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

Anchor Environmental, LLC
1201 Third Ave. Suite 2600
Seattle, WA 98101
ATTN: Ms. Cindy Fields
cfields@anchorqea.com

October 18, 2019

SUBJECT: Revised NW Natural - Gasco ATC Env Liabilities, Data Validation

Dear Ms. Fields,

Enclosed are the revised validation reports for the fractions listed below. This SDG was received on August 8, 2019. Attachment 1 is a summary of the samples that were reviewed for each analysis.

- A2b: Removed holding time qualifiers since samples were frozen. Added the MSD outlier for acenaphthylene.
- A39: Removed holding time qualifiers since samples were frozen.

LDC Project #45703_RV1:

SDG #	Fraction
L1928037	Polynuclear Aromatic Hydrocarbons & Biomarkers, Saturated Petroleum Hydrocarbons

The data validation was performed under Stage 2B guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA National Functional Guidelines for Organic Superfund Methods Data Review; January 2017
- 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; IIB, November 2004; update IV, February 2007; update V, July 2014

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

Sincerely,

Christina Rink

Christina Rink
crink@lab-data.com
Project Manager/Senior Chemist

4,617 pages-ADV

Attachment 1

EDD Stage 2B **LDC #45703 (Anchor Environmental-Seattle WA / NW Natural - Gasco ATC Env Liabilities)**

LDC	SDG#	DATE REC'D	(3) DATE DUE	PAHs (8270D -SIM)		Sat.Pet. Hydro. (8015D)																															
Matrix:	Oil/Water/Sediment/Soil			O	S	O	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	W	S
A	L1928037	08/08/19	08/29/19	2	17	1	11																														
Total	J/CR			2	17	1	11	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	0	0	0	31

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). These sample counts do not include MS, MSD, or DUP's.

L:\Anchor\Gasco\ATC Env Liabilities\45703ST.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NW Natural - Gasco ATC Env Liabilities

LDC Report Date: October 17, 2019

Parameters: Polynuclear Aromatic Hydrocarbons & Biomarkers

Validation Level: Stage 2B

Laboratory: Alpha Analytical, Inc.

Sample Delivery Group (SDG): L1928037

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
2708-190528-015P	L1928037-01	Soil	05/28/19
2708-190528-015T	L1928037-02	Soil	05/28/19
2708-190528-016	L1928037-03	Soil	05/28/19
2708-190528-016DL	L1928037-03DL	Soil	05/28/19
2708-190513-002	L1928037-04	Soil	05/13/19
2708-190513-003	L1928037-05	Soil	05/13/19
2708-190513-003DL	L1928037-05DL	Soil	05/13/19
2708-190520-006	L1928037-06	Soil	05/20/19
2708-190520-006DL	L1928037-06DL	Soil	05/20/19
2708-190523-012	L1928037-07	Soil	05/23/19
2708-190523-012DL	L1928037-07DL	Soil	05/23/19
2708-190521-009	L1928037-08	Soil	05/21/19
2708-190521-009DL	L1928037-08DL	Soil	05/21/19
2708-190521-010	L1928037-09	Soil	05/21/19
2708-190506-OIL	L1928037-10	Oil	06/06/19
2708-190506-OILDL	L1928037-10DL	Oil	06/06/19
2708-190514-004	L1928037-11	Soil	05/14/19
2708-190520-1-006	L1928037-12	Soil	05/20/19
2708-190520-1-006DL	L1928037-12DL	Soil	05/20/19
2708-190521-010DUP	L1928037-09DUP	Soil	05/21/19
2708-190514-004MS	L1928037-11MS	Soil	05/14/19
2708-190514-004MSD	L1928037-11MSD	Soil	05/14/19

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 a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). 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) & Biomarkers 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): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or 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.

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

Instrument performance was checked.

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 20.0% for all compounds.

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

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 25.0% for all compounds.

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. Surrogate recoveries (%R) were not within QC limits for sample 2708-190521-009. Using professional judgment, no data were qualified when one surrogate %R was outside the QC limits and the %R was greater than or equal to 10%.

VIII. Matrix Spike/Matrix Spike Duplicates/Duplicate Sample Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
2708-190514-004MS/MSD (2708-190514-004)	Acenaphthylene	197 (50-150)	0 (50-150)	J (all detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
2708-190514-004MS/MSD (2708-190514-004)	Acenaphthylene	51 (≤30)	J (all detects)	A

Other percent recoveries (%R) and relative percent differences (RPD) were not within the QC limits for 2708-190514-004MS/MSD. No data were qualified since the parent sample results were greater than 4X the spiked concentration.

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Compound	RPD (Limits)	Difference (Limits)	Flag	A or P
2708-190521-010DUP (2708-190521-010)	Anthracene Carbazole	46 (≤30) 34 (≤30)	- -	J (all detects) J (all detects)	A

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 2708-190520-006/DL and 2708-190520-1-006/DL were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (mg/Kg)		RPD
	2708-190520-006/DL	2708-190520-1-006/DL	
13b,17a-20R-Diacholestane (S5)	0.205	0.222	8
13b,17a-20R-Ethyldiacholestane (S18)	0.162	0.124	27
13b,17a-20S-Diacholestane (S4)	0.33	0.312	6
13b,17a-20S-Methyldiacholestane (S8)	0.254	0.207	20
14a,17a-20R-Cholestane / 13b,17a-20R-Ethyldiacholestane (S17)	0.513	0.579	12
14a,17a-20R-Ethylcholestane (S28)	0.358	0.333	7
14a,17a-20R-Methylcholestane (S24)	0.296	0.253	16
14a,17a-20S-Cholestane / 13b,17a-20S-Ethyldiacholestane (S12)	0.498	0.526	5
14a,17a-20S-Ethylcholestane (S25)	0.33	0.302	9
14a,17a-20S-Methylcholestane (S20)	0.268	0.253	6
14b,17b-20R-Cholestane (S14)	0.276	0.26	6
14b,17b-20R-Ethylcholestane (S26)	0.438	0.354	21
14b,17b-20R-Methylcholestane (S22)	0.326	0.24	30
14b,17b-20S-Cholestane (S15)	0.272	0.256	6
14b,17b-20S-Ethylcholestane (S27)	0.332	0.352	6
14b,17b-20S-Methylcholestane (S23)	0.356	0.319	11
17a-22,29,30-Trisnorhopane-TM (T12)	1.23	1.23	0
18a-22,29,30-Trisnorneohopane-TS (T11)	0.326	0.333	2
18a-30-Norneohopane-C29Ts (T16)	0.183U	0.221	Not calculable
1-Methyldibenzothiophene	16.5	18.4	11
1-Methylnaphthalene	5650	4540	22
1-Methylphenanthrene	475	392	19
1-Methylpyrene	175	158	10
2,3,5-Trimethylnaphthalene (1,6,7-Trimethylnaphthalene)	44.2	39.8	10
2,6-Dimethylnaphthalene	957	766	22
2-Methylanthracene	307	328	7
2-Methyldibenzothiophene & 3-Methyldibenzothiophene	72.2	76.6	6
2-Methylnaphthalene	12200	10300	17
2-Methylphenanthrene	667	668	0
2-Methylpyrene	262	242	8
30,31-Bishomohopane-22R (T27)	0.246	0.235	5
30,31-Bishomohopane-22S (T26)	0.315	0.285	10
30-Homohopane-22R (T22)	0.5	0.518	4
30-Homohopane-22S (T21)	0.659	0.76	14
30-Norhopane (T15)	2.21	2.08	6
30-Normoretane (T17)	0.528	0.648	20

Compound	Concentration (mg/Kg)		RPD
	2708-190520-006/DL	2708-190520-1-006/DL	
3-Methylphenanthrene	549	553	1
4-Methyldibenzothiophene	47.7	41.1	15
4-Methylphenanthrene & 9-Methylphenanthrene	408	421	3
4-Methylpyrene	167	158	6
Acenaphthene	18400	16200	13
Acenaphthylene	384	228	51
Anthracene	8970	8300	8
Benzo(a)anthracene	5900	4400	29
Benzo(a)fluoranthene	979	815	18
Benzo(a)pyrene	6000	4990	18
Benzo(b)fluoranthene	4120	3670	12
Benzo(b)fluorene	1120	1000	11
Benzo(c)fluorene	393	229	53
Benzo(e)pyrene	3190	2580	21
Benzo(g,h,i)perylene	3810	3210	17
Benzo(j,k)fluoranthene	4180	3090	30
Benzothiophene	1110	920	19
Biphenyl (1,1'-Biphenyl)	4700	3970	17
C1-Benzo(b)thiophene	352	318	10
C1-Chrysenes	856	659	26
C1-Dibenzothiophenes	198	179	10
C1-Fluoranthenes/Pyrenes	2810	2560	9
C1-Fluorenes	529	464	13
C1-Naphthalenes	11600	10100	14
C1-Naphthobenzothiophenes	112	102	9
C1-Phenanthrenes/Anthracenes	2260	2300	2
C23 Tricyclic terpane (T4)	0.272	0.267	2
C24 Tetracyclic terpane (T6a)	0.203	0.158	25
C24 Tricyclic terpane (T5)	0.206	0.151	31
C25 Tricyclic terpane (T6)	0.221	0.18	20
C26 Tricyclic terpane-22R (T6c)	0.149	0.148	1
C26 Tricyclic terpane-22S (T6b)	0.11	0.118	7
C28 Tricyclic terpane-22R (T8)	0.135	0.19	34
C28 Tricyclic terpane-22S (T7)	0.178	0.121	38
C29 Tricyclic Terpane-22R (T10)	0.173	0.138	23
C29 Tricyclic Terpane-22S (T9)	0.176	0.165	6
C2-Benzo(b)thiophene	93.1	82.7	12
C2-Chrysenes	199	174	13
C2-Dibenzothiophenes	93.6	87.9	6
C2-Fluoranthenes/Pyrenes	437	413	6
C2-Fluorenes	138	145	5

Compound	Concentration (mg/Kg)		RPD
	2708-190520-006/DL	2708-190520-1-006/DL	
C2-Naphthalenes	2220	1960	12
C2-Naphthobenzothiophenes	34.9	37.4	7
C2-Phenanthrenes/Anthracenes	479	579	19
C3-Benzo(b)thiophene	30.2	30.2	0
C3-Chrysenes	161	168	4
C3-Dibenzothiophenes	47.6	53.1	11
C3-Fluoranthenes/Pyrenes	184	194	5
C3-Fluorenes	209	192	8
C3-Naphthalenes	444	467	5
C3-Naphthobenzothiophenes	51.8	50.8	2
C3-Phenanthrenes/Anthracenes	120	150	22
C4-Benzo(b)thiophene	13.2	14.8	11
C4-Chrysenes	59.4	60.8	2
C4-Dibenzothiophenes	18.4	20	8
C4-Fluoranthenes/Pyrenes	170	152	11
C4-Naphthalenes	105	123	16
C4-Naphthobenzothiophenes	18.4	20.5	11
C4-Phenanthrenes/Anthracenes	38.6	45.1	16
Carbazole	4780	4000	18
Chrysene	4840	3930	21
Dibenzo(a,h)anthracene and Dibenzo(a,c)anthracene	671	554	19
Dibenzofuran	10500	9330	12
Dibenzothiophene	1440	1200	18
Fluoranthene	18200	15700	15
Fluorene	9600	8400	13
Hopane (T19)	2.39	2.29	4
Indeno(1,2,3-c,d)pyrene	3720	3060	19
Moretane (T20)	0.92	0.862	7
Naphthalene	32900	28000	16
Naphthobenzothiophene	608	488	22
Perylene	1840	1470	22
Phenanthrene	36000	31100	15
Pyrene	15000	12700	17

XI. Internal Standards

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

XII. Compound Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Compound Identifications

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.

In the case where more than one result was reported for an individual sample, the least technically acceptable results were deemed not reportable as follows:

Sample	Compound	Reason	Flag	A or P
2708-190528-016	Fluoranthene Pyrene	Results exceeded calibration range.	Not reportable	-
2708-190513-003	Fluoranthene	Result exceeded calibration range.	Not reportable	-
2708-190520-006 2708-190523-012 2708-190521-009 2708-190520-1-006	Naphthalene Phenanthrene	Results exceeded calibration range.	Not reportable	-
2708-190506-OIL	Naphthalene C1-Naphthalenes 2-Methylnaphthalene 1-Methylnaphthalene Benzo(b)thiophene Biphenyl Phenanthrene Pyrene	Results exceeded calibration range.	Not reportable	-

Due to MS/MSD %R and RPD, and DUP RPD, data were qualified as estimated in two samples.

No results were rejected in this SDG.

NW Natural - Gasco ATC Env Liabilities
Polynuclear Aromatic Hydrocarbons & Biomarkers - Data Qualification Summary - SDG L1928037

Sample	Compound	Flag	A or P	Reason
2708-190514-004	Acenaphthylene	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)(RPD)
2708-190521-010	Anthracene Carbazole	J (all detects) J (all detects)	A	Duplicate sample analysis (RPD)
2708-190528-016	Fluoranthene Pyrene	Not reportable	-	Overall assessment of data
2708-190513-003	Fluoranthene	Not reportable	-	Overall assessment of data
2708-190520-006 2708-190523-012 2708-190521-009 2708-190520-1-006	Naphthalene Phenanthrene	Not reportable	-	Overall assessment of data
2708-190506-OIL	Naphthalene C1-Naphthalenes 2-Methylnaphthalene 1-Methylnaphthalene Benzo(b)thiophene Biphenyl Phenanthrene Pyrene	Not reportable	-	Overall assessment of data

NW Natural - Gasco ATC Env Liabilities
Polynuclear Aromatic Hydrocarbons & Biomarkers - Laboratory Blank Data Qualification Summary - SDG L1928037

No Sample Data Qualified in this SDG

LDC #: 45703A2b
SDG #: L1928037
Laboratory: Alpha Analytical, Inc.

VALIDATION COMPLETENESS WORKSHEET
Stage 2B

Date: 08/29/19
Page: 1 of 2
Reviewer: SVG
2nd Reviewer:

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons & Biomarkers (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
I.	Sample receipt/Technical holding times	A / SW A	SVG
II.	GC/MS Instrument performance check	A	PFTBA
III.	Initial calibration/ICV	A / A	ICAL ≤ 20% ICV ≤ 30%
IV.	Continuing calibration	A	CCV ≤ 25%
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates /LD	SW / SW	
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	SW	D = 8,9 / 18,19
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	SW	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	SW	

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	2708-190528-015P	L1928037-01	Soil	05/28/19
2	2708-190528-015T	L1928037-02	Soil	05/28/19
3	2708-190528-016	L1928037-03	Soil	05/28/19
4	2708-190528-016DL	L1928037-03DL	Soil	05/28/19
5	2708-190513-002	L1928037-04	Soil	05/13/19
6	2708-190513-003	L1928037-05	Soil	05/13/19
7	2708-190513-003DL	L1928037-05DL	Soil	05/13/19
8	2708-190520-006 D1	L1928037-06	Soil	05/20/19
9	2708-190520-006DL D1	L1928037-06DL	Soil	05/20/19
10	2708-190523-012	L1928037-07	Soil	05/23/19
11	2708-190523-012DL	L1928037-07DL	Soil	05/23/19
12	2708-190521-009	L1928037-08	Soil	05/21/19
13	2708-190521-009DL	L1928037-08DL	Soil	05/21/19

LDC #: 45703A2b
SDG #: L1928037
Laboratory: Alpha Analytical, Inc.

VALIDATION COMPLETENESS WORKSHEET
Stage 2B

Date: 08/29/19
Page: 2 of 2
Reviewer: JV6
2nd Reviewer:

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

14	2708-190521-010	L1928037-09	Soil	05/21/19
15 2	2708-190506-OIL	L1928037-10	Oil	06/06/19
16 ~~2~~	2708-190506-OILDL	L1928037-10DL	Oil	06/06/19
17	2708-190514-004	L1928037-11	Soil	05/14/19
18	2708-190520-1-006 D1	L1928037-12	Soil	05/20/19
19	2708-190520-1-006DL D1	L1928037-12DL	Soil	05/20/19
20	2708-190521-010DUP	L1928037-09DUP	Soil	05/21/19
21	2708-190514-004MS	L1928037-11MS	Soil	05/14/19
22	2708-190514-004MSD	L1928037-11MSD	Soil	05/14/19
23				
24				
25				

Notes:

1	WG1264828-1 BLANK		(PAH)				
2 ~~1~~	WG1264844-1 ↓		↓				
1	WG1265655-1		(Biomarkers)				
2 ~~1~~	WG1265665- ↓		↓				

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

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

LDC #: 45703A26

VALIDATION FINDINGS WORKSHEET
Surrogate Recovery

Reviewer: JVG
2nd Reviewer: [signature]

METHOD: GC/MS PAH (EPA SW 846 Method 8270D-SIM)

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

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

Y N (N/A) 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?

#	Date	Sample ID	Surrogate	%R (Limits)	Qualifications
		12	III-d12	138 (50-130)	NQ (only one out)
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
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				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

(NBZ) = Nitrobenzene-d5
(FBP) = 2-Fluorobiphenyl
(TPH) = Terphenyl-d14
(DCB) = 1,2-Dichlorobenzene-d4

LDC #: 45703A2b

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates /LD

Page: 1 of 1
Reviewer: JVG
2nd Reviewer: [illegible]

METHOD: GC/MS PAH (EPA SW 846 Method 8270D-SIM)

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

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		21/22	DD	197 (50-150)	0 (50-150)	( )	17 (Det)	J/UJ/A
			DD	( )	( )	51 (30)	↓ ↓	J dets/A
				( )	( )	( )		
			All others outside limits for %R and %RPD, NQ parent concentration > 4x spike amount					
				( )	( )	( )		
		20	VV	( )	( )	46 (30)	14 (Det)	J dets A
			WW	( )	( )	34 (↓)	↓ ↓	↓
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC#: 45703A2b

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JVG
2nd Reviewer:

METHOD: GC/MS PAH (EPA SW 846 Method 8270D-SIM)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound Name	Concentration (mg/Kg)		RPD
	8,9	18,19	
13b,17a-20R-Diacholestane (S5)	0.205	0.222	8
13b,17a-20R-Ethyldiacholestane (S18)	0.162	0.124	27
13b,17a-20S-Diacholestane (S4)	0.33	0.312	6
13b,17a-20S-Methyldiacholestane (S8)	0.254	0.207	20
14a,17a-20R-Cholestane / 13b,17a-20R-Ethyldiacholestane (S17)	0.513	0.579	12
14a,17a-20R-Ethylcholestane (S28)	0.358	0.333	7
14a,17a-20R-Methylcholestane (S24)	0.296	0.253	16
14a,17a-20S-Cholestane / 13b,17a-20S-Ethyldiacholestane (S12)	0.498	0.526	5
14a,17a-20S-Ethylcholestane (S25)	0.33	0.302	9
14a,17a-20S-Methylcholestane (S20)	0.268	0.253	6
14b,17b-20R-Cholestane (S14)	0.276	0.26	6
14b,17b-20R-Ethylcholestane (S26)	0.438	0.354	21
14b,17b-20R-Methylcholestane (S22)	0.326	0.24	30
14b,17b-20S-Cholestane (S15)	0.272	0.256	6
14b,17b-20S-Ethylcholestane (S27)	0.332	0.352	6
14b,17b-20S-Methylcholestane (S23)	0.356	0.319	11
17a-22,29,30-Trisnorhopane-TM (T12)	1.23	1.23	0
18a-22,29,30-Trisnorneohopane-TS (T11)	0.326	0.333	2
18a-30-Norneohopane-C29Ts (T16)	0.183U	0.221	NC
1-Methyldibenzothiophene	16.5	18.4	11
1-Methylnaphthalene	5650	4540	22
1-Methylphenanthrene	475	392	19
1-Methylpyrene	175	158	10
2,3,5-Trimethylnaphthalene (1,6,7-Trimethylnaphthalene)	44.2	39.8	10
2,6-Dimethylnaphthalene	957	766	22
2-Methylanthracene	307	328	7
2-Methyldibenzothiophene & 3-Methyldibenzothiophene	72.2	76.6	6
2-Methylnaphthalene	12200	10300	17
2-Methylphenanthrene	667	668	0
2-Methylpyrene	262	242	8
30,31-Bishomohopane-22R (T27)	0.246	0.235	5
30,31-Bishomohopane-22S (T26)	0.315	0.285	10
30-Homohopane-22R (T22)	0.5	0.518	4
30-Homohopane-22S (T21)	0.659	0.76	14
30-Norhopane (T15)	2.21	2.08	6
30-Normoretane (T17)	0.528	0.648	20
3-Methylphenanthrene	549	553	1
4-Methyldibenzothiophene	47.7	41.1	15
4-Methylphenanthrene & 9-Methylphenanthrene	408	421	3
4-Methylpyrene	167	158	6
Acenaphthene	18400	16200	13
Acenaphthylene	384	228	51
Anthracene	8970	8300	8

LDC#: 45703A2b

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JVG
2nd Reviewer:

METHOD: GC/MS PAH (EPA SW 846 Method 8270D-SIM)
Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound Name	Concentration (mg/Kg)		RPD
	8,9	18,19	
Benzo(a)anthracene	5900	4400	29
Benzo(a)fluoranthene	979	815	18
Benzo(a)pyrene	6000	4990	18
Benzo(b)fluoranthene	4120	3670	12
Benzo(b)fluorene	1120	1000	11
Benzo(c)fluorene	393	229	53
Benzo(e)pyrene	3190	2580	21
Benzo(g,h,i)perylene	3810	3210	17
Benzo(j,k)fluoranthene	4180	3090	30
Benzothiophene	1110	920	19
Biphenyl (1,1'-Biphenyl)	4700	3970	17
C1-Benzo(b)thiophene	352	318	10
C1-Chrysenes	856	659	26
C1-Dibenzothiophenes	198	179	10
C1-Fluoranthenes/Pyrenes	2810	2560	9
C1-Fluorenes	529	464	13
C1-Naphthalenes	11600	10100	14
C1-Naphthobenzothiophenes	112	102	9
C1-Phenanthrenes/Anthracenes	2260	2300	2
C23 Tricyclic terpane (T4)	0.272	0.267	2
C24 Tetracyclic terpane (T6a)	0.203	0.158	25
C24 Tricyclic terpane (T5)	0.206	0.151	31
C25 Tricyclic terpane (T6)	0.221	0.18	20
C26 Tricyclic terpane-22R (T6c)	0.149	0.148	1
C26 Tricyclic terpane-22S (T6b)	0.11	0.118	7
C28 Tricyclic terpane-22R (T8)	0.135	0.19	34
C28 Tricyclic terpane-22S (T7)	0.178	0.121	38
C29 Tricyclic Terpane-22R (T10)	0.173	0.138	23
C29 Tricyclic Terpane-22S (T9)	0.176	0.165	6
C2-Benzo(b)thiophene	93.1	82.7	12
C2-Chrysenes	199	174	13
C2-Dibenzothiophenes	93.6	87.9	6
C2-Fluoranthenes/Pyrenes	437	413	6
C2-Fluorenes	138	145	5
C2-Naphthalenes	2220	1960	12
C2-Naphthobenzothiophenes	34.9	37.4	7
C2-Phenanthrenes/Anthracenes	479	579	19
C3-Benzo(b)thiophene	30.2	30.2	0
C3-Chrysenes	161	168	4
C3-Dibenzothiophenes	47.6	53.1	11
C3-Fluoranthenes/Pyrenes	184	194	5
C3-Fluorenes	209	192	8
C3-Naphthalenes	444	467	5

LDC#: 45703A2b

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JVG
2nd Reviewer:

METHOD: GC/MS PAH (EPA SW 846 Method 8270D-SIM)
Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound Name	Concentration (mg/Kg)		RPD
	8,9	18,19	
C3-Naphthobenzothiophenes	51.8	50.8	2
C3-Phenanthrenes/Anthracenes	120	150	22
C4-Benzo(b)thiophene	13.2	14.8	11
C4-Chrysenes	59.4	60.8	2
C4-Dibenzothiophenes	18.4	20	8
C4-Fluoranthenes/Pyrenes	170	152	11
C4-Naphthalenes	105	123	16
C4-Naphthobenzothiophenes	18.4	20.5	11
C4-Phenanthrenes/Anthracenes	38.6	45.1	16
Carbazole	4780	4000	18
Chrysene	4840	3930	21
Dibenzo(a,h)anthracene and Dibenzo(a,c)anthracene	671	554	19
Dibenzofuran	10500	9330	12
Dibenzothiophene	1440	1200	18
Fluoranthene	18200	15700	15
Fluorene	9600	8400	13
Hopane (T19)	2.39	2.29	4
Indeno(1,2,3-c,d)pyrene	3720	3060	19
Moretane (T20)	0.92	0.862	7
Naphthalene *	32900	28000	16
Naphthobenzothiophene	608	488	22
Perylene	1840	1470	22
Phenanthrene *	36000	31100	15
Pyrene	15000	12700	17

* = Result from dilution

LDC #: 45703A2b

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported RLs

Page: 1 of 1
Reviewer: JVG
2nd Reviewer:

METHOD: GC/MS PAH (EPA SW 846 Method 8270D-SIM)

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

Y N N/A Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?

Y N N/A Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	Sample ID	Compound	Finding	Qualifications
		3	YY, ZZ	7 cal range	J dets A
		6	YY		
		8, 10, 12, 18	S, UU		
		15	S, C1-S, W, TTT, UUU, EEEE, UU, ZZ		

Comments: See sample calculation verification worksheet for recalculations

LDC #: 45703 A26

VALIDATION FINDINGS WORKSHEET
Overall Assessment of Data

Reviewer: JVG
2nd Reviewer: C

METHOD: GC/MS PAH (EPA SW 846 Method 8270D-SIM)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
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 and usability of the data acceptable?

#	Date	Sample ID	Compound	Finding	Qualifications
		3	YY, ZZ	> cal range	NR
		6	YY		
		8, 10, 12, 18	S, UU		
		15	S, C1-S, W, TTT, UUU, EEEE, UU, ZZ		

Comments: _____

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NW Natural - Gasco ATC Env Liabilities

LDC Report Date: October 17, 2019

Parameters: Saturated Petroleum Hydrocarbons

Validation Level: Stage 2B

Laboratory: Alpha Analytical, Inc.

Sample Delivery Group (SDG): L1928037

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
2708-190528-015P	L1928037-01	Soil	05/28/19
2708-190528-015T	L1928037-02	Soil	05/28/19
2708-190528-016	L1928037-03	Soil	05/28/19
2708-190513-002	L1928037-04	Soil	05/13/19
2708-190513-003	L1928037-05	Soil	05/13/19
2708-190520-006	L1928037-06	Soil	05/20/19
2708-190523-012	L1928037-07	Soil	05/23/19
2708-190521-009	L1928037-08	Soil	05/21/19
2708-190521-010	L1928037-09	Soil	05/21/19
2708-190506-OIL	L1928037-10	Oil	06/06/19
2708-190514-004	L1928037-11	Soil	05/14/19
2708-190520-1-006	L1928037-12	Soil	05/20/19
2708-190521-010DUP	L1928037-09DUP	Soil	05/21/19
2708-190514-004MS	L1928037-11MS	Soil	05/14/19
2708-190514-004MSD	L1928037-11MSD	Soil	05/14/19

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 a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). 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:

Saturated Petroleum Hydrocarbons by Environmental Protection Agency (EPA) SW 846 Method 8015D

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): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or 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.

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 compounds.

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

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 compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WG1264828-1BLANK	07/26/19	n-Pentadecane (C15) n-Tricosane (C23) n-Octacosane (C28) Total Saturated HC	87.0 mg/Kg 38.0 mg/Kg 52.2 mg/Kg 177 mg/Kg	All soil samples in SDG L1928037
WG1264844-1BLANK	07/26/19	Total Petroleum HC (C9-C44)	11400 mg/Kg	2708-190506-OIL

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
2708-190521-009	n-Tricosane (C23) n-Octacosane (C28)	151 mg/Kg 12.6 mg/Kg	151U mg/Kg 53.2U mg/Kg

Sample	Compound	Reported Concentration	Modified Final Concentration
2708-190521-010	n-Pentadecane (C15) n-Tricosane (C23)	27.4 mg/Kg 66.2 mg/Kg	37.5U mg/Kg 66.2U mg/Kg

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

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 Compound	Flag	A or P
2708-190528-015P	d50-Tetracosane	132 (50-130)	All compounds	J (all detects)	P
2708-190528-015T	d50-Tetracosane	138 (50-130)	All compounds	J (all detects)	P

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

VII. Matrix Spike/Matrix Spike Duplicates/Duplicate Sample Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
2708-190514-004MS/MSD (2708-190514-004)	n-Triacontane (C30)	-	174 (50-150)	J (all detects)	A

For 2708-190514-004MS/MSD, no data were qualified for n-Octadecane (C18) percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

Relative percent differences (RPD) were within QC limits.

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Compound	RPD (Limits)	Difference (Limits)	Flag	A or P
2708-190521-010DUP (2708-190514-004)	Phytane	36 (≤30)	-	J (all detects)	A

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 2708-190520-006 and 2708-190520-1-006 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (mg/Kg)		RPD
	2708-190520-006	2708-190520-1-006	
2,6,10-Trimethyldodecane	58.2	53.9	8
2,6,10-Trimethyltridecane	235	216	8
n-Decane (C10)	420	398	5
n-Docosane (C22)	57.9	44.7	26
n-Dodecane (C12)	938	948	1
n-Dotriacontane (C32)	202	176	14
n-Eicosane (C20)	46.1	55.2	18
n-Heneicosane (C21)	59	82.4	33
n-Hentriacontane (C31)	330	290	13
n-Heptadecane (C17)	122	127	4
n-Heptatriacontane (C37)	221	192	14
n-Hexacosane (C26)	217	177	20
n-Hexadecane (C16)	135	333	85
n-Nonacosane (C29)	2950	2580	13
n-Nonadecane (C19)	101	95	6
n-Octadecane (C18)	30000	30200	1
Norpristane	1180	1110	6
n-Pentacosane (C25)	5010	4680	7
n-Tetracosane (C24)	60.7	52.9	14
n-Triacontane (C30)	220	199	10
n-Tricosane (C23)	350	310	12
Phytane	9250	8700	6
Pristane	95.4	92	4
Total petroleum hydrocarbons (C9-C44)	367000	338000	8
Total saturated hydrocarbons	52300	49300	6

X. Compound Quantitation

All compound quantitations were within validation criteria with the following exceptions:

Sample	Finding	Flag	A or P
All samples in SDG L1928037	Target analytes flagged "G" co-elutes with non-target compounds.	J (all detects)	A

Raw data were not reviewed for Stage 2B validation.

XI. Target Compound Identifications

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method.

Due to surrogates %R, MS/MSD %R, DUP RPD, and co-elution, data were qualified as estimated in twelve samples.

Due to laboratory blank contamination, data were qualified as not detected in two samples.

No results were rejected in this SDG.

NW Natural - Gasco ATC Env Liabilities
Saturated Petroleum Hydrocarbons - Data Qualification Summary - SDG L1928037

Sample	Compound	Flag	A or P	Reason
2708-190528-015P 2708-190528-015T	All compounds	J (all detects)	P	Surrogates (%R)
2708-190514-004	n-Triacontane (C30)	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
2708-190514-004	Phytane	J (all detects)	A	Duplicate sample analysis (RPD)
2708-190528-015P 2708-190528-015T 2708-190528-016 2708-190513-002 2708-190513-003 2708-190520-006 2708-190523-012 2708-190521-009 2708-190521-010 2708-190506-OIL 2708-190514-004 2708-190520-1-006	Target analytes flagged "G" co-elutes with non-target compounds.	J (all detects)	A	Compound quantitation (co-elution)

NW Natural - Gasco ATC Env Liabilities
Saturated Petroleum Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG L1928037

Sample	Compound	Modified Final Concentration	A or P
2708-190521-009	n-Tricosane (C23) n-Octacosane (C28)	151U mg/Kg 53.2U mg/Kg	A
2708-190521-010	n-Pentadecane (C15) n-Tricosane (C23)	37.5U mg/Kg 66.2U mg/Kg	A

LDC #: 45703A39 **VALIDATION COMPLETENESS WORKSHEET** Date: 08/29/19
SDG #: L1928037 Stage 2B Page: 1 of 1
Laboratory: Alpha Analytical, Inc. Reviewer: JV6
2nd Reviewer:

METHOD: GC Saturated Petroleum Hydrocarbons (EPA SW846 Method 8015D)

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/SW/A	Frozen
II.	Initial calibration/ICV	A/A	ICAL ≤ 20?, ICV ≤ 20?
III.	Continuing calibration	A	CCV ≤ 20?
IV.	Laboratory Blanks	SW	
V.	Field blanks	N	
VI.	Surrogate spikes /IS	SW/A	
VII.	Matrix spike/Matrix spike duplicates /LD	SW/SW	
VIII.	Laboratory control samples	A	LCS/D
IX.	Field duplicates	SW	D = 6/12
X.	Compound quantitation RL/LOQ/LODs	SW	
XI.	Target compound identification	N	
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:

	Client ID		Lab ID	Matrix	Date
1	2708-190528-015P		L1928037-01	Soil	05/28/19
2	2708-190528-015T		L1928037-02	Soil	05/28/19
3	2708-190528-016		L1928037-03	Soil	05/28/19
4	2708-190513-002		L1928037-04	Soil	05/13/19
5	2708-190513-003		L1928037-05	Soil	05/13/19
6	2708-190520-006	D	L1928037-06	Soil	05/20/19
7	2708-190523-012		L1928037-07	Soil	05/23/19
8	2708-190521-009		L1928037-08	Soil	05/21/19
9	2708-190521-010		L1928037-09	Soil	05/21/19
10	2708-190506-OIL		L1928037-10	Oil	06/06/19
11	2708-190514-004		L1928037-11	Soil	05/14/19
12	2708-190520-1-006	D	L1928037-12	Soil	05/20/19
13	2708-190521-010DUP		L1928037-09DUP	Soil	05/21/19
14	2708-190514-004MS		L1928037-11MS	Soil	05/14/19
15	2708-190514-004MSD		L1928037-11MSD	Soil	05/14/19
16					
17	WG1264828-1 BLANK				

-2 WG1264824-1

LDC #: 45703A39

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: JVG
2nd Reviewer: C

METHOD: / GC ___ HPLC

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

(Y) N N/A Were all samples associated with a given method blank?
(Y) N N/A Was a method blank performed for each matrix and whenever a sample extraction procedure was performed?
(Y) N N/A Was a method blank performed with each extraction batch?
(Y) N N/A Were any contaminants found in the method blanks? If yes, please see findings below.

Level IV/D Only

Y N (N/A) (Gasoline and aromatics only)Was a method blank analyzed with each 24 hour batch?
(Y) N N/A Was a method blank analyzed for each analytical / extraction batch of ≤20 samples?

Blank extraction date: 07/26/19 **Blank analysis date:** 07/27/19 **Associated samples:** All S

Conc. units: mg/kg

Compound	Blank ID	Sample Identification						
[redacted]	WG1264828-1BLANK(5X)	8	9					
n-Pentadecane (C15)	87.0	435		27.4/37.5U				
n-Tricosane (C23)	38.0	190	151/U	66.2/U				
n-octacosane (C28)	52.2	261	12.6/53.2					
Total Saturated HC	177	885						

Blank extraction date: 07/26/19 **Blank analysis date:** 07/31/19 **Associated samples:** 10 (>5X)

Conc. units: mg/kg

Compound	Blank ID	Sample Identification						
[redacted]	WG1264844-1BLANK (5X)							
Total Petroleum HC (C9_C44)	11400	57000						

ALL CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 45703A39

VALIDATION FINDINDS WORKSHEET
Surrogate Recovery

Reviewer: JVG
2nd Reviewer:

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?

#	Sample ID	Detector/ Column	Surrogate Compound	%R (Limits)	Qualifications
	1 (ND + Det)		d50-Tetracosane	132 (50-130)	J dets/P
	2		↓	138 (↓)	↓
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

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

LDC #: 45703A39

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates /Lab Dup

Page: 1 of 1
Reviewer: JVG
2nd Reviewer: [illegible]

METHOD: ✓ GC __ HPLC

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

(Y) N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG?

(Y) N N/A Was an MS/MSD analyzed every 20 samples for each matrix or whenever a sample extraction was performed?

Y (N) N/A Were the MS/MSD percent recoveries (%R) and relative percent differences (RPD) within QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	14/15	n-Octadecane (C18)	446 (50-150)	0 (50-150)	( )	11 (Det)	NQ *
		n-Triacontane (C30)	( )	174 (50-150)	( )	↓ ↓	J dets/A
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
	13	Phytane	( )	( )	36 (30)	11 (Det)	J dets/A
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

* parent conc. > 4x spike

LDC#: 45703A39 **VALIDATION FINDINGS WORKSHEET** Page: 1 of 1

Field Duplicates Reviewer: JVG

2nd Reviewer:

METHOD: Saturated HC (EPA SW 846 Method 8015D)

Y N NA Were field duplicate pairs identified in this SDG?

Y N NA Were target analytes detected in the field duplicate pairs?

Compound Name	Concentration (mg/Kg)		RPD
	6	12	
2,6,10-Trimethyldodecane	58.2	53.9	8
2,6,10-Trimethyltridecane	235	216	8
n-Decane (C10)	420	398	5
n-Docosane (C22)	57.9	44.7	26
n-Dodecane (C12)	938	948	1
n-Dotriacontane (C32)	202	176	14
n-Eicosane (C20)	46.1	55.2	18
n-Heneicosane (C21)	59	82.4	33
n-Hentriacontane (C31)	330	290	13
n-Heptadecane (C17)	122	127	4
n-Heptatriacontane (C37)	221	192	14
n-Hexacosane (C26)	217	177	20
n-Hexadecane (C16)	135	333	85
n-Nonacosane (C29)	2950	2580	13
n-Nonadecane (C19)	101	95	6
n-Octadecane (C18)	30000	30200	1
Norpristane	1180	1110	6
n-Pentacosane (C25)	5010	4680	7
n-Tetracosane (C24)	60.7	52.9	14
n-Triacontane (C30)	220	199	10
n-Tricosane (C23)	350	310	12
Phytane	9250	8700	6
Pristane	95.4	92	4
Total petroleum hydrocarbons (C9-C44)	367000	338000	8
Total saturated hydrocarbons	52300	49300	6

LDC #: 45703A3c

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported RLs

Page: 1 of 1
Reviewer: JVG
2nd Reviewer:

METHOD: GC TPHE (EPA SW 846 Method 8015)

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

(Y) N N/A Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?

Y N (N/A) Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Date	Sample ID	Compound	Finding	Qualifications
			All	Results qualified G by the lab may be biased high due to matrix interference with non-target compounds.	J dets/A

Comments: _____