Dioxin/Furan in Lake Ontario Tributaries 1995 - 1997

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Abstract

Between 1995 and 1997 samples of sediment, water, macroinvertebrates and fish were collected from tributaries to Lake Ontario and were analyzed for dibenzo-dioxins and furans. The purpose of this study was to provide an initial screening of the levels of dioxin/furan in several tributaries to and backwater areas of Lake Ontario. Additionally, during the study, twenty-one samples were collected in Lake Ontario, two were collected in Lake Erie and several were collected in tributaries to Lake Erie.

Toxic Equivalency Quotients (TEQ's) were calculated using the analytical results. Toxic Equivalency is a methodology that quantifies the toxicity of 2,3,7,8-substituted dioxin and furan congeners by proportioning their toxicities to 2,3,7,8-TCDD. The TEQ's were then compared to existing criteria and guidelines for protection of wildlife and/or human health. All of the TEQ's for the water samples collected exceeded the NYS Ambient Water Quality Standard for human consumption of fish (see QA/QC Summary for further details). The TEQ's of the fish tissue samples were all less than existing guidelines proposed by the New York State Department of Health. These statements may not be contradictory because only two fish sample locations corresponded with the water sample locations. The concentrations in the macroinvertebrate tissue samples were less than the guideline adapted from numbers proposed by Eisler of the U.S. Fish and Wildlife Service for fish tissue concentrations. The TEQ's of sediment samples collected at many sites including 20 of the 22 sediment samples collected in Lake Ontario and 24 of the 41 tributary/core samples, exceeded the wildlife bioaccumulation criteria as presented in the NYSDEC Division of Fish and Wildlife Technical Guidance for the screening of Contaminated Sediments. The only sample where the TEQ exceeded the sediment criteria for both wildlife bioaccumulation and human bioaccumulation was collected at the Pettit Flume.

The dioxin/furan data were evaluated by comparison to sediment samples collected by NYSDEC from throughout New York State. For this evaluation, homolog totals for both dioxin and furan were designated a low, average or elevated classification. A database of 218 sample sites in NYS was used to designate these ranges. Based on this qualitative evaluation, there were elevated levels of dioxin or furan at twenty two of the sixty three surficial/core sediment sampling sites, with twenty-nine sites having average levels.

This report is intended to be a summary of the data that was gathered as part of the Dioxin/furan in Lake Ontario Tributaries study and the sediment inventory validation (1A) study. All samples were collected by NYSDEC with sample analyses funded by EPA grants. The collected data will be combined with other dioxin/furan data from throughout the State. Future reports will attempt to identify sources of dioxin/furan to Lake Ontario and to correlate this data with data collected throughout the State for different matrixes (fish tissue, water, sediment and macroinvertebrate tissue). A future report will also correlate the dioxin/furan data with other contaminant data (i.e.:

chlorinated phenols, PCB’s, etc) obtained for each site. This is a long term project which will be completed as the needed time and resources are available.

The multi media database needs to be expanded so that the relationships of the dioxin and furan concentrations in the water column, sediment and biota and the usefulness of the various standards and guidelines can be studied in greater detail.

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Introduction

Dioxins and furans are a group of chemical compounds (halogenated aromatic hydrocarbons) that are created through a number of processes. Some of these processes include: chlorination of phenolic compounds; manufacture of chlorinated phenols, phenoxy herbicides, chlorinated benzenes, etc.; combustion of municipal, hospital, or hazardous waste or sewage sludge; smelting operations and the burning of coal, wood, or petroleum products.

Low yields of dioxins and furans are produced relative to other environmental pollutants. But because they are thought to be highly toxic, bioaccumulative, and environmentally persistent, they have garnered much attention and debate over the last quarter of the century.

The purpose of this report is to establish a database of dioxin and furan concentrations in the various media (water, tissue and sediment) in New York State. This portion of the database specifically focuses on the tributaries to Lake Ontario, twenty three locations within Lake Ontario and several tributaries to Lake Erie. The results of this database and the previously collected dioxin/furan data have been combined in order to determine qualitative values for low, average and elevated homolog totals for dioxins and furans. These qualitative values are used as one tool available to evaluate the concentrations of dioxin/furan observed in the sediment. Additionally, toxic equivalency quotients were calculated for each sample using both the existing toxic equivalency factors (ITEF, 1994) and the newest World Health Organization (1999) toxic equivalency factors. These TEQ's were then used to compare the dioxin/furan concentrations to NYSDEC human and wildlife bioaccumulation criteria. Also, percent abundance of dioxin and furan homologs, 2,3,7,8,-substituted congeners and TEQ's were calculated and presented graphically. These patterns were evaluated to determine similarity or differences between sample sites. Percent abundance patterns will be used as a first step to identifying sources.

Future efforts will focus on expanding the Lake Ontario Basin database and also combining this database with the previously collected dioxin/furan data obtained throughout New York State. The combined database will be used to evaluate relationships between dioxins and furans with other contaminants (e.g.: furans and PCB congeners), and to evaluate the relationships between dioxin/furan congeners in different media (water, biota, sediment) collected at the same site. An evaluation of relationships between percent abundance patterns and whether they're useful in identifying possible sources of dioxin/furan to Lake Ontario will also be completed. Mapping of the concentration gradients in the Lake and the Tributaries could also be useful in identifying sources. Additional core samples should be collected and compared to historical core data in order to assess whether trends in dioxin/furan concentrations can be determined for the Great Lakes Basin. Areal deposition of dioxin's/furans could be evaluated by sampling water bodies with no known direct inputs.

Historical Studies

A historical review of some of the known studies of dioxin/furan levels in the Lake Ontario drainage basin was performed and is presented below. The purpose of the historical review was to gather existing information regarding dioxin/furan concentrations in the study area.

Since 1989, Frank Estabrooks of the NYSDEC Division of Water has been monitoring various environmental matrices (bottom sediment, water, macroinvertebrates, and fish) for dioxin/furan concentrations. Sixty sites, within New York State, were selected for this long term study. These sites represented both clean, "normal", and contaminated areas. The goal of this study was to develop a database of environmental dioxin/furan concentrations from which scientific and management decisions could be made. The results of this 1995-1997 study will augment this previously existing database with additional samples from drainage areas into the Great Lakes.

The Hyde Park TCDD study, was conducted from 1986 through 1990 by NYSDEC Division of Hazardous Waste to determine the extent of 2,3,7,8,-tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD) contamination in Lake Ontario. The contamination was attributable to releases from the Hyde Park Landfill site which is located near the Niagara River. Sediment and fish tissue samples were collected throughout the Lake. Contours of the results of the sediment sample analyses were plotted for the entire Lake. These contours showed the highest concentrations of 2,3,7,8-TCDD (greater than 300 ppt) to be located near the Olcott Harbor and Sodus Bay.

The National Study of Chemical Residues in Fish (September 1992), conducted by the USEPA, indicated tributaries (Niagara River and the Eighteenmile Creek) where dioxin/furan concentrations in fish flesh exceeded the Food and Drug Administration (FDA) action levels for poisonous and deleterious substances in fish and shellfish for human consumption (25 ppt).

The dioxins/furans contributed to Lake Ontario via Eighteenmile Creek was the subject of a study by Frank Estabrooks et al of the NYSDEC during the years 1989 through 1992. The results of this study are described in An Investigation of the Dioxin/Furan Concentrations in the Sediments of Eighteenmile Creek and the Erie Canal Near Lockport, New York. The results of this investigation indicated that the highest concentrations of dioxin/furans were detected in the Erie Canal near Lockport and were the likely source of dioxins/furans to Eighteenmile Creek. Also, the concentrations were considered "levels of concern" since they exceeded NYSDEC wildlife bioaccumulation guidance values.

The NYSDEC Division of Fish and Wildlife collected fish as part of the Lake Ontario Supplemental Biomonitoring Project, 1996. Fish were collected in the Buffalo River, Black River Bay, Oswego River, Eighteenmile Creek, Raquette River, Genesee

River, Grasse River, Oswegatchie River, Oak Orchard Creek and Dunkirk Harbor. These fish were analyzed for dioxin/furan concentrations by Triangle Labs of North Carolina and the data is contained in Table 5.

Description of Sampling Program

Twenty seven surficial sediment samples from tributaries, twenty two surficial sediment samples from Lake Ontario and four sediment core samples from Lake Ontario backwater areas were collected as part of this study. These samples were collected to determine the current and historical concentration of dioxin/furan and PCB's at these locations. Macroinvertebrate and water samples were collected at eight and nine of the surficial sediment sample locations, respectively. (No suitable macroinvertebrate sample was collected at Cattaraugus Creek). Macroinvertebrate samples were collected in an attempt to characterize benthic tissue concentrations within the bioaccumulation process. All nine water and eight macroinvertebrate tissue samples were analyzed for dioxin/furan and PCB concentrations. In 1996 and 1997, young of year fish were collected, by NYSDEC Division of Fish and Wildlife personnel, in seventeen tributaries to Lake Ontario. Samples were prepared and frozen and were submitted for dioxin/furan analyses.

Core Samples

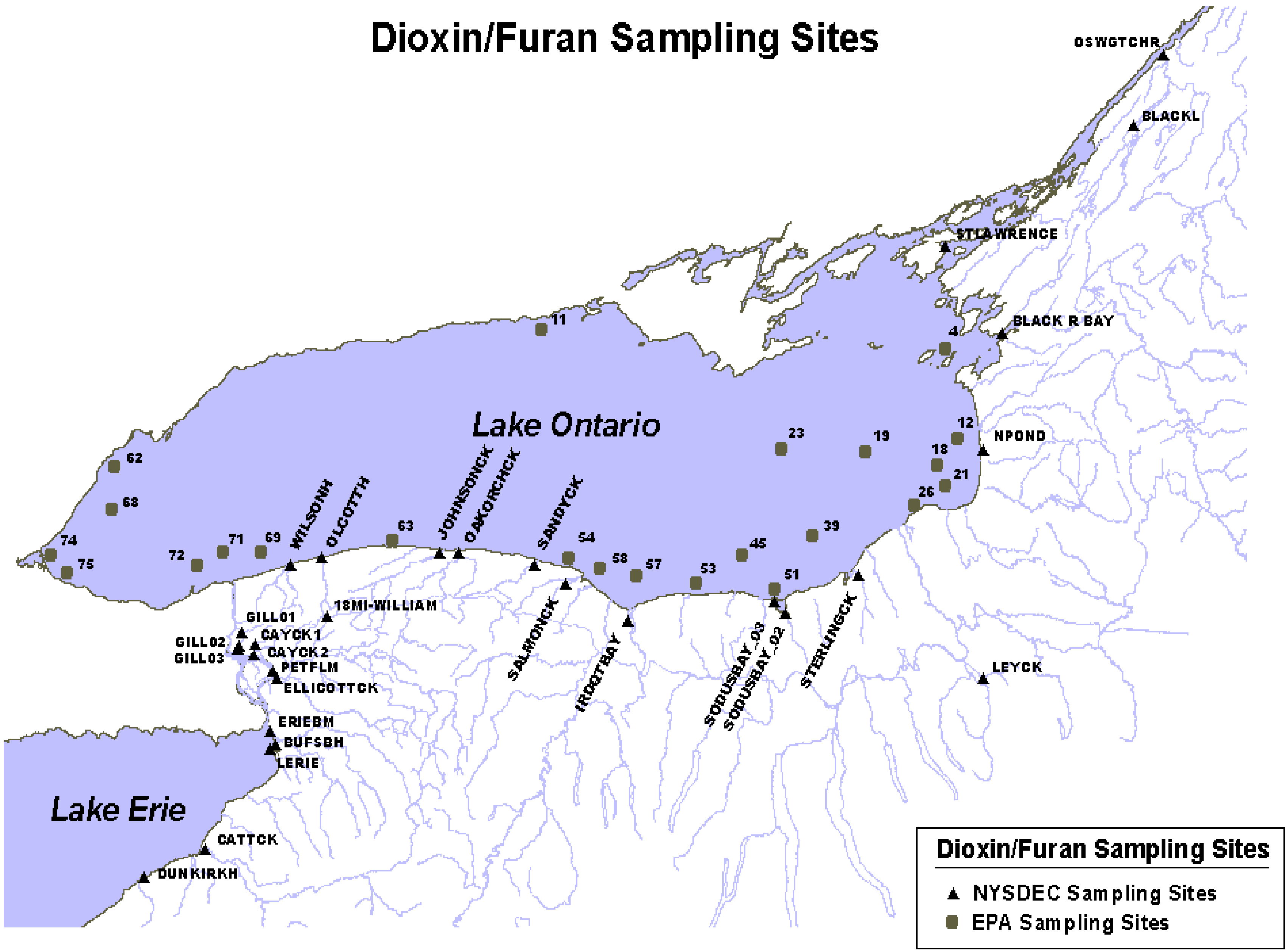
Radio-dated sediment core samples were collected at three locations, Irondequoit Bay, Sodus Bay and North Pond, with two separate cores collected in Sodus Bay. Radio-dating provides time identifiers to the strata in the core. Irondequoit Bay and Sodus Bay were selected for core samples because they are representative of Lake backwater areas, with additional inputs from Irondequoit Creek and Sodus Creek. North Pond was selected as representing a "clean" Lake backwater area. Core samples were collected from the NYSDEC pontoon boat using a vibra-core sampler.

The North Pond core sample was divided into two sub-samples, the Irondequoit Bay core was subdivided into four subsections and the Sodus Bay cores were subdivided into three and four sub-samples respectively prior to chemical analysis. Each subsection was analyzed for total dioxin and furan tetra thru octa homologs and 2,3,7,8 - substituted congeners (using EPA method 1613B), congener PCB, total organic carbon, total volatile solids and grain size distribution. The second core sample from each location was sent for radio-dating using cesium 137, beryllium 7 and lead 210.

Surficial Samples

Surficial sediment samples were collected in 1997 from Olcott Harbor, Black Lake and near the mouths of Oswegatchie River, Johnson Creek, Oak Orchard Creek, Sandy Creek, Salmon Creek, Sterling Creek and Cattaraugus Creek. These sample sites represent tributaries to Lake Ontario and one tributary to Lake Erie. In addition, 22 of 75 surficial sediment samples collected from Lake Ontario, by EPA staff, were analyzed for dioxin/furan concentration. In 1995, nine surficial sediment samples were collected from sites adjacent to Lake Erie, and one site on Eighteenmile Creek. Samples collected at these locations provide a representation of current, ambient conditions. A Ponar® Dredge, which has been modified to allow removal of reasonably undisturbed sediments by sliding the jaw screens off, was used for sample collection. Dioxin/furan and PCB analyses were performed on the surficial sediment samples. All sample sites are depicted in Figure 1 - Dioxin/furan sampling sites.

Dioxin/Furan Sampling Sites



Results and Observations

EPA method 1613B, dioxin/furan analysis, produces fifteen 2,3,7,8-substituted congener and ten tetra-through octa- homolog results. The results of these analyses are presented in Tables contained in Appendix A. The results of the PCB congener analyses and the grain size distributions are presented in Tables contained in Appendix B.

I. Sediment samples

Qualitative Evaluation

One process for evaluating dioxin and furan concentrations uses a qualitative approach. For this report, based on analytical results of 218 sediment samples collected by NYSDEC from throughout New York State, the tetra through octa dioxin homolog totals are considered to be low or background levels if less than 500 ppt. An average level would be greater than 500 and less than 2,500 ppt. Elevated levels would be greater than 2,500 ppt. For the furan tetra- through octa- homolog totals, less than 100 ppt would be low or background. From greater than 100 ppt to less than 750 ppt, the level would be average. Elevated levels would be greater than 750 ppt. These levels were determined using the NYSDEC Division of Water's existing database and dividing the database into thirds. The homolog totals representing the highest one-third of the database are designated as elevated, those totals representing the middle one-third are designated average and the lowest one-third are designated as low or background.

Elevated levels of the dioxin homolog totals were observed in samples collected from the Black River Bay, Eighteenmile Creek (William St. Dump), Gill Creek (3), Cayuga Creek (2), Petit Flume, Wilson and Olcott Harbors, Erie Basin Marina and sections representing 10-40 and 40-80 cm of the Irondequoit Bay core sample. In the Lake Ontario samples, elevated levels of dioxin homolog totals occurred at sites 19, 23, 39A, 45, 57, 63, 68 and 72. Average levels of the dioxin homolog totals were observed in samples collected from twenty-one of the other sites (see Table 1).

Elevated levels of the furan homolog totals were observed at all of the same sites as the elevated dioxin homolog totals except for Wilson Harbor and site 63 in Lake Ontario. Additional Lake Ontario sites contained elevated levels of furan homolog totals including sites 4, 21, 69, and 71. Average levels of the furan homolog totals were observed in twenty-three samples as per Table 1.

Table 1 - Dioxin and Furan Homolog Totals

Site	dioxin homolog totals (ppt)	furan homolog totals (ppt)	Site	dioxin homolog totals (ppt)	furan homolog totals (ppt)
Oswegatchie River	968	191	Sodus Bay (1) (0-10)	837	225
Black River	5,989	1,633	Sodus Bay (1) (10-20)	429	118
St. Lawrence River	594	197	Irondequoit Bay (0-10)	2,396	593
Erie Basin Marina	14,155	1,960	Irondequoit Bay (10-40)	3,534	790
Buffalo Ship Canal	2,381	640	Irondequoit Bay (40-80)	7,682	3,290
Lake Erie (06)	860	110	Sodus Bay (2) (0-10)	707	272
Eighteenmile Creek	49,927	13,090	Cayuga Creek (1)	789	268
Pettit Flume	68,000	837,000	Cayuga Creek (2)	5,980	3,210
Ellicott Creek	2,345	739	Gill Creek (1)	18	126
Wilson Harbor	3,374	572	Gill Creek (3)	12,162	4,330
Olcott Harbor	10,692	2,471	Black Lake	594	197
Oak Orchard Creek	667	148	Lake Erie (03)	501	43
Dunkirk Harbor	966	80	Lake 4	2,263	1,400
Lake 12	251	120	Lake 54	478	245
Lake 18	1,088	583	Lake 57	3,205	2,260
Lake 19	4,130	3,390	Lake 58	988	423
Lake 21	1,460	2,210	Lake 62	1,647	432
Lake 23	4,090	3,000	Lake 63	2,603	569
Lake 26	746	235	Lake 68	2,731	2,360
Lake 39A	4,700	4,830	Lake 69	2,480	1,420
Lake 45	4,330	4,320	Lake 71	1,690	1,630
Lake 51	196	104	Lake 72	4,370	8,610
Lake 53	322	176			

*elevated levels - red   average levels -blue

Toxic Equivalency

Another process for assessing the toxicity of the measured concentration of dioxin and furan in a particular sample is the toxic equivalency. This is a methodology that quantifies the toxicity of 2,3,7,8-substituted dioxin and furan congeners by proportioning their toxicities to 2,3,7,8-TCDD. These individual values can then be summed with the total Toxic Equivalency Quotient (TEQ) representing the overall toxicity of the various 2,3,7,8-congeners. The toxic equivalency factors used for comparing TEQ's to the NYSDEC Water Quality Criteria are the International Toxicity Equivalency Factors (ITEF) used by both the USEPA, the New York State Department of Health and the New York State Department of Environmental Conservation Water Quality Regulations for Surface and Groundwaters. New TEF values (1999) developed by the World Health Organization (WHO) are also presented in this report for calculation of TEQ's in sediment. For this report, all comparisons to criteria and standards use the existing (ITEF) toxicity factors whereas all graphs of TEQ data use the new WHO toxicity factors. In Tables 2 and 3, both values are presented. Table 2 presents the TEQ's for Tributaries to Lake Ontario and other sampled sites. Table 3 presents the TEQ's for those sites sampled in Lake Ontario.

The toxicity equivalency quotients can be compared to human health and wildlife bioaccumulation sediment guidance values (based on 1994 WHO TEF's) as presented in the DEC publication Technical Guidance for Screening Contaminated Sediments (1998). These values are based on equilibrium partitioning methodology and are a function of the organic carbon content of the sediment being evaluated. Those TEQ's that exceed the wildlife bioaccumulation guidance values are highlighted in blue (see Tables 2 and 3) and the sample exceeding the human bioaccumulation guidance value is highlighted in red.

The TEQ's in 45 of the 63 sediment samples exceeded the wildlife bioaccumulation sediment guidance values. The sample collected at the Pettit Flume site exceeded both the wildlife and human bioaccumulation sediment guidance values.

Table 2 - Toxic Equivalency at Sampled Sites

Site	ITEF TEQ (ppt)	WHO TEQ (ppt)	Site	ITEF TEQ (ppt)	WHO TEQ (ppt)
Dunkirk Harbor	4.0	3.6	Irondequoit Bay (0-10)	13.9	13.0
Cattaraugus Creek	0.0	0.7	Irondequoit Bay (10-40)	17.3	14.6
Lake Erie (03)	2.6	2.5	Irondequoit Bay (40-80)	25.6	18.6
Erie Basin Marina	56.8	51.5	Irondequoit Bay (80-115)	1.25	1.27
Buffalo Ship Canal	18.9	18.7	Sodus Bay (2) (0-10)	9.8	10.0
Lake Erie (06)	4.4	4.2	Sodus Bay (2) (10-22)	0.3	0.2
Sandy Creek	1.0	0.8	Sodus Bay (2) (22-85)	0.1	0.1
Salmon Creek	0.3	0.2	Sodus Bay (2) (85-140)	0.1	0.1
Oswegatchie River	4.6	4.1	Ellicott Creek	19.6	19.9
Black River	23.6	19.9	Wilson Harbor	15.6	14.7
St. Lawrence	6.8	7.1	Olcott Creek	40.0	32.8
Sodus Bay (1) (0-10)	7.3	7.1	Johnson Creek	1.7	1.6
Sodus Bay (1) (10-20)	3.6	3.3	Oak Orchard Creek	3.9	3.6
Sodus Bay (1) (20-163)	0.1	0.0	Sterling Creek	0.2	0.2
Sodus Bay (1) (163-178)	0.1	0.0	Black Lake	5.2	4.8
North Pond (0-30)	2.1	2.1	Bottle Brook	0.0	0.0
North Pond (30-82)	0.0	0.0	Ley Creek	0.2	0.2
Gill Creek (1)	0.0	0.1	Pettit Flume	14,861.0	14,743.7
Gill Creek (2)	0.0	0.1	Cayuga Creek (1)	6.5	5.8
Gill Creek (3)	151.5	147.6	Cayuga Creek (2)	226.2	230.5
Eighteenmile Creek	151.1	108.7			

blue - exceeds NYSDEC wildlife bioaccumulation criteria
red - exceeds NYSDEC human bioaccumulation criteria

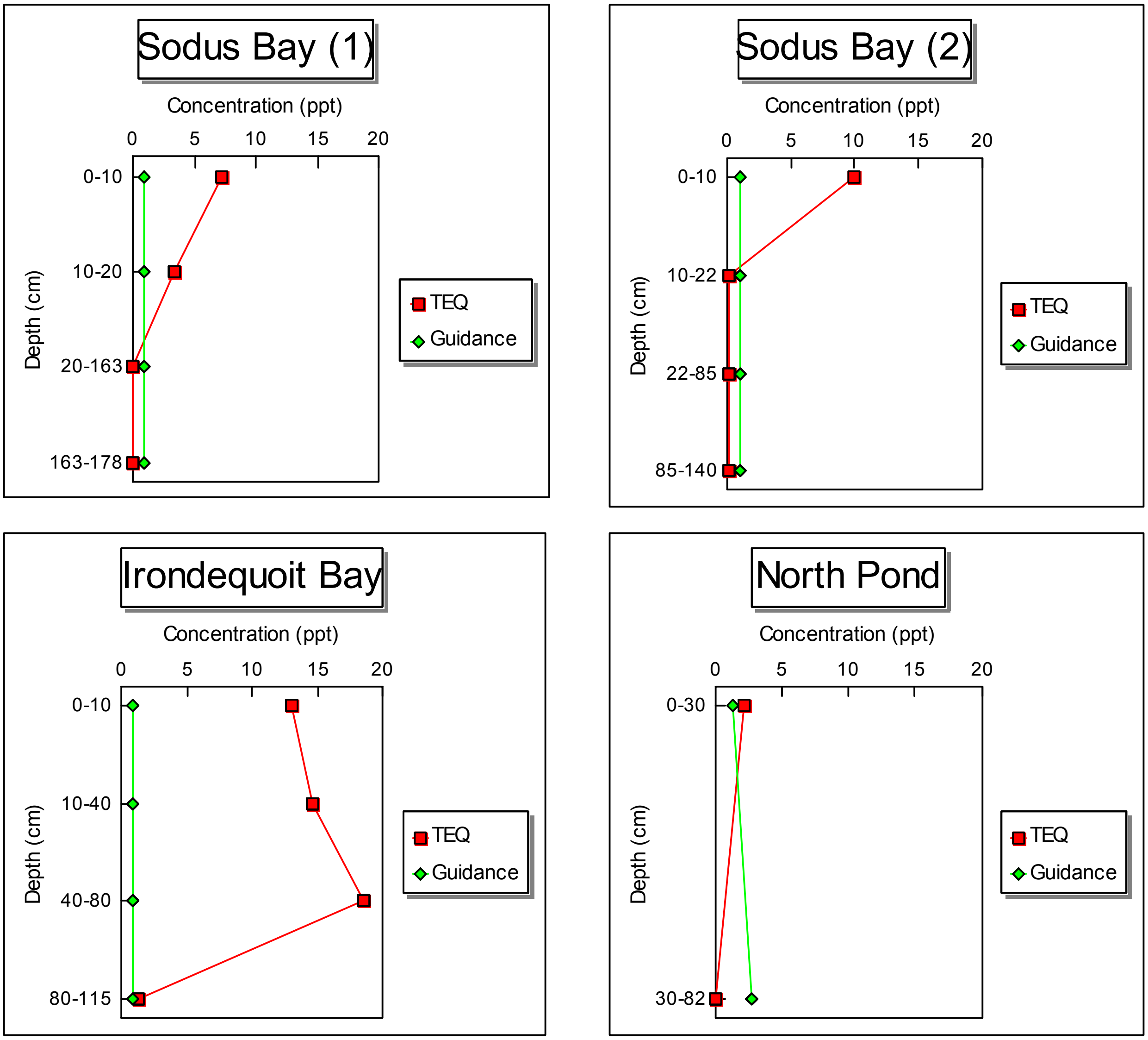
Table 3 - Toxic Equivalency at Sites in Lake Ontario

Site	ITEF TEQ (ppt)	WHO TEQ (ppt)	Site	ITEF TEQ (ppt)	WHO TEQ (ppt)
4	50.0	51.4	54	3.5	3.4
11	2.2	2.3	57	6.4	6.5
12	5.3	5.6	58	9.4	9.5
18	22.9	22.9	62	77.4	78.1
21	76.4	76.8	63	15.3	15.1
23	100.0	100.3	68	12.9	12.5
26	8.9	8.7	69	20.1	19.2
39A	153.3	154.6	71	88.4	88.4
45	133.3	133.6	72	281.5	282.6
51	3.5	3.4	74	3.4	3.4
53	6.4	6.5	75	2.1	2.2

Blue - exceeds wildlife bioaccumulation values

The 2,3,7,8 TCDD TEQ's were plotted versus depth for the core samples collected in Irondequoit Bay, North Pond and the two locations in Sodus Bay (Figure 2). In both of the Sodus Bay samples, the toxic equivalence decreased with depth in the core samples. In the Irondequoit Bay core sample, the toxic equivalence increased with depth up to a depth of 80 centimeters. The deepest section of the core 80 to 115 cm had the lowest toxic equivalence. The North Pond core sample proved to be representative of a "clean" lake backwater area with very low toxic equivalence from the surface to the bottom of the core. The core samples were sent for radio-dating using cesium 137, beryllium 7 and lead 210. The results of the radio-dating are not yet available. When available, the radio-dating results will be used to provide time identifiers to the strata in these cores.

Figure 2 - TEQ's with Depth for Core Sampling Sites



*Guidance - Wildlife Bioaccumulation Guidance value calculated using NYSDEC Division of Fish and Wildlife Technical Guidance for Screening Contaminated Sediments

Percent Abundance Patterns

A third process for evaluating the dioxin data are the percent abundance patterns of 2,3,7,8-substituted congeners, homolog totals and toxic equivalency quotients. Percent abundance patterns are useful in characterizing the composition of complex compounds such as dioxins, furans, and PCB's. Percent abundances are calculated by dividing each individual 2,3,7,8-substituted congener concentration, homolog total or TEQ value by a representative total. These percent abundance values can then be arranged in a fixed sequence which establishes a pattern. This pattern can be used to compare the similarity or divergence of the analytical results of multiple samples.

While the percent abundance patterns may provide insight into the complex realm of dioxin and furan characteristics, it must be remembered that there are 75 dioxin congeners (7 of which are 2,3,7,8-substituted) and 135 furan congeners (10 of which are 2,3,7,8-substituted). Furthermore, only the tetra- through octa- homolog totals are used in these homolog percent abundance calculations. The analytical results used to characterize the dioxins and furans represents only a fraction of the total dioxin or furan mass.

Dioxin/Furan Homolog Percent Abundance Patterns

Graphs of dioxin, furan and dioxin/furan homolog percent abundance patterns were created for different sections throughout the study area. A separate graph was created for an eastern, central and western section of Lake Ontario, Lake Erie and tributaries to Lake Erie, tributaries to Niagara River and to Lake Ontario and of Lake Ontario outlet and backwater areas. A cursory evaluation of the homolog percent abundance graphs was then undertaken. A more detailed assessment of these percent abundance patterns, and their usefulness in identifying possible sources of the dioxin/furan, will be conducted in the future.

The graphs indicate that the dioxin homolog percent abundance patterns are very consistent throughout the locations studied, with the octa-chlorodioxin dominating. The exception to this pattern occurs only in the Cayuga Creek (2) and Pettit Flume samples. Octa-chlorodioxin is thought to be produced by multi-combustion processes and the production of pentachlorophenol. The furan homolog and the dioxin/furan ratio percent abundance patterns demonstrate considerable variability and these graphs will likely be useful for source identification and interpretation.

Generally, for the dioxin/furan ratio percent abundance, the furan mass for the tetra- and penta- homolog is much greater than the dioxins. For the hepta- and octa-homologs, the dioxins dominate. A characteristic of the Lake Ontario tributaries sampled is that for the furan homolog percent abundance there is a greater percentage of hepta-homolog relative to the percentage of octa- homolog. The hepta- homolog is thought to be a characteristic of contamination caused by sintering plants with the iron/steel industry.

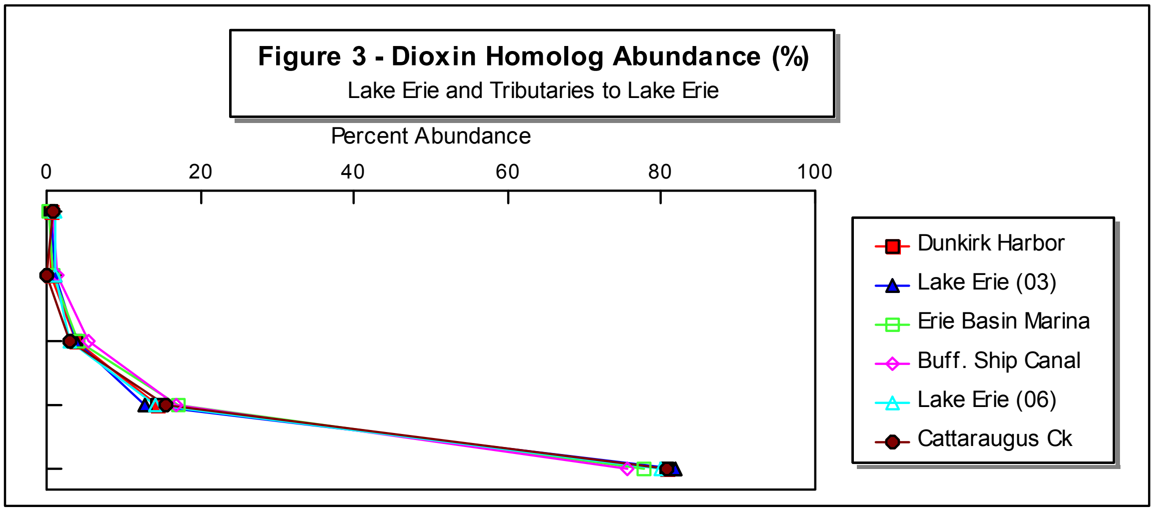


Figure 3 - Dioxin Homolog Abundance (%)
Lake Erie and Tributaries to Lake Erie
Percent Abundance
0
20
40
60
80
100
Dunkirk Harbor
Lake Erie (03)
Erie Basin Marina
Buff. Ship Canal
Lake Erie (06)
Cattaraugus Ck

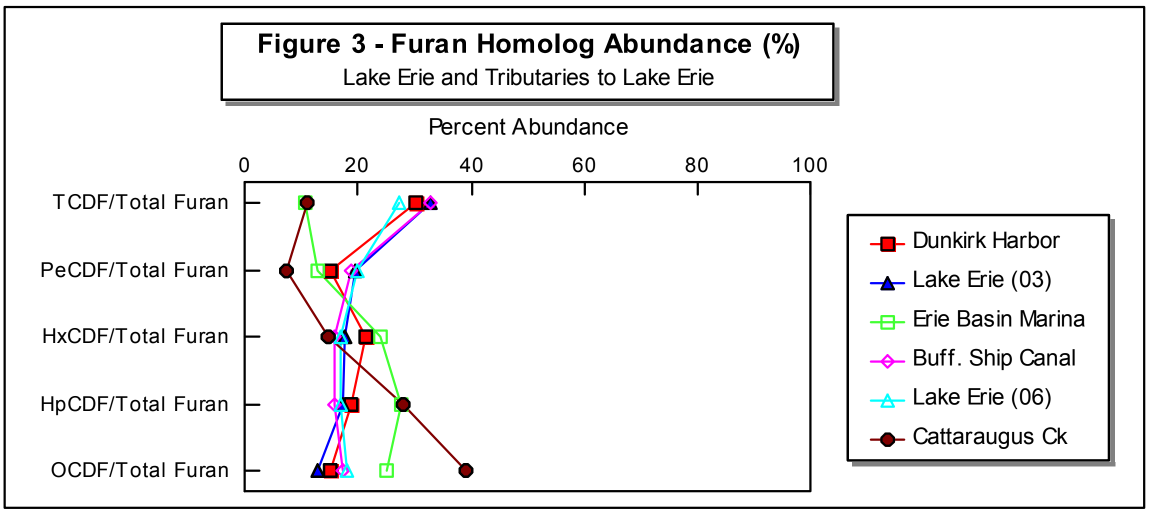


Figure 3 - Furan Homolog Abundance (%)
Lake Erie and Tributaries to Lake Erie
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Dunkirk Harbor
Lake Erie (03)
Erie Basin Marina
Buff. Ship Canal
Lake Erie (06)
Cattaraugus Ck

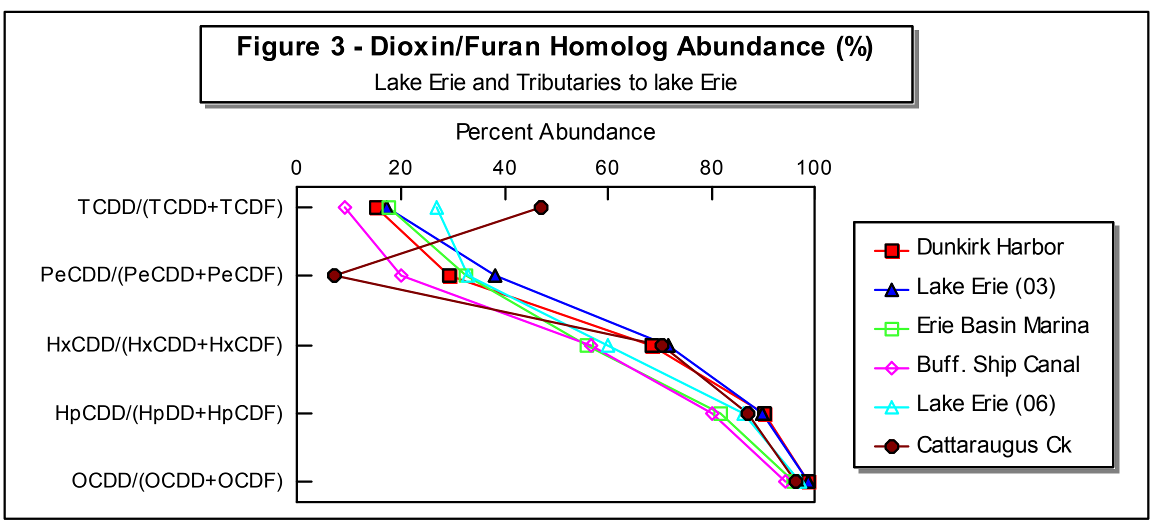


Figure 3 - Dioxin/Furan Homolog Abundance (%)
Lake Erie and Tributaries to lake Erie
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Dunkirk Harbor
Lake Erie (03)
Erie Basin Marina
Buff. Ship Canal
Lake Erie (06)
Cattaraugus Ck

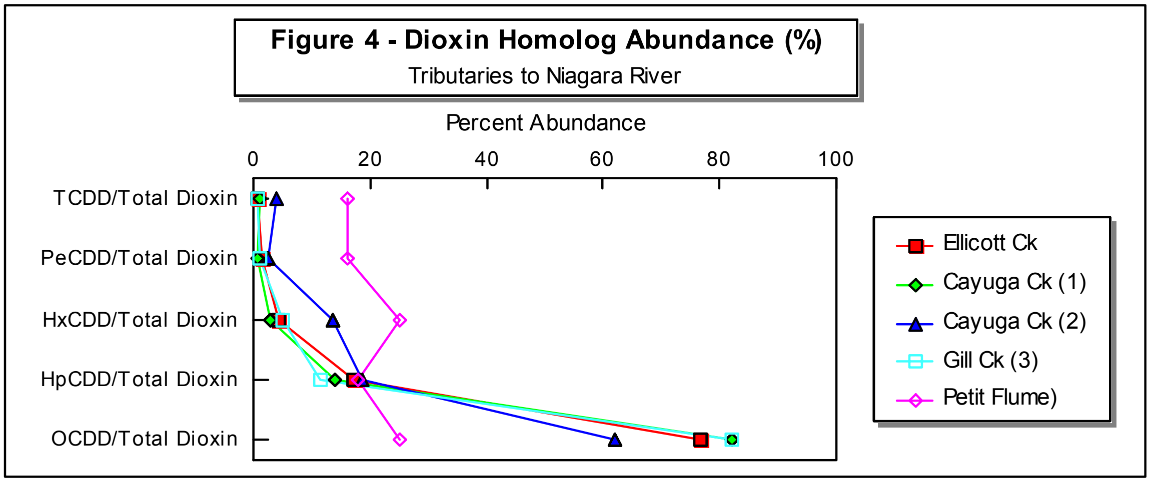


Figure 4 - Dioxin Homolog Abundance (%)
Tributaries to Niagara River
Percent Abundance
0
20
40
60
80
100
TCDD/Total Dioxin
PeCDD/Total Dioxin
HxCDD/Total Dioxin
HpCDD/Total Dioxin
OCDD/Total Dioxin
Ellicott Ck
Cayuga Ck (1)
Cayuga Ck (2)
Gill Ck (3)
Petit Flume)

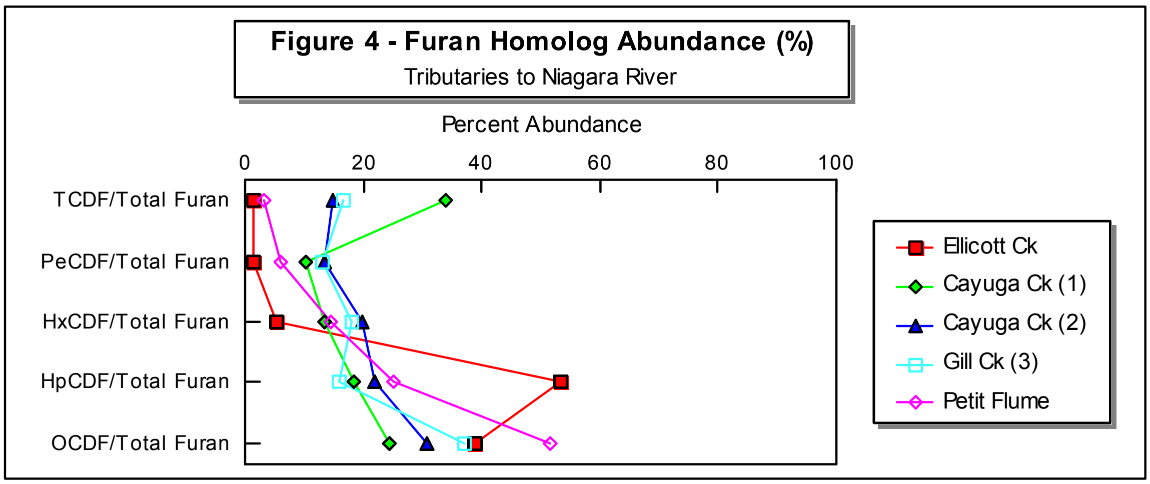


Figure 4 - Furan Homolog Abundance (%)
Tributaries to Niagara River
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Ellicott Ck
Cayuga Ck (1)
Cayuga Ck (2)
Gill Ck (3)
Petit Flume

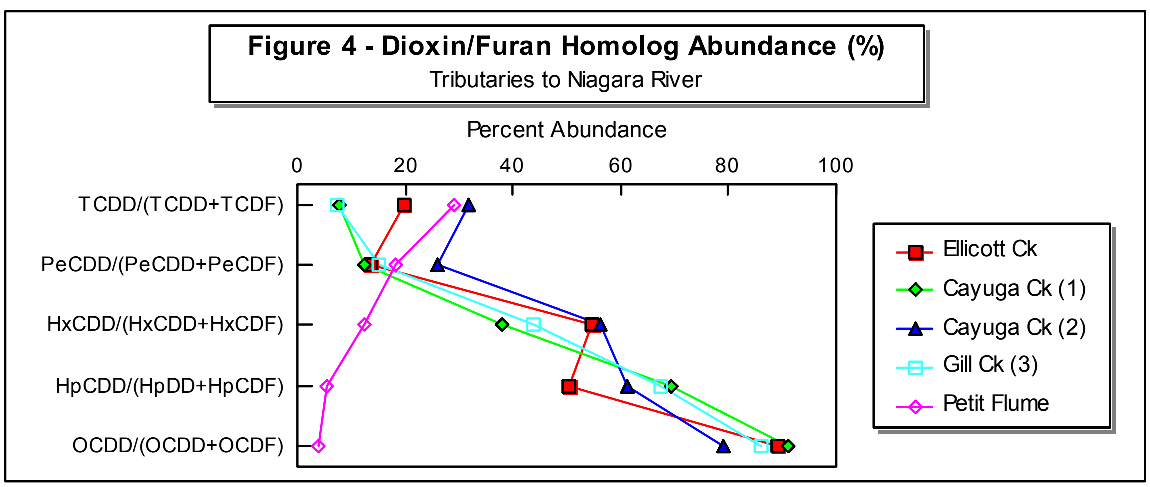


Figure 4 - Dioxin/Furan Homolog Abundance (%)
Tributaries to Niagara River
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Ellicott Ck
Cayuga Ck (1)
Cayuga Ck (2)
Gill Ck (3)
Petit Flume

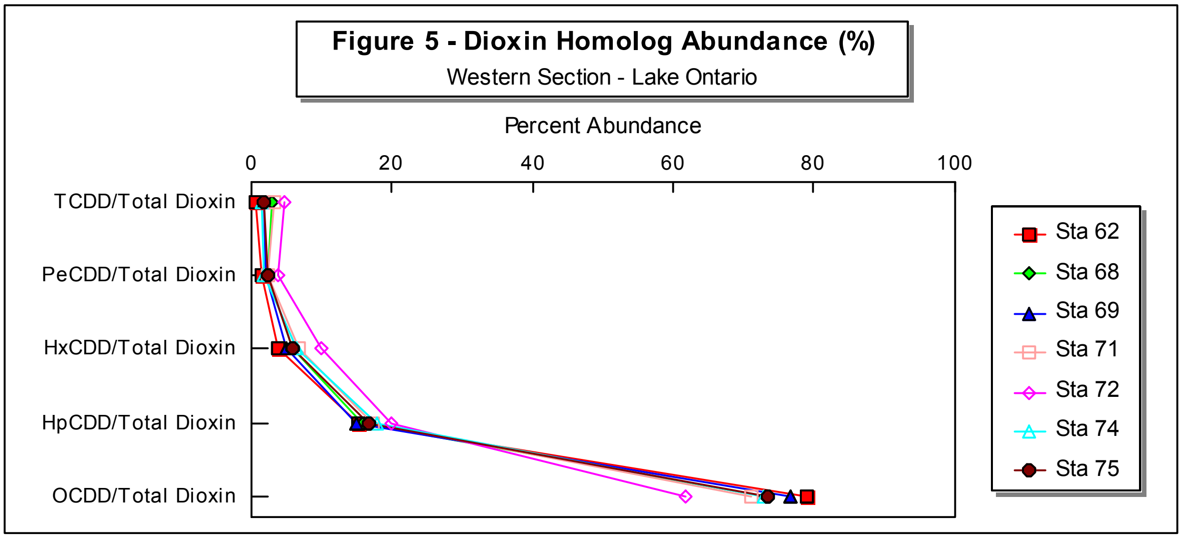


Figure 5 - Dioxin Homolog Abundance (%)
Western Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/Total Dioxin
PeCDD/Total Dioxin
HxCDD/Total Dioxin
HpCDD/Total Dioxin
OCDD/Total Dioxin
Sta 62
Sta 68
Sta 69
Sta 71
Sta 72
Sta 74
Sta 75

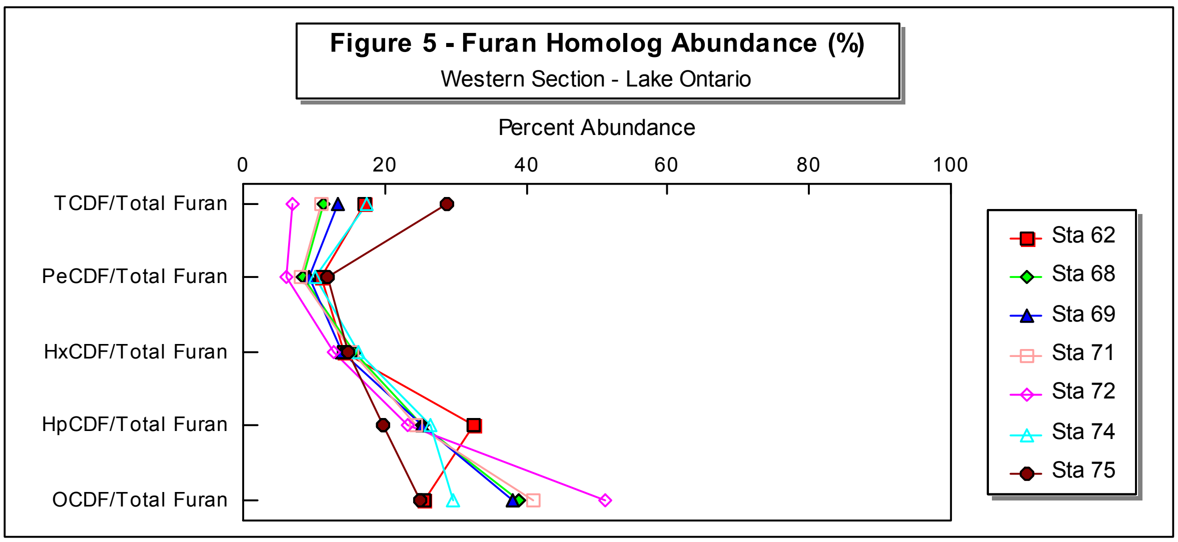


Figure 5 - Furan Homolog Abundance (%)
Western Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Sta 62
Sta 68
Sta 69
Sta 71
Sta 72
Sta 74
Sta 75

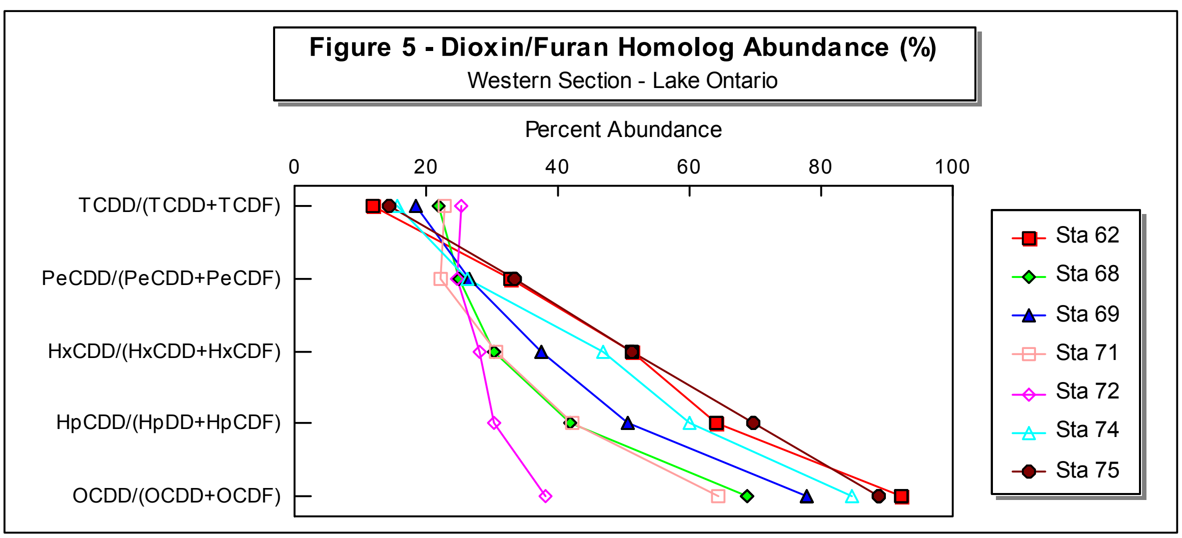


Figure 5 - Dioxin/Furan Homolog Abundance (%)
Western Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Sta 62
Sta 68
Sta 69
Sta 71
Sta 72
Sta 74
Sta 75

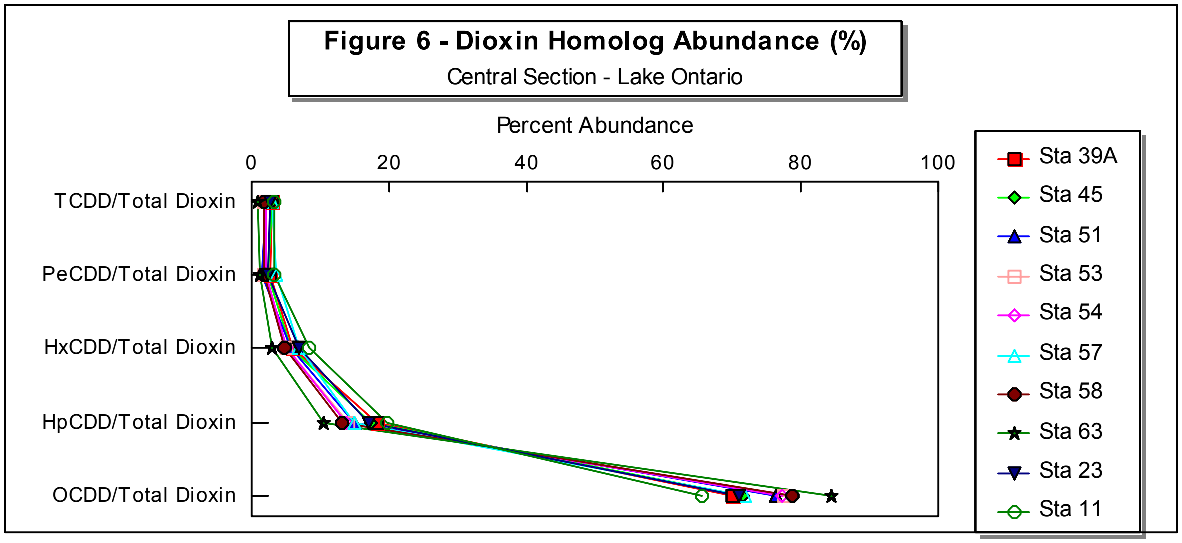


Figure 6 - Dioxin Homolog Abundance (%)
Central Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/Total Dioxin
PeCDD/Total Dioxin
HxCDD/Total Dioxin
HpCDD/Total Dioxin
OCDD/Total Dioxin
Sta 39A
Sta 45
Sta 51
Sta 53
Sta 54
Sta 57
Sta 58
Sta 63
Sta 23
Sta 11

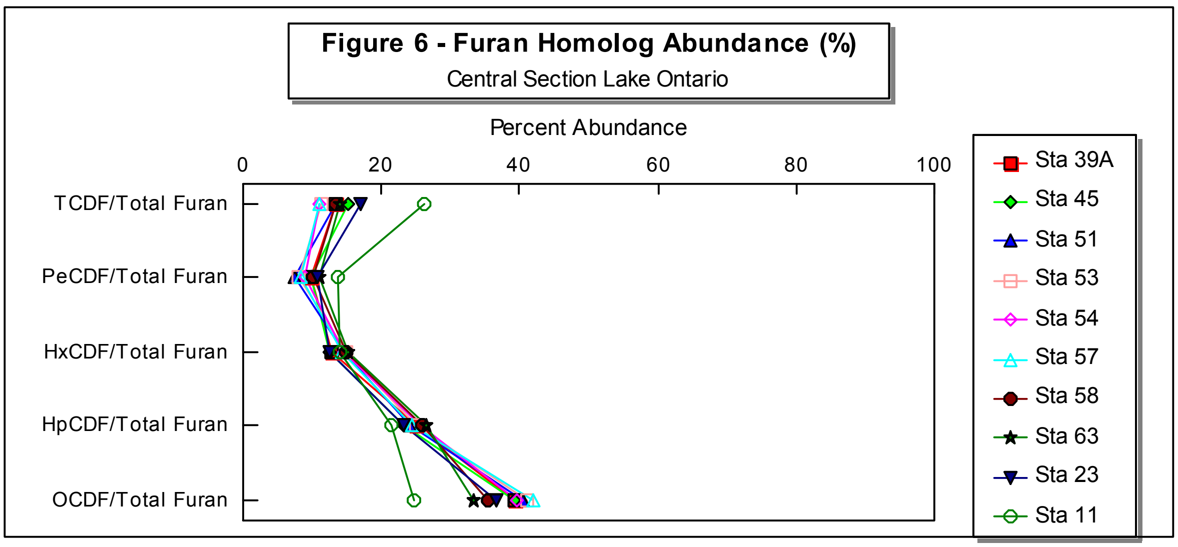


Figure 6 - Furan Homolog Abundance (%)
Central Section Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Sta 39A
Sta 45
Sta 51
Sta 53
Sta 54
Sta 57
Sta 58
Sta 63
Sta 23
Sta 11

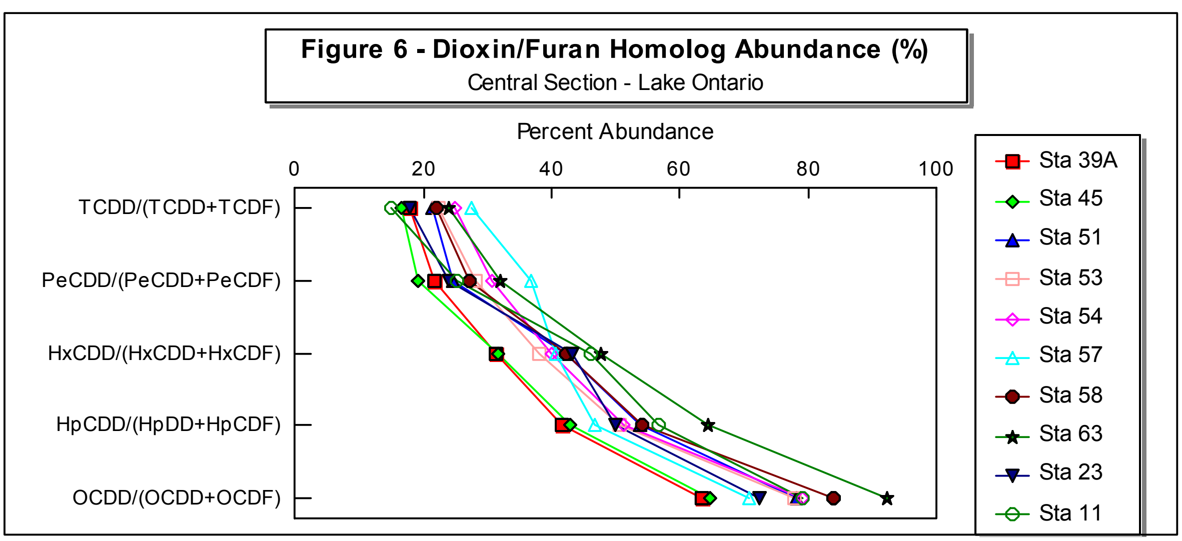


Figure 6 - Dioxin/Furan Homolog Abundance (%)
Central Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Sta 39A
Sta 45
Sta 51
Sta 53
Sta 54
Sta 57
Sta 58
Sta 63
Sta 23
Sta 11

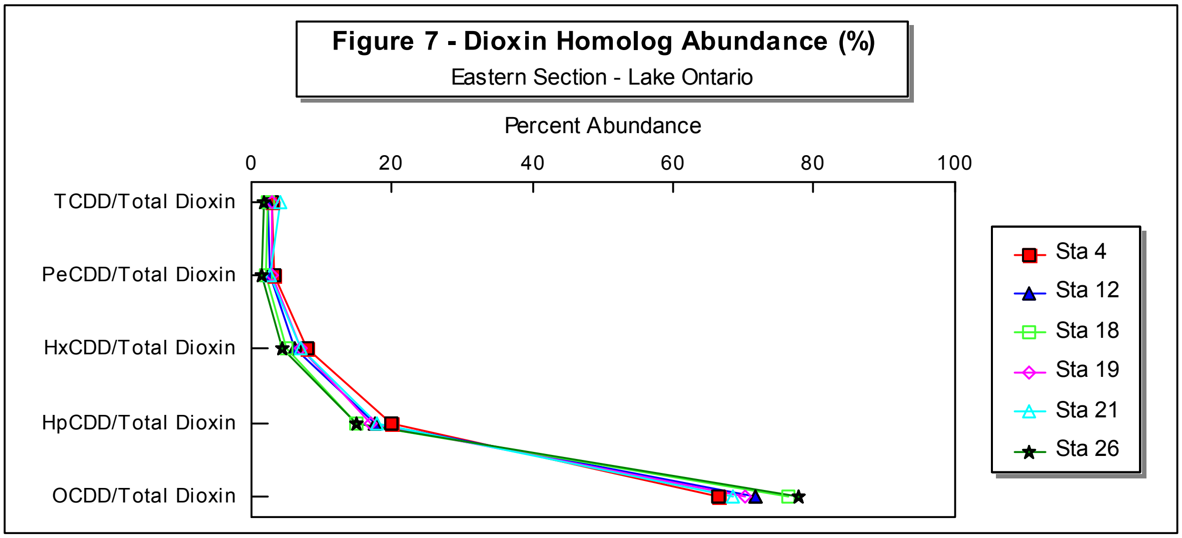


Figure 7 - Dioxin Homolog Abundance (%)
Eastern Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/Total Dioxin
PeCDD/Total Dioxin
HxCDD/Total Dioxin
HpCDD/Total Dioxin
OCDD/Total Dioxin
Sta 4
Sta 12
Sta 18
Sta 19
Sta 21
Sta 26

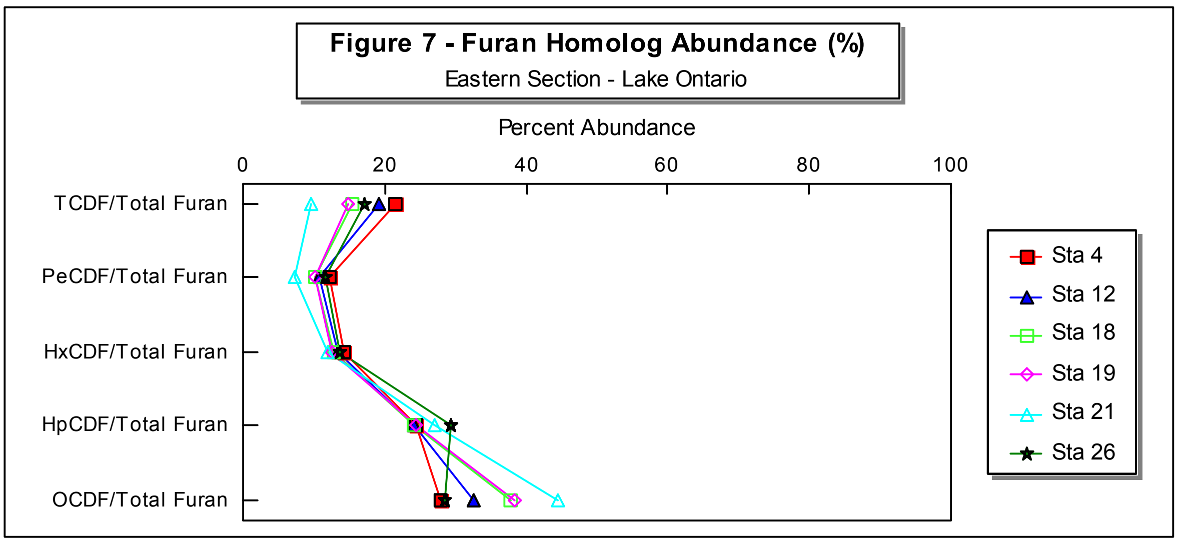


Figure 7 - Furan Homolog Abundance (%)
Eastern Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Sta 4
Sta 12
Sta 18
Sta 19
Sta 21
Sta 26

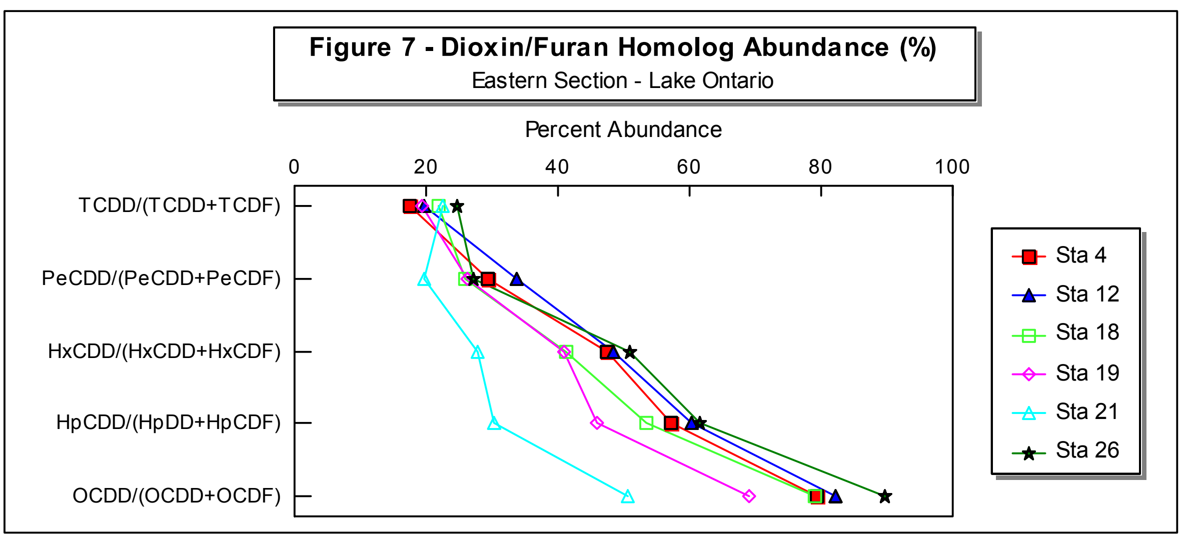


Figure 7 - Dioxin/Furan Homolog Abundance (%)
Eastern Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Sta 4
Sta 12
Sta 18
Sta 19
Sta 21
Sta 26

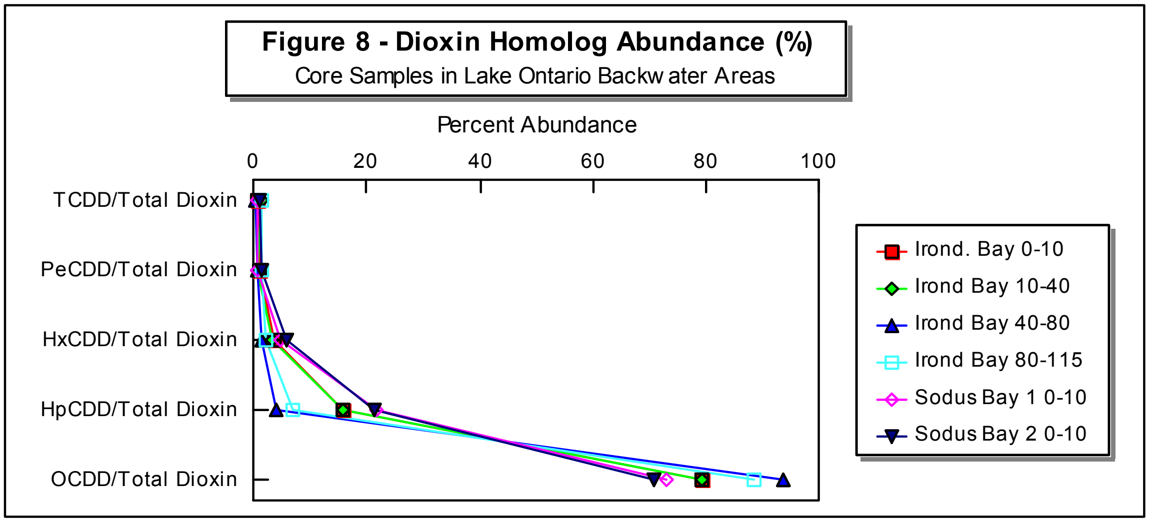


Figure 8 - Dioxin Homolog Abundance (%)
Core Samples in Lake Ontario Backw ater Areas
Percent Abundance
0
20
40
60
80
100
TCDD/Total Dioxin
PeCDD/Total Dioxin
HxCDD/Total Dioxin
HpCDD/Total Dioxin
OCDD/Total Dioxin
Irond. Bay 0-10
Irond Bay 10-40
Irond Bay 40-80
Irond Bay 80-115
Sodus Bay 1 0-10
Sodus Bay 2 0-10

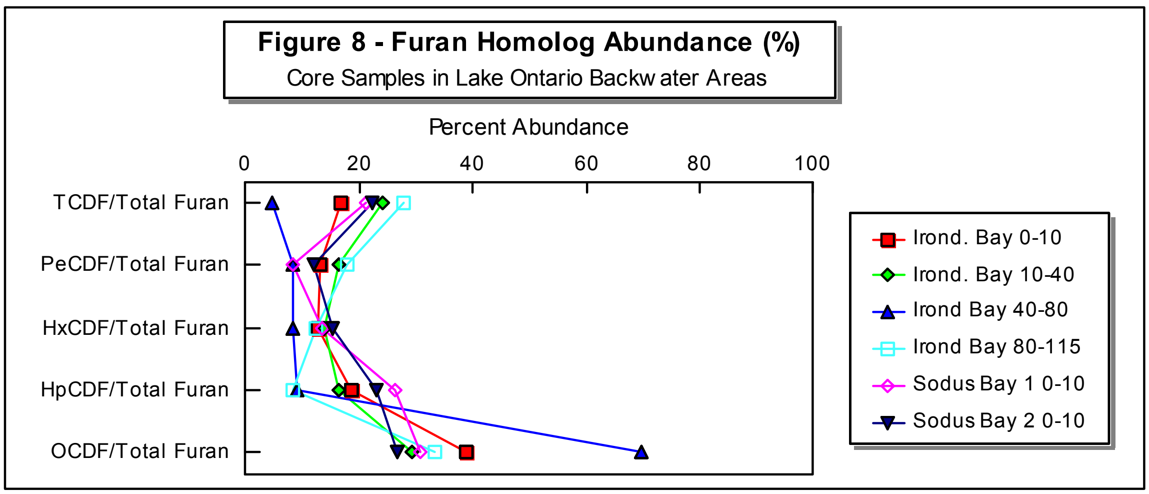


Figure 8 - Furan Homolog Abundance (%)
Core Samples in Lake Ontario Backw ater Areas
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Irond. Bay 0-10
Irond. Bay 10-40
Irond Bay 40-80
Irond Bay 80-115
Sodus Bay 1 0-10
Sodus Bay 2 0-10

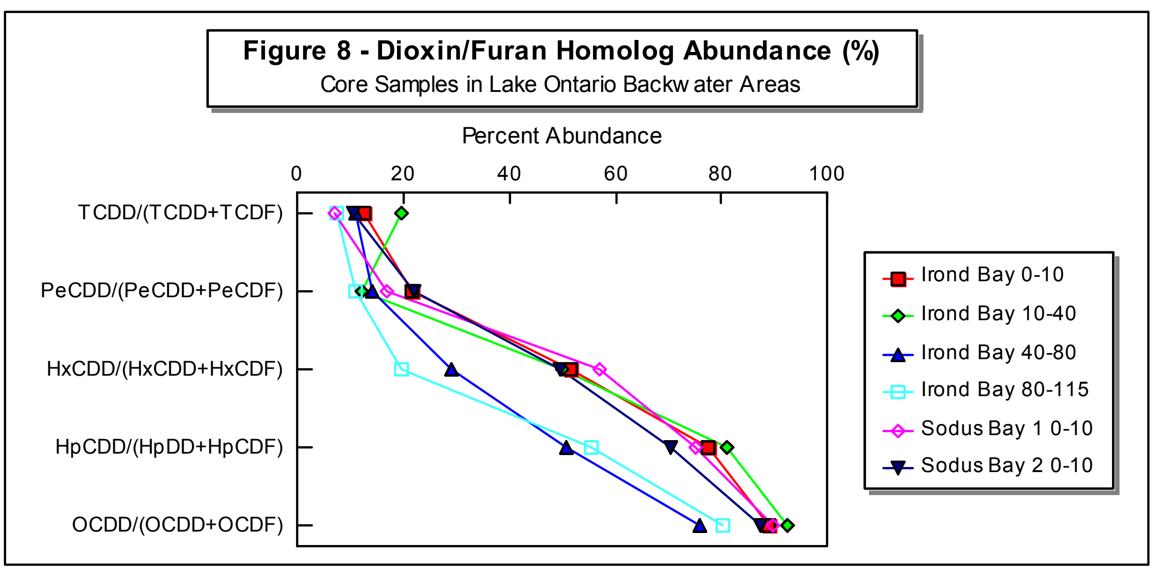


Figure 8 - Dioxin/Furan Homolog Abundance (%)
Core Samples in Lake Ontario Backw ater Areas
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Irond Bay 0-10
Irond Bay 10-40
Irond Bay 40-80
Irond Bay 80-115
Sodus Bay 1 0-10
Sodus Bay 2 0-10

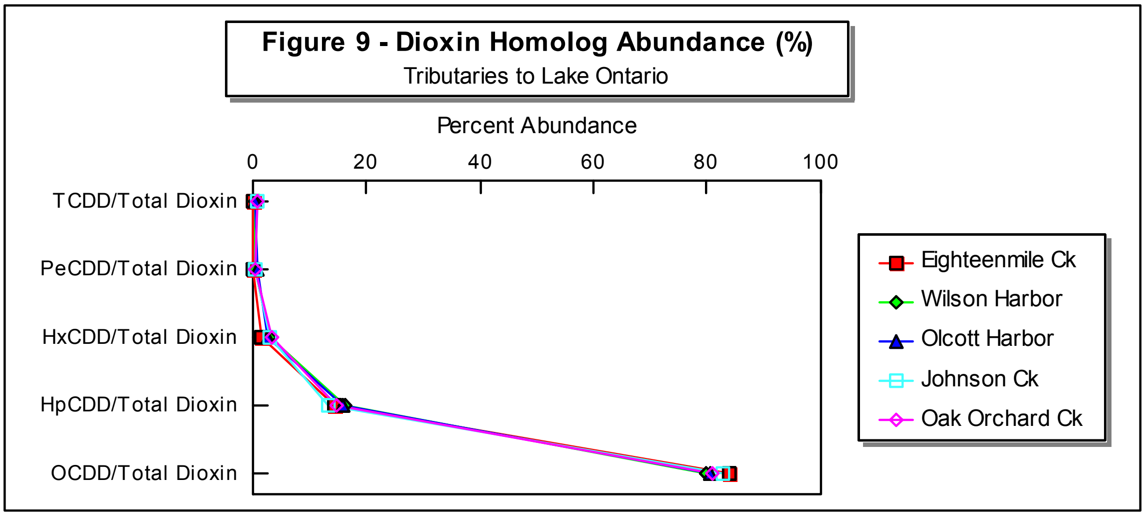


Figure 9 - Dioxin Homolog Abundance (%)
Tributaries to Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/Total Dioxin
PeCDD/Total Dioxin
HxCDD/Total Dioxin
HpCDD/Total Dioxin
OCDD/Total Dioxin
Eighteenmile Ck
Wilson Harbor
Olcott Harbor
Johnson Ck
Oak Orchard Ck

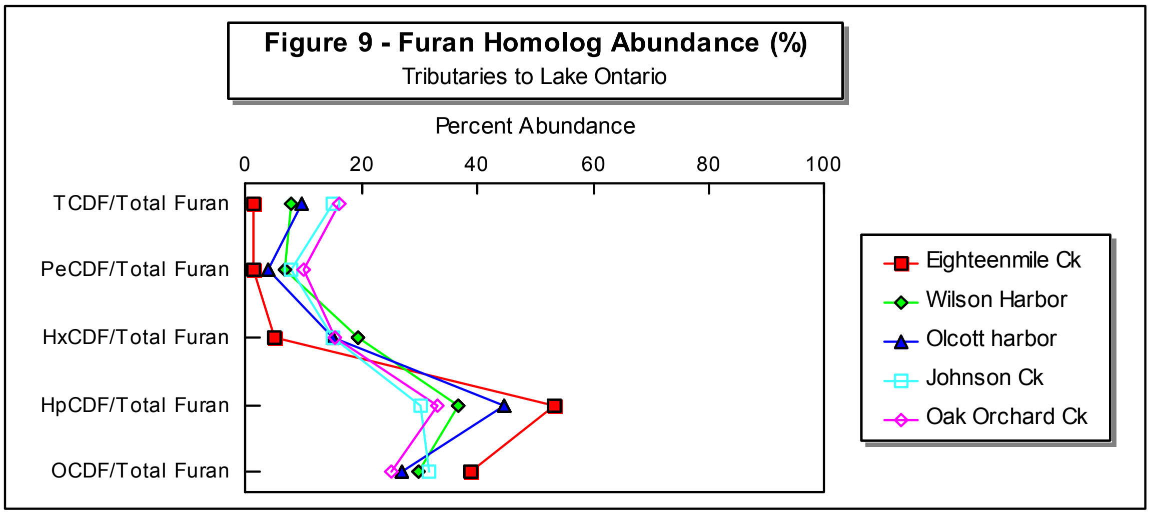


Figure 9 - Furan Homolog Abundance (%)
Tributaries to Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Eighteenmile Ck
Wilson Harbor
Olcott harbor
Johnson Ck
Oak Orchard Ck

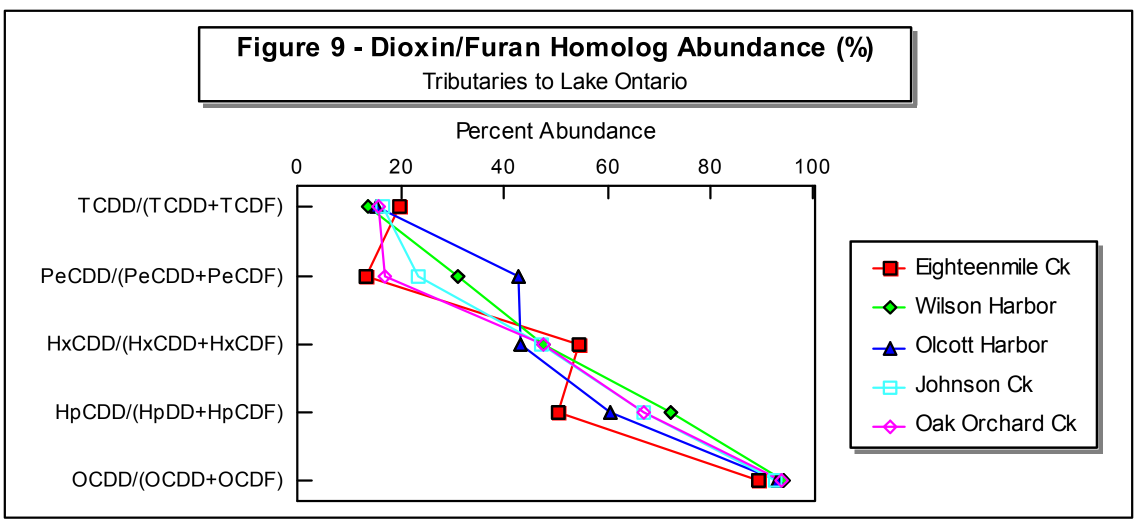


Figure 9 - Dioxin/Furan Homolog Abundance (%)
Tributaries to Lake Ontario
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Eighteenmile Ck
Wilson Harbor
Olcott Harbor
Johnson Ck
Oak Orchard Ck

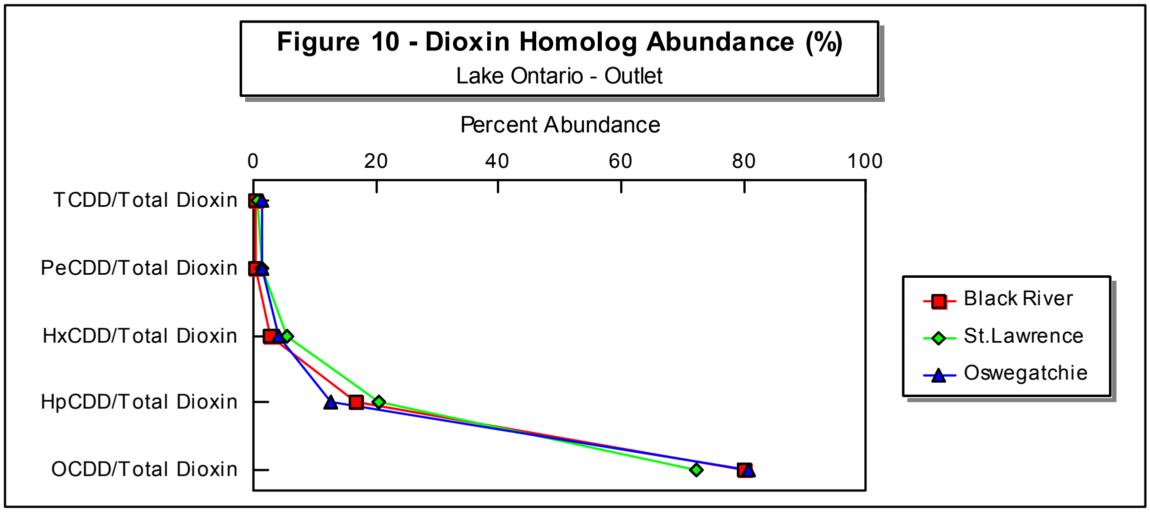


Figure 10 - Dioxin Homolog Abundance (%)
Lake Ontario - Outlet
Percent Abundance
0
20
40
60
80
100
TCDD/Total Dioxin
PeCDD/Total Dioxin
HxCDD/Total Dioxin
HpCDD/Total Dioxin
OCDD/Total Dioxin
Black River
St.Lawrence
Oswegatchie

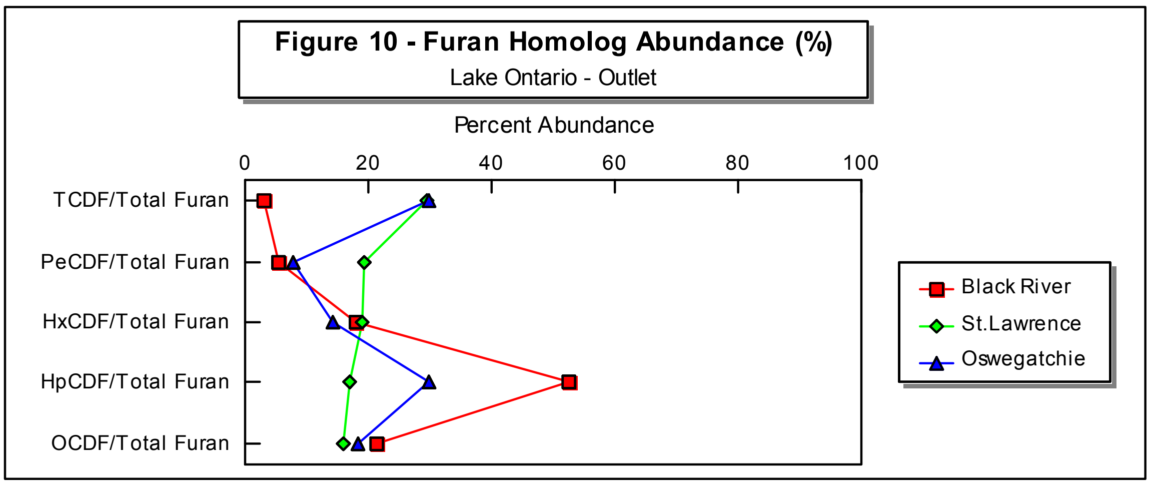


Figure 10 - Furan Homolog Abundance (%)
Lake Ontario - Outlet
Percent Abundance
0
20
40
60
80
100
TCDF/Total Furan
PeCDF/Total Furan
HxCDF/Total Furan
HpCDF/Total Furan
OCDF/Total Furan
Black River
St.Lawrence
Oswegatchie

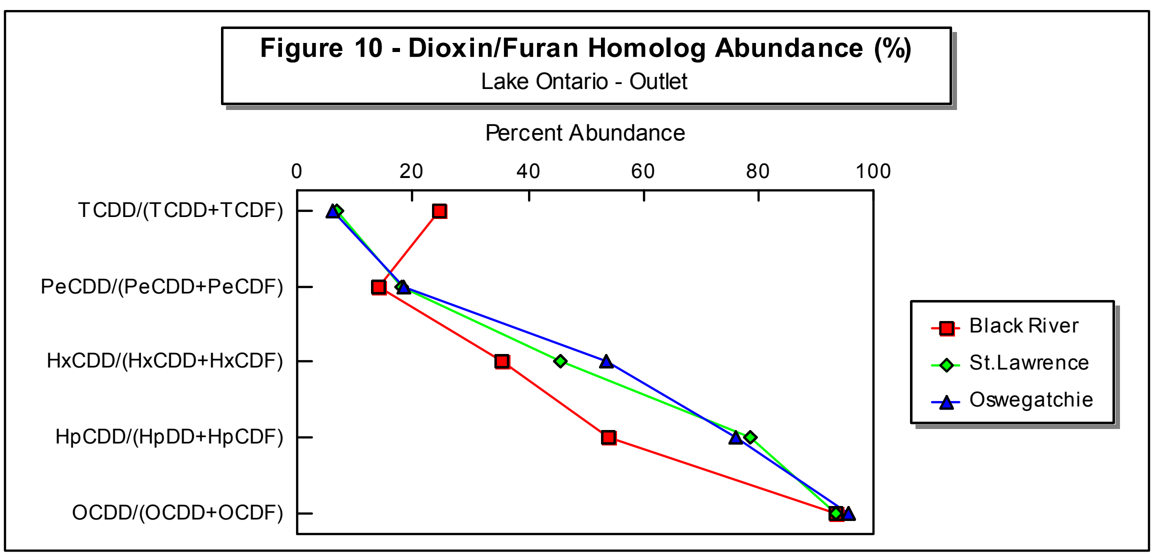


Figure 10 - Dioxin/Furan Homolog Abundance (%)
Lake Ontario - Outlet
Percent Abundance
0
20
40
60
80
100
TCDD/(TCDD+TCDF)
PeCDD/(PeCDD+PeCDF)
HxCDD/(HxCDD+HxCDF)
HpCDD/(HpDD+HpCDF)
OCDD/(OCDD+OCDF)
Black River
St.Lawrence
Oswegatchie

2,3,7,8-Substituted Congener Percent Abundance Patterns

Graphs of the 2,3,7,8-substituted congener percent abundance patterns were created using the analytical results. Similar to the dioxin/furan homolog percent abundance pattern graphs, a separate graph was created for an eastern, central and western section of Lake Ontario, Lake Erie and tributaries to Lake Erie, tributaries to Niagara River and to Lake Ontario and of Lake Ontario outlet and backwater areas. A cursory evaluation of the 2,3,7,8-substituted congener percent abundance graphs was then undertaken. A more detailed assessment of these percent abundance patterns, and the relationship to identifying possible sources of the dioxin/furan, will be conducted in the future.

Two consistent peaks (high percent abundance values) were identified, one for 1,2,3,4,6,7,8-HpCDD and one for its sister congener 1,2,3,4,6,7,8-HpCDF. This is not unexpected, however, since the 1,2,3,4,6,7,8-HpCDD congener is one of two isomers that make up the hepta-dioxin homolog total and the furan congener is one of four making up the hepta-furan homolog total. The Lake Ontario sediment samples have additional peaks for the 2,3,7,8-TCDD and 1,2,3,4,7,8-HxCDF congeners. The 2,3,7,8-TCDD congener is thought to be produced from 2,4,5-T production and pulp bleaching processes.

The Lake Erie, Cayuga Creek, Gill Creek and Petit Flume samples are the only locations where there is a peak of 1,2,3,4,7,8-HxCDF. Aside from the Lake Ontario samples, the only locations with a peak of 2,3,7,8-TCDD are the Cayuga Creek, Gill Creek and Sodus Bay. <u>These are additional pieces of information linking the Cayuga Creek, Gill Creek and Pettit Flume samples to the dioxin/furan concentrations in the Lake Ontario samples</u>. This is a tentative observation based on the limited data set available. A complete set of Lake Ontario tributary data would have to include areas such as the Wellington Canal, Hamilton Harbor, etc.

A very different percent abundance pattern was observed in the deeper section from the Irondequoit Bay core sample (80 - 115 cm section). There is a peak for the congener 1,2,3,6,7,8-HxCDF. This peak is found only in this sample.

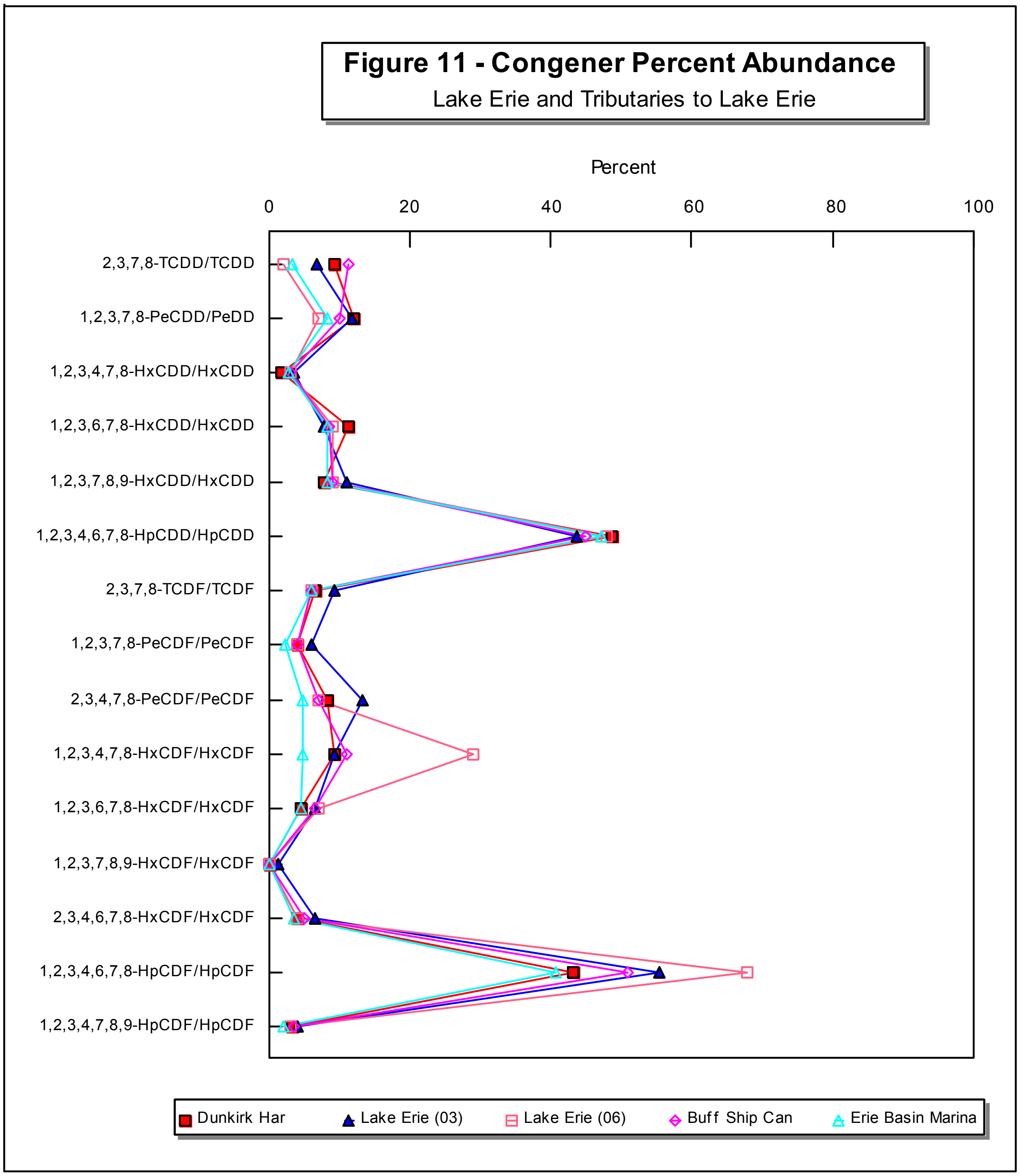


Figure 11 - Congener Percent Abundance
Lake Erie and Tributaries to Lake Erie
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
Dunkirk Har
Lake Erie (03)
Lake Erie (06)
Buff Ship Can
Erie Basin Marina

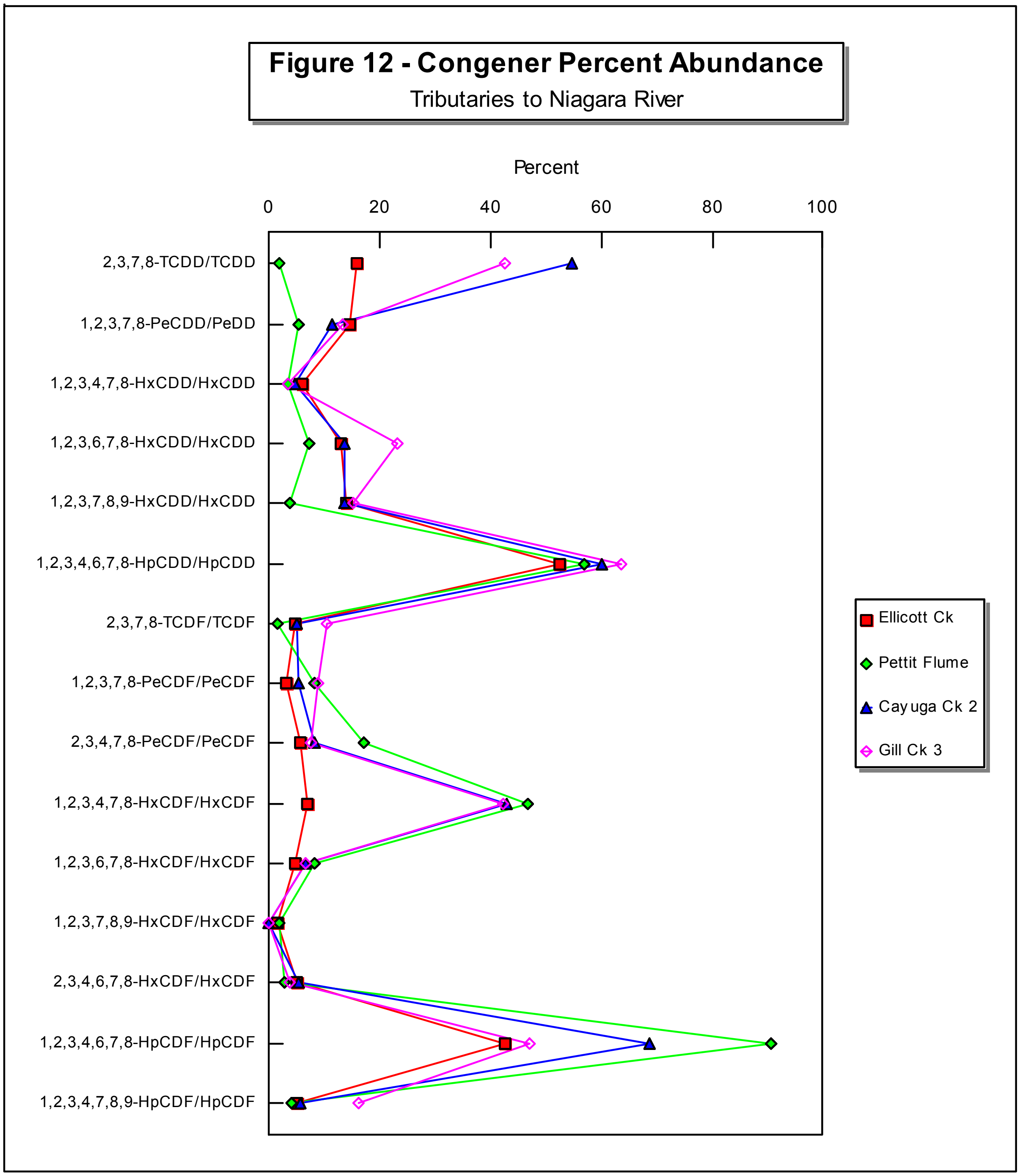


Figure 12 - Congener Percent Abundance
Tributaries to Niagara River
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
Ellicott Ck
Pettit Flume
Cayuga Ck 2
Gill Ck 3

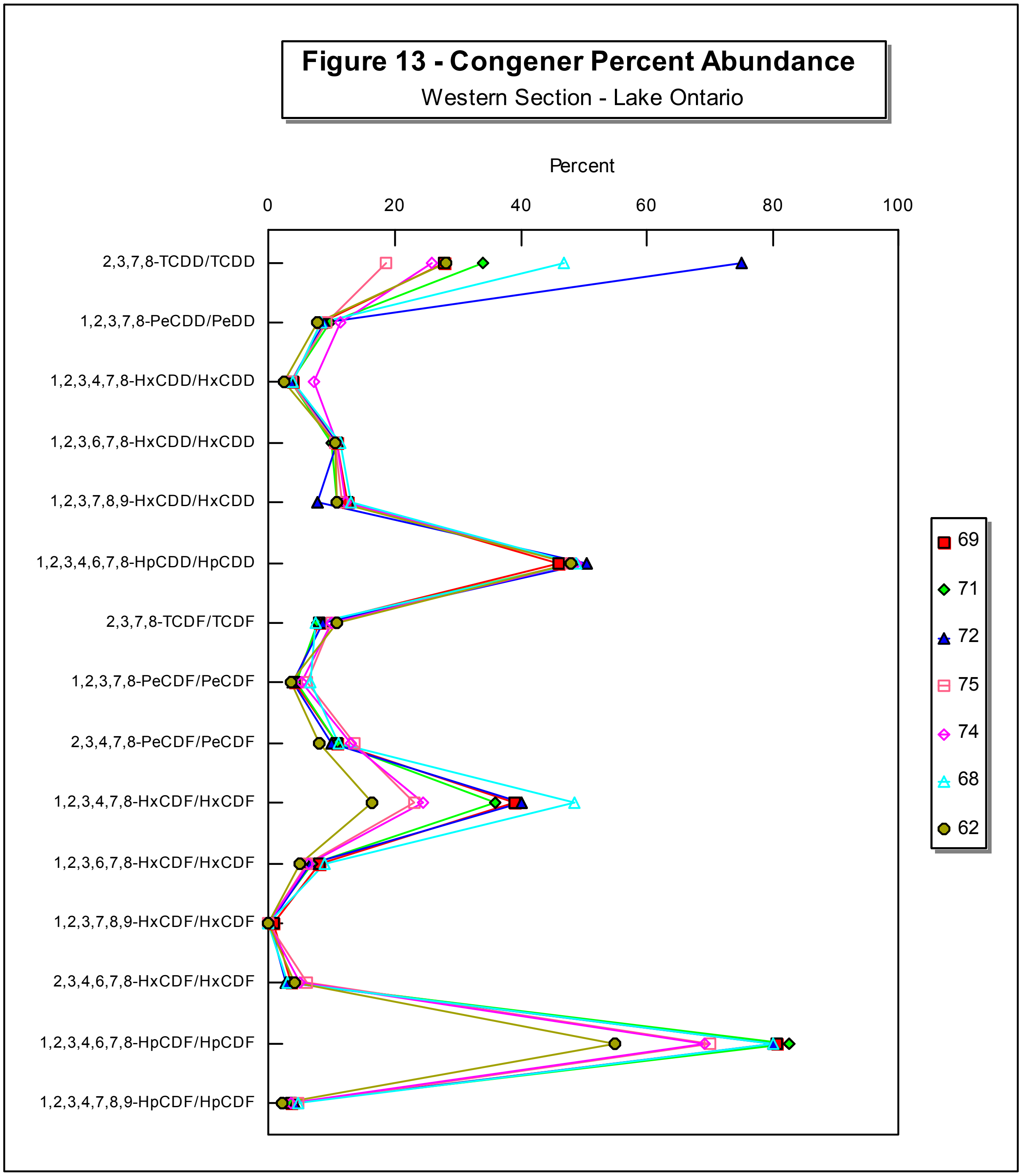


Figure 13 - Congener Percent Abundance
Western Section - Lake Ontario
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
69
71
72
75
74
68
62

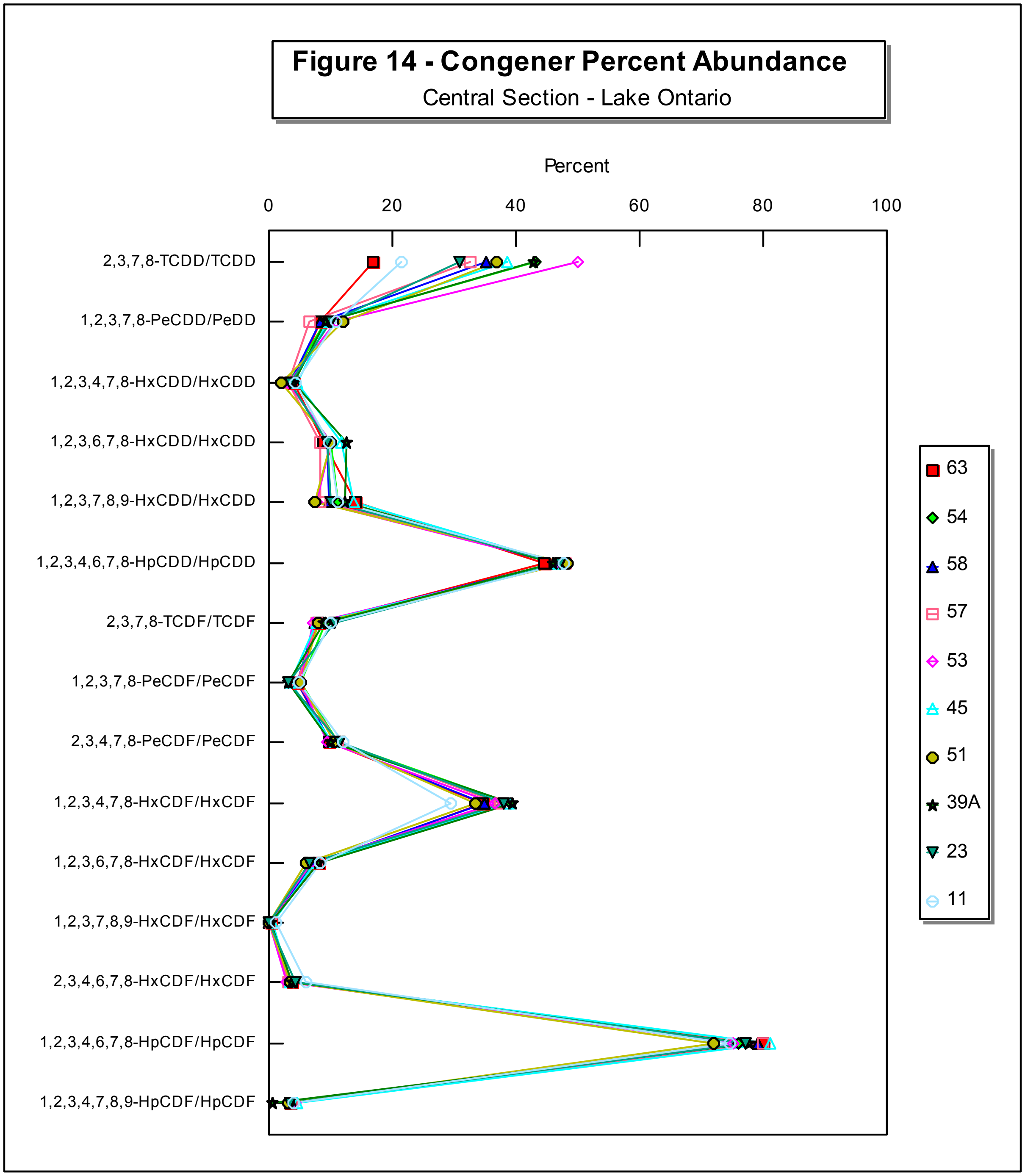


Figure 14 - Congener Percent Abundance
Central Section - Lake Ontario
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
63
54
58
57
53
45
51
39A
23
11

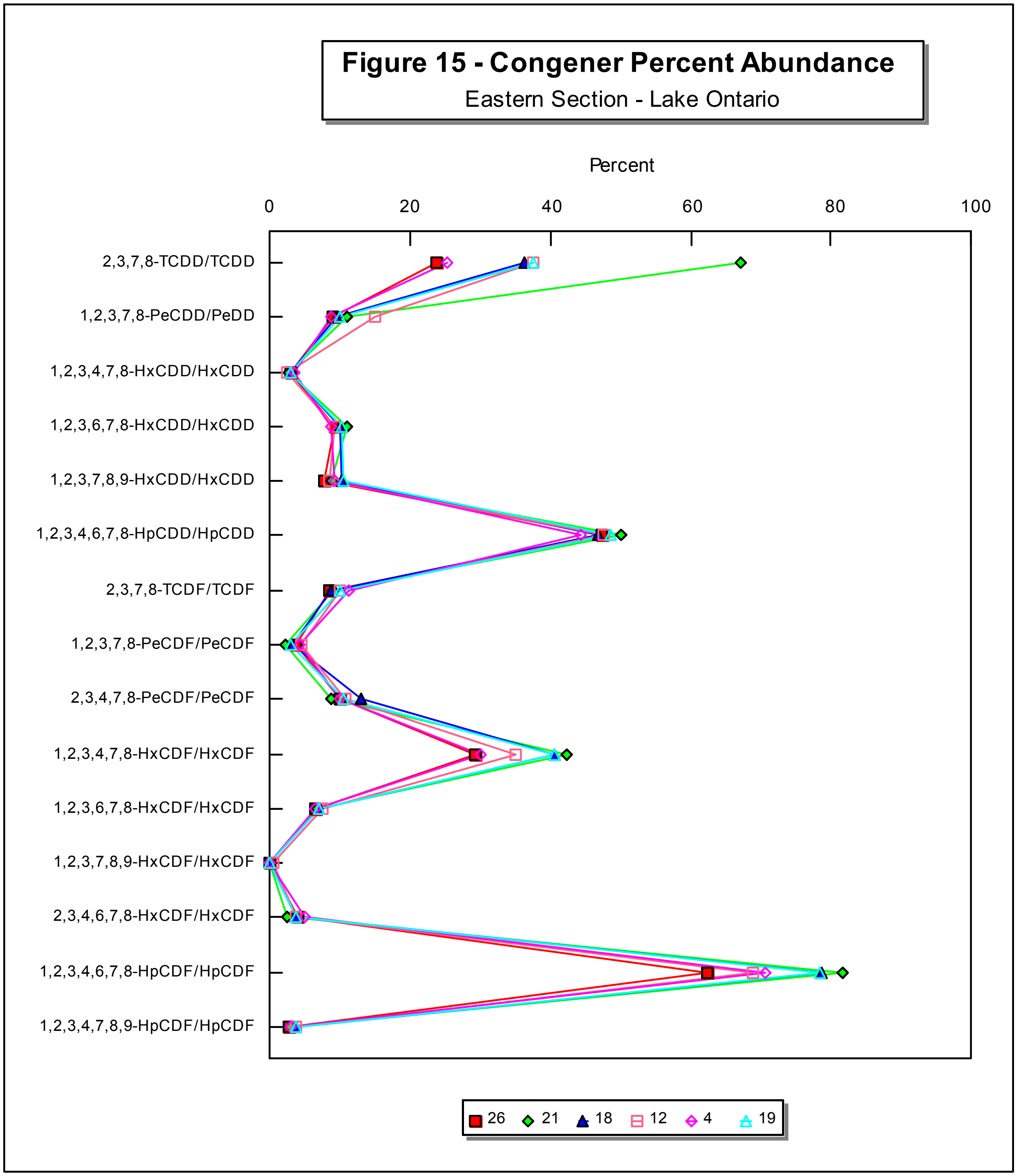


Figure 15 - Congener Percent Abundance
Eastern Section - Lake Ontario
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
26
21
18
12
4
19

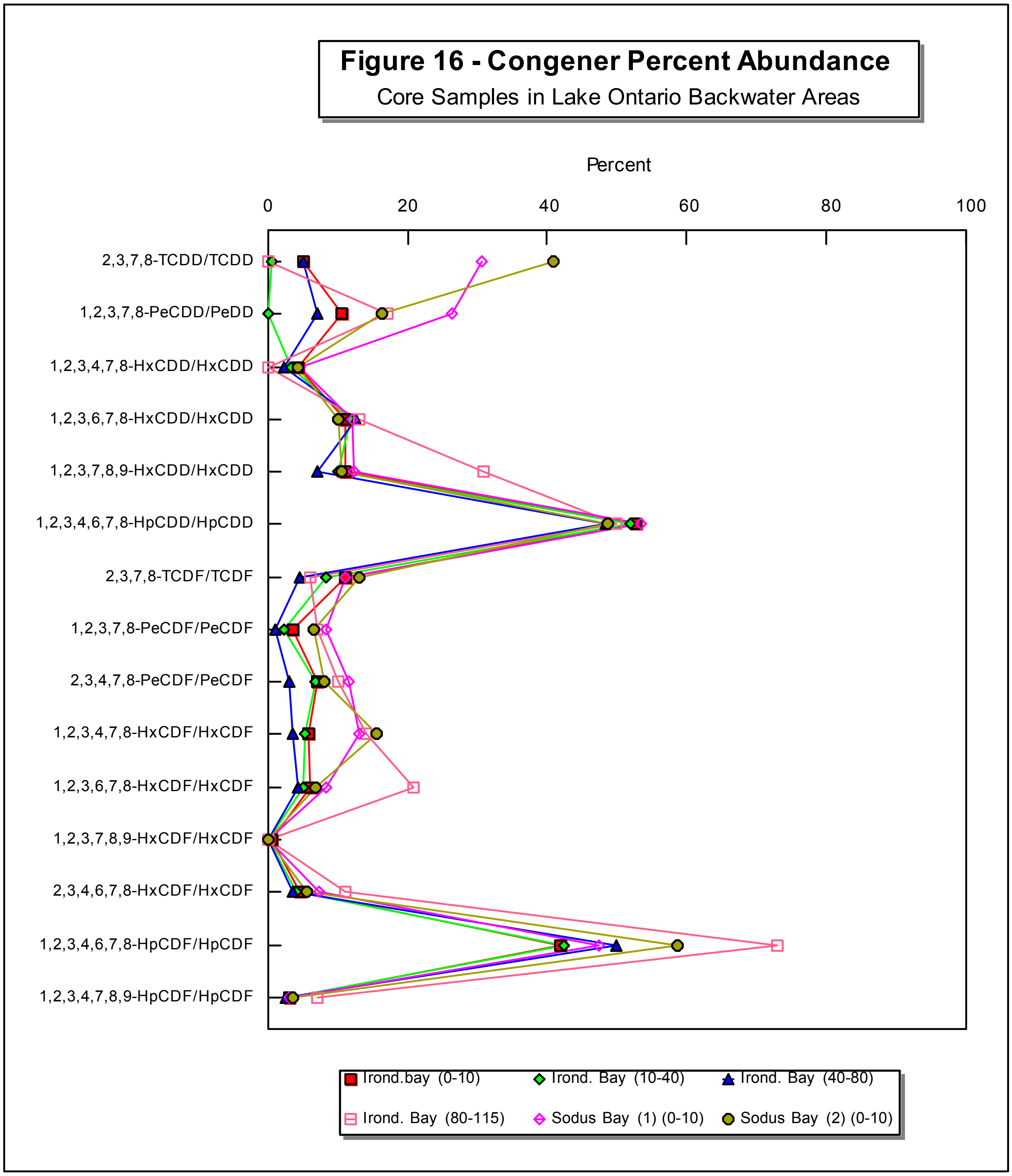
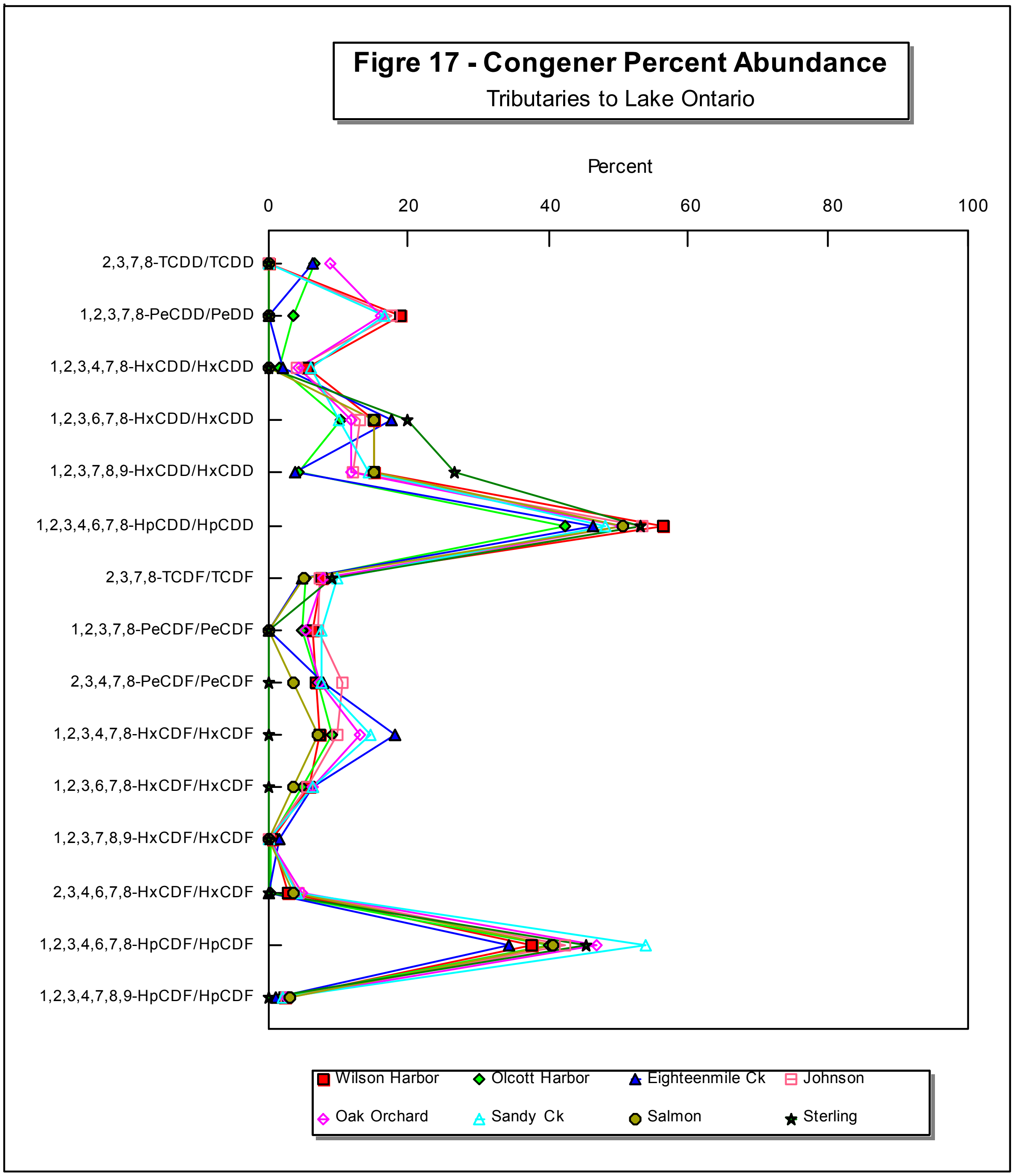


Figure 16 - Congener Percent Abundance
Core Samples in Lake Ontario Backwater Areas
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
Irond.bay (0-10)
Irond. Bay (10-40)
Irond. Bay (40-80)
Irond. Bay (80-115)
Sodus Bay (1) (0-10)
Sodus Bay (2) (0-10)



Figre 17 - Congener Percent Abundance
Tributaries to Lake Ontario
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
Wilson Harbor
Olcott Harbor
Eighteenmile Ck
Johnson
Oak Orchard
Sandy Ck
Salmon
Sterling

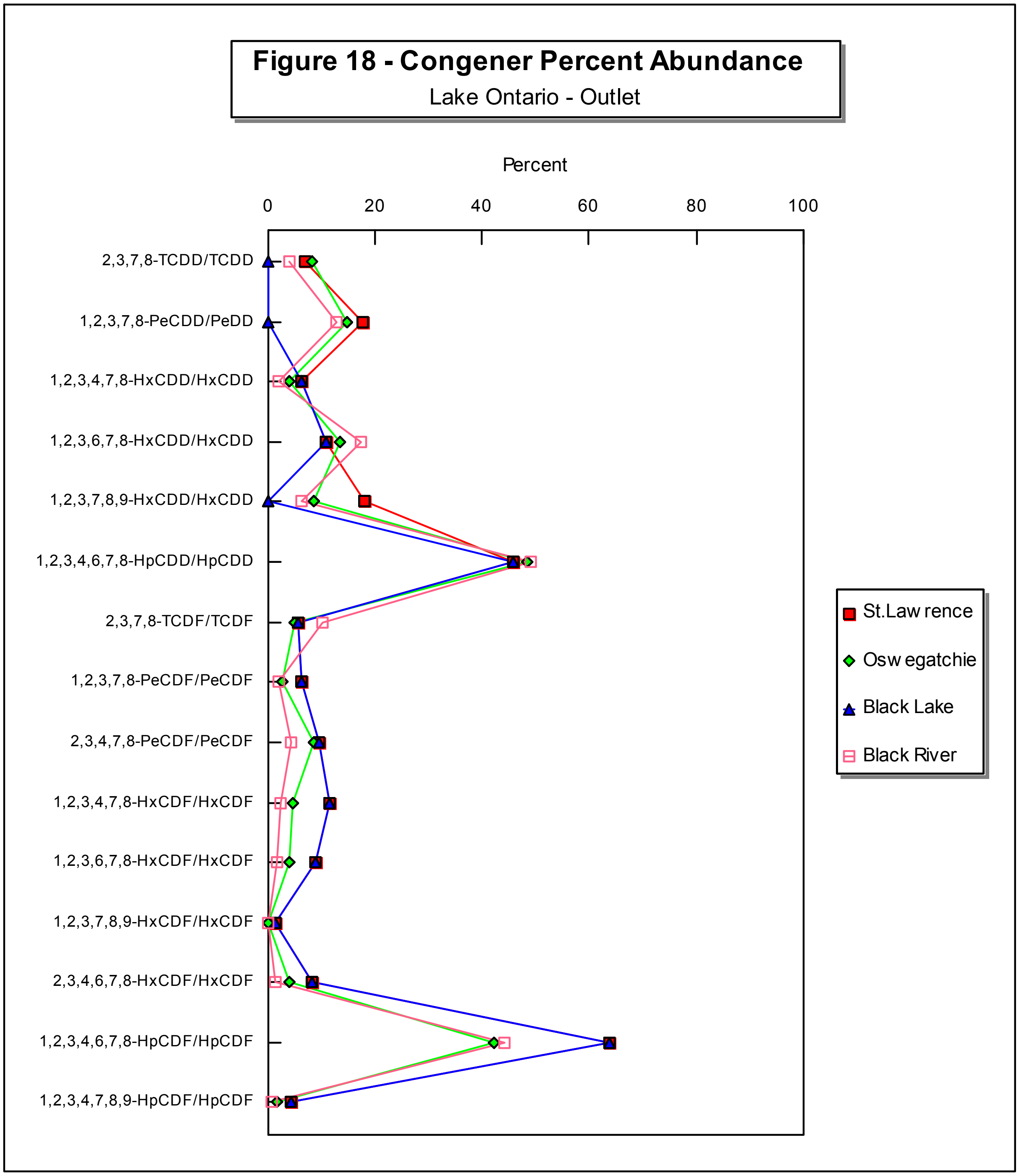


Figure 18 - Congener Percent Abundance
Lake Ontario - Outlet
Percent
0
20
40
60
80
100
2,3,7,8-TCDD/TCDD
1,2,3,7,8-PeCDD/PeDD
1,2,3,4,7,8-HxCDD/HxCDD
1,2,3,6,7,8-HxCDD/HxCDD
1,2,3,7,8,9-HxCDD/HxCDD
1,2,3,4,6,7,8-HpCDD/HpCDD
2,3,7,8-TCDF/TCDF
1,2,3,7,8-PeCDF/PeCDF
2,3,4,7,8-PeCDF/PeCDF
1,2,3,4,7,8-HxCDF/HxCDF
1,2,3,6,7,8-HxCDF/HxCDF
1,2,3,7,8,9-HxCDF/HxCDF
2,3,4,6,7,8-HxCDF/HxCDF
1,2,3,4,6,7,8-HpCDF/HpCDF
1,2,3,4,7,8,9-HpCDF/HpCDF
St.Law rence
Osw egatchie
Black Lake
Black River

TEQ Percent Abundance Patterns

Graphs of toxic equivalency percent abundance patterns were created using the analytical results. Similar to the dioxin/furan homolog percent abundance pattern graphs, a separate graph was created for an eastern, central and western section of Lake Ontario, Lake Erie and tributaries to Lake Erie, tributaries to Niagara River and to Lake Ontario and of Lake Ontario outlet and backwater areas. A cursory evaluation of the TEQ percent abundance graphs is presented. A more detailed assessment of these percent abundance patterns, and the relationship to identifying possible sources of the dioxin/furan, will be conducted in the future.

The graphs indicate that the Cayuga Creek and Pettit Flume samples (tributaries to the Niagara River) had identifying patterns that separate them from the remaining samples. The Cayuga Creek samples had high percentages of 2,3,7,8-TCDD while the Pettit Flume had a relatively high percentage of 1,2,3,4,7,8-HxCDF. The Cayuga Creek is located in the vicinity of Love Canal and the Pettit Flume received discharges from the Occidental Chemical, Durez Division. Surficial sediment samples collected in the western, central and eastern sections of Lake Ontario all exhibit the same characteristics of the Cayuga Creek and Pettit Flume samples with peaks at 2,3,7,8-TCDD and 1,2,3,4,7,8-HxCDF. The samples collected from Lake Erie and the tributaries to Lake Ontario do not exhibit these characteristic peaks.

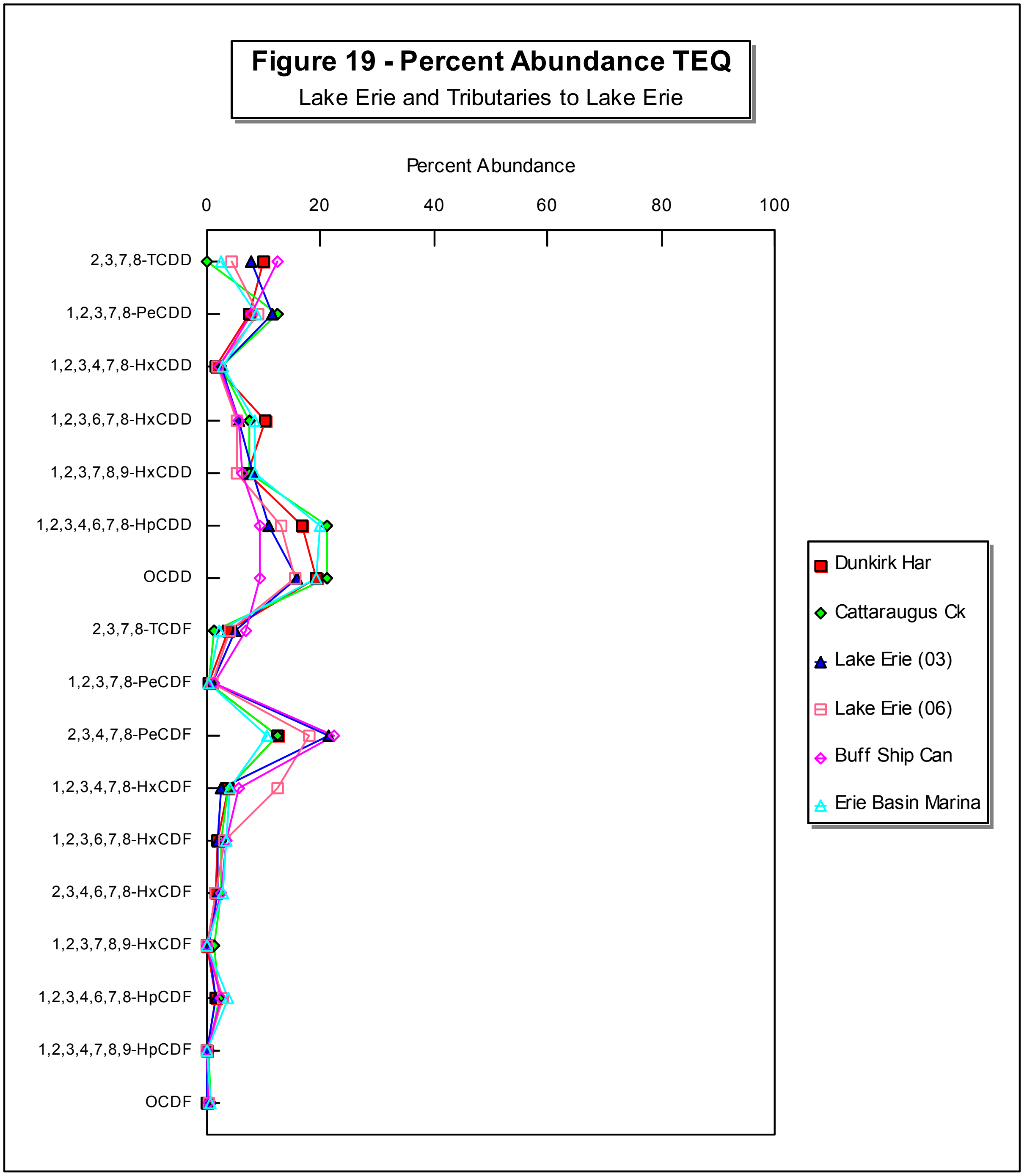


Figure 19 - Percent Abundance TEQ
Lake Erie and Tributaries to Lake Erie
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Dunkirk Har
Cattaraugus Ck
Lake Erie (03)
Lake Erie (06)
Buff Ship Can
Erie Basin Marina

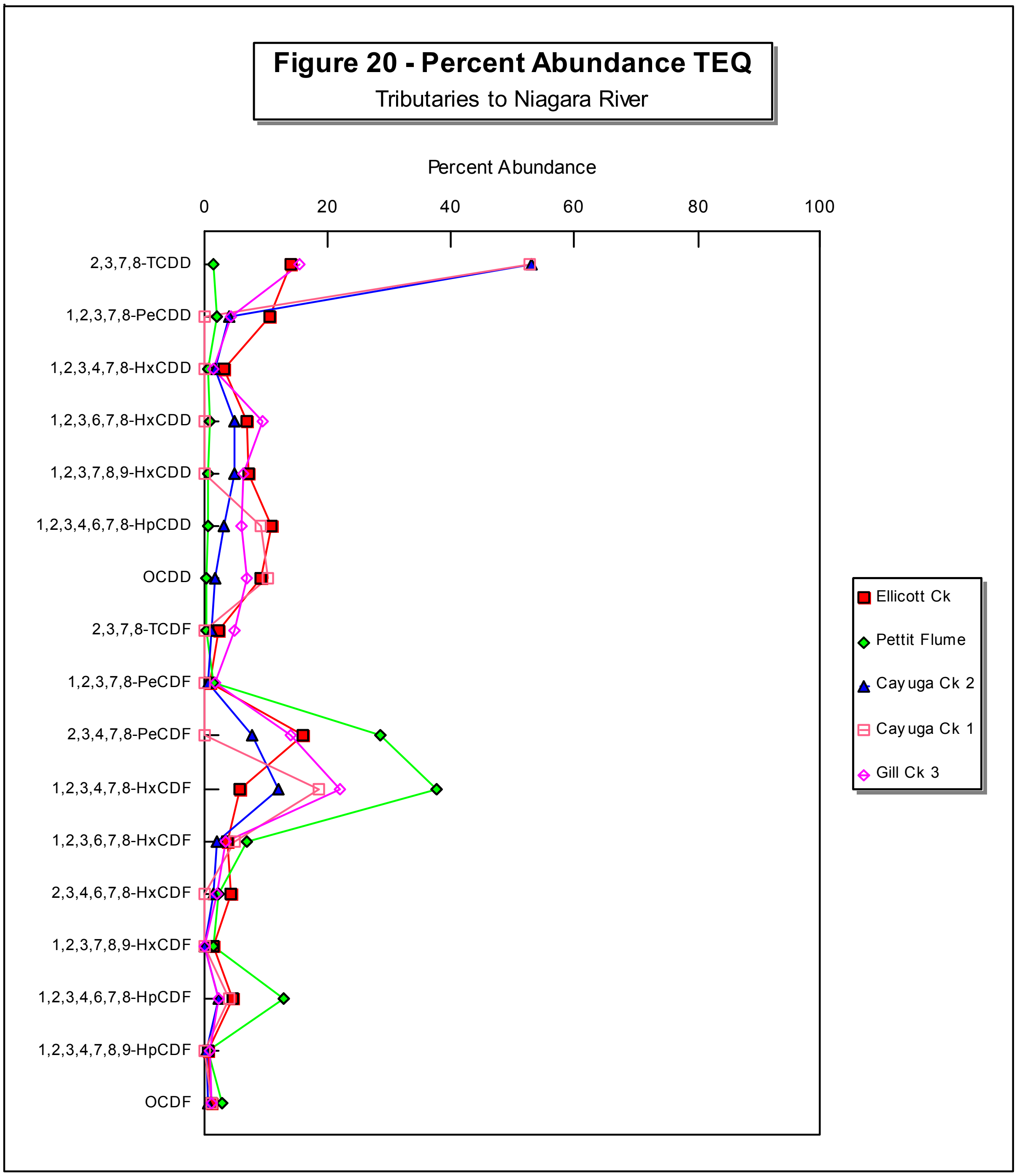


Figure 20 - Percent Abundance TEQ
Tributaries to Niagara River
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Ellicott Ck
Pettit Flume
Cayuga Ck 2
Cayuga Ck 1
Gill Ck 3

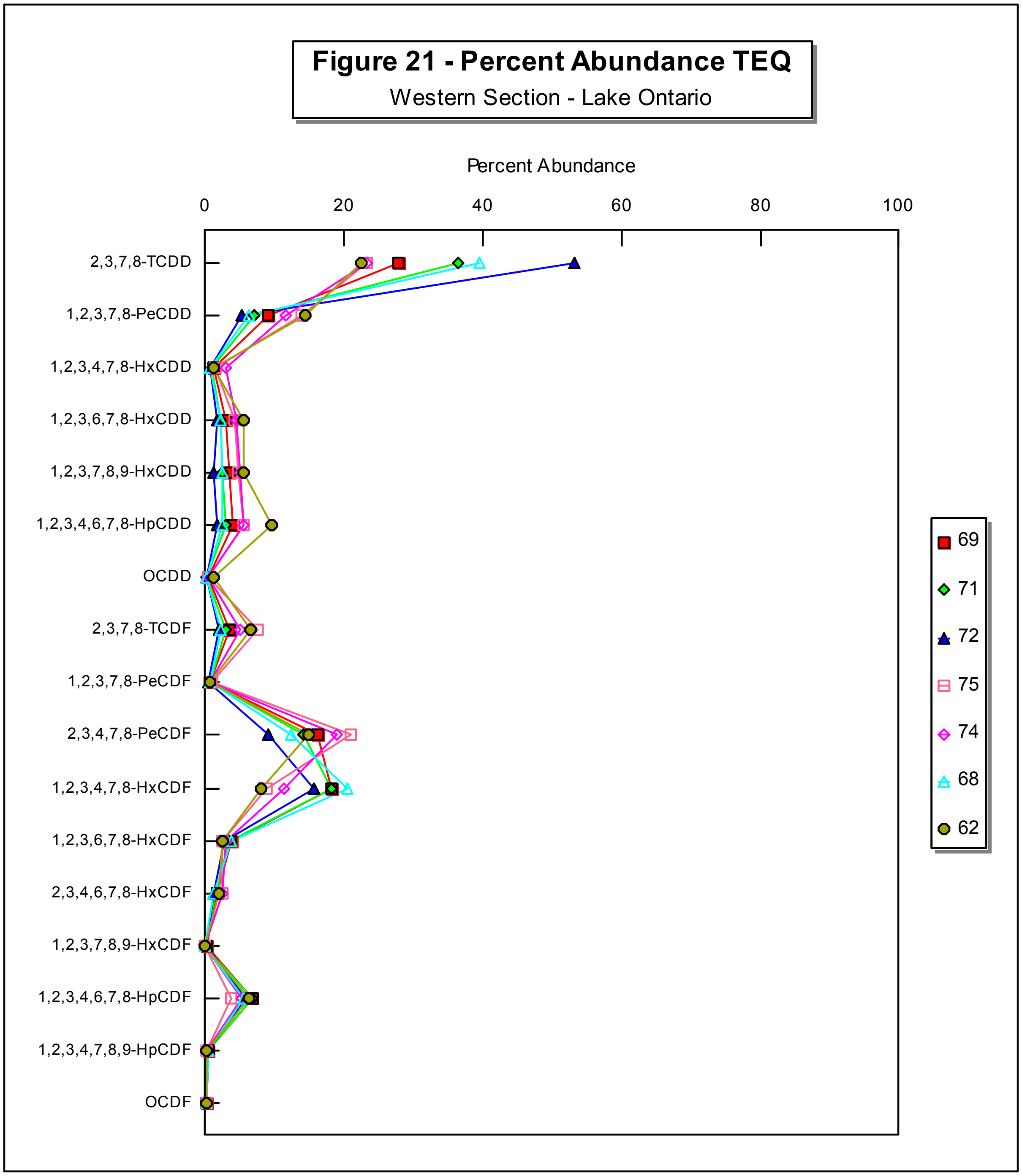


Figure 21 - Percent Abundance TEQ
Western Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
69
71
72
75
74
68
62

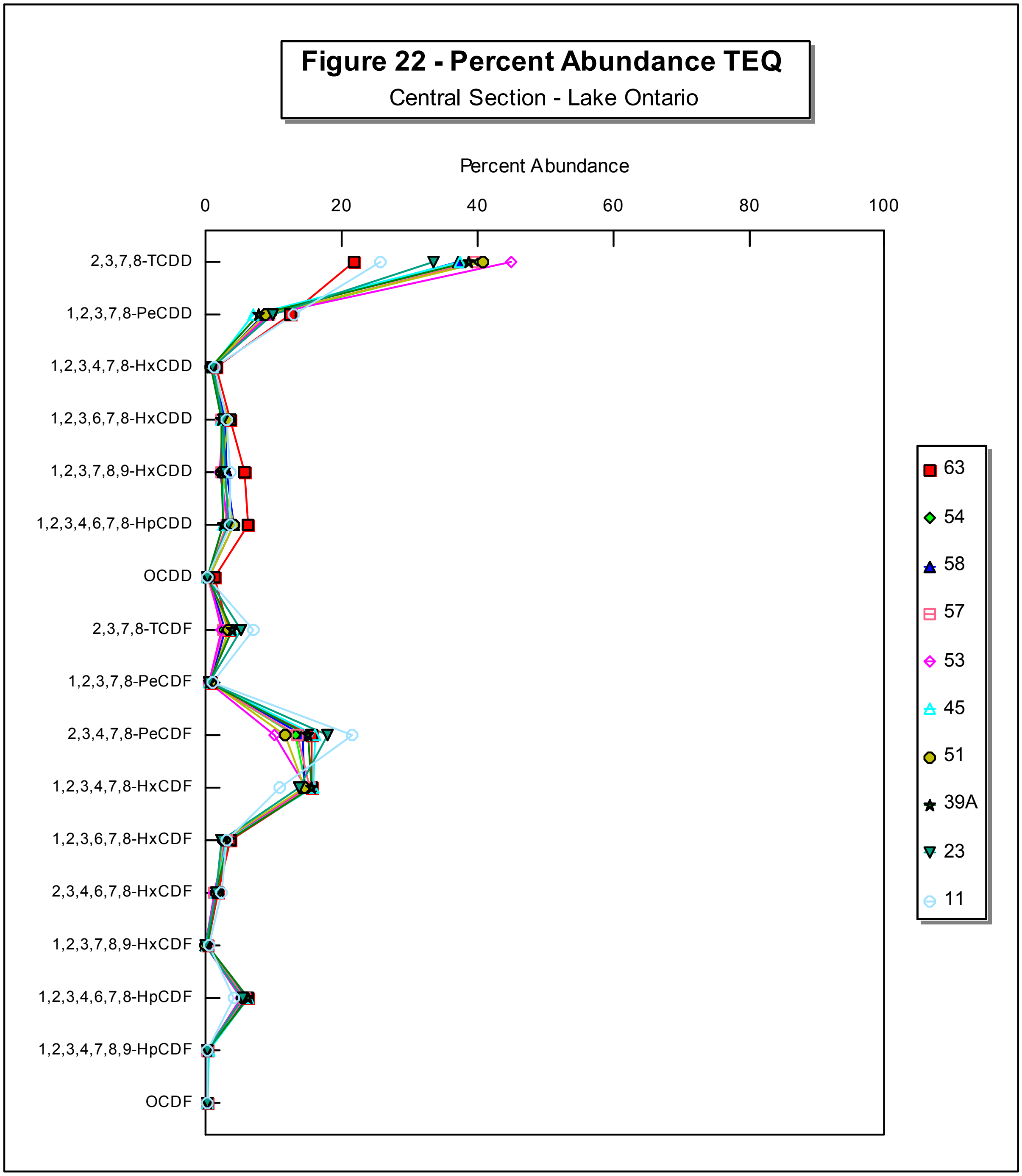


Figure 22 - Percent Abundance TEQ
Central Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
63
54
58
57
53
45
51
39A
23
11

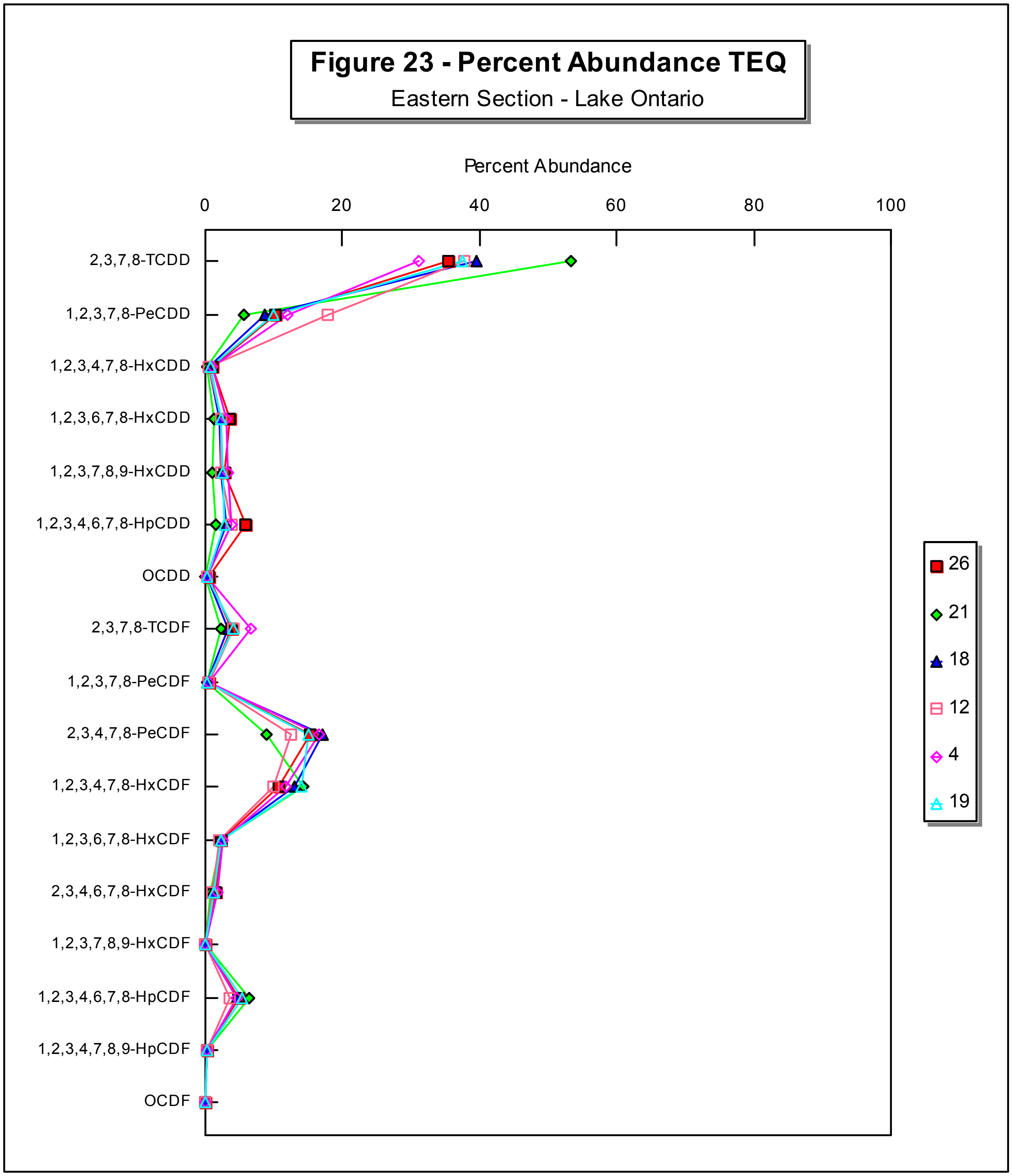


Figure 23 - Percent Abundance TEQ
Eastern Section - Lake Ontario
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
26
21
18
12
4
19

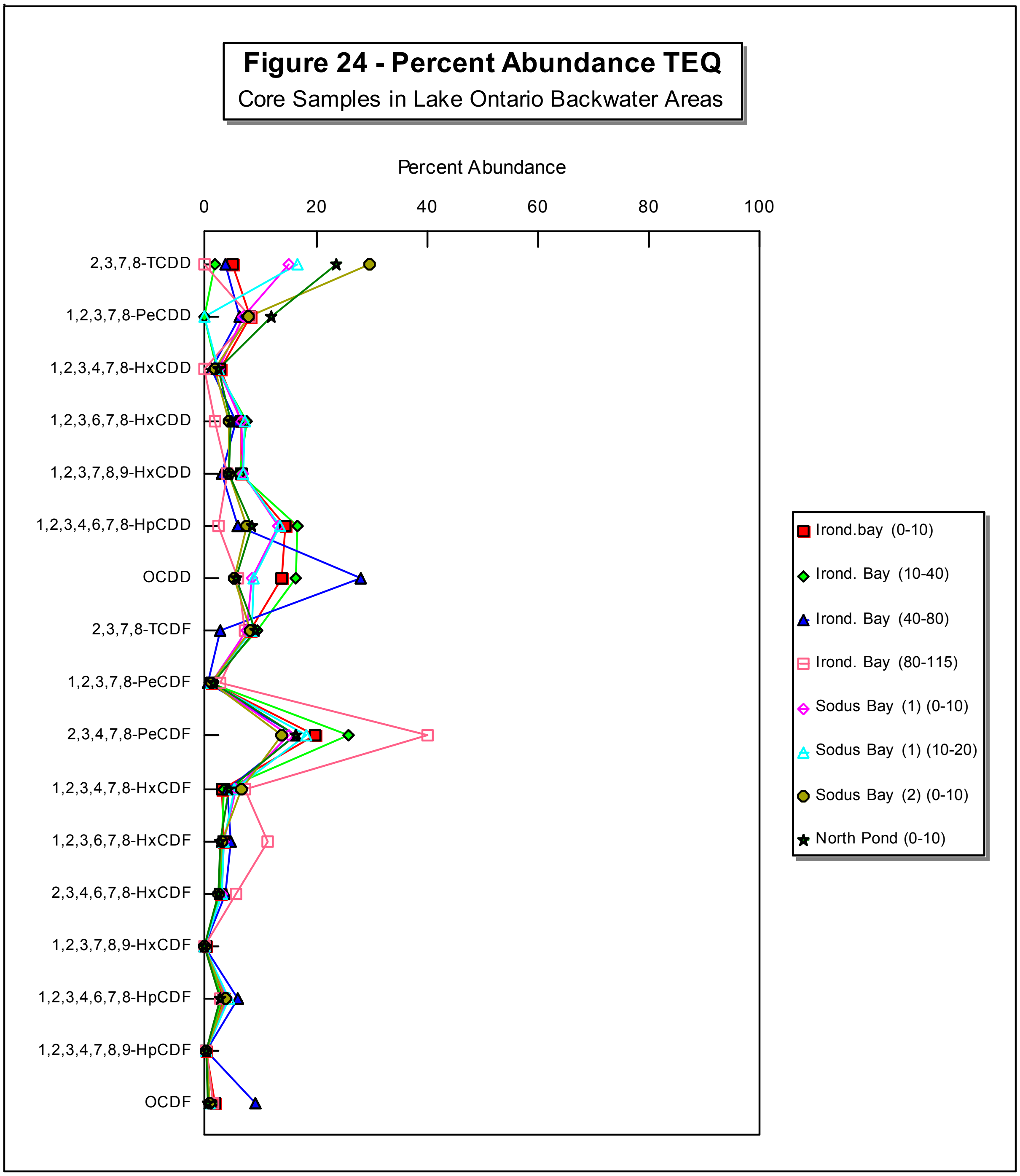


Figure 24 - Percent Abundance TEQ
Core Samples in Lake Ontario Backwater Areas
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Irond.bay (0-10)
Irond. Bay (10-40)
Irond. Bay (40-80)
Irond. Bay (80-115)
Sodus Bay (1) (0-10)
Sodus Bay (1) (10-20)
Sodus Bay (2) (0-10)
North Pond (0-10)

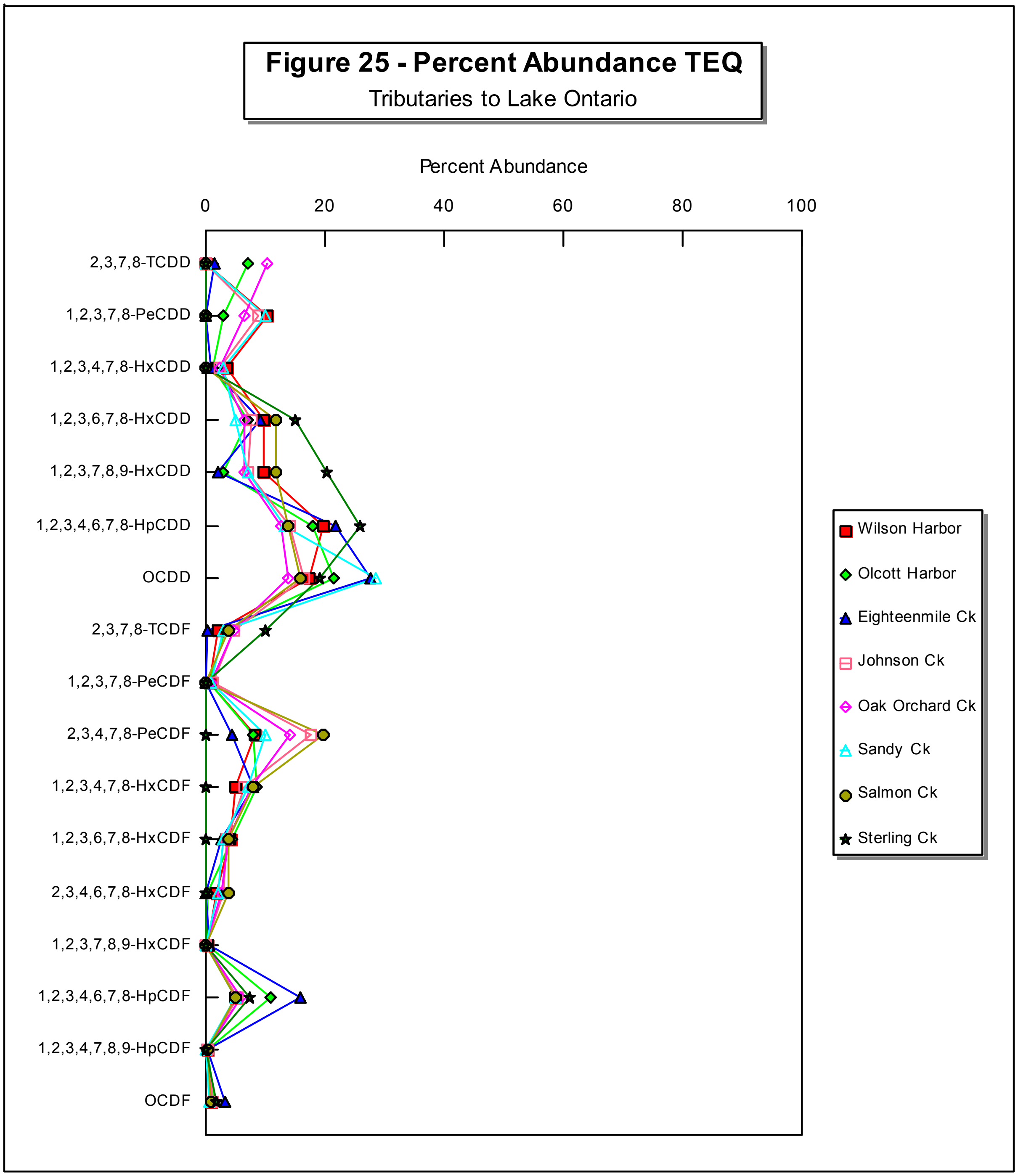


Figure 25 - Percent Abundance TEQ
Tributaries to Lake Ontario
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Wilson Harbor
Olcott Harbor
Eighteenmile Ck
Johnson Ck
Oak Orchard Ck
Sandy Ck
Salmon Ck
Sterling Ck

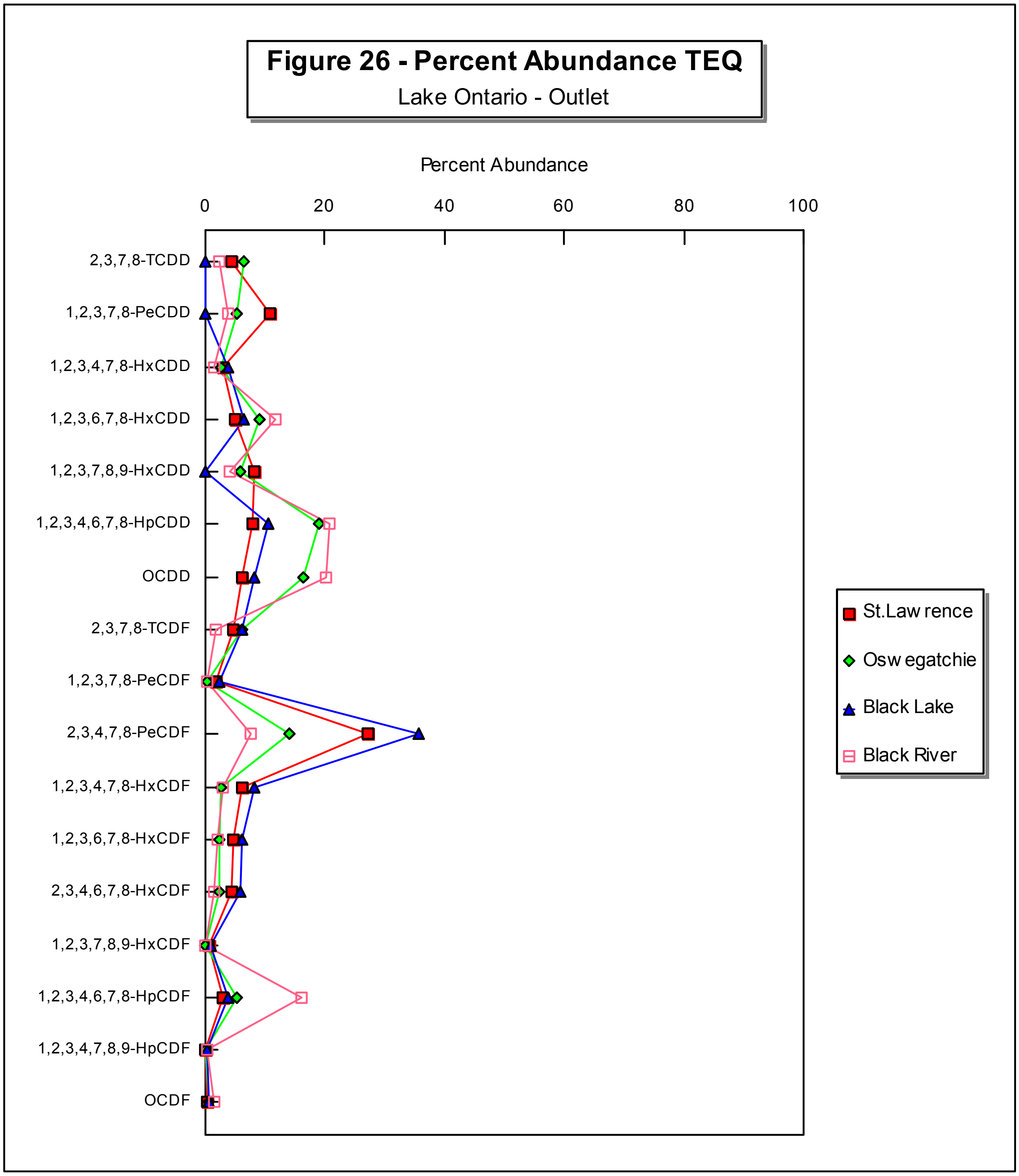


Figure 26 - Percent Abundance TEQ
Lake Ontario - Outlet
Percent Abundance
0
20
40
60
80
100
2,3,7,8-TCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
St.Lawrence
Oswegatchie
Black Lake
Black River

II. Water Column

One liter, grab water column samples were collected at nine sites. These sites corresponded to nine of the surficial sediment sites which were sampled for sediment, water and macroinvertebrate tissue. The TEQ's calculated from the analytical results are contained in Table 4. The New York State ambient water quality standard for human fish consumption in all classes of water is 0.0006 ppt. This standard is based on the Toxic Equivalency Factor multiplied by the Bioaccumulation Equivalency Factor (see NYSDEC Division of Water TOGS 1.1.1). As can be seen from the Table, the results of the TEQ multiplied by the BAF exceed the water quality standards at all water sample locations (see QA/QC Summary for further details).

Table 4 - Water Column TEQ Data

Site	ITEF TEQ (ppt)	WHO TEQ (ppt)	WHO TEQ x BAF (ppt)
Salmon Creek	0.09	0.06	0.003
Sandy Creek	0.10	0.07	0.003
Cattaraugus Creek	0.03	0.02	0.001
Olcott Harbor	0.80	0.50	0.161
Johnson Creek	0.03	0.02	0.001
Oak Orchard Creek	0.97	1.06	1.393
Sterling Creek	0.08	0.08	0.005
Black Lake	0.58	0.57	0.452
Oswegatchie River	0.35	0.33	0.302

*Red - exceeds water quality standard of 0.0006 ppt

III. Fish Tissue

Young of year fish were collected at many sites by the NYSDEC Division of Fish and Wildlife as part of the Lake Ontario Supplemental Biomonitoring Project. Seventeen frozen tissue samples were selected for analysis of dioxin/furan concentration. Only two sites correspond to locations where sediment, water column and macroinvertebrate tissue were collected (Oswegatchie River and Oak Orchard Creek). The results are contained in Table 5. The Division of Fish and Wildlife guidance of 2.3 ppt TEQ for wildlife consumption of fish was only exceeded in the Perch River sample. There were no exceedances of the Food and Drug Administration (FDA) action levels for poisonous and deleterious substances in fish and shellfish for human consumption (25 ppt).

Table 5 - TEQ Data for Fish Tissue

Site	Fish	ITEF TEQ (ppt)	WHO TEQ (ppt)	% lipid
Eighteenmile Creek	Spottail shiner	0.1	0.05	1.9
Raquette River (mouth)	Bluntnose	0.098	0.049	0.9
Genesee River	Spottail shiner	0.047	0.024	0.4
Grasse River (dam)	Emerald shiner	0.063	0.032	1.0
Grasse River (mouth)	Emerald shiner	1.16	0.855	2.4
Dunkirk Harbor	Emerald shiner	0.08	0.04	5.9
Buffalo River	Bluntnose	0.03	0.028	0.0
Black River Bay	Emerald shiner	0.19	0.095	3.0
Oswego River	Spottail shiner	0.036	0.018	1.6
Oswegatchie River	Bluntnose	0.11	0.055	n/a
Perch River	Bluntnose	1.82	2.33	1.8
Salmon River	Bluntnose	0.10	0.05	1.9
Wine Creek	Creek chub	0.27	0.15	2.2
Sodus Creek	Fathead minnow	0.10	0.06	1.6
Irondequoit Creek	Tessellated darter	0.01	0.001	2.5
Oak Orchard Creek	Creek chub	1.17	0.84	3.3
Eighteenmile Creek	Bluntnose	1.04	0.56	1.0

*New TEQ using WHO TEF's for fish

IV. Macroinvertebrate Tissue

Macroinvertebrate tissue samples were collected at eight sites. These eight sites were the same sites as the previously reported water and surficial sediment sample sites. Staff was unable to collect a macroinvertebrate tissue sample at the Cattaraugus Creek. Crayfish samples were collected using kick sampling, snails and clams were collected using nets and the zebra mussels were collected by picking them off rocks. The macroinvertebrate tissue samples collected did not contain substantial concentrations of dioxin or furan (see Table 6). All concentrations of 2,3,7,8-TCDD were less than 5 ppt. This 5 ppt guideline was adapted from the 10 ppt guideline for fish proposed by Eisler of the U.S. Fish and Wildlife Service in a 1968 paper Dioxin Hazards to Fish, Wildlife and Invertebrates: A Synoptic Review.

Table 6 - TEQ Data for Macroinvertebrate Tissue

Site	Type	ITEF TEQ (ppt)	WHO TEQ (ppt)	% lipid
Oak Orchard Creek	zebra mussels	0.018	0.013	n/a
Oswegatchie River	crayfish	0.489	0.484	2.4
Olcott Harbor	crayfish, snail	0.62	0.57	0.75
Sandy Creek	crayfish	0.059	0.054	0.42
Black Lake	snail	0.068	0.052	0.76
Salmon Creek	crayfish	0.098	0.094	1.6
Sterling Creek	crayfish	0.011	0.007	0.45
Johnson Creek	crayfish, clam	0.16	0.16	0.60

Apparent inconsistencies among the analyses of the different medium exist and are not currently resolvable. For example, all water samples exceeded the ambient water quality standard for human consumption of fish, whereas no sampled macroinvertebrates (at corresponding sites) approached the 5 ppm guideline. For fish filet data, sample concentrations at the two corresponding sites were not close to the FDA action level of 25 ppt.

The multi media database needs to be expanded so that the relationships of the dioxin and furan concentrations in the water column, sediment and biota and the usefulness of the various standards and guidelines can be studied in greater detail.

QA/QC Summary

The analytical laboratory QA/QC for Method 1613B includes an Internal Standard Spike, as part of each sample, and a Method Blank, also with an Internal Standard Spike, run with each sample batch. These Internal Standard Spikes consist of 15 carbon-13 and one chlorine-37 labeled isotopes. The method acceptable criteria for the percent recoveries for these Internal Standard Spikes varies from 17-35% to 123-197%. For our evaluation, we will also apply a more stringent acceptable percent recovery range of 60% to 150%.

As far as the Method Blanks are concerned, desired results would be for all analyses to be less than the analytical reporting limit. If any “positive” detection of an analyte occurs, but it is less than 10% of the lowest corresponding 2,3,7,8-substituted congener result for that particular batch, then this would be considered acceptable. If, however, a positive blank result is greater than 10% of its corresponding analytical result, than that result should be labeled as suspicious.

Sediments Samples

All percent recoveries of the labeled isotopes data for the sediment samples fell within the limits set by Method 1613B. The vast majority also fell within our more stringent evaluation range. The exceptions were all less than 60%. There were several detections of PCDF, HxCDF, HpCDF and OCDD congeners in the Method Blanks, but at concentrations not greater than 10% of their corresponding batch congener result.

Fish and Macroinvertebrate Tissues

All percent recoveries of the labeled isotopes for the biota tissue samples were within the limits set by Method 1613B and within our more stringent evaluation range. There were singular detections of OCDD and HpCDF congeners in one of the method blanks, but they were less than 10% of the lowest OCDD and HpCDF concentration reported in the corresponding sample batch.

Water Samples

All percent recoveries of the labeled percent recovery data for the water samples fell within the limits set by Method 1613B. There were, however, numerous exceptions (below 60%) to our more stringent evaluation range. The Method Blanks for the water samples contained positive detections for OCDD (5.5 ppq) and OCDF (1.8ppq) or 1,2,3,4,6,7,8- HpCDD (1.5ppq) and 1,2,3,7,8,9-HxCDD (1.1ppq). If this Method Blank contamination was introduced into the analytical process by the blank water, then the TEQ's calculated for the water samples would not be altered. If the contamination was introduced by the "process" then this would likely impact the TEQ calculations.

The toxic equivalencies for the nine water samples were re-calculated, eliminating the total mass of the contaminant congener. All but the Cattaraugus Creek sample continued to exceed the New York State Water Quality Standard for the protection of humans consuming fish.

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Eisler, R. 1986. Dioxin hazards to Fish, Wildlife and Invertebrates: A Synoptic Review. U.S. Department of the Interior, Fish and Wildlife Service, Biological Report 85 (1.8):37 pp.

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APPENDIX A

Dioxin/Furan Data - Sediment

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

Analyte	Station / Sample Type / Laboratory	Oswegatchie		Black River		St.Lawrence	
	Station	**Oswegatchie**		**Black River**		**St.Lawrence**	
	Sample Type	**Sediment**		**Sediment**		**Sediment**	
Analyte	**Laboratory**	**Axys**		**Axys**		**Axys**	
2,3,7,8-TCDD		0.3		0.6		0.3	*
1,2,3,7,8-PeCDD		0.5	*	1.8		1.5	
1,2,3,4,7,8-HxCDD		1.2		3.5		2.0	
1,2,3,6,7,8-HxCDD		4.2	*	28		3.4	
1,2,3,7,8,9-HxCDD		2.7		9.9		5.6	*
1,2,3,4,6,7,8-HpCDD		87		490		55	
2,3,7,8-TCDF		2.9		4.7		3.3	
1,2,3,7,8-PeCDF		0.4		1.7		2.4	
2,3,4,7,8-PeCDF		1.3	*	3.7		3.7	
1,2,3,4,7,8-HxCDF		1.3	*	7.3		4.3	
1,2,3,6,7,8-HxCDF		1.1	*	5.2		3.3	
1,2,3,7,8,9-HxCDF	<	0.3		<1.8		0.5	
2,3,4,6,7,8-HxCDF		1.1		3.9		3.1	
1,2,3,4,6,7,8-HpCDF		24		380		21	
1,2,3,4,7,8,9-HpCDF		1.0		6.7		1.5	*
TCDDs (total)		3.6		15		4.3	
PeCDDs (total)		3.4		14		8.4	
HxCDDs (total)		31		160		31	
HpCDDs (total)		180		1000		120	
OCDD		750		4800		430	
TCDFs (total)		57		46		58	
PeCDFs (total)		15		87		38	
HxCDFs (total)		27		290		37	
HpCDFs (total)		57		860		33	
OCDF		35		350		31	
Data Summary(1)							
Tetra thru Octa Homolog Totals							
	Dioxin homologs	968.0		5,989.0		593.7	
	Furan homologs	191.0		1,633.0		197.0	
	Sum	1,159.0		7,622.0		790.7	
2,3,7,8-TCDD Toxic Equivalence(2)		4.6		23.6		6.8	
2,3,7,8-TCDD Toxic Equivalence(3)		4.1		19.9		7.1	
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(4)							
Human Bioaccumulation(sc=10,000 pg/gOC)		314.0		185.0		140.0	
Wildlife Bioaccumulation(sc=200 pg/gOC)		6.3		3.7		2.8	
Total Organic Carbon(%)		3.14		1.85		1.4	

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria

Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Irondequoit Bay

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

Analyte	Irondequoit Bay 0-10 cm Sediment Axys	Irondequoit Bay 10-40 cm sediment Axys	Irondequoit Bay 40-80 cm Sediment Axys	Irondequoit Bay 80-115 cm Sediment Axys
2,3,7,8-TCDD	0.7	<0.3	0.9	<0.2
1,2,3,7,8-PeCDD	2.2	2.6	3.1	0.2
1,2,3,4,7,8-HxCDD	3.5	3.6	2.5	<0.2
1,2,3,6,7,8-HxCDD	9.1	13	14	0.2
1,2,3,7,8,9-HxCDD	8.9	11	7.9	0.5
1,2,3,4,6,7,8-HpCDD	200	290	150	2.8
2,3,7,8-TCDF	11	16	6.8	0.9
1,2,3,7,8-PeCDF	2.7	2.8	3.2	0.7
2,3,4,7,8-PeCDF	5.5	8.9	8.3	1.0
1,2,3,4,7,8-HxCDF	4.4	5.8	9.8	0.9
1,2,3,6,7,8-HxCDF	4.6	5.5	12	1.4
1,2,3,7,8,9-HxCDF	0.4	<0.5	<0.9	<0.2
2,3,4,6,7,8-HxCDF	3.6	4.5	9.4	0.7
1,2,3,4,6,7,8-HpCDF	46	55	150	3.3
1,2,3,4,7,8,9-HpCDF	3.5	3.7	7.6	0.3
TCDDs (total)	14	46	18	1.2
PeCDDs (total)	21	18	44	1.2
HxCDDs (total)	81	110	110	1.6
HpCDDs (total)	380	560	310	5.6
OCDD	1900	2800	7200	73
TCDFs (total)	100	190	150	15
PeCDFs (total)	77	130	270	9.7
HxCDFs (total)	76	110	270	6.6
HpCDFs (total)	110	130	300	4.5
OCDF	230	230	2300	18
Data Summary(1)				
Tetra thru Octa Homolog Totals				
Dioxin Homologs	2,396.0	3,534.0	7,682.0	82.60
Furan Homologs	593.0	790.0	3,290.0	53.80
Sum	2,989.0	4,324.0	10,972.0	136.40
2,3,7,8-TCDD Toxic Equivalence(2)	13.9	17.3	25.6	1.25
2,3,7,8-TCDD Toxic Equivalence(3)	13.0	14.6	18.6	1.27
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(4)				
Human Bioaccumulation(sc=10,000 pg/gOC)	18.9	53.1	47.2	37.40
Wildlife Bioaccumulation(sc=200 pg/gOC)	0.4	1.1	0.9	0.75
Total Organic Carbon(%)	0.189	0.531	0.472	0.37

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sodus Bay (1)

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

Analyte	Sodus Bay 0-10 cm Sediment Axys		Sodus Bay 10-20 cm Sediment Axys		Sodus Bay 20-163 cm Sediment Axys	Sodus Bay 163-178 cm Sediment Axys
2,3,7,8-TCDD	1.1		0.6	*	< 0.2	< 0.2
1,2,3,7,8-PeCDD	1.0		<0.2		< 0.2	< 0.2
1,2,3,4,7,8-HxCDD	1.8		0.9	*	< 0.2	< 0.2
1,2,3,6,7,8-HxCDD	4.8		2.6		< 0.2	< 0.2
1,2,3,7,8,9-HxCDD	4.9		2.5		< 0.2	< 0.2
1,2,3,4,6,7,8-HpCDD	96		48		1.5	1.6
2,3,7,8-TCDF	5.3		3.0		< 0.2	< 0.2
1,2,3,7,8-PeCDF	1.6	*	0.9	*	< 0.2	< 0.2
2,3,4,7,8-PeCDF	2.2		1.3		< 0.2	< 0.2
1,2,3,4,7,8-HxCDF	3.9		1.9		< 0.2	< 0.2
1,2,3,6,7,8-HxCDF	2.5		1.2		< 0.2	< 0.2
1,2,3,7,8,9-HxCDF	<0.4		<0.3		< 0.2	< 0.2
2,3,4,6,7,8-HxCDF	2.2	*	1.1	*	< 0.2	< 0.2
1,2,3,4,6,7,8-HpCDF	28		15		< 0.5	< 0.3
1,2,3,4,7,8,9-HpCDF	1.9		1.1	*	< 0.5	< 0.3
TCDDs (total)	3.6		<0.3		< 0.2	< 0.2
PeCDDs (total)	3.8		3.0		0.2	< 0.2
HxCDDs (total)	40		21		1.1	0.5
HpCDDs (total)	180		95		5.2	5.3
OCDD	610		310		70	68
TCDFs (total)	48		28		< 0.2	< 0.2
PeCDFs (total)	19		13		< 0.2	< 0.2
HxCDFs (total)	30		16		< 0.2	< 0.2
HpCDFs (total)	59		29		< 0.5	< 0.3
OCDF	69		32		< 0.8	< 0.4

Data Summary (1)

	Sodus Bay 0-10 cm	Sodus Bay 10-20 cm	Sodus Bay 20-163 cm	Sodus Bay 163-178 cm
Tetra thru Octa Homolog Totals				
Dioxin Homologs	837.4	429.0	76.5	73.8
Furan Homologs	225.0	118.0	0.0	0.0
Sum	1,062.4	547.0	76.5	73.8
2,3,7,8-TCDD Toxic Equivalence (2)	7.3	3.6	0.1	0.1
2,3,7,8-TCDD Toxic Equivalence (3)	7.1	3.3	0.0	0.0
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)				
Human Bioaccumulation (sc=10,000 pg/gOC)	44.3	48.9	22.3	37.5
Wildlife Bioaccumulation (sc=200 pg/gOC)	0.9	1.0	0.4	0.8
Total Organic Carbon (%)	0.443	0.489	0.223	0.375

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria

Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sodus Bay (2)

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

Analyte	Sodus Bay (2) 0-10 cm Sediment Axys			Sodus Bay (2) 10-22 cm Sediment Axys			Sodus Bay (2) 22-85 cm Sediment Axys		Sodus Bay (2) 85-140 cm Sediment Axys
2,3,7,8-TCDD	2.9			0.1		<	0.1	<	0.2
1,2,3,7,8-PeCDD	1.5	*	<	0.1		<	0.3	<	0.2
1,2,3,4,7,8-HxCDD	1.8		<	0.4		<	0.3	<	0.2
1,2,3,6,7,8-HxCDD	4.1		<	0.4		<	0.3	<	0.2
1,2,3,7,8,9-HxCDD	4.3		<	0.4			0.4		0.4
1,2,3,4,6,7,8-HpCDD	73			4.7			1.6		2.1
2,3,7,8-TCDF	7.9			0.6		<	0.1	<	0.2
1,2,3,7,8-PeCDF	2.2		<	0.3		<	0.3	<	0.2
2,3,4,7,8-PeCDF	2.7		<	0.3		<	0.3	<	0.2
1,2,3,4,7,8-HxCDF	6.5		<	0.4		<	0.3	<	0.2
1,2,3,6,7,8-HxCDF	2.9		<	0.4		<	0.3	<	0.2
1,2,3,7,8,9-HxCDF	<0.3		<	0.4		<	0.3	<	0.2
2,3,4,6,7,8-HxCDF	2.3		<	0.4		<	0.3	<	0.2
1,2,3,4,6,7,8-HpCDF	37			2.3		<	0.4	<	0.3
1,2,3,4,7,8,9-HpCDF	2.3		<	0.4		<	0.4	<	0.3
TCDDs (total)	7.1			0.1			1.6		0.2
PeCDDs (total)	9.2			0.6		<	0.3	<	0.2
HxCDDs (total)	41			2.5			1.0		1.7
HpCDDs (total)	150			11			4.2		7.5
OCDD	500			46			24		40
TCDFs (total)	61			2.6			0.2		0.2
PeCDFs (total)	33		<	0.3		<	0.3	<	0.2
HxCDFs (total)	42			1.8		<	0.3	<	0.2
HpCDFs (total)	63			3.6		<	0.4	<	0.3
OCDF	73			4	*		0.6	<	0.5

Data Summary (1)

	Sodus Bay (2) 0-10 cm	Sodus Bay (2) 10-22 cm	Sodus Bay (2) 22-85 cm	Sodus Bay (2) 85-140 cm
Tetra thru Octa Homolog Totals				
Dioxin Homologs	707.3	60.2	30.8	49.4
Furan Homologs	272.0	12.0	0.8	0.2
Sum	979.3	72.2	31.6	49.6
2,3,7,8-TCDD Toxic Equivalence (2)	9.8	0.3	0.1	0.1
2,3,7,8-TCDD Toxic Equivalence (3)	10.0	0.2	0.1	0.1
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)				
Human Bioaccumulation (sc=10,000 pg/gOC)	64.7	34.0	25.4	63.7
Wildlife Bioaccumulation (sc=200 pg/gOC)	1.3	0.7	0.5	1.3
Total Organic Carbon (%)	0.647	0.34	0.254	0.637

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin in Tributaries Study
All concentrations pg/g, dry weight

Analyte	North Pond 0-30 Sediment Axys			North Pond 30-82 sediment Axys
2,3,7,8-TCDD	0.5		<	0.1
1,2,3,7,8-PeCDD	0.5	*	<	0.2
1,2,3,4,7,8-HxCDD	0.5	*	<	0.4
1,2,3,6,7,8-HxCDD	1.0		<	0.4
1,2,3,7,8,9-HxCDD	0.9	*	<	0.4
1,2,3,4,6,7,8-HpCDD	18		<	1.3
2,3,7,8-TCDF	1.9		<	0.1
1,2,3,7,8-PeCDF	0.6	*	<	0.1
2,3,4,7,8-PeCDF	0.7		<	0.1
1,2,3,4,7,8-HxCDF	0.9		<	0.2
1,2,3,6,7,8-HxCDF	0.6		<	0.2
1,2,3,7,8,9-HxCDF	<0.2		<	0.2
2,3,4,6,7,8-HxCDF	0.5		<	0.2
1,2,3,4,6,7,8-HpCDF	5.4		<	0.4
1,2,3,4,7,8,9-HpCDF	0.4		<	0.4
TCDDs (total)	1.7			0.3
PeCDDs (total)	<0.1		<	0.2
HxCDDs (total)	8.2		<	0.4
HpCDDs (total)	34		<	1.3
OCDD	120		<	2.1
TCDFs (total)	17			0.5
PeCDFs (total)	7.2		<	0.1
HxCDFs (total)	7.9		<	0.2
HpCDFs (total)	12		<	0.4
OCDF	11		<	1
Data Summary (1)				
Tetra thru Octa Homolog Totals				
Dioxin Homologs	163.9			0.3
Furan Homologs	55.1			0.5
Sum	219.0			0.8
2,3,7,8-TCDD Toxic Equivalence (2)	2.1			0.0
2,3,7,8-TCDD Toxic Equivalence (3)	2.1			0.0
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)				
Human Bioaccumulation (sc=10,000 pg/gOC)	65.6			134.0
Wildlife Bioaccumulation (sc=200 pg/gOC)	1.3			2.7
Total Organic Carbon (%)	0.656			1.34

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria
Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

	Station		**Ley Ck**	**Pettit Flume**
	Sample Type		**sediment**	**sediment**
	Collection Date		**10/25/95**	**9/8/95**
Analyte				
2,3,7,8-TCDD		<	1.1	190
1,2,3,7,8-PeCDD		<	0.4	570
1,2,3,4,7,8-HxCDD		<	0.54	570
1,2,3,6,7,8-HxCDD		<	1.5	1200
1,2,3,7,8,9-HxCDD		<	1.5	610
1,2,3,4,6,7,8-HpCDD			14	6800
2,3,7,8-TCDF		<	1.3	430
1,2,3,7,8-PeCDF		<	0.8	4100
2,3,4,7,8-PeCDF		<	0.43	8500
1,2,3,4,7,8-HxCDF		<	2.2	56000
1,2,3,6,7,8-HxCDF		<	0.5	10000
1,2,3,7,8,9-HxCDF		<	0.28	2100
2,3,4,6,7,8-HxCDF		<	1.6	3400
1,2,3,4,6,7,8-HpCDF		<	4.2	190000
1,2,3,4,7,8,9-HpCDF		<	1.8	8500
TCDDs (total)			11	11000
PeCDDs (total)		<	2.8	11000
HxCDDs (total)			14	17000
HpCDDs (total)			14	12000
OCDD			71	17000
TCDFs (total)		<	1.3	27000
PeCDFs (total)		<	1.4	50000
HxCDFs (total)		<	2.2	120000
HpCDFs (total)		<	4.2	210000
OCDF		<	7.7	430000

Data Summary (1)

Tetra thru Octa Homolog Totals			
	Dioxin Homologs	110.0	68,000.0
	Furan Homologs	0.0	837,000.0
	Sum	110.0	905,000.0
2,3,7,8-TCDD Toxic Equivalence (2)		0.2	14861.0
2,3,7,8-TCDD Toxic Equivalence (3)		0.2	14743.7
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)			
Human Bioaccumulation (sc=10,000 pg/gOC)		627.0	150.0
Wildlife Bioaccumulation (sc=200 pg/gOC)		12.5	3.0
Total Organic Carbon (%)		6.27	1.5

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

	Station		Gill Ck 1		Gill Ck 2		Gill Ck 3
	Sample Type		sediment		sediment		sediment
	Collection Date		10/26/95		10/26/95		10/26/95
Analyte							
2,3,7,8-TCDD		<	0.35	<	0.3		23
1,2,3,7,8-PeCDD		<	0.26	<	0.31		13
1,2,3,4,7,8-HxCDD		<	0.53	<	0.44		20
1,2,3,6,7,8-HxCDD		<	0.43	<	0.44		140
1,2,3,7,8,9-HxCDD		<	0.58	<	0.4		92
1,2,3,4,6,7,8-HpCDD			9.4	<	2.6		890
2,3,7,8-TCDF		<	0.66	<	0.54		74
1,2,3,7,8-PeCDF		<	0.54	<	0.48		50
2,3,4,7,8-PeCDF		<	0.26	<	0.36		42
1,2,3,4,7,8-HxCDF		<	1.6	<	0.5		330
1,2,3,6,7,8-HxCDF		<	0.66	<	0.13		51
1,2,3,7,8,9-HxCDF		<	0.16	<	0.13	<	6.9
2,3,4,6,7,8-HxCDF		<	0.25	<	0.79		30
1,2,3,4,6,7,8-HpCDF		<	0.83	<	0.66		320
1,2,3,4,7,8,9-HpCDF		<	2.9	<	0.15		110
TCDDs (total)		<	0.24	<	0.64		54
PeCDDs (total)		<	0.48	<	0.31		98
HxCDDs (total)		<	0.55	<	0.71		610
HpCDDs (total)		<	1.4	<	2.9		1400
OCDD			18		130		10000
TCDFs (total)			100	<	0.54		710
PeCDFs (total)		<	0.95	<	0.52		560
HxCDFs (total)		<	2.2	<	0.79		780
HpCDFs (total)			9.3	<	0.66		680
OCDF			17	<	1.7		1600
Data Summary(1)							
Tetra thru Octa Homolog Totals							
Dioxin Homologs			18.0		130.0		12,162.0
Furan Homologs			126.3		0.0		4,330.0
	Sum		144.3		130.0		16,492.0
2,3,7,8-TCDD Toxic Equivalence(2)			0.1		0.1		151.5
2,3,7,8-TCDD Toxic Equivalence(3)			0.1		0.1		147.6
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)							
Human Bioaccumulation (sc=10,000 pg/gOC)			227.0		177.0		584.0
Wildlife Bioaccumulation (sc=200 pg/gOC)			4.5		3.5		11.7
Total Organic Carbon (%)			2.27		1.77		5.84

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria
Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

	18mi Ck william	Bottle Bk	Cayuga Ck 1	Cayuga Ck 2
Station	**18mi Ck william**	**Bottle Bk**	**Cayuga Ck 1**	**Cayuga Ck 2**
Sample Type	**sediment**	**sediment**	**sediment**	**sediment**
Collection Date	**10/27/95**	**11/9/95**	**10/26/95**	**10/26/95**
Analyte				
2,3,7,8-TCDD	2.4	< 0.51 *	3.4	120
1,2,3,7,8-PeCDD	< 4.7	< 0.99 *	< 2.5	17
1,2,3,4,7,8-HxCDD	16	< 1.3	< 1.8	38
1,2,3,6,7,8-HxCDD	140	< 1.2	< 4.5	110
1,2,3,7,8,9-HxCDD	31	< 1.4 *	< 4.8	110
1,2,3,4,6,7,8-HpCDD	3300	< 4.4	59	660
2,3,7,8-TCDF	7.3	< 0.49	< 3	23
1,2,3,7,8-PeCDF	< 10	< 0.96	< 3.3	23
2,3,4,7,8-PeCDF	14	< 0.82	< 5.3	35
1,2,3,4,7,8-HxCDF	120	< 0.78	12	270
1,2,3,6,7,8-HxCDF	43	< 0.7	3	42
1,2,3,7,8,9-HxCDF	11	< 0.51	< 0.41	< 7.3
2,3,4,6,7,8-HxCDF	< 35	< 0.8	< 3.7	33
1,2,3,4,6,7,8-HpCDF	2400	< 1.5	25	480
1,2,3,4,7,8,9-HpCDF	77	< 0.95	< 2.8	39
TCDDs (total)	37	< 0.8	7.4	220
PeCDDs (total)	< 28	< 6.4	< 3.8	150
HxCDDs (total)	790	< 1.4	22	810
HpCDDs (total)	7100	< 4.4	110	1100
OCDD	42000	29	650	3700
TCDFs (total)	150	< 0.69	91	470
PeCDFs (total)	180	< 1.1	27	430
HxCDFs (total)	660	< 1.2	36	630
HpCDFs (total)	7000	< 1.5	49	700
OCDF	5100	< 2.7	65	980

Data Summary (1)

	18mi Ck william	Bottle Bk	Cayuga Ck 1	Cayuga Ck 2
Tetra thru Octa Homolog Totals				
Dioxin Homologs	49,927.0	0.0	789.4	5,980.0
Furan Homologs	13,090.0	0.0	268.0	3,210.0
Sum	63,017.0	0.0	1,057.4	9,190.0
2,3,7,8-TCDD Toxic Equivalence (2)	151.1	0.0	6.5	226.2
2,3,7,8-TCDD Toxic Equivalence (3)	108.7	0.0	5.8	230.5
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)				
Human Bioaccumulation (sc=10,000 pg/gOC)	596.0	126.0	441.0	618.0
Wildlife Bioaccumulation (sc=200 pg/gOC)	11.9	2.5	8.8	12.4
Total Organic Carbon (%)	5.96	1.26	4.41	6.18

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

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Blue - Exceeds Wildlife and Human Bioaccumulation Criteria

Green - exceeds Wildlife Bioaccumulation Criteria

Red - Elevated percent abundance

Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Lake Ontario Tributaries

All concentrations pg/g, dry weight

Analyte	Station / Sample Type / Laboratory	Oak Orchard Sediment Axys	Sterling Sediment Axys	Black Lake sediment Axys
2,3,7,8-TCDD		0.4	< 0.1	0.3
1,2,3,7,8-PeCDD		0.5 *	< 0.2	1.5
1,2,3,4,7,8-HxCDD		0.9	< 0.3	2
1,2,3,6,7,8-HxCDD		2.5	0.3 *	3.4
1,2,3,7,8,9-HxCDD		2.5	0.4 *	5.6
1,2,3,4,6,7,8-HpCDD		50	5.1	55
2,3,7,8-TCDF		1.9	0.2	3.3
1,2,3,7,8-PeCDF		0.8	< 0.3	2.4
2,3,4,7,8-PeCDF		1.1	< 0.3	3.7
1,2,3,4,7,8-HxCDF		3.0	< 0.3	4.3
1,2,3,6,7,8-HxCDF		1.5	< 0.3	3.3
1,2,3,7,8,9-HxCDF		< 0.2	< 0.3	0.5
2,3,4,6,7,8-HxCDF		1.1	< 0.3	3.1
1,2,3,4,6,7,8-HpCDF		23	1.5	21
1,2,3,4,7,8,9-HpCDF		1.3	< 0.3	1.5
TCDDs (total)		4.5	0.3	4.3
PeCDDs (total)		3.1	< 0.2	8.4
HxCDDs (total)		21	1.5	31
HpCDDs (total)		99	9.6	120
OCDD		540	38	430
TCDFs (total)		24	2.2	58
PeCDFs (total)		15	1.8	38
HxCDFs (total)		23	1.9	37
HpCDFs (total)		49	3.3	33
OCDF		37	3.5	31
Data Summary (1)				
Tetra thru Octa Homolog Totals				
	Dioxin Homologs	667.6	49.4	593.7
	Furan Homologs	148.0	12.7	197.0
	Sum	815.6	62.1	790.7
2,3,7,8-TCDD Toxic Equivalence (2)		3.9	0.2	5.2
2,3,7,8-TCDD Toxic Equivalence (3)		3.6	0.2	4.8
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)				
Human Bioaccumulation (sc=10,000 pg/gOC)		57.4	84.7	140.0
Wildlife Bioaccumulation (sc=200 pg/gOC)		1.1	1.7	2.8
Total Organic Carbon (%)		0.574	0.847	1.4

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

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Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Lake Ontario Tributaries

All concentrations pg/g, dry weight

Station	Ellicott Ck	Wilson Har	Olcott Har	Johnson
Sample Type	Sediment	Sediment	Sediment	Sediment
Laboratory	Axys	Axys	Axys	Axys
Analyte				
2,3,7,8-TCDD	2.7 *	2.4	2.9	< 0.2
1,2,3,7,8-PeCDD	4.1	3.2	2.5	0.3 *
1,2,3,4,7,8-HxCDD	5.8	5.6	4.4	0.4
1,2,3,6,7,8-HxCDD	13	15	29	1.3
1,2,3,7,8,9-HxCDD	14	15	12	1.2
1,2,3,4,6,7,8-HpCDD	210	310	720	24
2,3,7,8-TCDF	4.1	3.4	13	0.8
1,2,3,7,8-PeCDF	3.2	2.4	4.5	0.4
2,3,4,7,8-PeCDF	6.2	2.6	6.5	0.6
1,2,3,4,7,8-HxCDF	11	8.1	34	1.1
1,2,3,6,7,8-HxCDF	7.2	6.5	18	0.6
1,2,3,7,8,9-HxCDF	2.6	0.8	1.2	< 0.2
2,3,4,6,7,8-HxCDF	8.1	3.1	1.2	0.5
1,2,3,4,6,7,8-HpCDF	85	79	440	9.3
1,2,3,4,7,8,9-HpCDF	9.9	5	20	0.6
TCDDs (total)	17	6.9	44	2.2
PeCDDs (total)	28	17	68	1.7
HxCDDs (total)	100	100	280	9.9
HpCDDs (total)	400	550	1700	45
OCDD	1800	2700	8600	280
TCDFs (total)	89	44	240	11
PeCDFs (total)	110	38	91	5.6
HxCDFs (total)	160	110	370	11
HpCDFs (total)	200	210	1100	22
OCDF	180	170	670	23

Data Summary (1)

	Ellicott Ck	Wilson Har	Olcott Har	Johnson
Tetra thru Octa Homolog Totals				
Dioxin Homologs	2,345.0	3,373.9	10,692.0	338.8
Furan Homologs	739.0	572.0	2,471.0	72.6
Sum	3,084.0	3,945.9	13,163.0	411.4
2,3,7,8-TCDD Toxic Equivalence (2)	19.6	15.6	40	1.7
2,3,7,8-TCDD Toxic Equivalence (3)	19.9	14.7	32.8	1.6
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)				
Human Bioaccumulation (sc=10,000 pg/gOC)	83.1	78.4	140.0	82.0
Wildlife Bioaccumulation (sc=200 pg/gOC)	1.7	1.6	2.8	1.6
Total Organic Carbon (%)	0.831	0.784	1.4	0.82

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

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Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries - Lake Ontario Samples

All concentrations pg/g, dry weight

Station	4	11	12	18	19
Sample Depth (cm)	Surficial	Surficial	Surficial	Surficial	Surficial
Laboratory	Axys	Axys	Axys	Axys	Axys
Analyte					
2,3,7,8-TCDD	16	0.6	2.1	9.1	45
1,2,3,7,8-PeCDD	6.2	0.3	1.0	2.0	12
1,2,3,4,7,8-HxCDD	6.3	0.3	0.4	1.6	9.0
1,2,3,6,7,8-HxCDD	16	0.7	1.4	5.2	30
1,2,3,7,8,9-HxCDD	17	0.8	1.3	5.4	31
1,2,3,4,6,7,8-HpCDD	200	8.1	21	75	340
2,3,7,8-TCDF	34	1.6	2.3	7.9	51
1,2,3,7,8-PeCDF	7.1	0.4	0.6	2.0	11
2,3,4,7,8-PeCDF	17	1	1.4	7.9	36
1,2,3,4,7,8-HxCDF	60	2.5	5.6	30	170
1,2,3,6,7,8-HxCDF	13	0.7	1.2	5.3	30
1,2,3,7,8,9-HxCDF	0.2	0.1	0.1	0.1	0.3
2,3,4,6,7,8-HxCDF	10	0.5	0.6	2.8	16
1,2,3,4,6,7,8-HpCDF	240	9.7	20	110	650
1,2,3,4,7,8,9-HpCDF	11	0.5	1.1	5.4	31
TCDDs (total)	63	2.8	5.6	25	120
PeCDDs (total)	70	2.8	6.6	21	120
HxCDDs (total)	180	7.3	15	52	290
HpCDDs (total)	450	17	44	160	700
OCDD	1500	57	180	830	2900
TCDFs (total)	300	16	23	89	500
PeCDFs (total)	170	8.3	13	60	340
HxCDFs (total)	200	8.5	16	74	420
HpCDFs (total)	340	13	29	140	830
OCDF	390	15	39	220	1300

Data Summary (1)	4	11	12	18	19
Tetra thru Octa Homolog Totals					
Dioxin Homologs	2,263.0	86.9	251.2	1,088.0	4,130.0
Furan Homologs	1,400.0	60.8	120.0	583.0	3,390.0
Sum	3,663.0	147.7	371.2	1,671.0	7,520.0
2,3,7,8-TCDD Toxic Equivalence (2)	50	2.2	5.3	22.9	117.7
2,3,7,8-TCDD Toxic Equivalence (3)	51.4	2.3	5.6	22.9	119.9
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)					
Human Bioaccumulation (sc=10,000 pg/gOC)	565.0	37.0	103.0	156.0	462.0
Wildlife Bioaccumulation (sc=200 pg/gOC)	11.3	0.7	2.1	3.1	9.2
Total Organic Carbon (%)	5.65	0.37	1.03	1.56	4.62

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

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Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries - Lake Ontario Samples

All concentrations pg/g, dry weight

Station	21	23	26	39A	45
Sample Depth (cm)	Surficial	Surficial	Surficial	Surficial	Surficial
Laboratory	Axys	Axys	Axys	Axys	Axys
Analyte					
2,3,7,8-TCDD	41	34	3.1	60	50
1,2,3,7,8-PeCDD	4.3	9.8	0.9	12	9.3
1,2,3,4,7,8-HxCDD	2.9	9.3	1.0	11	11
1,2,3,6,7,8-HxCDD	11	26	3.1	35	29
1,2,3,7,8,9-HxCDD	8.9	28	2.6	34	34
1,2,3,4,6,7,8-HpCDD	130	330	52	390	350
2,3,7,8-TCDF	19	53	3.4	58	51
1,2,3,7,8-PeCDF	3.9	10	1.0	15	14
2,3,4,7,8-PeCDF	14	36	2.7	46	43
1,2,3,4,7,8-HxCDF	110	140	9.4	240	210
1,2,3,6,7,8-HxCDF	18	24	2.1	49	40
1,2,3,7,8,9-HxCDF	<0.2	<0.3	<0.6	2.1	2.0
2,3,4,6,7,8-HxCDF	7.1	16	1.3	22	19.0
1,2,3,4,6,7,8-HpCDF	490	540	43	930	810
1,2,3,4,7,8,9-HpCDF	19	24	2	4.2	45
TCDDs (total)	61	110	13	140	130
PeCDDs (total)	39	100	10	130	100
HxCDDs (total)	100	280	33	280	250
HpCDDs (total)	260	700	110	850	750
OCDD	1000	2900	580	3300	3100
TCDFs (total)	210	510	40	650	660
PeCDFs (total)	160	320	27	470	420
HxCDFs (total)	260	370	32	610	540
HpCDFs (total)	600	700	69	1200	1000
OCDF	980	1100	67	1900	1700
Data Summary (1)					
Tetra thru Octa Homolog Totals					
Dioxin Homologs	1,460.0	4,090.0	746.0	4,700.0	4,330.0
Furan Homologs	2,210.0	3,000.0	235.0	4,830.0	4,320.0
Sum	3,670.0	7,090.0	981.0	9,530.0	8,650.0
2,3,7,8-TCDD Toxic Equivalence (2)	76.4	100	8.9	153.3	133.3
2,3,7,8-TCDD Toxic Equivalence (3)	76.8	101.3	8.7	154.6	133.6
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)					
Human Bioaccumulation (sc=10,000 pg/gOC)	149.0	436.0	210.0	507.0	512.0
Wildlife Bioaccumulation (sc=200 pg/gOC)	3.0	8.7	4.2	10.1	10.2
Total Organic Carbon (%)	1.49	4.36	2.1	5.07	5.12

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria

Green - exceeds Wildlife Bioaccumulation Criteria

Red - Elevated percent abundance

Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries - Lake Ontario Samples

All concentrations pg/g, dry weight

Station	51	53	54	57	58
Sample Depth (cm)	Surficial	Surficial	Surficial	Surficial	Surficial
Laboratory	Axys	Axys	Axys	Axys	Axys
Analyte					
2,3,7,8-TCDD	1.4	2.9	3.8	31	5.6
1,2,3,7,8-PeCDD	0.3	0.6	0.9	7.3	1.3
1,2,3,4,7,8-HxCDD	0.2	0.5	0.8	7.0	1.5
1,2,3,6,7,8-HxCDD	1.1	1.6	2.4	18	4.3
1,2,3,7,8,9-HxCDD	0.8	1.2	2.6	18	4.4
1,2,3,4,6,7,8-HpCDD	14	21	31	230	60
2,3,7,8-TCDF	1.1	1.4	2.3	19	4.2
1,2,3,7,8-PeCDF	0.4	0.7	1.0	8.5	1.9
2,3,4,7,8-PeCDF	0.8	1.3	2.5	21	4.3
1,2,3,4,7,8-HxCDF	5.0	9.5	14	120	22
1,2,3,6,7,8-HxCDF	0.9	1.8	2.6	24	4.6
1,2,3,7,8,9-HxCDF	<0.1	<0.1	<0.1	0.6	<0.4
2,3,4,6,7,8-HxCDF	0.5	0.7	1.2	9.7	2.2
1,2,3,4,6,7,8-HpCDF	18	33	48	440	87
1,2,3,4,7,8,9-HpCDF	0.8	1.9	2.2	20	4
TCDDs (total)	3.8	5.8	8.9	95	16
PeCDDs (total)	2.5	5.5	9.7	110	16
HxCDDs (total)	11	16	24	220	46
HpCDDs (total)	29	45	66	480	130
OCDD	150	250	370	2300	780
TCDFs (total)	14	20	27	250	57
PeCDFs (total)	7.7	14	22	190	43
HxCDFs (total)	15	26	36	320	63
HpCDFs (total)	25	44	63	550	110
OCDF	42	72	97	950	150
Data Summary (1)					
Tetra thru Octa Homolog Totals					
Dioxin Homologs	196.3	322.3	478.60	3,205.0	988.0
Furan Homologs	103.7	176.0	245.00	2,260.0	423.0
Sum	300.0	498.3	723.60	5,465.0	1,411.0
2,3,7,8-TCDD Toxic Equivalence (2)	3.5	6.4	9.42	77.4	15.3
2,3,7,8-TCDD Toxic Equivalence (3)	3.4	6.5	9.45	78.1	15.1
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)					
Human Bioaccumulation (sc=10,000 pg/gOC)	97.0	74.0	115.00	315.0	174.0
Wildlife Bioaccumulation (sc=200 pg/gOC)	1.9	1.5	2.30	6.3	3.5
Total Organic Carbon (%)	0.97	0.74	1.15	3.15	1.74

(1) Only results greater than laboratory reporting limits used in data summary.
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(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

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Blue - Exceeds Wildlife and Human Bioaccumulation Criteria

Green - exceeds Wildlife Bioaccumulation Criteria

Red - Elevated percent abundance

Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries - Lake Ontario Samples

All concentrations pg/g, dry weight

Station	62	63	65	69	71
Sample Depth (cm)	Surficial	Surficial	Surficial	Surficial	Surficial
Laboratory	Axys	Axys	Axys	Axys	Axys
Analyte					
2,3,7,8-TCDD	2.8	4.2	35	12	18
1,2,3,7,8-PeCDD	1.8	2.4	5.4	3.9	3.5
1,2,3,4,7,8-HxCDD	1.5	3.0	6.2	4.5	3.9
1,2,3,6,7,8-HxCDD	6.7	7.0	18	13	11
1,2,3,7,8,9-HxCDD	6.9	11	21	15	12
1,2,3,4,6,7,8-HpCDD	120	120	210	170	140
2,3,7,8-TCDF	8.1	6.2	20	15	14
1,2,3,7,8-PeCDF	1.6	2.8	13	5.2	5.6
2,3,4,7,8-PeCDF	3.7	6	22	14	14
1,2,3,4,7,8-HxCDF	10	30	180	78	90
1,2,3,6,7,8-HxCDF	2.9	6.9	33	16	17
1,2,3,7,8,9-HxCDF	<0.5	0.3	<1.1	1.1	<0.7
2,3,4,6,7,8-HxCDF	2.5	3.2	11	7.2	7.2
1,2,3,4,6,7,8-HpCDF	77	120	480	290	330
1,2,3,4,7,8,9-HpCDF	2.8	5.1	27	13	14
TCDDs (total)	10	25	75	43	53
PeCDDs (total)	23	29	66	47	37
HxCDDs (total)	64	79	160	120	110
HpCDDs (total)	250	270	430	370	290
OCDD	1300	2200	2000	1900	1200
TCDFs (total)	74	80	270	190	180
PeCDFs (total)	47	62	200	130	130
HxCDFs (total)	61	87	370	200	250
HpCDFs (total)	140	150	600	360	400
OCDF	110	190	920	540	670

Data Summary(1)	62	63	65	69	71
Tetra thru Octa Homolog Totals					
Dioxin Homologs	1,647.0	2,603.0	2,731.0	2,480.0	1,690.0
Furan Homologs	432.0	569.0	2,360.0	1,420.0	1,630.0
Sum	2,079.0	3,172.0	5,091.0	3,900.0	3,320.0
2,3,7,8-TCDD Toxic Equivalence(2)	12.9	20.1	88.4	43.4	49.3
2,3,7,8-TCDD Toxic Equivalence(3)	12.5	19.2	88.4	43.1	49.3
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)					
Human Bioaccumulation(sc=10,000 pg/gOC	135.0	344.0	358.0	338.0	358.0
Wildlife Bioaccumulation(sc=200 pg/gOC)	2.7	6.9	7.2	6.8	7.2
Total Organic Carbon(%)	1.35	3.44	3.58	3.38	3.58

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries - Lake Ontario Samples

All concentrations pg/g, dry weight

Station	72		74		75	
Sample Depth (cm)	Surficial		Surficial		Surficial	
Laboratory	Axys		Axys		Axys	
Analyte						
2,3,7,8-TCDD	150		0.8		0.5	
1,2,3,7,8-PeCDD	15		0.4		0.3	
1,2,3,4,7,8-HxCDD	15		1	*	0.3	*
1,2,3,6,7,8-HxCDD	47		1.5		0.9	
1,2,3,7,8,9-HxCDD	33		1.7		1.0	
1,2,3,4,6,7,8-HpCDD	440		19		12	
2,3,7,8-TCDF	51		1.7		1.6	
1,2,3,7,8-PeCDF	20		0.5		0.4	
2,3,4,7,8-PeCDF	51		1.3		0.9	
1,2,3,4,7,8-HxCDF	440		3.9		1.9	
1,2,3,6,7,8-HxCDF	74		1.0		0.5	
1,2,3,7,8,9-HxCDF	2.3		<0.1		<0.1	
2,3,4,6,7,8-HxCDF	29		0.8		0.5	
1,2,3,4,6,7,8-HpCDF	1600		18		7.7	
1,2,3,4,7,8,9-HpCDF	82		0.9		0.5	
TCDDs (total)	200		3.1		2.7	
PeCDDs (total)	170		3.5		3.3	
HxCDDs (total)	430		14		8.6	
HpCDDs (total)	870		39		25	
OCDD	2700		160		110	
TCDFs (total)	590		17		16	
PeCDFs (total)	520		9.9		6.6	
HxCDFs (total)	1100		16		8.2	
HpCDFs (total)	2000		26		11	
OCDF	4400		29		14	

Data Summary (1)

	72	74	75
Tetra thru Octa Homolog Totals			
Dioxin Homologs	4,370.0	219.6	149.6
Furan Homologs	8,610.0	97.9	55.8
Sum	12,980.0	317.5	205.4
2,3,7,8-TCDD Toxic Equivalence (2)	281.5	3.4	2.1
2,3,7,8-TCDD Toxic Equivalence (3)	282.6	3.4	2.2
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD (4)			
Human Bioaccumulation (sc=10,000 pg/gOC)	435.0	197.0	155.0
Wildlife Bioaccumulation (sc=200 pg/gOC)	8.7	3.9	3.1
Total Organic Carbon (%)	4.35	1.97	1.55

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria
Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment
Dioxin in Tributaries Study

All concentrations pg/g, dry weight

Station	Buff Ship Can		Lake Erie (06)		Sandy Ck		Salmon	
Sample Type	Sediment		Sediment		Sediment		Sediment	
Laboratory	Axys		Axys		Axys		Axys	
Analyte								
2,3,7,8-TCDD		2.4		0.2	<	0.1	<	0.1
1,2,3,7,8-PeCDD		3.0		0.8		0.2 *	<	0.1
1,2,3,4,7,8-HxCDD		4.2		0.9		0.3	<	0.1
1,2,3,6,7,8-HxCDD		11		2.4		0.5		0.3
1,2,3,7,8,9-HxCDD		12		2.4		0.7		0.3
1,2,3,4,6,7,8-HpCDD		180		58		13		3.5
2,3,7,8-TCDF		13		1.9		0.3		0.1
1,2,3,7,8-PeCDF		4.9		0.9		0.2	<	0.1
2,3,4,7,8-PeCDF		8.5		1.6		0.2		0.1
1,2,3,4,7,8-HxCDF		11		5.5		0.7		0.2
1,2,3,6,7,8-HxCDF		6.5		1.4		0.3		0.1
1,2,3,7,8,9-HxCDF	<	0.8	<	0.2	<	0.1	<	0.1
2,3,4,6,7,8-HxCDF		5.2		0.7		0.2		0.1
1,2,3,4,6,7,8-HpCDF		51		13		5.0		1.3
1,2,3,4,7,8,9-HpCDF		3.5		0.6		0.2		0.1
TCDDs (total)		21		11		0.3		0.1
PeCDDs (total)		30		11		1.2	<	0.1
HxCDDs (total)		130		28		4.9		2.0
HpCDDs (total)		400		120		27		6.9
OCDD		1800		690		280		40
TCDFs (total)		210		30		3.0		2.0
PeCDFs (total)		120		22		2.6		2.8
HxCDFs (total)		100		19		4.8		2.8
HpCDFs (total)		100		19		9.3		3.2
OCDF		110		20		6.3		2.2

Data Summary(1)	Buff Ship Can	Lake Erie (06)	Sandy Ck	Salmon
Tetra thru Octa Homolog Totals				
Dioxin Homologs	2,381.0	860.00	313.4	49.0
Furan Homologs	640.0	110.00	26.0	13.0
Sum	3,021.0	970.00	339.4	62.0
2,3,7,8-TCDD Toxic Equivalence(2)	18.9	4.39	1.0	0.3
2,3,7,8-TCDD Toxic Equivalence(3)	18.7	4.15	0.8	0.2
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(4)				
Human Bioaccumulation(sc=10,000 pg/gOC)	81.7	34.80	180.0	37.2
Wildlife Bioaccumulation(sc=200 pg/gOC)	1.6	0.70	3.6	0.7
Total Organic Carbon(%)	0.817	0.35	1.8	0.372

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria
Blue - Exceeds Wildlife and Human Bioaccumulation Criteria
Green - exceeds Wildlife Bioaccumulation Criteria
Red - Elevated percent abundance
Yellow - Average percent abundance

Dioxin/Furan Data - Sediment

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

	Dunkirk Har		Cattaraugus		Lake Erie (03)	Erie Basin Marina
Station	Dunkirk Har		Cattaraugus		Lake Erie (03)	Erie Basin Marina
Sample Type	Sediment		Sediment		Sediment	Sediment
Laboratory	Axys		Axys		Axys	Axys
Analyte						
2,3,7,8-TCDD	0.4		<0.1		0.2	1.5
1,2,3,7,8-PeCDD	0.6		0.2	*	0.6	10
1,2,3,4,7,8-HxCDD	0.7		0.2		0.7	17
1,2,3,6,7,8-HxCDD	4.2		0.6		1.5	49
1,2,3,7,8,9-HxCDD	2.9		0.6		2.1	49
1,2,3,4,6,7,8-HpCDD	68		17		28	1130
2,3,7,8-TCDF	1.6		0.1		1.3	13
1,2,3,7,8-PeCDF	0.5		0.1		0.5	6.3
2,3,4,7,8-PeCDF	1		0.2		1.1	12
1,2,3,4,7,8-HxCDF	1.6		0.3		0.7	23
1,2,3,6,7,8-HxCDF	0.8		0.2		0.5	21
1,2,3,7,8,9-HxCDF	<0.2		0.1		0.1	<2.8
2,3,4,6,7,8-HxCDF	0.7		0.2		0.5	17
1,2,3,4,6,7,8-HpCDF	6.5		1.9		4.1	220
1,2,3,4,7,8,9-HpCDF	0.5	*	0.4		0.3	12
TCDDs (total)	4.3		1.7		2.9	45
PeCDDs (total)	5.0		<0.1		5.1	120
HxCDDs (total)	37		6.2		19	590
HpCDDs (total)	140		33		64	2400
OCDD	780		170		410	11000
TCDFs (total)	24		1.9		14	210
PeCDFs (total)	12		1.3		8.3	250
HxCDFs (total)	17		2.6		7.5	470
HpCDFs (total)	15		4.9		7.4	540
OCDF	12		6.9		5.5	490

Data Summary(1)

Tetra thru Octa Homolog Totals				
Dioxin Homologs	966.3	210.9	501.0	14,155.0
Furan Homologs	80.0	17.6	42.7	1,960.0
Sum	1,046.3	228.5	543.7	16,115.0
2,3,7,8-TCDD Toxic Equivalence(2)	4.0	0.0	2.6	56.8
2,3,7,8-TCDD Toxic Equivalence(3)	3.6	0.7	2.5	51.5
DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(4)				
Human Bioaccumulation(sc=10,000 pg/gOC)	89.5	23.7	0.0	65.9
Wildlife Bioaccumulation(sc=200 pg/gOC)	1.8	0.5	0.0	1.3
Total Organic Carbon(%)	0.895	0.237	n/a	0.659

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

* - Peak detected but did not meet quantification criteria

Blue - Exceeds Wildlife and Human Bioaccumulation Criteria

Green - exceeds Wildlife Bioaccumulation Criteria

Red - Elevated percent abundance

Yellow - Average percent abundance

Dioxin/Furan Data - Water Column

Dioxin in Tributaries Study

All concentrations pg/l

Analyte		Black Lake Water Axys			Oswegatchie Water Axys
2,3,7,8-TCDD	<	0.3			0.3
1,2,3,7,8-PeCDD	<	0.4		<	0.3
1,2,3,4,7,8-HxCDD	<	0.5		<	1.0
1,2,3,6,7,8-HxCDD	<	0.5		<	1.0
1,2,3,7,8,9-HxCDD		0.8		<	1.0
1,2,3,4,6,7,8-HpCDD		2.2			3.1
2,3,7,8-TCDF		0.5		<	0.5
1,2,3,7,8-PeCDF		0.3	*	<	0.4
2,3,4,7,8-PeCDF		0.4		<	0.4
1,2,3,4,7,8-HxCDF		0.4	*	<	0.2
1,2,3,6,7,8-HxCDF		0.5		<	0.2
1,2,3,7,8,9-HxCDF		0.4		<	0.2
2,3,4,6,7,8-HxCDF		0.6	*	<	0.2
1,2,3,4,6,7,8-HpCDF		1.5		<	1.0
1,2,3,4,7,8,9-HpCDF	<	0.3		<	1.0
TCDDs (total)		0.5		<	0.3
PeCDDs (total)	<	0.4		<	0.3
HxCDDs (total)		1.7		<	1.0
HpCDDs (total)		4.1			3.1
OCDD		9.2			20
TCDFs (total)		0.6		<	0.5
PeCDFs (total)		0.4		<	0.4
HxCDFs (total)		2.1		<	0.2
HpCDFs (total)		1.5		<	1.0
OCDF		1.5		<	1.4
Data Summary(1)					
Tetra thru Octa Homolog Totals					
Dioxin Homologs		15.5			23.1
Furan Homologs		6.1			0.0
Sum		21.6			23.1
2,3,7,8-TCDD Toxic Equivalence(2)		0.58			0.35
2,3,7,8-TCDD Toxic Equivalence(3)		0.57			0.33
Toxic Equivalency * Bioaccumulation Equivalency		**0.452**			**0.3017**
DOW Site Specific Water Quality Standards for 2,3,7,8-TCDD(4)					
Human Consumption of Fish (0.0006 pg/l)		0.0006			0.0006
Wildlife Protection (0.0031 pg/l)		0.0031			0.0031

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

Purple - exceeds water quality criteria for human consumption of fish

Dioxin/Furan Data - Water Column

Dioxin in Tributaries Study

All concentrations pg/l

	Sandy Ck		Salmon		Cattaraugus	
Station	**Sandy Ck**		**Salmon**		**Cattaraugus**	
Sample Type	**Water**		**Water**		**Water**	
Laboratory	**Axys**		**Axys**		**Axys**	
Analyte						
2,3,7,8-TCDD	<0.4		<1.4		<1.4	
1,2,3,7,8-PeCDD	<0.3		<1.4		<1.4	
1,2,3,4,7,8-HxCDD	<1.0		<1.4		<1.4	
1,2,3,6,7,8-HxCDD	<1.0		<1.4		<1.4	
1,2,3,7,8,9-HxCDD	<1.0		<1.4		<1.4	
1,2,3,4,6,7,8-HpCDD	4.4		4	*	2.2	*
2,3,7,8-TCDF	<0.4		<1.4		<1.4	
1,2,3,7,8-PeCDF	<0.6		<1.4		<1.4	
2,3,4,7,8-PeCDF	<0.6		<1.4		<1.4	
1,2,3,4,7,8-HxCDF	<0.7		<1.4		<1.4	
1,2,3,6,7,8-HxCDF	<0.7		<1.4		<1.4	
1,2,3,7,8,9-HxCDF	<0.7		<1.4		<1.4	
2,3,4,6,7,8-HxCDF	<0.7		<1.4		<1.4	
1,2,3,4,6,7,8-HpCDF	2.7		1.8	*	<1.4	
1,2,3,4,7,8,9-HpCDF	<0.6		<1.4		<1.4	
TCDDs (total)	<0.4		<1.4		<1.4	
PeCDDs (total)	<0.3		<1.4		<1.4	
HxCDDs (total)	<1.0		<1.4		<1.4	
HpCDDs (total)	8.0		3.4		1.5	
OCDD	29		31		8.7	
TCDFs (total)	<0.4		<1.4		1.4	
PeCDFs (total)	<0.6		<1.4		<1.4	
HxCDFs (total)	<0.7		<1.4		<1.4	
HpCDFs (total)	3.8		1.8		<1.4	
OCDF	4.4		2.9		1.5	

Data Summary (1)

	Sandy Ck	Salmon	Cattaraugus
Tetra thru Octa Homolog Totals			
Dioxin Homologs	37.0	34.4	10.2
Furan Homologs	8.2	4.7	2.9
Sum	45.2	39.1	13.1
2,3,7,8-TCDD Toxic Equivalence (2)	0.1	0.09	0.03
2,3,7,8-TCDD Toxic Equivalence (3)	0.07	0.06	0.02
Toxic Equivalency * Bioaccumulation Equivalency	0.0028	0.0025	0.0012
DOW Site Specific Water Quality Standards for 2,3,7,8-TCDD (4)			
Human Consumption of Fish (0.0006 pg/l)	0.0006	0.0006	0.0006
Wildlife Protection (0.0031 pg/l)	0.0031	0.0031	0.0031

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

Purple - exceeds water quality criteria for human consumption of fish

Dioxin/Furan Data - Water Column
Lake Ontario Tributaries

All concentrations pg/l

Station		Olcott Har			Johnson			Oak Orchard			Sterling	
Sample Type		Water			Water			Water			Water	
Laboratory		Axys			Axys			Axys			Axys	
Analyte												
2,3,7,8-TCDD	<	0.4		<	0.3		<	0.5		<	0.7	
1,2,3,7,8-PeCDD	<	0.4		<	0.6		<	0.7		<	0.8	
1,2,3,4,7,8-HxCDD		0.4		<	0.7		<	0.7		<	0.5	
1,2,3,6,7,8-HxCDD		0.7		<	0.7		<	0.7		<	0.5	
1,2,3,7,8,9-HxCDD		0.6	*	<	0.7		<	0.7		<	0.5	
1,2,3,4,6,7,8-HpCDD		6.1			2.2			2	*		1.5	*
2,3,7,8-TCDF		1.2		<	0.5			1.4		<	0.6	
1,2,3,7,8-PeCDF		0.4		<	0.4		<	0.4		<	0.3	
2,3,4,7,8-PeCDF	<	0.3		<	0.4			1.6	*	<	0.3	
1,2,3,4,7,8-HxCDF		1	*	<	0.7		<	0.7			0.5	
1,2,3,6,7,8-HxCDF	<	0.4		<	0.7		<	0.7		<	0.5	
1,2,3,7,8,9-HxCDF	<	0.4		<	0.7		<	0.7		<	0.5	
2,3,4,6,7,8-HxCDF	<	0.4		<	0.7		<	0.7		<	0.5	
1,2,3,4,6,7,8-HpCDF		3.6		<	0.9		<	1.2			1.1	
1,2,3,4,7,8,9-HpCDF	<	0.5		<	0.9		<	1.2		<	0.6	
TCDDs (total)	<	0.4		<	0.3		<	0.5		<	0.7	
PeCDDs (total)	<	0.4		<	0.6		<	0.7		<	0.8	
HxCDDs (total)		2.4		<	0.7		<	0.7		<	0.5	
HpCDDs (total)		13			2.2		<	0.2		<	0.4	
OCDD		50			7.3	*		11			5.0	
TCDFs (total)		4.7		<	0.5			1.7		<	0.6	
PeCDFs (total)		0.4		<	0.4		<	0.4			0.4	
HxCDFs (total)		1.3		<	0.7		<	0.7		<	0.5	
HpCDFs (total)		3.6		<	0.9		<	1.2			1.1	
OCDF		5.4		<	1.4		<	0.9			1.3	

Data Summary (1)

	Olcott Har	Johnson	Oak Orchard	Sterling
Tetra thru Octa Homolog Totals				
Dioxin Homologs	65.4	9.5	11.0	5.0
Furan Homologs	15.4	0.0	1.7	2.8
Sum	80.8	9.5	12.7	7.8
2,3,7,8-TCDD Toxic Equivalence (2)	0.80	0.03	0.97	0.08
2,3,7,8-TCDD Toxic Equivalence (3)	0.50	0.02	1.06	0.08
Toxic Equivalency * Bioaccumulation Equivalency	0.161	0.0011	1.393	0.005
DOW Site Specific Water Quality Standards for 2,3,7,8-TCDD (4)				
Human Consumption of Fish (0.0006 pg/l)	0.0006	0.0006	0.0006	0.0006
Wildlife Protection (0.0031 pg/l)	0.0031	0.0031	0.0031	0.0031

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors
(4) NYSDEC Division of Fish and Wildlife

Purple - exceeds water quality criteria for human consumption of fish

Table Dioxin/Furan Data - Fish Tissue

Dioxin in Tributaries Study

All concentrations pg/g

Station	18-MILE CK.	Raquette R	Genesee R
Sample Type	Tissue	Tissue	Tissue
Laboratory	Triangle	Triangle	Triangle
Analyte			
2,3,7,8-TCDD	<0.3	<0.6	<0.3
1,2,3,7,8-PeCDD	<0.6	<1.2	<0.5
1,2,3,4,7,8-HxCDD	<1	<2.1	<0.7
1,2,3,6,7,8-HxCDD	<0.9	<2	<0.7
1,2,3,7,8,9-HxCDD	<0.9	<1.9	<0.7
1,2,3,4,6,7,8-HpCDD	<1.4	<3	<1.1
2,3,7,8-TCDF	1	0.98	0.47
1,2,3,7,8-PeCDF	<0.4	<0.8	<0.4
2,3,4,7,8-PeCDF	<0.4	<0.8	<0.4
1,2,3,4,7,8-HxCDF	<0.6	<1.2	<0.5
1,2,3,6,7,8-HxCDF	<0.6	<1.1	<0.4
1,2,3,7,8,9-HxCDF	<0.7	<1.4	<0.5
2,3,4,6,7,8-HxCDF	<0.7	<1.5	<0.6
1,2,3,4,6,7,8-HpCDF	<1	<2.1	<0.7
1,2,3,4,7,8,9-HpCDF	<1.4	<2.8	<1
TCDDs (total)	<0.3	<0.6	<0.3
PeCDDs (total)	<0.6	<1.2	<0.5
HxCDDs (total)	<0.9	<2	<0.7
HpCDDs (total)	<1.4	<3	<1.1
OCDD	<3	<5.3	<1.9
TCDFs (total)	1.3	0.98	0.47
PeCDFs (total)	<0.42	<0.8	<0.4
HxCDFs (total)	<0.6	<1.3	<0.5
HpCDFs (total)	<1.2	<2.4	<0.8
OCDF	<2.3	<4.1	<1.5
Data Summary(1)			
Tetra thru Octa Homolog Totals			
Dioxin Homologs	0.0	0.0	0.0
Furan Homologs	1.3	1.0	0.5
Sum	1.3	1.0	0.5
2,3,7,8-TCDD Toxic Equivalence(2)	0.1	0.1	0.0
2,3,7,8-TCDD Toxic Equivalence(3)	0.1	0.0	0.0
NYSDEC/DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(3) as TEQ (for wildlife eating fish)	2.3	2.3	2.3
DOH fish advisory criteria	10.0	10.0	10.0
FDA Action levels	25	25	25
Percent lipid (%)	1.9	0.9	0.4

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO New TEQ using values for fish

Table Dioxin/Furan Data - Fish Tissue

Dioxin in Tributaries Study

All concentrations pg/g

Station	Grasse R dam	Grasse R mouth	Dunkirk
Sample Type	Tissue	Tissue	Tissue
Laboratory	Triangle	Triangle	Triangle
Analyte			
2,3,7,8-TCDD	<0.2	<0.3	<0.3
1,2,3,7,8-PeCDD	<0.4	<0.5	<0.4
1,2,3,4,7,8-HxCDD	<0.5	<0.8	<0.6
1,2,3,6,7,8-HxCDD	<0.5	<0.8	<0.6
1,2,3,7,8,9-HxCDD	<0.5	<0.7	<0.6
1,2,3,4,6,7,8-HpCDD	<0.7	<1.1	<0.8
2,3,7,8-TCDF	0.63	6.1	0.8
1,2,3,7,8-PeCDF	<0.3	<0.4	<0.3
2,3,4,7,8-PeCDF	<0.3	1.1	<0.3
1,2,3,4,7,8-HxCDF	<0.3	<0.5	<0.4
1,2,3,6,7,8-HxCDF	<0.3	<0.5	<0.4
1,2,3,7,8,9-HxCDF	<0.4	<0.6	<0.5
2,3,4,6,7,8-HxCDF	<0.4	<0.6	<0.5
1,2,3,4,6,7,8-HpCDF	<0.5	<0.8	<0.6
1,2,3,4,7,8,9-HpCDF	<0.6	<1	<0.8
TCDDs (total)	<0.2	<0.3	<0.3
PeCDDs (total)	<0.4	<0.5	<0.4
HxCDDs (total)	<0.5	<0.8	<0.6
HpCDDs (total)	<0.7	<1.1	<0.8
OCDD	<1.1	<2.2	<1.6
TCDFs (total)	0.63	7.5	0.8
PeCDFs (total)	<0.3	1.1	<0.3
HxCDFs (total)	<0.4	<0.5	<0.4
HpCDFs (total)	<0.5	<0.9	<0.7
OCDF	<0.8	<1.7	<1.3
Data Summary(1)			
Tetra thru Octa Homolog Totals			
Dioxin Homologs	0.0	0.0	0.0
Furan Homologs	0.6	8.6	0.8
Sum	0.6	8.6	0.8
2,3,7,8-TCDD Toxic Equivalence(2)	0.1	1.2	0.1
2,3,7,8-TCDD Toxic Equivalence(3)	0.0	0.9	0.0
NYSDEC/DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(3) as TEQ (for wildlife eating fish)	2.3	2.3	2.3
DOH fish advisory criteria	10.0	10.0	10.0
FDA Action levels	25	25	25
Percent lipid (%)	1	2.4	5.9

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO New TEQ using values for fish

Table Dioxin/Furan Data - Fish Tissue

Dioxin in Tributaries Study

All concentrations pg/g

Station	Buffalo R	Black R	Oswego R
Sample Type	Tissue	Tissue	Tissue
Laboratory	Triangle	Triangle	Triangle
Analyte			
2,3,7,8-TCDD	<0.06	<0.2	<0.07
1,2,3,7,8-PeCDD	<0.07	<0.3	<0.09
1,2,3,4,7,8-HxCDD	<0.1	<0.7	<0.2
1,2,3,6,7,8-HxCDD	<0.1	<0.6	<0.1
1,2,3,7,8,9-HxCDD	<0.1	<0.6	<0.2
1,2,3,4,6,7,8-HpCDD	<0.2	<0.9	<0.2
2,3,7,8-TCDF	<0.6	1.9	0.36
1,2,3,7,8-PeCDF	<0.06	<0.3	<0.07
2,3,4,7,8-PeCDF	<0.06	<0.3	<0.08
1,2,3,4,7,8-HxCDF	0.24	<0.5	<0.1
1,2,3,6,7,8-HxCDF	<0.08	<0.4	<0.1
1,2,3,7,8,9-HxCDF	<0.1	<0.5	<0.1
2,3,4,6,7,8-HxCDF	<0.1	<0.6	<0.2
1,2,3,4,6,7,8-HpCDF	0.33	<0.7	<0.2
1,2,3,4,7,8,9-HpCDF	<0.2	<1	<0.3
TCDDs (total)	0.13	0.31	<0.07
PeCDDs (total)	<0.07	<0.3	<0.09
HxCDDs (total)	<0.1	<0.6	<0.2
HpCDDs (total)	<0.28	<0.9	<0.2
OCDD	2.4	<2.1	<0.6
TCDFs (total)	0.18	1.9	0.36
PeCDFs (total)	0.61	<0.3	<0.07
HxCDFs (total)	0.24	<0.5	<0.1
HpCDFs (total)	0.33	<0.8	<0.2
OCDF	<0.3	<1.9	<0.5
Data Summary(1)			
Tetra thru Octa Homolog Totals			
Dioxin Homologs	2.5	0.3	0.0
Furan Homologs	1.4	1.9	0.4
Sum	3.9	2.2	0.4
2,3,7,8-TCDD Toxic Equivalence(2)	0.0	0.2	0.0
2,3,7,8-TCDD Toxic Equivalence(3)	0.0	0.1	0.0
NYSDEC/DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(3) as TEQ (for wildlife eating fish)	2.3	2.3	2.3
DOH fish advisory criteria	10.0	10.0	10.0
FDA Action levels	25	25	25
Percent lipid (%)	0	3	1.6

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO New TEQ using values for fish

Table Dioxin/Furan Data - Fish Tissue

Dioxin in Tributaries Study

All concentrations pg/g

Station	Oswegatchie	Perch R	Salmon R	Wine Creek	Sodus Ck
Sample Type	**Tissue**	**Tissue**	**Tissue**	**Tissue**	**Tissue**
Laboratory	**Triangle**	**Triangle**	**Triangle**	**Triangle**	**Triangle**
Analyte					
2,3,7,8-TCDD	<0.2	< 0.5	<0.6	<0.4	<0.2
1,2,3,7,8-PeCDD	<0.4	< 1	<1.3	<0.8	<0.5
1,2,3,4,7,8-HxCDD	<0.6	< 0.5	<0.6	<0.4	<0.3
1,2,3,6,7,8-HxCDD	<0.5	< 0.4	<0.6	<0.4	<0.2
1,2,3,7,8,9-HxCDD	<0.5	< 0.4	<0.6	<0.4	<0.2
1,2,3,4,6,7,8-HpCDD	<0.8	0.63	<0.7	0.5	0.82
2,3,7,8-TCDF	1.1	2.1	1	2.3	0.38
1,2,3,7,8-PeCDF	<0.3	< 0.6	<0.9	<0.5	<0.3
2,3,4,7,8-PeCDF	<0.3	< 0.6	<0.9	<0.5	<0.3
1,2,3,4,7,8-HxCDF	<0.3	< 0.3	<0.5	<0.3	<0.2
1,2,3,6,7,8-HxCDF	<0.3	< 0.3	<0.4	<0.2	<0.1
1,2,3,7,8,9-HxCDF	<0.4	< 0.3	<0.5	0.31	0.44
2,3,4,6,7,8-HxCDF	<0.4	< 0.4	<0.6	<0.3	<0.2
1,2,3,4,6,7,8-HpCDF	<0.5	< 0.3	<0.5	<0.3	<0.2
1,2,3,4,7,8,9-HpCDF	<0.8	< 0.5	<0.8	<0.4	<0.3
TCDDs (total)	<0.2	< 0.5	< 0.6	<0.4	<0.2
PeCDDs (total)	<0.4	< 1	<1.3	<0.8	<0.5
HxCDDs (total)	<0.5	< 0.5	<0.6	<0.4	<0.2
HpCDDs (total)	<0.8	0.44	<0.7	0.8	1.4
OCDD	<3.1	3.5	1.4	2.2	4.9
TCDFs (total)	1.5	3.5	1.7	0.89	0.38
PeCDFs (total)	<0.3	0.35	<0.9	<0.5	<0.3
HxCDFs (total)	<0.4	< 0.3	<0.5	0.31	0.44
HpCDFs (total)	<0.6	< 0.4	<0.6	<0.3	<0.2
OCDF	<1.6	< 0.9	<1.5	<0.8	<0.7

Data Summary(1)

	Oswegatchie	Perch R	Salmon R	Wine Creek	Sodus Ck
Tetra thru Octa Homolog Totals					
Dioxin Homologs	0.0	5.9	1.4	3.0	6.3
Furan Homologs	1.5	5.5	1.7	1.2	0.8
Sum	1.5	11.4	3.1	4.2	7.1
2,3,7,8-TCDD Toxic Equivalence(2)	0.1	1.8	0.1	0.3	0.1
2,3,7,8-TCDD Toxic Equivalence(3)	0.1	2.3	0.1	0.2	0.1
NYSDEC/DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(3) as TEQ (for wildlife eating fish)	2.3	2.3	2.3	2.3	2.3
DOH fish advisory criteria	10.0	10.0	10.0	10.0	10.0
FDA Action levels	25	25	25	25	25
Percent lipid (%)	n/a	1.8	1.9	2.2	1.6

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO New TEQ using values for fish

Table Dioxin/Furan Data - Fish Tissue

Dioxin in Tributaries Study

All concentrations pg/g

	Irondequoit C	Oak Orchard Ck	Eighteenmile Ck
Station	**Irondequoit C**	**Oak Orchard Ck**	**Eighteenmile Ck**
Sample Type	**Tissue**	**Tissue**	**Tissue**
Laboratory	**Triangle**	**Triangle**	**Triangle**
Analyte			
2,3,7,8-TCDD	<0.3	1.7	<0.6
1,2,3,7,8-PeCDD	<0.5	3.5	<1.2
1,2,3,4,7,8-HxCDD	<0.4	1.7	<0.6
1,2,3,6,7,8-HxCDD	<0.4	1.8	0.99
1,2,3,7,8,9-HxCDD	<0.4	1.5	<0.6
1,2,3,4,6,7,8-HpCDD	1	3.1	12.9
2,3,7,8-TCDF	<0.3	2.6	2.7
1,2,3,7,8-PeCDF	<0.3	1.9	<0.7
2,3,4,7,8-PeCDF	<0.3	1.8	<0.7
1,2,3,4,7,8-HxCDF	<0.3	1.6	1.5
1,2,3,6,7,8-HxCDF	<0.3	1.4	0.64
1,2,3,7,8,9-HxCDF	<0.3	2.2	0.81
2,3,4,6,7,8-HxCDF	<0.4	1.2	<0.4
1,2,3,4,6,7,8-HpCDF	<0.3	2.2	8
1,2,3,4,7,8,9-HpCDF	<0.5	2.2	1.2
TCDDs (total)	<0.3	1.7	<0.6
PeCDDs (total)	<0.5	3.5	<1.2
HxCDDs (total)	<0.4	1.8	4
HpCDDs (total)	1.5	3.1	25.3
OCDD	3.9	9.2	133
TCDFs (total)	<0.3	2.6	2.1
PeCDFs (total)	<0.3	1.9	1.5
HxCDFs (total)	<0.3	5.2	8.3
HpCDFs (total)	<0.2	4.4	19.1
OCDF	<1	7.9	18.5
Data Summary(1)			
Tetra thru Octa Homolog Totals			
Dioxin Homologs	5.4	19.3	162.3
Furan Homologs	0.0	22.0	49.5
Sum	5.4	41.3	211.8
2,3,7,8-TCDD Toxic Equivalence(2)	0.0	1.2	1.0
2,3,7,8-TCDD Toxic Equivalence(3)	0.0	0.8	0.6
NYSDEC/DFW Site Specific Sediment Criteria for 2,3,7,8-TCDD(3) as TEQ (for wildlife eating fish)	2.3	2.3	2.3
DOH fish advisory criteria	10.0	10.0	10.0
FDA Action levels	25	25	25
Percent lipid (%)	2.5	0.84	1

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO New TEQ using values for fish

Dioxin/Furan Data - Macroinvertebrate Tissue Data

Lake Ontario Tributaries

All concentrations pg/g

Station		Olcott Har			Johnson		Oak Orchard		Sterling	
Sample Type		Tissue			Tissue		Tissue		Tissue	
Laboratory		Axys			Axys		Axys		Axys	
Analyte										
2,3,7,8-TCDD	<	0.2		<	0.1	<	0.3	<	0.4	
1,2,3,7,8-PeCDD	<	0.2		<	0.1	<	0.3	<	0.4	
1,2,3,4,7,8-HxCDD	<	0.2		<	0.1	<	0.3	<	0.4	
1,2,3,6,7,8-HxCDD		0.8		<	0.1	<	0.3	<	0.4	
1,2,3,7,8,9-HxCDD		0.4		<	0.1	<	0.3	<	0.4	
1,2,3,4,6,7,8-HpCDD		8.6			0.5		0.8		0.6	
2,3,7,8-TCDF		1.6			0.5	<	0.3	<	0.4	
1,2,3,7,8-PeCDF		0.2	*	<	0.1	<	0.3	<	0.4	
2,3,4,7,8-PeCDF	<	0.3			0.2	<	0.3	<	0.4	
1,2,3,4,7,8-HxCDF		0.9		<	0.1	<	0.3	<	0.4	
1,2,3,6,7,8-HxCDF		0.4		<	0.1	<	0.3	<	0.4	
1,2,3,7,8,9-HxCDF	<	0.2		<	0.1	<	0.3	<	0.4	
2,3,4,6,7,8-HxCDF	<	0.2		<	0.1	<	0.3	<	0.4	
1,2,3,4,6,7,8-HpCDF		5.6			0.3		0.4	<	0.4	
1,2,3,4,7,8,9-HpCDF		0.3	*	<	0.1	<	0.3	<	0.4	
TCDDs (total)		5.5			0.8	<	0.3	<	0.4	
PeCDDs (total)		3.5		<	0.1	<	0.3	<	0.4	
HxCDDs (total)		8.1			0.1	<	0.3	<	0.4	
HpCDDs (total)		19			1.0		14		0.6	
OCDD		54			3.4		4.8		4.8	
TCDFs (total)		39			5.7		0.3	<	0.4	
PeCDFs (total)		4.3			0.2	<	0.3	<	0.4	
HxCDFs (total)		6.6			0.2	<	0.3	<	0.4	
HpCDFs (total)		11			0.6		0.4	<	0.4	
OCDF		5.4			0.5		0.8		0.4	*

Data Summary(1)	Olcott Har	Johnson	Oak Orchard	Sterling
Tetra thru Octa Homolog Totals				
Dioxin Homologs	90.1	2.00	18.8	5.4
Furan Homologs	66.3	10.10	1.5	0.4
Sum	156.4	12.10	20.3	5.8
2,3,7,8-TCDD Toxic Equivalence(2)	0.6	0.16	0.0	0.0
2,3,7,8-TCDD Toxic Equivalence(3)	0.6	0.16	0.0	0.0
% lipid	0.75	0.60	n/a	0.45

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors

Dioxin/Furan Data - Macroinvertebrate Tissue Data

Dioxin in Tributaries Study

All concentrations pg/g, dry weight

Station	Sandy Ck		Salmon		Black Lake	Oswegatchie	
Sample Type	Tissue		Tissue		Tissue	Tissue	
Laboratory	Axys		Axys		Axys	Axys	
Analyte							
2,3,7,8-TCDD	<0.4		<0.3		<0.2	<0.2	
1,2,3,7,8-PeCDD	<0.4		<0.3		<0.2	<0.2	
1,2,3,4,7,8-HxCDD	<0.4		<0.3		<0.2	<0.2	
1,2,3,6,7,8-HxCDD	<0.4		<0.3		<0.2	0.3	
1,2,3,7,8,9-HxCDD	0.4		<0.3		<0.2	<0.2	
1,2,3,4,6,7,8-HpCDD	0.7		0.4	*	2.2	0.9	
2,3,7,8-TCDF	<0.4		0.9		0.2	2.9	
1,2,3,7,8-PeCDF	<0.4		<0.3		<0.2	<0.2	
2,3,4,7,8-PeCDF	<0.4		<0.3		<0.2	0.3	
1,2,3,4,7,8-HxCDF	<0.4		<0.3		<0.2	<0.2	
1,2,3,6,7,8-HxCDF	<0.4		<0.3		<0.2	<0.2	
1,2,3,7,8,9-HxCDF	<0.4		<0.3		<0.2	<0.2	
2,3,4,6,7,8-HxCDF	<0.4		<0.3		<0.2	<0.2	
1,2,3,4,6,7,8-HpCDF	0.6	*	<0.3		0.8	0.4	*
1,2,3,4,7,8,9-HpCDF	<0.4		<0.3		<0.2	<0.2	
TCDDs (total)	0.4		<0.3		<0.2	3.2	
PeCDDs (total)	<0.4		<0.3		<0.2	<0.2	
HxCDDs (total)	0.4		<0.3		0.5	1.9	
HpCDDs (total)	0.7		0.5		4.5	2.2	
OCDD	5.3		3.6		17	6.1	
TCDFs (total)	1.0		18		1.1	59	
PeCDFs (total)	<0.4		3.2		<0.2	4.8	
HxCDFs (total)	<0.4		1.3		1.0	1.8	
HpCDFs (total)	<0.4		<0.3		1.8	<0.2	
OCDF	1.0		0.4		1.3	0.3	*
Data Summary(1)							
Tetra thru Octa Homolog Totals							
Dioxin Homologs	6.8		4.1		22.0	13.4	
Furan Homologs	2.0		22.9		5.2	65.9	
Sum	8.8		27.0		27.2	79.3	
2,3,7,8-TCDD Toxic Equivalence(2)	0.1		0.1		0.1	0.5	
2,3,7,8-TCDD Toxic Equivalence(3)	0.1		0.1		0.1	0.5	
% lipid	0.42		1.6		0.76	2.4	

(1) Only results greater than laboratory reporting limits used in data summary.
(2) International Toxicity Equivalency Factors
(3) WHO Toxicity Equivalency Factors

APPENDIX B

Table B1 - Sum of Congener PCB Concentrations

	Sediment (ppb)	Tissue (ppb)	Water (ppt)
North Pond 0-30 cm	15.23		
North Pond 30-82 cm	0		
North Pond 30-82 cm	0		
Black Lake	10.22	4.07	ND
Oswegatchie River	464.64	288.7	1.03
Sandy Creek	2.35	6.94	1.94
Irondequoit Bay 0-10 cm	72.93		
Irondequoit Bay 10-40 cm	398.05		
Sodus Bay 1 0-10 cm	17.43		
Sodus Bay 2 0-10 cm	24.98		
Ellicott Creek	300.41		
Wilson Harbor	36.96		
Olcott Harbor	510.01	209.92	50.54
Johnson Creek	5.16	7.99	0.35
Oak Orchard Creek	12.43		0.45
Sterling Creek	1.51	0.11	0.05
Salmon Ck	2.37	29.99	1.3
Lake Erie (03)	7.28		
Lake Erie (06)	32.12		
Erie Basin Marina	815.13		
Buffalo Small Boat Harbor	148.59		
Cattaraugus Ck	3.94		0.34
Dunkirk Harbor	88.01		
Dunkirk Harbor	78.85		

*The sum of the PCB congeners was calculated using a zero for all non-detected congeners.

Grain Size Distribution

	DX097-04001-031022		DX097-04001-032285		DX097-04001-038514	
	Sodus Bay (2nd embay) 10-22		Sodus Bay (2nd embay) 22-85		Sodus Bay (2nd embay) 85-140	
U.S. Standard	Diameter		Diameter		Diameter	
Sieve Size	mm	% Finer	mm	% Finer	mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	100.0	4.750	100.0	4.750	100.0
#10	2.000	100.0	2.000	100.0	2.000	87.9
#20	0.850	99.9	0.850	99.8	0.850	75.6
#50	0.300	99.3	0.300	98.7	0.300	67.1
#100	0.150	97.9	0.150	97.0	0.150	62.4
#200	0.075	82.9	0.075	83.6	0.075	57.8
Hydrometer	0.0335	52.8	0.0372	52.4	0.0437	33.8
	0.0263	44.5	0.0284	43.7	0.0321	28.2
	0.0201	37.2	0.0222	30.7	0.0233	23.8
	0.0155	28.0	0.0161	26.4	0.0169	19.3
	0.0120	20.6	0.0123	19.9	0.0125	17.1
	0.0088	15.1	0.0090	14.5	0.0091	11.6
	0.0064	10.5	0.0065	9.1	0.0066	8.2
	0.0046	6.8	0.0047	6.9	0.0047	4.9
	0.0033	5.0	0.0033	4.8	0.0033	4.9
	0.0024	4.0	0.0024	4.8	0.0024	3.8
	0.0014	4.0	0.0014	3.7	0.0014	2.7
	0.0010	4.0	0.0010	3.7	0.0010	2.7
Description	light gray		light brown gray		light brown gray	
United Soil Classification System (USCS)	L, CL, MH, or CH		ML, CL, MH, or CH		ML, CL, MH, or CH	

Grain Size Distribution

	CTD97-04001-010010		CT097-07131-2		DX097-04001-011040	
	Irondequoit Bay 0-10		Cattaraugus Creek		Irondequoit Bay 10-40	
	just N of Lakes of NY sta #3				just N of Lakes of NY sta #3	
U.S. Standard	Diameter		Diameter		Diameter	
Sieve Size	mm	% Finer	mm	% Finer	mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	100.0	4.750	100.0	4.750	100.0
#10	2.000	77.3	2.000	99.9	2.000	81.3
#20	0.850	58.1	0.850	99.7	0.850	61.3
#50	0.300	49.6	0.300	97.7	0.300	53.7
#100	0.150	46.6	0.150	83.7	0.150	51.3
#200	0.075	43.9	0.075	67.9	0.075	49.8
Hydrometer	0.0496	30.5	0.0387	58.5	0.0475	26.3
	0.0353	27.8	0.0287	51.9	0.0338	24.9
	0.0250	27.8	0.0213	44.0	0.0241	23.4
	0.0178	25.2	0.0153	41.4	0.0171	22.0
	0.0130	22.5	0.0119	30.8	0.0127	19.2
	0.0093	19.8	0.0089	19.0	0.0091	16.3
	0.0066	17.1	0.0065	12.4	0.0065	13.4
	0.0047	14.5	0.0047	8.4	0.0046	10.6
	0.0033	11.8	0.0033	7.1	0.0033	7.7
	0.0024	9.1	0.0024	5.8	0.0024	6.3
	0.0014	9.1	0.0014	5.8	0.0014	6.3
	0.0010	9.1	0.0010	5.8	0.0010	4.9
Description	light brown		light gray		light brown gray	
United Soil Classification System (USCS)	SM or SC		ML, CL, MH, or CH		SM or SC	

Grain Size Distribution

	DX097-04001-014080		DX097-04001-018011		CTD97-04001-020010	
	Irondequoit Bay 40-80		Irondequoit Bay 80-115		Sodus Bay (near inlet) 0-10	
	just N of Lakes of NY sta #3		just N of Lakes of NY sta #3			
U.S. Standard	Diameter		Diameter		Diameter	
Sieve Size	mm	% Finer	mm	% Finer	mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	100.0	4.750	100.0	4.750	100.0
#10	2.000	87.4	2.000	87.0	2.000	99.4
#20	0.850	74.5	0.850	73.4	0.850	86.6
#50	0.300	68.4	0.300	67.5	0.300	77.8
#100	0.150	66.4	0.150	65.7	0.150	69.3
#200	0.075	65.0	0.075	64.0	0.075	54.8
Hydrometer	0.0457	35.0	0.0387	41.4	0.0406	37.1
	0.0327	32.1	0.0284	37.6	0.0311	27.7
	0.0233	30.7	0.0207	34.8	0.0231	21.1
	0.0169	24.9	0.0148	33.0	0.0169	16.4
	0.0125	22.1	0.0111	30.2	0.0127	11.7
	0.0090	19.2	0.0083	23.7	0.0093	7.0
	0.0065	13.5	0.0062	16.2	0.0066	5.1
	0.0047	9.2	0.0045	11.6	0.0047	4.1
	0.0033	7.7	0.0033	7.8	0.0034	3.2
	0.0024	6.3	0.0023	6.0	0.0024	3.2
	0.0014	6.3	0.0014	4.1	0.0014	3.2
	0.0010	4.9	0.0010	3.2	0.0010	3.2
Description	light gray		light gray		light brown gray	
United Soil Classification System (USCS)	L, CL, MH, or CH		ML, CL, MH, or CH		ML, CL, MH, or CH	

Grain Size Distribution

U.S. Standard Sieve Size	DX097-07131-7 Sandy Creek Diameter mm	% Finer	DX097-04001-021020 Sodus Bay (near inlet) 10-20 Diameter mm	% Finer	DX097-07131-8 Salmon Creek Diameter mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	99.3	4.750	100.0	4.750	99.7
#10	2.000	98.8	2.000	99.5	2.000	99.3
#20	0.850	95.9	0.850	90.9	0.850	93.1
#50	0.300	91.3	0.300	83.1	0.300	12.7
#100	0.150	81.5	0.150	71.9	0.150	3.7
#200	0.075	61.0	0.075	49.4	0.075	2.4
Hydrometer	0.0406	48.7	0.0430	37.2	0.0511	4.6
	0.0311	36.4	0.0325	26.9	0.0363	3.9
	0.0233	26.5	0.0238	21.1	0.0257	3.9
	0.0168	22.8	0.0172	16.5	0.0182	3.9
	0.0125	19.1	0.0128	13.1	0.0133	3.9
	0.0090	16.6	0.0093	8.5	0.0094	3.2
	0.0064	12.9	0.0066	7.3	0.0067	3.2
	0.0046	10.4	0.0047	6.2	0.0047	3.2
	0.0033	7.9	0.0034	3.9	0.0033	3.2
	0.0023	6.7	0.0024	3.9	0.0024	2.5
	0.0014	6.7	0.0014	3.9	0.0014	2.5
	0.0010	5.4	0.0010	2.8	0.0010	2.5
Description	pinkish gray		light brown gray		light brownish gray	
United Soil Classification System (USCS)	L, CL, MH, or CH		SM or SC		SP	

Grain Size Distribution

U.S. Standard Sieve Size	DX097-04001-022016 Sodus Bay (near inlet) 20-163 Diameter mm	% Finer	DX097-04001-021617 Sodus Bay (near inlet) 163-178 Diameter mm	% Finer	CTD97-04001-030010 Sodus Bay (2nd embay) 0-10 Diameter mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	100.0	4.750	100.0	4.750	100.0
#10	2.000	99.8	2.000	99.3	2.000	99.5
#20	0.850	98.2	0.850	91.2	0.850	87.8
#50	0.300	95.6	0.300	86.0	0.300	82.4
#100	0.150	91.2	0.150	80.3	0.150	77.2
#200	0.075	74.0	0.075	63.4	0.075	67.0
Hydrometer	0.0335	53.7	0.0420	38.3	0.0420	44.5
	0.0260	46.2	0.0314	30.7	0.0316	34.4
	0.0199	38.7	0.0233	23.1	0.0235	25.6
	0.0151	31.3	0.0174	13.4	0.0172	18.1
	0.0117	23.8	0.0130	10.2	0.0129	13.1
	0.0088	14.4	0.0093	6.9	0.0093	9.3
	0.0064	11.6	0.0067	4.8	0.0066	6.8
	0.0046	8.8	0.0047	3.7	0.0047	6.8
	0.0033	6.9	0.0034	3.7	0.0033	5.5
	0.0023	5.1	0.0024	3.7	0.0024	4.3
	0.0014	4.1	0.0014	3.7	0.0014	3.0
	0.0010	4.1	0.0010	2.6	0.0010	3.0
Description	light brown		light brown gray		light brown gray	
United Soil Classification System (USCS)	L, CL, MH, or CH		ML, CL, MH, or CH		ML, CL, MH, or CH	

Grain Size Distribution

U.S. Standard Sieve Size	CTD97-05001-01 Ellicott Creek Diameter mm	CTD97-05001-01 Ellicott Creek % Finer	CT097-07131-1 Dunkirk Harbor Diameter mm	CT097-07131-1 Dunkirk Harbor % Finer	CT097-07131-4 Erie Basin Marina Diameter mm	CT097-07131-4 Erie Basin Marina % Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	98.5	4.750	100.0	4.750	100.0
#10	2.000	88.5	2.000	99.2	2.000	87.6
#20	0.850	77.3	0.850	97.4	0.850	71.8
#50	0.300	66.5	0.300	92.5	0.300	61.2
#100	0.150	54.8	0.150	63.5	0.150	57.1
#200	0.075	44.4	0.075	30.7	0.075	53.9
Hydrometer	0.0391	31.6	0.0466	26.3	0.0447	39.1
	0.0284	29.4	0.0336	22.6	0.0321	36.2
	0.0207	27.3	0.0242	18.9	0.0231	31.9
	0.0148	25.8	0.0173	16.5	0.0166	29.1
	0.0111	23.6	0.0130	11.6	0.0123	26.2
	0.0082	19.2	0.0093	7.9	0.0091	16.2
	0.0061	14.1	0.0066	6.6	0.0066	10.5
	0.0044	12.0	0.0047	5.4	0.0047	7.7
	0.0032	9.0	0.0033	5.4	0.0033	6.3
	0.0023	7.6	0.0024	4.2	0.0024	6.3
	0.0013	6.1	0.0014	4.2	0.0014	4.8
	0.0010	4.7	0.0010	4.2	0.0010	4.8
Description	grayish brown		light brownish gray		light gray	
United Soil Classification System (USCS)	SM or SC		SM or SC		ML, CL, MH, or CH	

Grain Size Distribution

U.S. Standard Sieve Size	CT097-07131-5 BufSm. Boat Harbor Diameter mm	% Finer	LE097-07131-6 Lake Erie (6) Diameter mm	% Finer	CTD 97-05001-02 Wilson Harbor Diameter mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	100.0	4.750	100.0	4.750	100.0
#10	2.000	85.6	2.000	99.9	2.000	99.5
#20	0.850	69.9	0.850	99.9	0.850	96.1
#50	0.300	60.6	0.300	99.6	0.300	89.0
#100	0.150	55.5	0.150	98.8	0.150	81.2
#200	0.075	50.5	0.075	86.1	0.075	63.9
Hydrometer	0.0440	39.1	0.0395	56.1	0.0384	36.1
	0.0321	33.8	0.0307	41.6	0.0297	28.2
	0.0231	29.8	0.0233	28.3	0.0223	21.8
	0.0169	23.1	0.0168	24.4	0.0165	17.0
	0.0126	19.1	0.0126	19.1	0.0124	13.9
	0.0090	16.5	0.0090	16.4	0.0090	9.9
	0.0065	12.5	0.0065	11.1	0.0065	6.7
	0.0046	9.8	0.0047	8.5	0.0046	5.9
	0.0033	7.2	0.0033	7.1	0.0033	4.3
	0.0024	5.8	0.0024	5.8	0.0024	3.5
	0.0014	5.8	0.0014	5.8	0.0014	3.5
	0.0010	4.5	0.0010	5.8	0.0010	3.5
Description	light brownish gray		light gray		brownish gray	
United Soil Classification System (USCS)	., CL, MH, or CH		ML, CL, MH, or CH		ML, CL, MH, or CH	

Grain Size Distribution

U.S. Standard Sieve Size	DXO 97-05001-03 Olcott Harbor Diameter mm	% Finer	DXO 97-05001-04 Johnson Creek Diameter mm	% Finer	DXO 97-05001-05 Oak Orchard Creek Diameter mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0	9.500	100.0
#4	4.750	100.0	4.750	100.0	4.750	100.0
#10	2.000	98.9	2.000	98.5	2.000	98.1
#20	0.850	94.0	0.850	94.7	0.850	92.0
#50	0.300	85.7	0.300	88.6	0.300	85.1
#100	0.150	75.2	0.150	75.0	0.150	73.0
#200	0.075	62.6	0.075	51.7	0.075	51.6
Hydrometer	0.0430	33.3	0.0430	34.6	0.0453	32.1
	0.0323	25.1	0.0318	28.2	0.0334	24.5
	0.0238	18.9	0.0235	21.8	0.0242	19.5
	0.0173	13.8	0.0170	17.5	0.0174	15.7
	0.0130	9.7	0.0127	14.3	0.0128	14.4
	0.0092	8.6	0.0091	12.2	0.0091	13.1
	0.0066	6.6	0.0065	9.0	0.0066	9.4
	0.0047	5.6	0.0047	6.8	0.0047	8.1
	0.0033	5.6	0.0033	5.8	0.0033	6.8
	0.0024	4.5	0.0024	4.7	0.0024	5.6
	0.0014	4.5	0.0014	4.7	0.0014	5.6
	0.0010	4.5	0.0010	4.7	0.0010	5.6
Description	brownish gray		brownish gray		brown	
United Soil Classification System (USCS)	L, CL, MH, or CH		ML, CL, MH, or CH		ML, CL, MH, or CH	

Grain Size Distribution

U.S. Standard Sieve Size	DXO 97-05001-06 Sterling Creek		CTD 97-09211-11 Black Lake		CTD 97-09211-030030 North Pond (0-30)	
	Diameter mm	% Finer	Diameter mm	% Finer	Diameter mm	% Finer
3"	75.00	100.0	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	51.1	9.500	100.0
#4	4.750	100.0	4.750	29.2	4.750	100.0
#10	2.000	99.2	2.000	20.7	2.000	99.8
#20	0.850	97.8	0.850	13.1	0.850	98.3
#50	0.300	87.3	0.300	8.0	0.300	93.5
#100	0.150	43.6	0.150	6.3	0.150	80.8
#200	0.075	16.1	0.075	4.8	0.075	53.6
Hydrometer	0.0494	15.5	0.0517	10.8	0.0430	33.7
	0.0355	11.7	0.0365	10.8	0.0325	24.3
	0.0255	8.0	0.0258	10.8	0.0242	16.0
	0.0182	6.7	0.0183	10.8	0.0174	12.9
	0.0133	6.7	0.0134	8.3	0.0130	9.8
	0.0094	6.7	0.0095	8.3	0.0093	7.7
	0.0067	5.5	0.0067	8.3	0.0066	5.6
	0.0047	5.5	0.0047	8.3	0.0047	4.6
	0.0033	5.5	0.0034	5.9	0.0034	3.5
	0.0024	5.5	0.0024	3.4	0.0024	3.5
	0.0014	5.5	0.0014	3.4	0.0014	3.5
	0.0010	4.2	0.0010	3.4	0.0010	3.5
Description	grayish brown		gray		gray	
United Soil Classification System (USCS)	SM or SC		GW		ML, CL, MH, or CH	

Grain Size Distribution

	CTD 97-09211-033082		CTD 97-09211-12	
	North Pond (30-82)		Oswegatchie	
U.S. Standard	Diameter		Diameter	
Sieve Size	mm	% Finer	mm	% Finer
3"	75.00	100.0	75.00	100.0
1½"	37.50	100.0	37.50	100.0
3/4"	19.00	100.0	19.00	100.0
3/8"	9.500	100.0	9.500	100.0
#4	4.750	100.0	4.750	100.0
#10	2.000	99.8	2.000	95.4
#20	0.850	93.5	0.850	91.3
#50	0.300	85.1	0.300	72.7
#100	0.150	75.5	0.150	39.0
#200	0.075	44.2	0.075	20.8
Hydrometer	0.0460	26.8	0.0478	16.7
	0.0336	21.0	0.0347	12.8
	0.0247	14.2	0.0250	10.0
	0.0177	11.9	0.0179	8.0
	0.0130	9.6	0.0131	7.1
	0.0093	7.3	0.0093	7.1
	0.0066	6.2	0.0066	6.1
	0.0047	5.0	0.0047	5.2
	0.0034	3.9	0.0033	4.2
	0.0024	2.7	0.0024	4.2
	0.0014	2.7	0.0014	4.2
	0.0010	2.7	0.0010	3.3
Description	gray		light grayish brown	
United Soil Classification System (USCS)	SM or SC		SM or SC	