

VAL10236: Validation “Preservation time organochlorine pesticides, PCB and tri-, tetra, penta end hexachlorobenzene in groundwater”

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1. Summary

In the period from October 6th until October 20th the preservation time of organo chlorine pesticides, (OCB), PCB and tri-, tetra-, penta- and hexachlorobenzene (ClBz) was investigated. Two different groundwater samples were spiked on day "0" with respectively 0.2 µg/l and 2 µg/l OCB, PCB en ClBz. Subsequent extraction and analysis were done at day 1, 2, 4, 7, 10 and 14. During this a routine control sample, containing 7 parameters, and an extra control sample, containing all investigated parameters, were also extracted and analysed.

Concluding from the results all ClBa, PCB, HCH, drins, DDx, and hexachlorobutadiene, cis- and trans-heptachloroepoxide, cis- and trans-chlordane and endosulfansulphate have a preservation time from at least 14 days. The following OCB do have a preservation time of 10 days: heptachlor and beta-endosulfan.

2. Introduction

Several proposed preservation times are standards and even ISO5667-3 is not based on studies. In some cases the proposed preservation time is too short to do an extraction and/or analysis in time. Therefore Fenelab and SIKB proposed a list in which studies should be started to prolong the preservation time for certain parameters. One of the parameters is the group of organo chlorine pesticides, PCB and chlorobenzenes. By several FeNeLab-members a study is started based on "Validatie van conserveringstermijnen van milieumonsters" (SIKB, april 2003). Alcontrol did the study on two different groundwater samples with concentrations of approximately 0.2 µg/l and 2 µg/l being 20 times and 200 times the reporting limit.

The goal "for this study to set the preservation time for several parameters on 14 days. After this the extended preservation time can be incorporated in SIKB protocol 3001. The study was carried out on two different filtered groundwater samples (location numbers b32d0149, filter 3 and b36b0346, filter 1). The sample from the first location was spiked with 0.2 µg/l. The second sample was spiked with 2.0 µg/l. On the day the samples were spiked both samples were extracted and analysed in eightfold. Further extraction and analysis were done on day 1, 2, 4, 7, 10 and 14 in threefold. On every extraction day a standard control sample was extracted and analysed. Since not all parameters taken into account of the study an extra control sample was introduced to monitor the day-to-day variances of all parameters. The extraction and analysis were performed according to the Alcontrol SOP: AH1000W and AH1010W, which are accredited by RVA, the Dutch accreditation body. The results were evaluated according to "Validatie van conserveringstermijnen van milieumonsters" (SIKB, april 2003).

3. Goal

The goal "for this study to set the preservation time for several parameters on 14 days conform "Onderzoeksprogramma validatie van conserveringstermijnen van milieumonsters" project 55, versie 10, 29-04-2003.

4. The experiment

4.1 Used documents

- AS3000: Accreditatieschema 3000 (versie 2, september 2006).
- SIKB-protocol AS3001
- "Onderzoeksprogramma validatie van conserveringstermijnen van milieumonsters" project 55, versie 10, 29-04-2003.
- Procedure AH1000W, extraction of water samples
- Procedure AH1010W, Analysis of OCB, PCB and ClBz with GCMS.

4.2 Principals of the experiments

ALcontrol acquired from one of our customers two 5-litre samples of groundwater. Both samples were taken from different locations (b32d0149, filter 3 and b36b0346). From both samples a 2 litre sub sample was taken. From this sub sample 30 sub samples of 75 ml were taken in 100 ml extraction bottles. One set of 30 samples was spiked with 33 µl of standard solution T1010735. The other set was spiked with 330 µl of the same standard. After homogenisation from each set eight samples were extracted (day 0) according to AH1000W including blanks and control samples. The others were stored in a refrigerator at 2-8°C. On day 1, 2, 4, 7, 10 and 14 both sets were extracted in threefold. After extraction the samples were analysed according to AH1010W.

4.3 Results

In annex 1 the control charts are reported from before and after the start of the experiments. Those charts show no out of control situation during the experiment. Because not all parameters are present in the control chart an extra control sample with all parameters was analysed during the experiment to observe the individual performance of the parameters.

Table 1 shows the performance characteristics during the duration of the experiments. Except for heptachlor (high) trans-hepachoroepoxide (control sample) and endosulfansulphate (high and low) all the observed standard deviations (RSDR control sample, RSDR high and RSDR low) meets the standard deviation during the validation of the method (RSDR validation) and are lower than the standard deviation required by AS3000. The consequences for those deviations in relation to the preservation time is discussed in table 2. The RSDR used is the standard deviation which is used to calculate the z-scores. This value is the maximum of the observed standard deviation of the control sample and the result from the validation with a minimum of 12.5% and a maximum of 25%, both the half or equal the required limit by AS3000.

Table 1: Performance characteristics during tests

Parameter	standard deviation							
	RSDR used	RSDR validation	RSDR required by AS3000	RSDR control sample	RSDr low	RSDR low	RSDr high	RSDR high
chlorobenzenes								
1,3,5-trichlorobenzene	14.8%	14%	25%	14.8%	3.2%	8.9%	3.6%	8.0%
1,2,4-trichlorobenzene	14.0%	14%	25%	8.6%	2.5%	5.7%	2.5%	6.1%
1,2,3-trichlorobenzene	14.0%	14%	25%	6.4%	1.9%	5.9%	2.7%	5.5%
1,2,3,5+1,2,4,5-tetrachlorobenzene	15.0%	15%	25%	9.5%	3.1%	7.0%	4.7%	9.2%
1,2,3,4-tetrachlorobenzene	16.0%	16%	25%	8.5%	3.2%	6.8%	5.1%	8.2%
pentachlorobenzene	18.0%	18%	25%	9.7%	4.3%	9.7%	6.1%	13.4%
hexachlorobenzene	20.0%	20%	25%	14.1%	5.0%	10.7%	6.6%	17.3%
Pesticides								
hexachlorobutadiene	23.4%	23%	25%	23.4%	7.0%	11.8%	7.6%	11.3%
a-HCH	12.5%	11%	25%	5.6%	3.6%	5.9%	4.8%	11.9%
b-HCH	12.5%	11%	25%	9.4%	2.3%	6.9%	3.2%	6.0%
γ-HCH	12.5%	12%	25%	7.8%	3.5%	5.9%	4.0%	10.5%
d-HCH	14.0%	6%	25%	14.0%	6.1%	6.7%	3.3%	11.7%
heptachlor	20.7%	14%	25%	20.7%	5.3%	15.6%	5.7%	32.1%
aldrin	14.0%	14%	25%	7.4%	4.3%	8.8%	5.0%	9.4%
telodrin	12.5%	12%	25%	4.5%	4.2%	9.6%	3.9%	8.7%
isodrin	12.5%	12%	25%	10.0%	4.4%	8.0%	4.9%	10.8%
cis-heptachlorepoxyde	12.5%	10%	25%	4.9%	3.3%	8.2%	3.2%	10.2%
trans-heptachlorepoxyde	25.0%	9%	25%	37.9%	4.2%	9.7%	3.3%	11.3%
o,p'-DDE	12.5%	7%	25%	7.9%	2.6%	4.9%	3.3%	4.6%
trans-chlordane	12.5%	9%	25%	5.2%	3.0%	8.3%	2.8%	9.1%
cis-chlordane	12.5%	10%	25%	4.7%	3.1%	7.8%	2.7%	9.1%

Table 1: Performance characteristics during tests

Parameter	standard deviation							
	RSDR used	RSDR validation	RSDR required by AS3000	RSDR control sample	RSDr low	RSDR low	RSDr high	RSDR high
a-endosulfan	12.5%	8%	25%	5.1%	7.0%	13.2%	4.3%	11.6%
p,p'-DDE	12.5%	4%	25%	7.9%	3.5%	7.5%	3.4%	3.9%
o,p'-DDD	12.5%	5%	25%	8.4%	3.2%	7.2%	3.2%	5.3%
dieldrin	12.5%	8%	25%	5.3%	3.1%	8.9%	3.0%	10.1%
endrin	16.3%	8%	25%	16.3%	3.8%	7.9%	2.9%	11.8%
p,p'-DDD	12.5%	5%	25%	7.8%	5.2%	9.8%	3.6%	5.8%
b-endosulfan	12.5%	9%	25%	11.3%	6.2%	19.1%	3.2%	8.8%
o,p'-DDT	13.2%	8%	25%	13.2%	4.0%	11.0%	3.0%	16.9%
p,p'-DDT	13.0%	13%	25%	5.5%	3.1%	5.1%	2.2%	4.5%
endosulfansulphate	12.5%	7%	25%	5.9%	15.6%	26.9%	8.0%	30.6%
PCB's								
PCB28	12.5%	10%	25%	4.6%	3.0%	7.4%	3.3%	8.8%
PCB52	12.5%	11%	25%	5.3%	1.7%	2.8%	2.8%	4.3%
PCB101	12.5%	7%	25%	5.9%	3.2%	7.8%	3.3%	6.2%
PCB118	12.5%	3%	25%	4.0%	4.8%	11.6%	3.0%	4.9%
PCB153	12.5%	4%	25%	7.8%	4.0%	10.8%	2.9%	5.3%
PCB138	12.5%	5%	25%	6.1%	4.3%	10.9%	3.2%	5.6%
PCB180	12.5%	8%	25%	7.2%	4.1%	9.3%	3.3%	9.8%
Sum parameters								
Sum HCH	12.5%	10%	25%	8.9%	3.0%	5.0%	3.2%	8.9%
Sum Drins	12.5%	11%	25%	6.7%	3.4%	7.1%	3.4%	9.2%
Sum PCB's	12.5%	7%	25%	5.6%	3.1%	7.9%	2.6%	3.9%
Sum DDX	12.5%	8%	25%	5.6%	4.4%	8.3%	2.9%	7.2%
Sum heptachloroepoxide	18.5%	10%	25%	18.5%	3.5%	8.5%	3.2%	10.5%
Sum chloorbenzenes	16.0%	16%	25%	8.2%	2.4%	5.8%	4.0%	8.7%

In annexes 2 till 4 the results from respectively the low sample (0.2 µg/l), high sample (2g/l) and the extra control sample are reported. The results shows the average and standard deviation of every day as well as the recovery relative to the initial value (day 0) and the z-score. In annex 5 the plots for all samples are displayed for each parameter.

The results of the majority of the parameters follow the expected standard deviation and preservation time. A few parameters who did not follow this expectation are discussed in table 2.

Table 2: Discussion of deviated results

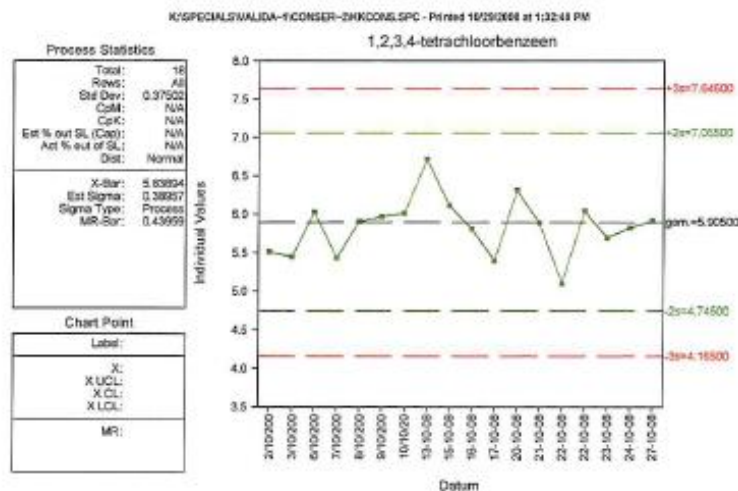
Parameter	Remarks	Conclusion
Beta-endosulfan	The plot shows for the sample with low concentration a steady decrease in concentration. The z-score at day 14 is -3.2 with a recovery relative to initial value on day "0" of 60%.	Preservation time for this parameter is 10 days
endosulfansulphate	On day 4 and 7 the results deviate extreme for the low and the high sample while the control sample is stable. Low sample day 4 has a z-score of +4.3 and an recovery relative to the initial value of 154%. The high sample did have a a z-sore and recovery on day 4 and 7 respectively (+2.7, 133%) and (+7.9, 199%). In both cases the standard deviation was relatively high in respect to the measurements of the other days. There is no analytical explanation for this phenomenon.	Although the observed deviations the preservation time is set on 14 days

Table 2: Discussion of deviated results

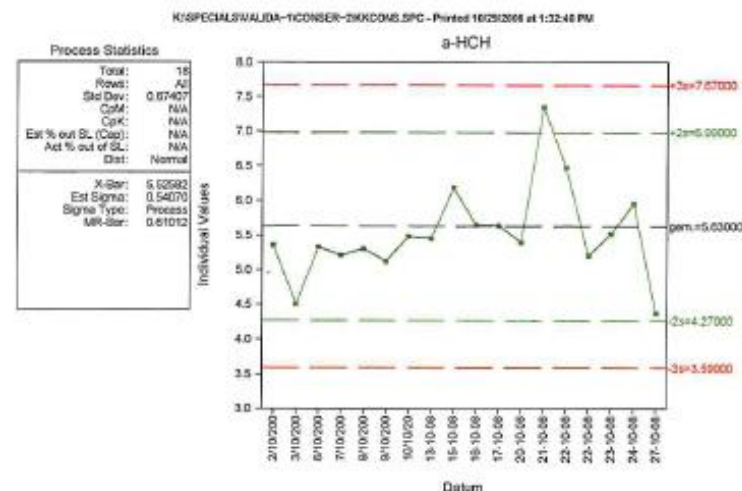
Delta-HCH	On day 7 the high sample has a z-score of +2.5 with a recovery relative to the initial value of 134%. This result is addressed as an outlier	The preservation time is 14 days
Heptachlor	On day 7 the z-score of the high samples is +4.9 with a recovery relative to the initial value of 202%. The results of the control sample of day 7 and day 14 are also high with a z-score of respectively of +2.1 and +3.3 with a recovery of 143% and 169%. The plot shows for the control sample a steady increase of the concentration while the samples seem to be stable. There is no explanation of this phenomenon.	The preservation time with respect of the results of the control sample is 10 days
Dieldrin	On day 4 the high sample has a z-score of +2.2 with a recovery relative to the initial value of 127%. This result is addressed as an outlier	The preservation time is 14 days
o,p'-DDT	On day 7 the high sample has a z-score of -2.6 with a recovery relative to the initial value of 65%. On day 14 the z-score of the control sample is -2.4 with a recovery relative to the initial value of 68%. These results are addressed as outliers	The preservation time is 14 days
Trans-heptachloroepoxide	On day 10 the control sample has a z-score of -3.5 with a recovery relative to the initial value of 13%. Chromatographic conditions for this measurement caused this problem. A reanalysis was not possible at that moment. This result is addressed as an outlier	The preservation time is 14 days
Endrin	On day 14 the control sample has a z-score of 3.1 with a recovery relative to the initial value of 150%. Chromatographic conditions for this measurement caused this problem. A reanalysis was not possible at that moment. This result is addressed as an outlier	The preservation time is 14 days

5. Conclusions

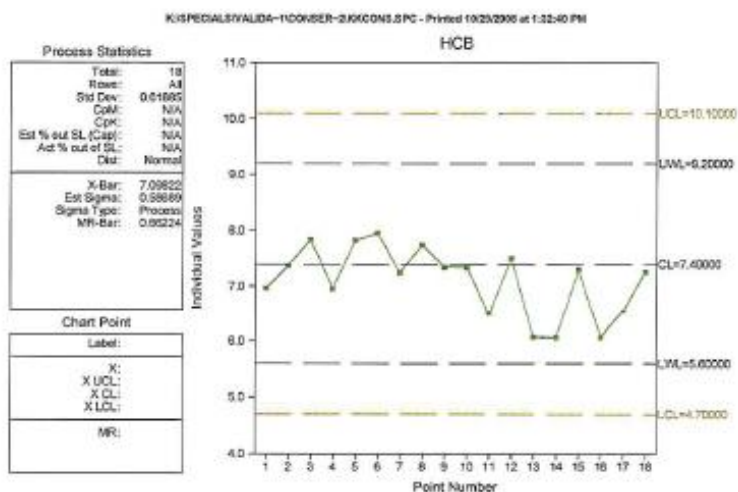
Concluding from the results all ClBa, PCB, HCH, drins, DDx, and hexachlorobutadiene, cis- and trans-heptachloroepoxide, cis- and trans-chlordane and endosulfansulphate have a preservation time of at least 14 days. The following OCB do have a preservation time of 10 days: heptachlor and beta-endosulfan.



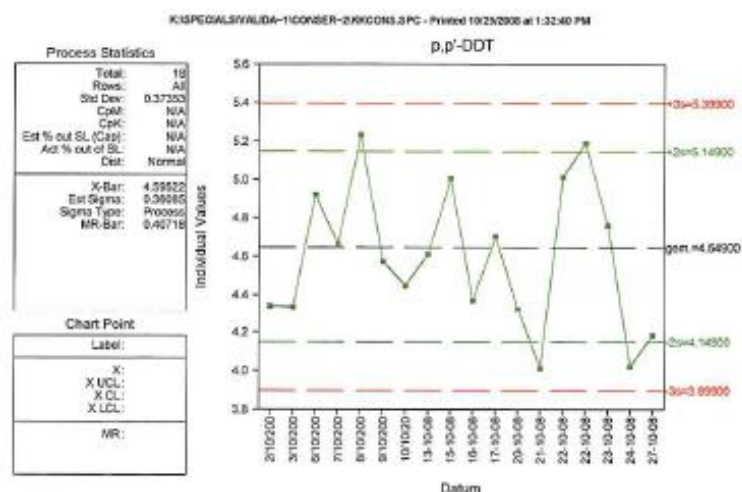
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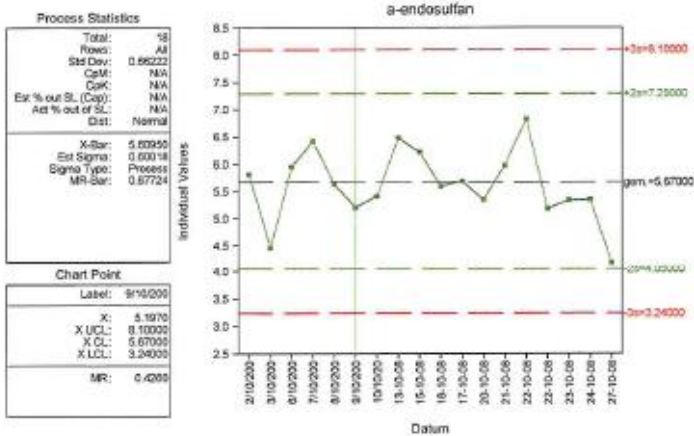
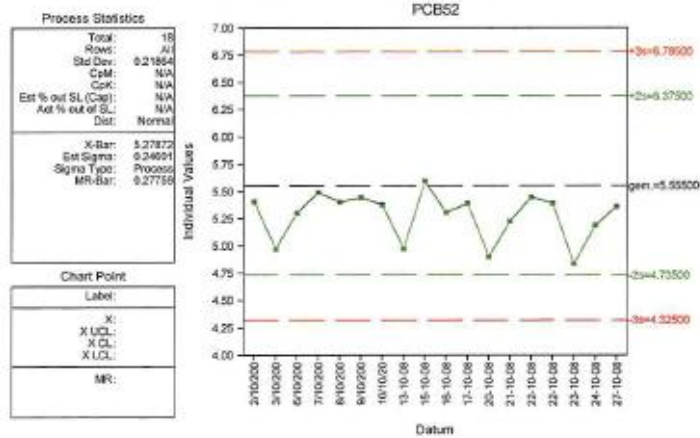
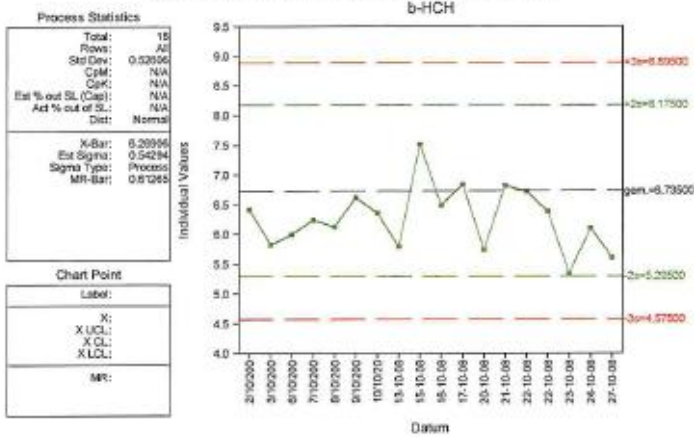


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Annex 1: ControlCharts



Annex 2 Results ground water sample low (0.2 µg/l)

Annex 2 Results groundwater low								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
chlorobenzenes								
1,3,5-trichlorobenzene	µg/l	0.201	0.195	0.195	0.212	0.219	0.176	0.188
stdev	µg/l	0.007	0.003	0.013	0.002	0.006	0.002	0.004
SR validation	%	15%						
1,2,4-trichlorobenzene	µg/l	0.217	0.201	0.200	0.208	0.208	0.193	0.192
stdev	µg/l	0.004	0.002	0.007	0.002	0.008	0.005	0.004
SR validation	%	14%						
1,2,3-trichlorobenzene	µg/l	0.236	0.216	0.209	0.223	0.232	0.214	0.208
stdev	µg/l	0.004	0.006	0.003	0.005	0.005	0.002	0.002
SR validation	%	14%						
1,2,3,5+1,2,4,5-tetrachlorobenzene	µg/l	0.461	0.437	0.390	0.410	0.433	0.427	0.408
stdev	µg/l	0.014	0.017	0.007	0.023	0.010	0.008	0.004
SR validation	%	15%						
1,2,3,4-tetrachlorobenzene	µg/l	0.240	0.228	0.204	0.215	0.222	0.234	0.223
stdev	µg/l	0.008	0.008	0.005	0.010	0.008	0.006	0.006
SR validation	%	16%						
pentachlorobenzene	µg/l	0.246	0.238	0.203	0.207	0.231	0.243	0.220
stdev	µg/l	0.010	0.012	0.010	0.013	0.010	0.007	0.003
SR validation	%	18%						
hexachlorobenzene	µg/l	0.250	0.246	0.215	0.213	0.237	0.266	0.229
stdev	µg/l	0.011	0.018	0.014	0.014	0.008	0.008	0.005
SR validation	%	20%						
Pesticides								
hexachlorobutadiene	µg/l	0.182	0.180	0.181	0.203	0.209	0.171	0.168
stdev	µg/l	0.017	0.003	0.015	0.011	0.020	0.005	0.010
SR validation	%	23%						
a-HCH	µg/l	0.216	0.201	0.205	0.218	0.227	0.212	0.218
stdev	µg/l	0.006	0.005	0.004	0.004	0.010	0.009	0.012
SR validation	%	13%						
b-HCH	µg/l	0.215	0.221	0.208	0.229	0.224	0.231	0.249
stdev	µg/l	0.007	0.005	0.001	0.006	0.001	0.006	0.005
SR validation	%	13%						
γ-HCH	µg/l	0.218	0.208	0.210	0.232	0.230	0.224	0.223
stdev	µg/l	0.008	0.004	0.005	0.002	0.010	0.004	0.014
SR validation	%	13%						
d-HCH	µg/l	0.240	0.250	0.230	0.249	0.258	0.250	0.243
stdev	µg/l	0.005	0.004	0.003	0.023	0.031	0.004	0.004
SR validation	%	14%						
heptachlor	µg/l	0.192	0.205	0.188	0.183	0.239	0.177	0.160
stdev	µg/l	0.010	0.003	0.007	0.009	0.019	0.009	0.008
SR validation	%	21%						
aldrin	µg/l	0.197	0.185	0.207	0.227	0.219	0.210	0.211
stdev	µg/l	0.011	0.010	0.007	0.010	0.009	0.008	0.007
SR validation	%	14%						
telodrin	µg/l	0.225	0.200	0.216	0.229	0.212	0.193	0.189
stdev	µg/l	0.010	0.008	0.008	0.012	0.010	0.007	0.006
SR validation	%	13%						
isodrin	µg/l	0.207	0.179	0.213	0.213	0.205	0.205	0.214

Annex 2 Results groundwater low								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
stdev	µg/l	0.009	0.004	0.006	0.010	0.017	0.006	0.006
SR validation	%	13%						
cis-heptachlorepoxyde	µg/l	0.227	0.210	0.227	0.258	0.235	0.225	0.217
stdev	µg/l	0.010	0.005	0.006	0.011	0.008	0.004	0.005
SR validation	%	13%						
trans-heptachlorepoxyde	µg/l	0.239	0.212	0.232	0.253	0.262	0.223	0.222
stdev	µg/l	0.014	0.004	0.007	0.005	0.017	0.007	0.007
SR validation	%	25%						
o,p'-DDE	µg/l	0.220	0.212	0.216	0.230	0.213	0.222	0.206
stdev	µg/l	0.006	0.003	0.004	0.002	0.005	0.003	0.011
SR validation	%	13%						
trans-chlordane	µg/l	0.227	0.212	0.238	0.260	0.236	0.226	0.217
stdev	µg/l	0.009	0.008	0.005	0.010	0.005	0.005	0.002
SR validation	%	13%						
cis-chlordane	µg/l	0.231	0.209	0.228	0.254	0.242	0.221	0.224
stdev	µg/l	0.012	0.004	0.007	0.011	0.004	0.002	0.003
SR validation	%	13%						
a-endosulfan	µg/l	0.205	0.216	0.231	0.247	0.208	0.186	0.239
stdev	µg/l	0.006	0.001	0.019	0.018	0.006	0.006	0.029
SR validation	%	13%						
p,p'-DDE	µg/l	0.221	0.202	0.205	0.220	0.204	0.208	0.186
stdev	µg/l	0.006	0.005	0.002	0.005	0.005	0.005	0.016
SR validation	%	13%						
o,p'-DDD	µg/l	0.220	0.221	0.226	0.235	0.227	0.224	0.196
stdev	µg/l	0.005	0.002	0.001	0.006	0.003	0.006	0.016
SR validation	%	13%						
dieldrin	µg/l	0.223	0.208	0.228	0.258	0.243	0.230	0.215
stdev	µg/l	0.011	0.007	0.004	0.011	0.006	0.002	0.003
SR validation	%	13%						
endrin	µg/l	0.250	0.233	0.270	0.269	0.276	0.249	0.269
stdev	µg/l	0.011	0.004	0.005	0.008	0.015	0.006	0.015
SR validation	%	16%						
p,p'-DDD	µg/l	0.211	0.209	0.213	0.222	0.229	0.215	0.181
stdev	µg/l	0.008	0.005	0.004	0.012	0.006	0.007	0.023
SR validation	%	13%						
b-endosulfan	µg/l	0.243	0.208	0.221	0.233	0.192	0.188	0.146
stdev	µg/l	0.020	0.009	0.001	0.008	0.014	0.020	0.005
SR validation	%	13%						
o,p'-DDT	µg/l	0.214	0.205	0.215	0.202	0.164	0.194	0.187
stdev	µg/l	0.005	0.013	0.006	0.009	0.011	0.001	0.006
SR validation	%	13%						
p,p'-DDT	µg/l	0.214	0.210	0.208	0.217	0.197	0.207	0.197
stdev	µg/l	0.006	0.004	0.002	0.004	0.012	0.005	0.007
SR validation	%	13%						
endosulfansulphate	µg/l	0.222	0.222	0.227	0.255	0.342	0.243	0.198
stdev	µg/l	0.010	0.006	0.006	0.016	0.097	0.011	0.016
SR validation	%	13%						
PCB's								
PCB28	µg/l	0.198	0.188	0.190	0.183	0.167	0.186	0.171

Annex 2 Results groundwater low								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
stdev	µg/l	0.007	0.003	0.004	0.003	0.006	0.007	0.007
SR validation	%	13%						
PCB52	µg/l	0.208	0.200	0.204	0.210	0.201	0.207	0.201
stdev	µg/l	0.006	0.003	0.001	0.002	0.006	0.003	0.002
SR validation	%	13%						
PCB101	µg/l	0.222	0.199	0.207	0.219	0.201	0.202	0.184
stdev	µg/l	0.006	0.005	0.004	0.005	0.007	0.004	0.012
SR validation	%	13%						
PCB118	µg/l	0.222	0.193	0.206	0.221	0.202	0.193	0.168
stdev	µg/l	0.009	0.011	0.006	0.010	0.005	0.005	0.017
SR validation	%	13%						
PCB153	µg/l	0.226	0.194	0.211	0.226	0.202	0.201	0.175
stdev	µg/l	0.008	0.006	0.003	0.008	0.003	0.003	0.017
SR validation	%	13%						
PCB138	µg/l	0.226	0.200	0.211	0.230	0.214	0.208	0.175
stdev	µg/l	0.008	0.010	0.004	0.010	0.003	0.005	0.016
SR validation	%	13%						
PCB180	µg/l	0.219	0.194	0.209	0.228	0.218	0.210	0.184
stdev	µg/l	0.008	0.010	0.006	0.012	0.002	0.005	0.012
SR validation	%	13%						
Sommen								
Som HCH	µg/l	0.888	0.880	0.853	0.927	0.938	0.917	0.933
stdev	µg/l	0.023	0.014	0.012	0.033	0.039	0.024	0.033
SR validation	%	13%						
Som Drins	µg/l	1.101	1.005	1.134	1.196	1.155	1.087	1.098
stdev	µg/l	0.050	0.030	0.023	0.050	0.052	0.024	0.020
SR validation	%	13%						
Som PCB's	µg/l	1.521	1.367	1.438	1.517	1.404	1.408	1.259
stdev	µg/l	0.044	0.045	0.011	0.040	0.023	0.030	0.081
SR validation	%	13%						
Som DDx	µg/l	1.308	1.277	1.295	1.379	1.413	1.319	1.164
stdev	µg/l	0.038	0.014	0.011	0.009	0.116	0.034	0.084
SR validation	%	13%						
Som heptachloorepoxide	µg/l	0.465	0.422	0.459	0.511	0.497	0.449	0.439
stdev	µg/l	0.023	0.009	0.013	0.016	0.025	0.007	0.011
SR validation	%	18%						
Som chloorbenzenen	µg/l	1.850	1.761	1.616	1.689	1.781	1.753	1.668
stdev	µg/l	0.047	0.064	0.015	0.061	0.033	0.028	0.015
SR validation	%	16%						

Annex 2 Results groundwater low								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
chlorobenzenes								
1,3,5-trichlorobenzene	%	100%	97%	97%	106%	109%	88%	94%
stdev	%	1%	0%	1%	0%	1%	0%	0%
z-score		0.0	-0.2	-0.2	0.4	0.6	-0.8	-0.4
1,2,4-trichlorobenzene	%	100%	93%	92%	96%	96%	89%	88%
stdev	%	0%	0%	1%	0%	1%	1%	0%
z-score		0.0	-0.5	-0.6	-0.3	-0.3	-0.8	-0.8
1,2,3-trichlorobenzene	%	100%	92%	89%	95%	98%	91%	88%
stdev	%	0%	1%	0%	1%	0%	0%	0%
z-score		0.0	-0.6	-0.8	-0.4	-0.1	-0.7	-0.9
1,2,3,5+1,2,4,5-tetrachlorobenzene	%	100%	95%	85%	89%	94%	93%	89%
stdev	%	1%	2%	1%	2%	1%	1%	0%
z-score		0.0	-0.3	-1.0	-0.7	-0.4	-0.5	-0.8
1,2,3,4-tetrachlorobenzene	%	100%	95%	85%	90%	93%	98%	93%
stdev	%	1%	1%	0%	1%	1%	1%	1%
z-score		0.0	-0.3	-0.9	-0.6	-0.5	-0.2	-0.4
pentachlorobenzene	%	100%	97%	83%	84%	94%	99%	90%
stdev	%	1%	1%	1%	1%	1%	1%	0%
z-score		0.0	-0.2	-1.0	-0.9	-0.3	-0.1	-0.6
hexachlorobenzene	%	100%	98%	86%	85%	95%	107%	92%
stdev	%	1%	2%	1%	1%	1%	1%	0%
z-score		0.0	-0.1	-0.7	-0.7	-0.2	0.3	-0.4
Pesticides								
hexachlorobutadiene	%	100%	99%	100%	112%	115%	94%	93%
stdev	%	2%	0%	2%	1%	2%	1%	1%
z-score		0.0	0.0	0.0	0.5	0.6	-0.3	-0.3
a-HCH	%	100%	93%	95%	101%	105%	98%	101%
stdev	%	1%	0%	0%	0%	1%	1%	1%
z-score		0.0	-0.5	-0.4	0.1	0.4	-0.1	0.1
b-HCH	%	100%	103%	97%	106%	104%	107%	116%
stdev	%	1%	0%	0%	1%	0%	1%	1%
z-score		0.0	0.2	-0.3	0.5	0.3	0.6	1.3
γ-HCH	%	100%	96%	96%	106%	105%	103%	102%
stdev	%	1%	0%	1%	0%	1%	0%	1%
z-score		0.0	-0.4	-0.3	0.5	0.4	0.2	0.2
d-HCH	%	100%	104%	96%	104%	108%	104%	101%
stdev	%	1%	0%	0%	2%	3%	0%	0%
z-score		0.0	0.3	-0.3	0.3	0.5	0.3	0.1
heptachlor	%	100%	107%	98%	96%	125%	92%	84%
stdev	%	1%	0%	1%	1%	2%	1%	1%
z-score		0.0	0.3	-0.1	-0.2	1.2	-0.4	-0.8
aldrin	%	100%	94%	105%	115%	111%	106%	107%
stdev	%	1%	1%	1%	1%	1%	1%	1%
z-score		0.0	-0.4	0.3	1.1	0.8	0.5	0.5
telodrin	%	100%	89%	96%	102%	95%	86%	84%
stdev	%	1%	1%	1%	1%	1%	1%	1%
z-score		0.0	-0.9	-0.3	0.2	-0.4	-1.1	-1.3
isodrin	%	100%	87%	103%	103%	99%	99%	104%

Annex 2 Results groundwater low								
stdev	%	1%	0%	1%	1%	2%	1%	1%
z-score		0.0	-1.1	0.2	0.2	-0.1	-0.1	0.3
cis-heptachlorepoxyde	%	100%	93%	100%	114%	104%	99%	96%
stdev	%	1%	1%	1%	1%	1%	0%	1%
z-score		0.0	-0.6	0.0	1.1	0.3	0.0	-0.3
trans-heptachlorepoxyde	%	100%	89%	97%	106%	110%	94%	93%
stdev	%	1%	0%	1%	1%	2%	1%	1%
z-score		0.0	-0.5	-0.1	0.2	0.4	-0.3	-0.3
o,p'-DDE	%	100%	96%	98%	105%	97%	101%	94%
stdev	%	1%	0%	0%	0%	0%	0%	1%
z-score		0.0	-0.3	-0.1	0.4	-0.3	0.1	-0.5
trans-chlordane	%	100%	94%	105%	115%	104%	100%	96%
stdev	%	1%	1%	0%	1%	1%	0%	0%
z-score		0.0	-0.5	0.4	1.2	0.3	0.0	-0.3
cis-chlordane	%	100%	91%	99%	110%	105%	96%	97%
stdev	%	1%	0%	1%	1%	0%	0%	0%
z-score		0.0	-0.7	-0.1	0.8	0.4	-0.3	-0.2
a-endosulfan	%	100%	105%	112%	120%	102%	91%	116%
stdev	%	1%	0%	2%	2%	1%	1%	3%
z-score		0.0	0.4	1.0	1.6	0.1	-0.7	1.3
p,p'-DDE	%	100%	91%	93%	100%	92%	94%	84%
stdev	%	1%	0%	0%	0%	0%	0%	2%
z-score		0.0	-0.7	-0.6	0.0	-0.6	-0.5	-1.3
o,p'-DDD	%	100%	101%	103%	107%	103%	102%	89%
stdev	%	1%	0%	0%	1%	0%	1%	2%
z-score		0.0	0.1	0.2	0.6	0.3	0.2	-0.9
dieldrin	%	100%	94%	102%	116%	109%	103%	97%
stdev	%	1%	1%	0%	1%	1%	0%	0%
z-score		0.0	-0.5	0.2	1.3	0.7	0.3	-0.3
endrin	%	100%	93%	108%	108%	110%	100%	108%
stdev	%	1%	0%	0%	1%	1%	1%	2%
z-score		0.0	-0.4	0.5	0.5	0.6	0.0	0.5
p,p'-DDD	%	100%	99%	101%	105%	109%	102%	86%
stdev	%	1%	0%	0%	1%	1%	1%	2%
z-score		0.0	-0.1	0.1	0.4	0.7	0.2	-1.1
b-endosulfan	%	100%	86%	91%	96%	79%	77%	60%
stdev	%	2%	1%	0%	1%	1%	2%	0%
z-score		0.0	-1.2	-0.7	-0.3	-1.7	-1.8	-3.2
o,p'-DDT	%	100%	96%	101%	95%	77%	91%	87%
stdev	%	1%	1%	1%	1%	1%	0%	1%
z-score		0.0	-0.3	0.0	-0.4	-1.8	-0.7	-1.0
p,p'-DDT	%	100%	98%	97%	101%	92%	97%	92%
stdev	%	1%	0%	0%	0%	1%	1%	1%
z-score		0.0	-0.1	-0.2	0.1	-0.6	-0.2	-0.6
endosulfansulphate	%	100%	100%	102%	115%	154%	109%	89%
stdev	%	1%	1%	1%	2%	10%	1%	2%
z-score		0.0	0.0	0.2	1.2	4.3	0.7	-0.9
PCB's								
PCB28	%	100%	95%	96%	93%	84%	94%	86%
stdev	%	1%	0%	0%	0%	1%	1%	1%
z-score		0.0	-0.4	-0.3	-0.6	-1.3	-0.5	-1.1

Annex 2 Results groundwater low								
PCB52	%	100%	96%	98%	101%	97%	100%	97%
stdev	%	1%	0%	0%	0%	1%	0%	0%
z-score		0.0	-0.3	-0.1	0.1	-0.3	0.0	-0.2
PCB101	%	100%	90%	93%	99%	90%	91%	83%
stdev	%	1%	1%	0%	1%	1%	0%	1%
z-score		0.0	-0.8	-0.6	-0.1	-0.8	-0.7	-1.4
PCB118	%	100%	87%	93%	100%	91%	87%	76%
stdev	%	1%	1%	1%	1%	0%	1%	2%
z-score		0.0	-1.0	-0.6	0.0	-0.7	-1.0	-1.9
PCB153	%	100%	86%	94%	100%	89%	89%	77%
stdev	%	1%	1%	0%	1%	0%	0%	2%
z-score		0.0	-1.1	-0.5	0.0	-0.8	-0.9	-1.8
PCB138	%	100%	88%	93%	102%	95%	92%	78%
stdev	%	1%	1%	0%	1%	0%	0%	2%
z-score		0.0	-0.9	-0.5	0.1	-0.4	-0.6	-1.8
PCB180	%	100%	88%	95%	104%	99%	96%	84%
stdev	%	1%	1%	1%	1%	0%	0%	1%
z-score		0.0	-0.9	-0.4	0.3	-0.1	-0.3	-1.3
Sommen								
Som HCH	%	100%	99%	96%	104%	106%	103%	105%
stdev	%	2%	1%	1%	3%	4%	2%	3%
z-score		0.0	-0.1	-0.3	0.4	0.4	0.3	0.4
Som Drins	%	100%	91%	103%	109%	105%	99%	100%
stdev	%	5%	3%	2%	5%	5%	2%	2%
z-score		0.0	-0.7	0.2	0.7	0.4	-0.1	0.0
Som PCB's	%	100%	90%	95%	100%	92%	93%	83%
stdev	%	4%	4%	1%	4%	2%	3%	8%
z-score		0.0	-0.8	-0.4	0.0	-0.6	-0.6	-1.4
Som DDx	%	100%	98%	99%	105%	108%	101%	89%
stdev	%	4%	1%	1%	1%	12%	3%	8%
z-score		0.0	-0.2	-0.1	0.4	0.6	0.1	-0.9
Som heptachloorepoxide	%	100%	91%	99%	110%	107%	96%	94%
stdev	%	2%	1%	1%	2%	2%	1%	1%
z-score		0.0	-0.5	-0.1	0.5	0.4	-0.2	-0.3
Som chloorbenzenes	%	100%	95%	87%	91%	96%	95%	90%
stdev	%	5%	6%	1%	6%	3%	3%	1%
z-score		0.0	-0.3	-0.8	-0.5	-0.2	-0.3	-0.6

Annex 3 Results ground water sample high (2 µg/l)

Annex 3 Results groundwater high								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
chlorobenzenes								
1,3,5-trichlorobenzene	µg/l	2.178	1.933	1.979	1.994	2.096	1.827	1.865
stdev	µg/l	0.080	0.060	0.085	0.037	0.096	0.025	0.084
SR validation	%	15%						
1,2,4-trichlorobenzene	µg/l	2.300	2.082	2.059	2.059	2.104	2.056	1.973
stdev	µg/l	0.052	0.016	0.047	0.021	0.082	0.025	0.075
SR validation	%	14%						
1,2,3-trichlorobenzene	µg/l	2.384	2.247	2.151	2.193	2.331	2.231	2.130
stdev	µg/l	0.054	0.043	0.029	0.080	0.065	0.042	0.083
SR validation	%	14%						
1,2,3,5+1,2,4,5-tetrachlorobenzene	µg/l	4.891	4.847	4.185	4.274	4.639	4.520	4.145
stdev	µg/l	0.141	0.172	0.157	0.310	0.162	0.164	0.309
SR validation	%	15%						
1,2,3,4-tetrachlorobenzene	µg/l	2.526	2.572	2.230	2.281	2.444	2.443	2.276
stdev	µg/l	0.075	0.117	0.092	0.188	0.053	0.115	0.165
SR validation	%	16%						
pentachlorobenzene	µg/l	2.661	2.760	2.265	2.226	2.525	2.567	2.073
stdev	µg/l	0.113	0.150	0.126	0.194	0.115	0.150	0.176
SR validation	%	18%						
hexachlorobenzene	µg/l	2.708	2.814	2.381	2.141	2.450	2.671	1.859
stdev	µg/l	0.142	0.179	0.150	0.154	0.166	0.197	0.132
SR validation	%	20%						
Pesticiden								
hexachlorobutadiëne	µg/l	1.741	1.822	1.867	1.780	1.977	1.758	1.545
stdev	µg/l	0.205	0.053	0.082	0.090	0.200	0.047	0.167
SR validation	%	23%						
α-HCH	µg/l	2.056	2.059	2.068	2.327	2.488	2.233	2.578
stdev	µg/l	0.049	0.010	0.085	0.071	0.048	0.044	0.252
SR validation	%	13%						
β-HCH	µg/l	2.268	2.404	2.383	2.535	2.446	2.598	2.499
stdev	µg/l	0.048	0.006	0.083	0.087	0.054	0.058	0.138
SR validation	%	13%						
γ-HCH	µg/l	2.133	2.116	2.147	2.469	2.604	2.374	2.476
stdev	µg/l	0.040	0.007	0.073	0.058	0.041	0.037	0.221
SR validation	%	13%						
δ-HCH	µg/l	2.478	2.693	2.529	2.890	3.322	2.740	2.737
stdev	µg/l	0.036	0.015	0.090	0.105	0.170	0.080	0.041
SR validation	%	14%						
heptachlor	µg/l	1.949	2.048	1.976	2.392	3.938	2.150	2.322
stdev	µg/l	0.052	0.027	0.089	0.110	0.146	0.080	0.284
SR validation	%	21%						
aldrin	µg/l	1.951	1.781	1.992	2.123	2.157	2.074	2.184
stdev	µg/l	0.046	0.005	0.087	0.117	0.059	0.064	0.207
SR validation	%	14%						
telodrin	µg/l	2.068	1.979	2.186	2.389	2.306	2.136	2.056
stdev	µg/l	0.036	0.013	0.077	0.058	0.020	0.068	0.184
SR validation	%	13%						
isodrin	µg/l	1.997	1.819	2.156	2.390	2.176	2.115	2.183

Annex 3 Results groundwater high								
stdev	µg/l	0.039	0.003	0.073	0.135	0.050	0.051	0.213
SR validation	%	13%						
cis-heptachlorepoxyde	µg/l	2.164	2.070	2.307	2.685	2.479	2.383	2.353
stdev	µg/l	0.047	0.011	0.065	0.094	0.043	0.038	0.146
SR validation	%	13%						
trans-heptachlorepoxyde	µg/l	2.131	2.101	2.327	2.612	2.717	2.321	2.410
stdev	µg/l	0.051	0.030	0.079	0.144	0.022	0.041	0.106
SR validation	%	25%						
o,p'-DDE	µg/l	2.179	2.159	2.225	2.269	2.122	2.266	2.106
stdev	µg/l	0.026	0.004	0.058	0.082	0.060	0.055	0.135
SR validation	%	13%						
trans-chlordane	µg/l	2.158	2.096	2.377	2.632	2.444	2.374	2.271
stdev	µg/l	0.033	0.004	0.060	0.131	0.046	0.018	0.072
SR validation	%	13%						
cis-chlordane	µg/l	2.097	2.036	2.266	2.532	2.458	2.318	2.307
stdev	µg/l	0.035	0.013	0.061	0.113	0.041	0.026	0.077
SR validation	%	13%						
a-endosulfan	µg/l	2.465	2.034	2.343	2.472	2.444	2.171	2.723
stdev	µg/l	0.155	0.055	0.077	0.092	0.052	0.166	0.038
SR validation	%	13%						
p,p'-DDE	µg/l	2.136	2.090	2.126	2.164	2.074	2.164	2.038
stdev	µg/l	0.022	0.014	0.052	0.094	0.069	0.046	0.131
SR validation	%	13%						
o,p'-DDD	µg/l	2.225	2.219	2.347	2.355	2.275	2.319	2.125
stdev	µg/l	0.021	0.021	0.026	0.112	0.039	0.056	0.139
SR validation	%	13%						
dieldrin	µg/l	2.061	2.031	2.275	2.615	2.350	2.356	2.273
stdev	µg/l	0.044	0.010	0.038	0.150	0.027	0.051	0.060
SR validation	%	13%						
endrin	µg/l	2.277	2.287	2.736	2.775	2.815	2.663	3.016
stdev	µg/l	0.055	0.030	0.065	0.125	0.056	0.082	0.090
SR validation	%	16%						
p,p'-DDD	µg/l	2.189	2.100	2.200	2.210	2.367	2.270	2.137
stdev	µg/l	0.028	0.036	0.016	0.133	0.043	0.065	0.136
SR validation	%	13%						
b-endosulfan	µg/l	2.186	2.163	2.239	2.406	1.904	2.243	2.063
stdev	µg/l	0.050	0.018	0.055	0.081	0.021	0.076	0.121
SR validation	%	13%						
o,p'-DDT	µg/l	1.715	1.644	1.785	1.526	1.119	1.429	1.342
stdev	µg/l	0.026	0.047	0.032	0.010	0.084	0.050	0.027
SR validation	%	13%						
p,p'-DDT	µg/l	1.783	1.769	1.798	1.764	1.626	1.721	1.712
stdev	µg/l	0.018	0.033	0.028	0.046	0.072	0.020	0.023
SR validation	%	13%						
endosulfansulphate	µg/l	2.122	2.268	2.364	2.833	4.229	2.601	2.439
stdev	µg/l	0.032	0.058	0.041	0.162	0.525	0.098	0.101
SR validation	%	13%						
PCB's								
PCB28	µg/l	2.042	1.971	1.995	1.791	1.719	2.033	1.783
stdev	µg/l	0.042	0.037	0.083	0.009	0.089	0.083	0.049
SR validation	%	13%						

Annex 3 Results groundwater high								
PCB52	µg/l	2.141	2.065	2.110	2.044	2.029	2.131	1.978
stdev	µg/l	0.026	0.007	0.094	0.033	0.080	0.073	0.031
SR validation	%	13%						
PCB101	µg/l	2.209	2.086	2.177	2.125	2.035	2.109	1.920
stdev	µg/l	0.024	0.013	0.065	0.079	0.077	0.086	0.093
SR validation	%	13%						
PCB118	µg/l	2.134	1.953	2.092	2.151	2.051	2.149	2.060
stdev	µg/l	0.034	0.028	0.044	0.123	0.057	0.031	0.070
SR validation	%	13%						
PCB153	µg/l	2.147	1.997	2.162	2.247	2.084	2.201	2.175
stdev	µg/l	0.024	0.025	0.045	0.112	0.034	0.032	0.096
SR validation	%	13%						
PCB138	µg/l	2.184	2.007	2.127	2.253	2.156	2.234	2.249
stdev	µg/l	0.030	0.037	0.040	0.138	0.036	0.026	0.092
SR validation	%	13%						
PCB180	µg/l	2.050	1.887	2.025	2.193	2.139	2.201	2.438
stdev	µg/l	0.034	0.053	0.051	0.146	0.028	0.035	0.069
SR validation	%	13%						
Sommen								
Som HCH	µg/l	8.934	9.273	9.128	10.220	10.860	9.946	10.290
stdev	µg/l	0.146	0.014	0.331	0.309	0.169	0.217	0.633
SR validation	%	13%						
Som Drins	µg/l	10.353	9.898	11.345	12.292	11.804	11.344	11.711
stdev	µg/l	0.203	0.055	0.338	0.564	0.163	0.071	0.725
SR validation	%	13%						
Som PCB's	µg/l	14.907	13.966	14.688	14.803	14.213	15.058	14.603
stdev	µg/l	0.178	0.186	0.350	0.625	0.379	0.214	0.474
SR validation	%	13%						
Som DDx	µg/l	12.634	12.603	13.060	13.594	14.693	13.341	12.557
stdev	µg/l	0.113	0.080	0.193	0.617	0.378	0.138	0.662
SR validation	%	13%						
Som heptachloorepoxide	µg/l	4.295	4.171	4.634	5.297	5.196	4.704	4.763
stdev	µg/l	0.091	0.040	0.144	0.237	0.064	0.079	0.248
SR validation	%	18%						
Som chloorbenzenes	µg/l	19.648	19.254	17.249	17.169	18.590	18.315	16.321
stdev	µg/l	0.560	0.648	0.499	0.911	0.720	0.680	0.976
SR validation	%	16%						

Annex 3 Results groundwater high								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
chlorobenzenen								
1,3,5-trichlorobenzene	%	100%	89%	91%	92%	96%	84%	86%
stdev	%	8%	6%	8%	4%	10%	3%	8%
z-score		0.0	-0.8	-0.6	-0.6	-0.3	-1.1	-1.0
1,2,4-trichlorobenzene	%	100%	91%	90%	90%	91%	89%	86%
stdev	%	5%	2%	5%	2%	8%	2%	7%
z-score		0.0	-0.7	-0.7	-0.7	-0.6	-0.8	-1.0
1,2,3-trichlorobenzene	%	100%	94%	90%	92%	98%	94%	89%
stdev	%	5%	4%	3%	8%	7%	4%	8%
z-score		0.0	-0.4	-0.7	-0.6	-0.2	-0.5	-0.8
1,2,3,5+1,2,4,5-tetrachlorobenzene	%	100%	99%	86%	87%	95%	92%	85%
stdev	%	14%	17%	16%	31%	16%	16%	31%
z-score		0.0	-0.1	-1.0	-0.8	-0.3	-0.5	-1.0
1,2,3,4-tetrachlorobenzene	%	100%	102%	88%	90%	97%	97%	90%
stdev	%	8%	12%	9%	19%	5%	11%	17%
z-score		0.0	0.1	-0.7	-0.6	-0.2	-0.2	-0.6
pentachlorobenzene	%	100%	104%	85%	84%	95%	96%	78%
stdev	%	11%	15%	13%	19%	12%	15%	18%
z-score		0.0	0.2	-0.8	-0.9	-0.3	-0.2	-1.2
hexachlorobenzene	%	100%	104%	88%	79%	90%	99%	69%
stdev	%	14%	18%	15%	15%	17%	20%	13%
z-score		0.0	0.2	-0.6	-1.0	-0.5	-0.1	-1.6
Pesticiden								
hexachlorobutadiëne	%	100%	105%	107%	102%	114%	101%	89%
stdev	%	20%	5%	8%	9%	20%	5%	17%
z-score		0.0	0.2	0.3	0.1	0.6	0.0	-0.5
a-HCH	%	100%	100%	101%	113%	121%	109%	125%
stdev	%	5%	1%	9%	7%	5%	4%	25%
z-score		0.0	0.0	0.0	1.1	1.7	0.7	2.0
b-HCH	%	100%	106%	105%	112%	108%	115%	110%
stdev	%	5%	1%	8%	9%	5%	6%	14%
z-score		0.0	0.5	0.4	0.9	0.6	1.2	0.8
γ-HCH	%	100%	99%	101%	116%	122%	111%	116%
stdev	%	4%	1%	7%	6%	4%	4%	22%
z-score		0.0	-0.1	0.1	1.3	1.8	0.9	1.3
d-HCH	%	100%	109%	102%	117%	134%	111%	110%
stdev	%	4%	1%	9%	11%	17%	8%	4%
z-score		0.0	0.6	0.1	1.2	2.4	0.8	0.7
heptachlor	%	100%	105%	101%	123%	202%	110%	119%
stdev	%	5%	3%	9%	11%	15%	8%	28%
z-score		0.0	0.2	0.1	1.1	4.9	0.5	0.9
aldrin	%	100%	91%	102%	109%	111%	106%	112%
stdev	%	5%	0%	9%	12%	6%	6%	21%
z-score		0.0	-0.6	0.1	0.6	0.8	0.4	0.9
telodrin	%	100%	96%	106%	116%	112%	103%	99%
stdev	%	4%	1%	8%	6%	2%	7%	18%
z-score		0.0	-0.3	0.5	1.2	0.9	0.3	0.0
isodrin	%	100%	91%	108%	120%	109%	106%	109%

Annex 3 Results groundwater high								
stdev	%	4%	0%	7%	14%	5%	5%	21%
z-score		0.0	-0.7	0.6	1.6	0.7	0.5	0.7
cis-heptachlorepoxyde	%	100%	96%	107%	124%	115%	110%	109%
stdev	%	5%	1%	6%	9%	4%	4%	15%
z-score		0.0	-0.3	0.5	1.9	1.2	0.8	0.7
trans-heptachlorepoxyde	%	100%	99%	109%	123%	127%	109%	113%
stdev	%	5%	3%	8%	14%	2%	4%	11%
z-score		0.0	-0.1	0.4	0.9	1.1	0.4	0.5
o,p'-DDE	%	100%	99%	102%	104%	97%	104%	97%
stdev	%	3%	0%	6%	8%	6%	5%	14%
z-score		0.0	-0.1	0.2	0.3	-0.2	0.3	-0.3
trans-chlordane	%	100%	97%	110%	122%	113%	110%	105%
stdev	%	3%	0%	6%	13%	5%	2%	7%
z-score		0.0	-0.2	0.8	1.8	1.1	0.8	0.4
cis-chlordane	%	100%	97%	108%	121%	117%	111%	110%
stdev	%	4%	1%	6%	11%	4%	3%	8%
z-score		0.0	-0.2	0.6	1.7	1.4	0.8	0.8
a-endosulfan	%	100%	83%	95%	100%	99%	88%	110%
stdev	%	15%	5%	8%	9%	5%	17%	4%
z-score		0.0	-1.4	-0.4	0.0	-0.1	-1.0	0.8
p,p'-DDE	%	100%	98%	100%	101%	97%	101%	95%
stdev	%	2%	1%	5%	9%	7%	5%	13%
z-score		0.0	-0.2	0.0	0.1	-0.2	0.1	-0.4
o,p'-DDD	%	100%	100%	105%	106%	102%	104%	95%
stdev	%	2%	2%	3%	11%	4%	6%	14%
z-score		0.0	0.0	0.4	0.5	0.2	0.3	-0.4
dieldrin	%	100%	99%	110%	127%	114%	114%	110%
stdev	%	4%	1%	4%	15%	3%	5%	6%
z-score		0.0	-0.1	0.8	2.2	1.1	1.1	0.8
endrin	%	100%	100%	120%	122%	124%	117%	132%
stdev	%	6%	3%	6%	12%	6%	8%	9%
z-score		0.0	0.0	1.2	1.3	1.5	1.0	2.0
p,p'-DDD	%	100%	96%	100%	101%	108%	104%	98%
stdev	%	3%	4%	2%	13%	4%	7%	14%
z-score		0.0	-0.3	0.0	0.1	0.7	0.3	-0.2
b-endosulfan	%	100%	99%	102%	110%	87%	103%	94%
stdev	%	5%	2%	5%	8%	2%	8%	12%
z-score		0.0	-0.1	0.2	0.8	-1.0	0.2	-0.4
o,p'-DDT	%	100%	96%	104%	89%	65%	83%	78%
stdev	%	3%	5%	3%	1%	8%	5%	3%
z-score		0.0	-0.3	0.3	-0.8	-2.6	-1.3	-1.7
p,p'-DDT	%	100%	99%	101%	99%	91%	97%	96%
stdev	%	2%	3%	3%	5%	7%	2%	2%
z-score		0.0	-0.1	0.1	-0.1	-0.7	-0.3	-0.3
endosulfansulphate	%	100%	107%	111%	133%	199%	123%	115%
stdev	%	3%	6%	4%	16%	53%	10%	10%
z-score		0.0	0.5	0.9	2.7	7.9	1.8	1.2
PCB's								
PCB28	%	100%	97%	98%	88%	84%	100%	87%
stdev	%	4%	4%	8%	1%	9%	8%	5%
z-score		0.0	-0.3	-0.2	-1.0	-1.3	0.0	-1.0

Annex 3 Results groundwater high								
PCB52	%	100%	96%	99%	95%	95%	100%	92%
stdev	%	3%	1%	9%	3%	8%	7%	3%
z-score		0.0	-0.3	-0.1	-0.4	-0.4	0.0	-0.6
PCB101	%	100%	94%	99%	96%	92%	95%	87%
stdev	%	2%	1%	7%	8%	8%	9%	9%
z-score		0.0	-0.4	-0.1	-0.3	-0.6	-0.4	-1.0
PCB118	%	100%	92%	98%	101%	96%	101%	97%
stdev	%	3%	3%	4%	12%	6%	3%	7%
z-score		0.0	-0.7	-0.2	0.1	-0.3	0.1	-0.3
PCB153	%	100%	93%	101%	105%	97%	103%	101%
stdev	%	2%	2%	4%	11%	3%	3%	10%
z-score		0.0	-0.6	0.1	0.4	-0.2	0.2	0.1
PCB138	%	100%	92%	97%	103%	99%	102%	103%
stdev	%	3%	4%	4%	14%	4%	3%	9%
z-score		0.0	-0.6	-0.2	0.3	-0.1	0.2	0.2
PCB180	%	100%	92%	99%	107%	104%	107%	119%
stdev	%	3%	5%	5%	15%	3%	3%	7%
z-score		0.0	-0.6	-0.1	0.6	0.3	0.6	1.5
Sommen								
Som HCH	%	100%	104%	102%	114%	122%	111%	115%
stdev	%	15%	1%	33%	31%	17%	22%	63%
z-score		0.0	0.3	0.2	1.2	1.7	0.9	1.2
Som Drins	%	100%	96%	110%	119%	114%	110%	113%
stdev	%	20%	6%	34%	56%	16%	7%	73%
z-score		0.0	-0.4	0.8	1.5	1.1	0.8	1.0
Som PCB's	%	100%	94%	99%	99%	95%	101%	98%
stdev	%	18%	19%	35%	63%	38%	21%	47%
z-score		0.0	-0.5	-0.1	-0.1	-0.4	0.1	-0.2
Som DDx	%	100%	100%	103%	108%	116%	106%	99%
stdev	%	11%	8%	19%	62%	38%	14%	66%
z-score		0.0	0.0	0.3	0.6	1.3	0.4	0.0
Som heptachloorepoxide	%	100%	97%	108%	123%	121%	110%	111%
stdev	%	9%	4%	14%	24%	6%	8%	25%
z-score		0.0	-0.2	0.4	1.3	1.1	0.5	0.6
Som chloorbenzenes	%	100%	98%	88%	87%	95%	93%	83%
stdev	%	56%	65%	50%	91%	72%	68%	98%
z-score		0.0	-0.1	-0.8	-0.8	-0.3	-0.4	-1.1

Annex 4 Results Control Sample

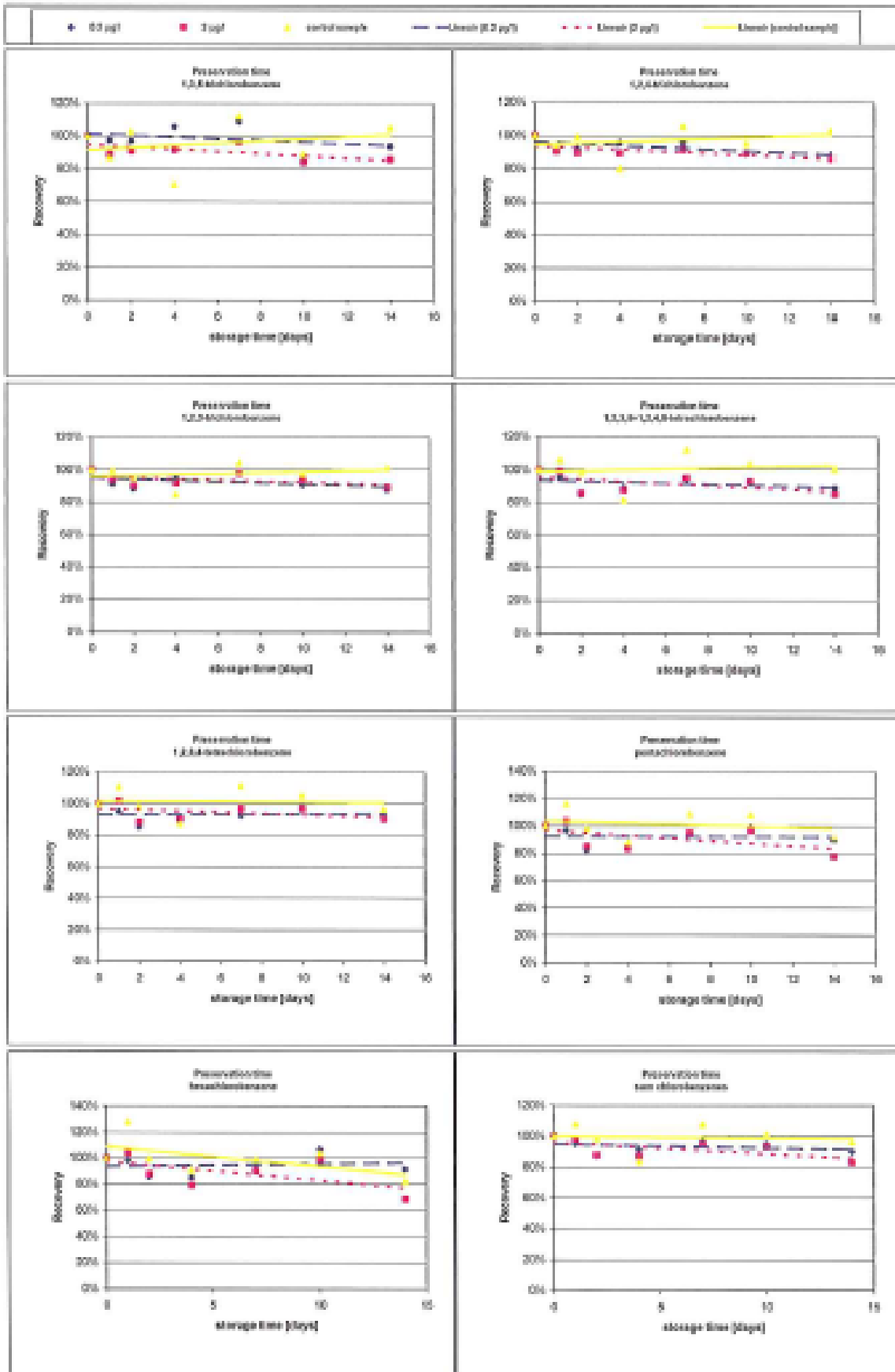
Annex 4 Results Contro Sample								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
chlorobenzenen								
1,3,5-trichlorobenzene	µg/l	1.221	1.060	1.251	0.860	1.367	1.083	1.283
SR validation	%	15%						
1,2,4-trichlorobenzene	µg/l	1.226	1.157	1.215	0.982	1.294	1.168	1.260
SR validation	%	14%						
1,2,3-trichlorobenzene	µg/l	1.303	1.295	1.242	1.104	1.356	1.270	1.319
SR validation	%	14%						
1,2,3,5+1,2,4,5-tetrachlorobenzene	µg/l	2.865	3.034	2.804	2.328	3.210	2.964	2.865
SR validation	%	15%						
1,2,3,4-tetrachlorobenzene	µg/l	1.606	1.778	1.576	1.398	1.790	1.686	1.548
SR validation	%	16%						
pentachlorobenzene	µg/l	1.608	1.867	1.578	1.418	1.751	1.738	1.482
SR validation	%	18%						
hexachlorobenzene	µg/l	2.088	2.675	2.084	1.898	2.062	2.178	1.718
SR validation	%	20%						
Pesticiden								
hexachlorobutadiëne	µg/l	0.720	0.655	0.730	0.380	0.916	0.658	0.745
SR validation	%	23%						
a-HCH	µg/l	1.421	1.604	1.415	1.620	1.454	1.557	1.509
SR validation	%	13%						
b-HCH	µg/l	1.599	1.982	1.633	1.742	1.545	1.735	1.520
SR validation	%	13%						
γ-HCH	µg/l	1.560	1.748	1.539	1.788	1.437	1.699	1.576
SR validation	%	13%						
d-HCH	µg/l	1.786	2.292	1.788	2.008	1.462	1.855	1.706
SR validation	%	14%						
heptachlor	µg/l	1.528	1.777	1.435	1.933	2.183	1.804	2.580
SR validation	%	21%						
aldrin	µg/l	1.350	1.431	1.393	1.564	1.263	1.544	1.399
SR validation	%	14%						
telodrin	µg/l	1.836	1.935	1.853	2.074	1.863	1.985	1.889
SR validation	%	13%						
isodrin	µg/l	1.533	1.629	1.651	1.767	1.279	1.699	1.535
SR validation	%	13%						
cis-heptachlorepoxyde	µg/l	1.463	1.452	1.466	1.648	1.446	1.491	1.443
SR validation	%	13%						
trans-heptachlorepoxyde	µg/l	1.511	1.586	1.532	1.684	1.464	0.202	1.482
SR validation	%	25%						
o,p'-DDE	µg/l	1.435	1.634	1.474	1.535	1.318	1.491	1.310
SR validation	%	13%						
trans-chlordane	µg/l	1.503	1.566	1.579	1.732	1.493	1.597	1.521
SR validation	%	13%						
cis-chlordane	µg/l	1.526	1.582	1.544	1.717	1.493	1.597	1.534
SR validation	%	13%						
a-endosulfan	µg/l	1.584	1.585	1.499	1.632	1.726	1.490	1.579
SR validation	%	13%						
p,p'-DDE	µg/l	1.466	1.574	1.448	1.494	1.289	1.468	1.262
SR validation	%	13%						

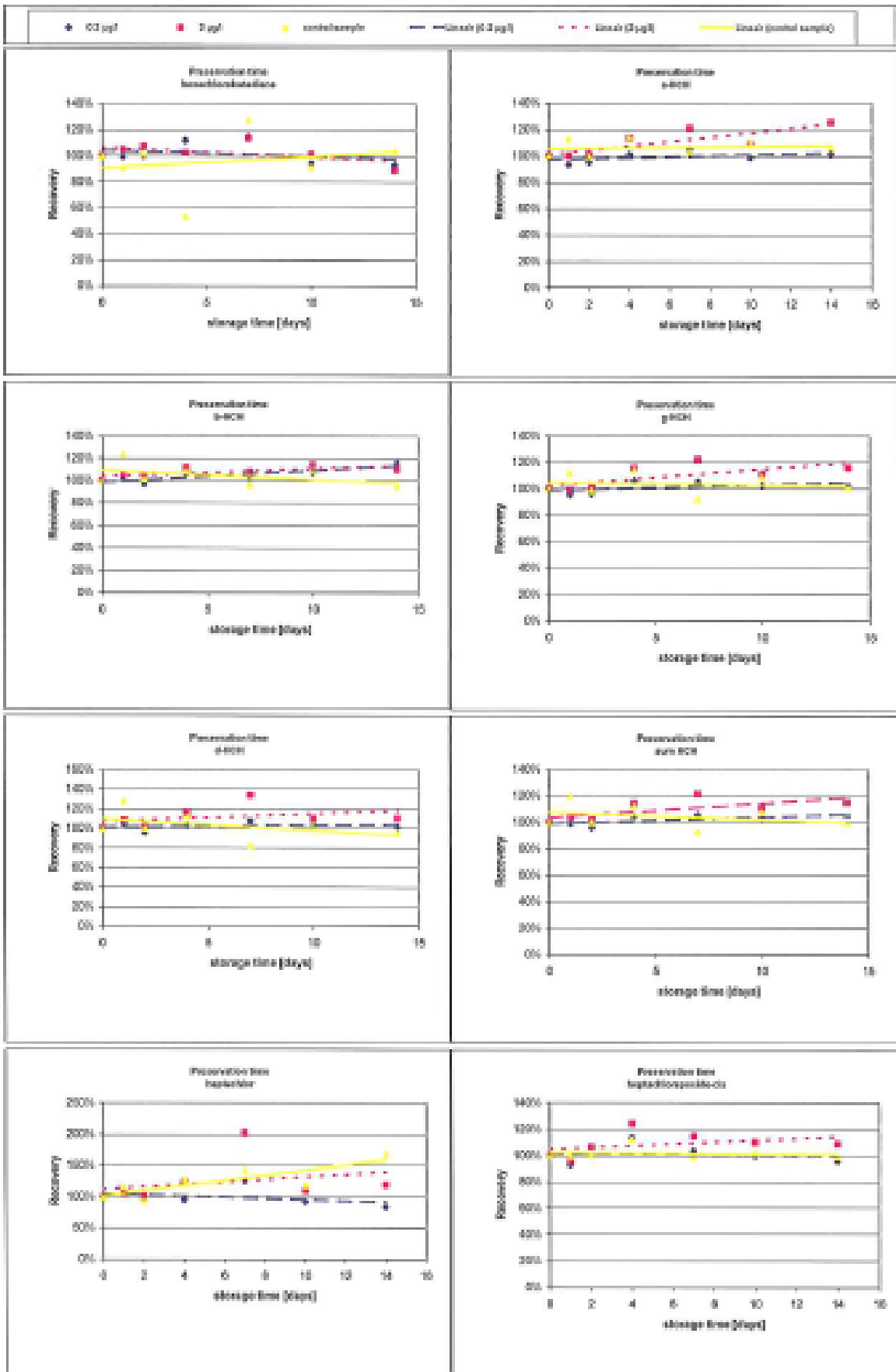
Annex 4 Results Contro Sample								
o,p'-DDD	µg/l	1.525	1.683	1.546	1.540	1.339	1.459	1.330
SR validation	%	13%						
dieldrin	µg/l	1.431	1.411	1.451	1.607	1.355	1.459	1.450
SR validation	%	13%						
endrin	µg/l	3.055	3.165	3.219	3.286	3.156	3.027	4.579
SR validation	%	16%						
p,p'-DDD	µg/l	1.398	1.575	1.360	1.349	1.243	1.334	1.289
SR validation	%	13%						
b-endosulfan	µg/l	1.536	1.643	1.520	1.711	1.170	1.526	1.578
SR validation	%	13%						
o,p'-DDT	µg/l	1.379	1.267	1.340	1.301	1.057	1.200	0.941
SR validation	%	13%						
p,p'-DDT	µg/l	1.312	1.195	1.395	1.302	1.230	1.212	1.260
SR validation	%	13%						
endosulfansulphate	µg/l	1.484	1.598	1.519	1.667	1.448	1.427	1.616
SR validation	%	13%						
PCB's								
PCB28	µg/l	1.377	1.496	1.470	1.437	1.306	1.437	1.378
SR validation	%	13%						
PCB52	µg/l	1.413	1.506	1.441	1.491	1.327	1.440	1.308
SR validation	%	13%						
PCB101	µg/l	1.553	1.624	1.549	1.577	1.388	1.492	1.404
SR validation	%	13%						
PCB118	µg/l	1.118	1.170	1.099	1.143	1.033	1.105	1.079
SR validation	%	13%						
PCB153	µg/l	1.207	1.256	1.181	1.236	1.039	1.207	1.036
SR validation	%	13%						
PCB138	µg/l	1.357	1.390	1.314	1.394	1.205	1.362	1.209
SR validation	%	13%						
PCB180	µg/l	1.181	1.229	1.155	1.250	1.065	1.173	1.023
SR validation	%	13%						
Sommen								
Som HCH	µg/l	6.366	7.626	6.375	7.158	5.898	6.846	6.311
SR validation	%	13%						
Som Drins	µg/l	9.205	9.571	9.567	10.298	8.916	9.714	10.852
SR validation	%	13%						
Som PCB's	µg/l	9.206	9.671	9.209	9.528	8.363	9.216	8.437
SR validation	%	13%						
Som DDx	µg/l	8.620	9.259	8.742	8.887	7.867	8.391	8.067
SR validation	%	13%						
Som heptachloorepoxide	µg/l	2.974	3.038	2.998	3.332	2.910	1.693	2.925
SR validation	%	18%						
Som chloorbenzenen	µg/l	11.917	12.866	11.750	9.988	12.830	12.087	11.475
SR validation	%	16%						

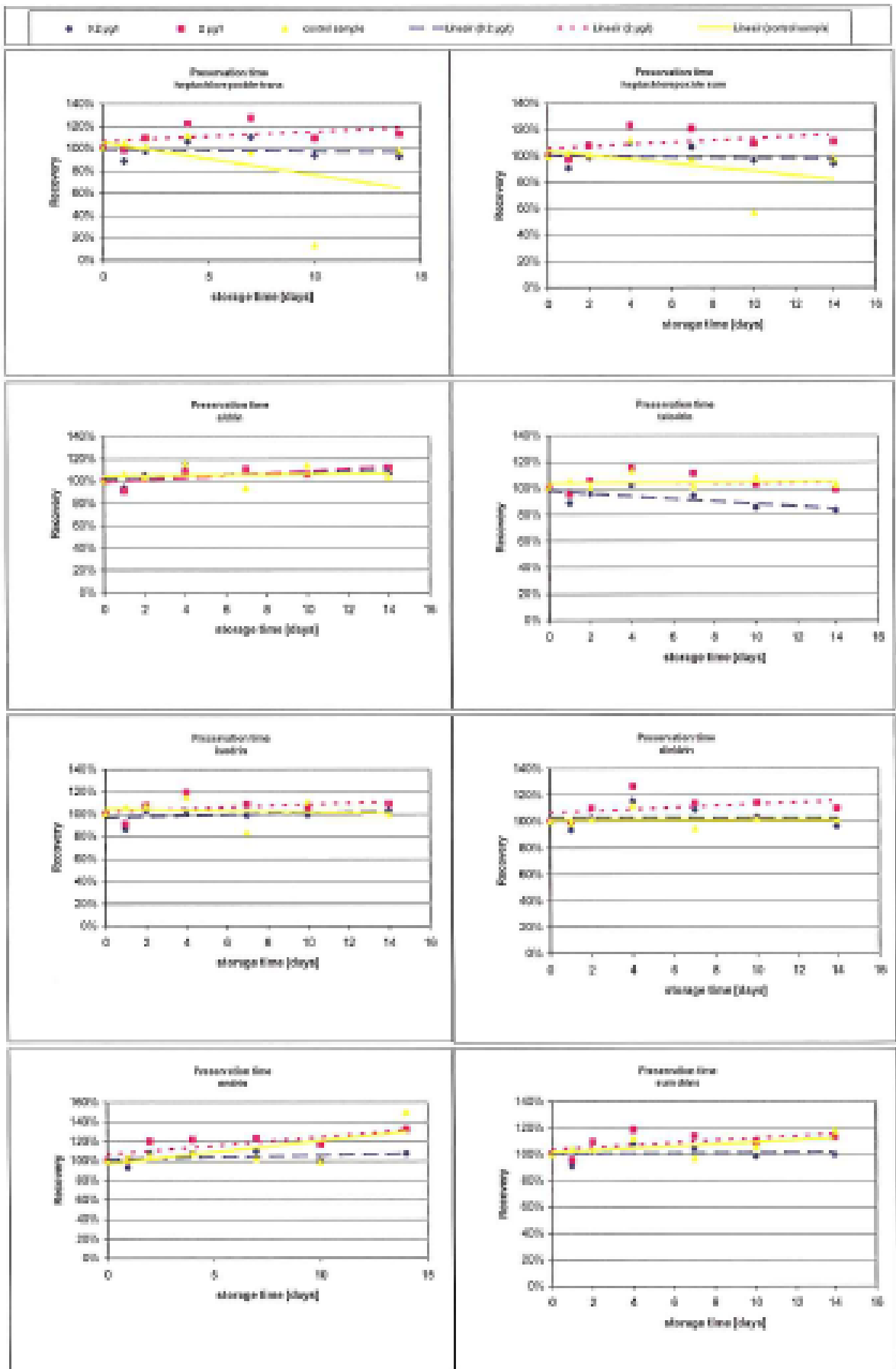
Annex 4 Results Contro Sample								
		day 0	day 1	day 2	day 4	day 7	day 10	day 14
	Unit							
chlorobenzenen								
1,3,5-trichlorobenzene	%	100%	87%	102%	70%	112%	89%	105%
z-score		0.0	-0.9	0.2	-2.0	0.8	-0.8	0.3
1,2,4-trichlorobenzene	%	100%	94%	99%	80%	106%	95%	103%
z-score		0.0	-0.4	-0.1	-1.4	0.4	-0.3	0.2
1,2,3-trichlorobenzene	%	100%	99%	95%	85%	104%	97%	101%
z-score		0.0	0.0	-0.3	-1.1	0.3	-0.2	0.1
1,2,3,5+1,2,4,5-tetrachlorobenzene	%	100%	106%	98%	81%	112%	103%	100%
z-score		0.0	0.4	-0.1	-1.2	0.8	0.2	0.0
1,2,3,4-tetrachlorobenzene	%	100%	111%	98%	87%	111%	105%	96%
z-score		0.0	0.7	-0.1	-0.8	0.7	0.3	-0.2
pentachlorobenzene	%	100%	116%	98%	88%	109%	108%	92%
z-score		0.0	0.9	-0.1	-0.7	0.5	0.4	-0.4
hexachlorobenzene	%	100%	128%	100%	91%	99%	104%	82%
z-score		0.0	1.4	0.0	-0.5	-0.1	0.2	-0.9
Pesticiden								
hexachlorobutadiëne	%	100%	91%	101%	53%	127%	91%	103%
z-score		0.0	-0.4	0.1	-2.0	1.2	-0.4	0.1
a-HCH	%	100%	113%	100%	114%	102%	110%	106%
z-score		0.0	1.0	0.0	1.1	0.2	0.8	0.5
b-HCH	%	100%	124%	102%	109%	97%	109%	95%
z-score		0.0	1.9	0.2	0.7	-0.3	0.7	-0.4
γ-HCH	%	100%	112%	99%	115%	92%	109%	101%
z-score		0.0	1.0	-0.1	1.2	-0.6	0.7	0.1
d-HCH	%	100%	128%	100%	112%	82%	104%	96%
z-score		0.0	2.0	0.0	0.9	-1.3	0.3	-0.3
heptachlor	%	100%	116%	94%	127%	143%	118%	169%
z-score		0.0	0.8	-0.3	1.3	2.1	0.9	3.3
aldrin	%	100%	106%	103%	116%	94%	114%	104%
z-score		0.0	0.4	0.2	1.1	-0.5	1.0	0.3
telodrin	%	100%	105%	101%	113%	101%	108%	103%
z-score		0.0	0.4	0.1	1.0	0.1	0.6	0.2
isodrin	%	100%	106%	108%	115%	83%	111%	100%
z-score		0.0	0.5	0.6	1.2	-1.3	0.9	0.0
cis-heptachlorepoxyde	%	100%	99%	100%	113%	99%	102%	99%
z-score		0.0	-0.1	0.0	1.0	-0.1	0.2	-0.1
trans-heptachlorepoxyde	%	100%	105%	101%	111%	97%	13%	98%
z-score		0.0	0.2	0.1	0.5	-0.1	-3.5	-0.1
o,p'-DDE	%	100%	114%	103%	107%	92%	104%	91%
z-score		0.0	1.1	0.2	0.6	-0.7	0.3	-0.7
trans-chlordane	%	100%	104%	105%	115%	99%	106%	101%
z-score		0.0	0.3	0.4	1.2	-0.1	0.5	0.1
cis-chlordane	%	100%	104%	101%	113%	98%	105%	101%
z-score		0.0	0.3	0.1	1.0	-0.2	0.4	0.0
a-endosulfan	%	100%	100%	95%	103%	109%	94%	100%
z-score		0.0	0.0	-0.4	0.2	0.7	-0.5	0.0
p,p'-DDE	%	100%	107%	99%	102%	88%	100%	86%
z-score		0.0	0.6	-0.1	0.2	-1.0	0.0	-1.1

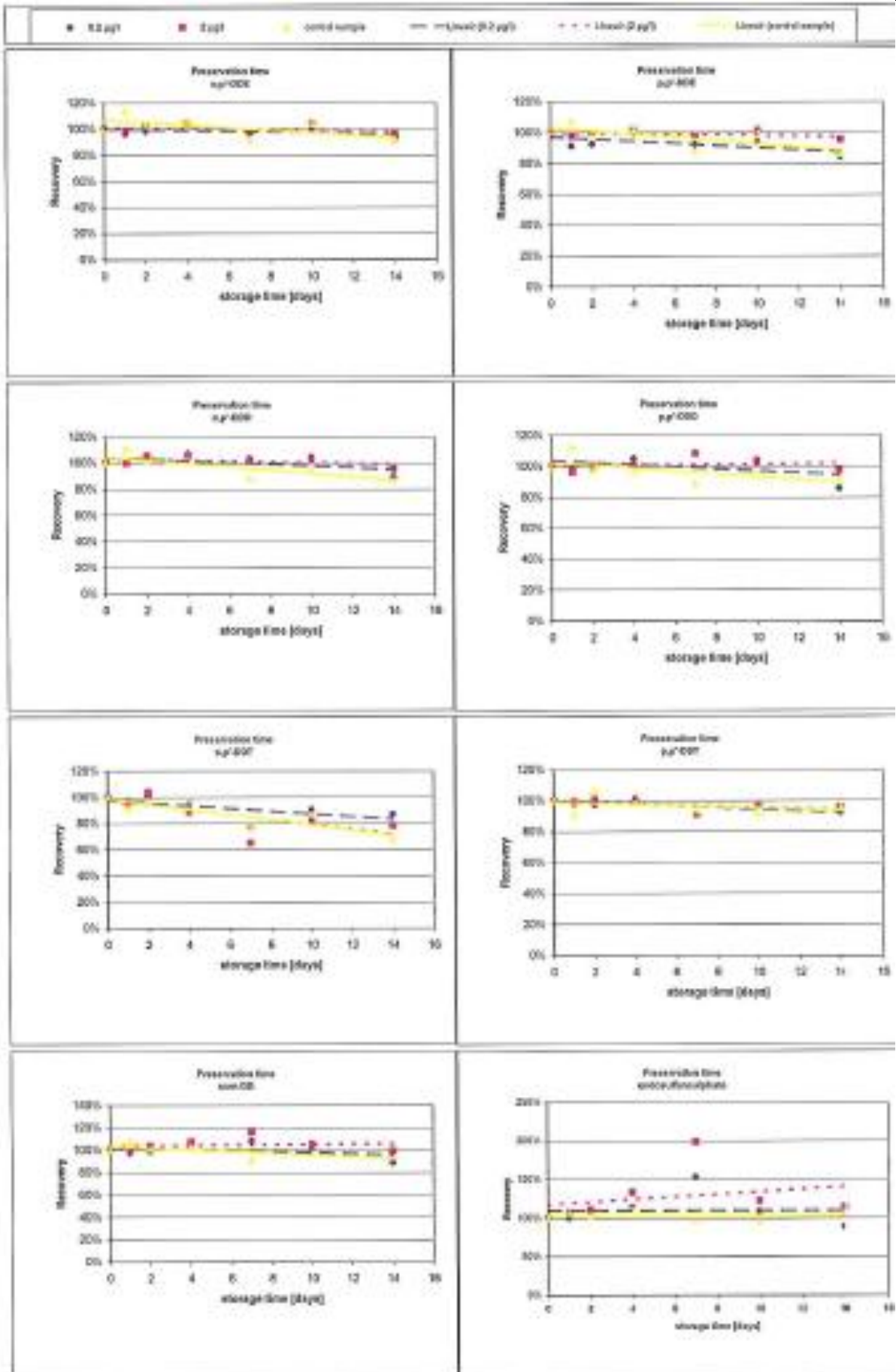
Annex 4 Results Contro Sample								
o,p'-DDD	%	100%	110%	101%	101%	88%	96%	87%
z-score		0.0	0.8	0.1	0.1	-1.0	-0.3	-1.0
dieldrin	%	100%	99%	101%	112%	95%	102%	101%
z-score		0.0	-0.1	0.1	1.0	-0.4	0.2	0.1
endrin	%	100%	104%	105%	108%	103%	99%	150%
z-score		0.0	0.2	0.3	0.5	0.2	-0.1	3.1
p,p'-DDD	%	100%	113%	97%	96%	89%	95%	92%
z-score		0.0	1.0	-0.2	-0.3	-0.9	-0.4	-0.6
b-endosulfan	%	100%	107%	99%	111%	76%	99%	103%
z-score		0.0	0.6	-0.1	0.9	-1.9	-0.1	0.2
o,p'-DDT	%	100%	92%	97%	94%	77%	87%	68%
z-score		0.0	-0.6	-0.2	-0.4	-1.8	-1.0	-2.4
p,p'-DDT	%	100%	91%	106%	99%	94%	92%	96%
z-score		0.0	-0.7	0.5	-0.1	-0.5	-0.6	-0.3
endosulfansulphate	%	100%	108%	102%	112%	98%	96%	109%
z-score		0.0	0.6	0.2	1.0	-0.2	-0.3	0.7
PCB's								
PCB28	%	100%	109%	107%	104%	95%	104%	100%
z-score		0.0	0.7	0.5	0.3	-0.4	0.3	0.0
PCB52	%	100%	107%	102%	106%	94%	102%	93%
z-score		0.0	0.5	0.2	0.4	-0.5	0.2	-0.6
PCB101	%	100%	105%	100%	102%	89%	96%	90%
z-score		0.0	0.4	0.0	0.1	-0.8	-0.3	-0.8
PCB118	%	100%	105%	98%	102%	92%	99%	97%
z-score		0.0	0.4	-0.1	0.2	-0.6	-0.1	-0.3
PCB153	%	100%	104%	98%	102%	86%	100%	86%
z-score		0.0	0.3	-0.2	0.2	-1.1	0.0	-1.1
PCB138	%	100%	102%	97%	103%	89%	100%	89%
z-score		0.0	0.2	-0.3	0.2	-0.9	0.0	-0.9
PCB180	%	100%	104%	98%	106%	90%	99%	87%
z-score		0.0	0.3	-0.2	0.5	-0.8	-0.1	-1.1
Sommen								
Som HCH	%	100%	120%	100%	112%	93%	108%	99%
z-score		0.0	1.6	0.0	1.0	-0.6	0.6	-0.1
Som Drins	%	100%	104%	104%	112%	97%	106%	118%
z-score		0.0	0.3	0.3	0.9	-0.3	0.4	1.4
Som PCB's	%	100%	105%	100%	103%	91%	100%	92%
z-score		0.0	0.4	0.0	0.3	-0.7	0.0	-0.7
Som DDx	%	100%	107%	101%	103%	91%	97%	94%
z-score		0.0	0.6	0.1	0.2	-0.7	-0.2	-0.5
Som heptachloorepoxide	%	100%	102%	101%	112%	98%	57%	98%
z-score		0.0	0.1	0.0	0.7	-0.1	-2.3	-0.1
Som chloorbenzenes	%	100%	108%	99%	84%	108%	101%	96%
z-score		0.0	0.5	-0.1	-1.0	0.5	0.1	-0.2

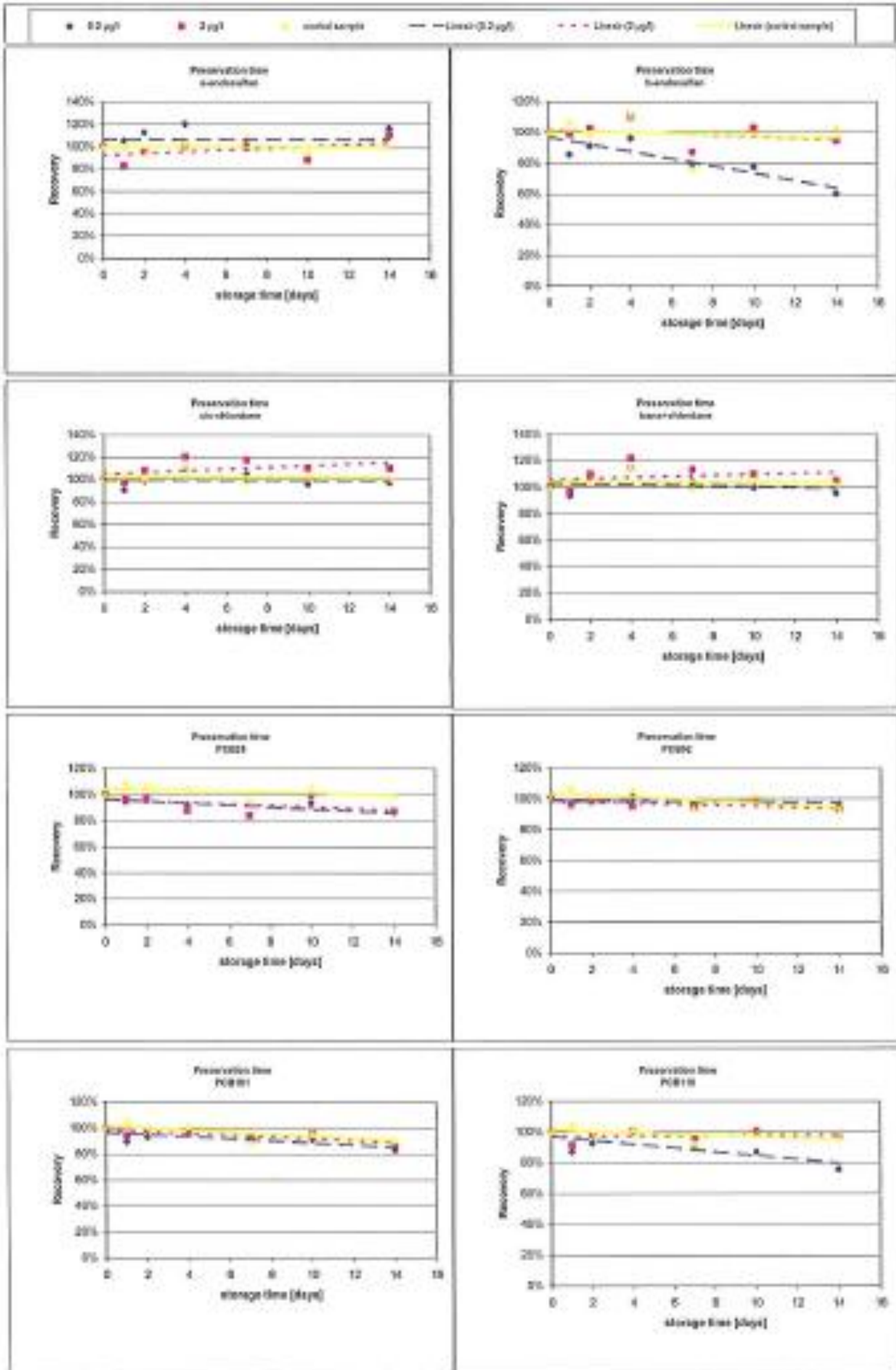
Annex 5 Plots Preservation time

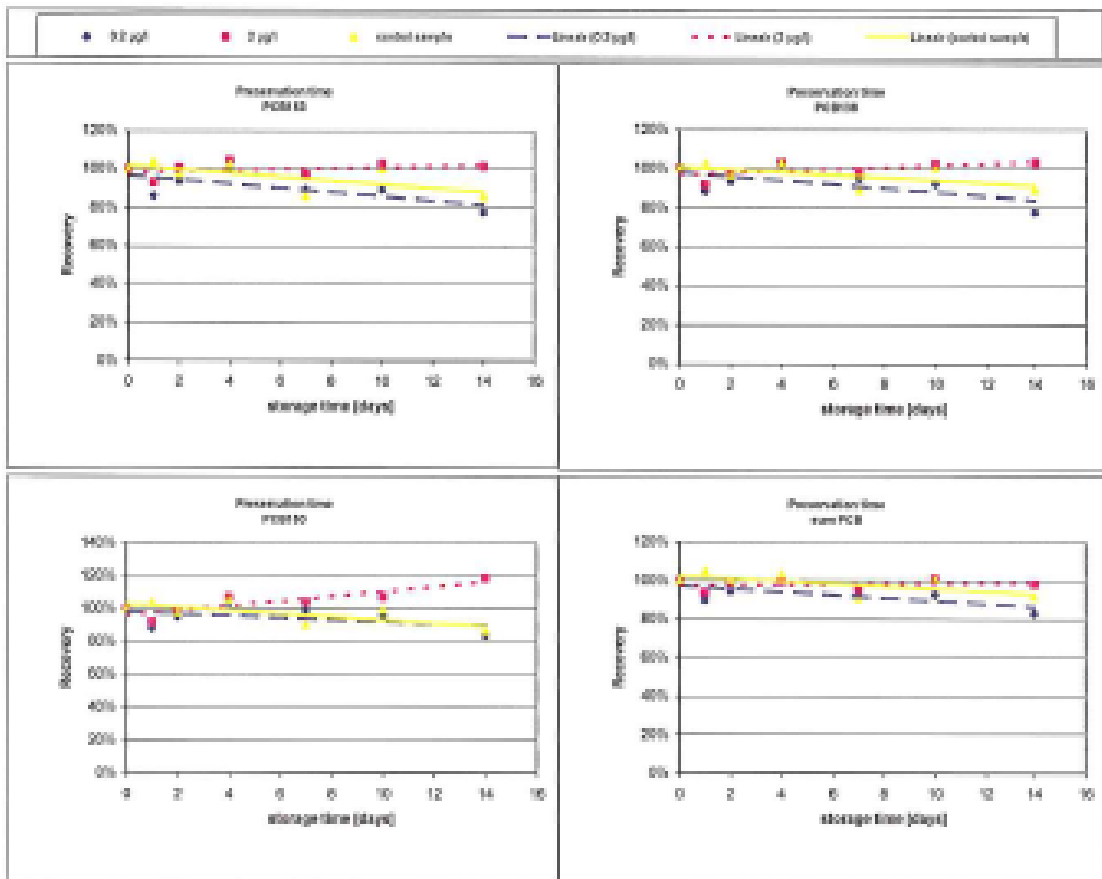












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