5.4. Chemical Parameters

Water quality and other chemistry tests were made during much of the monitoring periods. Tests included salinity in the ditches (as part of an overall evaluation of the pre-existing condition of the ditches), water quality samples collected when fish were sampled, more rigorous sampling of water quality parameters at the fish stations (originally undertaken at three week intervals), limited chemistry tests of water quality in the ditches in 2004, pore water salinity readings made in conjunction with marsh water table monitoring, and water quality sampling conducted in the river and two in-marsh creeks (Big Fish Creek and Little Fish Creek).

The County Public and Environmental Health Laboratory (PEHL), which is part of SCDHS, conducted all chemical analyses. The PEHL is a participating laboratory in the USEPA Environmental Laboratory Assurance Program, which means it has achieved the highest level of certification that is possible for an environmental laboratory.

The data will be presented in four broad categories. One is general water quality parameters. These parameters (temperature, salinity, pH, dissolved oxygen, Secchi disk depths) were all collected using field instrumentation. The second is pathogen indicators (fecal and total coliform). These were analyzed following strict regulatory program protocols by the PEHL. The third is nutrients (suites of nitrogen and phosphorous compounds). These analytes are routinely collected by Suffolk County in its various surface water programs. They were analyzed by the PEHL. Finally, some of the water samples were analyzed for the full suite of organic compounds (solvents, gasoline constituents, other industrial chemicals, pesticides, herbicides, and pesticide degradates) that Suffolk County monitors for in surface water and groundwater collected across the County. The PEHL analyzed these compounds (the PEHL is acknowledged as one of the best environmental laboratories for these kinds of analyses, and created the methodologies for some compounds that have been certified by USEPA as the most appropriate means of determining their presence in aqueous samples).

Certain of the chemical data sets were analyzed using Kolmogorov-Smirnov tests initially. Data sets that were not significantly different under this non-parametric test, and found to be normal or log-normal in distribution, were analyzed using Student's t-tests (any log-normal data were transformed prior to analysis). Where significance was not determined under Kolmogorov-

Smirnov tests and the data were not normally or log-normally distributed, Mann-Whitney rank-sum tests were used. Significance for all tests was at $p<0.05$. Test data are provided in the Addendum, pp. 233-234, 245, 251, and 256. More details regarding the statistical tests are provided in Section 5.1, above.

Where BACI comparisons were made, Before (pre-treatment) data for Area 1 (an Impact or Treatment area) were from 2003-2004. The control Before (pre-treatment) data Area 1 controls were Area 3 and Area 4 2003-2004 data. Post-treatment (After) data for Area 1 was 2005-2007 data, and its Control post-treatment (After) data were Area 3 and Area 4 data for 2005-2007. The Before (pre-treatment) data for Area 2 (also an Impact or Treatment area) were 2003-2005 data sets. The control Before (pre-treatment) data Area 2 controls were Area 3 and Area 4 2003-2005 data. Post-treatment (After) data for Area 2 was 2006-2007 data, and its Control post-treatment (After) data were Area 3 and Area 4 data for 2006-2007.

5.4.1. General Water Quality Parameters

Salinity was measured along the mosquito ditches in November 2003. The highest individual salinity readings were generally in the mid portions of the ditches in Areas 1 and 4, the western portions in Area 2, and mid to western portions in Area 3. However, overall, the Area 2 had the highest salinity, and Area 1 had the lowest. The differences between all of the Area means, except for the comparison between Area 3 and Area 4, were significant.

Table 72. Mean Area-wide Ditch Salinities, November 2003

Area	Average Ditch Salinity (ppt)
1	6.9
2	16.1
3	9.5
4	11.5

Water quality parameters were measured every time nekton were sampled. Table 73 shows the means for these values (samples were taken in September 2003, and then three times a year for 2004-2006, at the beginning, middle, and end of the summer). These values therefore describe summer water quality at the fish stations. The surface waters tend to be hot (2003 data were collected only in September), of only moderate salinity, and hypoxic. In 2005, temperatures were elevated, and in 2006 salinity was reduced. The treatment areas tended to have higher dissolved oxygen levels, although in 2007 mean dissolved oxygen concentrations were nearly above concentrations of concern (according to USEPA, 2001) across the marsh. Table 74 compares treatment and control areas for these parameters. The temperature increases associated with treatment in Areas 1 and 2 were significant, but for Area 1, the control areas also experienced a significant increase in temperature. The salinity decreases associated with the treatment in Areas 1 and 2 were also significant. The dissolved oxygen concentration increases for Areas 1 and 2 post-treatment were also significant.

NYSDEC has expressed concerns that constructing ponds on the marsh may cause increased fish mortality if water quality in the ponds becomes poor. The data in Table 74 suggest that, in comparison to the tidal channels and modified ditches, temperatures are elevated and dissolved oxygen concentrations depressed in the constructed ponds in Areas 1 and 2. The higher salinity in the ponds suggests that water circulation is not as robust there, leading to evaporation and lesser exchange with the River and the estuary. However, the data show no major differences between water quality in the control area ditches and the ponds, indicating that the ponds should not cause mortality to fish that would not occur if the marsh modifications had not been made. In addition, although the highest temperatures post-modifications were measured in the ponds, the lowest dissolved oxygen concentrations were measured outside of the ponds in Areas 1 and 2. Thus, most areas in the marsh appear to have the potential to experience unsatisfactory water quality (in terms of suitability as fish habitat) over the course of the summer.

Table 73. Water Quality Parameters Measured When Nekton Sampling Was Conducted

Year	Area	Temperature (°C)	Salinity (psu)	Dissolved Oxygen (mg/l)
2003	Area 1	14.9	9.0	1.4
	Area 2	14.5	14.6	1.3
	Area 3	17.4	10.8	1.6
	Area 4	11.6	10.4	2.4
2004	Area 1	21.6	7.7	2.3
	Area 2	22.0	15.5	3.9
	Area 3	24.3	11.9	3.6
	Area 4	23.2	10.9	3.3
2005	Area 1	27.1	8.6	4.5
	Area 2	26.4	14.4	1.0
	Area 3	29.2	12.0	2.9
	Area 4	25.4	11.1	1.3
2006	Area 1	22.4	5.0	4.3
	Area 2	23.1	9.4	4.5
	Area 3	24.6	8.8	1.9
	Area 4	21.1	6.4	1.9
2007	Area 1	24.8	6.0	5.1
	Area 2	24.8	9.5	4.3
	Area 3	28.2	11.5	5.5
	Area 4	24.7	9.7	4.5

Table 74. Comparison of Treatment and Control Area Means for Field Parameters Collected during Nekton Sampling

	Temperature (°C)	Salinity (psu)	Dissolved Oxygen (mg/l)
Area 1 Pre-treatment	19.8	8.0	2.0
Area 1 Post-treatment (all)	24.5	6.6	4.6
Modified Ditches	24.1	4.5	5.3
Tidal Channels	24.0	6.5	4.4
Ponds	25.5	8.8	4.1
Area 1 Controls Pre-treatment	21.4	11.2	3.1
Area 1 Controls Post-treatment	25.4	9.9	3.1
Area 2 Pre-treatment	22.1	14.9	2.4
Area 2 Post-treatment (all)	24.0	9.5	4.4
Modified Ditches	23.6	9.0	5.5
Tidal Channels	23.5	7.9	4.0
Ponds	24.9	11.9	3.7
Area 2 Controls Pre-treatment	23.4	11.3	2.7
Area 2 Controls Post-treatment	24.7	9.1	3.1

SCDHS collected general water quality parameters through routine sampling at the fish stations. Data were collected at three week intervals in the fall and winter of 2003, and at approximate three week intervals in 2004 from March to October. In 2005, samples were collected in February, October, and December. In 2006, they were collected in March. No sampling was made in 2007.

Table 75. Fish Station Water Quality Parameters

Area	Year (sampling events)	Dissolved Oxygen (mg/l)	pH (Std. units)	Salinity (psu)	Temperature (°C)
Pre-construction 1	2003 (5)	5.6	6.7	13.6	10.0
	2004 (9)	5.5	7.0	9.8	16.0
	2005 (1)	-	6.7	8.2	2.2
Post-construction 1	2005 (1)	5.5	7.0	7.3	4.3
	2006 (1)	6.2	6.9	6.3	11.9
2	2003 (5)	7.5	6.3	17.9	9.3
	2004 (9)	6.6	7.4	14.6	15.4
	2005 (3)	4.8	6.9	13.2	6.1
3	2003 (4)	5.2	7.0	15.2	10.1
	2004 (9)	4.7	6.9	11.4	15.0
	2005 (3)	3.6	6.9	8.4	5.7)
	2006 (1)	3.7	6.7	9.6	9.7
4	2003 (5)	4.9	7.0	15.7	8.3
	2004 (9)	3.7	7.0	9.0	13.4
	2005 (3)	3.8	6.7	8.5	6.8
	2006 (1)	4.0	6.3	6.9	8.4

The data collected by SCDHS do not necessarily match the data collected in conjunction with fish sampling. The difference in the values probably stems from the difference in the times of year when the samples were collected (all fish sampling data were collected in summer, whereas the SCDHS efforts included many samples from spring, late fall, and early winter).

In terms of the general trend agreements, salinities data generally agree with the fish sampling data. For instance, Area 1 tends to have the lowest values, with Areas 2 and 3 tending to be much higher. However, dissolved oxygen values are higher in these SCDHS data sets, perhaps reflecting the larger number of samples taken in winter and early spring when microbial respiration rates are suppressed. The mean temperature values are also much lower, reflecting the collection of data at times other than summer. pH values are lower than typical ocean values of 8 standard units or more, which reflects the mixing of more alkaline high salinity water with more acidic fresh water. pH values may also be lower in marshes due to the presence of reduced sulfur compounds that when they are oxidized may form sulfuric acids of various kinds (acidification or marshes can be a concern when conducting alterations like those done at Wertheim).

Sampling was also made in the river. Sampling occurred on July 15, July 29, and October 15, 2003, September 16, 2004, March 21, June 23, September 20 (field parameters only) and

December 5, 2005, and March 20 and June 21, 2006. Duplicate samples were often taken (morning and afternoon). Stations WWR001, WWR002, WWR003, and WWR004 are in the main stem of the Carmans River. Station WWR005 is in Big Fish Creek and Station WWR006 is in Little Fish Creek.

Table 76. Mean Values, 2003-2006 Carmans River Stations Water Quality Parameters

Station	Dissolved Oxygen (mg/l)	pH (Std. units)*	Salinity (psu)	Temperature (^oC)	Secchi (ft)*	Samples
WWR001	6.9	7.4	18.3	17.4	3.1	18
WWR002	6.7	7.4	16.2	17.2	2.4	18
WWR003	7.2	7.4	12.1	17.3	1.7	18
WWR004	7.9	7.5	8.3	16.9	1.5	18
WWR005	5.6	7.0	14.6	13.4	1.8	11
WWR006	6.2	7.1	13.6	13.4	1.6	11

* Secchi disk and pH readings not made every sample

pH values and DO concentrations tended to be higher than those recorded within the marsh. Salinity in the river decreases with distance upstream, but increases up the creeks (reflecting that they drain areas subject to evaporation, most probably). These data suggest there is not a great deal of fresh groundwater discharge to the marsh (that is, relative to the discharge of groundwater into the River itself), as otherwise the upcreek salinity values might have been lower than those found in the river. The individual sampling points reflect the dominant influence of the tidal cycle on this part of the river, as morning and afternoon values are often very different. The decreases in turbidity (reflected by increasing Secchi disc depths) could signal the occurrence of estuarine particle flocculation, due partially to changes in saturation values because of changes in overall water chemistry as the salt estuarine water mixes with fresh river water.

Comparisons were made of these data pre-project and post-project. Stations WWR003 and WWR004 are both immediately off-shore of Area 1. None of the river stations particularly targets Area 2, so the distinction that was made was between pre-2005 data and post-2004 data (the sample taken during construction, on March 21, 2005, was therefore classified as being post-construction). All Secchi disk data and all samples from WWR005 and WWR006 were taken post-construction, and so they are not presented in this comparison.

Table 77. Comparison of Pre- and Post-treatment Mean Values, Carmans River Stations Water Quality Parameters

Station	Pre- or Post-construction	Dissolved Oxygen (mg/l)	pH (Std. units)*	Salinity (psu)	Temperature (°C)	Samples*
WWR001	Pre	7.4	7.7	19.2	24.1	7
	Post	6.6	7.3	17.6	13.1	11
WWR002	Pre	6.7	7.7	15.0	23.3	7
	Post	6.7	7.3	17.0	13.3	11
WWR003	Pre	6.4	7.9	12.1	23.0	7
	Post	7.6	7.3	12.1	13.7	11
WWR004	Pre	7.4	7.9	9.2	22.2	7
	Post	8.2	7.3	7.6	13.4	11

*only 2 pre-treatment and 5 post-treatment pH samples at each station

It is obvious that average temperatures decreased post-construction, but this reflects the inclusion of colder weather sampling times. Salinities generally decreased post-construction, and the limited pH values also show a slight decrease. This may reflect the higher river flows in the latter half of 2005 and in 2006. Dissolved oxygen values appear to be slightly higher post-construction art stations WWR003 and WWR004, near to Area 1. This may reflect better water quality in the area following construction, or it may only be an artifact of more cold (or cool) weather samples (microbial respiration is less in colder weather, and so dissolved oxygen values tend to be higher then). However, a similar trend was not found for the other two stations. The effect clearly did not propagate far downstream.

Pore water salinities were measured at the same time water table heights were measured (Section 5.3.2), and share many of the same problems in terms of interpretation of the data. There are often wide variations between samples collected at various stations in an Area on the same date, and there can also be considerable scatter considering data points collected across relatively short periods of time. This has to do with the processes driving pore water salinity. These salinities are a function of evaporation (which increases the values), tidal inundation (which, considering baseline salinity in the water table and the salinity of the Carmans River, may either increase or dilute the ambient salinity), precipitation (which decreases salinity), the rate of flow of the river (presumably, salinity is inversely linked to river flow rates), salinity levels in the bay, and potential groundwater inputs (it is unclear whether the underlying aquifer is saline or not, although data seem to indicate it is fresh). These multivariate controls are then combined with use of a refractometer to measure the values in question. An experienced, careful technician can make consistent readings that, whatever may be the accuracy of the data, will at least be ordered (readings indicating lower salinities will be derived from lower salinity water, etc.) and may be relatively precise. However, many believe that data sets generated by refractometer are quantifiable only to a certain degree. If the technician making the readings is not careful, the data may even be relatively inaccurate, so that even an ordering of the readings is not possible. The data presented here were collected by at least four different individuals, and so there may be some concerns regarding the transferability of the data to a single compiled data set.

With that caveat in mind, mean values for pore water salinity are presented in Figures 72 and 73. Figure 72 illustrates means across each Area per sampling date; Figure 73 illustrates annual means for each Area. The data show that pore water salinity was higher in 2005. This is important (and interesting) because this is the growing season following the construction work in Area 1. *Phragmites* extent was seriously reduced in Area 1 in 2005. Water salinity data suggest that salinities in the channels and ponds were much too low to have affected *Phragmites* (reduction in vigor is only expected for salinities of 15 ppt or more [per Witje et al., 1996a, Witje et al., 1996b, and Warren et al., 2001]). Figure 60 indicates that pore water salinities in Area 1 may have been high enough, on average, to inhibit some of the regrowth of *Phragmites* in 2005. Please note that the river salinity values suggest that, especially on high tides, the salinity in the river sometimes was well in excess of 20 ppt. This means that if this higher salinity water were the water infusing into the marsh water table, it could account for the higher salinities recorded in the pore water samples.

The pore water salinity data is relatively ordered for each Area, but not absolutely: that is, Areas 1 and 4 tend to have lower pore water salinities than Areas 2 and 3 do, although it is not true for all years or sampling occasions. It is clear that pore water salinity is not just a function of river flow (which was highest in 2006) or rainfall (also greatest in 2006), as the annual salinity values were among the highest across the five years in 2006. Pore water salinities do not necessarily rise in summer, as might be expected if evaporation were the dominant control, although in 2005 they did (and 2005 was relatively dry). It may be that soil salinities for Area 1 are relatively lower post-treatment, in that post-treatment Area 1 sampling event values are often the lowest of all four Areas (especially in 2006 and 2007), whereas that was not generally so in 2003 and 2004. There does not seem to have been a discernable change for Area 2.

Figure 72. Pore Water Salinity, Means by Area, by Sampling Date

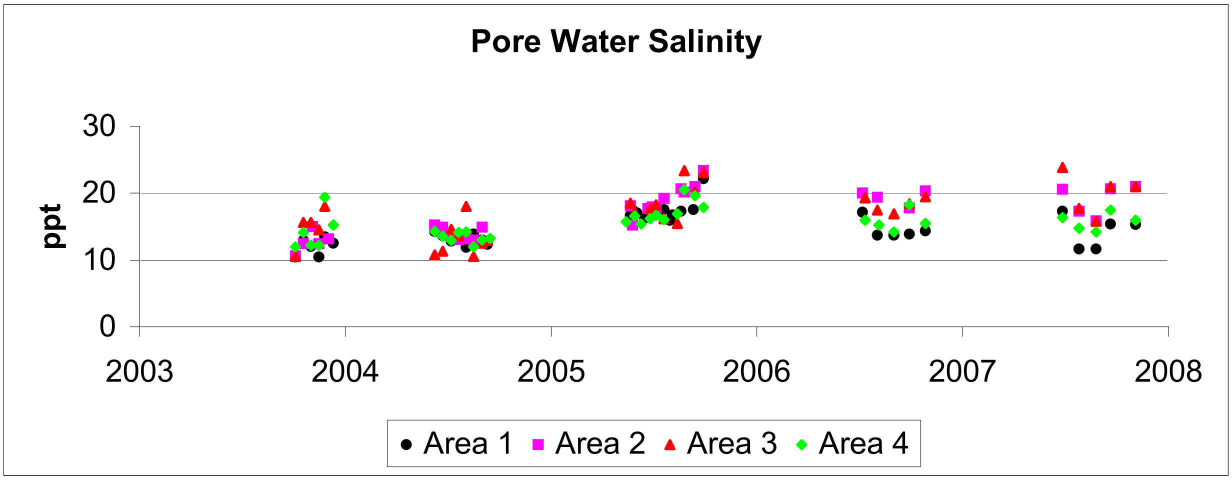
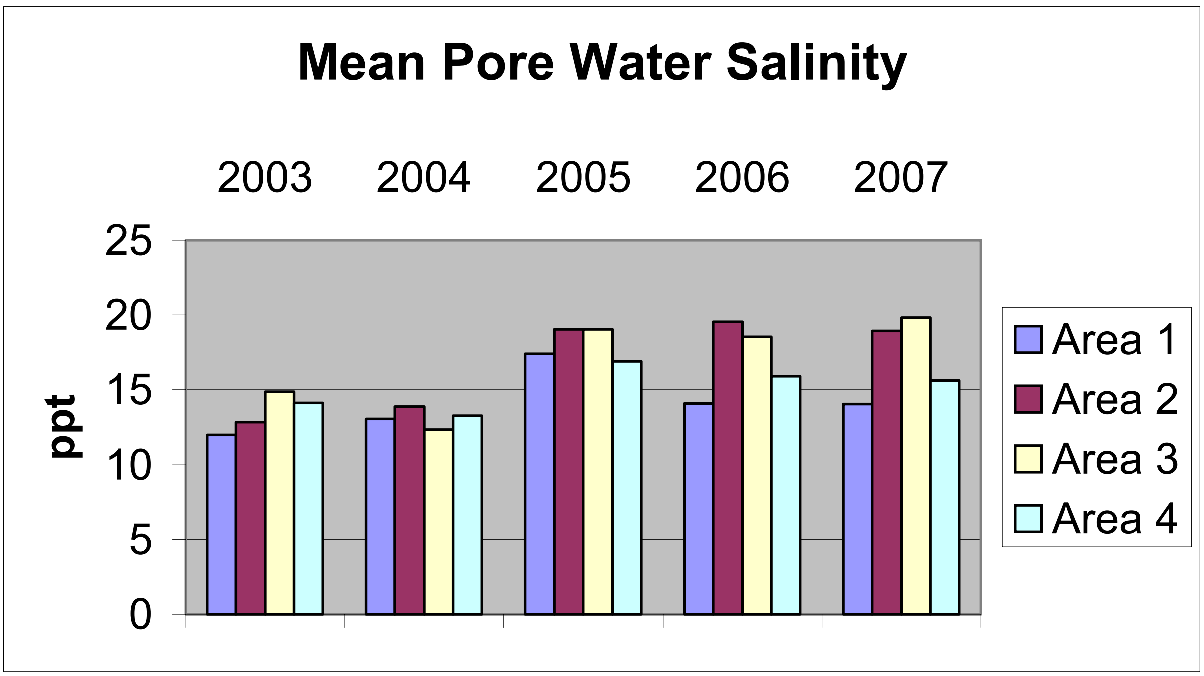


Figure 73. Annual Mean Pore Water Salinity (based on means of data from each station)



5.4.2. Pathogen Indicators

Pathogens were measured in two ways. One was the SCDHS sampling conducted at the fish stations. On June 10 and August 11, 2004, samples were collected and analyzed at all fish stations across the marsh. Secondly, pathogens were analyzed as part of the river and creek sampling conducted by SCDHS.

Table 78. Pathogen Indicators, Fish Stations, 2004 (Arithmetic Means) (MPN/100 ml)

Area	Fecal Coliform	Total Coliform
1	440	2000
2	180	2200
3	140	4700
4	1560	4300

Table 79. Pathogen Indicators, Carmans River Stations (Arithmetic Means) (MPN/100 ml)

Station	Fecal Coliform	Total Coliform
WWR001	450	1540
WWR002	1650	2460
WWR003	640	1710
WWR004	1320	2200
WWR005	590	1300
WWR006	930	3410

All of these measures are elevated, probably because of bird wastes (which are known sources of coliform and fecal coliform). Coliform and fecal coliform detections can cause shellfish area closures, because they are considered to be indicative of potential contamination by human pathogens. In addition, SCDHS formerly used these indicators for its bathing beach protection program; elevated levels would have caused beach closures under the older program (SCDHS now uses *Enterococci* as its bathing beach water quality indicator).

Some concerns are raised that ditches and other open waterways from marshes may elevate pathogen indicator concentrations in nearby open waters. The Town of East Hampton is plugging the mouths of ditches to reduce such potential contaminant sources, for instance (Town of East Hampton, 2002), although sampling data do not seem to support the notion that coliform concentrations will be reduced if the ditches are blocked (Town of East Hampton, 2001). Unpublished data by the Gobler laboratory at Stony Brook University seems to indicate that ditches may be a major source of coliform. The limited data presented here do not seem to indicate that fecal coliform cell counts are greater within the marsh as compared to the river, although it is possible to infer total coliform counts are slightly higher within the marsh than at the river stations. However, the river itself is often used by a variety of waterfowl (ducks, swans, and geese).

Pre- and post-construction comparisons can be made for the river sampling program, similarly to the comparisons made for water quality. These comparisons seem to indicate that pathogen indicator counts increased for the stations closest to Area 1 post-construction. This may be because of increased waterfowl use of the marsh post-construction (although the inference of increased waterfowl usage is largely based on anecdotal observations, not the quantitative bird observations, see Section 5.2.4.2, above. However, the data from the two downriver stations might be interpreted as the effect not propagating very far, as there the concentrations seemed to decrease post-construction.

Table 80. Pre- and Post-treatment Carmans River Stations Pathogen Indicators (Arithmetic Means) (MPN/100 ml, means)

Station	Pre- or Post-construction	Fecal Coliform	Total Coliform	Count
WWR001	Pre Post	460 450	2300 1070	5 8
WWR002	Pre Post	2730 1050	4450 1360	5 9
WWR003	Pre Post	290 840	1560 1790	5 9
WWR004	Pre Post	600 1720	1400 2650	5 9

5.4.3. Nutrient Compounds

Nutrients were also sampled at the same time that pathogens were sampled for (i.e., at the fish stations in 2004, and at all river stations 2003-2006). The data show that nitrogen compounds, mostly measured as organic nitrogen, are elevated on the marsh and in the river near the marsh.

Table 81. Mean Nitrogen Compound Concentrations, Fish Stations, 2004 (all data in ug/l)

Area	Total Nitrogen	Dissolved Nitrogen	Ammonia	Ammonia (not distilled)	Nitrate + Nitrite
1	920	730	50	160	10
2	1110	790	40	30	10
3	610	620	50	50	-
4	1050	900	160	160	250

Table 82. Mean Nitrogen Compound Concentrations, Carmans River Stations (all data in ug/l)

Station	Total Nitrogen	Dissolved Nitrogen	Ammonia	Ammonia (not distilled)	Nitrate + Nitrite
WWR001	720	620	90	40	240
WWR002	730	640	120	40	380
WWR003	740	650	90	50	460
WWR004	950	810	80	70	500
WWR005	710	680	160	50	350
WWR006	1140	1080	150	60	500

The limited fish station sampling, and the means generated in Big Fish Creek and Little Fish Creek appear to show that concentrations are greater within the marsh. Valiela and Teal (1979) found there was a strong seasonal component to the balance of nitrogen between a marsh and the surrounding estuary. Salt marshes, according to this seminal work, often take up more nitrogen than they gives off at the height of the growing season, although generally they were found to release more nitrogen than they sequester. However, it is not clear that these data directly bear on the source of the nitrogen measured in the samples. Salinity, after all, was elevated in the creeks as well, but a marsh is generally not considered to be a source of salinity. The data indicate that nitrogen concentrations tend to be elevated in the waterways in Wertheim.

The values reported here can be compared to long-term monitoring data, provided by SCDHS. The concentrations reported for the marsh and river samples are higher than those found in more open waters. The total nitrogen data collected for the three southernmost stations are not very different from the long-term data collected by SCDHS at the mouth of the river, although nitrate-nitrite values are much higher, and the ammonia values are also somewhat elevated.

Table 83. SCDHS Estuarine Monitoring Data Means (1976-2005) (in ug/l)

Embayment	Total Nitrogen	Ammonia	Nitrate-Nitrite
Beaver Dam Creek	500	31	73
Western Great South Bay	450	55	57
Bayshore Cove	620	20	39
Patchogue Bay	750	22	39
Carmans River Mouth	640	21	59
Eastern Moriches Bay	380	17	16
Western Shinnecock Bay	420	13	16
Eastern Shinnecock Bay	310	10	14

Phosphorus compounds were also analyzed for. The data are not as revealing, as the concentrations were generally close to the detection limit when they were detected, and there was a relatively high percentage of non-detections (all non-detections were statistically treated as zero values for all parameters).

Table 84. Mean Phosphorus Compound Concentrations, Fish Stations, 2004 (all data in ug/l)

Area	Total Phosphorus	Dissolved Phosphorus	Orthophosphate
1	100	50	10
2	100	20	-
3	90	50	-
4	50	30	0

Table 85. Mean Phosphorus Compound Concentrations, Carmans River Stations (all data in ug/l)

Station	Total Phosphorus	Dissolved Phosphorus	Orthophosphate
WWR001	40	30	10
WWR002	40	20	10
WWR003	30	20	10
WWR004	40	10	20
WWR005	20	All ND	10
WWR006	20	10	10

Again, these somewhat limited data would suggest the marshes are areas where nutrient concentrations are elevated above surrounding waterways – although whether they are the source of these compounds was not tested by this sampling. The concentrations measured for the river stations are in line with those reported for more open waters in long-term sampling by SCDHS.

Table 86. SCDHS Estuarine Monitoring Data Means (1976-2005) (in ug/l)

Embayment	Total Phosphorus	Ortho-phosphate
Beaver Dam Creek	47	5
Western Great South Bay	62	16
Bayshore Cove	66	8
Patchogue Bay	70	9
Carmans River Mouth	63	9
Eastern Moriches Bay	71	17
Western Shinnecock Bay	72	14
Eastern Shinnecock Bay	53	18

Salt marshes have long been identified as a source of ecologically important compounds (usually discussed in terms of carbon) to the surrounding estuarine systems (Teal, 1962; Odum, 2000). It is fair to assume that they may also be sources of nutrients to these systems, as estuaries are areas where the generally nutrient-deficient open marine waters are enhanced by additions of necessary compounds from the terrestrial biosphere. However, as humans have doubled the amount of nitrogen available to the natural world (Vitousek et al., 1997), this has caused a condition known as eutrophication where excess nutrients cause environmental impacts by, simplistically speaking, overstimulating the local ecology. Eutrophication is especially worrisome in coastal waters, where nitrogen is the primary nutrient of concern, and in fact nitrogen has been implicated in several Long Island coastal water quality problems. Therefore, additional sources of nutrients to Long Island coastal waters are necessarily a point of concern.

Table 87 includes data for stations WWR003 and WWR004, which are just off Area 1. The small number of samples mean the data are somewhat limited, and the samples were not evenly spaced over time, so that they may be biased in terms of seasonality. However, they appear to indicate that the post-treatment nitrogen concentrations were higher than those collected pre-treatment. For certain parameters, WWR004 had the highest concentrations. This may indicate that the alterations to Area 1 increased the release of nitrogen compounds from the marsh, perhaps due to increased flow through the marsh. Unpublished work by the Gobler laboratory, Marine Sciences Research Center, Stony Brook University, suggests that nitrogen concentrations are enhanced in the outflows from ditches as compared to other nearby estuarine waters, and Dr. Gobler has speculated that this may be due to increased flow through the marsh sediments because the enhanced drainage caused by ditches (see Koch and Gobler, 2007, abstract of a presentation). The concentrations as reported by Koch and Gobler coming from the ditches in Flanders (assuming that the mean data reported in the abstract as "M" is really "uM") are approximately the same as found in the river samples post-treatment, and the concentrations Koch and Gobler found in Accabonac Harbor are approximately the same as those found pre-treatment in the river samples. It should be noted here that the marshes at Wertheim are all ditched.

Table 87. Pre- and Post-treatment Carmans River Stations Mean Nitrogen Compound Concentrations (ug/l)

Station	Pre- or Post-construction	Total Nitrogen	Dissolved Nitrogen	Ammonia	Ammonia (not distilled)	Nitrate-Nitrite	Samples
WWR001	Pre	440	350	30	10	80	5
	Post	890	800	130	50	240	6
WWR002	Pre	590	540	90	10	260	5
	Post	810	700	140	60	470	7
WWR003	Pre	740	380	30	10	200	5
	Post	890	790	130	70	650	7
WWR004	Pre	770	510	30	30	160	5
	Post	1060	980	90	90	750	7

However, there are complicating factors that are not well accounted for. The Koch and Gobler work was accomplished in summer; although Valiela and Teal (1979) suggested that in growing season a salt marsh sequesters more nitrogen than it releases, Dr. Gobler has suggested that summer releases from ditched marshes are greater. It may be that decomposition processes in the sediments occur faster in warmer weather, resulting in greater releases of nitrogen from the sediments. The river sampling data was largely collected in summer pre-construction, and had a larger variation in seasonality post-construction. In addition, flow in the river was much greater in 2006 than in previous years (although it was lower in 2005, immediately post-construction). Rivers are known to be sources of nitrogen to estuarine systems for a variety of reasons (see Vitousek et al., 1997) – although it is not immediately obvious why the concentrations of the nitrogen compounds should be increased when flow rates of the river increase. This analysis is hampered by the lack of a station upriver of Area 1.

5.4.4. Organic Compounds

The river samples were analyzed for 234 discrete organic compounds, although not all samples were analyzed for every compound. Table 88 specifies which particular compounds were analyzed for on each date.

Only seven compounds were detected. The most commonly detected compound was methyl sulfide (also called dimethyl sulfide). It was found in 30 samples, at concentrations ranging from 0.5 ug/l to 10 ug/l (but all but six were less than 2 ug/l). This compound is used in petroleum refining, but it is also a breakdown product resulting from natural bacterial metabolism, especially in salt water systems. Carbon disulfide was detected twice, at concentrations of 0.5 ug/l and 0.8 ug/l. This compound is an industrial pollutant, but is also released as a decomposition gas from salt marsh sediments. This suggests there are natural sources in or near the river for these two compounds.

Gasoline-related compounds were detected. There were seven detections of MTBE, the gasoline additive banned in New York State in 2004 for its contamination effects on groundwater systems. Five of the detections were on one date (July 15, 2003). MTBE was detected at concentrations ranging from 0.5 ug/l to 4 ug/l. In addition, on July 15, 2003 there were three detections of TAME (an MTBE degradate), at concentrations ranging from 0.5 ug/l to 0.7 ug/l, one of toluene (another common gasoline constituent) at 1 ug/l, and one of xylene (another gasoline constituent) at 0.8 ug/l.

DEET, the insect repellent, was also detected seven times (five of them occurring on June 21, 2006) at concentrations ranging from 0.2 ug/l to 5.9 ug/l.

Given the sampling effort, 50 detections of compounds is a relatively low number of detections. The low incidence of detections and the compounds detected (nearly two-thirds of the detections came from what seem to be naturally-occurring sulfur-related chemicals) suggests there is very little organic compound contamination of the river from anthropogenic sources. The DEET detections are possibly from unintended sampler contamination; trace gasoline-source detections may be from the boat, but also signal the general ubiquity of petroleum-linked contamination of the Suffolk County environment.

Table 88. Organic Compounds Sampled in Carmans River

Date: 7/15/2003 **Stations: WWR001-WWR004** **Diurnal: A & P**	**Date: 7/29/2003** **Stations: WWR001-WWR004** **Diurnal: A & P**	**Date: 10/15/2003** **Stations: WWR001-WWR004** **Diurnal: -**	**Date: 9/16/2004** **Stations: WWR001-WWR004** **Diurnal: A & P**	**Date: 03/21/05** **Stations: WWR001-WWR006** **Diurnal: A & P**	**Date: 6/23/05** **Stations: WWR001-WWR006** **Diurnal: A & P**	**Date: 12/05/05** **Stations: WWR001-WWR006** **Diurnal: A & P**	**Date: 3/20/06** **Stations: WWR001-WWR006** **Diurnal: A & P**	**Date: 6/21/06** **Stations: WWR001-WWR006** **Diurnal: -**
1,1,1,2-Tetrachloroethane		1,1,1,2-Tetrachloroethane	1,1,1,2-Tetrachloroethane	1,1,1,2-Tetrachloroethane		1,1,1,2-Tetrachloroethane		1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane		1,1,1-Trichloroethane	1,1,1-Trichloroethane	1,1,1-Trichloroethane	1,1,1-Trichloroethane	1,1,1-Trichloroethane	1,1,1-Trichloroethane	1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane		1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane		1,1,2-Trichloroethane	1,1,2-Trichloroethane	1,1,2-Trichloroethane	1,1,2-Trichloroethane	1,1,2-Trichloroethane	1,1,2-Trichloroethane	1,1,2-Trichloroethane
1,1-Dichloroethane		1,1-Dichloroethane	1,1-Dichloroethane	1,1-Dichloroethane	1,1-Dichloroethane	1,1-Dichloroethane	1,1-Dichloroethane	1,1-Dichloroethane
1,1-Dichloroethene		1,1-Dichloroethene	1,1-Dichloroethene	1,1-Dichloroethene	1,1-Dichloroethene	1,1-Dichloroethene	1,1-Dichloroethene	1,1-Dichloroethene
1,1-Dichloropropene		1,1-Dichloropropene	1,1-Dichloropropene	1,1-Dichloropropene	1,1-Dichloropropene	1,1-Dichloropropene	1,1-Dichloropropene	1,1-Dichloropropene
1,2,3-Trichlorobenzene		1,2,3-Trichlorobenzene	1,2,3-Trichlorobenzene	1,2,3-Trichlorobenzene	1,2,3-Trichlorobenzene	1,2,3-Trichlorobenzene	1,2,3-Trichlorobenzene	1,2,3-Trichlorobenzene
1,2,3-Trichloropropane		1,2,3-Trichloropropane	1,2,3-Trichloropropane	1,2,3-Trichloropropane	1,2,3-Trichloropropane	1,2,3-Trichloropropane	1,2,3-Trichloropropane	1,2,3-Trichloropropane
1,2,4,5-Tetramethylbenzene		1,2,4,5-Tetramethylbenzene	1,2,4,5-Tetramethylbenzene	1,2,4,5-Tetramethylbenzene	1,2,4,5-Tetramethylbenzene	1,2,4,5-Tetramethylbenzene	1,2,4,5-Tetramethylbenzene	1,2,4,5-Tetramethylbenzene
1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene		1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene
1,2-dibromo-3-chloropropane		1,2-dibromo-3-chloropropane	1,2-dibromo-3-chloropropane	1,2-dibromo-3-chloropropane	1,2-dibromo-3-chloropropane	1,2-dibromo-3-chloropropane	1,2-dibromo-3-chloropropane	1,2-dibromo-3-chloropropane
1,2-dibromoethane		1,2-dibromoethane	1,2-dibromoethane	1,2-dibromoethane	1,2-dibromoethane	1,2-dibromoethane	1,2-dibromoethane	1,2-dibromoethane
1,2-Dichlorobenzene (o)		1,2-Dichlorobenzene (o)	1,2-Dichlorobenzene (o)	1,2-Dichlorobenzene (o)	1,2-Dichlorobenzene (o)	1,2-Dichlorobenzene (o)	1,2-Dichlorobenzene (o)	1,2-Dichlorobenzene (o)
1,2-Dichloroethane		1,2-Dichloroethane	1,2-Dichloroethane	1,2-Dichloroethane	1,2-Dichloroethane	1,2-Dichloroethane	1,2-Dichloroethane	1,2-Dichloroethane
1,2-Dichloropropane		1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dichloropropane
1,3,5-Trimethylbenzene		1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene
1,3-Dichloropropane		1,3-Dichloropropane	1,3-Dichloropropane	1,3-Dichloropropane	1,3-Dichloropropane	1,3-Dichloropropane	1,3-Dichloropropane	1,3-Dichloropropane
1,4-Dichlorobutane		1,4-Dichlorobutane	1,4-Dichlorobutane	1,4-Dichlorobutane	1,4-Dichlorobutane	1,4-Dichlorobutane	1,4-Dichlorobutane	1,4-Dichlorobutane
1-Bromo-2-chloroethane		1-Bromo-2-chloroethane	1-Bromo-2-chloroethane	1-Bromo-2-chloroethane	1-Bromo-2-chloroethane	1-Bromo-2-chloroethane	1-Bromo-2-chloroethane	1-Bromo-2-chloroethane
				1-Methylnaphthalene	1-Methylnaphthalene	1-Methylnaphthalene	1-Methylnaphthalene	1-Methylnaphthalene
2,2-Dichloropropane		2,2-Dichloropropane	2,2-Dichloropropane	2,2-Dichloropropane	2,2-Dichloropropane	2,2-Dichloropropane	2,2-Dichloropropane	2,2-Dichloropropane
2,3-Dichloropropene		2,3-Dichloropropene	2,3-Dichloropropene	2,3-Dichloropropene	2,3-Dichloropropene	2,3-Dichloropropene	2,3-Dichloropropene	2,3-Dichloropropene
		2,6-Dichlorobenzamide	2,6-Dichlorobenzamide	2,6-Dichlorobenzamide	2,6-Dichlorobenzamide	2,6-Dichlorobenzamide		
2-Bromo-1-chloropropane		2-Bromo-1-chloropropane	2-Bromo-1-chloropropane	2-Bromo-1-chloropropane	2-Bromo-1-chloropropane	2-Bromo-1-chloropropane	2-Bromo-1-chloropropane	2-Bromo-1-chloropropane

2-Butanone (MEK)		2-Butanone (MEK)	2-Butanone (MEK)	2-Butanone (MEK)	2-Butanone (MEK)	2-Butanone (MEK)	2-Butanone (MEK)	2-Butanone (MEK)
2-Chlorotoluene		2-Chlorotoluene	2-Chlorotoluene	2-Chlorotoluene	2-Chlorotoluene	2-Chlorotoluene	2-Chlorotoluene	2-Chlorotoluene
		2-Hydroxyatrazine	2-Hydroxyatrazine	2-Hydroxyatrazine	2-Hydroxyatrazine	2-Hydroxyatrazine		2-Methylnaphthalene
3-Chlorotoluene		3-Chlorotoluene	3-Chlorotoluene	2-Methylnaphthalene	2-Methylnaphthalene	2-Methylnaphthalene	2-Methylnaphthalene	
		3-Hydroxycarbofuran	3-Hydroxycarbofuran	3-Chlorotoluene	3-Chlorotoluene	3-Chlorotoluene	3-Chlorotoluene	3-Chlorotoluene
4,4 DDD		4,4 DDD	4,4 DDD	4,4 DDD	4,4 DDD	4,4 DDD	4,4 DDD	4,4 DDD
4,4 DDE		4,4 DDE	4,4 DDE	4,4 DDE	4,4 DDE	4,4 DDE	4,4 DDE	4,4 DDE
4,4 DDT		4,4 DDT	4,4 DDT	4,4 DDT	4,4 DDT	4,4 DDT	4,4 DDT	4,4 DDT
4-Chlorotoluene		4-Chlorotoluene	4-Chlorotoluene	4-Chlorotoluene	4-Chlorotoluene	4-Chlorotoluene	4-Chlorotoluene	4-Chlorotoluene
Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene
Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene
Acetochlor	Acetochlor	Acetochlor	Acetochlor	Acetochlor	Acetochlor	Acetochlor	Acetochlor	Acetochlor
Acrylonitrile		Acrylonitrile	Acrylonitrile	Acrylonitrile	Acrylonitrile	Acrylonitrile	Acrylonitrile	Acrylonitrile
Alachlor	Alachlor	Alachlor	Alachlor	Alachlor	Alachlor	Alachlor	Alachlor	Alachlor
		Alachlor ESA	Alachlor ESA	Alachlor ESA	Alachlor ESA	Alachlor ESA		
		Alachlor OA	Alachlor OA	Alachlor OA	Alachlor OA	Alachlor OA		
		ALDICARB	ALDICARB					
		Aldicarb sulfone	Aldicarb sulfone					
		Aldicarb sulfoxide	Aldicarb sulfoxide					
Aldrin		Aldrin	Aldrin	Aldrin	Aldrin	Aldrin	Aldrin	Aldrin
Allethrin	Allethrin	Allethrin	Allethrin	Allethrin	Allethrin	Allethrin	Allethrin	Allethrin
Allyl chloride		Allyl chloride	Allyl chloride	Allyl chloride	Allyl chloride	Allyl chloride	Allyl chloride	Allyl chloride
Alpha - BHC		Alpha - BHC	Alpha - BHC	Alpha - BHC	Alpha - BHC	Alpha - BHC	Alpha - BHC	Alpha - BHC
		A-Naphthol	A-Naphthol	Anthracene	Anthracene	Anthracene	Anthracene	Anthracene
Anthracene	Anthracene	Anthracene	Anthracene	Atrazine	Atrazine	Atrazine	Atrazine	Atrazine
Atrazine	Atrazine	Atrazine	Atrazine	Azoxystrobin	Azoxystrobin	Azoxystrobin	Azoxystrobin	Azoxystrobin
Azoxystrobin	Azoxystrobin	Azoxystrobin	Azoxystrobin	Benfluralin	Benfluralin	Benfluralin	Benfluralin	Benfluralin
Benfluralin	Benfluralin	Benfluralin	Benfluralin	Benzene	Benzene	Benzene	Benzene	Benzene
Benzene		Benzene	Benzene	Benzo(a)anthracene	Benzo(a)anthracene	Benzo(a)anthracene	Benzo(a)anthracene	Benzo(a)anthracene
Benzo(a)anthracene	Benzo(a)anthracene	Benzo(a)anthracene	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(b)fluoranthene	Benzo(b)fluoranthene	Benzo(b)fluoranthene	Benzo(b)fluoranthene
Benzo(b)fluoranthene	Benzo(b)fluoranthene	Benzo(b)fluoranthene	Benzo(b)fluoranthene	Benzo(ghi)perylene	Benzo(ghi)perylene	Benzo(ghi)perylene	Benzo(ghi)perylene	Benzo(ghi)perylene

Benzo(ghi)perylene	Benzo(ghi)perylene	Benzo(ghi)perylene	Benzo(ghi)perylene	Benzo(k)fluoranthene	Benzo(k)fluoranthene	Benzo(k)fluoranthene	Benzo(k)fluoranthene	Benzo(k)fluoranthene
Benzo(k)fluoranthene	Benzo(k)fluoranthene	Benzo(k)fluoranthene	Benzo(k)fluoranthene	Benzo-a-pyrene	Benzo-a-pyrene	Benzo-a-pyrene	Benzo-a-pyrene	Benzo-a-pyrene
Benzo-a-pyrene	Benzo-a-pyrene	Benzo-a-pyrene	Benzo-a-pyrene	Benzophenone	Benzophenone	Benzophenone	Benzophenone	Benzophenone
Benzophenone	Benzophenone	Benzophenone	Benzophenone	Benzyl butyl phthalate	Benzyl butyl phthalate	Benzyl butyl phthalate	Benzyl butyl phthalate	Benzyl butyl phthalate
Benzyl butyl phthalate		Benzyl butyl phthalate	Benzyl butyl phthalate	Beta - BHC	Beta - BHC	Beta - BHC	Beta - BHC	Beta - BHC
Beta - BHC		Beta - BHC	Beta - BHC	bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) adipate
bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) adipate	bis(2-ethylhexyl) phthalate	bis(2-ethylhexyl) phthalate	bis(2-ethylhexyl) phthalate	bis(2-ethylhexyl) phthalate	bis(2-ethylhexyl) phthalate
bis(2-ethylhexyl) phthalate	bis(2-ethylhexyl) phthalate	bis(2-ethylhexyl) phthalate	bis(2-ethylhexyl) phthalate	Bisphenol A	Bisphenol A	Bisphenol A	Bisphenol A	Bisphenol A
Bloc	Bloc	Bloc	Bloc	Bloc	Bloc	Bloc	Bloc	Bloc
Bromacil	Bromacil	Bromacil	Bromacil	Bromacil	Bromacil	Bromacil	Bromacil	Bromacil
Bromobenzene		Bromobenzene	Bromobenzene	Bromobenzene	Bromobenzene	Bromobenzene	Bromobenzene	Bromobenzene
Bromochloromethane		Bromochloromethane	Bromochloromethane	Bromochloromethane	Bromochloromethane	Bromochloromethane	Bromochloromethane	Bromochloromethane
Bromodichloro-methane		Bromodichloro-methane	Bromodichloro-methane	Bromodichloro-methane	Bromodichloro-methane	Bromodichloro-methane	Bromodichloro-methane	Bromodichloro-methane
Bromoform		Bromoform	Bromoform	Bromoform	Bromoform	Bromoform	Bromoform	Bromoform
Bromomethane		Bromomethane	Bromomethane	Bromomethane	Bromomethane	Bromomethane	Bromomethane	Bromomethane
Butachlor	Butachlor	Butachlor	Butachlor	Butachlor	Butachlor	Butachlor	Butachlor	Butachlor
Butylated Hydroxyanisole	Butylated Hydroxyanisole	Butylated Hydroxyanisole	Butylated Hydroxyanisole	Butylated Hydroxyanisole	Butylated Hydroxyanisole	Butylated Hydroxyanisole	Butylated Hydroxyanisole	Butylated Hydroxyanisole
Butylated Hydroxytoluene	Butylated Hydroxytoluene	Butylated Hydroxytoluene	Butylated Hydroxytoluene	Butylated Hydroxytoluene	Butylated Hydroxytoluene	Butylated Hydroxytoluene	Butylated Hydroxytoluene	Butylated Hydroxytoluene
Caffeine	Caffeine	Caffeine	Caffeine	Caffeine	Caffeine	Caffeine	Caffeine	Caffeine
Carbamazepine	Carbamazepine	Carbamazepine	Carbamazepine	Carbamazepine	Carbamazepine	Carbamazepine	Carbamazepine	Carbamazepine
		CARBARYL	CARBARYL					
			Carbazole	Carbazole	Carbazole	Carbazole	Carbazole	Carbazole
		CARBOFURAN	CARBOFURAN					
Carbon disulfide		Carbon disulfide	Carbon disulfide	Carbon disulfide	Carbon disulfide	Carbon disulfide	Carbon disulfide	Carbon disulfide
Carbon tetrachloride		Carbon tetrachloride	Carbon tetrachloride	Carbon tetrachloride	Carbon tetrachloride	Carbon tetrachloride	Carbon tetrachloride	Carbon tetrachloride
Carisoprodol	Carisoprodol	Carisoprodol	Carisoprodol	Carisoprodol	Carisoprodol	Carisoprodol	Carisoprodol	Carisoprodol
Chlordane	Chlordane	Chlordane	Chlordane	Chlordane	Chlordane	Chlordane	Chlordane	Chlordane
Chlorobenzene		Chlorobenzene	Chlorobenzene	Chlorobenzene	Chlorobenzene	Chlorobenzene	Chlorobenzene	Chlorobenzene
Chloro-dibromomethane		Chloro-dibromomethane	Chloro-dibromomethane	Chloro-dibromomethane	Chloro-dibromomethane	Chloro-dibromomethane	Chloro-dibromomethane	Chloro-dibromomethane
Chloro-difluoromethane		Chloro-difluoromethane	Chloro-difluoromethane	Chloro-difluoromethane	Chloro-difluoromethane	Chlorodifluoromethane	Chlorodifluoromethane	Chlorodifluorometha ne

Chloroethane		Chloroethane	Chloroethane	Chloroethane	Chloroethane	Chloroethane	Chloroethane	Chloroethane
Chlorofenvinphos	Chlorofenvinphos	Chlorofenvinphos	Chlorofenvinphos	Chlorofenvinphos	Chlorofenvinphos	Chlorofenvinphos	Chlorofenvinphos	Chlorofenvinphos
Chloroform		Chloroform	Chloroform	Chloroform	Chloroform	Chloroform	Chloroform	Chloroform
Chloromethane		Chloromethane	Chloromethane	Chloromethane	Chloromethane	Chloromethane	Chloromethane	Chloromethane
Chlorothalonil	Chlorothalonil	Chlorothalonil	Chlorothalonil	Chlorothalonil	Chlorothalonil	Chlorothalonil	Chlorothalonil	Chlorothalonil
Chloroxylenol	Chloroxylenol	Chloroxylenol	Chloroxylenol	Chloroxylenol	Chloroxylenol	Chloroxylenol	Chloroxylenol	Chloroxylenol
Chlorpyriphos	Chlorpyriphos	Chlorpyriphos	Chlorpyriphos	Chlorpyriphos	Chlorpyriphos	Chlorpyriphos	Chlorpyriphos	Chlorpyriphos
Chrysene	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene
cis-1,2-Dichloroethene		cis-1,2-Dichloroethene	cis-1,2-Dichloroethene	cis-1,2-Dichloroethene	cis-1,2-Dichloroethene	cis-1,2-Dichloroethene	cis-1,2-Dichloroethene	cis-1,2-Dichloroethene
cis-1,3-Dichloropropene		cis-1,3-Dichloropropene	cis-1,3-Dichloropropene	cis-1,3-Dichloropropene	cis-1,3-Dichloropropene	cis-1,3-Dichloropropene	cis-1,3-Dichloropropene	cis-1,3-Dichloropropene
Cyanazine	Cyanazine	Cyanazine	Cyanazine	Cyanazine	Cyanazine	Cyanazine	Cyanazine	Cyanazine
Cyfluthrin	Cyfluthrin	Cyfluthrin	Cyfluthrin	Cyfluthrin	Cyfluthrin	Cyfluthrin	Cyfluthrin	Cyfluthrin
Cypermethrin	Cypermethrin	Cypermethrin	Cypermethrin	Cypermethrin	Cypermethrin	Cypermethrin	Cypermethrin	Cypermethrin
Dacthal	Dacthal	Dacthal	Dacthal	Dacthal	Dacthal	Dacthal	Dacthal	Dacthal
		Deisopropylatrazine	Deisopropylatrazine	Deisopropylatrazine	Deisopropylatrazine	Deisopropylatrazine		
Delta - BHC		Delta - BHC	Delta - BHC	Delta - BHC	Delta - BHC	Delta - BHC	Delta - BHC	Delta - BHC
Deltamethrin	Deltamethrin	Deltamethrin	Deltamethrin	Deltamethrin	Deltamethrin	Deltamethrin	Deltamethrin	Deltamethrin
		Desethylatrazine	Desethylatrazine	Desethylatrazine	Desethylatrazine	Desethylatrazine		
Diazinon	Diazinon	Diazinon	Diazinon	Diazinon	Diazinon	Diazinon	Diazinon	Diazinon
Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene	Dibenzo-(a,h)anthracene
Dibromomethane		Dibromomethane	Dibromomethane	Dibromomethane	Dibromomethane	Dibromomethane	Dibromomethane	Dibromomethane
Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate	Dibutyl phthalate
Dichlorbenil	Dichlorbenil	Dichlorbenil	Dichlorbenil		Dichlorbenil	Dichlobenil	Dichlobenil	Dichlobenil
Dichloro-difluoromethane		Dichloro-difluoromethane	Dichloro-difluoromethane	Dichloro-difluoromethane	Dichloro-difluoromethane	Dichloro-difluoromethane	Dichloro-difluoromethane	Dichloro-difluoromethane
Dichlorvos	Dichlorvos	Dichlorvos	Dichlorvos	Dichlorvos	Dichlorvos	Dichlorvos	Dichlorvos	Dichlorvos
		Didealkylatrazine	Didealkylatrazine	Didealkylatrazine	Didealkylatrazine	Didealkylatrazine		
Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin
Diethyl ether		Diethyl ether	Diethyl ether	Diethyl ether	Diethyl ether	Diethyl ether	Diethyl ether	Diethyl ether
Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate
Diethyltoluamide (DEET)	Diethyltoluamide (DEET)	Diethyltoluamide (DEET)	Diethyltoluamide (DEET)	Diethyltoluamide (DEET)	Diethyltoluamide (DEET)	Diethyltoluamide (DEET)	Diethyltoluamide (DEET)	Diethyltoluamide (DEET)
Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate

Dimethyldisulfide		Dimethyldisulfide	Dimethyldisulfide	Dimethyldisulfide	Dimethyldisulfide	Dimethyldisulfide	Dimethyldisulfide	Dimethyldisulfide
Dinoseb	Dinoseb	Dinoseb	Dinoseb	Dinoseb	Dinoseb	Dinoseb	Dinoseb	Dinoseb
Dioctyl phthalate	Dioctyl phthalate	Dioctyl phthalate	Dioctyl phthalate	Dioctyl phthalate	Dioctyl phthalate	Dioctyl phthalate	Dioctyl phthalate	Dioctyl phthalate
Disulfoton	Disulfoton	Disulfoton	Disulfoton	Disulfoton	Disulfoton	Disulfoton	Disulfoton	Disulfoton
Disulfoton sulfone	Disulfoton sulfone	Disulfoton sulfone	Disulfoton sulfone	Disulfoton sulfone	Disulfoton sulfone	Disulfoton sulfone	Disulfoton sulfone	Disulfoton sulfone
d-Limonene		d-Limonene	d-Limonene	d-Limonene	d-Limonene	d-Limonene	d-Limonene	d-Limonene
Endosulfan I		Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I
Endosulfan II		Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II
Endosulfan Sulfate	Endosulfan sulfate	Endosulfan sulfate	Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan sulfate
Endrin		Endrin	Endrin	Endrin	Endrin	Endrin	Endrin	Endrin
Endrin aldehyde		Endrin aldehyde	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde
EPTC	EPTC	EPTC	EPTC	EPTC	EPTC	EPTC	EPTC	EPTC
Ethenylbenzene (Styrene)		Ethenylbenzene (Styrene)	Ethenylbenzene (Styrene)	Ethenylbenzene (Styrene)	Ethenylbenzene (Styrene)	Ethenylbenzene (Styrene)	Ethenylbenzene (Styrene)	Ethenylbenzene (Styrene)
Ethofumesate	Ethofumesate	Ethofumesate	Ethofumesate	Ethofumesate	Ethofumesate	Ethofumesate	Ethofumesate	Ethofumesate
Ethyl parathion	Ethyl parathion	Ethyl parathion	Ethyl parathion	Ethyl parathion	Ethyl parathion	Ethyl parathion	Ethyl parathion	Ethyl parathion
Ethylbenzene		Ethylbenzene	Ethylbenzene	Ethylbenzene	Ethylbenzene	Ethylbenzene	Ethylbenzene	Ethylbenzene
Ethylmethacrylate		Ethylmethacrylate	Ethylmethacrylate	Ethylmethacrylate	Ethylmethacrylate	Ethylmethacrylate	Ethylmethacrylate	Ethylmethacrylate
Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene
Fluorene	Fluorene	Fluorene	Fluorene	Fluorene	Fluorene	Fluorene	Fluorene	Fluorene
Freon 113		Freon 113	Freon 113	Freon 113	Freon 113	Freon 113	Freon 113	Freon 113
Gamma - BHC		Gamma - BHC	Gamma - BHC	Gamma - BHC	Gamma - BHC	Gamma - BHC	Gamma - BHC	Gamma - BHC
Gemfibrozil	Gemfibrozil	Gemfibrozil	Gemfibrozil	Gemfibrozil	Gemfibrozil	Gemfibrozil		
Heptachlor		Heptachlor	Heptachlor	Heptachlor	Heptachlor	Heptachlor	Heptachlor	Heptachlor
Heptachlor epoxide		Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide
Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene
Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene
Hexachloro-cyclopentadiene	Hexachloro-cyclopentadiene	Hexachloro-cyclopentadiene	Hexachloro-cyclopentadiene	Hexachloro-cyclopentadiene	Hexachloro-cyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene
			Hexachloroethane	Hexachloroethane	Hexachloroethane	Hexachloroethane	Hexachloroethane	Hexachloroethane
				Hexazinone	Hexazinone	Hexazinone	Hexazinone	Hexazinone
Ibuprofen	Ibuprofen	Ibuprofen	Ibuprofen	Ibuprofen	Ibuprofen	Ibuprofen		
		Imidacloprid	Imidacloprid	Imidacloprid	Imidacloprid	Imidacloprid		

Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene
Iodofenphos	Iodofenphos	Iodofenphos	Iodofenphos	Iodofenphos	Iodofenphos	Iodofenphos	Iodofenphos	Iodofenphos
Iprodione	Iprodione	Iprodione	Iprodione	Iprodione	Iprodione	Iprodione	Iprodione	Iprodione
Isofenphos	Isofenphos	Isofenphos	Isofenphos	Isofenphos	Isofenphos	Isofenphos	Isofenphos	Isofenphos
Isopropylbenzene		Isopropylbenzene	Isopropylbenzene	Isopropylbenzene	Isopropylbenzene	Isopropylbenzene	Isopropylbenzene	Isopropylbenzene
Kelthane	Kelthane	Kelthane	Kelthane	Kelthane	Kelthane	Kelthane	Kelthane	Kelthane
m,p-Dichlorobenzene		m,p-Dichlorobenzene	m,p-Dichlorobenzene	m,p-Dichlorobenzene	m,p-Dichlorobenzene	m,p-Dichlorobenzene	m,p-Dichlorobenzene	m,p-Dichlorobenzene
		Malaoxon	Malaoxon	Malaoxon	Malaoxon	Malaoxon		
Malathion	Malathion	Malathion	Malathion	Malathion	Malathion	Malathion	Malathion	Malathion
Metalaxyl	Metalaxyl	Metalaxyl	Metalaxyl	Metalaxyl	Metalaxyl	Metalaxyl	Metalaxyl	Metalaxyl
Methacrylonitrile		Methacrylonitrile	Methacrylonitrile	Methacrylonitrile	Methacrylonitrile	Methacrylonitrile	Methacrylonitrile	Methacrylonitrile
		METHIOCARB	METHIOCARB					
		METHOMYL	METHOMYL					
Methoprene	Methoprene	Methoprene	Methoprene	Methoprene	Methoprene	Methoprene	Methoprene	Methoprene
Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor
Methyl isothiocyanate		Methyl isothiocyanate	Methyl isothiocyanate	Methyl isothiocyanate	Methyl isothiocyanate	Methyl isothiocyanate	Methyl isothiocyanate	Methyl isothiocyanate
Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion
Methyl sulfide		Methyl sulfide	Methyl sulfide	Methyl sulfide	Methyl sulfide	Methyl sulfide	Methyl sulfide	Methyl sulfide
Methylene chloride		Methylene chloride	Methylene chloride	Methylene chloride	Methylene chloride	Methylene chloride	Methylene chloride	Methylene chloride
Methylmethacrylate		Methylmethacrylate	Methylmethacrylate	Methylmethacrylate	Methylmethacrylate	Methylmethacrylate	Methylmethacrylate	Methylmethacrylate
Methyl-tertiary-butyl-ether		Methyl-tertiary-butyl-ether	Methyl-tertiary-butyl-ether	Methyl-tertiary-butyl-ether	Methyl-tertiary-butyl-ether	Methyl-tertiary-butyl-ether	Methyl-tertiary-butyl-ether	Methyl-tertiary-butyl-ether
Metolachlor	Metolachlor	Metolachlor	Metolachlor	Metolachlor	Metolachlor	Metolachlor	Metolachlor	Metolachlor
		Metolachlor ESA (CGA-354743)	Metolachlor ESA (CGA-354743)	Metolachlor ESA (CGA-354743)	Metolachlor ESA (CGA-354743)	Metolachlor ESA (CGA-354743)		
		Metolachlor Metabolite (CGA-37735)	Metolachlor Metabolite (CGA-37735)	Metolachlor Metabolite (CGA-37735)	Metolachlor Metabolite (CGA-37735)	Metolachlor Metabolite (CGA-37735)		
		Metolachlor Metabolite (CGA-40172)	Metolachlor Metabolite (CGA-40172)	Metolachlor Metabolite (CGA-40172)	Metolachlor Metabolite (CGA-40172)	Metolachlor Metabolite (CGA-40172)		
		Metolachlor Metabolite (CGA-41638)	Metolachlor Metabolite (CGA-41638)	Metolachlor Metabolite (CGA-41638)	Metolachlor Metabolite (CGA-41638)	Metolachlor Metabolite (CGA-41638)		
		Metolachlor Metabolite (CGA-67125)	Metolachlor Metabolite (CGA-67125)	Metolachlor Metabolite (CGA-67125)	Metolachlor Metabolite (CGA-67125)	Metolachlor Metabolite (CGA-67125)		
		Metolachlor OA (CGA-51202)	Metolachlor OA (CGA-51202)	Metolachlor OA (CGA-51202)	Metolachlor OA (CGA-51202)	Metolachlor OA (CGA-51202)		

Metribuzin	Metribuzin	Metribuzin	Metribuzin	Metribuzin	Metribuzin	Metribuzin	Metribuzin	Metribuzin
		Monomethyltetrachloro-terephthalate	Monomethyltetrachloro-terephthalate					
m-Xylene		m-Xylene	m-Xylene	m-Xylene	m-Xylene	m-Xylene	m-Xylene	m-Xylene
Naled (Dibrom)	Naled (Dibrom)	Naled (Dibrom)	Naled (Dibrom)	Naled (Dibrom)	Naled (Dibrom)	Naled (Dibrom)	Naled (Dibrom)	Naled (Dibrom)
Naphthalene	Naphthalene	Naphthalene	Naphthalene	Naphthalene	Naphthalene	Naphthalene	Naphthalene	Naphthalene
Napropamide	Napropamide	Napropamide	Napropamide	Napropamide	Napropamide	Napropamide	Napropamide	Napropamide
n-Butylbenzene		n-Butylbenzene	n-Butylbenzene	n-Butylbenzene	n-Butylbenzene	n-Butylbenzene	n-Butylbenzene	n-Butylbenzene
			n-Propane	n-Propane	n-Propane	n-Propane	n-Propane	n-Propane
n-Propylbenzene		n-Propylbenzene	n-Propylbenzene	n-Propylbenzene	n-Propylbenzene	n-Propylbenzene	n-Propylbenzene	n-Propylbenzene
Ortho-Phosphate		Ortho-Phosphate	Ortho-Phosphate	Ortho-Phosphate	Ortho-Phosphate	Ortho-Phosphate	Ortho-Phosphate	Ortho-Phosphate
		OXAMYL	OXAMYL					
o-Xylene		o-Xylene	o-Xylene	o-Xylene	o-Xylene	o-Xylene	o-Xylene	o-Xylene
p-Diethylbenzene		p-Diethylbenzene	p-Diethylbenzene	p-Diethylbenzene	p-Diethylbenzene	p-Diethylbenzene	p-Diethylbenzene	p-Diethylbenzene
Pendimethalin	Pendimethalin	Pendimethalin	Pendimethalin	Pendimethalin	Pendimethalin	Pendimethalin	Pendimethalin	Pendimethalin
Pentachlorobenzene	Pentachlorobenzene	Pentachlorobenzene	Pentachlorobenzene	Pentachlorobenzene	Pentachlorobenzene	Pentachlorobenzene	Pentachlorobenzene	Pentachlorobenzene
Pentachloro-nitrobenzene	Pentachloro-nitrobenzene	Pentachloro-nitrobenzene	Pentachloro-nitrobenzene	Pentachloro-nitrobenzene	Pentachloro-nitrobenzene	Pentachloro-nitrobenzene	Pentachloro-nitrobenzene	Pentachloro-nitrobenzene
Permethrin	Permethrin	Permethrin	Permethrin	Permethrin	Permethrin	Permethrin	Permethrin	Permethrin
Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene
Piperonyl butoxide	Piperonyl butoxide	Piperonyl butoxide	Piperonyl butoxide	Piperonyl butoxide	Piperonyl butoxide	Piperonyl butoxide	Piperonyl butoxide	Piperonyl butoxide
p-Isopropyltoluene		p-Isopropyltoluene	p-Isopropyltoluene	p-Isopropyltoluene	p-Isopropyltoluene	p-Isopropyltoluene	p-Isopropyltoluene	p-Isopropyltoluene
Prometon	Prometon	Prometon	Prometon	Prometon	Prometon	Prometon	Prometon	Prometon
Prometryne	Prometryne	Prometryne	Prometryne	Prometryne	Prometryne	Prometryne	Prometryne	Prometryne
Propachlor	Propachlor	Propachlor	Propachlor	Propachlor	Propachlor	Propachlor	Propachlor	Propachlor
		Propamocarb hydrochloride	Propamocarb hydrochloride	Propamocarb hydrochloride	Propamocarb hydrochloride	Propamocarb hydrochloride		
Propiconazole	Propiconazole	Propiconazole	Propiconazole	Propiconazole	Propiconazole	Propiconazole (TILT)	Propiconazole (TILT)	Propiconazole (TILT)
		PROPOXUR	PROPOXUR					
p-Xylene		p-Xylene	p-Xylene	p-Xylene	p-Xylene	p-Xylene	p-Xylene	p-Xylene
Pyrene	Pyrene	Pyrene	Pyrene	Pyrene	Pyrene	Pyrene	Pyrene	Pyrene
Resmethrin	Resmethrin	Resmethrin	Resmethrin	Resmethrin	Resmethrin	Resmethrin	Resmethrin	Resmethrin
				Ronstar	Ronstar	Ronstar	Ronstar	Ronstar
sec-Butylbenzene		sec-Butylbenzene	sec-Butylbenzene	sec-Butylbenzene	sec-Butylbenzene	sec-Butylbenzene	sec-Butylbenzene	sec-Butylbenzene

		Siduron	Siduron	Siduron	Siduron	Siduron		
Simazine	Simazine	Simazine	Simazine	Simazine	Simazine	Simazine	Simazine	Simazine
Sumithrin	Sumithrin	Sumithrin	Sumithrin	Sumithrin	Sumithrin	Sumithrin	Sumithrin	Sumithrin
Tebuthiuron	Tebuthiuron	Tebuthiuron	Tebuthiuron	Tebuthiuron	Tebuthiuron	Tebuthiuron	Tebuthiuron	Tebuthiuron
Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature
Terbacil	Terbacil	Terbacil	Terbacil	Terbacil	Terbacil	Terbacil	Terbacil	Terbacil
Terbufos	Terbufos	Terbufos	Terbufos	Terbufos	Terbufos	Terbufos	Terbufos	Terbufos
tert-Amyl-Methyl-Ether		tert-Amyl-Methyl-Ether	tert-Amyl-Methyl-Ether	tert-Amyl-Methyl-Ether	tert-Amyl-Methyl-Ether	tert-Amyl-Methyl-Ether	tert-Amyl-Methyl-Ether	tert-Amyl-Methyl-Ether
tert-Butylbenzene		tert-Butylbenzene	tert-Butylbenzene	tert-Butylbenzene	tert-Butylbenzene	tert-Butylbenzene	tert-Butylbenzene	tert-Butylbenzene
tert-Butyl-Ethyl-Ether		tert-Butyl-Ethyl-Ether	tert-Butyl-Ethyl-Ether	tert-Butyl-Ethyl-Ether	tert-Butyl-Ethyl-Ether	tert-Butyl-Ethyl-Ether	tert-Butyl-Ethyl-Ether	tert-Butyl-Ethyl-Ether
Tetrachloroethene		Tetrachloroethene	Tetrachloroethene	Tetrachloroethene	Tetrachloroethene	Tetrachloroethene	Tetrachloroethene	Tetrachloroethene
		Tetrachloro-terephthalic Acid	Tetrachloro-terephthalic Acid					
Tetrahydrofuran		Tetrahydrofuran	Tetrahydrofuran	Tetrahydrofuran	Tetrahydrofuran	Tetrahydrofuran	Tetrahydrofuran	Tetrahydrofuran
Toluene		Toluene	Toluene	Toluene	Toluene	Toluene	Toluene	Toluene
Total Chlorotoluene		Total Chlorotoluene	Total Chlorotoluene	Total Chlorotoluene	Total Chlorotoluene	Total Chlorotoluene	Total Chlorotoluene	Total Chlorotoluene
Total Xylene		Total Xylene	Total Xylene	Total Xylene	Total Xylene	Total Xylene	Total Xylene	Total Xylene
trans-1,2-Dichloroethene		trans-1,2-Dichloroethene	trans-1,2-Dichloroethene	trans-1,2-Dichloroethene	trans-1,2-Dichloroethene	trans-1,2-Dichloroethene	trans-1,2-Dichloroethene	trans-1,2-Dichloroethene
trans-1,3-Dichloropropene		trans-1,3-Dichloropropene	trans-1,3-Dichloropropene	trans-1,3-Dichloropropene	trans-1,3-Dichloropropene	trans-1,3-Dichloropropene	trans-1,3-Dichloropropene	trans-1,3-Dichloropropene
Triadimefon	Triadimefon	Triadimefon	Triadimefon	Triadimefon	Triadimefon	Triadimefon	Triadimefon	Triadimefon
		Trichlorfon	Trichlorfon	Trichlorfon	Trichlorfon	Trichlorfon		
Trichloroethene		Trichloroethene	Trichloroethene	Trichloroethene	Trichloroethene	Trichloroethene	Trichloroethene	Trichloroethene
Trichlorofluoro-methane		Trichlorofluoro-methane	Trichlorofluoro-methane	Trichlorofluoro-methane	Trichlorofluoro-methane	Trichlorofluoro-methane	Trichlorofluoro-methane	Trichlorofluoro-methane
Triclosan	Triclosan	Triclosan	Triclosan	Triclosan	Triclosan	Triclosan	Triclosan	Triclosan
Trifluralin	Trifluralin	Trifluralin	Trifluralin	Trifluralin	Trifluralin	Trifluralin	Trifluralin	Trifluralin
Vinclozolin	Vinclozolin	Vinclozolin	Vinclozolin	Vinclozolin	Vinclozolin	Vinclozolin	Vinclozolin	Vinclozolin
Vinyl chloride		Vinyl chloride	Vinyl chloride	Vinyl chloride	Vinyl chloride	Vinyl chloride	Vinyl chloride	Vinyl chloride