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

March 1, 2022

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 27, 2021. Attachment 1 is a summary of the samples that were reviewed for the analysis.

**LDC Project #52408A:**

| SDG # | Fraction |
|---|---|
| B21100806 | Total Petroleum Hydrocarbons 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

100 pages-EM 3 DAY TAT Attachment 1

**90/10 2B/4 EDD** **LDC# 52408 (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 | B21100806 | 10/27/21 | 11/01/21 | 4 | 0 | 2 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | B21100806 | 10/27/21 | 11/01/21 | 3 | 0 | 3 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | T/SC | | | 7 | 0 | 5 | 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 | 12 |

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\52408ST-18F0126_A.wpd

**LDC Report#** 52408A8

# Laboratory Data Consultants, Inc.
# Data Validation Report

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

**LDC Report Date:** November 9, 2021

**Parameters:** Total Petroleum Hydrocarbons as Extractables

**Validation Level:** Stage 2B & 4

**Laboratory:** Energy Laboratories, Billings, MT

**Sample Delivery Group (SDG):** B21100806

| Sample Identification | Laboratory Sample Identification | Matrix | Collection Date |
|---|---|---|---|
| ERH1784(RHMW01R) | B21100806-001 | Water | 10/06/21 |
| ERH1787(RHMW02)** | B21100806-002** | Water | 10/06/21 |
| ERH1790(RHMW03)** | B21100806-003** | Water | 10/06/21 |
| ERH1793(RHMW05)** | B21100806-004** | Water | 10/06/21 |
| ERH1796(RHMW2254-01) | B21100806-005 | Water | 10/06/21 |
| ERH1799(RHSF) | B21100806-006 | Water | 10/06/21 |
| ERH1801(RHSF) | B21100806-007 | Water | 10/06/21 |
| ERH1784(RHMW01R)(SGCU) | B21100806-001(SGCU) | Water | 10/06/21 |
| ERH1787(RHMW02)(SGCU)** | B21100806-002(SGCU)** | Water | 10/06/21 |
| ERH1790(RHMW03)(SGCU)** | B21100806-003(SGCU)** | Water | 10/06/21 |
| ERH1793(RHMW05)(SGCU)** | B21100806-004(SGCU)** | Water | 10/06/21 |
| ERH1796(RHMW2254-01)(SGCU) | B21100806-005(SGCU) | Water | 10/06/21 |
| ERH1784(RHMW01R)MS | B21100806-001MS | Water | 10/06/21 |
| ERH1784(RHMW01R)MSD | B21100806-001MSD | Water | 10/06/21 |
| ERH1787(RHMW02)MS | B21100806-002MS | Water | 10/06/21 |
| ERH1787(RHMW02)MSD | B21100806-002MSD | Water | 10/06/21 |
| ERH1784(RHMW01R)(SGCU)MS | B21100806-001(SGCU)MS | Water | 10/06/21 |
| ERH1784(RHMW01R)(SGCU)MSD | B21100806-001(SGCU)MSD | Water | 10/06/21 |
| ERH1787(RHMW02)(SGCU)MS | B21100806-002(SGCU)MS | Water | 10/06/21 |
| ERH1787(RHMW02)(SGCU)MSD | B21100806-002(SGCU)MSD | Water | 10/06/21 |

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 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.

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 |
|---|---|---|---|---|---|
| ERH1793(RHMW05)(SGCU)** | Ortho-Terphenyl | 55.0 (56-125) | TPH as extractables | UJ (all non-detects) | P |

## 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

Samples ERH1799(RHSF) and ERH1801(RHSF) 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 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.

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

**Red Hill Bulk Storage Facility, CTO 18F0126**
**Total Petroleum Hydrocarbons as Extractables - Data Qualification Summary - SDG B21100806**

| Sample | Analyte | Flag | A or P | Reason (Code) |
|---|---|---|---|---|
| ERH1793(RHMW05)(SGCU)** | TPH as extractables | UJ (all non-detects) | P | Surrogates (%R) (s) |

**Red Hill Bulk Storage Facility, CTO 18F0126**
**Total Petroleum Hydrocarbons as Extractables - Laboratory Blank Data Qualification Summary - SDG B21100806**

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 B21100806**

No Sample Data Qualified in this SDG

LDC #: 52408A8
SDG #: B21100806
Laboratory: Energy Laboratories, Billings, MT

# VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

Date: 11/8/21
Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

**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 ending | A | CCV ≤ 20/20 |
| IV. | Laboratory Blanks | A | |
| V. | Field blanks | N | |
| VI. | Surrogate spikes | SW | |
| VII. | Matrix spike/Matrix spike duplicates | A | |
| VIII. | Laboratory control samples | A | LCS |
| IX. | Field duplicates | ND | D = 6,7 |
| 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 | ERH1784(RHMW01R) | B21100806-001 | Water | 10/06/21 |
| 2 | ERH1787(RHMW02)** | B21100806-002** | Water | 10/06/21 |
| 3 | ERH1790(RHMW03)** | B21100806-003** | Water | 10/06/21 |
| 4 | ERH1793(RHMW05)** | B21100806-004** | Water | 10/06/21 |
| 5 | ERH1796(RHMW2254-01) | B21100806-005 | Water | 10/06/21 |
| 6 | ERH1799(RHSF) D | B21100806-006 | Water | 10/06/21 |
| 7 | ERH1801(RHSF) D | B21100806-007 | Water | 10/06/21 |
| 8 | ERH1784(RHMW01R)(SGCU) | B21100806-001(SGCU) | Water | 10/06/21 |
| 9 | ERH1787(RHMW02)(SGCU)** | B21100806-002(SGCU)** | Water | 10/06/21 |
| 10 | ERH1790(RHMW03)(SGCU)** | B21100806-003(SGCU)** | Water | 10/06/21 |
| 11 | ERH1793(RHMW05)(SGCU)** | B21100806-004(SGCU)** | Water | 10/06/21 |
| 12 | ERH1796(RHMW2254-01)(SGCU) | B21100806-005(SGCU) | Water | 10/06/21 |
| 13 | ERH1784(RHMW01R)MS | B21100806-001MS | Water | 10/06/21 |
| 14 | ERH1784(RHMW01R)MSD | B21100806-001MSD | Water | 10/06/21 |
| 15 | ERH1787(RHMW02)MS | B21100806-002MS | Water | 10/06/21 |
| 16 | ERH1787(RHMW02)MSD | B21100806-002MSD | Water | 10/06/21 |
| 17 | ERH1784(RHMW01R)(SGCU)MS | B21100806-001(SGCU)MS | Water | 10/06/21 |

LDC #: 52408A8 **VALIDATION COMPLETENESS WORKSHEET** Date: 11/8/21
SDG #: B21100806 Stage 2B/4 Page: 2 of 2
Laboratory: Energy Laboratories, Billings, MT Reviewer:
2nd Reviewer:

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

| | Client ID | Lab ID | Matrix | Date |
|---|---|---|---|---|
| 18 | ERH1784(RHMW01R)(SGCU)MSD | B21100806-001(SGCU)MSD | Water | 10/06/21 |
| 19 | ERH1787(RHMW02)(SGCU)MS | B21100806-002(SGCU)MS | Water | 10/06/21 |
| 20 | ERH1787(RHMW02)(SGCU)MSD | B21100806-002(SGCU)MSD | Water | 10/06/21 |
| 21 | | | | |
| 22 | | | | |
| 23 | | | | |

Notes:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 160178 | | | | | | |
| | | | | | | | |
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| | | | | | | | |

LDC #: 52408 A8

**VALIDATION FINDINGS CHECKLIST**

Page: 1 of 2
Reviewer: A

**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 #: 52408 A8

# VALIDATION FINDINDS WORKSHEET
## Surrogate Recovery


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".

Y N N/A Were surrogates spiked into all samples and blanks?

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

(5)

| # | Sample ID | Detector/ Column | Surrogate Compound | %R (Limits) | Qualifications |
|---|---|---|---|---|---|
| | 11 | | H | 55.0 ( 56-125 ) | J-/UJ/P ND |
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| | 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 #: 52408 A8

# 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 #: 52408 A8

# 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 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 #: 52408A8

# 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 | 12/4/2020 | DRO Range | 26221.18 | 26221.18 | 26029.55 | 26029.55 | 2.690 | 2.690 |
| | | | | | | | | | |

LDC #: 52408A8

# 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 | 10/7/2020 | DRO Range | 24156.53 | 24156.53 | 24529.56 | 24529.56 | 2.304 | 2.304 |
| | | | | | | | | | |

LDC #: 53408 MS

# VALIDATION FINDINGS WORKSHEET
## Continuing Calibration Results Verification


Reviewer: FT

**METHOD:** GC ✓ 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 13r 0654 | 10/11/21 | DRO ($C_{10}$-$C_{24}$) | 15 | 15 | 14.725 | 98 | 98 |
| 2 | CCV 20r 0453 | 10/12/21 | ↓ | 15 | 15 | 15.464 | 103 | 103 |
| 3 | CCV 41r 1534 | 10/12/21 | ↓ | 15 | 15 | ~~15.954~~ FT<br>15.383 | 103 | ~~106~~ FT<br>103 |
| 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 #: 52408 AY

# VALIDATION FINDINGS WORKSHEET
## Continuing Calibration Results Verification


Reviewer: FT

**METHOD:** GC ✓ 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 %D | Recalculated %D |
|---|---|---|---|---|---|---|---|---|
| 1 | CCV - 08r 1338 | 10/14/21 | DRO ($C_{10}$-$C_{24}$) | 15 | 16 | ~~16.827~~ FT<br>16.207 | 108 | ~~112~~ 108 |
| 2 | CCV- 21r 1127 | 10/14/21 | ↓ | 15 | 16 | ~~16.769~~ FT<br>15.562 | 104 | ~~108~~<br>104 FT |
| 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.

LDC #: 52408AJ

# VALIDATION FINDINGS WORKSHEET
## Surrogate Results Verification



**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:** #3

| Surrogate | Column/Detector | Surrogate Spiked | Surrogate Found | Percent Recovery | Percent Recovery | Percent Difference |
|---|---|---|---|---|---|---|
| | | | | Reported | Recalculated | |
| o- Terphenyl | | 0.19 | 0.155 | 80.0 | ~~0.8578~~ 81.578 | 1.97 |
| | | | | | | |
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**Sample ID:** _____

| Surrogate | Column/Detector | Surrogate Spiked | Surrogate Found | Percent Recovery | Percent Recovery | Percent Difference |
|---|---|---|---|---|---|---|
| | | | | Reported | Recalculated | |
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| | 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 #: 52408 AV

# 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: 15 + 16

| 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) | 25 | 25 | 0.49 | 31 | 31 | 108 | 109 | 107 | 109 | 0.4 | 0.35 |
| | | | | 31.135 | 31.025 | | | | | | |
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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 #: 52408AJ

# 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-160178 ✓

| 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 C10-C24 | 15 | NA | 14 | (14.08) | 94.0 | 94 | | | | |
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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 #: 52408A8

# 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. #2 Compound Name DRO ($C_{10}$-$C_{24}$)

Concentration = $\frac{9.78\ 2638 \times 10^{7}\ (1)}{29457.83\ (1055)}$ =

= 3.147 mg/L

| # | Sample ID | Compound | Reported Concentrations (mg/L) | Recalculated Results Concentrations (mg/L) | Qualifications |
|---|---|---|---|---|---|
| | # 2 | DRO ($C_{10}$-$C_{24}$) | 3.1 | 3.1 | |
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Comments: