



WDA

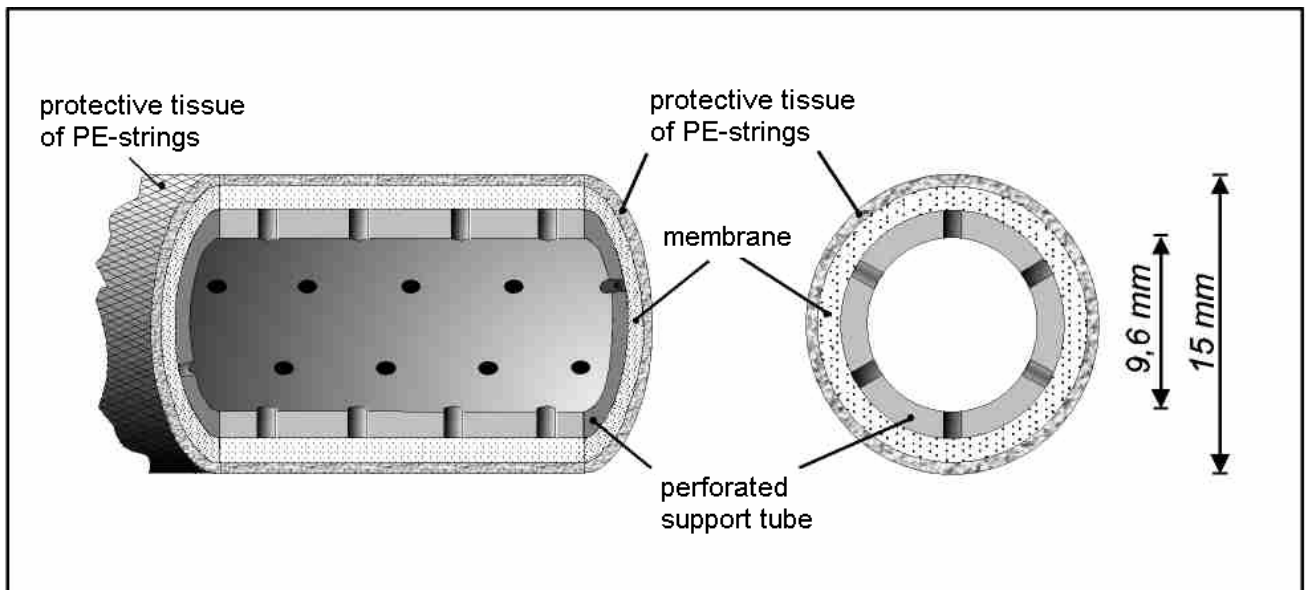
Introducing
GASSYS

GASSYS

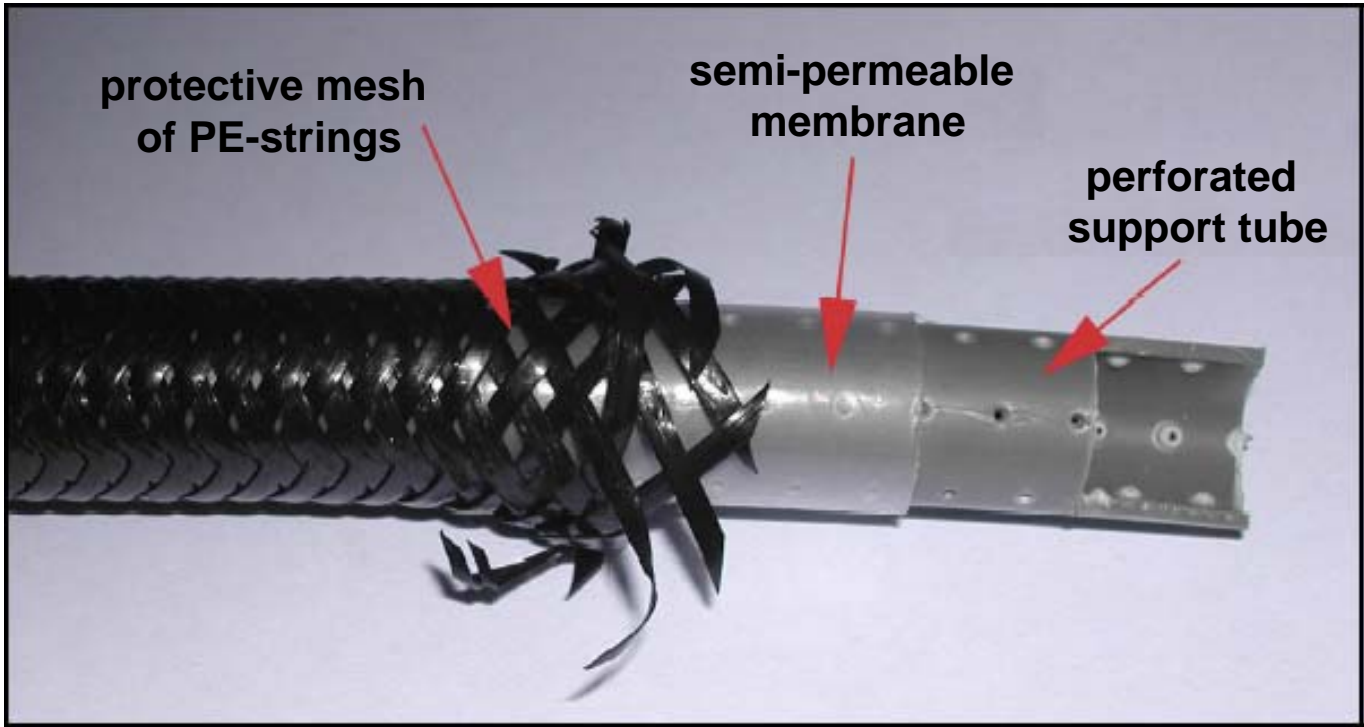
A unique in-situ and passive gas sampling system for soil and groundwater

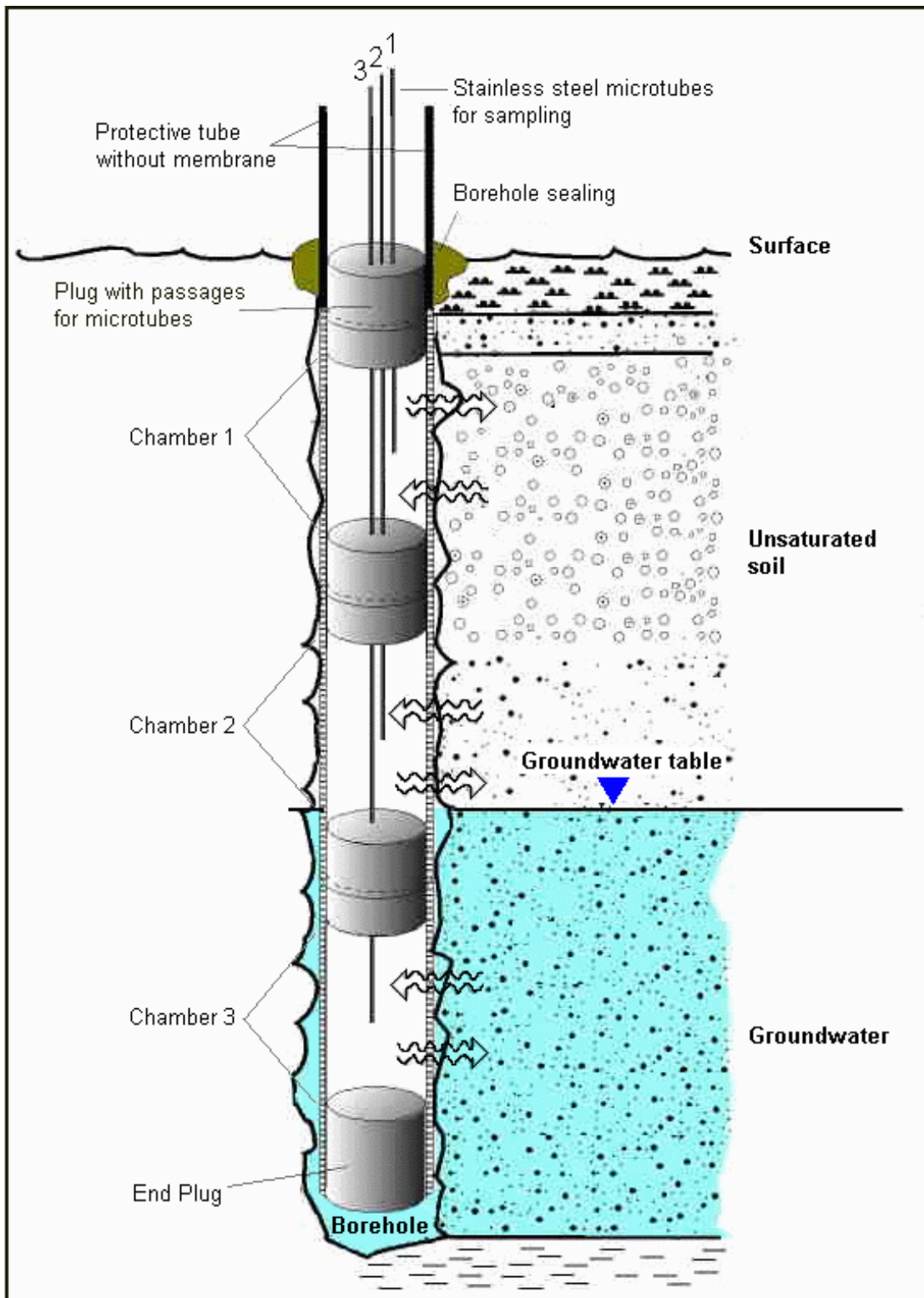
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Basics of GASSYS design

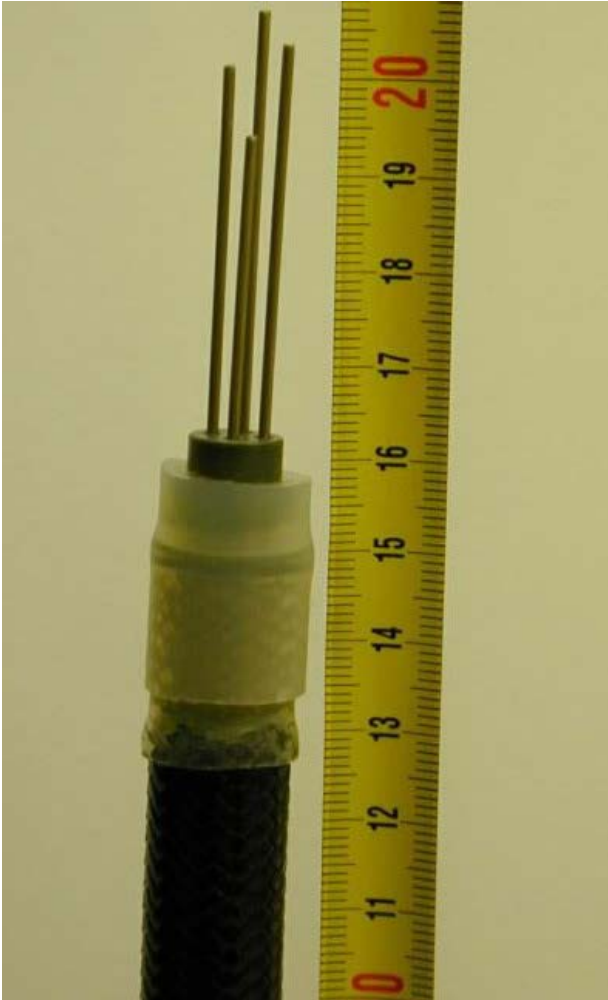


Schematic diagram of membrane tube used for GASSYS developed in Germany by Siemens AG



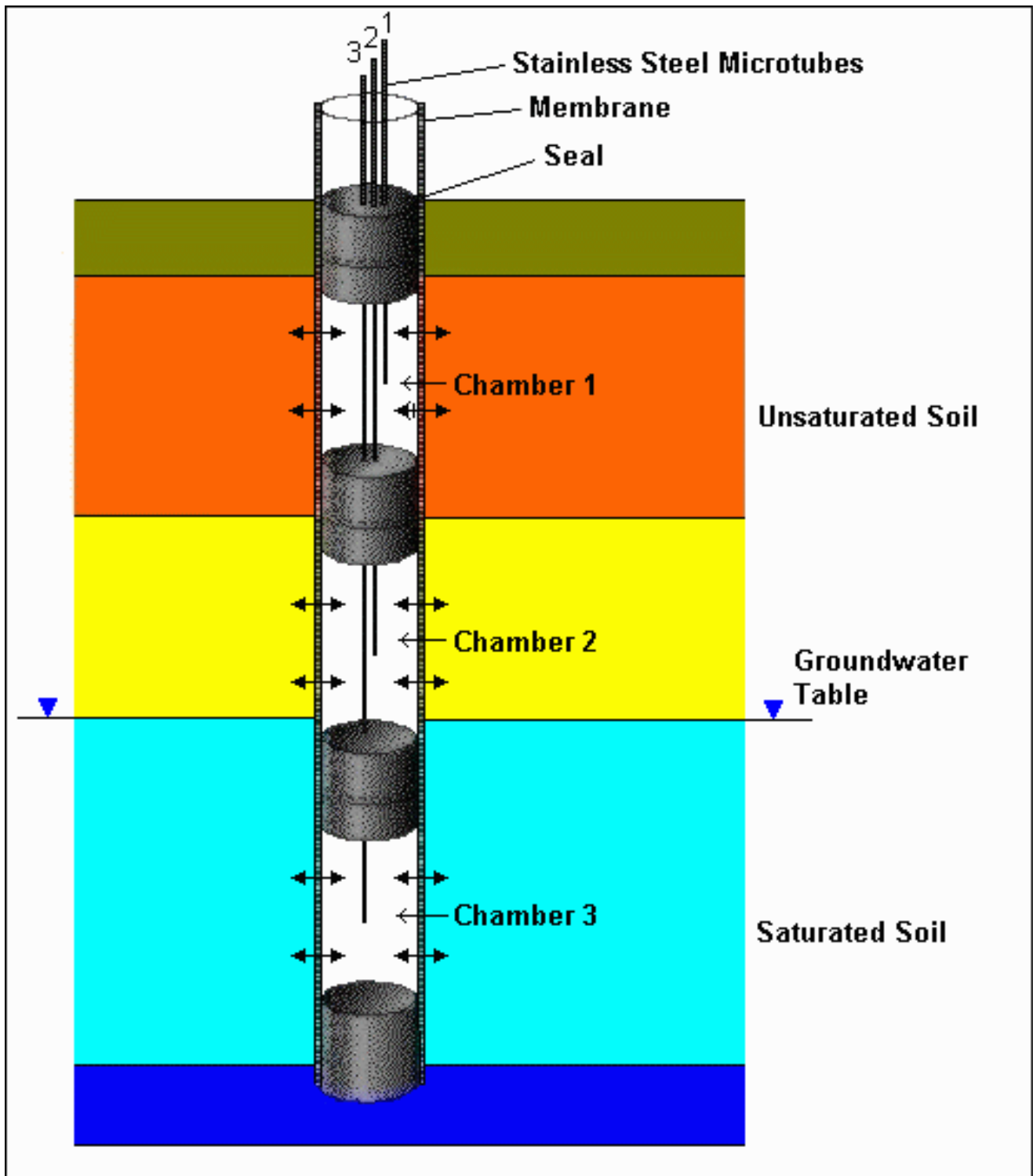


Schematic diagram of a GASSYS unit with three collection chambers arranged by layer. Gas enters and leaves these chambers by diffusion to maintain a continual equilibrium with the surroundings.



Top end of GASSYS installation showing the stainless steel microtubes for taking samples from four distinct collection chambers.

Field installation of GASSYS



Field installation of GASSYS unit with three collection chambers.

Dedicated small-diameter hole on a landfill



Drilling a small diameter hole with a hydraulic hammer. This drilling method can be used in tight spots. Other small diameter drilling systems could also have been used.



Driving of small-diameter installation casing into borehole.



Removal of lost tip of the installation casing.



GASSYS hose with two semipermeable collection chambers prepared for installation. The hose system is inserted into the installation casing.



Pulling of the installation casing.
Installed GASSYS hose remains in place.



Small-diameter installation casing has been drawn.
Protective tube is shown (see Figure 6).



Inner protective surface casing has been installed.



Outer protective surface casing has been installed.



Outer protective surface casing with cap open.



Outer protective surface casing with cap closed.

Installations at industrial sites



Installation of GASSYS at a large-diameter remediation well.

Screen of well (blue), screen of 2" piezometer (black), and chamber of GASSYS system (black/blue, diameter 15mm) are on same level, allowing for concordant sampling of groundwater and gas in groundwater.



Bottom of GASSYS tube (black/blue) attached to screen of a remediation well (blue) with nearby screen of 2" piezometer (black).



Installation of riser pipes of GASSYS and 2" piezometer (black) along pipe of remediation well (blue).



GASSYS installation above ground at a plant site.



GASSYS installation above ground.



Access to GASSYS installation above ground.



Access to installation below ground in a paved area at a plant site.



Access to GASSYS installation below ground in the field.



Oblique installation at a plant site.

Sampling of gas



Sampling set to collect gas samples from GASSYS.



Sampling at a plant site.



Evacuation of air from a headspace vial.

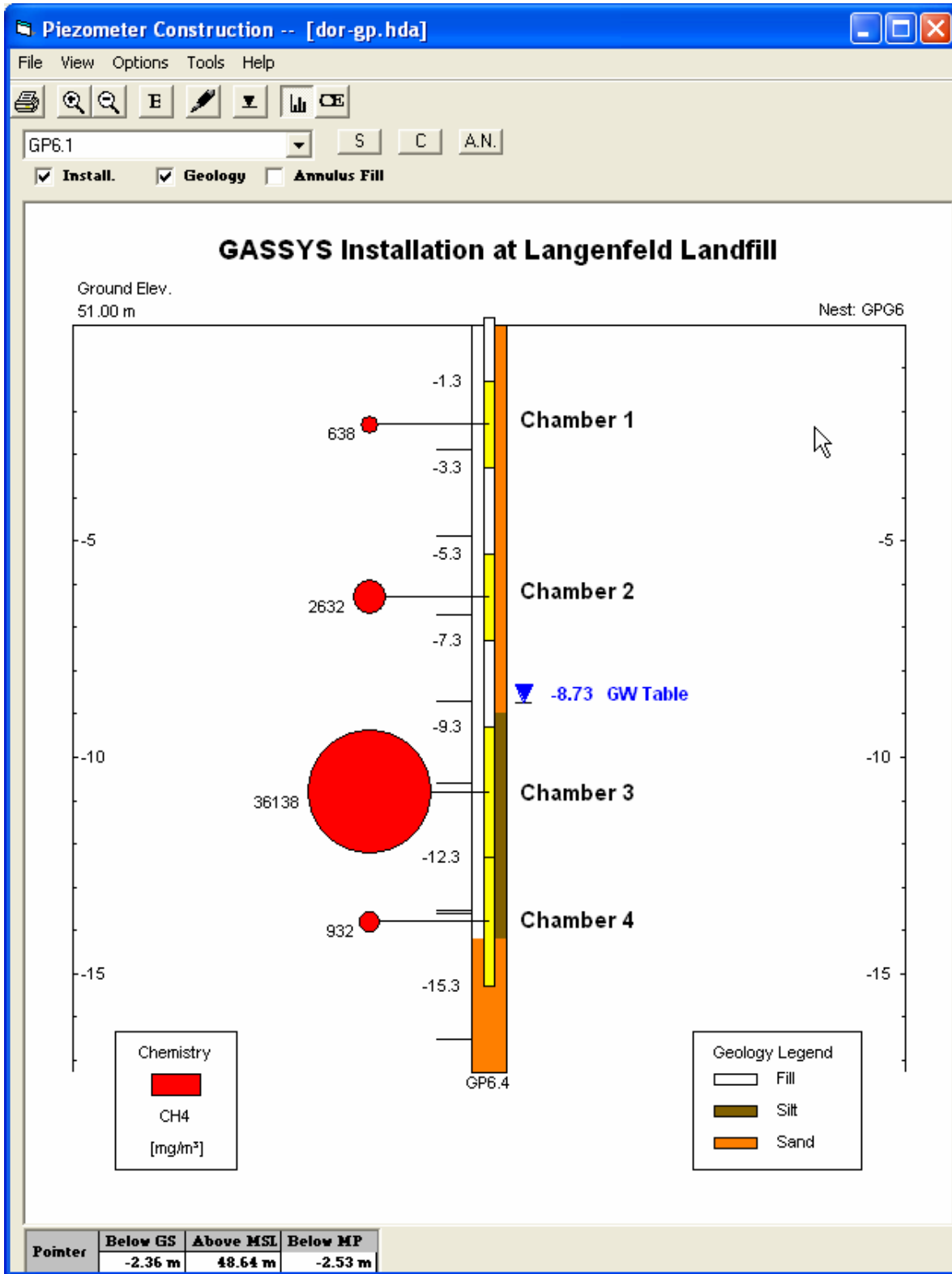


Evacuation of gas from a GASSYS collection chamber by means of a special syringe.
Pressure meter in front.



Insertion of gas sample into headspace vial.
The sample should be transported to the lab
promptly for next-day analysis.

Example of methane content in
unsaturated soil and in groundwater



Results of methane sampling above and below the groundwater table at a landfill site, as presented by WDA's program HYDRODYNAMIK [HD].

Range of gases sampled thus far

acetone	cyclohexanone	freon-21	oxygen
acrylonitrile	dibutyl ether	freon-113	pentanol
ammonia	dichloroethane	freon-502	pentyl acetate
benzene	dichloroethene	gasoline	propane
n-butane	dichloromethane	halon-1211	iso-propanol
iso-butane	diesel fuel	halon-1301	phenyl methanol
butanol	diethyl ether	heating oil	styrene
butanone	dimethylamine	n-hexane	tetrachloroethene
butyl acetate	dioxane	hydrogen	tetrahydrofuran
carbon dioxide	ethane	hydrogen sulfide	toluene
carbon	ethanol	methane	trichloroethane
monoxide	ethyl acetate	methanol	trichloroethene
chlorine	ethene	methyl acetate	trichloromethane
chloromethane	ethylene oxide	methyl ethyl	vinyl chloride
chloropicrin	formaldehyde	ketone	xylene
crude oil	freon-11	methyl mercaptan	
cyclohexane	freon-12	nitrogen dioxide	
		n-pentane	

Range of gases sampled thus far within EVA collection tubes.

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WDA Consultants is the distributor of GASSYS for the Americas.