



The Waterloo Membrane Sampler™ (WMS™) for Monitoring VOCs in Sewer Gas



The Waterloo Membrane Sampler™ (WMS™) is a passive permeation sampler for quantitatively measuring time-weighted average concentrations of volatile organic compound (VOC) vapors. Commercially available since 2010, the WMS™ incorporates a polydimethylsiloxane (PDMS) membrane across the face of a vial filled with a sorbent medium. The WMS™ has been demonstrated and validated for vapor intrusion assessment (ESTCP 2014) and is supported by many peer-reviewed scientific articles (see references below). The WMS™ is specifically well designed for VOC sampling in sewer headspace, an emerging component of vapor intrusion assessment.

The WMS™ is deployed at a sampling location for a measured amount of time (T), during which volatile organic compound (VOC) vapors permeate through the membrane at experimentally measured uptake rates (UR) and are retained by the sorbent. Once returned to the analytical laboratory, the mass (M) of each compound is determined by GC-MS. The concentration (C) is calculated using the equation:

$$C = \frac{M}{T \times UR}$$

WMS™ ADVANTAGES COMPARED TO CANISTER SAMPLES:

- Sampling protocols are simple and rapid
- Time weighted average concentrations (typically 1 week duration)
- Sampler and hanger are small and easy/inexpensive to ship
- Inexpensive to replace in the event of damage or loss

WMS™ ADVANTAGES COMPARED TO OTHER PASSIVE SAMPLERS:

- The membrane is waterproof and protects the sorbent from bias due to water sorption or saturation
- Uptake rates have been determined for a wide range of compounds and are predictable for many more
- Uptake rates are not very sensitive to temperature, air velocity or moisture levels
- Very strong sorbent provides high adsorptive capacity if elevated VOC concentrations are encountered
- Available in different configurations to meet specific sampling objectives and conditions

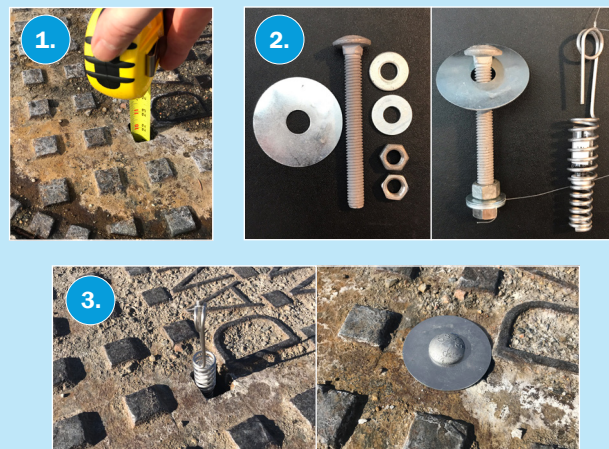
WMS™ ADVANTAGES SPECIFICALLY FOR SEWER GAS SAMPLING

- The hydrophobic PDMS membrane repels water in humid conditions and has a low partition coefficient for methane (CH₄) and hydrogen sulfide (H₂S) minimizing their potential interference.
- Sampling is quick and simple (see suggested deployment procedure below)
- The WMS™ can remain in place over multiple days, reducing uncertainty from temporal variability
- The WMS™ can be deployed in the sewer without impeding overhead traffic
- The WMS™ provides adequate sensitivity
 - Reporting limits for tetrachloroethene (PCE) and trichloroethene (TCE) are less than 2 µg/m³ for a 7-day sampling interval
 - The sample duration can be longer or shorter to provide lower or higher reporting limits as needed.

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SUGGESTED DEPLOYMENT PROCEDURE FOR WMS™ SEWER GAS HEADSPACE SAMPLING

**Cost-effective, quantitative sampling
and analysis for VOCs in humid, variable
temperature and complex matrix
environments such as sewer headspace**



1. Consider access agreements, road-traffic safety precautions, community awareness, regulatory approvals and other preparations on a case-by-case basis and secure all necessary and appropriate approvals. Consider traffic control, safety cones, police escort or additional safety measures as appropriate.
2. Measure the depth from the underside of the manhole to the water level using a water level meter or measuring tape (see Photo 1).
3. Cut the nylon line provided with the WMS™ to a length approximately one foot shorter than the measured depth-to-water to protect it from being submerged due to water-level fluctuations. Attach the WMS™ hanger to one end of the nylon line and verify that the knot is secure. Remove the WMS™ from its packaging and insert it into the hanger (see instructions provided with the sampler).
4. Where the manhole cover has holes large enough to fit the WMS™ hanger:
 - a. Secure the nylon line to a carriage-bolt by wrapping several times around the bolt, and toqueing between two flat washers compressed between two nuts (Photo 2).
 - b. Pull on the nylon to verify that it does not come off.
 - c. Lower the WMS™ through the hole in the manhole lid and lower until carriage bolt rests on manhole cover (Photo 3).
5. Where the manhole cover does not have a hole large enough to fit the WMS™ hanger:
 - a. Fasten the line to a tether that can be “pinched” by the manhole cover when it is set back down in place but will not be damaged by traffic. Leave a small part of the tether available to be grasped with plyers for retrieval.
6. Leave sampler deployed for appropriate amount of time to yield concentration reporting limits equal to or lower than applicable or relevant and appropriate screening levels. Consult with your analytical laboratory on guidance for deployment duration and/or visit www.waterloomembranesampler.com to use the sampler duration calculator.
7. Retrieve the WMS™ by either:
 - a. Slowly lifting on carriage bolt to retrieve the WMS™ where the manhole cover has holes, or
 - b. Pinch tether with pliers, lift lid and withdraw WMS sampler where lid has no holes. Replace lid securely.
8. Replace the WMS™ sampler in the overpack vial and bubble-wrap protective packet (see instructions provided with the sampler).
9. Complete a Chain of Custody form, specifying the sample numbers and analytical method and ship to the analytical laboratory at ambient temperature following their protocols.



FOR MORE INFORMATION ON WMS™ CONTACT

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FOR WMS™ MEDIA AND LABORATORY ANALYSIS, CONTACT

Eurofins Air Toxics

1-800-985-5955

www.eurofinsus.com/AirToxics



References

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