophenyl-phenylether	TTT. 1-Methylnaphthalene	VVVV. 1,2,4,5-Tetrachlorobenzene	X1. Pentachloroethane
Q. 2,4-Dichlorophenol	SS. Hexachlorobenzene	UUU.Benzo(b)thiophene	WWWW 2-Picoline	Y1. 3,3'-Dimethylbenzidine
R. 1,2,4-Trichlorobenzene	TT. Pentachlorophenol	VVV.Benzonaphthothiophene	XXXX. 3-Methylcholanthrene	Z1. o-Toluidine
S. Naphthalene	UU. Phenanthrene	WWW.Benzo(e)pyrene	YYYY. a,a-Dimethylphenethylamine	A2. 1-Naphthylamine
T. 4-Chloroaniline	VV. Anthracene	XXX. 2,6-Dimethylnaphthalene	ZZZZ. Hexachloropropene	B2. 4-Aminobiphenyl
U. Hexachlorobutadiene	WW. Carbazole	YYY. 2,3,5-Trimethylnaphthalene	A1. N-Nitrosodiethylamine	C2. 4-Nitroquinoline-1-oxide
V. 4-Chloro-3-methylphenol	XX. Di-n-butylphthalate	ZZZ. Perylene	B1. N-Nitrosodi-n-butylamine	D2. Hexachloropene
W. 2-Methylnaphthalene	YY. Fluoranthene	AAAA. Dibenzothiophene	C1. N-Nitrosomethylethylamine	E2. Bis (2-chloro-1-methylethyl) ether
X. Hexachlorocyclopentadiene	ZZ. Pyrene	BBBB. Benzo(a)fluoranthene	D1. N-Nitrosomorpholine	F2. Bifenthrin
Y. 2,4,6-Trichlorophenol	AAA. Butylbenzylphthalate	CCCC. Benzo(b)fluorene	E1. N-Nitrosopyrrolidine	G2. Cyfluthrin
Z. 2,4,5-Trichlorophenol	BBB. 3,3'-Dichlorobenzidine	DDDD. cis/trans-Decalin	F1. Phenacetin	H2. Cypermethrin
AA. 2-Chloronaphthalene	CCC. Benzo(a)anthracene	EEEE. 1,1'-Biphenyl	G1. 2-Acetylaminofluorene	I2. Permethrin (cis/trans)
BB. 2-Nitroaniline	DDD. Chrysene	FFFF. Retene	H1. Pronamide	J2. 5-Nitro-o-toluidine

LDC#: 53054 A2h

VALIDATION FINDINGS WORKSHEET Surrogate Recovery

Page:_	_/of_	_/
Reviewer:	FT	

(s)

METHOD: GC/MS BNA (EPA SW 846 Method 8270 P)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

YN/A

Were percent recoveries (%R) for surrogates within OC limits?

If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?

Y N N/A If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)		Qualifications	
	211028A-BIK	W-DIU	116	39-114)	J'du'IP ND	
)	/-	
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(NBZ) = Nitrobenzene - d5

(FBP) = 2-Fluorobiphenyl

(TPH) = Terphenyl - d14

(2FP) = 2-Fluorophenol

(TBP) = 2,4,6 -Tribromophenol

(2CP) = 2-Chlorophenol - d4

LDC #: 53054A2b

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page:1_	_ of _1
Reviewer:	FT

METHOD: GCMS 8270D SIM

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)

Where:

Ax = Area of compound

average RRF = sum of the RRFs/number of standards

Cx = Concentration of compound S = Standard deviation of the RRFs

%RSD = 100 * (S/X)

X = Mean of the RRFs

Ais = Area of associated internal standard Cis = Concentration of internal Standard

			70.40	Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
	[Calibration				AverageRRF	Average RRF	%RSD	%RSD
#	Standard ID	Date	Compound	(RRF1.0 std)	(RRF1.0 std)	(Initial)	(Initial)		1
	ICAL	10/19/2021	S	1.336	1.336	1.299	1.299	8.6	8.6
	KYLO								

LDC #: 53054A2b

VALIDATION FINDINGS WORKSHEET Continuing Calibration Results Verification

Page:_	1	of_	1
eviewer:	FT		

METHOD: GC/MS BNA (EPA SW 846 Method 8270 P)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF

-

Where: ave. RRF = initial calibration average RRF

RRF = continuing calibration RRF

 $RRF = (A_x)(C_{is})/(A_{is})(C_x)$

A_x = Area of target analyte

A_{is} = Area of associated internal standard

 $\hat{C_x}$ = Concentration of target analyte

C_{is} = Concentration of internal standard

					Reported	Recalculated	Reported	Recalculated
#	Standard ID	Calibration Date	Target Analyte (Internal Standard)	Average RRF (Initial)	RRF (CC)	RRF (CC)	%D	%D
1	Lev	11/3/2/	S (1st IS)	1.299	1.3/9	1.319	1.6	1.6
1	1019×236	' ' /	(2 nd IS)					
1			(3 rd IS)					
			(4 th IS)					
1			(5 th IS)					
<u> </u>			(6 th IS)					
2			(1st IS)					
			(2 nd IS)					
			(3 rd IS)					
			(4 th IS)					
1			(5 th IS)					
<u> </u>			(6 th IS)					
3			(1st IS)					
1			(2 nd IS)					
			(3 rd IS)					
ŀ			(4 th IS)					
)			(5 th IS)		7			
			(6 th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 53054 A26

VALIDATION FINDINGS WORKSHEET Surrogate Results Verification

Page: <u>1</u>	of	1_
Reviewer:	FT	

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found

SS = Surrogate Spiked

Sample ID: # /

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene d5 W - d10	5.0	106 5.34	107	107	O
2-Fluorobiphenyl YY - dIU	V	4.96	99.2	99.2	J
Terphenyl-114					
Phenol-15					
2-Fixorophenol					
2,4,6-Tribromophenol					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5			***		
2-Fluorophenol					·
2,4,6-Tribromophenol					

LDC#: 53054A2b

VALIDATION FINDINGS WORKSHEET

WEDNING WORKS	rayei
Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification	Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the target analytes identified below using the following calculation:

 $SSC = \frac{(Ax)(Cis)(Fv)(Df)}{(Ais)(RRF)(Vs \text{ or Ws})(%S/100)}$

%Recovery = (SSC/SA)*100

Where: A_X= Area of the target analyte

 A_{ls} = Area for the specific internal standard C_{ls} = Concentration of internal standard

Fv =Final volume of extract

Df= Dilution factor

Ws= Initial weight of the sample

%S= Percent Solid

SSC = Spiked sample concentration LCS = Laboratory control sample

LCSD = Laboratory control sample duplicate

RRF= Average relative response factor of the target analyte Vs= Initial volume of the sample

RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

LCS/LCSD samples: 2/1 ©

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	S	pike ddegl		pike entration		cs	LCSD		LCS/LCSD	
Compound		3/2)		9/4	Percent I	Recovery	Percent	Recovery	RPD	
	LCS	I CSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol										
N-Nitroso-di-n-propylamine										
4-Chloro-3-methylphenol										
Acenaphthene										
Pentachlorophenol										
Pyrene										
S	5.0	5.0	4.74	5.23	94.8	94.8	105	105	9.8	9.8
			•							

LDC#: 53054A2b

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	1_	_of_	1_
Reviewer:	FT	•	

METHOD: GC/MS BNA (EPA SW 846 Method 8270 /

The concentration of the sample was calculated for the target analyte identified below using the following calculation:

Conce	entratio	$n = (A_{x})(I_{x})(V_{y})(DF)(2.0)$ $(A_{is})(RRF)(V_{o})(V_{i})(%S)$	Example:
A_{x}	=	Area of the characteristic ion (EICP) for the target analyte to be measured	Sample I.D. 21/628A LCO S
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	$(1,1,1,1)$ $(2,\infty)$
Is	=	Amount of internal standard added in nanograms (ng)	Conc. = (44704) (2.30)
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	Conc. = (44704) (2.50) (18146) (1.299)
V_{i}	=	Volume of extract injected in microliters (ul)	= , , , , , , , , , , , , , , , , , , ,
V_{t}	=	Volume of the concentrated extract in microliters (ul)	4-74 ug/L
Df	=	Dilution Factor.	, , ,
%S	=	Percent solids, applicable to soil and solid matrices only.	
2.0	=	Factor of 2 to account for GPC cleanup	

#	Sample ID	Target Analyte	Reported Concentration (43/4	Calculated Concentration (Ug/L)	Qualification
	ies	5	4.74	4.74	
				, ,	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

January 21, 2022 LDC Report Date:

Total Organic Carbon Parameters:

Validation Level: Stage 4

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 97984

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1859	BA44379	Water	10/26/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant.
- The analysis with this flag should not be used because another more d technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. S
- Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
11/05/21	CCV (04:24)	Total organic carbon	88.2 (90-110)	All samples in SDG 97984	J- (all detects)	Р

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

All target analyte quantitations were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to continuing calibration %R, data were qualified as estimated in one sample.

Red Hill Bulk Storage Facility, CTO 18F0126 **Total Organic Carbon - Data Qualification Summary - SDG 97984**

Sample	Analyte	Flag	A or P	Reason (Code)
ERH1859	Total organic carbon	J- (all detects)	Р	Continuing calibration (%R)

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Laboratory Blank Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Field Blank Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 53054A6 SDG #: 97984 Stage 4

Laboratory: APPL, Inc., Clovis, CA

Date:	1	19	22
Page:_	Ĺ	of_	<u></u>
Reviewer:_	_	AI	<u> </u>
2nd Reviewer:_		V	<u> </u>

METHOD: (Analyte) TOC (EPA SW-846 Method 9060A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	AA	
11	Initial calibration	A	
111.	Calibration verification	SW	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	CS
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCSILCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	A	
XI.	Overall assessment of data	A	

A = Acceptable Note:

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank
EB = Equipment blank

SB=Source blank OTHER:

				Ţ
-	Client ID	Lab ID	Matrix	Date
1	ERH1859	BA44379	Water	10/26/21
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes:						

METHOD: Inorganics				
Validation Area	Yes	No	NA	Comments
I. Technical holding times				
Were all technical holding times met?	V			
II. Calibration				
Were all instruments calibrated at the	./			
required frequency?	V			
Were the proper number of standards	V			
used?	V			
Were all initial and continuing calibration				
verifications within the QC limits?	•	V		
Were all initial calibration correlation				
coefficients within limits as specifed by the	\checkmark			
method?				
Were balance checks performed as			./	
required?			\	
III. Blanks			<u> </u>	
Was a method blank associated with every	1			
sample in this SDG?	V			
Was there contamination in the method				
blanks?		\ \		
Was there contamination in the initial and		1/		
continuing calibration blanks?				
IV. Matrix Spike/Matrix Spike Duplicates/L	aborat	ory Du	plicates	
Were MS/MSD recoveries within the QC				
limits? (If the sample concentration				not run
exceeded the spike concentration by a			\	
factor of 4, no action was taken.)				
Were the MS/MSD or laboratory duplicate				
relative percent differences (RPDs) within				
the QC limits?		ł		
V. Laboratory Control Samples				
Was a LCS analyzed for each batch in the	V			
SDG?	V		<u> </u>	
Were the LCS recoveries and RPDs (if	1,/			
applicable) within QC limits?	"			
X. Target Analyte Quantitation				
Were all reporting limits adjusted to reflect	1			
sample dilutions?			/	
Were all soil samples dry weight corrected?				
XI. Overall Assessment of Data				
Was the overall assessment of the data	./			
found to be acceptable?		<u> </u>	<u> </u>	

Page 2 of 2 Reviewer: ATL

METHOD: Inorganics	1		T	
Validation Area	Yes	No	NA	Comments
XII. Field Duplicates				
Were field duplicates identifed in this SDG?		\		
Were target analytes detected in the field duplicates?			V	
XIII. Field Blanks				
Were field blanks identified in this SDG?		\ \ \		
Were target analytes detected in the field blanks?			/	

LDC #: 53054A6

VALIDATION FINDINGS WORKSHEET Calibration

Page:_	1 of 1
aviewer.	ΔΤΙ

METHOD: Inorganics,	EPA Method	See cover	

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y) N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110%?

Y) N N/A Are all correlation coefficients \geq 0.995?

LEVEL IV/D ONLY:

 $(\widehat{\mathbf{Y}})$ N N/A

Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.

Y N (N/A) Was a balance check conducted prior to the TDS analysis.?

Y N (N/A) Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications Code: c
	11/05/21	CCV (04:24)	тос	88.2 (90-110)	all	J-/UJ/P (detect)
 						
			<u> </u>			
-						
<u> </u>						

Comments:			
_			

LDC #: 53054A6

Validation Findings Worksheet Initial and Continuing Calibration Calculation Verification

Page:1	of		1
Reviewer:		ATI	_

Method: Inorganics, MethodSee Cover	wetnoa:	inorganics,	Method	See Cover	
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The correlation coefficient (r) for the calibration of $\underline{700}$ was recalculated. Calibration date: $\underline{100252}$

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = <u>Found X 100</u>

Where,

Found = concentration of each analyte <u>measured</u> in the analysis of the ICV or CCV solution

True

True = concentration of each analyte in the ICV or CCV source

		FOUND	TRUE		Recalculated	Reported	Acceptable
Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	r or r ²	r or r ²	(Y/N)
Initial calibration		s1	0.0	4558			
		s2	0.5	9475	0.99987	0.99987	
	TOC	s3	2	29763			Υ
		s4	5	69278			
		s5	10	139847			
		s6	20	273227			
TCV Calibration verification	TOC	10.4835	10.000		104.8	105.5	Υ
CCV Calibration verification	TOC	5.3361	5.000		106.7	105.9	Υ
CCV Calibration verification	TOC	4.4538	5.000		89.1	88.2	Υ

Comments: Refer to Calibration Ve	rification findings worksheet for lis	st of qualifications and associate	ed samples when reported	results do not agree withir
10.0% of the recalculated results				

LDC #: 53054AC

VALIDATION FINDINGS WORKSHEET Level IV Recalculation Worksheet

Page:_	1_of_1
Reviewer:	4

METHOD: Inorganics, Method	see cover
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Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

 $%R = \frac{Found}{True} \times 100$

Where,

Found =

concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation,

Found = SSR (spiked sample result) - SR (sample result).

True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

 $RPD = |S-D| \times 100$

Where,

S =

Original sample concentration

(S+D)/2

D =

Duplicate sample concentration

Sample ID	Type of Analysis	Element	MGIL Found / S (units)	MG/L True/D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	TOC	5.4209	5.00	108	108	Y
	Matrix spike sample		(SSR-SR)				
	Duplicate sample						

Comments:			

LDC #: 53054A6

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:	of	!
Reviewer:	ATT	/

METHOD: Inorganics, Met	thod <u>See Cover</u>		
Please see qualifications by N N/A Have results Y N N/A Are results Y N N/A Are all det	nelow for all questions answere lts been reported and calculat s within the calibrated range o ection limits below the CRQL'	ed "N". Not applicable que ed correctly? f the instruments? ?	estions are identified as "N/A".
Compound (analyte) result recalculated and verified u	ts for	DC	reported with a positive detect were
Concentration =	Recalcul	ation:	
	6327 x (7.398×10	(5) - 0.237615 =	= 0.2305

#	Sample ID	Analyte	Reported Concentration (MG/L)	Calculated Concentration (MOLL)	Acceptable (Y/N)
		TOC	0.28	0, 2305	V
					/

Note:	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Gasoline Range Organics

Validation Level:

Stage 4

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 97984

	Laboratory Sample		Collection
Sample Identification	Identification	Matrix	Date
ERH1858	BA44378	Water	10/26/21
ERH1859	BA44379	Water	10/26/21
ERH1861	BA44380	Water	10/26/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample guantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits. L
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the V problem can be found in the validation report.
- W LCS/LCSD RPD was high.
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r²) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample ERH1858 was identified as a trip blank. No contaminants were found.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

Samples ERH1859 and ERH1861 were identified as field duplicates. No results were detected in any of the samples.

X. Target Analyte Quantitation

All target analyte quantitations met validation criteria.

XI. Target Analyte Identification

All target analyte identifications met validation criteria.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 97984

No Sample Data Qualified in this SDG

SDG	#: 97984		PLETENES: Stage 4	S WORKSHEET		Date: /// Page:lof_
MET I	ratory: <u>APPL, Inc., Clovis, CA</u> HOD: GC/MS Gasoline Range Organics samples listed below were reviewed for eation findings worksheets.	•				Reviewer: 1
	Validation Area			Comme	nts	
I.	Sample receipt/Technical holding times	AA				
II.	GC/MS Instrument performance check	Α				
III.	Initial calibration/ICV	AA	12	1cy = 20		
IV.	Continuing calibration le nding	Δ		ew = 20	120	
V.	Laboratory Blanks	K			7	
VI.	Field blanks	HD	TB=	1		
VII.	Surrogate spikes					
VIII.	Matrix spike/Matrix spike duplicates	2	45			
IX.	Laboratory control samples	A	Les 10			
X.	Field duplicates	ON	D= 3	3		
XI.	Internal standards	10	0=2,3	•		
XII.	Target analyte quantitation	4				
XIII.	Target analyte identification	A				
XIV.		A				
XV.	Overall assessment of data	人				
Note:	N = Not provided/applicable R = F	= No compounds Rinsate = Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipment blank	SB=So OTHER	urce blank R:
	Client ID			Lab ID	Matrix	Date
1-	ERH1858 TP			BA44378	Water	10/26/21
2-	ERH1859 D			BA44379	Water	10/26/21
3	ERH1861 P			BA44380	Water	10/26/21
4						
5	1					
6						

ف		 			
Note	S:	 			
	211102 AM				
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LDC#: 530위시7

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT

Method: Volatiles (EPA SW 846 Method 8260 (b))

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?		•		
Was cooler temperature criteria met?		,		
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?		•		
Were all samples analyzed within the 12 hour clock criteria?				
Illa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?				
Were all percent relative standard deviations (%RSD) ≤ 15% and relative response factors (RRF) within method criteria?			_	-
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of \geq 0.990?				
IIIb. Initial Calibration Verification		,	,	
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?				
Were all percent differences (%D) ≤ 20% ?				
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?				
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria? Were all percent differences (%D) ≤ 50% in the ending CCV?		i		
عند V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?				
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?				
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation findings worksheet.				
VI. Field blanks				
Were field blanks were identified in this SDG?		}		
Were target analytes detected in the field blanks?				
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		-		
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?				
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			/	

LDC#: 53054A7

VALIDATION FINDINGS CHECKLIST

Page: 2_of_2 Reviewer:__FT___

Validation Area	Yes	No	NA	Findings/Comments
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per analytical batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?			Ĺ	
X. Field duplicates				
Were field duplicate pairs identified in this SDG?				
Were target analytes detected in the field duplicates?				
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?				,
Were retention times within <u>+</u> 30 seconds of the associated calibration standard?				
XII. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	_			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the target analyte?	/			
Were target analyte quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?				
XIII. Target analyte identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?				
Did analyte spectra meet specified EPA "Functional Guidelines" criteria?				
Were chromatogram peaks verified and accounted for?				
Were manual integrations reviewed and found acceptable?			<u> </u>	
Did the laboratory provide before and after integration printouts?				<u> </u>
XIV. System performance				
System performance was found to be acceptable.				
XV. Overall assessment of data		_		
Overall assessment of data was found to be acceptable.				

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-lsopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. lodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanai
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1. 2-Propanol
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC#: 53054A7

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page:	_1_	of	_1_
Reviewe	er:	FT	

Method: Gasoline (EPA SW 846 Method 8260B)

Calibration				(Y)	(X)
Date	System	Compound	Standard	Response	Concentration
8/25/2021	GCMS	Gasoline C6-C10	1	11.040	0.8
l l	Max		2	11.378	2.0
	:		3	12.076	4.0
l			4	15.480	12.0
			5	19.694	24.0
			6	22.774	32.0
			7	25.396	40.0

Regression Output

Reported

Constant	10.743188	10.700000
Std Err of Y Est		
R Squared	0.999132	0.999000
Degrees of Freedom		
X Coefficient(s)	0.371398	0.372000
Std Err of Coef.		
Correlation Coefficient	0.999566	
Coefficient of Determination (r^2)	0.999132	0.999000

LDC#: 53054 M7

VALIDATION FINDINGS WORKSHEET Continuing Calibration Results Verification

Page:_	1	_of_	1_
Reviewer:_		FT	

METHOD: GC/MS VOA (EPA SW 846 Method 8260 ろ)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF

Where:

ave. RRF = initial calibration average RRF

 A_x = Area of target analyte

RRF = continuing calibration RRF A_{is} = Area of associated internal standard

 $RRF = (A_x)(C_{is})/(A_{is})(C_x)$ C_x = Concentration of target analyte

C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Target Analyte (Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CEV 1102M07	11/2/2/	GRO 4-40	300	282-11	282.1)	6.0	6·U
2								
<u></u>								
3								
4								

LDC #:	53054	47

VALIDATION FINDINGS WORKSHEET Surrogate Results Verification

Page:_	1	of_	1
Reviewer:_	F	<u> </u>	

METHOD: GC/MS VOA (EPA SW 846 Method 8260 /3

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found

SS = Surrogate Spiked

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene	26. O	25./3	101	101	O

Comments: _		·	 · · · · · · · · · · · · · · · · · · ·	 	
			 · · · · · · · · · · · · · · · · · · ·	 	

LDC#: *53054カ*フ

VALIDATION FINDINGS WORKSHEET Laboratory Control Sample Results Verification

Page:_	1	of	1
Reviewer:		FT	

METHOD: GC/MS VOA (EPA SW 846 Method 8260 /3

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate (if applicable) were recalculated for the target analytes identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration

SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration

LCSDC = Laboratory control sample duplicate concentration

LCS ID: 211/02 AM 1001D

	Sı	pike	Spiked	l Sample		cs	10	CSD	LCS	/LCSD
Compound		ded, 9/4	(u	entration 3 / L)	Percent	Recovery	Percent	Recovery	R	PD
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
CARO 1,4-Dichloroethenje	300	300	७८ ७	305	119	119	102	102	16.0	16.0
Trichloroethene										
Benzene										
Toluene										
2hlorobenzone										

Comments:	 	 			 	
			11200			

LDC#: 5365447

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	1	of_	1	
Reviewer:		FT		

METHOD: GC/MS VOA (EPA SW 846 Method 8260 P)

The concentration of the sample was calculated for the target analytes identified below using the following calculation:

Concen	tratio	on = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$
A_x	=	Area of the characteristic ion (EICP) for the target analyte to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
l _s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V _o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid

matrices only.

Example:

Sample I.D. $\frac{211102 \text{ AM Les}}{428863} - 10.7$ (35)

Conc. = $\frac{(882893 - 10.7)(35)}{428863}$ - 0-372

#	Sample ID	Compound	Reported Concentration	Calculated Concentration	Qualification
	LOS	GRO	358	359	-
-					
-					
					
					·

Laboratory Data Consultants, Inc. Data Validation Report

Red Hill Bulk Storage Facility, CTO 18F0126 **Project/Site Name:**

January 21, 2022 LDC Report Date:

Total Petroleum Hydrocarbons as Extractables Parameters:

Validation Level: Stage 4

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 97984

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1859	BA44379	Water	10/26/21
ERH1861	BA44380	Water	10/26/21
ERH1859(SGCU)	BA44379(SGCU)	Water	10/26/21
ERH1861(SGCU)	BA44380(SGCU)	Water	10/26/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Petroleum Hydrocarbons as Extractables by Environmental Protection Agency (EPA) SW 846 Method 8015B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- а ICP Serial Dilution %D was not within control limits.
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. S
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the ٧ problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average calibration factors were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0% for all analytes.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
211029A LCS/LCSD (ERH1859 ERH1861)	Oil (C24-C40)	116 (41-113)	-	NA	-

Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

Samples ERH1859 and ERH1861 were identified as field duplicates. No results were detected in any of the samples.

X. Target Analyte Quantitation

All target analyte quantitations met validation criteria.

XI. Target Analyte Identification

All target analyte identifications met validation criteria.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Data Qualification Summary -SDG 97984

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Laboratory Blank Data **Qualification Summary - SDG 97984**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Field Blank Data Qualification **Summary - SDG 97984**

No Sample Data Qualified in this SDG

LDC #:_	53054A8	VALIDATION COMPLETENESS WORKSHEET
SDG #:_	97984	Stage 4

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7

Laboratory: APPL, Inc., Clovis, CA

METHOD: GC TPH as Extractables (EPA SW-846 Method 8015B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l	Sample receipt/Technical holding times	AIA	
II.	Initial calibration/ICV	Δ/Δ	0/0 PSD = 20, 12 1CV = 20 CW € 20 ZU
III.	Continuing calibration / ending	4	CW & 20 20
IV.	Laboratory Blanks	Δ	·
V.	Field blanks	7	
VI.	Surrogate spikes	Α	
VII.	Matrix spike/Matrix spike duplicates	2	U)
VIII.	Laboratory control samples	SW	Les 10
IX.	Field duplicates	NO	D = 1,2
X.	Target analyte quantitation	۵	
XI.	Target analyte identification	A	
XII	Overall assessment of data	Δ	

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

TB = Trip blank
EB = Equipment blank

SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1-	ERH1859	BA44379	Water	10/26/21
2	ERH1861 07	BA44380	Water	10/26/21
3 _	ERH1859(SGCU)	BA44379(SGCU)	Water	10/26/21
4	ERH1861(SGCU)	BA44380(SGCU)	Water	10/26/21
6				
7				
5 6 7 8				
9				
10				
11				
12				
13				
lotes	:			

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT

Method: GC HPLC

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?				
Was cooler temperature criteria met?	/			
lla. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?				
Were all percent relative standard deviations (%RSD) < 20%?				
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥0.990?				
Were the RT windows properly established?		-		
Ilb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?				
Were all percent differences (%D) ≤ 20%?				
III. Continuing calibration				
Was a continuing calibration analyzed daily?				
Were all percent differences (%D) ≤ 20%?				
Were all the retention times within the acceptance windows?				
IV. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?				
Was a laboratory blank analyzed for each matrix and concentration?				
Was there contamination in the laboratory blanks?				
V. Field Blanks				
Were field blanks identified in this SDG?		_		
Were target analytes detected in the field blanks?				
VI. Surrogate spikes				
Were all surrogate percent recovery (%R) within the QC limits?				
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?			_	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?				
VII. Matrix spike/Matrix spike duplicates		 ;		· · · · · · · · · · · · · · · · · · ·
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?				
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
VIII. Laboratory control samples				
Was an LCS analyzed per analytical or extraction batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				

LDC#: 53054AX

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: FT

Validation Area	Yes	No	NA	Findings/Comments
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?	/			,
Were target analytes detected in the field duplicates?				
X. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	/			
Were analyte quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	/			
XI. Target analyte identification				
Were the retention times of reported detects within the RT windows?				
Were manual integrations reviewed and found acceptable?	\			
Did the laboratory provide before and after integration printouts?				
XIII. Overall assessment of data	•			
Overall assessment of data was found to be acceptable.				

LDC#: 53054 AX

VALIDATION FINDINGS WORKSHEET Laboratory Control Samples (LCS)

Page: 1 of 1 Reviewer: FT

METHOD: VGC __ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N. N/A Were a laboratory control samples (LCS) and laboratory control sample duplicate (LCSD) analyzed for each matrix in this SDG? Y (N)N/A

Were the LCS percent recoveries (%R) and relative percent differences (RPD) within the QC limits?

Level IV/D Only YN NA

Was an LCS analyzed every 20 samples for each matrix or whenever a sample extraction was performed?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	2110294	Oil (cz4-cy	0) 116 (41-113)	()	()	1,2,211029A-BIK	It det IP NO
	usio	,	/ ()	()	()	[7]	/
			()	()	()		
			()	()	()		
			()	()	()		
			()	()	()		
			()	()	()		
			(-)	(
			()	()	()		
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			()	()	()		
			()_	()	()		
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LDC #: 53054A8

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page: _	_1	of_	_1	
Review	er:	F	-T	

METHOD: GC	X	HPLC	

The calibration factors (CF), average CF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

CF = A/C

Where:

average CF = sum of the CF/number of standards

%RSD = 100 * (S/X)

A = Area of compound C = Concentration of compound

S = Standard deviation of calibration factors

X = Mean of calibration factors

_				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
	l i	Calibration				Average CF	Average CF	%RSD	%RSD
#	Standard ID	Date	Compound	(std=250ppb)	(std=250ppb)	(Initial)	(Initial)		
1	ICAL	10/28/2021	Diesel C10-C24)	2418941	2418941	2516669	2516669	8.7	8.7
	Apollo								

LDC #: 53054 AX

VALIDATION FINDINGS WORKSHEET Continuing Calibration Results Verification

Page:_	1	of <u>1</u>	
Reviewer:	F	Т	

METHOD: GC	HPLC	
MILITIOD. OC		

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. CF -CF)/ave.CF

Where: ave. CF = initial calibration average CF

CF = continuing calibration CF

A = Area of target analyte

C = Concentration of target analyte

	Standard	Calibration			Reported	Recalculated	Reported	Recalculated
#	ID	Date	Target Analyte	Average CF(Ical)/ CCV Conc.	CF/ Conc. CCV	CF/ Conc. CCV	%D	%D
1	101110	1/3/2/	Diesel C10-C24	2516670	23/4530	23/4530	8.0	8-V
2	W 1110003	11/10/2/	V	V	2403900	2103900	4.5	4.57
<u> </u>								
3								
	·							
4								
			·					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

VALIDATION FINDINGS WORKSHEET Surrogate Results Verification

Page:_	1	_of_	1
Reviewer:		FT	

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found

SS = Surrogate Spiked

Sample ID: #

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
9		144.23/	132.698	92.0	92.0	U
Н		· \lambda	אצם צטן	74.9	74.9	U

Sample ID:

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
						V

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound
Α	Chlorobenzene (CBZ)	G	Octacosane	М	Benzo(e)Pyrene	s	1-Chloro-3-Nitrobenzene	Υ	Tetrachloro-m- xylene
В_	4-Bromofluorobenzene (BFB)	Н	Ortho-Terphenyl	N	Terphenyl-D14	Т	3,4-Dinitrotoluene	z	2-Bromonaphthalene
C,	a,a,a-Trifluorotoluene	1	Fluorobenzene (FBZ)	0	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	Р	1-methylnaphthalene	V	Tri-n-propyltin	ВВ	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	к	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	w	Tributyl Phosphate	СС	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)		Bromobenzene	R	4-Nitrophenol	L X	Triphenyl Phosphate		

LDC#: 53094 A8

VALIDATION FINDINGS WORKSHEET	Page:_	_1_of_1
Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification	Reviewer	FT

METHOD:	<u>√</u> GC	HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the target analytes identified below using the following calculation:

%Recovery = 100 * (SSC/SA)

RPD =(((SSCLCS - SSCLCSD) * 2) / (SSCLCS + SSCLCSD))*100

Where SSC = Spiked sample concentration LCS = Laboratory Control Sample

SA = Spike added

LCSD = Laboratory Control Sample duplicate

LCS/LCSD samples: ____

	Spike Addęd		Spike Sample Concentration		LCS		LC	SD	LCS/I	.csd
Compound	(ug		(ug/L)		Percent Recovery		Percent Recovery		RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Diesel (co-en)	ww	2000	2/00	1980	105	105	99	99	5.9	5.9
								·		
								i		
				7.0						
	1									

Comments:			
	 		

%S= Percent Solid

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:	_1_of_1_
Reviewer:	_FT_

LDC#: 53054AB

METHOD: VGC_HPLC

The concentration of the sample was calculated for the target analyte identified below using the following calculation:

Concentration= (A)(Fv)(Df)	Example:	
(RF)(Vs or Ws)(%S/100)	Sample ID. <u>2110 29A LCS</u>	Diesel (10-CM)
A= Area or height of the target analyte to be measured	· · · · · · · · · · · · · · · · · · ·	/
Fv= Final Volume of extract		
Df= Dilution Factor		21/4420240 (5) (1000)
RF= Average response factor of the target analyte		
In the initial calibration		2516670 (1000) (2)
Vs= Initial volume of the sample		25/00/0 (1000) (2)
Ws= Initial weight of the sample		/ • /

#	Sample ID	Target analyte	Reported Concentrations (Recalculated Results Concentrations (ug /)	Qualifications
	LOS	Diesel co-czy	2/00	2/00	
		V-			
 					
<u> </u>					

Comments:			 	 		

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Volatiles

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 97943

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1823	BA44047	Water	10/20/21
ERH1824	BA44048	Water	10/20/21
ERH1826	BA44049	Water	10/20/21
ERH1827	BA44050	Water	10/20/21
ERH1829	BA44051	Water	10/20/21
ERH1830	BA44052	Water	10/20/21
ERH1832	BA44053	Water	10/20/21
ERH1833	BA44054	Water	10/20/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) which are Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- (Estimated, Bias Indeterminate): The analyte was analyzed for and positively J identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- а ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). p
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. S
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples ERH1823, ERH1826, ERH1829, and ERH1832 were identified as trip blanks. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 **Volatiles - Data Qualification Summary - SDG 97943**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Laboratory Blank Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Field Blank Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

LDC #: 53054B1a VA	LIDATION COMPLETENESS WORKSHEET	Date: 1 22
SDG #: 97943	Stage 2B	Page: <u>1</u> of <u>)</u>
Laboratory: APPL, Inc., Clovis, CA		Reviewer:
		Reviewer:
METHOD: GC/MS Volatiles (BTEX)	(EPA SW-846 Method 8260B)	
The samples listed below were revievalidation findings worksheets.	wed for each of the following validation areas. Validation f	indings are noted in attached

	Validation Area		Comments
l.	Sample receipt/Technical holding times	<u> </u>	
11.	GC/MS Instrument performance check	4	
III.	Initial calibration/ICV	A/A	°/0 PSD £ 15 1CY € 20
IV.	Continuing calibration ending	4	cw € 20 5D
V.	Laboratory Blanks	6	
VI.	Field blanks	ND	TB=1, 3, 5, 7
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	Un
IX.	Laboratory control samples	A	Les 10
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	1	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1 -	ERH1823 ፒ ዓ	BA44047	Water	10/20/21
2	ERH1824	BA44048	Water	10/20/21
3	ERH1826 TB	BA44049	Water	10/20/21
4+	ERH1827	BA44050	Water	10/20/21
5	ERH1829 T 🕏	BA44051	Water	10/20/21
3	ERH1830	BA44052	Water	10/20/21
7	ERH1832 T 19	BA44053	Water	10/20/21
8	ERH1833	BA44054	Water	10/20/21
9				

211026BM			

Laboratory Data Consultants, Inc. Data Validation Report

Red Hill Bulk Storage Facility, CTO 18F0126 **Project/Site Name:**

LDC Report Date: January 21, 2022

Polynuclear Aromatic Hydrocarbons Parameters:

Validation Level: Stage 2B

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 97943

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1824	BA44048	Water	10/20/21
ERH1827	BA44050	Water	10/20/21
ERH1830	BA44052	Water	10/20/21
ERH1833	BA44054	Water	10/20/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) which are 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene by Environmental Protection Agency (EPA) SW 846 Method 8270D in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more technically d sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory.
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits. ı
- m Result exceeded the calibration range.
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- S Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification **Summary - SDG 97943**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary -SDG 97943

No Sample Data Qualified in this SDG

LDC #: 53054B2b	VALIDATION COMPLETENESS WORKSHEET	Date: <u>1 / 1 岁</u> / ルン
SDG #: 97943	Stage 2B	Page: <u>1</u> of/
Laboratory: <u>APPL, Inc., Clovis,</u>	<u>CA</u>	Reviewer: 7
METHOD: GC/MS Polynuclear	Aromatic Hydrocarbons (EPA SW-846 Method 8270D-SIM)	
The samples listed below were validation findings worksheets.	reviewed for each of the following validation areas. Validation fin	dings are noted in attached

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A .A	
II.	GC/MS Instrument performance check	A	
111.	Initial calibration/ICV	44	0/0 PSD 615 KV 620
IV.	Continuing calibration	\(\)	0/0 PSD 415 KY 420 CW 420/5U
V.	Laboratory Blanks	۵	
VI.	Field blanks	2	
VII.	Surrogate spikes	Α	
VIII.	Matrix spike/Matrix spike duplicates	2	es
IX.	Laboratory control samples	Δ	LCSM
X.	Field duplicates	И	
XI.	Internal standards	Δ	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data		

Note:	A = Acceptable N = Not provided/applicable SW = See worksheet	ND = No compounds detected R = Rinsate FB = Field blank	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Source blank OTHER:	
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	Client ID	Lab ID	Matrix	Date
<u> </u>	ERH1824	BA44048	Water	10/20/21
2 ⁺	ERH1827	BA44050	Water	10/20/21
3	ERH1830	BA44052	Water	10/20/21
4	ERH1833	BA44054	Water	10/20/21
5				
6				
7				
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lotes:				

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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Total Organic Carbon

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 97943

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1824	BA44048	Water	10/20/21
ERH1827	BA44050	Water	10/20/21
ERH1830	BA44052	Water	10/20/21
ERH1833	BA44054	Water	10/20/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more d technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded.
- Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. S
- Presumed contamination from trip blank. t
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
11/05/21	CCV (17:26)	Total organic carbon	87.7 (90-110)	ERH1833	J- (all detects)	Р
11/06/21	CCV (03:12)	Total organic carbon	82.2 (90-110)	ERH1833	J- (all detects)	Р

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to continuing calibration %R, data were qualified as estimated in one sample.

Red Hill Bulk Storage Facility, CTO 18F0126 **Total Organic Carbon - Data Qualification Summary - SDG 97943**

Sample	Analyte	Flag	A or P	Reason (Code)
ERH1833	Total organic carbon	J- (all detects)	Р	Continuing calibration (%R) (c)

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Laboratory Blank Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Field Blank Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

LDC #: 53054B6 VALIDATION COMPLETENESS WORKSHEET SDG #: 97943 Stage 2B

e 2B Page: 1 of 1 Reviewer: 41 2nd Reviewer: 6

Laboratory: APPL, Inc., Clovis, CA

METHOD: (Analyte) TOC (EPA SW-846 Method 9060A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
l.	Sample receipt/Technical holding times	AIA	
11	Initial calibration	A	
III.	Calibration verification	S#	
IV	Laboratory Blanks	A	
V	Field blanks	\square N \square	
VI.	Matrix Spike/Matrix Spike Duplicates	N	C.S
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCSILCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	N	
XI.	Overall assessment of data	A	

Note: A =

A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	ERH1824	BA44048	Water	10/20/21
2	ERH1827	BA44050	Water	10/20/21
3	ERH1830	BA44052	Water	10/20/21
4	ERH1833	BA44054	Water	10/20/21
5				
6				
7				_
8				
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12				
13				
14				
15_				

lotes:				 					
				 		_			

LDC #: 53054B6

VALIDATION FINDINGS WORKSHEET Calibration

Page	: <u>1</u> _of	1
Reviewer:_	ATL	

METHOD: Inorganics, EPA Method_	See cover	
-		_

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YN N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Y(N)N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110%?

Y) N N/A Are all correlation coefficients >0.995?

LEVEL IV/D ONLY:

YN WA Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.

Y N (N/A) Was a balance check conducted prior to the TDS analysis.?

Y N (N/A) Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications Code: c
	11/05/21	CCV (17:26)	тос	87.7 (90-110)	4	J-/UJ/P (detect)
		CCV (03:12)		82.2 (90-110)		J-/UJ/P (detect)

Comments:	 		 		
				13.00	

Laboratory Data Consultants, Inc. Data Validation Report

Red Hill Bulk Storage Facility, CTO 18F0126 **Project/Site Name:**

LDC Report Date: January 21, 2022

Parameters: Gasoline Range Organics

Validation Level: Stage 2B

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 97943

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1823	BA44047	Water	10/20/21
ERH1824	BA44048	Water	10/20/21
ERH1826	BA44049	Water	10/20/21
ERH1827	BA44050	Water	10/20/21
ERH1829	BA44051	Water	10/20/21
ERH1830	BA44052	Water	10/20/21
ERH1832	BA44053	Water	10/20/21
ERH1833	BA44054	Water	10/20/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more technically d sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- Internal standard performance was unsatisfactory. i
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- 1 LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. S
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r²) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples ERH1823, ERH1826, ERH1829, and ERH1832 were identified as trip blanks. No contaminants were found.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 97943

No Sample Data Qualified in this SDG

LDC #: 53054B7	VALIDATION COMPLETENESS WORKSHEET
SDG #: 97943	Stage 2B
Laboratory: APPL, Inc., Clovis,	CA

Date: 1/18/22 Page:of Reviewer:
2nd Reviewer:

METHOD: GC/MS Gasoline Range Organics (EPA SW-846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
ļ <u>l.</u>	Sample receipt/Technical holding times	AIA	
II.	GC/MS Instrument performance check	A	
111.	Initial calibration/ICV	A1A	92 ICY = DO
IV.	Continuing calibration evaluation	A	CW = 20/20
V.	Laboratory Blanks	4	
VI.	Field blanks	ND	TB =1, 3, 5, 7
VII.	Surrogate spikes	4	
VIII.	Matrix spike/Matrix spike duplicates	7	US .
IX.	Laboratory control samples	<u> </u>	10010
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	_ <u> </u>	

Note: A = Acceptable N = Not provided/applicable

ND = No compounds detected R = Rinsate

D = Duplicate TB = Trip blank SB=Source blank OTHER:

	SW = See worksheet	FB = Field blank	EB = Equipment	blank	•
	Client ID		Lab ID	Matrix	Date
1	ERH1823 TB		BA44047	Water	10/20/21
2	ERH1824		BA44048	Water	10/20/21
3	ERH1826 TB		BA44049	Water	10/20/21

21 ERH1827 BA44050 Water 10/20/21 ERH1829 TB BA44051 Water 10/20/21 6 ERH1830 BA44052 Water 10/20/21 TB BA44053 10/20/21

7 ERH1832 T12 BA44053 Water 10/20/21
8 ERH1833 BA44054 Water 10/20/21

Note	es:	 <u></u>		
	21/026 BM - BIL			
	- 1			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date: March 3, 2022

Parameters: Total Petroleum Hydrocarbons as Extractables

Validation Level: Stage 2B

Laboratory: APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 97943

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1824	BA44048	Water	10/20/21
ERH1824RE	BA44048RE	Water	10/20/21
ERH1827	BA44050	Water	10/20/21
ERH1830	BA44052	Water	10/20/21
ERH1830RE	BA44052RE	Water	10/20/21
ERH1833	BA44054	Water	10/20/21
ERH1833RE	BA44054RE	Water	10/20/21
ERH1824(SGCU)	BA44048(SGCU)	Water	10/20/21
ERH1824RE(SGCU)	BA44048RE(SGCU)	Water	10/20/21
ERH1827(SGCU)	BA44050(SGCU)	Water	10/20/21
ERH1830(SGCU)	BA44052(SGCU)	Water	10/20/21
ERH1830RE(SGCU)	BA44052RE(SGCU)	Water	10/20/21
ERH1833(SGCU)	BA44054(SGCU)	Water	10/20/21
ERH1833RE(SGCU)	BA44054RE(SGCU)	Water	10/20/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Petroleum Hydrocarbons as Extractables by Environmental Protection Agency (EPA) SW 846 Method 8015B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- (Estimated, High Bias): The analyte was analyzed for and positively identified by J+ the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more technically d sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- S Surrogate recovery was not within control limits.
- Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- W LCS/LCSD RPD was high.
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average calibration factors were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0% for all analytes.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Analyte	Flag	A or P
ERH1824	ortho-Terphenyl	52.5 (56-125)	TPH as extractables	UJ (all non-detects)	Α

Sample	Surrogate	%R (Limits)	Affected Analyte	Flag	A or P
ERH1824(SGCU)	Octacosane ortho-Terphenyl	58.9 (60-142) 47.4 (56-125)	TPH as extractables	UJ (all non-detects)	А
ERH1830(SGCU)	ortho-Terphenyl	54.2 (56-125)	TPH as extractables	UJ (all non-detects)	Α
ERH1833(SGCU)	Octacosane ortho-Terphenyl	48.7 (60-142) 38.7 (56-125)	TPH as extractables	UJ (all non-detects)	А

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were recommended for exclusion as follows:

Sample	Analyte	Reason	Flag	A or P
ERH1824 ERH1830 ERH1833 ERH1824(SGCU) ERH1830(SGCU) ERH1833(SGCU)	All analytes	Lower result or surrogate outside of limits,	X	А

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Data Qualification Summary -SDG 97943

Sample	Analyte	Flag	A or P	Reason (Code)
ERH1824 ERH1830 ERH1833 ERH1824(SGCU) ERH1830(SGCU) ERH1833(SGCU)	All analytes	X	А	Overall assessment of data (d)

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Laboratory Blank Data **Qualification Summary - SDG 97943**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Field Blank Data Qualification **Summary - SDG 97943**

No Sample Data Qualified in this SDG

LDC#	t: <u>5305</u>	4B8	

VALIDATION COMPLETENESS WORKSHEET

SDG #: 97943 Laboratory: APPL, Inc., Clovis, CA Stage 2B

Reviewer:

METHOD: GC TPH as Extractables (EPA SW-846 Method 8015B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
<u>I.</u>	Sample receipt/Technical holding times	AIA	
11.	Initial calibration/ICV	4/4	% PSD = 20, (2) CV = 20
111.	Continuing calibration	b	0/0 \$50 ± 20, (\$\sigma \cd \in 20) \\ cut \(\perp \cd
IV.	Laboratory Blanks	A	
V.	Field blanks	7	
VI.	Surrogate spikes	مرد	
VII.	Matrix spike/Matrix spike duplicates	7	es
VIII.	Laboratory control samples	A	10x 10
IX.	Field duplicates	N	
X.	Target analyte quantitation	N	
XI.	Target analyte identification	N,	
XII	Overall assessment of data	سی	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank

OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	ERH1824	BA44048	Water	10/20/21
2 +3	ERH1824R	BA44048RÆ	Water	10/20/21
3+1	ERH1827	BA44050	Water	10/20/21
4*1	ERH1830	BA44052	Water	10/20/21
5 大	ERH1830RXE /	BA44052RX	Water	10/20/21
₆ 1	ERH1833	BA44054	Water	10/20/21
73	ERH1833RÆ	BA44054R₩	Water	10/20/21
8 2	ERH1824(SGCU)	BA44048(SGCU)	Water	10/20/21
9 4	ERH1824R (SGCU)	BA44048RE(SGCU)	Water	10/20/21
10 2	ERH1827(SGCU)	BA44050(SGCU)	Water	10/20/21
112	ERH1830(SGCU)	BA44052(SGCU)	Water	10/20/21
12 4	ERH1830R (SGCU)	BA44052R (SGCU)	Water	10/20/21
13 2	ERH1833(SGCU)	BA44054(SGCU)	Water	10/20/21
14 4	ERH1833R (SGCU)	BA44054R (SGCU)	Water	10/20/21
15_				
16	211026A-BIK			
. ₁₇ 2	21/026A1 - B1/4			

LDC#: 53054 B8

VALIDATION FINDINDS WORKSHEET <u>Surrogate Recovery</u>

Page:1of	1
Reviewer: FT	

METHOD: ___GC ___HPLC
Are surrogates required by the method? Yes____ or No____.

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

YNNA Were surrogates spiked into all samples and blanks?

Y(N)N/A Did all surrogate recoveries (%R) meet the QC limits?

#	Sample ID	Detector/ Column	Surrogate Compound	%R (L	.imits)	Qu	alifications
	1		H	52.5	(56-125)	1-/41/A	ND
					()		
					()		
	લ્ધ્ર		G	58.9	(60-142)	1-/U1/A	ND
			4	47.4	(56-125)	1	
					()		
			Н	54.2	(56-125)	1-/W/A	NN
					(
	13		4	4x.7	(60-142)	1-/W/Z	NN
			H	34.7	(56-125)	1 1	
							
	211103A-	BIK	H	53.8	(56-125)	17-M7/b	~
						,	
					()	 	
						 	
					(
						+	
					()		
					(

	Surrogate Compound		Surrogate Compound		Surrogate Compound Surrogate Compound				
Α	Chlorobenzene (CBZ)	G	Octacosane	М	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Υ	Tetrachloro-m- xylene
В	4-Bromofluorobenzene (BFB)	Н	Ortho-Terphenyl	N	Terphenyl-D14	Т	3,4-Dinitrotoluene	z	2-Bromonaphthalene
C`	a,a,a-Trifluorotoluene		Fluorobenzene (FBZ)	0	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	Р	1-methylnaphthalene	V	Tri-n-propyltin	ВВ	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	К	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	w	Tributyl Phosphate	СС	2,5-Dibromotoluene
F	1.4-Difluorobenzene (DFB)		Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 57054 BX

VALIDATION FINDINGS WORKSHEET <u>Overall Assessment of Data</u>

Page: _	1	_of_ <u>1</u> _	
Reviewer:_	F	Τ	

METHOD: VGC __HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Comments:

All available information pertaining to the data were reviewed using professional judgement to compliment the determination of the overall quality of the data.

(Y N	N/A Was the overall quality a	and usability of the data acceptable?		(d)
#	Associated samples	Compounds	Findings	Qualifications
	1, 4, 6, 8, 11, 13	٨١	lower result or surrogate outside limit	X/\\
			surrogati outsid	,
			1imit	
_				
				· · · · · · · · · · · · · · · · · · ·
				·

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Volatiles

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98278

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1929	BA46713	Water	11/17/21
ERH1930	BA46714	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) which are Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only).
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. S
- Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample ERH1929 was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 **Volatiles - Laboratory Blank Data Qualification Summary - SDG 98278**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Field Blank Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

SDG #	:53054C1a		PLETENE Stage 2B	SS WORKSHE		Date: /// Page:lof_ Reviewer: Reviewer:
he sa	OD: GC/MS Volatiles (BTEX) (EPA Stamples listed below were reviewed for ion findings worksheets.		·	lidation areas. Vali	Zild	reviewer
	Validation Area			C	omments	
I.	Sample receipt/Technical holding times	A /A				
II.	GC/MS Instrument performance check	Δ				
111.	Initial calibration/ICV	A/A	0/0	PSD 4 15	(2 ICY	20
IV.	Continuing calibration lending	4		civ	£ 20 50	
V.	Laboratory Blanks	A			,	
VI.	Field blanks	NO	TB=1			
VII.	Surrogate spikes	Α				
VIII.	Matrix spike/Matrix spike duplicates	7				
IX.	Laboratory control samples	A	10510			
X.	Field duplicates	1				
XI.	Internal standards	Δ				
XII.	Target analyte quantitation	N				
XIII.	Target analyte identification	N				
XIV.	System performance	N				
XV.	Overall assessment of data	7				
ote:	N = Not provided/applicable R =	= No compound: Rinsate = Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipmer	OTHER:	rce blank
	Client ID			Lab ID	Matrix	Date
^ E	RH1929 て の			BA46713	Water	11/17/21
· E	ERH1930			BA46714	Water	11/17/21
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

January 21, 2022 LDC Report Date:

Polynuclear Aromatic Hydrocarbons Parameters:

Validation Level: Stage 2B

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 98278

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1930	BA46714	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) which are 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene by Environmental Protection Agency (EPA) SW 846 Method 8270D in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary -SDG 98278

No Sample Data Qualified in this SDG

SDG	#: <u>53054C2b</u> VALIDAT #: <u>98278</u> ratory: <u>APPL, Inc., Clovis, CA</u>		PLETENESS Stage 2B	S WORKSHE		Date: 1 8 Page:lof Reviewer:
The s	HOD: GC/MS Polynuclear Aromatic Hy samples listed below were reviewed for ation findings worksheets.	·			•	noted in attache
	Validation Area			C	omments	
l.	Sample receipt/Technical holding times	4/4				
II.	GC/MS Instrument performance check	Δ				
III.	Initial calibration/ICV	A/A	0/0 ps) = 15	1cy = 20	
IV.	Continuing calibration ending	V		cW	= 20 50	
V.	Laboratory Blanks	Δ				
VI.	Field blanks	N				-
VII.	Surrogate spikes	4				
VIII.	Matrix spike/Matrix spike duplicates	N	cs			
IX.	Laboratory control samples	<u>A</u>	LCS IP			
X.	Field duplicates	N				
XI.	Internal standards	Δ				
XII.	Target analyte quantitation	N				
XIII.	Target analyte identification	N				
XIV.	System performance	N_				······································
XV.	Overall assessment of data					
Note:	N = Not provided/applicable R =	= No compounds Rinsate = Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipmer	OTHER	rce blank :
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Total Organic Carbon

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98278

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1930	BA46714	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more d technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- Presumed contamination from FB or ER. f
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- L LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- q MS/MSD recovery was not within control limits.
- S Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the V problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 **Total Organic Carbon - Data Qualification Summary - SDG 98278**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Laboratory Blank Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Field Blank Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

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he s	HOD: (Analyte) TOC (EPA SW-846) amples listed below were reviewed			ition areas. Valid	dation findings are	noted in attached
alida	tion findings worksheets. Validation Area				mments	
ļ.	Sample receipt/Technical holding times	AA				
::	Initial calibration	A				
III.	Calibration verification	A				
IV	Laboratory Blanks	A				
V	Field blanks	N				
VI.	Matrix Spike/Matrix Spike Duplicates	N	as			-
VII.	Duplicate sample analysis	Ň	<u>, , , , , , , , , , , , , , , , , , , </u>	····		
VIII.	Laboratory control samples	À	LCSILCS	D		
IX.	Field duplicates	N				
X.	Target Analyte Quantitation	N				
XI.	Overall assessment of data	A				
ote:	N = Not provided/applicable F	ND = No compounds R = Rinsate FB = Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipment	OTHER	irce blank :
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Notes:

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Gasoline Range Organics

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98278

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1929	BA46713	Water	11/17/21
ERH1930	BA46714	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work. 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- (Estimated, Low Bias): The analyte was analyzed for and positively identified by Jthe laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- а ICP Serial Dilution %D was not within control limits.
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits. 1
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). ٧

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r²) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample ERH1929 was identified as a trip blank. No contaminants were found.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 98278

No Sample Data Qualified in this SDG

LDC #: 53054C7	VALIDATION COMPLETENESS WORKSHEET	Date: 1/28/2 2
SDG #: 98278	Stage 2B	Page:_ <u>/_</u> of <i>/</i>
Laboratory: APPL, Inc., Clovis,	CA	Reviewer:
-		2nd Reviewer:

Date:	1/28/22
Page:_	<u>/</u> _of/
Reviewer:	F7
nd Reviewer	

METHOD: GC/MS Gasoline Range Organics (EPA SW-846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	A/A	
11.	GC/MS Instrument performance check	Δ	
111.	Initial calibration/ICV	411	
IV.	Continuing calibration	7	
V.	Laboratory Blanks	7	
VI.	Field blanks	NA	TPo=)
VII.	Surrogate spikes	7	
VIII.	Matrix spike/Matrix spike duplicates	2	S
IX.	Laboratory control samples	7	Les IP
X.	Field duplicates	7	
XI.	Internal standards	4	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

A = Acceptable N = Not provided/applicable Note: ND = No compounds detected D = Duplicate SB=Source blank R = Rinsate TB = Trip blank OTHER: SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
17	ERH1929 Tp	BA46713	Water	11/17/21
2	ERH1930	BA46714	Water	11/17/21
3				
4				
5				
6	2			
7				
8				
9				

Notes: 211179AL-BIH

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Total Petroleum Hydrocarbons as Extractables

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98278

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1930	BA46714	Water	11/17/21
ERH1930(SGCU)	BA46714(SGCU)	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan. Addendum 03. 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Petroleum Hydrocarbons as Extractables by Environmental Protection Agency (EPA) SW 846 Method 8015B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- (Estimated, High Bias): The analyte was analyzed for and positively identified by J+ the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- (Estimated, Bias Indeterminate): The analyte was analyzed for and positively J identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- (Not Applicable): The non-conformance discovered during data validation NA demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average calibration factors were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0% for all analytes.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Data Qualification Summary -SDG 98278

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Laboratory Blank Data **Qualification Summary - SDG 98278**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Field Blank Data Qualification **Summary - SDG 98278**

No Sample Data Qualified in this SDG

				S WORKSHEET		Date: 1/18
	#: <u>98278</u> atory: <u>APPL, Inc., Clovis, CA</u>	3	Stage 2B		1	Page:bf Reviewer:
Lavoic	ALOLY. AFFL, IIIC., CIOVIS, OA				2nd l	Reviewer:
METH	IOD: GC TPH as Extractables (EPA SW-	846 Metho	od 8015B)			
The sa	amples listed below were reviewed for eac	ch of the f	following valida	etion areas. Validation	n findings are	noted in attache
	tion findings worksheets.		JIIO W. I. I.	morraneau.		noted in discount
	Validation Area			Comme	ents	
l.	Sample receipt/Technical holding times	AIA			<u></u>	
11.	Initial calibration/ICV	AIA	00 850	1 w 12	1cv = 22)
III.	Continuing calibration ewing	Δ		CWE.	10/ ± 20/20	
IV.	Laboratory Blanks	A				
V.	Field blanks	7				
VI.	Surrogate spikes	4				
VII.	Matrix spike/Matrix spike duplicates		25			
VIII.	Laboratory control samples	Δ	res 10			
IX.	Field duplicates	N				
X.	Target analyte quantitation	N				
XI.	Target analyte identification	N				
LXIL	Overall assessment of data					
Note:	N = Not provided/applicable R = Rins	o compounds sate eld blank	s detected	D = Duplicate TB = Trip blank EB = Equipment blank	OTHER:	rce blank
(Client ID			Lab ID	Matrix	Date
1 E	ERH1930			BA46714	Water	11/17/21
2 E	ERH1930(SGCU)			BA46714(SGCU)	Water	11/17/21
3						
4						
5						
6						
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9						
10						
11_						

211/22 A-BIK			
211122 AI-BIK			
,			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Volatiles

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98285

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1932	BA46715	Water	11/17/21
ERH1933	BA46716	Water	11/17/21
ERH1935	BA46717	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017). the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) which are Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- а ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- L LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. S
- Presumed contamination from trip blank. t
- Unusual problems found with the data not defined elsewhere. Description of the ٧ problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample ERH1932 was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples ERH1933 and ERH1935 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 **Volatiles - Laboratory Blank Data Qualification Summary - SDG 98285**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Field Blank Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

SDG # Labora	: 53054D1a VALIDATI : 98285 atory: APPL, Inc., Clovis, CA OD: GC/MS Volatiles (BTEX) (EPA S)	S	tage 2B	S WORKSHEE	1	Date:
	amples listed below were reviewed for a lion findings worksheets.	each of the fo	ollowing valida	tion areas. Validat	ion findings are	noted in attach
	Validation Area			Com	ments	
I.	Sample receipt/Technical holding times	AIA			<u> </u>	
II.	GC/MS Instrument performance check	4				
III.	Initial calibration/ICV	414	% PSD	±15 12	1CY = 20	
IV.	Continuing calibration	4		£15, 12 cw.	£ 20 50	
V.	Laboratory Blanks	Δ				
VI.	Field blanks	140	TB =			
VII.	Surrogate spikes	Δ				
VIII.	Matrix spike/Matrix spike duplicates	N				
IX.	Laboratory control samples	1	LCS 10	1		
X.	Field duplicates	W	D = 7	; う		
XI.	Internal standards	4				
XII.	Target analyte quantitation	N				
XIII.	Target analyte identification	N				
XIV.	System performance	N				
XV.	Overall assessment of data					
Note:	N = Not provided/applicable R = I	- No compounds Rinsate - Field blank	detected	D = Duplicate TB = Trip blank EB = Equipment bla	OTHER:	rce blank
	Client ID	****		Lab ID	Matrix	Date
1 E	ERH1932 TB			BA46715	Water	11/17/21
2 E	ERH1933			BA46716	Water	11/17/21

	Client ID		 	Lab ID	Matrix	Date
1	ERH1932 TB			BA46715	Water	11/17/21
2	ERH1933		 	BA46716	Water	11/17/21
3	ERH1935			BA46717	Water	11/17/21
4						
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9						
lotes	s:					
	211/29AL					
		<u> </u>	 1 1			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Polynuclear Aromatic Hydrocarbons

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98285

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1933	BA46716	Water	11/17/21
ERH1935	BA46717	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) which are 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene by Environmental Protection Agency (EPA) SW 846 Method 8270D in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- (Estimated, Low Bias): The analyte was analyzed for and positively identified by Jthe laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- а ICP Serial Dilution %D was not within control limits.
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- 1 LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- Presumed contamination from trip blank. t
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples ERH1933 and ERH1935 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary -SDG 98285

No Sample Data Qualified in this SDG

LDC #: 53054D2b	VALIDATION COMPLETENESS WORKSHEET	
SDG #: <u>98285</u>	Stage 2B	
Laboratory: <u>APPL, Inc., Clovi</u> s	<u>s, CA</u>	0

Date: 1 /18/22
Page:_/_of/
Reviewer: 77
2nd Reviewer:

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW-846 Method 8270D-SIM)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	4/4	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	0/0 PSD = 15 ICV = 20 CU = 20/50
IV.	Continuing calibration enama	A	au = 20/50
V.	Laboratory Blanks	Δ	t
VI.	Field blanks	1	
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	N	es
IX.	Laboratory control samples	Δ	res 10
X.	Field duplicates	NO	D = 1,2
XI.	Internal standards	Δ	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	4	

Note:	A = Acceptable N = Not provided/applicable SW = See worksheet	ND = No compounds detected R = Rinsate FB = Field blank	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Source b OTHER:	olank
	Client ID		Lab ID	Matrix	Date
1	ERH1933		BA46716	Water	11/17/21
1 2	ERH1935		BA46717	Water	11/17/21
3					
4					
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6					
7					
8					
9					
Notes:					
	211119AK				

Note:

Laboratory Data Consultants, Inc. Data Validation Report

Red Hill Bulk Storage Facility, CTO 18F0126 **Project/Site Name:**

LDC Report Date: January 21, 2022

Total Organic Carbon Parameters:

Stage 2B Validation Level:

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 98285

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1933	BA46716	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 **Total Organic Carbon - Data Qualification Summary - SDG 98285**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Laboratory Blank Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Field Blank Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

				S WORKSHEET		Date: 1/19
	t: <u>98285</u> atory: <u>APPL, Inc., Clovis, CA</u>	S	tage 2B		1	Page: / of / Reviewer: AJV
MFTH	OD: (Analyte) TOC (EPA SW-846 I	Method 9060A)			2nd l	Reviewer:
The sa	amples listed below were reviewed for ion findings worksheets.			ation areas. Validatio	n findings are	noted in attache
	Validation Area			Comm	ents	
ı.	Sample receipt/Technical holding times	AA				
П	Initial calibration	A				
111.	Calibration verification	A				
IV	Laboratory Blanks	A				
V	Field blanks	N		·		
VI.	Matrix Spike/Matrix Spike Duplicates	\mathcal{N}	CS		<u> </u>	
VII.	Duplicate sample analysis	N_{\perp}				
VIII.	Laboratory control samples	A	LOSILO	SD		1.0
IX.	Field duplicates	N			<u></u>	· · · · · · · · · · · · · · · · · · ·
X.	Target Analyte Quantitation	N				
XI.	Overall assessment of data	A			···	
Note:	N = Not provided/applicable R	ID = No compounds t = Rinsate B = Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipment blank	OTHER:	rce blank
	Client ID			Lab ID	Matrix	Date
1 E	ERH1933			BA46716	Water	11/17/21
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Notes:_____

Laboratory Data Consultants, Inc. Data Validation Report

Red Hill Bulk Storage Facility, CTO 18F0126 **Project/Site Name:**

LDC Report Date: January 21, 2022

Parameters: Gasoline Range Organics

Validation Level: Stage 2B

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 98285

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1932	BA46715	Water	11/17/21
ERH1933	BA46716	Water	11/17/21
ERH1935	BA46717	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- (Not Applicable): The non-conformance discovered during data validation NA demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- 1 LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). ٧

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r²) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample ERH1932 was identified as a trip blank. No contaminants were found.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

Samples ERH1933 and ERH1935 were identified as field duplicates. No results were detected in any of the samples.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 98285

No Sample Data Qualified in this SDG

				S WORKSHE	ET	Date: 1/1
	t: <u>98285</u> atory: <u>APPL, Inc., Clovis, CA</u>	5	Stage 2B			Page:/_of Reviewer:
METH The sa	OD: GC/MS Gasoline Range Organics amples listed below were reviewed for elion findings worksheets.	•		·	2nd	Reviewer:
	Validation Area			Co	omments	
I.	Sample receipt/Technical holding times	A /A				
11.	GC/MS Instrument performance check	A			<u></u>	
III.	Initial calibration/ICV	A/A	0/2 750	42	1CV = 20	
IV.	Continuing calibration endura	A			CCV = 20 2	$ oldsymbol{m{z}} $
V.	Laboratory Blanks	Δ			t	
VI.	Field blanks	ND	TB-1			
VII.	Surrogate spikes	<u>\</u>		-		
VIII.	Matrix spike/Matrix spike duplicates	7	U>			
IX.	Laboratory control samples	A	ves 10			
X.	Field duplicates	ND	D= 2.	+3		
XI.	Internal standards	7				
XII.	Target analyte quantitation	N				
XIII.	Target analyte identification	N				
XIV.	System performance	N				
XV.	Overall assessment of data	<u> </u>	[
lote:	N = Not provided/applicable R = F	No compounds Rinsate Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipment	OTHER	rce blank
	Client ID			Lab ID	Matrix	Date
î E	RH1932 №			BA46715	Water	11/17/21
2 E	ERH1933			BA46716	Water	11/17/21
3 E	RH1935			BA46717	Water	11/17/21
4						
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Note	s:					
	211179AV					
				-		

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

January 21, 2022 **LDC Report Date:**

Total Petroleum Hydrocarbons as Extractables Parameters:

Validation Level: Stage 2B

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 98285

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1933	BA46716	Water	11/17/21
ERH1935	BA46717	Water	11/17/21
ERH1933(SGCU)	BA46716(SGCU)	Water	11/17/21
ERH1935(SGCU)	BA46717(SGCU)	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Petroleum Hydrocarbons as Extractables by Environmental Protection Agency (EPA) SW 846 Method 8015B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- (Estimated, High Bias): The analyte was analyzed for and positively identified by J+ the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- (Exclusion of data recommended): The sample results (including non-detects) Χ were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more technically d sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- 1 LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- 0 Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- У Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average calibration factors were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0% for all analytes.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

ERH1933 and ERH1935 and samples ERH1933(SGCU) Samples ERH1935(SGCU) were identified as field duplicates. No results were detected in any of the samples.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Data Qualification Summary -SDG 98285

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Laboratory Blank Data **Qualification Summary - SDG 98285**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Field Blank Data Qualification **Summary - SDG 98285**

No Sample Data Qualified in this SDG

SDG #	::53054D8 ::98285 atory: APPL, Inc., Clovis, C			LETENESS tage 2B	WORKSHEET	F	Date: 1/18/ Page: 1 of ewer: F
	OD: GC TPH as Extractal		846 Metho	d 8015B)		2nd Revi	ewer:
	amples listed below were r	·			tion areas. Validation	findings are note	ed in attached
	ion findings worksheets.			_		-	
	Validation A	rea			Comme	nts	
1.	Sample receipt/Technical hold	ling times	414				
11.	Initial calibration/ICV		Δ / Δ	% PSD	= 20, 12	1W = 20	
111.	Continuing calibration end	ing	٨	•	CW =	20/20	
IV.	Laboratory Blanks	7	Δ			· · · · · · · · · · · · · · · · · · ·	
V.	Field blanks		N				
VI.	Surrogate spikes		Δ				
VII.	Matrix spike/Matrix spike dupli	cates	N	! 			
VIII.	Laboratory control samples		Δ	ics IP	·		
IX.	Field duplicates		NO	0=1,2	3,4		
X	Target analyte quantitation		N		\		
XI.	Target analyte identification		N				
سح	Overall assessment of data		4				
Note:	A = Acceptable N = Not provided/applicable SW = See worksheet	R = Rins	o compounds sate eld blank	detected	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Source b OTHER:	lank
	Client ID				Lab ID	Matrix	Date
1- [ERH1933 Ø)			BA46716	Water	11/17/21
27 1	ERH1935)			BA46717	Water	11/17/21
3- 1	ERH1933(SGCU)	?			BA46716(SGCU)	Water	11/17/21
4	ERH1935(SGCU)	<u>'</u>			BA46717(SGCU)	Water	11/17/21
5							
6							
7						<u></u>	
8							
9							
10							
11							
12							
13							
Notes:							

2111 22 A - BIK

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Volatiles

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98299

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1917	BA46826	Water	11/17/21
ERH1918	BA46827	Water	11/17/21
ERH1920	BA46828	Water	11/17/21
ERH1921	BA46829	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) which are Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more technically d sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample O custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits.
- Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- W LCS/LCSD RPD was high.
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples ERH1917 and ERH1920 were identified as trip blanks. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Laboratory Blank Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Field Blank Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

_DC #:53054E1a VALIDATION COMPLETENESS WORKSHEET	Date: 1/18/11
SDG #: 98299 Stage 2B	Page: / of /
_aboratory: APPL, Inc., Clovis, CA	Reviewer:
METHOD: GC/MS Volatiles (BTEX) (EPA SW-846 Method 8260B)	2nd Reviewer: /

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	A/A	
11.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/Δ	2/0 PSD = 15, 12 W = 20
IV.	Continuing calibration ending	4	CW = 20/50
V.	Laboratory Blanks	Δ	
VI.	Field blanks	NO	TB= 1,3
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	14	כט
IX.	Laboratory control samples	Δ	10510
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	N	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank N = Not provided/applicable SW = See worksheet R = Rinsate TB = Trip blank OTHER: FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	ERH1917 TB	BA46826	Water	11/17/21
2	ERH1918	BA46827	Water	11/17/21
3	ERH1920 7	BA46828	Water	11/17/21
4	ERH1921	BA46829	Water	11/17/21
5				
6				
7				
8				
9				

211129 AL-BIK

Laboratory Data Consultants, Inc. **Data Validation Report**

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

January 21, 2022 **LDC Report Date:**

Polynuclear Aromatic Hydrocarbons Parameters:

Validation Level: Stage 2B

Laboratory: APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98299

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1918	BA46827	Water	11/17/21
ERH1921	BA46829	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) which are 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene by Environmental Protection Agency (EPA) SW 846 Method 8270D in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Analyte	Flag	A or P
ERH1921	Fluoranthene-d10	52.3 (58-120)	All analytes	J- (all detects)	Р

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to surrogate %R, data were qualified as estimated in one sample.

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 98299

Sample	Analyte	Flag	A or P	Reason (Code)
ERH1921	All analytes	J- (all detects)	Р	Surrogates (%R) (s)

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification **Summary - SDG 98299**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary -SDG 98299

No Sample Data Qualified in this SDG

SDG #	: 53054E2b VALIDATIO #: 98299 atory: APPL, Inc., Clovis, CA	WORKSHEET	F	Date: 1/8/12 Page: 1 of 1		
ИЕТН	OD: GC/MS Polynuclear Aromatic Hydro	ocarbons (E	EPA SW-846 I	Method 8270D-SIM)	Ziiu Nev	lewer
	amples listed below were reviewed for ea ion findings worksheets.	ch of the fo	ollowing valida	tion areas. Validation	findings are not	ed in attached
	Validation Area			Comme	nts	
I.	Sample receipt/Technical holding times	A /A				
11.	GC/MS Instrument performance check	4	<u> </u>			
III.	Initial calibration/ICV	AIA	% PSD =	=15 ley.	<u>∠</u> 20	
IV.	Continuing calibration ending	A			= 20 50	
V.	Laboratory Blanks	Δ				
VI.	Field blanks	N		······································		
VII.	Surrogate spikes	SU				
VIII.	Matrix spike/Matrix spike duplicates	7				
IX.	Laboratory control samples	A	LCSIV			
X.	Field duplicates	7				
XI.	Internal standards	Δ				
XII.	Target analyte quantitation	N				
XIII.	Target analyte identification	N				
XIV.	System performance	N				
XV.	Overall assessment of data	Δ				
lote:	N = Not provided/applicable R = Rin	o compounds sate eld blank	s detected	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Source b OTHER:	lank
1	Client ID			Lab ID	Matrix	Date
1 T E	ERH1918			BA46827	Water	11/17/21
2+ [ERH1921			BA46829	Water	11/17/21
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LDC#: 53054E25

VALIDATION FINDINGS WORKSHEET Surrogate Recovery

Page:_	_/of_	_/
Reviewer:	FT	

METHOD: GC/MS BNA (EPA SW 846 Method 8270 ♥)
Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

N/A H4 Y Were percent recoveries (%R) for surrogates within QC limits?

YNNA	If 2 or more base neutral If any %R was less than	or acid surrogates were outside C 10 percent, was a reanalysis perfo	QC limits, was a reanalysis ormed to confirm %R?	performed to confirm	1 %R?		(3)	
#	Sample ID	Surrogate	%R (Lim	its)			Qualifications	
	2	44-DIO	52.3	(58-120)	7-	Lu	IP Det	
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(NBZ) = Nitrobenzene - d5 (FBP) = 2-Fluorobiphenyl

(2FP) = 2-Fluorophenol (TBP) = 2,4,6 -Tribromophenol (2CP) = 2-Chlorophenol - d4

(TPH) = Terphenyl - d14

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Total Organic Carbon

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98299

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1918	BA46827	Water	11/17/21
ERH1921	BA46829	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 **Total Organic Carbon - Data Qualification Summary - SDG 98299**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Laboratory Blank Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Field Blank Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 53054E6 Stage 2B SDG #: 98299

Page: of Reviewer: ATV Laboratory: APPL, Inc., Clovis, CA 2nd Reviewer:__

METHOD: (Analyte) TOC (EPA SW-846 Method 9060A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
1.	Sample receipt/Technical holding times	AIA	
II	Initial calibration	A	
111.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	CIS
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCSILCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	N	
XI.	Overall assessment of data	A	

A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank Note: N = Not provided/applicable R = Rinsate TB = Trip blank OTHER: SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	ERH1918	BA46827	Water	11/17/21
2	ERH1921	BA46829	Water	11/17/21
3				
4				
5				
6				
7				:
8				
9				
10				
11				
12				
13				
14				
15				

Notes:	15	 		
	Notes:			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date: January 21, 2022

Parameters: Gasoline Range Organics

Validation Level: Stage 2B

APPL, Inc., Clovis, CA Laboratory:

Sample Delivery Group (SDG): 98299

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1917	BA46826	Water	11/17/21
ERH1918	BA46827	Water	11/17/21
ERH1920	BA46828	Water	11/17/21
ERH1921	BA46829	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- (Estimated, High Bias): The analyte was analyzed for and positively identified by J+the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r²) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples ERH1917 and ERH1920 were identified as trip blanks. No contaminants were found.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 98299

No Sample Data Qualified in this SDG

LDC #: 53054E7	VALIDATION COMPLETENESS WORKSHEET
SDG #: 08200	Stage 2B

Date: 1 18 22

Page: of 1

Reviewer: 2nd Reviewer:

Laboratory: APPL, Inc., Clovis, CA

METHOD: GC/MS Gasoline Range Organics (EPA SW-846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
<u> </u>	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check		
111.	Initial calibration/ICV	4/0	y γ (N ≤ 20)
IV.	Continuing calibration e win	Δ	V 1 (N ≤ 20 20 20 20 20 20 20 20 20 20 20 20 20
V.	Laboratory Blanks	Δ	,
VI.	Field blanks	NO	TB=1,3
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	7	US
IX.	Laboratory control samples	A	10510
X.	Field duplicates	N	
XI.	Internal standards	Α	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	<u> </u>	

Note: A = Acceptable

N = Not provided/applicable SW = See worksheet ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank

EB = Equipment blank

SB=Source blank OTHER:

Date **Client ID** Lab ID Matrix ERH1917 BA46826 Water 11/17/21 ERH1918 BA46827 Water 11/17/21 TB BA46828 11/17/21 ERH1920 Water 44 ERH1921 BA46829 Water 11/17/21 6 8

211129AL-81K			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Total Petroleum Hydrocarbons as Extractables

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98299

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1918	BA46827	Water	11/17/21
ERH1921	BA46829	Water	11/17/21
ERH1918(SGCU)	BA46827(SGCU)	Water	11/17/21
ERH1921(SGCU)	BA46829(SGCU)	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Petroleum Hydrocarbons as Extractables by Environmental Protection Agency (EPA) SW 846 Method 8015B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- Χ (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0% for all analytes.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Data Qualification Summary -SDG 98299

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Laboratory Blank Data **Qualification Summary - SDG 98299**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Field Blank Data Qualification **Summary - SDG 98299**

No Sample Data Qualified in this SDG

SDG # Labora	#:53054E8 VALIDATION #:_98299 ratory: APPL, Inc., Clovis, CA HOD: GC TPH as Extractables (EPA SW-i	S	Stage 2B	S WORKSHEET	F	Date: 1/8 Page: of) riewer: ** riewer: **
The sa	amples listed below were reviewed for each tion findings worksheets.		·	ation areas. Validation	ı findings are note	ed in attached
<u></u>	Validation Area	<u> </u>	<u> </u>	Comme	ints	
_ l.	Sample receipt/Technical holding times	A/A	1			<u> </u>
II.	Initial calibration/ICV	A/A	0 /0 P3	D = 7:0 1	CY = W	
III.	Continuing calibration ending	4	<u> </u>	con e	= 20/20	
IV.	Laboratory Blanks	Δ	<u> </u>		t .	
V.	Field blanks	7				
VI.	Surrogate spikes	Δ				
VII.	Matrix spike/Matrix spike duplicates	7	45			
VIII.	Laboratory control samples	Δ	Les W			
IX.	Field duplicates	N				
X.	Target analyte quantitation	N				
XI.	Target analyte identification	N				
XII	Overall assessment of data	A				
Note: A = Acceptable ND = No comp N = Not provided/applicable R = Rinsate SW = See worksheet FB = Field bla			s detected	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Source bl OTHER:	lank
	Client ID			Lab ID	Matrix	Date
1 + 1	ERH1918			BA46827	Water	11/17/21
+	ERH1921			BA46829	Water	11/17/21
	ERH1918(SGCU)			BA46827(SGCU)	Water	11/17/21
ا بد اا	ERH1921(SGCU)			BA46829(SGCU)	Water	11/17/21
5	21111021(0000)			Britisani,	11445	10
6						
7				 		
				1	+	
8				 	+	
9				 	+	+
10				 	+	
11				<u> </u>	_	

Notes:			
21119A -B112			
211119AI-BIK			

Laboratory Data Consultants, Inc. **Data Validation Report**

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Volatiles

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98300

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1923	BA46820	Water	11/17/21
ERH1924	BA46821	Water	11/17/21
ERH1926	BA46822	Water	11/17/21
ERH1927	BA46823	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017). the 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), the Sampling and Analysis Plan. Addendum 01. 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) which are Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- а ICP Serial Dilution %D was not within control limits.
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more technically d sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- Presumed contamination from FB or ER. f
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples ERH1923 and ERH1926 were identified as trip blanks. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Volatiles - Laboratory Blank Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 **Volatiles - Field Blank Data Qualification Summary - SDG 98300**

No Sample Data Qualified in this SDG

LDC #: 53054F1a VALIDATION COMPLETENESS WORKSHEET	Date: 1/18/22
SDG #: 98300 Stage 2B	Page:_ <u>_</u> _of
Laboratory: <u>APPL, Inc., Clovis, CA</u>	Reviewer: 7
METHOD: GC/MS Volatiles (BTEX) (EPA SW-846 Method 8260B)	
The samples listed below were reviewed for each of the following validation areas. Validation fir validation findings worksheets.	dings are noted in attached

	Validation Area		Comments
I.	Sample receipt/Technical holding times	AIA	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	4,0	0/0 PSD = 15 (2 10Y = 20) CUY = 20/30
IV.	Continuing calibration ending	D	CU = 20/3D
V.	Laboratory Blanks	7	•
VI.	Field blanks	ND	TB = 1,3
VII.	Surrogate spikes	\ <u>\</u>	
VIII.	Matrix spike/Matrix spike duplicates	1	US
IX.	Laboratory control samples	Δ	LOSID
X.	Field duplicates	N	
XI.	Internal standards	b	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	T 4	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank N = Not provided/applicable R = Rinsate TB = Trip blank OTHER: SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	ERH1923 でり	BA46820	Water	11/17/21
2	ERH1924	BA46821	Water	11/17/21
3-	ERH1926 Tp	BA46822	Water	11/17/21
4-	ERH1927	BA46823	Water	11/17/21
5				
6				
7				
8				
9				

Note	es:	 	 	 	 	
	21117					
	211129 AL					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date: January 21, 2022

Polynuclear Aromatic Hydrocarbons Parameters:

Validation Level: Stage 2B

Laboratory: APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98300

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1924	BA46821	Water	11/17/21
ERH1927	BA46823	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017). the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) which are 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene by Environmental Protection Agency (EPA) SW 846 Method 8270D in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary -**SDG 98300**

No Sample Data Qualified in this SDG

SDG #	#: 53054F2b VALIDATIC #: 98300 ratory: <u>APPL, Inc., Clovis, CA</u>		PLETENE Stage 2B	SS WORKSHEE		Date: 1 8 Page: of Reviewer: 5
METH	HOD: GC/MS Polynuclear Aromatic Hydr	rocarbons (I	EPA SW-84	16 Method 8270D-SIN		
	amples listed below were reviewed for e tion findings worksheets.	ach of the f	ollowing val	idation areas. Valida	tion findings are	noted in attached
	Validation Area			Com	ments	
1.	Sample receipt/Technical holding times	A/A			<u> </u>	
II.	GC/MS Instrument performance check	<u>A</u>				
111	Initial calibration/ICV	AIA	1/0 PS	D = 15 10	CY = 20	
IV.	Continuing calibration endina	Δ	<u> </u>	D = 15 10 CW = 1	20/50	
V.	Laboratory Blanks	4				
VI.	Field blanks	1				
VII.	Surrogate spikes	A				
VIII.	Matrix spike/Matrix spike duplicates	7	C			
IX.	Laboratory control samples	A	Les 10			
X.	Field duplicates	N				
XI.	Internal standards	A			_	
XII.	Target analyte quantitation	N		-		
XIII.	Target analyte identification	N				
XIV.	System performance	N				
XV.	Overall assessment of data	Δ				
Note:	N = Not provided/applicable R = Ri	No compound: insate Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipment bla	OTHER:	rce blank
	Client ID			Lab ID	Matrix	Date
	ERH1924			BA46821	Water	11/17/21
2	ERH1927			BA46823	Water	11/17/21
3						
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Notes:						
<u> </u>	211119AK - BIK					

Laboratory Data Consultants, Inc. Data Validation Report

Red Hill Bulk Storage Facility, CTO 18F0126 **Project/Site Name:**

January 21, 2022 **LDC Report Date:**

Parameters: **Total Organic Carbon**

Validation Level: Stage 2B

Laboratory: APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98300

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1924	BA46821	Water	11/17/21
ERH1927	BA46823	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific quidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- ICP Serial Dilution %D was not within control limits. а
- b Presumed contamination from preparation (method blank).
- Calibration %RSD, r, r², %D or %R was noncompliant.
- The analysis with this flag should not be used because another more d technically sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- Holding times were exceeded. h
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- ı LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample O custody problems.
- RPD between two columns was high (GC only). p
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). ٧

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 **Total Organic Carbon - Data Qualification Summary - SDG 98300**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Laboratory Blank Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Organic Carbon - Field Blank Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

VALIDATION COMPLETENESS WORKSHEET LDC #: 53054F6

SDG #: 98300 Laboratory: APPL, Inc., Clovis, CA Stage 2B

Date:	1	19	122
Page:_			<u> </u>
Reviewer:		ATT	_
2nd Reviewer:		M	
		•	

METHOD: (Analyte) TOC (EPA SW-846 Method 9060A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	AIA	
11_	Initial calibration	A	
III.	Calibration verification	A	
IV_	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	C.S
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS/LCSD
IX.	Field duplicates	N	,
Χ	Target Analyte Quantitation	N	
XI.	Overall assessment of data	A	

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank EB = Equipment blank SB=Source blank OTHER:

	Client ID	Lab ID	Matrix	Date
1	ERH1924	BA46821	Water	11/17/21
2	ERH1927	BA46823	Water	11/17/21
3				
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13				
14				
15				

Notes:		 	
-			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Gasoline Range Organics

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98300

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1923	BA46820	Water	11/17/21
ERH1924	BA46821	Water	11/17/21
ERH1926	BA46822	Water	11/17/21
ERH1927	BA46823	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- а ICP Serial Dilution %D was not within control limits.
- Presumed contamination from preparation (method blank). b
- Calibration %RSD, r, r², %D or %R was noncompliant. С
- The analysis with this flag should not be used because another more technically d sound analysis is available.
- MS/MSD or Duplicate RPD was high. е
- f Presumed contamination from FB or ER.
- ICP ICS results were unsatisfactory. g
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- Estimated Maximum Possible Concentration (HRGC/HRMS only) k
- LCS/LCSD %R was not within control limits.
- Result exceeded the calibration range. m
- Cooler temperature or temperature blank was noncompliant and/or sample 0 custody problems.
- RPD between two columns was high (GC only). р
- MS/MSD recovery was not within control limits. q
- Surrogate recovery was not within control limits. s
- Presumed contamination from trip blank. t
- Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- LCS/LCSD RPD was high. W
- Chemical recovery was not within control limits (Radiochemistry only). У

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r2) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples ERH1923 and ERH1926 were identified as trip blanks. No contaminants were found.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 98300

No Sample Data Qualified in this SDG

SDG Labor	#: 98300 ratory: APPL, Inc., Clovis, CA	S	Stage 2B	S WORKSHEET	J	Date: 1 8 Page: 1 of Reviewer: Reviewer:
The s	HOD: GC/MS Gasoline Range Organics samples listed below were reviewed for e			·	on findings are	noted in attache
valida	ation findings worksheets.					
	Validation Area			Comm	nents	
١.	Sample receipt/Technical holding times	4/4				
II.	GC/MS Instrument performance check	Δ				
III.	Initial calibration/ICV	AA	F	1CY 520		
IV.	Continuing calibration ending	Δ		CW = 20/20	>	
V.	Laboratory Blanks	٨				
VI.	Field blanks	NN	TB=12	<u> </u>		
VII.	Surrogate spikes	Δ	11 -			
VIII.	Matrix spike/Matrix spike duplicates	7	U>			
IX.	Laboratory control samples	A	LOSID			
X.	Field duplicates	И				
XI.	Internal standards	Δ				
XII.	Target analyte quantitation	N				
XIII.		N				
XIV.		N				
XV.	Overall assessment of data					
Note:	N = Not provided/applicable R = R	= No compounds Rinsate = Field blank	s detected	D = Duplicate TB = Trip blank EB = Equipment blar	OTHER:	rce blank :
	Client ID			Lab ID	Matrix	Date
1	ERH1923 TS			BA46820	Water	11/17/21
2	ERH1924			BA46821	Water	11/17/21
3	ERH1926 TO			BA46822	Water	11/17/21
	ERH1927			BA46823	Water	11/17/21

3	ERH1926 TO	 BA46822	Water	11/17/21
4	ERH1927	BA46823	Water	11/17/21
5				
6				
7				
8		 		
9		<u> </u>		
Notes:		 		
	211129AL			

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

Total Petroleum Hydrocarbons as Extractables

Validation Level:

Stage 2B

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98300

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1924	BA46821	Water	11/17/21
ERH1927	BA46823	Water	11/17/21
ERH1924(SGCU)	BA46821(SGCU)	Water	11/17/21
ERH1927(SGCU)	BA46823(SGCU)	Water	11/17/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work. 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Total Petroleum Hydrocarbons as Extractables by Environmental Protection Agency (EPA) SW 846 Method 8015B

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average calibration factors were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r²) were greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

III. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0% for all analytes.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Data Qualification Summary -**SDG 98300**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Laboratory Blank Data **Qualification Summary - SDG 98300**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 Total Petroleum Hydrocarbons as Extractables - Field Blank Data Qualification **Summary - SDG 98300**

No Sample Data Qualified in this SDG

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LDC	#: <u>53054F8</u>	VALIDATIO	ON COMP	LETENES	S WORKSH	EET		Date: 1/18
	#: <u>98300</u>		S	tage 2B				Page:lof
Labo	aboratory: <u>APPL, Inc., Clovis, CA</u> Reviewer:							
MET	METHOD: GC TPH as Extractables (EPA SW-846 Method 8015B)							
The	samples listed below we	ere reviewed for e	ach of the fo	ollowing valid	ation areas. Val	lidation findin	gs are note	ed in attached
	ation findings workshee			· ·				
	Validatio	n Area			С	omments		
1.	Sample receipt/Technical	holding times	AIA					
II.	Initial calibration/ICV		AIA	0/0 PS	£ 20, (2 10	1 = W	
111.	Continuing calibration	lendina	<u> </u>		(CW = 20	20	
IV.	Laboratory Blanks	1 7	1					
V.	Field blanks		1					
VI.	Surrogate spikes		Δ					
VII.	Matrix spike/Matrix spike	duplicates	7	<i>U</i> >				
VIII	Laboratory control sample	98	A	LOS V		·		
IX.	Field duplicates		N					
Χ.	Target analyte quantitation	n	, N					
XI.	Target analyte identification	on	N					
LXIL	Overall assessment of date	ta						
Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank N = Not provided/applicable R = Rinsate TB = Trip blank OTHER: SW = See worksheet FB = Field blank EB = Equipment blank					lank			
	Client ID				Lab ID	Matrix	x	Date
† 1	ERH1924				BA46821	Water	T	11/17/21
2+	ERH1927		BA46823	Water	<u> </u>	11/17/21		
3+	ERH1924(SGCU)		BA46821(SGCU) Water	r	11/17/21		
4 +	ERH1927(SGCU)		BA46823(SGCU) Water	r	11/17/21		
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13 Notes:								

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name: Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date: March 4, 2022

Parameters: 2-(2-Methoxyethoxy)-ethanol

Validation Level: Stage 2B

Laboratory: APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98556

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH2265	BA48142	Water	12/21/21
ERH2267	BA48143	Water	12/21/21

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work, 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 02, January 2017), the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

2-(2-Methoxyethoxy)-ethanol by Environmental Protection Agency (EPA) SW 846 Method 8270D Modified

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0%.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were not added to all samples by the laboratory. Although the LCSD percent recovery was outside the QC limits, using professional judgement, no data were qualified.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
211222A LCS/LCSD (All samples in SDG 98556)	2-(2-Methoxyethoxy)-ethanol		159 (30-130)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
211222A LCS/LCSD (All samples in SDG 98556)	2-(2-Methoxyethoxy)-ethanol	38.8 (≤20)	NA	-

X. Field Duplicates

Samples ERH2265 and ERH2267 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method with the exception noted in Section VII. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 2-(2-Methoxyethoxy)-ethanol - Data Qualification Summary - SDG 98566

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 2-(2-Methoxyethoxy)-ethanol - Laboratory Blank Data Qualification Summary -SDG 98566

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 2-(2-Methoxyethoxy)-ethanol - Field Blank Data Qualification Summary - SDG 98566

No Sample Data Qualified in this SDG

LDC #	#:53054H2c VALIDATIO	N COMP	LETENESS	WORKSHEET		Date: 1/18
	#: 98556		tage 2B		F	Page:of
	atory: APPL, Inc., Clovis, CA		•		Revi	Page:of ewer:
The s	HOD: GC/MS 2-(2-Methoxyethoxy)-Ethano amples listed below were reviewed for eaction findings worksheets.	·			ZIIG NOVI	CWC1
	Validation Area			Commer	nts	
1.	Sample receipt/Technical holding times	A /A				
11.	GC/MS Instrument performance check	Δ				
111.	Initial calibration/ICV	Δ/Δ	% PSD	= 1 cv = 2	+W	
IV.	Continuing calibration endur	Δ		CW = 2	م ا	
V	Laboratory Blanks	Δ			•	
VI.	Field blanks	N				
VII.	Surrogate spikes	2				
VIII.	/III. Matrix spike/Matrix spike duplicates		مح ا			
IX.	Laboratory control samples	ين	10210			
X.	Field duplicates	ND	0=1,	2		
XI.	Internal standards	1				
XII.	Target analyte quantitation	N				
XIII.	Target analyte identification	N				
XIV.	System performance	N				
XV.	Overall assessment of data	<u> </u>				
Note:	N = Not provided/applicable R = Rins	o compounds sate eld blank	s detected	D = Duplicate TB = Trip blank EB = Equipment blank	SB=Source b OTHER:	lank
	Client ID			Lab ID	Matrix	Date
1	ERH2265 Ŋ			BA48142	Water	12/21/21
li	ERH2267 D			BA48143	Water	12/21/21
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5		· · · · · · · · · · · · · · · · · · ·				
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Note	s:			
	211222 A-BIK			

LDC #:	53054H2c	
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VALIDATION FINDINGS WORKSHEET Surrogate Recovery

Page: <u>1</u>	of_1
Reviewer	FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Were percent recoveries (%R) for surrogates within QC limits? N/A N/A

If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?

N/A If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	all	laboratory. Although the percent RPD were ou professional judgment, no	added to all samples by the LCSD percent recovery and the itside the QC limits, using data were qualified. Additionally, trecoveries were within QC limits	Text
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LDC #: 53054HZe

VALIDATION FINDINGS WORKSHEET Laboratory Control Samples (LCS)

Page:	of
Reviewer:	FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 ♥)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

<u>Y'N N/A</u> Was a LCS required?

Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	21/2224	*	()	159 (30-13)	()	A1) (1)	It du 1/2 MD
	Ves ID	*	()	()	38.8 (2U)	1 (w)	1 out 1P
<u></u>			()	()	()		7
<u> </u>			()	()	()		
<u></u>			()	()	()		
<u> </u>			()	()	()		
	1		()	()	()		
<u> </u>			()	()	()		
<u></u>			7 = 11				
-	* 2-	(2-Methoxyetho	xy) - t(+hano)	()	()		
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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Red Hill Bulk Storage Facility, CTO 18F0126

LDC Report Date:

January 21, 2022

Parameters:

2-(2-Methoxyethoxy)-ethanol

Validation Level:

Stage 2B & 4

Laboratory:

APPL, Inc., Clovis, CA

Sample Delivery Group (SDG): 98566

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH2273	BA48188	Water	11/21/21
ERH2274**	BA48198**	Water	11/21/21
ERH2273MS	BA48188MS	Water	11/21/21
ERH2273MSD	BA48188MSD	Water	11/21/21

^{**}Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Work Plan/Scope of Work. 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 02, January 2017). the 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), the Sampling and Analysis Plan, Addendum 01, 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 00, September 2017), the Sampling and Analysis Plan, Addendum 03, 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 00, June 2018), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

2-(2-Methoxyethoxy)-ethanol by Environmental Protection Agency (EPA) SW 846 Method 8270D Modified

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

- J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.
- J-(Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.
- J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.
- U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).
- UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.
- X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.
- NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

- a ICP Serial Dilution %D was not within control limits.
- b Presumed contamination from preparation (method blank).
- c Calibration %RSD, r, r², %D or %R was noncompliant.
- d The analysis with this flag should not be used because another more technically sound analysis is available.
- e MS/MSD or Duplicate RPD was high.
- f Presumed contamination from FB or ER.
- g ICP ICS results were unsatisfactory.
- h Holding times were exceeded.
- i Internal standard performance was unsatisfactory.
- k Estimated Maximum Possible Concentration (HRGC/HRMS only)
- I LCS/LCSD %R was not within control limits.
- m Result exceeded the calibration range.
- o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.
- p RPD between two columns was high (GC only).
- q MS/MSD recovery was not within control limits.
- s Surrogate recovery was not within control limits.
- t Presumed contamination from trip blank.
- v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.
- w LCS/LCSD RPD was high.
- y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r²) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0%.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were not added to all samples by the laboratory. Although the LCSD percent recovery was outside the QC limits, using professional judgement, no data were qualified.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
211223A LCS/LCSD (ERH2273)	2-(2-Methoxyethoxy)-ethanol	-	143 (30-130)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

All target analyte quantitations met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method with the exception noted in Section VII. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126 2-(2-Methoxyethoxy)-ethanol - Data Qualification Summary - SDG 98566

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 2-(2-Methoxyethoxy)-ethanol - Laboratory Blank Data Qualification Summary -**SDG 98566**

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126 2-(2-Methoxyethoxy)-ethanol - Field Blank Data Qualification Summary - SDG 98566

No Sample Data Qualified in this SDG

LDC #: 53054l2c	VALIDATION COMPLETENESS WORKSHEET	Date: 1/18/11
SDG #: 98566	Stage 2B/4	Page: _/of_/
Laboratory: <u>APPL, Inc., Clovis,</u>	CA	Reviewer: 19
		2nd Reviewer:/
METHOD: GC/MS 2-(2-Methox	yethoxy)-Ethanol (EPA SW-846 Method 8270D-Modified)	
The samples listed below were validation findings worksheets.	reviewed for each of the following validation areas. Validation fir	ndings are noted in attached

	Validation Area		Comments
Į.	Sample receipt/Technical holding times	AIA	
II.	GC/MS Instrument performance check	Δ'	
III.	Initial calibration/ICV	\triangle \triangle	2 12 ICV 200
IV.	Continuing calibration	Δ	CU = 20 /50
V.	Laboratory Blanks	۵	
VI.	Field blanks	2	
VII.	Surrogate spikes	رسي	
VIII.	Matrix spike/Matrix spike duplicates	Δ	
IX.	Laboratory control samples	SW	LES W
X.	Field duplicates	N	Date
XI.	Internal standards		
XII.	Target analyte quantitation	A	Not reviewed for Stage 2B validation.
XIII.	Target analyte identification	Δ	Not reviewed for Stage 2B validation.
XIV.	System performance	A	Not reviewed for Stage 2B validation.
XV.	Overall assessment of data	\ <u>\</u>	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank
** Indicates sample underwent Stage 4 validation

Client ID	Lab ID	Matrix	Date
1 ERH2273 D	BA48188	Water	11/21/21
2 ⁺ 2 ERH2274** 17	BA48198**	Water	11/21/21
3 ERH2273MS	BA48188MS	Water	11/21/21
4 1 ERH2273MSD	BA48188MSD	Water	11/21/21
5			
6			
7			
8			

Notes:		
1 21223A -BIK		
221227A-BK		

LDC#: 53054 IZC

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT

Method: Semivolatiles (EPA SW 846 Method 8270 (2)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?				
Was cooler temperature criteria met?		ĺ		
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?				
Were all samples analyzed within the 12 hour clock criteria?	/	L.,		
Illa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?		-		
Were all percent relative standard deviations (%RSD) ≤ 15% and relative response factors (RRF) within method criteria?	×			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of \geq 0.990?	_			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	_			
Were all percent differences (%D) ≤ 20%?		<u></u>		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	_	-		
Were all percent differences (%D) \leq 20% and relative response factors (RRF) within method criteria? Were all percent differences (%D) \leq 50% for closing calibration verification?	/			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?				
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?				
Was there contamination in the laboratory blanks? If yes, please see the blanks validation findings worksheet.				
VI. Field blanks				
Were field blanks were identified in this SDG?				
Were target analytes detected in the field blanks?				
VII. Surrogate spikes		_		
Were all surrogate percent recovery (%R) within QC limits?	ļ	<u> </u>	_	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			_	
If any percent recoveries (%R) was less than 10%, was a reanalysis performed to confirm %R?				
VIII. Matrix spike/Matrix spike duplicates				
Were matrix snike (MS) and matrix snike duplicate (MSD) analyzed in this SDG?		r_		

LDC#: 53054 I2C

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: FT

Validation Area	Yes	No	NA	Findings/Comments
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?				
IX. Laboratory control samples				
Was an LCS analyzed per extraction batch?	_			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				
X. Field duplicates				
Were field duplicate pairs identified in this SDG?				
Were target analytes detected in the field duplicates?				
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	/	<u>-</u>		
Were retention times within ± 30 seconds of the associated calibration standard?	_			
XII. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the target analyte?				
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?				
XIII. Target analyte identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?				
Did compound spectra meet specified EPA "Functional Guidelines" criteria?				
Were chromatogram peaks verified and accounted for?				
Were manual integrations reviewed and found acceptable?			<u></u>	
Did the laboratory provide before and after integration printouts?			/	
XIV. System performance				
System performance was found to be acceptable.	/			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.			/	

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

		~ ~~~		
A. Phenol	CC. Dimethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	GGGG. C30-Hopane	I1. Methyl methanesulfonate
B. Bis (2-chloroethyl) ether	DD. Acenaphthylene	FFF. Di-n-octylphthalate	HHHH. 1-Methylphenanthrene	J1. Ethyl methanesulfonate
C. 2-Chlorophenol	EE. 2,6-Dinitrotoluene	GGG. Benzo(b)fluoranthene	IIII. 1,4-Dioxane	K1. o,o',o"-Triethylphosphorothioate
D. 1,3-Dichlorobenzene	FF. 3-Nitroaniline	HHH. Benzo(k)fluoranthene	JJJJ. Acetophenone	L1. n-Phenylene diamine
E. 1,4-Dichlorobenzene	GG. Acenaphthene	III. Benzo(a)pyrene	KKKK. Atrazine	M1. 1,4-Naphthoquinone
F. 1,2-Dichlorobenzene	HH. 2,4-Dinitrophenol	JJJ. Indeno(1,2,3-cd)pyrene	LLLL. Benzaldehyde	N1. N-Nitro-o-toluidine
G. 2-Methylphenol	II. 4-Nitrophenol	KKK. Dibenz(a,h)anthracene	MMMM. Caprolactam	O1. 1,3,5-Trinitrobenzene
H. 2,2'-Oxybis(1-chloropropane)	JJ. Dibenzofuran	LLL. Benzo(g,h,i)perylene	NNNN. 2,6-Dichlorophenol	P1. Pentachlorobenzene
I. 4-Methylphenol	KK. 2,4-Dinitrotoluene	MMM. Bis(2-Chloroisopropyl)ether	OOOO. 1,2-Diphenylhydrazine	Q1. 4-Aminobiphenyl
J. N-Nitroso-di-n-propylamine	LL. Diethylphthalate	NNN. Aniline	PPPP. 3-Methylphenol	R1. 2-Naphthylamine
K. Hexachloroethane	MM. 4-Chlorophenyl-phenyl ether	OOO. N-Nitrosodimethylamine	QQQQ. 3&4-Methylphenol	S1. Triphenylene
L. Nitrobenzene	NN. Fluorene	PPP. Benzoic Acid	RRRR. 4-Dimethyldibenzothiophene (4MDT)	T1. Octachlorostyrene
M. Isophorone	OO. 4-Nitroaniline	QQQ. Benzyl alcohol	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	U1. Famphur
N. 2-Nitrophenol	PP. 4,6-Dinitro-2-methylphenol	RRR. Pyridine	TTTT. 1-Methyldibenzothiophene (1MDT)	V1. 1,4-phenylenediamine
O. 2,4-Dimethylphenol	QQ. N-Nitrosodiphenylamine	SSS. Benzidine	UUUU 2,3,4,6-Tetrachlorophenol	W1. Methapyrilene
P. Bis(2-chloroethoxy)methane	RR. 4-Bromophenyl-phenylether	TTT. 1-Methylnaphthalene	VVVV. 1,2,4,5-Tetrachlorobenzene	X1. Pentachloroethane
Q. 2,4-Dichlorophenol	SS. Hexachlorobenzene	UUU.Benzo(b)thiophene	WWWW 2-Picoline	Y1. 3,3'-Dimethylbenzidine
R. 1,2,4-Trichlorobenzene	TT. Pentachlorophenol	VVV.Benzonaphthothiophene	XXXX. 3-Methylcholanthrene	Z1. o-Toluidine
S. Naphthalene	UU. Phenanthrene	WWW.Benzo(e)pyrene	YYYY. a,a-Dimethylphenethylamine	A2. 1-Naphthylamine
T. 4-Chloroaniline	VV. Anthracene	XXX. 2,6-Dimethylnaphthalene	ZZZZ. Hexachloropropene	B2. 4-Aminobiphenyl
U. Hexachlorobutadiene	WW. Carbazole	YYY. 2,3,5-Trimethylnaphthalene	A1. N-Nitrosodiethylamine	C2. 4-Nitroquinoline-1-oxide
V. 4-Chloro-3-methylphenol	XX. Di-n-butylphthalate	ZZZ. Perylene	B1. N-Nitrosodi-n-butylamine	D2. Hexachloropene
W. 2-Methylnaphthalene	YY. Fluoranthene	AAAA. Dibenzothiophene	C1. N-Nitrosomethylethylamine	E2. Bis (2-chloro-1-methylethyl) ether
X. Hexachlorocyclopentadiene	ZZ. Pyrene	BBBB. Benzo(a)fluoranthene	D1. N-Nitrosomorpholine	F2. Bifenthrin
Y. 2,4,6-Trichlorophenol	AAA. Butylbenzylphthalate	CCCC. Benzo(b)fluorene	E1. N-Nitrosopyrrolidine	G2. Cyfluthrin
Z. 2,4,5-Trichlorophenol	BBB. 3,3'-Dichlorobenzidine	DDDD. cis/trans-Decalin	F1. Phenacetin	H2. Cypermethrin
AA. 2-Chloronaphthalene	CCC. Benzo(a)anthracene	EEEE. 1,1'-Biphenyl	G1. 2-Acetylaminofluorene	I2. Permethrin (cis/trans)
BB. 2-Nitroaniline	DDD. Chrysene	FFFF. Retene	H1. Pronamide	J2. 5-Nitro-o-toluidine

LDC#:	53054 I2c	
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VALIDATION FINDINGS WORKSHEET Surrogate Recovery

Page: 1	of_	1	
Reviewer:	FT		

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Were percent recoveries (%R) for surrogates within QC limits? N/A

N/A If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?

If any %R was less than 10 percent, was a reanalysis performed to confirm %R? N/A

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	all	laboratory. Although the	added to all samples by the E LCSD percent recovery was using professional judgment, no	Text
			()	
			()	
			()	
		777	()	
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			()	
			()	
			()	
	-		()	
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			()	
			()	
			()	
			()	

(NBZ) = Nitrobenzene - d5 (FBP) = 2-Fluorobiphenyl

(2FP) = 2-Fluorophenol (TBP) = 2,4,6 -Tribromophenol

(TPH) = Terphenyl - d14

(2CP) = 2-Chlorophenol - d4

LDC #: 53094 FZC

VALIDATION FINDINGS WORKSHEET Laboratory Control Samples (LCS)

Page:	<u>/</u> of/
Reviewer:	FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Was a LCS required?

Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

(1)

#	LCS/LCSD ID	Compound	LCS %R (Limits)	%F	LCSD R (Limits)		RPD (Limits)		Associated Samples	Qualifications	
	211223△	*	()	143	(30-	-130	()	1, 211223A-BK	J+ at 1P M	0
	VCS 10		()		()	()			
	_		()		()	()			
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Ш		* 2-(2-Me)	hoxyethoxy)-	Etha	(no))	()			
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LDC#:53054I2c

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

P	age:1	 of	1
R	eviewer	 FT	

Method: 8270D M

Calibration				(Y)	(X)
Date	System	Compound	Standard	Response	Concentration
12/22/2021	Yoda	2-(2-Methoxyethoxy)Ethanol	1	0.0271	0.025
1	GCMS		2	0.0807	0.25
			3	0.1970	1.25
			4	0.4683	2.5
			5	0.9590	5
)			6	2.6100	12.5
			7	4.2600	20
			8	5.3075	25

Regression Output

Re	po	rte	d
----	----	-----	---

Constant	-0.036319	NR
Std Err of Y Est		
R Squared	0.999474	1.000000
Degrees of Freedom		
X Coefficient(s)	0.213455	NR
Std Err of Coef.		
Correlation Coefficient	0.999737	
Coefficient of Determination (r^2)	0.999474	

LDC#: 53054 IZC

VALIDATION FINDINGS WORKSHEET Continuing Calibration Results Verification

Page:_	1	_of	1
Reviewer:		FT	

METHOD: GC/MS BNA (EPA SW 846 Method 8270 🖂

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF

Where: ave. RRF = initial calibration average RRF

RRF = continuing calibration RRF

 $RRF = (A_x)(C_{is})/(A_{is})(C_x)$

 A_x = Area of target analyte C_x = Concentration of target

A_{is} = Area of associated internal standard

 Concentration of target analy 	yte C _{is} = Concentration of i	nternal standare

					Reported	Recalculated	Reported	Recalculated
#_	Standard ID	Calibration Date	Target Analyte (Internal Standard)	Average RRF (Initial)	RRF (CC)	RRF (CC)	%D	%D
1	cev	12 27 2	2 (-2ME)-E (1st IS)	<i>9</i> 00	527.641	527.641	5.5	5.5
	11104161	(' '	(2 nd IS)			·		
	'	:	(3 rd IS)					
			(4 th IS)					
1	-		(5 th IS)					
			(6 th IS)					
2			(1st IS)					
			(2 nd IS)					
			(3 rd IS)					
			(4 th IS)					
1			(5 th IS)	 				
			(6 th IS)					
3			(1st IS)					
			(2 nd IS)			·		
			(3 rd IS)					
			(4 th IS)					
1			(5 th IS)					
			(6 th IS)					

Comments:	Refer to Contin	nuing Calibration	findings worksheet	for list of qualification	<u>s and associated sample</u>	es when reported resul	<u>its do not agree withir</u>	1 10.0% of
the recalcula	ated results.							
							,,,,,	

LDC#: 530 54 I 2C

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates Results Verification

Page:_	_1_	_of_	1	_
Reviewer:	F	Т		

METHOD: GC/MS BNA (EPA SW 846 Method 8270 D

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the target analytes identified below using the following calculation:

SSC = (Ax)(Cis)(Fv)(Df)

Where: A_x = Area of the target analyte

Ws= Initial weight of the sample

(Ais)(RRF)(Vs or Ws)(%S/100)

A_{is} = Area for the specific internal standard Cis = Concentration of internal standard

SSC = Spiked sample concentration

%Recovery = (SSC/SA)*100

Fv =Final volume of extract

SA= Spike added

%S= Percent Solid

Df= Dilution factor

MS= Matrix spike

RRF= Average relative response factor of the target analyte MSD= Matrix spike duplicate

RPD =(({SSCMS - SSCMSD} * 2) / (SSCMS + SSCMSD))*100

Vs= Initial volume of the sample

MS/MSD samples: Spiked Sample Matrix Snike Spike Sample Matrix Spike Duplicate MS/MSD Added Concentration Concentration ug W Compound va II Percent Recovery **Percent Recovery** RPD MSD MSD Reported Recalc Reported Recalc Reported Recalc Phenol N-Nitroso-di-n-propylamine 4-Chloro-3-methylphenol Acenaphthene Pentachlorophenol Pyrene 6.5 9170 91.7 91.7 - (2 ME)-E 20 97.9 97.9 6.5 10000 10000 9790

LDC#: 530列 I2C

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification R

Page:_	1	_of_	1	
eviewer:	F	Т		

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the target analytes identified below using the following calculation:

 $SSC = \frac{(Ax)(C_{IS})(Fv)(Df)}{(A_{IS})(RRF)(Vs \text{ or } Ws)(\%S/100)}$

%Recovery = (SSC/SA)*100

Where: A_x= Area of the target analyte

A_{is}= Area for the specific internal standard

C_{is} = Concentration of internal standard Fv =Final volume of extract

Df= Dilution factor

Ws= Initial weight of the sample

%S= Percent Solid

SSC = Spiked sample concentration LCS = Laboratory control sample

LCSD = Laboratory control sample duplicate

RRF= Average relative response factor of the target analyte Vs= Initial volume of the sample

RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

LCS/LCSD samples: 2 127 A COS IN

Commonad	S	Spike dded (%)	Conc	Spike entration	LCS		LCSD		LCS/LCSD	
Compound	<u> (</u>	13/1/	<u> </u>	19/11	Percent	Recovery	Percent	Recovery	I R	RPD T
	LCS	I CSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol										
N-Nitroso-di-n-propylamine							<u> </u>			
4-Chloro-3-methylphenol										
Acenaphthene			<u> </u>		ļ					
Pentachlorophenol										
Pyrene										
2-(2 ME)-E	80 ·	જા	69.3	65.4	ما. ما يا	46.6	81.8	४।.४	۶۰۶	5.8
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LDC#: 53054 I Ze

VALIDATION FINDINGS WORKSHEET Sample Calculation Verification

Page:_	_1_	_of_	1_
Reviewer:	FT	•	

METHOD: GC/MS BNA (EPA SW 846 Method 8270 \mathcal{D}

The concentration of the sample was calculated for the target analyte identified below using the following calculation:

Conce	entratio	on = $\frac{(A_{\bullet})(I_{\bullet})(V_{\bullet})(DF)(2.0)}{(A_{i\bullet})(RRF)(V_{o})(V_{\bullet})(%S)}$	Example:
A_{x}	=	Area of the characteristic ion (EICP) for the target analyte to be measured	Sample I.D. #2 , 2 (z - MEE).
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	$\frac{(1687235)}{1902877} + 0.036319)(40)(10)$
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = 1002812
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	0.213455
V_{l}	=	Volume of extract injected in microliters (ul)	= 32 207.6 ug/L
V_{t}	=	Volume of the concentrated extract in microliters (ul)	32 20 1 2 mg/L
Df	=	Dilution Factor.	
%S	=	Percent solids, applicable to soil and solid matrices only.	
2.0	=	Factor of 2 to account for GPC cleanup	

#	Sample ID	Target Analyte	Reported Concentration (ug L	Calculated Concentration	Qualification
	# 2	2 (2 - MEE)	32000	32207.4	
ļ					
	4477.7				