

ENVIROMAIL # 32

October 2008



Analysis for 1,4-Dioxane in Catchment, Drinking, Recycled and Ground Water.

1,4-Dioxane is a colourless inflammable liquid that is miscible in water and reacts with Oxygen to form peroxide. 1,4-Dioxane has a World Health Organisation Guideline for Drinking Water Quality (2005) value of 50µg/L and is a chemical of concern that is receiving increasing attention in the Environment.

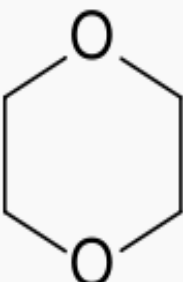

Following the recent completion of an R&D project, ALS is now able to offer trace analysis of dioxane in water matrices with other matrices soon to follow.

Background on 1,4-Dioxane

1,4-Dioxane (Dioxane) is primarily used as a stabiliser in chlorinated organic solvents in the manufacturing sector and should not be confused with the highly carcinogenic Dioxin group of chemicals. In addition to solvents, Dioxane can be found in fumigants and automotive coolant. Dioxane may also be an accidental by-product of condensing ethylene oxide or ethylene glycol during the production of certain consumer items resulting in trace contamination in personal care products such as some deodorants, shampoos, toothpastes and mouthwashes.

Dioxane is a known eye and respiratory tract irritant and is also classified as a class 2B carcinogen (possibly carcinogenic to Humans). Exposure to the solvent 1,4-Dioxane has also been directly linked to a number of deaths. Primary routes of ingestion of Dioxane are inhalation, ingestion and dermal contact.

In the environment, 1,4-Dioxane is highly soluble in Groundwater and does not readily bind to soils. In addition, 1,4-Dioxane is resistant to natural biodegradation. These properties can result in significant and mobile plumes, which, as a result has seen groundwater and surface water supplies adversely affected internationally with a number of cases in the USA.

1,4-Dioxane	
	
IUPAC name	1,4-Dioxane 1,4-Dioxacyclohexane
Other names	[1,4]Dioxane p-Dioxane

WHO Guidelines for Drinking Water Quality.

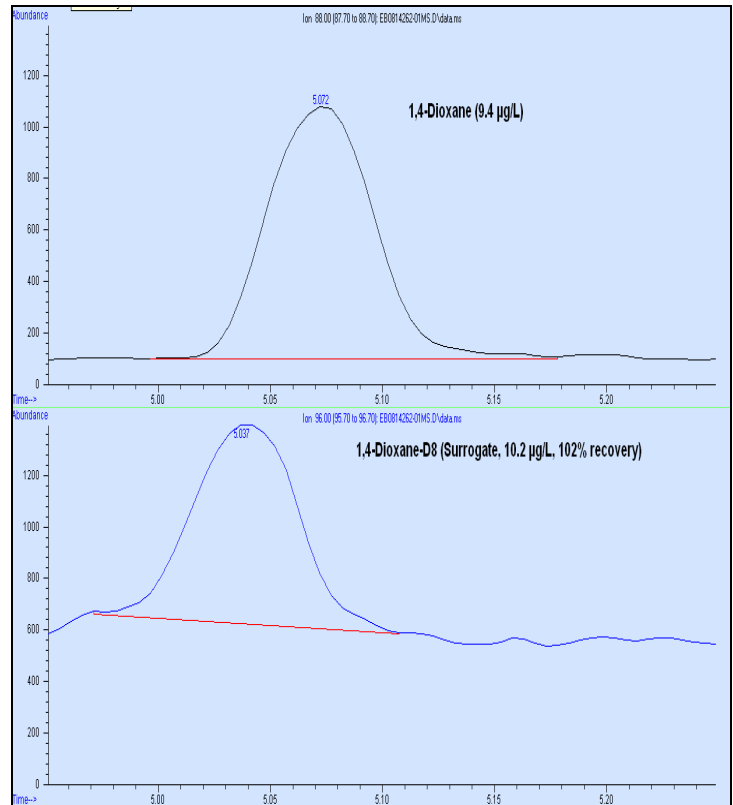
The World Health Organisation created the first draft Guidelines for 1,4-Dioxane in drinking water in 2005. The international Agency for Research on Cancer (1999) has classified 1,4-Dioxane as Group 2B (possibly carcinogenic to humans). While further studies are ongoing, the 2005 WHO guideline references a drinking water value (limit) of 50µg/L.

*Right solutions....
....Right partner*

Analysis by GC/MS

The analysis of 1,4-Dioxane is performed using specialised equipment including high sensitivity GC/MS with deuterated surrogates added to the sample and recoveries reported. Peak confirmation uses established qualifier ions as per USEPA protocols. The analytical methodology adopted by ALS is extremely sensitive and LORs of (0.5 µg/L) are offered - approximately 100 times lower than the WHO guideline.

This fully validated method currently being offered will soon be extended to additional matrices.



Chromatogram showing the response from 9.4 µg/L Dioxane in water, plus the equivalent surrogate

Table 1 – ALS Analytical Services

Analyte	CAS Number	ALS Method Code EP-116
		LOR (µg/L)
1,4-Dioxane	123-91-1	0.5

General Sampling Requirements

A further advantage of the ALS methodology is that the sample collection volume is minimised. Two HCl, Sodium Bisulphate or H₂SO₄ preserved 40ml vials (standard VOC vials) are sufficient for analysis. These vials should be submitted with zero headspace and chilled to 4°C as per standard protocol for VOC analysis to ensure data quality is not compromised. These vials if preserved with Sodium Bisulphate or H₂SO₄ will also facilitate shipment by air to allow timely reporting of results.

ALS Environmental

CLIENT / REFERENCE: _____

SAMPLED BY: _____

SAMPLE ID: _____

DATE / TIME: _____

Major analytes include:
**VOCs, BTEX, TPH (C6-C9),
 VHCs, MAHs, THMs.** ZERO HEADSPACE REQUIRED

This bottle contains traces of corrosive SODIUM BISULPHATE or SULPHURIC ACID which, prior to filling may prove HAZARDOUS. Consult the MSDS (www.alsenviro.com/download.html) for safe handling requirements.
 R04 - Causes burns
 S24/25 - Avoid contact with skin and eyes.
 S26 - In case of contact with eyes, rinse immediately with plenty of water and contact a doctor or Poisons Information Centre.

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For further information please contact the ALS Technical Manager or your local ALS team.

References:

- (1) Dioxane, <http://en.wikipedia.org/wiki/Dioxane>
- (2) WHO/SDE/WSH/05.08/120: 1,4-Dioxane in Drinking Water.

For further information on specialist Services please visit the ALS website: www.alsglobal.com

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