COMPREHENSIVE TABLES FOR CORRECTIVE ACTION GUIDELINES

PETROLEUM AND HAZARDOUS SUBSTANCE UST RELEASES

PETROLEUM NON-UST RELEASES

UST Section

North Carolina Department of Environmental Quality

Division of Waste Management

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Index of Changes

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NOTES applicable to Tables 3 through 7 and Table 12

1) Reportable Concentration: Any amount above MDL.

2) *Other EPA approved comparable methods, which target the same constituents and have equivalent or lower detection limits may be used if analyses are conducted by a NC DWR certified laboratory that is certified for the method.*
3) *Submit copies of original laboratory reports.*
4) *Method Detection Limits and Reporting Limits: For target analytes with Maximum Soil Contaminant Concentrations below laboratory reporting limits, the MDL concentration must be indicated with the analytical result and results reported down to the MDL. Results above the MDL, but below the laboratory reporting limit, must be reported and qualified as estimated. See Appendix K for recommended reporting limits.*
5) *All MDLs must be performed at or below the standards as outlined in 15A NCAC 2L.*
6) *Laboratories must be certified by the North Carolina DWR to perform the listed methods.*
7) *Required target analytes for the approved methods are listed in the Guidelines for Sampling.*
8) *Once contaminants have been initially identified by GC/MS methods, more economical compound specific methods may be used.*

Table 1
Maximum Soil Contaminant Concentration Levels (MSCCs)

(See https://deq.nc.gov/about/divisions/waste-management/ust/guidance-documents for current version)

Constituent	CAS#	Soil-to-Water Maximum Contaminant Concentration (Soil mg/kg)	Residential Soil Cleanup Levels (mg/kg)	Industrial/ Commercial Soil Cleanup Levels (mg/kg)
Acenaphthene	83-32-9	8.3	930	14000
Acenaphthylene	208-96-8	20	930	14000
Acetone	67-64-1	24	14000	210000
Aliphatics, C5-C8	N/A	68	625	9340
Aliphatics, C9-C18	N/A	540	1560	23300
Aliphatics, C19-C36	N/A	#	31200	467000
Anthracene	120-12-7	640	4600	70000
Aromatics, C9-C22	N/A	31	469	7000
Barium	7440-39-3	620	3100	46000
Benzene	71-43-2	0.0072	12	59.4
Benzo(a)anthracene (benz(a)anthracene)	56-55-3	0.17	6.6	32
Benzo(b)fluoranthene	205-99-2	0.6	6.6	32
Benzo(g,h,i)perylene	191-24-2	7600	469	7000
Benzo(k)fluoranthene	207-08-9	5.8	66	327
Benzoic acid	65-85-0	120	62500	934000
Benzo(a)pyrene	50-32-8	0.058	0.66	3.2
Benzyl Alcohol	100-51-6	3.1	1500	23300
Bis(chloroethyl)ether (BCEE)	111-44-4	0.00013	0.6	2.9
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	6.6	47	233
Bromoform (tribromomethane)	75-25-2	0.018	84	413
Bromomethane (methylbromide)	74-83-9	0.047	21	327
Butanol	71-36-3	2.8	1560	23300
Butyl alcohol, tert- (butanol, tert-) (TBA)	75-65-0	0.04	1400	21000
n-Butylbenzene	104-51-8	2.4	782	11600
sec-Butylbenzene	135-98-8	2.2	1560	23300
tert-Butylbenzene	98-06-6	1.7	1560	23300
Carbon disulfide	75-15-0	3.7	1560	23300
Chlorobenzene	108-90-7	0.44	312	4670
Chloroform (trichloromethane)	67-66-3	0.34	21	105
Chloromethane (methyl chloride)	74-87-3	0.014	51	251
4-Chlorotoluene (p-chlorotoluene)	106-43-4	0.28	312	4670
Chromium (Total)	7440-50-8	3.8*	1.32	6.54

Constituent	CAS#	Soil-to-Water Maximum Contaminant Concentration (Soil mg/kg)	Residential Soil Cleanup Levels (mg/kg)	Industrial/ Commercial Soil Cleanup Levels (mg/kg)
Chromium III	16065-83-1	360000	23400	350000
Chromium VI	18540-29-9	3.8	1.32	6.54
Chrysene	218-01-9	18	663	3270
Dibenz(a,h)anthracene	53-70-3	0.19	0.66	3.27
Dibenzofuran	132-64-9	5.2	15.6	233
Dibromochloromethane	124-48-1	0.0019	7.9	38.9
1,2-Dichlorobenzene (orthodichlorobenzene)	95-50-1	0.23	1400	21000
1,3-Dichlorobenzene (metadichlorobenzene)	541-73-1	7.6	460	7000
1,4-Dichlorobenzene (paradichlorobenzene)	106-46-7	0.069	122	605
Dichlorodifluoromethane (Freon-12; halon)	75-71-8	29	3120	46700
1,1-Dichloroethane	75-34-3	0.03	116	573
1,2-Dichloroethane (ethylene dichloride)	107-06-2	0.0019	7.29	35.9
1,2-Dichloroethene (cis)	156-59-2	0.35	31.2	467
1,2-Dichloroethene (trans)	156-60-5	0.54	312	4670
1,2-Dichloroethene (cis and trans)	540-59-0	0.3	140	2100
1,1-Dichloroethylene (vinylidene chloride)	75-35-4	2.2	782	11600
2,4-Dichlorophenol	120-83-2	0.0067	46	700
1,2-Dichloropropane	78-87-5	0.003	17.9	88.3
1,3-Dichloropropene (cis and trans isomers)	542-75-6	0.002	6.63	32.7
2,4-Dimethylphenol (2,4-xylenol)	105-67-9	1.3	312	4670
Ethanol	64-17-5	16	5160	77000
Ethyl acetate	141-78-6	12	14000	210000
Ethylbenzene	100-41-4	8	60.3	297
Ethylene dibromide (1,2-dibromoethane)	106-93-4	0.000096	0.33	1.63
Ethylene glycol	107-21-1	40	31200	467000
Ethyl tert-butyl ether	63-79-23	0.2		
Fluoranthene	206-44-0	330	625	9340
Fluorene	86-73-7	55	625	9340
Hexachlorobutadiene	87-68-3	0.0086	8.5	41.9
2-Hexanone (methyl n-butyl ketone, MBK)	591-78-6	0.17	78.2	1160
Indeno(1,2,3-cd)pyrene	193-39-5	1.9	6.63	32.7
Isopropyl benzene (cumene)	98-82-8	1.3	1560	23300
Isopropyl ether (diisopropyl ether)	108-20-3	0.32	156	2330
4-Isopropyltoluene (p-cymene)	99-87-6	0.12	1560	23300

Constituent	CAS#	Soil-to-Water Maximum Contaminant Concentration (Soil mg/kg)	Residential Soil Cleanup Levels (mg/kg)	Industrial/ Commercial Soil Cleanup Levels (mg/kg)
Lead	7439-92-1	270	400	400
Methanol	67561	16	31200	467000
Methyl ethyl ketone (2-butanone; MEK)	78-93-3	16	9380	140000
Methyl tert-butyl ether (MTBE)	1634-04-4	0.085	156	1810
Methylene chloride	75-09-2	0.023	93.8	1400
Methyl isobutyl ketone (MIBK)	108-10-1	0.42	1250	18600
1-Methylnaphthalene	90-12-0	0.054	22.8	112
2-Methylnaphthalene	91-57-6	1.5	62.5	934
2-Methylphenol	95-48-7	4	782	11600
Naphthalene	91-20-3	0.2	5.5	27
Pentachlorophenol	87-86-5	0.0047	1.65	8.17
Phenanthrene	85-01-8	64	469	7000
Phenol	108-95-2	0.22	4690	70000
n-Propylbenzene	103-65-1	1.4	1560	23300
Pyrene	129-00-0	210	469	7000
Silver	7440-22-4	4.8	78.2	1160
Styrene (ethenylbenzene)	100-42-5	0.9	3120	46700
tert-Amyl alcohol (TAA)	75-85-4	0.16	156	2330
tert-Amyl methyl ether (TAME)	994-05-8	0.52	625	9340
tert-Butyl formate (TBF)	762-75-4	0.1		
1,1,1,2-Tetrachloroethane	360-20-6	0.004	25.2	125
1,1,2,2-Tetrachloroethane	79-34-5	0.0012	3.31	16.3
Tetrachloroethylene (perchloroethylene; PCE)	127-18-4	0.005	93.8	1400
Toluene	108-88-3	5.4	1250	18600
1,2,4-Trichlorobenzene	120-82-1	2.1	22.8	112
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	1.2	31200	467000
1,1,2-Trichloroethane	79-00-5	0.0032	11.6	57.3
Trichloroethylene (TCE)	79-01-6	0.017	7.82	71
Trichlorofluoromethane	75-69-4	23	4690	70000
1,2,4-Trimethylbenzene	95-63-6	6.6	156	2330
1,3,5-Trimethylbenzene	108-67-8	6.6	156	2330
2,4,6-Trichlorophenol	88-06-2	0.15	15.6	233
Vinyl acetate	108-05-4	0.36	15600	233000
Vinyl chloride	75-01-4	0.00019	0.921	4.54
Xylenes (o-, m-, and p-; mixed)	1330-20-7	6	3120	46700

Health based level > 100%

*If total Chromium exceeds this value, check for Chromium IV and III

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considered immobile

Table 2
Gross Contamination Levels for Groundwater

(See https://deq.nc.gov/about/divisions/waste-management/ust/guidance-documents for current version)

Compound	CAS #	North Carolina Groundwater Quality Standards* (GWQS) (ug/l)	Gross Contamination Levels for Groundwater (GCL) (ug/l)	BASIS
Acenaphthene	83-32-9	80	1950	SOL
Acenaphthylene	208-96-8	200	8000	SOL
Acetone	67-64-1	6000	6000000	STD
Anthracene	120-12-7	2000	2000	GWQS
Barium	7440-39-3	700	700000	STD
Benzene	71-43-2	1	5000	DWSTD
Benzo(a)anthracene (benz(a)anthracene)	56-55-3	0.05	4.7	SOL
Benzo(b)fluoranthene	205-99-2	0.05	0.75	SOL
Benzo(g,h,i)perylene	191-24-2	200	200	GWQS
Benzo(k)fluoranthene	207-08-9	0.5	0.5	GWQS
Benzoic acid	65-85-0	30000	1700000	SOL
Benzo(a)pyrene	50-32-8	0.005	0.8	SOL
Benzyl alcohol	100-51-6	700	700000	STD
Bis(2-chloroethyl)ether (BCEE)	111-44-4	0.03	30	STD
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	3	135	SOL
Bromoform (tribromomethane)	75-25-2	4	4000	STD
Bromomethane (methylbromide)	74-83-9	10	100000	STD
Butanol	71-36-3	700	700000	STD
Butanol, tert- (TBA)	75-65-0	10	10000	STD
n-Butylbenzene	104-51-8	70	5900	SOL
sec-Butylbenzene	135-98-8	70	8800	SOL
tert-Butylbenzene	98-06-6	70	14750	SOL
Carbon disulfide	75-15-0	700	550000	SOL
Chlorobenzene	108-90-7	50	50000	STD
Chloroform (trichloromethane)	67-66-3	70	70000	STD
Chloromethane (methyl chloride)	74-87-3	3	3000	STD
4-Chlorotoluene (p-chlorotoluene)	106-43-4	24	24000	STD
Chromium	7440-47-3	10	10000	STD
Chrysene	218-01-9	5	5	GWQS
Dibenz(a,h)anthracene	53-70-3	0.005	1.2	SOL
Dibenzofuran	132-64-9	28	1550	SOL
Dibromochloromethane	124-48-1	0.4	400	STD
1, 2-Dichlorobenzene (orthodichlorobenzene)	95-50-1	20	20000	STD
1, 3-Dichlorobenzene (metadichlorobenzene)	541-73-1	200	61500	SOL
1, 4-Dichlorobenzene (paradichlorobenzene)	106-46-7	6	405	SOL
Dichlorodifluoromethane (Freon-12; halon)	75-71-8	1000	140000	SOL

Compound	CAS #	North Carolina Groundwater Quality Standards* (GWQS) (ug/l)	Gross Contamination Levels for Groundwater (GCL) (ug/l)	BASIS
1, 1-Dichloroethane	75-34-3	6	6000	STD
1. 2-Dichloroethane (ethylene dichloride)	107-06-2	0.4	400	STD
1, 2-Dichloroethene (cis)	156-59-2	70	70000	STD
1, 2-Dichloroethene (trans)	156-60-5	100	100000	STD
1,2-Dichloroethene (cis and trans)	540-59-0	60	60000	STD
1, 1-Dichloroethylene (vinylidene chloride)	75-35-4	350	350000	STD
2,4-Dichlorophenol	120-83-2	0.98	980	STD
1, 2-Dichloropropane	78-87-5	0.6	600	STD
1, 3-Dichloropropene (cis and trans isomers)	542-75-6	0.4	400	STD
2,4-Dimethylphenol	105-67-9	100	100000	STD
Ethanol	64-17-5	4000	4000000	STD
Ethyl acetate	141-78-6	3000	3000000	STD
Ethylbenzene	100-41-4	600	80000	SOL
Ethylene dibromide (1, 2- Dibromoethane, EDB)	106-93-4	0.02	50	DWSTD
Ethylene glycol	107-21-1	10000	10000000	STD
Ethyl tert-butyl ether	63-79-23	47	47000	STD
Fluoranthene	206-44-0	300	300	GWQS
Fluorene	86-73-7	300	845	SOL
Hexachlorobutadiene	87-68-3	0.4	400	STD
2-Hexanone (methyl n-butyl ketone)	591-78-6	40	40000	STD
Indeno(1,2,3-cd)pyrene	193-39-5	0.05	0.095	SOL
Isopropyl benzene (cumene)	98-82-8	70	30500	SOL
Isopropyl ether (diisopropyl ether)	108-20-3	70	70000	STD
4-Isopropyltoluene (p-cymene)	99-87-6	25	11700	SOL
Lead	7439-92-1	15	15000	STD
Methanol	67-56-1	4000	4000000	STD
Methyl ethyl ketone (2-butanone; MEK)	78-93-3	4000	4000000	STD
Methyl isobutyl ketone (MIBK)	108-10-1	100	100000	STD
1-Methylnaphthalene	90-12-0	1	1000	STD
2-Methylnaphthalene	91-57-6	30	12000	SOL
2-Methylphenol (o-Cresol)	95-48-7	400	400000	STD
Methyl tert-butyl ether (MTBE)	1634-04-4	20	20000	STD
Methylene chloride	75-09-2	5	5000	STD
Naphthalene	91-20-3	6	6000	STD
Pentachlorophenol	87-86-5	0.3	300	STD
Phenanthrene	85-01-8	200	550	SOL
Phenol	108-95-2	30	30000	STD
n-Propylbenzene	103-65-1	70	26100	SOL
Pyrene	129-00-0	200	200	GWQS
Silver	7440-22-4	20	20000	STD
Styrene (ethenylbenzene)	100-42-5	70	70000	STD
tert-Amyl Alcohol (TAA)	75-85-4	40	40000	PQL

Compound	CAS #	North Carolina Groundwater Quality Standards* (GWQS) (ug/l)	Gross Contamination Levels for Groundwater (GCL) (ug/l)	BASIS
tert-Amyl Methyl Ether (TAME)	994-05-8	128	128000	STD
tert-Butyl Formate (TBF)	762-75-4	40	40000	PQL
1,1,1,2-Tetrachloroethane	630-20-6	1	1000	STD
1,1,2,2-Tetrachloroethane	79-34-5	0.2	200	STD
Tetrachloroethylene (perchloroethylene; PCE)	127-18-4	0.7	700	STD
Toluene	108-88-3	600	260000	SOL
1,2,4-Trichlorobenzene	120-82-1	70	24500	SOL
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	200	200000	STD
1,1,2-Trichloroethane	79-00-5	0.6	600	STD
Trichloroethylene (TCE)	79-01-6	3	3000	STD
Trichlorofluoromethane	75-69-4	2000	550000	SOL
1,2,4-Trimethylbenzene	95-63-6	400	28500	SOL
1,3,5-Trimethylbenzene	108-67-8	400	24100	SOL
2,4,6-Trichlorophenol	88-06-2	4	4000	STD
Vinyl acetate	108-05-4	88	88000	STD
Vinyl chloride	75-01-4	0.03	30	STD
Xylenes (o-, m-, and p-; mixed)	1330-20-7	500	50000	SOL

Rev. 10/8/2020

SOL – 50% of the solubility at 25 degrees Celsius
DWSTD – 1000 x federal drinking water standard (40 CFR 141)
STD – 1000 x North Carolina groundwater quality standard (15A NCAC 2L .0202)
GWQS – 50% Solubility is less than GWQS
* includes interim Groundwater Quality Standards
PQL – Practical Quantitation Limit

Table 3
Approved Soil Analyses Methods for Petroleum UST Closures, Over-Excavation, and at Site Checks

Suspected Contaminant	Analytical Methods for Closure, Site Check, or Other Preliminary Investigation Samples	Analytical Methods for Samples from Over-Excavation Following a Release
1a. Low Boiling Point Fuels: gasoline, aviation gasoline, etc.	EPA 8015[a] for TPH-GRO **(or** UVF for TPH)[b]	EPA 8260[a] **and** MADEP VPH
1b. Ethanol-Gasoline Blends	EPA 8015[a] for TPH-GRO **(or** UVF for TPH)[b] **and** EPA 8260[a]	
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, biodiesel (containing diesel), etc. Varsol, mineral spirits, naphtha.	EPA 8015[a] for TPH-GRO **and** EPA 8015[a] for TPH-DRO **(or** UVF for TPH)[b]	EPA 8260[a], EPA 8270[a], MADEP VPH, **and** MADEP EPH
3. Heavy Fuels: #4, #5, #6 fuel oils, motor oil, hydraulic fluid, etc. mineral oil[c]	EPA 8015[a] for TPH-DRO **(or** UVF for TPH)[b]	EPA 8270[a] **and** MADEP EPH
4. Used / Waste Oil (non-hazardous)	EPA 8260[a], EPA 8270[a], MADEP VPH, MADEP EPH, **(or** UVF for TPH and PAH)[b] **and** Total Metals (Cr and Pb), EPA 8081[a] (pesticides)**, and** EPA 8082[a] (PCBs)[d]	EPA 8260[a], EPA 8270[a], MADEP VPH, MADEP EPH, Total Metals (Cr and Pb), EPA 8081[a] (pesticides)**, and** EPA 8082[a] (PCBs)[d]

Rev. 0920

a Analyze for EPA Method; 8015; EPA Method 8260; EPA Method 8270; EPA Method 8081 and EPA Method 8082 using the current version in the Third Edition of SW-846.

b Only UVF technology with product (fuel) identification and calibration approved by DWM is allowed. (Other methods for TPH analysis may be approved by DWM for the initial investigation if determined to meet all requirements.)

c Carbon chains in mineral oils range from approximately C_{12}-C_{45}.

d Analyses for PCBs and pesticides are not required for service station/garage waste oil investigations.

Table 4
Approved Soil Analyses Methods for Advanced Phases of Petroleum UST and Non-UST Release Investigations

Suspected Contaminant	LSA 1 Soil Sampling [b, c]	Comprehensive Site Assessment, Monitoring, and Final Site Closure Soil Sampling [b, f, g]
1. Low Boiling Point Fuels: gasoline, aviation gasoline, ethanol-gasoline blends, etc.	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8260[a] **and** MADEP VPH Analyze all other samples by: MADEP VPH	Analyze all samples from each vertical boring by: EPA 8260[a] **and** MADEP VPH
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, biodiesel, etc. Varsol, mineral spirits, naphtha	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8260[a], EPA 8270[a], MADEP VPH, **and** MADEP EPH Analyze all other samples by: MADEP VPH, **and** MADEP EPH	Analyze all samples from each vertical boring by: EPA 8260[a], EPA 8270[a], MADEP VPH, **and** MADEP EPH
3. Heavy Fuels: #4, #5, #6 fuel oils; motor oil; hydraulic fluid; etc. Mineral oil[d]	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8270[a] **and** MADEP EPH Analyze all other samples by: MADEP EPH	Analyze all samples from each vertical boring by: EPA 8270[a] **and** MADEP EPH
4. Used / Waste Oil (non-hazardous)	Analyze the first sample collected below land/excavation surface and the last sample prior to saturated zone by: EPA 8260[a] EPA 8270[a], MADEP VPH, MADEP EPH, Total Metals (Cr and Pb), EPA 8081[a] (pesticides), **and** EPA 8082[a] (PCBs)[e] Analyze all other samples by: MADEP VPH, **and** MADEP EPH	Analyze all samples from each vertical boring by: EPA 8260[a], EPA 8270[a], MADEP VPH, MADEP EPH, Total Metals (Cr and Pb), EPA 8081[a] (pesticides), **and** EPA 8082[a] (PCBs)[e]

Rev.0619

a Analyze for EPA Method 8260; EPA Method 8270; EPA Method 8081 and EPA Method 8082 using the current version in the Third Edition of SW-846.
b The smear zone should be avoided.
c Two full analysis samples are required per well boring.
d Carbon chains in mineral oils range from approximately C_{12}-C_{45}.
e Analyses for PCBs and pesticides are not required for service station/garage waste oil investigations.
f Sample analysis for monitoring should be limited to constituents previously detected.
g Prior to full-constituent sampling, intensive field-based, semi-quantitative assessment of contamination should be conducted to determine optimal locations of borings and minimize the quantity of samples.

Table 5
Approved Groundwater Analyses Methods for Petroleum UST and Non-UST Release Investigations (All Phases)

Suspected Contaminant	Analytical Methods (See Notes)
1. Low Boiling Point Fuels: gasoline, aviation gasoline, ethanol-gasoline blends, etc.	SM 6200[a,b], MADEP VPH, **and** Metals (Pb)[c]
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil#2, biodiesel (containing diesel), etc. Varsol, mineral spirits, naphtha.	EPA 602 with Xylenes, EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, MADEP VPH, **and** MADEP EPH
3. Heavy Fuels: #4, #5, #6 fuel oils; motor oil; hydraulic fluid, etc. Mineral oil[d]	EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, **and** MADEP EPH
4. Used / Waste Oil (non-hazardous)	SM 6200, EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, MADEP VPH, MADEP EPH, **and** Metals (Cr and Pb)[d]

Rev. 0619

a Analyze for EDB using EPA Method 504.1, initially and at closure.

b Analyze for full list of target analytes using certified version of SM 6200 (in *Guidelines for Sampling*, App. B) at initi groundwater investigation (e.g., IAA/ IAR or LSA) unless DWM directs otherwise.

c Analyze for metals using Methods from sources listed in 15A NCAC 2L .0112 and .0413.

d Carbon chains in mineral oils range from approximately C_{12}-C_{45}.

Table 6
Approved Soil Analyses Methods for Non-Petroleum UST Closures and Release Investigations

Suspected Contaminant	Analytical Methods (See Notes)
1. Halogenated Solvents 2. Non-Halogenated Solvents	EPA 8260
3. Non-Petroleum - Unknown	Contact NC DEQ/ UST Section/Corrective Action Branch (919) 707-8171
4. Pesticides	Contact NC Dept. of Agriculture and Consumer Services/ Pesticide Section (919) 733-3556 **and** NC DEQ/ UST Section at (919) 707-8171
5. For substances not covered in 1 through 5	Contact NC DEQ/ UST Section/Corrective Action Branch (919) 707-8171

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Table 7
Approved Groundwater Analysis Methods for Non-Petroleum UST Closures and Release Investigations

Suspected Contaminant	Analytical Methods* (See Notes)
1. Solvents: a. Halogenated/Non-Halogenated b. Ethanol, c. Ethylene Glycol d. Formaldehyde	 a. EPA 8260 b. EPA 8260 c. EPA 8260 d. EPA 8315A
2. Non-Petroleum - Unknown	Contact NC DEQ/ UST Section/Corrective Action Branch at (919) 707-8171.
3. Pesticides	Contact NC Dept. of Agriculture and Consumer Services/ Pesticide Section at (919) 733-3556 **and** NC DEQ/ UST Section at (919) 707-8171.
4. For substances not covered in 1 - 4	Contact NC DEQ/ UST Section/Corrective Action Branch at (919) 707-8171.

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Table 8
Soil Analyses Sample Containers and Preservatives

Method	Number and Type of Containers	Preservation	Holding Times
EPA 8015 GRO MADEP VPH	Duplicate pre-weighed VOA vials with methanol and Teflon-lined screw caps Extra VOA vial w/o preservative[a]	Cool to 4±2°C	28 days
	Duplicate EnCore samplers or equivalent **or** Duplicate pre-weighed empty VOA vials with Teflon-lined screw caps Extra VOA vial w/o preservative[a]	Cool to 4±2°C **and** Complete laboratory preservation[b] or analyze within 48 hours	
EPA 8260[c]	Triplicate EnCore samplers or equivalent **or** Duplicate pre-weighed VOA vials w/ de-ionized water, sodium bisulfate, and stir bar, and duplicate pre-weighed VOA vials with methanol. Extra VOA vial w/o preservative[a]	Cool to 4±2°C **and** complete laboratory preservation[b] or analyze within 48 hours	14 days
EPA 8015 DRO EPA 8270 EPA 8081 EPA 8082	8-oz glass jar with Teflon-lined screw cap	Cool to 4±2°C	Extract within 14 days and analyze extracts within 40 days of extraction.
MADEP EPH	4-oz (120-ml) wide-mouth amber glass jar with Teflon-lined screw cap	Cool to 4±2°C	Extract within 14 days and analyzed extracts within 40 days of extraction.
Total Metals	500-ml polyethylene or glass jar	Cool to 4±2°C	6 months

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a Use for dry weight determination and for soil characterization (i.e., laboratory effervescence check) of low-concentration samples suspected to contain carbonate minerals.

b See the current version of the *Guidelines for Sampling,* for details on preservation options. Consult with the laboratory when selecting the preservation option and ensure option is documented with analytical results. If low level sodium bisulfate or equivalent preservation is required, check with the laboratory that will be doing the analysis for any other requirements. Sample size should be limited to 5 to 10 grams, depending on soil type. See the *Guidelines for Sampling,* current version, for additional information.

c Soil Samples collected for the analysis of ethanol and ethanol-gasoline blend releases must be analyzed with no delay.

Table 9
Groundwater Analyses Sample Containers and Preservatives

Method	Number and Type of Containers	Preservative[a]	Holding Times
EPA 8260 SM 6200 MADEP VPH	Triplicate 40-ml VOA vials with Teflon-lined septa screw cap	Add 3 to 4 drops of 1:1 HCl Cool to 4±2°C	14 days
MADEP EPH	1-L amber glass with Teflon-lined screw cap	Add 5 ml of 1:1 HCl (to pH<2) Cool to 4±2°C	Samples must be extracted within 14 days and extracts analyzed within 40 days.
EPA 625	1-L amber glass with Teflon-lined screw cap	Cool to 4±2°C	Samples must be extracted within 7 days and extracts analyzed within 40 days.
Metals (Cr and Pb)	500-ml polyethylene or glass jar	Add 5 ml of 1:1 HNO_3 (to pH<2) Cool to 4±2°C	Samples must be analyzed within 6 months.
EPA 504.1	40-ml VOA vials with Teflon-lined septa screw cap	Add 3mg sodium thiosulphate Cool to 4±2°C	Samples must be extracted and analyzed within 14 days.

a Check with the laboratory that will be doing the analysis for any other requirements. Rev. 1113

Table 10
Worksheet for Calculating MADEP Soil Sample Results

Contaminant	Analytical Method	Hydrocarbon Fraction Ranges	Analytical Hydrocarbon Fractions		Laboratory Results Concentration	Final VPH and/or EPH Concentrations (mg/kg)
Low Boiling Point Fuels: gasoline, aviation gasoline, gasohol, etc.	MADEP VPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x mg/kg	x
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a mg/kg	a
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c mg/kg	c
Medium/ High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, etc. Varsol, mineral spirits, naphtha,	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x mg/kg	x
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a mg/kg	a + b
			C9-C18 Aliphatics	EPH	b mg/kg	
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y mg/kg	y
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c mg/kg	c + d
			C11-C22 Aromatics	EPH	d mg/kg	
Heavy Fuels: #4, #5, #6 fuel oils; motor oils; hydraulic fluid; etc. Mineral oil*;	MADEP EPH	C9-C18 Aliphatics	C9-C18 Aliphatics	EPH	b mg/kg	b
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y mg/kg	y
		C9-C22 Aromatics	C11-C22 Aromatics	EPH	d mg/kg	d
Used/ Waste Oil	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x mg/kg	x
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a mg/kg	a + b
			C9-C18 Aliphatics	EPH	b mg/kg	
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y mg/kg	y
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c mg/kg	c + d
			C11-C22 Aromatics	EPH	d mg/kg	

* Carbon chains in mineral oils range from approximately C_{12}-C_{45}.

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Table 11
Worksheet for Calculating MADEP Groundwater Sample Results

Contaminant	Analytical Method	Hydrocarbon Fraction Standard Ranges	Analytical Hydrocarbon Fractions		Laboratory Results Concentration	Final VPH and/or EPH Concentrations (µg/L)
Low Boiling Point Fuels: gasoline, aviation gasoline, gasohol, etc.	MADEP VPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x µg/L	x
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a µg/L	a
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c µg/L	c
Medium/ High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, etc. Varsol, mineral spirits, naphtha,	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x µg/L	x
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a µg/L	a + b
			C9-C18 Aliphatics	EPH	b µg/L	
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y µg/L	y
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c µg/L	c + d
			C11-C22 Aromatics	EPH	d µg/L	
Heavy Fuels: #4, #5, #6 fuel oils; motor oils; hydraulic fluid; etc. Mineral oil*:	MADEP EPH	C9-C18 Aliphatics	C9-C18 Aliphatics	EPH	b µg/L	b
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y µg/L	y
		C9-C22 Aromatics	C11-C22 Aromatics	EPH	d µg/L	d
Used/ Waste Oil	MADEP VPH and MADEP EPH	C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	x µg/L	x
		C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	a µg/L	a + b
			C9-C18 Aliphatics	EPH	b µg/L	
		C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	y µg/L	y
		C9-C22 Aromatics	C9-C10 Aromatics	VPH	c µg/L	c + d
			C11-C22 Aromatics	EPH	d µg/L	

* Carbon chains in mineral oils range from approximately C_{12}-C_{45}. Rev. 0421

Table 12
Approved Methods for Soil Analyses for a Permit

(See permit for required methods)

Contaminant	Methods (See Notes)	Reportable Concentration
1. Low Boiling Point Fuels: gasoline, aviation gasoline, ethanol-gasoline blends, etc.	1. EPA 8015 for TPH-GRO, 2. EPA 8260, 3. EPA 9045 (pH), and EPA 1311 (TCLP) Metals* Methods required for sampling purposes: (routine monitoring 1), (permit completion 1 & 2), (initial characterization 1, 2 & 3)	Any amount above MDL
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, fuel oil #2, biodiesel (containing diesel), etc. Varsol, mineral spirits, naphtha	1. EPA 8015 for TPH-GRO and EPA 8015 for TPH-DRO 2. EPA 8260 and EPA 8270, 3. EPA 9045 (pH) and EPA 1311 (TCLP) Metals* Methods required for sampling purposes: (routine monitoring 1), (permit completion 1 & 2), (initial characterization 1, 2 & 3)	Any amount above MDL
3. Heavy Fuels: #4, #5 and #6 fuel oils; motor oil; hydraulic fluid; etc. Mineral oil	1. EPA 8015 DRO, 2. EPA 8270, 3. EPA 9045 (pH), and EPA 1311 (TCLP) Metals* Methods required for sampling purposes: (routine monitoring 1) (permit completion 1 & 2) (initial characterization 1, 2 & 3)	Any amount above MDL
4. Used / Waste Oil	1. EPA 8260 and EPA 8270, 2. EPA 9045 (pH), and EPA 1311 (TCLP) Metals 3.EPA Method 9071 (only if no other option available)**, Methods required for sampling purposes: (routine monitoring 1) (permit completion 1 & 2) (initial characterization 1, 2 & 3)	Any amount above MDL
5. For substances not covered in 1 through 4	Contact NC DEQ / UST Section (919) 707-8171	Contact the UST Section

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* In lieu of TCLP analysis, a total analysis of the TCLP constituents to document that individual analytes are not present at levels which could exceed TCLP regulatory levels.

** MADEP EPH or an expanded TPH DRO is preferable.

NOTES: *1) If TCLP metals exceed TCLP limits, contact the DWM-Hazardous Waste Section at (919) 707-8200 for disposal information. 2) For permit completion sampling, the MDL concentration must be indicated with the analytical result and results reported down to the MDL. Results above the MDL, but below the laboratory reporting limit, must be reported and qualified as estimated. Blank results for these target analytes must also be reported down to MDL in order to evaluate the low level reporting. See the Guidelines for Sampling, current edition, for tables of volatile and semi-volatile target analytes, groundwater quality standard, and routine laboratory reporting limits.*

Table 13
Equipment Construction Materials

Construction Material[1]	Acceptable Analyte Groups	Precautions
Metals		
316 Stainless Steel	All analyte groups. Recommended for inorganic nonmetallics, metals, volatile and extractable organics.	Do not use if weathered, corroded or pitted.[2]
300-Series Stainless Steel (304, 303, 302)	Suitable for all analyte groups (if used, check for corrosion before use). Recommended for inorganic nonmetallics, metals, volatile and extractable organics.	Do not use if weathered, corroded or pitted.[2] If corroded, samples may be contaminated with iron, chromium, copper or nickel. Check for compatibility with water chemistry for dedicated applications. Do not use in low pH, high chloride or high TDS waters.
Low Carbon Steel Galvanized Steel Carbon Steel	Inorganic nonmetallics only.	Appropriate liners must be used. Teflon liners for organics. Plastic or Teflon liners for metals. Galvanized equipment will also contaminate with zinc and cadmium. If used to collect large samples (e.g., dredges), samples may be collected from portions of the interior of the collected material.
Brass	Inorganic nonmetallics only.	Do not use if weathered, corroded or pitted.[2]
Plastics [3]		
Teflon and other fluorocarbon polymers	All analyte groups. Especially recommended for trace metals and organics.	Easily scratched. Do not use if scratched or discolored.
Polypropylene Polyethylene	All analyte groups.	Easily scratched. Do not use if scratched or discolored.
Polyvinyl chloride (PVC)	All analyte groups except extractable and volatile organics	Do not use when collecting extractable or volatile organic samples.
Tygon, Silicone, Neoprene	All analyte groups except extractable and volatile organics.	Do not use when collecting extractable or volatile organic samples. Do not use silicone if sampling for silica.
Viton	All analyte groups except extractable and volatile organics.	Minimize contact with sample. Use only if no alternative material exists.
Glass		
Glass, borosilicate	All analyte groups except silica and boron.	None

[1] Refers to construction material of the portions of the sampling equipment that come in contact with the sample (e.g., housing of variable speed submersible pump must be stainless steel if extractable organics are samples; the housing of a variable speed submersible pump used to sample metals may be plastic.

[2] Corroded/weathered surfaces are active sorption sites for organic compounds.

[3] Plastics used in connections with inorganic trace element samples (including metals) must be uncolored or white. Rev. 0908

Table 14
Construction Material Selection for Sample Collection Equipment

Analyte Group	Acceptable Materials
Extractable Organics	Teflon Stainless steel Glass Polypropylene Polyethylene All parts of the system, including connectors and gaskets, must be considered. Viton may be used if no other material is acceptable.
Volatile Organics	Teflon Stainless steel Glass Polypropylene Polyethylene All parts of the system, including connectors and gaskets, must be considered. Viton may be used if no other material is acceptable.
Metals	Teflon Stainless steel Polyethylene, including high density (HDPE) Polypropylene Tygon, Viton, Silicone, Neoprene PVC Glass (except silica and boron)
Ultratrace Metals	Teflon Polyethylene, including high density (HDPE) Polypropylene Polycarbonate Mercury must be in glass or Teflon
Inorganic Nonmetallics	Teflon Stainless steel Low carbon, galvanized or carbon steel Polyethylene, including high density (HDPE) Polypropylene Tygon, Viton, Silicone, Neoprene PVC Glass Brass

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Table 15
Equipment for Collecting Groundwater Samples

Activity	Equipment Type
Well Purging	Variable speed centrifugal pump Variable speed submersible pump Variable speed bladder pump Variable speed peristaltic pump Bailer with lanyard
Well Stabilization	pH meter DO meter Conductivity meter Thermometer/Thermistor Turbidimeter Flow-through cell Multi-function meters
Sample Collection	Variable speed peristaltic pump Variable speed submersible pump Variable speed bladder pump Bailer with lanyard (See Appendix F for cautions when using bailers for sample collection.)
Groundwater Level	Electronic sensor Chalked tape

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Table 16
Water Sampling Equipment Use and Construction

EQUIPMENT	CONSTRUCTION HOUSING [1]	TUBING [1]	USE	PERMISSIBLE ANALYTE GROUPS	RESTRICTIONS AND PRECAUTIONS
WATER SAMPLING					
GROUNDWATER					
1. Positive displacement pumps [2]					
a. Submersible (turbine, helical rotor, gear driven)	SS, Teflon	SS, Teflon, PE, PP	Purging	All analyte groups	See notes [3,4,5], must be variable speed
			Sampling	All analyte groups	See notes [3,4,5], must be variable speed
	SS, Teflon	Non-inert[6]	Purging	All analyte groups	See notes [3,4,5], must be variable speed; polishing required[7]
			Sampling	All analyte groups except volatile and extractable organics	Must be variable speed If sampling for metals, the tubing must be non-metallic if not SS
	Non-inert[6]	Non-inert[6]	Purging	All analyte groups	See notes [3,4,5], must be variable speed; polishing required[7]
			Sampling	All analyte groups except volatile and extractable organics	Must be variable speed If sampling for metals, the tubing must be non-metallic if not SS
b. Bladder pump (no gas contact)	SS, Teflon, PE, PP or PVC if permanently installed	SS, Teflon, PE, PP	Purging	All analyte groups	See notes [3,4,5], must be variable speed
			Sampling	All analyte groups	See notes [3,4], must be variable speed Bladder must be Teflon if sampling for volatile or extractable organics or PE if used in portable pumps
	SS, Teflon, PE, PP	Non-inert[6]	Purging	All analyte groups	See notes [3,4], must be variable speed; polishing required[7] **This configuration is not recommended**
			Sampling	All analyte groups except volatile and extractable organics	See notes [3,4], must be variable speed If sampling for metals, the tubing must be non-metallic if not SS
	Non-inert[6]	Non-inert[6]	Purging	All analyte groups	See notes [3,4], must be variable speed; polishing required[7]
			Sampling	All analyte groups except volatile and extractable organics	See notes [3,4], must be variable speed; polishing required[7] If sampling for metals, the tubing must be non-metallic if not SS

EQUIPMENT	CONSTRUCTION HOUSING [1]	TUBING [1]	USE	PERMISSIBLE ANALYTE GROUPS	RESTRICTIONS AND PRECAUTIONS
2. Suction lift pumps					
a. Centrifugal	N/A	SS, Teflon, PE, PP	Purging	All analyte groups	See note [4], foot-valve required Must be variable speed
	N/A	Non-inert[6]	Purging	All analyte groups	See note [4], foot-valve required; polishing required[7] Must be variable speed
b. Peristaltic	N/A	SS, Teflon, PE, PP	Purging	All analyte groups	See note [4],foot-valve required; polishing required[7] or continuous pumping required Must be variable speed
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	See note [4], medical grade silicone tubing in pump head Must be variable speed
				Extractable organics	See note [4], configured with trap as specified in Appendix F or use Teflon-lined tubing in the pump head
	N/A	Non-inert[6]	Purging	All analyte groups	See note [4], foot-valve required Must be variable speed
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	See note [4], medical grade silicone tubing in pump head Must be variable speed
3. Bailers	SS, Teflon, PE or PP	N/A	Purging	All analyte groups	None, **<u>see Appendix F</u>**
		N/A	Sampling	All analyte groups	None, **<u>see Appendix F</u>**
	Non-inert[6]	N/A	Purging	All analyte groups <u>except</u> volatile and extractable organics	None, **<u>see Appendix F</u>** If sampling for metals, the tubing must be non-metallic if not SS
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	None, **<u>see Appendix F</u>** If sampling for metals, the tubing must be non-metallic if not SS
<u>SURFACE WATER</u>					
1. Intermediate containers such as pond sampler, scoops, beakers, buckets, and dippers	SS, Teflon, Teflon-coated, HDPE, PP	N/A	Grab sampling	All analyte groups	None
	Glass	N/A		All analyte groups except boron and fluoride	None
	Non-inert[6]	N/A		All analyte groups <u>except</u> volatile and extractable organics	None

EQUIPMENT	CONSTRUCTION HOUSING [1]	TUBING [1]	USE	PERMISSIBLE ANALYTE GROUPS	RESTRICTIONS AND PRECAUTIONS
2. Nansen, Kemmerer, Van Dorn, Alpha and Beta Samplers, Niskin (or equivalent)	SS, Teflon, Teflon-coated, HDPE, PP	N/A	Specific depth grab sampling	All analyte groups	None
	Non-inert[6]	N/A		All analyte groups except volatile and extractable organics	None
3. DO Dunker	SS, Teflon, glass, HDPE, PP	N/A	Water column composite sampling	All analyte groups	None
4 Bailers – double valve	SS, Teflon, HDPE, PP	N/A	Grab sampling	All analyte groups	None
	Non-inert[6]	N/A	Grab sampling	All analyte groups except volatile and extractable organics	None If sampling for metals, the tubing must be non-metallic if not SS
5. Peristaltic pump	N/A	SS, Teflon, PE, PP	Specific depth sampling	All analyte groups except volatile and extractable organics Extractable organics	Medical grade silicone tubing in pump head Must be variable speed See note [4], configured as specified in Figure 4, or use Teflon-lined tubing in the pump head
	N/A	Non-inert[6]		All analyte groups except volatile and extractable organics	Medical grade silicone tubing in pump head Must be variable speed

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Acronyms:

N/A	not applicable	SS	stainless steel	HDPE	high density polyethylene
PE	polyethylene	PP	polypropylene	PVC	polyvinyl chloride

[1] Refers to tubing and pump housings/internal parts that are in contact with purged or sampled water (interior and exterior of delivery tube, inner lining of the discharge tube, etc.).

[2] If used to collect volatile or extractable organics, all power cords and other tubing must be encased in Teflon , PE or PP.

[3] If used as a non-dedicated system, pump must be completely disassembled, if practical, and cleaned between wells.

[4] Delivery tubing must be pre-cleaned and precut at the base of operations or laboratory. If the same tubing is used during the sampling event, it must be cleaned and decontaminated between uses.

[5] In-line check valve required.

[6] "Non-inert" pertains to materials that are reactive (adsorb, absorb, etc.) to the analytes being sampled. For organics, materials include rubber and plastics (except PE and PP) and PVC. For metals, materials include brass, galvanized, and carbon steel.

[7] "Polishing": When purging for volatile or extractable organics, the entire length of tubing or the portion which comes in contact with the formation water must be constructed of Teflon, SS, PE or PP. If other materials (e.g., PVC, garden hoses, etc.) are used, the following protocols must be followed: 1) slowly withdraw the pump from the water column during the last phase of purging, 2) to remove any water from the well that may have contacted the exterior of the pump and/or tubing, remove a single well volume with the sampling device before sampling begins. **Do not use Tygon** for purging if purgeable or extractable organics are of interest. Polishing **is not recommended;** use of sampling equipment constructed of appropriate materials is preferred.

Table 17
Soil Sampling Equipment Use and Construction

	EQUIPMENT	CONSTRUCTION HOUSING[1]	USE	PERMISSIBLE ANALYTE GROUPS	RESTRICTIONS AND PRECAUTIONS
SOIL SAMPLING					
SOILS					
1.	Core barrel (or liner)	SS, Teflon, glass, Teflon-coated, aluminum, PE, PP	Sampling	All analyte groups.[2]	See notes [3, 4, 5]
		Non-inert[6] nonmetallics	Sampling	All analyte groups	See note [7]
		Non-inert[6] metals	Sampling	All analyte groups	See note [7]
2.	Trowel, scoop, spoon or spatula	SS, Teflon, Teflon-coated, HDPE, PP	Sampling	All analyte groups[2]	
			Compositing	All analyte groups except volatile organics	Samples for volatile organics must grab samples
		Plastic	Sampling and compositing	All analyte groups except volatile and extractable organics	None Must be nonmetallic if not SS
3.	Mixing tray (pan)	SS, Teflon, glass, Teflon-coated, aluminum , HDPE, PP	Sampling	All analyte groups[2]	See note [5]
			Compositing or homogenizing	All analyte groups except volatile organics	See note [5]
		Non-inert[6]	Compositing or homogenizing	All analyte groups	See notes [4, 5, 7];must be nonmetallic if not SS
4.	Shovel, hand/bucket auger	SS	Sampling	All analyte groups[2]	None
		Non-SS	Sampling	All analyte groups[2]	See notes [4, 5, 7]
5.	Split spoon	SS or carbon steel w/ Teflon insert	Sampling	All analyte groups[2]	See notes [4, 5, 7]
6.	Shelby tube	SS	Sampling	All analyte groups[2]	See note [3]
		Carbon steel	Sampling	All analyte groups	See notes [3, 4, 7]
SEDIMENT					
1.	Coring devices	SS, Teflon, glass, Teflon-coated, aluminum, HDPE, PP	Sampling	All analyte groups[2]	See notes [3, 4, 5]
		Non-inert[6] nonmetallics	Sampling	All analyte groups	See note [7]
		Non-inert[6] metals			See notes [4, 5, 7]

	EQUIPMENT	CONSTRUCTION HOUSING[1]	USE	PERMISSIBLE ANALYTE GROUPS	RESTRICTIONS AND PRECAUTIONS
2.	Grab – Young, Petersen, Shipek	Teflon, Teflon-lined, SS	Sampling	All analyte groups[2]	None
		Carbon steel	Sampling	All analyte groups	See notes [4, 5]
3.	Dredges – Eckman, Ponar, Petit Ponar, Van Veen	SS	Sampling	All analyte groups[2]	None
		Carbon steel, brass	Sampling	All analyte groups	See notes [4, 5]
4.	Trowel, scoop, spoon or spatula	SS, Teflon, Teflon-coated, HDPE, PP	Sampling	All analyte groups[2]	
			Compositing	All analyte groups except volatile organics	Samples for volatile organics be grab samples
		Plastic	Sampling and compositing	All analyte groups except volatile and extractable organics	None must be nonmetallic if not SS
5.	Mixing tray (pan)	SS, Teflon, glass, Teflon-coated, aluminum, HDPE, PP	Sampling	All analyte groups[2]	See note [5]
			Compositing or homogenizing	All analyte groups except volatile organics	See note [5]
		Non-inert[6]	Compositing or homogenizing	All analyte groups except volatile and extractable organics	none See note [5]; must be nonmetallic if not SS
			WASTE[8]		
1.	Scoop	SS	Liquids, solids & sludges	All analyte groups[2]	Cannot collect deeper phases
2.	Spoon	SS	Solids, sludges	All analyte groups[2]	Cannot collect deeper phases
3.	Push tube	SS	Solids, sludges	All analyte groups[2]	Cannot collect deeper phases
4.	Auger	SS	Solids	All analyte groups[2]	None
5.	Sediment sampler	SS	stockpiles	All analyte groups[2]	None
6.	Backhoe bucket	Steel	Solids, Sludges	All analyte groups[2]	Difficult to clean Volatiles and metals must be taken from the interior part of the sample
7.	Split spoon	SS	Solids	All analyte groups[2]	

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[1] Refers to tubing and pump housings/internal parts that are in contact with purged or sampled water (interior and exterior of delivery tube, inner lining of the discharge tube, etc.).

[2] Do not use if collecting for hexavalent chromium ($Chromium^{+6}$)

[3] If samples are sealed in the liner for transport to the laboratory, the sample for VOC analysis must be taken from the interior part of the core.

[4] If a non-stainless steel (carbon steel, aluminum) liner, core barrel or implement is used, take the samples for metals, purgeable organics and organics from the interior part of the core sample.

[5] Aluminum foil, trays or liners may be used only if aluminum is not an analyte of interest.

[6] "Non-inert" pertains to materials that are reactive (adsorb, absorb, etc.) to the analytes being sampled. For organics, materials include rubber, plastics (except PE and PP), and PVC. For metals, materials include brass, galvanized, and carbon steel.

[7] If non-inert-liner, core barrel or implement is used, take samples from the interior part of the collected sample.

[8] If disposable equipment of alternative construction materials is used, the construction material must be compatible with the chemical composition of the waste, cannot alter the characteristics of the waste sample in any way, and cannot contribute analytes of interest or any interfering components.

[9] Peristaltic pump may be used without vacuum trap assembly if the flexible, Teflon-lined tubing is used in the pump head.

Table 18
EPA Method 8260 NC UST Section Required Target Analytes for Petroleum Contaminated Soil

8260 Target Analytes	CASRN	EPA 8260 Minimum Reporting Limit, mg/kg
Acetone	67-64-1	0.05
tert-Amyl alcohol (TAA)	75-85-4	0.4
tert-Amyl methyl ether (TAME)	994-05-8	0.1
Benzene	71-43-2	0.005
Bromobenzene	108-86-1	0.005
Bromochloromethane	74-97-5	0.005
Bromodichloromethane	75-27-4	0.005
Bromoform	75-25-2	0.005
Bromomethane (methylbromide)	74-83-9	0.005
2-Butanone (MEK)	78-93-3	0.05
tert-Butyl alcohol (TBA)	75-65-0	0.2
n-Butylbenzene	104-51-8	0.005
sec-Butylbenzene	135-98-8	0.005
tert-Butylbenzene	98-06-6	0.005
tert-Butyl formate (TBF)	762-75-4	0.4
Carbon tetrachloride	56-23-5	0.005
Chlorobenzene	108-90-7	0.005
Chlorodibromomethane	124-48-1	0.005
Chloroethane	75-00-3	0.005
Chloroform	67-66-3	0.005
Chloromethane	74-87-3	0.005
2-Chlorotoluene	95-49-8	0.005
4-Chlorotoluene	106-43-4	0.005
1,2- Dibromoethane (EDB)	106-93-4	0.005
1,2-Dichlorobenzene	95-50-1	0.005
1,3-Dichlorobenzene	541-73-1	0.005
1,4-Dichlorobenzene	106-46-7	0.005
Dichlorodifluoromethane	75-71-8	0.005
1,1-Dichloroethane	75-35-3	0.005
1,2-Dichloroethane (1,2-DCA)	107-06-2	0.005
1,1-Dichloroethene	75-35-4	0.005
cis-1,2-Dichloroethene	156-59-2	0.005

trans-1,2-Dichloroethene	156-60-5	0.005
1,2-Dichloropropane	78-87-5	0.005
1,3-Dichloropropane	142-28-9	0.005
2,2-Dichloropropane	590-20-7	0.005
1,1-Dichloropropene	563-58-6	0.005
cis-1,3-Dichloropropene	10061-01-5	0.005
trans-1,3-Dichloropropene	10061-02-6	0.005
Ethanol	64-17-5	0.25
Ethylbenzene	100-41-4	0.005
Ethyl tert-butyl ether (ETBE)	63-79-23	0.1
2-Hexanone	591-78-6	0.010
Isopropyl benzene	98-82-8	0.005
Isopropyl ether	108-20-3	0.005
4-Isopropyl toluene	99-87-6	0.005
Methylene chloride	75-09-2	0.005
Methyl isobutyl ketone (MIBK	108-10-1	0.05
Methyl-tert-butyl ether (MTBE)	1634-04-4	0.005
Naphthalene	91-20-3	0.005
n-Propylbenzene	103-65-1	0.005
Styrene	100-42-5	0.005
1,1,1,2-Tetrachloroethane	630-20-6	0.005
1,1,2,2-Tetrachloroethane	79-34-5	0.005
Tetrachloroethene (PCE)	127-18-4	0.005
Toluene	108-88-3	0.005
1,2,3-Trichlorobenzene	87-61-6	0.005
1,2,4-Trichlorobenzene	120-82-1	0.005
1,1,1-Trichloroethane	71-55-6	0.005
1,1,2-Trichloroethane	79-00-5	0.005
Trichloroethene (TCE)	79-01-6	0.005
Trichlorofluoromethane	75-69-4	0.005
1,2,3-Trichloropropane	96-18-4	0.005
1,2,4-Trimethylbenzene	95-63-6	0.005
1,3,5-Trimethylbenzene	108-67-8	0.005
Vinyl acetate	108-05-4	0.010
Vinyl chloride	75-01-4	0.005
o-Xylene	95-47-6	0.005
m-Xylene	108-38-3	0.005
p-Xylene	106-42-3	0.005
(Xylenes, Total)	1330-20-7	0.015

[1] Please note that the Minimum Reporting Limits (MRLs) listed in this table should be routinely achievable but are not corrected for dilution factors (i.e. due to high levels of contamination and/or soil moisture). Dilution factors must be applied, which will result in the elevation of these routinely achievable lower reporting concentrations. Soil moisture content, which is sample specific, will result in sample-specific adjustments in method detection limit and reporting limit concentrations.

[2] The MRL is set at the level of 0.005 mg/kg for most of the target analytes listed; however, the MRLs for some target analytes is set at levels higher than 0.005 mg/kg due to the lower purging efficiency of some instruments.

[3] See Table 1 for current MSCCs. Detection is a violation.

[4] Shading indicates that the MRL for an analyte is greater than its standard limit. If decisions hinge on the concentration of this analyte, then it may be necessary to repeat the analysis in order to reduce the MRL.

Table 19
EPA Method 8270 NC UST Section Required Target Analytes for Petroleum Contaminated Soil

EPA 8270 Target Analytes	CASRN	EPA 8270 Minimum Reporting Limit, mg/kg
Acenaphthene	83-32-9	0.167
Acenaphthylene	208-96-8	0.167
Anthracene	120-12-7	0.167
Benzoic Acid	65-85-0	1.67
Benz(a)anthracene	56-55-3	0.167
Benzo(b)fluoranthene	205-99-2	0.167
Benzo(k)fluoranthene	207-08-9	0.167
Benzo(g,h,i)perylene	191-24-2	0.167
Benzo(a)pyrene	50-32-8	0.167
Benzyl alcohol	100-51-6	0.333
Bis(2-chloroethoxy)methane	111-91-1	0.167
Bis(2-chloroethyl)ether	111-44-4	0.167
Bis(2-chloroisopropyl)ether	108-60-1	0.167
Bis(2-ethylhexyl)phthalate	117-81-7	0.167
4-Bromophenyl phenyl ether	101-55-3	0.167
Butyl benzyl phthalate	85-68-7	0.167
4-Chloroaniline	106-47-8	0.167
4-Chloro-3-methylphenol	59-50-7	0.333
2-Chloronaphthalene	91-58-7	0.167
2-Chlorophenol	95-57-8	0.167
4-Chlorophenyl phenyl ether	7005-72-3	0.167
Chrysene	218-01-9	0.167
Dibenz(a,h)anthracene	53-70-3	0.167
Dibenzofuran	132-64-9	0.167
Di-n-butyl phthalate	84-74-2	0.167
1,2-Dichlorobenzene	95-50-1	0.167
1,3-Dichlorobenzene	541-73-1	0.167
1,4-Dichlorobenzene	106-46-7	0.167
3,3'-Dichlorobenzidine	91-94-1	1.67
2,4-Dichlorophenol	120-83-2	0.167
Diethyl phthalate	84-66-2	0.167
2,4-Dimethylphenol (2,4-xylenol)	105-67-9	0.167
Dimethyl phthalate	131-11-3	0.167
4,6-Dinitro-2-methylphenol	534-52-1	0.667

2,4-Dinitrophenol	51-28-5	1.67
Di-n-octyl phthalate	117-84-0	0.167
1,2,Diphenylhydrazine (as Azobenzene)	122-66-7	0.333
Fluoranthene	206-44-0	0.167
Fluorene	86-73-7	0.167
'Hexachlorobenzene	118-74-1	0.167
Hexachlorobutadiene	87-68-3	0.167
Hexachlorocyclopentadiene	77-47-4	0.167
Hexachloroethane	67-72-1	0.167
Indeno(1,2,3-c,d)pyrene	193-39-5	0.167
Isophorone	78-59-1	0.167
1-Methylnaphthalene	90-12-0	0.167
2-Methylnaphthalene	91-57-6	0.167
2-Methylphenol	95-48-7	0.167
4-Methylphenol	106-44-5	0.167
Naphthalene	91-20-3	0.167
Nitrobenzene	98-95-3	0.167
2-Nitrophenol	88-75-5	0.167
4-Nitrophenol	100-02-7	0.667
N-Nitrosodiphenylamine	86-30-6	0.167
N-Nitroso-di-n-propylamine	621-64-7	0.167
Pentachlorophenol	87-86-5	0.667
Phenanthrene	85-01-8	0.167
Phenol	108-95-2	0.167
Pyrene	129-00-0	0.167
1,2,4-Trichlorobenzene	120-82-1	0.167
2,4,6-Trichlorophenol	88-06-2	0.167

[1] Please note that the Minimum Reporting Limits (MRLs) listed in this table should be routinely achievable but are not corrected for dilution factors (i.e. due to high levels of contamination and/or soil moisture). Dilution factors must be applied, which will result in the elevation of these routinely achievable lower reporting concentrations. Soil moisture content, which is sample specific, will result in sample-specific adjustments in method detection limit and reporting limit concentrations.

[2] The MRL is set at the level of 0.167 mg/kg for most of the target analytes listed; however, the MRLs for some target analytes are set at levels higher than 0.167 mg/kg due to the lower response of some instruments.

[3] See Table 1 for current MSCCs. Detection is a violation.

[4] Shading indicates that the MRL for an analyte is greater than its standard limit. If decisions hinge on the concentration of this analyte, then it may be necessary to repeat the analysis in order to reduce the MRL.

Table 20
EPA Method SM 6200 NC UST Section Required Target Analytes for Petroleum Contaminated Water

SM 6200 Target Analytes	CASRN	2L Groundwater Standard µg/L	SM 6200 Minimum Reporting Limit, µg/L
Acetone	67-64-1	6000	5
tert-Amyl alcohol (TAA)	75-85-4	40	40
tert-Amyl methyl ether (TAME)	994-05-8	128	10
Benzene	71-43-2	1	0.5
Bromobenzene	108-86-1		0.5
Bromochloromethane	74-97-5		0.5
Bromodichloromethane	75-27-4	0.6	0.5
Bromoform	75-25-2	4	0.5
Bromomethane (methylbromide)	74-83-9	100	0.5
2-Butanone (MEK)	78-93-3	4000	5
tert-Butyl alcohol (TBA)	75-65-0	10	20
tert-Butyl formate (TBF)	762-75-4	40	40
n-Butylbenzene	104-51-8	70	0.5
sec-Butylbenzene	135-98-8	70	0.5
tert-Butylbenzene	98-06-6	70	0.5
Carbon tetrachloride	56-23-5	0.3	0.5
Chlorobenzene	108-90-7	50	0.5
Chlorodibromomethane	124-48-1	0.4	0.5
Chloroethane	75-00-3	3000	0.5
Chloroform	67-66-3	70	0.5
Chloromethane	74-87-3	3	0.5
2-Chlorotoluene	95-49-8	100	0.5
4-Chlorotoluene	106-43-4	24	0.5
1,2- Dibromoethane (EDB)	106-93-4	0.02	0.5
1,2-Dichlorobenzene	95-50-1	20	0.5
1,3-Dichlorobenzene	541-73-1	200	0.5
1,4-Dichlorobenzene	106-46-7	6	0.5
Dichlorodifluoromethane	75-71-8	1000	0.5
1,1-Dichloroethane	75-35-3	6	0.5
1,2-Dichloroethane	107-06-2	0.4	0.5
1,1-Dichloroethene	75-35-4	7	0.5

cis-1,2-Dichloroethene	156-59-2	70	0.5
trans-1,2-Dichloroethene	156-60-5	100	0.5
1,2-Dichloropropane	78-87-5	0.6	0.5
1,3-Dichloropropane	142-28-9		0.5
2,2-Dichloropropane	590-20-7		0.5
1,1-Dichloropropene	563-58-6		0.5
cis-1,3-Dichloropropene	10061-01-5	0.4 (cis & trans)	0.5
trans-1,3-Dichloropropene	10061-02-6	0.4 (cis & trans)	0.5
Ethanol	64-17-5	4000	50
Ethylbenzene	100-41-4	600	0.5
Ethyl tert-butyl ether (ETBE)	63-79-23	47	10
2-Hexanone	591-78-6	40	1
Isopropyl benzene	98-82-8	70	0.5
Isopropyl ether	108-20-3	70	0.5
4-Isopropyl toluene	99-87-6	25	0.5
Methylene chloride	75-09-2	5	0.5
Methyl isobutyl ketone (MIBK)	108-10-1	100	0.5
Methyl-tert-butyl ether (MTBE)	1634-04-4	20	0.5
Naphthalene	91-20-3	6	0.5
n-Propylbenzene	103-65-1	70	0.5
Styrene	100-42-5	70	0.5
1,1,1,2-Tetrachloroethane	630-20-6	1	0.5
1,1,2,2-Tetrachloroethane	79-34-5	0.2	0.5
Tetrachloroethene (PCE)	127-18-4	0.7	0.5
Toluene	108-88-3	600	0.5
1,2,3-Trichlorobenzene	87-61-6		0.5
1,2,4-Trichlorobenzene	120-82-1	70	0.5
1,1,1-Trichloroethane	71-55-6	200	0.5
1,1,2-Trichloroethane	79-00-5	0.6	0.5
Trichloroethene (TCE)	79-01-6	3	0.5
Trichlorofluoromethane	75-69-4	2000	0.5
1,2,3-Trichloropropane	96-18-4	0.005	0.5
1,2,4-Trimethylbenzene	95-63-6	400	0.5
1,3,5-Trimethylbenzene	108-67-8	400	0.5
Vinyl acetate	108-05-4	88	1
Vinyl chloride	75-01-4	0.03	0.5
o-Xylene	95-47-6		0.5
m-Xylene	108-38-3		0.5
p-Xylene	106-42-3		0.5
(Xylenes, Total)	1330-20-7	500	1.5

[1] Please note that the Minimum Reporting Limits (MRLs) listed in this table should be routinely achievable but are not corrected for dilution factors (i.e. due to high levels of contamination and/or soil moisture). Dilution factors must be applied, which will result in the elevation of these routinely achievable lower reporting concentrations. Soil moisture content, which is sample specific, will result in sample-specific adjustments in method detection limit and reporting limit concentrations.

[2]. The MRL is set at the level of 0.5 µg/L for most of the target analytes listed; however, the MRLs for some target analytes are set at levels higher than 0.5 µg/L due to the lower purging efficiency of some instruments.

[3] If no value is entered in the standard column, no standard limit has been established. Detection is a violation.

[4] Shading indicates that the MRL for an analyte is greater than its standard limit. If decisions hinge on the concentration of this analyte, then it may be necessary to repeat the analysis in order to reduce the MRL.

Table 21
EPA Method 625 NC UST Section Required Target Analytes for Petroleum Contaminated Water

EPA 625 Base/Neutrals Target Analytes	CASRN	2L Groundwater Standard µg/L	EPA 625 Minimum Reporting Limit, µg/L
Acenaphthene	83-32-9	80	5
Acenaphthylene	208-96-8	200	5
Anthracene	120-12-7	2000	5
Benz(a)anthracene	56-55-3	0.05	5
Benzo(b)fluoranthene	205-99-2	0.05	5
Benzo(k)fluoranthene	207-08-9	0.5	5
Benzo(g,h,i)perylene	191-24-2	200	5
Benzo(a)pyrene	50-32-8	0.005	5
Benzyl alcohol	100-51-6	700	10
Bis(2-chloroethoxy)methane	111-91-1		5
Bis(2-chloroethyl)ether	111-44-4	0.03	5
Bis(2-chloroisopropyl)ether	108-60-1		5
Bis(2-ethylhexyl)phthalate	117-81-7	3	5
4-Bromophenyl phenyl ether	101-55-3		5
Butyl benzyl phthalate	85-68-7	1000	5
4-Chloroaniline	106-47-8		5
2-Chloronaphthalene	91-58-7		5
4-Chlorophenyl phenyl ether	7005-72-3		5
Chrysene	218-01-9	5	5
Dibenz(a,h)anthracene	53-70-3	0.005	5
Dibenzofuran	132-64-9	28	5
Di-n-butyl phthalate	84-74-2	700	5
1,2-Dichlorobenzene	95-50-1	20	5
1,3-Dichlorobenzene	541-73-1	200	5
1,4-Dichlorobenzene	106-46-7	6	5
3,3'-Dichlorobenzidine	91-94-1		50
Diethyl phthalate	84-66-2	6000	5
Dimethyl phthalate	131-11-3		5
Di-n-octyl phthalate	117-84-0	100	5
1,2,Diphenylhydrazine (as Azobenzene)	122-66-7		10
Fluoranthene	206-44-0	300	5

Fluorene	86-73-7	300	5
Hexachlorobenzene	118-74-1	0.02	5
Hexachlorobutadiene	87-68-3	0.4	5
Hexachlorocyclopentadiene	77-47-4		5
Hexachloroethane	67-72-1		5
Indeno(1,2,3-c,d)pyrene	193-39-5	0.05	5
Isophorone	78-59-1	40	5
1-Methylnaphthalene	90-12-0	1	5
2-Methylnaphthalene	91-57-6	30	5
Naphthalene	91-20-3	6	5
Nitrobenzene	98-95-3		5
N-Nitrosodiphenylamine	86-30-6		5
N-Nitroso-di-n-propylamine	621-64-7		5
Phenanthrene	85-01-8	200	5
Pyrene	129-00-0	200	5
1,2,4-Trichlorobenzene	120-82-1	70	5

EPA 625 Acids Target Analytes			
Benzoic Acid	65-85-0	30000	50
4-Chloro-3-methylphenol	59-50-7		10
2-Chlorophenol	95-57-8	0.4	5
2,4-Dichlorophenol	120-83-2	0.98	5
2,4-Dimethylphenol	105-67-9	100	5
4,6-Dinitro-2-methylphenol	534-52-1		20
2,4-Dinitrophenol	51-28-5		50
2-Methylphenol	95-48-7	400	5
4-Methylphenol	106-44-5	40	5
2-Nitrophenol	88-75-5		5
4-Nitrophenol	100-02-7		20
Pentachlorophenol	87-86-5	0.3	20
Phenol	108-95-2	30	5
2,4,6-Trichlorophenol	88-06-2	4	5

[1] Please note that the Minimum Reporting Limits (MRLs) listed in this table should be routinely achievable but are not corrected for dilution factors (i.e. due to high levels of contamination and/or soil moisture). Dilution factors must be applied, which will result in the elevation of these routinely achievable lower reporting concentrations. Soil moisture content, which is sample specific, will result in sample-specific adjustments in method detection limit and reporting limit concentrations.

[2] The MRL is set at the level of 5 µg/L for most of the target analytes listed; however, the MRLs for some target analytes are set at levels higher than 5 µg/L due to the lower response of some instruments.

[3] If no value is entered in the standard column, no standard limit has been established. Detection is a violation.

[4] Shading indicates that the MRL for an analyte is greater than its standard limit. If decisions hinge on the concentration of this analyte, then it may be necessary to repeat the analysis in order to reduce the MRL.

Table 22
EPA Method 602 NC UST Section Required Target Analytes for Petroleum Contaminated Water

EPA 602 Analytes	CASRN	2L Groundwater Standard µg/L	Minimum Reporting Limit, µg/L
Benzene	71-43-2	1	1
Chlorobenzene	108-90-7	50	1
1,2-Dichlorobenzene	95-50-1	20	1
1,3-Dichlorobenzene	541-73-1	200	1
1,4-Dichlorobenzene	106-46-7	6	1
Ethylbenzene	100-41-4	600	1
Toluene	108-88-3	600	1
o-Xylene	95-47-6		1
m-Xylene	108-38-3		1
p-Xylene	106-42-3		1
(Xylenes, Total)	1330-20-7	500	3

[1] If no value is entered in the standard column, no standard limit has been established. Detection is a violation.