Guidelines for

TPH Fractionation

at

Leaking Underground

Storage Tank Sites

Prepared by the
Leaking Underground Storage Tank Program
Division of Environmental Response and Remediation
Utah Department of Environmental Quality

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INTRODUCTION

This document provides the reader with an overview of Utah's Total Petroleum Hydrocarbons (TPH) Fractionation protocol used in conjunction with the risk-based corrective action (RBCA) program currently being implemented by the leaking underground storage tank (LUST) program. The purpose of this document is to provide the reader with a summary of the TPH fractionation used by various programs, and present the Utah-specific approach to the TPH fractionation and reporting process.

Figure 1 shows the Utah-specific TPH fractionation groupings in relation to the corresponding analytical methods. Also shown are the specific surrogate chemicals used to represent the toxicity of each fraction. Some of the surrogates used (e.g., Pyrene, Hexane and Nonane) are the similar to those used by other programs, such as the Massachusetts Department of Environmental Protection in their VPH/EPH approach. One difference is that Utah uses 1,3,5-Trimethylbenzene as the representative surrogate for the C9-C10 alkylbenzenes, rather than methylnaphthalene. Although both surrogates have the same oral reference dose (0.04 mg/kg-day) and inhalation reference dose (0.06 mg/kg-day), the fractions and representative surrogates have different environmental fate and transport properties.

Table 1 provides an overview of the different approaches used by these different agencies, including Utah's approach, in deriving their TPH fractionation process and chemical surrogate selection for both the aromatic and aliphatic fractions of TPH. Table 2 outlines Utah's TPH fraction-specific and chemical-specific fate and transport properties and corresponding toxicity values (derived from the assigned chemical surrogates used by the LUST program). Table 3 describes how Utah's LUST program uses the values derived by the TPH fractionation process in determining appropriate site-specific cleanup levels for any given LUST site within the RBCA process. Appendix A shows the standard reporting format for TPH Fractionation.

These guidelines are not meant to be inclusive of the entire LUST program, the RBCA process or the TPH fractionation protocol. The reader of this document should therefore call their state-assigned LUST project manager at (801) 536-4100 to discuss any site-specific questions regarding the TPH fractionation protocol, and to ensure correct application of the TPH fractionation process and that it is used in a cost-effective manner to minimize the need for unnecessary sampling at leaking underground storage tank sites.

FIGURE 1

TPH Fractionation and Analytical Methods

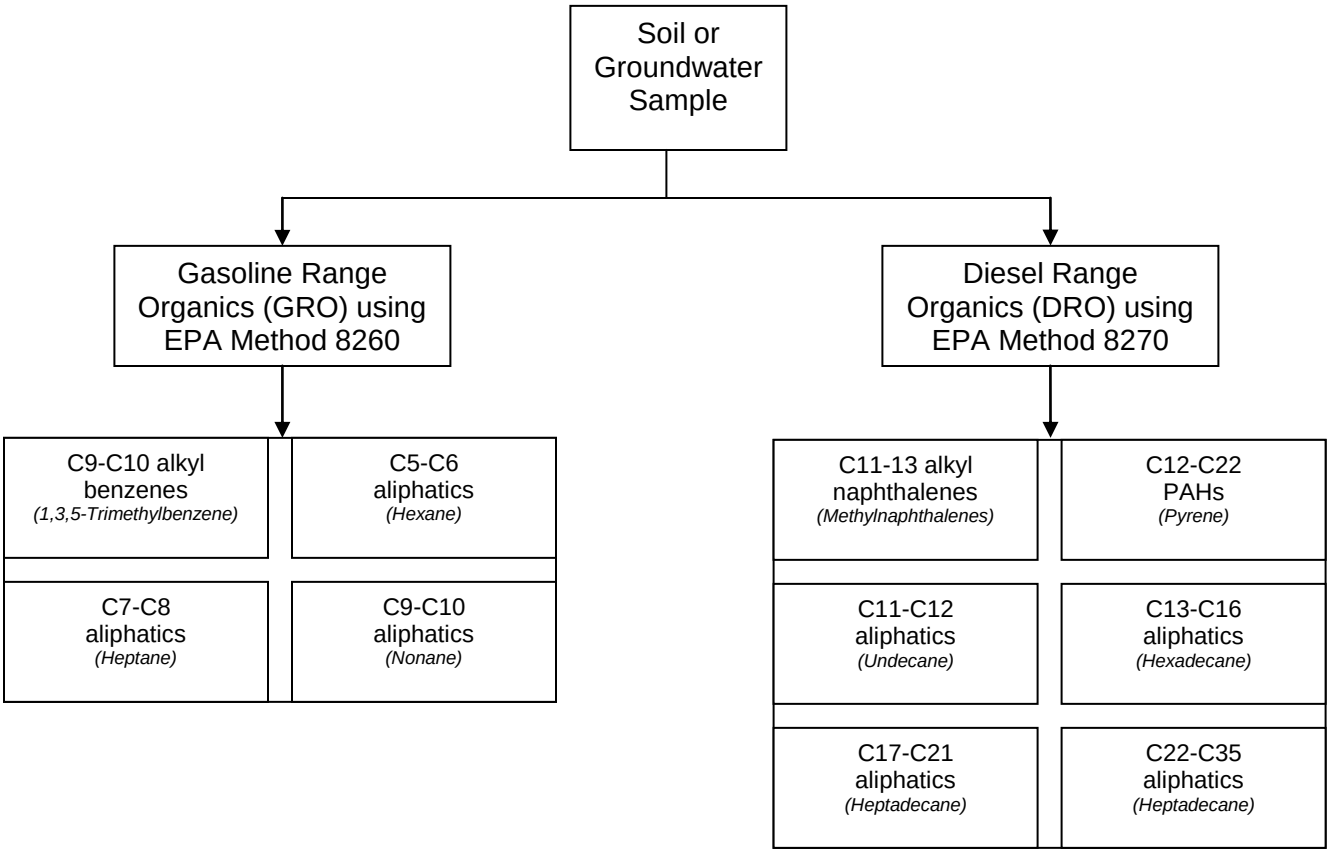

Table 1: Comparison of TPH Fractionation Chemical Surrogates Used by Various Programs

Program/ Protocol	Aromatic Fraction	Aliphatic Fraction	EC #	Chemical or Toxicity Surrogate for Aromatics	Chemical or Toxicity Surrogate for Aliphatics	Analytical Method & Oral Reference Dose (mg/Kg/day) for Chemical Surrogate
TPHCWG	C6 - C7	C5 - C6				
	C7 - C8	C7 - C8				0.2 for aromatics & 5.0 for aliphatics
	C9 - C10	C9 - C10				0.04 for aromatics & 0 .1 for aliphatics
	C11 - C12	C11 - C12				0.04 for aromatics & 0.1 for aliphatics
	C13 - C16	C13 - C16				0.004 for aromatics & 0 .1 for aliphatics
	C17 - C21	C17 - C21				0.03 for aromatics & 2.0 for aliphatics
	C22 - C35					0.03 for aromatics
WA DE TCP	C8 - C10 (PID) / , EC = 9 (Trimethylbenzene)	C5 - C6 (FID) / EC = 5.5 (Hexane)		Biphenyl	cyclohexane	VPH / 5.7 for aliphatics & 0.05 for aromatics
	C11 - C12 (PID) / , EC = 11 (Naphthalene)	C7 - C8 (FID) / EC = 7 (Octane)		Biphenyl	cyclohexane	VPH / 5.7 for aliphatics & .005 for aromatics
		C9 - C10 (FID) / Decane	9			VPH / 0.03 for aliphatics
		C11 - C12 (FID) / Dodecane	11			VPH / 0.03 for aliphatics
	C13 - C16 (acenaphthene)	C13 - C16 (Dodecane -hexadecane)	14	Biphenyl		EPH / 0.03 for aliphatics & .05 for aromatics
	C17 - C21 (pyrene)	C17 - C21 (Hexadecane - Henicosane)	19	Pyrene	Mineral Oil	EPH / 2.0 for aliphatics & 0.03 for aromatics
	C22 - C36 (benzoperylene)	C22 - C36 (Henicosane - Tetratricontane)	28	Pyrene	Mineral Oil	EPH / 2.0 for aliphatics & 0.03 for aromatics

Table 1, continued: Comparison of TPH Fractionation Chemical Surrogates Used by Various Programs

Program/ Protocol	Aromatic Fraction	Aliphatic Fraction	EC#	Chemical or Toxicity Surrogate for Aromatics	Chemical or Toxicity Surrogate for Aliphatics	Analytical Method & Oral Reference Dose (mg/Kg/day) for Chemical Surrogate
MA DEP	C9 - C10		9	Pyrene		VPH / 0.03
MA DEP	C11 - C22		14	Pyrene		EPH / 0.03
MA DEP		C5 - C8	6		n-hexane	VPH / 0.06
MA DEP		C9 - C12	10		n-nonane	VPH / 0.6
MA DEP		C9 - C18	12		n-nonane	EPH / 0.6
MA DEP		C19 - C36			Eicosane	EPH / 6.0
Utah DEQ	C9 - C10 alkyl benzenes			1, 3, 5-Trimethylbenzene		8260B / 0.04
Utah DEQ	C11 - C13 alkyl naphthalenes		11	Methylnaphthalene		8270B / 0.04
Utah DEQ	C12 - C22 Polynuclear aromatic hydrocarbons (PAHs)		16	Pyrene		8270B / 0.03
Utah DEQ		C5 - C6	6		Hexane	8260B / 0.06
Utah DEQ		C7 -C8			Heptane	8260B / 0.06
Utah DEQ		C9 - C10	9		Nonane	8260B / 0.1
Utah DEQ		C11 - C12			Undecane	8270B / 0.1
Utah DEQ		C13 - C16			Hexadecane	8270B / 0.1
Utah DEQ		C17 - C21	20		Heptadecane	8270B / 2.0
Utah DEQ		C22 - C35			Heptadecane	8270B / 2.0

Table 2: TPH Fraction-Specific [a] and Chemical-Specific Property [a] and Toxicity Values

TPH Fractions and Chemicals showing Carbon Number and Representative CAS number	EPA Analytical Method[b]	Molecular weight (g/mol)	Vapor Pressure[c] (mm Hg)	Henry's Law Constant[d] (L-H_2O/L-air, unitless)	Diffusion Coefficient in Air [e] (D^{air}, cm^2/s)	Diffusion Coefficient in Water [e] (D^w, cm^2/s)	Aqueous Solubility (20-25° C) (pure compound) (mg/L)	Adsorption Coefficient (Koc) (mL/g)	Cancer Slope Factor, Oral (SF_o) (kg-day/mg)	Cancer Slope Factor, Inhalation (SF_i) (kg-day/mg)	Reference Dose, Oral (RfD_o) (mg/kg-day)	Reference Dose, Inhalation (RfD_i) (mg/kg-day)
ALIPHATICS												
C_5-C_6 110-54-3 (hexane)	8260B	81	2.66 E+02 [g]	4.10 E+01	8.57 E-02	8.34 E-06	3.60 E+01	6.30 E+02	-	-	6.00 E-02 [h]	6.00 E-02 [h]
C_7-C_8 142-82-5 (heptane)	8260B	100	4.80 E+01	7.70 E+01	6.69 E-02	6.89 E-06	5.40 E+00	3.16 E+03	-	-	6.00 E-02 [h]	6.00 E-02 [h]
C_9-C_{10} 111-84-2 (nonane)	8260B	130	5.00 E+00	1.60 E+02	6.44 E-02	5.90 E-06	4.30 E-01	3.16 E+04	-	-	1.00 E-01 [i]	2.90 E-01 [i]
C_{11}-C_{12} 1120-21-4 (undecane)	8270B	160	4.80 E-01	1.60 E+02	4.60 E-02	5.19 E-06	3.40 E-02	3.16 E+05	-	-	1.00 E-01 [i]	2.90 E-01 [i]
C_{13}-C_{16} 544-76-3 (hexadecane)	8270B	200	3.60 E-02	1.60 E+02	3.95 E-02	4.50 E-06	7.60 E-04	5.00 E+06	-	-	1.00 E-01 [i]	2.90 E-01 [i]
C_{17}-C_{21} 544-76-3 (heptadecane)	8270B	270	8.40 E-04	1.10 E+02	3.28 E-02	3.76 E-06	2.50 E-06	4.00 E+08	-	-	2.00 E+00 [i]	na [i]
C22-C35 629-78-7 (heptadecane)	8270B	280	8.40 E-04	1.10 E+02	3.28 E-02	3.76 E-06	1.50 E-06	4.00 E+08	-	-	2.00 E+00 i	na i

Table 2, continued: TPH Fraction-Specific [a] and Chemical-Specific Property [a] and Toxicity Values

TPH Fractions and Chemicals showing Carbon Number and Representative CAS number	EPA Analytical Method[b]	Molecular weight (g/mol)	Vapor Pressure[c] (mm Hg)	Henry's Law Constant[d] (L-H_2O/L-air, unitless)	Diffusion Coefficient in Air [e] (D^{air}, cm^2/s)	Diffusion Coefficient in Water [e] (D^w, cm^2/s)	Aqueous Solubility (20-25° C) (pure compound) (mg/L)	Adsorption Coefficient (Koc) (mL/g)	Cancer Slope Factor, Oral (SF_o) (kg-day/mg)	Cancer Slope Factor, Inhalation (SF_i) (kg-day/mg)	Reference Dose, Oral (RfD_o) (mg/kg-day)	Reference Dose, Inhalation (RfD_i) (mg/kg-day)
AROMATICS												
Benzene C_6 71-43-2	8260B	78.11	9.50 E+01	2.25 E-01	8.80 E-02	9.80 E-06	1.78 E+03	8.12 E+01	2.90 E-02[j]	2.90 E-02[j]	-	-
Toluene C_7 108-88-3	8260B	92.13	2.85 E+01	2.74 E-01	8.57 E-02	8.60 E-06	5.15 E+02	2.34 E+02			8.00 E-02 [j]	1.43 E+00 [j]
Ethylbenzene C_8 100-41-4	8260B	106.2	9.50 E+00	3.58 E-01	7.50 E-02	7.80 E-06	1.52 E+02	5.37 E+02			1.00 E-01 [j]	2.90 E-01 [j]
Xylenes C_8 1330-20-7 [1]	8260B	106.2	8.59 E+00	2.52 E-01	7.85 E-02	8.90 E-06	1.98 E+02	5.86 E+02			2.00 E-01 [j]	2.90 E-02 [j]
Naphthalene C_{10} 91-20-3	8260B	128.19	2.76 E-01	1.74 E-02	5.90 E-02	7.50 E-06	3.10 E+01	8.44 E+02			2.00 E-02 [k]	8.60 E-04 [k]
Methyl t-Butyl Ether (MtBE) 1634-04-04 [m]	8260B	88.146	2.49 E+02	2.40 E-02	7.92 E-02	9.41 E-05	4.30 E+04	1.20 E+01			5.00 E-03 [o]	8.57 E-01 [k]
C_9-C_{10} (alkyl benzenes)	8260B	120.2 – 176.2	5.00 E+00	4.20 E-01	6.00 E-02	7.51 E-06	1.10 E+02	1.26 E+03			4.00 E-02 [i]	6.00 E-02 [i]
C_{11}-C_{13} (total alkyl naphthalenes) [n]	8270B	142.2 – 176.2	5.00 E-02	2.30 E-02	4.80 E-02	7.67 E-06	1.45 E+03	7.06 E+03		-	4.00 E-02 [i]	6.00 E-02 [i]
C_{12}-C_{22} [p] (polynuclear aromatic hydrocarbons)	8270B	152.21 – 278.35	2.70 E-03	4.12 E-01	3.23 E-02	1.66 E-05	4.86E+01	6.29 E+04			3.00 E-02 [i]	na [i]

Table 2, continued: TPH Fraction-Specific [a] and Chemical-Specific Property [a] and Toxicity Values

TPH Fractions and Chemicals showing Carbon Number and Representative CAS number	EPA Analytical Method[b]	Molecular weight (g/mol)	Vapor Pressure[c] (mm Hg)	Henry's Law Constant[d] (L-H_2O/L-air, unitless)	Diffusion Coefficient in Air [e] (D^{air}, cm^2/s)	Diffusion Coefficient in Water [e] (D^w, cm^2/s)	Aqueous Solubility (20-25° C) (pure compound) (mg/L)	Adsorption Coefficient (Koc) (mL/g)	Cancer Slope Factor, Oral (SF_o) (kg-day/mg)	Cancer Slope Factor, Inhalation (SF_i) (kg-day/mg)	Reference Dose, Oral (RfD_o) (mg/kg-day)	Reference Dose, Inhalation (RfD_i) (mg/kg-day)
POLYNUCLUEAR AROMATIC HYDROCARBONS (PAHs)												
Acenaphthylene C_{12} **208-96-8**	8270B	152.2	3.11 E-02	3.39 E-03	4.40 E-02	7.53 E-06	1.61 E+01	2.77 E+03			3.00 E-02 [q]	na
Acenaphthene C_{12} **83-32-9**	8270B	154.21	1.14 E-02	4.91 E-03	4.21 E-02	7.69 E-06	3.80 E+00	2.38 E+03			6.00 E-02 [j]	1.70 E-02 [i]
Fluorene C_{13} **86-73-7**	8270B	166.2	5.37 E-03	3.19 E-03	3.60 E-02	7.88 E-06	1.902 E+00	3.90 E+03			4.00 E-02 [j]	1.10 E-02 [i]
Phenanthrene C_{14} **85-01-8**	8270B	178.2	8.51 E-40	1.31 E-03	3.30 E-02	7.47 E-06	1.10 E+00	8.14 E+03			3.00 E-02 [q]	na
Anthracene C_{14} **120-12-7**	8270B	178.2	5.84 E-04	1.60 E-03	3.24 E-02	7.74 E-06	4.50 E-02	7.69 E+03			3.00 E-01 [j]	8.57 E-02 [i]
Fluoranthene C_{16} **206-44-0**	8270B	202.3	6.54 E-05	4.17 E-04	3.02 E-02	6.35 E-06	2.60 E-01	2.78 E+04			4.00 E-02 [j]	1.14 E-02 [i]
Pyrene C_{16} **129-00-0**	8270B	202.3	8.89 E-05	3.71 E-04	2.70 E-02	7.24 E-06	1.32 E-01	2.57 E+04			3.00 E-02 [j]	8.57 E-03 [i]
Benz(a)-Anthracene C_{18} **56-55-3**	8270B	228.3	4.54 E-06	2.34 E-04	5.10 E-02	9.00 E-06	1.10 E-01	1.02 E+05	7.30 E-01 [i]	7.30 E-02 [i]		

Table 2, continued: TPH Fraction-Specific [a] and Chemical-Specific Property [a] and Toxicity Values

TPH Fractions and Chemicals showing Carbon Number and Representative CAS number	EPA Analytical Method[b]	Molecular weight (g/mol)	Vapor Pressure[c] (mm Hg)	Henry's Law Constant[d] ($L\text{-}H_2O/L\text{-}air$, unitless)	Diffusion Coefficient in Air [e] (D^{air}, cm^2/s)	Diffusion Coefficient in Water [e] (D^w, cm^2/s)	Aqueous Solubility (20-25° C) (pure compound) (mg/L)	Adsorption Coefficient (Koc) (mL/g)	Cancer Slope Factor, Oral (SF_o) (kg-day/mg)	Cancer Slope Factor, Inhalation (SF_i) (kg-day/mg)	Reference Dose, Oral (RfD_o) (mg/kg-day)	Reference Dose, Inhalation (RfD_i) (mg/kg-day)
POLYNUCLUEAR AROMATIC HYDROCARBONS (PAHs), continued												
Chrysene C_{18} **218-01-09**	8270B	228.3	8.06 E-07	1.80 E-04	2.48 E-02	6.21 E-06	1.50 E-03	8.14 E+04	7.30 E-03 [i]	7.30 E-03 [i]		
Benzo(b)-Fluoranthene C_{20} **205-99-2**	8270B	252.32	5.07 E-05	8.36 E-04	2.26 E-02	5.56 E-06	1.50 E-03	8.30 E+04	7.30 E-01 [i]	7.30 E-01 [i]		
Benzo(k)-Fluoranthene C_{20} **207-08-09**	8270B	252.32	3.09 E-08	6.46 E-06	2.26 E-02	5.56 E-06	8.00 E-04	1.21 E+05	7.30 E-02 [i]	7.30 E-02 [i]		
Benzo(a)-Pyrene C_{20} **50-32-8**	8270B	252.3	1.60 E-07	1.86 E-05	4.30 E-02	9.00 E-06	3.80 E-03	1.31 E+05	7.30 E+00 [m]	6.10 E+00 [m]		
Indeno (1, 2, 3-Cd) Pyrene C_{22} **193-39-5**	8270B	276.34	7.60 E-07	2.07 E-11	2.30 E-02	4.41 E-06	6.20 E-02	8.00 E+03	7.30 E-01 [o]	6.10 E-01 [o]		
Dibenzo-(a, h) Anthracene C_{122} **53-70-3**	8270B	278.35	5.20 E-10	1.58 E-05	2.00 E-02	5.24 E-06	5.00 E-04	7.41 E+05	7.30 E-01 [o]	6.10 E-01 [o]		
Benzo (g, h, i)-Perylene C_{22} **191-24-2**	8270B	268.36	1.69 E-07	3.03 E-05	4.90 E-02	5.56 E-06	3.00 E-04	3.11 E+05			3.00 E-02 [q]	na [q]

Table 2 Notes:

na not available or applicable

a after Gustafson, et. al., 1997, Tables 3, 7 and 8.

b The EPA laboratory methods listed only pertain to the TPH fractionation process. Note that MTBE/BTEXN are also analyzed and reported when using EPA method 8260B for the TPH fractionation.

c mm Hg = 760 X atmospheres

d Henry's Law Constant (H) unit conversion:

$$\frac{H\ unitless}{41.6} = \frac{H\ atmospheres \bullet meter^3}{mole}$$

e Diffusion coefficients for the TPH fractions are based on average shown in Gustafson, et al., 1997, Table 3.

f Conversion formula for converting Reference Concentration (RfC) mg/m^3 to Reference Dose-inhalation (RfD_i) mg/kg-day:

$$RfC\ \frac{mg}{m^3} \times \frac{1}{70\ kg\ body\ weight} \times \frac{20\ m^3}{day}\ breathing\ rate = RfD_i\ \frac{mg}{kg\text{ - }day}$$

g E = Exponent to the base 10; for example, 2.66 E+02 = 2.66 X 10^{+2} = 266

h Hexane RfD and RfC based on USEPA (HEAST), 1997.

i after Edwards, et al., 1997.

j USEPA (IRIS), 1998a.

k USEPA (IRIS), 1998b.

l Total xylenes parameter values are based on average values of ortho-xylene, para-xylene and meta-xylene.

m ASTM, 1997.

n $C_{11} - C_{13}$ alkyl (or methyl) naphthalenes include the following chemicals. Fate and transport properties for this fraction are based on average values:

2-Methyl-naphthalene C_{11}
1-Methyl-naphthalene C_{11}
Total Dimethyl Naphthalenes C_{12}
Total Trimethyl Naphthalenes C_{13}

Toxicity values for the TPH fractions are represented by non-carcinogenic compounds.

o USEPA Region 3 Risk-Based Concentration table, EPA Region 3, March 1995.

p $C_{12} - C_{22}$ polynuclear aromatic hydrocarbons include the following chemicals. Fate and transport properties for this fraction are based on average values:

Acenaphthylene	C_{12}
Acenaphthene	C_{12}
Fluorene	C_{13}
Phenanthrene	C_{14}
Anthracene	C_{14}
Fluoranthene	C_{16}
Pyrene	C_{16}
*Benz(a)-Anthracene	C_{18}
*Chrysene	C_{18}
*Benzo(b)-Fluoranthene	C_{20}
*Benzo(k)-Fluoranthene	C_{20}
*Benzo(a)-Pyrene	C_{20}
*Indeno(1,23-Cd) Pyrene	C_{22}
*Dibenzo(a,h) Anthracene	C_{22}
Benzo(g,h,I) Perylene	C_{22}

* = Carcinogenic compounds. If these compounds are detected, SSCLs must be calculated for those compounds using their unique chemical and toxicity parameter values.

Toxicity values for the TPH fractions are represented by non-carcinogenic compounds.

q no toxicity data available; values used are for the C_{17} to C_{35} aromatic fraction according to Edwards, et al., 1997

Table 3: Determining RBSL and SSCL Values for Total Petroleum Hydrocarbons (TPH)

1. Sample Collection
   - Collect a minimum of one environmental sample which is representative of each contaminated medium (e.g., soil and groundwater) and the maximum concentration and composition of the petroleum contamination at the site. For sites where TPH contamination is highly variable in concentration or composition, the user should collect multiple TPH samples at representative locations to ensure a representative analysis by the laboratory.

2. Laboratory Analysis
   - Analyze the sample(s) using EPA methods 8260 and 8270. Specify Utah TPH Fractionation on the chain of custody forms to ensure that the laboratory uses the reporting format specific for TPH fractionation which differs from a typical 8260 and/or 8270 chemical parameter listing. The laboratory should report concentrations for each of the 10 different TPH fractions shown on Figure 1 and listed in Table 2. In addition, on the 8260 report, the laboratory should list values for any detectable BTEXN and MTBE. For fractions where the measured concentration is below the method reporting limit, a value of half the method reporting limit should be used as the representative source area concentration in deriving SSCLs.

3. Determining Tier 2 RBSLs for Each TPH Fraction
   - Fraction-specific RBSL values must be derived for each complete exposure pathway at the site. For each TPH fraction, RBSL values can be calculated for each relevant exposure pathway. Fraction-specific chemical property values and toxicological parameters to be used in the RBSL calculations are provided in Table 2.

4. Determining SSCL Values for Each TPH Fraction
   - Under Tier 2 Options 2 through Option 4, SSCL values for the individual TPH fractions are developed in the same manner as for any other COCs (e.g., BTEXN and MTBE). Using the chemical property values and toxicological parameter values listed on Table 2, a NAF value may be derived for each TPH fraction using the Option 2 through Option 4 calculation methods. The NAF is then multiplied by the appropriate RBSL value to obtain an SSCL for each complete exposure pathway. The fraction that exceeds its applicable SSCL the most will ultimately drive the cleanup for all the other fractions contained within TPH at the site.

5. Confirmation Sampling for TPH Fractions Following TPH-Driven Cleanup Activities
   - After completing cleanup activities that are driven by the exceedence of SSCLs for the TPH fraction(s), the user should obtain an appropriate number of environmental samples at representative locations and depths in order to verify the effectiveness of the cleanup at the release site. The same procedures described herein would again be employed for comparison with representative source area TPH fractionation values obtained. During cleanup, the user may elect to obtain samples for TPH fractionation, and BTEXN and MTBE (8260B method) if applicable, to measure the relative progress of the cleanup activities and to estimate the cleanup duration.

APPENDIX A

Standard Reporting Format

for

TPH Fractionation

ORGANIC ANALYSIS REPORT

Client: Contact:
Date Sampled: Date Received:
Lab Set ID: Received by:

Analysis Requested:	Analysis Method:	Date Analyzed:
Utah TPH Fractionation	EPA SW-846 #8260 (GCMS) Sample Prep: 5030 (Purge & Trap)	

Lab Sample ID:	Field Sample ID:	Reporting Units:
Water		ug/L

Analytical Results Volatile Fractionation

Compound:	Reporting Limit:	Amount Detected:
Methyl tert-butyl ether	2	<2
Benzene	1	<1
Toluene	2	<2
Ethylbenzene	2	<2
Total Xylenes	2	<2
Naphthalene	4	<4
C9 & C10 Alkyl Benzenes	2	<2
C5 & C6 Aliphatic hydrocarbons	20	<20
C7 & C8 Aliphatic hydrocarbons	20	<20
C9 & C10 Aliphatic hydrocarbons	20	<20

Surrogate QA/QC	% Recovery	QC Limits

Footnotes:
Dilution Factor = 1.0

Approved by: _____ Date:_____
Laboratory Supervisor

ORGANIC ANALYSIS REPORT

Client: Contact:
Date Sampled: Date Received:
Lab Set ID: Received by:

Analysis Requested:	Analysis Method:	Date Analyzed:
Utah TPH Fractionation	EPA SW-846 #8270 (GCMS) Sample Prep: 3510 (separatory liquid-liquid extraction) or 3511 (microextraction)	

Lab Sample ID:	Field Sample ID:	Reporting Units:
Water		ug/L

Analytical Results Semi-Volatile Fractionation

Compound:	Reporting Limit:	Amount Detected:
Acenaphthylene	15	<15
Acenaphtene	15	<15
Fluorene	15	<15
Phenanthrene	15	<15
Anthracene	15	<15
Fluoranthene	15	<15
Pyrene	15	<15
Benz(a)Anthracene	15	<15
Chrysene	15	<15
Benzo(b)Fluoranthene	15	<15
Benzo(k)Fluoranthene	15	<15
Benzo(a)Pyrene	15	<15
Ideno(1,2,3-Cd)Pyrene	15	<15
Dibenz(a,h)Anthracene	15	<15
Benzo(g,h,i)Perylene	15	<15
C12 to C22 Total PAHs	25	<25
C11 to C12 Aliphatic hydrocarbons	25	<25
C13 to C16 Aliphatic hydrocarbons	25	<25
C17 to C21 Aliphatic hydrocarbons	25	<25
C22 to C35 Aliphatic hydrocarbons	25	<25
C11 to C13 Alkyl Naphthalenes**	25	<25

Surrogate QA/QC	% Recovery	QC Limits

Footnotes:

* This value is a summation of the above-listed compounds

** This value is a summation of total methyl, di-methyl and tri-methyl naphthalene isomers

Approved by: _____ Date:_____

Laboratory Supervisor

ORGANIC ANALYSIS REPORT

Client: Contact:
Date Sampled: Date Received:
Lab Set ID: Received by:

Analysis Requested:	Analysis Method:	Date Analyzed:
Utah TPH Fractionation	EPA SW-846 #8260 (GCMS) Sample Prep: 5030 (Purge & Trap)	

Lab Sample ID:	Field Sample ID:	Reporting Units:
Soil		mg/kg

Analytical Results Volatile Fractionation

Compound:	Reporting Limit:	Amount Detected:
Methyl tert-butyl ether	2	<2
Benzene	1	<1
Toluene	2	<2
Ethylbenzene	2	<2
Total Xylenes	2	<2
Naphthalene	4	<4
C9 & C10 Alkyl Benzenes	2	<2
C5 & C6 Aliphatic hydrocarbons	20	<20
C7 & C8 Aliphatic hydrocarbons	20	<20
C9 & C10 Aliphatic hydrocarbons	20	<20

Surrogate QA/QC	% Recovery	QC Limits

Footnotes:
Dilution Factor = 1.0

Approved by: _____ Date:_____
Laboratory Supervisor

ORGANIC ANALYSIS REPORT

Client: Contact:
Date Sampled: Date Received:
Lab Set ID: Received by:

Analysis Requested:	Analysis Method:	Date Analyzed:
Utah TPH Fractionation	EPA SW-846 #8270 (GCMS) Sample Prep: 3550 (Ultrasonic Extraction)	

Lab Sample ID:	Field Sample ID:	Reporting Units:
Soil		mg/kg

Analytical Results Semi-Volatile Fractionation

Compound:	Reporting Limit:	Amount Detected:
Acenaphthylene	15	<15
Acenaphtene	15	<15
Fluorene	15	<15
Phenanthrene	15	<15
Anthracene	15	<15
Fluoranthene	15	<15
Pyrene	15	<15
Benz(a)Anthracene	15	<15
Chrysene	15	<15
Benzo(b)Fluoranthene	15	<15
Benzo(k)Fluoranthene	15	<15
Benzo(a)Pyrene	15	<15
Ideno(1,2,3-Cd)Pyrene	15	<15
Dibenz(a,h)Anthracene	15	<15
Benzo(g,h,i)Perylene	15	<15
C12 to C22 Total PAHs	25	<25
C11 to C12 Aliphatic hydrocarbons	25	<25
C13 to C16 Aliphatic hydrocarbons	25	<25
C17 to C21 Aliphatic hydrocarbons	25	<25
C22 to C35 Aliphatic hydrocarbons	25	<25
C11 to C13 Alkyl Naphthalenes**	25	<25

Surrogate QA/QC	% Recovery	QC Limits

Footnotes:

* This value is a summation of the above-listed compounds

** This value is a summation of total methyl, di-methyl and tri-methyl naphthalene isomers

Approved by: _____ Date:_____

Laboratory Supervisor