

# VOA Compound List Grouped by Surrogates

**Surrogate Definition:** Surrogates are compounds similar in chemical composition to the analytes of interest and spiked into environmental samples prior to preparation and analysis. They are used to evaluate extraction efficiency and matrix interference on a sample-specific basis. In order for this to work, surrogates must behave in the same manner as the corresponding analytes. Unfortunately, in practice, this equivalency is typically difficult to demonstrate and is often more assumed than empirically derived.

The matrix spike recovery is the best indicator of how a specific analyte performs in your samples. Unfortunately matrix spikes aren't performed on all sample. Surrogate recoveries will give you an overall indication of accuracy but are not analyte specific. When determining how a surrogate recovery may affect specific analytes one should consider the following:

**1. Check associated blank and BS/BSD data.** These surrogates should be within control limits.

If any of these surrogates are outside of control and the same surrogates are also outside of control limits in the associated samples then the problem is procedural and not the sample matrix. The batch should be reanalyzed.

**2. All surrogates within control limits:** Even though all surrogates worked within control limits, one cannot assume all analytes worked within control limits. Some analytes are notoriously poor performers (PP). Review BS/BSD and MS/MSD data. Not all analyte types are represented by surrogates.

**3. One or more surrogates outside of control limits:** For RCP and MCP work, when a surrogate is outside of control limits reanalysis is required, unless there is obvious interference from visual inspection of the chromatogram, to ensure the problem was not due to an instrument error. If reanalysis produces the same results then matrix interference is confirmed and results are reported with surrogates outside of control limits. Some things to consider:

1. Does the matrix or interference only affect the surrogate? (Rare)
2. Does the matrix or interference only affect analytes in the part of the chromatogram with the low surrogate? (See Project Narrative for details)
3. Is only a certain type of analyte affected by matrix or interference? Not every type of compound is represented with a surrogate. (Example: Ketones (K) not represented)

There are 4 VOA surrogates:

These surrogates best represent the halogenated hydrocarbons (H).

**Dibromofluoromethane(SURR)** is a halomethane.

**1,2-Dichloroethane-d4(SURR)** is a chlorinated hydrocarbon.

These surrogates best represents the aromatics (A)

**Toluene-d8 (SURR)** is an aromatic hydrocarbon.

**Bromofluorobenzene(Surr)** is a halogenated benzene.

The following tables are the breakdown of the VOA compounds according to their corresponding surrogates. They are grouped by type (structure) of organic compound. Compounds that are not similar (in structure) to a surrogate are listed on their own table. These compounds may not behave like the surrogates. Some compounds are qualified with "PP" to indicate they are poor performers. The poor performers include those compounds that do not purge efficiently, are reactive, show low response, or poor chromatographic behavior. Due to their unique chemical characteristics, compounds with the PP qualifier may not perform like the surrogates.

# VOA Compound List Grouped by Surrogates

Analyte	Retention Time	Type
<b>Bromofluorobenzene (SURR)</b>	<b>15.79</b>	<b>Surrogate</b>
<b>Toluene-d8 (SURR)</b>	<b>13.29</b>	<b>Surrogate</b>
1,2 Dichlorobenzene	17.43	A
1,2,3-Trichlorobenzene	20.19	A
1,2,4-Trichlorobenzene	19.54	A
1,2,4-Trimethylbenzene	16.78	A
1,3 Dichlorobenzene	17	A
1,3,5-Trimethylbenzene	16.4	A
1,4 Dichlorobenzene	17.06	A
2-Chlorotoluene	16.26	A
4-Chlorotoluene	16.33	A
4-Isopropyltoluene	17.06	A
Benzene	11.09	A
Bromobenzene	16	A
Chlorobenzene	14.71	A
Ethylbenzene	14.87	A
Isopropylbenzene	15.74	A
Naphthalene	19.9	A
n-Butylbenzene	17.46	A
n-Propylbenzene	16.15	A
sec-Butylbenzene	16.9	A
tert-Butylbenzene	16.69	A
Toluene	13.36	A
Xylene O	15.42	A
Xylene P,M	15.04	A

Analyte	Retention Time	Type
<b>1,2-Dichloroethane-d4(SURR)</b>	<b>10.44</b>	<b>Surrogate</b>
<b>Dibromofluoromethane(SURR)</b>	<b>9.93</b>	<b>Surrogate</b>
1,1,1,2-Tetrachloroethane	14.64	H
1,1,1-Trichloroethane	10.64	H
1,1,2,2-Tetrachloroethane	15.41	H
1,1,2-Trichloro-1,2,2-trifluoroethane	7.86	H
1,1,2-Trichloroethane	13.16	H
1,1-Dichloroethane	8.91	H
1,2,3-Trichloropropane	15.54	H
1,2-Dibromo-3-Chloropropane	17.92	H PP
1,2-Dibromoethane	13.94	H
1,2-Dichloroethane	10.53	H
1,2-Dichloropropane	11.74	H
1,3-Dichloropropane	13.4	H
1-Chlorobutane	10.61	H
2,2-Dichloropropane	9.89	H
Bromochloromethane	9.49	H
Bromodichloromethane	11.83	H
Bromomethane	5.91	H
Chloroethane	6.12	H
Chloromethane	4.99	H
Dibromochloromethane	13.7	H
Dibromomethane	11.7	H
Dichlorodifluoromethane	4.69	H
Hexachloroethane	18.01	H
Iodomethane	7.67	H
Pentachloroethane	16.52	H
Trichlorofluoromethane	6.92	H

A = Aromatic Hydrocarbon Compounds  
H = Halogenated Hydrocarbon Compounds  
PP = Poor Performers

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Analyte	Retention Time	Type
<b>No Representative Surrogate</b>		
2-Butanone	9.38	K PP
2-Hexanone	13.52	K PP
4-Methyl-2-Pentanone	12.61	K PP
Acetone	7.05	K PP
1,1-Dichloroethene	7.62	
1,1-Dichloropropene	10.84	
1,4-Dioxane	11.93	PP
1-Chlorohexane	14.61	
2-Chloroethyl vinyl ether	12.24	PP
2-Nitropropane	12.61	PP
Acrolein	6.89	PP
Acrylonitrile	7.66	PP
Allyl Chloride	7.91	
Bromoform	15.19	
Carbon Disulfide	8.11	PP
Carbon Tetrachloride	11.06	
Chloroform	9.8	
Chloroprene	9.33	
cis-1,2 Dichloroethene	9.56	
cis-1,3-Dichloropropene	12.52	
cis-1,4-Dichloro-2-butene	15.25	
Cyclohexane	10.97	
Diethyl ether	7.22	
Di-isopropyl ether	9.39	
Ethyl Methacrylate	13.37	PP
Ethyl tertiary-butyl ether	9.84	
Hexachlorobutadiene	19.93	
Methacrylonitrile	9.75	PP
Methyl Acetate	7.84	
Methyl Acrylate	9.82	
Methyl Cyclohexane	12.36	
Methyl Methacrylate	11.94	
Methyl tert-Butyl Ether	8.73	
Methylene Chloride	7.79	
Styrene	15.35	
Tertiary-amyl methyl ether	11.23	
Tertiary-butyl Alcohol	7.62	
Tetrachloroethene	14.09	
Tetrahydrofuran	10.17	PP
trans-1,2-Dichloroethene	8.61	
trans-1,3-Dichloropropene	12.98	
Trans-1,4-Dichloro-2-Butene	15.54	PP
Trichloroethene	11.78	
Vinyl Acetate	9.02	
Vinyl Chloride	5.27	

K = Ketone Compounds

PP = Poor Performers