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	<b>NOTES applicable to Tables 3 through 6:</b>	
	<i>1) Reportable Concentration: Any amount above MDL</i>	
	<i>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.</i>	
	<i>4) Submit copies of original laboratory reports.</i>	
	<i>5) 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. The reporting limit concentration must be indicated for all target analytes and must be supported by the inclusion of a calibration standard at this concentration in the calibration curve.</i>	
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**Table 1**  
**Required Permits for Different Methods of Soil Storage/Treatment**

<b>NOTE: These required permits are those associated with various alternatives for storage and treatment of non-hazardous contaminated soil.</b>	<b>Non-discharge Permit</b>	<b>Erosion Control Plans</b>	<b>Certificate of Approval</b>	<b>Air Quality Permit or Registration (1)</b>
Temporary storage (<45 days) on-site			✓ (2)	
Temporary storage (<45 days) off-site			✓ (3)	
Thermal treatment by a stationary facility	✓ (4)			✓ (4)
Thermal treatment by a mobile facility	✓ (5)			✓
Storage at a production facility (brick, asphalt, etc.)	✓ (4)	✓ (6)		✓ (7)
Containment/treatment on an impermeable surface open to the environment	✓ (1) (4)	✓ (6)		✓ (1)
Containment/treatment inside an enclosed structure	✓ (4) (5)			✓ (1)
Land Application for volumes < 50 yds <sup>3</sup>	✓ (4)	✓ (6)	✓	
Land application at minimum rates (< 100 yds <sup>3</sup> )	✓ (4)	✓ (6)	✓	
Land application at minimum rates (> 100 yds <sup>3</sup> )	✓ (4)	✓ (6)		
Land application at conventional rates (> 50 yds <sup>3</sup> )	✓ (4)	✓ (6)		

**Legend for Table 1**

- (1) Air Quality Permits may be required for this remediation method. Determination will be made on a site-specific basis.
- (2) Approval is automatic when designed in accordance with Figure 2.
- (3) Off-site temporary storage will be approved only in emergency situations (i.e., when there is a direct and immediate threat to human health or environmental resources). However, the responsible party must notify the appropriate regional office.
- (4) This remediation method may be used as a dedicated system, which may require additional design/operation criteria.
- (5) A general non-discharge permit will be issued for the remediation process. Procedures for disposal of the treated soil at various sites will be stipulated in the permit.
- (6) Erosion Control Plans are required in cases where more than one acre will be affected.
- (7) This method may also require amendment to the facility's air quality permit.

**NOTE:** An "enclosed structure," for the purposes of these guidelines, shall mean a rigid building that contains a roof, four complete sidewalls, and a floor with a hydraulic conductivity of  $1 \times 10^{-6}$  cm/sec (or  $1 \times 10^{-7}$  cm/sec) if the liner is to be placed four feet or less above bedrock .

**Table 2**  
**Maximum Concentration of Contaminants for Toxicity Characteristic**

EPA hazardous waste number	Contaminant	CAS No.	Regulatory Level (mg/l)
<u>Metals</u>			
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D006	Cadmium	7440-43-9	1.0
D007	Chromium	7440-47-3	5.0
D008	Lead	7439-92-1	5.0
D009	Mercury	7439-97-6	0.2
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0
<u>Organics</u>			
D018	Benzene	71-43-2	0.5
D019	Carbon Tetrachloride	56-23-5	0.5
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D023	o-Cresol	95-48-7	200.00
D024	m-Cresol	108-39-4	200.00
D025	p-Cresol	106-44-5	200.00
D026	Cresol	-----	200.00
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	0.13
D032	Hexachlorobenzene	118-74-1	0.13
D033	Hexachlorobutadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3.0
D035	Methyl ethyl ketone	78-93-3	200.0
D036	Nitrobenzene	98-95-3	2.0
D037	Pentachlorophenol	87-86-5	100.0
D039	Tetrachloroethylene	127-18-4	0.7
D040	Trichloroethylene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400.0
D042	2,4,6-Trichlorophenol	88-06-2	2.0
D043	Vinyl chloride	75-01-4	0.2
<u>Pesticides</u>			
D016	2,4-D	94-75-7	10.0
D012	Endrin	72-20-8	0.02
D031	Heptochlor (and its hydroxide)	76-44-8	0.008
D013	Lindane	58-89-9	0.4
D038	Pyridine	110-86-1	5.0
D015	Toxaphene	8001-35-2	0.5
D017	2,4,5-TP Silvex	93-72-1	1.0
D020	Chlordane	57-74-9	0.03

CAS = Chemical Abstracts Service Number

**NOTE:** If quantitation limit is greater than the calculated regulatory level, the quantitation limit becomes the regulatory level. If o-, m-, and p-Cresol concentration cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level for cresol is 200 mg/L.

**Table 3**  
**Approved Methods for Soil Analyses for a Permit**

(Laboratories must be certified by the North Carolina DWR to perform the following methods.)

Contaminant	Methods (See Notes)	Reportable Concentration
1. Low Boiling Point Fuels: gasoline, aviation gasoline, ethanol-gasoline blends, etc.	1. EPA 8015C for TPH-GRO, 2. EPA 8260B, 3. EPA 9045C (pH), and EPA 1311 (TCLP) Metals*  Methods required for sampling purposes: routine monitoring - 1, permit completion - 1 & 2, and 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 8015C for TPH-GRO and EPA 8015C for TPH-DRO 2. EPA 8260B and EPA 8270D, 3. EPA 9045C (pH) and EPA 1311 (TCLP) Metals*  Methods required for sampling purposes: routine monitoring - 1, permit completion - 1 & 2, and 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 8015C DRO, 2. EPA 8270D, 3. EPA 9045C (pH), and EPA 1311 (TCLP) Metals*  Methods required for sampling purposes: routine monitoring - 1, permit completion - 1 & 2, and initial characterization - 1, 2, & 3	Any amount above MDL
4. Used / Waste Oil	1. EPA Method 9071 B, 2. EPA 8260B and EPA 8270D, 3. EPA 9045C (pH), and EPA 1311 (TCLP) Metals  Methods required for sampling purposes: routine monitoring - 1, permit completion - 1 & 2, and initial characterization - 1, 2, & 3	Any amount above MDL
5. For substances not covered in 1 through 4	Contact NC DENR / 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 (as found in SW846) may be used to document that individual analytes are not present at levels which could exceed TCLP regulatory levels.

**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 4**  
**Sample Containers and Preservatives for Soil Analyses for a Permit**  
(Laboratories must be certified by the North Carolina DWR to perform the following methods.)

Method	Container	Preservative	Holding Times
EPA 8015C GRO	Six pre-weighed VOA vials with Methanol and Teflon-lined screw caps Extra VOA vial w/o preservative*	Field Preserve <b>AND</b> Cool to 4 °C	28 days
	Six pre-weighed empty VOA vials with Teflon-lined screw caps Extra VOA vial w/o preservative*	Cool to 4 °C <b>AND</b> Complete laboratory preservation** or analyze within 48 hours	
EPA 8260B	Six pre-weighed VOA vials with Methanol and Teflon-lined screw caps Extra VOA vial w/o preservative*	Field Preserve <b>AND</b> Cool to 4 °C	14 days
	Six pre-weighed empty VOA vials with Teflon-lined screw caps Extra VOA vial w/o preservative*	Cool to 4 °C <b>AND</b> Complete laboratory preservation** or analyze within 48 hours	
EPA 8015C DRO EPA 9071B EPA 8270D EPA 8081B and EPA 8082A	8-oz glass jar with Teflon-lined screw cap	Cool to 4 °C	Extract within 14 days and analyze extracts within 40 days of extraction.
Total Metals	8-oz polyethylene or glass jar	Cool to 4 °C	6 months

\* Use for dry weight determination and for soil characterization (i.e., pH by EPA SW-846 Method 9045C).

\*\* See *Guidelines for Sampling*, current edition for details on preservation options. Consult with laboratory when selecting the preservation option. Option must be documented with analytical results.

**Table 5**  
**Approved Methods for Groundwater Analyses for Petroleum Contamination**

Suspected Contaminant	Analytical Methods (See Notes)
1. Low Boiling Point Fuels: gasoline, aviation gasoline, ethanol-gasoline blend, etc.	SM 6200B <sup>a,b</sup> , MADEP VPH, <b>and</b> Metals (Pb) <sup>d</sup>
2. Medium/High Boiling Point Fuels: jet fuels, kerosene, diesel, #2 fuel oil, 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, <b>and</b> MADEP EPH
3. Heavy Fuels: #4, #5, #6 fuel oil; motor oil; hydraulic fluid, etc. Mineral oil <sup>c</sup>	EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, <b>and</b> MADEP EPH
4. Used / Waste Oil	SM 6200B, EPA 625 Base/ Neutrals and Acids plus 10 largest non-target peaks, MADEP VPH, MADEP EPH, <b>and</b> Metals (Cr and Pb) <sup>d</sup>

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- a For EDB, also use EPA Method 504.1, initially and at closure
- b Only analyze for full list of target analytes for SM 6200B (presented in *Guidelines for Sampling*, current version) at initial groundwater investigation (e.g., IAA or LSA) unless DWM directs otherwise.
- c Carbon chains in mineral oils range from approximately C<sub>12</sub>-C<sub>45</sub>.
- d Use methods for metals from sources listed in 15A NCAC 2L.0112 and .0413.

**Table 6**  
**Sample Containers and Preservatives for Groundwater Analyses**

Method	Number and Type of Containers	Preservative <sup>a</sup>	Holding Times
EPA 8260B SM 6200B 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 <sub>3</sub> (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 7**  
Application Rates of Petroleum Fuel-Contaminated Soil (weight %)

		Application Site Vegetation																								
		Group A		Group B		Group C		Group D																		
		Cotton	Coastal Bermuda Grass	Peanuts	Perennial Grasses	Red Clover	Sorghum	Barley	Beans	Cereals	Corn	Kale	Lettuce	Oats	Rye Grass	Soybeans	Tomatoes	Wheat	Beets	Carrots	Radishes	Turnips	Yams	Other Tap Root Crops	Lawn Grasses	Others Not Specified Elsewhere
Depth To Seasonal High Water Table (in feet) from Land Surface (Assumes Contaminated Soil Incorporated to a Depth of 6 Inches.)	1.5' – 2.5'	3.5%	3.0%	2.0%	1.5%	1.0%	0.5%	1.5%	1.0%																	
	2.5' – 3.5'	4.0%	3.5%	2.5%	2.0%	1.5%	1.0%	2.0%	1.5%																	
	>3.5'	4.5%	4.0%	3.0%	3.0%	2.0%	1.5%	2.5%	2.0%																	
Fuel Class		I	II	I	II	I	II	I	II																	

**Table 8**  
Application Rates of Petroleum Fuel-Contaminated Soil (average thickness)

		Application Site Vegetation							
		Group A		Group B		Group C		Group D	
Depth To Seasonal High Water Table (in feet) from Land Surface (Assumes Contaminated Soil Incorporated to a Depth of 6 Inches.)	1.5' – 2.5'	3"	2"	2"	1"	1"	1"	1"	1"
	>3.5'	4"	3"	3"	2"	2"	1"	1"	1"
Fuel Class		I	II	I	II	I	II	I	II

**Table 9**  
Determination of the Amount of Land Necessary for Treatment

	<u>Weight of Petroleum</u>	<u>Weights of Average Native Soil</u>
Gasoline	1 gal. = 6.0 lbs.	1 ft <sup>2</sup> (6" deep) = ~88 lbs.
Kerosene, Diesel,	1 gal. = ~ 6.75 lbs.	1 acre (6" deep) = ~3,840,000 lbs.
Jet Fuel,		1 yd <sup>3</sup> = ~ 4,762 lbs.
#2 Fuel Oil		= 324 ft <sup>2</sup> x 1" deep
		= 162 ft <sup>2</sup> x 2" deep
		= 108 ft <sup>2</sup> x 3" deep
		= 81 ft <sup>2</sup> x 4" deep
Motor Oil,	1 gal. = 7.5 lbs.	
#4 Fuel Oil		
#6 Fuel Oil	1 gal. = ~ 8.5 lbs.	

**NOTE:** One acre is 43,560 ft<sup>2</sup>

#### Example 1

Contaminated soil containing 5,000 gallons of diesel fuel (Class II) is to be applied on a site where sorghum will be grown and where the depth to seasonal high water table is 3.0 feet. Determine the amount of land area necessary for application (contaminated soil will be mixed with 6 inches of native soil).

#### Applicable Data

Application rate (wt/wt basis) = 0.035 (3.5% - from Table 7)

Weight of 5,000 gallons diesel fuel = 33,750 lbs. (5,000 x 6.75)

Weight of Native Soil = Weight of Fuel / Application-Rate = 33,750 / 0.035 = 964,285 lbs.  
Needed for mixing

Area needed (in ft<sup>2</sup>) = 964,285 / 88 = 10,957 ft<sup>2</sup>

Area needed (in acres) = 964,285 / 3,840,000 = 0.25 acre

#### Example 2

There are 30 yd<sup>3</sup> of soils contaminated with an unknown amount of gasoline (Class I), to be applied on a site where cotton will be grown and where the depth to seasonal high water is 4.0 feet. Again, determine the amount of land necessary for application, using 6 inches of native soil for mixture.

#### Applicable Data

Application rate (volume/area basis) = 4" average thickness of application (from Table 8). 1 yd = coverage of 81 ft<sup>2</sup> at a thickness of 4"

Area needed = (Vol. of contaminated soils in yd<sup>3</sup>) x (area of coverage at specified depth)  
= 30 x 81 = 2430 ft<sup>2</sup> = 0.05 acres