Designation: D7352 – 07 (Reapproved 2012)

Standard Practice for
Direct Push Technology for Volatile Contaminant Logging with the Membrane Interface Probe (MIP)[1,2]

This standard is issued under the fixed designation D7352; 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 standard practice describes a method for rapid delineation of volatile organic contaminants (VOC) in the subsurface using a membrane interface probe. Logging with the membrane interface probe is usually performed with direct push equipment.

1.2 This standard practice describes how to obtain a real time vertical log of volatile organic contaminants with depth. The data obtained is indicative of the total volatile organic contaminant concentration in the subsurface at depth.

1.3 Other sensors, such as electrical conductivity, fluorescence detectors, and cone penetration tools may be included to provide additional information. The use of a lithologic logging tool is highly recommended to define hydrostratigraphic conditions, such as migration pathways, and to guide confirmation sampling.

1.4 *Limitations*—The MIP system does not provide specificity of analytes. This tool is to be used as a total volatile organic contaminant-screening tool. Soil and/or water sampling (Guides D6001, D6282, D6724, and Practice D6725) must be performed to identify specific analytes and exact concentrations. Only VOCs are detected by the MIP system in the subsurface. Detection limits are subject to the selectivity of the gas phase detector applied and characteristics of the formation being penetrated (for example, clay and organic carbon content).

1.5 *This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice 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 the consideration of a project's many unique aspects. The word "standard" in the title means that the document has been approved through the ASTM consensus process.*

1.6 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D5299 Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities

D6001 Guide for Direct-Push Groundwater Sampling for Environmental Site Characterization

D6282 Guide for Direct Push Soil Sampling for Environmental Site Characterizations

D6724 Guide for Installation of Direct Push Groundwater Monitoring Wells

D6725 Practice for Direct Push Installation of Prepacked Screen Monitoring Wells in Unconsolidated Aquifers

E355 Practice for Gas Chromatography Terms and Relationships

3. Terminology

3.1 Terminology used within this practice is in accordance with Terminology D653 with the addition of the following:

3.2 *Definitions:*

3.2.1 *carry over*—retention of contaminant in the membrane and trunkline which may result in false positive results or an increased detector baseline at subsequent depth intervals.

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[1] This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Groundwater and Vadose Zone Investigations.

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[2] The Membrane Interface Probe is covered by a patent. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to the ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

[3] 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.

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3.2.2 *closed couple flow*—gas flow in the MIP system when a probe is detached and the gas lines are coupled together. The flow is then measured with a gas flow meter on the return tubing before entering the gas phase detectors. Used to verify continuity of gas flow in the MIP system.

3.2.3 *gas dryer*—a selectively permeable membrane tubing (Nafion®) is used to continuously dry the MIP carrier gas stream by removing only water vapor.

3.2.4 *gas phase detectors*—heated laboratory grade detectors used for gas chromatography (Practice E355). Gas effluent from the MIP flows through these detectors for the analysis of VOC compounds. Detectors most often used with the MIP include photoionization detector (PID), flameionization detector (FID), and an electron capture detector (ECD).

3.2.5 *membrane interface probe (MIP)*—a subsurface logging tool for detection of volatile organic compounds (VOCs).

3.2.6 *response test*—a test of the working MIP system performed by placing the MIP probe in an aqueous phase solution with a known contaminant of known concentration. Performed before each MIP log is conducted and one at the end of the working day to validate the MIP system performance. Also used to compare data from individual locations.

3.2.7 *trigger*—mechanical interface between the operator and instrumentation to initiate or terminate data collection.

3.2.8 *trip time*—the time required for a contaminant to penetrate the semi-permeable membrane and travel to the gas phase detectors at the surface through a fixed length of tubing.

3.2.9 *trunkline*—plastic or metal jacketed cord containing electrical wires for the heaters in the probe block, electrical wires for other sensors, and tubing for the transport of carrier gas and the contaminant to the surface and detectors.

3.2.10 *working standard*—a chemical standard used in response testing the MIP system. This standard is a diluted concentration of an analyte stock standard, used for one application and then properly disposed.

4. Summary of Practice

4.1 This practice describes the field method for delineation of volatile organic contaminants with depth via the Membrane Interface Probe (MIP). The MIP is a continuously sampling tool advanced through the soil using a direct push machine for the purpose of logging contaminant and lithologic data in real time (**1**, **2**).[4]

4.2 A semipermeable membrane on the probe is heated to a temperature of 100 to 120°C. Clean carrier gas is circulated across the internal surface of the membrane carrying volatile organic contaminants, which have diffused (**3**) through the membrane, to the surface for analysis by gas phase detectors.

5. Significance and Use

5.1 The MIP system provides a timely and cost effective way (**4**) for delineation of volatile organic contaminants (for example, benzene, toluene, solvents, trichloroethylene, tetrachloroethylene) with depth (**5**, **6**). Recent investigation (**2**) has found the MIP can be effective in locating zones where dense nonaqueous phase liquids (DNAPL) may be present. MIP provides real-time measurement for optimizing selection of sample locations when using a dynamic work plan. By identifying the depth at which a contaminant is located, a more representative sample of soil or water can be collected.

5.2 Correlation of a series of MIP logs across a site can provide 2-D and 3-D definition of the contaminant plume. When lithologic logs are obtained (EC, CPT, etc.) with the MIP data, contaminant migration pathways may be defined.

5.3 The MIP logs provide a detailed record of contaminant distribution in the saturated and unsaturated formations. A proportion of the chlorinated and non-chlorinated volatile organic contaminants in the sorbed, aqueous, or gaseous phases partition through the membrane for detection up hole.

5.4 The data obtained from application of this practice may be used to guide soil (Guide D6282) and groundwater sampling (Guide D6001) or placement of long-term monitoring wells (Guide D6724).

5.5 MIP data can be used to optimize site remediation by knowing the depth distribution of volatile organic contaminants. For example, materials injected for remediation are placed at correct depths in the formation.

5.6 This practice also may be used as a means of evaluating remediation performance. MIP can provide a cost-effective way to monitor the progress of remediation. When properly performed at suitable sites, logging locations can be compared from the initial investigation to the monitoring of the contaminant under remediation conditions.

NOTE 1—The quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Practitioners that meet the criteria of Practice D3740 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice D3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some of those factors. Practice D3740 was developed for agencies engaged in the testing and/or inspection of soils and rock. As such, it is not totally applicable to agencies performing this practice. However, users of this practice should recognize that the framework of Practice D3740 is appropriate for evaluating the quality of an agency performing this practice. Currently there is no known qualifying national authority that inspects agencies that perform this practice.

6. Apparatus

6.1 *General*—The following discussion provides descriptions and details for the Membrane Interface Probe and system components (Fig. 1). Additional details on the MIP system are available in the Geoprobe MIP SOP (**1**).

6.1.1 *The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

6.2 *Membrane Interface Probe*—The MIP is the interface between the bulk formation and the gas phase detectors up

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

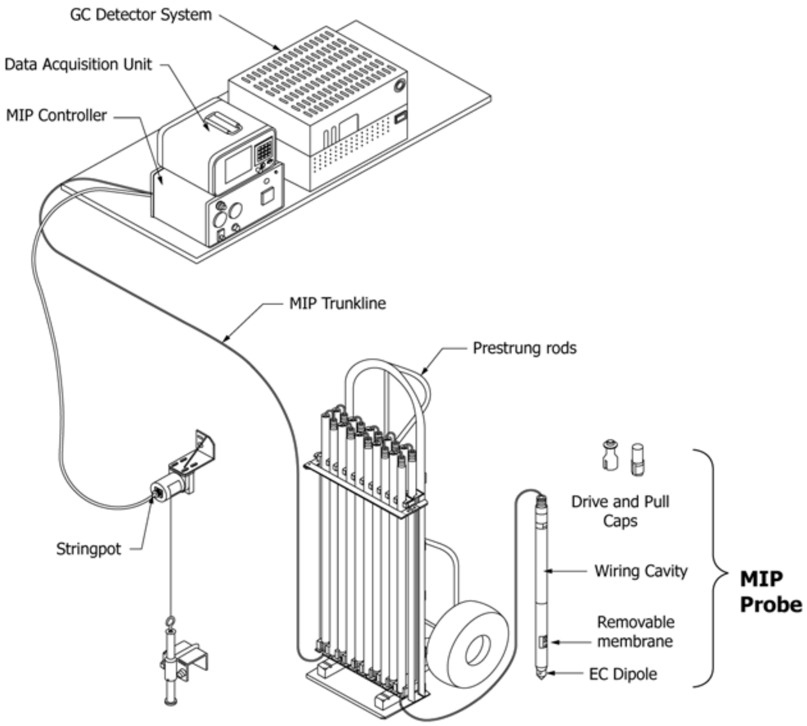


FIG. 1 The Primary Components of the Membrane Interface System

hole. Volatile compounds outside the probe diffuse across the membrane and are swept up hole via an inert carrier gas (Fig. 2).

6.2.1 The membrane is set in a removable insert. It is constructed of a polymer coating impregnated into stainless steel wire mesh.

6.2.2 The membrane is inserted into a heater block. The elevated temperature of the heater block is used to speed the diffusion of contaminants out of the bulk formation and through the membrane. This heater block has a regulated temperature typically set at 100 to 120°C.

6.2.3 Tubing is used to supply carrier gas to the membrane. Two tubes are used: a supply tube running from the carrier gas source to the membrane and a return tube running from the membrane to the gas phase detectors at ground surface.

6.2.4 The MIP system may be configured with a soil electrical conductivity dipole for simultaneous collection of general lithologic data.

6.2.5 The MIP probe may be coupled to a CPT probe at its lower end for simultaneous collection of CPT data (Fig. 3).

6.3 *MIP Trunkline*—This cable consists of electrical wires for heating the MIP heater block and supplying voltage to additional sensors. The trunkline also contains gas lines for the transport of VOCs from the probe to detectors up-hole. This trunkline is packaged in a durable, protective jacketing to be prestrung through steel drive rods prior to logging (Fig. 2).

6.4 *MIP Controller*—The MIP controller is used to control the flow delivered to the membrane and the voltage delivered to the heater block and electrical conductivity dipole electrode. The primary features of the MIP controller include:

6.4.1 Primary pressure regulator to control the pressure of carrier gas to the flow regulation circuit of the MIP controller.

6.4.2 A mass flow controller is used to regulate the flow of carrier gas through the MIP system. Typical flow rates of 20 to 60 mL/min are used in the operation of the membrane interface probe.

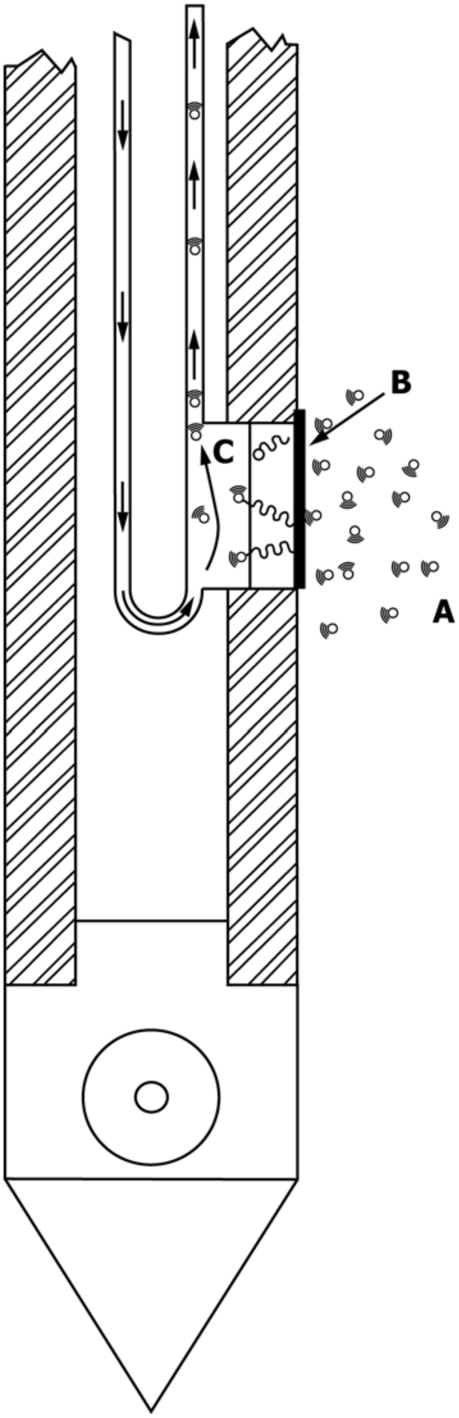
6.4.3 Temperature controller regulates the voltage supplied to the heater block to maintain an elevated temperature in the subsurface. The temperature controller has two outputs on an LCD. The top output is the temperature of the membrane in the heater block. The bottom output is the set temperature of the controller; the manufacturer sets this temperature at 121°C.

6.4.4 Analog signal input from the detector system. The analog outputs from the gas phase detectors are connected to the controller to be transferred to the data acquisition system.

6.5 *Data Acquisition System*—The primary purpose of this system is to save and graph data collected from the MIP probe and detector system in real time. The data saved by the acquisition system are: depth; soil electrical conductivity; rate of probe penetration into the subsurface; temperature of the probe; pressure of the carrier gas supply at the flow controller; and four possible gas phase detector inputs. The primary components of the data acquisition system include:

6.5.1 Alpha/numeric keypad for entry of site location information,

6.5.2 Internal and/or external data storage device for transfer of data from acquisition system to desktop or laptop computers, and



NOTE 1—The schematic of the membrane interface probe depicts the movement of VOCs in the bulk formation (A) diffusing through the membrane (B) into the carrier gas (C) to be swept to the surface detectors.

FIG. 2 Schematic Diagram of the Membrane Interface Probe

6.5.3 Global positioning system connections for acquiring latitude and longitude locations of logging location and storage of this data directly to the log file.

6.6 *Detector System*—Laboratory grade, gas phase detectors are needed for the detection of volatile organic contaminants in the carrier gas stream. Detectors may be in a gas chromatograph or in a stand-alone chassis. Different detectors are used for identification of species groups of volatile compounds, not individual volatile compounds. Certain detectors may be operated in series for the detection of different contaminant types. A brief discussion of commonly used detectors with the MIP system is provided.

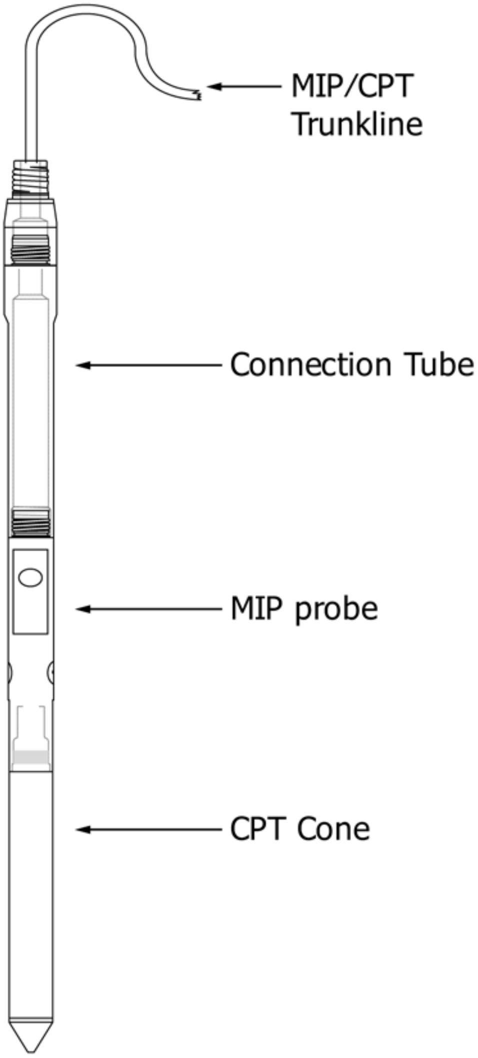


FIG. 3 Diagram of a MIP Connected in Series with the CPT Cone

6.6.1 *Photoionization Detector (PID)*—The PID uses an intense beam of ultraviolet radiation to ionize molecules in the effluent of the MIP carrier gas stream for analyte detection. The PID is a non-destructive detector and can therefore be used in series with other detector types. A gas dryer must be used on the carrier gas before entering the PID. The PID in the MIP system is generally used for detection of aromatic hydrocarbons such as benzene and toluene.

6.6.2 *Flameionization Detector (FID)*—The FID uses a hydrogen/air flame to produce ions and electrons that can conduct electricity through the flame. A potential is applied across the burner tip and the collector electrode. The resulting current is then amplified and recorded. The FID is best used with a high carbon content contaminant (that is, propane, octane, heptane, and volatile aliphatic hydrocarbons).

6.6.3 *Electron Capture Detector (ECD)*—The ECD operates by passing the effluent of the MIP carrier gas over a beta-emitter, such as nickel-63, causing ionization of the carrier gas and the production of electrons. In the presence of molecules that tend to capture electrons the current will decrease. This decrease in current is then measured and recorded. The ECD is highly sensitive toward electronegative functional groups such as halogens, peroxides, quinines, and nitro groups. The MIP system primarily uses the ECD for the detection of chlorinated VOCs.

6.6.4 *Dry Electrolytic Conductivity Detector (DELCD)*—The DELCD uses pyrolysis and oxygen to react with the effluent of the sample stream. This device uses the elevated temperature to separate the chlorinated molecule from the compound forming chlorine dioxide. The chlorine dioxide reacts with an electrode measuring the conductivity of the gases in the cell which generates a current that is amplified and recorded. The DELCD is a destructive detector typically used for the selective determination of chlorinated species.

6.7 *Stringpot*—A depth measuring potentiometer mounted to the direct push machine, transfers a voltage to the data acquisition system for accurate depth measurement below ground surface.

6.8 *Drive Rods*—Steel rods having adequate strength to sustain the force required to advance the membrane interface probe into the subsurface. The rods must be secured together to form a rigid column of drive rods.

6.9 *Direct Push Machine*—A machine with hydraulic rams supplemented with vehicle weight or a high frequency hammer to advance drive rods into unconsolidated formations.

7. Reagents and Materials

7.1 *Carrier Gas*—A non-reactive (inert) gas is used for the transportation of the contaminant from the membrane to the up hole detector system. Examples of gases used for MIP logging include: UHP grade Nitrogen, UHP grade Helium, or a filtered AIR supply. Nitrogen is mainly used for the carrier gas because it is readily available, is a stable gas, and is inert to hydrocarbons.

NOTE 2—Electron capture detectors require the use of a Nitrogen carrier gas or a 5 % Argon/Methane mix auxiliary gas.

7.2 *Methanol*—CH_3OH, for use in the dilution of stock standards.

7.3 *Neat Volatile Organic Standards*—Pure product standards are used for the preparation of stock standards. The neat product chosen should correlate to the contaminant of concern at the investigation site. If specific contaminants are known (for example, TCE, benzene), standards of those compounds may be used.

8. Preparation/Conditioning

8.1 *General*—Response testing is an integral part of ensuring the quality of data from the MIP system. A response test must be conducted before deploying the system in the field. To conduct a response test, a stock standard is prepared. The stock standard is determined by the contaminants of concern. Preparation of the stock standard is critical to the final outcome of the concentration to be used in the response test.

8.2 *Preparation of Stock Standards*—A 50-mg/mL stock standard is sufficient for a stock standard concentration. At this concentration, only a small amount (25 mL) in a 40 mL vial is needed in the field. Stock standards have a shelf life of 30 days when appropriately handled and stored.

8.2.1 *Mass of Solute, M_s*—This parameter is the mass, in milligrams, of solute needed to prepare the stock standard and is defined as:

$$M_s = V_m \times C_{final} \tag{1}$$

where:

V_m = volume of solvent (methanol) in milliliters, and
C_{final} = final concentration of stock standard in milligrams per milliliter.

8.2.2 *Volume of Solute in Microliters, V_s*—This parameter is the volume of solute needed for the stock standard prepared to equal a concentration of 50 mg/mL. By using the density of the compound and the result in 8.2.1, a volume of the solute is obtained.

$$V_s = \frac{M_s}{d_s} \tag{2}$$

where:

M_s = definition in 8.2.1, and
d_s = density, in milligrams per micro liter, of the solute.

8.3 Label the vial with the date the standard was prepared, initials of the one who prepared the standard, the concentration and the contaminant contained within the standard.

8.4 Handle and store standards appropriately. VOC standards should be handled with appropriate gloves in a well-ventilated area. Some standards are considered to be carcinogens and a material safety data sheet (MSDS) should be consulted before handling. Some VOCs (for example, benzene) will degrade in sunlight and standards should be stored in a cool and dark container. When storing, replace damaged septa or lids on vials.

9. Procedure

9.1 *General Requirements:*

9.1.1 Prior to driving the membrane interface probe into the subsurface, ensure that the proper clearance for direct push equipment has been provided to avoid any hazards from underground and overhead utilities.

9.2 *MIP System Start Up:*

9.2.1 Turn on carrier gases. Typically compressed cylinders are equipped with a 2-stage gas regulator that is typically set at 40 psi for MIP operation.

9.2.2 Power on the detector system, data acquisition system and MIP controller box. The data acquisition system and controller box require a 10-minute warm up time. The detector systems may require up to 60 minutes of warm up time depending upon the detector being used.

9.3 *Response Testing*—Response testing must be conducted before and after each log (Fig. 4). This will ensure the validity of the data and the integrity of the system. Response testing also provides for comparison of data for later MIP logs at the same site. Results of the response test may change due to membrane wear from soil contact and abrasion.

9.3.1 Power on the MIP heater and submerge the probe into a container of clean water to obtain a stable baseline on all detectors. Typically 5 minutes of temperature cycling in the clean water will result in a stable baseline.

9.3.2 Prepare Response test standard solution by adding the appropriate volume of the stock standard solution to 0.5 liters of clean water in a suitable measuring container (beaker or graduated cylinder). Example: 10 µL of a 50 mg/mL concentration stock standard into 0.5 liters of water yields a 1 mg/L working standard.

9.3.3 Pour the working standard into a nominal 2-in. diameter by 30-in. long PVC pipe that is plugged or capped at one end. Immediately insert the stabilized MIP into the solution. Leave the MIP in the test solution for 45 seconds. At the end of 45 seconds, place the probe back in the clean water. This

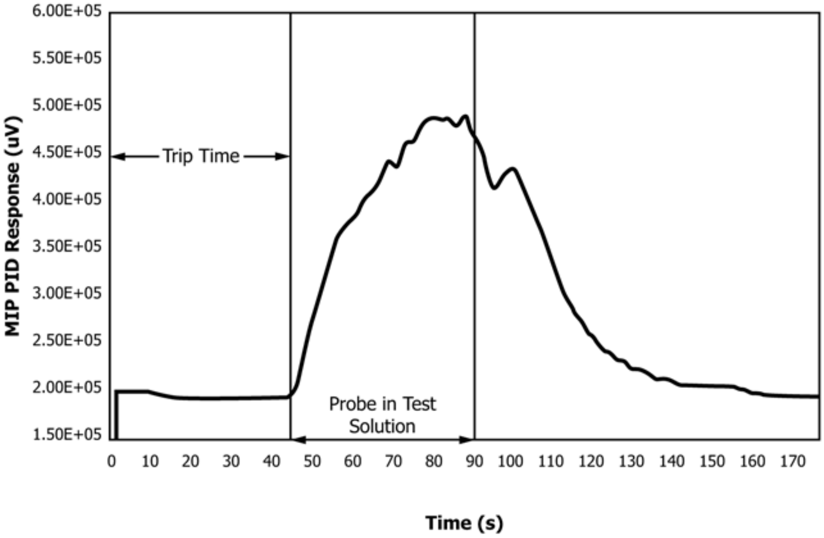


FIG. 4 Response Test Graph of a 10 mg/L Benzene Solution Analyzed with MIP System Coupled to a PID Detector

standard cannot be reused throughout the day, it must be made fresh each time a response test is conducted.

9.3.4 Record the baseline, in micro-Volts, of each detector, the maximum peak height obtained during the test, and the trip time observed on the data acquisition unit (Fig. 4). The trip time is measured by timing the response of the detectors, starting when the probe is placed into the response test solution and ending when the response is first recorded on the acquisition unit. The peak height and base line data should be recorded digitally on the internal and/or external storage devices. The trip time is entered manually into the data acquisition system each time to account for change in flow or length of trunkline.

9.4 *Probe Advancement*—After a successful response test, position the direct push machine over the cleared location and anchor or level the machine as appropriate for the direct push machine being used for the logging operation. Place a split drive cap on the top of the rods to ensure the safety of the trunkline ascending out of the drive rods.

9.5 Attach the stringpot and all necessary cables to the direct push machine and the data acquisition system.

9.6 Zero the depth of the MIP by driving the tip into the subsurface aligning the membrane with the ground surface.

9.7 Turn the trigger, located on the data acquisition unit, to the ON position. The data acquisition system is now ready to obtain data. Any downward movement will now be recorded.

9.8 The MIP tool string is driven into the subsurface at a rate in which the temperature of the probe can stay constant. Typically the probe is driven into the subsurface at 1 foot per minute. Example: If 20 seconds is needed to advance the MIP 1 foot, then a 40 second wait time should be used before the MIP is advanced to the next interval. Advance the probe to the predetermined depth or until refusal. The rate of advancement is important for the consistent diffusion of contaminants through the membrane. Consistency of this diffusion enables comparison of depth intervals.

9.9 MIP logs are displayed on screen as the probe is advanced to depth. MIP data is stored and saved within the acquisition unit every 0.05 feet. Data points saved on the acquisition unit are all in reference to depth from surface. Detector data and lithologic data may be printed in the field for on-site decision making (Fig. 5). Other data graphed versus depth include rate of advancement, temperature of the probe, and carrier gas pressure of the system (Fig. 6).

9.9.1 Record in the field notes any observations of bore hole irregularities, pressure differences of the carrier gas, temperature fluctuations and any detector anomalies.

9.9.2 The MIP should be advanced at a consistent rate. Any extended periods at a depth interval can change the relative response and should be recorded in the field notes.

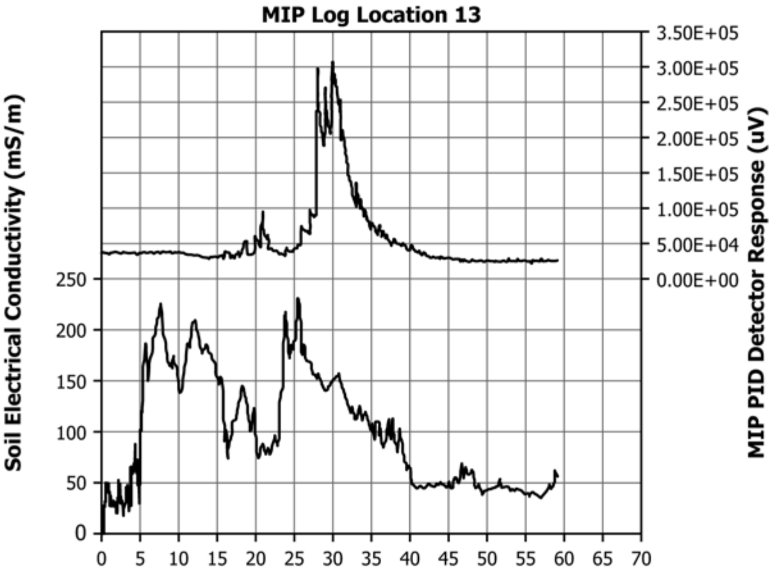
9.10 *Removal from the Subsurface :*

9.10.1 Before removing the MIP from the subsurface, pause at the terminal depth for a period equal to three times the measured trip time. This allows data from the final probe position to be recorded to the appropriate depth in the data acquisition system.

9.10.2 Set the trigger to the OFF position and use the direct push machine to remove the MIP from the subsurface. It may be necessary to turn the heater off for removal if an elevated amount of contaminant was encountered at the location. Turning off of the heater allows for cooling of the membrane and minimizes diffusion of the contaminant into the system during removal.

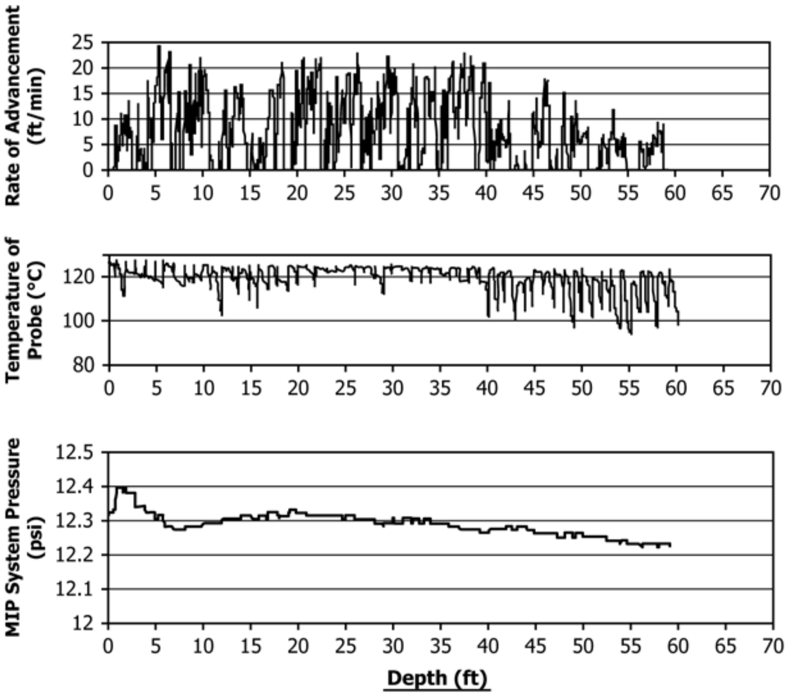
9.10.3 Upon complete removal of the probe, clean the membrane with water and a wire brush, turn on the heater, and place the probe back into the clean water in preparation for response testing with a newly prepared working standard.

9.10.4 Record baseline readings and complete another response test as outlined in Section 8. Compare the results of the response tests, noting any major differences in trip time or peak response.



NOTE 1—An MIP PID log obtained at a petroleum-contaminated site is graphed in the upper half of this diagram. Detector response in microvolts (µV) is on the right (y) axis and EC on the left with probing depth on the bottom (x) axis. An increment of one foot per minute was used in the advancement of the MIP probe with no contaminant encountered until the 17 ft depth interval. Significant PID response was observed at the 26–35 ft interval. Detector response returned to baseline below the 45 ft interval. An electrical log obtained during MIP probe advancement is shown graphed below the MIP-PID detector results. Lower conductivity readings (20–23 ft depth interval and 39–59 ft depth interval) indicate coarse grain units (for example, sand) and possible higher permeability zones. The elevated conductivity readings (5–16 ft depth interval and 23–31 ft depth intervals) indicate fine-grain units (for example, clay) and lower permeability zones.

FIG. 5 MIP Log



NOTE 1—Rate of Advancement, Temperature, and Pressure are other parameters logged with the PID and EC results of Fig. 5. The rate of advancement (top diagram) gives indication of the density of a material. The slower the rate (for example, 42–45 ft depth increment) indicates a dense zone of material. The temperature graph (middle diagram) is used to monitor the temperature of the membrane. The temperature graph is needed to ensure the membrane temperature stays consistent throughout the MIP push. MIP system pressure is graphed (lower diagram) to monitor carrier gas fluctuations. Fluctuations in pressure can change the trip time. This change could cause the contaminant to be graphed at the wrong depth.

FIG. 6 MIP Log

9.10.5 Properly abandon open borehole by grouting as per Guide D5299.

10. Report

10.1 The following information should be included in the field report. Refer to the form in Appendix X1.

10.1.1 Facility name, location and site contacts,

10.1.2 Date and Time the log is obtained,

10.1.3 MIP Contractor, MIP field technician and assistants,

10.1.4 File name of the MIP logging location and depth of final penetration,

10.1.5 File name of the pre-log response test along with test compound used and concentration,

10.1.6 File name of the post-log response test along with test compound used and concentration,

10.1.7 Equipment used in the investigation (gas phase detectors, flow rate and type of carrier gas, probe serial number, data acquisition unit, MIP controller, etc.), and

10.1.8 Site and location specific information relevant to the project. (for example, Petroleum UST, dry cleaning shop, dense till with cobbles, etc.).

11. Precision and Bias

11.1 *Precision*—Test data on precision is not presented due to the nature of this test method. It is either not feasible or too costly at this time to have 10 or more agencies participate in an in situ testing program at a given site.

11.2 *Bias*—There is no accepted reference value for this test method, therefore, bias cannot be determined.

12. Keywords

12.1 CPT; direct push; electrical conductivity; membrane interface probe; MIP; soil investigations; VOC; volatile organic contaminants

ANNEX

(Mandatory Information)

A1. REMOVAL AND REPLACEMENT REQUIREMENTS FOR MIP MEMBRANES

A1.1 Introduction

A1.1.1 This annex describes procedures and requirements for removing and replacing the MIP membrane.

A1.1.2 A membrane is operational if the response test signal (µV) of a compound is twice that of the baseline noise and if the flow of the system has not changed more than 3 mL/min from the closed couple flow of the system.

A1.2 Removal of a Membrane

A1.2.1 Turn off the heater power switch and allow the block to cool to 50°C or less.

A1.2.2 Clean the heater block and probe to remove any debris that may interfere with removal of the membrane or clog small gas ports in the block.

A1.2.3 Remove the membrane with the membrane wrench from the MIP service kit (Fig. A1.1). Keep the wrench parallel to the probe while removing the membrane to ensure proper engagement with socket head cap screw.

NOTE A1.1—Do not leave the membrane cavity open for extended periods of time. Debris can become lodged in the gas openings and affect the flow of the system.

A1.2.4 Remove and discard the copper washer. The copper washer conforms to a membrane and may not seal with a new membrane inserted.

A1.2.5 Inspect the open cavity for any foreign particles. Remove if necessary.

A1.3 Installation of Membranes

A1.3.1 Insert the new copper washer into the cavity. Ensure that the washer is setting flat on the base of the cavity.

A1.3.2 Install the new membrane by threading it into the socket. Use the membrane wrench to tighten the membrane to a snug fit.

A1.3.3 As the membrane is being inserted into the socket, a flow meter must be attached to the up-hole tubing to measure the flow of the MIP system. A minimum flow of 3 mL/min difference from the closed couple measurement is required to ensure a proper seal. If a minimum flow of 3 mL/min is not achieved, then more torque is applied to the membrane to further seal the membrane.

A1.3.4 Run a response test as per Section 8.

FIG. A1.1 Membrane Wrench Shown with Membrane Removed Exposing the Sub-Membrane Fittings

APPENDIX

(Nonmandatory Information)

X1. MIP FIELD INFORMATION FORM

SITE INFORMATION

Site Name: ____________________

Location Name: ____________________

Date: ____________________ Time: ____________________

MIP Operator: ____________________

MIP Contractor: ____________________

INSTRUMENT INFORMATION

Detectors Used: ____________________

Probe Type: MP4510 MP6510

Probe S/N: ____________________

LOGGING INFORMATION

MIP File Name: ____________________

Pre-Log Response Test File Name: ____________________

Response Test Compound: ____________________ Concentration: ____________________

Trip Time (seconds): ____________________

Final Depth of Penetration: ____________________

Post Log Response Test File Name: ____________________

Response Test Compound: ____________________ Concentration: ____________________

Trip Time (seconds): ____________________

OBSERVATIONS

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