

Appendix L

Water Sampling Safety

This guide describes safe practices for Water-Quality Activities with known hazards such as:

- Collecting Samples from Streams, Rivers, and Lakes
- Sampling Wells
- Sample Preservation and Shipment
- Operating Field Parameter Meters
- Installing and Operating Water-Quality Monitors

Introduction

Water samples are collected under a wide range of conditions and the work can be dangerous. A knowledge of the hazards involved and means by which they can be minimized should be helpful in preventing accidents and in providing greater safety for sample collectors. It is the responsibility of every field person to take proper precautions to insure their own safety and the safety of others while collecting water samples. Follow normal field safety precautions regarding weather, insects, heat, dehydration, etc., and follow the recommended procedures and precautions for wading, boat, bridge, cableway, or ice measurements. Especially, pay attention to dangers present in the vicinity of the sampling site. List all specific instructions in field files for safety procedures according to TWRI's or established standards.

Collecting Samples from Streams, Rivers, and Lakes

Taking samples from streams, rivers, and lakes for water-quality analysis has unique safety risks. The inability to swim and difficulty in freeing oneself of burdensome equipment or waders if suddenly plunged into deep water are perhaps the most serious risks in taking samples. Remember to always wear your PFD and make sure it is in good condition. Keep your feet spread apart and body aligned parallel to the flow and don't fight the water. At cableways, remember to inspect anchorages at both banks, if possible, and look for signs of excessive wear, vandalism, or accidental damage to the equipment. At bridge sites, follow all State laws for blocking traffic, wear high visibility vests with reflective strips, post appropriate signs at each end of the bridge, and be alert for wide loads and large trucks which may extend over the walkway. Develop a plan for each bridge site for placing traffic control devices. When working on ice, there is no substitute for experience. When possible, work with someone who is experienced working on ice. Be aware of the temperature, whether the stage is rising or falling, and whether the ice is strong enough to support your body and equipment.

Water is a carrier for many disease-producing organisms. Appearance alone is no way to judge the safety of the water. Water-borne hazards may come from material dissolved in the water, suspended in the water, or in sediment of the stream bottom. Infections or disease can enter the body through accidental ingestion by mouth or through skin broken by injury or another infection. The following guidelines must be used for protection of personnel working around polluted water:

- Assume the water is polluted.
- Wear rubber gloves to avoid contact with water, especially if it is suspected of being contaminated.
- Obtain immunizations for known hazards.
- Equipment for each personnel should include separate supplies of drinking water, wash water, soap, and a disinfectant.

- Wash water, soap, and disinfectant should be used after all sampling even if the sampled water appears to be uncontaminated.
- Protect feet with waders while in mud or water. Remove waders before washing hands; remember, they may be more contaminated than the current meter or sampler.
- Protect wounds on hands with rubber or plastic gloves.
- Avoid contamination of water, places, or people with your equipment or waders.
- Avoid carrying a pencil in the mouth while sampling or stream gaging.
- Avoid rubbing eyes.

Sampling Wells

There is no single sampling method that will work best for all wells. A number of methods are currently in use for sampling wells. The equipment ranges from simple to refined, including bailers, gas-driven samplers, bladder pumps, syringe devices, electric submersible pumps, suction-lift pumps, air-lift samplers, and gas-driven piston pumps. In selecting a sampling method for a well, a number of details must be considered. Among the considerations are the portability of the equipment, depth to water, well diameter, water volume, ease of cleaning the equipment, method by which the sampling device brings the water to the surface, and reliability of the equipment.

Due to the great variety of physical equipment and field situations in well water sampling, it is impracticable to list a detailed set of safety rules and standards applicable to this activity. Collecting ground-water samples has its own special risks. Follow normal field-safety precautions and procedures for ground-water activities.

General guidelines to follow are:

- All routine field safety and equipment and procedures must be followed at all times.
- Know as much as possible about the types of pumps you will be working with.
- Follow specific instructions on instrument operations provided by the manufacturer.
- Make sure all equipment is in good operating condition. Check all equipment and power sources prior to leaving the office.
- Before using any pump, be familiar with its operation, and for installed pumps, review procedures in the field folder for the site.
- Electrical sources are potential hazards. Electrical sources, batteries, generators, or existing AC can cause shocks. Respect the energy source and properly ground all instruments.
- Gasoline is a source of potential contamination, fire, and fumes; gasoline must be stored in approved containers. Pumps and generators must be fueled and oiled away from the area of operation.
- If the site is in a well house or spring house, watch for low doorways and beams inside.
- As you enter, check for rotten or loose floor boards, slippery floors, snakes, and biting or stinging insects.
- Check for exposed wiring, open electrical panels, and any other possible electrical hazards which might be encountered while working near the pump.

Sample Preservation and Shipment

Chemicals, supplies, and equipment used in the collection and preservation of water-quality samples may be dangerous to both field personnel and to passers-by if precautions are not followed. Most preservatives are either corrosive or poisonous and contact with them must be avoided. Buffers, standards, and filling solutions also are potentially harmful and it is a good general rule to also avoid contact with them. The following safety rules must be practiced when handling preservatives:



- Protective gloves, clothing, and eye wear must be worn when handling hazardous chemicals.
- Carry a sufficient volume of water and antiseptic washes to rinse any accidental spills. Baking soda is a good all-purpose substance to absorb acid spills in trucks.
- Avoid spillage and personal contact and have appropriate clean-up kits.
- Wash gloved hands thoroughly with disinfectant soap after sampling and discard gloves properly.
- Be careful when handling acid ampoules to avoid cuts splashes, and breathing fumes. Wear eye protection devices (goggles or face shield).
- Dispose of each empty ampoule and tip immediately following use and before filling a bottle for the next sample. It is recommended that the two parts of the ampoule be placed in either a wide-mouth glass screw jar or a steel disposal can. The disposal container should be filled to 1/4 volume with tap water to minimize shock breakage to the used ampoule.
- Concentrated acid used to preserve samples should be carried in the smallest volumes possible and practicable.
- If ampoules are used, they should be carried in their original shipping container.
- If a larger volume of acid is needed, it should be carried in a container with non-flammable packing which will absorb spills. The container must be secured in the vehicle so that even if the vehicle is involved in an accident or upset, the acid will not leak out of the container and packaging.
- Avoid rapid heating and cooling of glassware, because it can cause breakage. Do not pick up broken glass with hands. Sweep or scoop the glass up.
- Avoid contact with contaminated water. If contact is unavoidable, wash hands and equipment frequently.
- Special care must be used with syringes. The used syringe must be packaged for disposal so that no one handling the wastes will be cut or gouged.
- Alcohol or other flammable chemicals must be transported in the smallest practical volumes and in closed containers that are secured in the vehicles so they will not leak or break.
- Cylinders of compressed gasses must always be tightly secured in a vehicle and while in use. Gas cylinders must never be allowed to stand upright without being secured.

Follow established procedures for shipping samples to the laboratory and observe proper lifting procedures when transporting water and ice-filled coolers. It is recommended that shipping containers be lined with appropriate water-proof materials to prevent water leakage from melting ice. Use sufficient packing material in containers to avoid breakage of sample bottles.

Operating Field Parameter Meters

A wide variety of meters are commercially available for measuring water-quality field parameters. Parameters commonly measured in the field include alkalinity, dissolved oxygen, pH, specific conductance, and temperature. A less commonly measured parameter is RP (redox potential). Usually parameters are measured independently using separate meters. However, multi-parameter meters also are available.

Standards are used to calibrate the meters both in the office and in the field. All meters must be recalibrated at each site. This means, if the meter is packed up and moved, it must be recalibrated.

Standards should be at ambient water temperatures for accurate calibration. When the air temperature is radically different from water temperature, standards should be placed in a circulating bath of sample water until they are close to the water temperature. Remember, good field data depends on proper care, calibration, and maintenance of field equipment.



The operation of field meters is generally a relatively safe activity. A few reminders that may prevent accidents or damage to the equipment are:

- Keep meters in good operating condition and routinely clean, repair, or replace dirty or corroded connections, cells, probes, or sensors.
- Read and follow instrument manual and become familiar with its operation.
- Protect yourself from electrical shock. Replace or repair any broke, weak, exposed, or frayed wiring. Replace batteries that show any unusual wear or cracks in housing.
- Store and transport meters, probes, and sensors carefully. Equipment and tools should be kept separate as much as possible and carried in such a manner as to minimize damage from vibrations and jostling.
- Meters and probes should not be stored in vehicle overnight, if possible. Return meters and probes to the office or lab at the end of each field day.

Installing and Operating Water-Quality Monitors

In recent years, equipment to record measurements of various water-quality parameters every few minutes has been developed and can be installed on stream banks, bridges, or wells. These data are often needed to determine short term and in some cases real time fluctuations in the concentration of these water quality parameters. In many cases, data are needed at remote sites, which have no electrical utilities.

Personnel who install and operate water-quality monitors must have a thorough understanding of the equipment and its operation. General guidelines to follow are:

- Follow all instructions when operating the equipment.
- Make sure all equipment is in good operating condition. Check all equipment and power sources prior to leaving the office.
- When working on bridges, follow the safety procedures discussed in the section on surface-water procedures.
- Follow all safety precautions in the construction and repair of gage structures that may house the equipment.

The above guide is adapted from portions of:

A Guide to Safe Field Operations

U.S. Geological Survey Open-File Report 95-777

http://water.er.usgs.gov/pubs/ofr/ofr95777/wq_act.html

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For additional information please visit: <http://water.USGS.gov/owq/FieldManual/Chap9/chap9.pdf>