



Project Summary

Analysis of Solid Waste— Performance Data for SW-846 Methods 8270, 8081, and 8141

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The U.S. Environmental Protection Agency (U.S. EPA) has developed a Best Demonstrated Available Technology (BDAT) list of specific chemicals to be monitored in treated wastes before land disposal. Reliable measurement of these chemicals in wastes is a measurement issue facing the Office of Solid Waste and the Office of Research and Development. This report provides data for the precision and accuracy of recoveries of BDAT chemicals from fly ash, sewage sludge, and a petroleum still bottom.

Three SW-846 analytical methods (8270 [semi-volatile organics], 8081 [organochlorine pesticides], and 8141 [organophosphorus insecticides]) can be used in conjunction with extraction procedures (Methods 3540 or 3550) and sample clean-up (Methods 3640 and draft-3670) to measure almost all of the BDAT list chemicals in waste matrices. Surrogates added at the time of sample extraction provide a reliable measure of method performance for measuring analytes with similar chemical properties.

Analyte recoveries of 40-70 percent were obtained for most analytes from fly ash, sewage sludge, and petroleum still bottom using Method 8270 (Table 1).

Strongly polar chemicals (2-picoline [20-60 percent], phenol [20-60 percent], the nitroso compounds [20-80 percent]) presented greater difficulties than most neutral species. Several analytes are not measured using Method 8270: toluene di-isocyanate, the four diaminotoluene isomers (2,4-, 2,3-, 2,6-, and 3,4-), and all methylcyclohexylamine isomers. Ortho- and para-toluidine were not resolved and must be measured as the sum of both compounds. The high level of co-extracted interferences in these matrices caused quantitation problems in the analysis of organochlorine pesticides; a number of recoveries were >100 percent (Table 2). The spiking levels of the organophosphorus pesticides were relatively high, recoveries were 75-95 percent (Table 3).

It is clear that it may be difficult to achieve BDAT target detection limits in complex matrices without additional cleanup of waste extracts.

This Project Summary was developed by U.S. EPA's Environmental Monitoring Systems Laboratory, Las Vegas, NV, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Table 1. Percent Recoveries of Semivolatiles (Method 8270)

Surrogates	Sludge Sonication Soxhlet				Still Bottom Sonication Soxhlet				Fly Ash Sonication Soxhlet			
	Average	Std	Average	Std	Average	Std	Average	Std	Average	Std	Average	Std
2-Fluorophenol	29	15	54	1	46	2	28	9	28	17	49	4
D5-Phenol	33	13	54	2	41	2	27	8	33	14	52	3
D5-Nitrobenzene	46	12	56	5	50	2	42	13	49	11	64	4
2-Fluorobiphenyl	54	11	69	3	56	12	38	9	59	8	67	3
2,4,6-Tribromophenol	75	23	74	11	37	7	37	7	7	4	78	3
D14-Torphenyl	73	13	77	6	86	4	50	11	90	1	79	5
Analytes												
N-Nitrosodimethylamine	32	31	59	51	37	33	39	11	20	35	80	22
2-Picoline	23	9	63	6	50	6	34	11	33	25	45	7
3-Methylcyclohexylamine	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylcyclohexanone	44	10	78	2	60	8	49	18	59	19	76	7
Phenol	34	13	57	2	38	3	24	8	33	14	49	2
Bis(2-Chloroisopropyl)ether	56	15	71	6	65	6	47	12	64	16	77	2
Hexachloroethane	54	15	85	9	58	2	46	12	68	11	86	6
o-Toluidine	59	13	87	6	25	11	0	0	60	8	95	11
Di-n-propylnitrosamine	50	2	72	9	62	8	40	11	72	27	75	6
Nitrobenzene	55	14	67	4	64	4	53	17	62	15	79	7
Toluene <i>ci</i> -isocyanate	0	-	0	-	0	-	0	-	0	-	0	-
Hexachlorobutadiene	62	18	87	4	65	2	69	20	80	18	91	5
o-Nitrotoluene	42	10	55	1	45	4	36	11	51	8	60	4
m-Nitrotoluene	65	14	94	4	70	2	50	11	80	12	94	5
p-Nitrotoluene	68	17	96	2	69	2	53	14	85	14	96	6
2,3-Diaminotoluene	0	-	0	-	0	-	0	-	0	-	11	19
2,6-Diaminotoluene	0	-	0	-	0	-	0	-	5	8	46	43
Hexachlorocyclopentadiene	44	9	19	4	11	5	0	-	60	9	53	10
2-Chloronaphthalene	54	14	72	9	51	5	25	18	70	16	75	4
2,6-Dinitrotoluene	69	14	79	4	62	8	37	10	83	8	86	1
2,4-Dinitrotoluene	63	15	68	2	49	4	30	10	71	7	79	4
1,2-Diphenylhydrazine	55	12	64	5	51	2	45	11	63	8	73	2
4-Bromophenylphenylether	89	24	106	10	78	3	87	16	108	11	124	3
A-BHC	83	19	97	9	70	3	75	16	94	11	107	2
B-BHC	93	25	112	12	75	4	90	25	118	10	134	2
G-BHC	77	20	96	9	62	6	72	17	90	9	108	3
D-BHC	84	23	100	9	58	5	76	20	99	9	116	4
Pronamide	72	15	83	5	70	5	48	12	91	14	92	2
Heptachlor	69	9	73	3	63	7	37	8	93	16	95	1
Aldrin	37	5	27	8	44	4	39	11	71	13	86	1
Heptachlor epoxide	71	15	102	10	58	5	59	19	85	14	102	1
Endosulfan I	75	11	96	8	63	6	58	13	76	6	85	1
Gamma-chlordane	68	9	69	7	54	7	40	7	71	6	70	1
Alpha-chlordane	62	9	59	6	44	6	32	7	68	5	68	1
DDE	74	21	89	9	48	8	49	13	91	7	97	5
Dieldrin	68	15	92	4	53	6	57	20	84	18	94	3
Endrin	88	19	121	17	71	13	71	11	95	7	114	1
Endosulfan II	78	16	102	11	59	9	64	16	79	7	91	3
DDD	117	43	97	52	52	9	76	23	150	22	173	15
DDT	70	14	70	24	34	10	16	6	109	15	117	5

Table 2. Percent Recoveries of Organochlorine Pesticides

	Sludge Sonication Soxhlet				Still Bottom Sonication Soxhlet				Fly Ash Sonication Soxhlet			
	Average Std		Average Std		Average Std		Average Std		Average Std		Average Std	
Surrogates												
Tetra-cl-m-xylene	71	19	82	1	49	2	176	211	119	12	57	41
Decachlorobiphenyl	26	23	28	48	17	29	104	93	49	2	57	11
Analytes												
Hexachloroethane	80	7	79	1	70	2	50	30	81	3	54	39
2-Chloronaphthalene	50	56	67	8	59	3	35	35	48	3	39	36
4-Br-diphenylether	118	14	0	-	159	19	128	137	37	64	118	70
A-BHC	88	25	265	18	55	7	47	25	45	3	38	24
G-BHC	55	9	155	29	43	6	30	30	47	3	41	23
Heptachlor	60	13	469	294	48	6	55	18	53	2	46	26
Aldrin	92	33	875	734	48	5	200	258	49	3	46	22
B-BHC	351	71	150	260	51	7	75	42	62	3	58	23
D-BHC	51	11	57	2	43	4	119	129	49	3	43	20
Hept. epoxide	54	11	70	3	47	6	66	34	53	2	51	17
Endosulfan I	52	11	70	4	47	4	41	18	52	3	52	15
G-Chlordane	50	9	65	1	48	5	47	13	53	3	52	16
A-Chlordane	49	8	66	0	45	5	37	21	53	3	53	15
DDE	52	11	74	1	45	4	70	40	51	3	53	14
Dieldrin	89	19	327	7	45	5	58	24	52	3	50	16
Endrin	56	10	92	15	50	6	41	23	55	2	36	35
Endosulfan II	52	10	88	11	49	5	46	17	54	2	56	12
DDT	57	10	95	17	49	4	40	29	56	3	57	16
Endrin aldehyde	45	6	42	10	40	4	29	20	50	2	47	19
DDD	57	11	99	8	48	5	35	21	54	3	55	13

Table 3. Percent Recoveries of Organophosphorous Pesticides

	Sludge Sonication Soxhlet				Still Bottom Sonication Soxhlet				Fly Ash Sonication Soxhlet			
	Average Std		Average Std		Average Std		Average Std		Average Std		Average Std	
Surrogates												
Ethion	78	4	85	4	78	4	85	4	78	4	85	4
Analytes												
Dichlorvos	74	4	93	10	84	4	48	6	61	4	87	2
Ethoprop	76	4	88	4	85	4	85	5	73	3	85	1
Phorate	74	5	83	1	81	3	81	4	71	3	81	2
Diazinon	79	4	85	4	85	4	88	6	75	0	85	4
Ethyl parathion	78	4	87	<1	84	4	80	7	78	4	87	<1
Tetrachlorvinphos	62	27	74	4	75	8	57	4	73	2	83	2
Bolstar	77	4	88	2	81	5	80	5	76	3	84	2
Fensulfathion	82	5	136	51	87	<1	53	3	76	12	96	10
Methyl Azinophos	82	8	72	9	72	9	33	6	76	4	73	0
Coumaphos	81	3	83	7	83	5	59	6	75	2	84	3

MS: Not spiked.

N/A: Not applicable.

Paul Marsden (also the U.S. EPA Project Officer, see below) is with the Environmental Monitoring Systems Laboratory, Las Vegas, NV.

The complete report, entitled "Analysis of Solid Waste—Performance Data for SW-846 Methods 8270, 8081, and 8141" (Order No. PB 90-251 844: Cost \$23.00, subject to change) will be available only from:

*National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650*

*The EPA Project Officer can be contacted at:
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