Designation: ~~D6232 – 16~~ D6232 – 21

Standard Guide for Selection of Sampling Equipment for Waste and Contaminated Media Data Collection Activities[1]

This standard is issued under the fixed designation D6232; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers criteria which should be considered when selecting sampling equipment for collecting environmental and waste samples for waste management activities. This guide includes a list of equipment that is used and is readily available. Many specialized sampling devices are not specifically included in this guide. However, the factors that should be weighed when choosing any piece of equipment are covered and remain the same for the selection of any piece of equipment. Sampling equipment described in this guide includes automatic samplers, pumps, bailers, tubes, scoops, spoons, shovels, dredges, ~~coring and augering~~ coring, augering, passive, and vapor sampling devices. The selection of sampling locations is outside the scope of this guide.

1.1.1 Table 1 lists selected equipment and its applicability to sampling matrices, including water (surface and ground), sediments, soils, liquids, multi-layered liquids, mixed solid-liquid phases, and consolidated and unconsolidated solids. The guide does not ~~address~~ specifically address the collection of samples of any suspended materials from flowing rivers or streams. Refer to Guide D4411 for more information.

1.2 Table 2 presents the same list of equipment and its applicability for use based on compatibility of sample and equipment; volume of the sample required; physical requirements such as power, size, and weight; ease of operation and decontamination; and whether it is reusable or disposable.

1.3 Table 3 provides the basis for selection of suitable equipment by the use of an ~~Index.~~ index.

1.4 Lists of advantages and disadvantages of selected sampling devices and line drawings and narratives describing the operation of sampling devices are also provided.

1.5 *Units*—The values stated in ~~both inch-pound and~~ SI units are to be regarded ~~separately as the standard units. The values given in parentheses~~ as standard. No other units of measurement are included in this standard. All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026 ~~are for information only.~~. Reporting of test results in units other than SI shall not be regarded as nonconformance with this standard.

1.6 This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional ~~judgement.~~ judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document

[1] This guide is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.01.01 on Planning for Sampling.

Current edition approved ~~Nov. 15, 2016~~Oct. 1, 2021. Published ~~December 2016~~October 2021. Originally approved in 1998. Last previous edition approved in ~~2008~~2016 as ~~D6232 – 08.~~D6232 – 16. DOI: ~~10.1520/D6232-16.~~10.1520/D6232-21.

be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate ~~safety~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D653 Terminology Relating to Soil, Rock, and Contained Fluids
D1452 Practice for Soil Exploration and Sampling by Auger Borings
D1586 Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils
D1587 Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes
D3550 Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils
D4136 Practice for Sampling Phytoplankton with Water-Sampling Bottles (Withdrawn 2020)[3]
D4342 Practice for Collecting of Benthic Macroinvertebrates with Ponar Grab Sampler (Withdrawn 2003)[3]
D4343 Practice for Collecting Benthic Macroinvertebrates with Ekman Grab Sampler (Withdrawn 2003)[3]
D4348 Practice for Collecting Benthic Macroinvertebrates with Holme (Scoop) Grab Sampler (Withdrawn 2003)[3]
D4387 Guide for Selecting Grab Sampling Devices for Collecting Benthic Macroinvertebrates (Withdrawn 2003)[3]
D4411 Guide for Sampling Fluvial Sediment in Motion
D4448 Guide for Sampling Ground-Water Monitoring Wells
D4547 Guide for Sampling Waste and Soils for Volatile Organic Compounds
D4687 Guide for General Planning of Waste Sampling
D4696 Guide for Pore-Liquid Sampling from the Vadose Zone
D4700 Guide for Soil Sampling from the Vadose Zone
D4823 Guide for Core Sampling Submerged, Unconsolidated Sediments
D5013 Practices for Sampling Wastes from Pipes and Other Point Discharges
D5079 Practices for Preserving and Transporting Rock Core Samples (Withdrawn 2017)[3]
D5088 Practice for Decontamination of Field Equipment Used at Waste Sites
D5283 Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation
D5314 Guide for Soil Gas Monitoring in the Vadose Zone (Withdrawn 2015)[3]
D5358 Practice for Sampling With a Dipper or Pond Sampler
D5451 Practice for Sampling Using a Trier Sampler
D5495 Practice for Sampling with a Composite Liquid Waste Sampler (COLIWASA)
D5633 Practice for Sampling with a Scoop
D5679 Practice for Sampling Consolidated Solids in Drums or Similar Containers
D5680 Practice for Sampling Unconsolidated Solids in Drums or Similar Containers
D5681 Terminology for Waste and Waste Management
D5730 Guide for Site Characterization for Environmental Purposes With Emphasis on Soil, Rock, the Vadose Zone and Groundwater (Withdrawn 2013)[3]
D5743 Practice for Sampling Single or Multilayered Liquids, with or Without Solids, in Drums or Similar Containers
D5778 Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils
~~D5781 Guide for Use of Dual-Wall Reverse-Circulation Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water Quality Monitoring Devices~~
~~D5782 Guide for Use of Direct Air-Rotary Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices~~
~~D5783 Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices~~
D5784 Guide for Use of Hollow-Stem Augers for Geoenvironmental Exploration and the Installation of Subsurface Water Quality Monitoring Devices

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

D5875 Guide for Use of Cable-Tool Drilling and Sampling Methods for Geoenvironmental Exploration and Installation of Subsurface Water Quality Monitoring Devices
D5876 Guide for Use of Direct Rotary Wireline Casing Advancement Drilling Methods for Geoenvironmental Exploration and Installation of Subsurface Water-Quality Monitoring Devices
D6001 Guide for Direct-Push Groundwater Sampling for Environmental Site Characterization
D6009 Guide for Sampling Waste Piles
D6044D6026 Guide for Representative Sampling for Management of Waste and Contaminated MediaPractice for Using Significant Digits and Data Records in Geotechnical Data
D6051 Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities
D6063 Guide for Sampling of Drums and Similar Containers by Field Personnel
D6151 Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling
D6169 Guide for Selection of Soil and Rock Sampling Devices Used With Drill Rigs for Environmental Investigations
D6282 Guide for Direct Push Soil Sampling for Environmental Site Characterizations
D6286 Guide for Selection of Drilling and Direct Push Methods for Geotechnical and Environmental Subsurface Site Characterization
D6418D6519 Practice for Using the Disposable En Core Sampler for Sampling and Storing Soil for Volatile Organic AnalysisSampling of Soil Using the Hydraulically Operated Stationary Piston Sampler
D6538 Guide for Sampling Wastewater With Automatic Samplers
D6634 Guide for Selection of Purging and Sampling Devices for Groundwater Monitoring Wells
D6640 Practice for Collection and Handling of Soils Obtained in Core Barrel Samplers for Environmental Investigations
D6699 Practice for Sampling Liquids Using Bailers
D6759 Practice for Sampling Liquids Using Grab and Discrete Depth Samplers
D6771 Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations
D6907 Practice for Sampling Soils and Contaminated Media with Hand-Operated Bucket Augers
D6914 Practice for Sonic Drilling for Site Characterization and the Installation of Subsurface Monitoring Devices
D7353 Practice for Sampling of Liquids in Waste Management Activities Using a Peristaltic Pump
D7758 Practice for Passive Soil Gas Sampling in the Vadose Zone for Source Identification, Spatial Variability Assessment, Monitoring, and Vapor Intrusion Evaluations
D7929 Guide for Selection of Passive Techniques for Sampling Groundwater Monitoring Wells
D8170 Guide for Using Disposable Handheld Soil Core Samplers for the Collection and Storage of Soil for Volatile Organic Analysis
E300 Practice for Sampling Industrial Chemicals
E1391 Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing and for Selection of Samplers Used to Collect Benthic Invertebrates

3. Terminology

3.1 For definitions of terms used in this standard, refer to Terminologies D653 and D5681.

3.2 *Definitions of Terms Specific to This Standard:*

~~3.1.1 *consolidated, adj*—a compact solid not easily compressed or broken into smaller particles.~~

~~3.1.2 *decontamination, n*—the process of removing or reducing to a known level undesirable physical or chemical constituents, or both, from a sampling apparatus to maximize the representativeness of physical or chemical analyses proposed for a given sample.~~

~~3.1.3 *data quality objectives (DQOs), n*—qualitative or quantitative statement(s) derived from the DQO process describing the problem(s), the decision rule(s) and the uncertainties of the decision(s) stated in the con text of the problem.~~

3.2.1 *environmental data, n*—defined for use in this document to mean data in support of environmental activities.

3.2.2 *matrix, n*—the principal constituent(s) or phase(s) of a material.

~~3.1.6 *unconsolidated, adj*—defined for use in this document to mean uncemented or uncompacted material that is easily separated into smaller portions.~~

~~3.1.7 *representative sample, n*—a sample collected in such a manner that it reflects one or more characteristics of interest (as defined by the project objectives) of a population from which it was collected. (D6044)~~

4. Summary of Guide

4.1 This guide discusses important criteria which should be considered when choosing sampling equipment.

4.1.1 Criteria discussed in this document include physical and chemical compatibility, sample matrix, sample volume, physical requirements, ease of operation, and decontamination. Costs are considered, where appropriate.

4.2 A limited list of sampling equipment is presented in two separate tables. The list attempts to include a variety of different types of equipment. However, this list is in no way all inclusive, as there are many excellent pieces of equipment not included. Table 1 lists matrices (surface and ~~ground water,~~ groundwater, stationary sediment, soil, and ~~mixed phase~~ mixed-phase wastes) and indicates which sampling devices are appropriate for use with these matrices. It also includes ASTM method references (draft standards are not included). Table 2 indicates physical requirements (such as battery), electrical power, and weight; physical and chemical compatibility; effect on matrix; range of volume; ease of operation; decontamination; and reusability. Table 3 provides sampler type selection process based upon the sample type and matrix to be sampled.

5. Significance and Use

5.1 Although many technical papers address topics important to efficient and accurate sampling investigations ~~(DQO's,~~(DQOs, study design, QA/QC, data assessment; see Guides D4687, D5730, D6009, D6051, and Practice D5283), the selection and use of appropriate sampling equipment is assumed or omitted.

5.2 The choice of sampling equipment can be crucial to the task of collecting a sample appropriate for the intended use.

5.3 When a sample is collected, all sources of potential bias should be considered, not only in the selection and use of the sampling device, but also in the interpretation and use of the data generated. Some major considerations in the selection of sampling equipment for the collection of a sample are listed ~~below.~~below:

5.3.1 The ability to access and extract from every relevant location in the target population,

5.3.2 The ability to collect a sufficient mass of sample such that the distribution of particle sizes in the population are represented, and

TABLE 1 Equipment Selection—Matrix Guide

Equipment (May be used for discrete sample collection)	Water and Waste Water Wastewater			Sediment	Soil	Waste				
	Surface Water	Ground Ground-Water water	Point Discharge			Liquid	Multi-Layer Liquid	Mixed Phase Solid/Liquid	Consolidated Solid	Unconsolidated Solid
Pumps and Siphons										
Automatic Sampler—Non volatiles	√D6538[G]	√D6538[G]	-	-	N	N	N	-	-	-
Automatic Sampler—Non Volatiles	√D6538[G]	-	-	-	-	N	N	-	-	-
Automatic Composite Sampler—Volatiles	√		√	-	-	-	-	-	-	-
Air/Gas Displacement Pump		√D4448[G]	√	-	-	-	√	-	-	-
Piston Displacement Pump		√D4448[G]	√	-	-		N	-	-	-
Bladder Pumps		√D4448[G]	√	-	-	N	N	-	-	-
		D6771[P]		-	-	-	-	-	-	-
Corrugated Bladder Pumps		√D6634[G]								
Peristaltic Pump	√D6759[P]	√D4448[G]	√D6759[P]	-	-	√D6759[P]	√D6759[P]	N	-	-
		√D7353[P]								
Centrifugal Submersible Pump	√	√D4448[G]	√	-	-	N	N	-	-	-
		√D6771[P]								
Gear Drive Pump	√	√D6634[G]	√	-	-	N	N	-	-	-
Progressing Cavity Pump	√	√D6634[G]	√	-	-	N	N	-	-	-
Inertia Lift Pump	-	√D4448[G]	-	-	-	-	-	-	-	-
Dredges										
Ekman Dredge	-	-	-	√D4387[G]	-	-	-	-	-	-
				D4343[P]						
				√E1391[G]						
Petersen Dredge	-	-	-	√D4387[G]	-	-	-	-	-	-
				√E1391[G]						
Ponar Dredge	-	-	-	√D4387[G]	-	-	-	-	-	-
				D4342[P]						
				√E1391[G]						
				D4342[P]						
Discrete Depth Samplers										
Bacon Bomb	√D6759[P]	-	-	-	-	√D6759[P]	N	-	-	-
Kemmerer Sampler	√D4136[P]	-	-	-	-	√D6759[P]	N	-	-	-
	D6759[P]	-	-	-	-	-	-	-	-	-
Syringe Sampler	√D5743[G]	-	N	-	-	√D6759[P]	√D6759[P]	√D6759[P]	-	-
	D6759[P]	-	-	-	-	-	-	-	-	-
Peristaltic Pump	√D6759[P]	√D4448[G]	√D6759[P]	-	-	√D6759[P]	√D6759[P]	N	-	-
Lidded Sludge/Water Sampler	-	-	-	-	-	N	N	√D6759[P]	-	N
Discrete Level Sampler	√D6759[P]	√	√D6759[P]	-	-	√D6759[P]	√D6759[P]	-	-	-
HYDRASleeve	N	√D4448[G]	-	-	-	N	N	-	-	-
HYDRASleeve	N	√D7929[G]	-	-	-	N	N	-	-	-
Snap Sampler	-	√D4448[G]	-	-	-	N	N	-	-	-
Snap Sampler	-	√D7929[G]	-	-	-	N	N	-	-	-
Drive Push Samplers										
Drive/Push/Drill Samplers										
Direct Push Water Sampler	-	√	-	-	-	N	-	-	-	-
Direct-Push Water Sampler	-	√	-	-√	-√	N	-	-	-	-
Probe Sampler, Hand Use	-	-	-	N	√	-	-	N	-	√
Probe Sampler, Rig Use	-	-	-	√D4823[G]	√	√	√	N	-	N
Split Barrel Sampler	-	-	-	√	√D1586[TM]	-	-	N	-	N
					√D4700[G]					
Split-Barrel Sampler	-	-	-	√	√D1586[T]	-	-	N	-	N
					√D6640[P]					
Continuous Core Sampler	-	-	-	√	√D5784	-	-	√	-	N
Ring-Lined Barrel Sampler					√D3550[P]	-	-	√	-	N
					D6640[P]					
Thin Walled Tube	-	-	-	√D4823[G]	√D1587[P]	-	-	-	-	√
					D4700[G]					
Thin-Walled Soil Sampler	-	-	-	√D4823[G]	√D1587[P]	-	-	-	-	√
					√D6640[P]					
Direct-Push Single-Tube Soil Sampler					√D6640[P]					
					D6282[G]					
Direct-Push Dual-Tube Soil Sampler					√D6640[P]					
					D6282[G]					
Sonic Drill Soil and Rock Sampler					√D6914[P]				√	
Soil Corers					√					
Coring Type w/Valve (Hand Use)	-	-	-	N	√D4823[G]	-	-	√	-	√
Coring-Type Sampler w/ Valve	-	-	-	√D4823[G]	N	-	-	√	-	√
Concentric Tube Thief (Hand Use)	-	-	-	-	-	-	-	-	-	√
Concentric Tube Thief	-	-	-	-	-	-	-	-	-	√

TABLE 1 *Continued*

Equipment (May be used for discrete sample collection)	Water and Waste Water Wastewater			Sediment	Soil	Waste				
	Surface Water	Ground Ground-Water water	Point Discharge			Liquid	Multi-Layer Liquid	Mixed Phase Solid/Liquid	Consolidated Solid	Unconsolidated Solid
Trier (Hand Use)	-	-	-	-	√	-	-	N	-	√D5451[P] √E300[P]
Trier	-	-	-	-	√	-	-	N	-	√D5451[P] √E300[P]
Miniature Core Sampler (Hand Use)	-	-	-	N	D4700[G] √D4547[G] D6418[P]	-	-	-	-	N
Handheld Soil Core Sampler	-	-	-	N	D4700[G] √D4547[G] √D8170[P]	-	-	-	-	N
Modified Syringe Sampler (Hand Use)	-	-	-	N	√D4547[G]	-	-	-	-	N
Modified Syringe Sampler	-	-	-	N	√D4547[G]	-	-	-	-	N
Rotating Coring Devices										
Screw Auger	-	-	-	-	-	-	-	-	√	-
Screw Auger	-	-	-	-	N	-	-	-	√	-
Rotating Corer	-	-	-	√D4823[G]	√D4700[G]	-	-	-	√	-
Captive Screw Auger	-	-	-	-	-	-	-	-	N	√
Augers										
Hand-Operated Bucket Auger	-	-	-	N	√D1452[P] D4700 G	-	-	-	-	√D1452[P]
Hand-Operated Bucket Auger	-	-	-	N	√D1452[P] D4700[G] √D6907[P]	-	-	-	-	√D1452[P] √D6907[P]
Solid-Stem Flighted Auger	-	-	-	-	√D6907[P] √D1452[G] √D6286[G]	-	-	-	N	√D6907[P] N
Solid-Stem Flighted Auger	-	-	-	-	√D1452[G] √D6286[G]	-	-	-	N	N
Hollow-Stem Flighted Auger	-	-	-	-	√D5784[G] √D6151[G]	-	-	-	N	N
Hollow-Stem Flighted Auger	-	√D5784[G]	-	-	√D6169[G] √D6151[G]	-	-	-	N	N
Peat Borer	-	-	-	√	√	-	-	-	-	N
Liquid Profile Devices										
COLIWASA	-	-	-	-	-	√D5495[P] √D5743[G]	√D5495[P] D5743[G]	-	-	
Reuseable Point Sampler	N	-	N	-	-	√D5743[G]	√D5743[G]	√	-	-
Reusable Point Sampler	N	-	N	-	-	√D5743[G]	√D5743[G]	√	-	-
Drum Thief	-	-	-	-	-	√D5743[G]	√D5743[G]	√	-	-
Valved Drum Sampler	-	-	-	-	-	√D5743[G]	√D5743[G]	√	-	-
Valved Sampler	-	-	-	-	-	√D5743[G]	√D5743[G]	√	-	-
Plunger-Type Sampler	N	-	N	-	-	√D5743[G]	√D5743[G]	√D5743[G]	-	-
Plunger-Type Sampler	N	-	N	-	-	√D5743[G]	√D5743[G]	√D5743[G]	-	-
Liquids Profiler	N	-	N	-	-	√D6759[P]	√D6759[P]	√D6759[P]	-	-
Liquid Profiler	N	-	N	-	-	√D6759[P]	√D6759[P]	√D6759[P]	-	-
Surface Sampling Devices (Liquids)										
Bailer	N	√D4448[G] √D6699[P]	-	-	-	N -	N -	-	-	-
Point Sampling Bailer	N	√D4448[G] √D6699[P]	-	-	-	N -	N -	-	-	-
Differential Pressure Bailer	-	√D6699[P]	-	-	-	N	N	-	-	-
Dipper	√D5358[P] √D6759[P]	-	√D5013[P]	-	-	√D5358[P] √D6759[P]	-	√D5358[P] √D6759[P]	-	-
Liquid Grab Sampler	√	-	N	-	-	√	√	√	-	-
Liquid Grab Sampler	√D6759[P]	-	N	-	-	√D6759[P]		√D6759[P]	-	-
Swing Jar Sampler	√	-	N	N	-	√	√	N	-	-
Swing Jar Sampler	√D6759[P]	-	N	N	-	√D6759[P]		N	-	-
Passive Water Sampling Devices										
Passive Sampler, Bag Type	√	√D7929[G]	-	-	-	-	-	-	-	-
Passive Sampler, Chamber Type	-	√D7929[G]	-	-	-	-	-	-	-	-
Surface Sampling Devices (Solids) **Multi-Level Sampling Devices**										
Impact Devices	-	-	-	-	-	-	-	-	√	-
Dedicated Type 1	-	√	-	-	N	-	-	-	-	-

TABLE 1 *Continued*

Equipment (May be used for discrete sample collection)	Water and Waste Water Wastewater			Sediment	Soil	Waste				
	Surface Water	Ground Ground-Waterwater	Point Discharge			Liquid	Multi-Layer Liquid	Mixed Phase Solid/Liquid	Consolidated Solid	Unconsolidated Solid
Spoon	N	-	N	-	√D4700[G]	N	N	-	-	N
Dedicated Type 2	-	√	-	-	N	-	-	-	-	-
Scoops and Trowel	-	-	-	N	√D4700[G]	N	-	N	-	√
Shovels	-	-	-	N	√D4700[G]	-	-	N	-	√
Portable	-	N	-	-	√	-	-	-	-	-
Multi-Level Sampling Devices										
Surface Sampling Devices (Solids)										
Dedicated Type 1	-	√	-	-	N	-	-	-	-	-
Impact Devices	-	-	-	-	-	-	-	-	√D5679[P]	-
Spoon	N	-	N	-	N	N	N	-	-	N
Dedicated Type 2	-	√	-	-	N	-	-	-	-	-
Scoops and Trowels	-	-	-	N	√D5633[P]	N	-	N	-	√
Portable	-	N	-	-	√	-	-	-	-	-
Shovels	-	-	-	N	N	-	-	N	-	√
Vadose Zone Pore Sampling Devices										
Vacuum Lysimeter	-	N	-	N	√D4696[G]	-	-	-	-	-
Vacuum/Pressure Lysimeter	-	N	-	N	√D4696[G]	-	-	-	-	-
Gas Adsorber	N	N	-	N	√D5314[G]	-	-	-	-	-
Passive Soil Gas Sampler	N	N	-	N	√D7758[P]	-	-	-	-	-

√ = Equipment may be used with this matrix N = Not equipment of choice but use is possible - = Not recommended
[G] = ASTM Guide [TM] = ASTM Test Method [P] = ASTM Practice
√ = Equipment may be used with this matrix N = Not equipment of choice but use is possible - = Not recommended
[G] = ASTM Guide [T] = ASTM Test Method [P] = ASTM Practice

5.3.3 The ability to collect a sample without the addition or loss of constituents of interest.

5.4 The characteristics discussed in 5.3 are particularly important in investigations when the target population is heterogeneous, such as when particle sizes vary, liquids are present in distinct phases, a gaseous phase exists, or material materials from different sources are present in the population. The consideration of these characteristics during the equipment selection process will enable the data user to make appropriate statistical inferences about the target population based on the sampling results.

5.5 If samples are to be collected for the determination of per- and poly-fluorinated alkyl substances (PFAS), all sampling equipment should be made of fluorine-free materials. Other considerations for PFAS sampling may exist but are beyond the scope of this standard.

6. Selection Criteria

6.1 Refer to Tables 1 and 2 for a summary of matrix compatibility and selection criteria. Refer to Table 3 for an index of sampling equipment based upon sample type and matrix to be sampled.

6.2 *Compatibility*—It is important that sampling equipment, other equipment which may come in contact with samples (such as gloves, mixing pans, knives, spatulas, spoons, etc.)etc.), and sample containers be constructed of materials that are compatible with the matrices and analytes of interest. Incompatibility may result in the contamination of the sample and the degradation of the sampling equipment. Appropriate sampling equipment must be compatible chemically and physically.physically compatible.

6.2.1 *Chemical Compatibility*—The effects of a matrix on the sampling equipment is usually considered in the light of the analytes, or groups of analytes of interest. For example, poly-vinyl poly-vinyl chloride (PVC) has been found to degrade in the presence of many separate phase organic compounds in water; therefore, it would be preferable to collect ground water groundwater samples for organic analyses using polytetrafluoroethylene (PTFE), fluoropolymer, stainless steel, or glass sampling equipment (**1**, **2**).[4] Acids, bases, and high chloride ground water high-chloride groundwater in coastal areas, and wastes with high concentrations of

[4] The boldface numbers in parentheses refer to the list of references at the end of this standard.

TABLE 2 Sampling Equipment Selection Guide

Equipment	Chemical	Physical	Effect on Sample	Volume Range	Physical	Ease of Operation	Decon	Disposal or Reuse
~~**Pumps and Siphon**~~								
Pumps and Siphons								
Automatic Sampler–Nonvolatiles	X	X	√	U	B/P	√	X	R
Automatic Composite Sampler–Volatiles	X	X	√	U	B/P	X	X	R
Air/Gas Displacement Pump	√	X	X	U	P/S/W	X	X	R
Piston Displacement Pump	√	X	X	U	P/S/W	X	X	R
Bladder Pumps	√	X	√	U	P	X	X	R
Corrugated Bladder Pump	√	X	√	U	P	√	X	R
Peristaltic Pump	X	X	√	U	B/P	X	√	R
Centrifugal Submersible Pump	X	X	X	U	P/S/W	√	X	R
Gear Drive Pump	X	X	X	U	B/P	√	X	D/R
Progressive Cavity Pump	X	X	X	U	P	√	X	R
Inertia Lift Pump	X	X	X	U	B/N	√	√	R
Dredges								
~~Ekman Dredge~~	~~√~~	~~√~~	~~X~~	~~0.5-3.0~~	~~N~~	~~X~~	~~X~~	~~R~~
Ekman Dredge	√	√	X	0.5–3.0	N	X	X	R
~~Petersen Dredge~~	~~√~~	~~√~~	~~X~~	~~0.5-3.0~~	~~W~~	~~X~~	~~X~~	~~R~~
Petersen Dredge	√	√	X	0.5–3.0	W	X	X	R
~~Ponar Dredge~~	~~√~~	~~√~~	~~X~~	~~0.5-3.0~~	~~W~~	~~X~~	~~X~~	~~R~~
Ponar Dredge	√	√	X	0.5–3.0	W	X	X	R
Discrete Depth Samplers								
~~Bacon Bomb~~	~~X~~	~~X~~	~~√~~	~~0.1-0.94~~	~~N~~	~~√~~	~~X~~	~~R~~
Bacon Bomb	X	X	√	0.1–0.94	N	√	X	R
~~Kemmerer Sampler~~	~~X~~	~~X~~	~~X~~	~~1.0-2.0~~	~~N~~	~~X~~	~~X~~	~~R~~
Kemmerer Sampler	X	X	X	1.0–2.0	N	X	X	R
~~Syringe Sampler~~	~~√~~	~~√~~	~~√~~	~~0.2-0.5~~	~~N~~	~~√~~	~~X~~	~~R~~
Syringe Sampler	√	√	√	0.2–0.5	N	√	X	R
Lidded Sludge/Water Sampler	√	X	X	1.0	S/W	X	X	R
~~Discrete Level Sampler~~	~~√~~	~~X~~	~~√~~	~~0.2-0.5~~	~~N~~	~~√~~	~~√~~	~~R~~
Discrete Level Sampler	√	X	√	0.2–0.5	N	√	√	R
~~Bailer~~	~~X~~	~~√~~	~~X~~	~~0.5-2.0~~	~~N~~	~~√~~	~~√~~	~~D/R~~
~~Point Sampling Bailer~~	~~X~~	~~√~~	~~√~~	~~0.5-2.0~~	~~N~~	~~√~~	~~√~~	~~R~~
~~Differential Pressure Bailer~~	~~√~~	~~√~~	~~√~~	~~0.04-1.0~~	~~N~~	~~√~~	~~X~~	~~R~~
~~Dipper~~	~~√~~	~~X~~	~~√~~	~~0.5-1.0~~	~~N~~	~~√~~	~~√~~	~~R~~
~~Liquid Grab Sampler~~	~~√~~	~~√~~	~~√~~	~~0.5-1.0~~	~~N~~	~~√~~	~~√~~	~~R~~
~~Swing Jar Sampler~~	~~X~~	~~√~~	~~√~~	~~0.5-1.0~~	~~N~~	~~√~~	~~√~~	~~R~~
~~HYDRASleeve~~	~~√~~	~~√~~	~~√~~	~~0.6-3.1~~	~~N~~	~~√~~	~~√~~	~~D~~
HYDRASleeve	√	√	√	0.6–3.1	N	√	√	D
~~Snap Sampler~~	~~√~~	~~√~~	~~√~~	~~0.04-0.35~~	~~N~~	~~√~~	~~X~~	~~R~~
Snap Sampler	√	√	√	0.04–0.35	N	√	X	R
~~**Drive/Push Samplers**~~								
Drive/Push/Drill Samplers								
~~Direct Push Water Sampler~~	~~√~~	~~√~~	~~√~~	~~0.1-0.3~~	~~P/S/W~~	~~X~~	~~X~~	~~R~~
Direct-Push Water Sampler	√	√	√	0.1–0.3	P/S/W	X	X	R
~~Probe Sampler~~	~~√~~	~~√~~	~~X~~	~~0.2-2.0~~	~~S/W~~	~~X~~	~~√~~	~~R~~
Split-Barrel Sampler	√	√	X	0.5–30.0	S/W	X	√	R
~~Split Barrel Sampler~~	~~√~~	~~√~~	~~X~~	~~0.5-30.0~~	~~S/W~~	~~X~~	~~√~~	~~R~~
Ring-Lined Barrel Sampler	√	√	X	0.5–30.0	S/W	X	√	R
~~Thin Walled Tube~~	~~√~~	~~√~~	~~X~~	~~0.5-5.0~~	~~S/W~~	~~√~~	~~√~~	~~R~~
Thin-Walled Tube Sampler	√	√	X	0.5–5.0	S/W	√	√	R
Direct-Push Single-Tube Sampler	√	√	X	0.5–30.0	S/W	X	√	R
Direct-Push Dual-Tube Sampler	√	√	X	0.5–30.0	S/W	X	√	R
Sonic Drill Soil and Rock Sampler	√	√	X	0.5–100	S/W/P	X	√	R
~~Coring Type w/Valve~~	~~√~~	~~√~~	~~√~~	~~0.2-1.5~~	~~N~~	~~√~~	~~√~~	~~R~~
Soil Corers	√	√	X	0.2–1	N	√	√	R
Coring-Type Sampler w/ Valve	√	√	√	0.2–1.5	N	√	√	R
~~Concentric Tube Theif~~	~~√~~	~~√~~	~~√~~	~~0.5-1.0~~	~~N~~	~~√~~	~~√~~	~~R~~
Concentric Tube Thief	√	√	√	0.5–1.0	N	√	√	R
~~Trier~~	~~√~~	~~√~~	~~√~~	~~0.1-0.5~~	~~N~~	~~√~~	~~√~~	~~R~~
Trier	√	√	√	0.1–0.5	N	√	√	R
~~Miniature Core Sampler~~	~~√~~	~~√~~	~~√~~	~~0.01-0.05~~	~~N~~	~~√~~	~~√~~	~~D~~
Handheld Core Sampler	√	√	√	0.01–0.05	N	√	√	D
~~Modified Syringe Sampler~~	~~√~~	~~√~~	~~√~~	~~0.01-0.05~~	~~N~~	~~√~~	~~X~~	~~D~~
Modified Syringe Sampler	√	√	√	0.01–0.05	N	√	X	D
Rotating Coring Devices								
~~Screw Auger~~	~~√~~	~~X~~	~~X~~	~~0.1-0.3~~	~~N~~	~~X~~	~~√~~	~~R~~
Screw Auger	√	X	X	0.1–0.3	N	X	√	R
~~Rotating Corer~~	~~√~~	~~√~~	~~X~~	~~0.5-1.0~~	~~B/P~~	~~√~~	~~√~~	~~R~~
Rotating Corer	√	√	X	0.5–1.0	B/P	√	√	R
~~Captive Screw Auger~~	~~X~~	~~√~~	~~X~~	~~1-2~~	~~P~~	~~√~~	~~√~~	~~R~~

TABLE 2 *Continued*

Equipment	Chemical	Physical	Effect on Sample	Volume Range	Physical	Ease of Operation	Decon	Disposal or Reuse
Captive Screw Auger	X	√	X	1–2	P	√	√	R
Augers								
~~Bucket Auger~~	~~√~~	~~X~~	~~X~~	~~0.2-1.0~~	~~N~~	~~X~~	~~√~~	~~R~~
Hand-Operated Bucket Auger	√	X	X	0.2–1.0	N	X	√	R
~~Solid-Stem Flighted Auger~~	~~X~~	~~√~~	~~X~~	~~U~~	~~P/S/W~~	~~X~~	~~√~~	~~R~~
Solid-Stem Flighted Auger	X	√	X	U	P/S/W	X	√	R
~~Hollow-Stem Flighted Auger~~	~~X~~	~~√~~	~~X~~	~~U~~	~~P/S/W~~	~~X~~	~~√~~	~~R~~
Hollow-Stem Flighted Auger	X	√	X	U	P/S/W	X	√	R
~~Peat Borer~~	~~X~~	~~√~~	~~√~~	~~0.3~~	~~S~~	~~X~~	~~X~~	~~R~~
Peat Borer	X	√	√	0.3	N	√	X	R
Liquid Profile Devices								
~~COLIWASA~~	~~√~~	~~X~~	~~√~~	~~0.5-3.0~~	~~N~~	~~√~~	~~X~~	~~D/R~~
COLIWASA	√	X	√	0.5–3.0	N	√	X	D/R
~~Reuseable Point Sampler~~	~~√~~	~~√~~	~~√~~	~~0.2-0.6~~	~~N~~	~~√~~	~~√~~	~~R~~
Reusable Point Sampler	√	√	√	0.2–0.6	N	√	√	R
~~Drum Thief~~	~~√~~	~~X~~	~~√~~	~~0.1-0.5~~	~~N~~	~~√~~	~~X~~	~~D/R~~
Drum Thief	√	X	√	0.1–0.5	N	√	X	D/R
~~Valved Sampler~~	~~√~~	~~√~~	~~√~~	~~0.3-1.6~~	~~N~~	~~√~~	~~√~~	~~D/R~~
Valved Sampler	√	√	√	0.3–1.6	N	√	√	D/R
~~Plunger-Type Sampler~~	~~√~~	~~X~~	~~√~~	~~0.2-U~~	~~N~~	~~√~~	~~√~~	~~D/R~~
Plunger-Type Sampler	√	X	√	0.2–U	N	√	√	D/R
~~Liquids Profiler~~	~~X~~	~~X~~	~~√~~	~~1.3-4.0~~	~~N~~	~~√~~	~~√~~	~~R~~
Liquid Profiler	X	X	√	1.3–4.0	N	√	√	R
Surface Sampling Devices (Liquids)								
Bailer	X	√	X	0.5–2.0	N	√	√	D/R
Point Sampling Bailer	X	√	√	0.5–2.0	N	√	√	R
Differential Pressure Bailer	√	√	√	0.04–1.0	N	√	X	R
Dipper	√	X	√	0.5–1.0	N	√	√	R
Liquid Grab Sampler	√	√	√	0.5–1.0	N	√	√	R
Swing Jar Sampler	X	√	√	0.5–1.0	N	√	√	R
Passive Water Sampling Devices								
~~Passive Sampler, Bag Type~~	~~√~~	~~√~~	~~√~~	~~0.1-0.2~~	~~N~~	~~√~~	~~√~~	~~D/R~~
Passive Sampler, Bag Type	√	√	√	0.1–0.2	N	√	√	D/R
~~Passive Sampler, Chamber Type~~	~~√~~	~~√~~	~~√~~	~~1-4~~	~~W/S~~	~~X~~	~~X~~	~~D/R~~
Passive Sampler, Chamber Type	√	√	√	1–4	W/S	X	X	D/R
Multi-Level Sampling Devices								
Dedicated Type 1	√	√	√	U	W/S	X	X	D/R
Dedicated Type 2	√	√	√	U	W/S	X	X	D
Portable	√	√	√	0.01	N	X	X	DR
Surface Sampling Devices (Solids)								
Impact Devices	X	X	X	N/A	B/P	√	√	R
Spoon	√	√	X	N/A	N	√	√	R
~~Scoops and Trowel~~	~~√~~	~~√~~	~~X~~	~~0.1-0.6~~	~~N~~	~~√~~	~~√~~	~~R~~
Scoops and Trowels	√	√	X	0.1–0.6	N	√	√	R
~~Shovels~~	~~√~~	~~√~~	~~X~~	~~1.0-5.0~~	~~N~~	~~√~~	~~√~~	~~R~~
Shovels	√	√	X	1.0–5.0	N	√	√	R
Vadose Zone Pore Sampling Devices								
~~Vacuum Lysimeter~~	~~√~~	~~√~~	~~√~~	~~0.1-0.5~~	~~N~~	~~√~~	~~√~~	~~D/R~~
Vacuum Lysimeter	√	√	√	0.1–0.5	N	√	√	D/R
~~Vacuum/Pressure Lysimeter~~	~~√~~	~~√~~	~~√~~	~~0.1-0.5~~	~~S/P~~	~~√~~	~~√~~	~~D~~
Vacuum/Pressure Lysimeter	√	√	√	0.1–0.5	S/P	√	√	D
~~Gas Adsorber~~	~~√~~	~~√~~	~~√~~	~~N/A~~	~~N~~	~~√~~	~~√~~	~~D~~
Passive Soil Gas Samplers	√	√	√	N/A	N	√	√	D

~~X = Significant operational consideration~~
~~√ = Not a significant operational consideration~~

~~Range of Volume (liters)~~
~~U = Unlimited~~
~~N/A = Not Applicable~~

~~Physical Requirements:~~
~~B = Battery W = Weight~~
~~P = Power S = Size~~
~~N = No limitations~~

~~Disposal and Reuse:~~
~~R = Reusable~~
~~D = Single Use~~

X = Significant operational consideration
√ = Not a significant operational consideration

Range of Volume (liters):
U = Unlimited
N/A = Not applicable

Physical Requirements:
B = Battery W = Weight
P = Power S = Size
N = No limitations

Disposal and Reuse:
R = Reusable
D = Single use

solvents may also degrade many types of sampling equipment over time. The residence or contact time, the time the sample is in contact with the sampling equipment, may be significant in terms of chemical interaction between the sampled matrix and the equipment.

TABLE 3 Index of Sampling Equipment

Media Type	Sampler Type	~~Section~~Subsection	Sample Type
~~Consolidated~~	~~Rotating Corer~~	~~(7.6.2)~~	~~Surface or Depth, Undisturbed~~
Consolidated Solid	Screw Auger	(7.6.1)	Surface, Disturbed
	Rotating Corer	(7.6.2)	Surface, Undisturbed
	~~Impact Device~~	~~(7.11.1)~~	~~Surface, Disturbed~~
	Impact Devices	(7.11.1)	Surface, Disturbed
	~~Lidded Sludge~~	~~(7.4.4)~~	~~Discrete, Composite~~
Unconsolidated Solid	Lidded Sludge/Water Sampler	(7.4.4)	Discrete, Composite
	~~Probe Sampler~~	~~(7.5.2)~~	~~Discrete, Undisturbed~~
	Split-Barrel Sampler	(7.5.2)	Discrete, Undisturbed
	~~Split Barrel~~	~~(7.5.3)~~	~~Discrete, Undisturbed~~
	Ring-Lined Barrel Sampler	(7.5.3)	Surface, Undisturbed
	Thin-Walled Tube Sampler	(7.5.4)	Surface or Depth, Undisturbed
	Direct-Push Single-Tube Sampler	(7.5.5)	Surface or Depth, Representative
	Direct-Push Dual-Tube Sampler	(7.5.6)	Surface or Depth, Representative
	Sonic Drill Coring	(7.5.7)	Continuous, Representative/Disturbed
	Soil Corers	(7.5.8)	Surface, Undisturbed
	Coring-Type Sampler w/ Valve	(7.5.9)	Surface or Depth, Disturbed
	~~Concentric Tube Thief~~	~~(7.5.7.1)~~	~~Surface, Disturbed, Selective~~
	Concentric Tube Thief	(7.5.10)	Surface, Disturbed, Selective
	~~Trier~~	~~(7.5.7.2)~~	~~Surface, Relatively Undisturbed, Selective~~
	Trier	(7.5.10)	Surface, Relatively Undisturbed, Selective
~~Unconsolidated~~	~~Thin-Walled Tube~~	~~(7.5.5)~~	~~Surface or Depth, Undisturbed~~
	Handheld Core Sampler	(7.5.11)	Surface, Undisturbed
~~Solid~~	~~Coring Type w/Valve~~	~~(7.5.6)~~	~~Surface or Depth, Disturbed~~
	Modified Syringe	(7.5.12)	Surface, Undisturbed
	Captive Screw Auger	(7.6.3)	Discrete, Disturbed
	Hand-Operated Bucket Auger	(7.7.1)	Surface or Depth, Disturbed
	~~Solid Stem Flighted Auger~~	~~(7.7.2.1)~~	~~Surface or Depth, Disturbed~~
	Solid-Stem Flighted Auger	(7.7.2.1)	Surface or Depth, Disturbed
	~~Hollow Stem Flighted Auger~~	~~(7.7.2.2)~~	~~Surface or Depth, Disturbed (if from flights)~~
	Hollow-Stem Flighted Auger	(7.7.2.3)	Surface or Depth, Disturbed (if from flights)
	~~Captive Screw Auger~~	~~(7.6.3)~~	~~Discrete, Disturbed~~
	Peat Borer	(7.7.3)	Discrete, Relatively Undisturbed
	Spoon	(7.11.2)	Surface, Disturbed, Selective
	~~Scoops/Trowel~~	~~(7.11.3)~~	~~Surface, Disturbed, Selective~~
	Scoops and Trowels	(7.11.3)	Surface, Disturbed, Selective
	~~Shovel~~	~~(7.11.4)~~	~~Surface, Disturbed~~
	Shovels	(7.11.4)	Surface, Disturbed
	~~Miniature Core~~	~~(7.5.8)~~	~~Surface, Undisturbed~~
	~~Modified Syringe~~	~~(7.5.9)~~	~~Surface, Undisturbed~~
	~~Probe Sampler~~	~~(7.5.2)~~	~~Discrete, Undisturbed~~
Soil	Split-Barrel Sampler	(7.5.2)	Discrete, Representative
	~~Split Barrel~~	~~(7.5.3)~~	~~Discrete, Undisturbed~~
	Ring-Lined Barrel Sampler	(7.5.3)	Discrete, Representative
	~~Trier~~	~~(7.5.7.2)~~	~~Surface, Relatively Undisturbed, Selective~~
	~~Thin-Walled Tube~~	~~(7.5.5)~~	~~Surface or Depth, Undisturbed~~
	Thin-Walled Tube Sampler	(7.5.4)	Surface or Depth, Undisturbed
	Direct-Push Single-Tube Sampler	(7.5.5)	Surface or Depth, Representative
	Direct-Push Dual-Tube Sampler	(7.5.6)	Surface or Depth, Representative
	Sonic Drill Coring	(7.5.7)	Subsurface, Representative/Disturbed
	Soil Corers	(7.5.8)	Surface, Disturbed
	~~Coring Type w/Valve~~	~~(7.5.6)~~	~~Surface or Depth, Disturbed~~
	Coring-Type Sampler w/ Valve	(7.5.9)	Surface or Depth, Disturbed
	~~Hand-Operated Bucket Auger~~	~~(7.7.1)~~	~~Surface or Depth, Disturbed~~
	Trier	(7.5.10)	Surface, Relatively Undisturbed, Selective
	~~Solid Stem Flighted Auger~~	~~(7.7.2.1)~~	~~Surface or Depth, Disturbed~~
	Solid-Stem Flighted Auger	(7.7.2.1)	Surface or Depth, Disturbed
~~Soil~~	~~Hollow Stem Flighted Auger~~	~~(7.7.2.2)~~	~~Surface or Depth, Disturbed (if from flights)~~
	Hollow-Stem Flighted Auger	(7.7.2.3)	Surface or Depth, Disturbed (if from flights)
	Peat Borer	(7.7.3)	Discrete, Relatively Undisturbed
	Spoon	(7.11.2)	Surface, Disturbed, Selective
	~~Scoops/Trowel~~	~~(7.11.3)~~	~~Surface, Disturbed, Selective~~
	Scoops and Trowels	(7.11.3)	Surface, Disturbed, Selective
	~~Shovel~~	~~(7.11.4)~~	~~Surface, Disturbed~~
	Shovels	(7.11.4)	Surface, Disturbed
	~~Miniature Core~~	~~(7.5.8)~~	~~Surface, Undisturbed~~
	~~Modified Syringe~~	~~(7.5.9)~~	~~Surface, Undisturbed~~
	Vacuum Lysimeter	(7.12.1)	Surface to Depth, Pore Liquid
	Vacuum/Pressure Lysimeter	(7.12.2)	Depth, Pore Liquid
	~~Gas Adsorber~~	~~(7.12.3)~~	~~Surface to Depth, Soil Gas~~
	Passive Soil Gas Samplers	(7.12.3)	Surface to Depth, Soil Gas
	~~AutoSampler, Non-V.~~	~~(7.2.1)~~	~~Shallow, Composite Suspended Solids only~~
Mixed Solid/Liquid	Autosampler, Non-Volatiles	(7.2.1)	Shallow, Composite, Suspended solids only
	~~Peristaltic Pump~~	~~(7.2.5)~~	~~Shallow, Discrete or Composite Suspended Solids Only~~
	Peristaltic Pump	(7.2.5)	Shallow, Discrete or Composite, Suspended solids only

TABLE 3 *Continued*

Media Type	Sampler Type	~~Section~~Subsection	Sample Type
	Syringe Sampler	(7.4.3)	Shallow, Discrete, Disturbed
	Lidded Sludge/Water	(7.4.4)	Discrete, Composite
	Dipper	(7.4.9)	Shallow, Composite
	Liquid Grab Sampler	(7.4.10)	Shallow, Composite, Suspended solids only
	Swing Jar Sampler	(7.4.11)	Shallow, Composite
	~~Probe Sampler~~	~~(7.5.2)~~	~~Depth, Discrete, Undisturbed~~
	Split-Barrel Sampler	(7.5.2)	Depth, Discrete, Undisturbed
	~~Split Barrel~~	~~(7.5.3)~~	~~Depth, Discrete, Undisturbed~~
	Ring-Lined Barrel Sampler	(7.5.3)	Depth, Discrete, Undisturbed
	~~Peat Borer~~	~~(7.7.3)~~	~~Discrete, Relatively Undisturbed~~
	Soil Corers	(7.5.8)	Depth, Discrete, Undisturbed
	Coring-Type Sampler w/ Valve	(7.5.9)	Depth, Disturbed
	~~Trier~~	~~(7.5.7.2)~~	~~Surface, Semi-solid only, Selective~~
	Trier	(7.5.10)	Surface, Semi-solid only, Selective
	~~Coring Type w/Valve~~	~~(7.5.6)~~	~~Depth, Disturbed~~
	Peat Borer	(7.7.3)	Discrete, Relatively Undisturbed
~~Mixed Solid/Liquid~~	~~COLIWASA~~	~~(7.8.1)~~	~~Shallow, Composite, Semi-liquid only~~
	COLIWASA	(7.8.1)	Shallow, Composite, Semi-liquid only
	~~Reuseable Point~~	~~(7.8.1.2)~~	~~Shallow, Discrete~~
	Reusable Point Sampler	(7.8.1.3)	Shallow, Discrete
	~~Plunger Type~~	~~(7.8.4)~~	~~Shallow, Discrete~~
	~~Liquids Profiler~~	~~(7.8.5)~~	~~Depth, Composite Suspended Solids only~~
	~~Drum Thief~~	~~(7.8.2)~~	~~Shallow, Composite Semi-Liquid only~~
	Drum Thief	(7.8.2)	Shallow, Composite, Semi-liquid only
	~~Valved~~	~~(7.8.3)~~	~~Shallow, Composite Semi-Liquid only~~
	Valved Sampler	(7.8.3)	Shallow, Composite, Semi-liquid only
	~~Dipper~~	~~(7.4.9)~~	~~Shallow, Composite~~
	Plunger-Type Sampler	(7.8.4)	Shallow, Discrete
	~~Liquid Grab~~	~~(7.4.10)~~	~~Shallow, Composite Suspended Solids only~~
	Liquid Profiler	(7.8.5)	Depth, Composite, Suspended solids only
	~~Swing Jar~~	~~(7.4.11)~~	~~Shallow, Composite~~
	~~Scoops/Trowel~~	~~(7.11.3)~~	~~Shallow, Composite, Semi-solid only~~
	Scoops and Trowels	(7.11.3)	Shallow, Composite, Semi-solid only
	~~Shovel~~	~~(7.11.4)~~	~~Shallow, Composite, Semi-solid only~~
	Shovels	(7.11.4)	Shallow, Composite, Semi-solid only
Sediment	Ekman Dredge	(7.3.1)	Bottom, Surface, Soft only, Disturbed
	Petersen Dredge	(7.3.2)	Bottom, Surface, Rocky or Soft, Disturbed
	Ponar Dredge	(7.3.3)	Bottom, Surface, Rocky or Soft, Disturbed
	~~Probe Sampler~~	~~(7.5.2)~~	~~Bottom Surface or Depth, Undisturbed~~
	Split-Barrel Sampler	(7.5.2)	Discrete, Undisturbed
	Ring-Lined Barrel Sampler	(7.5.3)	Discrete, Undisturbed
	Thin-Walled Tube Sampler	(7.5.4)	Surface or Depth, Undisturbed
	~~Split Barrel~~	~~(7.5.3)~~	~~Bottom Surface or Depth, Relatively Undisturbed~~
	Coring-Type Sampler w/ Valve	(7.5.9)	Surface or Depth, Disturbed
	Handheld Core Sampler	(7.5.11)	Exposed Surface only, Undisturbed
~~Sediments~~	~~Thin Walled Tube~~	~~(7.5.5)~~	~~Bottom Surface or Depth, Undisturbed~~
	Modified Syringe	(7.5.12)	Exposed Surface only, Undisturbed
	~~Coring Type w/Valve~~	~~(7.5.6)~~	~~Bottom Surface or Depth, Disturbed~~
	Rotating Corer	(7.6.2)	Bottom, Surface, Undisturbed if solid
	~~Hand-Operated Bucket Auger~~	~~(7.7.1)~~	~~Bottom Surface, Disturbed~~
	Hand-Operated Bucket Auger	(7.7.1)	Surface or Depth, Disturbed
	Solid-Stem Flighted Auger	(7.7.2.1)	Surface or Depth, Disturbed
	Hollow-Stem Flighted Auger	(7.7.2.3)	Surface or Depth, Disturbed (if from flights)
	Peat Borer	(7.7.3)	Discrete, Relatively Undisturbed
	~~Rotating Corer~~	~~(7.6.2)~~	~~Bottom Surface, Undisturbed if solid~~
	~~Scoops, Trowel~~	~~(7.11.3)~~	~~Exposed Surface only, Disturbed, Selective~~
	Scoops and Trowels	(7.11.3)	Exposed Surface only, Disturbed, Selective
	~~Shovel~~	~~(7.11.4)~~	~~Exposed Surface only, Disturbed~~
	Shovels	(7.11.4)	Exposed Surface only, Disturbed
	~~Minature Core~~	~~(7.5.8)~~	~~Exposed Surface only, Undisturbed~~
	~~Modified Syringe~~	~~(7.5.9)~~	~~Exposed Surface only, Undisturbed~~
	~~Auto Splr. - Non Vols.~~	~~(7.2.1)~~	~~25 ft Lift, Discrete or Composite~~
Surface Water	Autosampler, Non-Volatiles	(7.2.1)	7.6 m (25 ft) Lift, Discrete or Composite
	~~Auto Splr. - Vols.~~	~~(7.2.1)~~	~~25 ft Lift, Discrete~~
	Autosampler, Volatiles	(7.2.1)	7.6 m (25 ft) Lift, Discrete
	~~Peristaltic Pump~~	~~(7.2.5)~~	~~Shallow(25 ft), Discrete~~
	Peristaltic Pump	(7.2.5)	Shallow, up to 7.6 m (25 ft) Lift, Discrete
	~~Centrifugal Sub. Pump~~	~~(7.2.6)~~	~~Depth, Discrete~~
	Centrifugal Submersible Pump	(7.2.6)	Depth, Discrete
	Gear Drive Pump	(7.2.7)	Depth, Discrete
~~Surface Water~~	~~Progressing Cavity Pump~~	~~(7.2.8)~~	~~Depth, Discrete~~
	Progressing Cavity Pump	(7.2.8)	Depth, Discrete
	Bacon Bomb	(7.4.1)	Depth, Discrete
	~~Kemmerer~~	~~(7.4.2)~~	~~Depth, Discrete~~
	Kemmerer Sampler	(7.4.2)	Depth, Discrete

TABLE 3 *Continued*

Media Type	Sampler Type	~~Section~~Subsection	Sample Type
	Discrete Level Sampler	(7.4.5)	Depth, Discrete
	~~Plunger Type~~	~~(7.8.4)~~	~~Shallow (12-ft), Discrete~~
	~~Liquids Profiler~~	~~(7.8.5)~~	~~Shallow, Composite~~
	~~Dipper~~	~~(7.4.9)~~	~~Shallow (10-ft.), Composite~~
	Dipper	(7.4.9)	Shallow, 3 m (10 ft), Composite
	~~Liquid Grab~~	~~(7.4.10)~~	~~Shallow (6-ft), Composite~~
	Liquid Grab Sampler	(7.4.10)	Shallow, 1.8 m (6 ft), Composite
	~~Swing Jar~~	~~(7.4.11)~~	~~Shallow, (10-ft), Composite~~
	Swing Jar Sampler	(7.4.11)	Shallow, 3 m (10 ft), Composite
	Plunger-Type Sampler	(7.8.4)	Shallow, 3.65 m (12 ft), Discrete
	Liquid Profiler	(7.8.5)	Shallow, Composite
	~~Spoon~~	~~(7.11.2)~~	~~Shallow (1-in.), Composite~~
	Spoon	(7.11.2)	Shallow, 2.5 cm (1 in.), Composite
Groundwater	Air/Gas Displacement Pump	(7.2.2.1)	Depth, Discrete
	Piston Displacement Pump	(7.2.2.2)	Depth, Discrete
	Bladder Pump	(7.2.3)	Depth, Discrete
	Corrugated Bladder Pump	(7.2.4)	Depth, Discrete
	~~Peristaltic Pump~~	~~(7.2.5)~~	~~25-ft Lift, Discrete~~
	Peristaltic Pump	(7.2.5)	7.6 m (25 ft) Lift, Discrete
	~~Centrifugal Sub. Pump~~	~~(7.2.6)~~	~~Depth, Discrete~~
	Centrifugal Submersible Pump	(7.2.6)	Depth, Discrete
	Gear Drive Pump	(7.2.7)	Depth, Discrete
	Progressing Cavity Pump	(7.2.8)	Depth, Discrete
~~Ground Water~~	~~Inertia Lift Pump~~	~~(7.2.9)~~	~~Depth Discrete~~
	Inertia Lift Pump	(7.2.9)	Depth, Discrete
	Discrete Level Sampler	(7.4.5)	Depth, Discrete
	~~Direct Push Water Sampler~~	~~(7.5.1.1)~~	~~Depth, Discrete~~
	Bailer	(7.4.6)	Depth, Composite
	Point Sampling Bailer	(7.4.7)	Depth, Discrete
	~~Diff. Pressure Bailer~~	~~(7.4.8)~~	~~Depth, Discrete~~
	Differential Pressure Bailer	(7.4.8)	Depth, Discrete
	Direct-Push Water Sampler	(7.5.1)	Depth, Discrete
	~~Bag Type Diffusion~~	~~(7.9.1)~~	~~Depth Discrete~~
	Passive Sampler, Bag Type	(7.9.1)	Depth, Discrete
	~~Chamber Type Diffusion~~	~~(7.9.2)~~	~~Multiple Depths, Discrete~~
	Passive Sampler, Chamber Type	(7.9.2)	Multiple Depths, Discrete
	Dedicated Multi-Level Type 1	(7.10.1)	Multiple Depths, Discrete
	Dedicated Multi-Level Type 2	(7.10.1)	Multiple Depths, Discrete
	Portable Multi-Level	(7.10.2)	Multiple Depths, Discrete, Pore water
	~~AutoSplr. Non Vols.~~	~~(7.2.1)~~	~~Shallow (25-ft), Discrete or Composite~~
Liquid Effluent	Autosampler, Non-Volatiles	(7.2.1)	7.6 m (25 ft) Lift, Discrete or Composite
	~~Auto Splr. - Vols.~~	~~(7.2.1)~~	~~Shallow (25-ft), Discrete~~
	Autosampler, Volatiles	(7.2.1)	7.6 m (25 ft) Lift, Discrete
	~~Peristaltic Pump~~	~~(7.2.5)~~	~~Shallow (25-ft), Discrete~~
	Peristaltic Pump	(7.2.5)	Shallow, up to 7.6 m (25 ft) Lift, Discrete
	~~Centrifugal Sub. Pump~~	~~(7.2.6)~~	~~Depth, Discrete~~
	Centrifugal Submersible Pump	(7.2.6)	Depth, Discrete
	Gear Drive Pump	(7.2.7)	Depth, Discrete
	Progressing Cavity Pump	(7.2.8)	Depth, Discrete
	Bacon Bomb	(7.4.1)	Depth, Discrete
	Kemmerer Sampler	(7.4.2)	Depth, Discrete
	Syringe Sampler	(7.4.3)	Shallow, 2.4 m (8 ft), Discrete
	Discrete Level Sampler	(7.4.5)	Depth, Discrete
	Dipper	(7.4.9)	Shallow, 3 m (10 ft), Composite
	Liquid Grab Sampler	(7.4.10)	Shallow, 1.8 m (6 ft), Composite
	Swing Jar Sampler	(7.4.11)	Shallow, 3 m (10 ft), Composite
	HYDRASleeve	(7.4.12)	Depth, Discrete
	Snap Sampler	(7.4.13)	Depth, Discrete
~~Liquid Effluent~~	~~Syringe Sampler~~	~~(7.4.3)~~	~~Shallow (8-ft), Discrete~~
	Reusable Point Sampler	(7.8.1.3)	Shallow, 2.4 m (8 ft), Discrete
	~~Discrete Level~~	~~(7.4.5)~~	~~Depth, Discrete~~
	~~Reuseable Point~~	~~(7.8.1.2)~~	~~Shallow (8-ft), Discrete~~
	Valved Sampler	(7.8.3)	Shallow, Discrete
	~~Plunger Type~~	~~(7.8.4)~~	~~Shallow (12-ft), Discrete~~
	Plunger-Type Sampler	(7.8.4)	Shallow, 3.7 m (12 ft), Discrete
	~~Liquids Profiler~~	~~(7.8.5)~~	~~Shallow, Composite~~
	Liquid Profiler	(7.8.5)	Shallow, Composite
	~~Dipper~~	~~(7.4.9)~~	~~Shallow (10-ft), Composite~~
	~~Liquid Grab~~	~~(7.4.10)~~	~~Shallow (6-ft), Composite~~
	~~Swing Jar~~	~~(7.4.11)~~	~~Shallow (10-ft), Composite~~
	~~Spoon~~	~~(7.11.2)~~	~~Shallow (1-in.), Composite~~
	Spoon	(7.11.2)	Shallow, 2.5 cm (1 in.), Composite
	~~Air Displacement Pump~~	~~(7.2.2.1)~~	~~Depth, Discrete~~
Liquid	Air/Gas Displacement Pump	(7.2.2.1)	Depth, Discrete
	Piston Displacement Pump	(7.2.2.2)	Depth, Discrete

TABLE 3 *Continued*

Media Type	Sampler Type	~~Section~~Subsection	Sample Type
	Bladder Pump	(7.2.3)	Depth, Discrete
	Corrugated Bladder Pump	(7.2.4)	Depth, Discrete
	~~Peristaltic Pump~~	~~(7.2.5)~~	~~Shallow (25-ft), Discrete~~
	Peristaltic Pump	(7.2.5)	Shallow, 7.6 m (25 ft), Discrete
	~~Centrifugal Sub. Pump~~	~~(7.2.6)~~	~~Depth, Discrete~~
	Centrifugal Submersible Pump	(7.2.6)	Depth, Discrete
	Gear Drive Pump	(7.2.7)	Depth, Discrete
	Progressing Cavity Pump	(7.2.8)	Depth, Discrete
	~~Syringe Sampler~~	~~(7.4.3)~~	~~Shallow (8-ft), Discrete~~
	Syringe Sampler	(7.4.3)	Shallow, 2.4 m (8 ft), Discrete
	~~Lidded Sludge/Water~~	~~(7.4.4)~~	~~Shallow (8-ft), Discrete~~
	Lidded Sludge/Water	(7.4.4)	Shallow, 2.4 m (8 ft), Discrete
	Discrete Level Sampler	(7.4.5)	Depth, Discrete
	Bailer	(7.4.6)	Depth, Discrete
	Point Sampling Bailer	(7.4.7)	Depth, Discrete
	Differential Pressure Bailer	(7.4.8)	Depth, Discrete
	Dipper	(7.4.9)	Shallow, 3 m (10 ft), Composite
	Liquid Grab Sampler	(7.4.10)	Shallow, 1.8 m (6 ft), Composite
	Swing Jar Sampler	(7.4.11)	Shallow, 3 m (10 ft), Composite
~~Liquid~~	~~Direct Push Water Sampler~~	~~(7.5.1.1)~~	~~Depth, Discrete~~
	Direct-Push Water Sampler	(7.5.1)	Depth, Discrete
	~~COLIWASA~~	~~(7.8.1)~~	~~Shallow (4-ft), Composite~~
	COLIWASA	(7.8.1)	Shallow, 1.2 m (4 -ft), Composite
	~~Reuseable Point~~	~~(7.8.1.2)~~	~~Shallow (8-ft), Discrete~~
	Reusable Point Sampler	(7.8.1.3)	Shallow, 2.4 m (8- ft), Discrete
	~~Plunger Type~~	~~(7.8.4)~~	~~Shallow, (12-ft), Discrete~~
	~~Liquids Profiler~~	~~(7.8.5)~~	~~Shallow, Composite~~
	~~Drum Thief~~	~~(7.8.2)~~	~~Shallow (3-ft), Composite~~
	Drum Thief	(7.8.2)	Shallow, 0.9 m (3 ft), Composite
	~~Valved Sampler~~	~~(7.8.3)~~	~~Shallow (8-ft), Composite~~
	Valved Sampler	(7.8.3)	Shallow, 2.4 m (8 ft), Composite
	~~Bailer~~	~~(7.4.6)~~	~~Depth, Discrete~~
	Plunger-Type Sampler	(7.8.4)	Shallow, 3.7 m (12 ft), Discrete
	~~Point Sampling Bailer~~	~~(7.4.7)~~	~~Depth, Discrete~~
	~~Diff. Pressure Bailer~~	~~(7.4.8)~~	~~Depth, Discrete~~
	~~Dipper~~	~~(7.4.9)~~	~~Shallow (10-ft), Composite~~
	~~Liquid Grab~~	~~(7.4.10)~~	~~Shallow (6-ft), Composite~~
	Liquid Profiler	(7.8.5)	Shallow, Composite
	~~Swing Jar~~	~~(7.4.11)~~	~~Shallow, (10-ft), Composite~~
	~~Spoon~~	~~(7.11.2)~~	~~Shallow (1-in.), Composite~~
	Spoon	(7.11.2)	Shallow, 2.5 cm (1 in.), Composite
	~~Scoops & Trowel~~	~~(7.11.3)~~	~~Shallow, (1-in.), Composite~~
	Scoops and Trowels	(7.11.3)	Shallow, 2.5 cm (1 in.), Composite
	~~Air Displacement Pump~~	~~(7.2.2.1)~~	~~Depth, Discrete~~
Multi-Layer Liquid	Air/Gas Displacement Pump	(7.2.2.1)	Depth, Discrete
	Piston Displacement Pump	(7.2.2.2)	Depth Discrete
	Bladder Pump	(7.2.3)	Depth, Discrete
	Corrugated Bladder Pump	(7.2.4)	Depth, Discrete
	~~Peristaltic Pump~~	~~(7.2.5)~~	~~Shallow(25-ft), Discrete~~
	Peristaltic Pump	(7.2.5)	Shallow, 7.6 m (25 ft), Discrete
	~~Centrifugal Sub. Pump~~	~~(7.2.6)~~	~~Depth, Discrete~~
	Centrifugal Submersible Pump	(7.2.6)	Depth, Discrete
	Gear Drive Pump	(7.2.7)	Depth, Discrete
	Progressing Cavity Pump	(7.2.8)	Depth, Discrete
~~Multi Layer~~	~~Syringe Sampler~~	~~(7.4.3)~~	~~Shallow (8-ft), Discrete~~
	Syringe Sampler	(7.4.3)	Shallow, 2.4 m (8 ft), Discrete
~~Liquid~~	~~Discrete Level~~	~~(7.4.5)~~	~~Depth, Discrete~~
	Discrete Level Sampler	(7.4.5)	Depth, Discrete
	Bailer	(7.4.6)	Depth, Discrete
	Point Sampling Bailer	(7.4.7)	Depth, Discrete
	Differential Pressure Bailer	(7.4.8)	Depth, Discrete
	Dipper	(7.4.9)	Shallow, 3 m (10 ft), Composite
	Liquid Grab Sampler	(7.4.10)	Shallow, 1.8 m (6 ft), Composite
	Swing Jar Sampler	(7.4.11)	Shallow, 3 m (10 ft), Composite
	~~Direct Push Water Sampler~~	~~(7.5.1.1)~~	~~Depth, Discrete~~
	Direct-Push Water Sampler	(7.5.1)	Depth, Discrete
	~~COLIWASA~~	~~(7.8.1)~~	~~Shallow (4-ft), Composite~~
	COLIWASA	(7.8.1)	Shallow, 1.2 m (4 ft), Composite
	~~Reuseable Point~~	~~(7.8.1.2)~~	~~Shallow (8-ft), Discrete~~
	Reusable Point Sampler	(7.8.1.3)	Shallow, 2.4 m (8 ft), Discrete
	~~Plunger Type~~	~~(7.8.4)~~	~~Shallow, (12-ft), Discrete~~
	~~Liquids Profiler~~	~~(7.8.5)~~	~~Shallow, Composite~~
	~~Drum Thief~~	~~(7.8.2)~~	~~Shallow (3-ft), Composite~~
	Drum Thief	(7.8.2)	Shallow, 0.9 m (3 ft), Composite
	~~Valved Sampler~~	~~(7.8.3)~~	~~Shallow (8-ft), Composite~~

TABLE 3 *Continued*

Media Type	Sampler Type	~~Section~~Subsection	Sample Type
	Valved Sampler	(7.8.3)	Shallow, 2.4 m (8 ft), Composite
	~~Bailer~~	~~(7.4.6)~~	~~Depth, Discrete~~
	Plunger-Type Sampler	(7.8.4)	Shallow, 3.7 m (12 ft), Discrete
	~~Point Sampling Bailer~~	~~(7.4.7)~~	~~Depth, Discrete~~
	~~Diff. Pressure Bailer~~	~~(7.4.8)~~	~~Depth, Discrete~~
	~~Dipper~~	~~(7.4.9)~~	~~Shallow (10 ft), Composite~~
	~~Liquid Grab~~	~~(7.4.10)~~	~~Shallow (6 ft), Composite~~
	Liquid Profiler	(7.8.5)	Shallow, Composite
	~~Swing Jar~~	~~(7.4.11)~~	~~Shallow (10 ft), Composite~~

6.2.1.1 The choice of materials used in the construction of sampling devices should be based upon a knowledge of what constituents may be present in the sampling environment because the constituents and materials may interact chemically or be incompatible. Consult available chemical compatibility charts.

6.2.1.2 If samples are to be collected for the determination of per- and poly-fluorinated alkyl substances (PFAS), all sampling equipment should be made of fluorine-free materials. Other considerations for PFAS sampling may exist but are beyond the scope of this standard.

6.2.2 *Physical Compatibility*—The sampling equipment should also be compatible with the physical characteristics of the matrices to be sampled. Equipment used to dig or core (shovels, augers, ~~coring type~~ coring-type samplers) should be constructed of material that will not deform during ~~use,~~use or be abraded by the material being sampled. Equipment abrasion may result in the contribution of contaminants to the sample being collected. For example, plastic or glass would not be appropriate for ~~difficult to access~~ difficult-to-access matrices, and stainless steel equipment may contribute small amounts of metals if significantly abraded by the matrix.

NOTE 1—Information on sample containers and equipment used in sampling that is not used in the actual collection of the sample is not within the scope of this guide.

6.3 *Equipment Effects on the Matrix:*

6.3.1 *Equipment Design*—Samples collected using inappropriate sampling equipment may not provide representative samples (**1, 3**). An example of equipment design influencing sample results is a sampler which excludes certain sized particles from a soil matrix or waste pile sample. The shape of some scoops may influence the distribution of particle sizes collected from a sample (**1**). Dredges used to collect river or estuarine stationary sediments may also exclude certain sized particles, particularly the fines fraction which may contain a significant percentage of some contaminants such as polynuclear aromatic hydrocarbons (PAHs).

6.3.2 *Equipment Use*—Inappropriate use of sampling equipment can influence analytical ~~results.~~results (**1, 3**). For example, if a pump is used to purge a well and the intake is placed below the well screen, sediment in the sump can be put into suspension and become part of the water sample (**4**). Excessive vacuum generated by sampling pumps can cause loss of volatile constituents or change valence states of some ions. The use of bailers for well purging and sample collection may also cause increased turbidity levels in ~~ground water samples.~~ groundwater samples and result in elevated organic and inorganic target analyte concentrations in the sample. When sampling containerized liquids, insertion of a COLIWASA sampler at too fast a rate may prevent it from collecting a representative, depth integrated sample.

6.4 *Sample Volume Capabilities*—Most sampling devices will provide adequate sample volume. However, the sampling equipment volumes should be compared to the volume necessary for all required analyses including the additional amount necessary for quality control (QC), split, and ~~repeat~~replicate samples (**4, 5**). Sampling devices which may not provide an adequate volume would be ~~small diameter~~ small-diameter glass ~~tubes,~~tubes and triers. In this case, the investigator must consider the following options:

6.4.1 A similar device with an increased capacity,

6.4.2 An alternate device with an increased capacity, or

6.4.3 Modification of an existing device (often difficult or impractical).

6.4.4 If these alternatives are not acceptable or available, then the investigator must consider the collection of multiple aliquots to fulfill the sample volume requirement. The effect of multiple aliquots on the data quality objectives should be considered.

6.5 *Physical Requirements*—Sampling equipment selection should always consider factors such as the size and weight of the equipment, power requirements (battery/110V), and ancillary equipment required ~~(drill rig for split barrel samplers).~~ (for example, drill rig for direct-push technologies such as split-barrel samplers and augers). Most sampling equipment used in the collection of environmental samples is relatively easy to transport and use in the field. The use of equipment with significant physical requirements may impede the progress of a sampling investigation.

6.6 *Ease of Operation*—Much of the equipment used for environmental sampling is rather simple to employ. Samples may be collected easily as long as properly selected equipment is used with adequate consideration of the matrix of interest. ~~Sampling errors may occur as a result of inadequate consideration of matrix effects, and poor collection techniques (1, 3).~~Training requirements should focus on the proper use of equipment in varying environmental matrices.

6.7 *Decontamination and Reuse of Equipment:*

6.7.1 *Decontamination (see Practice D5088)*—Inadequate decontamination of sampling equipment can result in significant errors in analytical results. When choosing sampling equipment, ease of decontamination must be a consideration. Pumps, automatic samplers, Kemmerer samplers, and dredges require more effort to decontaminate than does a bailer or ~~split barrel~~ split-barrel sampler. The investigator should consider decontamination requirements prior to the study to avoid significant delays.

6.7.2 *Reuse*—Due to the expense of materials associated with modern sampling equipment (stainless steel, PTFE), most equipment is reusable following proper decontamination. Some equipment such as bailers may be disposed of after use or dedicated to a sampling point to save time during extensive field investigations. Drum thieves and COLIWASA samplers are typically not reused, particularly when waste samples have been collected.

6.8 *Cost*—Detailed information on the cost of sampling equipment is not contained within this guide. Cost is usually a major consideration in the process of sampling equipment selection. In general, the cost of PTFE and stainless steel equipment will be greater than equipment made of glass, PVC, or other plastics. However, the life expectancy for PTFE or stainless steel equipment is usually longer. In addition, labor costs for decontamination of reusable equipment versus the disposal costs of ~~single use~~ single-use equipment are also relevant considerations. Comments on costs are included in the "Advantages and Limitations" tables, where appropriate.

7. Sampling Equipment

7.1 Presented below are brief descriptions of some sampling equipment used in waste management and in the collection of environmental samples as they relate to waste management activities (**6**). This is by no means an inclusive list of the sampling equipment which is available to investigators. There are many pieces of equipment that have been designed for specific sampling needs. In addition, investigators may design their own pieces of equipment for a specific project. In all these instances, an investigator must keep in mind the criteria for sampling equipment selection which have been discussed previously in this guide.

7.2 *Pumps and Siphons (see Guide D4448)*—Pumps used for the collection of waste and environmental liquid samples for waste management include automatic samplers and displacement, bladder, peristaltic, and centrifugal pumps.

7.2.1 *Automatic Samplers (see Guide D6538)*—Automatic samplers may be used when samples are to be collected at frequent intervals (see Figs. 1 and 2). They are frequently used in ~~waste water~~ wastewater collection systems and treatment plants, but they can also be used during stream sampling investigations. They may be used to collect time composite or flow proportional samples. In the flow proportional sampling mode, the samplers are activated by a compatible flow meter. Peristaltic and vacuum pumps are commonly employed as the sampling mechanism. Automatic samplers designed specifically for the collection of samples for volatile organic analyses are available. See Table 4 for advantages and limitations.

NOTE 2—Flow proportional samples can also be collected using a discrete sampler and a flow recorder and manually compositing the individual aliquots in flow proportional amounts.

7.2.2 *Displacement Pumps (see Guide D4448, Practice D6771)*—Displacement pumps are designed for ~~ground water~~ groundwater