

Diffusion Results for Rigid Porous Polyethylene Samplers

Table 1: Metals

Metals	14-day Deployment			21-day Deployment		
	Jar (mg/L)*	RPPS (mg/L)	% Migration**	Jar (mg/L)*	RPPS (mg/L)	% Migration**
Antimony	0.0878	0.0810	92%	0.0847	0.0799	94%
Arsenic	0.0840	0.0768	91%	0.0853	0.083	97%
Barium	0.0900	0.0845	94%	0.0884	0.084	95%
Beryllium	0.0855	0.0749	88%	0.0867	0.0787	91%
Cadmium	0.0885	0.0782	88%	0.0900	0.0829	92%
Chromium	0.169	0.152	90%	0.177	0.160	90%
Cobalt	0.0892	0.0797	89%	0.0918	0.0851	93%
Copper	0.148	0.0927	63%	0.546	0.276	51%
Nickel	0.871	0.628	72%	0.972	0.819	84%
Selenium	0.0715	0.0687	96%	0.0746	0.0744	100%
Silver	0.0466	0.0141	30%	0.0391	0.0147	38%
Thallium	0.0805	0.0858	107%	0.0890	0.0852	96%
Vanadium	0.0852	0.0762	89%	0.0872	0.0809	93%
Zinc	0.0968	0.104	107%	0.098	0.0972	99%

* 20 L Glass carboy

** Sampler concentration/Jar concentration X 100

Table 2: 1,4-Dioxane

1,4-Dioxane	14-day Deployment			28-day Deployment		
	Jar (ug/L)*	RPPS (ug/L)	% Migration**	Jar (ug/L)*	RPPS (ug/L)	% Migration**
	80	74	92.50%	64	67	104.69%

* 20 L Glass carboy

** Sampler concentration/Jar concentration X 100

Table 3: Wet Chemistry

Wet Chemistry	14-day Deployment		
	Jar Conc. (ug/L)*	Sampler Conc (ug/L)	% Migration**
Perchlorate	18	18	100%
Chloride	14.7	14.6	99%
Hexavalent Chromium	0.0800	0.0763	95%
Nitrate Nitrogen	6.40	6.36	99%
Sulfate	4.07	4.74	116%

* 20 L Glass carboy

** Sampler concentration/Jar concentration X 100

In this study the RPPS worked well for volatiles, except for those of low water solubility (see Table 5-6, Columbia Analytical Services, 2005). It is theorized that the less soluble compounds partially sorbed to the polyethylene material.

Table 4: Volatile Organic Compounds

Volatile Organics	Spiked Conc.	Solubility (g/100 mL)	14-day Deployment		
			Jar Conc. (ug/L)*	RPPS Conc (ug/L)	% Migration**
Acetone	160	very	150	160	107%
Benzene	77	0.18	60	60	100%
Bromodichloromethane	89	0.6735	74	73	99%

Volatile Organics, (continued)	Spiked Conc.	Solubility (g/100 mL)	14-day Deployment		
			Jar Conc. (ug/L)	RPPS Conc (ug/L)	% Migration*
Bromoform	91	0.301	55	58	105%
Bromomethane	66	1.522	60	56	93%
2-Butanone (MEK)	110	25.6	105	105	100%
Methyl tert-Butyl Ether (MTBE)	99	5.1	92	95	103%
Carbon Disulfide	72	0.1185	54	50	93%
Carbon Tetrachloride	64	0.08048	21	35	167%
Chlorobenzene	71	0.0497	28	41	146%
Chloroethane	76	0.574	73	65	89%
Chloroform	1500	0.795	1400	1300	93%
Chloromethane	77	0.5325	75	72	96%
Dibromochloromethane	80	0.4	62	62	100%
1,1-Dichloroethane	84	0.506	76	74	97%
1,2-Dichloroethane (EDC)	99	0.8608	86	86	100%
1,1-Dichloroethene	68	0.225	52	49	94%
cis-1,2-Dichloroethene	75	0.08	66	63	95%
trans-1,2-Dichloroethene	68	0.63	56	53	95%
1,2-Dichloropropane	87	0.27	74	76	103%
cis-1,3-Dichloropropene	81	<0.1	57	53	93%
trans-1,3-Dichloropropene	80	<0.1	58	56	97%
Ethylbenzene	60	0.0206	11	31	282%
2-Hexanone	99	1.4	91	92	101%
Methylene Chloride	88	1.32	82	77	94%
4-Methyl-2-pentanone (MIBK)	98	1.9	90	91	101%
Styrene	68	0.032	17	34	200%
1,1,2,2-Tetrachloroethane	88	0.2962	79	78	99%
Tetrachloroethene (PCE)	57	0.015	5	21	420%
Toluene	68	0.0526	30	40	133%
1,1,1-Trichloroethane (TCA)	58	0.1495	40	45	113%
1,1,2-Trichloroethane	83	0.442	75	74	99%
Trichloroethene (TCE)	62	0.442	33	39	118%
Vinyl Chloride	64	0.11	61	58	95%
o-Xylene	68	0	9	32	356%
m+p-Xylenes	130	0	17	56	329%

* 20 L Glass carboy

** Sampler concentration/Jar concentration X 100

Table 5: Methane, Ethane, Ethene

Analytes	Spiked Conc.	14-day Deployment		
		Jar Conc. (ug/L)	RPPS Conc (ug/L)	% Migration*
Methane	11	9.1	10	109%
Ethane	22	18	21	116%
Ethene	20	19	20	105%

* 20 L Glass carboy

** Sampler concentration/Jar concentration X 100

Studies were also performed for semivolatile compounds, this time using 4 L glass carboys. Again sorbing of poorly soluble compounds was evidenced.

Table 6: Semivolatile Organics

Semivolatiles	7-day Deployment			14-day Deployment			21-day Deployment		
	Jar Conc	RPPS Sampler Conc.	% Migration*	Jar Conc	RPPS Conc.	% Migration*	Jar Conc.	RPPS Conc.	% Migration*
N-Nitrosodimethylamine	190	120	63%	240	250	104%	220	220	100%
Aniline	220	140	64%	63	210	333%	170	170	100%
Bis(2-chloroethyl) Ether	220	190	86%	230	220	96%	210	220	105%
Phenol	220	120	55%	220	210	95%	210	210	100%
2-Chlorophenol	220	190	86%	230	220	96%	210	220	105%
1,3-Dichlorobenzene	48	0	0%	26	15	58%	24	20	83%
1,4-Dichlorobenzene	48	0	0%	28	19	68%	27	23	85%
1,2-Dichlorobenzene	56	0	0%	33	21	64%	32	28	88%
Benzyl alcohol	220	81	37%	210	190	90%	240	220	92%
Bis(2-chloroisopropyl) Ether	190	160	84%	180	170	94%	190	190	100%
2-Methylphenol	220	140	64%	240	220	92%	220	230	105%
Hexachloroethane	44	2	5%	21	3.8	18%	16	4.3	27%
N-Nitrosodi-n-propylamine	220	170	77%	260	250	96%	220	240	109%
4-Methylphenol	220	110	50%	240	220	92%	210	210	100%
Nitrobenzene	190	160	84%	230	220	96%	210	210	100%
Isophorone	240	160	67%	270	250	93%	240	240	100%
2-Nitrophenol	200	190	95%	210	230	110%	210	230	110%
2,4-Dimethylphenol	220	130	59%	240	210	88%	210	200	95%
Bis(2-chloroethoxy)methane	220	150	68%	230	210	91%	200	210	105%
2,4-Dichlorophenol	210	160	76%	220	210	95%	200	210	105%
Benzoic acid	160	0	0%	220	100	45%	210	110	52%
1,2,4-Trichlorobenzene	42	2.6	6%	14	3.5	25%	12	5.2	43%
Naphthalene	55	13	24%	33	17	52%	28	21	75%
4-Chloroaniline	230	130	57%	140	210	150%	210	200	95%
Hexachlorobutadiene	44	0	0%	13	0	0%	8.9	0	0%
4-Chloro-3-methylphenol	220	88	40%	260	190	73%	230	200	87%
2-Methylnaphthalene	43	1.9	4%	18	4.2	23%	12	4.1	34%
Hexachlorocyclopentadiene	0	0		0	0		0	0	
2,4,6-Trichlorophenol	190	180	95%	190	330	174%	180	330	183%
2,4,5-Trichlorophenol	200	100	50%	210	190	90%	190	200	105%
2-Chloronaphthalene	44	0	0%	16	3.4	21%	11	2.8	25%
2-Nitroaniline	210	73	35%	250	180	72%	240	170	71%
Acenaphthylene	56	0	0%	27	2.6	10%	20	5.3	27%
Dimethyl Phthalate	250	59	24%	270	160	59%	230	150	65%
2,6-Dinitrotoluene	220	86	39%	230	170	74%	230	180	78%
Acenaphthene	48	0	0%	21	0	0%	15	1.3	9%
3-Nitroaniline	250	52	21%	170	130	76%	260	140	54%
2,4-Dinitrophenol	210	31	15%	240	100	42%	260	120	46%
Dibenzofuran	47	0	0%	19	0	0%	13	1.2	9%
4-Nitrophenol	260	48	18%	240	130	54%	260	120	46%

Semivolatiles (continued) Analytes (Spiked at 264 ug/L)	7-day Deployment			14-day Deployment			21-day Deployment		
	Jar Conc.	RPPS Conc.	% Migration*	Jar Conc	RPPS Conc.	% Migration*	Jar Conc.	RPPS Conc.	% Migration*
2,4-Dinitrotoluene	240	61	25%	250	140	56%	280	190	68%
Fluorene	53	0	0%	22	0	0%	15	0	0%
4-Chlorophenyl Phenyl Ether	51	0	0%	21	0	0%	16	0	0%
Diethyl Phthalate	260	42	16%	260	120	46%	240	130	54%
4-Nitroaniline	260	0	0%	200	130	65%	260	150	58%
2-Methyl-4,6-dinitrophenol	240	50	21%	250	120	48%	270	150	56%
N-Nitrosodiphenylamine	160	41	26%	120	30	25%	130	47	36%
4-Bromophenyl Phenyl Ether	59	3.4	6%	25	0	0%	19	0	0%
Hexachlorobenzene	72	0	0%	27	0	0%	12	0	0%
Pentachlorophenol	190	0	0%	170	83	49%	190	100	53%
Phenanthrene	63	11	17%	29	0	0%	20	0	0%
Anthracene	120	0	0%	67	0	0%	36	0	0%
Di-n-butyl Phthalate	170	0	0%	110	2	2%	100	0	0%
Fluoranthene	97	0	0%	38	0	0%	25	0	0%
Pyrene	65	0	0%	21	0	0%	12	0	0%
Butyl Benzyl Phthalate	130	0	0%	100	0	0%	87	0	0%
3,3'-Dichlorobenzidine	190	0	0%	62	14	23%	220	13	6%
Benz(a)anthracene	140	0	0%	120	0	0%	69	0	0%
Chrysene	180	0	0%	180	0	0%	100	0	0%
Bis(2-ethylhexyl) Phthalate	92	0	0%	77	0	0%	41	0	0%
Di-n-octyl Phthalate	100	0	0%	97	0	0%	36	0	0%
Benzo(b)fluoranthene	93	0	0%	73	0	0%	31	0	0%
Benzo(k)fluoranthene	150	0	0%	150	0	0%	74	0	0%
Benzo(a)pyrene	110	0	0%	110	0	0%	55	0	0%
Indeno(1,2,3-cd)pyrene	91	0	0%	62	0	0%	39	0	0%
Dibenz(a,h)anthracene	120	0	0%	110	0	0%	64	0	0%
Benzo(g,h,i)perylene	96	0	0%	62	0	0%	41	0	0%

* Sampler concentration/Jar concentration X 100

Taken from: [Various Bench Study Test Results of the Use of RPP
Columbia Analytical Services, Inc., Environmental Monitoring and Data
Quality Workshop, April 5-7, San Antonio, TX 2006.](#)