932031

Occidental Chemical Corporation

Industrial & Specialty Chemicals

Olin

CHEMICALS GROUP

NIAGARA RIVER SEDIMENT SURVEY

102nd Street Landfill

October 1988

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102nd Street Landfill

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Ref. No. 1431

CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

This report is intended to provide historical data and information on the presence of chemicals in the Niagara River sediment in the area of the 102nd Street Landfill Site. The detected levels of chemicals in the sediment directly adjacent to the Site are compared with levels further out from shore and upstream of the Site. This information will aid in the interpretation of chemical data used to delineate the influence of the 102nd Street Landfill Site on sediment in the area and also in identifying background levels of chemicals known to be in the area.

The locations of all of the identified sediment sampling stations have been estimated and plotted on attached Map 1. Although this report discusses only historical sediment sampling programs, Map 1 also includes the recent sediment sampling locations from the Remedial Investigation conducted in 1986/87. These have been included to show the total distribution of sediment samples taken adjacent to the 102nd Street Landfill Site.

2.0 HISTORICAL SAMPLING PROGRAMS AT THE SITE

Since 1976, several sampling programs were initiated in order to determine the extent of the migration of chemicals from the 102nd Street Landfill Site into the sediment deposits of the Niagara River. The following is a list of the known sampling programs that have been undertaken:

Hooker Chemicals & Plastics Corp.	- November 1976
RECRA Phase I (OLIN)	- November 1978
Arthur D. Little, Inc. (Hooker)	- April-June 1979
Hydroscience (Hooker)	- April 1979
Hooker Chemicals & Plastics Corp.	- June 1979
Hites/EPA	- June-November 1979
RECRA Phase II (OLIN)	- October 1979
NYSDOH/NYSDEC	- November 1979
Arthur D. Little, Inc. (Hooker)	- August 1981
Jaffe/EPA	- September 1981
USEPA	- May 1982
Malcolm Pirnie, Inc./NYSDEC	- January 1983
U.S. Army Corps of Engineers	- September 1983

Each of the above sampling programs is briefly described in the following sections.

2.1 1976 - HOOKER CHEMICALS & PLASTICS CORP.

In November 1976 a sampling program was conducted by Hooker Chemicals and Plastics Corp. and the New York State Department of Environmental Conservation (NYSDEC). The program consisted of sampling at three waste disposal sites; 102nd Street Landfill, Hyde Park Landfill and Love Canal. Two sediment samples and one water sample were taken at the 102nd Street Landfill from the locations illustrated in Figure A-1 (in Appendix A).

The analysis of the samples was performed at the New York State Department of Health Laboratories in Buffalo, Syracuse and Albany and the results are presented in Table A-1. The sediment samples were analyzed for metals, PCB and Mirex. The PCB and Mirex analytical results were not found for the soil sample located in the lowland area downstream from the Storm Sewer Outlet. Elevated concentrations of PCBs were identified at the Storm Sewer Outlet.

2.2 1978 - RECRA (PHASE I)

On November 30, 1978, RECRA Research Inc. and Wehran Engineering P.C. conducted a sediment sampling program at the 102nd Street Landfill. This program will hereinafter

be referred to as the RECRA (Phase I) study. On the above-mentioned date, six sediment samples (SS3 through SS8) were taken along the shore of OLIN's portion of the 102nd Street Landfill. Another sample (SS2) was taken immediately east of the Site with the last sample (SS1) being taken in the adjacent bay to the east of the Site as an upstream background sample. Pertinent portions of the RECRA (Phase I) report are included in Appendix B including the tables of analytical results.

The sediment samples were analyzed for phenols, grease and oils, total mercury, total halogenated organics, total chlorinated organics, four isomers of hexachlorocyclohexane (BHC) and total N-P organics. In summary, low concentrations of phenols and chlorinated organics were found upstream (SS1). At SS2, elevated levels of phenols, mercury, chlorinated organics and delta-BHC were detected indicating the hydrogeologic connection of the landfill to the area east of the OLIN Site. The sediment samples taken adjacent to the Site (SS3 to SS8) indicated elevated levels of mercury, total halogenated organics, phenols and delta-BHC at most of all sampling locations.

A 1980 report (updated to include 1983 data) by Arthur D. Little Inc. entitled "Presentation Viewgraphs, 102nd Street", included some drawings showing sampling locations and chemical concentrations for four sampling

programs. RECRA (Phase I) is the first of these programs. The ADL report presented results for the following six parameters:

Arsenic,

BHC,

Hexachlorobenzene,

Lead,

Mercury, and

Trichlorobenzene

The RECRA (Phase I) study included only two of the above parameters (Mercury and BHC). Only the six sampling stations along the shore of OLIN's portion of the 102nd Street Landfill are included in the ADL report. All six viewgraphs from the ADL report are presented in Appendix C.

2.3 1979 - ADL

A report by Arthur D. Little Inc. (ADL) entitled "Chemical Migration Patterns and Ecological Impacts, 102nd Street Landfill" contains data from a 1979 sampling program. Sediment samples were taken at eight sampling locations along the Niagara River shoreline and at five sampling locations from the bottom of the Niagara River in the shallow waters

ten feet off-shore. Figure D-1 (in Appendix D) identifies the sampling locations while Figures D-2 and D-3 illustrate the Base/Neutral Extractables and Pesticides and PCBs analytical results respectively.

Analysis of the off-shore samples was not performed for Volatile Organics, Acid Extractables and Heavy Metals. Analytical data for all the parameters included in the analyses at the 13 sampling locations is included in Appendix D.

2.4 1979 - HYDROSCIENCE

A report by Hydroscience, Inc. entitled "Priority Pollutant Investigation Report, - Screening of Waters and Sediment" contains results from a 1979 sampling program performed by the United States Environmental Protection Agency (EPA) and Hooker Chemicals & Plastics Corp. One soil sample was taken by EPA representatives on April 12, 1979 in the lowland area downstream from the Storm Sewer Outlet. The sample was taken from the largest of three seepage locations in the lowland area. The EPA team returned to the 102nd Street Landfill on April 19, 1979 and collected three sediment core samples along the Olin and Hooker sections of the Niagara River and two soil samples along the

Griffon Park shoreline, slightly west of the 102nd Street Landfill Site (Figure E-1, Appendix E).

The initial sample from the lowland area, was analyzed for Volatile Priority Pollutants and the results are presented in Table E-1 of Appendix E. The "Priority Pollutant Investigation Report - Screening of Waters and Sediment" contained analytic results for four of the five remaining samples. The surface samples and core samples were analyzed for all Priority Pollutants; Volatiles, Pesticides, Acid Compounds, Base/Neutral Compounds and Metals. The results are presented in Table E-1. Results were not found for the core sediment sample immediately in front of the Storm Sewer Outfall.

2.5 1979 - HOOKER CHEMICALS & PLASTICS CORP.

In June 1979, Hooker Chemicals & Plastics Corporation performed a sampling program consisting of ten sediment and water samples at five locations ten feet from the Niagara River shoreline. Two samples were located in front of the Olin property; one directly in line with the Storm Sewer Outlet and the second 40 feet upstream. Two samples were located along the Hooker section of the 102nd Street Landfill shoreline and the final sample was taken 125 feet downstream from the 102nd Street Landfill in front of Griffon Park.

The analyses were performed by Radian Corporation, of Austin, Texas. The results are presented in the report entitled "Analysis of Ten Water and Sediment Samples". (Table F-1, Appendix F). The samples were analyzed for ten specific compounds. A repeat analysis was performed on one sample after a three-month storage period.

2.6 1979 - HITES

Sediment sampling was conducted by Ronald A. Hites under EPA research grant No. R-806350. Environmental Science and Technology, October 1981, published an article describing this sampling program. Samples were collected at three Niagara Falls sites (102nd Street, Gill Creek and Bloody Run Creek) between June and November 1979. Sediment samples at 102nd Street were collected at four locations along the shoreline and approximately 100 feet from shore. Table G-1 (in Appendix G) contains the maximum concentrations for major compounds detected in those sediments. The article does not discuss the data at the shore in comparison with the off-shore data nor does it present that data or include any figure(s) indicating the sample locations.

2.7 1979 - RECRA (PHASE II)

In October of 1979 and January of 1980, RECRA Research Inc. and Wehran Engineering P.C. conducted a second

sediment sampling program at the 102nd Street Landfill Site. This program will hereinafter be referred to as the RECRA (Phase II) study. On the above-mentioned dates, 25 surface sediment samples (G-1 through G-25) and 16 subsurface sediment samples were collected from the Niagara River in the bay adjacent to OLIN's portion of the 102nd Street Landfill. On July 23, 1980, 11 samples (RS-1 through RS-11) were taken upstream of the landfill site to serve as background samples. Pertinent portions of the RECRA (Phase II) report, including tables of analytical results, are included in Appendix H.

All of the sediment samples collected were analyzed for total mercury and total halogenated organics with five of the samples being additionally tested for BHC isomers, chlorobenzenes, total phenols, chlorophenols (chlorinated priority pollutant phenolics), and 2, 4, 5-trichlorophenol.

The RECRA (Phase II) report indicated that there were elevated levels of total mercury and total halogenated organics present in the three samples just upstream of the eastern edge of the landfill site (RS-1, RS-2 and RS-3).

The sediment samples taken adjacent to the Site indicated that the highest concentrations occurred in areas adjacent to the central and western portions of the

Site. A plume of elevated levels of total halogenated organics was found to extend into the river from the central section of the landfill with the highest concentration occurring in the sample taken closest to the sewer outfall in the western portion of the Site. Two small plumes of total mercury were identified; one near the center of the landfill and one adjacent to the sewer outfall.

RECRA (Phase II) is the second of four sampling programs which were included in the "Presentation Viewgraphs" report by Arthur D. Little, Inc. Appendix C contains the six viewgraphs with RECRA (Phase II) data for surface sediments included.

2.8 1979 - NYSDOH/NYSDEC

In 1979 and 1980 a study was conducted by the NYSDOH and NYSDEC to gather dioxin data in relation to Love Canal. Results of this study were reported in "Environmental Science & Technology" in 1983.

One of the samples collected was described as black sediment collected from storm sewer outflow at 102nd Street and East Niagara River. Dioxin was detected in this sample at 31 ng/g.

Appendix I contains a table of all dioxin results for the sediments of the Niagara River near the 102nd Street Landfill.

2.9 1981 - ADL

The third of four sampling programs which are included in the viewgraphs presented in Appendix C, was conducted by Arthur D. Little, Inc. in 1981. Six pairs of sampling locations were involved with each pair including a shoreline sample and sample ten feet off-shore.

2.10 1981 - JAFFE

Sediment sampling was conducted by Rudolf Jaffe under EPA research grant No 808961. The Journal of Great Lakes Research, 1984, published an article describing this sampling program. This article was co-authored by Ronald A. Hites of the ES&T article discussed earlier.

The field work involved the collection of nine sample locations from which core samples were obtained using a stainless steel cylindrical core sampling device. Figure J-1 presents the nine sampling locations while

Table J-1 presents the analytical results for six of the nine locations. The data for the remaining locations could not be located and it is assumed that these samples were not collected.

It can be seen from the analytical data that the chemical concentrations decrease with sample depth as would be expected. The data also reveals that the highest concentrations are found in the surface sediments directly adjacent to the landfill.

2.11 1982 - USEPA

In May 1982 the USEPA collected three sediment samples from the Niagara River near the 102nd Street storm sewer outfall. The levels of dioxin in these samples ranged from 0.02 ppb to 0.10 ppb.

Results are included on Table I-1 in Appendix I and sampling locations are shown on Figure I-1.

Total Organics (includes all "other extractables" detected), and
Heavy Metals.

Figures K-2 through K-5 present the concentrations for the Volatile Organics, Base/Neutral Extractables, Pesticides and PCBs and Total (priority pollutant) Organics, respectively, and also indicate the limits of the 10 ppm chemical concentrations for each priority pollutant fraction. The Acid Extractable fraction of the priority pollutant list was not detected at any sampling location and therefore no figure has been prepared.

When the "other extractables" are included as in Figure K-6, the same basic limits of chemical concentrations exist, however, the measured concentrations are approximately one-half order of magnitude higher. Some examples of these "other extractables" and where they were found are:

Tricosane	- 810 ppm at G-9a
Unknown Acid Extractable	- 540 ppm at E-9a
1,2,4-Trichlorobenzene	- 200 ppm at E-9a
1,2,3,4,5,6-Hexachlorobenzene	- 200 ppm at E-9a
1,2,3,5-Tetrachlorobenzene	- 160 ppm at E-9a
Eicosane	- 140 ppm at G-9a
Pentacosane	- 110 ppm at G-9a
1,2,3,5-Tetrachlorobenzene	- 106 ppm at F-9a

These "other extractables" have been identified by best-fit mass spectrometric matching of computer library mass spectra. They are presumed to be reported as "significant" (defined as those compounds exhibiting peaks of at least 25 percent of the nearest internal surrogate standard), and their quantification (concentration) is therefore qualitative (estimated) since their relationship to the internal surrogate standard is unquantified. "Unknown" denotes that the match of chromatographic patterns had a confidence level of less than 80 percent.

Figure K-7 presents the Heavy Metal concentrations for all of the sampling locations.

2.12.2 Dioxin

Sixty-three samples were collected from 39 locations for analysis of Dioxin. Samples were collected at one-foot intervals ranging from 0 to 3 feet.

Dioxin was detected in only one sample (see Table I-1 and Figure I-1).

2.12.3 River Bottom Elevations

At the time of Malcolm Pirnie's sampling in January 1983; a survey was conducted to determine the elevations of the River bottom adjacent to the outfall. An extensive grid system was used as shown in Figure K-1 and the results of this survey are presented in Figure K-8.

Also included in Figure K-8 is a contour marked "estimated five-foot water depth". The five-foot contour is based on the USGS maps of the area. It should be noted that the USGS map does not provide information to determine the stage of the river at the time the contours were generated. This is important since the River fluctuates as much as four feet in elevation depending upon the flow conditions from Lake Erie wind and ice. The water elevation is further complicated by the presence of the Chippawa-Grass Island Pool which is used to regulate the volume of water released to the Falls and to provide a constant supply of water to the two hydroelectric power authorities. The 102nd Street Site is located within the area of influence of the Chippawa-Grass Island Pool and is therefore subject to a constantly changing water elevation. Details of the restrictions at the Chippawa-Grass Island Pool are found in a report entitled "Historical Review, Hydrogeologic Conditions, Plan of Remedial Work" by Conestoga-Rovers & Associates.

The estimated five-foot contour was included since this was decided upon as the limit of sediment sampling specified in the agreed "Work Plan" for the 102nd Street Site.

2.13 1983 - U.S. ARMY CORPS OF ENGINEERS

In September 1983, the United States Army Corps of Engineers undertook a sampling program immediately downstream from the 102nd Street Landfill in the Little Niagara River surrounding Cayuga Island. The sampling was performed to assess the feasibility of dredging the Little Niagara River for small craft navigation and to determine the appropriate disposal location for the dredged material. Twelve sediment samples were taken in total from seven sampling locations of which three locations were adjacent to Griffon Park. The remaining samples were located further downstream (Figure L-1, Appendix L).

Priority Pollutant analyses and EP toxicity tests of the sediments were completed by Floyd Browne Associates, Limited from Ohio and the results are presented in Tables L-1 through L-4.

2.13.1 Dioxin

Sediment samples from the Little River were also analyzed for Dioxin. Results for all twelve samples are included on Table I-1. Locations are as shown on Figure L-1.

3.0 HISTORICAL SAMPLING PROGRAMS UPSTREAM OF THE SITE

Many sediment sampling programs have been conducted in the past in the Niagara River between Lake Erie and Lake Ontario. Although these studies were not directly involved in the 102nd Street Landfill sediment sampling program, they provide data useful in interpreting the extent of contamination present in the river sediments upstream of the landfill site. This information can be used to determine the relative role of the 102nd Street Landfill Site in contributing to the contamination of the Niagara River sediments.

3.1 1978 - RECRA (PHASE I)

As part of the RECRA (Phase I) sampling program (Section 2.2) one sediment sample, SS1, was collected a sufficient distance upstream in the bay east of the landfill site.

The analysis of this sample indicated the presence of phenols and total halogenated organics but at relatively low concentrations of 2.5 and 0.37 ug/g, respectively. BHC isomers were also detected in the sample but were present in concentrations too low to quantify.

Analytical results from the RECRA (Phase II) study are included in Appendix B. In general, the one upstream sediment sample contained contaminants in concentrations less than those detected in the downstream samples for all parameters tested.

3.2 1979 - RECRA (PHASE II)

The RECRA (Phase II) sampling program (Section 2.7) included ten sampling locations upstream of the 102nd Street Landfill Site. These samples were used to determine background levels for the downstream samples. The results of the analysis of these samples are included in Appendix H.

It was determined that the background levels for total mercury and total halogenated organics for surface sediments were 0.08 ug/g and 0.41 ug/g, respectively, and for subsurface sediments were <0.05 ug/g and 0.23 ug/g, respectively. The surface sediment background levels were determined using seven samples and the subsurface levels were determined using one sample.

3.3 1984 - THE NIAGARA RIVER TOXICS COMMITTEE

In October of 1981, the Niagara River Toxics Committee was established to oversee and co-ordinate a study on toxic substances pollution in the Niagara River. The committee consisted of representatives of:

Environment Canada,
United States Environmental Protection Agency,
Ontario Ministry of the Environment, and
New York State Department of Environmental Conservation.

The Niagara River Toxics Project consolidated a series of existing sub-projects that had been individually designed to fulfill certain agency objectives. To offset deficiencies or gaps in data, various sub-project activities were augmented and others developed specifically for this Toxics Committee study. The results of this study were published in October 1984 in the report entitled "Report of the Niagara River Toxics Committee".

Only the data upstream of the 102nd Street Landfill from the Site to the Buffalo City limits (where the Niagara River splits at Grand Island) has been included in this report. The 1981 Buffalo New York Area Sediment Survey (BASS) was included in the Niagara River Toxics Committee report but the analytical results were not presented. The

BASS report has therefore been included in Section 3.4 of this report.

Three separate studies conducted in 1979, 1981 and 1982 involved sediment samples within the upstream area. These studies were:

1979 - Sub-project 27a, Niagara River Sediment Survey (1979), Ontario Ministry of the Environment.

1981 - Sub-project 23, Toxics Contaminants Sources Survey, Inland Waters Directorate, Ontario Region, Environment Canada.

1982 - Sub-project 12, Open Lake (Erie) Dredge Spoil Site Sampling, U.S. Environmental Protection Agency, Region II New York, N.Y.

The locations included from these three projects were labeled M-5 through M-9 (1979), E-5 through E-9 (1981) and U-28 through U-33 (1982). M-9, E-9 and U-33 are considered to be at the Site while the remaining 13 locations are upstream of the Site. Appendix M presents the pertinent results from these three studies.

Figure M-1 identifies the location of all 16 sampling locations used. Bottom sediments for all the programs discussed in the Niagara River Toxic Committee report were obtained using Ponar, Shipek or modified Shipek dredge samplers which collected the upper, most recently deposited sediments. Tables M-1, M-2, M-3 present the data for each of the three previously mentioned projects. Table M-4 summarizes all three studies.

3.4 1981 - BUFFALO NEW YORK AREA SEDIMENT SURVEY (BASS)

In 1981 the Great Lakes National Program Office (GLNPO) collected river sediments in the Buffalo, New York area to determine the extent of toxicant contamination in various sections of the Niagara and Buffalo Rivers. In May of that year 93 sites were sampled, only 15 of which are pertinent to this report, and those are illustrated on Figure N-1 of Appendix N. (Note that there were two separate samples collected at location G61.)

This report was included in the 1984 Report of The Niagara River Toxics Committee (see Section 3.3), but the analytical results were not presented. The analytical results of the BASS study are included in Table N-1 of Appendix N. A summary of this data is presented in Table N-2

which separates the 12 upstream sites from the three sites in the 102nd Street Landfill vicinity. This table includes the maximum concentrations found in the group of samples and the number of samples in the group which had concentrations above the detection limits.

4.0 REFERENCES

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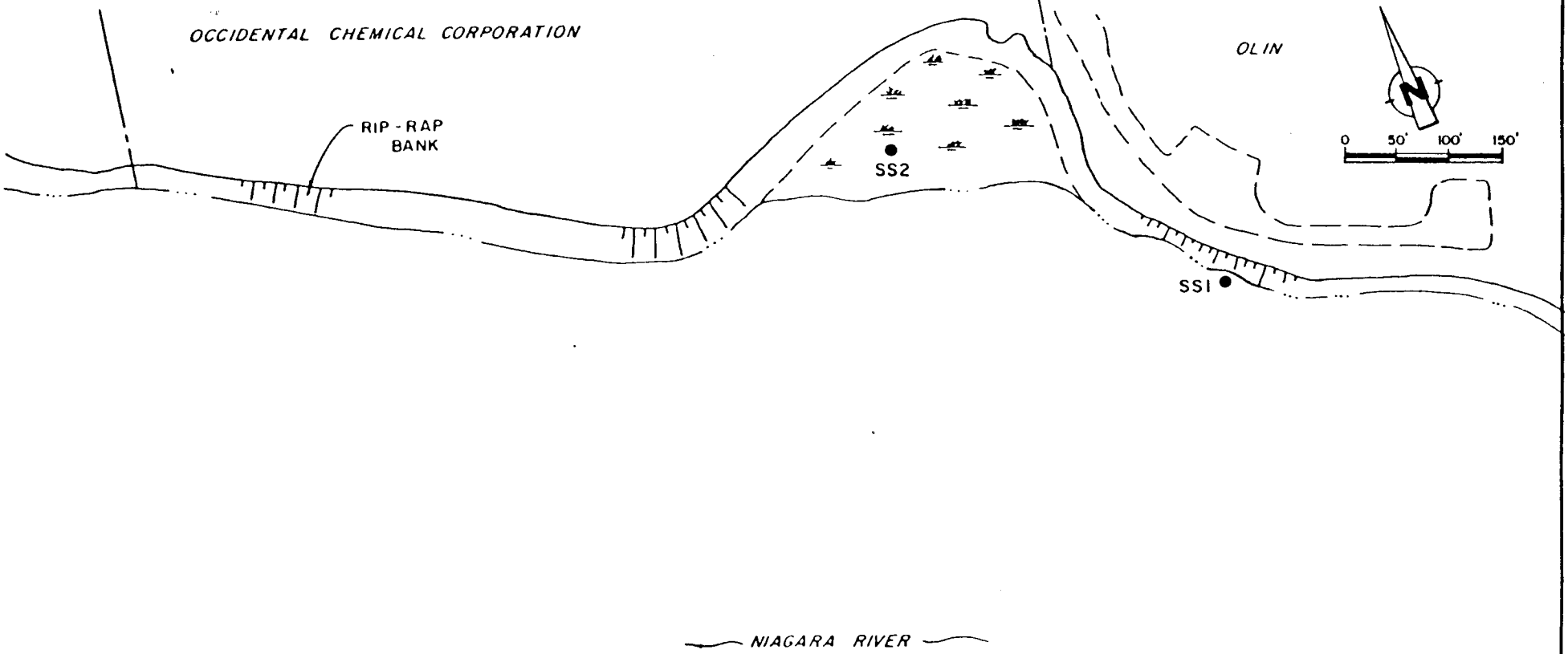
APPENDIX A

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(Hooker Chemicals & Plastics Corp. - 1976)



LEGEND

● SEDIMENT SAMPLING LOCATIONS
HOOKER CHEMICALS AND PLASTICS CORP. -1976

figure A-1

RIVER SEDIMENT SAMPLING LOCATIONS
HOOKER CHEMICALS AND PLASTICS CORP./NYSDEC - 1976
102nd Street Landfill

CRA

1431-17/06/87-9-D-1

TABLE A-1

ANALYTICAL RESULTS 102ND STREET LANDFILL

Analytical Parameters	SS1	SS2
Hg, ppm	8.6	6.6
Total Phos., ppm	14	178
Ni, ppm	7.9	14.4
Cu, ppm	20.0	12.5
Cd, ppm	<1	1.3
Pb, ppm	415	676
% Fe	0.4	0.7
Cr, ppm	23.4	119
Mn, ppm	373	338
PCB 1016/1242 ppm	160,000	--
PCB 1254 ppm	6,600	--
PCB 1221 ppm	<0.3	--
Total PCB ppm	166,600	--
Mirex ppm	<0.007	--

APPENDIX B

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(RECRA Phase I - 1978)

HYDROGEOLOGIC INVESTIGATION

OLIN 102nd STREET LANDFILL

NIAGARA FALLS, NIAGARA COUNTY, NEW YORK

Prepared for

OLIN CHEMICAL CORP.

Prepared by

RECRA RESEARCH, INC.
and WEHRAN ENGINEERING CORPORATION

(WE/Recra Project No. 01569004/8C038092)

TABLE 4
ANALYTICAL RESULTS

The Olin Chemical Group
Hydrogeologic Investigation - 102nd Street Landfill

Report Date: 1/31/79
Sample Date: 11/21/78 - 12/15/78

RIVER SEDIMENTS

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION SS1	SS2	SS3	SS4	SS5	SS6
Dry Weight	%	83.0	83.4	82.9	84.7	82.6	70.6
Phenols	ug/g (dry)	2.5	7.1	1.5	<1.5	5.7	3.3
Grease and Oils	mg/g (dry)	1.5	2.4	1.2	2.5	4.1	1.6
Total Mercury	ug/g (dry)	0.5	12	19	14	220	24

COMMENTS: Values reported as "less than" indicate working detection limits for the parameter evaluated.

FOR RECRA RESEARCH, INC. Robert K Lyeth

DATE 2/5/79

TABLE 4
ANALYTICAL RESULTS

The Olin Chemical Group
Hydrogeologic Investigation - 102nd Street Landfill

Report Date: 1/31/79
Sample Date: 11/21/78 - 12/15/78

RIVER SEDIMENTS

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION SS7	SS8
Dry Weight	%	78.8	81.2
Phenols	µg/g (dry)	<1.5	2.1
Grease and Oils	mg/g (dry)	0.3	8.5
Total Mercury	µg/g (dry)	6.0	61

COMMENTS: Differences in detectabilities for a given parameter is due to varying sample volumes taken for analyses.

FOR RECRA RESEARCH, INC. Robert K Wyatt

DATE 2/5/79

TABLE 5
ANALYTICAL RESULTS

The Olin Chemical Group
Hydrogeologic Investigation - 102nd Street Landfill Site

Report Date: 1/31/79
Sample Date: 11/15/78 - 12/15/78

RIVER SEDIMENTS

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION SS1	SS2	SS3	SS4	SS5	SS6
Total Halogenated Organics (GLC/ECD)	µg/g (dry) as Chlorine; Lindane Standard	0.37	25.5	9.74	13.9	392	329
Total Chlorinated Organics (GLC/Coulson)	µg/g (dry) as Chlorine; Lindane Standard	0.4	25.2	2.5	3.6	378	283
α - BHC	µg/g (dry)	<0.3	<0.5	<0.5	<0.5	<2.0	1.6
β - BHC	µg/g (dry)	<0.3	<0.5	<0.5	<0.5	<2.0	<1.0
γ - BHC	µg/g (dry)	<0.3	<0.5	<0.5	<0.5	4.5	6.8
Δ - BHC	µg/g (dry)	<0.3	6.1	2.8	1.2	30.1	15.1
Total N-P Organics (GLC/NPD)	µg/g (dry) as Nitrogen; Dimethyl-Aniline Standard	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

COMMENTS: The Coulson chromatograms were also evaluated for the α, β, γ, Δ isomers of BHC (hexachlorocyclohexane). There values are not directly comparable to the THO or TCO results since these results are expressed as the compound and not as Chlorine.

FOR RECRA RESEARCH, INC. Robert K Wyeth

DATE 2/8/79

RECRA RESEARCH, INC. 111 Wales Avenue / Tonawanda, New York
TOTAL CHEMICAL WASTE MANAGEMENT THROUGH APPLIED RESEARCH

TABLE 5
ANALYTICAL RESULTS

The Olin Chemical Group
Hydrogeologic Investigation - 102nd Street Landfill Site

Report Date: 1/31/79
Sample Date: 11/21/78 - 12/15/78

RIVER SEDIMENTS

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION SS7	SS8
Total Halogenated Organics (GLC/ECD)	µg/g (dry) as Chlorine; Lindane Standard	8.13	704
Total Chlorinated Organics (GLC/Coulson)	µg/g (dry) as Chlorine Lindane Standard	7.4	-
α - BHC	µg/g (dry)	<0.2	-
β - BHC	µg/g (dry)	<0.2	-
γ - BHC	µg/g (dry)	<0.2	-
Δ - BHC	µg/g (dry)	0.2	-
Total N-P Organics (GLC/NPD)	µg/g (dry) as Nitrogen; Dimethyl-Aniline Standard	<0.02	-

COMMENTS: Also, for the purpose of data evaluation, the differences in response factors for Δ - BHC (7.5) and γ - BHC (4.5; Lindane) must be considered.

FOR RECRA RESEARCH, INC. Robert K Wyeth

DATE 2/8/79

Surface Water Quality

Niagara River

Surface water samples from the Niagara River area were collected on two dates: November 21, 1978 and December 15, 1978. Sediment samples from the Niagara River were collected on November 30, 1978. Data concerning the analysis of these samples is contained in Tables 4 and 5. Sample point locations are delineated in Figure 2. With the exception of sample point SS8, sediment samples were taken at the same general locations as the surface waters. Sample point SS8 is located at the base of the dike approximately midway between the terminus of the sewer line and sample point SS5. A sediment sample was taken at this point because of the extensive staining of the shore that was visually evident.

As discussed previously, water samples were taken on two different dates in an attempt to provide information on temporal and weather variations.

Surface sample point 1 (Figure 2) is located in the adjacent bay to the east of the landfill site. This point was chosen to provide information on water quality upstream from the Olin site. The point was located at a considerable distance upstream to eliminate the possibility of localized influence from the Olin site. Water quality at sample point 1 for parameters analyzed under this program, met or exceeded existing surface water standards. Total halogenated organic concentrations were low but detectable. Generally, the results of analyses of samples collected on November 21, 1978 were insignificantly different from the results of samples collected on December 15, 1978. The analysis of sediments from sample point 1 indicated the presence of phenols, although the concentration was relatively low. It is interesting to note that although total halogenated organic concentrations for the sediments were low, practically all of the fraction was chlorinated.

Surface sample point 2 (Figure 2) is situated just east of the Olin property line. The sample point is located in a surface discharge emanating from the property immediately east of the Olin site. The discharge is black in color, and has the appearance and odor of a septic tank leachate. The discharge is flowing from the subsurface and may be from a pre-existing septic system. Despite it's physical appearance, water quality was generally good at sample point 2. The data from the November 21, 1978 sampling, however, showed elevated concentrations for mercury, sodium, iron, and total halogenated hydrocarbons. Values for these parameters were significantly lower on the December 15, 1978 sampling. It is conceivable that the lower concentrations on December 15, 1978 were due to mixing with Niagara River waters. There was considerable wave action on this date and it is possible that this water was reaching

sample point 2 and mixing with it. Analysis of sediments at sample point 2 demonstrated elevated concentrations for phenols, total mercury, and total halogenated hydrocarbons. Extended gas chromatographic analysis of the sediment sample revealed that a considerable portion of the halogenated organic fraction consisted of chlorinated materials. The delta BHC isomer was specifically identified in the sample. Data compiled for sample point 2 tend to confirm the hydrogeological conclusion that some leachate from the landfill is discharging into the area east of the Olin site.

Surface sample point 3 (Figure 2) is located at the approximate east property line of the Olin site. Surface point SS4 is located approximately 250 feet west of sample point SS3. Surface point SS5 is located approximately 50 feet east of the terminus of the sewer line while surface point SS6 lies about 50 feet to the west of this line. Surface point SS7 is located at the approximate west property line of the Olin site. Surface point SS8 is located approximately 25 feet east of the sewer line.

With the exception of mercury and total halogenated organic concentrations, the results of analyses of surface waters from the two sampling dates for sample points SS3 through SS7 were insignificantly different. Furthermore with the exception of these two parameters and in some cases phenols, water quality generally met or exceeded surface water standareds. These same parameters were also high in the sediment samples (SS3 through SS8).

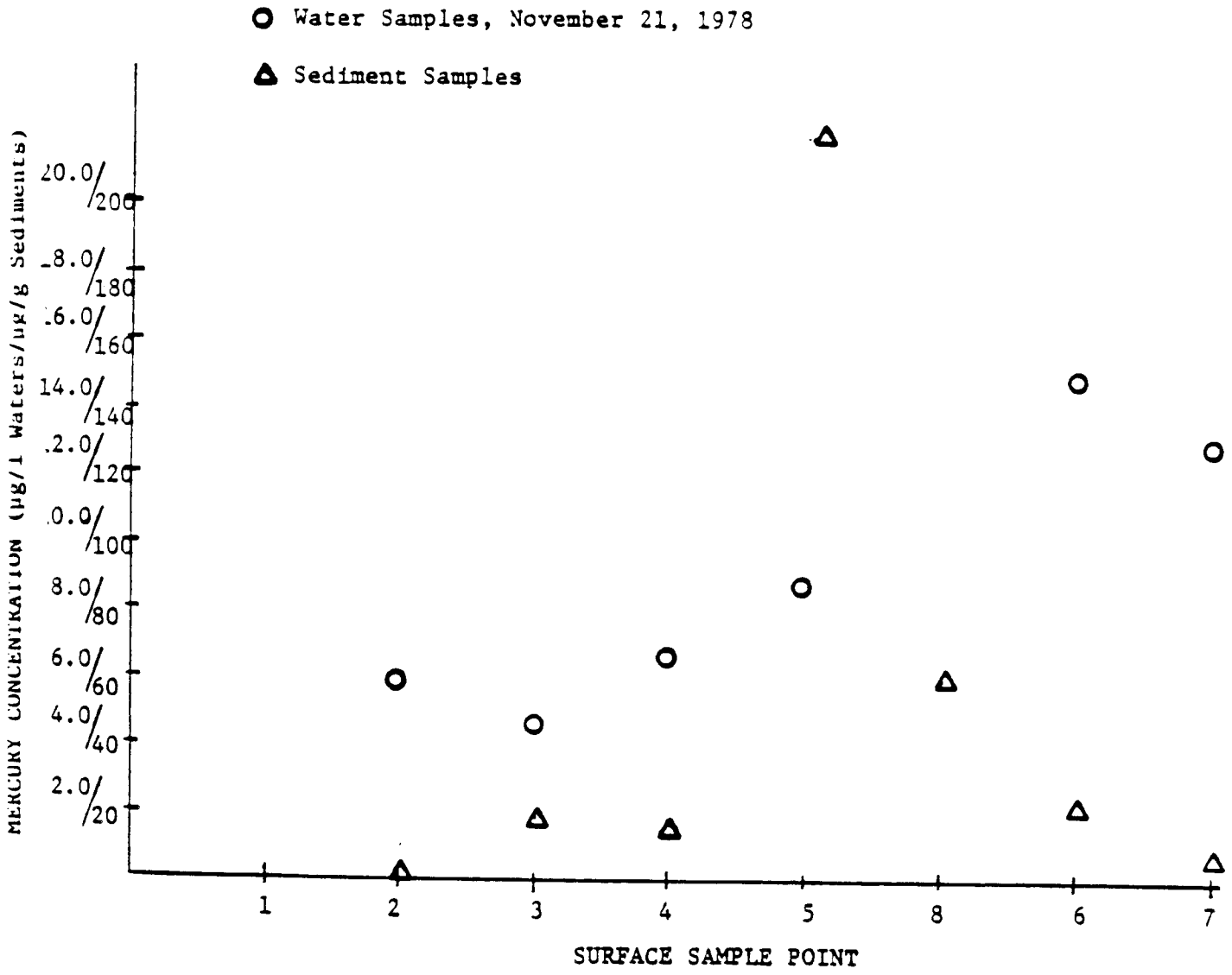
For the November 21, 1978 sampling date, mercury was detected in water samples collected from sample points SS3 through SS7. In general, mercury concentrations increased across the site with the minimum concentration being detected at SS3 (4.7 ppb) and the maximum at SS6 (~15 ppb). Concentrations at the western property line decreased only slightly (13 ppb) from values at SS6. Concentrations of mercury in the sediment samples followed

much the same pattern. However, the maximum concentration was observed at SS5 (220 ppm) with values decreasing toward the west. This pattern of variation is figuratively depicted in Figure 12. For the December 15, 1978 sampling date, mercury was below detectable limits for all water samples (SS3 through SS7). The difference between these two dates is probably attributable to weather conditions on the two dates. On November 21, 1978 conditions were very calm and water levels in the Niagara River were low. On December 15, 1978, conditions were quite stormy, with very high water levels. Hence, the volume of Niagara River water in relation to leachate was much greater than on the November 21, 1978 date and a "dilution" factor was in operation. Although turbulence was high, resulting in the suspension of sediments that contained mercury, mercury concentrations were not affected by this phenomenon, since all samples were filtered prior to analysis.

Total halogenated organics were detected in water samples collected on both the November 21, 1978 and December 15, 1978 sampling dates for sample points SS3 through SS7. With the exception of SS6, concentrations were higher on the December 15, 1978 date. In general, total halogenated organic concentrations increased in a westerly direction across the site with the highest concentrations existing in the vicinity of the terminus of the sewer line. Concentrations decreased from this point to the western property line. Concentrations of halogenated organics in the sediment samples followed the same pattern. Extended gas chromatographic analysis of both water and sediment samples demonstrated that a significant portion of the halogenated fraction was chlorinated. All samples examined for chlorinated organic content demonstrated the presence of BHC isomers. Concentrations of chlorinated organics and BHC isomers specifically, followed the same pattern as exhibited by the halogenated organic concentrations. The highest concentrations for chlorinated organics and BHC isomers were detected at sample points just east of the

FIGURE 12

VARIATION OF MERCURY CONCENTRATIONS
IN SURFACE POINT SAMPLES ACROSS
THE OLIN SITE



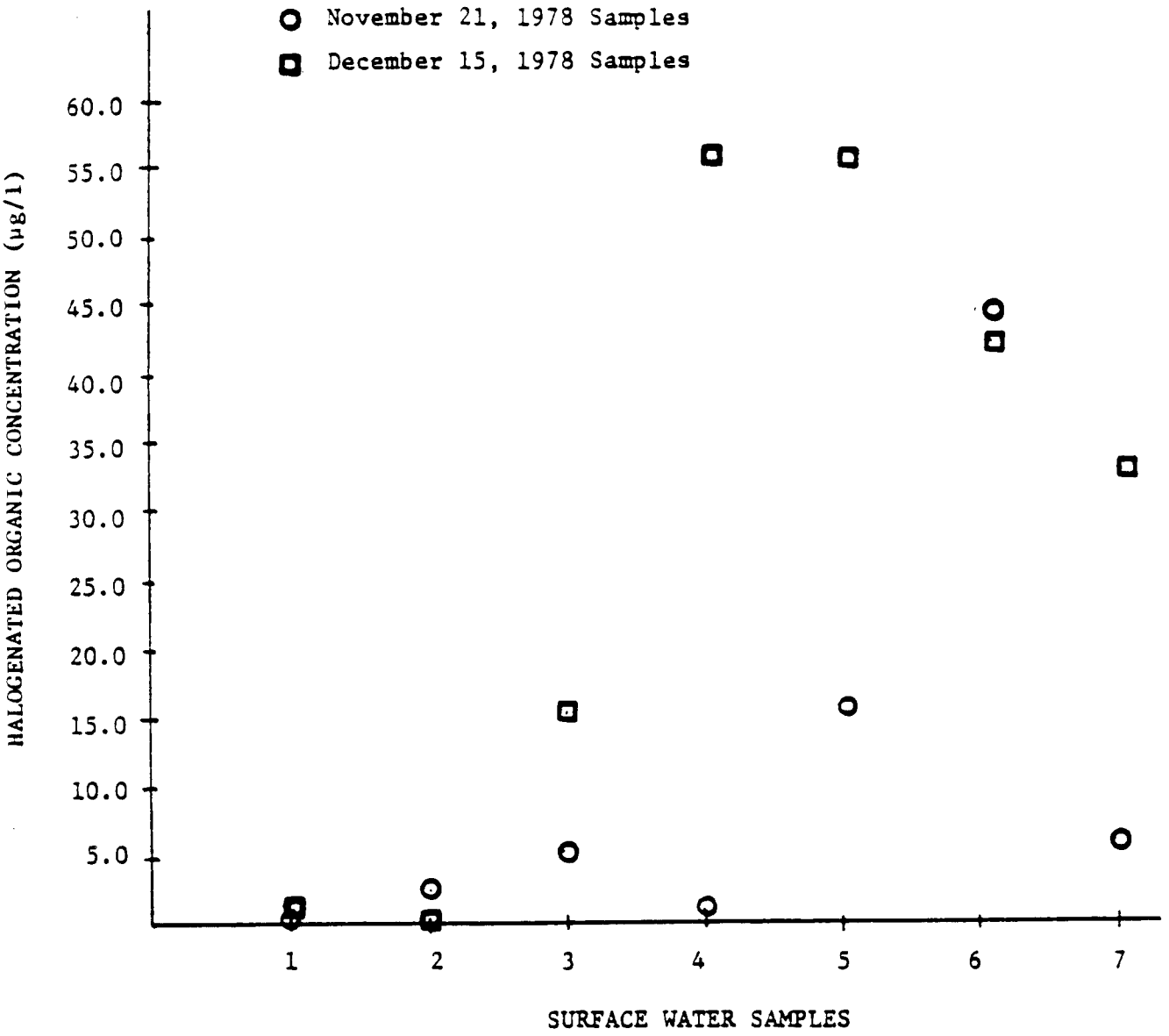
terminus of the sewer line. GC/MS analysis of the November 21, 1978 water sample from point SS6; the December 15, 1978 water sample from point SS5; and the sediment sample from point SS8 confirmed the presence of BHC isomers in each of these samples. In addition, chlorinated benzenes were confirmed in the SS6 samples. The spatial variation of halogenated organics is figuratively depicted in Figure 13. The difference in the halogenated organic content of the waters between the two sampling dates is probably a function of sediment suspension due to excessive turbulence on the December 15, 1978 date. These samples were not filtered prior to analysis.

Analytical data presented for sample points SS3 through SS8 verify previous hydrogeological conclusions concerning ground water flow patterns (Figure 9) and the extent of the contamination plume. The presence of mercury and BHC isomers in water and sediment samples from the Niagara River demonstrate that the constructed dike has been ineffective in preventing leachate migrating out of the landfill proper. As previously stated, the dike, when constructed, was keyed into the organic silt stratum of the Niagara River alluvial deposits. The permeability of these alluvial deposits is not sufficiently low enough to preclude the flow of contaminated ground waters. Consequently, ground waters are capable of bypassing the dike through the underlying alluvial deposits.

The pattern of variation observed for halogenated organics and mercury are probably indicative of the concentrations of these constituents "upstream" of this discharge zone. The highest concentrations for halogenated organics and mercury were obtained for samples collected in the western half of the site (e.g., P3; P4; P7; P9; P10; Well A). This data may be indicative of intensive disposal of these materials in the west end of the site.

FIGURE 13

VARIATION OF TOTAL HALOGENATED ORGANIC CONCENTRATIONS
IN SURFACE WATER SAMPLES ACROSS
THE OLIN SITE



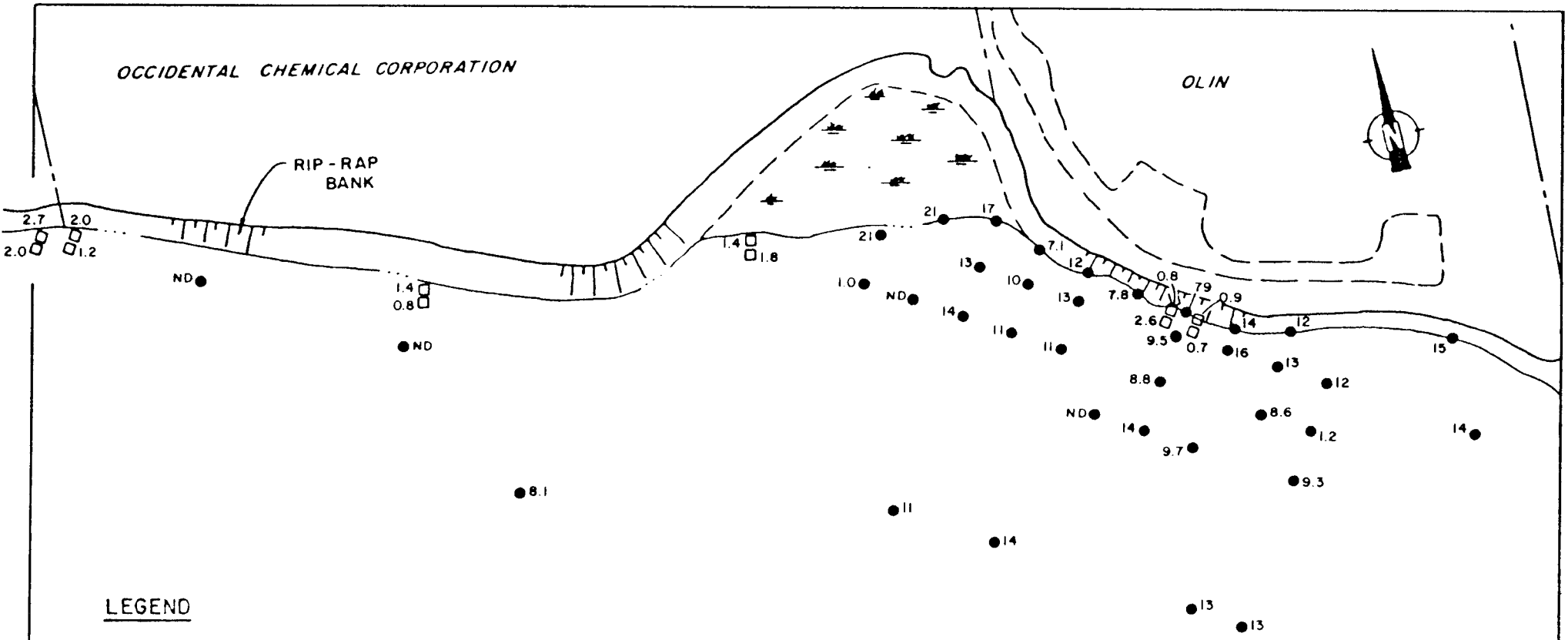
Although hydrogeologic and analytical data demonstrate that, in general, ground water flow is from the landfill into the Niagara River, some localized flow also occurs from the site located to the west onto the Olin site (refer to Figure 9). Analysis of samples from P1, P9 and P8 (west property line, see Figure 2) indicated the presence of both mercury and BHC isomers. Although it is not possible to quantitatively determine the contribution of the adjacent site to the contaminant load on the Olin site, it is apparent that some impact does exist.

APPENDIX C

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(Presentation Viewgraphs - 1980)



LEGEND

- ○ RECRA - PHASE I - 11/78
- △ RECRA - PHASE II - 10/79
- □ ADL - 8/81
- ● MALCOLM PIRNIE - 1/83
- 1.4 CONCENTRATION (ppm)
- ND NOT DETECTED

0' 50' 100' 200'

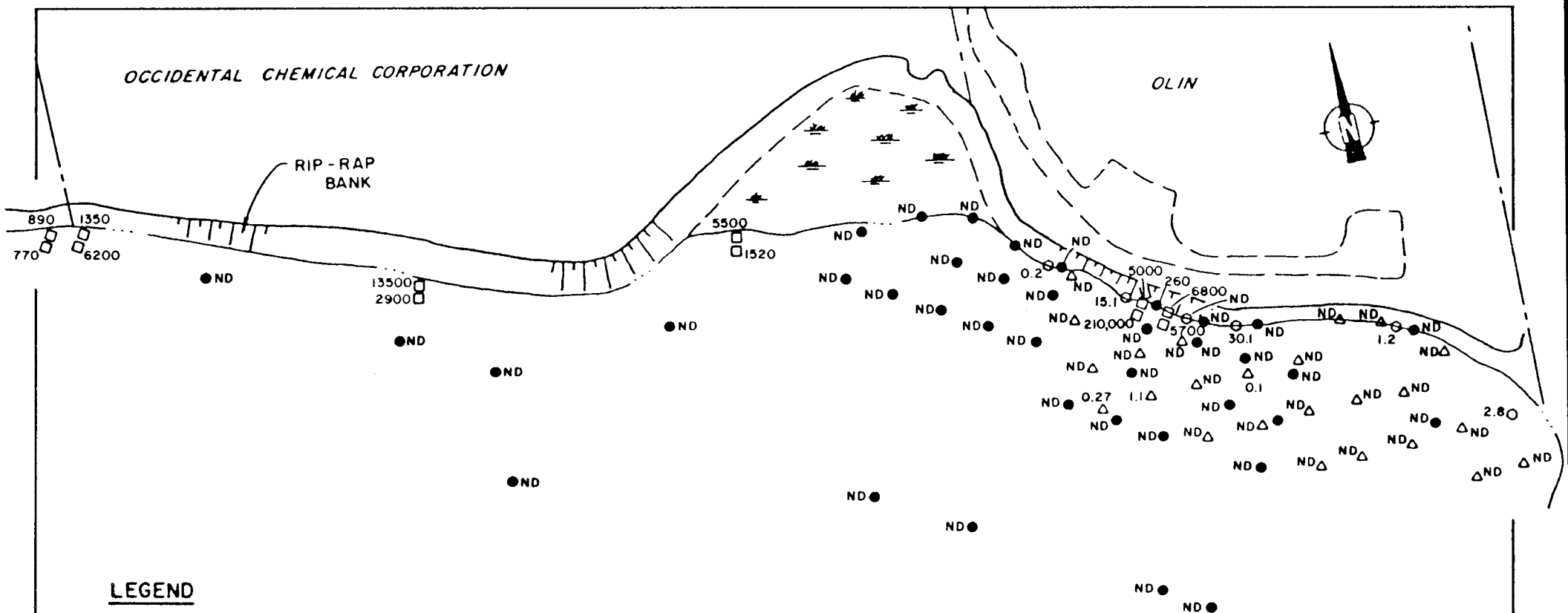
CRA

figure C-1

ARSENIC CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

1431-1/02/85-9-D-2



LEGEND

- ○ RECRA – PHASE I – 11/78
- △ RECRA – PHASE II – 10/79
- □ ADL – 8/81
- ● MALCOLM PIRNIE – 1/83
- 5500 CONCENTRATION (ppm)
- ND NOT DETECTED

0' 50' 100' 200'

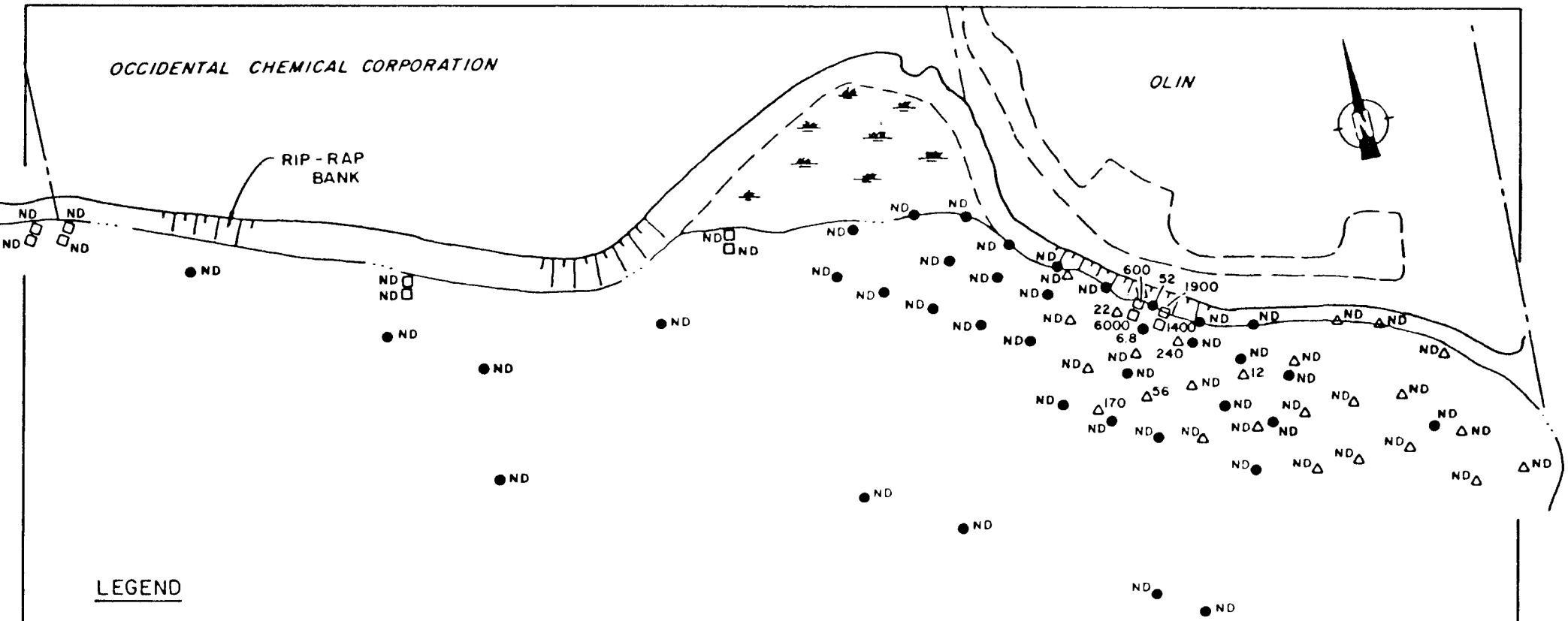
CRA

figure C-2

BHC CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

1431-1/02/85-9-D-2



LEGEND

- ○ RECRA - PHASE I - 11/78
- △ RECRA - PHASE II - 10/79
- □ ADL - 8/81
- ● MALCOLM PIRNIE - 1/83
- 56 CONCENTRATION (ppm)
- ND NOT DETECTED

0' 50' 100' 200'

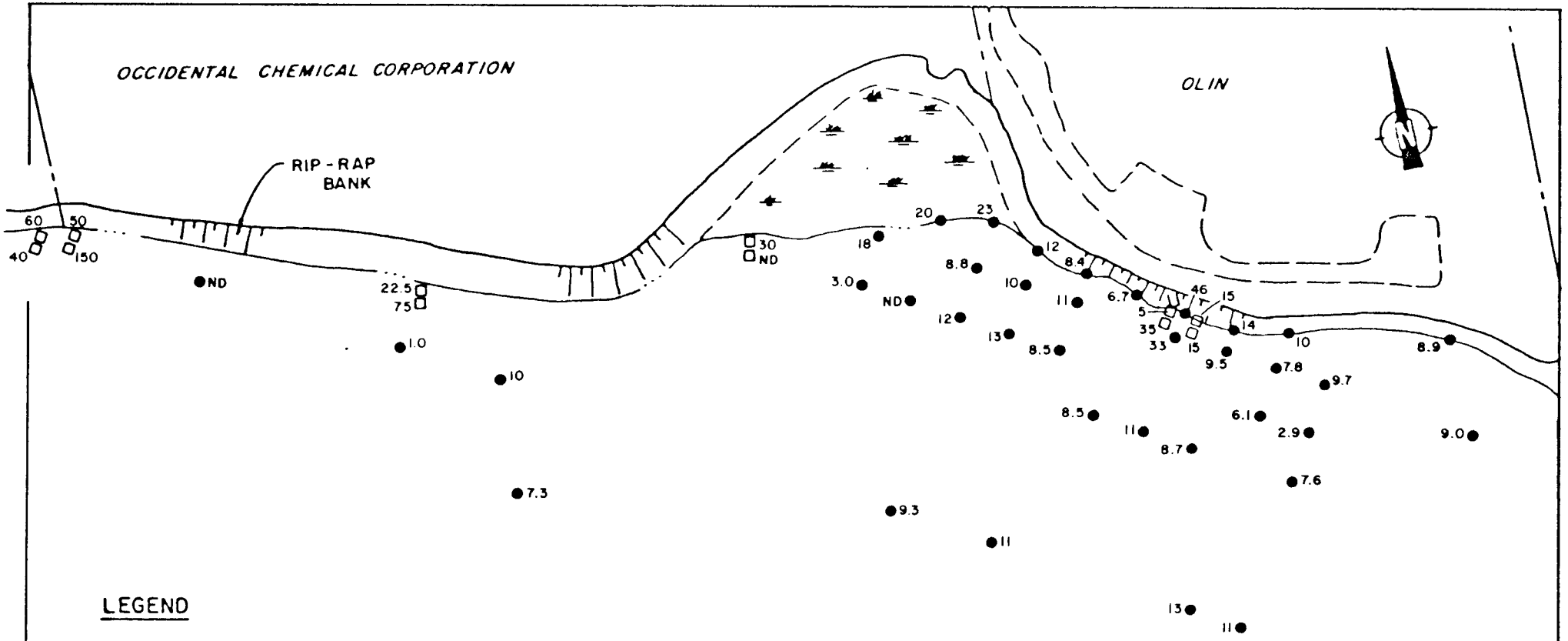
figure C-3

HEXACHLOROBENZENE CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

CRA

1431-1/02/85-9-D-2



LEGEND

- ○ RECRA – PHASE I - 11/78
- △ RECRA - PHASE II - 10/79
- □ ADL – 8/81
- ● MALCOLM PIRNIE - 1/83
- 75 CONCENTRATION (ppm)
- ND NOT DETECTED

0' 50' 100' 200'

CRA

figure C-4

LEAD CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

1431-1/02/85-9-D-2

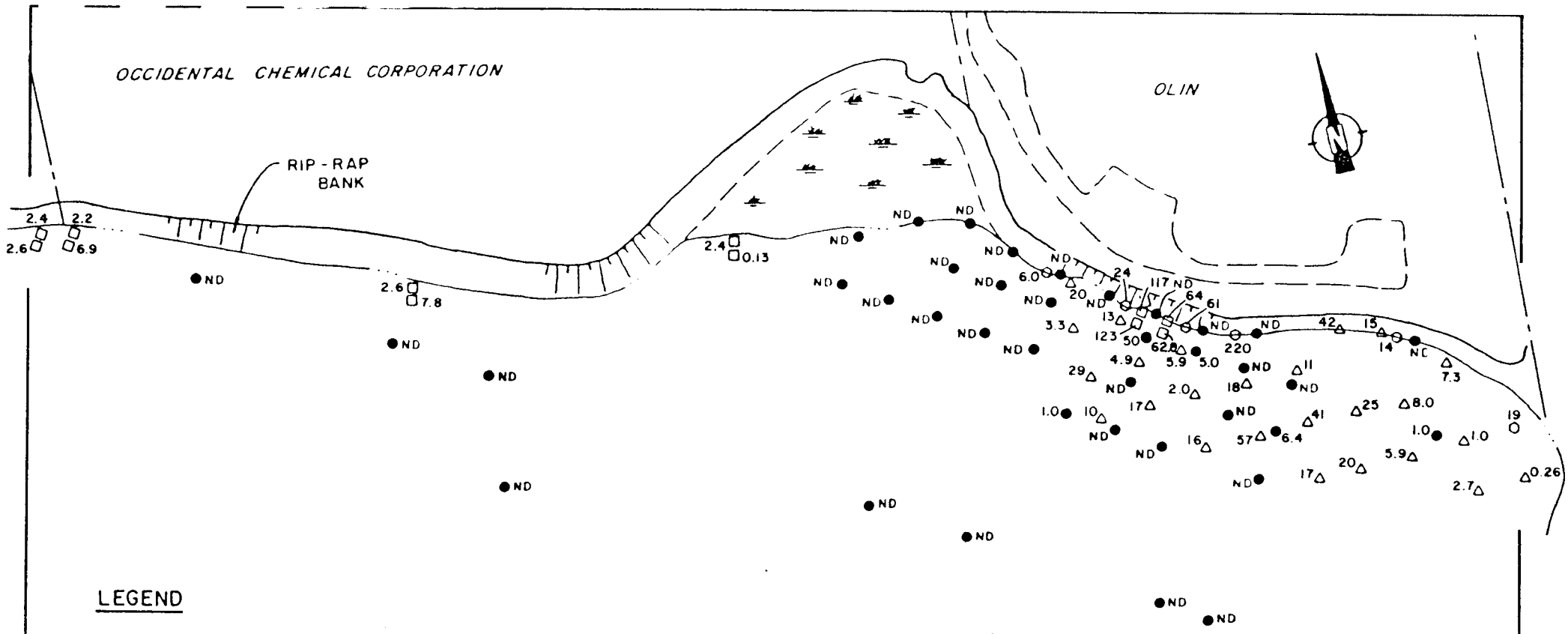


figure C-5

MERCURY CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

CRA

1431-1/02/85-9-D-2

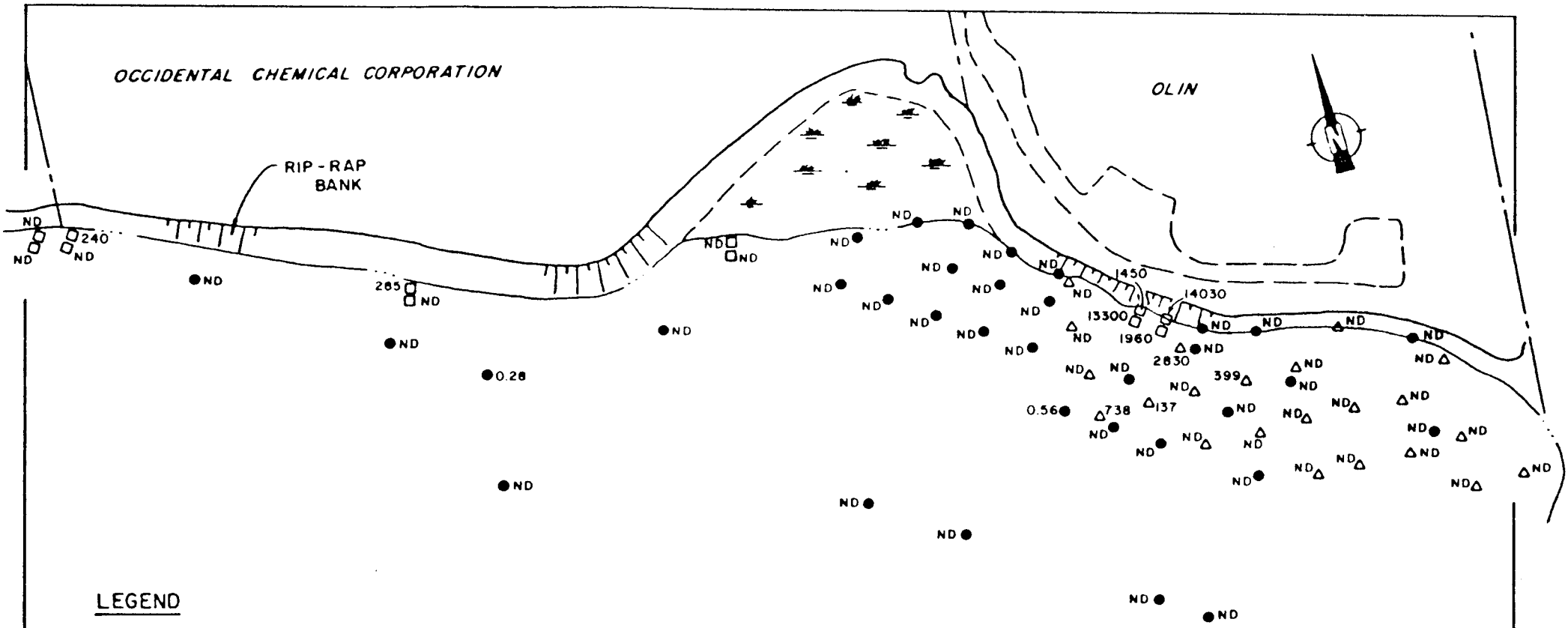


figure C-6

TRICHLOROBENZENE CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

CRA

1431-1/02/85-9-D-2

APPENDIX D

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(Arthur D. Little - 1979)

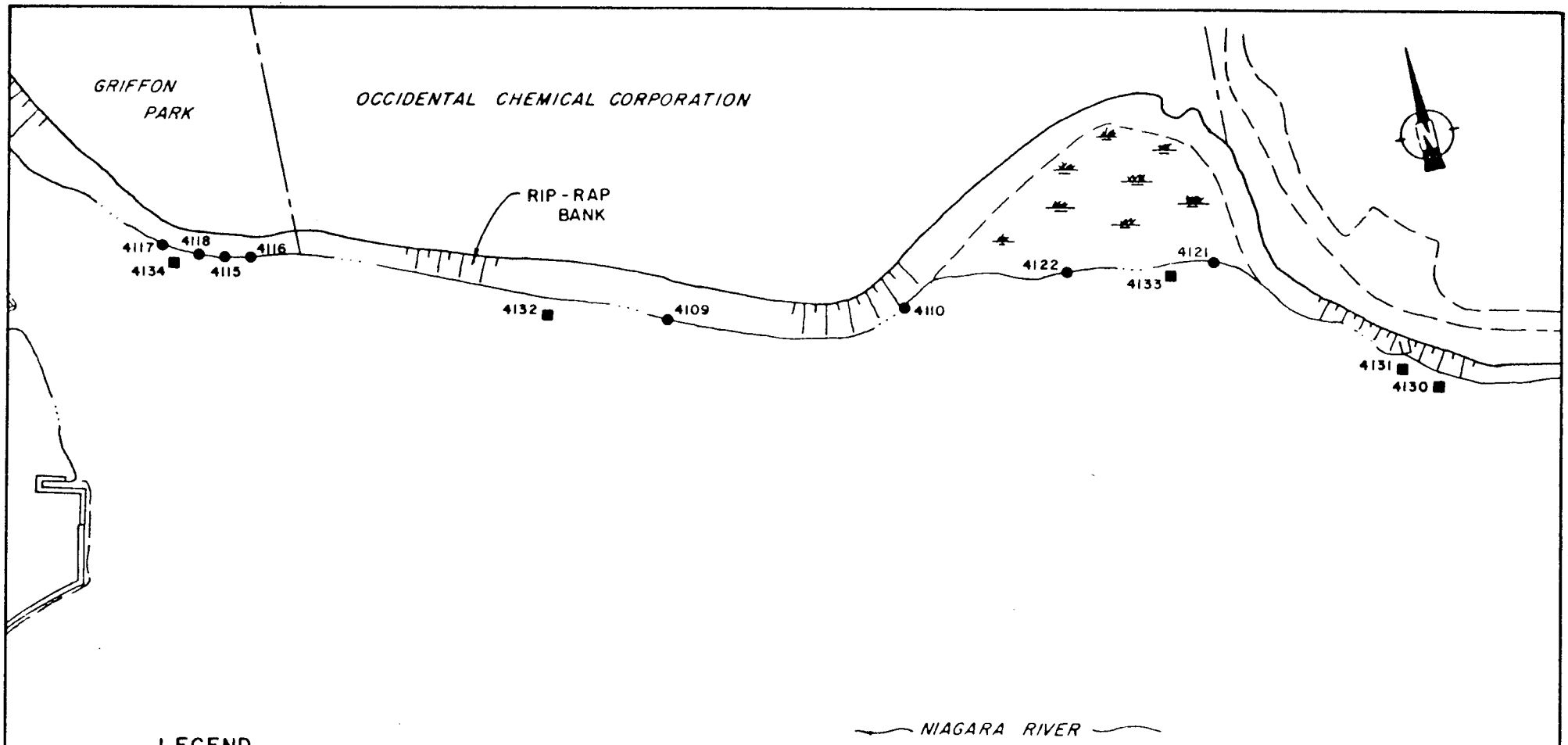


figure D-1

SHORELINE SAMPLING STATIONS
102nd St. Landfill

1431-1/02/85-9-D-2

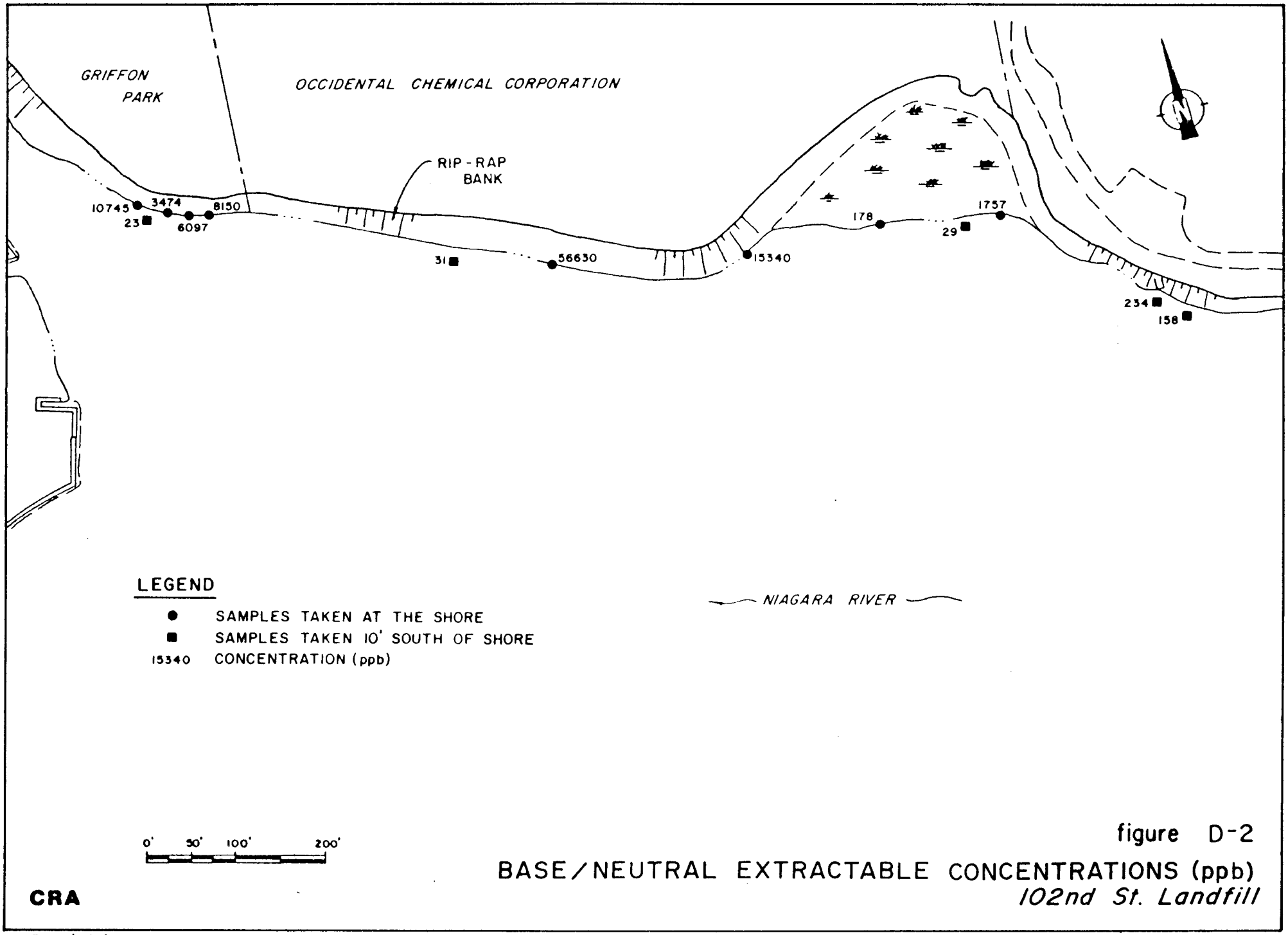


figure D-2

BASE/NEUTRAL EXTRACTABLE CONCENTRATIONS (ppb)

102nd St. Landfill

1431-1/02/85-9-D-2

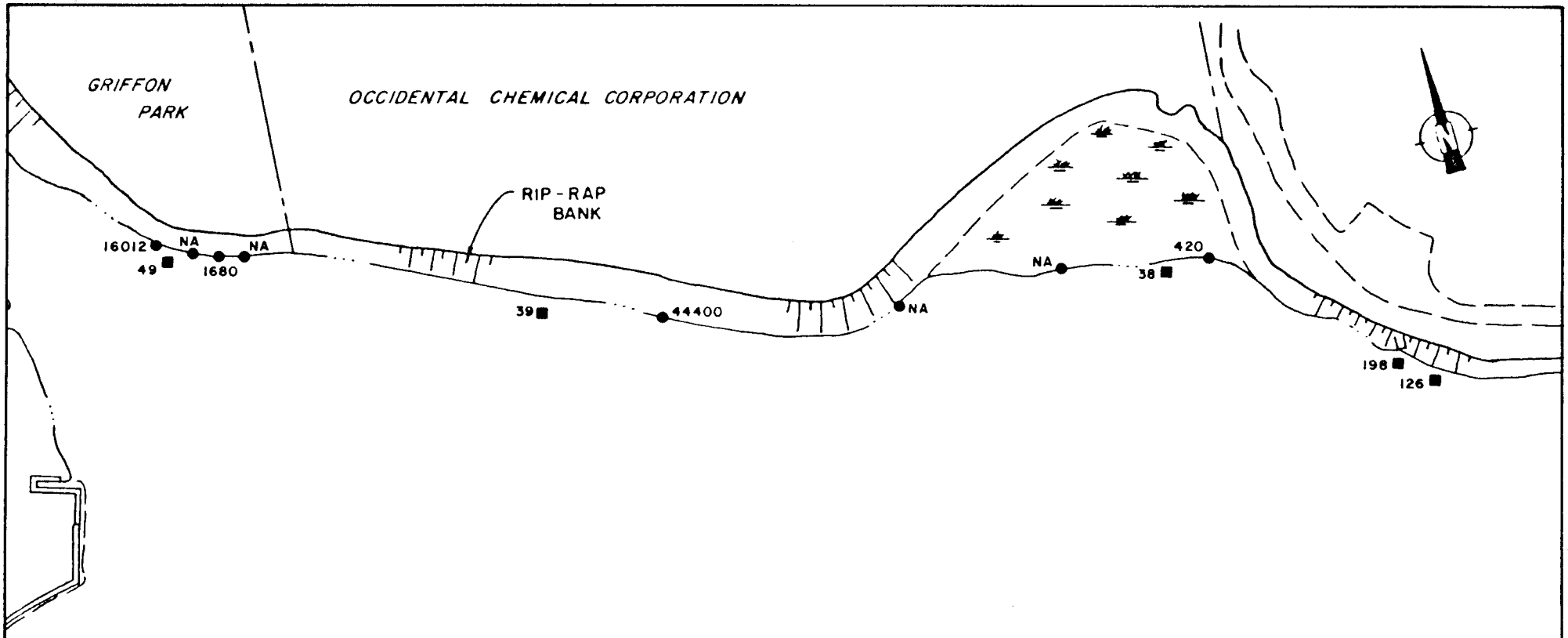


figure D-3

PESTICIDE AND PCB CONCENTRATIONS (ppb)

102nd St. Landfill

CRA

1431-1/02/85-9-D-2

TABLE D-1

102ND STREET LANDFILL SEDIMENT CONCENTRATIONS (ppb)

ADL Sample No.	4109	4110	4115	4116	4117	4118
104 Vinyl chloride	0	0	0	-1	0	-1
106 Methylene chloride	84	0	29	-1	57	-1
108 Trichlorofluoromethane	0	0	40	-1	40	-1
110 1,1-Dichloroethylene	0	0	0	-1	0	-1
111 1,1-Dichloroethane	0	0	0	-1	0	-1
112 Trans-1,2-dichloroethylene	0	0	8	-1	0	-1
113 Chloroform	0	0	0	-1	0	-1
114 1,2-Dichloroethane	0	1.3	0	-1	0	-1
115 1,1,1-Trichloroethane	0	0	0	-1	0	-1
116 Carbon tetrachloride	0	0	0	-1	0	-1
120 Trichloroethylene	0	3.2	0	-1	0	-1
121 Benzene	140	47	93	-1	270	-1
122 Cis-1,3-dichloropropylene	0	0	0	-1	0	-1
126 1,1,2,2-Tetrachloroethane	0	0	0	-1	0	-1
127 1,1,2,2-Tetrachloroethylene	110	27	25	-1	0	-1
128 Toluene	0	1.7	0	-1	20	-1
129 Chlorobenzene	260	150	58	-1	115	-1
130 Ethyl benzene	0	0	0	-1	0	-1
201 2-Chlorophenol	0	0	0	0	0	0
203 Phenol	0	300	0	225	33	131
204 2,4-Dimethylphenol	0	0	0	0	0	0
205 2,4-Dichlorophenol	70	466	0	0	0	0
206 2,4,6-Trichlorophenol	-1	0	0	0	39	0
207 4-Chloro-3-cresol	0	0	53	0	0	0
209 4,6-Dinitro-2-cresol	0	642	0	0	0	0
*301 Dichlorobenzenes	550	0	166	0	228	0
*302 1,4 Dichlorobenzene	550	0	166	0	228	0
*303 1,2-Dichlorobenzene	550	0	166	0	228	0
311 Hexachlorobutadiene	0	0	0	0	0	0

continued....

TABLE D-1

102ND STREET LANDFILL SEDIMENT CONCENTRATIONS (ppb)

ADL Sample No.	4109	4110	4115	4116	4117	4118
312 1,2,4-Trichlorobenzene	24800	4300	468	0	1690	815
315 Naphthalene	0	0	0	0	0	0
317 Hexachlorocyclopentadiene	0	0	0	0	0	0
318 2-Chloronaphthalene	620	2700	0	0	0	0
319 Acenaphthylene	190	0	0	0	0	0
320 Acenaphthene	120	0	0	0	0	0
321 Dimethyl phthalate	0	0	0	0	0	0
324 Fluorene	580	0	0	0	0	45
326 Diethyl phthalate	0	0	0	0	0	0
329 Hexachlorobenzene	590	0	0	0	0	0
331 Anthracene/Phenanthrene	5200	0	217	410	179	1100
332 Phenanthrene	5200	0	217	410	179	1100
333 Di-n-butyl phthalate	0	1700	4340	0	163	585
334 Fluoranthene	5500	1100	179	440	211	1250
335 Pyrene	4200	740	157	0	187	980
337 Butyl benzyl phthalate	0	0	0	0	0	0
338 Bis(2-ethylhexyl)phthalate	150	3000	570	7300	413	980
339 Di-n-octyl phthalate	150	3000	340	7300	413	960
340 Chrysene	6400	0	0	0	403	1550
341 Benzo(a)anthracene	6400	0	0	0	403	1550
343 Benzo(b)fluoranthene	1500	800	0	0	0	1200
344 Benzo(k)fluoranthene	1500	800	0	0	0	1200
345 Benzo(a)pyrene	4400	1000	0	0	0	1700
346 Indeno(1,2,3-c,d) pyrene	670	0	0	0	0	0
347 Dibenzo (a,h) anthracene	380	0	0	0	0	0
348 Benzo (g,h,i) perylene	780	0	0	0	0	560
401 Alpha-BHC	36000	-1	1680	-1	7890	-1
402 Gamma-BHC	8400	-1	0	-1	0	-1
404 Beta-BHC	0	-1	0	-1	7190	-1

continued....

TABLE D-1

102ND STREET LANDFILL SEDIMENT CONCENTRATIONS (ppb)

ADL Sample No.	4109	4110	4115	4116	4117	4118
405 Delta-BHC	0	-1	0	-1	772	-1
408 Endosulfan I	0	-1	0	-1	0	-1
409 DDE	0	-1	0	-1	0	-1
413 Endosulfan II	0	-1	0	-1	0	-1
417 Chlordane	0	-1	0	-1	0	-1
501 Antimony	37000	10000	0	80000	0	3300
502 Arsenic	6600	5000	100000	11000	104000	8400
503 Beryllium	250	40	500	200	700	510
504 Cadmium	1500	600	2300	24000	1200	11000
505 Chromium	280000	440000	1225000	160000	111000	78000
506 Copper	140000	94000	170000	150000	167000	110000
507 Lead	79000	64000	152000	1200000	202000	140000
509 Mercury	0	4700	5490	5000	4930	8600
510 Nickel	77000	82000	67000	48000	44000	29000
511 Selenium	0	1700	110000	570	232000	650
512 Silver	280	200	3000	640	0	500
513 Thallium	0	0	7000	0	9000	0
514 Zinc	370000	310000	1088000	1300000	710000	36000
802 Trichlorobenzenes	24800	4300	468	0	1690	815
806 Dichlorotoluenes	0	-1	-1	-1	-1	-1
809 Trichlorophenol	510	0	0	0	39	0
810 m-Chlorobenzoic acid	0	-1	-1	-1	-1	-1
811 o-Chlorobenzoic acid	0	-1	-1	-1	-1	-1
812 Hexachlorocyclohexanes (Total)	44400	-1	1680	-1	15852	-1
813 Mirex	-1	-1	-1	-1	160	-1

Notes: 0 denotes 'not detected'.
-1 denotes 'not analyzed'.
* incomplete resolutions of peaks required reporting as one.

continued....

TABLE D-1

102ND STREET LANDFILL SEDIMENT CONCENTRATIONS (ppb)

ADL Sample No.	4121	4122	4130	4131	4132	4133	4134
104 Vinyl chloride	0	-1	-1	-1	-1	-1	-1
106 Methylene chloride	0	-1	-1	-1	-1	-1	-1
108 Trichlorofluoromethane	100	-1	-1	-1	-1	-1	-1
110 1,1-Dichloroethylene	0	-1	-1	-1	-1	-1	-1
111 1,1-Dichloroethane	0	-1	-1	-1	-1	-1	-1
112 Trans-1,2-dichloroethylene	0	-1	-1	-1	-1	-1	-1
113 Chloroform	0	-1	-1	-1	-1	-1	-1
114 1,2-Dichloroethane	0	-1	-1	-1	-1	-1	-1
115 1,1,1-Trichloroethane	0	-1	-1	-1	-1	-1	-1
116 Carbon tetrachloride	0	-1	-1	-1	-1	-1	-1
120 Trichloroethylene	0	-1	-1	-1	-1	-1	-1
121 Benzene	950	-1	-1	-1	-1	-1	-1
122 Cis-1,3-dichloropropylene	0	-1	-1	-1	-1	-1	-1
126 1,1,2,2-Tetrachloroethane	0	-1	-1	-1	-1	-1	-1
127 1,1,2,2-Tetrachloroethylene	0	-1	-1	-1	-1	-1	-1
128 Toluene	95	-1	-1	-1	-1	-1	-1
129 Chlorobenzene	730	-1	-1	-1	-1	-1	-1
130 Ethyl benzene	0	-1	-1	-1	-1	-1	-1
201 2-Chlorophenol	0	0	-1	-1	-1	-1	-1
203 Phenol	0	0	-1	-1	-1	-1	-1
204 2,4-Dimethylphenol	0	0	-1	-1	-1	-1	-1
205 2,4-Dichlorophenol	0	0	-1	-1	-1	-1	-1
206 2,4,6-Trichlorophenol	0	0	-1	-1	-1	-1	-1
207 4-Chloro-3-cresol	0	0	-1	-1	-1	-1	-1
209 4,6-Dinitro-2-cresol	0	0	-1	-1	-1	-1	-1
301 Dichlorobenzenes	0	0	5	8.1	6.3	4.5	2
302 1,4 Dichlorobenzene	0	0	-1	-1	-1	-1	-1
303 1,2-Dichlorobenzene	0	0	-1	-1	-1	-1	-1
311 Hexachlorobutadiene	0	0	-1	-1	-1	-1	-1

continued....

TABLE D-1

102ND STREET LANDFILL SEDIMENT CONCENTRATIONS (ppb)

ADL Sample No.	4121	4122	4130	4131	4132	4133	4134
312 1,2,4-Trichlorobenzene	175	0	40	56	3	2	1
315 Naphthalene	0	0	-1	-1	-1	-1	-1
317 Hexachlorocyclopentadiene	0	0	106	160	22	22	20
318 2-Chloronaphthalene	0	0	-1	-1	-1	-1	-1
319 Acenaphthylene	0	0	-1	-1	-1	-1	-1
320 Acenaphthene	0	0	-1	-1	-1	-1	-1
321 Dimethyl phthalate	0	0	-1	-1	-1	-1	-1
324 Fluorene	0	0	-1	-1	-1	-1	-1
326 Diethyl phthalate	230	0	-1	-1	-1	-1	-1
329 Hexachlorobenzene	0	0	-1	-1	-1	-1	-1
331 Anthracene/Phenanthrene	0	18	-1	-1	-1	-1	-1
332 Phenanthrene	0	18	-1	-1	-1	-1	-1
333 Di-n-butyl phthalate	122	0	-1	-1	-1	-1	-1
334 Fluoranthene	0	0	-1	-1	-1	-1	-1
335 Pyrene	0	0	-1	-1	-1	-1	-1
337 Butyl benzyl phthalate	0	0	-1	-1	-1	-1	-1
338 Bis(2-ethylhexyl)phthalate	1230	160	-1	-1	-1	-1	-1
339 Di-n-octyl phthalate	1230	160	-1	-1	-1	-1	-1
340 Chrysene	0	0	-1	-1	-1	-1	-1
341 Benzo(a)anthracene	0	0	-1	-1	-1	-1	-1
343 Benzo(b)fluoranthene	0	0	-1	-1	-1	-1	-1
344 Benzo(k)fluoranthene	0	0	-1	-1	-1	-1	-1
345 Benzo(a)pyrene	0	0	-1	-1	-1	-1	-1
346 Indeno(1,2,3-c,d) pyrene	0	0	-1	-1	-1	-1	-1
347 Dibenzo (a,h) anthracene	0	0	-1	-1	-1	-1	-1
348 Benzo (g,h,i) perylene	0	0	-1	-1	-1	-1	-1
401 Alpha-BHC	190	-1	67	80	16	22	44
402 Gamma-BHC	22	-1	21	44	20	15	2
404 Beta-BHC	0	-1	-1	-1	-1	-1	-1

continued....

TABLE D-1

102ND STREET LANDFILL SEDIMENT CONCENTRATIONS (ppb)

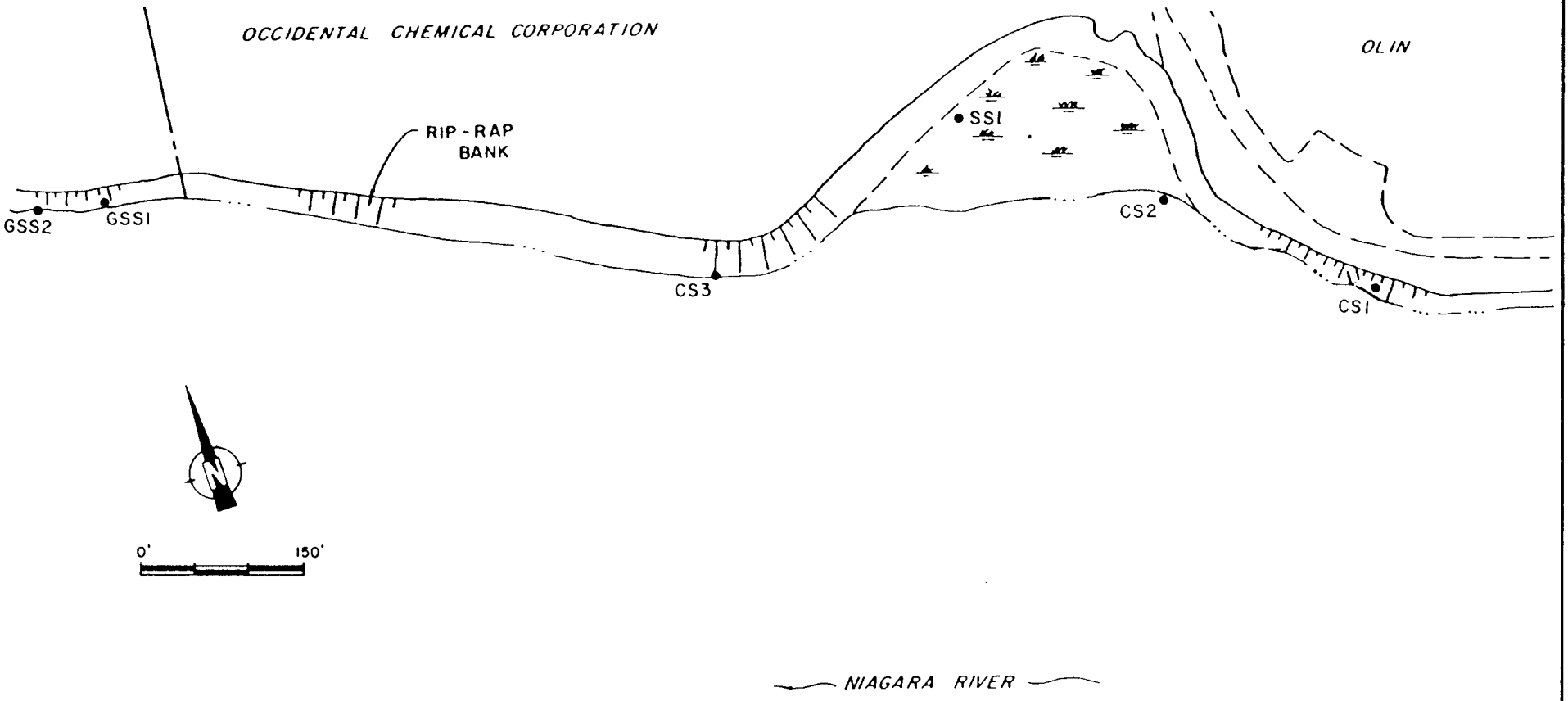
ADL Sample No.	4121	4122	4130	4131	4132	4133	4134
405 Delta-BHC	208	-1	-1	-1	-1	-1	-1
408 Endosulfan I	0	-1	18	29	0.2	0	0.1
409 DDE	0	-1	-1	-1	-1	-1	-1
413 Endosulfan II	0	-1	13	30	0.1	0	0
417 Chlordane	0	-1	-1	-1	-1	-1	-1
501 Antimony	0	1000	-1	-1	-1	-1	-1
502 Arsenic	36000	1100	-1	-1	-1	-1	-1
503 Beryllium	800	530	-1	-1	-1	-1	-1
504 Cadmium	0	4500	-1	-1	-1	-1	-1
505 Chromium	43000	17000	-1	-1	-1	-1	-1
506 Copper	22000	21000	-1	-1	-1	-1	-1
507 Lead	28000	0	-1	-1	-1	-1	-1
509 Mercury	1260	2000	-1	-1	-1	-1	-1
510 Nickel	32000	24000	-1	-1	-1	-1	-1
511 Selenium	108000	510	-1	-1	-1	-1	-1
512 Silver	3000	0	-1	-1	-1	-1	-1
513 Thallium	0	0	-1	-1	-1	-1	-1
514 Zinc	100000	84000	-1	-1	-1	-1	-1
802 Trichlorobenzenes	175	0	47	66	3.1	2	1.1
806 Dichlorotoluenes	-1	-1	-1	-1	-1	-1	-1
809 Trichlorophenol	0	0	-1	-1	-1	-1	-1
810 m-Chlorobenzoic acid	-1	-1	-1	-1	-1	-1	-1
811 o-Chlorobenzoic acid	-1	-1	-1	-1	-1	-1	-1
812 Hexachlorocyclohexanes (Total)	420	-1	88	124	36	37	46
813 Mirex	-1	-1	7	15	3	1	3

Notes: 0 denotes 'not detected'.
-1 denotes 'not analyzed'.
* incomplete resolutions of peaks required reporting as one.

APPENDIX E

SEDIMENT CONTAMINANT DATA AT THE 102ND STREET LANDFILL

(Hydroscience - 1979)



LEGEND

- SEDIMENT SAMPLING LOCATION
  HOOKER CHEMICALS & PLASTICS CORP. / EPA - 1979

figure E-1

RIVER SEDIMENT SAMPLING LOCATIONS
HOOKER CHEMICALS & PLASTICS CORP. / EPA - 1979
102nd St. Landfill

CRA

1431-4/06/87-9-D-2

TABLE E-1

PRIORITY POLLUTANTS ANALYSIS OF THE NIAGARA RIVER SEDIMENTS - 102ND STREET LANDFILL

ANALYTICAL PARAMETER	CONCENTRATION (ppb)				
	SS1-Cove Seepage 4/12/79	CS2 4/19/79	CS3 4/19/79	GSS1 4/19/79	GSS2 4/14/79
Acrolein	NA	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND	ND
Benzene	ND	950	100	93	270
Carbon Tetrachloride	ND	ND	ND	ND	ND
Chlorobenzene	ND	730	34	58	115
1,2-Dichloroethane	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND
Chloroform (Trichloromethane)	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND
1,2-trans-Dichloroethylene	ND	ND	ND	8	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND
1,3-Dichloropropylene	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND
Methylene chloride (dichloromethane)	ND	ND	41	29	57
Methyl chloride (chloromethane)	ND	ND	ND	ND	ND
Methyl bormide (bromomethane)	ND	ND	ND	ND	ND
Bromoform (tribromomethane)	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	100	60	40	40
Dichlorofluoromethane	NA	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	28	26	ND
Toluene	ND	95	16	ND	20
Trichloroethylene	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND

continued...

TABLE E-1

PRIORITY POLLUTANTS ANALYSIS OF THE NIAGARA RIVER SEDIMENTS - 102ND STREET LANDFILL

ANALYTICAL PARAMETER	CONCENTRATION			
	CS2 4/12/79	CS3 4/19/79	GSS1 4/19/79	GSS2 4/19/79
Pesticides (ppb)				
Aldrin	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND
Chlorodane	ND	ND	ND	ND
4,4-DDT	ND	ND	ND	ND
4,4-DDE	ND	ND	ND	ND
4,4-DDD	ND	ND	ND	ND
a-endosulfan	ND	ND	ND	ND
p-endosulfan	ND	ND	ND	ND
Endosulfan sulfate	ND	ND	ND	ND
Endrin	ND	ND	ND	ND
Endrin aldehyde	ND	ND	ND	ND
Heptachlor epoxide	ND	ND	ND	ND
a-BHC	190	8900	1680	7890
f-BHC	ND	4182	ND	7190
8-BHC	22	587	ND	ND
8-BHC	208	8296	ND	772
PCB-1242	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND
PCB-1016	ND	ND	ND	ND
toxaphene	ND	ND	ND	ND
mirex	ND	394	ND	160
Acid Compounds				
2,4,6-trichlorophenol	ND	ND	ND	39
p-chloro-m-cresol	ND	ND	53	ND
2-chlorophenol	ND	ND	ND	ND
2,4-dichlorophenol	ND	ND	ND	ND
2,4-dimethylphenol	ND	ND	ND	ND
2-nitrophenol	ND	ND	ND	ND
4-nitrophenol	ND	ND	ND	ND
2,4-dinitrophenol	ND	ND	ND	ND
4,6-dinitro-o-cresol	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
Phenol	ND	ND	ND	33

TABLE E-1

PRIORITY POLLUTANTS ANALYSIS OF THE NIAGARA RIVER SEDIMENTS - 102ND STREET LANDFILL

ANALYTICAL PARAMETER	CONCENTRATION			
	CS2 4/12/79	CS3 4/19/79	GSS1 4/19/79	GSS2 4/19/79
Base/Neutral Compounds (ppb)				
(results on dry weight basis)ppb				
Acenaphthene	ND	ND	ND	ND
Benzidine	ND	ND	ND	ND
1,2,4-trichlorobenzene	175	3520	468	1690
Hexachlorobenzene	ND	450	ND	ND
Hexachloroethane	ND	ND	ND	ND
bis(2-chloroethyl)ether	ND	ND	ND	ND
2-chloronaphthalene	ND	ND	ND	ND
1,2-dichlorobenzene	ND	ND	)	)
1,3-dichlorobenzene	ND	ND	>166	>228
1,4-dichlorobenzene	ND	ND	)	)
3,3-dichlorobenzidine	ND	ND	ND	ND
2,4-dinitrotoluene	ND	ND	ND	ND
2,6-dinitrotoluene	ND	ND	ND	ND
1,2-diphenylhydrazine (as azobenzene)	ND	ND	ND	ND
Fluoranthene	240	240	179	211
4-chlorophenyl phenyl ether	ND	ND	ND	ND
4-bromophenyl phenyl ether	ND	ND	ND	ND
bis(2-chloroisopropyl)ether	ND	ND	ND	ND
bis(2-chloroethoxy)methane	ND	ND	ND	ND
Hexachlorobutadiene	38	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
N-nitrosodimethylamine	ND	ND	ND	ND
N-nitrosodiphenylamine	ND	ND	ND	ND
N-nitrosodi-n-p	ND	ND	ND	ND
bis(2-ethylhexyl)phthalate	1230	1060	570	413
Butyl benzyl phthalate	ND	ND	ND	ND
Di-n-butyl phthalate	122	384	4340	163
Di-n-octyl phthalate	ND	ND	340	ND
Dietl phthalate	230	ND	ND	ND
Dimethyl phthalate	ND	ND	ND	ND
Benzo(a)pyrene	ND	228	ND	ND
trichlorobenzene isomer	ND	340E	ND	ND

continued...

TABLE E-1

PRIORITY POLLUTANTS ANALYSIS OF THE NIAGARA RIVER SEDIMENTS - 102ND STREET LANDFILL

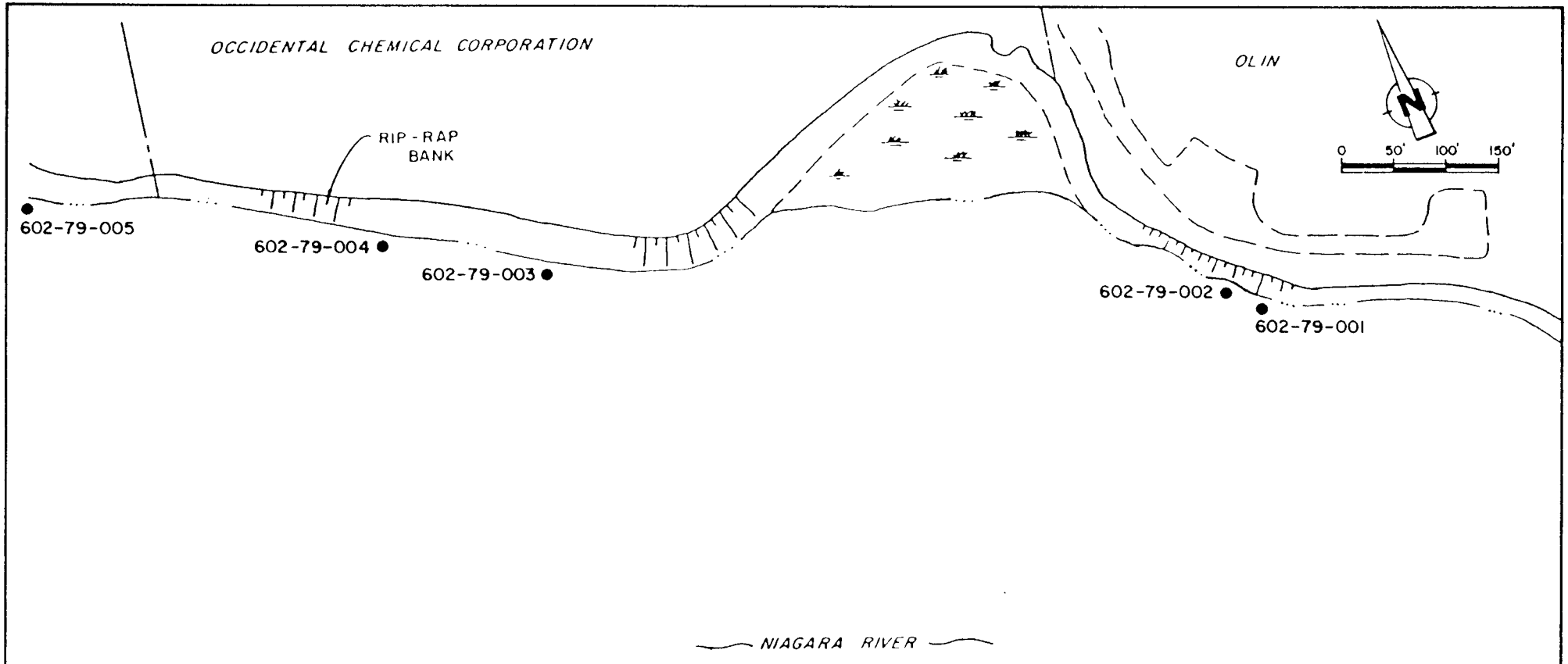
ANALYTICAL PARAMETER	CONCENTRATION			
	CS2 4/12/79	CS3 4/19/79	GSS1 4/19/79	GSS2 4/19/79
Base/Neutral Compounds (ppb)				
(results on dry weight basis)ppb				
Benzo(b,k)fluoranthene	ND	200	ND	ND
Chrysene/benzo(a)anthracene	ND	380	ND	403
Acenaphthylene	ND	ND	ND	ND
Anthracene/phenanthrene	ND	186	217	179
Benzo(ghi)perylene	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND
Ideno(1,2,3-cd)pyrene	ND	ND	ND	ND
Pyrene	ND	180	157	187
2,3,7,8-tetrachlorodibenzo-p-dioxin	ND	ND	ND	ND
Metals (ppm)				
Antimony	<12.0	<18.0	<10.0	<16.0
Arsenic	36.0	68.0	100.0	104.0
Beryllium	0.8	0.9	0.5	0.7
Cadmium	<0.4	0.8	2.3	1.2
Chromium	43.0	217.0	1225.0	111.0
Copper	22.0	52.0	170.0	167.0
Lead	28.0	64.0	152.0	202.0
Mercury	1.26	2.03	5.49	4.93
Nickel	32.0	48.0	67.0	44.0
Selenium	108.0	204.0	110.0	232.0
Silver	3.0	<1.0	3.0	<1.0
Thallium	<6.0	13.0	7.0	9.0
Zinc	100.0	122.0	1088.0	710.0
Total Cyanide	<0.14	0.24	3.85	0.58
Total Phenol	1.83	1.13	2.0	1.7

APPENDIX F

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(Hooker Chemicals & Plastics Corp. - 1979)



LEGEND

● SEDIMENT SAMPLING LOCATIONS
HOOKER CHEMICALS AND PLASTICS CORP. - 1979

figure F-1

RIVER SEDIMENT SAMPLING LOCATIONS
HOOKER CHEMICALS AND PLASTICS CORP. - 1979
102nd Street Landfill

CRA

1431-17/06/87-9-D-2

TABLE F-1

ORGANIC COMPOUNDS IDENTIFIED IN THE SEDIMENT OF THE NIAGARA RIVER AT THE 102ND STREET LANDFILL SITE

ANALYTICAL PARAMETERS	602-790-01 July 79	602-790-01 Oct. 79	602-790-02 July 79	602-790-03 July 79	602-790-09 July 79	602-790-05 July 79
P-Dichlorobenzene	3	1.6	8.1	6.3	4.5	2
O-Dichlorobenzene	2	--	--	--	--	--
1,2,4-Trichlorobenzene	40	73	56	3	2	1
1,2,3-Trichlorobenzene	7	13	10	0.1	<0.1	0.1
Hexachlorocyclopentadiene	106	236	160	22	22	20
Alpha-BHC	67	138	80	16	22	44
Gamma-BHC	21	44	44	20	15	2
Alpha-Endosulfan	18	33	29	0.2	<0.1	0.1
Beta-Endosulfan	13	45	30	0.1	<0.1	<0.1
Mirex	7	18	15	3	1	3

Note: Oct. 79 is a repeat analysis.

APPENDIX G

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(Hites - 1981)

TABLE G-1

ORGANIC COMPOUNDS IDENTIFIED IN THE SEDIMENT
OF THE NIAGARA RIVER AT THE 102ND STREET LANDFILL SITE

PARAMETER	DETECTED LEVEL (ppm)
Chlorobenzenes	
Chlorobenzene	NA[a]
Dichlorobenzenes	+
Trichlorobenzenes	40[b]
Tetrachlorobenzenes	200
Pentachorobenzene	100
Hexachlorobenzene	8
Chlorotoluenes	
Dichlorotoluenes	20
Trichlorotoluenes	100
Tetrachlorotoluenes	40
Pentachlorotoluenes	40
Hexachlorotoluenes	40
Heptachlorotoluenes	20
Polycyclic Aromatic Hydrocarbons and Derivatives	
Methylnaphthalenes	+
C_2-naphthalenes	+
C_3-naphthalenes	+
Chloronaphthalene	20
Dichloronaphthalene	8
Trichloronaphthalene	6
Biphenyl	8
Dichlorophenanthrene	20
Pyrene	+
Fluoranthene	+

continued....

TABLE G-1

ORGANIC COMPOUNDS IDENTIFIED IN THE SEDIMENT
OF THE NIAGARA RIVER AT THE 102ND STREET LANDFILL SITE

PARAMETER	DETECTED LEVEL (ppm)
Phenols	
Phenol	+
Dichlorophenol	+
Trichlorophenol	+
(1,1,3,3-Tetramethylbutyl)phenol	+
Cyclohexane Derivatives	
BHC (hexachlorocyclohexane)	10
Cyclohexylcyclohexanol	30
Cyclohexylcyclohexanone	5
Phenylcyclohexane	+
C_7-Benzyl Derivatives	
Benzyl alcohols (0-5 Cl)	+
Benzaldehydes (0-5 Cl)	+
Benzoic acids (0-5 Cl)	+
Benzamides (0-4 Cl)	+
C_{14}-Benzyl Derivatives	
(Methylphenyl)phenylmethane	90
Chloro(methylphenyl)phenylmethanes	20
Trichloro(methylphenyl)phenylmethanes	30
(Phenylmethyl)benzenemethanols	4
(Phenylmethyl)benzoic acid	+
Methylbenzophenone	7
Benzoylbenzoic acid	+
Benzyl ether	70

continued....

TABLE G-1

ORGANIC COMPOUNDS IDENTIFIED IN THE SEDIMENT
OF THE NIAGARA RIVER AT THE 102ND STREET LANDFILL SITE

PARAMETER	DETECTED LEVEL (ppm)
C_{21}-Benzyl Derivatives	
Methylbis(phenylmethyl)benzenes	30
Chloro(methyl)bis(phenylmethyl)benzenes[c]	2
Dichloro(methyl)bis(phenylmethyl)benzenes[c]	9
Trichloro(methyl)bis(phenylmethyl)benzenes[c]	5
Tetrachloro(methyl)bis(phenylmethyl)benzenes[c]	6
Pentachloro(methyl)bis(phenylmethyl)benzenes[c]	4
Bis(methylphenyl)phenylmethane	20
C_{28}-Benzyl Derivative	
Methyltris(phenylmethyl)benzenes	6
Miscellaneous	
Phenyl ether	20
Aminoacetophenone	+
1-Dodecanethiol	3

NOTES:
- a - NA indicates that sample was not analyzed for this compound.
- b - maximum level in ppm of compound detected in sediment.
- c - or another isomer.
- + indicates that compound was detected in sediment at a level of 0.5-2ppm but was not quantified.

APPENDIX H

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(RECRA/Phase II - 1979)

HYDROGEOLOGIC INVESTIGATION

FINAL REPORT

DRAFT

OLIN 102nd STREET LANDFILL

NIAGARA FALLS,

NEW YORK

Prepared By

RECRA RESEARCH, INC. &

WEHRAN ENGINEERING P.C.

RECRA RESEARCH, INC.

TOTAL CHEMICAL WASTE MANAGEMENT THROUGH APPLIED RESEARCH

P.O. Box 448 / Tonawanda, New York 14150 / (716) 838-6200

5.0 WATER/SEDIMENT QUALITY

The chemistry of the 102nd Street Landfill site was addressed through an extensive sampling and analysis program. This program was completed in two phases. The first phase of sampling and analysis began with sample collection in November of 1978 and culminated with the issuance of the report dated May of 1979. Sampling and analytical results for this phase of work will only be summarized in this report. For further detail as to the initial phase of work, the reader is referred to the above referenced document. The second phase of work began in October of 1979 and is the major thrust of this report.

5.1 Sampling Program

The sampling program at the 102nd Street Landfill site included the collection of a multitude of samples from wells, piezometers, and sewers as well as collection of surface water and sediments from the Niagara River.

5.1.1 Sample Acquisition

The various sample types referenced in section 5.1 were collected over the period from November 1978 through June 1980. The following sections of this report detail the dates and frequency of sample collection. Table 5-1 summarizes the collection during the first phase of work and Table 5-2 summarizes collections during the second phase of work.

TABLE 5-2
(continued)
SAMPLING PROGRAM

The Olin Chemical Group
Hydrogeologic Investigation
102nd Street Landfill

PHASE II COLLECTIONS

SAMPLE TYPE	SAMPLE IDENTIFICATION	SAMPLING EVENTS (by date)			
		1st	2nd	3rd	4th
Niagara River Sediment Grabs (at Site)	G-1	10/25/79	-	-	-
	G-2	10/25/79	-	-	-
	G-3	10/25/79	-	-	-
	G-4	10/25/79	-	-	-
	G-5	10/25/79	-	-	-
	G-6	10/25/79	-	-	-
	G-7	10/25/79	-	-	-
	G-8	10/25/79	-	-	-
	G-9	10/25/79	-	-	-
	G-10	10/25/79	-	-	-
	G-11	10/25/79	-	-	-
	G-12	10/25/79	-	-	-
	G-13	10/25/79	-	-	-
	G-14	10/25/79	-	-	-

TABLE 5-2
(continued)
SAMPLING PROGRAM

The Olin Chemical Group
Hydrogeologic Investigation
102nd Street Landfill

PHASE II COLLECTIONS

SAMPLE TYPE	SAMPLE IDENTIFICATION	SAMPLING EVENTS (by date)			
		1st	2nd	3rd	4
Niagara River Sediment Grabs (at Site) (Continued)	G-15	10/25/79	-	-	-
	G-16	10/25/79	-	-	-
	G-17	10/25/79	-	-	-
	G-18	10/25/79	-	-	-
	G-19	10/25/79	-	-	-
	G-20	10/25/79	-	-	-
	G-21	10/25/79	-	-	-
	G-22	10/25/79	-	-	-
	G-23	10/25/79	-	-	-
	G-24	10/25/79	-	-	-
	G-25	10/25/79	-	-	-
Niagara River Sediment Cores (at Site)	up river	1/15/80	-	-	-
	4	1/15/80	-	-	-
	6	1/17/80	-	-	-
	8	1/17/80	-	-	-
	10	1/17/80	-	-	-
	11	1/14/80	-	-	-
	12	1/17/80	-	-	-
	15	1/17/80	-	-	-

TABLE 5-1
(continued)
SAMPLING PROGRAM

The Olin Chemical Group
Hydrogeologic Investigation
102nd Street Landfill

PHASE II COLLECTIONS

SAMPLE TYPE	SAMPLE IDENTIFICATION	SAMPLING EVENTS (by date)			
		1st	2nd	3rd	4th
Niagara River Sediment Cores (at Site) (Continued)	16	1/15/80	-	-	-
	18	1/15/80	-	-	-
	19	1/18/80	-	-	-
	20	1/18/80	-	-	-
	21	1/18/80	-	-	-
	23	1/18/80	-	-	-
	24	1/18/80	-	-	-
	25	1/15/80	-	-	-
Niagara River Sediment Grabs and Cores (Upriver of Site)	RS-1	6/23/80	-	-	-
	RS-2	6/23/80	-	-	-
	RS-3	6/23/80	-	-	-
	RS-4	6/23/80	-	-	-
	RS-5	6/23/80	-	-	-
	RS-6	6/23/80	-	-	-
	RS-7	6/23/80	-	-	-
	RS-8	6/23/80	-	-	-
	RS-9	6/23/80	-	-	-
	RS-10	6/23/80	-	-	-
	RS-11	6/23/80	-	-	-

5.1.1.1 Surface Water and Sediments

Surface water samples were collected from seven (7) locations (SS1-SS7) adjacent to the 102nd Street Landfill on November 21, 1978, and again on December 17, 1978. No surface water collections were made during the second phase of work.

Surface sediment samples were collected once from eight (8) locations (SS1-SS8) on November 30, 1978. The locations of these sampling points can be seen in Figure 2 from the May 1979 Phase I report.

5.1.1.6 Sediment Grabs and Cores from Niagara River

In addition to the surface sediments collected during the Phase I work, both sediment grabs and cores were collected adjacent to the site and upriver of the site.

5.1.1.6.1 Adjacent to the Site

During the Phase II collections, 25 surface sediment samples were collected on October 25, 1979. The location of these sampling points are depicted on Figure 5-1. Sediment core samples were collected for a selected number of these same locations on January 15-18, 1980. Refer to Table 5-2 for specific information on the resampled locations.

5.1.1.6.2 Upriver (Background)

In addition to the grab and core sediments referred to in the preceeding section, upriver or background cores (RS-1 through RS-11) were collected on June 23, 1980. The location of these samples is depicted in Figure 5-2.

FIGURE 5-1

SURFACE AND CORE SEDIMENT SAMPLING LOCATION

PHASE II INVESTIGATION: OLIN 102 ND STREET LANDFILL

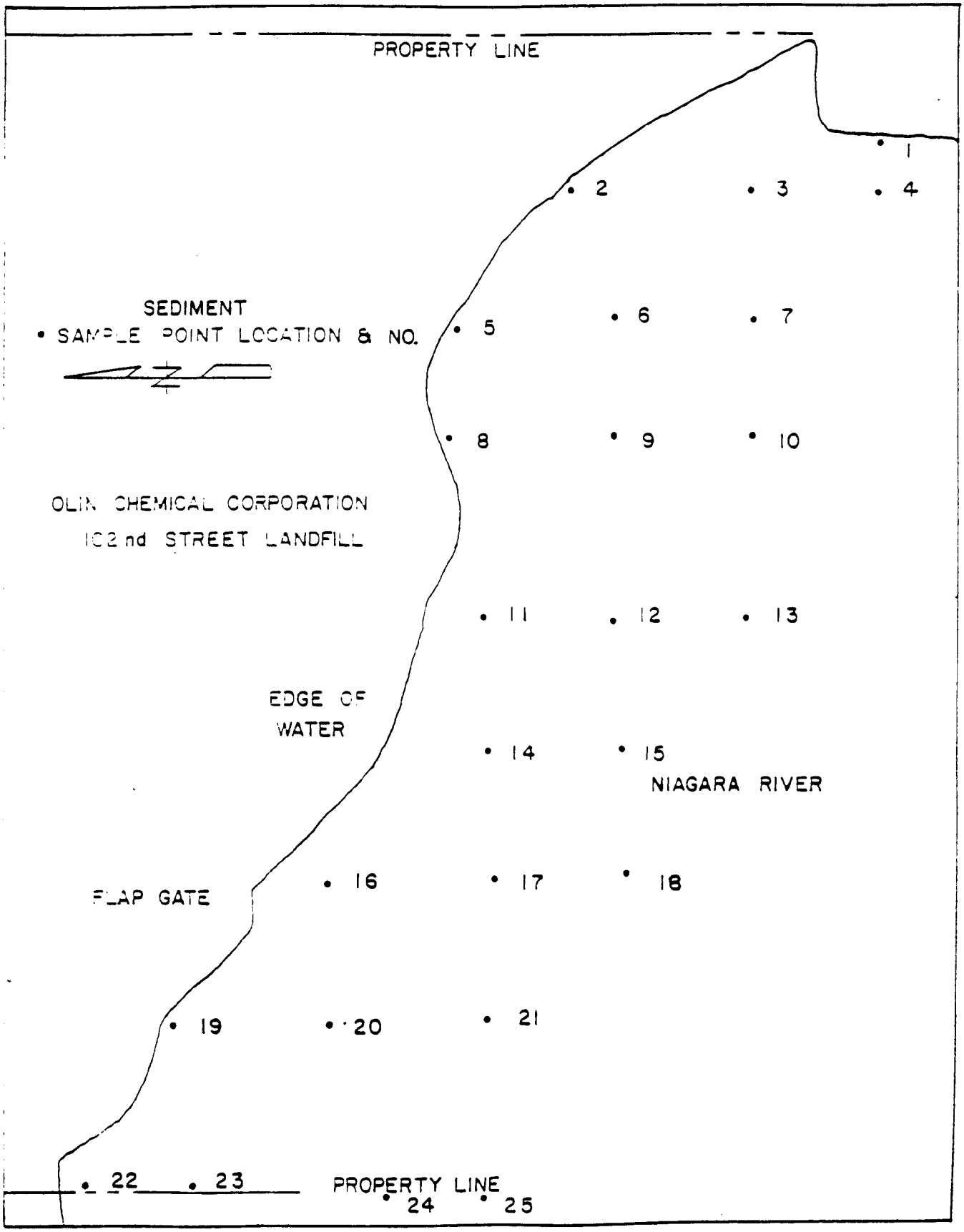
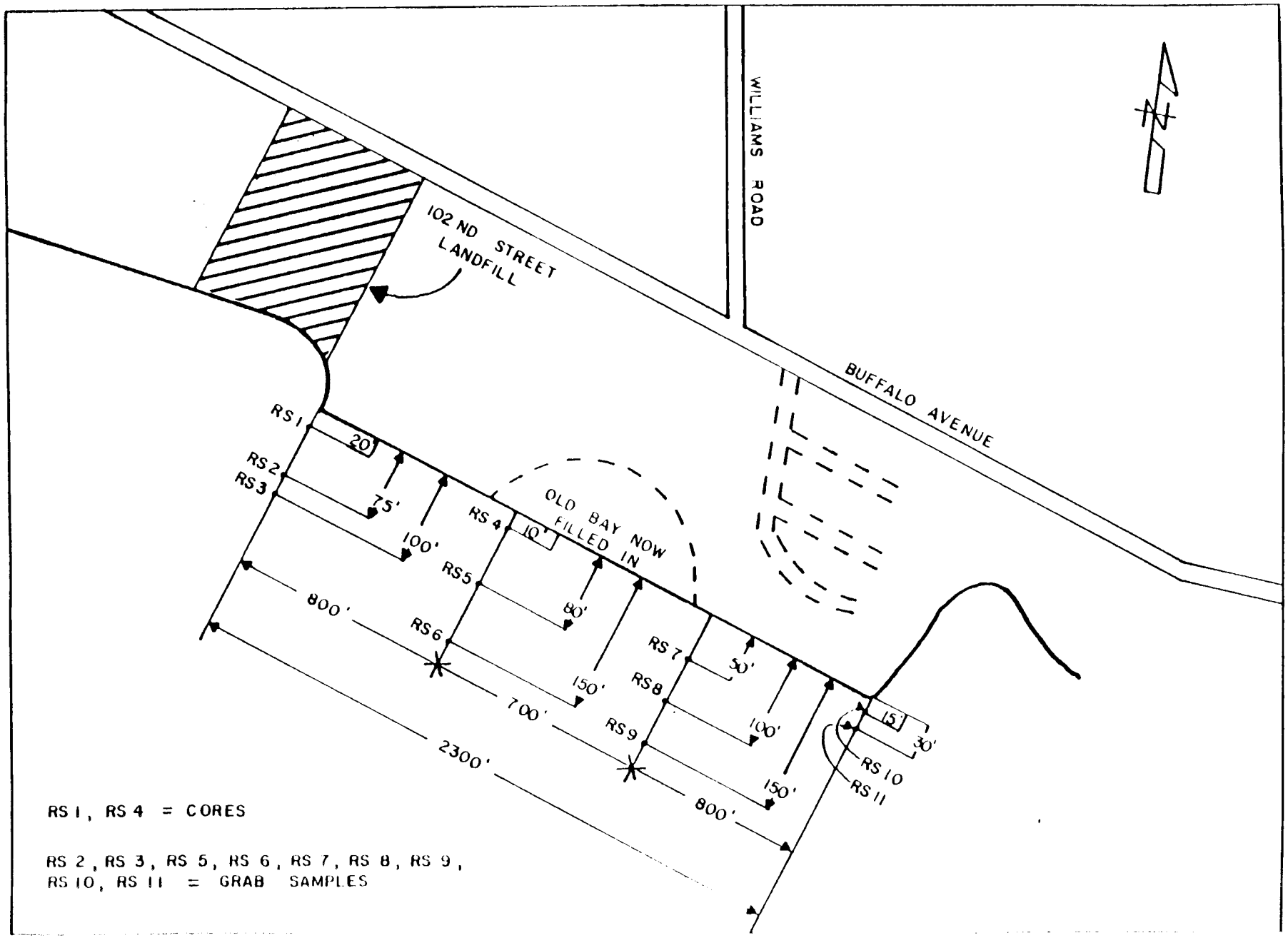


FIGURE 5-2

UPRIVER SURFACE GRAB AND CORE SEDIMENT SAMPLING LOCATION

PHASE II INVESTIGATION: OLIN 102ND STREET LANDFILL



5.1.2.2 Sediment Samples

Phase I Niagara River sediment samples (sample points SS1 through SS8) were grab sampled utilizing a small stainless steel shovel. Sediment samples were obtained by scraping materials from the surface to a depth of approximately six (6) inches.

During Phase II, the sediment samples were collected with either a Ponar dredge or a hand held K-B Corer. The core sampler employed a plastic liner and eggshell core catcher. After each use/collection with either the Ponar or the K-B Corer, the sample device was rinsed clean with copious quantities of water. Grab samples were immediately placed into scrupulously cleaned glass jars with foil or Teflon lined caps. Core camples were capped and returned to the Tonawanda based laboratories of Recra where samples were split (sectioned) by either depth or lithology before being placed in the same type of glass jars.

5.2.1.4 Sediments

The sediment samples adjacent to site (SS-1 through SS-8) collected during the Phase I work were analyzed for:

Dry Weight,
Phenols,
Grease and Oils,
Total Mercury, and
Halogenated Organics.

The sample SS-8 was also analyzed by GC/MS.

During the Phase II investigation, the 25 surface sediment grab samples (G-1 through G-25), cores adjacent to the site, and grab/core samples upriver from the site were analyzed for:

Dry Weight,
Total Mercury, and
Halogenated Organics.

In addition, five selected grab samples (G-14, G-16, G-19, G-21, and G-25) were analyzed for the parameters presented in Table 5-5.

The sewer sediment samples collected at the Buffalo Avenue and river outfall location acquired during the Phase II investigation were also analyzed for the parameters presented in Table 5-5.

5.2.2 Analytical Methodology

All analytical methods employed during the two investigative phases of work for the 102nd Street Landfill samples were either U. S. Environmental Protection Agency and/or American Public Health Association methods. Halogenated organic scan determinations are based upon the total chromographic response of an electron capture detection to injection of a pesticidal extract prepared according to U.S. Environmental Protection Agency methods. Total volatile halogenated organic analyses are based upon total chromatographic response of a chlor[illegible]ecific detection to purge and trap techniques as presen[illegible]ental Protection Agency.

TABLE 5-5

ANALYTICAL PROTOCOL

SELECTED SEDIMENT GRABS/SEWER SEDIMENTS

PHASE II

The Olin Chemical Group
Hydrogeologic Investigation
102nd Street Landfill

Total Halogenated Organics

BHC Isomers

Chlorobenzenes

Total Phenols

Chlorophenols*

2,4,5 Trichlorophenol

Total Mercury

Dry Weight

*Chlorinated Priority Pollutant Phenolics.

TABLE 5-15

ANALYTICAL RESULTS

THE OLIN CHEMICAL GROUP
HYDROGEOLOGICAL INVESTIGATION
102ND STREET LANDFILL

NIAGARA RIVER SEDIMENT GRAB SAMPLES

Adjacent to the Site

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		G-1 (10-25-79)	G-2 (10-25-79)	G-3 (10-25-79)	G-4 (10-25-79)
Dry Weight	%	74.7	79.2	82.4	73.6
Total Mercury	ug/g (dry)	0.26	7.3	1.0	2.7
Total Phenol	ug/g (dry)	-	-	-	-
Halogenated Organic Scan	ug/g (dry) as Chlorine, Lindane Standard	0.22	1.74	0.20	0.29
α - BHC	ug/g (dry)	-	-	-	-
β - BHC	ug/g (dry)	-	-	-	-
γ - BHC	ug/g (dry)	-	-	-	-
Δ - BHC	ug/g (dry)	-	-	-	-
2-Chlorophenol	ug/g (dry)	-	-	-	-
2,4-dichlorophenol	ug/g (dry)	-	-	-	-
2,4,5-trichlorophenol	ug/g (dry)	-	-	-	-
2,4,6-trichlorophenol	ug/g (dry)	-	-	-	-
p-chloro-m-cresol	ug/g (dry)	-	-	-	-
pentachlorophenol	ug/g (dry)	-	-	-	-
o-dichlorobenzene	ug/g (dry)	-	-	-	-
m-dichlorobenzene	ug/g (dry)	-	-	-	-
p-dichlorobenzene	ug/g (dry)	-	-	-	-
1,2,3-trichlorobenzene	ug/g (dry)	-	-	-	-
1,2,4-trichlorobenzene	ug/g (dry)	-	-	-	-
1,3,5-trichlorobenzene	ug/g (dry)	-	-	-	-
1,2,3,4-tetrachlorobenzene	ug/g (dry)	-	-	-	-
1,2,4,5- ; 1,2,3,5-tetrachlorobenzene	ug/g (dry)	-	-	-	-
pentachlorobenzene	ug/g (dry)	-	-	-	-
hexachlorobenzene	ug/g (dry)	-	-	-	-

TABLE 5-15

ANALYTICAL RESULTS

THE OLIN CHEMICAL GROUP
HYDROGEOLOGICAL INVESTIGATION
102ND STREET LANDFILL

NIAGARA RIVER SEDIMENT GRAB SAMPLES

Adjacent to the Site

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		G-5 (10-25-79)	G-6 (10-25-79)	G-7 (10-25-79)	G-8 (10-25-79)
Dry Weight	%	71.4	69.9	79.6	74.6
Total Mercury	ug/g (dry)	15	8.0	5.9	42
Total Phenol	ug/g (dry)	-	-	-	-
Halogenated Organic Scan	ug/g (dry) as Chlorine, Lindane Standard	ND	0.09	0.15	0.23
α - BHC	ug/g (dry)	-	-	-	-
β - BHC	ug/g (dry)	-	-	-	-
γ - BHC	ug/g (dry)	-	-	-	-
Δ - BHC	ug/g (dry)	-	-	-	-
2-Chlorophenol	ug/g (dry)	-	-	-	-
2,4-dichlorophenol	ug/g (dry)	-	-	-	-
2,4,5-trichlorophenol	ug/g (dry)	-	-	-	-
2,4,6-trichlorophenol	ug/g (dry)	-	-	-	-
p-chloro-m-cresol	ug/g (dry)	-	-	-	-
pentachlorophenol	ug/g (dry)	-	-	-	-
o-dichlorobenzene	ug/g (dry)	-	-	-	-
m-dichlorobenzene	ug/g (dry)	-	-	-	-
p-dichlorobenzene	ug/g (dry)	-	-	-	-
1,2,3-trichlorobenzene	ug/g (dry)	-	-	-	-
1,2,4-trichlorobenzene	ug/g (dry)	-	-	-	-
1,3,5-trichlorobenzene	ug/g (dry)	-	-	-	-
1,2,3,4-tetrachlorobenzene	ug/g (dry)	-	-	-	-
1,2,4,5- ; 1,2,3,5-tetrachlorobenzene	ug/g (dry)	-	-	-	-
pentachlorobenzene	ug/g (dry)	-	-	-	-
hexachlorobenzene	ug/g (dry)	-	-	-	-

TABLE 5-15

ANALYTICAL RESULTS

THE OLIN CHEMICAL GROUP
HYDROGEOLOGICAL INVESTIGATION
102ND STREET LANDFILL

NIAGARA RIVER SEDIMENT GRAB SAMPLES

Adjacent to the Site

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		G-9 (10-25-79)	G-10 (10-25-79)	G-11 (10-25-79)	G-12 (10-25-79)
Dry Weight	%	76.4	80.5	79.5	71.1
Total Mercury	ug/g (dry)	35	20	11	41
Total Phenol	ug/g (dry)	-	-	-	-
Halogenated Organic Scan	ug/g (dry) as Chlorine, Lindane Standard	0.03	1.10	0.79	0.24
α - BHC	ug/g (dry)	-	-	-	-
β - BHC	ug/g (dry)	-	-	-	-
γ - BHC	ug/g (dry)	-	-	-	-
δ - BHC	ug/g (dry)	-	-	-	-
2-Chlorophenol	ug/g (dry)	-	-	-	-
2,4-dichlorophenol	ug/g (dry)	-	-	-	-
2,4,5-trichlorophenol	ug/g (dry)	-	-	-	-
2,4,6-trichlorophenol	ug/g (dry)	-	-	-	-
p-chloro-m-cresol	ug/g (dry)	-	-	-	-
pentachlorophenol	ug/g (dry)	-	-	-	-
o-dichlorobenzene	ug/g (dry)	-	-	-	-
m-dichlorobenzene	ug/g (dry)	-	-	-	-
p-dichlorobenzene	ug/g (dry)	-	-	-	-
1,2,3-trichlorobenzene	ug/g (dry)	-	-	-	-
1,2,4-trichlorobenzene	ug/g (dry)	-	-	-	-
1,3,5-trichlorobenzene	ug/g (dry)	-	-	-	-
1,2,3,4-tetrachlorobenzene	ug/g (dry)	-	-	-	-
1,2,4,5- ; 1,2,3,5-tetrachlorobenzene	ug/g (dry)	-	-	-	-
pentachlorobenzene	ug/g (dry)	-	-	-	-
hexachlorobenzene	ug/g (dry)	-	-	-	-

TABLE 5-15

ANALYTICAL RESULTS

THE OLIN CHEMICAL GROUP
HYDROGEOLOGICAL INVESTIGATION
102ND STREET LANDFILL

NIAGARA RIVER SEDIMENT GRAB SAMPLES

Adjacent to the Site

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		G-13 (10-25-79)	G-14 (10-25-79)	G-15 (10-25-79)	G-16 (10-25-79)
Dry Weight	%	69.4	70.3	67.9	67.2
Total Mercury	ug/g (dry)	17	18	57	5.9
Total Phenol	ug/g (dry)	-	6.37	-	9.08
Halogenated Organic Scan	ug/g (dry) as Chlorine, Lindane Standard	0.02	2.43	1.85	58.1
α - BHC	ug/g (dry)	-	0.73	-	2.7
β - BHC	ug/g (dry)	-	0.37	-	$ND_{0.1}$
γ - BHC	ug/g (dry)	-	0.03	-	3.5
Δ - BHC	ug/g (dry)	-	0.10	-	$ND_{0.1}$
2-Chlorophenol	ug/g (dry)	-	ND	-	$ND_{1.0}$
2,4-dichlorophenol	ug/g (dry)	-	5	-	1,900
2,4,5-trichlorophenol	ug/g (dry)	-	ND	-	23
2,4,6-trichlorophenol	ug/g (dry)	-	ND	-	14
p-chloro-m-cresol	ug/g (dry)	-	ND	-	73
pentachlorophenol	ug/g (dry)	-	ND	-	62
o-dichlorobenzene	ug/g (dry)	-	$ND_{1.0}$	-	200
m-dichlorobenzene	ug/g (dry)	-	$ND_{1.0}$	-	19
p-dichlorobenzene	ug/g (dry)	-	$ND_{1.0}$	-	93
1,2,3-trichlorobenzene	ug/g (dry)	-	9.3	-	430
1,2,4-trichlorobenzene	ug/g (dry)	-	390	-	1,200
1,3,5-trichlorobenzene	ug/g (dry)	-	$ND_{1.0}$	-	1,200
1,2,3,4-tetrachlorobenzene	ug/g (dry)	-	91	-	4,000
1,2,4,5- ; 1,2,3,5-tetrachlorobenzene	ug/g (dry)	-	41	-	1,100
pentachlorobenzene	ug/g (dry)	-	56	-	2,400
hexachlorobenzene	ug/g (dry)	-	12	-	240

TABLE 5-15

ANALYTICAL RESULTS

THE OLIN CHEMICAL GROUP
HYDROGEOLOGICAL INVESTIGATION
102ND STREET LANDFILL

NIAGARA RIVER SEDIMENT GRAB SAMPLES

Adjacent to the Site

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		G-17 (10-25-79)	G-18 (10-25-79)	G-19 (10-25-79)	G-20 (10-25-79)
Dry Weight	%	69.2	74.9	93.4	69.5
Total Mercury	ug/g (dry)	2.0	16	13	4.9
Total Phenol	ug/g (dry)	-	-	24.1	-
Halogenated Organic Scan	ug/g (dry) as Chlorine, Lindane Standard	1.40	0.08	9.94	0.06
α - BHC	ug/g (dry)	-	-	0.70	-
β - BHC	ug/g (dry)	-	-	0.52	-
γ - BHC	ug/g (dry)	-	-	0.54	-
δ - BHC	ug/g (dry)	-	-	0.86	-
2-Chlorophenol	ug/g (dry)	-	-	ND	-
2,4-dichlorophenol	ug/g (dry)	-	-	160	-
2,4,5-trichlorophenol	ug/g (dry)	-	-	2	-
2,4,6-trichlorophenol	ug/g (dry)	-	-	ND	-
p-chloro-m-cresol	ug/g (dry)	-	-	330	-
pentachlorophenol	ug/g (dry)	-	-	85	-
o-dichlorobenzene	ug/g (dry)	-	-	ND 10	-
m-dichlorobenzene	ug/g (dry)	-	-	53	-
p-dichlorobenzene	ug/g (dry)	-	-	ND 10	-
1,2,3-trichlorobenzene	ug/g (dry)	-	-	9.4	-
1,2,4-trichlorobenzene	ug/g (dry)	-	-	160	-
1,3,5-trichlorobenzene	ug/g (dry)	-	-	680	-
1,2,3,4-tetrachlorobenzene	ug/g (dry)	-	-	140	-
1,2,4,5- ; 1,2,3,5-tetrachlorobenzene	ug/g (dry)	-	-	130	-
pentachlorobenzene	ug/g (dry)	-	-	140	-
hexachlorobenzene	ug/g (dry)	-	-	22	-

TABLE 5-15

ANALYTICAL RESULTS

THE OLIN CHEMICAL GROUP
HYDROGEOLOGICAL INVESTIGATION
102ND STREET LANDFILL

NIAGARA RIVER SEDIMENT GRAB SAMPLES

Adjacent to the Site

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		G-21 (10-25-79)	G-22 (10-25-79)	G-23 (10-25-79)	G-24 (10-25-79)
Dry Weight	%	95.9	60.4	71.9	69.6
Total Mercury	ug/g (dry)	17	20	3.3	29
Total Phenol	ug/g (dry)	3.58	-	-	-
Halogenated Organic Scan	ug/g (dry) as Chlorine, Lindane Standard	12.8	0.55	0.04	3.74
α - BHC	ug/g (dry)	0.53	-	-	-
β - BHC	ug/g (dry)	$ND_{0.01}$	-	-	-
γ - BHC	ug/g (dry)	0.71	-	-	-
δ - BHC	ug/g (dry)	1.10	-	-	-
2-Chlorophenol	ug/g (dry)	ND	-	-	-
2,4-dichlorophenol	ug/g (dry)	19	-	-	-
2,4,5-trichlorophenol	ug/g (dry)	4	-	-	-
2,4,6-trichlorophenol	ug/g (dry)	ND	-	-	-
p-chloro-m-cresol	ug/g (dry)	29	-	-	-
pentachlorophenol	ug/g (dry)	13	-	-	-
o-dichlorobenzene	ug/g (dry)	78	-	-	-
m-dichlorobenzene	ug/g (dry)	8.0	-	-	-
p-dichlorobenzene	ug/g (dry)	52	-	-	-
1,2,3-trichlorobenzene	ug/g (dry)	99	-	-	-
1,2,4-trichlorobenzene	ug/g (dry)	4.3	-	-	-
1,3,5-trichlorobenzene	ug/g (dry)	34	-	-	-
1,2,3,4-tetrachlorobenzene	ug/g (dry)	850	-	-	-
1,2,4,5- ; 1,2,3,5-tetrachlorobenzene	ug/g (dry)	260	-	-	-
pentachlorobenzene	ug/g (dry)	470	-	-	-
hexachlorobenzene	ug/g (dry)	56	-	-	-

TABLE 5-15

ANALYTICAL RESULTS

THE OLIN CHEMICAL GROUP
HYDROGEOLOGICAL INVESTIGATION
102ND STREET LANDFILL

NIAGARA RIVER SEDIMENT GRAB SAMPLES

Adjacent to the Site

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION (DATE)			
		G-25 (10-25-79)			
Dry Weight	%	69.8	-	-	-
Total Mercury	ug/g (dry)	10	-	-	-
Total Phenol	ug/g (dry)	5.66	-	-	-
Halogenated Organic Scan	ug/g (dry) as Chlorine, Lindane Standard	5.41	-	-	-
α - BHC	ug/g (dry)	2.15	-	-	-
β - BHC	ug/g (dry)	$ND_{0.01}$	-	-	-
γ - BHC	ug/g (dry)	0.21	-	-	-
δ - BHC	ug/g (dry)	0.27	-	-	-
2-Chlorophenol	ug/g (dry)	ND	-	-	-
2,4-dichlorophenol	ug/g (dry)	37	-	-	-
2,4,5-trichlorophenol	ug/g (dry)	6	-	-	-
2,4,6-trichlorophenol	ug/g (dry)	ND	-	-	-
p-chloro-m-cresol	ug/g (dry)	ND	-	-	-
pentachlorophenol	ug/g (dry)	ND	-	-	-
o-dichlorobenzene	ug/g (dry)	ND_{10}	-	-	-
m-dichlorobenzene	ug/g (dry)	ND_{10}	-	-	-
p-dichlorobenzene	ug/g (dry)	ND_{10}	-	-	-
1,2,3-trichlorobenzene	ug/g (dry)	130	-	-	-
1,2,4-trichlorobenzene	ug/g (dry)	584	-	-	-
1,3,5-trichlorobenzene	ug/g (dry)	24	-	-	-
1,2,3,4-tetrachlorobenzene	ug/g (dry)	170	-	-	-
1,2,4,5- ; 1,2,3,5-tetrachlorobenzene	ug/g (dry)	45	-	-	-
pentachlorobenzene	ug/g (dry)	105	-	-	-
hexachlorobenzene	ug/g (dry)	170	-	-	-

TABLE 5-16

ANALYTICAL RESULTS

The Olin Chemical Group

Hydrogeological Investigation

102nd Street Landfill

NIAGARA RIVER SEDIMENT CORE SAMPLES

Adjacent to the Site

Core Sample Identification	Depth of Core Section (inches)	PARAMETER		
		Dry Weight (%)	Total Mercury (µg/g dry)	Total Halogenated Organics (µg/g dry as Chlorine, Lindane Standard)
4	5-7	80	<0.06	0.26
	10-12	82	<0.06	0.08
	20-22	83	<0.07	0.10
6	5-7	81	0.37	0.17
	10-12	82	<0.06	1.21
	19-21	79	<0.06	0.12
8	5-7	77	1.5	2.10
	11-13	83	0.46	0.11
	21-23	81	<0.06	0.05
10	5-7	79	0.10	0.06
	10-12	85	<0.06	0.06
	19-21	82	0.13	0.05
11	5-7	84	2.4	27.8
	10-12	81	<0.1	2.66
	20-22	81	<0.06	0.39
12	2-4	55	310	246
	5-7	82	5.2	0.99
	9-11	82	1.2	0.05
	18-20	79	0.77	0.08
15	5-7	84	6.2	0.18
	8-10	85	<0.06	0.34
	17-19	84	1.3	0.11
16	5-7	81	1,100	472
	9-11	81	3.8	14.3
	19-21	80	710	412

TABLE 5-16

ANALYTICAL RESULTS

The Olin Chemical Group

Hydrogeological Investigation

102nd Street Landfill

NIAGARA RIVER SEDIMENT CORE SAMPLES

Adjacent to the Site

Core Sample Identification	Depth of Core Section (inches)	PARAMETER		
		Dry Weight (%)	Total Mercury (µg/g dry)	Total Halogenated Organics (µg/g dry as Chlorine, Lindane Standard)
18	5-7	84	0.44	0.43
	7-9	79	<0.06	5.08
	14-16	82	0.52	0.08
19	2-4	87	49	34.6
	5-7	81	0.19	0.75
	9-11	79	<0.07	0.06
	17-19	79	0.11	0.18
20	5-7	73	0.33	0.06
	11-13	80	<0.07	0.01
	20-22	78	<0.06	0.05
21	5-7	79	0.27	0.06
	10-12	77	<0.07	0.09
	17-19	78	<0.07	0.04
23	5-7	76	0.14	0.08
	9-11	68	<0.07	0.03
	16-18	80	<0.07	0.02
24	5-7	80	<0.06	0.06
	9-11	82	<0.06	0.07
	16-18	78	<0.06	0.07
25	5-7	79	0.24	0.04
	10-12	79	<0.06	0.07
	19-21	78	<0.06	<0.01
Upstream	5-7	82	0.48	<0.01
	7-9	80	<0.06	0.04
	14-16	83	<0.06	<0.01

TABLE 5-17

ANALYTICAL RESULTS

The Olin Chemicals Group

Hydrogeological Investigation

102nd Street Landfill

NIAGARA RIVER SEDIMENT GRAB AND CORE SAMPLES

Upriver of the Site

Sample Identification	Sample Depth	PARAMETER (UNITS OF MEASURE)		
		Dry Weight (%)	Total Mercury (µg/g dry)	Total Halogenated Organic (µg/g Dry as Chlorine, Lindane Standard)
RS-1	Surface	79.5	10.1	0.77
	Bottom	80.9	0.50	0.36
RS-2	Surface	64.7	1.24	0.60
RS-3	Surface	70.1	0.29	0.28
RS-4	Surface	82.9	0.24	0.72
	Bottom	82.3	<0.05	0.23
RS-5	Surface	75.6	<0.1	0.22
RS-6	Surface	72.9	0.07	0.26
RS-7	Surface	71.1	0.04	0.37
RS-8	Surface	75.6	0.04	0.61
RS-9	Surface	73.5	<0.04	0.37
RS-10	Surface	79.4	0.05	0.24
RS-11	Surface	72.6	0.06	0.50

6.3 Sediment Quality

In the initial phase of this study, samples of sediments from the Niagara River were taken by Recra personnel on Novmeber 30, 1978. The results of this sampling are detailed in the Phase I Hydrogeologic Report. A more extensive sampling program was undertaken after preparation of the preliminary hydrogeologic report. On November 25, 1979, grab samples of surficial sediments were collected at 25 stations in the Niagara River adjacent to the Olin site (see Figure 5-1). On January 15th and 18th, 1980, core samples were taken at many of these same sampling points. These core samples were generally segmented into three discrete depth fractions and are referred to as the upper (5-7"), middle (9-12") and bottom (<12") sediments. The upper sediments of these core samples are generally from slightly greater depths than the surficial (0-4") sediment collections. To determine the background level in the Niagara River, grab and core samples were also taken on four transects upstream from the site. The sample point locations of these upstream collections are shown on Figure 5-2 and the analytical results are given in Tables 5-15, 5-16, and 5-17, respectively.

APPENDIX I

SEDIMENT DIOXIN DATA AT THE

102ND STREET LANDFILL

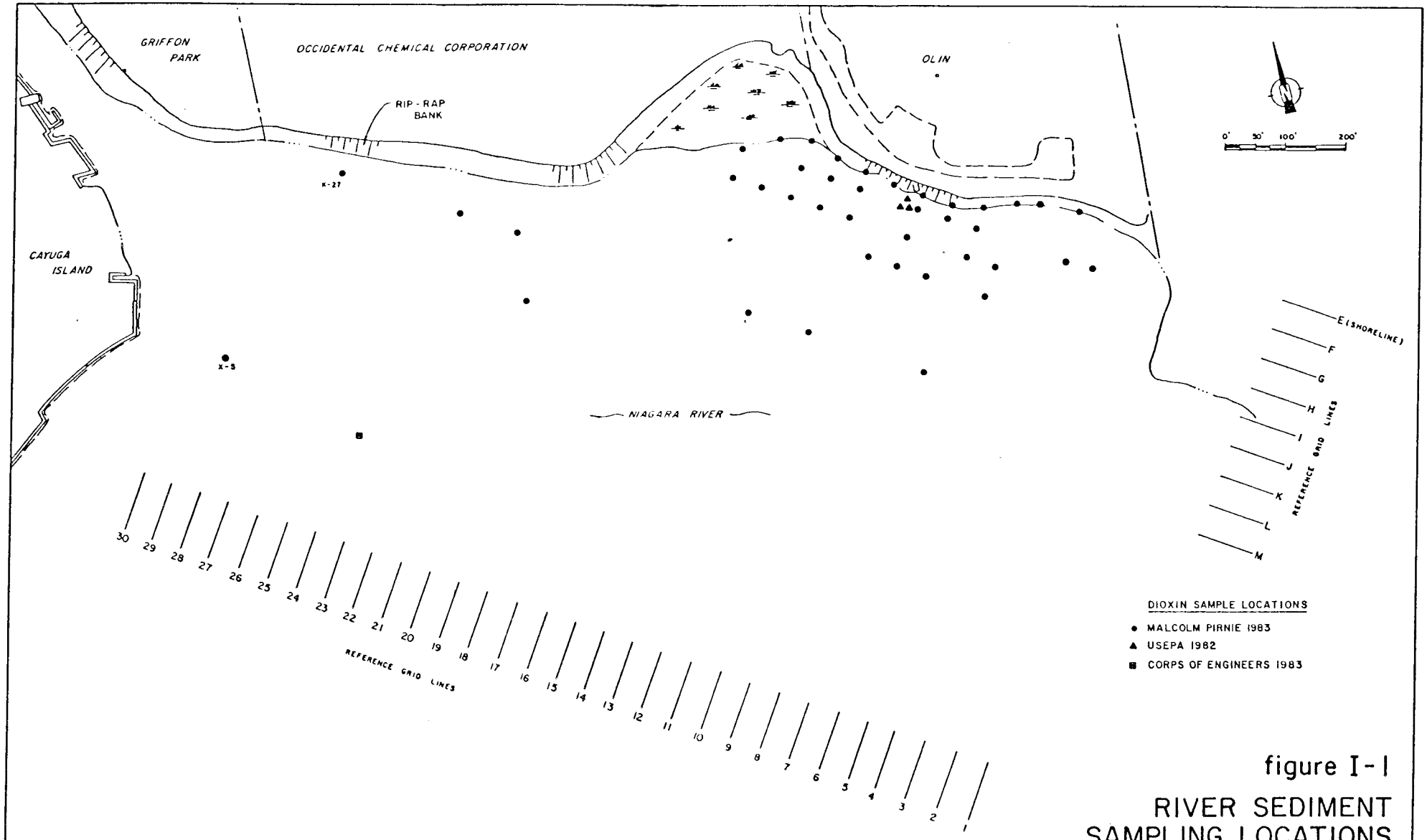


figure I-1

RIVER SEDIMENT SAMPLING LOCATIONS DIOXIN ANALYSIS

102nd Street Landfill

CRA

1431-1/02/85-9-D-3

SAMPLE NO.		DESCRIPTION	CONCENTRATION	SAMPLING PROGRAM
		Outfall Sediment	31 ng/g	NYSDOH/NYSDEC 11/79
		Near 102nd. St. Outfall	0.020 ug/kg	USEPA, 5/82
		Near 102nd. St. Outfall	0.100 ug/kg	USEPA, 5/82
		Near 102nd. St. Outfall	0.060 ug/kg	USEPA, 5/82
F	8	Niagara 0-1 ft.	3.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	10	Niagara 2-3 ft.	<0.090 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	10	Niagara 1-2 ft.	<0.060 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	10	Niagara 0-1 ft.	<0.050 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	11	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	11	Niagara 1-2 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	12	Niagara 0-1 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	12	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	12	Niagara 1-2 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	13	Niagara 1-2 ft.	<1.400 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	13	Niagara 2-3 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	13	Niagara 0-1 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	14	Niagara 0-1 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	4	Niagara 0-1 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	6	Niagara 0-1 ft.	<1.000 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	6	Niagara 1-2 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	6	Niagara 2-3 ft.	<0.050 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	7	Niagara 1-2 ft.	<0.020 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	7	Niagra 2-3 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	8	Niagara 0-1 ft.	<3.000 ug/kg	Malcolm-Pirnie, Inc., 10/83

SAMPLE NO.		DESCRIPTION	CONCENTRATION	SAMPLING PROGRAM
E	8	Niagara 1-2 ft.	<0.400 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	9	Niagara 1-2 ft.	<0.500 ug/kg	Malcolm-Pirnie, Inc., 10/83
E	9	Niagara 2-3 ft.	<2.600 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	11	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	12	Niagra 2-3 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	13	Niagara 0-1 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	13	Niagra 1-2 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	15	Niagra 0-1 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	3	Niagara 0-1 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	3	Niagra 1-2 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	4	Niagara 1-2 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	7	Niagara 0-1 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	7	Niagara 2-3 ft.	<0.090 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	8	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	8	Niagara 1-2 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	9	Niagara 2-3 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	9	Niagara 1-2 ft.	<0.600 ug/kg	Malcolm-Pirnie, Inc., 10/83
F	9	Niagara 0-1 ft.	<0.500 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	11	Niagara 1-2 ft.	<0.070 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	11	Niagara 0-1 ft.	<0.090 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	11	Niagara 2-3 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	12	Niagara 1-2 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	12	Niagara 0-1 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	13	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83

SAMPLE NO.		DESCRIPTION	CONCENTRATION	SAMPLING PROGRAM
G	14	Niagara 0-1 ft.	<0.700 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	15	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	6	Niagara 0-1 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	7	Niagara 2-3 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
G	9	Niagara 0-1 ft.	<0.500 ug/kg	Malcolm-Pirnie, Inc., 10/83
H	10	Niagara 0-1 ft.	<2.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
H	6	Niagara 0-1 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
H	8	Niagara 2-3 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
H	9	Niagara 2-3 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	11	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	11	Niagara 0-1 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	13	Niagara 0-1 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	21	Niagara 0-1 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	23	Niagara 2-3 ft.	<0.200 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	27	Niagara 1-2 ft.	<0.100 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	7	Niagara 1-2 ft.	<0.500 ug/kg	Malcolm-Pirnie, Inc., 10/83
K	7	Niagara 0-1 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
M	20	Niagara 1-2 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
X	5	Niagara 1-2 ft.	<0.300 ug/kg	Malcolm-Pirnie, Inc., 10/83
SS	1	0 - 3 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS	1	Clay	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83

TABLE I-1

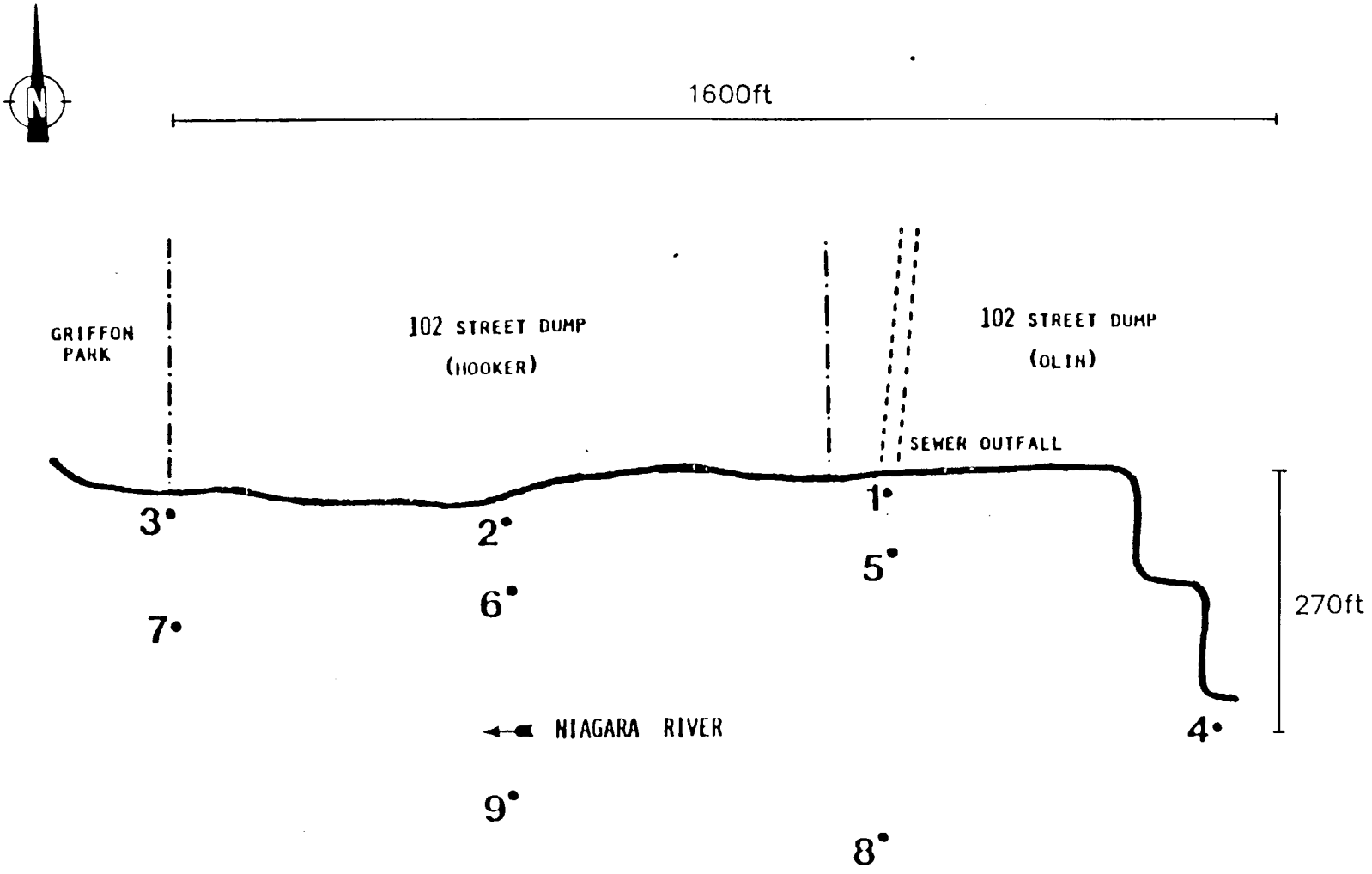
SAMPLE NO.	DESCRIPTION	CONCENTRATION	SAMPLING PROGRAM
SS 2	0 - 3 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 2	3 - 6 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 3	0 - 3 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 3	3 - 6 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 4	0 - 3 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 5	0 - 3 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 5	3 - 6 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 6	0 - 3 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 7	0 - 3 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83
SS 7	3 - 6 ft.	<0.2 ug/kg	Corps. of Engineers/Floyd Browne Assoc. 9/83

APPENDIX J

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL

(Jaffe - 1979)



REF: "AQUATIC FATE OF ANTHROPOGENIC ORGANIC COMPOUNDS FROM HAZARDOUS WASTE DISPOSAL SITES" (by Rudolf Jaffe, 1983)

figure J-1

SEDIMENT CORE SAMPLE LOCATIONS
102nd Street Landfill

CRA

1431-1/10/88-9-D-1

TABLE J-1

ANALYTICAL RESULTS FROM JAFFE
102nd STREET SEDIMENT STUDY

Site 1

COMPOUND	CONCENTRATION (PPM)						
Depth (CM)	0.50	2.25	6.00	11.00	16.00	22.50	30.50
Chlorobenzenes:							
Chlorobz.	0.1	0.1	0.09	0.05	0.05	0.1	0.08
Dichlorobz.	7.2	3.8	5.2	0.3	0.1	0.003	0.00
Trichlorobz.	190	160	36	26	2.7	0.06	0.1
Tetrachlorobz.	1100	760	370	270	6.8	0.03	0.6
Pentachlorobz.	320	270	86	83	1.5	0.003	0.2
Hexachlorobz..	17	30	5.5	4.7	0.08	-	0.00
Chlorotoluenes:							
Chlorotol.	2.2	2.2	0.3	0.06	0.004	-	-
Dichlorotol.	190	110	18	7.1	0.4	0.01	0.03
Trichlorotol.	230	210	43	13	1.0	0.01	0.07
Tetrachlorotol.	32	41	6.4	5.7	0.2	-	0.01
Pentachlorotol.	17	26	1.8	1.4	0.02	-	0.00
Hexachlorotol.	24	42	1.0	0.4	-	-	0.00
Heptachlorotol.	21	34	0.7	0.3	-	-	0.00
Dichloroethylbenzene	2.0	1.8	0.9	0.5	0.02	0.0003	0.02
Chloronaphthalenes:							
Chloronaphth.	11	1.9	1.9	0.4	-	-	-
Dichloronaphth.	14	7.6	2.7	2.5	0.08	-	-
Trichloronaphth.	5.7	3.8	1.1	1.4	0.04	-	-
Benzyl Derivatives:							
MDPM	400	280	61	32	1.0	-	0.3
Chloro-MDPM	-	5.5	3.5	-	-	-	-
Dichloro-MDPM	13	45	5.9	2.3	0.05	-	0.00
Trichloro-MDPM	45	87	13	13	0.4	-	0.03
Tetrachloro-MDPM	3.2	16	1.8	1.6	-	-	-
Pentachloro-MDPM	-	3.8	-	-	-	-	-
Me-Bis(PM)BZ	96	150	13	11	0.5	-	0.07
Chloro-Bis(PM)BZ	4.3	21	1.5	1.3	0.04	-	-
Dichloro-Bis(PM)BZ	-	30	1.9	2.1	0.08	-	-
Trichloro-Bis(PM)BZ	2.9	34	1.3	1.0	0.03	-	-
Tetrachloro-Bis(PM)BZ	-	38	-	0.3	-	-	-
Pentachloro-Bis(PM)BZ	-	41	-	0.5	-	-	-
Miscellaneous:							
BHC	160	140	260	110	7.5	0.01	0.6
Ethenylidenebischlorobz.	53	53	20	13	1.2	-	0.03
Mirex	-	-	-	-	-	-	-
Chlorinated Norboranes	+	+	+	+	-	-	-

MDPM = Methyldiphenylmethane
M -Bis(PM)BZ = Methylbisphenylmethylbz.

TABLE J-1

ANALYTICAL RESULTS FROM JAFFE
102nd STREET SEDIMENT STUDY

Site 2

COMPOUND	CONCENTRATION (PPM)			
Depth (CM)	1.50	7.50	16.50	26.50
Chlorobenzenes:				
Chlorobz.	-	-	-	-
Dichlorobz.	0.2	0.05	0.01	0.003
Trichlorobz.	0.3	0.02	0.008	0.003
Tetrachlorobz.	8.8	0.5	0.001	0.0006
Pentachlorobz.	0.3	0.005	-	-
Hexachlorobz..	0.4	0.001	-	-
Chlorotoluenes:				
Chlorotol.	-	-	-	-
Dichlorotol.	0.2	0.01	0.0007	0.0004
Trichlorotol.	0.1	0.002	-	-
Tetrachlorotol.	0.04	-	-	-
Pentachlorotol.	0.07	-	-	-
Hexachlorotol.	0.04	-	-	-
Heptachlorotol.	0.04	-	-	-
Dichloroethylbenzene	-	-	-	-
Chloronaphthalenes:				
Chloronapnth.	0.02	0.007	0.005	0.004
Dichloronaphth.	0.1	0.02	0.001	0.0004
Trichloronaphth.	0.08	0.003	-	-
Benzyl Derivatives:				
MDPM	0.7	-	-	-
Chloro-MDPM	-	-	-	-
Dichloro-MDPM	0.2	-	-	-
Trichloro-MDPM	1.8	-	-	-
Tetrachloro-MDPM	0.04	-	-	-
Pentachloro-MDPM	-	-	-	-
Me-Bis(PM)BZ	3.3	0.01	-	-
Chloro-Bis(PM)BZ	0.3	-	-	-
Dichloro-Bis(PM)BZ	0.8	-	-	-
Trichloro-Bis(PM)BZ	0.07	-	-	-
Tetrachloro-Bis(PM)BZ	-	-	-	-
Pentachloro-Bis(PM)BZ	-	-	-	
Miscellaneous:				
BHC	7.6	0.03	0.1	0.09
Ethenylidenebischlorobz.	0.8	-	-	-
Mirex	0.7	-	-	-
Chlorinated Norboranes	+	-	-	-

MDPM = Methyldiphenylmethane
Me-Bis(PM)BZ = Methylbisphenylmethylbz.

TABLE J-1

ANALYTICAL RESULTS FROM JAFFE
102nd STREET SEDIMENT STUDY

COMPOUND	Site 3	Site 5		Site 6		Site 7
	CONCENTRATION (PPM)					
Depth (CM)	1.00	1.25	6.50	1.00	6.00	1.50
Chlorobenzenes:						
Chlorobz.	-	-	-	-	-	-
Dichlorobz.	0.007	0.01	0.04	0.02	0.006	0.09
Trichlorobz.	0.07	0.004	0.03	0.01	0.003	0.03
Tetrachlorobz.	1	0.01	-	0.09	0.004	0.6
Pentachlorobz.	0.05	0.006	-	0.007	0.0004	0.03
Hexachlorobz..	0.01	-	-	-	-	0.1
Chlorotoluenes:						
Chlorotol.	-	0.05	0.04	-	-	-
Dichlorotol.	0.02	0.03	0.3	0.02	0.01	0.005
Trichlorotol.	0.02	0.003	0.0008	0.01	0.005	0.003
Tetrachlorotol.	0.003	-	-	-	-	-
Pentachlorotol.	0.005	-	-	-	-	-
Hexachlorotol.	-	-		-	-	-
Heptachlorotol.	0.002	-	-	-	-	-
Dichloroethylbenzene	-	0.002	0.1	-	-	-
Chloronaphthalenes:						
Chloronaphth.	0.01	0.01	0.007	0.04	0.002	0.03
Dichloronaphth.	0.04	0.03	-	0.01	0.004	0.05
Trichloronaphth.	0.02	0.005	-	0.01	0.003	0.008
Benzyl Derivatives:						
MDPM	0.06	0.4	-	0.07	0.003	0.005
Chloro-MDPM	0.05	-	-			-
Dichloro-MDPM	0.04	0.01	-			0.01
Trichloro-MDPM	0.1	0.2	-			-
Tetrachloro-MDPM	-	-	-			-
Pentachloro-MDPM	-	-	-			-
Me-Bis(PM)BZ	0.2	0.2	-	0.3	0.002	0.02
Chloro-Bis(PM)BZ	0.02	0.06	-	0.06	-	-
Dichloro-Bis(PM)BZ	0.02	0.1	-	0.1	-	-
Trichloro-Bis(PM)BZ	0.007	0.08	-	0.2	-	-
Tetrachloro-Bis(PM)BZ	-	-	-	0.07	-	-
Pentachloro-Bis(PM)BZ	-	0.008	-	0.03	-	-
Miscellaneous:						
BHC	2	2	-	0.4	0.007	0.09
Ethenylidenebischlorobz.	0.09	0.3	-	0.1	+	0.003
Mirex	0.3	-	-	0.04	-	0.03
Chlorinated Norboranes	-	+	-	-	-	-

MDPM = Methyldiphenylmethane
Me-Bis(PM)BZ = Methylbisphenylmethylbz.

APPENDIX K

SEDIMENT CONTAMINANT DATA
AT THE 102ND STREET LANDFILL

(Malcolm Pirnie - 1983)

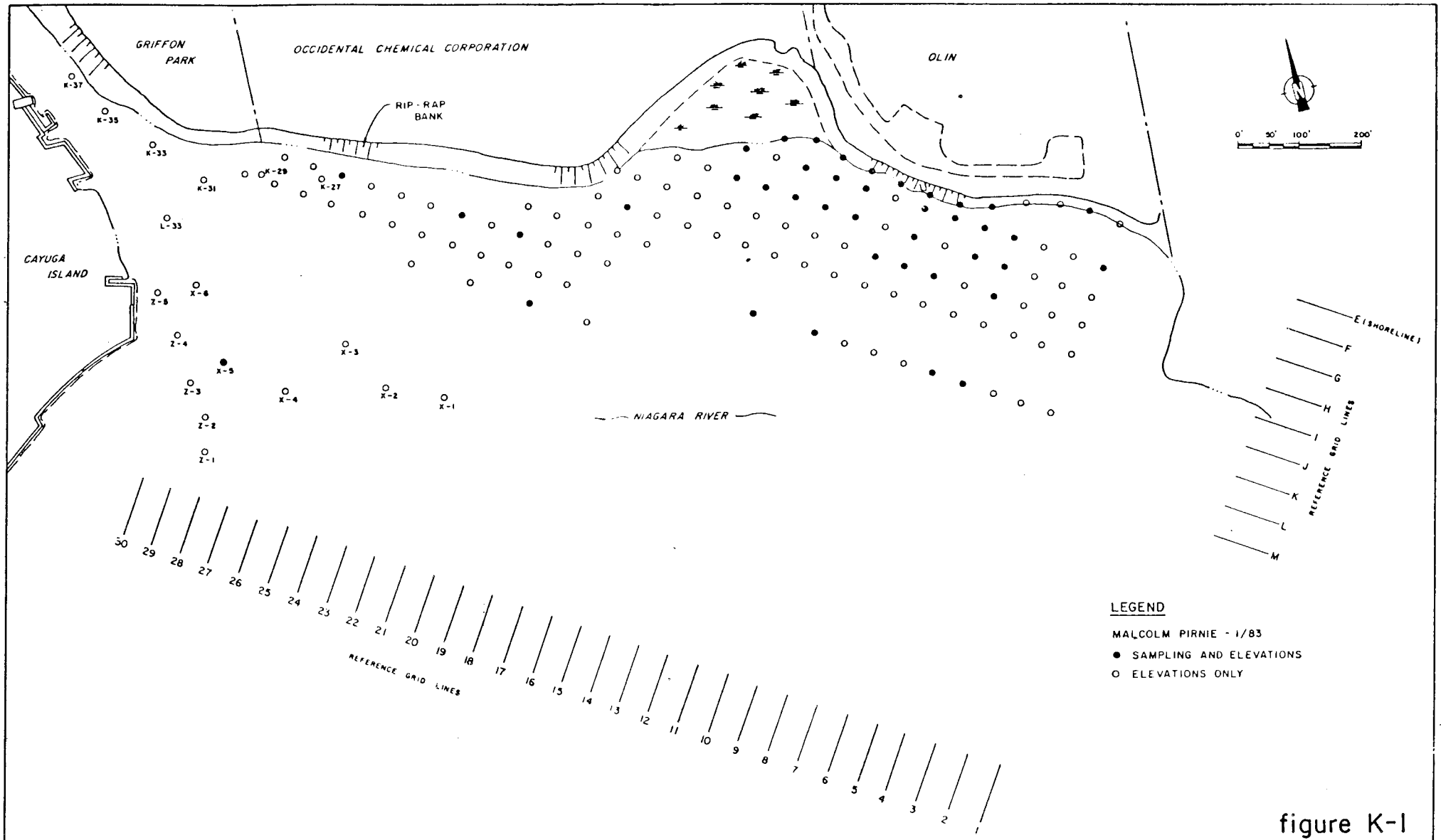


figure K-1

RIVER SEDIMENT SAMPLING LOCATIONS

102nd Street Landfill

CRA

1431-1/02/85-9-D-3

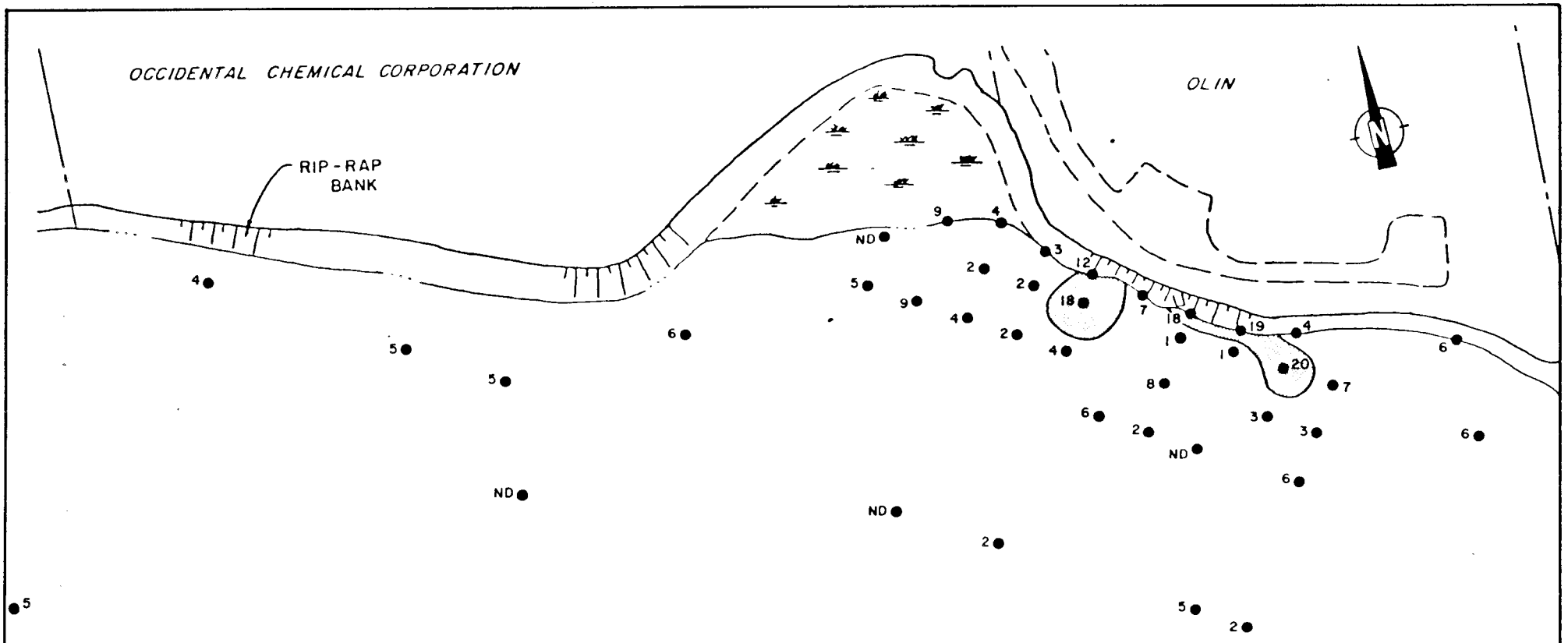


figure K-2

VOLATILE ORGANIC CONCENTRATIONS (ppm)
IN RIVER SEDIMENT
102nd Street Landfill

CRA

1431-1/02/85-9-D-3

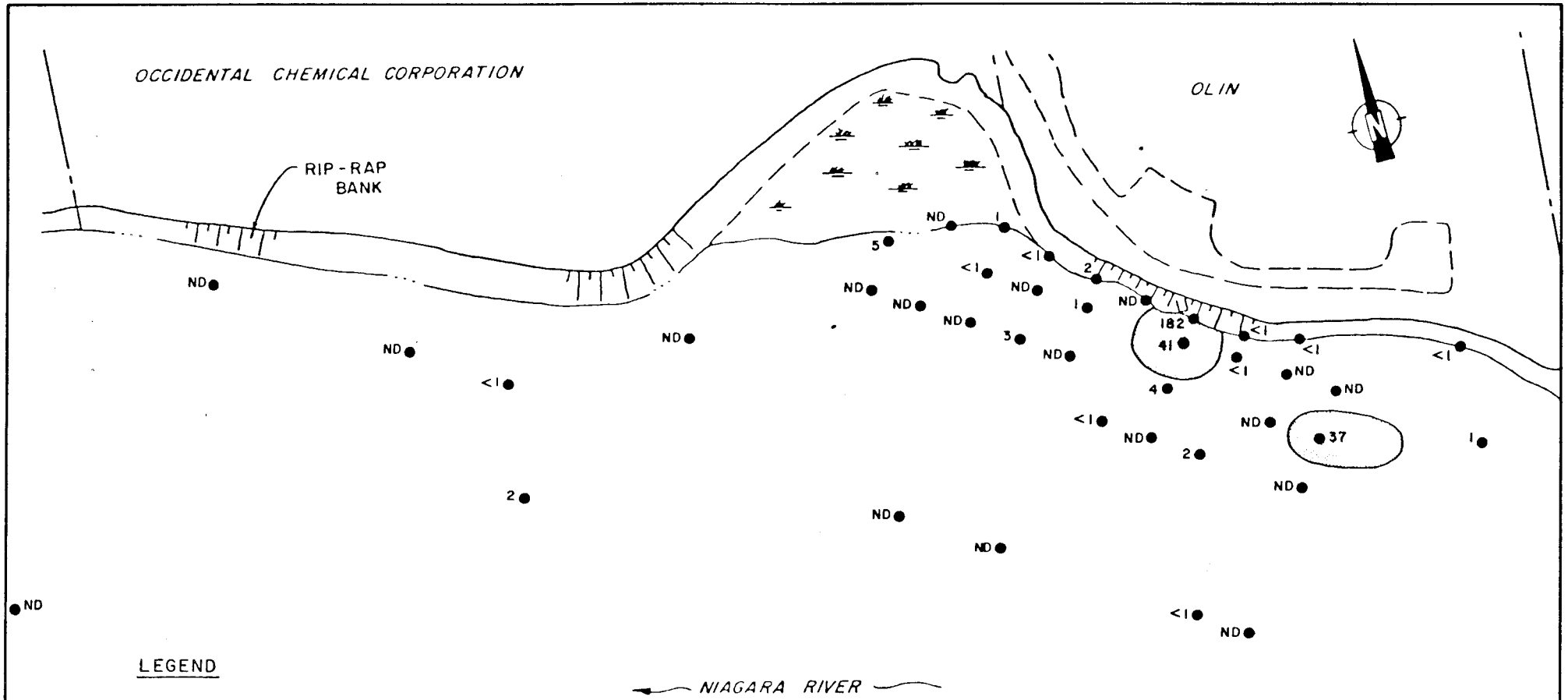


figure K-3

BASE/NEUTRAL EXTRACTABLE CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

CRA

1431-1/02/85-9-D-3

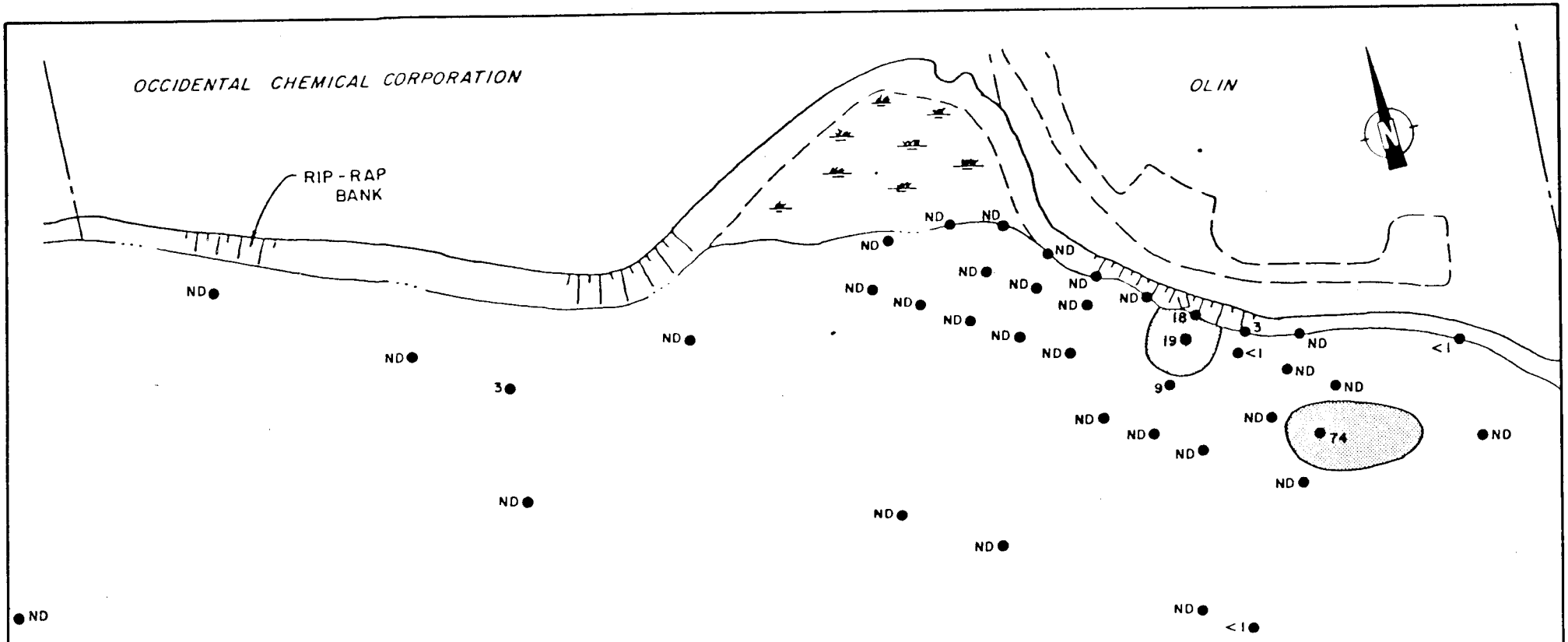


figure K-4

PESTICIDE AND PCB CONCENTRATIONS (ppm)
IN RIVER SEDIMENT
102nd Street Landfill

CRA

1431-1/02/85-9-D-3

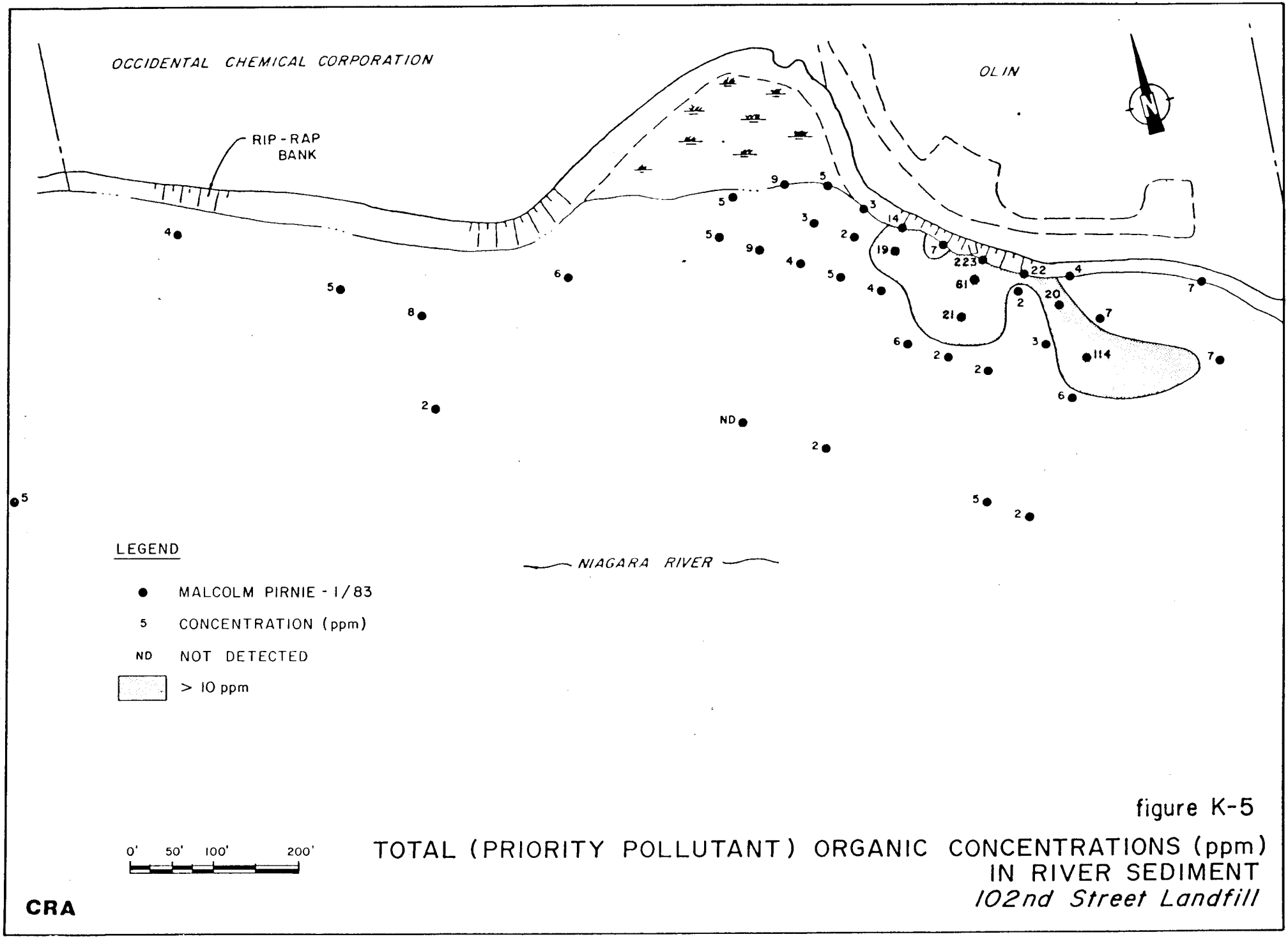


figure K-5

TOTAL (PRIORITY POLLUTANT) ORGANIC CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

1431-1/02/85-9-D-3

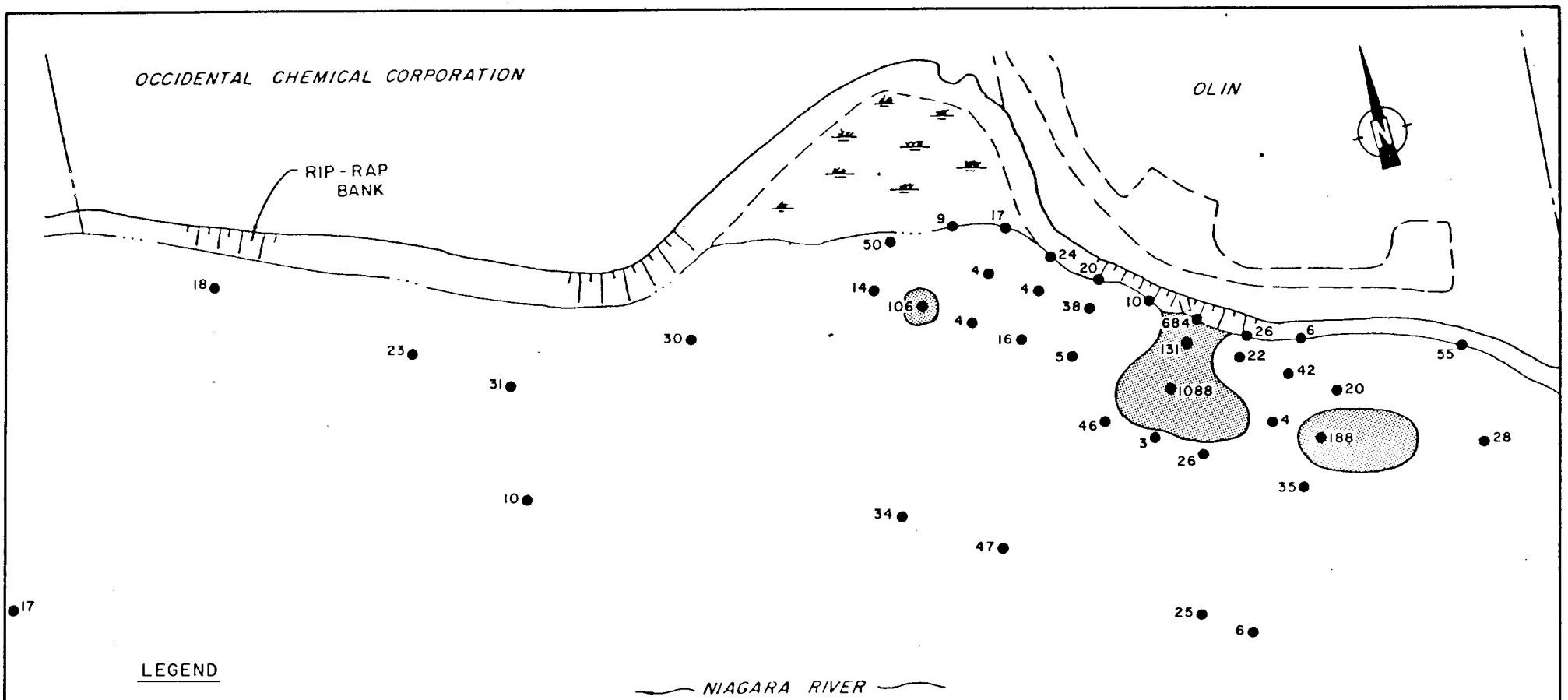


figure K-6

TOTAL ORGANIC CONCENTRATIONS (ppm) IN RIVER SEDIMENT

102nd Street Landfill

CRA

1431-1/02/85-9-D-3

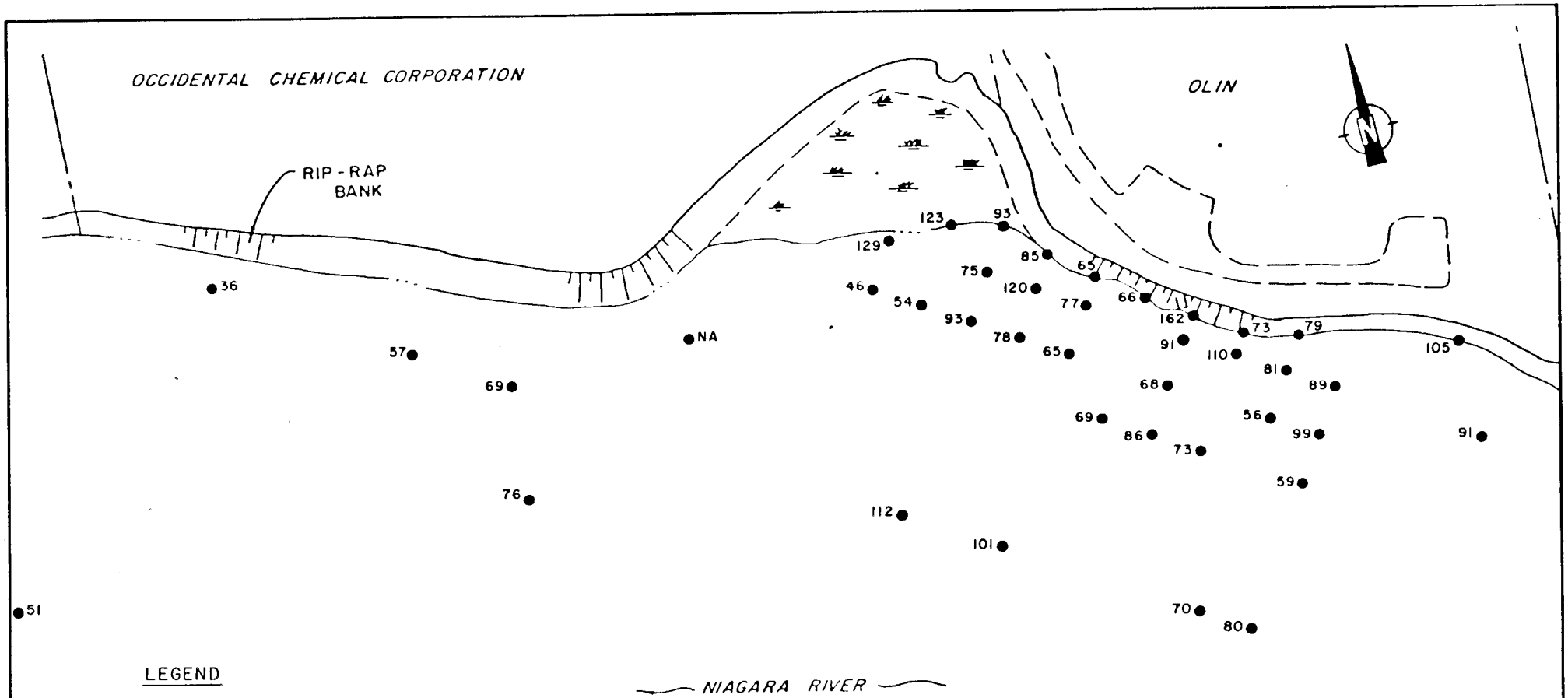


figure K-7

INORGANIC CONCENTRATIONS (ppm) IN RIVER SEDIMENT
102nd Street Landfill

CRA

1431-1/02/85-9-D-3

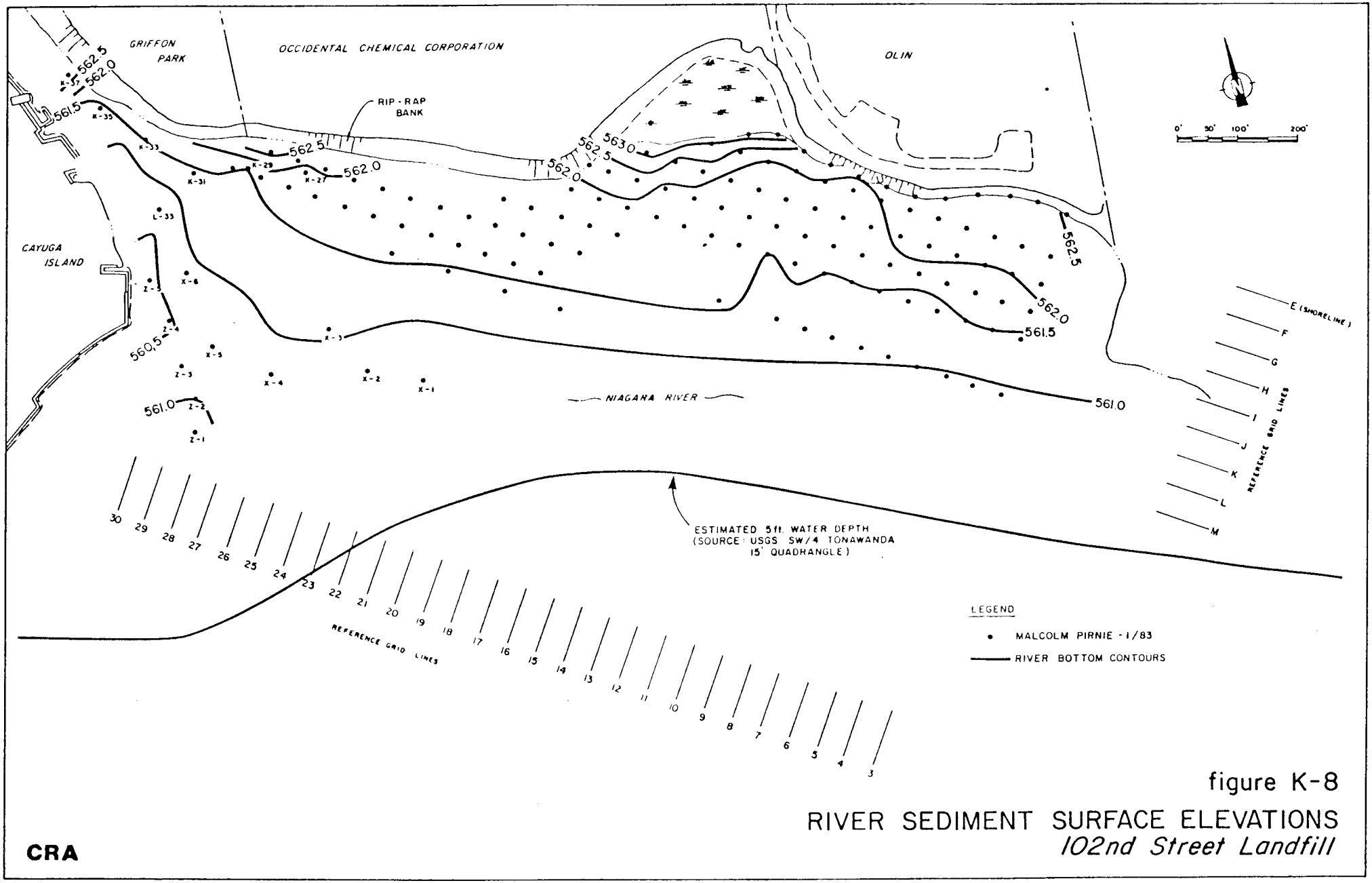


figure K-8

RIVER SEDIMENT SURFACE ELEVATIONS

102nd Street Landfill

CRA

1431-1/02/85-9-D-3

TABLE K-1

SUMMARY OF CONTAMINANT CONCENTRATION IN NIAGARA RIVER SEDIMENT, 1983 (ppm)

	Volatile Organics	Base/Neutral Extractables	Acid Extractables	Pesticides & PCBs	Total (P.P.) Organics	Total Organics	Heavy Metals
E-4	6.1	0.3	ND	0.2	6.6	54.9	104.9
E-7b	4.7	ND	ND	ND	4.7	5.2	79.7
E-7c	3.3	0.8	ND	ND	4.1	6.6	77.5
E-8a	49.0	1.8	ND	7.5	58.3	64.7	93.3
E-8b	ND	ND	ND	ND	ND	2.3	79.1
E-8c	8.6	ND	ND	ND	8.6	10.0	47.0
E-9a	44.5	536.0	ND	49.0	629.5	1877.5	354.7
E-9b	ND	15.7	ND	5.2	20.9	32.6	58.3
E-9c	11.0	8.0	ND	0.4	19.4	142.5	71.9
E-10a	2.3	ND	ND	ND	2.3	3.3	50.5
E-10b	2.7	ND	ND	ND	2.7	4.5	62.4
E-10c	17.1	ND	ND	ND	17.1	23.2	85.0

continued....

TABLE K-1

SUMMARY OF CONTAMINANT CONCENTRATION IN NIAGARA RIVER SEDIMENT, 1983 (ppm)

	Volatile Organics	Base/Neutral Extractables	Acid Extractables	Pesticides & PCBs	Total (P.P.) Organics	Total Organics	Heavy Metals
E-11b	6.2	1.2	ND	ND	7.4	11.4	74.3
E-11c	17.7	3.4	ND	ND	21.1	28.9	55.3
E-12a	ND	1.6	ND	ND	1.6	5.4	95.7
E-12b	3.0	ND	ND	ND	3.0	12.2	83.3
E-12c	5.0	ND	ND	ND	5.0	6.0	76.3
E-13a	4.0	ND	ND	ND	4.0	4.3	112.1
E-13b	7.4	ND	ND	ND	7.4	7.7	93.0
E-13c	ND	3.4	ND	ND	3.4	39.7	73.3
E-14	8.5	ND	ND	ND	8.5	9.4	123.1
F-3a	8.8	2.1	ND	ND	10.9	51.9	104.5
F-3b	2.5	ND	ND	ND	2.5	5.0	77.9
F-6	6.7	ND	ND	ND	6.7	20.4	88.5

continued....

TABLE K-1

SUMMARY OF CONTAMINANT CONCENTRATION IN NIAGARA RIVER SEDIMENT, 1983 (ppm)

	Volatile Organics	Base/Neutral Extractables	Acid Extractables	Pesticides & PCBs	Total (P.P.) Organics	Total Organics	Heavy Metals
F-7a	4.9	ND	ND	ND	4.9	8.6	66.3
F-7c	35.4	ND	ND	ND	35.4	74.6	95.4
F-8a	ND	0.8	ND	1.1	1.9	51.5	179.4
F-8b	ND	0.3	ND	ND	0.3	9.1	66.5
F-8c	3.5	ND	ND	ND	3.5	4.1	84.1
F-9a	ND	120.8	ND	55.6	176.4	378.8	131.9
F-9b	ND	2.0	ND	0.3	2.3	9.1	68.0
F-9c	3.7	1.1	ND	ND	4.8	6.4	73.2
F-11	18.3	0.5	ND	ND	18.8	38.1	77.0
F-12	1.5	ND	ND	ND	1.5	3.6	120.3
F-13a	2.0	0.8	ND	ND	2.8	3.9	73.0
F-13b	2.5	0.5	ND	ND	3.0	3.2	76.7
F-15	ND	5.1	ND	ND	5.1	50.4	129.0

continued....

TABLE K-1

SUMMARY OF CONTAMINANT CONCENTRATION IN NIAGARA RIVER SEDIMENT, 1983 (ppm)

	Volatile Organics	Base/Neutral Extractables	Acid Extractables	Pesticides & PCBs	Total (P.P.) Organics	Total Organics	Heavy Metals
G-6	3.4	37.3	ND	73.4	114.1	188.1	99.2
G-7	2.5	ND	ND	ND	2.5	3.7	55.8
G-9	8.1	4.6	ND	8.6	21.3	1087.7	67.8
G-11a	2.9	ND	ND	ND	2.9	5.8	67.3
G-11b	5.1	ND	ND	ND	5.1	6.0	53.6
G-11c	3.1	ND	ND	ND	3.1	3.7	73.0
G-12a	ND	6.7	ND	ND	6.7	9.4	79.4
G-12b	3.8	ND	ND	ND	3.8	22.0	76.5
G-13	3.7	ND	ND	ND	3.7	3.9	92.9
G-14	8.9	ND	ND	0.3	9.2	105.7	53.6
G-15	5.2	ND	ND	ND	5.2	13.6	46.0
H-6	5.7	ND	ND	ND	5.7	34.7	59.4

continued....

TABLE K-1

SUMMARY OF CONTAMINANT CONCENTRATION IN NIAGARA RIVER SEDIMENT, 1983 (ppm)

	Volatile Organics	Base/Neutral Extractables	Acid Extractables	Pesticides & PCBs	Total (P.P.) Organics	Total Organics	Heavy Metals
H-8	ND	1.8	ND	ND	1.8	26.3	72.7
H-9	2.4	ND	ND	ND	2.4	2.9	85.7
H-10	5.6	0.6	ND	ND	6.2	45.7	68.5
I-18	5.8	ND	ND	ND	5.8	30.4	NA
K-6a	2.4	ND	ND	0.4	2.8	11.0	82.3
K-6b	2.2	ND	ND	ND	2.2	2.6	75.7
K-6c	2.3	ND	ND	ND	2.3	4.8	83.2
K-7a	6.3	ND	ND	ND	6.3	18.5	94.8
K-7b	3.8	0.3	ND	ND	4.1	31.5	45.6
K-11a	ND	ND	ND	ND	ND	41.6	94.0
K-11c	4.5	ND	ND	ND	4.5	4.9	108.8
K-13	ND	ND	ND	ND	ND	34.0	111.6

continued....

TABLE K-1

SUMMARY OF CONTAMINANT CONCENTRATION IN NIAGARA RIVER SEDIMENT, 1983 (ppm)

	Volatile Organics	Base/Neutral Extractables	Acid Extractables	Pesticides & PCBs	Total (P.P.) Organics	Total Organics	Heavy Metals
K-21	4.5	0.3	ND	3.2	8.0	31.2	69.2
K-23	5.3	ND	ND	ND	5.3	23.3	57.1
K-27	4.1	ND	ND	ND	4.1	18.1	36.4
M-20	ND	2.3	ND	ND	2.3	9.6	77.7
X-5	4.5	ND	ND	ND	4.5	17.1	51.2

Notes:

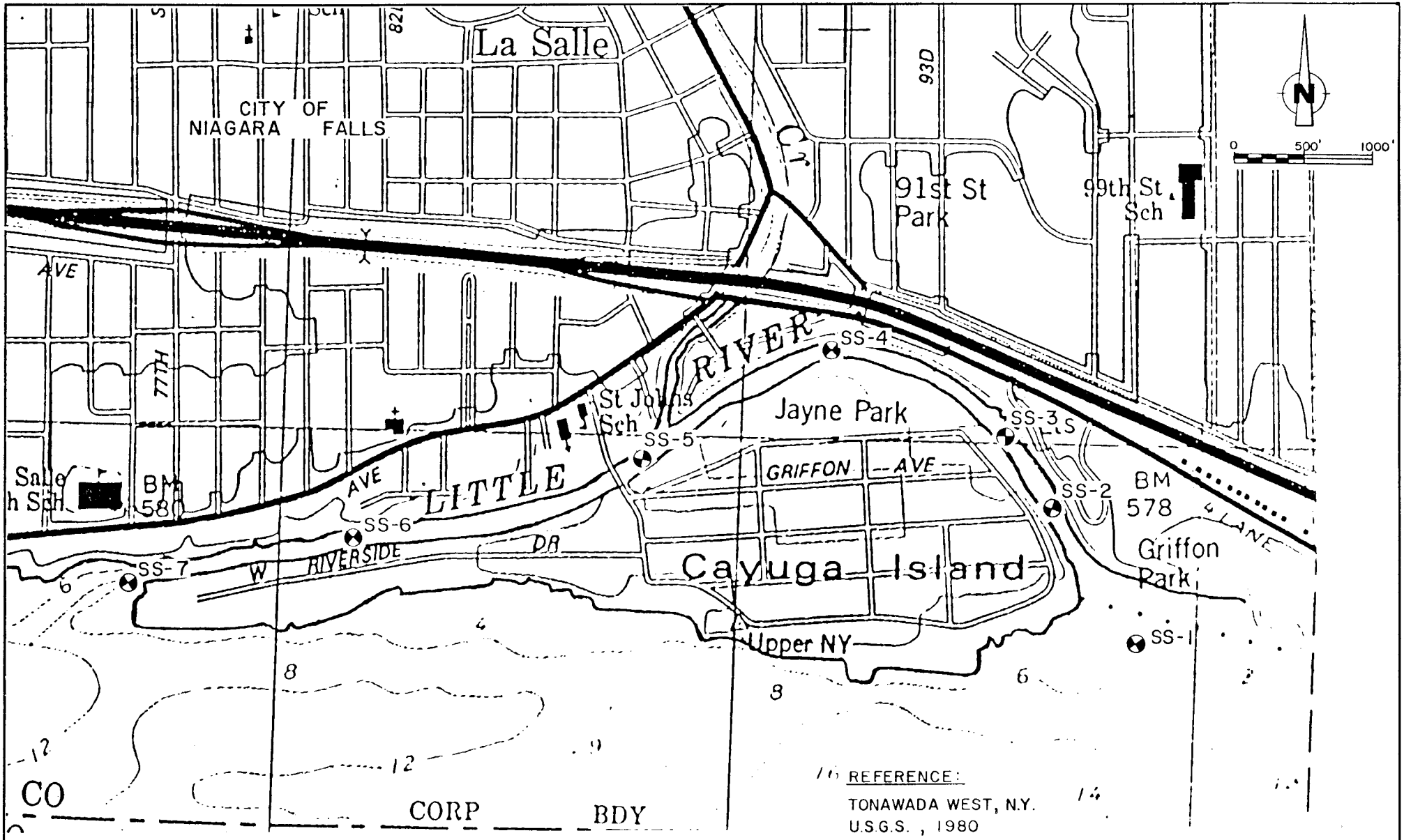
Concentrations are in ppm
ND = not detected
NA = not analyzed

APPENDIX L

SEDIMENT CONTAMINANT DATA

AT THE 102ND STREET LANDFILL AND GRIFFON PARK

(Army Corps of Engineers - 1983)



LEGEND

SS3 ⊗ SEDIMENT SAMPLING LOCATION ARMY CORPS OF ENGINEERS, SEPT 1983.

CRA

figure L-1

RIVER SEDIMENT SAMPLING LOCATIONS
ARMY CORPS OF ENGINEERS
102nd Street Landfill

1431-17/06/87-9-D-3

TABLE L-1

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
INORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2683-83 D83-1 0-3	2684-83 D83-1 clay	2685-83 D83-2 0-3	2686-83 D83-2 3-6
Total Solids, %	81.6	70.6	98.8	82.3
T. Volatile Solids, %	13.6	1.03	2.16	0.33
Cyanide	0.2	<0.06	0.3	0.4
Phenols	< 0.5	< 0.6	< 0.7	< 0.6
Arsenic	3.1	10.3	5.7	2.3
Cadmium	1.4	0.8	0.6	1.4
Chromium	16	26	21	12
Copper	21	20	72	12
Lead	26	4	55	15
Mercury	0.3	< 0.1	0.5	0.4
Nickel	11	36	17	12
Zinc	172	69	300	157

All results reported as mg/kg, unless otherwise noted.

TABLE L-1

Little River, Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
INORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO..	2687-83 D83-3 0-3	2688-83 D83-3 3-6	2689-83 D83-4 0-3	2690-83 D83-5 0-3
Total Solids, %	73.3	77.0	66.9	63.4
T. Volatile Solids, %	1.60	2.11	3.69	3.70
Cyanide	0.4	0.1	4.4	2.2
Phenols	< 0.6	< 0.5	< 0.6	< 0.6
Arsenic	3.6	1.8	4.2	4.4
Cadmium	0.8	0.2	0.8	1.8
Chromium	12	11	19	40
Copper	9	2	52	48
Lead	10	4	51	155
Mercury	0.2	< 0.1	0.4	0.3
Nickel	18	11	18	22
Zinc	94	36	250	406

All results reported as mg/kg, unless otherwise noted.

TABLE L-1

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
INORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2691-83 D83-5 3-6	2692-83 D83-6 0-3	2693-83 D83-7 0-3	2694-83 D83-7 3-6
Total Solids, %	60.0	72.3	65.6	75.9
T. Volatile Solids, %	3.73	2.16	3.11	1.64
Cyanide	1.7	0.2	1.9	0.3
Phenols	< 0.6	< 0.5	< 0.6	< 0.4
Arsenic	4.4	3.6	4.6	3.8
Cadmium	1.2	0.6	1.6	0.4
Chromium	23	14	31	11
Copper	33	21	29	12
Lead	73	29	51	6
Mercury	0.5	0.4	1.4	< 0.1
Nickel	16	14	21	15
Zinc	308	136	345	92

All results reported as mg/kg, unless otherwise noted.

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2683-83 D83-1 0-3	2684-83 D83-1 clay	2685-83 D83-2 0-3	2686- D83-2
Sediment, Nitroaromatics and Isophorone (Item No. 18)				
Isophorone	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	< 0.8	< 0.8	< 0.8	< 0.8
2,4-Dinitrotoluene	< 0.7	< 0.7	< 0.7	< 0.7
2,6-Dinitrotoluene	< 0.7	< 0.7	< 0.7	< 0.7
Sediment, Phenols (Item No. 22)				
4-Chloro-3-Methylphenol	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dichlorophenol	< 0.5	< 0.5	< 0.5	< 0.5
2,4-Dimethylphenol	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dinitrophenol	< 0.5	< 0.5	< 0.5	< 0.5
2-Methyl-4,6-Dinitrophenol	< 0.3	< 0.3	< 0.3	< 0.3
2-Nitrophenol	< 0.4	< 0.4	< 0.4	< 0.4
4-Nitrophenol	< 0.2	< 0.2	< 0.2	< 0.2
Pentachlorophenol	< 0.4	< 0.4	< 0.4	< 0.4
Phenol	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	< 0.4	< 0.4	< 0.4	< 0.4
Sediment, Nitrosamines (Item No. 24)				
N-Nitrosodimethylamine	< 1.0	< 1.0	< 1.0	< 1.0
N-Nitrosodiphenylamine	< 0.3	< 0.3	< 0.3	< 0.3
N-Nitrosodi-n-Propylamine	< 0.6	< 0.6	< 0.6	< 0.6
Sediments, PCB's (Item No. 28)				
Aroclor 1016	<0.10	<0.10	<0.10	<0.10
Aroclor 1221	<0.10	<0.10	<0.10	<0.10
Aroclor 1232	<0.10	<0.10	<0.10	<0.10
Aroclor 1242	<0.10	<0.10	<0.10	<0.10
Aroclor 1248	<0.10	<0.10	<0.10	<0.10
Aroclor 1254	<0.10	<0.10	<0.10	<0.10
Aroclor 1260	<0.10	<0.10	<0.10	<0.10

All results reported as mg/kg (dry weight basis).

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2683-83	2684-83	2685-83	2686-83
COE SITE NO.	D83-1 0-3	D83-1 clay	D83-2 0-3	D83-2 3-
Sediments, Pesticides (Item No. 26)				
β-Endosulfan	<0.02	<0.02	<0.02	<0.02
α-Endosulfan	<0.02	<0.02	<0.02	<0.02
Endosulfan Sulfate	<0.03	<0.03	<0.03	<0.03
α-BHC	<0.01	<0.01	<0.01	<0.01
β-BHC	<0.01	<0.01	<0.01	<0.01
γ-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01
δ-BHC	<0.01	<0.01	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01
Dieldrin	<0.02	<0.02	<0.02	<0.02
4,4'-DDE	<0.02	<0.02	<0.02	<0.02
4,4'-DDD	<0.02	<0.02	<0.02	<0.02
4,4'-DDT	<0.02	<0.02	<0.02	<0.02
Endrin	<0.03	<0.03	<0.03	<0.03
Endrin Aldehyde	<0.03	<0.03	<0.03	<0.03
Heptachlor	<0.02	<0.02	<0.02	<0.02
Heptachlor Epoxide	<0.03	<0.03	<0.03	<0.03
Chlordane	<0.10	<0.10	<0.10	<0.10
Toxaphene	<0.50	<0.50	<0.50	<0.50
Methoxychlor	<0.10	<0.10	<0.10	<0.10
Mirex	<0.05	<0.05	<0.05	<0.05
Sediments, Phthalates (Item No. 32)				
Dimethyl Phthalate	<0.90	<0.20	<0.66	<0.20
Diethyl Phthalate	<0.96	<1.38	<0.83	<0.66
Di-n-Butyl Phthalate	<0.85	<0.20	<1.24	<0.59
Butyl Benzyl Phthalate	<0.20	<0.20	<0.2[a]	<0.20
Bis(2-ethylhexyl)Phthalate	0.82	0.82	0.8[a]	0.61
Di-n-Octyl Phthalate	<0.20	<0.20	<0.03	<0.20
Sediments, Purgeable Aromatics (Item No. 34)				
Benzene	<0.01	<0.01	<0.01	<0.01
Chlorobenzene	<0.02	<0.02	<0.02	<0.02
1,2-Dichlorobenzene	<0.03	<0.03	<0.03	<0.03
1,3-Dichlorobenzene	<0.03	<0.03	<0.03	<0.03
1,4-Dichlorobenzene	<0.04	<0.04	<0.04	<0.04
Ethyl Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2683-83	2684-83	2685-83	268
COE SITE NO.	D83-1 0-3	D83-1 clay	D83-2 0-3	D83-
Sediments, Polynuclear Aromatic Hydrocarbons (Item No. 36)				
Phenanthrene	0.22	<0.10	0.20	<0.1
Anthracene	<0.10	0.27	0.10	<0.1
Fluoranthene	0.46	<0.10	0.47	0.1
Pyrene	0.53	<0.10	0.58	0.1
Benzo(a)Anthracene	0.18	<0.10	0.16	<0.1
Chrysene.	0.34	<0.20	0.44	<0.2
Benzo(b)Fluoranthene	<0.30	<0.30	<0.30	<0.3
Benzo(k)Fluoranthene	0.53	0.42	<0.20	0.5
Benzo(a)Pyrene	0.42	0.37	0.38	0.5
Dibenzo(a,h)Anthracene	<0.80	<0.80	<0.80	<0.8
Indeno(1,2,3-cd)Pyrene	<0.30	<0.30	<0.30	<0.3
Benzo(ghi)Perylene	<0.30	<0.30	<0.30	<0.3
Sediments, Other Base-Neutral Organics (Item No. 40)				
Hexachloroethane	< 0.4	< 0.4	< 0.4	< 0.4
Hexachlorobutadiene	< 0.5	< 0.5	< 0.5	< 0.5
Hexachlorobenzene	< 0.4	< 0.4	< 0.4	< 0.4
1,2,4-Trichlorobenzene	< 0.3	< 0.3	< 0.3	< 0.3
2-Chloronaphthalene	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Diphenylhydrazine	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorocyclopentadiene	< 1.0	< 1.0	< 1.0	< 1.0
Sediments, Herbicides (Item No. 44)				
2,4-Dichlorophenoxy Acetic Acid	< 0.5	< 0.5	< 0.5	< 0.5
Silvex	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-T	< 0.2	< 0.2	< 0.2	< 0.2
Benzidines (Item No. 46)				
Benzidines	< 5.0	< 5.0	< 5.0	< 5.0
3,3'-Dichlorobenzidine	< 1.0	< 1.0	< 1.0	< 1.0
Oil and Grease (Item No. 12)				
Oil & Grease	900	175	1150	350

All results reported as mg/kg (dry weight basis).

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2683-83	2684-83	2685-83	2686-83
COE SITE NO.	D83-1 0-3	D83-1 clay	D83-2 0-3	D83-2 3-6
Dioxin - Sediment, Contract Item #42				
2,3,7,8-Tetrachlorodibenzodioxin	< 0.2 µg/kg	< 0.2 µg/kg	< 0.2 µg/kg	< 0.2 µg/k
Acrolein and Acrylonitrile - Sediment, Contract Item #20				
Acrolein	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/k
Acrylonitrile	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/k

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2687-83	2688-83	2689-83	2690-8
COE SITE NO.	D83-3 0-3	D83-3 3-6	D83-4 0-3	D83-5
Sediment, Nitroaromatics and Isophorone (Item No. 18)				
Isophorone	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	< 0.8	< 0.8	< 0.8	< 0.8
2,4-Dinitrotoluene	< 0.7	< 0.7	< 0.7	< 0.7
2,6-Dinitrotoluene	< 0.7	< 0.7	< 0.7	< 0.7
Sediment, Phenols (Item No. 22)				
4-Chloro-3-Methylphenol	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dichlorophenol	< 0.5	< 0.5	< 0.5	< 0.5
2,4-Dimethylphenol	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dinitrophenol	< 0.5	< 0.5	< 0.5	< 0.5
2-Methyl-4,6-Dinitrophenol	< 0.3	< 0.3	< 0.3	< 0.3
2-Nitrophenol	< 0.4	< 0.4	< 0.4	< 0.4
4-Nitrophenol	< 0.2	< 0.2	< 0.2	< 0.2
Pentachlorophenol	< 0.4	< 0.4	< 0.4	< 0.4
Phenol	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	< 0.4	< 0.4	< 0.4	< 0.4
Sediment, Nitrosamines (Item No. 24)				
N-Nitrosodimethylamine	< 1.0	< 1.0	< 1.0	< 1.0
N-Nitrosodiphenylamine	< 0.3	< 0.3	< 0.3	< 0.3
N-Nitrosodi-n-Propylamine	< 0.6	< 0.6	< 0.6	< 0.6
Sediments, PCB's (Item No. 28)				
Aroclor 1016	<0.10	<0.10	<0.10	<0.10
Aroclor 1221	<0.10	<0.10	<0.10	<0.10
Aroclor 1232	<0.10	<0.10	<0.10	<0.10
Aroclor 1242	<0.10	<0.10	<0.10	<0.10
Aroclor 1248	<0.10	<0.10	<0.10	<0.10
Aroclor 1254	<0.10	<0.10	<0.10	<0.10
Aroclor 1260	<0.10	<0.10	<0.10	<0.10

All results reported as mg/kg (dry weight basis).

TABLE L-2
Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2687-83	2688-83	2689-83	2690-83
COE SITE NO.	D83-3 0-3	D83-3 3-6	D83-4 0-3	D83-5 0-3
Sediments, Pesticides (Item No. 26)				
β-Endosulfan	<0.02	<0.02	<0.02	<0.02
α-Endosulfan	<0.02	<0.02	<0.02	<0.02
Endosulfan Sulfate	<0.03	<0.03	<0.03	<0.03
α-BHC	<0.01	<0.01	<0.01	<0.01
β-BHC	<0.01	<0.01	<0.01	<0.01
γ-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01
δ-BHC	<0.01	<0.01	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01
Dieldrin	<0.02	<0.02	<0.02	<0.02
4,4'-DDE	<0.02	<0.02	<0.02	<0.02
4,4'-DDD	<0.02	<0.02	<0.02	<0.02
4,4'-DDT	<0.02	<0.02	<0.02	<0.02
Endrin	<0.03	<0.03	<0.03	<0.03
Endrin Aldehyde	<0.03	<0.03	<0.03	<0.03
Heptachlor	<0.02	<0.02	<0.02	<0.02
Heptachlor Epoxide	<0.03	<0.03	<0.03	<0.03
Chlordane	<0.10	<0.10	<0.10	<0.10
Toxaphene	<0.50	<0.50	<0.50	<0.50
Methoxychlor	<0.10	<0.10	<0.10	<0.10
Mirex	<0.05	<0.05	<0.05	<0.05
Sediments, Phthalates (Item No. 32)				
Dimethyl Phthalate	<0.20	<0.20	<0.20	<1.17
Diethyl Phthalate	<1.04	<0.52	<0.57	<1.23
Di-n-Butyl Phthalate	<0.47	<0.20	<1.28	<2.13
Butyl Benzyl Phthalate	<0.20	<0.20	<0.33	<0.31
Bis(2-ethylhexyl)Phthalate	0.38	<0.20	1.40	0.96
Di-n-Octyl Phthalate	<0.20	<0.20	<0.20	<0.39
Sediments, Purgeable Aromatics (Item No. 34)				
Benzene	<0.01	<0.01	<0.01	<0.01
Chlorobenzene	<0.02	<0.02	<0.02	<0.02
1,2-Dichlorobenzene	<0.03	<0.03	<0.03	<0.03
1,3-Dichlorobenzene	<0.03	<0.03	<0.03	<0.03
1,4-Dichlorobenzene	<0.04	<0.04	<0.04	<0.04
Ethyl Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2687-83	2688-83	2689-83	2690-83
COE SITE NO.	D83-3 0-3	D83-3 3-6	D83-4 0-3	D83-5 0-
Sediments, Polynuclear Aromatic Hydrocarbons (Item No. 36)				
Phenanthrene	<0.10	<0.10	0.43	1.02
Anthracene	0.14	<0.10	0.14	0.16
Fluoranthene	0.13	<0.10	0.39	1.62
Pyrene	0.13	<0.10	0.84	1.35
Benzo(a)Anthracene	0.12	<0.10	0.18	0.44
Chrysene	0.21	<0.20	0.82	1.67
Benzo(b)Fluoranthene	<0.30	<0.30	0.48	0.48
Benzo(k)Fluoranthene	0.54	0.40	0.37	0.57
Benzo(a)Pyrene	0.86	0.47	0.59	0.60
Dibenzo(a,h)Anthracene	<0.80	<0.80	<0.80	<0.80
Indeno(1,2,3-cd)Pyrene	0.19	<0.30	<0.30	<0.30
Benzo(ghi)Perylene	<0.30	<0.30	<0.30	<0.30
Sediments, Other Base-Neutral Organics (Item No. 40)				
Hexachloroethane	< 0.4	< 0.4	< 0.4	< 0.4
Hexachlorobutadiene	< 0.5	< 0.5	< 0.5	< 0.5
Hexachlorobenzene	< 0.4	< 0.4	< 0.4	< 0.4
1,2,4-Trichlorobenzene	< 0.3	< 0.3	< 0.3	< 0.3
2-Chloronaphthalene	< 0.2	< 0.2	< 0.2	0.27
1,2-Diphenylhydrazine	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorocyclopentadiene	< 1.0	< 1.0	< 1.0	< 1.0
Sediments, Herbicides (Item No. 44)				
2,4-Dichlorophenoxy Acetic Acid	< 0.5	< 0.5	< 0.5	< 0.5
Silvex	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-T	< 0.2	< 0.2	< 0.2	< 0.2
Benzidines (Item No. 46)				
Benzidines	< 5.0	< 5.0	< 5.0	< 5.0
3,3'-Dichlorobenzidine	< 1.0	< 1.0	< 1.0	< 1.0
Oil and Grease (Item No. 12)				
Oil & Grease	230	185	780	1820

All results reported as mg/kg (dry weight basis).

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2687-83	2688-83	2689-83	2690-83
COE SITE NO.	D83-3 0-3	D83-3 3-6	D83-4 0-3	D83-5 0-3
Dioxin - Sediment, Contract Item #42				
2,3,7,8-Tetrachlorodibenzodioxin	< 0.2 µg/kg	< 0.2 µg/kg	< 0.2 µg/kg	< 0.2 µg/kg
Acrolein and Acrylonitrile - Sediment, Contract Item #20				
Acrolein	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg
Acrylonitrile	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2691-83 D83-5 0-3	2692-83 D83-6 0-3	2693-83 D83-7 0-3	2694-83 D83-7 3-6
Sediment, Nitroaromatics and Isophorone (Item No. 18)				
Isophorone	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	< 0.8	< 0.8	< 0.8	< 0.8
2,4-Dinitrotoluene	< 0.7	< 0.7	< 0.7	< 0.7
2,6-Dinitrotoluene	< 0.7	< 0.7	< 0.7	< 0.7
Sediment, Phenols (Item No. 22)				
4-Chloro-3-Methylphenol	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dichlorophenol	< 0.5	< 0.5	< 0.5	< 0.5
2,4-Dimethylphenol	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dinitrophenol	< 0.5	< 0.5	< 0.5	< 0.5
2-Methyl-4,6-Dinitrophenol	< 0.3	< 0.3	< 0.3	< 0.3
2-Nitrophenol	< 0.4	< 0.4	< 0.4	< 0.4
4-Nitrophenol	< 0.2	< 0.2	< 0.2	< 0.2
Pentachlorophenol	< 0.4	< 0.4	< 0.4	< 0.4
Phenol	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	< 0.4	< 0.4	< 0.4	< 0.4
Sediment, Nitrosamines (Item No. 24)				
N-Nitrosodimethylamine	< 1.0	< 1.0	< 1.0	< 1.0
N-Nitrosodiphenylamine	< 0.3	< 0.3	< 0.3	< 0.3
N-Nitrosodi-n-Propylamine	< 0.6	< 0.6	< 0.6	< 0.6
Sediments, PCB's (Item No. 28)				
Aroclor 1016	<0.10	<0.10	<0.10	<0.10
Aroclor 1221	<0.10	<0.10	<0.10	<0.10
Aroclor 1232	<0.10	<0.10	<0.10	<0.10
Aroclor 1242	<0.10	<0.10	<0.10	<0.10
Aroclor 1248	<0.10	<0.10	<0.10	<0.10
Aroclor 1254	<0.10	<0.10	<0.10	<0.10
Aroclor 1260	<0.10	<0.10	<0.10	<0.10

All results reported as mg/kg (dry weight basis).

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2691-83	2692-83	2693-83	2694-83
COE SITE NO.	D83-5 0-3	D83-6 0-3	D83-7 0-3	D83-7 3-6
Sediments, Pesticides (Item No. 26)				
β-Endosulfan	<0.02	<0.02	<0.02	<0.02
α-Endosulfan	<0.02	<0.02	<0.02	<0.02
Endosulfan Sulfate	<0.03	<0.03	<0.03	<0.03
α-BHC	<0.01	<0.01	<0.01	<0.01
β-BHC	<0.01	<0.01	<0.01	<0.01
γ-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01
δ-BHC	<0.01	<0.01	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01
Dieldrin	<0.02	<0.02	<0.02	<0.02
4,4'-DDE	<0.02	<0.02	<0.02	<0.02
4,4'-DDD	<0.02	<0.02	<0.02	<0.02
4,4'-DDT	<0.02	<0.02	<0.02	<0.02
Endrin	<0.03	<0.03	<0.03	<0.03
Endrin Aldehyde	<0.03	<0.03	<0.03	<0.03
Heptachlor	<0.02	<0.02	<0.02	<0.02
Heptachlor Epoxide	<0.03	<0.03	<0.03	<0.03
Chlordane	<0.10	<0.10	<0.10	<0.10
Toxaphene	<0.50	<0.50	<0.50	<0.50
Methoxychlor	<0.10	<0.10	<0.10	<0.10
Mirex	<0.05	<0.05	<0.05	<0.05
Sediments, Phthalates (Item No. 32)				
Dimethyl Phthalate	<0.62	<0.52	<0.94	<0.20
Diethyl Phthalate	<0.68	<0.74	<0.70	<0.98
Di-n-Butyl Phthalate	<1.27	<0.64	<2.03	<0.20
Butyl Benzyl Phthalate	<0.22	<0.20	<0.20	<0.20
Bis(2-ethylhexyl)Phthalate	1.53	1.36	3.00	1.45
Di-n-Octyl Phthalate	<0.20	<0.20	<0.29	<0.20
Sediments, Purgeable Aromatics (Item No. 34)				
Benzene	<0.01	<0.01	<0.01	<0.01
Chlorobenzene	<0.02	<0.02	<0.02	<0.02
1,2-Dichlorobenzene	<0.03	<0.03	<0.03	<0.03
1,3-Dichlorobenzene	<0.03	<0.03	<0.03	<0.03
1,4-Dichlorobenzene	<0.04	<0.04	<0.04	<0.04
Ethyl Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-0-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2691-83	2692-83	2693-83	2694-83
COE SITE NO.	D83-5 0-3	D83-6 0-3	D83-7 0-3	D83-7 3-6
Sediments, Polynuclear Aromatic Hydrocarbons (Item No. 36)				
Phenanthrene	0.28	0.13	0.34	<0.10
Anthracene	<0.10	<0.10	<0.10	0.12
Fluoranthene	0.73	0.36	0.86	<0.10
Pyrene	0.64	0.37	0.75	<0.10
Benzo(a)Anthracene	0.25	0.16	0.10	<0.10
Chrysene	0.68	0.31	0.63	<0.20
Benzo(b)Fluoranthene	0.32	0.15	0.31	<0.30
Benzo(k)Fluoranthene	0.48	0.22	0.42	0.75
Benzo(a)Pyrene	0.44	0.23	0.33	1.19
Dibenzo(a,h)Anthracene	<0.80	<0.80	<0.80	<0.80
Indeno(1,2,3-cd)Pyrene	0.27	0.18	0.29	0.44
Benzo(ghi)Perylene	<0.30	<0.30	<0.30	<0.30
Sediments, Other Base-Neutral Organics (Item No. 40)				
Hexachloroethane	< 0.4	< 0.4	< 0.4	< 0.4
Hexachlorobutadiene	< 0.5	< 0.5	< 0.5	< 0.5
Hexachlorobenzene	< 0.4	< 0.4	< 0.4	< 0.4
1,2,4-Trichlorobenzene	< 0.3	< 0.3	< 0.3	< 0.3
2-Chloronaphthalene	< 0.2	< 0.2	< 0.3	< 0.2
1,2-Diphenylhydrazine	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorocyclopentadiene	< 1.0	< 1.0	< 1.0	< 1.0
Sediments, Herbicides (Item No. 44)				
2,4-Dichlorophenoxy Acetic Acid	< 0.5	< 0.5	< 0.5	< 0.5
Silvex	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-T	< 0.2	< 0.2	< 0.2	< 0.2
Benzidines (Item No. 46)				
Benzidines	< 5.0	< 5.0	< 5.0	< 5.0
3,3'-Dichlorobenzidine	< 1.0	< 1.0	< 1.0	< 1.0
Oil and Grease (Item No. 12)				
Oil & Grease	23	1100	720	1300	163

All results reported as mg/kg (dry weight basis).

TABLE L-2

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

SEDIMENT ANALYSIS
ORGANIC PARAMETERS

ATEC LAB NO.	2691-83	2692-83	2693-83	2694-83
COE SITE NO.	D83-5 0-3	D83-6 0-3	D83-7 0-3	D83-7 3-6
Dioxin - Sediment, Contract Item #42				
2,3,7,8-Tetrachlorodibenzodioxin	< 0.2 µg/kg	< 0.2 µg/kg	< 0.2 µg/kg	< 0.2 µg/kg
Acrolein and Acrylonitrile - Sediment, Contract Item #20				
Acrolein	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg
Acrylonitrile	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg	< 1.0 mg/kg

TABLE L-3

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

EP TOXICITY TESTS
INORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2759-83 Blank	2760-83 D83-1 0-3	2761-83 D83-2 3-6	2762-83 D83-2 3-6
TKN	0.95	1.45	1.33	0.56
Ammonia N	< 0.05	1.05	0.91	0.24
Total P	< 0.01	0.02	0.04	0.05
Arsenic	<0.004	0.009	0.006	<0.004
Cadmium	< 0.1	0.1	< 0.1	< 0.1
Chromium	< 0.1	0.1	< 0.1	< 0.1
Copper	< 0.1	< 0.1	< 0.1	< 0.1
Lead	< 0.1	0.1	0.1	0.1
Mercury	0.002	<0.002	<0.002	<0.002
Nickel	< 0.1	0.1	0.1	0.1
Zinc	< 0.1	2.0	3.8	1.0

All results reported as mg/l.

TABLE L-3

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

EP TOXICITY TESTS
INORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2763-83 D83-3 0-3	2764-83 D83-5 0-3	2765-83 D83-5 3-6	2766-83 D83-5 3-6	2767-83 D83-6 0- Replicat
TKN	0.61	0.41	0.28	0.71	0.96
Ammonia N	0.37	0.09	0.05	0.37	0.37
Total P	0.91	0.04	0.05	0.04	0.04
Arsenic	<0.004	0.005	0.006	<0.004	<0.004
Cadmium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	< 0.1	< 0.1	0.2	< 0.1	< 0.1
Copper	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lead	0.1	0.1	< 0.1	< 0.1	< 0.1
Mercury	<0.002	<0.002	0.075	0.003	<0.002
Nickel	0.1	< 0.1	0.1	0.1	< 0.1
Zinc	0.4	3.5	1.8	0.7	0.9

All results reported as mg/l.

TABLE L-4

Little River Sediments
Niagara Falls, New York

DACW49-83-D0006
Delivery No. 0002

EP TOXICITY TESTS
ORGANIC PARAMETERS

ATEC LAB NO.	2759-83	2760-83	2761-83	2762-8
COE SITE NO.	Blank	D83-1 0-3	D83-2 0-3	D83-2 3
Water, Pesticides (Item No. 25)				
β-Endosulfan	<0.02	<0.02	<0.02	<0.0
α-Endosulfan	<0.02	<0.02	<0.02	<0.0
Endosulfan Sulfate	<0.03	<0.03	<0.03	<0.0
α-BHC	<0.01	<0.01	<0.01	<0.0
β-BHC	<0.01	<0.01	<0.01	<0.0
γ-BHC (Lindane)	<0.01	<0.01	<0.01	<0.0
δ-BHC	<0.01	<0.01	<0.01	<0.0
Aldrin	<0.01	<0.01	<0.01	<0.0
Dieldrin	<0.02	<0.02	<0.02	<0.0
4,4'-DDE	<0.02	<0.02	<0.02	<0.0
4,4'-DDD	<0.02	<0.02	<0.02	<0.0
4,4'-DDT	<0.02	<0.02	<0.02	<0.0
Endrin	<0.03	<0.03	<0.03	<0.0
Endrin Aldehyde	<0.03	<0.03	<0.03	<0.0
Heptachlor	<0.02	<0.02	<0.02	<0.0
Heptachlor Epoxide	<0.03	<0.03	<0.03	<0.0
Chlordane	<0.10	<0.10	<0.10	<0.1
Toxaphene	<0.50	<0.50	<0.50	<0.5
Methoxychlor	<0.10	<0.10	<0.10	<0.1
Mirex	<0.05	<0.05	<0.05	<0.0
Water, Phthalates (Item No. 31)				
Dimethyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0
Diethyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0
Di-n-Butyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0
Butyl Benzyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0
Bis(2-ethylhexyl)Phthalate	< 1.0	< 1.0	< 1.0	< 1.0
Di-n-Octyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0
Water, Purgeable Aromatics (Item No. 34)				
Benzene	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0
1,3-Dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0
1,4-Dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0
Ethyl Benzene	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0	< 1.0

TABLE L-4

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

EP TOXICITY TESTS
ORGANIC PARAMETERS

ATEC LAB NO.	2759-83	2760-83	2761-83	2762-8
COE SITE NO.	Blank	D83-1 0-3	D83-2 0-3	D83-2 3
Water, Polynuclear Aromatic Hydrocarbons (Item No. 35)				
Phenanthrene	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)Anthracene	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(g)Fluoranthene	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(k)Fluoranthene	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(a)Pyrene	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzo(a,h)Anthracene	< 0.8	< 0.8	< 0.8	< 0.8
Indeno(1,2,3-cd)Pyrene	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(ghi)Perylene	< 0.3	< 0.3	< 0.3	< 0.3
Water, Other Base-Neutral Organics (Item No. 39)				
Hexachloroethane	< 0.4	< 0.4	< 0.4	< 0.4
Hexachlorobutadiene	< 0.5	< 0.5	< 0.5	< 0.5
Hexachlorobenzene	< 0.4	< 0.4	< 0.4	< 0.4
1,2,4-Trichlorobenzene	< 0.3	< 0.3	< 0.3	< 0.3
2-Chloronaphthalene	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Diphenylhydrazine	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorocyclopentadiene	< 1.0	< 1.0	< 1.0	< 1.0
Water, Herbicides (Item No. 43)				
2,4-Dichlorophenoxy Acetic Acid	< 0.5	< 0.5	< 0.5	< 0.5
Silvex	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-T	< 0.2	< 0.2	< 0.2	< 0.2
Water, Dioxin (Item No. 41)				
Dioxin	<0.002	<0.002	<0.002	<0.002

All results reported as ug/l.

TABLE L-4

Little River Sediments
Niagara Falls, New York

DACW49-83-D0006
Delivery No. 0002

EP TOXICITY TESTS
ORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2763-83 D83-3 0-3	2764-83 D83-5 0-3	2765-83 D83-5 3-6	2766-83 D83-6 0-3	2767-83 D83-6 0- Replica
ater, Pesticides (Item No. 25)					
β-Endosulfan	<0.02	<0.02	<0.02	<0.02	<<0.02
α-Endosulfan	<0.02	<0.02	<0.02	<0.02	<0.02
Endosulfan Sulfate	<0.03	<0.03	<0.03	<0.03	<0.03
α-BHC	<0.01	<0.01	<0.01	<0.01	<0.01
β-BHC	<0.01	<0.01	<0.01	<0.01	<0.01
γ-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01
δ-BHC	<0.01	<0.01	<0.01	<0.01	<0.01
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	<0.02	<0.02	<0.02	<0.02	<0.02
4,4'-DDE	<0.02	<0.02	<0.02	<0.02	<0.02
4,4'-DDD	<0.02	<0.02	<0.02	<0.02	<0.02
4,4'-DDT	<0.02	<0.02	<0.02	<0.02	<0.02
Endrin	<0.03	<0.03	<0.03	<0.03	<0.03
Endrin Aldehyde	<0.03	<0.03	<0.03	<0.03	<0.03
Heptachlor	<0.02	<0.02	<0.02	<0.02	<0.02
Heptachlor Epoxide	<0.03	<0.03	<0.03	<0.03	<0.03
Chlordane	<0.10	<0.10	<0.10	<0.10	<0.10
Toxaphene	<0.50	<0.50	<0.50	<0.50	<0.50
Methoxychlor	<0.10	<0.10	<0.10	<0.10	<0.10
Mirex	<0.05	<0.05	<0.05	<0.05	<0.05
ater, Phthalates (Item No. 31)					
Dimethyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Diethyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Di-n-Butyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butyl Benzyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bis(2-ethylhexyl)Phthalate	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Di-n-Octyl Phthalate	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
ater, Purgeable Aromatics (Item No. 34)					
Benzene	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,3-Dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,4-Dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethyl Benzene	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

TABLE L-4

Little River Sediments
Niagara Falls, New York

DACW49-83-D-0006
Delivery No. 0002

EP TOXICITY TESTS
ORGANIC PARAMETERS

ATEC LAB NO. COE SITE NO.	2763-83 D83-3 0-3	2764-83 D83-5 0-3	2765-83 D83-5 3-6	2766-83 D83-6 0-3	2767-8 D83-6 0 Replica
Water, Polynuclear Aromatic Hydrocarbons (Item No. 35)					
Phenanthrene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)Anthracene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(g)Fluoranthene	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(k)Fluoranthene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Benzo(a)Pyrene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzo(a,h)Anthracene	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Indeno(1,2,3-cd)Pyrene	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(ghi)Perylene	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Water, Other Base-Neutral Organics (Item No. 39)					
Hexachloroethane	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Hexachlorobutadiene	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Hexachlorobenzene	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,2,4-Trichlorobenzene	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2-Chloronaphthalene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Diphenylhydrazine	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorocyclopentadiene	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water, Herbicides (Item No. 43)					
2,4-Dichlorophenoxy Acetic Acid	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silvex	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-T	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Water, Dioxin (Item No. 41)					
Dioxin	<0.002	<0.002	<0.002	<0.002	<0.002

All results reported as µg/l.

APPENDIX M

SEDIMENT CONTAMINANT DATA UPSTREAM OF THE 102ND STREET LANDFILL

(The Niagara River Toxics Committee - 1984)

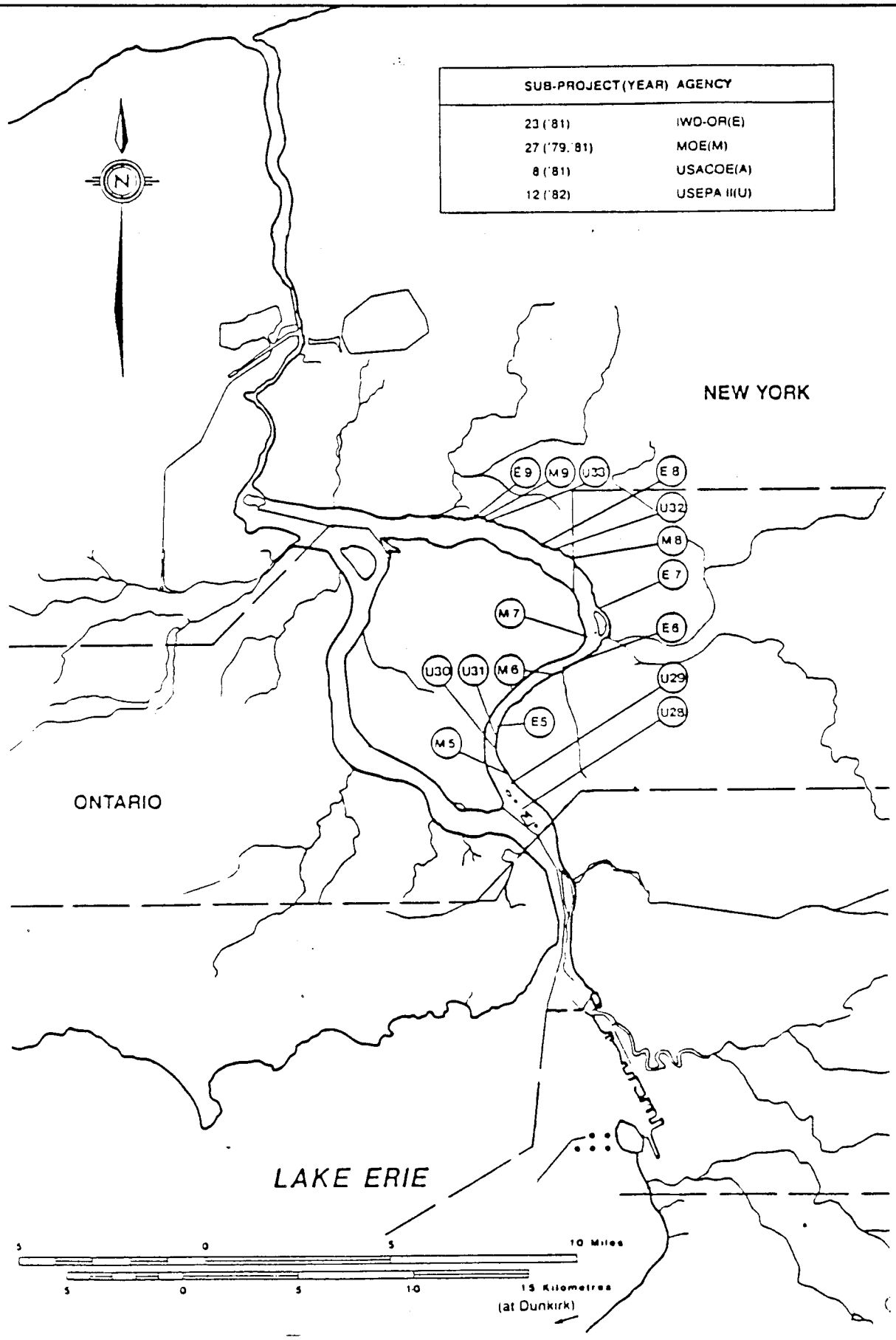


figure M-1

UPSTREAM SEDIMENT SAMPLING STATIONS

102nd St. Landfill

CRA

TABLE M-1

CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS
OF THE NIAGARA RIVER, 1979 (ppb)

Parameter	Detection Limit	Upstream 102nd Street					At 102nd Street
		M - 5	M - 6	M - 7	M - 8	Average	M - 9
Arsenic	300	2500	14000	5400	7600	7400	2400
Cadmium	40	< 400	500	< 400	400	330	800*
Chromium	3000	7000	79000	5800	28000	30000	19000
Copper	1000	9500	110000	10000	32000	40000	12000
Lead	3000	7000	200000	5000	48000	65000	13000
Mercury	10	60	670	< 10	650	350	40
Nickel	3000	6000	38000	10000	10000	16000	13000
Zinc	1000	42000	460000	50000	330000	221000	120000
PCB's, Total	10	50	380	220	340	248	810*
Aldrin	1	ND	ND	ND	ND	ND	ND
Dieldrin	1	ND	2	ND	ND	1	3*
alpha-BHC	1	ND	ND	ND	ND	ND	ND
beta-BHC	1	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	1	ND	ND	ND	ND	ND	ND
gamma-Chlordane	1	ND	5	ND	9	4	3
alpha-Chlordane	1	ND	1	ND	ND	1	1
o,p-DDT	5	ND	ND	ND	ND	ND	ND
o,p'-DDT	5	ND	ND	ND	ND	ND	ND
p,p'-DDE	1	3	6	3	5	4	3
p,p'-DDD (TDE)	5	ND	ND	ND	9	4	5*
Endrin	1	ND	ND	ND	ND	ND	ND
alpha-Endosulfan	1	ND	ND	ND	ND	ND	ND
beta-Endosulfan	1	ND	ND	ND	ND	ND	ND
Heptachlor	1	ND	ND	ND	ND	ND	ND

continued...

TABLE M-1

CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS
OF THE NIAGARA RIVER, 1979 (ppb)

Parameter	Detection Limit	Upstream 102nd Street					At 102nd Street
		M - 5	M - 6	M - 7	M - 8	Average	M - 9
Heptachlor epoxide	1	ND	ND	ND	ND	ND	ND
Mirex	5	ND	18	8	4	8	10*
Hexachlorobenzene	1	ND	ND	ND	ND	ND	ND

Notes: Data Source: Sub-project 27a, Niagara River Sediment Survey (1979), Ontario Ministry of the Environment (MOE).

ND = not detected at detection limit indicated.

Concentration are in ppb (ug/kg, dry weight).

* the concentration at the site exceeds the concentration upstream.

To calculate the average concentration, ND = 1/2 the detection limit or
ND = 0 (if detection limit not known)

TABLE M-2

CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS
OF THE NIAGARA RIVER, 1981 (ppb)

Parameter	Detection Limit	Upstream 102nd Street					At 102nd Street
		E - 5	E - 6	E - 7	E - 8	Average	E - 9
Arsenic		20000	7000	5000	5000	9000	3000
Cadmium (extr.)	100	1100	3200	790	200	1300	380
Chromium (extr.)		34000	49000	14000	4000	25000	4000
Cobalt (extr.)		4000	2000	2000	3000	3000	1000
Copper (extr.)		88000	58000	25000	9000	45000	6000
Lead (extr.)		88000	105000	72000	10000	69000	12000
Mercury		1440	290	160	30	480	420
Nickel (extr.)		20000	11000	9000	6000	12000	4000
Selenium	100	220	270	200	< 100	190	100
Zinc (extr.)		299000	239000	197000	6000	185000	4000
PCB's, Total	10	230	530	17900	50	4678	120
Aldrin	1	ND	ND	ND	ND	ND	ND
Dieldrin	1	ND	ND	10	ND	3	ND
alpha-BHC	1	ND	2	15	ND	5	ND
gamma-BHC (Lindane)	1	ND	ND	ND	ND	ND	ND
alpha-Chlordane	1	ND	ND	ND	ND	ND	ND
gamma-Chlordane	1	ND	ND	20	ND	5	ND
R,p-DDT	1	ND	ND	ND	ND	ND	ND
p,p'-DDT	1	ND	ND	ND	ND	ND	ND
p,p'-DDE	1	ND	11	280	1	73	ND
p,p'-DDD (TDE)	1	7	54	7	ND	17	ND
Endrin	1	ND	50	15	ND	17	ND
alpha-Endosulfan	1	3	ND	8	ND	3	ND
beta-Endosulfan	1	7	ND	ND	ND	2	ND

continued....

TABLE M-2

CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS
OF THE NIAGARA RIVER, 1981 (ppb)

Parameter	Detection Limit	Upstream 102nd Street					At 102nd Street
		E - 5	E - 6	E - 7	E - 8	Average	E - 9
Heptachlor	1	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	1	ND	19	ND	ND	5	ND
Methoxychlor	1	14	103	8	ND	31	ND
Mirex	1	ND	ND	ND	ND	ND	ND
Dichlorobenzenes	1	68	60	27	45	50	52*
Trichlorobenzenes	1	8	2	ND	ND	3	3*
Tetrachlorobenzenes	1	ND	ND	ND	ND	ND	2*
Pentachlorobenzene	1	13	2	ND	ND	4	1
Hexachlorobenzene	1	12	3	88	ND	26	1

Notes: Data Source: Sub-project 23, Toxic Contaminants Sources Survey, Inland Waters Directorate, Ontario Region, Environment Canada.

ND = not detected at detection limit indicated.

Concentrations are in ppb (ug/kg, dry weight). All inorganic values are total except those designated "(extr.)" for extractable.

* the concentration at the site exceeds the concentration upstream.

To calculate the average concentration, ND = 1/2 the detection limit or
ND = 0 (if detection limit not known).

TABLE M-3

CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS
OF THE NIAGARA RIVER, 1982 (ppb)

Parameter	Detection Limit	Upstream 102nd Street						At 102nd Street
		U - 28	U - 29	U - 30	U - 31	U - 32	Average	U - 33
Fluorotrichloromethane		3.4	1.9	1.9	1.9	ND	1.8	ND
Toluene		ND	ND	ND	ND	ND	ND	ND
Fluoranthene		ND	650	550	ND	8	242	ND
Bis(2-ethylhexyl) phthalate		ND	ND	ND	300	ND	60	300*
Benzo (a) anthracene		ND	300	300	ND	ND	120	ND
Chrysene		ND	650	300	ND	ND	190	ND
Phenanthrene		ND	450	600	ND	ND	210	ND
Pyrene		ND	700	420	ND	8	226	ND
Di-n-butyl phthalate		300	ND	ND	ND	ND	60	ND
Chlorobenzene		ND	ND	ND	ND	ND	ND	ND
Bromoform		ND	ND	ND	ND	ND	ND	ND
PCB-1248		ND	16.9	88.8	29.6	ND	27.1	ND
PCB-1260		ND	ND	ND	ND	ND	ND	ND
Benzo(a) pyrene		ND	600	ND	ND	15	123	ND
Benzo(b) fluoranthene		ND	600	ND	ND	ND	120	ND
Styrene		ND	ND	ND	ND	ND	ND	ND
O-xylene		ND	ND	ND	ND	ND	ND	ND
N-nitrosodiphenylamine		ND	ND	ND	ND	ND	ND	ND
Naphthalene		ND	1500	300	ND	ND	360	ND
Benzo(k) fluoranthene		ND	600	ND	ND	ND	120	ND
Dibenzo(a,h) anthracene		ND	600	ND	ND	ND	120	ND
Silver	1000	ND	ND	ND	ND	ND	ND	ND
Aluminum	20000	220000	530000	280000	1400000	6800000	622000	310000
Boron	10000	ND	ND	ND	ND	ND	ND	ND

continued....

TABLE M-3

CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS
OF THE NIAGARA RIVER, 1982 (ppb)

Parameter	Detection Limit	Upstream 102nd Street						At 102nd Street
		U - 28	U - 29	U - 30	U - 31	U - 32	Average	U - 33
Barium	10000	ND	ND	ND	24000	19000	12000	ND
Beryllium	500	ND	ND	ND	ND	ND	ND	ND
Chromium	1000	ND	16000	1600	6000	5600	5900	1600
Cobalt	5000	ND	ND	ND	ND	ND	ND	ND
Copper	5000	ND	6100	7200	16000	10000	8400	ND
Iron	5000	940000	2400000	1400000	7200000	3100000	3008000	1500000
Manganese	1000	30000	56000	120000	430000	85000	144000	31000
Nickel	4000	ND	ND	7100	6900	6000	4800	ND
Vanadium	20000	ND	ND	ND	ND	ND	ND	ND
Zinc	1000	ND	47000	40000	160000	170000	84000	75000
Arsenic	1000	1500	2200	ND	ND	ND	1000	ND
Cadmium	100	600	1000	500	1100	1900	1000	600
Mercruy	20	ND	ND	ND	ND	ND	ND	ND
Lead	500	6300	16000	15000	30000	60000	25000	12000
Antimony	2000	ND	ND	ND	ND	ND	ND	ND
Selenium	200	ND	ND	ND	ND	ND	ND	ND
Tin	2000	ND	ND	ND	ND	ND	ND	ND
Thallium	1000	ND	ND	ND	ND	ND	ND	ND

Notes: Data Source: Sub-project 12, Open Lake (Erie) Dredge Spoil Site Sampling, U. S. Environmental Protection Agency, Region II New York, N.Y.

ND = not detected at detection limit indicated.

Concentrations are in ppb (ug/kg, dry weight).

* the concentration at the site exceeds the concentration upstream.

To calculate the average concentration, ND = 1/2 the detection limit or
ND = 0 (if detection limit not known)

TABLE M-4

AVERAGE CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS OF THE NIAGARA RIVER, 1979-1982 (ppb)

Parameter	Detection Limit	Upstream 102nd Street				At 102nd Street
		M Average	E Average	U Average	Average	Average
Volatile Organics						
Bromoform				ND	ND	ND
Chlorobenzene				ND	ND	ND
Toluene				ND	ND	ND
Trichlorofluoromethane				1.8	1.8	ND
Base/Neutal Extractables						
Benzo (a) anthracene				120	120	ND
Benzo (a) pyrene				123	123	ND
Benzo (b) fluoranthene				120	120	ND
Benzo (k) fluoranthene				120	120	ND
Bis (2-ethylhexyl) phthalate				60	60	300*
Chrysene				190	190	ND
Dibenzo (a,h) anthracene				120	120	ND
Dichlorobenzenes	1		50		50	52*
Di-n-butyl phthalate				60	60	ND
Fluoranthene				242	242	ND
Hexachlorobenzene	1	ND	26		13	1
Naphthalene				360	360	ND
N-nitrosodiphenylamine	1			ND	ND	ND
Pentachlorobenzene			4		4	1
Phenanthrene				210	210	ND
Pyrene				226	226	ND
Tetrachlorobenzenes	1		ND		ND	2*
Trichlorobenzenes	1		3		3	3

continued....

TABLE M-4

AVERAGE CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS OF THE NIAGARA RIVER, 1979-1982 (ppb)

Parameter	Detection Limit	Upstream 102nd Street				At 102nd Street
		M Average	E Average	U Average	Average	Average
Pesticides and PCB's						
Aldrin	1	ND	ND		ND	ND
alpha-BHC	1	ND	5		3	ND
beta-BHC	1	ND			ND	ND
gamma-GHC (Lindane)	1	ND	ND		ND	ND
alpha-Chlordane	1	1	ND		1	1
gamma-Chlordane	1	4	5		5	2
o,p-DDT	5 & 1	ND	ND		ND	ND
p,p'-DDT	5 & 1	ND	ND		ND	ND
p,p'-DDE	1	4	73		39	2
p,p'-DDD (TDE)	5 & 1	4	17		11	3
Dieldrin	1	1	3		2	2
alpha-Endosulfan	1	ND	3		2	ND
beta-Endosulfan	1	ND	2		1	ND
Endrin	1	ND	17		9	ND
Heptachlor	1	ND	ND		ND	ND
Heptachlor epoxide	1	ND	5		3	ND
Methoxychlor	1		31		31	ND
Mirex	5 & 1	8	ND		4	5*
PCB's, Total	10	248	4678		2463	465
PCB 1248				27.1	27.1	ND
PCB 1260				ND	ND	ND
Styrene				ND	ND	ND
O-xylene				ND	ND	ND

continued....

TABLE M-4

AVERAGE CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS OF THE NIAGARA RIVER, 1979-1982 (ppb)

Parameter	Detection Limit	Upstream 102nd Street				At 102nd Street
		M Average	E Average	U Average	Average	Average
Heavy Metals						
Aluminum	20000			622000	622000	310000
Antimony	2000			ND	ND	ND
Arsenic	300 & 1000	7400	9000	1000	5500	2000
Barium	10000			12000	12000	ND
Beryllium	500			ND	ND	ND
Boron	10000			ND	ND	ND
Cadmium	40 & 100	330		1000	710	700
Cadmium (extr.)	100		1300		1300	380
Chromium	3000 & 1000	30000		5900	16600	10300
Chromium (extr.)			25000		25000	4000
Cobalt	5000			ND	ND	ND
Cobalt (extr.)			3000		3000	1000
Copper	1000 & 5000	40000		8400	22600	7000
Copper (extr.)			45000		45000	6000
Iron	5000			3008000	3008000	1500000
Lead	3000 & 500	65000		25000	43000	13000
Lead (extr.)			69000		69000	12000
Manganese	1000			144000	144000	31000
Mercury	10 & 20	350	480	ND	260	160
Nickel	3000 & 4000	16000		4800	9800	8000
Nickel (extr.)			12000		12000	4000
Selenium	100 & 200		190	ND	140	100
Silver	1000			ND	ND	ND
Thallium	1000			ND	ND	ND

continued...

TABLE M-4

AVERAGE CONTAMINANT CONCENTRATIONS IN BOTTOM SEDIMENTS OF THE NIAGARA RIVER, 1979-1982 (ppb)

Parameter	Detection Limit	Upstream 102nd Street				At 102nd Street
		M Average	E Average	U Average	Average	Average
Tin	2000			ND	ND	ND
Vanadium	20000			ND	ND	ND
Zinc	1000	221000		84000	144000	98000
Zinc (extr.)			185000		185000	4000

Notes: Data Sources: Sub-projects 27a, 23 and 12.

ND = not detected at detection limit indicated.

Concentrations are in ppb (ug/kg, dryweight). All inorganics values are total except those designated "(extr.)" for extractable.

* the concentration at the site exceeds the concentration upstream.

To calculate the average concentration, ND = 1/2 the detection limit or
ND = 0 (if detection limit not known)

APPENDIX N

SEDIMENT CONTAMINANT DATA UPSTREAM OF THE 102ND STREET LANDFILL

(Buffalo New York Area Sediment Survey - 1981)

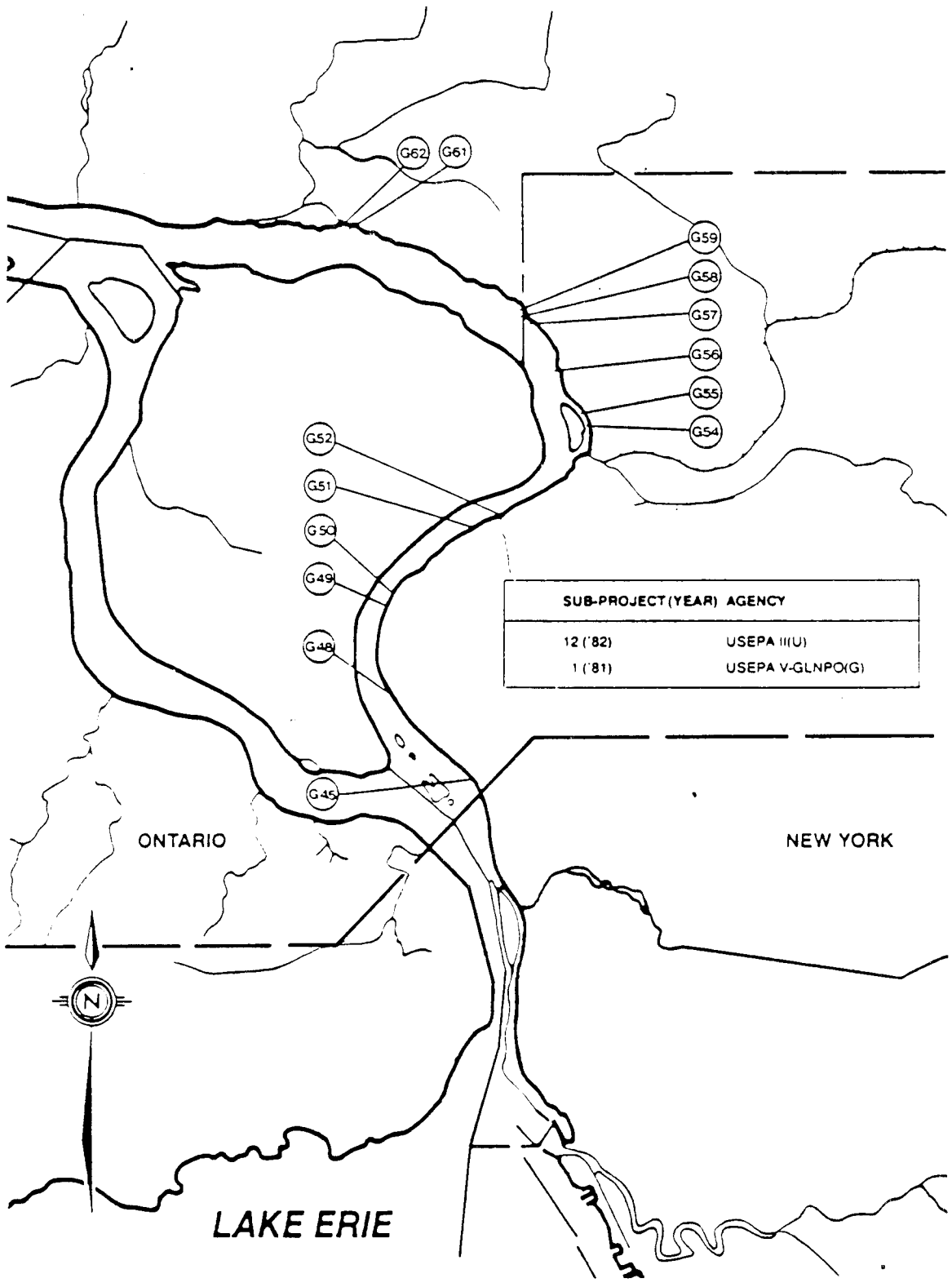


figure N-1

B.A.S.S. SEDIMENT SAMPLING LOCATIONS
102nd St. Landfill

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TABLE N-1

B.A.S.S. ANALYTICAL RESULTS
NIAGARA RIVER

CONCENTRATIONS OF PRIORITY POLLUTANTS IN ppm

	Upstream Locations												Site Locations		
Parameter	G45	G48	G49	G50	G51	G52	G54	G55	G56	G57	G58	G59	G61	G61A	G62
(Volatile Organics)															
Benzene								0.01							
Chlorobenzene				0.003			*	1.00	0.011	0.004			0.02	0.014	
Chloroform		0.012		1.19								0.038		0.041	
Dibromochloromethane				*								0.011			
1,1-Dichloroethane								1.0*	0.07*	0.05*	0.36*				
1,2-Dichloroethane												0.014			
1,2-Dichloropropane												0.011			
Ethylbenzene				0.002				0.124							
Methylene Chloride		1.37	0.19	0.146	0.007		0.004		0.056	1.06	1.37		0.191	0.195	0.091
1,1,2,2-Tetrachloroethane				0.005										0.002	
Tetrachloroethylene				0.004						0.005	0.012			0.003	
1,1,1-Trichloroethane				*								0.004			
1,1,2-Trichloroethane												0.008			
(Semi-Volatiles)															
Acenaphthene	0.6	1.0													
Chrysene	59.5	9.7	7.1	1.4								27.0			
1,2-Dichlorobenzene		0.2										1.7			
1,3-Dichlorobenzene												0.9			
1,4-Dichlorobenzene												1.4		0.8	
Bis(2-Ethylhexyl) Phthalate				1.9								4.2		0.6	
Fluoranthene	8.5	3.4	3.7	14.1								7.5			
Fluorene		0.6										0.6			
Naphthalene	0.3	1.2	0.8	3.1								3.1		0.8	
Phenanthrene	5.6	0.8	1.4	1.6								1.8			
Pyrene	6.4	3.5	3.3	10.2	16.9	0.5						5.8			
1,2,4-Trichlorobenzene												1.1			

continued....

TABLE B-1

B.A.S.S. ANALYTICAL RESULTS
NIAGARA RIVER

CONCENTRATIONS OF PRIORITY POLLUTANTS IN ppm

Parameter	Upstream Locations												Site Locations		
	G45	G48	G49	G50	G51	G52	G54	G55	G56	G57	G58	G59	G61	G61A	G62
(Pesticides & PCBs)															
Aldrin	<0.002	<0.001	<0.002	0.001			<0.002	<0.002				<0.001	<0.002	<0.001	<0.002
Beta-BHC	1.23	0.007	<0.01	0.002	<0.01	0.127	<0.01	<0.008	<0.008	0.39	0.081	0.006	<0.008	0.002	0.008
Gamma-BHC (Lindane)	3.25	0.001	0.015	<0.001	0.031	<0.01	0.027	0.048	<0.004			<0.001	<0.004	<0.001	<0.004
Chlordane	1.71	0.007	0.033	0.004	0.033	0.11	0.028	0.082	0.054	0.078	0.148	0.021	0.002	<0.002	0.011
4,4'-DDD	0.87	0.004	0.031	0.005	0.012	0.279	0.033	0.474	0.078	0.067	0.082	0.012	0.001		0.019
4,4'-DDE	0.91	0.008	0.103		0.022	0.09	0.062	0.28	0.076	0.149	0.243		0.005		0.046
4,4'-DDT	0.098	0.004	0.002				0.11	0.416	0.019	0.012	0.017	0.118			0.014
Dieldrin	<0.001		0.002		<0.001	0.005	0.26	<0.001					<0.001		0.001
Endosulfan I	<0.001	<0.02	<0.001				0.07	0.028	<0.02						<0.02
Endosulfan II	<0.003	0.003	0.006	0.006	<0.003	<0.003	0.20	<0.003	0.005	<0.003	0.004	0.015	<0.003	<0.001	<0.003
Endrin	<0.001	<0.003	0.004		<0.001		<0.001	<0.003					<0.003		<0.003
Heptachlor Epoxide	1.0	0.003	0.034	<0.001	0.025	0.019	0.023	0.027	0.007	0.057	0.158	0.011	<0.002	<0.001	0.002
PCB-1248	8.62	1.37	2.73	0.03	0.94	2.03	0.70	2.82	1.05	0.57	2.84	1.39	0.07	0.03	0.19
PCB-1254	9.0	1.25	0.78	<0.02	0.29	1.21	0.38	1.66	0.28	0.22	1.02	0.61	0.02	<0.02	0.08
PCB-1260	2.71	0.73	0.16	<0.02	0.10	0.55	0.10	1.33	0.13	0.11	0.21	0.31	0.01	<0.02	0.02
(Metals & Others)															
Beryllium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	5.1	0.9	0.6	1.8	1.3	5.9	2.1	2.3	NA	1.9	6.0	4.2	0.60	<0.20	1.00
Chromium	44	27	26	260	23	120	44	100	NA	44	89	74	9.0	7.0	25
Copper	230	46	29	76	40	180	72	390	NA	71	170	140	10	10	37
Lead	550	51	37	67	53	180	90	310	NA	130	250	180	19	15	49
Mercury	0.7	0.3	0.1	0.7	0.3	0.8	0.8	1.1	NA	0.6	0.5	1.2	0.2	0.1	0.3
Nickel	34	12	16	31	20	35	23	32	NA	22	35	26	5.7	10	13.
Silver	<0.3	<0.3	<0.3	<0.3	<0.3	3.7	0.67	1.7	NA	0.4	1.2	<0.3	<0.3	<0.3	<0.3
Zinc	530	270	230	230	210	540	430	630	NA	420	770	780	120	54	190
Cyanide	<1.2	<1.2	2.0	7.3	1.6	2.9	5.5	2.1	2.8	2.1	4.4	3.9	<1.2	<1.2	<1.2
Phenols	1.6	0.6	<0.6	0.4	<0.6	<0.6	<0.6	30	0.7	<0.6	0.9	0.6	<0.6	1.0	<0.6

Note: Parameters listed above represent priority pollutants detected in the sediment samples. Priority pollutants that were not detected in any sample, or that were not tested for, have been omitted from the table along with pollutants that do not appear on the priority pollutant listing.

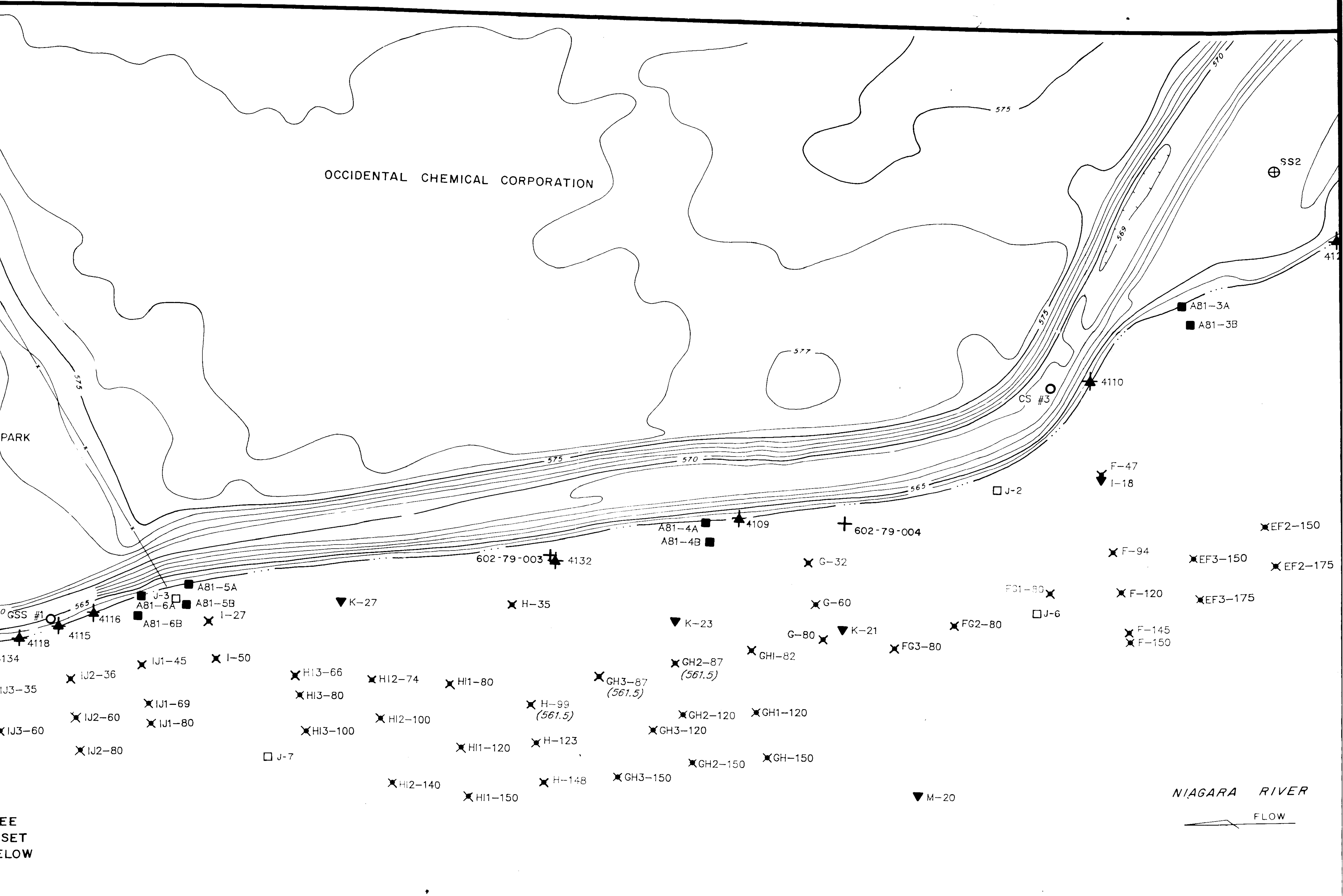
* - Tentative Identification and approximate quantitation.
Blank - Parameter not detected in sample.
NA - Parameter not analyzed

TABLE N-2

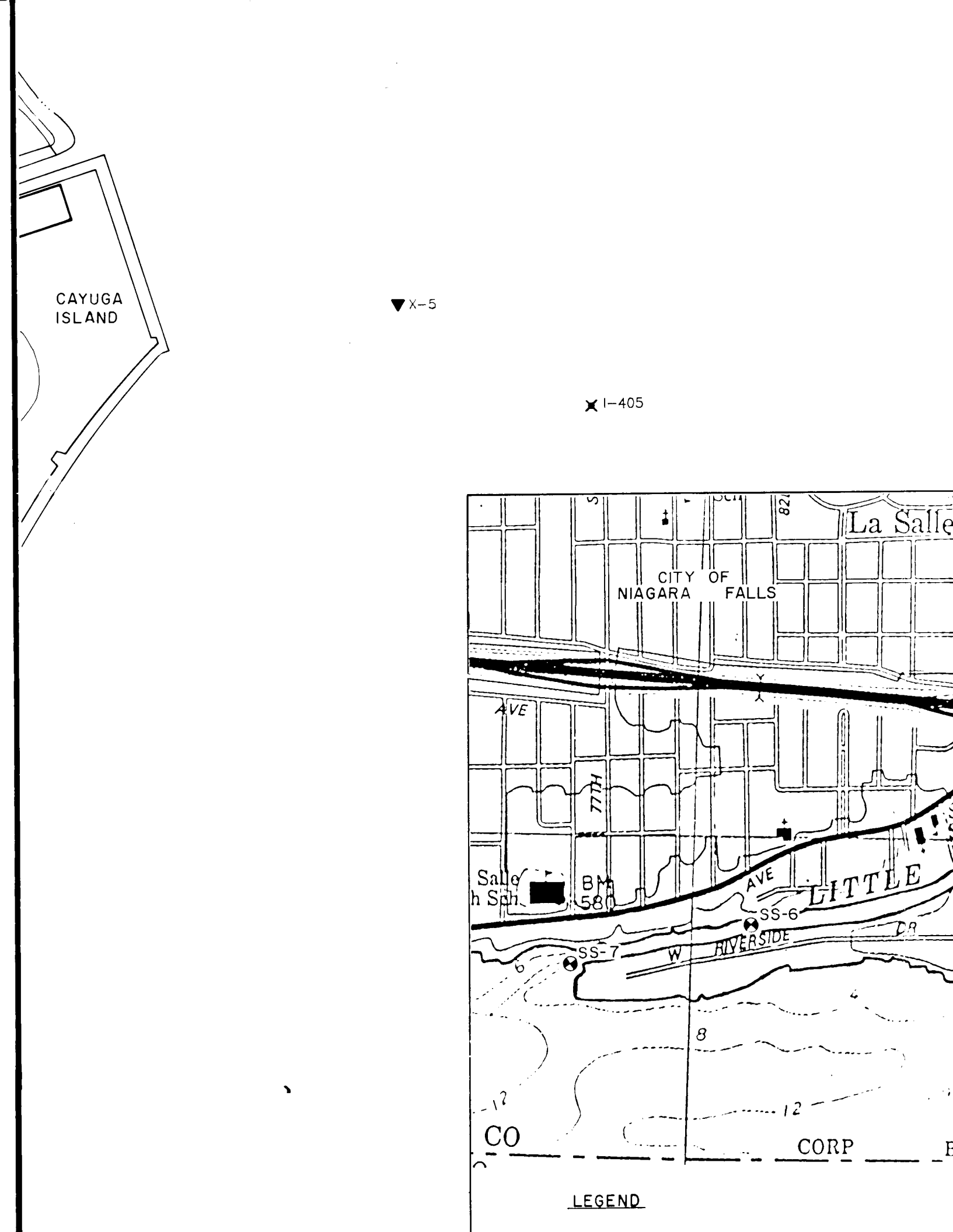
SUMMARY OF B.A.S.S. RESULTS
NIAGARA RIVER

Parameter	Upstream (12) Max. Conc. (ppm)	Upstream (12) Hits	At Site (3) Max. Conc. (ppm)	At Site (3) Hits
Benzene	0.01	1	ND	0
Chlorobenzene	1.00	4	0.014	2
Chloroform	1.19	3	0.041	1
Dibromochloromethane	0.011	1	ND	0
1,1-Dichloroethane	1.0*	4	ND	0
1,2-Dichloroethane	0.014	1	ND	0
1,2-Dichloropropane	0.011	1	ND	0
Ethylbenzene	0.124	2	ND	0
Methylene Chloride	1.37	8	0.195	3
1,1,2,2-Tetrachloroethane	0.005	1	0.002	1
Tetrachloroethylene	0.012	4	0.003	1
1,1,1-Trichloroethane	0.008	1	ND	0
1,1,2-Trichloroethane	ND	0	ND	0
Acenaphthene	1.0	2	ND	0
Chrysene	59.5	5	ND	0
1,2-Dichlorobenzene	1.7	2	ND	0
1,3-Dichlorobenzene	0.9	1	ND	0
1,4-Dichlorobenzene	1.4	1	0.8	1
Bis(2-Ethylhexyl) Phthalate	4.2	2	0.6	1
Fluoranthene	14.1	5	ND	0
Fluorene	0.6	2	ND	0
Naphthalene	3.1	5	0.8	1
Phenanthrene	5.6	5	ND	0
Pyrene	15.9	7	ND	0
1,2,4-Trichlorobenzene	1.1	1	ND	0

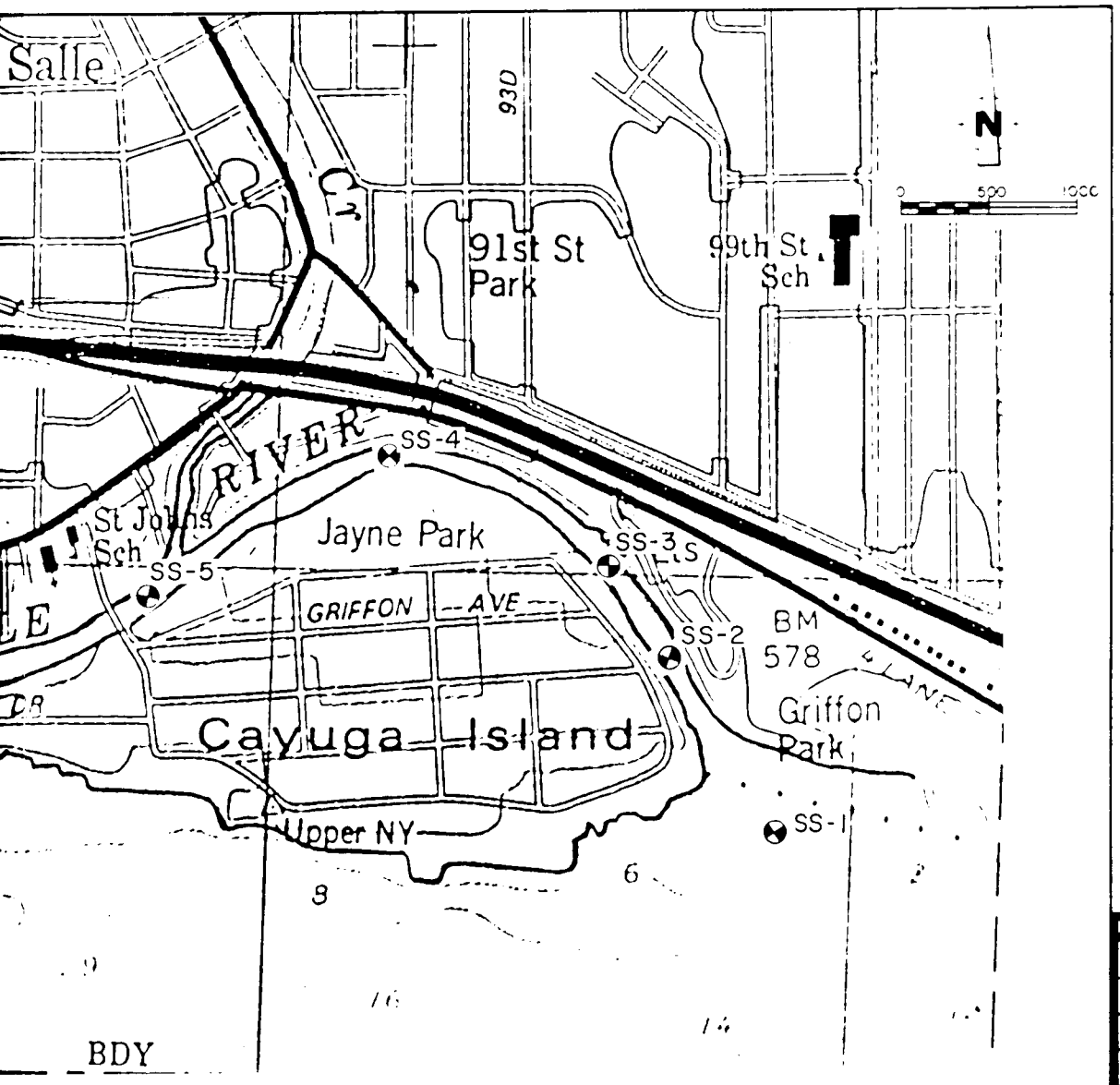
continued....



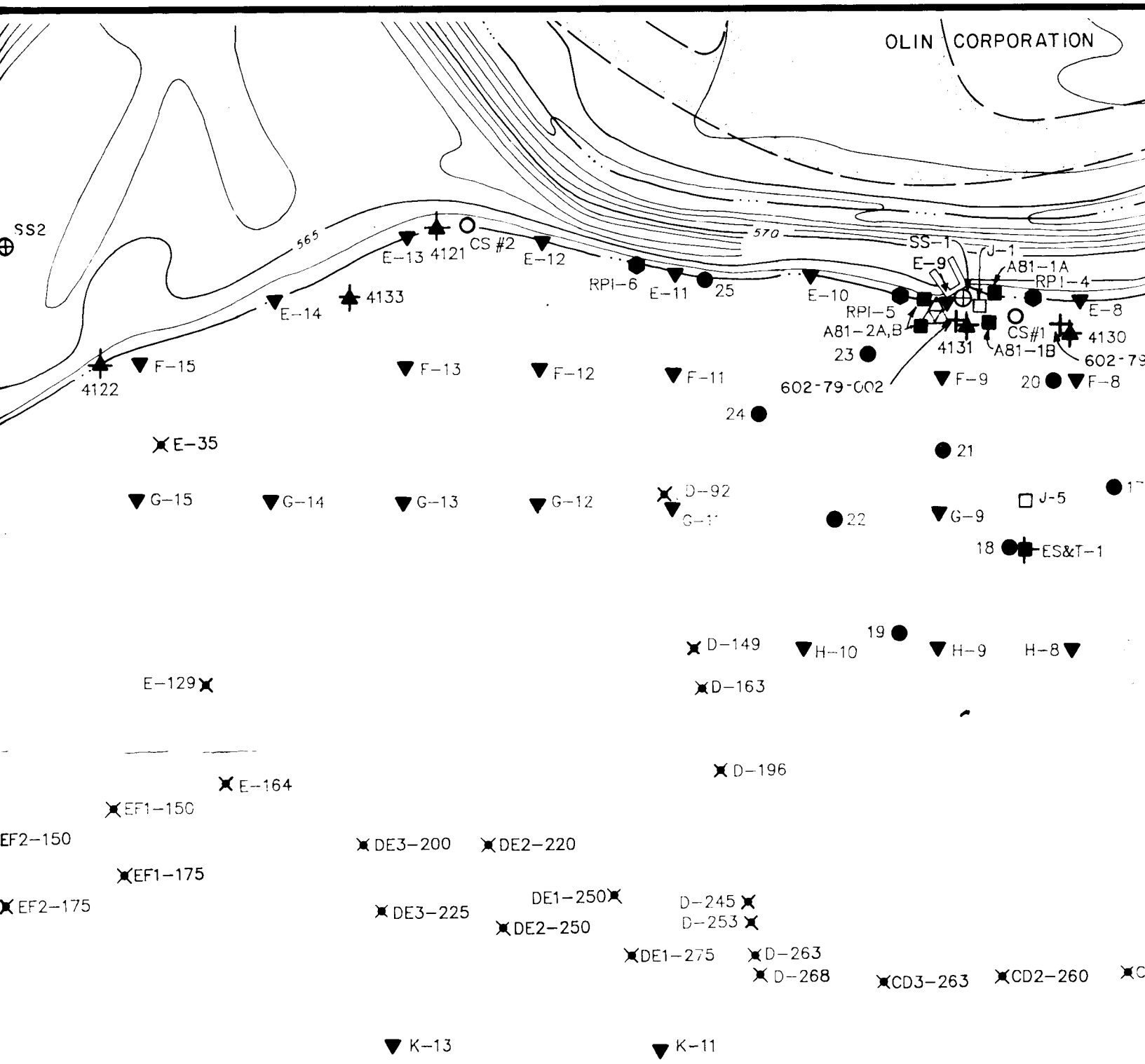
OCCIDENTAL CHEMICAL CORPORATION
PARK
NIAGARA RIVER
FLOW
SS2
CS #3
GSS #1
575
570
569
565
577
4110
4109
4132
4116
4115
4118
602-79-004
602-79-003
A81-3A
A81-3B
A81-4A
A81-4B
A81-5A
A81-5B
A81-6A
A81-6B
J-2
J-3
J-6
J-7
F-47
I-18
I-27
I-50
K-27
K-23
K-21
M-20
EF2-150
EF2-175
EF3-150
EF3-175
F-94
F-120
F-145
F-150
FG2-80
FG3-80
G-32
G-60
G-80
GHI-82
GH2-87
(561.5)
GH3-87
(561.5)
GH1-120
GH2-120
GH3-120
GH-150
GH2-150
GH3-150
H-35
H-99
(561.5)
H-123
H-148
HI1-80
HI1-120
HI1-150
HI2-74
HI2-100
HI2-140
HI3-66
HI3-80
HI3-100
IJ1-45
IJ1-69
IJ1-80
IJ2-36
IJ2-60
IJ2-80
IJ3-35
IJ3-60
EE
SET
ELOW


CAYUGA
ISLAND
X-5
I-405
CITY OF
NIAGARA FALLS
La Salle
AVE
77TH
BM
580
AVE
LITTLE
SS-6
SS-7
W
RIVERSIDE
DR
8
12
CO
CORP
LEGEND

G-427



4	UPDATE RI SAMPLING LOCA
3	ADDED JAFFE (1981) AND USE
2	MOVED BASE TO ADD APPROX


OLIN CORPORATION
SS2
565
570
E-13
4121
CS #2
E-12
SS-1
J-1
E-9
A81-1A
RPI-4
RPI-6
E-11
25
E-10
RPI-5
E-8
A81-2A,B
CS#1
4130
4133
E-14
4131
A81-1B
23
602-79
4122
F-15
F-13
F-12
F-11
602-79-002
F-9
20
F-8
24
E-35
21
G-15
G-14
G-13
G-12
D-92
J-5
22
G-9
18
ES&T-1
19
D-149
H-10
H-9
H-8
E-129
D-163
D-196
E-164
EF1-150
EF2-150
DE3-200
DE2-220
EF1-175
EF2-175
DE1-250
DE3-225
D-245
D-253
DE2-250
DE1-275
D-263
D-268
CD3-263
CD2-260
K-13
K-11

IVER

DW

E-528

TIONS	OCT 17, 1988	CRH
EPA (1982) LOCATIONS	Oct. 11, 1988	JK
X 200' ON RIGHT SIDE	June 19, 1987	JK

Approved

OCCID

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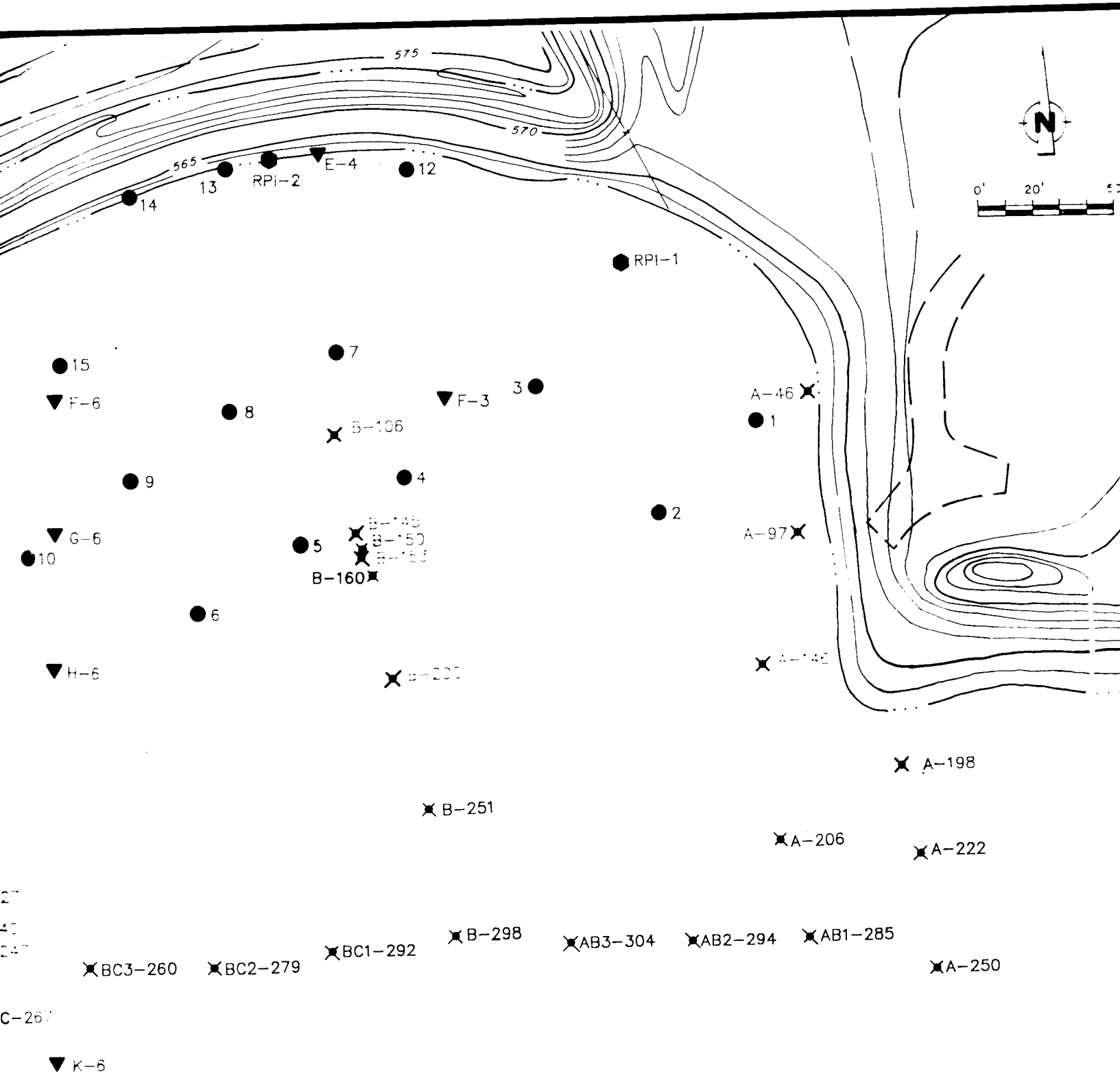
575
570
565
N
0'
20'
E-4
12
13
RPi-2
14
RPI-1
15
7
F-6
8
3
F-3
A-46
1
B-106
9
4
2
G-6
5
A-97
10
B-160
6
H-6
A-198
B-251
A-206
A-222
B-298
AB3-304
AB2-294
AB1-285
BC1-292
BC3-260
BC2-279
A-250
K-6

LEGEND

- ⊕ HOOKER CHEMICALS AND PLASTICS CORP. –1976 SAMPLING LOCATIONS
- ● RECRA–PHASE I (OLIN) –1978 SAMPLING LOCATIONS
- ○ HYDROSCIENCE (HOOKER) –1979 SAMPLING LOCATIONS
- ✦ ADL INC. (HOOKER) –1979 SAMPLING LOCATIONS
- ┼ HOOKER CHEMICALS AND PLASTICS CORP. –1979 SAMPLING LOCATIONS
- ✸ HITES (EPA) –1979 SAMPLING LOCATIONS (APPROXIMATE)
- ● RECRA–PHASE II (OLIN) –1979 SAMPLING LOCATIONS
- ■ ADL INC. (HOOKER) –1981 SAMPLING LOCATIONS
- –□– JAFFE (EPA) –1981 SAMPLING LOCATIONS (APPROXIMATE)
- △ USEPA –1982 SAMPLING LOCATIONS
- ▼ MALCOLM PIRNIE (NYSDEC) –1983 SAMPLING LOCATIONS
- ⊗ US ARMY CORPS OF ENGINEERS –1983 SAMPLING LOCATIONS
- ✖ REMEDIAL INVESTIGATION SAMPLING LOCATIONS –1986/87

CHEMICAL CORPORATION
EMICALS GROUP

EET LANDFILL SITE

ISTORICAL

CRA Consulting Engineers
CONESTOGA-ROVERS & ASSOCIATES
651 Colby Drive, Waterloo, Ontario Canada N2V 1C2

Drawn by	Scale	Date	File No.	Re
LDM	1" = 50'	APRIL 1987	OCC. A-3	