Ground Water Sampling Using a Bailer
FSOP 2.2.7, September 8, 2016
Ohio EPA Division of Environmental Protection and Revitalization

1.0 Scope and Applicability

1.1 Bailers are portable, manually operated ground water sampling devices that consist of a tube with one or more check valves and an attached cord. The cord is used to lower and raise the bailer to purge water from a well. As a bailer is lowered into a well water column, the check valve(s) opens and allows the tube to fill with water. As the bailer is raised from a well water column, the check valve(s) closes and seals the ground water-filled tube that is being retrieved from the well for ground water purging or sampling.

1.2 Bailers can be constructed of virtually any rigid or flexible material. For ground water sampling purposes, Ohio EPA uses bailers constructed of materials that are inert, i.e., neither sources of chemical contaminants nor adversely affected by chemical contaminants. Preferred materials for ground water sampling include, but are not limited to PVC, stainless steel, Teflon®, polyethylene and polypropylene. Bailers are available in a variety of diameters and lengths.

1.3 Bailer cords should be composed of contaminant-inert materials. Preferred cord materials include, but are not limited to nylon, polypropylene or Teflon®-coated wire or cord.

1.4 Given the range of material types and sizes, bailers can be used for sampling a wide variety of wells and ground water constituents. However, Ohio EPA does not consider bailers a best available technology for sampling ground water because when used, they surge the well and cause turbulence that increases turbidity and the potential for volatilization. The use of bailers to collect ground water samples for contaminants sensitive to turbidity and volatilization (especially VOCs and metals) should be avoided.

1.5 Bailers may be the only practicable option for sampling monitoring wells under the following conditions:

- The well is located in a remote area or in an area that is difficult to access
- The well is very low yielding (i.e., < 100 ml/min)
- The depth to ground water is very deep (i.e., > 100 ft)
- The water column is very small (i.e., < 1 ft)
- NAPL is present or contaminant concentrations are very high

1.6 Use of bailers to sample contaminated ground water may require an increased level of personal protective equipment (PPE) as compared to other ground water sampling techniques, because there is a higher likelihood of purge water contact.

1.7 All ground water sampling techniques and associated procedures should be consistent with Ohio EPA's Technical Guidance Manual (TGM) for Hydrogeologic Investigations and Ground Water Monitoring, specifically Chapter 10, Ground

Water Sampling. In addition, U.S. EPA 2002 (Yeskis and Zavala) provides ground water sampling guidance for RCRA and CERCLA sites. The site-specific work plan (SSWP) will provide project objectives and data quality objectives (DQOs). In the event there appears to be inconsistency between the TGM and project objectives or DQOs, please contact the DERR SIFU supervisor and DERR site coordinator for clarification.

1.8 If the use of bailers for collecting ground water samples is not included in the site-specific work plan (SSWP), contact the DERR-SIFU supervisor and DERR site coordinator before using bailers to collect ground water samples to ensure that the use of bailers will meet project objectives and data quality objectives (DQOs).

2.0 Definitions

2.1 **Top-filling bailer:** a bailer designed such that water can enter and exit only through its top. Due to sample agitation and aeration, top-filling bailers are only appropriate for collecting light non-aqueous phase liquids (LNAPLs).

2.2 **Bottom-filling (or single-check valve) bailer:** a bailer that is open at the top with a check valve at the bottom that seals the bailer when it is withdrawn from the well water column. Ohio EPA prefers disposable bottom-filling bailers with discharge tubes when using bailers for most ground water sampling projects.

2.3 **Discharge tube:** a short section of rigid tubing with tapered cuts at both ends that is used to collect a sample from the bottom of a bottom-filling or double-check valve bailer.

2.4 **Double-check valve (or point source) bailer:** a bailer with check valves at the top and bottom that is designed to collect water samples from discrete locations within a well water column. Water flows through both ends when the bailer is lowered into the water column. When the bailer reaches the desired depth and is retrieved, both valves close and the water from the sampled interval is retained with the bailer. Double-check valve bailers can be used to collect dense non-aqueous phase liquids (DNAPLs). The SSWP should include sample collection procedures when using double-check valve bailers.

3.0 Health and Safety Considerations

3.1 Always review the site-specific health and safety plan (HASP) for site-specific hazards before performing work.

3.2 Refer to FSOP 2.2.4, Ground Water Sampling (General Practices) for general ground water sampling and health and safety considerations

3.3 Using a bailer to purge and sample is labor intensive. Two or more staff may be needed to collect ground water samples using bailers under (but not necessarily limited to) the following conditions:

- More than 8 wells need to be sampled within one day or less

- Wells that need to be sampled are large diameter (i.e., > 2 inches) or very deep (> 50 ft)
- Well water columns are very large (i.e. > 20 ft)
- The temperature is very warm (i.e., > 80^{o} F) or very cold (i.e., < 32^{o} F)

3.2 Avoid splashing yourself with purge water when bailing a well. Use appropriate personal protective equipment (PPE), including chemical-resistant gloves, chemical resistant coveralls and safety glasses or goggles.

3.4 Avoid leaning over the well when purging or sampling to prevent back injuries and to prevent inhalation of organic vapors associated with VOC ground water contamination from the well casing.

4.0 Procedure Cautions

4.1 Refer to FSOP 2.2.4, Ground Water Sampling (General Practices) for general ground water sampling procedure cautions.

4.2 If NAPL is encountered in a monitoring well, do not perform ground water sampling. Immediately notify the DERR-SIFU supervisor and DERR site coordinator.

4.3 A non-slip knot such as a bowline is recommended for tying the rope to the bailer. Other knots may slip, resulting in the loss of the bailer in the well. Refer to the attached instructions on how to tie a bowline knot.

4.4 When using a bailer, do not purge quickly or allow the bailer to free fall into the well water column or “bounce” the bailer on the bottom of the well. These actions will aerate the well water column and/or cause significantly increased sample turbidity, and in some cases may damage the well,

5.0 Personnel Qualifications

Ohio EPA personnel working at sites that fall under the scope of OSHA’s hazardous waste operations and emergency response standard (29 CFR 1910.120) must meet the training requirements described in that standard.

6.0 Equipment and Supplies

6.1 Bailer
6.2 Cord
6.3 Knife or cord cutter
6.4 Graduated bucket or similar container
6.5 Other ground water sampling equipment and supplies as needed per FSOP 2.2.4, Ground Water Sampling (General Practices)

7.0 Procedures

7.1 Before purging or sampling, measure the static water level and total depth in accordance with FSOP 2.2.2, Ground Water Level Measurement.

7.2 Calculate the well volume and determine purge volume in accordance with FSOP 2.2.4, Ground Water Sampling (General Practices).

7.3 Don a clean pair of chemically resistant sampling gloves.

7.4 Place clean plastic sheeting adjacent to the well to prevent contamination of the bailer cord in the event it should touch the ground. Alternatively, a clean five-gallon bucket can be used to contain the bailer cord as it is removed from the well. Ideally, the cord should not touch the ground or any other potentially contaminated objects when purging or sampling.

7.5 If the well is deep (> 50 ft), the well volume is large (> 5 gallons) or the bailer is large (> 2 inches in diameter), a tripod and pulley assembly may be used to operate the bailer.

7.6 Attach the cord to the bailer using a non-slip knot such as a bowline (see attached instructions).

7.7 Slowly lower the bailer down the well to the water column. Do not allow the bailer to free-fall into the water column or touch the bottom of the well. If possible, avoid lowering the bailer into the wells screened interval to minimize sample turbidity.

7.8 Slowly withdraw the bailer and empty the purge water into the graduated container.

7.9 Lower the bailer to the same approximate depth in the well each time. Raise the bailer slowly. If the bailer is not filled with water upon retrieval, you may be purging the well dry, or you may not be lowering the bailer far enough into the water column. Continue until you meet SSWP purging and stabilization criteria (generally least three well volumes removed) or until the well purges dry.

7.10 Upon completion of purging, lower the bailer into the well to collect the ground water sample as follows:

7.10.1 If using a bottom-filling bailer with a discharge tube, hold the bailer vertically and carefully insert the discharge tube into the bottom of the bailer to displace the check valve ball. Collect the sample from the bottom of the bailer through the discharge tube, controlling the flow while adjusting the insertion depth of the discharge tube.

7.10.2 If using a bottom-filling bailer without a discharge tube, carefully and slowly decant the sample from the top of the bailer.

7.10.3 If using a double-check valve bailer, follow the sample collection procedures provided by the SSWP.

7.11 If using a non-disposable bailer, decontaminate the bailer between each sample location in accordance with FSOP 1.6, Sample Equipment Decontamination.

7.12 Manage ground water samples in accordance with FSOP 1.5, Sample Custody and Handling.

7.13 Dispose of used disposable bailers, cord and PPE in accordance with FSOP 1.7, Investigation Derived Waste.

8.0 Data and Records Management

Refer to FSOP 1.3, Field Documentation.

9.0 Quality Assurance and Quality Control

Refer to the SSWP and FSOP 2.2.4, Ground Water Sampling (General Practices).

10.0 Attachments

Step-by-step guide on how to tie a non-slip (bowline) knot

11.0 References

FSOP 1.3, Field Documentation.

FSOP 1.5, Sample Custody and Sampling

FSOP 1.6, Sampling Equipment Decontamination

FSOP 1.7, Investigation Derived Wastes

FSOP 2.2.2, Ground Water Level Measurement

FSOP 2.2.4, Ground Water Sampling (General Practices)

Ohio EPA, May 2012, Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring: Ohio EPA Division of Drinking and Ground Waters

U.S. EPA (D. Yeskis and B. Zavala), May 2002, Ground Water Sampling Guidelines for Superfund and RCRA Project Managers (Ground Water Forum Issue Paper): Office of Solid Waste and Emergency Response, EPA 542-S-02-001

How to Tie a Bowline (Non-slip) Knot