

UNEXPECTED SOURCES

of Petroleum Hydrocarbons and Chlorinated Solvents in Indoor Air

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Indoor Air Evaluations

Indoor Air Evaluations are recommended as an advanced step in a VI investigation*

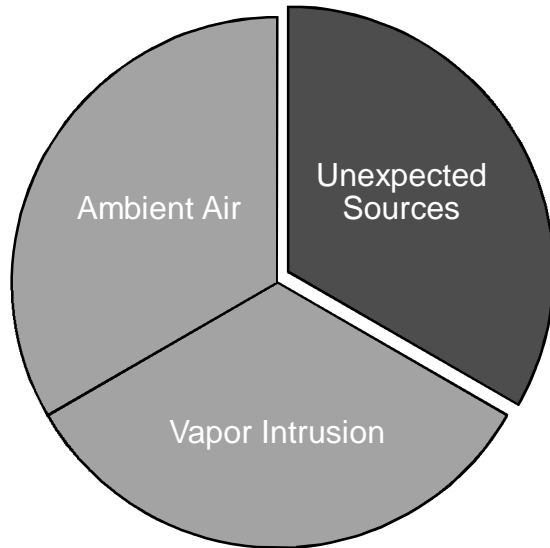
**There are situations when initial screening of the IA quality may be appropriate (i.e. buyer of a vacant warehouse wants to check for possible problems)*

Be prepared with the information you'll need to interpret the results

There are many things to be aware of and take into consideration before sampling, especially in an occupied space.



Occupied Spaces and Indoor Air



- Difficult to interpret the source of contamination found in indoor air results
- Be aware of unexpected sources of Petroleum Hydrocarbons and Chlorinated Solvents in indoor air

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Example of an Unexpected Source: Bloonies



Banned in Australia & NZ due to known toxicity levels – however, can still be found in America, usually in the cereal aisle!

Compound	Bloonies Yellow	Bloonies Red	Cancer (µg/m ³)	Noncancer (µg/m ³)
1,2,4-Trichlorobenzene	-	8,400	n/a	2.10
1,2,4-Trimethylbenzene	1,700	-	n/a	7.30
1,3,5-Trimethylbenzene	1,100	-	n/a	n/a
Benzene	960	1,200	0.310	31.00
Ethylbenzene	1,000	-	0.970	1,000.00
Toluene	1,300	5,000	n/a	5,200.00
Xylenes	3,800	15,900	n/a	100.00

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Disclaimers

- H&P is NOT a product testing company.
- H&P is NOT accusing any company of any wrongdoing; as far as we know, all of the companies that produce these products are in compliance with the regulations that apply to their industry.
- No claims about any brands are being made and any likeness to particular brands is unintentional.
- While we made an effort to collect blank QC samples and to collect and test these products in a controlled environment, simply put, we squeezed/squirted/poured about 1-2 mL of these products into 40mL VOA vials and analyzed the headspace a few days/hours/minutes later.

All screening values are per EPA RSLs Nov 2013

All values in this presentation are reported in $\mu\text{g}/\text{m}^3$

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Shaving Cream



- Daily use product
- Hair removal cream had over 27,000 $\mu\text{g}/\text{m}^3$ TPH Aliphatics.
- REMINDER: NOT appropriate for a leak check compound

Compound	Shaving Cream	Cancer ($\mu\text{g}/\text{m}^3$)	Noncancer ($\mu\text{g}/\text{m}^3$)
Benzene	389	0.310	31.00
Toluene	789	n/a	5,200.00
Ethylbenzene	77	0.970	1,000.00
Xylenes	142	n/a	100.00
Naphthalene	104	0.072	3.10
Hexachlorobutadiene	89	0.110	n/a

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Lotions and Sunscreen



Compound	Sunscreen	Body Lotion	Cancer (µg/m ³)	Noncancer (µg/m ³)
Ethanol	110,000	150	n/a	n/a
Ethyl acetate	11,000	-	n/a	73.00
MTBE	48	-	9.400	3,100.00
TPH (C5-C11)	93,000	2,800	n/a	n/a
(C5-C8) Aliphatics	-	1,200	13.000	630.00
(C9-C10) Aromatics	640	-	n/a	3.10
(C9-C12) Aliphatics	39,000	4,400	0.540	100.00

Lotions

- Sunscreen
- Mildly scented body lotion

Sunscreen FAQ: An aerosol sunscreen was recalled for fire hazards. People were applying it then going to a heat source (grill) and combusting.



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Shampoo & Conditioner

- Middle shelf brand
- According to European and Canadian reports, carcinogens are in almost every brand



Compound	Shampoo	Conditioner	Cancer (µg/m ³)	Noncancer (µg/m ³)
1,4-Dioxane	87	-	0.490	31.00
Chloromethane	170	88	n/a	94.00
Ethyl acetate	6,500	120	n/a	73.00
Isopropylbenzene	-	280,000	n/a	420.00
(C9-C12) Aliphatics	11,000	32,000	0.540	100.00

Again, a Daily Use Product!

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Fish Oil Vitamins



Heart Health x 2 = 2,400 mg

- Broke open (2) pills, squeezed the supplement into the VOA, dropped in both capsule casings, and closed the lid.

Compound	Fish Oil	Cancer ($\mu\text{g}/\text{m}^3$)
1,3-Butadiene	39	0.081
Benzene	19	0.310

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Baby Wipes

Testing Procedure

- A syringe was pushed into the packaging and a sample was pulled from the interior "headspace" into the syringe, which was immediately injected into the instrument.

Compound	Baby Wipe 1	Baby Wipe 2	Cancer ($\mu\text{g}/\text{m}^3$)
Benzene	17	21	0.310

Two different brands of baby wipes were tested with similar results. Is it from packaging, material, or soap?



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Dish Soap

- Daily use product, even multiple times a day
- Also contained a large amount of Ethanol (happy dishwashers)
- Take into consideration for homes, office break rooms, as well as restaurant kitchens



Compound	Dish Soap	Cancer ($\mu\text{g}/\text{m}^3$)
Benzene	19	0.310
Ethylbenzene	25	0.970
Naphthalene	31	0.072
Hexachlorobutadiene	29	0.110
1,3-Butadiene	7	0.081
1,4-Dioxane	2,100	0.490

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Hand Cleanser/Scrub

Pumice Hand Cleanser

- Used by many contractors (environmental, construction, automotive, etc)
- Refrain from using prior to and during sampling



Compound	Pumice Cleanser	Cancer ($\mu\text{g}/\text{m}^3$)	Noncancer ($\mu\text{g}/\text{m}^3$)
Benzene	27	0.310	31.00
(C5-C8) Aliphatics	16,000	13.000	630.00
(C9-C12) Aliphatics	34,000	0.540	100.00


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Shoe Closet

Casual Shoes
C5-C8 Aliphatics

Sport Shoes
C5-C12 Aliphatics
C6-C8 Aromatics
Ethylbenzene, Xylenes

Polish/Waterproofing
C5-C12 Aliphatics
Trichloroethene
1,3 Butadiene



Compound	Shoe Polish/ Waterproofing	Cancer ($\mu\text{g}/\text{m}^3$)	Noncancer ($\mu\text{g}/\text{m}^3$)
Trichloroethene	55	0.430	2.10
1,3-Butadiene	25	0.081	2.10

TCE Short Term Exposure – 2 $\mu\text{g}/\text{m}^3$ for only 24 hours during first trimester

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Caulking & Sealants

Not any major health concerns, but...

- Large amounts of background contamination that one may attribute to lab contamination (i.e. TBA, 2,2,4-TMP, etc).
- Although Siloxanes are not target compounds, they interfere with the Internal Standards on a TO-15 analysis.

Compound	Caulk 1	Caulk 2	Cancer ($\mu\text{g}/\text{m}^3$)	Noncancer ($\mu\text{g}/\text{m}^3$)
2,2,4-Trimethylpentane	130,000	-	n/a	n/a
Isopropyl Alcohol	69,000	-	n/a	7,300.00
Toluene	27,000	-	n/a	5,200.00
TBA	-	31,000	n/a	n/a
TPH gas (C5-C11)	2,800,000	not tested	n/a	n/a
Siloxanes*	loaded	not tested	n/a	n/a



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Natural Gas

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Compound	NG CC	NG NN	NG SB	NG HT	NG EW	Cancer (µg/m ³)	Noncancer (µg/m ³)
Benzene	470	2,200	270	49,000	20	0.310	31.00
Cyclohexane	1,300	1,700	750	42,000	48	n/a	6,300.00
Ethylbenzene	35	160	-	3,500	10	0.970	1,000.00
m,p-Xylene	180	870	36	16,000	40	n/a	100.00
n-Heptane	1,000	5,000	460	51,000	29	n/a	n/a
n-Hexane	3,100	7,600	1,700	76,000	160	n/a	730.00
o-Xylene	56	180	-	3,600	12	n/a	100.00
Propene	21,000	56,000	-	-	-	n/a	3,100.00
Toluene	380	2,600	150	50,000	58	n/a	5,200.00
Methane & TPH	yes	yes	yes	yes	yes	-	-

Air Fresheners

Various Forms/Tests

- Scented oil plug (flux chamber)
- Scented solid (flux chamber)
- Scented Spray (directly into VOA)
- Scented Spray (in a bathroom, door closed and air sampled minutes later)



Images courtesy of EPA.gov

Values in ug/m3

Heated Oil
Toluene
TPH C5-11 (230,000)

Scented Solid
Ethylbenzene (3,400)
TPH C5-11 (390,000)

Spray in VOA
Ethanol (3,000,000+)
Ethyl Acetate
TPH C5-11 (290,000)

Spray in Room*
Low levels of Benzene &
Carbon Tetrachloride
(TPH not tested)

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Candles

Melted and Unmelted Wax tested

- Organic Beeswax (unscented)
- One test with melted wax poured into a VOA.
- Another test with solid wax placed in VOA.



Compound	Candle Burn	Candle	Cancer ($\mu\text{g}/\text{m}^3$)	Noncancer ($\mu\text{g}/\text{m}^3$)
Benzene	7,100	6	0.310	31.00
1,3-Butadiene	2,000	-	0.081	2.10
Ethylbenzene	90	-	0.970	1,000.00
Naphthalene	24	-	0.072	3.10

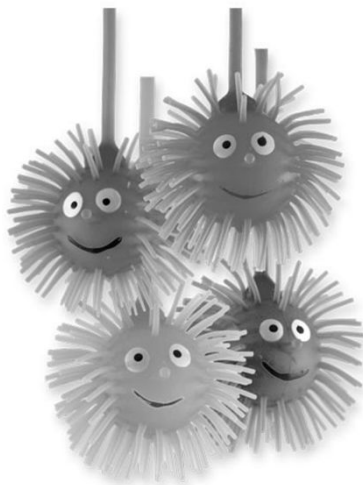
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Silly String



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Squeeze Toy



Compound	Toy	Cancer ($\mu\text{g}/\text{m}^3$)	Noncancer ($\mu\text{g}/\text{m}^3$)
Ethylbenzene	1,000	0.970	1,000.00
Xylenes	940	n/a	100.00
2,2,4-Trimethylpentane	52	n/a	n/a
(C5-C8) Aliphatics	7,100	13.000	630.00
(C6-C8) Aromatics	1,900	0.310	31.00
(C9-C12) Aliphatics	720	0.540	100.00

Benzene non-detect < 16 $\mu\text{g}/\text{m}^3$

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Modeling Clay

Compound	Clay 1	Clay 2	Cancer ($\mu\text{g}/\text{m}^3$)	Noncancer ($\mu\text{g}/\text{m}^3$)
Tetrachloroethene	430	18	9.400	42.00
Benzene	14	-	0.310	31.00
Ethylbenzene	25	76	0.970	1,000.00
Toluene	13,000	100	n/a	5,200.00
Xylenes	101	330	n/a	100.00
1,2,4-Trimethylbenzene	150	780	n/a	7.30



Two Types of Clay

- Tests performed because of confusion as to where PCE hits were coming from at a gas station?
- Lab contamination?

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Helium (Party Tank)



We tested two kinds of “party” helium with <1% impurities.

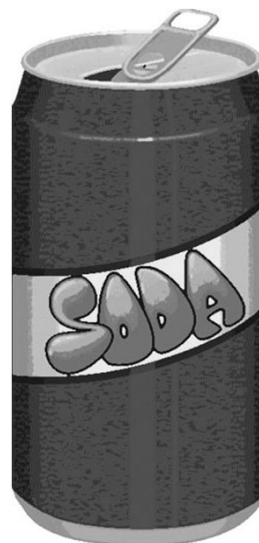
Compound	Helium 1	Helium 2	Cancer (µg/m ³)	Noncancer (µg/m ³)
Benzene	7	2	0.310	31.00
Ethylbenzene	8	7	0.970	1,000.00
Naphthalene	1	n/a	0.072	3.10
TPH gas (C5-C11)	n/a	600	n/a	n/a

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Soda Pop

Pop? Yes. I am from the Midwest.

Compound	Soda Pop	Cancer (µg/m ³)	Noncancer (µg/m ³)
(C5-C8) Aliphatics	260	13.000	630.00
(C9-C10) Aromatics	1,000	n/a	3.10
(C9-C12) Aliphatics	16,000	0.540	100.00

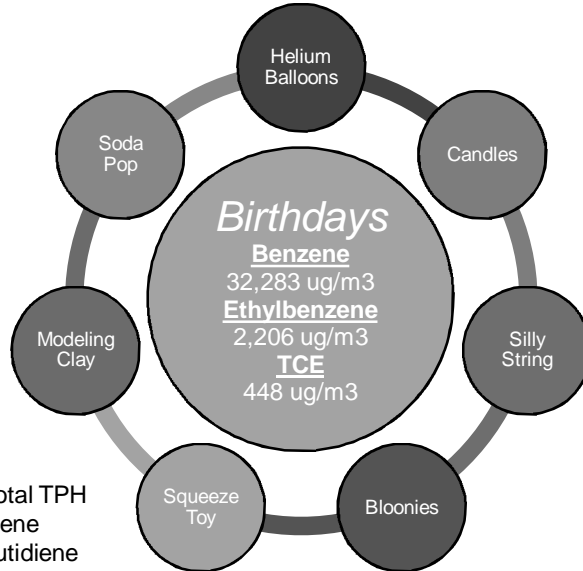


Interesting Fact:

It is a well studied fact that Benzene is in soda pop (combination of a benzoate preservative and citric acid, especially in warm/light conditions)

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Conclusion? Birthdays will kill you.



+7,027,580 Total TPH
+25 Naphthalene
+2,000 1,3-Butadiene

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Conclusion: Communication is Key

-
1. Communication with occupants before/during the sampling event
 2. Communication with the laboratory regarding analyte list and reporting limits

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Occupants: Do's and Don'ts...

...for ONE DAY



24 Hour DON'T Examples

- Don't have a birthday party
- Don't paint your walls
- Don't use air fresheners
- Don't park in the garage

Event the most experienced environmental consultants may miss something

Remember: Having a handle on occupant activities for one day is difficult, but manageable.

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Occupants: Do's and Don'ts...

...for A MONTH?!

LONG TERM SAMPLING: The push toward 21 Day Air Sampling brings in a whole new set of considerations



21 Day DO Examples

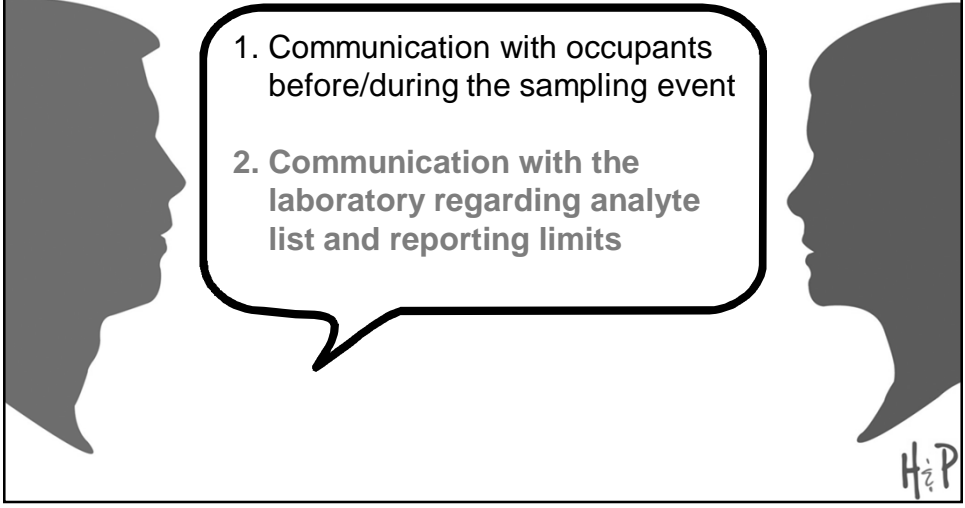
- You can have ONE birthday party

21 Day DON'TS: For 21 Days, no daily use products?

- Don't wash your hair
- Only do dishes once/week
- Absolutely no shaving
- How do you list everything?
- People's daily lives include chemicals of concern that can make it difficult to interpret data

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Conclusion: Communication is Key

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1. Communication with occupants before/during the sampling event
 2. Communication with the laboratory regarding analyte list and reporting limits

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Laboratory: Project Analyte List

**Report a Full VOC list, or create a project specific list with your lab?
Report as low as possible, or only as low as you need to achieve DQOs?**

Compounds detected in at least one of the 30+ products tested

1,2,3-Trichlorobenzene	Carbon disulfide	Isopropylbenzene (Cumene)	sec-Butylbenzene
1,2,4-Trichlorobenzene	Carbon tetrachloride	m,p-Xylene	Styrene
1,2,4-Trimethylbenzene	Chlorobenzene	Methyl tertiary-butyl ether (MTBE)	Tertiary-butyl alcohol (TBA)
1,3,5-Trimethylbenzene	Chloromethane	Methylene chloride (Dichloromethane)	Tetrachloroethene
1,3-Butadiene	Cyclohexane	Naphthalene	Tetrahydrofuran
1,3-Dichloropropane	Dichlorodifluoromethane (F12)	n-Butylbenzene	Toluene
1,4-Dioxane	Ethanol	n-Heptane	Trichloroethene
2,2,4-Trimethylpentane	Ethyl acetate	n-Hexane	Trichlorofluoromethane (F11)
2-Butanone (MEK)	Ethyl tertiary-butyl ether (ETBE)	n-Propylbenzene	Vinyl acetate
4-Ethyltoluene	Ethylbenzene	o-Xylene	TPH gas
Acetone	Hexachlorobutadiene	p-Isopropyltoluene	Low/Med Aliphatics
Benzene	Isopropyl Alcohol	Propene	Low/Med Aromatics

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In Summary

Occupant Communication

- Communication with occupants regarding products to avoid and products to disclose before/during the sampling event is key

Long Term Sampling Considerations

- Depending on the DQOs, long term sampling may make it more challenging to see through the everyday consumer products and properly assess the VI issue

Laboratory Communication

- Having a laboratory that can generate project specific analyte lists, proper RLs, and provide any additional sample information can be very helpful

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QUESTIONS?

Copy of the data set??

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