SOP #EH-03

Sediment Porewater Sampling using a Micro Push Point

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TECHNICAL STANDARD OPERATING PROCEDURE
SEDIMENT POREWATER SAMPLING

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a standardized method for collection of sediment porewater samples from micro Push Points or mini piezometers, to be used by employees of USEPA Region 8, or contractors and subcontractors supporting USEPA Region 8 projects and tasks. This SOP describes the equipment and operations used for sampling sediment porewater in areas which will produce data that can be used to support risk evaluations. Deviations from the procedures outlined in this document must be approved by the USEPA Region 8 Remedial Project Manager, Regional Toxicologist or On-Scene Coordinator prior to initiation of the sampling activity.

2.0 RESPONSIBILITIES

The Field Project Leader (FPL) may be an USEPA employee or contractor who is responsible for overseeing the sediment porewater sampling activities. The FPL is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and the Project Plan. It is the responsibility of the FPL to communicate with the Field Personnel regarding specific collection objectives and anticipated situations that require any deviation from the Project Plan. It is also the responsibility of the FPL to communicate the need for any deviations from the Project Plan with the appropriate USEPA Region 8 personnel (Remedial Project Manager, Regional Toxicologist or On-Scene Coordinator).

Field personnel performing sediment porewater sampling are responsible for adhering to the applicable tasks outlined in this procedure while collecting samples. The field personnel should have limited discretion with regard to collection procedures, but should exercise judgment regarding the exact location of sample collection, within the boundaries outlined by the FPL.

3.0 EQUIPMENT

- Micro Push Point (PP) Samplers - in lengths of 14" and 27" (referred to as PP14 and PP27).
- Syringe Assemblies - 50 ml, 100% polyethylene/polypropylene syringes configured to taigon tubing (1/4" OD x 1/8" ID) with clamps (to secure tubing to sampling port) and a stopper.
- Peristaltic Pump - either battery-powered or with AC car-adapter unit.
- Collection Containers and Preservative - as specified in the QAPP.

- Meter Stick - used to measure water depth, and water level.
- Decontamination Equipment - used to backflush cleaning solution through the PP samplers for decontamination.
- Gloves - for personal protection and to prevent cross-contamination of samples. May be plastic or latex; should be disposable and powderless.
- Sampling Flags - used for identifying porewater sampling locations.
- Field Notebook - a bound book used to record progress of sampling effort and record any problems and field observations during sampling.
- Permanent Marking Pen - used to identify sample containers and for documentation of field logbooks and data sheets.
- Cleaning Solution - used to decontaminate the PP samplers after use.
- Deionized Water - used to rinse cleaning solution from the PP samplers during decontamination.
- Trash Bag - used to dispose of gloves and any other non-hazardous waste generated during sampling and decontamination.
- Plastic Waste Bottle - used to dispose of decontamination waste.

4.0 POREWATER SAMPLE COLLECTION

Push point samplers consist of two pieces: a guard rod and a sampler (see Figure 1). The sampler is a rigid 1/8-inch diameter probe made of 316 stainless steel, with a short screened zone at one end (with approximately 20% open area) and a sample port at the other end. The guard rod is inserted into the sampler body to provide support and prevent plugging during insertion into sediments. A syringe or taigon tubing is attached to the sample port for measurement of head and/or collection of a porewater sample. Push point samplers are available in various lengths; for the purposes of this project two lengths are available - 14" (PP14) and 27" (PP27). Water depth at the sampling location and the desired depth of sample collection determine the necessary length of the sampler.

4.1 Preparation for Sample Collection

The sampling team will wade to the specified sampling location and mark the location with a pin flag on the shore. The sample location and GPS coordinates will be recorded prior to collecting the sediment porewater sample. Insert the guard-rod into the mini piezometer body so that the guard rod and handle are squeezed together (Figure 2). Holding the device in this manner, push the push point sampler into the sediment to the desired depth using a gentle twisting motion. When the desired depth or refusal is reached, remove the guard rod from the body without disturbing the position of the deployed sampler. The sampler shall be placed at a minimum depth of 10 cm. In no case shall the sampler be entirely immersed in water.

After reaching the desired depth, remove the guard rod from the Push Point Sampler. Once the guard rod has been removed it SHOULD NOT be reinserted into the device until the bore holes are thoroughly cleansed of all sand, silt and other debris. In addition, once the guard rod has been removed from the sampler, the sampler should not be pushed further into the sediments. This may damage the screened zone and/or plug the sampler with sediment.

Using the meter stick record the depth of the water (distance from the sediment bottom to the top of the surface water) and the length of the sampler that is not immersed in the sediment (distance from the sediment to the top of the sampler). Record this information in the field log book.

4.2 Collection of Groundwater Flux Measurements

After insertion into the sediment, the sampler can then be used as a mini-piezometer to determine the potential direction of groundwater flux. Connect a piece of taigon tubing to the sample port (see Figure 3). Be sure to place a clamp at the mouth of the sampler tubing to ensure a good seal at the sampling port of the sampler.

Pump out any remaining air in the sampler and/or tubing by extending 50 ml syringe and inserting it into the open end of the taigon tubing. Squeeze the syringe to blow any air and/or water out of the tubing and the micro Push Point Sampler. Slowly remove the syringe from the Taigon Tubing and hold the tubing as diagramed in Figure 3. Allow the water to rise to its static level. When the water level appears to have stabilized, record on the field data sheet a “positive” or “negative” groundwater flux observation at the respective sampling location. Using the meter stick, measure the distance between the water level in the tubing and the surface water and record this measurement on the field data sheet.

A positive flux measurement indicates that the groundwater is moving towards the surface water body, or the surface water body is “gaining” groundwater. A negative flux measurement indicates that the groundwater is moving away from the surface water body, or the surface water

body is “losing”water to the groundwater.

4.3 Collection of Sediment Porewater Samples for Analysis

Attach a "syringe assembly" (a pre-assembled 50 ml, 100% polyethylene/polypropylene syringe clamped to Taigon tubing) or peristaltic pump to the sampler port using a length of Taigon tubing. Be sure to place a clamp at the mouth of the sampler tubing to ensure a good seal at the sampling port. Withdraw water at a low-flow sampling rate (50-200 ml/min) until extracted water becomes non-turbid. Withdraw adequate amounts of porewater and transfer the sample into a labeled sample collection container as specified in the QAPP.

If sampling equipment is to be re-used, follow the appropriate decontamination procedures before collecting the next sample.

5.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, the following procedures should be followed:

- Transfer the sample(s) into suitable, labeled sample containers specific for the analyses to be performed.
- Preserve the sample, if appropriate, or use pre-preserved sample bottles. Do not overfill bottles if they are pre-preserved.
- Cap the container securely, place in a resealable plastic bag, and cool to 4^{o}C on wet ice.
- Record all pertinent data in the site logbook and/or on field data sheets.
- Complete the Chain of Custody record.
- Attach custody seals to cooler prior to shipment.
- Decontaminate all non-dedicated sampling equipment prior to the collection of additional samples.

6.0 INTERFERENCES AND POTENTIAL PROBLEMS

Care should be taken to avoid tracking sediment and/or silt from one area to another. As samples are taken sequentially, care should also be taken not to contaminate an area yet to be sampled with the residue of the sample that is currently being taken. In general one should move in a single direction through the sampling area. If an area is known or suspected of having a higher concentration of contaminants, all other considerations being equal, it should be sampled last to prevent cross contamination.

There are two primary interferences or potential problems associated with sediment porewater sampling. These include cross contamination of samples and improper sample collection.

Cross contamination problems can be eliminated or minimized through the use of dedicated or disposable sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary.

Improper sample collection can involve using contaminated equipment, equipment that is potentially not compatible with the contaminants of concern, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed or non-representative area. Be sure to use sampling equipment of an appropriate composition based upon the suspected contaminants and analyses to be performed.

Following proper decontamination procedures, minimizing disturbance of the sample site, and careful selection of sampling locations will eliminate these problems. Proper timing for the collection of samples must be taken into consideration due to tidal influences and low or fast-flowing streams or rivers.

7.0 RECORD KEEPING AND QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following general procedures apply:

- ✓ All data must be documented on field data sheets or within site logbooks.
- ✓ All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment calibration activities must occur prior to sampling/operation and they must be documented.

Descriptions of any deviations and the reason for deviations from the site QAPP or this SOP should be noted in the field notebook, as necessary. In addition, the logbook should track pertinent sample collection information such as: sample date/time, personnel, weather conditions, and sample identification information. Samples taken from areas with visible staining or other indications of non-homogeneous conditions should be noted.

Field personnel will collect the proper type and quantity of quality control samples as prescribed in the QAPP.

8.0 DECONTAMINATION

Because decontamination procedures are time-consuming, having a quantity of sampling tools sufficient to require decontamination at a maximum of once per day is recommended. All

sampling equipment must be decontaminated prior to reuse. Equipment decontamination will consist of the following 4 steps:

1) Cleaning Solution
2) Deionized water rinse
3) Acetone rinse
4) Deionized water rinse

Begin decontamination of the push point sampler by thoroughly removing all sand, silt etc. from the guard rod and the exterior of the sampler. Prepare three dedicated decontamination syringes with cleaning solution, deionized water, and acetone, respectively. Connect the cleaning syringe filled with cleaning solution to the end of the sampler port. Push the contents of the cleaning syringe through the sampler into a waste receptacle. Gently push the guard rod all the way into the bore of the Push Point sampler to dislodge any bridged material. Re-rinse the Push Point sampler with cleaning solution. Follow this with a distilled water/and or acetone rinse. Rinse the guard rod with cleaning solution, followed with a distilled water rinse then and acetone rinse followed by a second distilled water rinse. Reinsert the guard-rod into the push point sampler and the device is ready for re-use.

> *Note: Before the guard-rod is reinserted into the push point sampler, all small bends in both the guard-rod and in the sampler should be removed. Use caution when straightening the screened-zone, it is somewhat delicate without the guard-rod inside it, and can be broken through repeated bending. It is sometimes helpful when straightening the screened zone to insert the guard rod or the cleaning rod to the area of the bend in the screened zone. Gently unbend the portion of the screened zone nearest the rod and carefully advance the rod to the next bend. After the rod has been fully inserted into the screened zone perform the final screened zone straightening fine-tuning until the guard rod slides freely through it.*

All marker flags (if reused) should be decontaminated by wiping off with towels and/or baby wipes before re-use.

9.0 SITE CLEAN-UP

Disposable personal protective equipment and other non-hazardous waste generated during sampling and decontamination activities will be placed in a trash bag and taken to a waste receptacle at the field office to prevent disturbance by animals and dispersion by wind. All non-hazardous waste will be disposed of in municipal waste bins.

10.0 REFERENCES

Henry, M. 2000. MHE Push Point Sampling Tools. Proceedings of the Ground-Water/ Surface-Water Interactions Workshop. July 2000.
http://www.gsiwebpage.net Accessed: July 2001.

MHE Products. 2001. Operators Manual and Applications Guide. MHE-PP27" and MHE-PP14". Version 1.06. February 3, 2001.

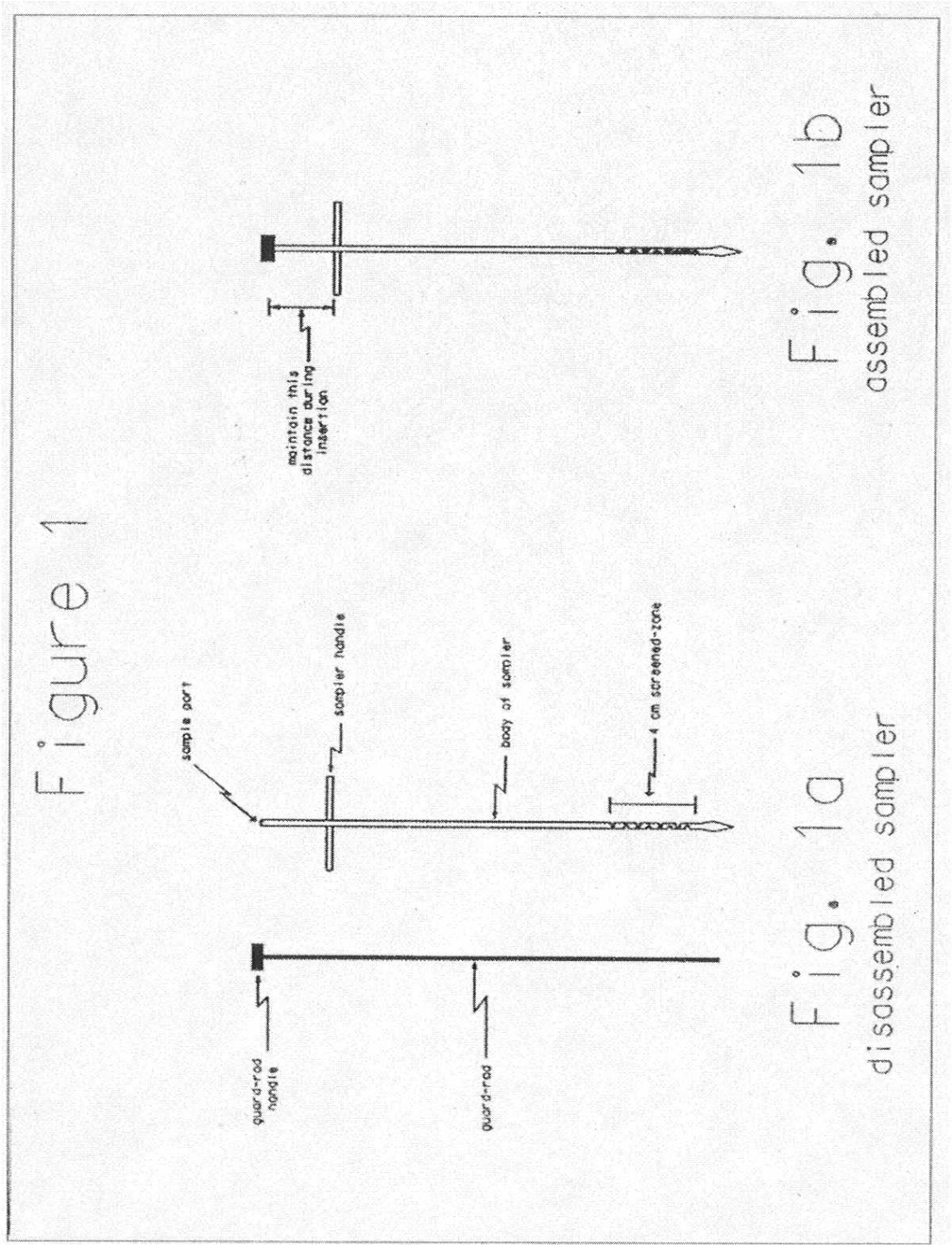
Figure 1
sample port
sampler handle
body of sampler
4 cm screened-zone
guard-rod handle
guard-rod
Fig. 1a
disassembled sampler
maintain this distance during insertion
Fig. 1b
assembled sampler

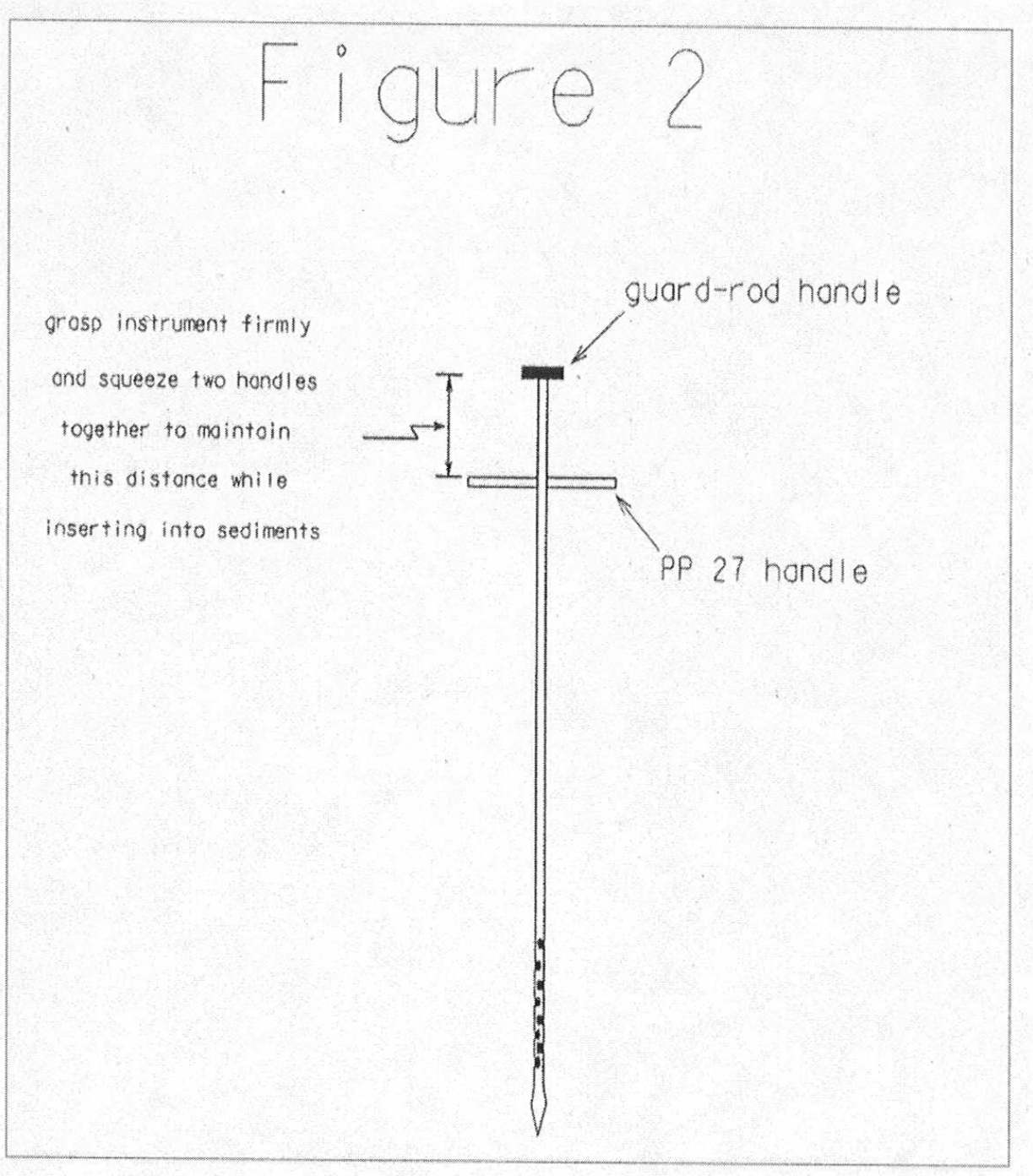
Figure 2
grasp instrument firmly
and squeeze two handles
together to maintain
this distance while
inserting into sediments
guard-rod handle
PP 27 handle

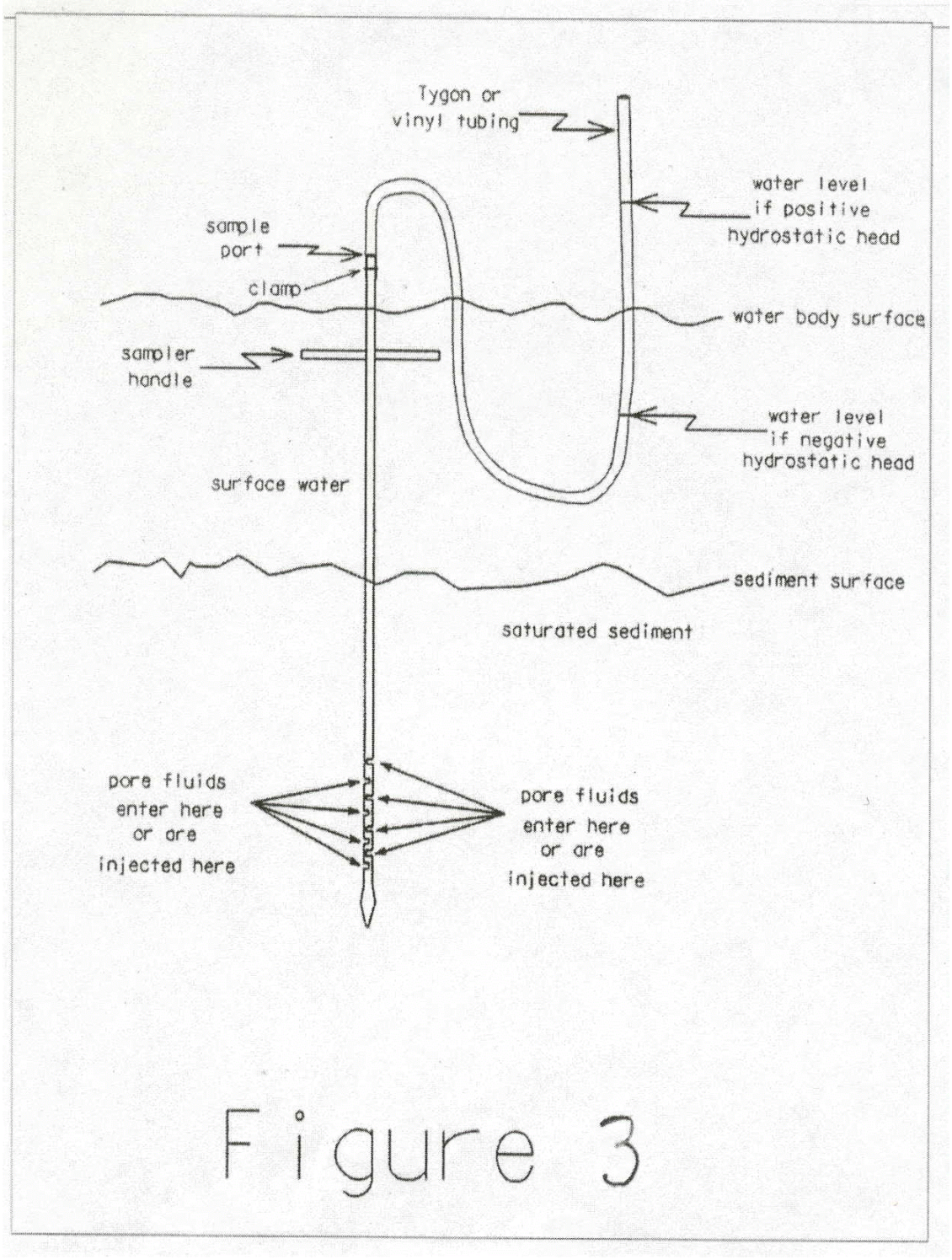
Tygon or
vinyl tubing
water level
if positive
hydrostatic head
sample
port
clamp
water body surface
sampler
handle
water level
if negative
hydrostatic head
surface water
sediment surface
saturated sediment
pore fluids
enter here
or are
injected here
pore fluids
enter here
or are
injected here

Figure 3