

SITE ASSESSMENT SAMPLING REQUIREMENTS AT REGULATED STORAGE TANK SYSTEM CLOSURES



pennsylvania **DEPARTMENT OF ENVIRONMENTAL PROTECTION**

Bureau of Environmental Cleanup and Brownfields

Division of Storage Tanks

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INTRODUCTION

In order to properly complete the closure of most regulated storage tank systems, a site assessment is necessary to measure for the presence of any release from the storage tank system. As part of this site assessment, confirmatory samples of soil and water may be required to determine if additional remedial actions are required to mitigate risks to human health and the environment.

To preserve consistency, accuracy and viability of sample results, the Department of Environmental Protection (DEP) has provided tables in this document, which reference accepted practices and minimum requirements during regulated storage tank site assessment sampling.

The information in this document should be used to complete site assessments conducted as part of the closure of regulated underground storage tank (UST) systems and some regulated aboveground storage tank (AST) systems in accordance with 25 Pa. Code Chapter 245, Sections 245.453 and 245.561, respectively. This document should be used in conjunction with 25 Pa. Code Chapter 250; 25 Pa. Code Chapter 245; and DEP Technical Guidance Document 263-4500-601, "Closure Requirements for Underground Storage Tank Systems" or DEP Technical Guidance Document 263-4200-001, "Closure Requirements for Aboveground Storage Tank Systems" (as appropriate) to ensure proper procedures are followed when sampling as part of a storage tank system closure site assessment.

Specific requirements related to regulated storage tank system closures, including selection of sample locations, may be found in the DEP's Closure Guidance documents for USTs and ASTs (Technical Guidance Documents 263-4500-601 and 263-4200-001, respectively). Additional regulatory requirements may also be found in 25 Pa. Code Chapter 250; 25 Pa. Code Chapter 245; and 34 Pa. Code Chapters 14 and 14a.

To report releases or request information, please contact the appropriate DEP regional office using the contact information provided on page 9 of this document.

RECOMMENDED CONTAINERS, PRESERVATIVES AND HOLDING TIMES

Table 1 describes several accepted sampling methods and the recommended containers, preservatives and holding times for each method. Documentation of the sampling methods used must be submitted with the appropriate Storage Tank System Closure Report Form, along with the laboratory testing results. Use of the prescribed sampling methods during regulated storage tank system closure site assessments is required.

Table 1.						
RECOMMENDED CONTAINERS, PRESERVATIVES AND HOLDING TIMES FOR SAMPLES COLLECTED DURING CLOSURE SITE ASSESSMENTS						
MEDIUM	METHOD ¹	CONTAINER/ SAMPLE SIZE	PRESERVATIVE	HOLDING TIME	REFERENCE	
Aqueous Samples With No Residual Chlorine Present ²	5030B/8011, 5030B/8021B or 5030B/8260B	2 X 40-mL vials with Teflon- lined septum caps	Cool to 4°C and adjust pH to < 2 with H ₂ SO ₄ , HCL or solid NaHSO ₄	14 Days	Table 4-1, SW- 846, Revision 6, February 2007	
	8270C or 8310	1-gal., 2 X 0.5-gal., or 4 X 1-L amber glass container with Teflon-lined lid	Cool to 4°C	Samples extracted within 7 days and extracts analyzed within 40 days after extraction		
	504.1	2 X 40 mL vials with Teflon- lined septum caps	Cool to 4°C	14 days	EPA Method 504.1, Revision 1.1, (1995)	
	524.2	2 X 40-mL vials with Teflon- lined septum caps	Adjust pH to < 2 at time of collection ³ , using two drops of 1:1 HCL for each 40-mL of sample. Cool to 4°C.	14 days	EPA Method 524.2, Revision 4.1, (1995)	
	525.2	1-gal., 2 X 0.5-gal., or 4 X 1-L amber glass container with Teflon-lined lid	Adjust pH to < 2 at time of collection ³ , using 6 N HCL. Cool to 4°C.	Samples extracted within 14 days and extracts analyzed within 30 days after extraction	EPA Method 525.2, Revision 2.0, (1995)	
	6020 or 7421	600-mL glass or plastic containers. Use only polyethylene or fluorocarbon containers for Method 6020.	Filter on site through .45-µm filter, preserve with HNO ₃ to pH < 2	6 months	Table 3-1, SW- 846, Revision 3, December 1996; and Table 11-1, SW-846, Revision 0, September 1986	
Solid Samples (e.g. soil, sediments, sludges, ash)	5035/8021B ^{4,5} or 5035/8260B ^{4,5}	<u>Low Concentration Soil Samples</u> 2 X 40 mL glass vials containing a clean magnetic stirring bar with Teflon-lined septum caps, OR use a soil collection device which is airtight and affords little to no headspace (such as the En Core™ sampler), which can also serve as a storage container after sample collection.	Collect 5.0± 0.5 g of sample in a glass vial preserved with 1 g of sodium bisulfate and 5 mL of organic-free reagent water. If samples are markedly smaller or larger than 5 g, adjust the preservative amount by 0.2 g for each 1 g of sample, OR use a soil collection device such as the En Core™ sampler. Cool to 4°C.	14 days. Soil collected and stored in a sampling device like the En Core™ sampler must be transferred to a sample container with the appropriate preservative, as soon as possible, or analyzed within 48 hours of collection.	Table 4-1, SW- 846, Revision 3, December 1996 and EPA Method 5035, Revision 0, December 1966	
		<u>High Concentration Soil Samples</u> 2 - glass vials capable of holding 5 g of soil or solid material to be tested and 10 mL of methanol and can be sealed with a screw- cap containing a Teflon-lined septum, OR use a soil collection device such as the En Core™ sampler.	Collect 5.0 ± 0.5 g of sample in a glass vial preserved with 10 mL of methanol, OR use a soil collection device such as the En Core™ sampler. Cool to 4°C.			
	8270C or 8310	250-mL widemouth glass container with Teflon-lined lid	Cool to 4°C	Samples extracted within 7 days and extracts analyzed within 40 days after extraction		Table 3-1, SW- 846, Revision 3, December 1996; and Table 11-1, SW-846, Revision 0, September 1986
	6010B or 7420	200 g in a plastic or glass container	None	6 months		

¹ Samples from potable water supplies must be collected using a method applicable to drinking water.

² If samples are possibly chlorinated, collector must follow dechlorination procedures listed within each method.

³ Addition of HCL to the sample bottles prior to shipping to the sampling site is not permitted.

⁴ Each type of soil sample (low and high concentration) will require one additional sample that is not preserved for moisture determination. Use at least a 40-mL glass vial with a teflon-lined cap.

⁵ Documentation of the sampling option(s) used must accompany the laboratory results.

TEST PARAMETERS FOR SOIL AND WATER SAMPLES

Table 2 lists the minimum parameters for which samples should be tested during a site assessment, based on the product(s) stored in a regulated storage tank system. Recognized methods, other than those listed in Table 2, may be used if they are approved by the appropriate DEP regional office.

When reporting non-detects (ND) in a closure report, the data must be accompanied by a numerical quantitation limit that takes into account dilution, sample preparation, and matrix effects. For a non-detect result to be considered uncontaminated, the numerical quantitation limit must be equal to or less than the appropriate action level listed in Tables 3 and 4.

The responsible party has the obligation to ensure that the analytical methodologies and techniques employed are suitable to provide data that meets the minimal data quality objectives outlined and referenced in this document and DEP's Closure Guidance Documents for USTs and ASTs (Technical Guidance Documents 263-4500-601 and 263-4200-001, respectively). Additionally, documentation from the analyzing laboratory must be provided in the closure report showing that all samples meet all applicable preservation requirements.

Table 2.

**TEST PARAMETERS FOR SOIL AND WATER BY PRODUCT STORED,
TO BE USED DURING CLOSURE SITE ASSESSMENTS**

PRODUCT STORED	PARAMETERS TO BE TESTED IN SOIL	ANALYTICAL METHOD (reported on a dry weight basis)	PARAMETERS TO BE TESTED IN WATER	ANALYTICAL METHOD¹
Leaded Gasoline, Aviation Gasoline, and Jet Fuel	Benzene Toluene Ethyl Benzene Xylenes (total) Cumene (Isopropylbenzene) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5- Dichloroethane, 1,2- Dibromoethane, 1,2- (Ethylene Dibromide)	EPA Method 5035/8021B or 5035/8260B	Benzene Toluene Ethyl Benzene Xylenes (total) Cumene (Isopropylbenzene) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5- Dichloroethane, 1,2- Dibromoethane, 1,2-(Ethylene Dibromide)	EPA Method 5030B/8021B, 5030B/8260B or 524.2
	Lead (total)		Lead (dissolved)	EPA Method 8011 or 504.1
		EPA Method 6010B or 7420		EPA Method 6020, 7421, 200.7, 200.8, or 200.9
Unleaded Gasoline	Benzene Toluene Ethyl Benzene Xylenes (total) Cumene (Isopropylbenzene) Methyl tert-Butyl Ether (MTBE) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5035/8260B	Benzene Toluene Ethyl Benzene Xylenes (total) Cumene (Isopropylbenzene) Methyl tert-Butyl Ether (MTBE) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5030B/8260B or 524.2
Kerosene, Fuel Oil No. 1	Benzene Toluene Ethyl Benzene Cumene (Isopropylbenzene) Methyl tert-Butyl Ether (MTBE) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5035/8260B	Benzene Toluene Ethyl Benzene Cumene (Isopropylbenzene) Methyl tert-Butyl Ether (MTBE) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5030B/8260B or 524.2
Diesel Fuel, Fuel Oil No. 2	Benzene Toluene Ethyl Benzene Cumene (Isopropylbenzene) Methyl tert-Butyl Ether (MTBE) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5035/8260B	Benzene Toluene Ethyl Benzene Cumene (Isopropylbenzene) Methyl tert-Butyl Ether (MTBE) Naphthalene Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5030B/8260B or 524.2

Table 2. - Continued

**TEST PARAMETERS FOR SOIL AND WATER BY PRODUCT STORED,
TO BE USED DURING CLOSURE SITE ASSESSMENTS**

PRODUCT STORED	PARAMETERS TO BE TESTED IN SOIL	ANALYTICAL METHOD (reported on a dry weight basis)	PARAMETERS TO BE TESTED IN WATER	ANALYTICAL METHOD ¹
Fuel Oil Nos. 4, 5 and 6, and Lubricating Oils and Fluids	Benzene Naphthalene	EPA Method 5035/8021B or 5035/8260B	Benzene Naphthalene	EPA Method 5030B/8021B, 5030B/8260B or 524.2
	Fluorene Anthracene Phenanthrene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(a)pyrene Benzo(g,h,i)perylene	EPA Method 8270C or 8310	Phenanthrene Pyrene Chrysene	EPA Method 8270C, 8310 or 525.2
Used Motor Oil	Benzene Toluene Ethyl Benzene Cumene (Isopropylbenzene) Naphthalene	EPA Method 5035/8021B or 5035/8260B	Benzene Toluene Ethyl Benzene Cumene (Isopropylbenzene) Naphthalene	EPA Method 5030B/8021B, 5030B/8260B or 524.2
	Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Benzo(g,h,i)perylene	EPA Method 8270C or 8310	Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Benzo(g,h,i)perylene	EPA Method 525.2
	Lead (total)	EPA Method 6010B or 7420	Lead (dissolved)	EPA Method 6020, 7421, 200.7, 200.8, or 200.9
	PCB-1016 (Aroclor) PCB-1221 (Aroclor) PCB-1232 (Aroclor) PCB-1242 (Aroclor) PCB-1248 (Aroclor) PCB-1254 (Aroclor) PCB-1260 (Aroclor)	EPA Method 8082	PCB-1016 (Aroclor) PCB-1221 (Aroclor) PCB-1232 (Aroclor) PCB-1242 (Aroclor) PCB-1248 (Aroclor) PCB-1254 (Aroclor) PCB-1260 (Aroclor)	EPA Method 8082 or 508A
Mineral Insulating Oil	Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5035/8021B or 5035/8260B	Trimethyl benzene, 1,2,4- (Trimethyl benzene, 1,3,4-) Trimethyl benzene, 1,3,5-	EPA Method 5030B/8021B, 5030B/8260B or 524.2

Table 2. - Continued

**TEST PARAMETERS FOR SOIL AND WATER BY PRODUCT STORED,
TO BE USED DURING CLOSURE SITE ASSESSMENTS**

PRODUCT STORED	PARAMETERS TO BE TESTED IN SOIL	ANALYTICAL METHOD (reported on a dry weight basis)	PARAMETERS TO BE TESTED IN WATER	ANALYTICAL METHOD ¹
Other Petroleum Products Blended Petroleum Products Unknown Petroleum Products Other Regulated Substances	Contact the DEP Regional Office responsible for the county in which the tank is located			

¹ Samples from potable water supplies must be analyzed using a method applicable to drinking water.

ACTION LEVELS

Tables 3 and 4 list action levels for the minimal sampling parameters at storage tank system closure sites. The action levels listed in these tables were developed in accordance with 25 Pa. Code Chapter 250 and are based upon the most current scientific information regarding medium-specific concentrations. These action levels may be used to interpret confirmatory sampling results during the closure site assessment of petroleum storage tanks. For action levels of non-petroleum substances, refer to 25 Pa Code Chapter 250.

In cases where two numbers are shown for a parameter's soil action level, the lower number represents the residential action level while the higher number represents the non-residential action level.

Because only a limited site characterization is required to be conducted in localized contamination situations, the more conservative action levels are presented. For instance, in soil, the confirmatory sampling will be assumed to be conducted within 2 to 15 feet of the surface. Therefore, the more stringent of the direct contact or highest soil to groundwater numeric values will apply. Where the soil to groundwater values apply, it will be assumed that the aquifer is a used aquifer with a total dissolved solids (TDS) content less than or equal to 2,500 mg/L. It will also be assumed that any soil reused on-site will be placed back in the excavation to grade and/or spread on the site. **All** sample results must attain the action levels. Please recognize that the action levels presented are based on these assumptions. Depending on the particular contamination situation, different action levels may apply or other cleanup options may be available. Consult with the appropriate DEP regional office for questions regarding other cleanup options specific to the site.

Table 3.

**ACTION LEVELS FOR CONFIRMATORY SAMPLES
COLLECTED AT CLOSURE SITE ASSESSMENTS**

*****No Water Encountered*****

PARAMETER	UNSATURATED SOIL ACTION LEVEL¹ (mg/kg)	ACTION LEVEL FOR REUSE OF SOIL ON-SITE² (mg/kg)
Anthracene	350	350
Benzene	0.5	0.5
Benzo[a]anthracene	6.1/340	6.1/130
Benzo[a]pyrene	4.2/46	4.2/46
Benzo[b]fluoranthene	3.5/170	3.5/76
Benzo[g,h,i]perylene	180	180
Chrysene	35/230	35/230
Cumene	600/2,500	600/2,500
Dibromoethane, 1,2- (Ethylene dibromide)	0.005	0.005
Dichloroethane, 1,2-	0.5	0.5
Ethyl benzene	70	70
Fluorene	2,800/3,800	2,800/3,800
Indeno[1,2,3-cd]pyrene	3.5/18,000	3.5/76
Lead (total)	450	450
Methyl tert-butyl ether (MTBE)	2	2
Naphthalene	13/25	13/25
Phenanthrene	10,000	10,000
Pyrene	2,200	2,200
Toluene	100	100
Trimethyl benzene, 1,3,4- (Trimethyl benzene, 1,2,4-)	73/300	73/300
Trimethyl benzene, 1,3,5-	23/93	23/93
Xylenes (total)	1,000	1,000

¹ Residential Unsaturated Soil Action Levels are the more stringent of the residential direct contact value or the highest residential soil to groundwater value. Non-residential values are the more stringent of the non-residential subsurface soil direct contact value or the highest non-residential soil to groundwater value. In cases where two numbers are shown for a parameter's soil action level, the lower number represents the residential action level while the higher number represents the non-residential action level.

² Residential Action Levels for Reuse of Soil On-site are the same as the Unsaturated Action levels. Non-residential Action Levels for Reuse of Soil On-site are the more stringent of the non-residential surface soil direct contact value or the highest non-residential soil to groundwater value. In cases where two numbers are shown for a parameter's soil action level, the lower number represents the residential action level while the higher number represents the non-residential action level.

Table 4. ACTION LEVELS FOR CONFIRMATORY SAMPLES COLLECTED AT CLOSURE SITE ASSESSMENTS ***Water Encountered***				
PARAMETER	SATURATED SOIL ACTION LEVEL ¹ (mg/kg)	UNSATURATED SOIL ACTION LEVEL ² (mg/kg)	WATER ACTION Level ³ (ug/L)	ACTION LEVEL FOR REUSE OF SOIL ON-SITE ⁴ (mg/kg)
Anthracene	35	350	66	35
Benzene	0.5	0.5	5	0.5
Benzo[a]anthracene	2.6/34	6.1/340	0.3	2.6/34
Benzo[a]pyrene	4.2/4.6	4.2/46	0.2	4.2/4.6
Benzo[b]fluoranthene	2.5/17	3.5/170	0.18	2.5/17
Benzo[g,h,i]perylene	18	180	0.26	18
Chrysene	22/23	35/230	1.8	22/23
Cumene	84/350	600/2,500	840	84/350
Dibromoethane, 1,2- (Ethylene dibromide)	0.005	0.005	0.05	0.005
Dichloroethane, 1,2-	0.5	0.5	5	0.5
Ethyl benzene	70	70	700	70
Fluorene	280/380	2,800/3,800	1,400	280/380
Indeno[1,2,3-cd]pyrene	3.5/1,800	3.5/18,000	0.18	3.5/76
Lead (dissolved)			5	
Lead (total)	45	450		45
Methyl tert-butyl ether (MTBE)	2	2	20	2
Naphthalene	10	13/25	100	10
Phenanthrene	1,000	10,000	1,100	1,000
Pyrene	220	2,200	130	220
Toluene	100	100	1,000	100
Trimethyl benzene, 1,3,4- (Trimethyl benzene, 1,2,4-)	13/53	73/300	130	13/53
Trimethyl benzene, 1,3,5-	13/53	23/93	130	13/53
Xylenes (total)	1,000	1,000	10,000	1,000
¹ Residential Saturated Soil Action Levels are the more stringent of the: 1) residential direct contact value, or 2) the larger of the residential generic soil to groundwater value divided by 10 or the 100 times groundwater medium specific concentration (MSC) value for residential use. Non-residential Soil Actions Levels are the more stringent of the: 1) non-residential subsurface soil direct contact value, or 2) the larger of the non-residential generic soil to groundwater value divided by 10 or the 100 times the groundwater MSC value for non-residential use. In cases where two numbers are shown for a parameter's soil action level, the lower number represents the residential action level while the higher number represents the non-residential action level. ² Unsaturated Soil Action Levels are the same as those for sites where water is not encountered. In cases where two numbers are shown for a parameter's soil action level, the lower number represents the residential action level while the higher number represents the non-residential action level. ³ Water Action Levels are the residential MSCs for used aquifers with TDS less than or equal to 2,500 mg/L. ⁴ Residential Action Levels for Reuse of Soil On-site are the same as the residential Saturated Soil Action Levels. Non-residential Action Levels for Reuse of Soil On-site are the more stringent of the: 1) non-residential surface soil direct contact value, or 2) the larger of the non-residential generic soil to groundwater value divided by 10 or the 100 times the groundwater MSC value for non-residential use.				

**PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF ENVIRONMENTAL CLEANUP AND BROWNFIELDS**

TO REPORT A RELEASE, CALL 1-800-541-2050
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For more information, visit DEP's website at www.dep.pa.gov.