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Standard Guide for Planning and Preparing for a Groundwater Sampling Event[1]

This standard is issued under the fixed designation D5903; 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.

ε[1] NOTE—Reapproved with editorial changes in June 2017.

1. Scope

1.1 This guide covers planning and preparing for a groundwater sampling event. It includes technical and administrative considerations and procedures. Example checklists are also provided as Appendices.

1.2 This guide may not cover every consideration procedure, or both, that is necessary before all groundwater sampling projects. In karst or fractured rock terranes, it may be appropriate to collect groundwater samples from springs (see Guide D5717). This guide focuses on sampling of groundwater from monitoring wells; however, most of the guidance herein can apply to the sampling of springs as well.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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 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 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.*

1.5 *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]

D5717 Guide for Design of Ground-Water Monitoring Systems in Karst and Fractured-Rock Aquifers (Withdrawn 2005)[3]

3. Significance and Use

3.1 The success of a sampling event is influenced by adequate planning and preparation. Use of this guide will help the groundwater sampler to methodically execute the planning and preparation.

3.2 This guide should be used by a professional or technician that has training or experience in groundwater sampling.

4. Considerations and Procedures

4.1 Evaluate the scope of the sampling and analysis program.

4.1.1 Review plans, protocols, and objectives of the sampling program and event. The sampler should review the sampling and analysis plan, site health and safety plan, sampling protocol, and quality assurance/quality control plan, when available. These documents will provide information on required sampling procedures and also should provide the information in the following paragraphs.

4.1.2 Determine which wells will be sampled. The sampler should have a map or diagram showing the locations of the wells to be sampled. Determine if there is a preferred well sampling sequence specified in the sampling and analysis plan.

4.1.3 Identify the laboratory analyses to be performed on samples from each well. The analytical requirements are often, but not always, the same for each well. Determine if there is a preferred order in filling containers based on analytes.

4.1.4 Identify data to be collected in the field. The sampler must know in advance what types of data must be collected in the field (that is, chemical measurements, water level

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[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.

measurements, etc.) Many samplers use a form to record field data and other observations. The use of a form can help the sampler to collect and record information in a consistent manner and can reduce the chance of failure to collect needed data.

4.1.5 Determine from what depth range within the well the samples will be collected.

4.1.6 Evaluate the need for specialized handling of purged water and decontamination wastewater. The waters may be released to the ground surface, discharged to a sanitary or industrial sewer, or containerized and handled as a potentially hazardous waste. Hazardous wastes will require specialized labeling, storage, transportation, and disposal.

4.1.7 Identify all documentation and field quality control procedures stipulated in the sampling and analysis plan or quality control plan.

4.2 Review available information.

4.2.1 Review well construction details. The sampler should know the material of construction, the inside diameter, the completion depth, the screened interval, and the cap type and lock type (if locked). This information is needed to select purging and sampling equipment, and may be needed to select other tools (for example, a strap wrench to remove the cap, boltcutters or a hack saw to remove damaged locks, or keys for locks).

4.2.2 Evaluate historical well performance and chemical characteristics of the water from each well, if available. The behavior of the well during past sampling events is useful information in the planning process. This may include the flow rate in the screened interval, the maximum pumping rate, the time required to purge the well, whether the well is easily bailed or pumped dry, etc. Knowledge of the past groundwater chemistry and non-aqueous phase liquids in the well also can be useful. The turbidity of the water may influence sampling methods and the need for or approach to filtration of samples. Use of personal protective equipment also may be dictated by known contamination of the water from a well.

4.2.3 Evaluate the physical setting of the well locations. This is necessary to determine the accessibility of the wells. Access could be impeded or difficult due to mud, snow, trees, fences, steep hills, secured areas, etc. This information will help the sampler determine what type of vehicle is needed, whether special tools are needed, or whether administrative clearances are required, or both.

4.2.4 For wells with dedicated sampling equipment find out the type of equipment, pump depth, whether there are any packers in the well, where packers are set, and the power source for equipment.

4.3 Estimate the time required to complete the sample collection and associated field work. The amount of time required will affect equipment needs and possibly lodging or other administrative arrangements. Evaluate the appropriate number of persons needed to sample the site. It is usually necessary to inform the laboratory when samples should arrive at the laboratory.

4.4 Coordinate with the analytical laboratory.

4.4.1 Notify the laboratory in advance of the number of analyses of each type to include quality control sample analyses. This notification allows the laboratory to plan for adequate equipment and personnel resources to complete the analyses.

4.4.2 Determine the volume of sample needed for each analysis.

4.4.3 Coordinate the preparation or shipment, or both, of sample containers, preservatives, and shipping containers to the site and to the laboratory. The analytical laboratory often supplies the sample containers and preservatives, and sometimes the shipping containers for the return of samples. The project manager or sampler will need to provide the details needed to accomplish this. The laboratory will need to know the number of containers and preservatives for each analyte, when the containers are needed, whether containers will be picked up or shipped, and the address of the location to which containers/preservatives must be shipped. The laboratory should specify any related administrative requirements. The return of samples to the laboratory also must be coordinated. The sampler will need to be aware of any special instructions regarding shipment or receipt of the samples (that is, times when samples cannot be received, unacceptable shipping containers, Department of Transportation restrictions, and documentation requirements). The sampler also must have the address of the laboratory if samples will be shipped.

4.4.4 When the sampler is also the project manager, the methods of analyses and lower reporting limits also must be coordinated with the laboratory. These are chosen based on the data quality objectives.

4.4.5 Identify the sample volumes, preparation, and holding time requirements. The sampler should be aware of the total volume of water that must be collected from each well. This may influence the selection of sampling equipment. The sampler also should know what will be involved in the preparation of samples (that is, chemical and physical preservation). This knowledge is needed to make logistical arrangements. For example, the sampler may need to use an area near the site that has an electrical outlet and a sink if filtration is required. Lastly, the sampler must know if any of the samples have a short holding time (maximum allowable time between sample collection and preparation or analysis). Collecting samples with short holding times could influence the timing or method of sample shipment.

4.4.6 Inform the laboratory of any special requirements that are different than normal laboratory procedures.

4.4.7 Notify the laboratory of the types and numbers of field quality control samples that will be submitted. Some quality control samples will be prepared or collected in the field; others will be prepared in the laboratory. The sampler must know how to collect and prepare the field quality control samples.

4.4.8 Identify laboratory documentation needs. The laboratory may have certain project identifiers, sample identifiers, or forms that they use for sample tracking or data reporting, or both. It is important that the sampler and the laboratory agree on all means of documentation that will be used by the laboratory.

4.4.9 Determine when the laboratory must be notified regarding sample arrival times and how accurate the time estimates must be (that is, within a day, a half a day, a week). The sampler should discuss this notification process with the laboratory.

4.4.10 Provide information to the laboratory on when data are needed. This is the responsibility of the project manager; however, the sampler and the project manager may be the same person.

4.5 Coordinate with the client or site-related personnel. Coordination with the client is necessary when sampling at a site not owned by you or your company. It also may be necessary to coordinate with people at your own site if they should be notified or have some involvement in your project.

4.5.1 Notify the client or site workers, or both, of when the sampling event will take place.

4.5.2 Request logistical support as needed. This may be as simple as requesting use of the phone. In some cases, logistical support needs may be more extensive. Other logistical support items could include an area for sample preparation and storage, a potable water source, a vehicle, fuel, maintenance support, traffic control, tools, etc. The sampler should ensure that all support needed from outside sources is prearranged.

4.5.3 Obtain necessary site and well access. It may be necessary to get a pass to enter a site or to have a permit to sample the wells. It also may be necessary to obtain keys to gates or wells, or both. All possible access restrictions should be identified in advance to prevent a delay in the sampling event.

4.5.4 Address site-specific safety concerns. This information should be available in a site health and safety plan. If no such plan exists, at a minimum the sampler should obtain emergency phone numbers and a map showing the location of the nearest health care facility, and identify any safety hazards or weather conditions unique to the site.

4.6 Identify equipment needs. This identification will include selecting purging and sampling devices; field measurement equipment; sample handling, filtration, preservation, and shipping supplies; documentation; personal protective equipment, and other incidental equipment. Appendix X1 is an example checklist of supplies and equipment. Using a comprehensive checklist will reduce the chance of overlooking a needed item.

4.7 Make provisions to keep sample containers separated from potential sources of contamination such as decontamination reagents and fuel.

4.8 Prepare sampling equipment and supplies for use. It is important that sampling equipment be in good operating condition before going into the field. The sampler should pack necessary and contingency supplies. Appendix X2 is an example checklist.

4.9 Prepare field measurement equipment for use. The sampler should check all field measurement devices to ensure that they are operational. This should include calibration of test instruments.

4.10 Make lodging and transportation arrangements if necessary.

5. Keywords

5.1 groundwater sampling; laboratory coordination; monitoring well; sampling and analysis plan

APPENDIXES

(Nonmandatory Information)

X1. SAMPLING EQUIPMENT CHECKLIST

X1.1 *Personal Protection:*

X1.1.1 Gloves,

X1.1.2 Coveralls,

X1.1.3 Respirators (with appropriate filters),

X1.1.4 Protective eyewear and footwear, and

X1.1.5 *Comfort Items*—Sunscreen, water, insect repellant, rain/snow gear, space heater.

X1.2 *Measurement:*

X1.2.1 Water level measuring device,

X1.2.2 Hydrocarbon/water interface probe,

X1.2.3 Thermometer,

X1.2.4 Ph meter and probes,

X1.2.5 Conductivity meter and probe,

X1.2.6 Dissolved oxygen meter and probe,

X1.2.7 Organic vapor analyzer,

X1.2.8 Turbidity meter,

X1.2.9 Oxidation reduction potential meter and probe,

X1.2.10 Flow-through cell/beakers,

X1.2.11 Calibration standards for all meters,

X1.2.12 Maintenance supplies and spare batteries for meters/probes,

X1.2.13 Deionized water and squeeze bottle,

X1.2.14 Timekeeping device, and

X1.2.15 Explosimeter.

X1.3 *Incidentals:*

X1.3.1 Plastic ground cover,

X1.3.2 Paper towels,

X1.3.3 Scissors,

X1.3.4 Miscellaneous tools,

X1.3.5 Duct tape,

X1.3.6 Trash bags,

X1.3.7 Keys for site or well access,

X1.3.8 Calculator,

X1.3.9 Funnel,

X1.3.10 Extension cord,

X1.3.11 Camera, and

X1.3.12 Cell phone.

X1.4 *Portable Sampling:*

X1.4.1 Bailer,

X1.4.2 Disposable haul line,

X1.4.3 Pump, cables, hoses, reel,

X1.4.4 Pump control box,

X1.4.5 Pump power supply,

X1.4.6 Fuel for pump or generator,

X1.4.7 Discharge tubing,

X1.4.8 Maintenance supplies and spare parts,

X1.4.9 Graduated cylinders or buckets for measuring discharge rate,

X1.4.10 Container for purged water, and

X1.4.11 *Decontamination Supplies*—Solutions, brushes, drums, buckets, spray bottles.

X1.5 *Sample Preparation and Shipment:*

X1.5.1 Filtration system,

X1.5.2 Chemical preservatives,

X1.5.3 Material Safety Data Sheets,

X1.5.4 Pipettes,

X1.5.5 Sample containers,

X1.5.6 Plastic bags (to keep containers dry),

X1.5.7 Shipping containers,

X1.5.8 Trash bags to line shipping containers,

X1.5.9 Packing material,

X1.5.10 Ice, and

X1.5.11 Packing tape.

X1.6 *Documentation:*

X1.6.1 Sampling and analysis plan,

X1.6.2 Well completion data,

X1.6.3 Sample container labels,

X1.6.4 Address labels,

X1.6.5 Chain of custody forms,

X1.6.6 Field data sheet or logbook,

X1.6.7 Calibration sheets,

X1.6.8 Custody seals, and

X1.6.9 Permanent marker.

X2. CHECKLIST FOR PREPARING SAMPLING EQUIPMENT AND SUPPLIES

X2.1 *Check Performance of Power Supplies and Controls*:

X2.1.1 Visually inspect power sources for damage or wear (hoses; cables, etc.)

X2.1.2 Check fluid levels, and fill to proper levels as needed.

X2.1.3 Check/tighten drive belts, shafts or gears, or both.

X2.1.4 Inspect for presence and condition of safety shrouds and guards.

X2.1.5 If electric start, check battery condition; if manual start, check pull cord condition.

X2.1.6 Perform maintenance per manufacturer's guidelines (for example, oil change).

X2.1.7 Operate to check performance and output if possible.

X2.2 *Check Condition and Operation of Purging and Sampling Devices:*

X2.2.1 Visually inspect tubing, hoses, electrical cable, support cable, etc. for damage or wear.

X2.2.2 Check condition of fittings, electrical connectors, and support cable attachments.

X2.2.3 Operate pumps to check performance and output if possible.

X2.3 *Prepare Spare Parts, Fuels and Lubricants for Equipment and Power Sources:*

X2.3.1 *Power Sources:*
X2.3.1.1 Lubricating oil, gasoline, etc.
X2.3.1.2 Spare spark plug and plug wrench.
X2.3.1.3 Funnel for refueling.

X2.3.2 *Pumps and Samplers:*
X2.3.2.1 Spare fittings or ferrules, or both.
X2.3.2.2 Check valves or valve components, or both.
X2.3.2.3 O-rings/seals.
X2.3.2.4 Retaining pins/clips.
X2.3.2.5 Polytetrafluoroethylene thread tape.
X2.3.2.6 Tools for service or disassembly, especially special tools for specific devices.
X2.3.2.7 Batteries/charger/extension cord.