

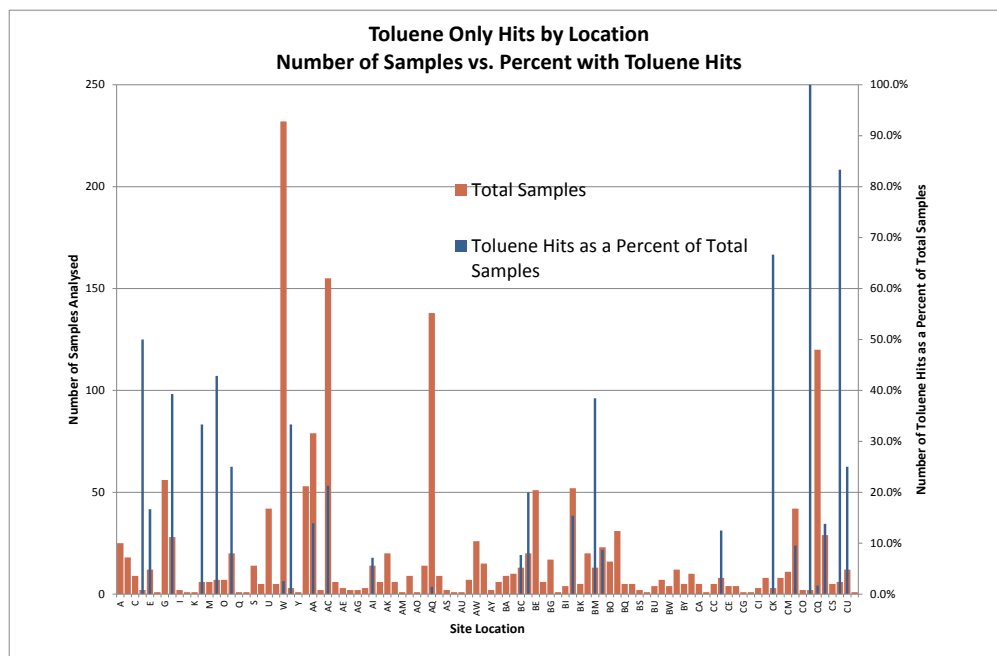
Toluene in Soil: Real or Artifact ?

TECHNICAL BULLETIN

In Canada, 2017 has seen the universal adoption of field methanol preservation for the analysis of volatile organic compounds (VOCs) in soils. Anecdotally, there appeared to be an increase in low level positive results (“hits”) for toluene. Maxxam suspected that methanol’s ability to act as a “sponge” for VOCs might increase the likelihood of contamination. Field procedures for sample collection must now take into account a larger number of potential sources of contamination, many of which may never have been considered before.

In an effort to verify whether the increase was real, Maxxam polled our database for a six month time frame prior and post introduction of field preservation with methanol. An increased frequency of low-level “hits” was identified. For example, in BC the frequency increased from 0.9% to 4.6%. Of the samples with toluene “hits”, 75% were between the RDL of 0.02ug/g and 0.05ug/g and 90% below 0.1ug/g. Further investigation showed the hits to be site dependent. 75% of sites had no hits, others up to 100% were positive for toluene.

Toluene is a widely used industrial chemical. It is also well known that toluene can also occur naturally in high organic soils; however, a number of the toluene “hits” occurred in sandy or rocky soils at sites with no history of toluene use.



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Thus, it must be concluded that in many cases, the strong potential for low level toluene being introduced somewhere in the sampling or analytical process. Further investigation undertaken to determine potential sources revealed the following:

- As the toluene “hits” were site dependent, this suggested transport or field sources rather than a laboratory problem;
- Laboratory method blanks associated with the “hits” were non-detect;
- Trip blanks, although submitted infrequently, were all non-detect. No field blanks were identified to have been submitted
- All of Maxxam’s standard container and methanol batch proofing procedures showed the vials to be VOC free when distributed.

The investigation was expanded to include other sampling materials. A key finding was that **packing tape often used to seal coolers and often used by field technicians to secure labels or bubble wrap can contain high toluene that may contribute to toluene artifacts (“hits).** Levels varied widely with brands and some examples are provided in the table below.

Tape Brand	Toluene mg/kg
U-Line S-6533	2800
Uline S 3267	20
Uline S2786	35
Uline S7593	625
Uline S119	5
Tartan Brand 369	5
Scotch Shipping	6
Uline S423	7
Cantech 257-00	3
IPG Acrylic (2008121)	0.038

In addition, most tape products tested contained traces of other VOC, but toluene was by far the principal VOC. One exception was the Cantech 257-00 which contained 13 mg/kg acetone.

Controlled experiments in the laboratory using the two highest toluene-containing tapes (U-Line S6533 & S7593) left in proximity to sealed methanol vials with septa caps over a 5 day period produced toluene hits well above the RDL, up to 0.16 ug/g, the equivalent of 8x the soil RDL of 0.02 ug/g. The effect was mitigated using solid cap vials but detectable levels below the RDL were still observed. The toluene concentrations reported in this study are comparable or greater than the low level “hits” identified in customer submitted samples.

In order to minimize the chance of the introduction of air borne toluene **Maxxam recommends the following:**

- **The use of low VOC tape for cooler sealing**, prior to shipment or submission of samples to the laboratory (*Maxxam studies show that Intertape Packing Group 2008121 is the lowest toluene containing product and performs equally well to other products*);
- **Avoid the use of packing tape on contents going into the cooler** (*Maxxam studies show that bubble wrap and zip lock bags are toluene free*);
- **Keep motor vehicles distant from the site and never store vials in motor vehicles.** Auto emissions are a major source of VOCs;
- **Conduct a regular program of Trip Blanks and Field Blanks;**
- Minimize the amount of time sample vials are open on site. (*Field blank samples should be left open for the same amount of time as the sample vials*).