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

November 19, 2021

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

Dear Ms. Ramos,

Enclosed are the final validation reports for the fraction listed below. These SDGs were received on October 21, 2021. Attachment 1 is a summary of the samples that were reviewed for the analysis.

LDC Project #52356A:

SDG #	**Fraction**
B21100166	TPH as Extractables

The data validation was performed under Stage 2B & 4 validation guidelines. The analysis was validated using the following documents and variances, as applicable to the 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 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
Operations Manager/Senior Chemist
scuenco@lab-data.com

27 pages-EM 3 DAY TAT Attachment 1

90/10 2B/4 EDD **LDC# 52356 (AECOM - Honolulu, HI / Red Hill Bulk Storage Facility, CTO 18F0126)**

LDC	SDG#	DATE REC'D	(2) DATE DUE	DRO (8015C)		SGCU DRO (8015C)																											
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	B21100166	10/21/21	10/26/21	7	0	7	0																										
A	B21100166	10/21/21	10/26/21	1	0	1	0																										
Total	T/SC			8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). These sample counts do not include MS/MSD, and DUPs V:\LOGIN\AECOM\Red Hill\52356ST-18F0126.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

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

LDC Report Date: November 19, 2021

Parameters: Total Petroleum Hydrocarbons as Extractables

Validation Level: Stage 2B & 4

Laboratory: Energy Laboratories, Billings, MT

Sample Delivery Group (SDG): B21100166

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
ERH1764(RHMW08)	B21100166-001	Water	09/30/21
ERH1765(RHMW09)	B21100166-002	Water	09/30/21
ERH1766(RHMW10)	B21100166-003	Water	09/30/21
ERH1769(RHMW19)**	B21100166-004**	Water	09/30/21
ERH1762(RHMW04)	B21100166-005	Water	10/01/21
ERH1763(RHMW06)	B21100166-006	Water	10/01/21
ERH1768(RHMW16)	B21100166-007	Water	10/01/21
ERH1770(OWDFMW01)	B21100166-008	Water	10/01/21
ERH1764(RHMW08)(SGCU)	B21100166-001(SGCU)	Water	09/30/21
ERH1765(RHMW09)(SGCU)	B21100166-002(SGCU)	Water	09/30/21
ERH1766(RHMW10)(SGCU)	B21100166-003(SGCU)	Water	09/30/21
ERH1769(RHMW19)(SGCU)**	B21100166-004(SGCU)**	Water	09/30/21
ERH1762(RHMW04)(SGCU)	B21100166-005(SGCU)	Water	10/01/21
ERH1763(RHMW06)(SGCU)	B21100166-006(SGCU)	Water	10/01/21
ERH1768(RHMW16)(SGCU)	B21100166-007(SGCU)	Water	10/01/21
ERH1770(OWDFMW01)(SGCU)	B21100166-008(SGCU)	Water	10/01/21
ERH1764(RHMW08)MS	B21100166-001MS	Water	09/30/21
ERH1764(RHMW08)MSD	B21100166-001MSD	Water	09/30/21
ERH1764(RHMW08)(SGCU)MS	B21100166-001(SGCU)MS	Water	09/30/21
ERH1764(RHMW08)(SGCU)MSD	B21100166-001(SGCU)MSD	Water	09/30/21
ERH1765(RHMW09)(SGCU)MS	B21100166-002(SGCU)MS	Water	09/30/21
ERH1765(RHMW09)(SGCU)MSD	B21100166-002(SGCU)MSD	Water	09/30/21

Samples appended with “SGCU” underwent Silica Gel cleanup
**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 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 (TPH) as Extractables by Environmental Protection Agency (EPA) SW 846 Method 8015C

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, r^2, %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)

l 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.

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

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.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. 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.

XI. 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.

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 B21100166

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 B21100166

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 B21100166

No Sample Data Qualified in this SDG

LDC #: 52356A8W

VALIDATION COMPLETENESS WORKSHEET

Stage 2B/4

Date: 10/25/21

SDG #: B21100166

Page: 1 of 2

Laboratory: Energy Laboratories, Billings, MT

Reviewer: TR

2nd Reviewer: AC

METHOD: GC ~~Diesel Range Organics~~ TPH Extractables (EPA SW 846 Method 8015C)

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	A /A	
II.	Initial calibration/ICV	A /A	%D RSD/ICV ≤ 20
III.	Continuing calibration	A	CCV ≤ 20
IV.	Laboratory Blanks	A	
V.	Field blanks	N	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	N	
X.	Target analyte quantitation	A	Not reviewed for Stage 2B validation.
XI.	Target analyte identification	A	Not reviewed for Stage 2B validation.
XII.	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:

** Indicates sample underwent Stage 4 validation

	Client ID	Lab ID	Matrix	Date
1	ERH1764(RHMW08)	B21100166-001	Water	09/30/21
2	ERH1765(RHMW09)	B21100166-002	Water	09/30/21
3	ERH1766(RHMW10)	B21100166-003	Water	09/30/21
4	ERH1769(RHMW19)**	B21100166-004**	Water	09/30/21
5	ERH1762(RHMW04)	B21100166-005	Water	10/01/21
6	ERH1763(RHMW06)	B21100166-006	Water	10/01/21
7	ERH1768(RHMW16)	B21100166-007	Water	10/01/21
8	ERH1770(OWDFMW01)	B21100166-008	Water	10/01/21
9	ERH1764(RHMW08)(SGCU)	B21100166-001(SGCU)	Water	09/30/21
10	ERH1765(RHMW09)(SGCU)	B21100166-002(SGCU)	Water	09/30/21
11	ERH1766(RHMW10)(SGCU)	B21100166-003(SGCU)	Water	09/30/21
12	ERH1769(RHMW19)(SGCU)**	B21100166-004(SGCU)**	Water	09/30/21
13	ERH1762(RHMW04)(SGCU)	B21100166-005(SGCU)	Water	10/01/21
14	ERH1763(RHMW06)(SGCU)	B21100166-006(SGCU)	Water	10/01/21
15	ERH1768(RHMW16)(SGCU)	B21100166-007(SGCU)	Water	10/01/21
16	ERH1770(OWDFMW01)(SGCU)	B21100166-008(SGCU)	Water	10/01/21
17	ERH1764(RHMW08)MS	B21100166-001MS	Water	09/30/21

LDC #: 5235688 **VALIDATION COMPLETENESS WORKSHEET** Date: 10/25/2

SDG #: B21100166 Stage 2B/4 Page: 2 of 2

Laboratory: Energy Laboratories, Billings, MT Reviewer: [illegible]

2nd Reviewer:

METHOD: GC ~~Diesel Range Organics~~ (EPA SW 846 Method 8015C)

	Client ID	Lab ID	Matrix	Date
18	ERH1764(RHMW08)MSD	B21100166-001MSD	Water	09/30/21
19	ERH1764(RHMW08)(SGCU)MS	B21100166-001(SGCU)MS	Water	09/30/21
20	ERH1764(RHMW08)(SGCU)MSD	B21100166-001(SGCU)MSD	Water	09/30/21
21	ERH1765(RHMW09)(SGCU)MS	B21100166-002(SGCU)MS	Water	09/30/21
22	ERH1765(RHMW09)(SGCU)MSD	B21100166-002(SGCU)MSD	Water	09/30/21
23				
24				
25				

Notes:

	MB - 150998						

LDC #: 52356 A8

VALIDATION FINDINGS CHECKLIST

Reviewer: FH

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?	✓			
IIa. 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?	✓			
IIb. 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?	✓			

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?	✓			
Were manual integrations reviewed and found acceptable?	✓			
Did the laboratory provide before and after integration printouts?	✓			
XI. Target analyte identification				
Were the retention times of reported detects within the RT windows?		✓		
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

LDC #: 52356A4

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: ____FT___

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
average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where:
A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported 5000ng	Recalculated 5000ng	Reported Average CF (Initial)	Recalculated Average CF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	2/18/2021	DRO Range	28746	28746	28542.4	28542.4	4.5	4.5

LDC #: 52356A8

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

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
average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where:
A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported 15000ng	Recalculated 15000ng	Reported Average CF (Initial)	Recalculated Average CF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	1/8/2021	DRO Range	30201	30201	29457.3	29457.3	5.8	5.8

LDC #: 52356A8

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT

METHOD: GC X HPLC

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the compounds 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 compound
C = Concentration of compound

#	Standard ID	Calibration Date	Compound	Average CF(ICAL)/ CCV Conc.	Reported CF/ Conc. CCV	Recalculated CF/ Conc. CCV	Reported %R	Recalculated %R
1	CCV-48r	10/5/21 21:58	DRO(C10-C24)	15	16	15.898	106	106
			TEH	15	16	16.443	110	110
	CCV-62r	10/6/21 09:34	DRO(C10-C24)	15	17	16.985	111	113
			TEH	15	18	17.565	117	117
2	CCV-75r	10/6/21 19:58	DRO(C10-C24)	15	15	15.278	102	102
			TEH	15	16	15.801	105	105
	CCV-19	10/7/21 10:54	DRO(C10-C24)	15	16.109	16.109	107	107
			TEH	15	16.665	16.665	111	111
3	CCV-32	10/8/21 09:50	DRO(C10-C24)	15	16.279	16.279	109	109
			TEH	15	16.836	16.836	112	112
	CCV-45	10/8/21 08:35	DRO(C10-C24)	15	16.27889	16.159	108	108
			TEH	15	16.716	16.716	111	111
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.

LDC #: 52356A8

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT

METHOD: ✓ GC ___ HPLC

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: #4

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
o- Terphenyl		0.196	0.119	60	60.7	0

Sample ID: _____

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

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C`	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 52356A8

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT

METHOD: ✓ GC __ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

%Recovery = 100 * (SSC - SC)/SA

RPD =(({SSCMS - SSCMSD} * 2) / (SSCMS + SSCMSD))*100

Where SSC = Spiked sample concentration; SC = Sample concentration; SA = Spike added

MS = Matrix spike; MSD = Matrix spike duplicate

MS/MSD samples: 17 and 18

Compound	Spike Added (mg/L)		Sample Conc. (mg/L)	Spike Sample Concentration (mg/L)		Matrix spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	---	MS	MSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
DRO C10-C24	29	29		27	26	90		89		1.4	

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

LDC #: 52356A8

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

METHOD: ✓ 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 compounds 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: LCS ID 159988

Compound	Spike Added (mg/L)		Spike Sample Concentration (mg/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
DRO C_{10}-C_{24}	15	NA	16	NA	103					

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 52356AY

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT

METHOD: GC HPLC

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds within 10% of the reported results?

Concentration= $\frac{(A)(Fv)(Df)}{(RF)(Vs \text{ or } Ws)(\%S/100)}$

A= Area or height of the compound to be measured
Fv= Final Volume of extract
Df= Dilution Factor
RF= Average response factor of the compound In the initial calibration
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid

Example:

Sample ID. #4 Compound Name Oil Range Hydrocarbons

Concentration = $\frac{1.094225 \times 10^7 (1)}{28542 (1020)}$ =

= 0.375856

#	Sample ID	Compound	Reported Concentrations (mg/L)	Recalculated Results Concentrations (mg/L)	Qualifications
	#4	Oil Range	0.38 mg/L	0.375856	
		TEH	0.55 0.57	0.5669	
	#4 Total Extractable Hydrocarbons		= $\frac{1.70335 \times 10^7}{29457.33}$	$\frac{(1)}{(1020)}$ = 0.5669	

Comments:

EPA_NO	LAB_ID	DF	ANALYTE	COLL_DATE	ANAL_DATE	QCLev	RESULT	UNITS	LAB_Q	LOQ	LOD	REV	Q_C
METHOD: **8015C**													
ERH1764	B211001661		C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	9/30/2021 2:55:00 PM	10/8/2021 5:03:00 AM	C		MG/L	U	0.30	0.12	U	
ERH1764	B211001661		C10-C24 DIESEL RANGE ORGANICS	9/30/2021 2:55:00 PM	10/6/2021 6:32:00 AM	C		MG/L	U	0.30	0.15	U	
ERH1764	B211001661		C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	9/30/2021 2:55:00 PM	10/8/2021 5:03:00 AM	C		MG/L	U	0.30	0.15	U	
ERH1764	B211001661		C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	9/30/2021 2:55:00 PM	10/6/2021 6:32:00 AM	C		MG/L	U	0.30	0.15	U	
ERH1765	B211001661		C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	9/30/2021 1:15:00 PM	10/8/2021 5:55:00 AM	C		MG/L	U	0.30	0.12	U	
ERH1765	B211001661		C10-C24 DIESEL RANGE ORGANICS	9/30/2021 1:15:00 PM	10/6/2021 11:54:00 AM	C		MG/L	U	0.30	0.14	U	
ERH1765	B211001661		C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	9/30/2021 1:15:00 PM	10/8/2021 5:55:00 AM	C		MG/L	U	0.30	0.14	U	
ERH1765	B211001661		C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	9/30/2021 1:15:00 PM	10/6/2021 11:54:00 AM	C		MG/L	U	0.30	0.14	U	
ERH1766	B211001661		C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	9/30/2021 12:00:00 PM	10/8/2021 11:27:00 AM	C		MG/L	U	0.30	0.12	U	
ERH1766	B211001661		C10-C24 DIESEL RANGE ORGANICS	9/30/2021 12:00:00 PM	10/6/2021 12:42:00 PM	C		MG/L	U	0.30	0.14	U	
ERH1766	B211001661		C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	9/30/2021 12:00:00 PM	10/8/2021 11:27:00 AM	C		MG/L	U	0.30	0.14	U	
ERH1766	B211001661		C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	9/30/2021 12:00:00 PM	10/6/2021 12:42:00 PM	C	0.14	MG/L	J	0.30	0.14	J	
ERH1769	B211001661		C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	9/30/2021 9:55:00 AM	10/8/2021 12:16:00 PM	D		MG/L	U	0.30	0.12	U	
ERH1769	B211001661		C10-C24 DIESEL RANGE ORGANICS	9/30/2021 9:55:00 AM	10/6/2021 1:29:00 PM	D	0.082	MG/L	J	0.30	0.15	J	
ERH1769	B211001661		C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	9/30/2021 9:55:00 AM	10/8/2021 12:16:00 PM	D		MG/L	U	0.30	0.15	U	
ERH1769	B211001661		C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	9/30/2021 9:55:00 AM	10/6/2021 1:29:00 PM	D	0.38	MG/L		0.30	0.15		
ERH1762	B211001661		C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	10/1/2021 9:10:00 AM	10/8/2021 6:43:00 AM	C		MG/L	U	0.30	0.12	U	
ERH1762	B211001661		C10-C24 DIESEL RANGE ORGANICS	10/1/2021 9:10:00 AM	10/6/2021 11:07:00 AM	C	0.047	MG/L	J	0.30	0.15	J	
ERH1762	B211001661		C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	10/1/2021 9:10:00 AM	10/8/2021 6:43:00 AM	C		MG/L	U	0.30	0.15	U	
ERH1762	B211001661		C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	10/1/2021 9:10:00 AM	10/6/2021 11:07:00 AM	C	0.17	MG/L	J	0.30	0.15	J	
ERH1763	B211001661		C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	10/1/2021 10:35:00 AM	10/8/2021 1:02:00 PM	C		MG/L	U	0.30	0.12	U	
ERH1763	B211001661		C10-C24 DIESEL RANGE ORGANICS	10/1/2021 10:35:00 AM	10/6/2021 3:57:00 PM	C		MG/L	U	0.30	0.15	U	
ERH1763	B211001661		C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	10/1/2021 10:35:00 AM	10/8/2021 1:02:00 PM	C		MG/L	U	0.30	0.15	U	
ERH1763	B211001661		C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	10/1/2021 10:35:00 AM	10/6/2021 3:57:00 PM	C	0.15	MG/L	J	0.30	0.15	J	
ERH1768	B211001661		C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	10/1/2021 11:50:00 AM	10/8/2021 1:49:00 PM	C		MG/L	U	0.30	0.12	U	

EPA_NO	LAB_ID	DF	ANALYTE	COLL_DATE	ANAL_DATE	QCLev	RESULT	UNITS	LAB_Q	LOQ	LOD	REV	Q_C
METHOD: **8015C**													
ERH1768	B21100166	1	C10-C24 DIESEL RANGE ORGANICS	10/1/2021 11:50:00 AM	10/6/2021 4:45:00 PM	C	0.073	MG/L	J	0.30	0.14	J	
ERH1768	B21100166	1	C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	10/1/2021 11:50:00 AM	10/8/2021 1:49:00 PM	C		MG/L	U	0.30	0.14	U	
ERH1768	B21100166	1	C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	10/1/2021 11:50:00 AM	10/6/2021 4:45:00 PM	C	0.32	MG/L		0.30	0.14		
ERH1770	B21100166	1	C10-C24 DIESEL RANGE ORG SILICA GEL CLEAN U	10/1/2021 12:55:00 PM	10/8/2021 2:37:00 PM	C		MG/L	U	0.30	0.11	U	
ERH1770	B21100166	1	C10-C24 DIESEL RANGE ORGANICS	10/1/2021 12:55:00 PM	10/6/2021 10:30:00 PM	C	0.42	MG/L		0.30	0.14		
ERH1770	B21100166	1	C24-C40 OIL RANGE ORGANICS SILICA GEL CLEAN	10/1/2021 12:55:00 PM	10/8/2021 2:37:00 PM	C		MG/L	U	0.30	0.14	U	
ERH1770	B21100166	1	C24-C40 TOTAL PETROLEUM HYDROCARBONS, OI	10/1/2021 12:55:00 PM	10/6/2021 10:30:00 PM	C	0.24	MG/L	J	0.30	0.14	J	