67284

# FT. EDWARD DAM PCB REMNANT DEPOSIT CONTAINMENT

# ENVIRONMENTAL MONITORING PROGRAM

## REPORT OF 1991 RESULTS

January - November 1991

## VOLUME I

Prepared by

**Harza Engineering Company**
**Chicago, Illinois**

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Prepared for

**General Electric Company**
**Albany, New York**

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## REPORT OF 1991 RESULTS
January - December 1991

First Draft

DRAFT

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Prepared for

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**Albany, New York**



**February 1992**

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## EXECUTIVE SUMMARY

General Electric Company continued performing an environmental monitoring program during 1991 in conjunction with the containment of the Ft. Edward Dam PCB Remnant Sites along the Hudson River near Ft. Edward, NY. The monitoring program began in August 1989. The results of the 1989 and 1990 portions of the program have been previously reported. This document describes the results of the environmental monitoring conducted in 1991.

During 1991, environmental monitoring for PCBs in air, sediments, water and aquatic biota was conducted during, and following, containment construction activities on the four Ft. Edward Dam PCB Remnant Sites. Over 2,625 samples were analyzed for total PCB and Aroclor content. Monitoring of construction activities continued from early January through June 28, 1991; post-containment monitoring was conducted June 29, 1991 through the end of November.

Although PCBs were detected in all sample matrices (air, sediments, water and aquatic biota) throughout 1991, the detections appear to be unrelated to the Remnant Sites. No PCB detections in either air or the aquatic media were related to construction activities, which were completed by the end of May. The 1991 spatial trends in PCB concentrations and dominant Aroclors in aquatic samples were similar to those observed in 1989 and 1990. Stations upstream of Bakers Falls continued to show little PCB contamination, with much of the total PCB being quantified as Aroclor 1254. Stations downstream of Bakers Falls continued to show PCB contamination, both upstream and downstream of the Remnant Sites, with most of the total PCB being quantified as Aroclor 1242. The Mohawk River station continued to show only low concentrations of Aroclor 1254.

Beginning sometime between September 14-17, an unusual increase in PCB concentration was observed in all aquatic samples (except sediment) taken downstream of Bakers Falls.

The elevated concentrations declined at stations downstream of the Remnant Sites. This event is unrelated to the Remnant Sites because the elevated PCB concentrations were observed both upstream and downstream of the Sites. Although the PCB concentrations in samples taken during October and November had declined from September levels, they were still elevated compared to the concentrations observed between August 1989 and August 1991. The occurrence of these elevated concentrations limited the ability of the post-containment monitoring program to determine the Remnant Area containment effectiveness. Nonetheless, the data collected prior to September 1991 strongly suggest that the contained Sites did not contribute significant quantities of PCBs to the Hudson River during 1991.

Based on the findings of the 1989, 1990 and 1991 monitoring programs, water grab samples and Hester-Dendy multiplate samples of periphyton/silt appear to be among the most useful methods to evaluate future changes in aquatic PCB concentrations resulting from Remnant Site containment. Because the airborne PCBs detected in the pre-construction and post-containment monitoring periods appear to be unrelated to the Remnant Sites, the need for future air quality monitoring is questionable.

## 1.0 INTRODUCTION

The PCB remnant deposits consist of PCB-contaminated sediments and debris remaining after the 1973 removal of the Niagara Mohawk Power Company's Ft. Edward Dam on the Hudson River. Malcolm Pirnie, Inc. (1986) identified five remnant deposits. Four of the five can be identified today along the riverbanks. Sites 2 and 4 are on the Saratoga County (west) shore and Sites 3 and 5 are on the Washington County (east) shore (Figure 1).

Much of the concern regarding the remnant areas is based on their potential contribution of PCBs to air in the immediate vicinity of the sites, and to the Hudson River between the sites and Waterford. Waterford is the only municipality between Ft. Edward and the tidal portion of the Hudson River (downstream of the Federal Dam at Troy) that uses the Hudson as a source of drinking water. The U.S. Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) estimated that 37% of the PCBs in the water column of the Hudson River at Waterford "originated upstream of the [Thompson Island] Pool in the remnant deposit sites" (USEPA/NYSDEC 1987 pg. I-22).

Some remedial actions (riprap cover and bank stabilization) had been taken during the 1970's at Sites 2, 3 and 5 (USEPA/NYSDEC 1987). In 1975, riprap was placed at Remnant Sites 3 and 5, and the angle of the riverbank slope was cut back at Remnant Site 2. Approximately 17,000 cubic yards of contaminated sediments were removed from Remnant Site 3 in 1977 and 1978. Additional riprap was also placed at Remnant Site 3 in 1978, and a low earthen dam was placed across the northern end of Remnant Site 3 to reduce the possibility of the river overtopping the northern end of the site and causing erosion and scouring of PCBs from the site.

In accordance with the USEPA Record of Decision (1984), construction efforts for in-place containment of Sites 2, 3, 4 and 5 began in July 1990. Containment of all sites was complete as of May 31, 1991 and was performed in accordance with the Administrative Order on Consent II CERCLA-90224. The Consent Order requires the General Electric Company (GE) to cap, or contain in place, Remnant Sites 2, 3, 4 and 5. Containment was effected by clearing and grading of the sites, followed by placement of a subgrade sand layer, a layer of contained finely-ground bentonite known as Claymax®, additional sand, topsoil and seeding with grass, and erosion controls, including the placement of riprap along the shoreline and construction of channels to funnel runoff away from the remnant areas.

As part of the remedial activities, GE has been conducting an environmental monitoring program. Begun in 1989, this program continued through (and following) the remediation containment activities on the remnant deposits during 1991. The sampling matrices conducted in the 1991 monitoring program included: sediment samples, water samples, dialysis membrane bags, multiplate samples, caddisfly samples, in-situ fish assays, and air quality samples. The program described herein is patterned after, and uses many of, the same monitoring techniques used by NYSDEC and NYSDOH in their previous Hudson River monitoring studies (NYSDEC 1982, Simpson et al. 1986, Jones and Sloan 1989).

This report describes the results of the monitoring program from January through November 1991. The results of the 1989 program have been reported by Harza/Yates & Auberle (1990a), an interim report of the 1990 air and water sampling results through mid-October was provided in Harza/Yates & Auberle (1990b), and the results of the entire 1990 program were reported in Harza/Yates & Auberle (1992). To the extent warranted by the 1989 - 1991 data, comparisons among stations and seasonal trends in PCB concentrations at a station are described to provide a basis for future (post-construction) monitoring.

## 2.0 MONITORING STRATEGY

The 1991 monitoring program was initially a continuation of the 1990 winter monitoring efforts (Harza/Yates & Auberle 1990c and 1992) and was directed at determining the effects of construction activity in the study area. When the weather conditions became more amenable, the 1990 Construction Monitoring Program (Harza/Yates & Auberle 1990d and 1992) resumed. The 1991 monitoring program changed again following the completion of containment construction activities on the Sites. In accordance with the 1989 and 1990 Plans of Study (Harza/Yates & Auberle 1989a, 1990c and 1990d), the monitoring efforts were reduced to preconstruction levels following the containment of a Site.

## 3.0 STUDY METHODS

### 3.1 Air Quality Monitoring

#### 3.1.1 Study Area

The study area to determine the PCB concentrations in air during the period of construction containment activities (January through May 1991) covered approximately two miles of the Hudson River in the Fort Edward area. Five fixed-location air monitoring stations operated throughout this five month period. Additional sampling with mobile stations placed on, or adjacent to, the Remnant Sites was also performed between January and May 1991.

Air monitoring after containment construction activities were complete (June through November 1991) focused on the Remnant Sites for the first six weeks and on residential areas in the four and half months that followed. Between June and mid-July 1991, one sampler operated on, or adjacent to, each Remnant Site. From mid-July to the end of November 1991, the three fixed-location stations in residential areas resumed operation.

The other two fixed-location stations, remote from the Remnant Sites, were not operated throughout the post-containment period.

Lead and cadmium air monitoring was performed in the vicinity of Remnant Site 4 during 1991. This sampling was a carryover of the metals sampling program for worker health and safety purposes that was begun in 1990. On going containment activities on Remnant Site 4 required metals monitoring based on the Plans of Study submitted for the construction monitoring program. Metals monitoring at Sites 2, 3, and 5 was completed during 1990.

Two independent sampling networks operated during containment activities in 1991. The five fixed-location sampling stations that were used in 1990 (A1, A2, A3, A4 and A5) operated from January through May 1991. The four mobile sampling stations (B2, B3, B4A and B4B) used in 1990 also continued operation during 1991. The mobile samplers were relocated several times in 1991 to remain proximate to the construction activities.

Figures 2, 3 and 4 show the locations of samplers in both networks. Four of the five fixed-location samplers are shown in Figure 2. The fifth location was at a remote farm site four miles southeast of Remnant Site 5. One mobile sampler operated on Remnant Site 2 and one on Remnant Site 3. Both samplers operated at two different locations on their respective remnant sites in 1991. The locations are shown in Figure 3. Two mobile samplers operated on Remnant Site 4 to simultaneously monitor PCB concentrations on the southern and northern ends of the site. The northern sampler (B4A) operated at two different locations, while the southern sampler (B4B) operated at three different locations. The locations of these samplers, as well as B5, are shown in Figure 4.

**1991 Air Sampling Station Locations and Frequencies**

| Site Designation | Location | Sampling Frequency |
|---|---|---|
| A1 | Bakers Falls | Every 3 Days |
| A2 | May Street | Every 3 Days |

| | | |
|---|---|---|
| A3 | McCrea Street | Every 3 Days |
| A4 | Scott Paper | Every 3 Days |
| A5 | Cary Road | Every 3 Days |
| B2 | Remnant Site 2 | Construction Dependent |
| B3 | Remnant Site 3 | Construction Dependent |
| B4A | Remnant Site 4 | Construction Dependent |
| B4B | Remnant Site 4 | Construction Dependent |
| B5 | Remnant Site 5 | Construction Dependent |

From June 1 through July 14, 1991, air monitoring was conducted using one sampler per remnant site. Mobile samplers were used for Remnant Sites 2, 3 and 4. The fixed location sampler A4 was used to monitor PCB concentrations in the vicinity of Site 5. Following this six week period of air monitoring on the Remnant Sites, sampling activities were shifted to focus on residential areas adjacent to the Sites. Concentrations measured at these fixed-location stations could then be compared to the preconstruction monitoring levels. Only the fixed-location sampling stations, A2, A3 and A4, operated after July 14, 1991.

### 3.1.2 Materials and Methods

The design of the mobile and permanent air samplers differed slightly. Permanent samplers measured the PCB concentration at a fixed-location for a 24-hour sample period, once every three days. Mobile samplers measured the PCB concentration, and in some cases the lead and cadmium concentrations on, or adjacent to, the Remnant Sites. Sample times were varied to match the containment activity schedule. The remote samplers used portable generators in place of 110 volt AC power.

Fixed-location samplers had a vacuum system control box mounted four feet above ground on a stationary wooden platform. Electrical power was provided by a standard 110 volt AC line. A single sample line attached to the vacuum system branched into two separate lines. The two branches were fed through a metal piping support system and connected to separate sample trains. The piping support system supported the sample trains an additional four feet above ground level. A critical orifice was inserted in each branch to control the sample flow rate. One sample train was identified as the red channel and the other as the green channel.

Mobile samplers had the vacuum system control box mounted on a flatbed trailer as opposed to a stationary platform. Electric power for the vacuum system was provided via a 1000 watt generator. The sample collection system was identical to that of fixed-location samplers. Two branches led from the vacuum system and connected to separate PCB sample trains. The sample trains were suspended eight feet above ground. A critical orifice was inserted in each branch to control the flow rate through each channel. The sample trains were identified as the red channel and green channel. Figure 5 shows the details of a mobile sampler.

In addition to PCB sampling, airborne lead and cadmium sampling was performed near Remnant Site 4 during site containment. Consequently, the Remnant Site 4 samplers were fitted with an additional sample line from the vacuum system to a separate sample train. Figure 5 shows a mobile sampler equipped with the metals sampling system. The metals sampling line had its own critical orifice to control flow.

Sampling frequency and sampling time at the fixed-location sites was on a constant cycle. Two simultaneous 24-hour PCB samples were taken once every three days. Mobile samplers used during site maintenance also operated with this frequency and sampling duration.

Mobile samplers operating during construction had a site-specific, construction-dependent schedule. Samples were collected near a remnant site each day that containment activities occurred on that site and once every three days during inactive periods. The sampling times varied. During one shift construction, sampling time varied from eight to twelve hours. During two shift construction, sampling time varied from 16 to 24 hours. When a site was inactive for a period of three or more days, the sampling time was extended to 24 hours.

The control box for both mobile and fixed-location type samplers is shown in Figure 6. It consists of a vacuum system, vacuum pressure gauge, six-day timer and an elapsed time clock. Vacuum pressure was used to monitor vacuum pump performance. The 6-day timer was used to automatically start and stop the vacuum system. The clock measured elapsed time to the nearest one tenth of a minute.

Fixed-location and mobile samplers operating during inactive construction periods used the 6-day timer to automatically start the vacuum system at 12:00 a.m. (midnight) and stop it approximately 24 hours later. Mobile samplers operating during active periods used the timer to stop the vacuum system only. The generators were manually started at the beginning of the work day and sample collection began shortly thereafter. The timer was then set to shut the vacuum system off at the scheduled completion of the work day.

The PCB sampling train was identical for all samplers. It is illustrated in Figure 7 and consists of glass fiber filter followed by two Florisil packed glass tubes in series. Each glass tube contains a front and rear section of Florisil adsorbent. Series arrangement of the tubes reduced the chances of PCB breakthrough. The combination of a glass fiber filter and Florisil packed tubes ensured that the sampling system captured both particulate (or PCB adsorbed to particulate) and PCBs in the vapor phase.

The sampling components were prepared before each sample period as follows. Each factory sealed Florisil tube was affixed with a sample label with a unique identification number. Both ends of the labelled tubes were removed with pliers and the tubes were placed in the sample holder. The filter was placed in the filter housing using tweezers. At this time, one vial per filter was prepared for sample recovery and labelled with a unique sample identification number.

The sample train for both lead and cadmium consisted of a 37mm filter canister pre-loaded with a 0.8 micrometer ($\mu$m) Mixed Cellulose Esters (MCE) filter. The upstream plastic face of the filter canister was removed prior to sampling to provide a more uniform velocity through the filtration area. The lead/cadmium filter canister was also affixed with a label identifying the location and sample date.

Field personnel visited the sampling stations before and after each sample event. These personnel measured flow rates, removed collected samples, reloaded the equipment and recorded pertinent field data. Flow rates were measured three consecutive times before and after each sample event. Flow rate measurements were taken with an SKC Model 712 electronic calibrator. The PCB sample trains were transported between the sample preparation area and the monitoring stations in screw top sealed, plastic, transport tubes. Lead/cadmium filter canisters were transported with the removable plastic face placed on the body of the canister.

Field personnel prepared collected samples for shipment to the laboratory. The Florisil tubes were removed from their holders and both open ends were sealed with tube caps. The filter was removed from the sampling train, placed in the labelled glass vial, and the vial was capped. The three components of each channel (filter, 1st tube and 2nd tube) were placed in plastic bags and sealed. The inlet and outlet ports of the lead/cadmium canisters were also sealed with caps and placed in a separate, sealed plastic bag. All samples were stored in a clean area, free of airborne contamination, until shipped to the analytical laboratory. Storage times were monitored to assure compliance with QAPP guidelines.

### 3.1.3 Meteorology

Meteorological data sheets indicating hourly surface weather observations recorded at the airport in Glens Falls, New York were obtained for the 1991 construction monitoring program. These observations include temperature, wind speed and wind direction. The forms are on file at the East Rutherford, New Jersey office of Harding Lawson Associates/Yates & Auberle, Ltd. for each sample date in 1991 .

### 3.1.4 QA/QC

The QA/QC procedures have been divided into two sections, Field Study and Laboratory. The Field Study section addresses sample preparation, collection, handling and storage. The Laboratory section addresses calibration, maintenance and validation of the laboratory instruments.

3.1.4.1 Field Study. The Field Study QA/QC relies primarily on written Standard Operating Procedures (SOPs) to assure integrity of both the field data and the ambient air samples. These SOPs explain sample preparation and handling, sampler operation and field data acquisition. All field technicians received supervised training to assure that the written SOPs were clearly understood and correctly followed. These procedures can be grouped into the following general areas:

1. Sampler data acquisition;
2. Chain of custody completion;
3. Sampler log book/maintenance; and
4. Collocated samples and field blank sample management.

A sample identification convention was established to facilitate sample tracking, record keeping and identification. The ambient air samples were labelled with an alphanumeric code which identified the sampler network, location, channel (red, green or metals), sample train segment (filter, first Florisil tube, second Florisil tube or MCE canister) and the sample date. These labels were attached directly on the Florisil tubes, metal sample canisters and filter vials before loading the sampler with the sample trains. These sample identification codes were also written on the Field Data forms and Chain of Custody (C.O.C.) forms.

One Field Data form was completed daily for each sampler that operated. The location, sample date and identification code were entered on the form prior to sample collection. The field technician measured and recorded the vacuum pressure, clock reading and air flow rate measurements prior to the sampling event. After the sampling event, the field technician measured and recorded the same parameters. The completed Field Data forms were forwarded periodically to the East Rutherford office of Harding Lawson Associates/Yates & Auberle, Ltd. for incorporation into a computerized database.

The C.O.C. forms were used to document transfer and storage of the samples. The forms list the sample identification numbers and corresponding collection dates for all samples in the package shipped to the laboratory. The forms were signed and dated by the field technician who unloaded the samples, the person who shipped the samples to the laboratory and the laboratory technician who received the samples.

Log books were used to record site visits to the sample site and to document maintenance of the equipment. One log book was kept for each sampler. Field personnel recorded the date of each visit and pertinent comments about sampler performance. All log books were initialed by the technician performing this work.

Collocated samples and field blanks were submitted to the laboratory for analysis. One collocated PCB sample was submitted per sampling network per sample day. Within each network, a different sample was used to generate the collocated sample on each sample day.

In addition, one full set of PCB field blanks (filter and two Florisil tubes) was collected and submitted per sampling network per sample day. The generation of the field blanks was also rotated within each network. One blank metals sample was collected and submitted for analysis per Remnant Site 4 sample day.

The flow rate QA/QC requirements established in the QAPP document were followed throughout 1991. Air volumes were calculated for samples with significant reductions in flow rate (more than 20%) based on the average of the three final visit flow rate measurements. The QAPP rejection criterion for samples with non-measurable final visit flow rates was increased such that samples having flow rate decreases of more than 50% were rejected. This stricter rejection criterion was established during the 1990 construction period when it was discovered that decreases of this magnitude were typically a result of rain water or snow being drawn into the sample train.

A minimum sample time was established for quality control purposes. Mobile samplers used gasoline-powered generators for their electrical supply. These generators, on occasion, would shut off because of mechanical problems before completion of the sampling time. To insure that all samples were representative, a minimum sampling time equal to one half of the scheduled sampling time was established. During site containment, the minimum sampling time was four hours. After site containment activities were completed (24 hour sampling), the minimum sampling time was 12 hours. Samples less than the minimum time were rejected.

3.1.4.2 Laboratory. Laboratory analyses of all airborne PCB samples were performed by Trinity Environmental Technologies Inc. (Mound Valley, KS). Trinity's Quality Assurance Procedures can be found in the Quality Assurance Project Plan (QAPP) document prepared prior to the start of the field program.

The analytical QA/QC package can be summarized according to the following six points.

1. Standards, splits, and spikes for the gas chromatographic work in accordance with Method 5503.
2. Five point linearity calibration for three Aroclors.
3. External QC testing with a minimum of two outside laboratories.
4. Kansas State Certification.
5. Participation in EPA's internal standard analysis program.
6. Desorption Efficiency Testing.

Trinity Environmental Technologies Inc., at the request of Yates & Auberle, Ltd., employed a modified version of NIOSH Method 5503 to quantify the PCB content in the various samples. The modifications consisted of separate analysis of the filter and front half of the first Florisil tube, and the use of jumbo Florisil tubes in place of the standard size. The larger tubes reduce the chance of PCB breakthrough in the sampling train; analyzing the filter separate from the tube potentially provides information on the vapor/particulate ratio of quantified PCBs.

Lead and Cadmium samples were analyzed by Hudson Environmental Services using NIOSH Methods 7048 and 7082.

## 3.2 Aquatic Monitoring

### 3.2.1 Study Area

The study area for the aquatic portion of the 1991 (Harza/Yates & Auberle 1992) monitoring program was identical to that in the 1990 program and included the Hudson River in the general vicinity of the remnant deposits and downstream to below the Federal Lock and Dam at Troy. Most of the monitoring activities were focused in the vicinity of the remnant areas, with monitoring control (non-affected) stations located upstream of the influence of the remnant areas. Due to the on-going construction activities performed during winter, the 1990 construction monitoring plan was modified to monitor PCB concentrations immediately adjacent to areas under construction that were not yet contained, as well as background levels outside the remnant area.

### 3.2.2 Aquatic Monitoring Stations

3.2.2.1 Station Locations. The location of aquatic stations sampled in the 1991 monitoring program remained identical to the construction monitoring stations during 1990. The locations of these stations are listed in Tables 2, 5, and 8 and are shown in Figures 8 through 13. Six "control" stations (C-1, GF-1, GF-2, GF-3, GF-4 and C-2) were located upstream of the remnant sites. All but one of these stations (C-2) are located upstream of the GE outfall at Hudson Falls. Station C-1 is located upstream of the Niagara Mohawk Sherman Island Dam above Glens Falls and was expected to be essentially free of PCB contamination. Stations GF-1, GF-2, GF-3 and GF-4 are located between the Sherman Island Dam and Bakers Falls. Station C-2 is located below Bakers Falls but upstream of the remnant deposits. The remaining stations characterized the existing conditions in the vicinity of the remnant areas and downstream. Eight of these stations are interspersed among the remnant deposits to measure the PCB contribution to the river from each remnant deposit (Figure 11). Additional stations between the remnant deposits and the Troy Dam were sampled to evaluate the contribution of PCBs from the remnant deposit area to PCB levels at downstream locations. One of these stations, HR-1, evaluated the contribution of PCBs due to construction to the Hudson River estuary (below Troy), while another station, MR-1, evaluated the contribution of PCBs to the levels at HR-1 coming from the Mohawk River.

Following the completion of containment construction, the number of stations was reduced to those listed in Table 8 and shown in Figures 12 and 13.

3.2.2.2 Station Descriptions. The general characteristics of all aquatic stations sampled during 1991 are described below.

**Station C-1** - Sherman Island Pool, between Spier Falls Dam and Sherman Island Dam - River Mile 212.8, Hudson River (Figure 10).

This station is located 1.25 miles downstream of the Niagara Mohawk Power Company boat ramp (Moreau Lake State Park). The site is approximately 30 feet from the south shore and, during 1991, the depth was between 21 and 30 feet depending on pond level fluctuation. The substrate consisted of muck and silt with boulders and rocks along the bank.

**Station GF-1** - Below Sherman Island Powerplant - River Mile 210.5, Hudson River (Figure 10)

This station is located approximately 1/10 mile downstream of the Niagra Mohawk Power Company Sherman Island hydro plant (20.0 feet from the north shoreline). Water depth at the site during 1991 varied between 6.0 and 8.0 feet, with a substrate consisting of sand and silt mixed with aquatic vegetation.

**Station GF-2** - Downstream from Town of Moreau boat ramp - River Mile 206.3, Hudson River (Figure 10)

This station is approximately 1/3 mile downstream of the Moreau boat ramp (downstream side of logging crib). Water depth at the site during 1991 varied from 9.0 to 12.0 feet. Bottom substrate consisted of sand, gravel and slate.

**Station GF-3** - Upstream of Feeder Dam - River Mile 203.5, Hudson River (Figure 10)

This station is located directly upstream of the Feeder Dam Canal (approximately 10.0 feet from the north shoreline). Water depth at the site varied between 3.0 and 6.0 feet. Bottom substrate consisted of muck and silt mixed with aquatic vegetation.

**Station GF-4** - Above Bakers Falls - River Mile 197.5, Hudson River (Figure 10)

This station was located adjacent to the Adirondack Scenic Pumphouse Boat Ramp (approximately 6.0 feet from shore). Water depth at this site varied between 3.0 and 6.0 feet. Bottom substrate consisted of sand and slate.

**Station C-2** - West shore of Hudson River, River Mile 196.7, below Bakers Falls (Figure 11)

This station is positioned off the southeast side of the first island downstream Bakers Falls (Fenimore Bridge). The island is approximately 15 feet from the west shoreline and was vegetated primarily by grasses and shrubs. The water depth at the site during 1991 was between 1.0 and 4.0 feet. Bottom substrate consisted of bedrock, sand and slate.

**Station E-0** - Island - River Mile 196.2, Hudson River (Figure 11)

This station is located at the southeast tip of the island just above the power line crossing. Water depth at the site during 1991 was between 1.5 and 5.0 feet. Substrate consisted of bedrock, sand, slate, and woodchips.

**Station RS-3W1** - Upstream end Remnant Area 3 - River Mile 195.9, Hudson River (Figure 11)

This station is located on the east side of the river, approximately 6 feet from the shore. Water depth at this site varied between 0.5 and 3.0 feet. Substrate consisted of bedrock and slate.

**Station RS-2W1** - Upstream end Remnant Area 2 - River Mile 195.9, Hudson River (Figure 11)

This station is on the west side of the river approximately 6 feet from the shore. The substrate consisted of sand, gravel and slate, and depth was between 0.5 and 3.0 feet.

**Station E-1, (same as RS-2W2)** - Downstream of Remnant Area 2 - River Mile 195.7, Hudson River (Figure 11)

This station is on the west side of the river, approximately 10 feet from the shore. The substrate consisted of sand and gravel, and depth was between 1.5 and 5.0 feet.

**Station RS-3W2** - Below Remnant Area 3 - River Mile 195.2, Hudson River (Figure 11)

This station is located on the east side of the river approximately 5 feet from the shore. The substrate consisted of sand and silt. Water depth at the site during 1991 was between 1.0 and 4.0 feet.

**Station E-2** -Downstream of Remnant Area 3 - River Mile 195.2, Hudson River (Figure 11)

This station is located on the east side of the river approximately 12 feet from the shore, below the timber crib where the depth was between 2.0 and 5.0 feet. Bottom substrate consisted of sand, gravel, and bedrock/slate.

**Station E-3, (same as RS-4W1)** - River Mile 195.2, Above Remnant Area 4 - Hudson River (Figure 11)

This station is located on the west side of the river approximately 10 feet from the shore. Station E-3 is directly opposite Station E-2. Water depth was between 1.0 and 4.0 feet, and the substrate consisted of sand and gravel.

**Station E-4, (same as RS-4W2)** - Below Remnant Area 4 - River Mile 194.9, Hudson River (Figure 11)

This station is on the west side of the river approximately 25 feet from shore. The depth of water at the station was between 2.0 and 6.0 feet. The substrate consisted of sand and gravel intermixed with aquatic vegetation.

**Station RS-5W1** - Above Remnant Area 5 - River Mile 194.9, Hudson River (Figure 11)

This station is located on the east side of the river approximately 10 feet from shore. Station R5-5W1 is opposite station E-4. The depth of water at the station was between 3.0 and 5.0 feet. The substrate consisted of sand and gravel.

**Station RS-5W2** - Below Remnant Area 5 - Scott Paper Water Intake - River Mile 194.7, Hudson River (Figure 11)

This station is located on the east side of the river at the Scott Paper Water Intake. Depth at the site varied between 3.0 and 5.0 feet.

**Station DS-1** - Rogers Island Below Remnant Area 5 - River Mile 194.5, Hudson River (Figure 11)

This station is located on the northeast side of Rogers Island (canal side) approximately 15 feet from shore. The depth of water at the station was between 3.0 and 5.0 feet. Bottom substrate consisted of sand, silt and woodchips.

**Station E-5** - Rogers Island Below Remnant Area 5 - River Mile 194.3, Hudson River (Figure 11)

This station is located downstream of the New York State Highway Route 197 bridge (east pilar) approximately 15 feet from the shore. The water depth was between 5.0 and 9.0 feet. The substrate consisted of slate, silt, sand, and gravel intermixed with aquatic vegetation.

**Station E-4A** - Below Remnant Area 4 - River Mile 194.3, Hudson River (Figure 11)

This station is at the west shoreline of the Rt. 197 Bridge approximately 5.0 feet from shore. The water depth at the station was between 3.0 and 5.0 feet. Substrate consisted of sand, gravel and slate.

**Station E-5A** - Below Rogers Island - Channel Marker No. 219 - River Mile 193.5, Hudson River (Figure 11)

This station is located below Lock #7 at Channel Marker No. 219. The depth of water at the station was between 12.0 and 18.0 feet, the substrate consisted of gravel and bedrock/slate.

**Station E-6** - Below Ft. Miller Dam and Lock No. 6 - River Mile 185.7, Hudson River (north of Schuylerville) (Figure 10)

This station is located at river Channel Marker No. 175. Water depth at the site was between 12 and 18 feet. Bottom substrate consisted of sand, silt, and gravel with aquatic vegetation present on both shorelines.

**Station E-7** - Channel Marker 13 Below Lock #1 (near Waterford) - River Mile 157.8, Hudson River (Figure 10)

This station is located approximately 1.5 miles north of the NYDEC boat ramp at the Erie Canal and Hudson River confluence. Water depth was between 12.0 and 18.0 feet. The substrate consisted of silt, sand, and gravel. Stations E-7R and E-7T were located at the Waterford Waterworks plant water quality laboratory. Station E-R7 sampled the raw water, while E-7T sampled the treated water at the facility.

**Station MR-1** - Upstream of Crescent Dam - River Mile 4.5 (from Hudson River), Mohawk River (Figure 10)

This station is located approximately 1/10 mile upstream of Crescent Dam (25 feet from the south shore line) adjacent to the Town of Colonie Landfill. Water depth at the site was between 3.0 and 6.0 feet. Bottom substrate consisted of sand, silt, organic matter and aquatic vegetation.

**Station HR-1** - Below Troy Dam - River Mile 152.8, Hudson River (Figure 10)

This station is located at the west pilar of the Green Island Bridge approximately 1/4 mile downstream of the Center Island boat ramp. Water depth was between 20.0 and 30.0 feet. Substrate consisted of sand, gravel and slate.

### 3.2.3 Monitoring Components

The PCB concentrations of the following components of the affected environment were monitored

- Sediment
- Water
- Dialysis Bags
- Aquatic Biota

### 3.2.4 Materials and Methods

**3.2.4.1 Sediments.** To characterize temporal changes in sediment PCB concentrations, visually located surface grab samples were taken at seasonal intervals. Surface grab samples (one to four) were taken at each monitoring station with a six-inch petite ponar dredge (Figure 14) and placed into hexane rinsed 1L bottles having Teflon-lined lids. Substrate conditions at some stations limited the number of sediment samples obtained. Collection depths varied between 3 and 30 feet below the water surface. In addition to the PCB content of the samples (quantified as Aroclors), the particle size distribution, total organic carbon (TOC), total solids (TS) and total volatile solids (TVS) content of the samples were determined if sufficient sample remained after analysis for PCBs.

3.2.4.2 Water. PCB concentrations were determined in weekly grab samples at all stations. Raw water samples were collected at mid-depth using a Kemmerer water bottle having a stainless steel cylinder and teflon seals at all stations except GF-4, GF-3, C-2, E-0 and E-1. Due to shallow depths at those stations, grab samples were taken using hexane-rinsed 1L glass jars. All samples were taken using hexane-rinsed glass jars having teflon-lined lids for PCB analyses and in clean 0.5L jars having wax-lined lids for total suspended solids analysis. The samples were chilled in an ice filled cooler upon collection, then refrigerated and sent to the analytical laboratory within five days of collection.

3.2.4.3 Dialysis Membrane Bags. Because waterborne PCB concentrations during the 1989 program had been below analytical detection limits, the water samples were supplemented with solvent-filled dialysis membrane bag monitors (Figure 15). Two dialysis bags (each filled with 4 ml of hexane) were suspended at mid-depth in brass cages so as to have representative exposure to the water column (Figure 16). The bags from each station were collected on a biweekly basis, stored in 0.5L hexane-rinsed glass jars and chilled in a ice filled cooler upon collection.

3.2.4.4 Aquatic Biota. The three major biotic components (periphyton, macroinvertebrates and fish) were monitored. Each of these components represents a trophic level in the aquatic ecosystem. The following aquatic biota sampling programs were conducted:

- Multiplate (Hester-Dendy) composite sampling for periphyton, silt and some macroinvertebrate species (Figure 17). The multiplate samplers were suspended at mid-depth to provide representative exposures in the water column (Figure 16).

Exposure periods were nominally five weeks in duration. Samples were obtained by scraping five plates separated by 3mm spacing and five plates separated by 6mm spacing. The samples were composited and placed in a hexane-rinsed 8 oz. glass jars. The multiplate sampling procedure followed the methods of Simpson, et. al. (1986). Multiplate samples were packed in ice and shipped to the laboratory.

- Caddisfly samples were obtained in riffle areas above and below the remnant deposit reach. Caddisfly larvae were hand collected (using forceps) from individual rocks located in the respective riffle areas. The samples were placed in hexane rinsed 8 oz. jars, placed on ice and frozen before shipment to the analytical laboratory.

- Fathead minnow in situ assay monitoring was conducted using the methodology of Jones and Sloan (1989). The fathead minnows were initially purchased from a fish hatchery. However, because the hatchery source became unable to supply healthy specimens, beginning on August 20, minnows were obtained from a local bait and tackle shop. Approximately 50 fathead minnows were placed in bioassay containers (Figure 18) and suspended mid-depth in the station water column for a nominal exposure period of three weeks. Upon removal, the minnows were placed in aluminum foil, stored in plastic bags, and frozen prior to shipment to the laboratory.

### 3.2.5 Additional Environmental Measurements

The following environmental parameters were measured (or obtained) in association with the aquatic monitoring programs:

- River discharge (cfs at Spiers Falls and Ft. Edward USGS gage)
- Precipitation data (Glens Falls FAA)
- Air and water temperature (°C)
- Dissolved oxygen (mg/L)
- pH (standard units)

- Conductivity ($\mu$mhos/cm)

Field measurements of pH, dissolved oxygen, temperature, and conductivity were obtained using portable meters. Dissolved oxygen and temperature were measured using a Yellow Springs Instruments Model 54 dissolved oxygen meter; conductivity was measured using a Yellow Springs Instruments Model 33 S-C-T meter and pH was measured with an Orion Model 407 pH meter. Calibration of these meters was in accordance with the manufacturer's instructions. Field measurements were obtained every week at each station. Data are provided in Tables 3, 10 and 18 of Appendix II.

### 3.2.6 Laboratory Methods

The laboratory analyses of aquatic samples were performed by Hazleton Laboratories America, Inc. (Madison, WI). All of the PCB analyses performed by Hazleton utilized packed column gas chromatography methods capable of identifying PCBs as the commercial Aroclor mixtures. Hazleton also performed the total suspended solids (TSS) analyses on water, and the particle size, total solids (TS), total organic carbon (TOC) and total volatile solids (TVS) analyses on sediments. Full details of the analytical procedures used by Hazleton are found in the Quality Assurance Project Plan (QAPP) appended to the 1989 monitoring program (Harza/Yates & Auberle 1989b).

Method limits of detection are listed below:

| Matrix | Detection Limit | Assumptions |
|---|---|---|
| Water | 0.10 $\mu$g/L | 1 L sample |
| Dialysis Bags | 0.10 $\mu$g/mL | |
| Sediment | 50 $\mu$g/kg | 20 g initial sample |
| Tissue | 50 $\mu$g/kg | 20 g initial sample |

Results of sediment analyses were expressed on a dry weight ($\mu$g/g) basis. (The wet weights of the sediments prior to drying are available should wet weight results be desired.) All tissue analysis results are also reported on a dry weight ($\mu g/g$) basis. However, because many of the existing analyses of tissues from the project vicinity are expressed on a wet weight basis, the wet weight of the tissues prior to drying are available so that calculation of results on that basis can be conducted.

The laboratory informed Harza in October 1991 of their ability to attain a 0.05 $\mu g/L$ PCB detection limit for 1 L water sample. This improves on the 0.10 $\mu g/L$ detection limit specified in the QAPP, and reported since monitoring began in 1989. Water samples collected during November 1991 are reported at the lower 0.05 $\mu g/L$ detection limit, as are a handful of pre-November 1991 samples which Hazleton Laboratories internally quantified at 0.05 $\mu g/L$, but originally reported at the higher 0.10 $\mu g/L$ detection limit.

### 3.2.7 QA/QC

3.2.7.1 Field Study. Aquatic sample chain of custody (COC) forms were completed by the field crew immediately after sample collection, and were shipped to the analytical laboratories with the samples. The COC forms documented sample shipping and holding times, as well as the personnel involved in collection, handling and analysis of the samples.

Instrument logbooks were maintained with each piece of equipment to document calibrations and maintenance records.

Biological samples were collected using the appropriate procedures for the biota in question (scraping of rocks, or Hester-Dendy multiplate sampler for both periphyton and benthic macroinvertebrates). A sample was retained for taxonomic analysis, while the composited portion for chemical analysis was placed in hexane-washed sample bottles, which were placed in ice chests containing water ice and shipped to the laboratory following the shipment and COC procedures detailed earlier.

For all environmental matrices, 10% field duplicate samples were collected and submitted for chemical analyses.

3.2.7.2 Laboratory. The quality assurance procedures for the laboratory analyses are found in the Quality Assurance Project Plan (QAPP) document (Harza/Yates & Auberle 1989b) prepared prior to the start of the 1989 field program. All chemical analyses of aquatic samples were performed by a NYSDEC certified analytical laboratory. The analytical chemistry procedures utilized by the laboratory are documented in the QAPP. Detection limits in the QAPP were those listed on the Federal Target Compound List (TCL) (0.5 μg/L for water, 0.08 mg/kg for sediment or lower). No TCL detection limits are available for biological tissue; however, a detection limit in this program was approximately 50 μg/kg wet weight for tissues.

### 3.2.8 Seasonal Sampling Matrices

3.2.8.1 Winter Construction Monitoring. Because of the temperature dependence of biological parameters and hexane-filled dialysis bags to accumulate PCBs (as well as the inappropriateness of sampling caddisfly larvae and caged fish during the winter), only water sampling was conducted to evaluate immediate impacts to the aquatic environment during the 1991 winter (January 1 - March 27). However, in accordance with the existing Construction Monitoring Plan (Harza/Yates & Auberle 1990d), one set of sediment samples was obtained during the winter. River discharge and air and water temperatures continued to be measured as per the 1990 Preconstruction Monitoring Program. Water quality parameters were not measured as winter conditions interfered with the operation of the meters.

3.2.8.1.1 Sediment. Samples were collected at 15 stations on the Hudson River (Table 4). Sediment sampling locations upstream of the Ft. Edward remnant areas are shown on Figure 19. Figures 20 through 22 show the sediment sample locations in the immediate vicinity of the remnant areas. The sediment sample locations downstream of the remnant areas to below Troy Dam are shown on Figures 23 through 25.

3.2.8.1.2 Water. A total of 18 water quality stations were sampled during the 1991 winter monitoring to assess construction activity impacts on PCB levels in the Hudson River (Table 2 and Figure 8). Of these, fourteen are located in the vicinity of the Remnant Areas (Figure 9). Because the river currents confined most runoff or bank sloughing to the side of the river where runoff occurs, samples were taken adjacent to the bank areas. All samples were grab water samples. The sampling frequency at stations adjacent to the Remnant Sites depended on the status of containment and construction activities at the site. Daily water samples were collected at stations for sites not covered by Claymax or where construction activities were occurring. Once a site was secure with Claymax, daily samples were collected during the first 30 days of post-containment, then weekly thereafter. Due to the construction schedule, daily water samples were collected throughout the winter program on Site 4, and for a one-month post-containment period of Site 2. Two samples were collected each week from Site 3. The stations and nominal sampling frequencies are provided in Table 3.

3.2.8.2 Spring Construction Monitoring. The aquatic sampling during the spring construction monitoring (March 28 - June 28) continued as per the 1990 Construction Monitoring Program. The stations, sampling matrices and sampling frequencies are provided in Tables 5, 6, and 7.

3.2.8.2.1 Sediment. Samples were collected during the spring (April) and summer (June) seasons. Sediment was collected from 17 stations during the spring construction monitoring. Figure 26 shows the spring sediment sampling locations upstream of the Ft. Edward remnant areas. The sample locations in the immediate vicinity of the remnant areas are shown on Figures 27 through 29. The sediment sample locations downstream of the remnant areas to below Troy Dam and including the Mohawk River are shown on Figures 30 through 33.

During the summer, sediment sampling locations upstream of the Ft. Edward remnant areas are shown on Figure 34. Figures 35 through 37 show the sediment locations in the immediate vicinity of the remnant areas. The locations downstream to below the Troy Dam are shown on Figures 38 through 41.

3.2.8.2.2 Water. Sampling locations were increased from the 1991 winter monitoring stations to those listed in Table 5 and Figure 10. Because of on-going containment efforts on Site 4, daily water samples were collected during the Spring Construction Monitoring Program. Two samples per week were collected at Site 3, while the remaining stations were sampled at weekly intervals. To supplement water samples, Hexane-filled dialysis bags were deployed at 17 monitoring stations (Table 7). Exposure time and sampling dates are reported in Appendix II.

3.2.8.2.3 Aquatic Biota. The major biotic components (periphyton, macroinvertebrates and fish) were monitored during the Spring construction period.

- Multiplate (Hester-Dendy) sampling was conducted at 18 stations (Table 7). One set of samples was collected during the spring program. Although exposure periods were nominally five weeks, several stations required additional exposure time to provide an adequate sample mass. Actual exposure times and sampling dates are provided in Appendix II.

- Caddisfly larvae samples were collected at five monitoring stations (GF-4,C-2,E-5,E-6,E-7). One set of samples was obtained during the Spring Construction Program. Sampling dates and locations are listed in Appendix II.

- Fathead minnow in situ bioaccumulation monitoring was conducted at six stations (C-1,GF-4,C-2,E-5,E-6,E-7). One set of minnows was deployed at all sites; however, the minnows did not survive the three-week interval. Total mortality of the minnows can be attributed to stress and disease obtained prior to shipment from the fish hatchery.

3.2.8.3 Post-Containment Monitoring. The post-containment monitoring effort (June 29 - November 27) was principally a reduction from daily and semi-weekly water sampling to the levels of the 1990 Preconstruction Monitoring Program. Sediment and aquatic biota continued to be monitored at the same stations and frequencies as in 1990. The stations, sampling matrices and sampling frequencies conducted during post-containment monitoring are provided in Tables 8, 9 and 10.

3.2.8.3.1 Sediment. Samples were collected during the fall (September) and winter (November) seasons (Table 10). Sediment was collected from 14 stations during the fall sampling. Figure 42 shows the sediment locations upstream of the Ft. Edward remnant areas. The sample locations in the immediate vicinity of the remnant areas are shown on Figures 43 through 45. The sediment sample locations downstream of the remnant areas to Waterford are shown on Figures 46 and 47.

During the 1991-1992 winter sample, sediments were collected from 12 stations. Sediment locations upstream of the Ft. Edward remnant areas are shown on Figure 19. Figures 20 through 22 show the sediment locations in the immediate vicinity of the remnant areas. The locations downstream to Waterford are shown on Figures 23 through 25.

3.2.8.3.2 Water. Sampling locations in the post-containment monitoring period were reduced to those listed in Table 8. Water samples were collected at weekly intervals. Site 3 sampling initially continued at a semi-weekly effort through July 14. Two periods of dialysis bags were collected at bi-weekly intervals during the post-containment monitoring. Dialysis bags were deployed at 17 monitoring stations, eventually being reduced to 13 stations. Exposure times and sampling dates are reported in Appendix II.

3.2.8.3.3 <u>Aquatic Biota</u>. The major biotic components continued to be monitored during the post-containment period.

- Multiplate (Hester-Dendy) sampling was conducted at 13 stations (Table 10). Three sampling period sets of samples were collected during the Post-Containment Program. As noted in the spring construction monitoring, several stations required additional exposure to provide an adequate sample. Actual exposure times and sampling dates are provided in Appendix II.

- Caddisfly larvae samples were collected at five monitoring stations (GF-4,C-2,E-5,E-6,E-7). Three sets of samples were collected during the Post-Containment Program (July, September and October). Caddisfly larvae samples were not collected at E-7 (October sampling) due to high flows. Sampling dates and locations are listed in Appendix II.

- Fathead minnow <u>in situ</u> assay monitoring was conducted at six stations (C-1,GF-4,C-2,E-5,E-6,E-7). Nine sets of minnows were deployed during the Post-Containment Program; however, only six sets were collected. Several sets were lost when the minnows did not survive the nominal three-week exposure intervals. As in spring construction monitoring, the samples were lost due to stressed and diseased fish purchased from the hatchery. Vandalism accounted for the loss of samples at Stations C-1 and E-5. A sample from Station E-7 was not recovered due to high flow. Exposure times and sampling dates are provided in Appendix II.

## 4.0 RESULTS AND DISCUSSION

The results of the aquatic portion of the 1991 monitoring program are discussed by sampling matrix (sediment, water and aquatic biota). In general, the results of the 1991 aquatic monitoring reveal spatial trends in PCB concentration similar to those observed during 1990.

However, beginning in mid-September, an unusual elevation in PCB concentration was observed in all matrices (except sediment) at all stations below Bakers Falls. The increase in concentration is believed to be unrelated to the Remnant Sites because elevated PCB concentrations were also observed at stations upstream of the Sites. Because the occurrence of these elevated concentrations strongly influenced the monitoring results, the September-November data are also evaluated separately, as well as being included with the entire 1991 data set.

### 4.1 Air Monitoring

The air sampling results are presented in Appendix I, Table 1, *Hudson River PCB Superfund Site - Construction Monitoring Program, Air Sampling Results January 1 - November 30, 1991.* This table lists, for each sample, the site, date, channel, sample time, PCB mass by segment analyzed, total PCB mass, sample volume and PCB concentration. Samples that had no detectable PCBs have the abbreviation ND (not detectable) in the mass columns and <LOQ (less than the Limit of Quantification) in the PCB concentration column. None of the samples collected in 1991 required the second Florisil tube to be analyzed. This is only necessary if PCBs are detected in the back half of the first tube. The results are arranged in chronological order by sampler location. Fixed-location Stations A1, A2, A3, A4 and A5 are listed first. The four mobile samplers and the fixed-location station near Remnant Site 5 (B2, B3, B4A, B4B and B5) are listed last.

Throughout the 1991 construction monitoring period, 985 airborne PCB samples were collected. Forty-four (44) of these were rejected for not meeting QA/QC requirements. Failure to achieve the minimum sampling time accounted for 40 rejections. Storm damage and a temporary power shutdown resulted in the loss of 5 samples. Filters from two additional samples were not analyzed because insects entered the PCB sample train and consumed portions of the glass fiber filter. However, the tubes from these samples were analyzed and are included in Appendix I.

All analyzed PCB samples meeting the QA/QC requirements are summarized in Table 1, *Hudson River PCB Superfund Site - Construction Monitoring Program, Summary of Air Sampling Results January 1 - November 29, 1991.* Table 1 lists the sampler location, the number of samples taken and the number of samples with quantifiable PCB concentrations for both the fixed-location and mobile networks. PCB concentrations above the limit of quantification were recorded on nine out of 471 samples (less than 2%) from the fixed-location network and four out of 468 samples (less than 2%) from the mobile network.

PCB concentrations ranging between 0.02 and 0.13 $ug/m^3$ were found in 13 samples collected from the east side of the Hudson River between May 1 and September 30, 1991. Aroclor 1242 was the only PCB detected. It was exclusively found in the front section of the first Florisil tube.

Detectable airborne PCBs were found in the vicinity of the Remnant Sites in the final month of the containment period. The only containment activities occurring on the Remnant Sites during May 1991 were seeding (all four Remnant Sites) and shoreline protection work (Remnant Site 4 exclusively). Mobile sampling Station B3 (on Remnant Site 3) detected airborne PCBs on May 15, May 21, May 24, and May 27.

Detectable PCBs were also found during the period that followed containment activities. Sampling Stations B3 and A4 both detected PCBs on June 8, 1991, and all three fixed-location sampling stations (A2, A3 and A4) detected PCBs on September 18, 1991. September 18 is the only date in 1991 that PCBs were detected by all three fixed-location stations.

Wind rose diagrams that illustrate wind speed and wind direction are presented in Appendix IV. There is one wind rose diagram for each date in 1991 that PCBs were detected (sample dates May 15, May 21, May 24, May 27, June 8 and September 18).

No detectable levels of lead or cadmium were identified in the metals sampling for Remnant Site 4. The limit of detection for lead was 5.0 $\mu g$, and 0.2 $\mu g$ for cadmium. This sampling was discontinued in mid-March 1991 when regrading and subgrade placement were completed on the Remnant Sites.

## 4.2 Sediment

A total of 164 sediment samples was collected during 1991. Of these, 33 samples were obtained during the winter construction monitoring program at 15 stations (Tables 11, 12 and 13); 74 were obtained at 17 stations during the spring construction period (Tables 14, 15 and 16); and 55 samples were obtained at 14 stations during post-containment monitoring (Tables 17, 18 and 19). Aroclor 1242 was found in 113 of the samples (Tables 11, 14 and 17), while Aroclor 1254 was found in 117 samples (Tables 12, 15 and 18).

Sediment PCB concentrations throughout this report are expressed as $\mu g/g$ dry weight. Particle size distributions were performed on dry sediment. The particle size distribution curves for each sample are found in Appendix V. Total organic carbon and total volatile solids are expressed as weight percent of the dried sediment. (Total solids is the weight percent of solid material in the wet sediment after the water was evaporated.) The particle size, TOC, TS and TVS content of the samples are listed in Tables 1, 5 and 12 of Appendix II.

The highest sediment PCB concentrations (58.0 $\mu g/g$ Aroclor 1242; 16.0 $\mu g/g$ Aroclor 1254) during 1991 were found in a sample taken at Station E-5 near Rogers Island during the winter (Tables 11 and 12). Station E-5 also had the highest mean PCB concentrations during 1991 (Tables 13, 16 and 19; Figures 48, 49 and 50), with the highest mean concentration (38.0 $\mu g/g$ total PCB) occurring during the winter monitoring period (January - March). Samples collected from the Rogers Island, or east bank, of the Hudson River consistently contain much higher PCB levels than samples taken from the west bank of the river. The highest sediment PCB concentrations since monitoring began at Station E-5A was also found in a winter monitoring sample containing 48.0 μg/g Aroclor 1242 and 9.6 μg/g Aroclor 1254.

The lowest PCB concentrations in sediments were found at stations upstream of Bakers Falls and in the Mohawk River (Tables 13, 16 and 19; Figures 48, 49 and 50). Most of the PCBs at these stations were quantified as Aroclor 1254. In the immediate vicinity of the Remnant Sites, Station E-3 contained the lowest PCB concentrations (Figure 49). The low levels of TOC and high proportion of gravel and sand is undoubtedly the reason for the low PCB concentrations in sediments at this station. With the exception of Station MR-1 in the Mohawk River, most of the PCB downstream of Bakers Falls was quantified as Aroclor 1242.

This spatial pattern of PCB distribution in sediments is a continuation of the trend noted throughout the Sediment monitoring program since 1989. Analysis of variance clearly indicates significant differences among station mean total PCB concentrations ($F=14.558$, $P < 0.001$). Subsequent analysis of the 1991 sediment Aroclor 1242 data indicates the following concentration trend among stations:
E5 > E5A = E0 = E1 = E2 = E6 > C2 = GF1 = E3 = C1 = E4 = E7 = HR1 > GF2 = GF3 = GF4 = MR1

Although individual sediment samples collected at any given station often contain highly variable PCB concentrations, the overall sediment mean concentrations at the stations have changed little since 1989. When sediment mean concentrations are analyzed for each of the three major monitoring periods (pre-construction, construction, post-containment), no significant difference is observed among the means (analysis of variance, $F = 0.847$, $P = 0.430$).

An episode of elevated PCB concentrations was observed in all other aquatic sampling matrices (water, algae caddisflies, caged fish) beginning in mid-September, and continuing through late October. Sediment was the only sampling matrix which did not show an increase in PCB concentrations downstream of Bakers Falls during this time (Figure 51). However, a sediment sample collected on September 18 at C-2 contained an Aroclor 1242 concentration (16.0 $\mu g/g$) higher than any other sample collected at this site since monitoring began in 1989. Given the magnitude of the PCB increase in the other matrices (between 10-100X higher PCB concentrations in tissues over the previously monitored maxima during this program, and between 10-100X elevations in waterborne PCB compared to August and early September 1991) the lack of change in sediment PCB concentrations raises questions about the ability of sediment to detect any environmental effects of the remnant area remediation.

## 4.3 Water Quality Monitoring

4.3.1 Water Grab Samples. Tables 2, 6, and 13 in Appendix II provide the complete listing for each individual sample analyzed during 1991, grouped by sampling station. Tables 3, 10, and 18 in Appendix II list the water quality parameters measured in the sampling periods, and Tables 4, 11, and 19 in Appendix II list discharge and precipitation data. These discharge and precipitation data are illustrated in Figures 52, 53, and 54. During 1991 1,274 water grab samples were collected in the study area. Of these, 400 were obtained during the winter construction monitoring program at 22 stations (Tables 20 and 21); 440 were obtained at 28 stations during the spring construction period (Table 22); and 431 samples were obtained at 20 stations during post-containment monitoring (Tables 23 and 24). Aroclor 1242 was found in 155 of the samples (Tables 20, 22, and 23), Aroclor 1254 was found in 5 samples (Tables 21 and 24), and Aroclor 1248 was found in one sample (Table 25). Table 26 provides summary statistics for the water grab samples for the sampling seasons of 1991.

Water PCB concentrations throughout this report are expressed as $\mu$g/L. The maximum observed concentrations of Aroclor 1242 (10.0 $\mu$g/L) and Aroclor 1254 (0.49 $\mu$g/L) were found in a sample taken at Station RS-3W1 on March 13 (Tables 20 and 21). These were abnormally high concentrations for 1991. Except for a Aroclor 1242 concentration of 5.30 $\mu$g/L (taken at Station RS-3W1 during post-containment monitoring; see Table 23), the maximum Aroclor 1242 concentrations observed during 1991 ranged up to approximately 2.0 $\mu$g/L. Most of these high concentrations occurred during the post-containment period (see Table 23), especially after September 15.

4.3.1.1 Relationship between PCB Concentrations and River Discharge. Figures 55 through 85 illustrate time series plots of Hudson River discharge measured at Ft. Edward and waterborne PCBs for each station which produced samples with detectable levels of PCBs in 1991. While these figures suggest no obvious correlation between Hudson River flows and concentration of PCBs in Hudson River water, they do suggest a few periods during 1991 with a higher frequency of PCB-containing samples. For example, several stations (E-0, E-1, E-2, E-3, RS-2W1, RS-3W1, RS-3W2, and RS-5W1) show samples in early June of 1991 with detectable levels of Aroclor 1242. This happens again for a similar group of stations (E-0, E-1, E-5A, E-6, E-7, RS-3W1, RS-3W2, and RS-5W2) in early July, 1991. From mid-September through mid-October, all stations downstream of Bakers Falls (C-2, E-0, E-1, E-2, E-3, E-4, E-5, E-5A, E-6, E-7, RS-2W1, RS-3W1, RS-3W2, RS-5W1, and RS-5W2) show a series of samples with detectable Aroclor 1242 concentrations. For these stations, the September-October sequence generally shows an initial high Aroclor 1242 concentration beginning September 18-19 which decays exponentially, at most stations, for a period of four to six weeks. PCB concentrations during the five weeks between September 18 and October 16, with a few exceptions, are relatively consistent at all stations between C-2 and E-6 within a given week (Figure 155). Station E-7 (Waterford) had lower PCB concentrations than the upstream stations, and had no detectable PCB on September 18, a date when other stations had elevated PCB levels.

These three instances (i.e., early June, early July, and September-October) produced a substantial fraction of the grab samples with detectable PCB concentrations. Also, the fact that several stations that are far apart and subject to different flow conditions show similar temporal patterns of detectable PCB levels indicates that the sampling is recording a response to the same event. Finally, similar recordings at stations upstream, downstream, and in the vicinity of the Remnant Sites indicate that the source of the increased PCBs during these times was not related to the Remnant Sites.

When all 1991 water data are pooled, a weak correlation was noted between PCB in water and discharge at Ft. Edward, Spier Falls, and Sacandaga Reservoir (Table 27, Figures 86-88). No significant ($P \leq 0.05$) correlation was noted between PCB concentrations in water and precipitation at Glens Falls (Table 27).

Discharge data for the Hudson River at Ft. Edward, at Spier Falls Dam, and at Sacandaga Reservoir, available from the U.S. Geological Survey (USGS) and the Hudson River-Black River Regulating District, were used to determine if there is a relationship between the detected PCB concentrations in water and river discharge. Figures 86-88 illustrate the scatter in the PCB-Hudson River discharge data for all 1991 grab samples. Figures 89-91 show similar scatter diagrams for the winter construction monitoring period; Figures 92-94 illustrate the PCB-Hudson River discharge data for the spring construction period; and Figures 95 through 97 demonstrate this scatter for the post-containment monitoring period. Though these figures indicate a wide scatter in the PCB-discharge plots, regression analyses indicate weak but statistically significant correlations between concentrations of Aroclor 1242 and discharge at Ft. Edward, Spier Falls, and Sacandaga during the post-containment monitoring period. Only one station, RS-3W1, demonstrated a significant correlation between detectable Aroclor 1242 concentrations and discharge at Ft. Edward. The results of statistical analyses of these data are reported in Table 28. As can be seen in Table 28, no statistically significant correlation (at $P \leq 0.05$) was noted between Aroclor 1242 concentrations and discharge at Ft. Edward, Spier Falls, or Sacandaga for the winter and spring construction periods.

4.3.1.2 Relationship between PCB Concentrations and Precipitation. Figures 98 through 128 illustrate the relationship between waterborne PCBs at stations reporting detectable PCB levels during 1991 and precipitation reported at Glens Falls. Table 29 provides a summary of regression statistics for correlations between waterborne PCBs and precipitation at Glens Falls. As can be seen in the table, no statistically significant ($P \leq 0.05$) correlations were observed during the winter and spring construction periods. However, statistically significant correlations were found in the 1991 post-containment data between detectable levels of Aroclor 1242 (0.1 μg/L) and precipitation at Glens Falls for two stations: RS-3W2 ($r = 0.827$, $n = 12$, $P = 0.001$), and RS-5W1 ($r = 0.760$, $n = 8$, $P = 0.029$). No significant correlations were discovered between waterborne PCBs and precipitation in the 1990 water quality data. Because both total precipitation volume and frequency were less in 1991 than in 1990 (see below), PCB transport via runoff water would be expected to be less in 1991 than in 1990, and correlations between waterborne PCBs and precipitation amounts would, therefore, not be expected for the 1991 data.

Frequency and Volume of Precipitation in 1990 and 1991

| | 1990 | 1991[1] |
|---|---|---|
| Volume | 38.8 in | 26.8 in |
| Frequency | 147 days | 145 days |

[1] Does not include the months of April and December

Tables 30 and 31 illustrate the proportion of all sampling days on which PCB was detected and the proportion of days when detectable PCB was observed on dates when precipitation also occurred. Table 30 indicates that during construction monitoring, the proportion of days with precipitation on which sampling occurred (46.1%) and on days where detectable

PCB was found (42.3%) were very similar. The proportion of days sampled during precipitation events during post-containment monitoring was slightly lower (37.7%) than the proportion during construction monitoring. However, a significantly higher proportion (65%) of the post-containment sampling days with detectable PCB occurred on days with precipitation (analysis of variance $F = 32.968$, $P < 0.001$, Tukey's HSD test, $P < 0.001$) than was the case for construction monitoring. When combined with the results of the correlation analyses discussed earlier, it becomes evident that the post-containment period PCB-precipitation relationship is not a statistical artifact or aberration.

There are two possible explanations for the post-containment PCB precipitation relationship. One is that the Remnant Sites are releasing PCB to the Hudson River during precipitation events. The second is that samples were collected coincidentally on days with precipitation. Examination of sampling dates at the stations between C-2 and E-5A indicates that the second explanation is more likely. Stations E-0, E-1, E-2, E-3, E-4, E-5A, D-S1 and RS-3W1 were all sampled on the same five dates during the period of elevated PCB levels: September 19 and 26; and October 3, 10 and 16. Measurable precipitation occurred on all five of these dates. Station C-2, which had PCB concentrations comparable to all other stations in the vicinity of the remnant areas during this time, was sampled on September 18, 24, and October 1, 8 and 15. All of these dates are different from the dates on which the remaining stations in the immediate remnant area vicinity were sampled, yet precipitation occurred on four of the five dates. Because Station C-2 is upstream of the Remnant Sites (as is Station E-0) it is apparent that the PCBs at Stations C-2 and E-0 are unrelated to any activities at the Remnant Sites. Given the consistency in PCB concentrations and temporal trends at all stations between C-2 and E-6, it is likely that a single event accounted for the elevated PCB levels in September and October. If this is the case, the correlation between PCB and precipitation is due to an event unrelated to the Remnant Sites.

**4.3.1.2.1 <u>Correlations at a Lower Detection Limit</u>.** The water quality data represent a censored data base, with most results reported as less than 0.1 $\mu g/L$. Laboratory analyses have reported Aroclor concentrations less than the official detection limit of 0.1 μg/L for over 120 samples (Tables 32-40), which increases the number of samples with detectable PCB. Additional regression analyses were conducted including data where Aroclor 1242 concentrations were less than 0.1 μg/L. When this was done, seven stations showed a statistically significant ($P \leq 0.05$) correlation between Aroclor 1242 concentrations and precipitation for 1991. These are reported in Table 41.

The regression statistics suggest a pattern indicating that PCB concentrations in post-containment samples from the stations in the vicinity of the Remnant Areas are correlated with precipitation, while PCB concentrations at stations upstream and downstream of the Remnant Areas are not. This is illustrated in Figure 129, which provides a station-by-station plot of the 2-tailed t-statistic probability (from Table 41) for the Aroclor 1242-precipitation regressions.

4.3.1.2.2 Characteristics of the Post-Containment Period. The post-containment monitoring period was characterized by 28 days, from September 19 to October 16, which produced most of the samples with detectable concentrations (i.e., greater than 0.1 μg/L) of Aroclor 1242, some of the highest waterborne PCB concentrations reported in 1991, and 17 days in which precipitation was reported at Glens Falls. This period was followed by several days wherein many stations had samples with lower Aroclor 1242 concentrations, often greater than zero, but less than 0.1 μg/L. Precipitation event frequencies and amounts were also lower after October 16 (Appendix II, Table 19). All stations with statistically significant correlations between Aroclor 1242 and precipitation had samples with high Aroclor 1242 levels on each of the five days in which samples were taken. Moreover, precipitation was reported for each of those same days. These stations also had samples with lower Aroclor 1242 concentrations reported after October 16, when precipitation frequency and quantities were lower. As noted in Table 31, post-containment samples with detectable PCB were detected on days with precipitation with a much higher frequency than were PCB samples collected during construction monitoring.

All stations downstream of Bakers Falls report a higher frequency of samples with elevated concentrations of Aroclor 1242 during the September 19 to October 16 period. Many of these stations do not show a statistically significant correlation with precipitation for post-containment sampling, but they do have mean, maximum, and median concentrations similar to those stations that are correlated with precipitation (refer to Table 23). For example, sample means for stations showing correlations between Aroclor 1242 concentrations and precipitation during the post-containment period range from 0.364 μg/L to 0.679 μg/L, and means for stations not showing such correlations range from 0.203 μg/L to 0.695 μg/L. If lower detection limits are included in the analysis, the stations showing significant correlations have sample means ranging from 0.27 to 0.41 μg/L for the post-containment period, while the non-correlated stations have sample means ranging from 0.16 to 0.56 μg/L (see Table 38). Of the non-correlated stations, C-2, E-6, and E-7 were sampled on some days with no precipitation during the September-October period, and on others with precipitation. Other non-correlated stations (RS-2W1 and RS-3W1) reported fewer samples having detectable concentrations of Aroclor 1242 (even at a lower detection limit) after October 16, and so had fewer low concentration-low precipitation data points in the regression analysis. Other stations (E-0, E-3, and E-5) simply show no correlation between Aroclor 1242 concentrations and precipitation.

As can be seen from Figures 55-85 and 98-128, at most stations, the September-October event presents a sharp peak in waterborne PCB concentrations around September 19, which decays exponentially through the following several weeks.

4.3.1.3 Relationship with TSS. Regression analyses showed no significant correlation between detectable Aroclor 1242 concentrations and total suspended solids during 1991 (Table 42).

4.3.1.4 Waterford Treated Drinking Water Supply. In accordance with the Administrative Consent Order, the Waterford drinking water supply was monitored during the construction period in 1991. Samples of the untreated and treated water were obtained at the Waterford facility and analyzed for PCBs. Tables 2, 6, and 13 of Appendix II gives the complete listing of PCB analyses performed on the Waterford facility samples. Untreated (raw) water samples are denoted as Station E-7R, and treated samples are denoted as Station E-7T. Sampling frequencies for these stations are reported in Tables 3, 6, and 9. During 1991, no samples from the Waterford facility showed detectable levels of PCBs.

4.3.1.5 Remnant Sites. As summarized in Table 43, the sampling stations at the various Remnant Sites generally showed fewer samples with detectable levels of PCBs in the winter and spring construction periods than in the post-containment period. The pattern of the post-containment period, in which samples with PCBs were more frequent and with generally higher concentrations when PCBs were detected, is found among all stations downstream of Bakers Falls and is not limited to the Remnant Site stations.

4.3.1.6 Comparison with 1989-1990 Data. Analysis of Variance (ANOVA) tests were conducted to determine if statistically significant ($P \leq 0.05$) differences exist in PCB concentrations in water grab samples between stations in 1991, and between the pre-construction, construction, and post-containment sampling periods. Table 44 provides a summary of these analyses. These analyses suggest that there are no significant differences in detectable waterborne PCB concentrations between the pre-construction, construction and post-containment periods ($F = 1.001$, $C = 0.368$).

An examination of the water column data for September and October from the stations in the vicinity of the remnant areas indicates that all stations between E-0 and E-5A were showing detectable PCB levels on the same dates. This pattern led to an analysis of whether there were other times when channel sampling stations showed detectable PCBs on the same day. A review of the data since the inception of the monitoring program found 21 instances (Table 45) when two or more channel sampling stations downstream of Bakers Falls (C-2, E-0 through E-7, and HR-1) had detectable PCBs on the same day. These dates account for 77% of all samples from these stations where detectable PCBs (greater than 0.10 μg/L) were found. This pattern leads to a general conclusion that on days when detectable PCB is observed in the water, it is found over a reach of the Hudson River extending, in some cases, over many miles. Although weak correlations between PCB and discharge have been noted in this study, the low number of high flow events since 1989 may be responsible for this correlation not being larger.

The presence of a much greater number of detectable PCB samples at nearshore stations, such as RS-3W1, along with generally higher concentrations at the nearshore stations, leads to the possibility that two separate events are responsible for the disparity in the number of detectable samples and concentrations between nearshore and channel samples. Channel samples likely integrate all riverine PCB sources upstream of the sampling station, while nearshore samples are possibly detecting local events, such as bank sloughing, which contribute PCBs to the immediate vicinity of the sampling station. It must be recognized that the nearshore stations are designed to detect localized PCB sources, such as Remnant Site construction activities, and are not intended to integrate riverine conditions, as are the channel stations.

4.3.1.7 Construction Activity Impacts During 1991. Construction activities took place at Remnant Sites 2, 4 and 5 during 1991 (Table 46). Of these three Sites, significant amounts of construction took place only at Remnant Site 4. Except for seeding and demobilization activities, all construction activities were completed at Site 2 on January 11, 1991, while work on Site 5 was completed January 3, 1991.

No water samples with detectable PCB were collected at either the upstream or downstream automatic sampling stations associated with Remnant Site 2 and 5 during construction activities (Table 47). The absence of detectable PCBs during 1991 construction indicates that no discernable construction impacts on PCB levels in the Hudson River resulted from the remedial activities on Sites 2 and 5.

No detectable PCB were found in samples collected at Station RS-4W1 during 1991, the sampling station located immediately upstream of Remnant Site 4. Two water samples with 0.11 and 0.18 $\mu$g/L Aroclor 1242 were collected immediately downstream of Site 4, at Station RS-4W2, on February 2 and 4. Numerous construction activities involving heavy earthmoving equipment were ongoing during these dates (Table 47).

Two dates on which elevated total suspended solids (TSS) levels were observed in water near Site 4 were March 23 and April 21. On both dates, concentrations were higher at Station RS-4W1 upstream of Site 4 (85 and 21 mg/L) than they were downstream at Station RS-4W2 (11 and 15 mg/L). Field crew observations indicate that the increase in TSS levels were due to runoff from a stream which drained a borrow area, rather than construction activities on Site 4 itself.

4.3.2 <u>Dialysis bags</u>. Detectable levels of Aroclor 1242 were noted at 11 of the 17 stations where dialysis bags were emplaced. No Aroclor 1254 (or any other Aroclor) was detected in any dialysis bags recovered during 1991. Table 14 of Appendix II gives deployment and recovery dates, the number of days exposed in the river, and the Aroclor concentrations for each individual sample. Analytical results are all expressed as $\mu$g/mL. A statistical summary of the dialysis bag results is given in Tables 48 and 49.

A statistically significant ($P \leq 0.05$) correlation was observed at all stations between dialysis bag samples containing detectable PCBs and water samples with detectable PCB during the period when the bags were exposed to the river ($r = 0.627$, $P = 0.007$). As the dialysis bags are designed to accumulate PCBs from water, it is apparent that they are performing their designed function.

Of particular note during the 1991 sampling is a dialysis bag containing detectable Aroclor 1242 (0.12 $\mu$g/mL) from Station C-1. This was the first such sample with detectable waterborne PCB collected from the upstream control station (Figure 130) since the monitoring program began in 1989. Prior to this sample, only low PCB concentrations in the sediment and biological matrices had been found at this station.

4.3.3 <u>Physical Water Quality Parameters</u>. The results of weekly monitoring of temperature, dissolved oxygen, pH and conductivity at the aquatic stations during the 1991 spring construction and post-containment periods are presented in Tables 10 and 18 of Appendix II. Water quality parameters for the 1991 winter construction period was not conducted due to the inability to calibrate field instruments during freezing conditions. However, air and water temperatures were obtained for this period and are listed in Table 3 of Appendix II.

The pH of the Hudson River varied from slightly acidic to somewhat alkaline (pH 6.6-8.9) and water temperatures fluctuated uniformly (4.5-28.5°C) throughout the entire study area for the 1991 season.

The dissolved oxygen levels also showed uniform seasonal trends at all stations on the Hudson and Mohawk River. Dissolved oxygen levels ranged from about 9.0-14.3 mg/L during the spring and fall months, and varied from about 6.0-9.0 mg/L during the summer months.

The water quality data display low conductivity levels upstream of site GF-3 (25-62 μmhos/cm) and increasing levels downstream to station HR-1 (135-238 μmhos/cm). Site MR-1 showed the highest levels (138-345 μmhos/cm).

Total suspended solids (TSS) data are given in Tables 2, 6 and 13 of Appendix II. The Stations in and above the Remnant Sites reveal low TSS levels, generally less than 5.0 mg/L, during the 1991 monitoring study. Station RS-4W1/E3 showed slightly higher TSS levels in the remnant area during the late winter - early spring construction monitoring period. It was noted during this period that a substantial amount of sediment loading (consisting mostly of sand) was occurring from a stream located above Remnant Site 4. The source did not appear to be related to construction activities on Site 4, due to the location of the stream. Station E-7, located above the Mohawk River confluence, also showed elevated TSS levels, generally above 5.0 mg/L, compared to the upper Hudson River stations. The Mohawk River at Station MR-1 was considerably more turbid that the upper Hudson, as shown by the elevated TSS levels. Station HR-1, on the Hudson River below the confluence of the Mohawk and upper Hudson, usually had TSS levels intermediate between those found in the Mohawk and upper Hudson.

## 4.4 Aquatic Biota

4.4.1 Hester-Dendy Multiplate Samples. During 1991, Hester-Dendy multiplate samplers were used to collect 65 silt and periphyton samples from 18 stations for PCB analysis. No samples were collected during winter. Nineteen samples were collected during the spring construction period (Table 7); 47 samples were collected during post-containment monitoring (Table 10). Aroclor 1242 was detected in 51 of the samples while Aroclor 1254 was detected in 38 samples. The results of the PCB analysis of silt and periphyton samples are given in Tables 8 and 15 in Appendix II as $\mu g/g$ dry weight. PCB summary statistics for Hester-Dendy samples are provided in Tables 50 through 54 and Figures 131-144. Total PCB concentrations during 1991 period varied from non-detectable (at Stations C-1, GF-1, GF-2, GF-3, GF-4, and MR-1) to 2,330.0 $\mu g/g$ (at Station E-0 during September). Aroclor 1242 accounted for most (70% to 100%) of the total PCB concentration at all 1991 Hudson River stations. However, at Station MR-1 (the Mohawk River), the entire total PCB concentration (0.09 $\mu g/g$) in a sample collected during the spring construction monitoring period was quantified as Aroclor 1254.

Multiplate sampling data from all monitoring stations, August 1989 to date, shows significant differences (Table 55) in total PCBs between pre-construction, construction, and post-containment sampling periods (Analysis of Variance, $F = 15.816$, $P < 0.001$). This difference is entirely due to the higher mean total PCB in post-containment silt and



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periphyton samples. These high PCB levels in post-containment samples were detected at Station C-2, as well as at stations in the vicinity of the remnant areas, and essentially overwhelmed or masked the ability to detect any effects of the containment of the remnant areas on PCB levels in silt and periphyton samples. For example, three samplers set at Station E-0 during the 1991 post-containment monitoring period were successfully recovered. The August 8 sample, collected after 50 days exposure, contained 5.70 μg/g total PCB, all of which was also Aroclor 1242 (Figure 133). In contrast, the September 26 sampler, exposed for 49 days, contained silt and periphyton with 2,330.0 μg/g total PCB; 90% of which was Aroclor 1242. The November 7 sample, collected after 42 days exposure, contained 320.0 μg/g total PCB, all of which was Aroclor 1242. The three silt and periphyton samples collected from Station E-1 during the 1991 post-containment monitoring period also showed similar trends to those at Station E-0, with E-1 concentrations being slightly lower. Further, Stations E-2, E-4, E-5 and E-7 showed significant differences in total PCBs among monitoring periods ($P \leq 0.05$), with post-containment levels being greater than pre-construction or construction levels (Table 55).

The increase in silt and periphyton PCB content in post-containment samples is due to the high levels of PCBs detected in September and, to a lesser extent, October and November samples at stations downstream of Bakers Falls (Figures 132-142). Stations C-1 and GF-4 (Figure 131) did not show this elevated contamination. The sample retrieved from Station C-2 on September 13, 1991, following a 59-day exposure period, showed only 7.10 μg PCB/g. However, the sample retrieved from Station E-0 on September 26, 1991 following a 49-day exposure period, contained 2,330.0 μg PCB/g. This suggests that an event unrelated to the contained Remnant Sites occurred after September 13 that caused PCB levels during post-containment monitoring to be significantly greater than those found in the pre-construction and construction monitoring periods. That the event occurred upstream of the Remnant Sites is documented by the sample retrieved from Station C-2 on October 29, which contained 260.0 μg/g Aroclor 1242.

An examination of the raw data (Appendix II, Tables 8 and 15) clearly indicates that the post-containment period, especially after the middle of September, contained the samples with the highest PCB concentrations. The Station E-0 sample with the highest PCB concentration in September 1991 (2330.0 μg/g) contained over 81 times the amount of PCB found in the sample with the highest PCB concentration collected prior to September from any station since monitoring began in 1989. Within an individual station, PCB concentrations during September and October at Hester-Dendy stations downstream of Bakers Falls were between 1.7 times (Station E-7) and approximately 80 times higher (Stations E-0 and E-3) than any previously recorded PCB concentrations.

A second period of elevated PCB concentrations was noted at Stations C-2, E-0, E-1 and E-2 during May and June of 1991. The highest recorded PCB levels to that date at C-2, E-0 and E-1 since monitoring began in 1989 were observed. These elevated PCB levels ware not observed downstream of Station E-2 during this period, and were greatly surpassed by the concentrations observed after September.

**4.4.2** Caddisflies. During 1991, caddisflies were sampled during the spring construction and post-containment monitoring periods. A total of 19 caddisfly samples was collected from five monitoring stations for PCB analysis (Tables 9 and 16 of Appendix II and Figures 145-150). PCBs were detected in 17 of 19 samples and at all stations, including the two control stations, GF-4 and C-2, upstream of the Remnant Sites. Aroclor 1242 was detected at all monitoring stations downstream of Bakers Falls. Only Aroclor 1254 was found at Station GF-4, upstream of Bakers Falls.

Composite caddisfly sample total PCB concentrations increased considerably between the 1991 construction monitoring and post-containment monitoring periods. During the spring construction monitoring period, total PCB concentrations ranged from 0.070 μg/g at Station GF-4 to 13.9 μg/g at Station E-5 (Table 56). During the post-containment monitoring periods with the exception of caddisflies collected at Station GF-4, the highest mean PCB levels in caddisflies were found to occur in the last collection in the year (typically the last week of October), when up to 220.0 μg/g of Aroclor 1242 was detected (Table 57). These relatively high post-containment values resulted in mean PCB levels in caddisflies being higher in 1991 than in 1989 or 1990 (Figure 145).

The increases during the post-containment period were found to vary at stations downstream of Bakers Falls. Three caddisfly samples were collected from Station C-2 during the 1991 post-containment monitoring period, all showing some level of PCB contamination (Figure 147). PCB levels in caddisflies increased over the course of the 1991 monitoring period, from 4.0 μg/g (75% quantified as Aroclor 1242) on July 24, to 34.0 μg/g (all Aroclor 1242) on September 4, to 160.0 μg/g (all quantified as Aroclor 1242) on October 23.

Caddisfly PCB levels also increased during the post-containment monitoring period at Station E-5 (Figure 148). In the July 24, 1991 collection, total PCB concentration was 2.75 μg/g (69% quantified as Aroclor 1242), while the October 23, 1991 sample had a total PCB concentration of 220.0 μg/g (all quantified as Aroclor 1242).

Three caddisfly samples were collected from Station E-6 during 1991 post-containment monitoring; all showing detectable levels of PCB. The highest PCB levels were detected in the sample collected November 1, 1991; this sample had 13.0 μg/g PCB, all quantified as Aroclor 1242 (Figure 149).

Two caddisfly samples were collected at Station E-7 during 1991 post-containment monitoring. The first, collected August 7, 1991 was analyzed to have 1.42 μg/g PCB, 63% quantified as Aroclor 1242. The second sample, collected September 10, 1991, contained 7.50 μg/g PCB, 79% quantified as Aroclor 1242 (Figure 150).

4.4.3 Caged Fish. Results of the 1991 caged fish (fathead minnow) bioaccumulation studies are compiled in Table 17 of Appendix II and summarized in Tables 58-60 and Figures 151-

154. All analytical PCB results are expressed as $\mu g/g$ dry weight. Table 17 of Appendix II also reports the percent lipid content of the fish samples.

Thirty-eight in-situ tests were conducted at Stations C-1, GF-4, C-2, E-5, E-6 and E-7 during 1991. A subset of each group of fish used in the tests was analyzed at the beginning of each exposure period. These samples are denoted as STOCK in Table 17 of Appendix II. No stock fish analyzed during 1991 showed detectable concentrations of PCB. Although 51 in-situ tests were attempted during 1991, vandalism and high mortality of the exposed fish reduced the number of completed tests to 32. The reasons for high mortalities can be attributed to disease problems incurred by the fish supplier.

Due to a suspected disease problem with fathead minnows, caged minnows were not emplaced in the Hudson River until the beginning of the post-containment monitoring, after the disease problem was remedied. Until mid-September, the PCB concentrations found at all stations were comparable to those found in 1989 and 1990. Table 61 lists the station mean Aroclor concentrations during 1991 for both the entire year and pre-September, and compares them to the 1989 station means. The 1990 data are not included in Table 61 due to the PCB contamination of stock fish, which occurred throughout most of 1990.

The most unusual feature of the pre-September 1991 data is the presence of 0.74 $\mu g/g$ Aroclor 1248 in the sample removed at Station E-5 on July 17 (Figure 151). This was the first instance of PCB quantified as Aroclor 1248 being detected in a biological sampling matrix since the monitoring program began in 1989.

In the in-situ tests during 1991, PCB bioaccumulation was not detected at Stations C-1 (4 samples) or GF-4 (6 samples) above Bakers Falls Dam. In contrast, PCB bioaccumulation at Station C-2 in the 29-day period preceding September 18, 1991, was the highest concentration in caged fish measured in the monitoring program to date (Figure 152). Fish in that sample contained 68.0 $\mu g/g$ PCB (all Aroclor 1242) approximately 22 times higher than any other PCB concentration found in caged fish at any station since the monitoring began in 1989. Station C-2's October 15, 1991 sample, exposed for the prior 21 days, showed the second highest PCB bioaccumulation: 14.0 $\mu g/g$, also all Aroclor 1242. Downstream at Station E-5, the October 10 sample, exposed for the prior 16 days, showed the third highest recorded PCB bioaccumulation: 11.0 $\mu g/g$, all Aroclor 1242. Elevated PCB concentrations were noted through mid-October at fish emplaced at both Stations C-2 and E-5. A smaller increase in PCB levels was also found at both Stations E-6 and E-7 in the fish removed from the river during early to mid-October (Figures 153 and 154). Because of the high concentrations at Station C-2, the source of the PCBs detected in mid-September at stations downstream of Bakers Falls is believed to be unrelated to the Remnant Sites.

## 5.0 SUMMARY AND CONCLUSIONS

### 5.1 Air

Air monitoring in 1991 was conducted from January through November. During this period, detectable PCBs were found in thirteen out of 941 air samples (1.4%). Airborne PCBs were detected on four May 1991 sample dates by the mobile air monitoring station located on Remnant Site 3 (May 15, May 21, May 24 and May 27). PCBs were detected on June 8, 1991 by two stations, the mobile sampler on Remnant Site 3 and fixed-location sampler A4. Lastly, all three fixed-location stations (A2, A3 and A4) detected PCBs on September 18, 1991. The highest Aroclor 1242 concentration (0.13 $\mu g/m^3$) was measured by fixed-location Station A4 on September 18, 1991. The mean average Aroclor 1242 concentration for 1991 was 0.08 $\mu/m^3$. No other Aroclor types were detected this year.

In mid-September, PCB levels in aquatic matrices also increased. However, the airborne PCB detections in 1991 seem to be single, isolated events that may be related to excavation or construction activities in the Fort Edward area unrelated to the Remnant Sites. The airborne PCBs detected on September 18 are also believed to be unrelated to the increased PCB levels in the aquatic media.

During 1990, PCBs were detected more frequently and at higher concentrations on, or immediately adjacent to, the Remnant Sites while regrading and initial sand layer placement activities were on-going. In 1990, a pathway existed for PCBs from the Remnant Sites to become airborne. This pathway was the surface area of the exposed Remnant Sites prior to completion of initial sand layer placement. However, all 1991 detections occurred after May. By this time all four Remnant Sites were covered with an initial layer of sand, a layer of Claymax and a layer of topsoil. The summary of all 1991 remnant area construction activities are described in Table 46. The pathway that existed in 1990 for PCBs from the defined Remnant Sites to become airborne no longer existed in 1991.

It is unlikely that the airborne PCBs detected in 1991 emanated from within the boundaries of the four Remnant Sites. The surfaces of the Remnant Sites were no longer exposed when these detections occurred. In addition, PCB levels were below the limit of detection throughout the first four months of 1991. The randomness of the PCB detections measured after May 1991 supports the conclusion that the Remnant Sites are not the source of these PCBs.

5.2 Sediment. Sediment results throughout 1991 at all locations are similar to those observed during the first two years of monitoring at the Remnant Sites. Station E-5 continues to have the highest mean total PCB content. Stations upstream of Bakers Falls and in the Mohawk River continue to show little PCB contamination, with much of the total PCB present at these stations consisting of Aroclor 1254. Stations downstream of Bakers Falls continue to contain between 80-90% Aroclor 1242, with the remaining 10-20% being Aroclor 1254.

Unlike the other aquatic matrices, sediment concentrations at the sampling stations have not changed significantly since sampling began in 1989. The relative insensitivity of sediment to changes in PCB concentrations in water makes it a poor matrix for monitoring changes in the Hudson River due to the remediation at the Remnant Sites. Small quantities of PCB emanating from the Remnant Areas (or any other location along the river) are not noticeable in sediments, where the total PCB concentration is anywhere from three to six orders of magnitude higher than concentrations in the water.

Sediment was the only aquatic sampling matrix which did not show an increase in concentration after the middle of September (Figure 51). Although the variability of individual sample concentrations within a station may contribute to the failure to detect the mid-September PCB increase, a more likely reason for this failure is that sediment PCB concentrations are much slower to respond to changes in waterborne PCB than the other matrices. If this is the case, future sediment sampling will not be able to detect the impacts of the remnant area remediation, which is the overall objective of the monitoring program.

## 5.3 Water Grab Samples

A total of 1,275 water grab samples was collected throughout the study area during 1991. PCBs, mostly quantified at the 0.1 $\mu g/L$ detection limit as Aroclor 1242, were detected at 17 stations. PCB levels in the samples ranged from undetectable to 10.0 $\mu g/L$. The analyses of data from the 1991 water grab samples do not indicate a significant relationship between PCB levels in Hudson River water in the vicinity of the Remnant Sites with Hudson River discharge. The statistical correlation between precipitation and PCB concentrations in grab samples is believed to be unrelated to precipitation at, or runoff from, the contained remnants.

In 1991, a large fraction of the samples with detectable levels of PCBs occur on the same days and at several stations that are upstream, downstream, and in the vicinity of the

Remnant Sites. This implies that much of the waterborne PCBs in the area results from activities, or processes, not associated with the Remnant Sites.

The water sampling program in 1991, and the comparisons of the 1991 grab sample data with the samples taken in 1989 and 1990, indicate that PCB concentrations in the Hudson River were not significantly affected by construction activities on the Remnant Sites. Post-containment data indicate that the Remnant Sites are not currently contributing significantly to PCBs in the Hudson River. However, the September-October event in 1991 provided substantial background noise which masked the behavior of the Remnant Sites for several weeks. Future monitoring will be needed to fully assess the efficacy of the containment activities.

The observed statistically significant correlations found between PCB and precipitation during the post-containment period are believed to be the result of sampling during a sequence of high PCB concentration-high precipitation days during September and October. The high concentration samples in September-October were most likely the result of an event on the river between Stations GF-4 and C-2 which, coincidentally, occurred at a time of high precipitation. This conclusion is based on the following observations:

1. The presence of elevated PCB concentrations at stations upstream of the remnant areas at concentrations comparable to those at stations in the vicinity of an downstream of the remnant areas (Figure 155).

2. The absence of correlations between Aroclor 1242 levels and precipitation in the 1990 data

3. All stations downstream of Bakers Falls show similar temporal patterns of high Aroclor 1242 concentrations in September and October

4. All stations with statistically significant correlations between Aroclor 1242 concentrations and precipitation report all of their highest concentration post-containment samples on the five sampling days in mid-September-mid-October period, each of which had precipitation

5. All stations with significant correlations were sampled largely or totally on rainy days during this period

We, therefore, conclude that the correlations between Aroclor 1242 concentrations and precipitation in 1991 are unrelated to the contained Remnant Sites.

Because monitoring results of this study since 1989 give no indication of any other event remotely similar to the widespread elevated PCB concentrations in water (and biota) during the fall of 1991, we believe the event to be a one time event unrelated to the remnants. There is no indication that Waterford treated drinking water was affected during construction periods. There is also no indication that Waterford drinking water has been affected during post-containment.

5.3.1 <u>Dialysis bags</u>. Dialysis bag monitoring was discontinued in the middle of July 1991. Since the monitoring was first instituted, additional studies have been performed by several researchers (Huckins et al. 1990, Crunkilton 1990). These studies have shown that the procedures and materials first proposed by Sodergren (1988), and followed in this study, are not reproducible. The lack of reproducibility is apparently related to the amount of water hydrated within the cellulose dialysis membranes used in this study. The amount of water in the membrane material is variable, resulting in essentially a water-water partitioning of PCB between river water and membrane occluded water. There is little chemical potential driving PCBs into the cellulose material under these circumstances, resulting in the low and variable levels of PCB accumulated in the dialysis bags. Membrane material constructed of linear polyethylene (LPE) has been shown to produce more consistent results, as well as a higher concentration factor between water and the solvent inside the dialysis bag (hexane in this study). Until the technique is further refined by other researchers, we believe that its use in this monitoring program is no longer warranted.

## 5.4 Aquatic Biota

5.4.1 Hester-Dendy Samples. A total of 65 Hester-Dendy multiplate samplers set at 18 stations was recovered during 1991. PCBs, largely Aroclor 1242, were detected at 14 stations, Total PCB concentrations in the silt and periphyton ranged from undetectable to 2,300.0 $\mu g/g$ (dry weight).

Analysis of variance (ANOVA) using all total PCB data from all monitoring stations showed statistically significant differences among sampling periods. Total PCB concentrations in silt and periphyton samples for most monitoring stations increased in the post-containment period, compared to the pre-construction and construction monitoring periods. This increase was due to a September and October 1991 event upstream of, and unrelated to, the Remnant Areas.

A correlation in detectable waterborne PCBs was found between the grab water samples and Hester-Dendy samples. This spatial correlation between mean PCB level in 1991 Hester-Dendy samples and the proportion of grab water samples showing detectable PCBs was statistically significant ($r = 0.71$, $n = 16$, $P = 0.001$). Correlations among other parameters were not assessed because sufficient data were not available (caddisflies and fish) or because short term temporal correlations were not appropriate (sediments).

Hester-Dendy samples clearly are capable of detecting changes in the PCB concentration of the Hudson River. As the biological sampling matrix which obtains its PCB content directly and entirely from the water, it is capable of tracking and integrating changes over time in waterborne PCB, even at concentrations in the water which are not detectable in the water samples themselves. They are also capable of bioaccumulating extremely high concentrations of PCB, and can be placed practically anywhere in the river. The disadvantage (if any) of the Hester-Dendy sampler is the time required for the plates to accumulate a sufficient mass of material to allow chemical analysis. Although it is likely that the periphyton attaching to the sampler very quickly accumulates elevated PCB levels, the length of time required to obtain a sufficient mass of sample for analysis results in the Hester-Dendy sampler serving as an integrator of waterborne PCB over the period of time the sampler is exposed in the river.

5.4.2 Caddisflies. A total of 19 caddisfly samples was collected from five stations in 1991. PCBs were detected at all stations, with total PCB concentrations ranging from undetectable to 220.0 μg/g (dry weight). All but one station showed Aroclor 1242 to dominate the caddisfly PCB burden. Caddisflies from Station GF-4, above Bakers Falls Dam, accumulated only Aroclor 1254. Although there are too few data for statistical analyses, high levels of PCBs were detected in caddisfly larvae collected during the fall of 1991.

5.4.3 Caged Fish. A total of 38 in-situ tests with caged fathead minnows was completed at six stations during 1991, all during the post-containment monitoring period. Caged fish at four of the six stations bioaccumulated PCBs, largely Aroclor 1242. Caged fish at Stations C-1 and GF-4, above Bakers Falls Dam, did not accumulate PCBs. Where PCB accumulation was detected, the levels ranged from 0.630 μg/g to 68.0 μg/g. The highest accumulation, 68.0 μg/g, occurred above the remnant deposit area at Station C-2, in a 29-day in-situ test completed on September 18, 1991. As only typical levels of PCBs were found in a Hester-Dendy sampler retrieved from Station C-2 on September 13, 1991, the fish data, combined with the Hester-Dendy data, indicate that the episode of elevated PCBs during September and October began between September 14 and 17.

Caged fathead minnows were successful in detecting the increased PCB concentrations in the Hudson River in mid-September 1991. Because the highest concentrations in fish were noted at Station C-2 (Figure 152) from a sample removed from the river September 18, it is apparent that the source of the PCB is located upstream of Station C-2. A sample removed from Station E-5 on September 12 did not show PCB concentrations elevated above concentrations previously observed at that station, although the next sample removed from E-5, on October 10, did show elevated concentrations.

Given the relatively small increase in waterborne PCB observed during the time of elevated PCB in fish, it is apparent that fish are capable of reflecting small changes in PCB levels in water or zooplankton prey organisms. Caged fish are, therefore, one of the sampling matrices that can successfully monitor changes in PCB concentration in the Hudson River due to the remnant area remediation.

The quantification of Aroclor 1248 in a sample from Station E-5 is not believed to indicate the presence of Aroclor 1248 in the vicinity of the Remnant Area. A mixture approximating a 50:50 mix of Aroclors 1242 and Aroclor 1254 could inadvertently be quantified as Aroclor 1248. Alternatively, selective uptake of more heavily chlorinated individual PCB congeners than are present in Aroclor 1242 could have resulted in a chromatogram which appears to be similar to Aroclor 1248. We are unaware of any record of Aroclor 1248 purchases or discharges in the vicinity of the Remnant Areas. Available General Electric purchase records do not indicate that either the Ft. Edward or Hudson Falls plants ever purchased Aroclor 1248.

## 5.5 Implications for Future Monitoring

Based on the findings of the 1989, 1990 and 1991 monitoring programs, certain sampling matrices and the methods used for sampling appear more promising than others for future evaluations of the effectiveness of Remnant Site containment. Monitoring the aquatic media using water grab samples, Hester-Dendy multiplate samplers, caddisfly larvae and caged fish were found to be better suited to measuring changes in PCB concentrations than were sediment samples and hexane-filled dialysis membrane bag samples. A statistically significant positive correlation was found between PCB concentrations in water grab samples and in the periphyton/silt samples obtained from the Hester-Dendy multiplates. This correlation and the temporal differences in their respective measurements suggest that these methods would be among the most useful for monitoring future changes in PCB concentrations in the water column and aquatic biota, especially if lowered PCB detection limits in water samples are routinely employed.

Monitoring airborne PCB concentrations using the residential background network appears to provide results representative of the Remnant Area. However, because the airborne PCBs detected during the pre-construction and post-containment periods appear to be unrelated to the Remnant Sites, the need for future air quality monitoring at the Sites is questionable.

## LITERATURE CITED


Crunkilton, R.L. 1990. Use of Hexane-Filled Dialysis Samplers to Monitor Nine Components of Technical Chlordane Under Laboratory and Field Conditions. Presented at the 11th Annual Meeting, Society of Environmental Toxicology and Chemistry, Arlington, VA.

Harza Engineering Company. 1989a. Plan of Study, Ft. Edward Dam PCB Remnant Deposit Containment Environmental Monitoring Program: Baseline Studies. Harza Engineering Co., Chicago, IL (October 1989).

Harza Engineering Company. 1989b. Quality Assurance Project Plan, Ft. Edward Dam PCB Remnant Deposit Containment Environmental Monitoring Program: Baseline Studies. Harza Engineering Co., Chicago, IL (October 1989).

Harza Engineering Company/Yates & Auberle, Ltd. 1990a. Ft. Edward Dam PCB remnant Deposit Containment Environmental Monitoring Program Baseline Studies: Report of 1989 Results, August - December 1989. Harza Engineering Co., Chicago, IL with Yates & Auberle, Ltd., East Rutherford, NJ (February 1990).

Harza Engineering Company/Yates & Auberle, Ltd. 1990b. Ft. Edward Dam PCB Remnant Deposit Containment Environmental Monitoring Program Baseline Studies: Interim Report of 1990 Air and Water PCB Concentration Data. Harza Engineering Co., Chicago, IL with Yates & Auberle, Ltd., East Rutherford, NJ (December 1990).

Harza Engineering Company/Yates & Auberle, Ltd. 1990c. Ft. Edward Dam PCB Remnant Deposit Containment Enviornmental Monitoring Program: Continuation of Baseline Studies - 1990. Harza Engineering Co., Chicago, IL with Yates & Auberle, Ltd., East Rutherford, NJ (March 1990).

Harza Engineering Company/Yates & Auberle, Ltd. 1990d. Ft. Edward Dam PCB Remnant Deposit Containment Environmental Monitoring Program. Construction Monitoring Plan. Harza Engineering Co., Chicago, IL with Yates and Auberle, Ltd., East Rutherford, NJ (May 1990).

Harza Engineering Company/Yates & Auberle, Ltd. 1990e. Ft. Edward Dam PCB Remnant Deposit Containment Environmental Monitoring Program: Construction Monitoring Plan For Winter 1990-1991. Harza Engineering Co., Chicago, IL with Yates & Auberle, Ltd., East Rutherford, NJ (December 1990).

Harza Engineering Company/Yates & Auberle, Ltd. 1992. Ft. Edward Dam PCB Remnant Deposit Containment Environmental Monitoring Program: Preconstruction and Construciton Monitoring Studies, Report of 1990 Results (March-December 1990).

Harza Engineering Co., Chicago, IL with Yates & Auberle, Ltd., East Rutherford, NJ(January 1992).

Huckins, J.N., M.W. Tubergen and G.K. Manuweera. 1990. Semipermeable Membrane Devices Containing Model Lipid: A New Approach to Monitoring the Bioavailability of Lipophilic Contaminants and Estimating their Bioconcentration Potential. Chemosphere 20:533-552.

Jones, P.A. and R.J. Sloan. 1989. An in situ river exposure vessel for bioaccumulation studies with juvenile fish. Environmental Toxicology and Chemistry 8:151-155.

Malcolm Pirnie, Inc., 1986. Hudson River PCB Dredging Reclamation/Demonstration Project Environmental Information Document. New York State Department of Environmental Conservation, Albany, NY.

New York State Department of Environmental Conservation. 1982. Environmental Monitoring Program, Hudson River PCB Reclamation Demonstration Project. New York State Department of Environmental Conservation, Albany, NY.

U.S. EPA, 1984. RECORD OF DECISION: Remedial Alternative Selection.

U.S. Environmental Protection Agency. 1986. Quality Criteria for Water. EPA 440/5-86-001. Office of Water Regulations and Standards, Washington, D.C.

U.S. Environmental Protection Agency, New York State Department of Environmental Conservation. 1987. Draft Joint Supplement to the Final Environmental Impact Statement on the Hudson River PCB Reclamation Demonstration Project. USEPA, Region II, New York, NY and NYSDEC, Albany, NY.

**Table 1**
**Hudson River PCB Superfund Site - Construction Monitoring Program**
**Summary of Air Sampling Results**
**January 1 - November 29, 1991**

**Fixed - Location Network**

| Sampler Location | Valid Samples | Samples with Quantifiable PCB Concentrations |
|---|---|---|
| A1 | 54 | 0 |
| A2 | 120 | 1 |
| A3 | 115 | 1 |
| A4 | 121 | 2 |
| A5 | 58 | 0 |
| Total | 468 | 4 |

**Mobile Monitoring Network**

| | | |
|---|---|---|
| Remnant Site 2 | 67 | 0 |
| Remnant Site 3 | 84 | 8 |
| Remnant Site 4 | 302 | 0 |
| Remnant Site 5* | 20 | 1 |
| Total | 473 | 9 |

* Construction was nearly complete on Remnant Site 5 in 1990.

Table 2

Ft. Edward Renmant Study
Winter Construction Monitoring Stations
(January 1 - March 27, 1991)

| Station | Station Location |
|---|---|
| C-1 | Between Spiers Falls and Sherman Island Dam |
| GF-4 | ASI Boat ramp between Old Fenimore Dam and Bakers Falls |
| RS-3W1 | At upper end Remnant Area 3 |
| RS-2W1 | At upper end Remnant Area 2 |
| RS-2W2 | At lower end Remnant Area 2 |
| E-1 | Below Remnant Area 2 |
| RS-3W2 | At lower end Remnant Area 3 |
| E-3 | At upper end Remnant Area 4 |
| RS-4W1 | At upper end Remnant Area 4 |
| E-4 | At lower end Remnant Area 4 |
| RS-4W2 | At lower end Remnant Area 4 |
| RS-5W1 | At upper end Remnant Area 5 |
| RS-5W2 | Scott Paper Water Intake; lower end Remnant Area 5 |
| DS-1 | Between Rogers Island and Ft. Edward (canal side) |
| E-5 | At Rogers Island Boat Ramp |
| E-4A | Between shoreline and west pier Rt. 197 Bridge |
| E-7 | Waterford - Downstream of Lock #1 |
| E-7T | Waterford Waterworks Plant |

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Table 3
Ft. Edward Remnant Study
Winter Construction Monitoring Stations
Water Sampling Schedule

| Station | Daily Sampling | Semi-Weekly Sampling | Weekly Sampling |
|---|---|---|---|
| C1 | | | 1/1/91 - 3/27/91 |
| GF4 | | | 1/1/91 - 3/27/91 |
| RS-3W1 | | 1/1/91 - 3/27/91 | |
| RS-2W1 | 1/1/91 - 2/2/91 | | 2/5/91 - 3/27/91 |
| RS-2W2 | 1/1/91 - 2/2/91 | | 2/5/91 - 3/27/91 |
| E1 | | | 1/1/91 - 3/27/91 |
| RS-3W2 | | 1/1/91 - 3/27/91 | |
| E3 | | | 1/1/91 - 3/27/91 |
| RS-4W1 | 1/1/91 - 3/27/91 | | |
| E4 | | | 1/1/91 - 3/27/91 |
| RS-4W2 | 1/1/91 - 3/27/91 | | |
| RS-5W1 | | | 1/1/91 - 3/27/91 |
| RS-5W2 | | | 1/1/91 - 3/27/91 |
| DS1 | | | 1/1/91 - 3/27/91 |
| E5 | | | 1/1/91 - 3/27/91 |
| E4A | | | 1/1/91 - 3/27/91 |
| E7 | | | 1/1/91 - 3/27/91 |
| E7T | | | 1/1/91 - 3/27/91 |

Table 4 Summary of Winter Construction Monitoring Program, Hudson River, N.Y. (Jan 1 - Mar 27, 1991)

| Parameter | Sampling Stations | Type of Sample | Sampling Frequency | Number of Samples in 1991 |
|---|---|---|---|---|
| Sediment | C1,GF1,GF2,GF3,C2,E0,E1,E2, E3,E4,E5,E5A,E6,E7,HR1 15 Stations | Grab Sample at 1-4 locations/station | 1 period | 33 |
| Water | All | Grab Sample (PCB) (Fractioned Monthly) and TSS | Weekly | 400 |
| | RS3W1, RS3W2 (2 Stations) | | Semi-Weekly | |
| | RS4W1, RS4W2, (2 Stations) | | Daily | |
| Air Quality | Permanent Locations Network A1,A2,A3,A4,A5 | Particulate and Gaseous | Every 3 Days | 165 |
| | Site Containment Monitoring Network B2,B3,B4A,B4B | | Construction Dependent | 253 |

Table 5

Ft. Edward Renmant Study
Spring Construction Monitoring Stations
(March 28 - June 28, 1991)

| Station | Station Location |
|---|---|
| C-1 | Between Spiers Falls and Sherman Island Dam |
| GF-1 | Below Sherman Island Powerplant |
| GF-2 | Downstream of Moreau Boat Ramp |
| GF-3 | Above Glens Falls Feeder Canal |
| GF-4 | ASI Boat ramp between Old Fenimore Dam and Bakers Falls |
| C-2 | Above Remnant Area 1, below Bakers Falls |
| E-0 | Above Remnant Area 2 |
| RS-3W1 | At upper end of Remnant Area 3 |
| RS-2W1 | At upper end of Remnant Area 2 |
| E-1 | At lower end Remnant Area 2 |
| RS-3W2 | At lower end of Remnant Area 3 |
| E-2 | Downstream of Remnant Area 3 |
| E-3 | Upstream end of Remnant Area 4 |
| RS-4W1 | Upstream end of Remnant Area 4 |
| E-4 | At lower end of Remnant Area 4 |
| RS-4W2 | At lower end of Remnant Area 4 |
| RS-5W1 | At upper end of Remnant Area 5 |
| RS-5W2 | Scott Paper Water Intake - lower end of Remnant Area 5 |
| DS-1 | Between Rogers Island and Ft. Edward (canal side) |
| E-4A (1) | Between shoreline and West Pilar Rt. 197 Bridge |
| E-5 | Downstream of east pilar Rt. 197 Bridge |
| E-5A | Downstream of Lock #7 |
| E-6 | Ft. Miller - Downstream of Lock #6 |
| E-7 | Waterford - Downstream of Lock #1 |
| E-7R | Waterford Waterworks Plant |
| E-7T | Waterford Waterworks Plant |
| MR-1 | Mohawk River Upstream of Crescent Dam |
| HR-1 | Below Troy Dam, West Pilar of Green Island Bridge |

(1) Sampling discontinued 4-25-91

Table 6
Ft. Edward Remnant Study
Spring Construction Monitoring Stations
Water Sampling Schedule

| Stations | Daily Sampling | Semi-Weekly Sampling | Weekly Sampling |
|---|---|---|---|
| C1 | | | 3/28/91 - 6/28/91 |
| GF1 | | | 3/28/91 - 6/28/91 |
| GF2 | | | 3/28/91 - 6/28/91 |
| GF3 | | | 3/28/91 - 6/28/91 |
| GF4 | | | 3/28/91 - 6/28/91 |
| C2 | | | 3/28/91 - 6/28/91 |
| EO | | | 3/28/91 - 6/28/91 |
| RS-3W1 | | 3/28/91 - 6/28/91 | |
| RS-2W1 | | | 3/28/91 - 6/28/91 |
| E1 | | | 3/28/91 - 6/28/91 |
| RS-3W2 | | 3/28/91 - 6/28/91 | |
| E2 | | | 3/28/91 - 6/28/91 |
| E3 | | | 3/28/91 - 6/28/91 |
| RS-4W1 | 3/28/91 - 4/25/91 | | |
| E4 | | | 3/28/91 - 6/28/91 |
| RS-4W2 | 3/28/91 - 4/25/91 | | |
| RS-5W1 | | | 3/28/91 - 6/28/91 |
| RS-5W2 | | | 3/28/91 - 6/28/91 |
| DS1 | | | 3/28/91 - 6/28/91 |
| E4A | | | 3/28/91 - 4/25/91 |
| E5 | | | 3/28/91 - 6/28/91 |
| E5A | | | 3/28/91 - 6/28/91 |
| E6 | | | 3/28/91 - 6/28/91 |
| E7 | | | 3/28/91 - 6/28/91 |
| E7R | | | 4/04/91 - 6/28/91 |
| E7T | | | 3/28/91 - 6/28/91 |
| MR1 | | | 3/28/91 - 6/28/91 |
| HR1 | | | 3/28/91 - 6/28/91 |

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Table 7 Summary of Spring Construction Monitoring Program, Hudson River, N.Y. (March 28 - June 28, 1991)

| Parameter | Sampling Stations | Type of Sample | Sampling Frequency | Number of Samples in 1991 |
|---|---|---|---|---|
| Sediment | C1,GF1,GF2,GF3,C2,E0,E1,E2, E3,E4,E5,E5A,E6,E7,MR1,HR1 17 Stations | Grab Sample at 1-4 locations/station | 2 periods (Spring, Summer) | 74 |
| Water | All Stations | Grab Sample (PCB) (Fractioned Monthly) and TSS | Weekly | 441 |
| | RS3W1, RS3W2 2 Stations | | Semi-weekly | |
| | RS4W1, RS4W2 2 Stations | | Daily (Mar 28-Apr 25) | |
| | C1,GF1,GF2,GF4,C2,E0,E1,E2,E3, E4,RS5W1,E5,E5A,E6,E7,MR1,HR1 17 Stations | Dialysis Bags | Bi-weekly (May 8-Jun 28) | 80 |
| Aquatic Biota | | | | |
| • Multiplate | C1,GF1,GF2,GF3,GF4,C2, E0,E1,E2,E3,E4,RS5W1, E5,E5A,E6,E7,HR1,MR1 18 Stations | Periphyton and Silt Composite | 5-week intervals (May 8-Jun 28) | 19 |
| • Caddisfly | GF4,C2,E5,E6,E7 | Macroinvertebrate Composite | 1 Period | 5 |
| • Fathead Minnow | C1,GF4,C2,E5,E6,E7 | Fish Assay Composite | 3-week intervals (Jun 6-Jun 28) | 0 |
| Air Quality | Permanent Locations Network A1,A2,A3,A4,A5 | Particulate and Gaseous | Every 3 Days | 130 |
| | Site Containment Monitoring Network B2,B3,B4A,B4B,B5 | | Construction Dependent | 185 |

Table 8

Ft. Edward Renmant Study
Post-Containment Monitoring Stations
(June 29 - November 27, 1991)

| Station | Station Location |
|---|---|
| C-1 | Between Spiers Falls and Sherman Island Dam |
| GF-4 | ASI Boat ramp between Old Fenimore Dam and Bakers Falls |
| C-2 | Above Remnant Area 1, below Bakers Falls |
| E-0 | Above Remnant Area 2 |
| RS-2W1 | At upper end Remnant Area 2 |
| RS-3W1 | At upper end Remnant Area 3 |
| E-1 | At lower end Remnant Area 2 |
| RS-3W2 | At lower end Remnant Area 3 |
| E-2 | Downstream of Remnant Area 3 |
| E-3 | Upstream end of Remnant Area 4 |
| E-4 | At lower end of Remnant Area 4 |
| RS-5W1 | At upper end of Remnant Area 5 |
| RS-5W2 | Scott Paper Water Intake; lower end of Remnant Area 5 |
| DS-1 | Between Rogers Island and Ft. Edward (canal side) |
| E-5 | Downstream of East Pilar Rt. 197 Bridge |
| E-5A | Downstream of Lock #7 |
| E-6 | Ft. Miller - Downstream of Lock #6 |
| E-7 | Waterford - Downstream of Lock #1 |
| E-7R(1) | Waterford Waterworks Plant |
| E-7T(1) | Waterford Waterworks Plant |

(1) Sampling Discontinued 7-11-91

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Table 9
Ft. Edward Remnant Study
Post-Containment Monitoring Stations
Water Sampling Schedule

| Stations | Daily Sampling | Semi-Weekly Sampling | Weekly Sampling |
|---|---|---|---|
| C1 | | | 7/2/91 - 11/27/91 |
| GF4 | | | 7/2/91 - 11/27/91 |
| C2 | | | 7/2/91 - 11/27/91 |
| E0 | | | 7/2/91 - 11/27/91 |
| RS-2W1 | | | 7/2/91 - 11/27/91 |
| RS-3W1 | | 6/29/91 - 7/14/91 | 7/22/91 - 11/27/91 |
| E1 | | | 7/2/91 - 11/27/91 |
| RS-3W2 | | 6/29/91 - 7/14/91 | 7/22/91 - 11/27/91 |
| E2 | | | 7/2/91 - 11/27/91 |
| E3 | | | 7/2/91 - 11/27/91 |
| E4 | | | 7/2/91 - 11/27/91 |
| RS-5W1 | | | 7/2/91 - 11/27/91 |
| RS-5W2 | | | 7/2/91 - 11/27/91 |
| DS1 | | | 7/2/91 - 11/27/91 |
| E5 | | | 7/2/91 - 11/27/91 |
| E5A | | | 7/2/91 - 11/27/91 |
| E6 | | | 7/2/91 - 11/27/91 |
| E7 | | | 7/2/91 - 11/27/91 |
| E7T | | | 7/2/91 - 7/11/91 |
| E7R | | | 7/2/91 - 7/11/91 |

[illegible]e 10 [illegible]nary [illegible]ost-C[illegible]inme[illegible]
Monitoring Progra[illegible] [illegible]udson River N.Y.
(June 29 - November 27, 1991)

| Parameter | Sampling Stations | Type of Sample | Sampling Frequency | Number of Samples in 1991 |
|---|---|---|---|---|
| Sediment | C1,GF1,GF2,GF4,C2,E0,E1E2, E3,E4,E5,E5A,E6,E7<br>14 Stations | Grab Sample at 1-4 locations/station | 1 period (Fall) | 30 |
| | C1,GF4,C2,E0,E1,E2, E3,E4,E5,E5A,E6,E7<br>12 Stations | | 1 period (Winter) | 25 |
| Water | All Stations | Grab Sample (PCB) (Fractioned Monthly) and TSS | Weekly | 434 |
| | RS3W1, RS3W2<br>2 Stations | | Semi-weekly | |
| | C1,GF1,GF2,GF4,C2,E0,E1E2, E3,E4,RS5W1,E5,E5A E6,E7,MR1,HR1<br>17 Stations | Dialysis Bags | Bi-weekly (July 2-July 19) | |
| | C1,GF4,C2,E0,E1,E2,E3,E4,RS 5W1,E5,E5A,E6,E7<br>13 Stations | Dialysis Bags | | 23 |
| Aquatic Biota | | | | |
| • Multiplate | C1,GF4,C2,E0,E1,E2,E3,E4,RS 5W1,E5,E5A,E6,E7<br>13 Stations | Periphyton and Silt Composite | 5-week intervals | 47 |
| • Caddisfly | GF4,C2,E5,E6,E7 | Macroinvertebrate Composite | 3 periods | 14 |
| • Fathead Minnow | C1,GF4,C2,E5,E6,E7 | Fish Assay Composite | 3-week intervals | 38 |
| Air Quality | Permanent Locations Network A2,A3,A4 | Particulate and Gaseous | Every 3 Days | 190 |
| | Site Containment Monitoring Network B2,B3,B4B,B5 | | Every 3 Days | 16 |

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**Table 11.** Summary statistics for Aroclor 1242 in sediment samples, Winter Construction Monitoring, January 1 to March 27, 1991.

| Station | Samples collected | Mean ug/g | Median ug/g | Min. ug/g | Max. ug/g | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|
| C-1 | 3 | 0.63 | 0.00 | 0.00 | 1.90 | 1.09 | 0.63 |
| GF-1 | 2 | 0.00 | | | | | |
| GF-2 | 2 | 0.00 | | | | | |
| GF-3 | 3 | 0.00 | | | | | |
| C-2 | 2 | 3.20 | 3.20 | 0.00 | 6.40 | 4.52 | 3.20 |
| E-0 | 1 | 14.00 | 14.00 | 14.00 | 14.00 | | |
| E-1 | 2 | 27.00 | 27.00 | 18.00 | 36.00 | 12.72 | 9.00 |
| E-2 | 1 | 20.00 | 20.00 | 20.00 | 20.00 | | |
| E-3 | 1 | 1.40 | 1.40 | 1.40 | 1.40 | | |
| E-4 | 2 | 3.40 | 3.40 | 1.80 | 5.00 | 2.26 | 1.60 |
| E-5 | 2 | 29.80 | 29.80 | 1.60 | 58.00 | 39.88 | 28.22 |
| E-5A | 3 | 21.66 | 12.00 | 5.00 | 48.00 | 23.07 | 13.32 |
| E-6 | 3 | 10.46 | 8.10 | 6.30 | 17.00 | 5.72 | 3.30 |
| E-7 | 3 | 1.12 | 1.00 | 0.87 | 1.50 | 0.33 | 0.19 |
| HR-1 | 2 | 1.10 | 1.10 | 0.50 | 1.70 | 0.84 | 0.60 |

Table 12. Summary statistics for Aroclor 1254 in sediment samples, Winter Construction Monitoring, January 1 to March 27, 1991.

| Station | Samples collected | Mean ug/g | Median ug/g | Min. ug/g | Max. ug/g | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|
| C-1 | 3 | 0.17 | 0.19 | 0.08 | 0.25 | 0.08 | 0.04 |
| GF-1 | 2 | 0.16 | 0.16 | 0.14 | 0.18 | 0.02 | 0.02 |
| GF-2 | 2 | 0.05 | 0.05 | 0.00 | 0.10 | 0.07 | 0.05 |
| GF-3 | 3 | 0.00 | | | | | |
| C-2 | 2 | 0.50 | 0.50 | 0.00 | 1.00 | 0.70 | 0.50 |
| E-0 | 1 | 1.30 | 1.30 | 1.30 | 1.30 | | |
| E-1 | 2 | 3.65 | 3.65 | 2.90 | 4.40 | 1.06 | 0.75 |
| E-2 | 1 | 2.80 | 2.80 | 2.80 | 2.80 | | |
| E-3 | 1 | 0.19 | 0.19 | 0.19 | 0.19 | | |
| E-4 | 2 | 0.83 | 0.83 | 0.37 | 1.30 | 0.65 | 0.46 |
| E-5 | 2 | 8.22 | 8.22 | 0.45 | 16.00 | 10.99 | 7.77 |
| E-5A | 3 | 4.43 | 2.70 | 1.00 | 9.60 | 4.55 | 2.62 |
| E-6 | 3 | 0.99 | 0.86 | 0.83 | 1.30 | 0.26 | 0.15 |
| E-7 | 3 | 0.29 | 0.31 | 0.26 | 0.32 | 0.03 | 0.01 |
| HR-1 | 2 | 0.21 | 0.21 | 0.20 | 0.23 | 0.02 | 0.01 |

Table 13. Summary of mean PCB concentrations in Winter Construction sediment samples, January 1 to March 27, 1991.

| Station | Number of samples | Aroclor 1242 ug/g | % of total PCB | Aroclor 1254 ug/g | % of total PCB | Total PCB |
|---|---|---|---|---|---|---|
| C-1 | 3 | 0.63 | 29.45 | 0.17 | 70.54 | 0.80 |
| GF-1 | 2 | N.D. | 0.00 | 0.16 | 100.00 | 0.16 |
| GF-2 | 2 | N.D. | 0.00 | 0.05 | 100.00 | 0.05 |
| GF-3 | 3 | N.D. | | N.D. | | N.D. |
| C-2 | 2 | 3.20 | 86.40 | 0.50 | 13.50 | 3.70 |
| E-0 | 1 | 14.00 | 91.50 | 1.30 | 8.49 | 15.30 |
| E-1 | 2 | 27.00 | 87.60 | 3.65 | 12.38 | 30.65 |
| E-2 | 1 | 20.00 | 87.70 | 2.80 | 12.28 | 22.80 |
| E-3 | 1 | 1.40 | 88.00 | 0.19 | 11.95 | 1.59 |
| E-4 | 2 | 3.40 | 81.15 | 0.83 | 18.84 | 4.23 |
| E-5 | 2 | 29.80 | 78.20 | 8.22 | 21.78 | 38.00 |
| E-5A | 3 | 21.66 | 82.76 | 4.43 | 17.20 | 26.10 |
| E-6 | 1 | 10.46 | 90.50 | 0.99 | 9.47 | 11.46 |
| E-7 | 3 | 1.12 | 78.44 | 0.29 | 21.55 | 1.42 |
| HR-1 | 2 | 1.10 | 79.75 | 0.21 | 20.24 | 1.31 |

Table 14. Summary statistics for Aroclor 1242 in sediment samples, Spring Construction Monitoring, March 28 to June 28, 1991.

| Station | Samples collected | Mean ug/g | Median ug/g | Min. ug/g | Max. ug/g | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|
| C-1 | 6 | 0.00 | | | | | |
| GF-1 | 6 | 0.19 | 0.11 | 0.00 | 0.67 | 0.24 | 0.09 |
| GF-2 | 4 | 0.00 | | | | | |
| GF-3 | 6 | 0.00 | | | | | |
| GF-4 | 4 | 0.00 | | | | | |
| C-2 | 4 | 3.49 | 3.55 | 0.27 | 6.60 | 2.99 | 1.49 |
| E-0 | 1 | 4.80 | 4.80 | 4.80 | 4.80 | | |
| E-1 | 1 | 11.00 | 11.00 | 11.00 | 11.00 | | |
| E-2 | 1 | 21.00 | 21.00 | 21.00 | 21.00 | | |
| E-3 | 1 | 1.50 | 1.50 | 1.50 | 1.50 | | |
| E-4 | 2 | 3.20 | 3.20 | 2.80 | 3.60 | 0.56 | 0.40 |
| E-5 | 2 | 19.93 | 19.93 | 0.87 | 39.00 | 26.96 | 19.06 |
| E-5A | 3 | 18.16 | 17.00 | 4.50 | 33.00 | 14.28 | 8.24 |
| E-6 | 6 | 15.56 | 10.45 | 5.60 | 44.00 | 14.28 | 5.83 |
| E-7 | 6 | 0.61 | 0.48 | 0.32 | 1.11 | 0.32 | 0.13 |
| HR-1 | 4 | 0.58 | 0.54 | 0.20 | 1.04 | 0.34 | 0.17 |
| MR-1 | 6 | 0.00 | | | | | |

Table 15. Summary statistics for Aroclor 1254 in sediment samples, Spring Construction Monitoring, March 28 to June 28, 1991.

| Station | Samples collected | Mean ug/g | Median ug/g | Min. ug/g | Max. ug/g | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|
| C-1 | 6 | 0.11 | 0.06 | 0.00 | 0.27 | 0.11 | 0.04 |
| GF-1 | 6 | 0.06 | 0.07 | 0.00 | 0.14 | 0.05 | 0.02 |
| GF-2 | 4 | 0.04 | 0.03 | 0.00 | 0.09 | 0.04 | 0.02 |
| GF-3 | 6 | 0.00 | | | | | |
| GF-4 | 4 | 0.00 | | | | | |
| C-2 | 4 | 0.31 | 0.08 | 0.00 | 1.10 | 0.52 | 0.26 |
| E-0 | 1 | 0.81 | 0.81 | 0.81 | 0.81 | | |
| E-1 | 1 | 2.10 | 2.10 | 2.10 | 2.10 | | |
| E-2 | 1 | 3.30 | 3.30 | 3.30 | 3.30 | | |
| E-3 | 1 | 0.15 | 0.15 | 0.15 | 0.15 | | |
| E-4 | 2 | 0.69 | 0.69 | 0.55 | 0.83 | 0.19 | 0.14 |
| E-5 | 2 | 4.77 | 4.77 | 0.24 | 9.30 | 6.40 | 4.53 |
| E-5A | 3 | 2.39 | 1.60 | 0.88 | 4.70 | 2.02 | 1.17 |
| E-6 | 6 | 1.39 | 1.60 | 0.00 | 2.40 | 0.91 | 0.37 |
| E-7 | 6 | 0.14 | 0.13 | 0.00 | 0.26 | 0.08 | 0.03 |
| HR-1 | 4 | 0.07 | 0.06 | 0.00 | 0.16 | 0.08 | 0.04 |
| MR-1 | 6 | 0.09 | 0.09 | 0.05 | 0.17 | 0.04 | 0.01 |

Table 16. Summary of mean PCB concentrations in Spring Construction sediment samples, March 28 to June 28, 1991.

| Station | Number of samples | Aroclor 1242 ug/g | % of total PCB | Aroclor 1254 ug/g | % of total PCB | Total PCB |
|---|---|---|---|---|---|---|
| C-1 | 6 | N.D. | 0.00 | 0.11 | 100.00 | 0.11 |
| GF-1 | 4 | N.D. | 0.00 | 0.04 | 100.00 | 0.04 |
| GF-3 | 6 | N.D. | | N.D. | | N.D. |
| GF-4 | 4 | N.D. | | N.D. | | N.D. |
| C-2 | 4 | 3.49 | 94.20 | 0.31 | 5.72 | 3.80 |
| E-0 | 1 | 4.80 | 85.50 | 0.81 | 14.40 | 5.61 |
| E-1 | 1 | 11.00 | 83.90 | 2.10 | 16.00 | 13.10 |
| E-2 | 1 | 21.00 | 86.40 | 3.30 | 13.50 | 24.30 |
| E-3 | 1 | 1.50 | 90.90 | 0.15 | 9.09 | 1.65 |
| E-4 | 2 | 3.20 | 82.40 | 0.69 | 17.50 | 3.89 |
| E-5 | 2 | 19.90 | 79.50 | 4.77 | 20.40 | 24.70 |
| E-5A | 3 | 18.10 | 87.50 | 2.39 | 12.40 | 20.50 |
| E-6 | 6 | 15.50 | 88.10 | 1.38 | 11.80 | 16.90 |
| E-7 | 6 | 0.61 | 78.8 | 0.14 | 21.1 | 0.75 |
| HR-1 | 4 | 0.58 | 83.80 | 0.07 | 16.11 | 0.65 |
| MR-1 | 6 | N.D. | 0.00 | 0.09 | 100.00 | 0.09 |

Table 17. Summary statistics for Aroclor 1242 in sediment samples, Post Containment Monitoring, June 29 to November 27, 1991.

| Station | Samples collected | Mean ug/g | Median ug/g | Min. ug/g | Max. ug/g | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|
| C-1 | 6 | 0.00 | | | | | |
| GF-1 | 3 | 0.35 | 0.21 | 0.00 | 0.85 | 0.44 | 0.25 |
| GF-2 | 2 | 0.00 | | | | | |
| GF-4 | 4 | 0.00 | | | | | |
| C-2 | 5 | 6.28 | 5.10 | 0.00 | 16.00 | 5.88 | 2.63 |
| E-0 | 4 | 13.42 | 10.50 | 6.70 | 26.00 | 9.03 | 4.51 |
| E-1 | 3 | 7.60 | 6.90 | 6.40 | 9.50 | 1.66 | 0.96 |
| E-2 | 3 | 12.06 | 14.00 | 5.20 | 17.00 | 6.13 | 3.54 |
| E-3 | 3 | 1.28 | 0.67 | 0.48 | 2.70 | 1.23 | 0.71 |
| E-4 | 6 | 3.82 | 1.83 | 0.16 | 13.00 | 4.96 | 2.02 |
| E-5 | 6 | 26.93 | 23.65 | 2.10 | 55.00 | 26.73 | 10.91 |
| E-5A | 9 | 13.46 | 11.00 | 2.10 | 31.00 | 9.81 | 3.27 |
| E-6 | 6 | 12.88 | 12.40 | 6.70 | 20.00 | 5.95 | 2.43 |
| E-7 | 9 | 0.21 | 0.47 | 0.21 | 3.30 | 1.06 | 0.35 |

Table 18. Summary statistics for Aroclor 1254 in sediment samples, Post Containment Monitoring, June 29 to November 27, 1991.

| Station | Samples collected | Mean ug/g | Median ug/g | Min. ug/g | Max. ug/g | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|
| C-1 | 6 | 0.04 | 0.05 | 0.00 | 0.08 | 0.03 | 0.01 |
| GF-1 | 3 | 0.15 | 0.16 | 0.00 | 0.29 | 0.14 | 0.08 |
| GF-2 | 2 | 0.03 | 0.03 | 0.00 | 0.06 | 0.04 | 0.03 |
| GF-4 | 4 | 0.00 | | | | | |
| C-2 | 5 | 0.63 | 0.84 | 0.00 | 1.30 | 0.57 | 0.25 |
| E-0 | 4 | 1.30 | 0.70 | 0.00 | 3.80 | 1.79 | 0.89 |
| E-1 | 3 | 1.66 | 1.70 | 1.50 | 1.80 | 0.15 | 0.08 |
| E-2 | 3 | 2.06 | 2.30 | 1.30 | 2.60 | 0.68 | 0.39 |
| E-3 | 3 | 0.00 | | | | | |
| E-4 | 6 | 0.65 | 0.05 | 0.00 | 3.00 | 1.19 | 0.48 |
| E-5 | 6 | 5.86 | 4.55 | 0.53 | 16.00 | 6.28 | 2.56 |
| E-5A | 9 | 2.04 | 1.80 | 0.00 | 4.70 | 1.43 | 0.47 |
| E-6 | 6 | 1.48 | 1.70 | 0.00 | 2.80 | 1.25 | 0.51 |
| E-7 | 9 | 0.19 | 0.15 | 0.00 | 0.71 | 0.21 | 0.07 |

Table 19. Summary of mean PCB concentrations in Post Containment sediment samples, June 29 to November 27, 1991.

| Station | Number of samples | Aroclor 1242 ug/g | % of total PCB | Aroclor 1254 ug/g | % of total PCB | Total PCB |
|---|---|---|---|---|---|---|
| C-1 | 6 | N.D. | 0.00 | 0.04 | 100.00 | 0.04 |
| GF-1 | 3 | 0.35 | 65.60 | 0.15 | 34.30 | 0.50 |
| GF-2 | 2 | N.D. | 0.00 | 0.03 | 100.00 | 0.03 |
| GF-4 | 4 | N.D. | | N.D. | | N.D. |
| C-2 | 5 | 6.28 | 70.00 | 0.63 | 29.90 | 6.91 |
| E-0 | 4 | 13.40 | 92.40 | 1.30 | 7.50 | 14.72 |
| E-1 | 3 | 7.60 | 81.70 | 1.60 | 18.20 | 9.26 |
| E-2 | 3 | 12.00 | 84.20 | 2.00 | 15.70 | 14.10 |
| E-3 | 3 | 1.28 | 100.00 | N.D. | 0.00 | 1.28 |
| E-4 | 6 | 3.82 | 89.90 | 0.65 | 10.10 | 4.47 |
| E-5 | 6 | 26.93 | 81.00 | 5.86 | 18.90 | 32.70 |
| E-5A | 9 | 13.40 | 86.20 | 2.04 | 13.70 | 15.50 |
| E-6 | 6 | 12.80 | 89.30 | 1.48 | 10.60 | 14.30 |
| E-7 | 9 | 1.07 | 81.00 | 0.19 | 18.90 | 1.26 |

Table 20 : Summary statistics for Aroclor 1242 in water grab samples, Winter Construction monitoring, January 1 to March 27, 1991.

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean ug/L | Median ug/L | Min. ug/L | Max. ug/L | Std. dev. of mean |
|---|---|---|---|---|---|---|---|---|
| C-1 | 12 | 0 | 0 | -- | | | | |
| GF-3 | 1 | 0 | 0 | -- | | | | |
| GF-4 | 14 | 0 | 0 | -- | | | | |
| C-2 | 1 | 0 | 0 | -- | | | | |
| E-1 | 12 | 0 | 0 | -- | | | | |
| E-3 | 12 | 0 | 0 | -- | | | | |
| E-4 | 12 | 0 | 0 | -- | | | | |
| E-4A | 12 | 0 | 0 | -- | | | | |
| E-5 | 13 | 0 | 0 | -- | | | | |
| E-7 | 11 | 0 | 0 | -- | | | | |
| E-7T | 13 | 0 | 0 | -- | | | | |
| RS2W1 | 36 | 0 | 0 | -- | | | | |
| RS2W2 | 24 | 0 | 0 | -- | | | | |
| RS3W1 | 31 | 2 | 6.5 | 5.475 | 5.472 | 0.95 | 10.00 | 6.399 |
| RS3W2 | 28 | 1 | 3.6 | 0.120 | 0.120 | 0.12 | 0.12 | N.A. |
| RS4W1 | 66 | 0 | 0 | -- | | | | |
| RS4W2 | 66 | 2 | 3.0 | 0.145 | 0.145 | 0.11 | 0.18 | 0.049 |
| RS5W1 | 11 | 0 | 0 | -- | | | | |
| RS5W2 | 11 | 0 | 0 | -- | | | | |
| DS-1 | 12 | 0 | 0 | -- | | | | |
| MR-1 | 1 | 0 | 0 | -- | | | | |
| HR-1 | 1 | 0 | 0 | -- | | | | |
| Totals | 400 | 5 | 1.3 | 2.272 | 0.180 | 0.11 | 10.00 | 4.334 |

Table 21 : Summary statistics for Aroclor 1254 in water grab samples, Winter Construction monitoring, January 1 to March 27, 1991.

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean ug/L | Median ug/L | Min. ug/L | Max. ug/L | Std. dev. of mean |
|---|---|---|---|---|---|---|---|---|
| C-1 | 12 | 0 | 0 | -- | | | | |
| GF-3 | 1 | 0 | 0 | -- | | | | |
| GF-4 | 14 | 1 | 7.1 | 0.300 | 0.30 | 0.30 | 0.30 | N.A. |
| C-2 | 1 | 0 | 0 | -- | | | | |
| E-1 | 12 | 0 | 0 | -- | | | | |
| E-3 | 12 | 0 | 0 | -- | | | | |
| E-4 | 12 | 0 | 0 | -- | | | | |
| E-4A | 12 | 0 | 0 | -- | | | | |
| E-5 | 13 | 0 | 0 | -- | | | | |
| E-7 | 11 | 0 | 0 | -- | | | | |
| E-7T | 13 | 0 | 0 | -- | | | | |
| RS2W1 | 36 | 0 | 0 | -- | | | | |
| RS2W2 | 24 | 0 | 0 | -- | | | | |
| RS3W1 | 31 | 1 | 3.2 | 0.490 | 0.49 | 0.49 | 0.49 | N.A. |
| RS3W2 | 28 | 1 | 3.6 | 0.300 | 0.30 | 0.30 | 0.30 | N.A. |
| RS4W1 | 66 | 0 | 0 | -- | | | | |
| RS4W2 | 66 | 0 | 0 | -- | | | | |
| RS5W1 | 11 | 0 | 0 | -- | | | | |
| RS5W2 | 11 | 0 | 0 | -- | | | | |
| DS-1 | 12 | 0 | 0 | -- | | | | |
| MR-1 | 1 | 0 | 0 | -- | | | | |
| HR-1 | 1 | 0 | 0 | -- | | | | |
| Totals | 400 | 3 | 0.8 | 0.363 | 0.300 | 0.30 | 0.49 | 0.110 |

Table 22 : Summary statistics for Aroclor 1242 in water grab samples, Spring Construction monitoring, March 28 to June 28, 1991.

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean ug/L | Median ug/L | Min. ug/L | Max. ug/L | Std. dev. of mean |
|---|---|---|---|---|---|---|---|---|
| C-1 | 15 | 0 | 0 | -- | | | | |
| GF-1 | 15 | 0 | 0 | -- | | | | |
| GF-2 | 14 | 0 | 0 | -- | | | | |
| GF-3 | 15 | 0 | 0 | -- | | | | |
| GF-4 | 14 | 0 | 0 | -- | | | | |
| C-2 | 13 | 0 | 0 | -- | | | | |
| E-0 | 15 | 3 | 20.0 | 0.140 | 0.130 | 0.13 | 0.16 | 0.017 |
| E-1 | 14 | 1 | 7.1 | 0.410 | 0.410 | 0.41 | 0.41 | N.A. |
| E-2 | 15 | 1 | 6.7 | 0.240 | 0.240 | 0.24 | 0.24 | N.A. |
| E-3 | 16 | 1 | 6.3 | 0.140 | 0.140 | 0.14 | 0.14 | N.A. |
| E-4 | 16 | 1 | 6.3 | 0.290 | 0.290 | 0.29 | 0.29 | N.A. |
| E-4A | 5 | 0 | 0 | -- | | | | |
| E-5 | 15 | 1 | 6.7 | 0.470 | 0.470 | 0.47 | 0.47 | N.A. |
| E-5A | 14 | 0 | 0 | -- | | | | |
| E-6 | 17 | 0 | 0 | -- | | | | |
| E-7 | 14 | 0 | 0 | -- | | | | |
| E-7R | 12 | 0 | 0 | -- | | | | |
| E-7T | 14 | 0 | 0 | -- | | | | |
| HR-1 | 15 | 0 | 0 | -- | | | | |
| MR-1 | 14 | 0 | 0 | -- | | | | |
| RS2W1 | 15 | 1 | 6.7 | 0.350 | 0.350 | 0.35 | 0.35 | N.A. |
| RS3W1 | 29 | 13 | 44.8 | 0.155 | 0.140 | 0.10 | 0.30 | 0.050 |
| RS3W2 | 28 | 5 | 17.9 | 0.142 | 0.140 | 0.11 | 0.19 | 0.031 |
| RS4W1 | 21 | 0 | 0 | -- | | | | |
| RS4W2 | 21 | 0 | 0 | -- | | | | |
| RS5W1 | 14 | 3 | 21.4 | 0.123 | 0.130 | 0.10 | 0.14 | 0.021 |
| RS5W2 | 15 | 1 | 6.7 | 0.100 | 0.100 | 0.10 | 0.10 | N.A. |
| DS-1 | 15 | 0 | 0 | -- | | | | |
| Totals | 440 | 31 | 7.0 | 0.178 | 0.140 | 0.10 | 0.47 | 0.092 |

Table 23 : Summary statistics for Aroclor 1242 in water grab samples, Post-Containment monitoring, June 29 to November 27, 1991.

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean ug/L | Median ug/L | Min. ug/L | Max. ug/L | Std. dev. of mean |
|---|---|---|---|---|---|---|---|---|
| C-1 | 25 | 0 | 0 | -- | | | | |
| GF-4 | 24 | 0 | 0 | -- | | | | |
| C-2 | 24 | 6 | 25.0 | 0.545 | 0.425 | 0.10 | 1.40 | 0.501 |
| E-0 | 23 | 7 | 30.4 | 0.684 | 0.550 | 0.10 | 1.91 | 0.679 |
| E-1 | 23 | 6 | 26.1 | 0.443 | 0.335 | 0.12 | 1.10 | 0.371 |
| E-2 | 24 | 6 | 25.0 | 0.637 | 0.255 | 0.13 | 2.00 | 0.737 |
| E-3 | 24 | 6 | 25.0 | 0.695 | 0.555 | 0.10 | 1.40 | 0.561 |
| E-4 | 22 | 5 | 22.7 | 0.614 | 0.380 | 0.22 | 1.50 | 0.531 |
| E-5 | 23 | 6 | 26.1 | 0.470 | 0.465 | 0.22 | 0.71 | 0.199 |
| E-5A | 23 | 6 | 26.1 | 0.460 | 0.355 | 0.24 | 1.01 | 0.292 |
| E-6 | 23 | 7 | 30.4 | 0.550 | 0.390 | 0.10 | 1.40 | 0.455 |
| E-7 | 24 | 6 | 25.0 | 0.203 | 0.165 | 0.11 | 0.32 | 0.093 |
| E-7R | 2 | 0 | 0 | -- | | | | |
| E-7T | 2 | 0 | 0 | -- | | | | |
| RS2W1 | 22 | 6 | 27.3 | 0.648 | 0.360 | 0.11 | 1.80 | 0.643 |
| RS3W1 | 27 | 16 | 59.3 | 0.618 | 0.190 | 0.10 | 5.30 | 1.296 |
| RS3W2 | 27 | 14 | 51.9 | 0.364 | 0.160 | 0.10 | 1.80 | 0.471 |
| RS5W1 | 24 | 8 | 33.3 | 0.679 | 0.330 | 0.10 | 1.80 | 0.672 |
| RS5W2 | 22 | 7 | 31.8 | 0.507 | 0.330 | 0.11 | 1.50 | 0.495 |
| DS-1 | 23 | 7 | 30.4 | 0.491 | 0.250 | 0.10 | 1.60 | 0.536 |
| Totals | 431 | 119 | 27.6 | 0.535 | 0.290 | 0.10 | 5.30 | 0.654 |

Table 24 : Summary statistics for Aroclor 1254 in water grab samples, Post-Containment monitoring, June 29 to November 27, 1991.

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean ug/L | Median ug/L | Min. ug/L | Max. ug/L | Std. dev. of mean |
|---|---|---|---|---|---|---|---|---|
| C-1 | 25 | 0 | 0 | -- | | | | |
| GF-4 | 24 | 0 | 0 | -- | | | | |
| C-2 | 24 | 0 | 0 | -- | | | | |
| E-0 | 23 | 1 | 4.3 | 0.230 | 0.230 | 0.23 | 0.23 | |
| E-1 | 23 | 0 | 0 | -- | | | | |
| E-2 | 24 | 0 | 0 | -- | | | | |
| E-3 | 24 | 0 | 0 | -- | | | | |
| E-4 | 22 | 0 | 0 | -- | | | | |
| E-5 | 23 | 0 | 0 | -- | | | | |
| E-5A | 23 | 1 | 4.3 | 0.100 | 0.100 | 0.10 | 0.10 | |
| E-6 | 23 | 0 | 0 | -- | | | | |
| E-7 | 24 | 0 | 0 | -- | | | | |
| E-7R | 2 | 0 | 0 | -- | | | | |
| E-7T | 2 | 0 | 0 | -- | | | | |
| RS2W1 | 22 | 0 | 0 | -- | | | | |
| RS3W1 | 27 | 0 | 0 | -- | | | | |
| RS3W2 | 27 | 0 | 0 | -- | | | | |
| RS5W1 | 24 | 0 | 0 | -- | | | | |
| RS5W2 | 22 | 0 | 0 | -- | | | | |
| DS-1 | 23 | 0 | 0 | -- | | | | |
| Totals | 431 | 2 | 0.5 | 0.165 | 0.165 | 0.10 | 0.23 | 0.092 |

Table 25 : Summary of all 1991 Aroclor 1248 and 1254 "hits"

| Station | Aroclor Type | Concentration ug/L | Date |
|---|---|---|---|
| RS3W1 | 1254 | 0.49 | 03/13/91 |
| RS3W1 | 1248 | 0.14 | 08/29/91 |
| RS3W2 | 1254 | 0.30 | 01/09/91 |
| GF4 | 1254 | 0.30 | 02/13/91 |
| E0 | 1254 | 0.23 | 10/24/91 |
| E5A | 1254 | 0.10 | 10/24/91 |

Table 26 : Summary statistics for Aroclors in all 1991 water grab samples

| Sampling Period | Total Samples | Aroclor 1242 | | Aroclor 1248 | | Aroclor 1254 | |
|---|---|---|---|---|---|---|---|
| | | Count | Percent | Count | Percent | Count | Percent |
| Winter-Construction | 400 | 5 | 1.3 | 0 | 0.0 | 3 | 0.8 |
| Spring-Construction | 441 | 31 | 7.0 | 0 | 0.0 | 0 | 0.0 |
| Post-Containment | 433 | 119 | 27.5 | 1 | 0.2 | 2 | 0.5 |
| 1991 Totals | 1274 | 155 | 12.2 | 1 | 0.1 | 5 | 0.4 |

**Table 27** Pearson correlation matrix of relationships between Aroclors 1242 and 1254 in water, precipitation, and Hudson River Discharge

| | A1242 | A1254 | PRECIP[a] | FTED Q[b] | SACAN Q[c] | SPIER Q[d] |
|---|---|---|---|---|---|---|
| A1242 | 1.000 | | | | | |
| A1254 | 1.000[2] | 1.000 | | | | |
| PRECIP | 0.186 | 0.072 | 1.000 | | | |
| FTED Q | 0.302[1] | 0.864 | 0.113 | 1.000 | | |
| SCAN Q | 0.244[1] | 0.608 | 0.117 | 0.378[1] | 1.000 | |
| SPIER Q | 0.210[1] | 0.762 | 0.085 | 0.967[1] | 0.409[1] | 1.000 |

1 - Correlation significant at P [illegible] 0.05 level
2 - Only two data points in correlation
a - Precipitation at Glens Falls
b - Discharge of Hudson River at Ft. Edward
c - Discharge from Sacandaga Reservoir
d - Discharge of Hudson River at Spier Falls

Table 28 : Summary of Regression Statistics for Detectable Aroclor 1242 Concentrations and Hudson River Discharge

| | All of 1991 | | | | | | | Spring Construction, 1991 | | | | | | | Post-Containment, 1991 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ft. Edward | | Spier Falls | | Sacandaga | | | Ft. Edward | | Spier Falls | | Sacandaga | | | Ft. Edward | | Spier Falls | | Sacandaga | |
| Station | n | r | P | r | P | r | P | n | r | P | r | P | r | P | n | r | P | r | P | r | P |
| all pooled | 155 | 0.301 | < 0.001 | 0.210 | 0.009 | 0.244 | 0.002 | 31 | -0.077 | 0.682 | -0.143 | 0.442 | -0.066 | 0.724 | 119 | 0.369 | < 0.001 | 0.315 | < 0.001 | 0.381 | < 0.001 |
| C1 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| C2 | 6 | 0.666 | 0.149 | 0.450 | 0.371 | 0.730 | 0.099 | insufficient points for regression analysis | | | | | | | 6 | 0.666 | 0.149 | 0.450 | 0.371 | 0.730 | 0.099 |
| GF1 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| GF2 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| GF3 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| GF4 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| E0 | 10 | -0.144 | 0.692 | -0.157 | 0.665 | 0.458 | 0.183 | 3 | -0.843 | 0.361 | -0.899 | 0.289 | co-linear | | 7 | 0.736 | 0.059 | 0.713 | 0.072 | 0.315 | 0.492 |
| E1 | 7 | 0.384 | 0.395 | 0.295 | 0.521 | 0.548 | 0.203 | insufficient points for regression analysis | | | | | | | 6 | 0.392 | 0.442 | 0.293 | 0.574 | 0.584 | 0.224 |
| E2 | 7 | 0.267 | 0.562 | 0.243 | 0.600 | 0.949 | 0.001 | insufficient points for regression analysis | | | | | | | 6 | 0.277 | 0.594 | 0.197 | 0.708 | 0.947 | 0.004 |
| E3 | 7 | 0.355 | 0.434 | 0.261 | 0.572 | 0.300 | 0.513 | insufficient points for regression analysis | | | | | | | 6 | 0.444 | 0.378 | 0.247 | 0.637 | 0.172 | 0.745 |
| E4 | 6 | -0.133 | 0.831 | -0.218 | 0.678 | 0.627 | 0.183 | insufficient points for regression analysis | | | | | | | 5 | 0.234 | 0.704 | 0.093 | 0.882 | 0.974 | 0.005 |
| E5 | 7 | 0.448 | 0.313 | 0.450 | 0.311 | 0.752 | 0.051 | insufficient points for regression analysis | | | | | | | 6 | 0.604 | 0.204 | 0.639 | 0.172 | 0.760 | 0.067 |
| E5A | 6 | 0.289 | 0.578 | 0.198 | 0.710 | 0.768 | 0.076 | insufficient points for regression analysis | | | | | | | 6 | 0.289 | 0.578 | 0.198 | 0.710 | 0.768 | 0.076 |
| E6 | 7 | 0.157 | 0.737 | 0.017 | 0.972 | 0.564 | 0.187 | insufficient points for regression analysis | | | | | | | 7 | 0.157 | 0.737 | 0.017 | 0.972 | 0.564 | 0.187 |
| E7 | 6 | -0.207 | 0.694 | -0.107 | 0.841 | -0.032 | 0.952 | insufficient points for regression analysis | | | | | | | 6 | -0.207 | 0.694 | -0.107 | 0.841 | -0.032 | 0.952 |
| RS2W1 | 7 | 0.357 | 0.432 | 0.383 | 0.398 | 0.648 | 0.155 | insufficient points for regression analysis | | | | | | | 6 | 0.382 | 0.454 | 0.368 | 0.473 | 0.638 | 0.173 |
| RS2W2 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| RS3W1 | 31 | 0.507 | 0.004 | 0.407 | 0.023 | 0.340 | 0.061 | 13 | -0.422 | 0.151 | -0.345 | 0.248 | 0.139 | 0.650 | 16 | 0.669 | 0.005 | 0.735 | 0.001 | 0.213 | 0.428 |
| RS3W2 | 20 | 0.029 | 0.902 | -0.044 | 0.854 | -0.029 | 0.904 | 5 | -0.279 | 0.649 | -0.332 | 0.585 | -0.194 | 0.755 | 14 | 0.443 | 0.122 | 0.431 | 0.124 | 0.233 | 0.423 |
| RS4W1 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| RS4W2 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| RS5W1 | 11 | -0.017 | 0.961 | -0.081 | 0.813 | 0.332 | 0.318 | 3 | 0.774 | 0.437 | 0.666 | 0.536 | -0.277 | 0.821 | 8 | 0.494 | 0.214 | 0.439 | 0.277 | 0.582 | 0.130 |
| RS5W2 | 8 | 0.547 | 0.160 | 0.496 | 0.211 | 0.253 | 0.545 | insufficient points for regression analysis | | | | | | | 7 | 0.466 | 0.269 | 0.478 | 0.278 | 0.464 | 0.294 |
| DS1 | 7 | 0.357 | 0.432 | 0.271 | 0.557 | 0.651 | 0.114 | insufficient points for regression analysis | | | | | | | 7 | 0.357 | 0.432 | 0.271 | 0.557 | 0.651 | 0.114 |
| HR1 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |
| MR1 | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | | insufficient points for regression analysis | | | | | | |

Table 29 : Summary of Regression Statistics for Correlations between Aroclor 1242 Concentrations in 1991 Grab Water Samples and Precipitation at Glen Falls (detection limit > 0.1ug/L)

| | All 1991 Data | | | 1991 Winter Construction | | | 1991 Spring Construction | | | 1991 Post-Containment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | n | r | P | n | r | P | n | r | P | n | r | P |
| all pooled | 146 | 0.183 | 0.027 | 5 | -0.280 | 0.648 | 25 | -0.063 | 0.765 | 116 | 0.363 | <0.001 |
| C2 | 6 | -0.647 | 0.165 | insufficient data | | | insufficient data | | | 6 | -0.647 | 0.165 |
| E0 | 8 | 0.382 | 0.350 | insufficient data | | | insufficient data | | | 7 | 0.338 | 0.458 |
| RS2W1 | 7 | 0.654 | 0.111 | insufficient data | | | insufficient data | | | 6 | 0.639 | 0.172 |
| RS3W1 | 28 | 0.018 | 0.929 | insufficient data | | | 10 | 0.044 | 0.903 | 16 | 0.137 | 0.613 |
| E1 | 7 | 0.541 | 0.210 | insufficient data | | | insufficient data | | | 6 | 0.558 | 0.250 |
| RS3W2 | 18 | 0.467 | 0.051 | insufficient data | | | 5 | 0.862 | 0.061 | 12 | 0.827 | 0.001 |
| E2 | 6 | 0.664 | 0.151 | insufficient data | | | insufficient data | | | 5 | 0.627 | 0.258 |
| E3 | 7 | 0.442 | 0.321 | insufficient data | | | insufficient data | | | 6 | 0.367 | 0.475 |
| RS5W1 | 11 | 0.801 | 0.003 | insufficient data | | | 3 | 0.693 | 0.512 | 8 | 0.760 | 0.029 |
| E4 | 5 | 0.624 | 0.261 | insufficient data | | | insufficient data | | | 5 | 0.624 | 0.261 |
| RS5W2 | 8 | 0.745 | 0.034 | insufficient data | | | insufficient data | | | 7 | 0.720 | 0.068 |
| DS1 | 7 | 0.662 | 0.105 | insufficient data | | | insufficient data | | | 7 | 0.662 | 0.105 |
| E5 | 7 | -0.185 | 0.692 | insufficient data | | | insufficient data | | | 6 | -0.195 | 0.711 |
| E5A | 6 | 0.633 | 0.177 | insufficient data | | | insufficient data | | | 6 | 0.633 | 0.177 |
| E6 | 7 | -0.048 | 0.919 | insufficient data | | | insufficient data | | | 7 | -0.048 | 0.919 |
| E7 | 6 | 0.584 | 0.224 | insufficient data | | | insufficient data | | | 6 | 0.548 | 0.224 |

Table 30. Proportion of construction monitoring water sampling dates with detectable PCB on which precipitation occurred.

| Station | Total number of samples | Samples on days with precipitation | Percentage sampled during precipitation | Samples with detectable PCB | Samples on days with precipitation | Percentage on days with precipitation |
|---|---|---|---|---|---|---|
| C-2 | 37 | 13 | 40.6 | 0 | -- | |
| E-0 | 37 | 14 | 42.4 | 6 | 2 | 50.0 |
| E-1 | 53 | 25 | 51.0 | 1 | 0 | 0.0 |
| E-2 | 37 | 15 | 45.5 | 3 | 0 | 0.0 |
| E-3 | 53 | 25 | 51.0 | 3 | 1 | 33.3 |
| E-4 | 52 | 24 | 50.0 | 3 | 0 | 0.0 |
| E-5 | 51 | 24 | 51.1 | 3 | 1 | 33.3 |
| E-5A | 35 | 15 | 48.4 | 3 | 2 | 66.7 |
| DS-1 | 48 | 21 | 47.7 | 2 | 1 | 50.0 |
| RS-2W1 | 135 | 65 | 49.6 | 12 | 4 | 33.3 |
| RS-3W1 | 189 | 78 | 44.1 | 83 | 32 | 39.5 |
| RS-3W2 | 185 | 77 | 44.5 | 81 | 40 | 49.4 |
| RS-5W1 | 151 | 65 | 44.2 | 40 | 17 | 42.5 |
| RS-5W2 | 155 | 67 | 44.4 | 6 | 2 | 33.3 |
| Summary | 1218 | 528 | 46.1 | 246 | 102 | 42.3 |

Proportions for all stations where instances of detectable PCB was found in April 1991 are calculated based on a reduced number of samples and/or number of samples with PCB, due to the absence of Weather Service precipitation records for Glens Falls.

Table 31 . Proportion of post-containment monitoring water sampling dates with detectable PCB on which precipitation occurred.

| Station | Total number of samples | Samples on days with precipitation | Percentage sampled during precipitation | Samples with detectable PCB | Samples on days with precipitation | Percentage on days with precipitation |
|---|---|---|---|---|---|---|
| C-2 | 22 | 10 | 45.5 | 8 | 5 | 62.5 |
| E-0 | 21 | 7 | 33.3 | 12 | 6 | 50.0 |
| E-1 | 22 | 8 | 36.4 | 10 | 7 | 70.0 |
| E-2 | 22 | 8 | 36.4 | 8 | 7 | 87.5 |
| E-3 | 22 | 8 | 36.4 | 10 | 7 | 70.0 |
| E-4 | 22 | 8 | 36.4 | 9 | 7 | 77.8 |
| E-5 | 22 | 8 | 36.4 | 7 | 6 | 85.7 |
| E-5A | 22 | 8 | 36.4 | 10 | 6 | 60.0 |
| DS-1 | 23 | 8 | 34.8 | 8 | 6 | 75.0 |
| RS-2W1 | 22 | 8 | 36.4 | 7 | 5 | 71.4 |
| RS-3W1 | 26 | 11 | 42.3 | 17 | 8 | 47.1 |
| RS-3W2 | 26 | 11 | 42.3 | 16 | 8 | 50.0 |
| RS-5W1 | 22 | 8 | 36.4 | 9 | 6 | 66.7 |
| RS-5W2 | 22 | 8 | 36.4 | 9 | 7 | 77.8 |
| Summary | 316 | 119 | 37.7 | 140 | 91 | 65.0 |

Table 32. Summary Statistics for Aroclor 1242 in Water Grab Samples
Winter Construction Monitoring - January 1 to March 27,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean u g/L | Median u g/L | Min. u g/L | Max. u g/L | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|---|---|
| C-1 | 12 | 0 | 0.0 | | | | | | |
| GF-3 | 1 | 0 | 0.0 | | | | | | |
| GF-4 | 14 | 0 | 0.0 | | | | | | |
| C-2 | 1 | 0 | 0.0 | | | | | | |
| RS-3W1 | 31 | 2 | 6.5 | 5.47 | 5.47 | 0.95 | 10.00 | 6.39 | 4.52 |
| RS-2W1 | 36 | 0 | 0.0 | | | | | | |
| E-1 | 12 | 0 | 0.0 | | | | | | |
| RS-2W2 | 24 | 0 | 0.0 | | | | | | |
| RS-3W2 | 28 | 1 | 3.6 | 0.12 | 0.12 | 0.12 | 0.12 | | |
| E-3 | 12 | 0 | 0.0 | | | | | | |
| RS-4W1 | 66 | 0 | 0.0 | | | | | | |
| E-4 | 12 | 0 | 0.0 | | | | | | |
| RS-4W2 | 66 | 2 | 3.0 | 0.14 | 0.14 | 0.11 | 0.18 | 0.04 | 0.03 |
| RS-5W1 | 11 | 1 | 9.1 | 0.08 | 0.08 | 0.08 | 0.08 | | |
| RS-5W2 | 11 | 1 | 9.1 | 0.07 | 0.07 | 0.07 | 0.07 | | |
| DS-1 | 12 | 1 | 8.3 | 0.05 | 0.05 | 0.05 | 0.05 | | |
| E-4A | 12 | 0 | 0.0 | | | | | | |
| E-5 | 13 | 1 | 7.7 | 0.08 | 0.08 | 0.08 | 0.08 | | |
| E-7 | 11 | 1 | 9.1 | 0.06 | 0.06 | 0.06 | 0.06 | | |
| E-7T | 13 | 0 | 0.0 | | | | | | |
| MR-1 | 1 | 0 | 0.0 | | | | | | |
| HR-1 | 1 | 0 | 0.0 | | | | | | |
| Totals | 400 | 10 | 2.5 | | | | | | |

Table 33. Summary Statistics for Aroclor 1248 in Water Grab Samples
Winter Construction Monitoring - January 1 to March 27,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable |
|---|---|---|---|
| C-1 | 12 | 0 | 0 |
| GF-3 | 1 | 0 | 0 |
| GF-4 | 14 | 0 | 0 |
| C-2 | 1 | 0 | 0 |
| RS-3W1 | 31 | 0 | 0 |
| RS-2W1 | 36 | 0 | 0 |
| E-1 | 12 | 0 | 0 |
| RS-2W2 | 24 | 0 | 0 |
| RS-3W2 | 28 | 0 | 0 |
| E-3 | 12 | 0 | 0 |
| RS-4W1 | 66 | 0 | 0 |
| E-4 | 12 | 0 | 0 |
| RS-4W2 | 66 | 0 | 0 |
| RS-5W1 | 11 | 0 | 0 |
| RS-5W2 | 11 | 0 | 0 |
| DS-1 | 12 | 0 | 0 |
| E-4A | 12 | 0 | 0 |
| E-5 | 13 | 0 | 0 |
| E-7 | 11 | 0 | 0 |
| E-7T | 13 | 0 | 0 |
| MR-1 | 1 | 0 | 0 |
| HR-1 | 1 | 0 | 0 |
| Totals | 400 | 0 | 0 |

Table 34. Summary Statistics for Aroclor 1254 in Water Grab Samples
Winter Construction Monitoring - January 1 to March 27,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean u g/L | Median u g/L | Min. u g/L | Max. u g/L |
|---|---|---|---|---|---|---|---|
| C-1 | 12 | 0 | 0.0 | | | | |
| GF-3 | 1 | 0 | 0.0 | | | | |
| GF-4 | 14 | 1 | 7.1 | 0.30 | 0.30 | 0.30 | 0.30 |
| C-2 | 1 | 0 | 0.0 | | | | |
| RS-3W1 | 31 | 1 | 3.2 | 0.49 | 0.49 | 0.49 | 0.49 |
| RS-2W1 | 36 | 0 | 0.0 | | | | |
| E-1 | 12 | 0 | 0.0 | | | | |
| RS-2W2 | 24 | 0 | 0.0 | | | | |
| RS-3W2 | 28 | 1 | 3.6 | 0.30 | 0.30 | 0.30 | 0.30 |
| E-3 | 12 | 0 | 0.0 | | | | |
| RS-4W1 | 66 | 0 | 0.0 | | | | |
| E-4 | 12 | 0 | 0.0 | | | | |
| RS-4W2 | 66 | 0 | 0.0 | | | | |
| RS-5W1 | 11 | 0 | 0.0 | | | | |
| RS-5W2 | 11 | 0 | 0.0 | | | | |
| DS-1 | 12 | 0 | 0.0 | | | | |
| E-4A | 12 | 0 | 0.0 | | | | |
| E-5 | 13 | 0 | 0.0 | | | | |
| E-7 | 11 | 0 | 0.0 | | | | |
| E-7T | 13 | 0 | 0.0 | | | | |
| MR-1 | 1 | 0 | 0.0 | | | | |
| HR-1 | 1 | 0 | 0.0 | | | | |
| Totals | 400 | 3 | 0.8 | | | | |

Table 35. Summary Statistics for Aroclor 1242 in Water Grab Samples
Spring Construction Monitoring - March 28 to June 28,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean u g/L | Median u g/L | Min. u g/L | Max. u g/L | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|---|---|
| C-1 | 15 | 0 | 0.0 | | | | | | |
| GF-1 | 15 | 0 | 0.0 | | | | | | |
| GF-2 | 14 | 0 | 0.0 | | | | | | |
| GF-3 | 15 | 0 | 0.0 | | | | | | |
| GF-4 | 14 | 0 | 0.0 | | | | | | |
| C-2 | 13 | 0 | 0.0 | | | | | | |
| E-0 | 15 | 3 | 20.0 | 0.140 | 0.130 | 0.130 | 0.160 | 0.017 | 0.010 |
| RS-3W1 | 29 | 13 | 44.8 | 0.155 | 0.140 | 0.100 | 0.300 | 0.050 | 0.014 |
| RS-2W1 | 15 | 1 | 6.7 | 0.350 | 0.350 | 0.350 | 0.350 | | |
| E-1 | 14 | 1 | 7.1 | 0.410 | 0.410 | 0.410 | 0.410 | | |
| RS-3W2 | 28 | 5 | 17.9 | 0.142 | 0.140 | 0.110 | 0.190 | 0.031 | 0.014 |
| E-2 | 15 | 1 | 6.7 | 0.240 | 0.240 | 0.240 | 0.240 | | |
| E-3 | 16 | 1 | 6.3 | 0.140 | 0.140 | 0.140 | 0.140 | | |
| RS-4W1 | 21 | 0 | 0.0 | | | | | | |
| E-4 | 16 | 1 | 6.3 | 0.290 | 0.290 | 0.290 | 0.290 | | |
| RS-4W2 | 21 | 0 | 0.0 | | | | | | |
| RS5W1 | 14 | 3 | 21.4 | 0.123 | 0.130 | 0.100 | 0.140 | 0.021 | 0.012 |
| RS5W2 | 15 | 1 | 6.7 | 0.100 | 0.100 | 0.100 | 0.100 | | |
| DS-1 | 14 | 0 | 0.0 | | | | | | |
| E-4A | 5 | 0 | 0.0 | | | | | | |
| E-5 | 15 | 1 | 6.7 | 0.470 | 0.470 | 0.470 | 0.470 | | |
| E-5A | 14 | 0 | 0.0 | | | | | | |
| DS-2 | 1 | 0 | 0.0 | | | | | | |
| E-6 | 17 | 0 | 0.0 | | | | | | |
| E-7 | 14 | 0 | 0.0 | | | | | | |
| E-7T | 14 | 0 | 0.0 | | | | | | |
| E-7R | 12 | 0 | 0.0 | | | | | | |
| MR-1 | 14 | 0 | 0.0 | | | | | | |
| HR-1 | 15 | 0 | 0.0 | | | | | | |
| TOTALS | 440 | 31 | 7.05 | | | | | | |

Table 36. Summary Statistics for Aroclor 1248 in Water Grab Samples
Spring Construction Monitoring - March 28 to June 28,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable |
|---|---|---|---|
| C-1 | 15 | 0 | 0.0 |
| GF-1 | 15 | 0 | 0.0 |
| GF-2 | 14 | 0 | 0.0 |
| GF-3 | 15 | 0 | 0.0 |
| GF-4 | 14 | 0 | 0.0 |
| C-2 | 13 | 0 | 0.0 |
| E-0 | 15 | 0 | 0.0 |
| RS-3W1 | 29 | 0 | 0.0 |
| RS-2W1 | 15 | 0 | 0.0 |
| E-1 | 14 | 0 | 0.0 |
| RS-3W2 | 28 | 0 | 0.0 |
| E-2 | 15 | 0 | 0.0 |
| E-3 | 16 | 0 | 0.0 |
| RS-4W1 | 21 | 0 | 0.0 |
| E-4 | 16 | 0 | 0.0 |
| RS-4W2 | 21 | 0 | 0.0 |
| RS-5W1 | 14 | 0 | 0.0 |
| RS-5W2 | 15 | 0 | 0.0 |
| DS-1 | 14 | 0 | 0.0 |
| E-4A | 5 | 0 | 0.0 |
| E-5 | 15 | 0 | 0.0 |
| E-5A | 14 | 0 | 0.0 |
| DS-2 | 1 | 0 | 0.0 |
| E-6 | 17 | 0 | 0.0 |
| E-7 | 14 | 0 | 0.0 |
| E-7T | 14 | 0 | 0.0 |
| E-7R | 12 | 0 | 0.0 |
| MR-1 | 14 | 0 | 0.0 |
| HR-1 | 15 | 0 | 0.0 |
| TOTALS | 440 | 0 | 0.0 |

Table 37 . Summary Statistics for Aroclor 1254 in Water Grab Samples
Spring Construction Monitoring - March 28 to June 28,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable |
|---|---|---|---|
| C-1 | 15 | 0 | 0.0 |
| GF-1 | 15 | 0 | 0.0 |
| GF-2 | 14 | 0 | 0.0 |
| GF-3 | 15 | 0 | 0.0 |
| GF-4 | 14 | 0 | 0.0 |
| C-2 | 13 | 0 | 0.0 |
| E-0 | 15 | 0 | 0.0 |
| RS-3W1 | 29 | 0 | 0.0 |
| RS-2W1 | 15 | 0 | 0.0 |
| E-1 | 14 | 0 | 0.0 |
| RS-3W2 | 28 | 0 | 0.0 |
| E-2 | 15 | 0 | 0.0 |
| E-3 | 16 | 0 | 0.0 |
| RS-4W1 | 21 | 0 | 0.0 |
| E-4 | 16 | 0 | 0.0 |
| RS-4W2 | 21 | 0 | 0.0 |
| RS-5W1 | 14 | 0 | 0.0 |
| RS-5W2 | 15 | 0 | 0.0 |
| DS-1 | 14 | 0 | 0.0 |
| E-4A | 5 | 0 | 0.0 |
| E-5 | 15 | 0 | 0.0 |
| E-5A | 14 | 0 | 0.0 |
| DS-2 | 1 | 0 | 0.0 |
| E-6 | 17 | 0 | 0.0 |
| E-7 | 14 | 0 | 0.0 |
| E-7T | 14 | 0 | 0.0 |
| E-7R | 12 | 0 | 0.0 |
| MR-1 | 14 | 0 | 0.0 |
| HR-1 | 15 | 0 | 0.0 |
| TOTALS | 440 | 0 | 0.0 |

Table 38. Summary Statistics for Aroclor 1242 in Water Grab Samples
Post-Containment Monitoring-June 29 to November 27,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean u g/L | Median u g/L | Min. u g/L | Max. u g/L | Std. dev. of mean | Std. error of mean |
|---|---|---|---|---|---|---|---|---|---|
| C-1 | 25 | 0 | 0.0 | | | | | | |
| GF-4 | 24 | 0 | 0.0 | | | | | | |
| C-2 | 24 | 9 | 37.5 | 0.38 | 0.11 | 0.05 | 1.40 | 0.46 | 0.15 |
| E-0 | 23 | 13 | 56.5 | 0.40 | 0.10 | 0.05 | 1.91 | 0.57 | 0.16 |
| RS-3W1 | 27 | 18 | 66.7 | 0.56 | 0.18 | 0.06 | 5.30 | 1.23 | 0.29 |
| RS-2W1 | 22 | 8 | 36.4 | 0.50 | 0.27 | 0.06 | 1.80 | 0.60 | 0.21 |
| E-1 | 23 | 11 | 47.8 | 0.27 | 0.12 | 0.06 | 1.10 | 0.32 | 0.09 |
| RS-3W2 | 27 | 20 | 74.1 | 0.28 | 0.12 | 0.06 | 1.80 | 0.41 | 0.09 |
| E-2 | 24 | 10 | 41.7 | 0.41 | 0.17 | 0.06 | 2.00 | 0.62 | 0.20 |
| E-3 | 24 | 12 | 50.0 | 0.38 | 0.09 | 0.05 | 1.40 | 0.50 | 0.15 |
| E-4 | 22 | 9 | 40.9 | 0.37 | 0.22 | 0.06 | 1.50 | 0.47 | 0.15 |
| RS-5W1 | 24 | 12 | 50.0 | 0.47 | 0.17 | 0.06 | 1.80 | 0.61 | 0.18 |
| RS-5W2 | 22 | 10 | 45.5 | 0.37 | 0.20 | 0.05 | 1.50 | 0.45 | 0.14 |
| DS-1 | 23 | 9 | 39.1 | 0.39 | 0.22 | 0.05 | 1.60 | 0.50 | 0.16 |
| E-5 | 23 | 10 | 43.5 | 0.31 | 0.27 | 0.06 | 0.71 | 0.25 | 0.08 |
| E-5A | 23 | 11 | 47.8 | 0.28 | 0.24 | 0.05 | 1.01 | 0.29 | 0.08 |
| E-6 | 23 | 14 | 60.9 | 0.31 | 0.09 | 0.05 | 1.40 | 0.39 | 0.10 |
| E-7 | 24 | 9 | 37.5 | 0.16 | 0.14 | 0.05 | 0.32 | 0.10 | 0.03 |
| E-7T | 2 | 0 | 0.0 | | | | | | |
| E-7R | 2 | 0 | 0.0 | | | | | | |
| Totals | 431 | 185 | 42.9 | | | | | | |

Table 39. Summary Statistics for Aroclor 1248 in Water Grab Samples
Post-Containment Monitoring-June 29 to November 27,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean u g/L | Median u g/L | Min. u g/L | Max. u g/L |
|---|---|---|---|---|---|---|---|
| C-1 | 25 | 0 | 0.0 | | | | |
| GF-4 | 24 | 0 | 0.0 | | | | |
| C-2 | 24 | 0 | 0.0 | | | | |
| E-0 | 23 | 0 | 0.0 | | | | |
| RS-3W1 | 27 | 1 | 3.7 | 0.14 | 0.14 | 0.14 | 0.14 |
| RS-2W1 | 22 | 0 | 0.0 | | | | |
| E-1 | 23 | 0 | 0.0 | | | | |
| RS-3W2 | 27 | 0 | 0.0 | | | | |
| E-2 | 24 | 0 | 0.0 | | | | |
| E-3 | 24 | 0 | 0.0 | | | | |
| E-4 | 22 | 0 | 0.0 | | | | |
| RS-5W1 | 24 | 0 | 0.0 | | | | |
| RS-5W2 | 22 | 0 | 0.0 | | | | |
| DS-1 | 23 | 0 | 0.0 | | | | |
| E-5 | 23 | 0 | 0.0 | | | | |
| E-5A | 23 | 0 | 0.0 | | | | |
| E-6 | 23 | 0 | 0.0 | | | | |
| E-7 | 24 | 0 | 0.0 | | | | |
| E-7T | 2 | 0 | 0.0 | | | | |
| E-7R | 2 | 0 | 0.0 | | | | |
| Totals | 431 | 1 | 0.2 | | | | |

Table 40. Summary Statistics for Aroclor 1254 in Water Grab Samples
Post-Containment Monitoring-June 29 to November 27,1991
Lower detection limits included

| Station | Samples collected | Samples [PCB]>LOD | Percent detectable | Mean u g/L | Median u g/L | Min. u g/L | Max. u g/L |
|---|---|---|---|---|---|---|---|
| C-1 | 25 | 0 | 0.0 | | | | |
| GF-4 | 24 | 0 | 0.0 | | | | |
| C-2 | 24 | 0 | 0.0 | | | | |
| E-0 | 23 | 1 | 4.3 | 0.23 | 0.23 | 0.23 | 0.23 |
| RS-3W1 | 27 | 0 | 0.0 | | | | |
| RS-2W1 | 22 | 0 | 0.0 | | | | |
| E-1 | 23 | 0 | 0.0 | | | | |
| RS-3W2 | 27 | 0 | 0.0 | | | | |
| E-2 | 24 | 0 | 0.0 | | | | |
| E-3 | 24 | 0 | 0.0 | | | | |
| E-4 | 22 | 0 | 0.0 | | | | |
| RS-5W1 | 24 | 0 | 0.0 | | | | |
| RS-5W2 | 22 | 0 | 0.0 | | | | |
| DS-1 | 23 | 0 | 0.0 | | | | |
| E-5 | 23 | 0 | 0.0 | | | | |
| E-5A | 23 | 1 | 4.3 | 0.10 | 0.10 | 0.10 | 0.10 |
| E-6 | 23 | 0 | 0.0 | | | | |
| E-7 | 24 | 0 | 0.0 | | | | |
| E-7T | 2 | 0 | 0.0 | | | | |
| E-7R | 2 | 0 | 0.0 | | | | |
| Totals | 431 | 2 | 0.5 | | | | |

Table 41 : Summary of Regression Statistics for Correlations between Aroclor 1242 Concentrations in 1991 Grab Water Samples and Precipitation at Glen Falls (lower detection limits included)

| Station | All 1991 Data | | | 1991 Winter Construction | | | 1991 Spring Construction | | | 1991 Post-Containment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | r | P | n | r | P | n | r | P | n | r | P |
| all pooled | 186 | 0.201 | 0.006 | 10 | -0.183 | 0.613 | 25 | -0.063 | 0.765 | 151 | 0.422 | <0.001 |
| C2 | 8 | -0.298 | 0.473 | insufficient data | | | insufficient data | | | 8 | -0.298 | 0.473 |
| E0 | 10 | 0.441 | 0.202 | insufficient data | | | insufficient data | | | 9 | 0.421 | 0.260 |
| RS2W1 | 9 | 0.702 | 0.035 | insufficient data | | | insufficient data | | | 8 | 0.703 | 0.052 |
| RS3W1 | 29 | 0.023 | 0.907 | insufficient data | | | 10 | -0.044 | 0.903 | 17 | 0.149 | 0.569 |
| E1 | 9 | 0.611 | 0.081 | insufficient data | | | insufficient data | | | 8 | 0.642 | 0.086 |
| RS3W2 | 22 | 0.494 | 0.019 | insufficient data | | | 5 | 0.862 | 0.061 | 16 | 0.842 | <0.001 |
| E2 | 9 | 0.733 | 0.025 | insufficient data | | | insufficient data | | | 8 | 0.729 | 0.040 |
| E3 | 9 | 0.526 | 0.146 | insufficient data | | | insufficient data | | | 8 | 0.498 | 0.209 |
| RS5W1 | 15 | 0.826 | <0.001 | insufficient data | | | 3 | 0.693 | 0.512 | 11 | 0.805 | 0.003 |
| E4 | 6 | 0.685 | 0.133 | insufficient data | | | insufficient data | | | 6 | 0.685 | 0.133 |
| RS5W2 | 11 | 0.784 | 0.004 | insufficient data | | | insufficient data | | | 9 | 0.764 | 0.017 |
| DS1 | 10 | 0.726 | 0.018 | insufficient data | | | insufficient data | | | 9 | 0.711 | 0.032 |
| E5 | 10 | 0.211 | 0.558 | insufficient data | | | insufficient data | | | 8 | 0.184 | 0.662 |
| E5A | 9 | 0.724 | 0.027 | insufficient data | | | insufficient data | | | 9 | 0.724 | 0.027 |
| E6 | 9 | -0.300 | 0.432 | insufficient data | | | insufficient data | | | 9 | 0.300 | 0.432 |
| E7 | 9 | -0.433 | 0.244 | insufficient data | | | insufficient data | | | 8 | 0.417 | 0.305 |

Table 42 : Summary of Statistics for Regressions of Detectable Aroclor 1242 Concentrations and Total Suspended Solids, 1991 Sampling Program

| Time Period | No. of Observations | r | P (2-tailed t) |
|---|---|---|---|
| all 1991 | 140 | -0.031 | 0.720 |
| winter construction | insufficient data for regression | | |
| spring construction | 25 | -0.130 | 0.537 |
| post-containment | 114 | 0.000 | 0.996 |

Table 43 : Summary of Remnant Site Statistics for 1991 Water Grab Samples

| Remnant Site | Stations at Site | Number of 1991 Samples | 1991 Samples with detect'bl Aroclor 1242 | Mean detectable A1242 at site (ug/L) | | |
|---|---|---|---|---|---|---|
| | | | | Winter-const | Spring-const | Post-contnmt |
| 2 | RS2W1<br>RS2W2<br>E1 | 74 | 14 | - | 0.38 | 0.55 |
| 3 | RS3W1<br>RS3W2 | 180 | 51 | 3.69 | 0.15 | 0.50 |
| 4 | RS4W1<br>RS4W2<br>E3<br>E4 | 186 | 15 | 0.15 | 0.22 | 0.66 |
| 5 | RS5W1<br>RS5W2 | 75 | 19 | - | 0.12 | 0.60 |

Table 44 : Analysis of Variance (ANOVA) Summary Statistics of Water Grab Sample Data for 1989-1991 Pre-construction, Construction, and Post-containment Periods

| | All Periods | | | Pre-constr vs. Constr | | | Pre-constr vs. Post-cont | | | Constr vs. Post-cont | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | n | F | P | n | F | P | n | F | P | n | F | P |
| all stations | 432 | 1.001 | 0.368 | 311 | 0.808 | 0.369 | 141 | 2.996 | 0.086 | 412 | 1.134 | 0.288 |
| C2 | 8 | 0.978 | 0.361 | no variance | | | 8 | 0.978 | 0.361 | no variance | | |
| DS1 | 9 | 0.896 | 0.375 | no variance | | | no variance | | | 9 | 0.896 | 0.375 |
| E0 | 14 | 1.545 | 0.248 | 7 | 0.139 | 0.724 | 8 | 0.549 | 0.487 | 13 | 2.812 | 0.122 |
| E1 | 8 | 0.142 | 0.871 | no variance | | | 7 | 0.284 | 0.617 | 7 | 0.007 | 0.937 |
| E2 | 11 | 0.756 | 0.500 | 5 | 3.588 | 0.155 | 8 | 0.769 | 0.414 | 9 | 0.809 | 0.398 |
| E3 | 8 | 4.476 | 0.079 | no variance | | | no variance | | | 8 | 4.476 | 0.079 |
| E4 | 11 | 1.219 | 0.345 | 6 | 2.827 | 0.168 | 8 | 0.635 | 0.456 | 8 | 1.790 | 0.229 |
| E5 | 10 | 1.839 | 0.228 | 5 | 0.070 | 0.808 | 7 | 3.112 | 0.138 | 9 | 1.971 | 0.210 |
| E5A | 11 | 0.751 | 0.503 | 4 | 1.630 | 0.330 | 10 | 0.547 | 0.481 | 8 | 0.960 | 0.365 |
| E6 | 8 | 0.169 | 0.695 | no variance | | | no variance | | | 8 | 0.169 | 0.695 |
| E7 | 7 | 3.116 | 0.138 | no variance | | | no variance | | | 7 | 3.116 | 0.138 |
| RS2W1 | 18 | 0.034 | 0.856 | no variance * | | | no variance * | | | 18 | 0.034 | 0.856 |
| RS2W2 | no variance | | | no variance * | | | no variance * | | | no variance | | |
| RS3W1 | 99 | 1.174 | 0.281 | no variance * | | | no variance * | | | 99 | 1.174 | 0.281 |
| RS3W2 | 94 | 0.004 | 0.953 | no variance * | | | no variance * | | | 94 | 0.004 | 0.953 |
| RS5W1 | 47 | 0.209 | 0.650 | no variance * | | | no variance * | | | 47 | 0.209 | 0.650 |
| RS5W2 | 13 | 3.281 | 0.097 | no variance * | | | no variance * | | | 13 | 3.281 | 0.097 |

* = The RS series of stations were not sampled during pre-construction monitoring.

**Table 45** Sampling dates when multiple mid-channel water sampling stations downstream of Bakers Falls contained PCB at concentrations above detection limit (0.10 $\mu$g/L).

| Date | Number of Stations | Station list |
|---|---|---|
| 3/29/90 | 4 | E1, E2, E4, E5A |
| 4/20/90 | 2 | E4, E5A |
| 5/24/90 | 2 | E5, E5A |
| 10/25/90 | 5 | DS1, E2, E4, E5, E5A |
| 11/2/90 | 2 | E6, E7 |
| 11/8/90 | 3 | DS1, E0, E5 |
| 4/18/91 | 2 | E0, E4 |
| 6/7/91 | 4 | E0, E1, E2, E3 |
| 7/2/91 | 2 | E6, E7 |
| 7/3/91 | 3 | E0, E1, E5A |
| 9/18/91 | 2 | C2, E6 |
| 9/19/91 | 8 | DS1, E0, E1, E2, E3, E4, E5, E5A |
| 9/26/91 | 8 | DS1, E0, E1, E2, E3, E4, E5, E5A |
| 9/27/91 | 2 | E6, E7 |
| 10/2/91 | 2 | E6, E7 |
| 10/3/91 | 7 | DS1, E1, E2, E3, E4, E5, E5A |
| 10/9/91 | 2 | E6, E7 |
| 10/10/91 | 8 | DS1, E0, E1, E2, E3, E4, E5, E5A |
| 10/16/91 | 8 | DS1, E0, E1, E2, E3, E4, E5, E5A |
| 10/18/91 | 2 | E6, E7 |
| 10/24/91 | 3 | DS1, E0, E6 |

TABLE 46 Summary of 1991 Remnant Area Construction Activities

**Site 2**

| Activities | Start Date | Finish Date |
|---|---|---|
| Topsoil placement | 11/23/90 | 1/05/91 |
| Channel work | 12/04/90 | 1/11/91 |

**Site 4**

| Activity | Start Date | Finish Date |
|---|---|---|
| Subgrade sand layer placement | 10/22/90 | 02/05/91 |
| Claymax + 12" Sand Layer | 01/14/91 | 03/22/91 |
| Top Soil | 01/26/91 | 05/01/91 |
| Channel Work | 10/06/90 | 03/22/91 |
| Shoreline Protection | 11/17/90 | 05/31/91 |

**Site 5**

| Activity | Start Date | Finish Date |
|---|---|---|
| Topsoil Placement | 10/18/90 | 01/03/91 |

**All Sites**

| Activity | Start Date | Finish Date |
|---|---|---|
| Seeding | 04/13/91 | 05/29/91 |
| Demobilization | 05/25/91 | 05/31/91 |

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Table 47 . 1991 remnant area construction activity impacts on PCB concentrations at monitoring stations immediately downstream of the remnant areas.

Remnant Site 2

| Activity | Start date | End date | Station RS-2W1 Number of samples | Station RS-2W1 Number with detectable PCB | Station RS-2W1 % detectable | Station RS-2W2 Number of samples | Station RS-2W2 Number with detectable PCB | Station RS-2W2 % detectable |
|---|---|---|---|---|---|---|---|---|
| Topsoil placement | 01/01/91 | 01/05/91 | 3 | 0 | 0 | 3 | 0 | 0 |
| Channel work | 01/01/91 | 01/11/91 | 8 | 0 | 0 | 7 | 0 | 0 |
| Seeding | 04/13/91 | 05/29/91 | 7 | 0 | 0 | 0 | 0 | 0 |
| Demobilization | 05/25/91 | 05/31/91 | 1 | 0 | 0 | 0 | 0 | 0 |

Remnant Site 4

| Activity | Start date | End date | Station RS-4W1 Number of samples | Station RS-4W1 Number with detectable PCB | Station RS-4W1 % detectable | Station RS-4W2 Number of samples | Station RS-4W2 Number with detectable PCB | Station RS-4W2 % detectable |
|---|---|---|---|---|---|---|---|---|
| Subgrade sand layer placement | 01/01/91 | 02/05/91 | 26 | 0 | 0 | 26 | 2 | 7.7 |
| Claymax, top sand placement | 01/14/91 | 03/22/91 | 51 | 0 | 0 | 52 | 2 | 3.8 |
| Topsoil placement | 01/26/91 | 05/01/91 | 67 | 0 | 0 | 68 | 2 | 2.9 |
| Channel work | 01/01/91 | 03/22/91 | 61 | 0 | 0 | 62 | 2 | 3.2 |
| Shoreline protection | 01/01/91 | 05/31/91 | 76 | 0 | 0 | 87 | 2 | 2.3 |
| Seeding | 04/13/91 | 05/29/91 | 10 | 0 | 0 | 10 | 0 | 0 |
| Demobilization | 05/25/91 | 05/31/91 | 0 | 0 | 0 | 0 | 0 | 0 |

Remnant Site 5

| Activity | Start date | End date | Station RS-5W1 Number of samples | Station RS-5W1 Number with detectable PCB | Station RS-5W1 % detectable | Station RS-5W2 Number of samples | Station RS-5W2 Number with detectable PCB | Station RS-5W2 % detectable |
|---|---|---|---|---|---|---|---|---|
| Topsoil placement | 01/01/91 | 01/03/91 | 0 | 0 | 0 | 0 | 0 | 0 |
| Seeding | 04/13/91 | 05/29/91 | 6 | 0 | 0 | 6 | 0 | 0 |
| Demobilization | 05/25/91 | 05/31/91 | 1 | 0 | 0 | 1 | 0 | 0 |

Table 48 . Dialysis bag summary statistics, spring construction monitoring. All concentrations are ug/mL Aroclor 1242.

| Station | Total number of samples | Samples with PCB > 0.1 ug/mL | Minimum detected | Maximum detected |
|---|---|---|---|---|
| C-1 | 4 | 0 | | |
| GF-1 | 5 | 0 | | |
| GF-2 | 6 | 0 | | |
| GF-4 | 4 | 0 | | |
| C-2 | 3 | 0 | | |
| E-0 | 3 | 1 | | 0.14 |
| E-1 | 5 | 3 | 0.10 | 0.13 |
| E-2 | 4 | 2 | 0.17 | 0.19 |
| E-3 | 5 | 3 | 0.11 | 0.14 |
| RS5-W1 | 5 | 2 | 0.10 | 0.24 |
| E-4 | 4 | 2 | 0.14 | 0.15 |
| E-5 | 4 | 4 | 0.15 | 0.18 |
| E-5A | 6 | 4 | 0.13 | 0.18 |
| E-6 | 6 | 4 | 0.17 | 0.25 |
| E-7 | 6 | 5 | 0.12 | 0.18 |
| HR-1 | 6 | 0 | | |
| MR-1 | 3 | 0 | | |

Table 49. Dialysis bag summary statistics, Post-containment monitoring. All concentrations are ug/mL Aroclor 1242.

| Station | Total number of samples | Samples with PCB > 0.1 ug/mL | Minimum detected | Maximum detected |
|---|---|---|---|---|
| C-1 | 4 | 1 | | 0.12 |
| GF-1 | 2 | 0 | | |
| GF-2 | 2 | 0 | | |
| GF-4 | 3 | 0 | | |
| C-2 | 3 | 0 | | |
| E-0 | 4 | 2 | 0.10 | 0.11 |
| E-1 | 3 | 2 | 0.11 | 0.11 |
| E-2 | 4 | 2 | 0.16 | 0.17 |
| E-3 | 4 | 2 | 0.11 | 0.13 |
| RS5-W1 | 2 | 2 | 0.11 | 0.12 |
| E-4 | 4 | 0 | | |
| E-5 | 3 | 3 | 0.12 | 0.15 |
| E-5A | 4 | 3 | 0.11 | 0.13 |
| E-6 | 4 | 4 | 0.12 | 0.18 |
| E-7 | 4 | 2 | 0.12 | 0.12 |
| HR-1 | 2 | 0 | | |
| MR-1 | 2 | 0 | | |

**Table 50** Aroclor 1242 summary statistics
for 1991 Spring Construction Monitoring Hester-Dendy samplers.

| | | Aroclor 1242 (mg/kg) | | | |
|---|---|---|---|---|---|
| Station | Samples Collected | Mean | Median | Minimum | Maximum |
| C-1 | 1 | 0 | | | |
| GF-1 | 1 | 0 | | | |
| GF-2 | 2 | 0 | | | |
| GF-3 | 1 | 0 | | | |
| GF-4 | 1 | 0 | | | |
| C-2 | 1 | 23.00 | 23.00 | 23.00 | 23.00 |
| E-0 | 1 | 24.00 | 24.00 | 24.00 | 24.00 |
| E-1 | 1 | 9.40 | 9.40 | 9.40 | 9.40 |
| E-2 | 1 | 9.00 | 9.00 | 9.00 | 9.00 |
| E-3 | 1 | 4.60 | 4.60 | 4.60 | 4.60 |
| E-4 | 1 | 5.00 | 5.00 | 5.00 | 5.00 |
| RS-5W1 | 1 | 7.70 | 7.70 | 7.70 | 7.70 |
| E-5 | 1 | 6.70 | 6.70 | 6.70 | 6.70 |
| E-5A | 1 | 5.00 | 5.00 | 5.00 | 5.00 |
| E-6 | 1 | 4.00 | 4.00 | 4.00 | 4.00 |
| E-7 | 1 | 1.50 | 1.50 | 1.50 | 1.50 |
| HR-1 | 1 | 0.44 | 0.44 | 0.44 | 0.44 |
| MR-1 | 1 | 0 | | | |

**Table 51** Aroclor 1254 summary statistics for 1991 Spring Construction Monitoring Hester-Dendy samplers.

| | | Aroclor 1254 (mg/kg) | | | |
|---|---|---|---|---|---|
| Station | Samples Collected | Mean | Median | Minimum | Maximum |
| C-1 | 1 | 0 | | | |
| GF-1 | 1 | 0 | | | |
| GF-2 | 2 | 0 | | | |
| GF-3 | 1 | 0 | | | |
| GF-4 | 1 | 0 | | | |
| C-2 | 1 | 5.10 | 5.10 | 5.10 | 5.10 |
| E-0 | 1 | 4.70 | 4.70 | 4.70 | 4.70 |
| E-1 | 1 | 1.80 | 1.80 | 1.80 | 1.80 |
| E-2 | 1 | 1.90 | 1.90 | 1.90 | 1.90 |
| E-3 | 1 | 0.95 | 0.95 | 0.95 | 0.95 |
| E-4 | 1 | 1.00 | 1.00 | 1.00 | 1.00 |
| RS-5W1 | 1 | 1.60 | 1.60 | 1.60 | 1.60 |
| E-5 | 1 | 1.10 | 1.10 | 1.10 | 1.10 |
| E-5A | 1 | 0.86 | 0.86 | 0.86 | 0.86 |
| E-6 | 1 | 0.85 | 0.85 | 0.85 | 0.85 |
| E-7 | 1 | 0.47 | 0.47 | 0.47 | 0.47 |
| HR-1 | 1 | 0.14 | 0.14 | 0.14 | 0.14 |
| MR-1 | 1 | 0.09 | 0.09 | 0.09 | 0.09 |

**Table 52** Aroclor [illegible] summary statistics
for 1991 Post Containment Monitoring Hester-Dendy samplers.

| | Aroclor 1242 (mg/kg) | | | | | | |
|---|---|---|---|---|---|---|---|
| Station | Samples Collected | Mean | Median | Minimum | Maximum | Std. Error of Mean | Std. Dev. of Mean |
| C-1 | 3 | 0 | | | | | |
| GF-2 | 1 | 0 | | | | | |
| GF-3 | 1 | 0 | | | | | |
| GF-4 | 3 | 0.55 | 0.55 | 0 | 1.10 | 0.55 | 0.77 |
| C-2 | 3 | 94.70 | 17.00 | 7.10 | 260.00 | 82.69 | 143.24 |
| E-0 | 3 | 808.56 | 320.00 | 5.70 | 2100.00 | 652.06 | 1129.40 |
| E-1 | 3 | 278.13 | 150.00 | 4.40 | 680.00 | 205.28 | 355.55 |
| E-2 | 3 | 285.36 | 150.00 | 6.10 | 700.00 | 211.43 | 366.22 |
| E-3 | 3 | 173.20 | 26.00 | 3.60 | 490.00 | 158.53 | 274.58 |
| E-4 | 3 | 77.20 | 38.00 | 3.60 | 190.00 | 57.26 | 99.19 |
| RS-5W1 | 3 | 186.60 | 50.00 | 9.80 | 500.00 | 157.12 | 272.15 |
| E-5 | 3 | 342.70 | 110.00 | 8.10 | 910.00 | 285.17 | 493.93 |
| E-5A | 3 | 32.96 | 4.40 | 3.50 | 91.00 | 29.01 | 50.26 |
| E-6 | 4 | 14.78 | 3.95 | 3.20 | 48.00 | 11.08 | 22.16 |
| E-7 | 4 | 4.70 | 4.00 | 1.10 | 9.70 | 2.01 | 4.03 |
| HR-1 | 2 | 0.71 | 0.71 | 0.69 | 0.72 | 0.02 | 0.02 |
| MR-1 | 2 | 0.30 | 0.30 | 0 | 0.60 | 0.30 | 0.42 |

**Table 53** Aroclor 1254 summary statistics
for 1991 Post Containment Monitoring Hester-Dendy samplers.

| | | Aroclor 1254 (mg/kg) | | | | | |
|---|---|---|---|---|---|---|---|
| Station | Samples Collected | Mean | Median | Minimum | Maximum | Std. Error of Mean | Std. Dev. of Mean |
| C-1 | 3 | 0 | | | | | |
| GF-2 | 1 | 0 | | | | | |
| GF-3 | 1 | 0 | | | | | |
| GF-4 | 3 | 0 | | | | | |
| C-2 | 3 | 22.83 | 4.50 | 0 | 64.00 | 20.62 | 35.72 |
| E-0 | 3 | 76.66 | 0 | 0 | 230.00 | 76.66 | 132.79 |
| E-1 | 3 | 0 | | | | | |
| E-2 | 3 | 0.56 | 0 | 0 | 1.70 | 0.56 | 0.98 |
| E-3 | 3 | 25.30 | 8.00 | 0.90 | 67.00 | 20.95 | 36.28 |
| E-4 | 3 | 10.03 | 1.10 | 0 | 29.00 | 9.48 | 16.43 |
| RS-5W1 | 3 | 27.26 | 12.00 | 2.80 | 67.00 | 20.04 | 34.71 |
| E-5 | 3 | 40.70 | 2.10 | 0 | 120.00 | 39.65 | 68.68 |
| E-5A | 3 | 7.53 | 1.50 | 1.10 | 20.00 | 6.23 | 10.79 |
| E-6 | 4 | 2.28 | 1.25 | 0 | 6.60 | 1.48 | 2.95 |
| E-7 | 4 | 0.23 | 0.17 | 0 | 0.57 | 0.14 | 0.28 |
| HR-1 | 2 | 0.29 | 0.29 | 0.29 | 0.29 | | |
| MR-1 | 2 | 0 | | | | | |

Table 54 Summary of mean PCB concentrations on Hester-Dendy multiplate samplers. 1991 Post Containment Monitoring

| Station | Number of Samples[1] | Aroclor 1242[2,3] | % of total PCB | Aroclor 1254[2,3] | % of total PCB | Total PCB[2,3] |
|---|---|---|---|---|---|---|
| C-1 | 3 | N.D. | | N.D. | | N.D. |
| GF-2 | 1 | N.D. | | N.D. | | N.D. |
| GF-3 | 1 | N.D. | | N.D. | | N.D. |
| GF-4 | 3 | 0.55 | 100.00 | N.D. | | 0.55 |
| C-2 | 3 | 94.70 | 86.43 | 22.83 | 13.56 | 117.53 |
| E-0 | 3 | 808.56 | 96.71 | 76.66 | 3.29 | 885.23 |
| E-1 | 3 | 278.13 | 100.00 | 0.0 | 0.0 | 278.13 |
| E-2 | 3 | 285.36 | 92.73 | 0.56 | 7.26 | 285.93 |
| E-3 | 3 | 173.20 | 81.48 | 25.30 | 18.51 | 198.50 |
| E-4 | 3 | 77.20 | 87.78 | 10.03 | 12.21 | 87.23 |
| RS-5W1 | 3 | 186.60 | 82.20 | 27.26 | 17.79 | 213.86 |
| E-5 | 3 | 342.70 | 89.25 | 40.70 | 10.74 | 383.40 |
| E-5A | 3 | 32.96 | 77.32 | 7.53 | 22.67 | 40.50 |
| E-6 | 4 | 14.78 | 83.53 | 2.28 | 16.47 | 17.05 |
| E-7 | 4 | 4.70 | 88.09 | 0.23 | 11.92 | 4.93 |
| HR-1 | 2 | 0.71 | 70.85 | 0.29 | 29.15 | 1.00 |
| MR-1 | 2 | 0.30 | 100.00 | N.D. | | 0.30 |

1 - Composite Samples
2 - All concentrations are expresses as mg/kg dry weight
3 - Means are based on only those samples with detectable PCB
N.D. - Not Detectable

**Table 55** Results of Analysis of variance tests to determine significant differences in Hester-Dendy station mean total PCB concentrations during the pre-construction, construction and post-containment monitoring periods.

| | Pre const-Post cont | Const-Post cont | Pre const-Const | Pre const-Post cont |
|---|---|---|---|---|
| C2 | P = 0.080 | P = 0.206 | P = 0.082 | P = 0.076 |
| E0 | P = 0.039* | P = 0.110 | P = 0.777 | P = 0.058 |
| E1 | P = 0.021* | P = 0.082 | P = 0.149 | P = 0.038* |
| E2 | P = 0.022* | P = 0.083 | P = 0.068 | P = 0.039* |
| E3 | P = 0.062 | P = 0.143 | P = 0.029* | P = 0.079 |
| E4 | P = 0.049* | P = 0.158 | P = 0.346 | P = 0.053 |
| E5 | P = 0.046* | P = 0.119 | P = 0.251 | P = 0.067 |
| E5A | P = 0.589 | P = 0.397 | P = 0.042* | P = 0.630 |
| E6 | P = 0.152 | P = 0.336 | P = 0.848 | P = 0.100 |
| E7 | P = 0.021* | P = 0.114 | P = 0.207 | P = 0.010* |

* - Significant difference at the station at P = 0.05 level.

**Table 56** PCB Concentrations in 1991 Spring Construction Caddisfly Larvae Samples

| | | Aroclor 1242 | | Aroclor 1254 | | |
|---|---|---|---|---|---|---|
| Station | Date Sampled | Conc.[1] | % of total PCB | Conc[1] | % of total PCB | Total PCB |
| GF-4 | 6/18/91 | <0.05 | 0.0 | 0.07 | 100.0 | 0.07 |
| C-2 | 6/18/91 | 5.9 | 78.7 | 1.6 | 21.3 | 7.5 |
| E-5 | 6/20/91 | 11.0 | 79.1 | 2.9 | 20.9 | 13.9 |
| E-6 | 6/26/91 | 2.4 | 72.1 | 0.93 | 27.9 | 3.33 |
| E-7 | 6/21/91 | 1.4 | 70.4 | 0.59 | 29.6 | 1.99 |

1 - All concentration expressed as mg/kg dry weight.

**Table 57** Summary of Mean PCB Concentrations in 1991 Post-Containment Caddisfly Larvae Samples

| | | Aroclor 1242 | | Aroclor 1254 | | |
|---|---|---|---|---|---|---|
| Station | No. of Samples | Conc.[1] | % of total PCB | Conc[1] | % of total PCB | Total PCB |
| GF-4 | 3 | 0 | 0.0 | 0.02 | 100.0 | 0.02 |
| C-2 | 3 | 65.6 | 99.5 | 0.33 | 0.5 | 65.9 |
| E-5 | 3 | 81.3 | 98.0 | 1.65 | 2.0 | 82.9 |
| E-6 | 3 | 7.57 | 88.5 | 0.98 | 11.5 | 8.55 |
| E-7 | 2 | 3.40 | 76.2 | 1.06 | 23.8 | 4.46 |

1 - All concentration expressed as mg/kg dry weight.

**Table 58** Aroclor 1242 summary of 1991 Post-Containment caged fathead minnows bioaccumulation studies.

| Aroclor 1242 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station | Samples collected | Mean µg/g | Median µg/g | Min. µg/g | Max. µg/g | Std. dev. of mean | Std. error of mean |
| C-1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| GF-4 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| C-2 | 6 | 15.28 | 2.80 | 1.50 | 68.00 | 26.24 | 10.71 |
| E-5 | 5 | 3.32 | 1.40 | 0 | 11.00 | 4.41 | 1.97 |
| E-6 | 6 | 2.22 | 1.60 | 0.63 | 4.60 | 1.56 | 0.63 |
| E-7 | 5 | 1.60 | 1.10 | 0.63 | 3.60 | 1.17 | 0.52 |
| Stock | 6 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 59** Aroclor 1248 Summary of 1991 Post-Containment caged fathead minnows bioaccumulation studies.

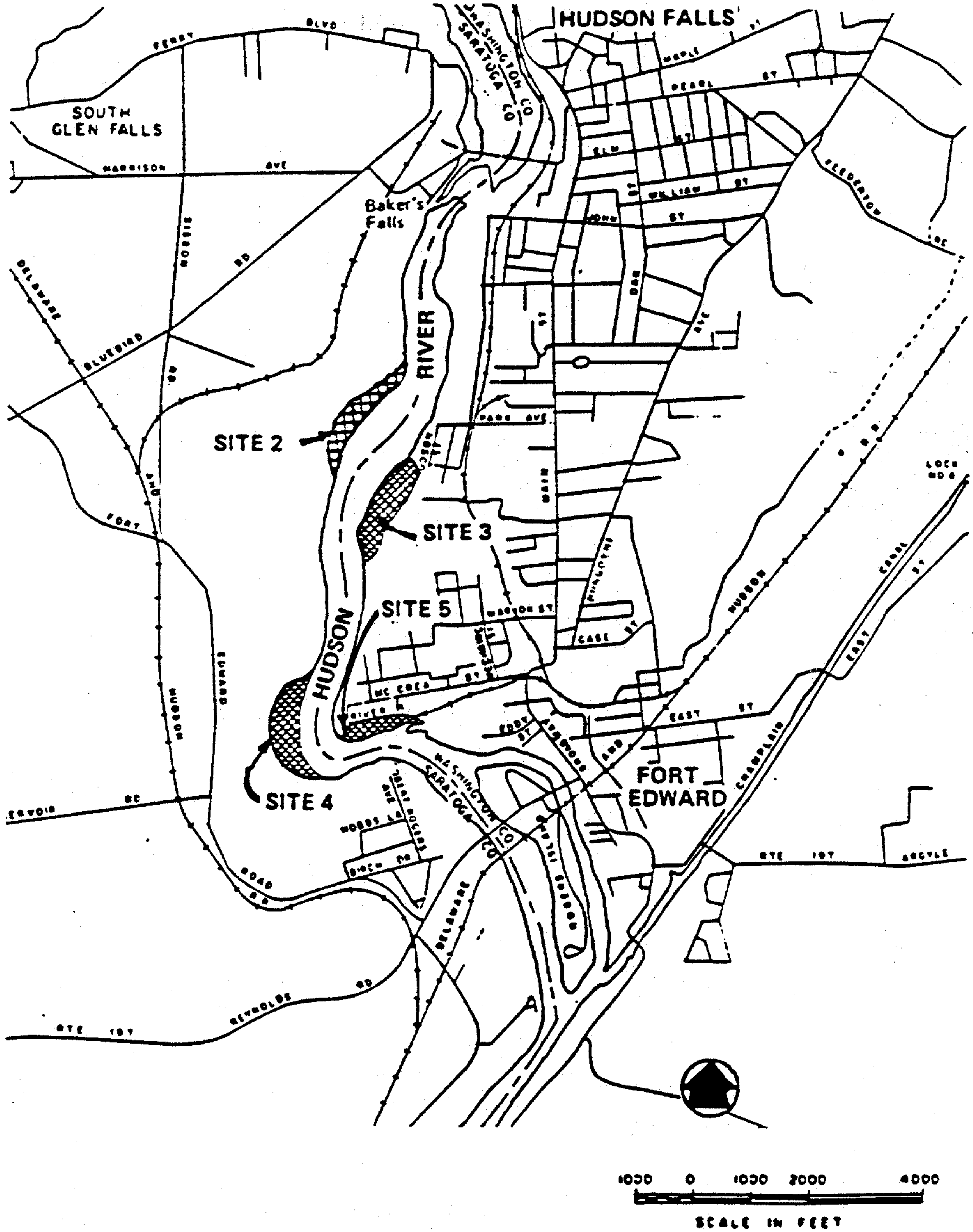
| Aroclor 1248 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station | Samples Collected | Mean µg/g | Median µg/g | Min. µg/g | Max. µg/g | Std. dev. of Mean | Std. Error of Mean |
| C-1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| GF-4 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| C-2 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| E-5 | 5 | 0.148 | 0 | 0 | 0.740 | 0.331 | 0.148 |
| E-6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| E-7 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stock | 6 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 60** Aroclor 1254 Summary of 1991 Post-Containment caged fathead minnows bioaccumulation studies.

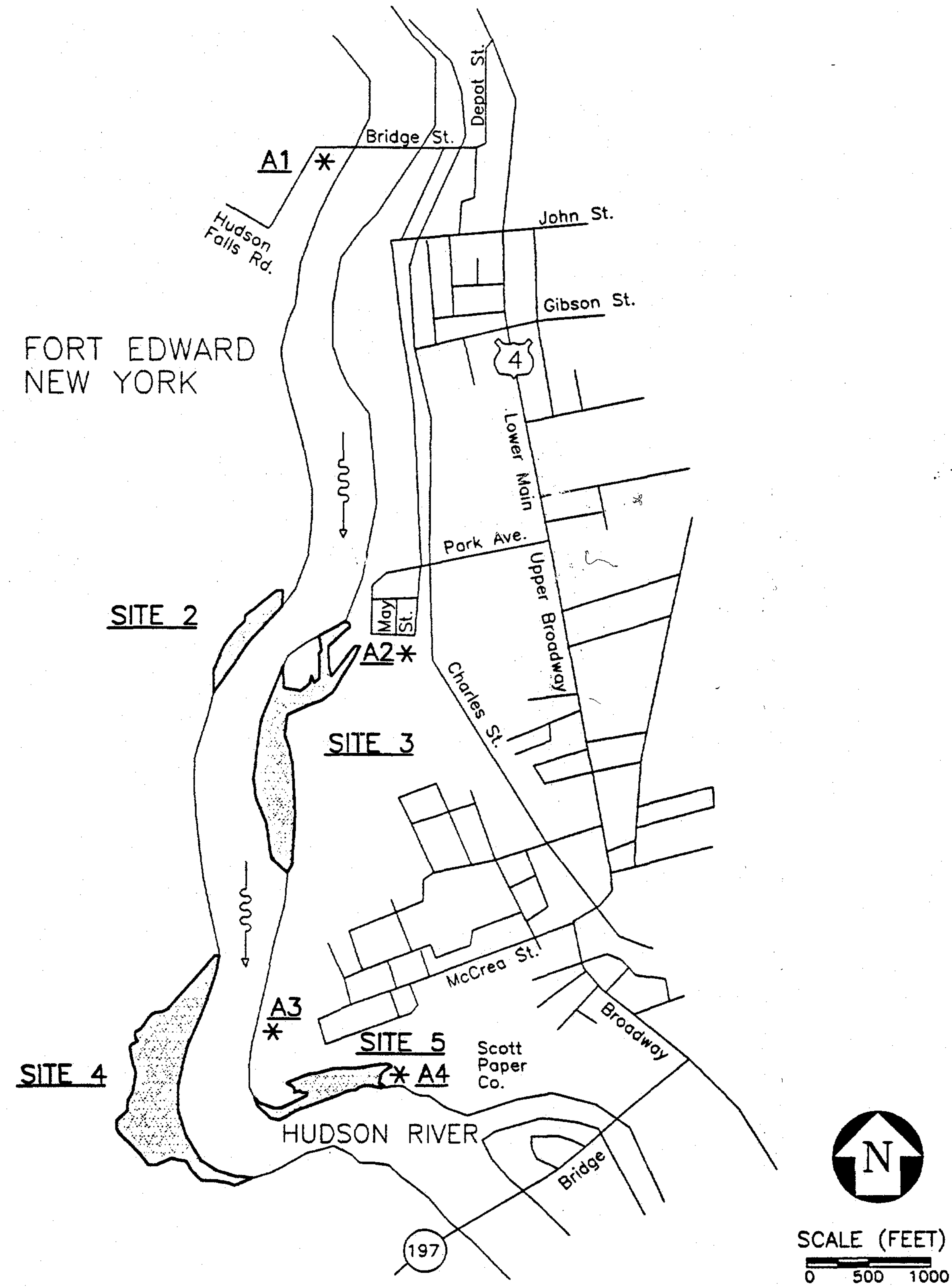
| Aroclor 1254 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station | Samples Collected | Mean µg/g | Median µg/g | Minimum µg/g | Maximum µg/g | Std. dev. of Mean | Std. Error of Mean |
| C-1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| GF-4 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| C-2 | 6 | 0.088 | 0 | 0 | 0.530 | 0.216 | 0.088 |
| E-5 | 5 | 0.064 | 0 | 0 | 0.320 | 0.143 | 0.064 |
| E-6 | 6 | 0.050 | 0 | 0 | 0.300 | 0.122 | 0.050 |
| E-7 | 5 | 0.132 | 0 | 0 | 0.400 | 0.187 | 0.084 |
| Stock | 6 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 61** Comparison of Aroclor mean concentrations in caged fathead minnows in 1989 and 1991. All concentrations are $\mu g/g$ dry weight.

| | 1989 | | 1991 pre mid-September | | | 1991 entire year | | |
|---|---|---|---|---|---|---|---|---|
| Station | 1242 | 1254 | 1242 | 1248 | 1254 | 1242 | 1248 | 1254 |
| C1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| C2 | 1.22 | 0 | 2.80 | 0 | 0.27 | 15.30 | 0 | 0.09 |
| E5 | 1.65 | 0 | 1.43 | 0.25 | 0.11 | 3.32 | 0.15 | 0.06 |
| E6 | 0.96 | 0.05 | 2.30 | 0 | 0.10 | 2.22 | 0 | 0.05 |
| E7 | 0.71 | 0 | 1.11 | O | 0.22 | 1.61 | 0 | 0.13 |




| FIGURE 1 | |
|---|---|
| REMNANT DEPOSIT SITES (Metcalf & Eddy 1975) | |
| HARZA ENGINEERING CO., CHICAGO | |
| APPROVED........................... | |
| DATE | DWG.NO. |




NOTE

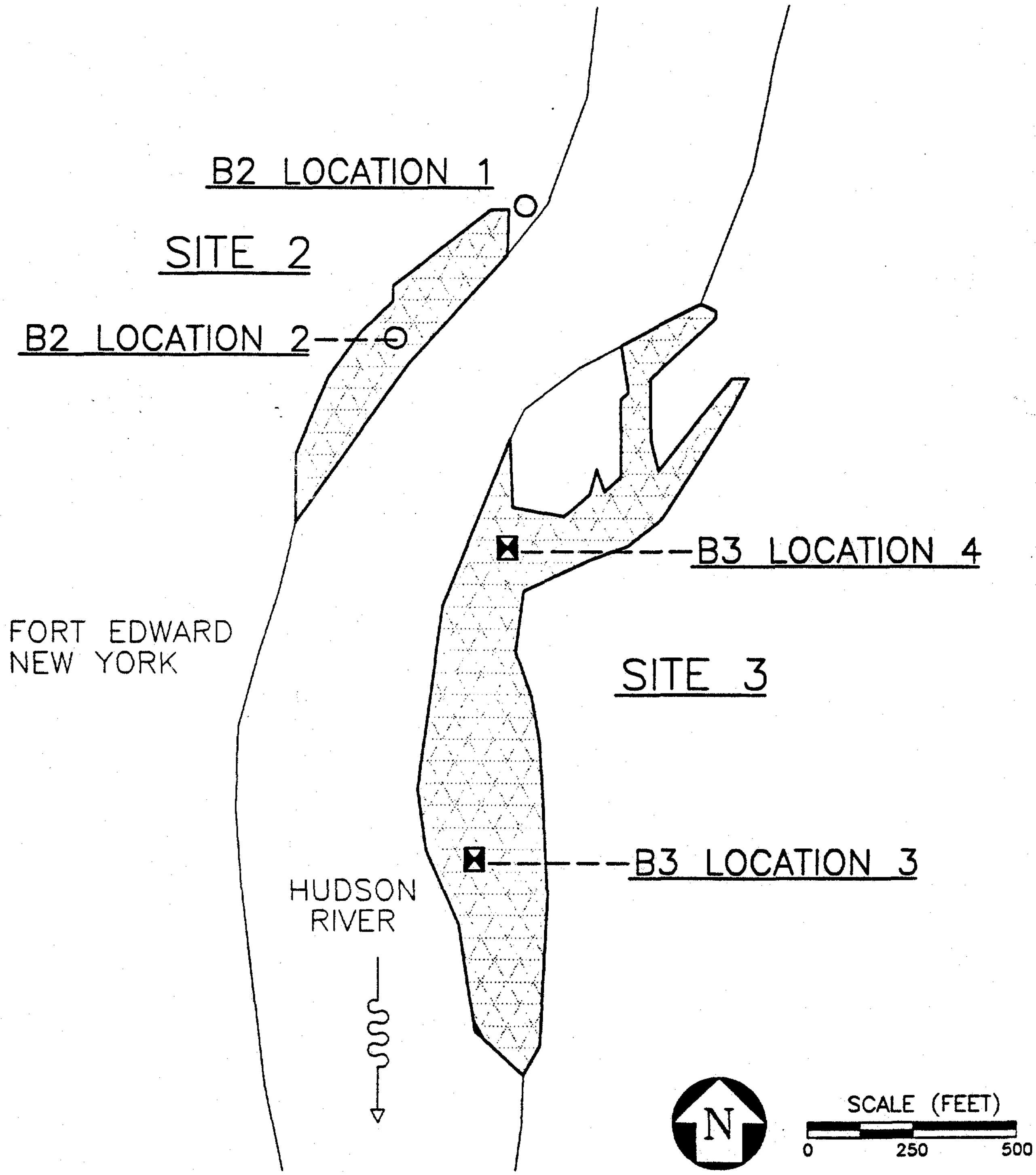
SAMPLER A5 IS LOCATED APPROXIAMATELY 4 MILES SSE OF SAMPLER A4.

FIGURE 2

1991 CONSTRUCTION MONITORING PROGRAM
STATIONARY AIR SAMPLER LOCATIONS A1–A4

YATES & AUBERLE, LTD
EAST RUTHERFORD, NEW JERSEY

309815



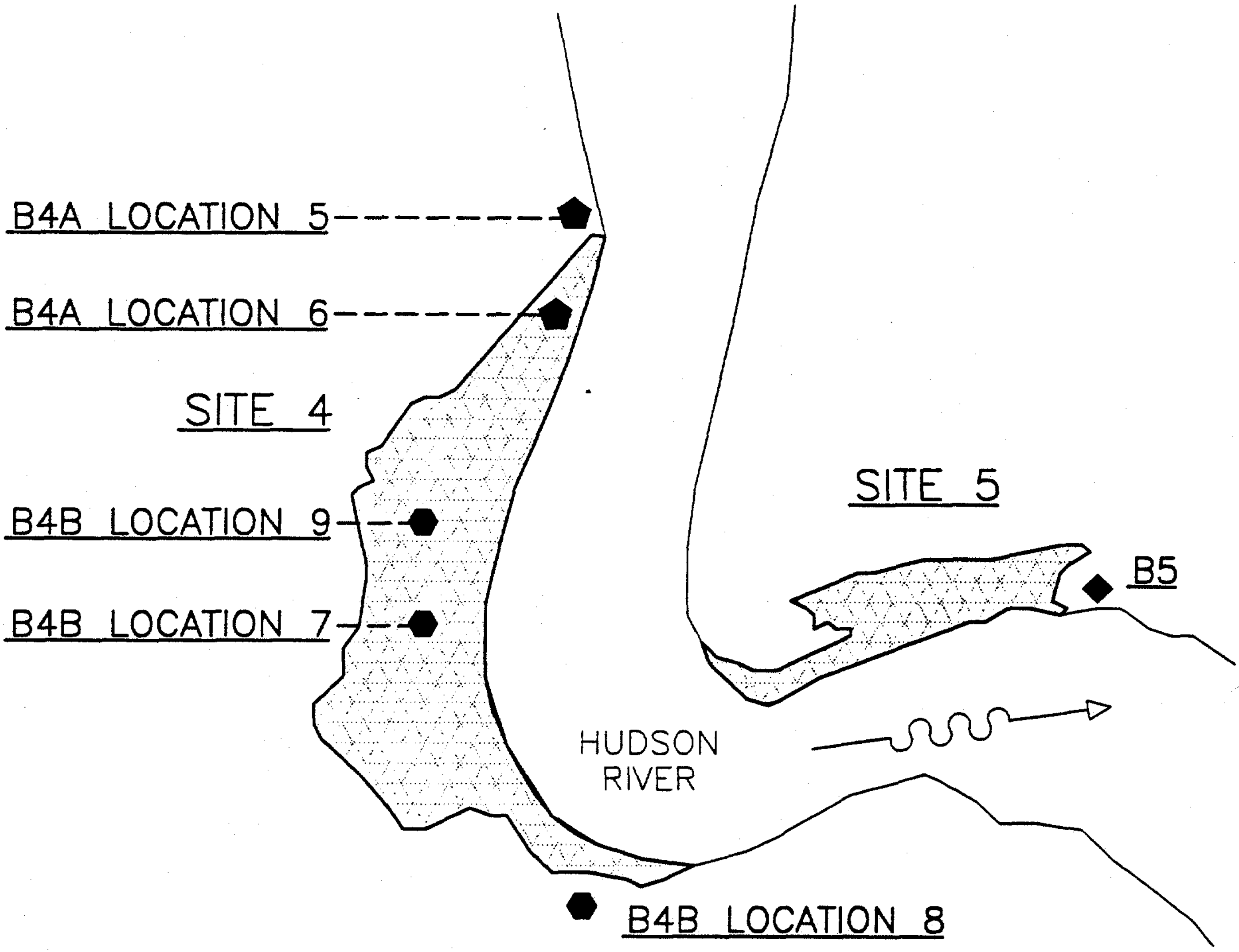

NOTE

SAMPLER B2 WAS AT LOCATION 1 JANUARY–MAY AND AT LOCATION 2 IN JUNE
SAMPLER B3 WAS AT LOCATION 3 JANUARY–APRIL AND AT LOCATION 4 MAY–JUNE

FIGURE 3

CONSTRUCTION MONITORING
1991 AIR SAMPLER LOCATIONS
REMNANT SITES 2 AND 3

YATES & AUBERLE, LTD
EAST RUTHERFORD, NEW JERSEY




NOTE

SAMPLER B4A WAS AT LOCATION 5 JANUARY–FEBRUARY AND AT LOCATION 6 MARCH–JUNE.
SAMPLER B4B WAS AT LOCATION 7 IN JANUARY, AT LOCATION 8 FEBRUARY–MAY AND AT LOCATION 9 JUNE–JULY.
SAMPLER B5 WAS A PERMANENT STATION.

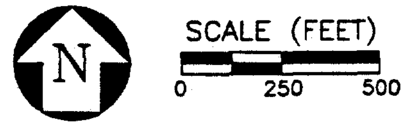



FIGURE 4

CONSTRUCTION MONITORING
MOBILE AIR SAMPLER LOCATIONS
1991 REMNANT SITES 4 AND 5

YATES & AUBERLE, LTD
EAST RUTHERFORD, NEW JERSEY

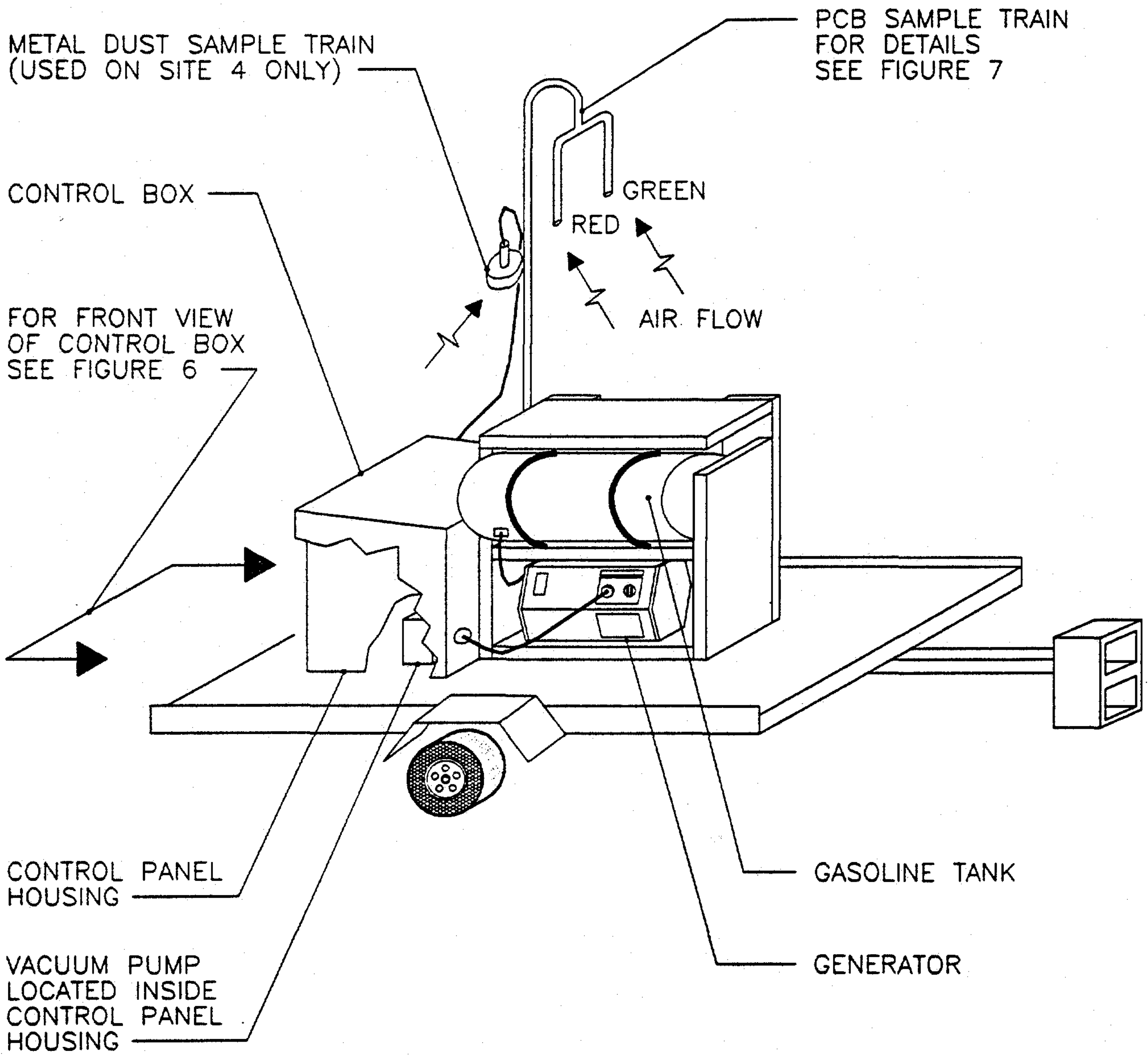



FIGURE 5

MOBILE AIR SAMPLER

YATES & AUBERLE, LTD
EAST RUTHERFORD, NEW JERSEY

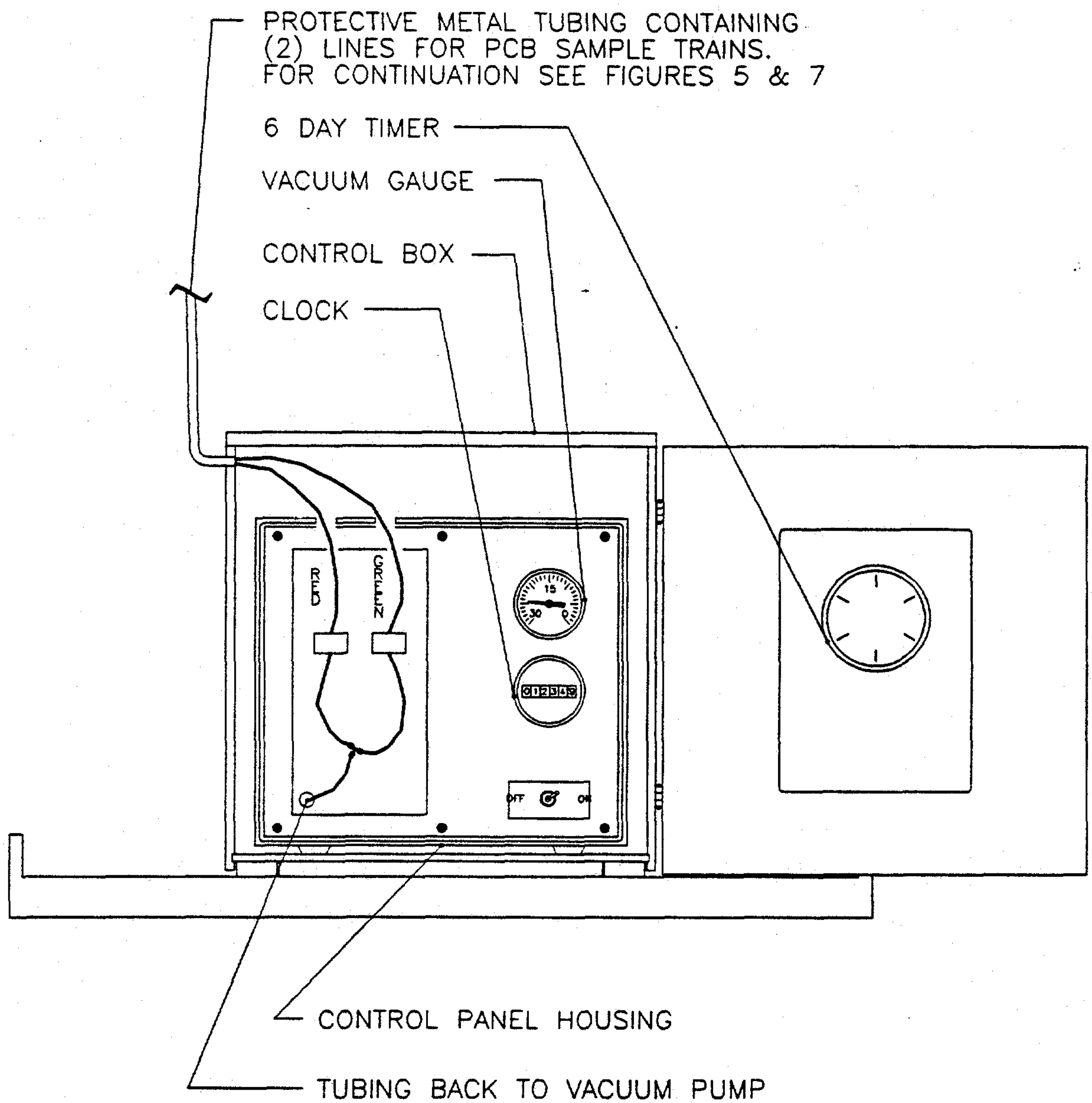



FIGURE 6

FRONT VIEW OF CONTROL BOX
FOR AN AIR MONITORING STATION

YATES & AUBERLE, LTD
EAST RUTHERFORD, NEW JERSEY

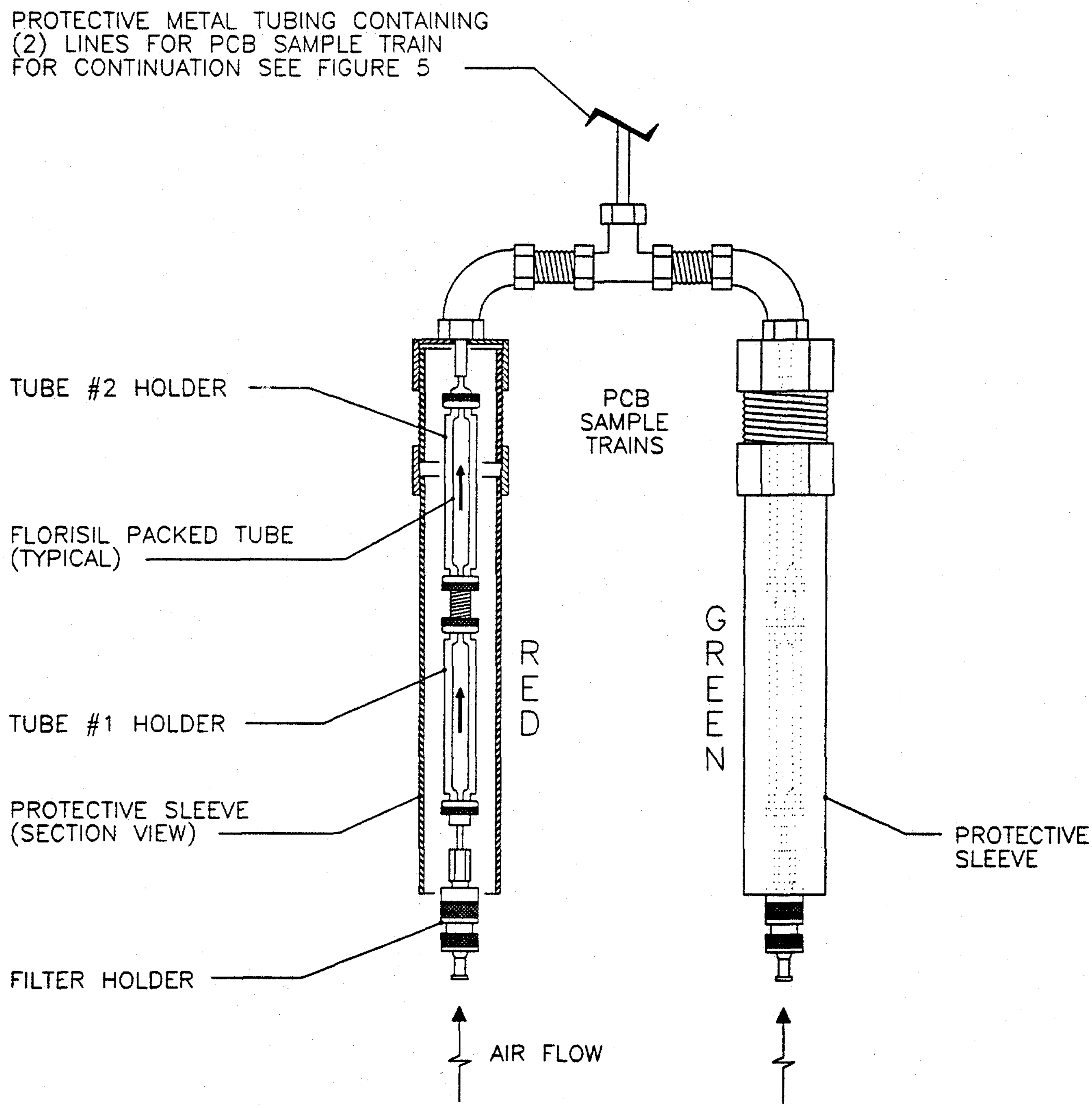



FIGURE 7

PCB SAMPLE TRAIN DETAIL

YATES & AUBERLE, LTD
EAST RUTHERFORD, NEW JERSEY

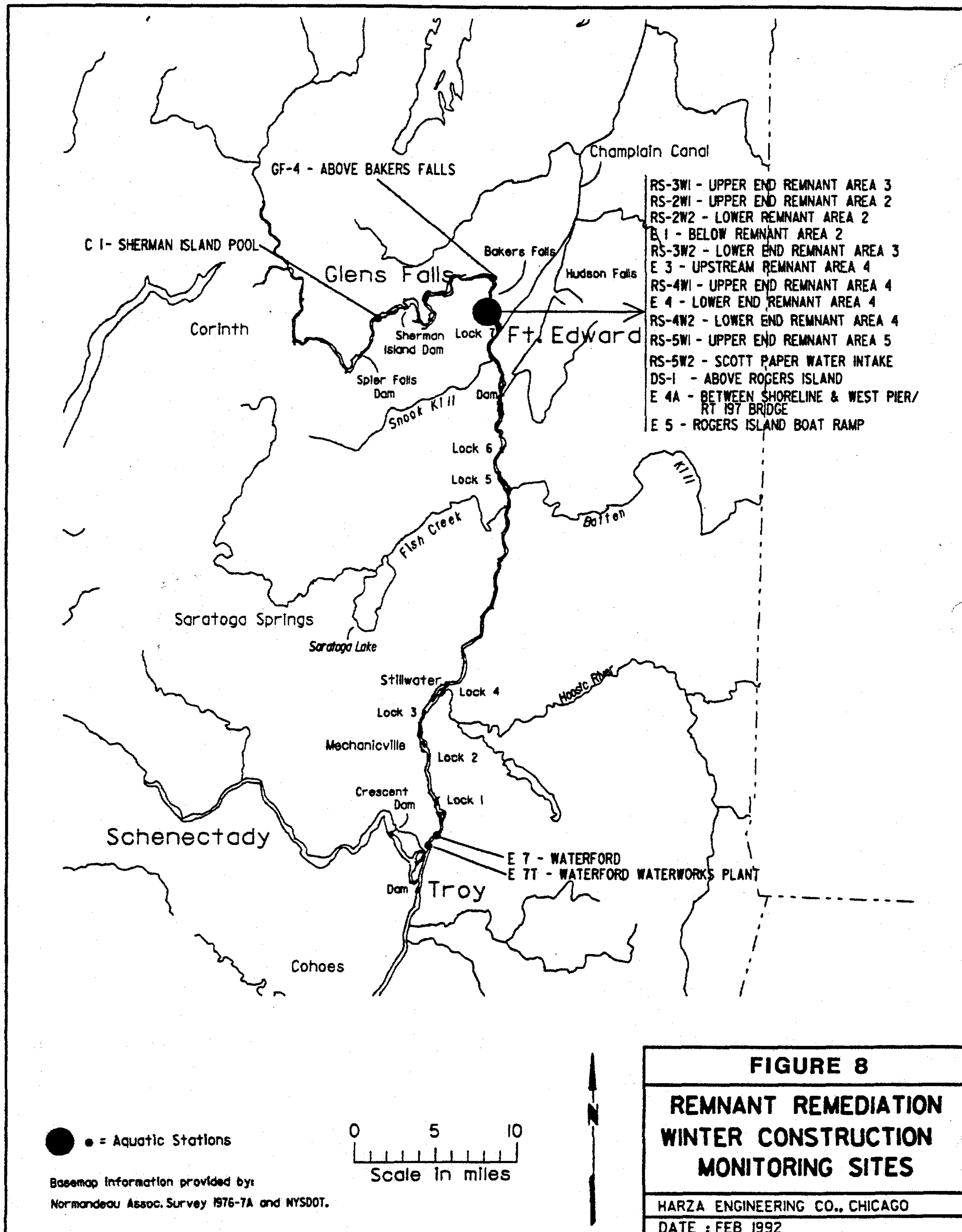
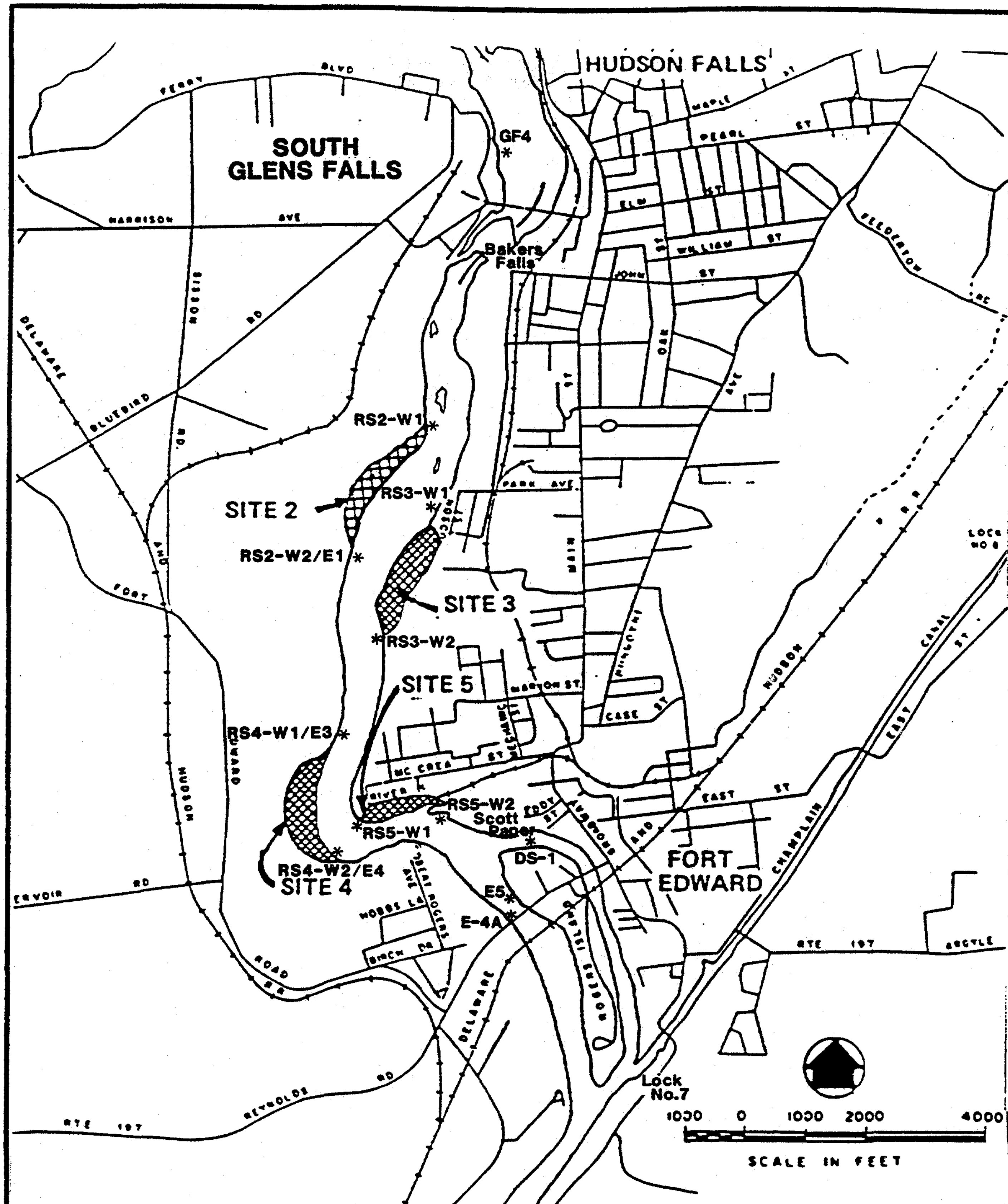



**FIGURE 8**

**REMNANT REMEDIATION WINTER CONSTRUCTION MONITORING SITES**

HARZA ENGINEERING CO., CHICAGO

DATE : FEB 1992




LEGEND

E,DS,RS — EXPERIMENTAL SITE

GF — CONTROL SITE

**FIGURE 9**

**WINTER CONSTRUCTION MONITORING SITES IN REMNANT AREA**

HARZA ENGINEERING CO., CHICAGO

APPROVED........................

| DATE | DWG.NO. |
|---|---|

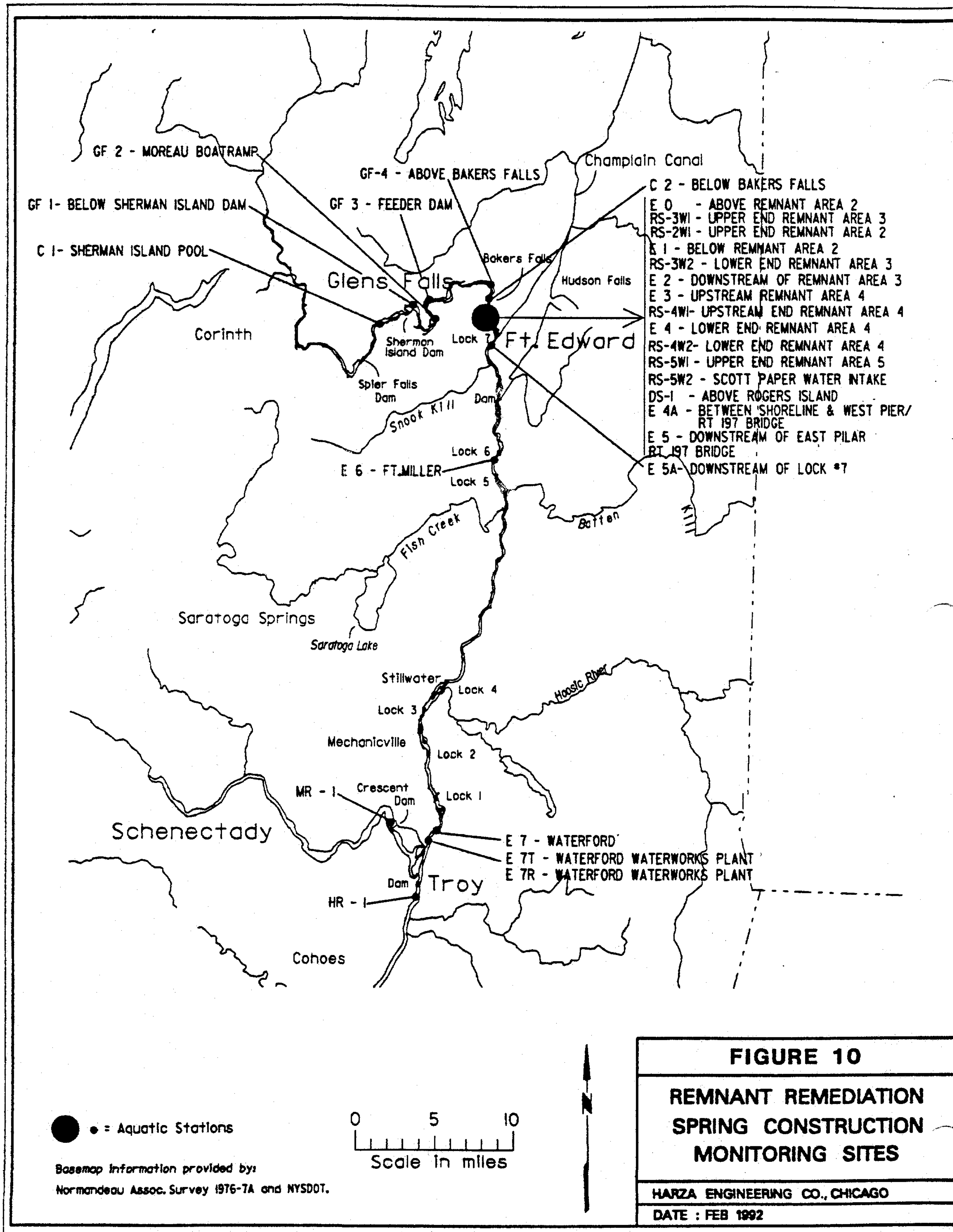
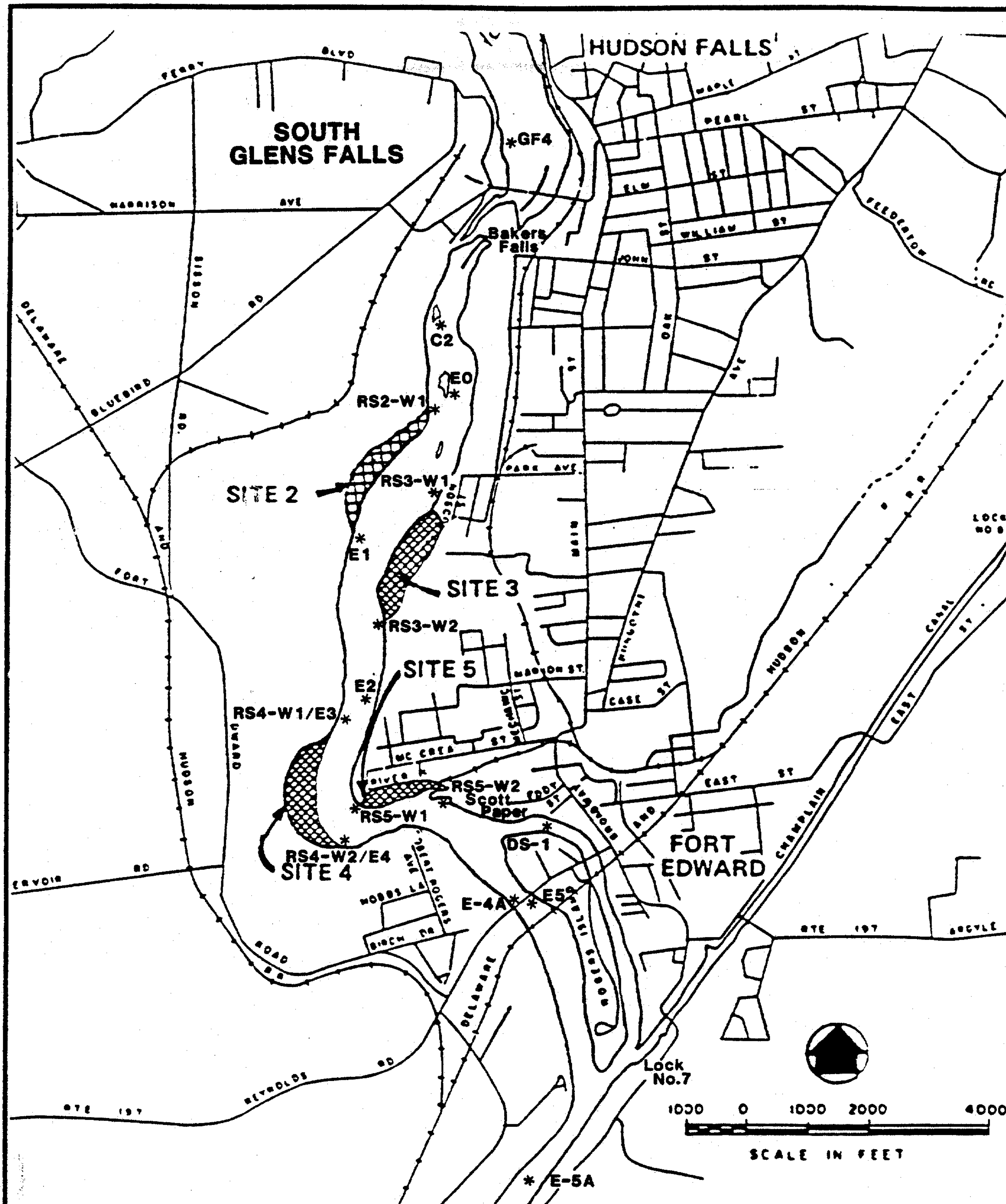



**FIGURE 10**

**REMNANT REMEDIATION SPRING CONSTRUCTION MONITORING SITES**

HARZA ENGINEERING CO., CHICAGO

DATE : FEB 1992




# FIGURE 11

## SPRING CONSTRUCTION MONITORING SITES IN REMNANT AREA

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

DATE | DWG.NO.

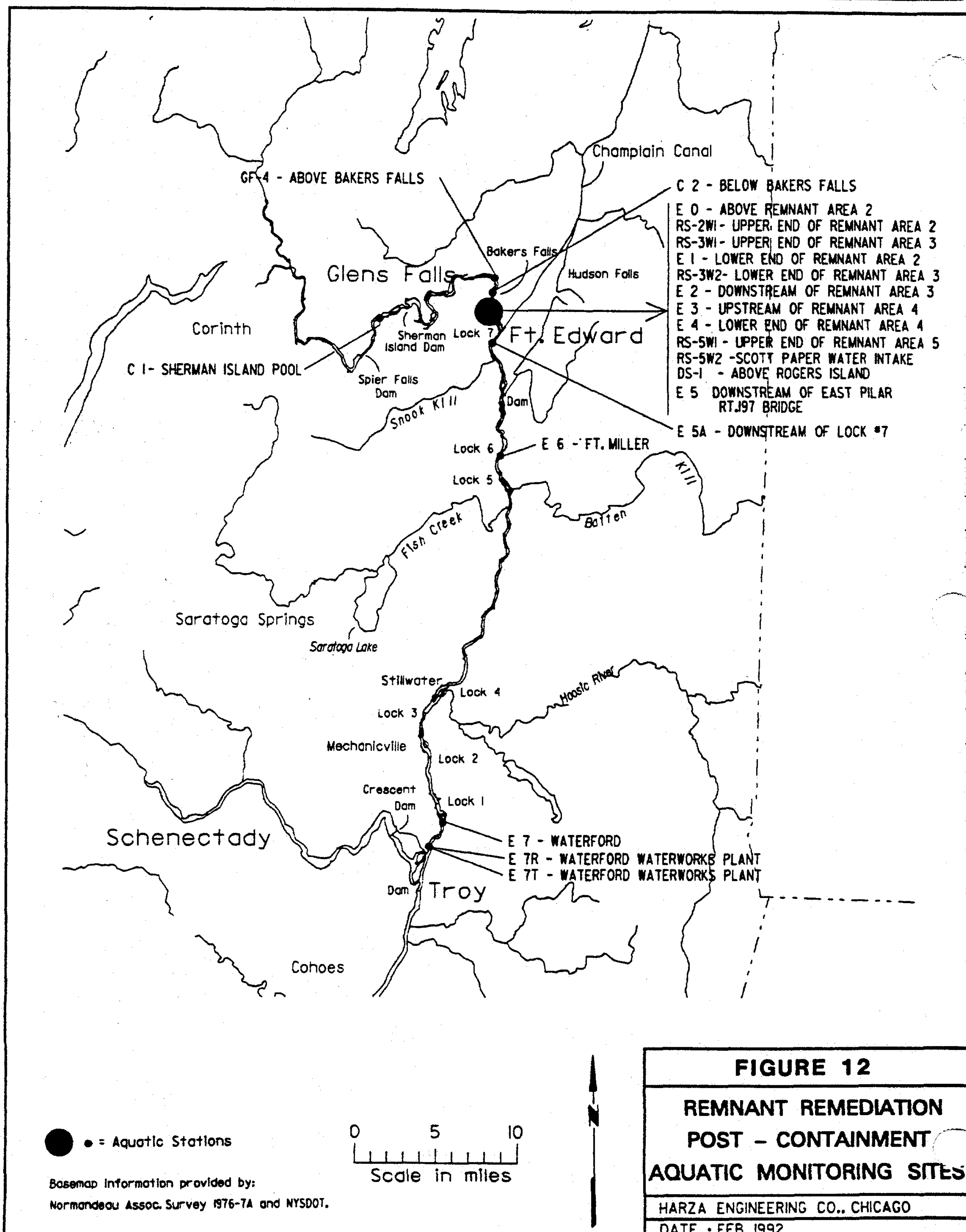
LEGEND

GF,C -- CONTROL SITE

E,DS -- EXPERIMENTAL SITE

E-4A -- Sampling discontinued 4/25/91

309824




● = Aquatic Stations

Basemap information provided by:
Normandeau Assoc. Survey 1976-7A and NYSDOT.

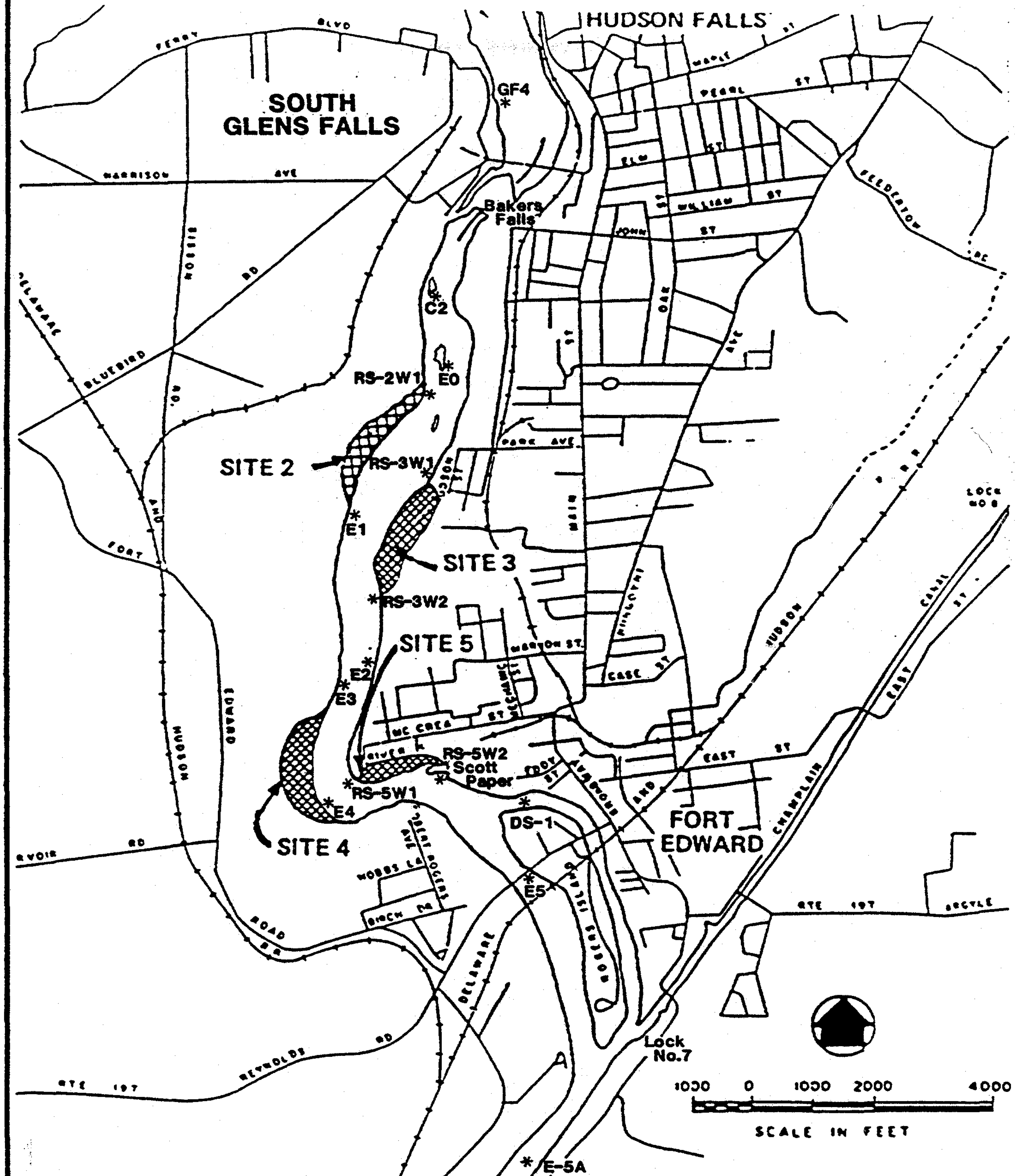
**FIGURE 12**

**REMNANT REMEDIATION POST - CONTAINMENT AQUATIC MONITORING SITES**

HARZA ENGINEERING CO., CHICAGO

DATE : FEB 1992

309825




Legend :
GF,C -- CONTROL SITE
E,DS,RS -- EXPERIMENTAL SITE

FIGURE 13

POST - CONTAINMENT MONITORING SITES IN REMNANT AREA

HARZA ENGINEERING CO., CHICAGO

APPROVED.........................

DATE | DWG.NO.

309826

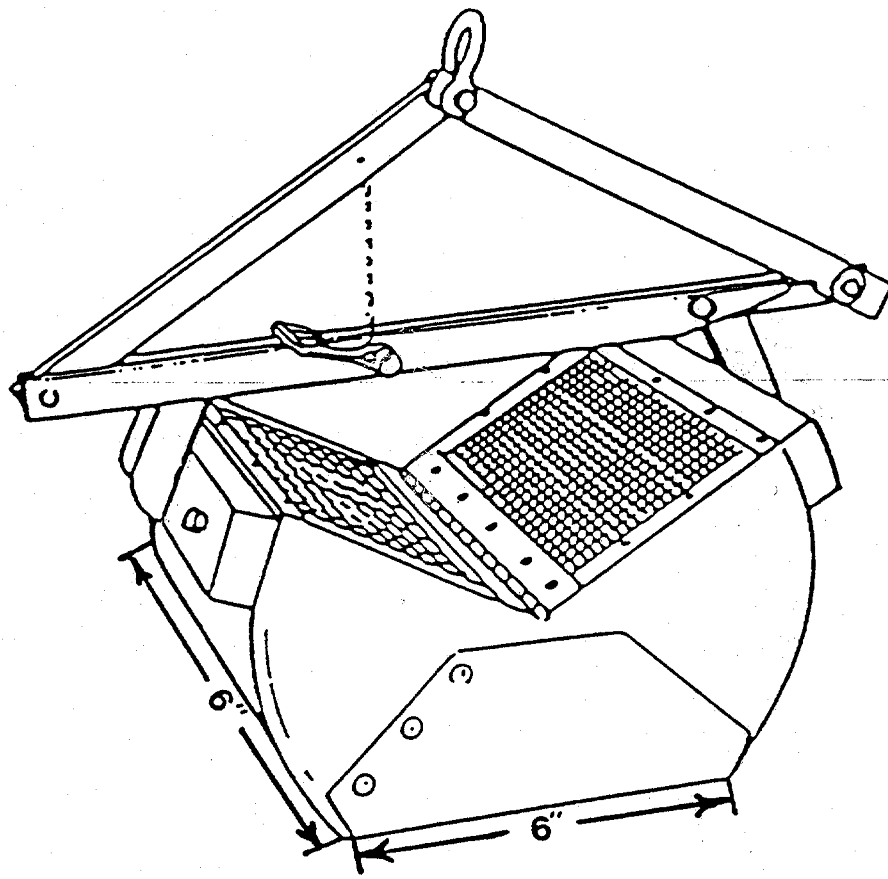


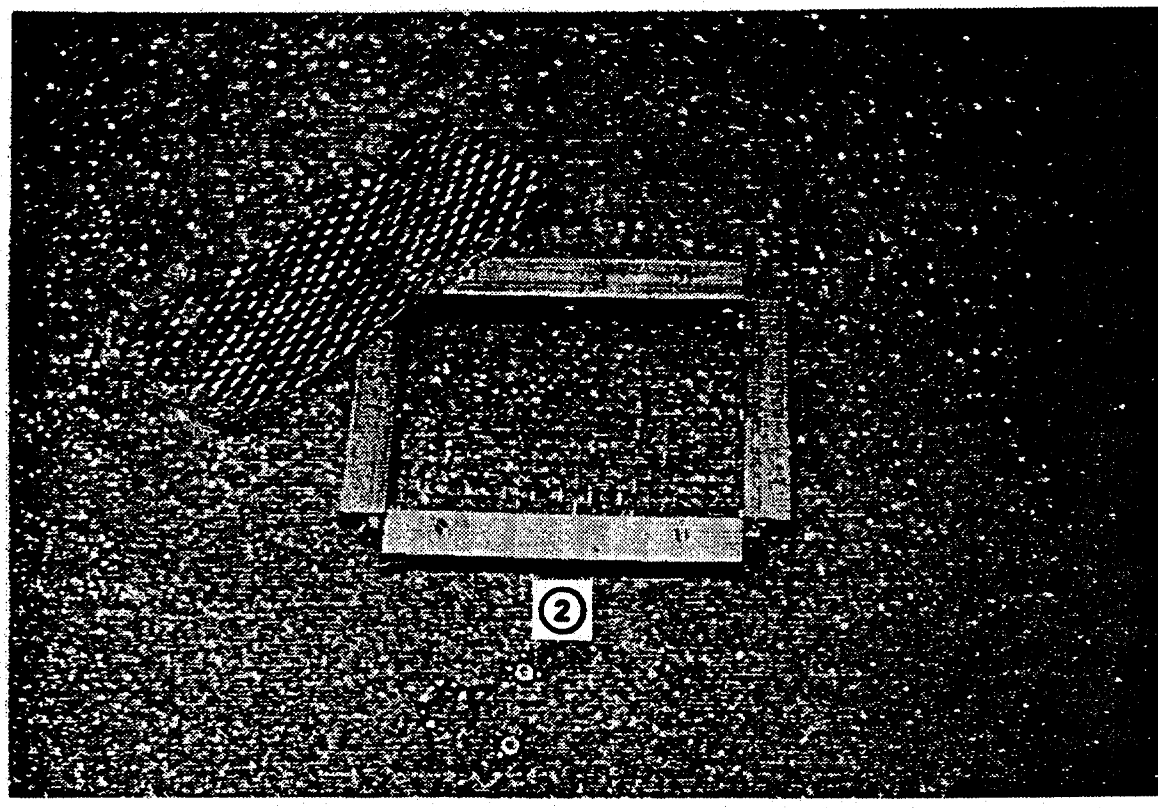

FIGURE 14

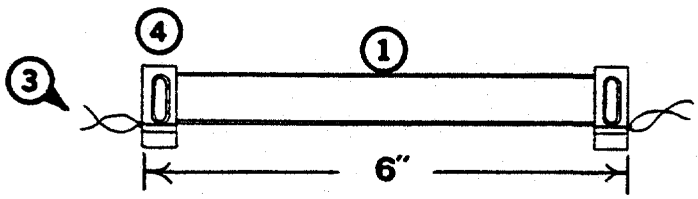
Ponar Grab Dredge
Petite Version

HARZA ENGINEERING CO., CHICAGO
APPROVED............................

| DATE | DWG.NO. |
| --- | --- |

309827



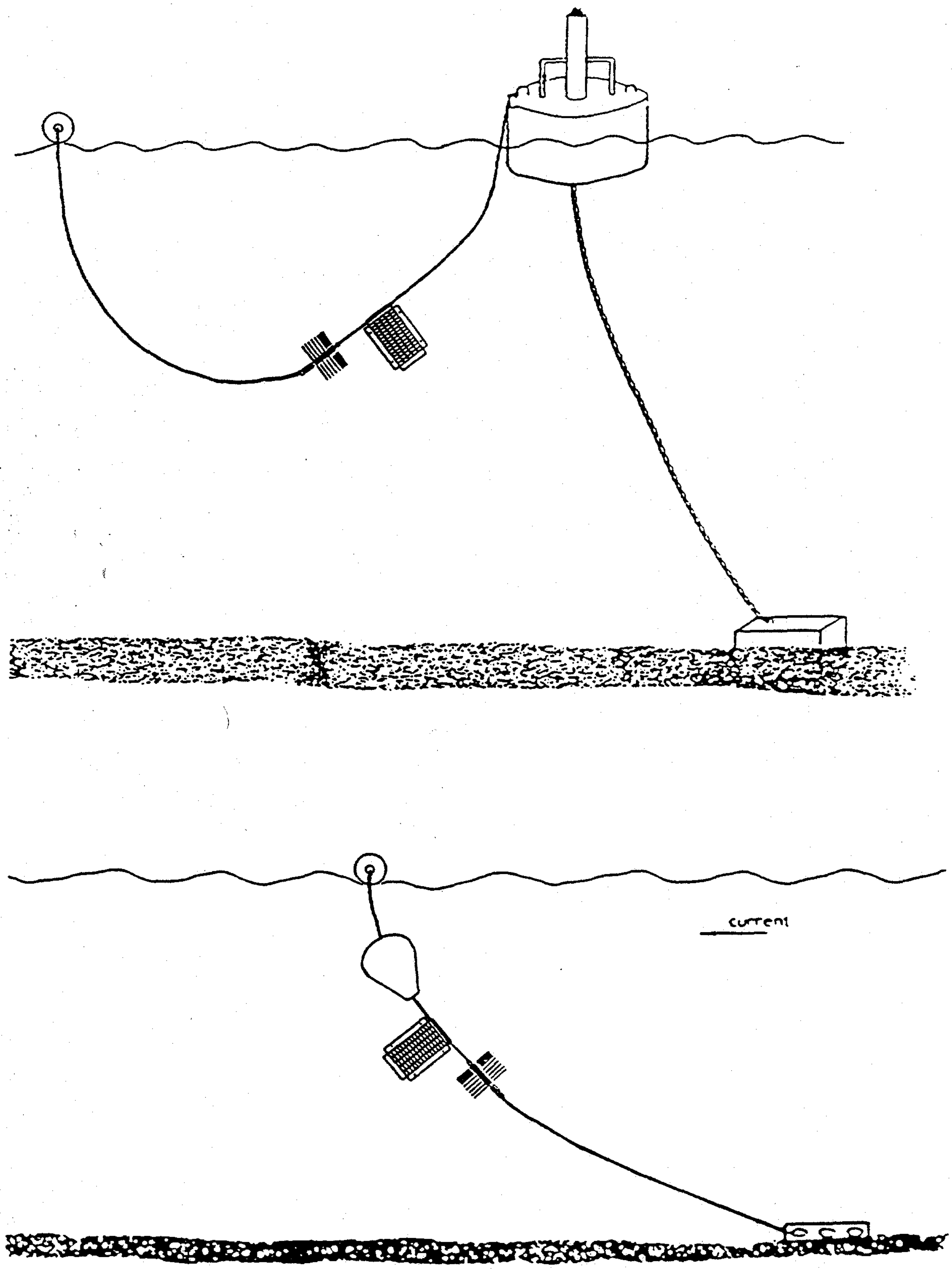

1 SOLVENT - FILLED DIALYSIS MEMBRANE
2 PROTECTIVE BRASS CAGE
3 6 lb. TEST FISHING LINE
4 PLASTIC CLIP

**FIGURE 15**

**Dialysis Membrane Bag and Brass Cage**

HARZA ENGINEERING CO., CHICAGO
APPROVED........................
DATE
DWG.NO.

309828




| FIGURE 16 | |
|---|---|
| Cage and Multiplate Set Methods | |
| HARZA ENGINEERING CO., CHICAGO APPROVED........................ | |
| DATE | DWG.NO. |

309829

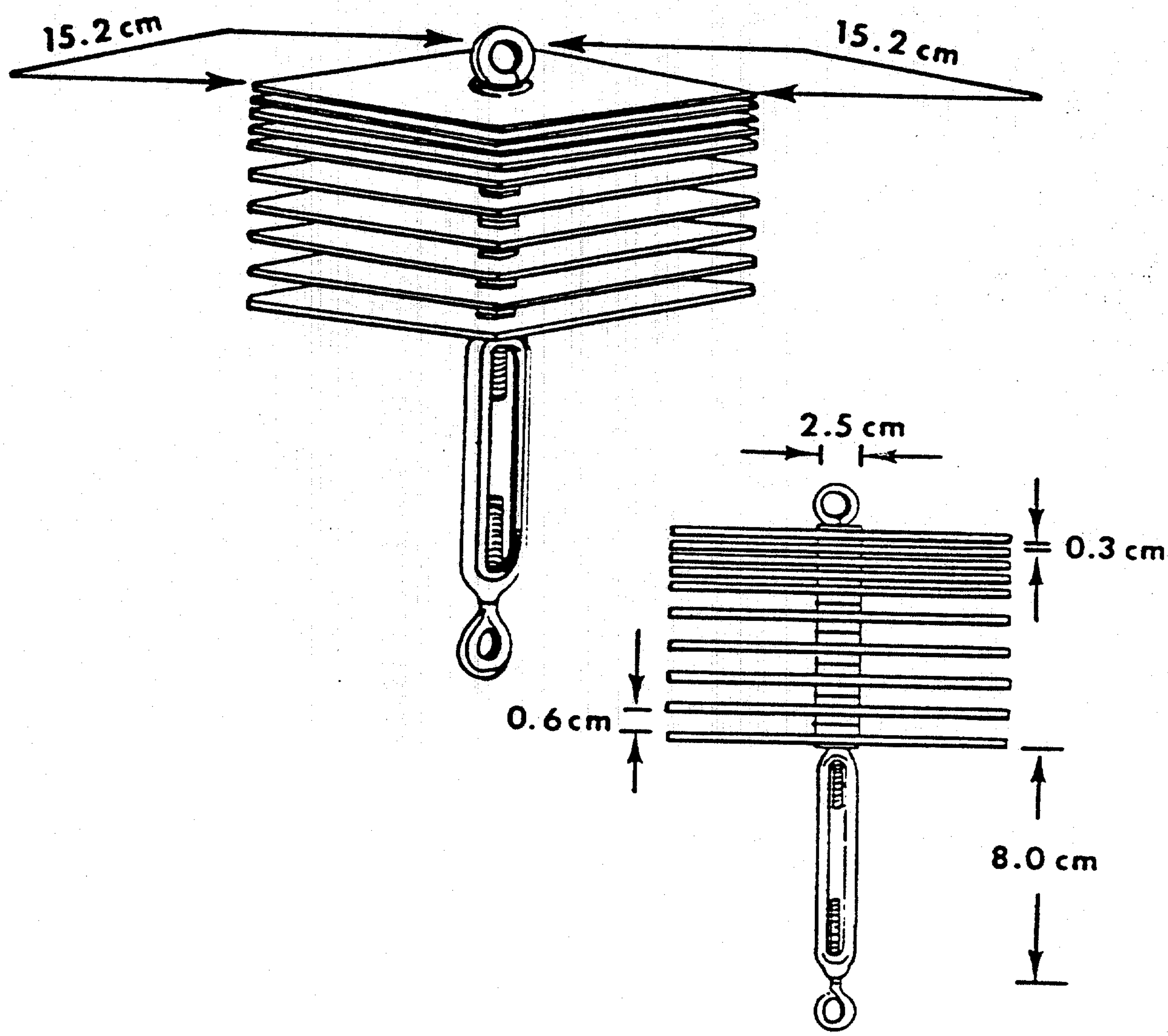



FIGURE 17

Multiple Plate Sampler
Hester - Dendy Type

HARZA ENGINEERING CO., CHICAGO
APPROVED........................

| DATE | DWG.NO. |
| --- | --- |

309830

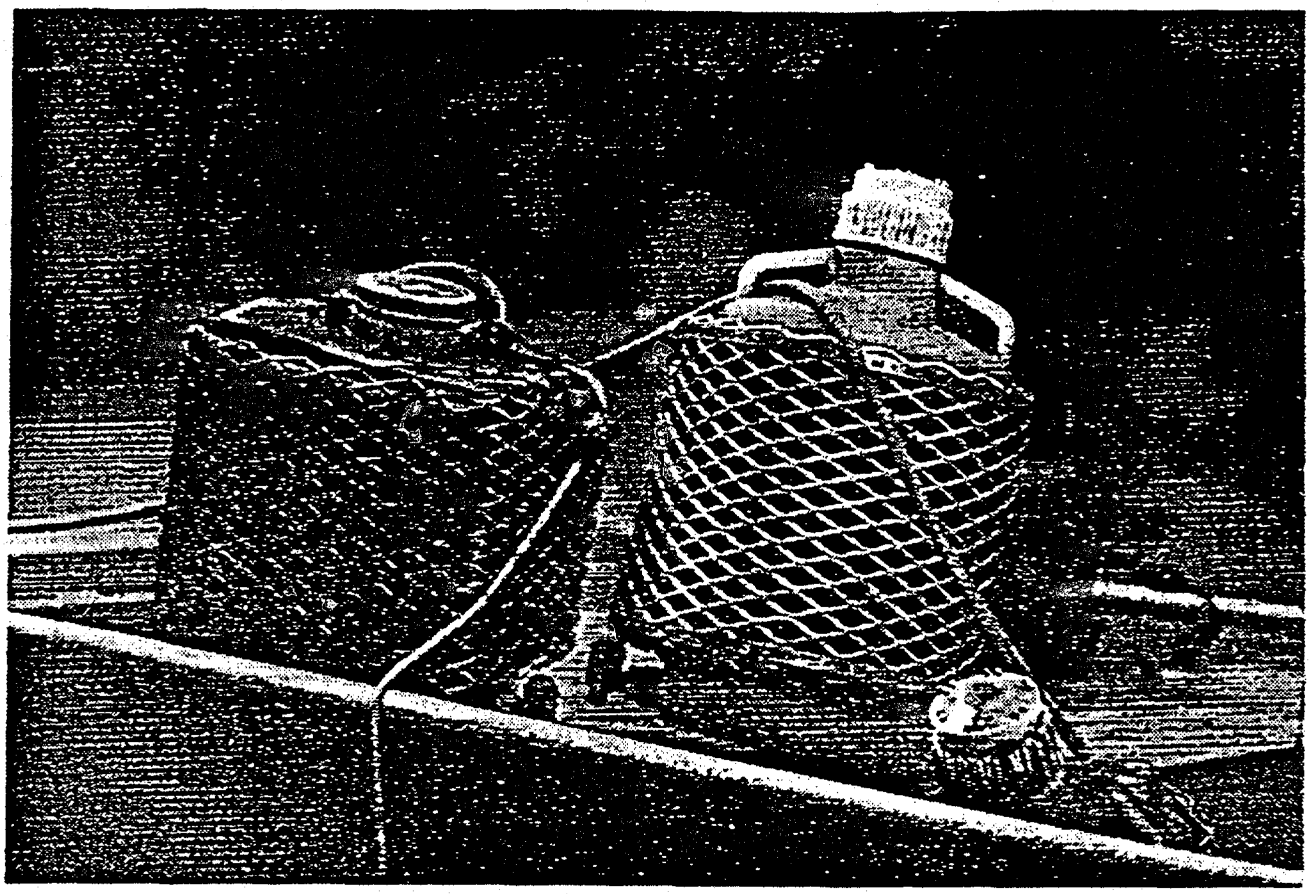


FIGURE 18

Bioassay Exposure Vessels

HARZA ENGINEERING CO., CHICAGO

APPROVED........................

| DATE | DWG.NO. |
| --- | --- |

309831

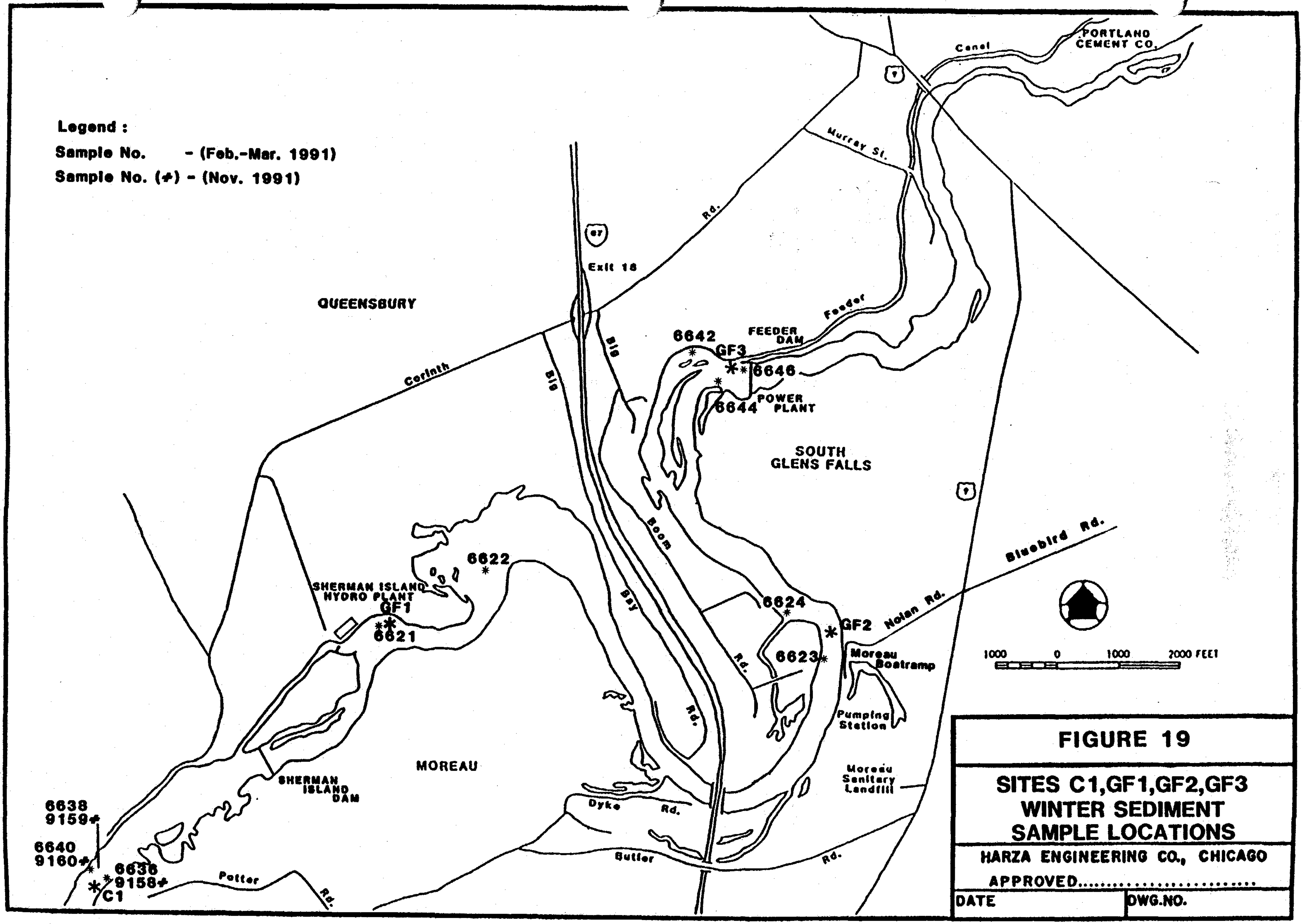


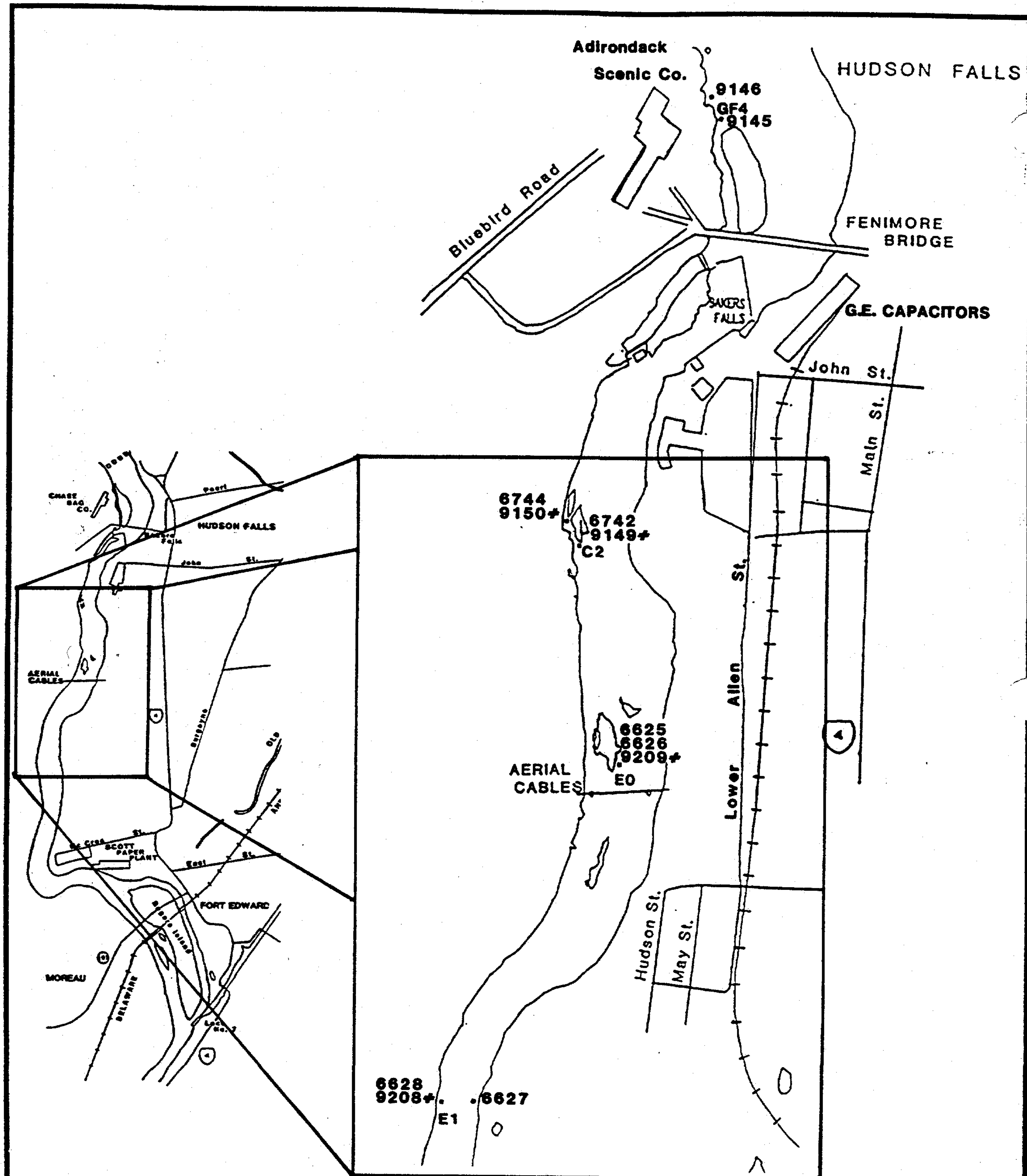

**FIGURE 19**

**SITES C1,GF1,GF2,GF3 WINTER SEDIMENT SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED.........................

| DATE | DWG.NO. |
|---|---|




Legend :
Sample No. - (Feb.-Mar. 1991)
Sample No. (+) - (Nov. 1991)

0 1000 2000 FEET

# FIGURE 20

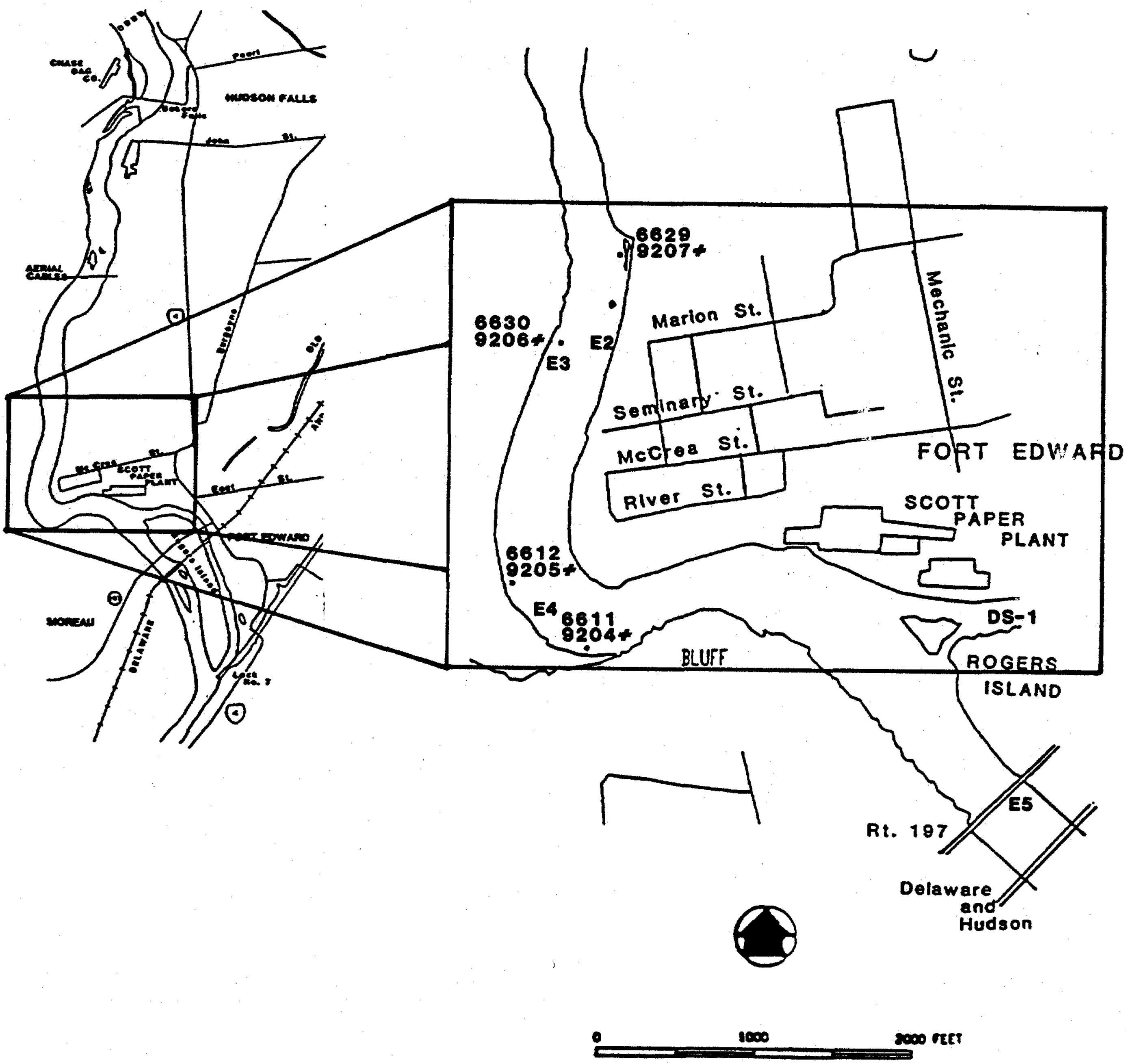
## SITES GF4,C2,E0,E1 WINTER SEDIMENT SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

................................PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

309833

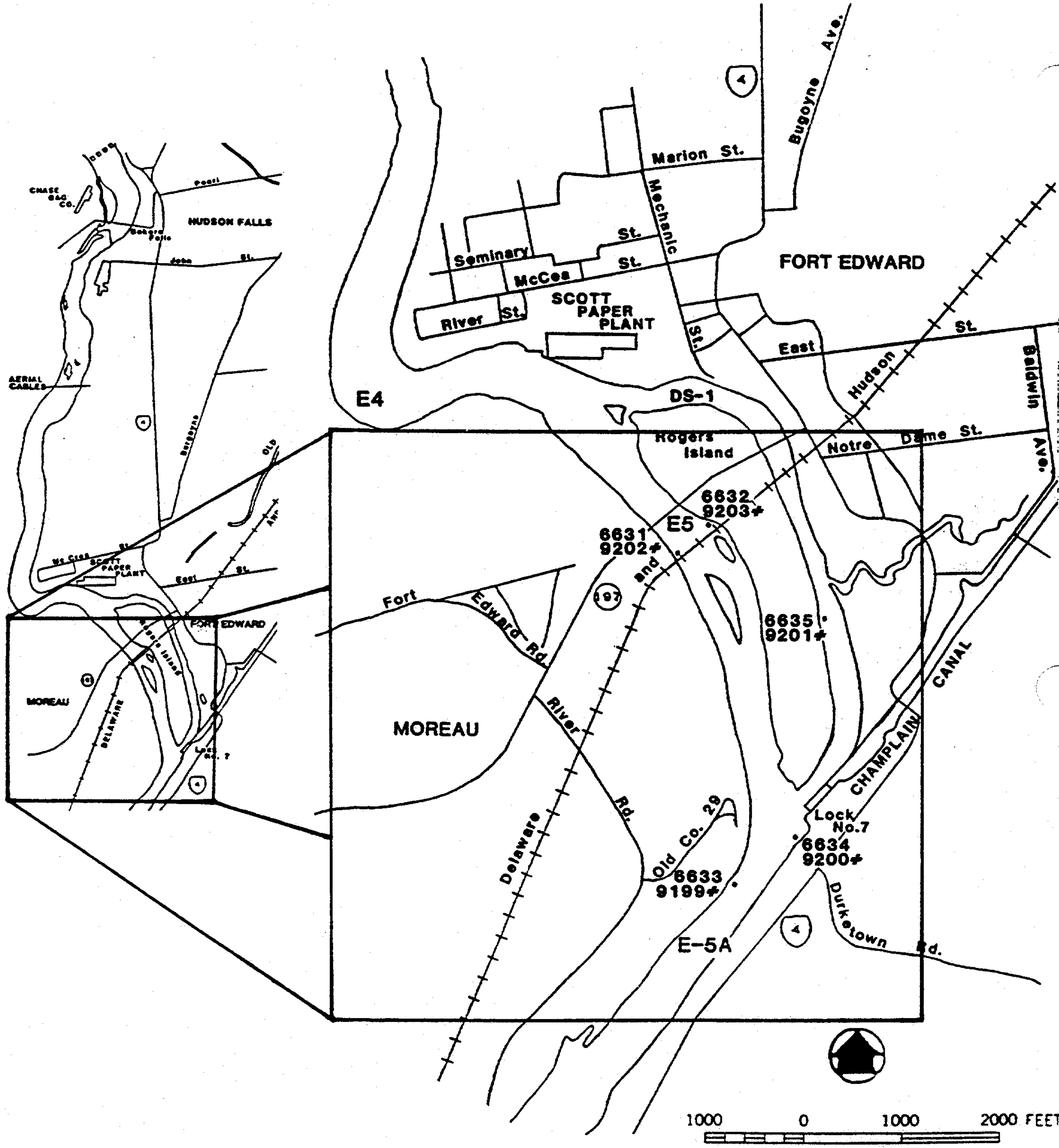



**Legend :**

**Sample No. - (Feb.-Mar. 1991)**

**Sample No. (≠) - (Nov. 1991)**

| **FIGURE 21** | |
|---|---|
| **SITES E2,E3,E4 WINTER SEDIMENT SAMPLE LOCATIONS** | |
| HARZA ENGINEERING CO., CHICAGO | |
| ..................................PROJECT MANAGER | |
| DATE | DWG. NO. |




**Legend :**

**Sample No. - (Feb.-Mar. 1991)**

**Sample No. (*) - (Nov. 1991)**

# FIGURE 22

## SITES E5,E-5A WINTER SEDIMENT SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

..............................PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

309835

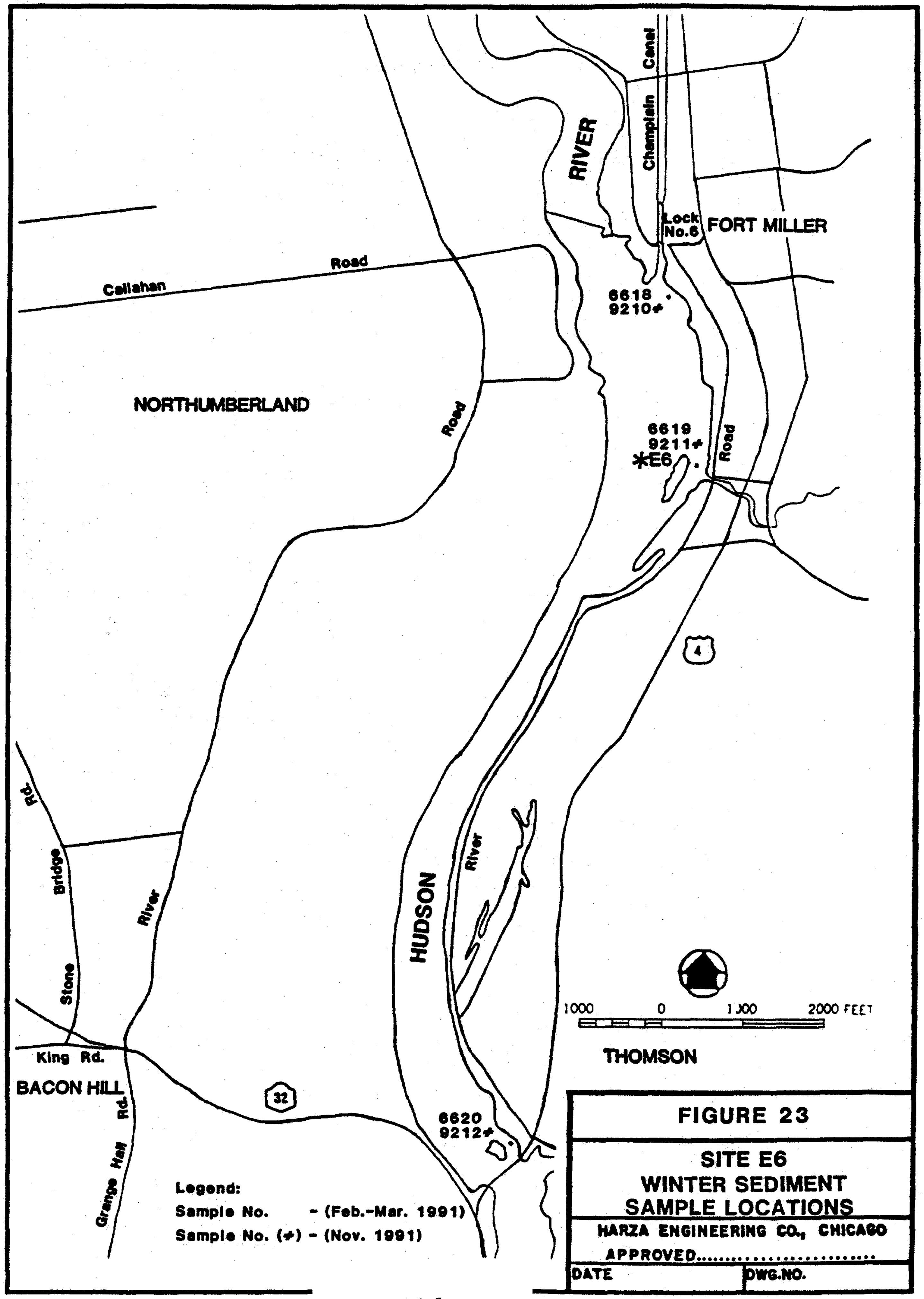



FIGURE 23

SITE E6
WINTER SEDIMENT
SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

DATE | DWG.NO.

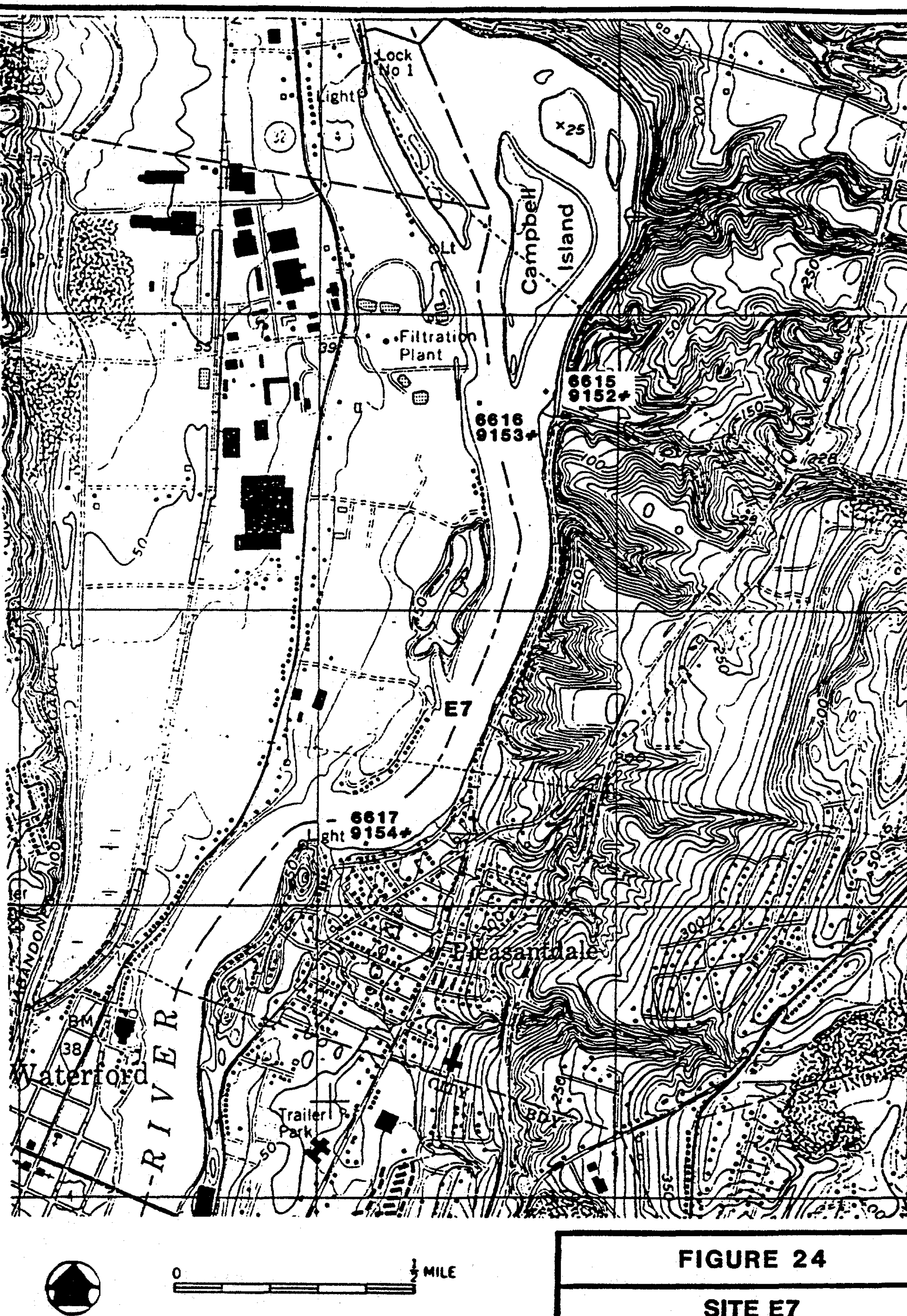



**FIGURE 24**

**SITE E7**
**WINTER SEDIMENT**
**SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

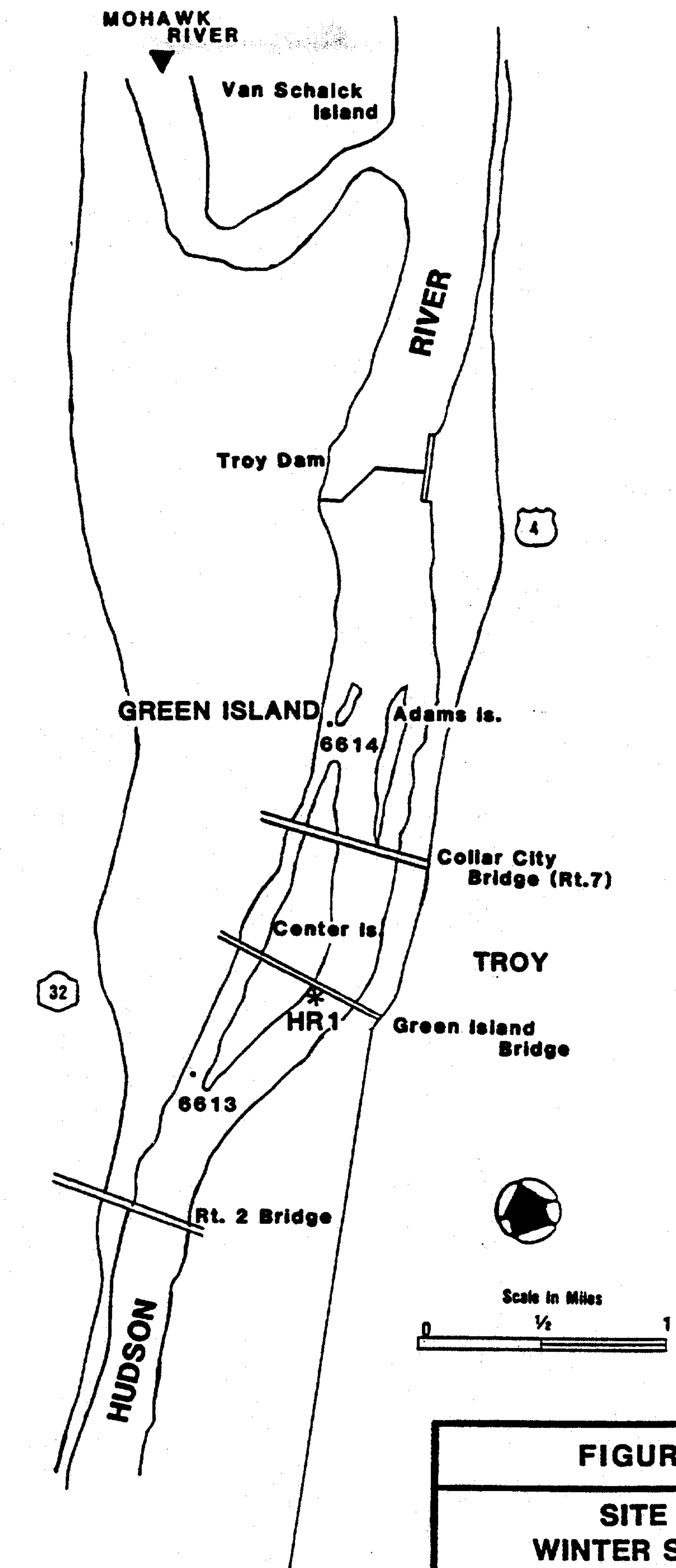
DATE | DWG.NO.

**Legend:**

Sample No. - (Feb.-Mar. 1991)

Sample No. (✢) - (Nov. 1991)

309837




## FIGURE 25

**SITE HR1**
**WINTER SEDIMENT**
**SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED............................

| DATE | DWG.NO. |
|---|---|

309838

309839

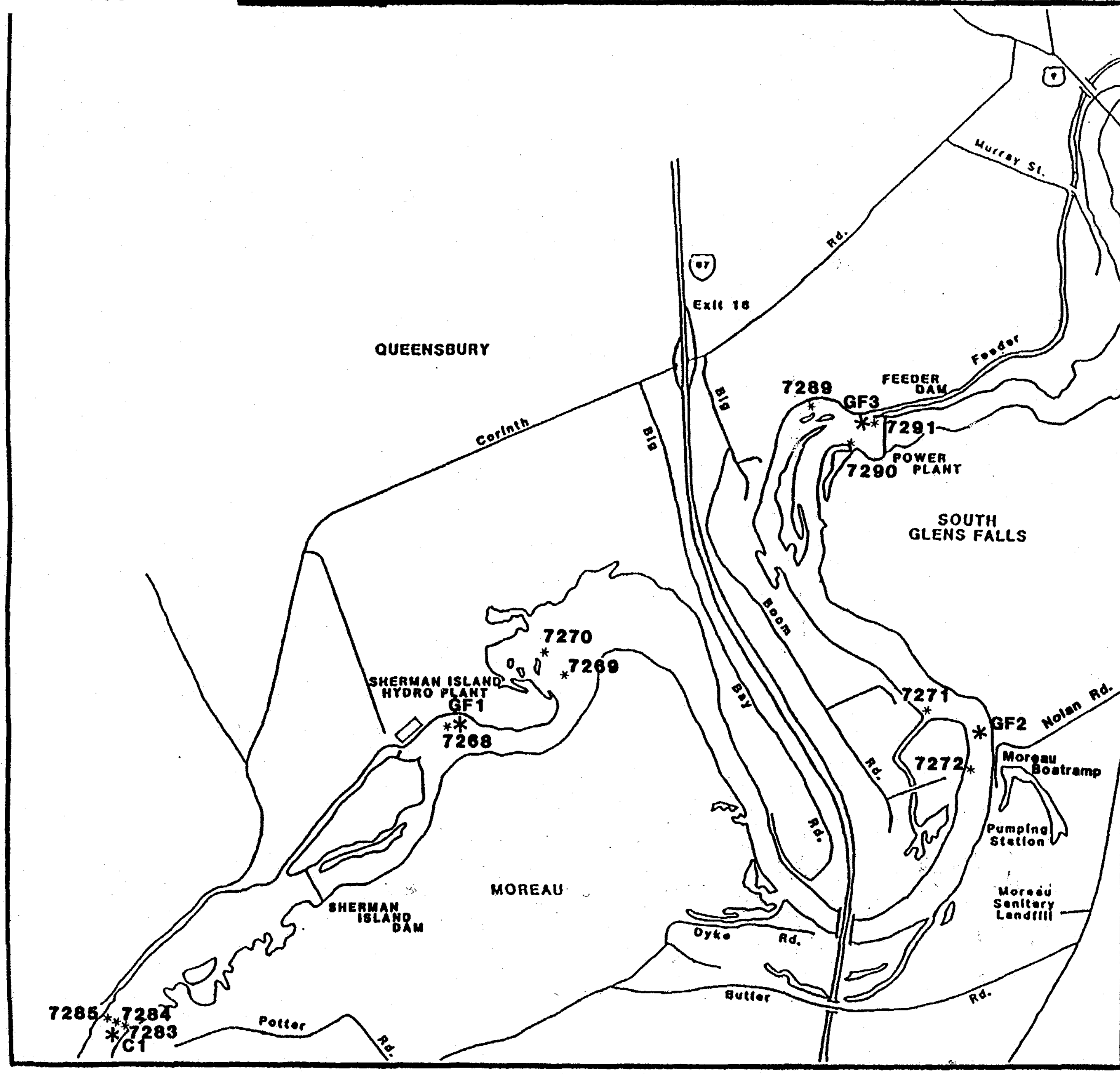


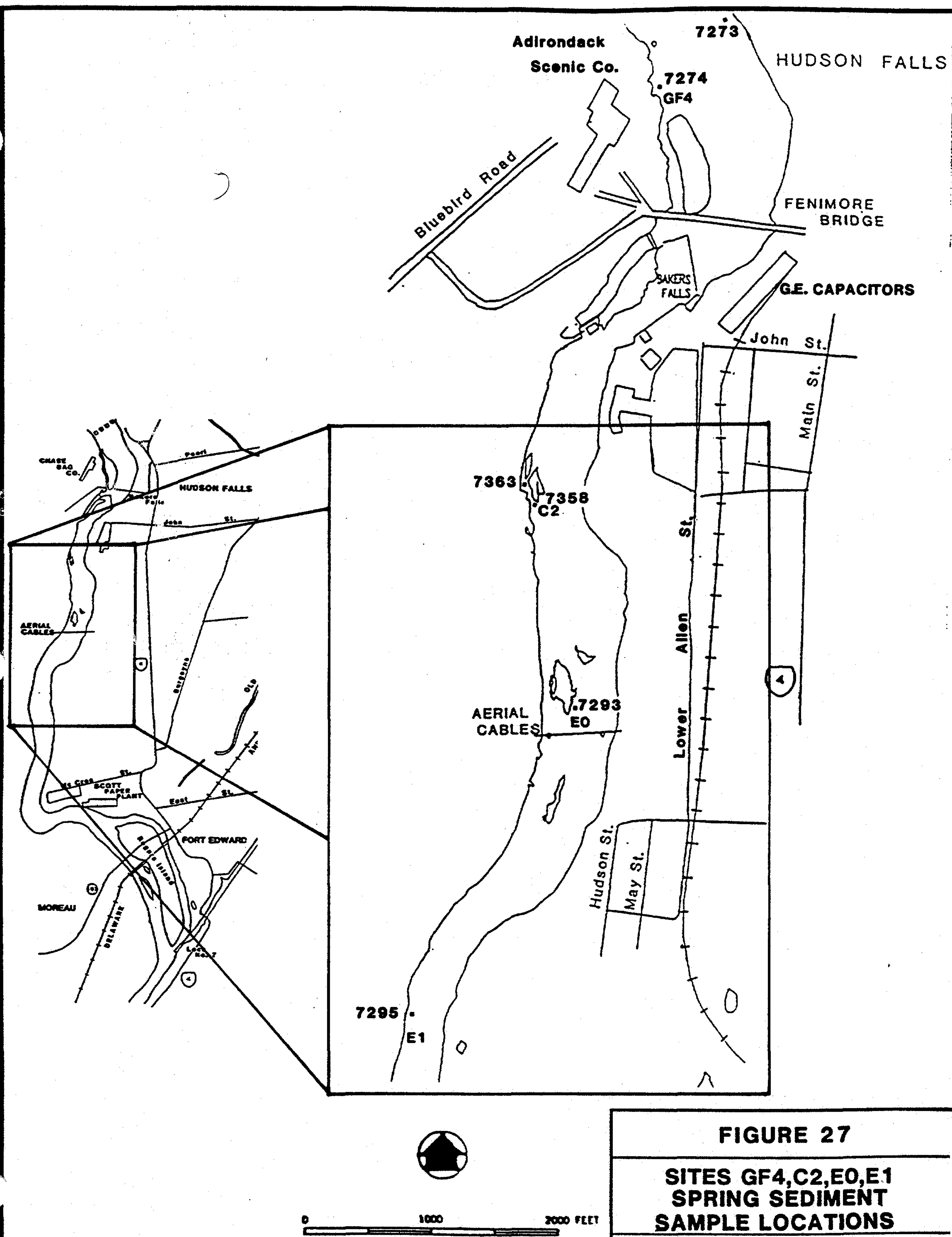

**FIGURE 26**

**SITES C1,GF1,GF2,GF3 SPRING SEDIMENT SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED........................

| DATE | DWG.NO. |
|---|---|




# FIGURE 27

## SITES GF4,C2,E0,E1 SPRING SEDIMENT SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

.................................... PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

309840

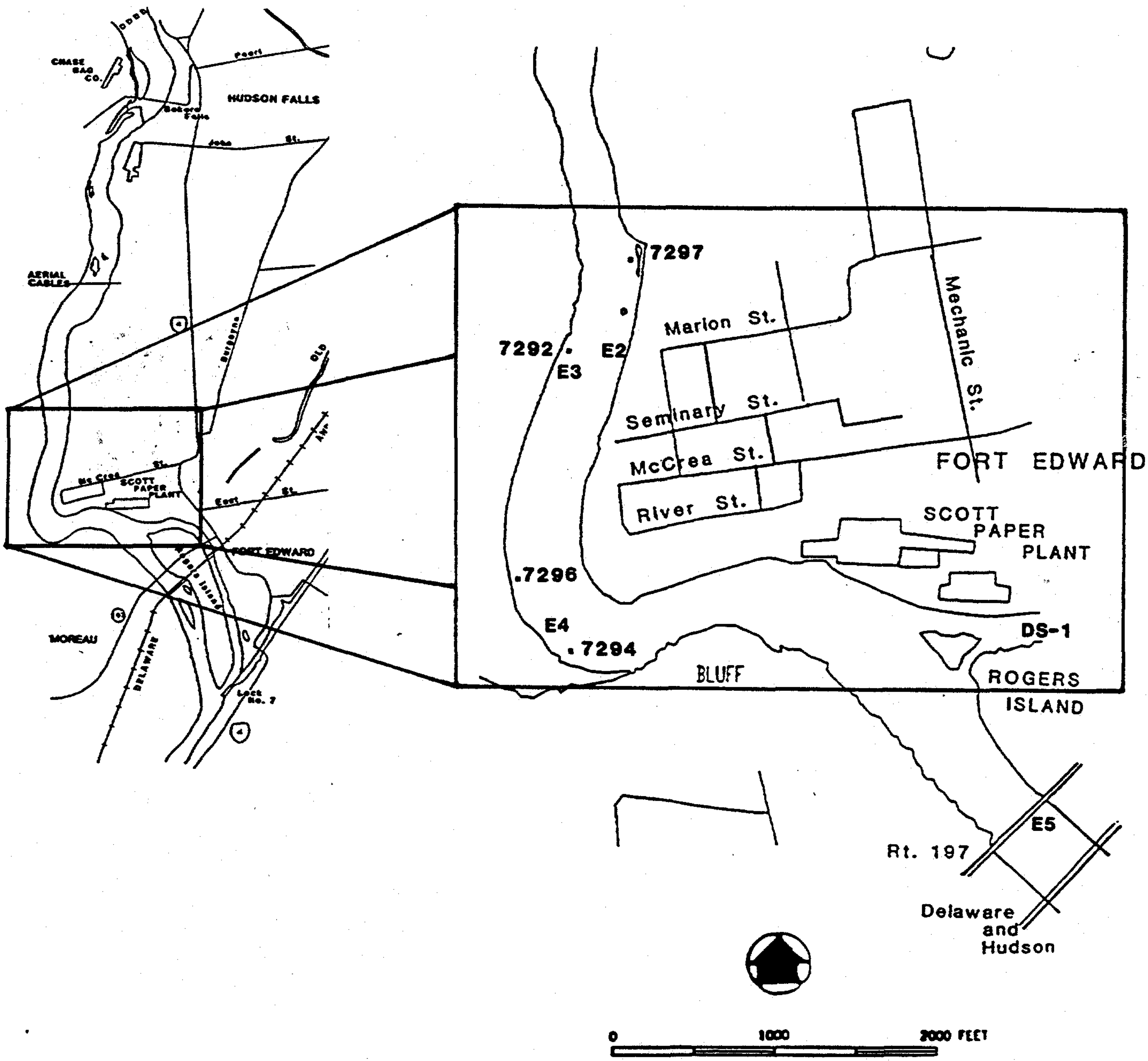



**FIGURE 28**

**SITES E2,E3,E4 SPRING SEDIMENT SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

..................................PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

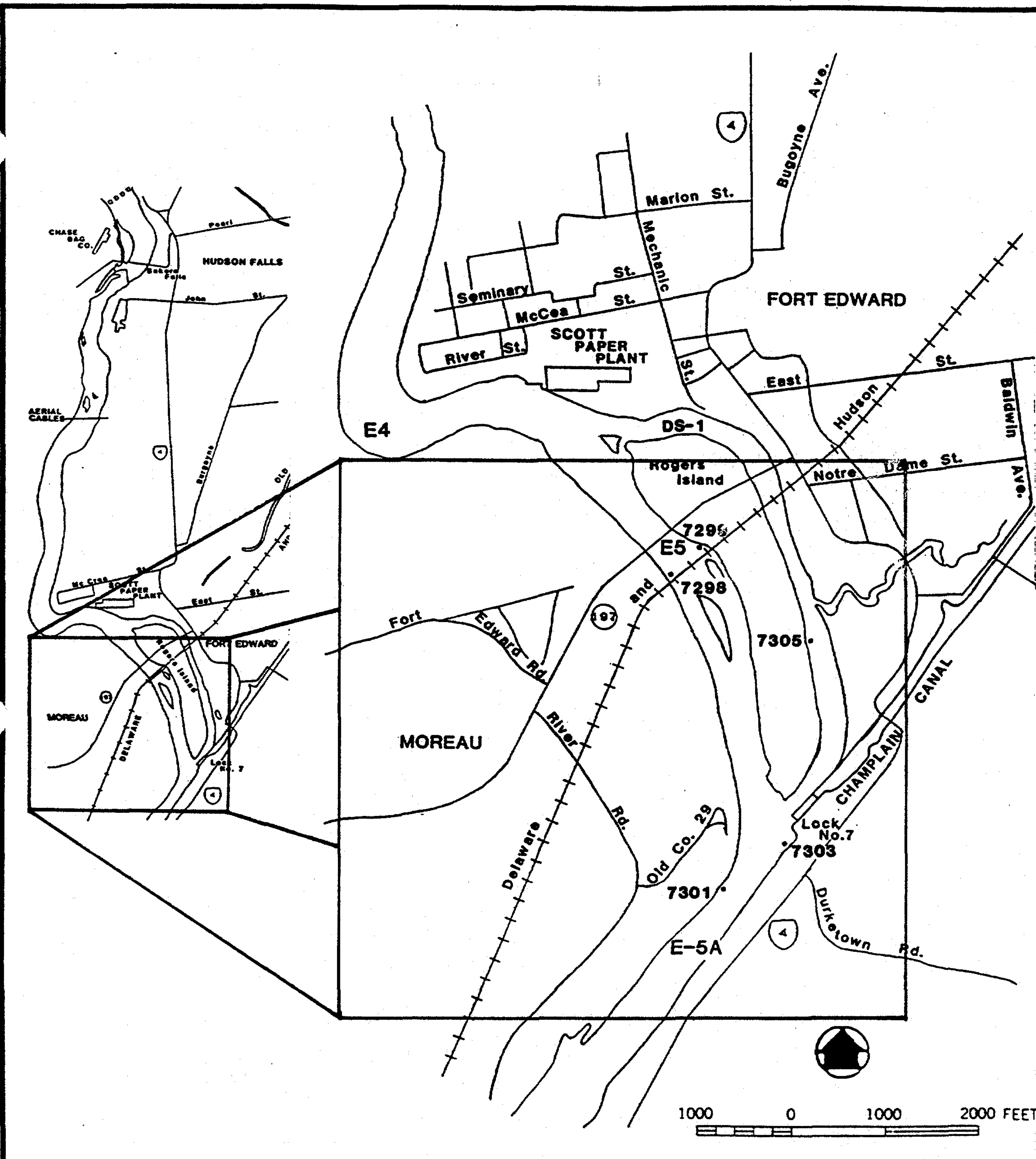



**FIGURE 29**

**SITES E5,E-5A SPRING SEDIMENT SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

..............................PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

309842

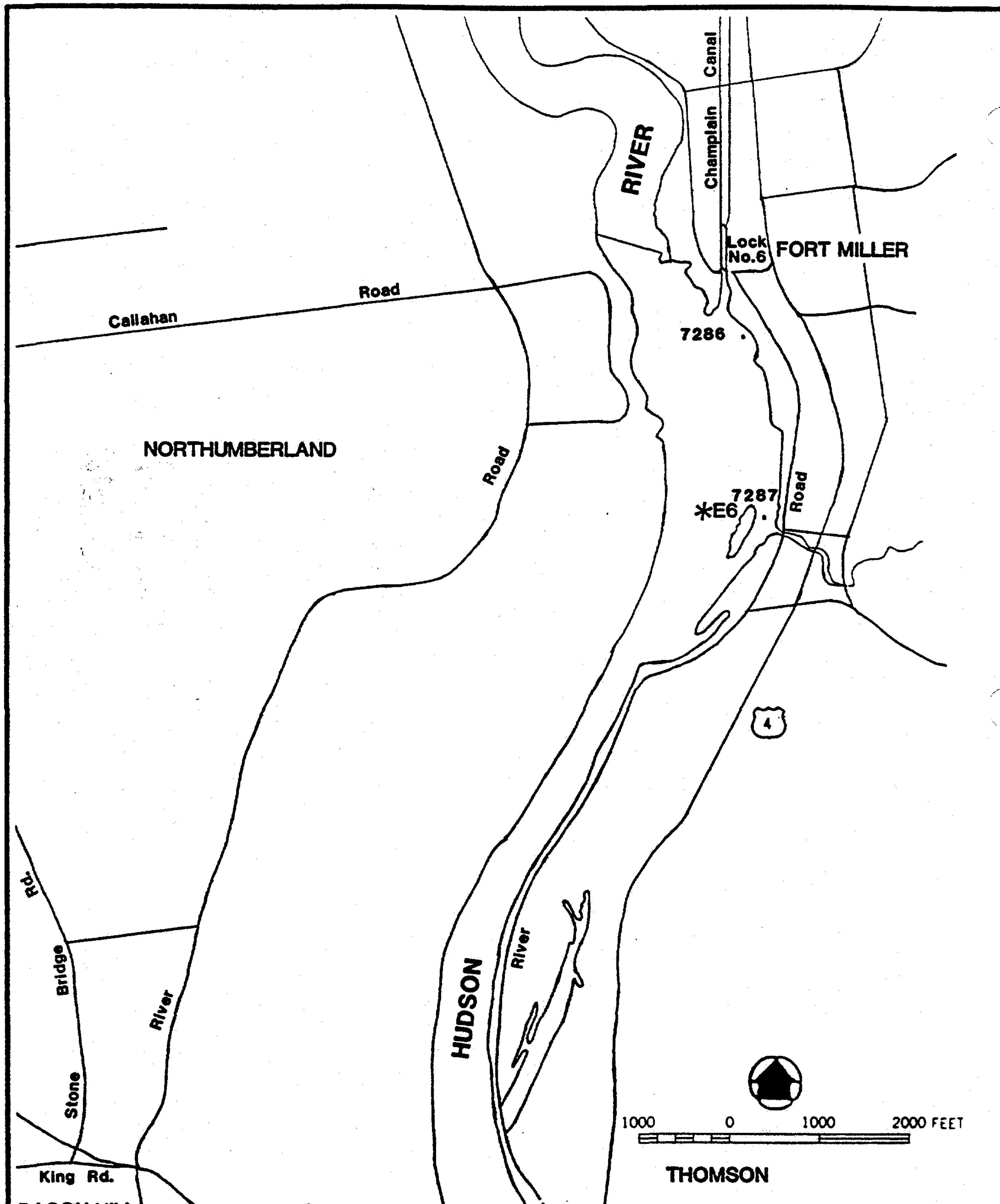



FIGURE 30

SITE E6
SPRING SEDIMENT
SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

| DATE | DWG.NO. |
|---|---|

309843

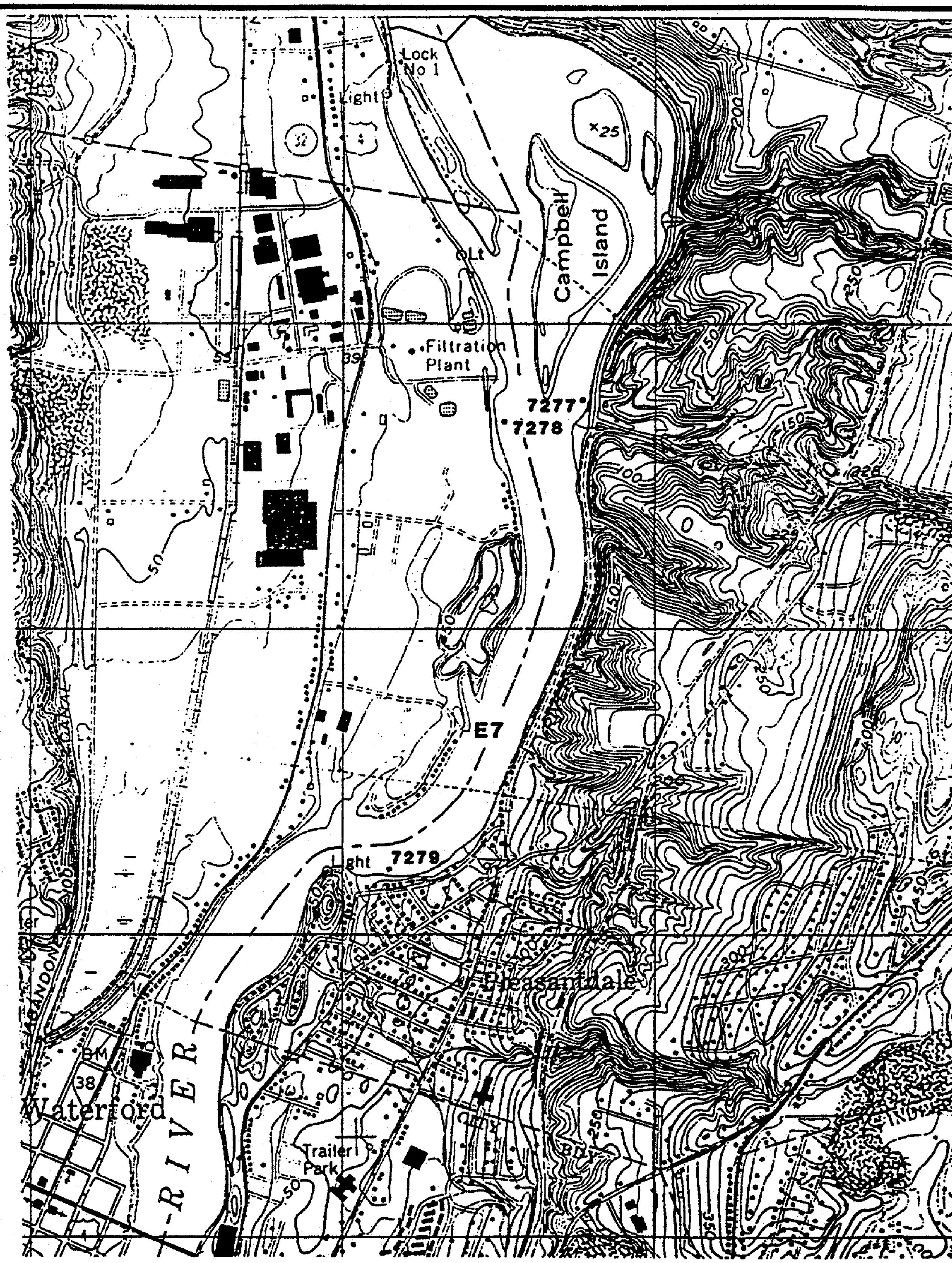



**FIGURE 31**

**SITE E7**
**SPRING SEDIMENT**
**SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED.........................

| DATE | DWG.NO. |
|---|---|

309844

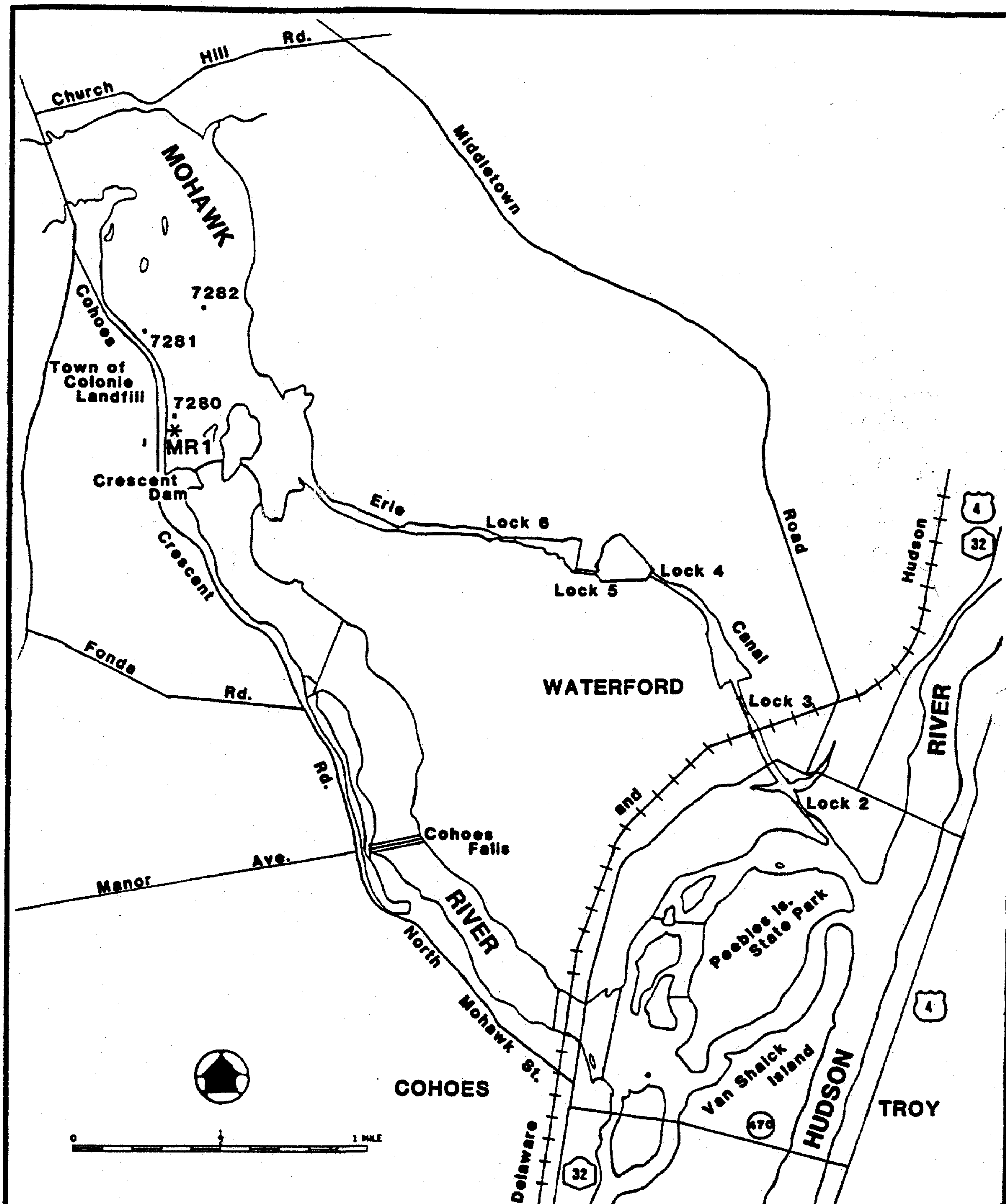



FIGURE 32

SITE MR1
SPRING SEDIMENT
SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

APPROVED.........................

DATE | DWG.NO.

309845

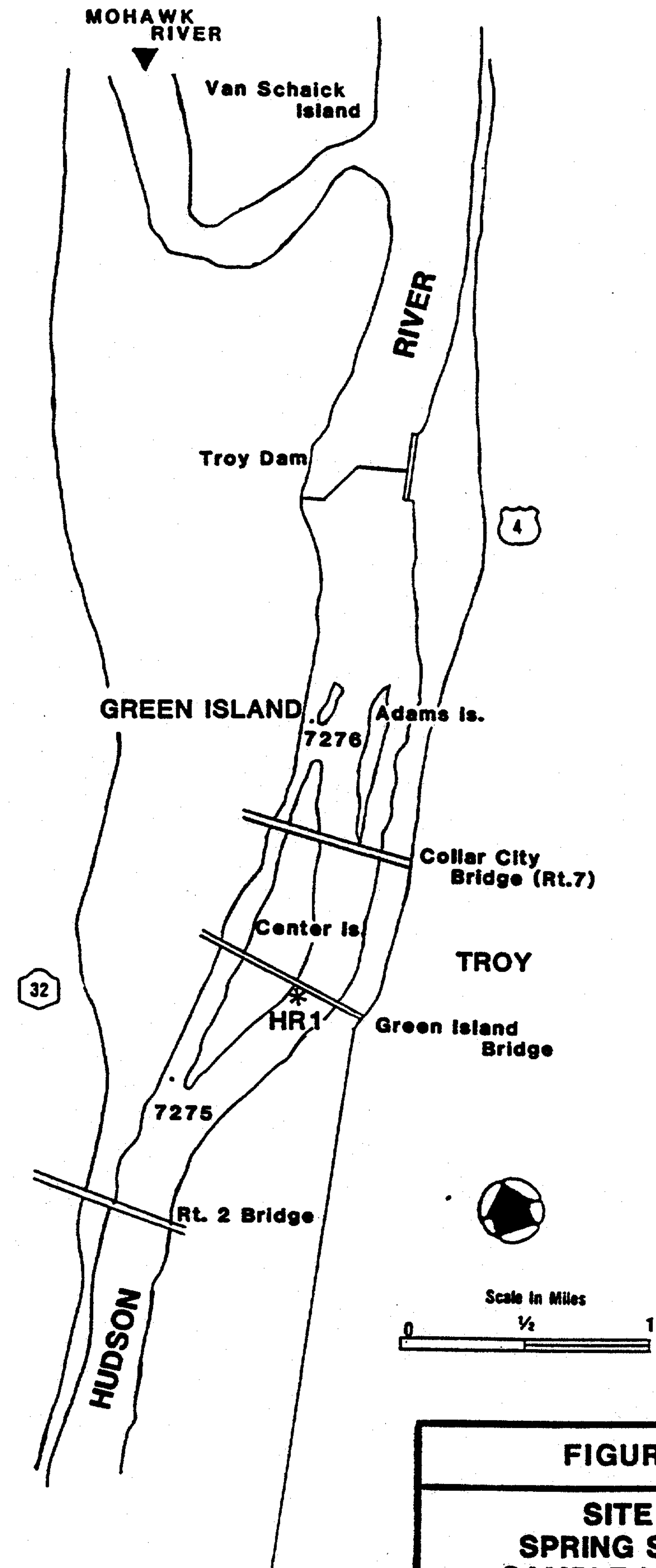



**FIGURE 33**

**SITE HR1**
**SPRING SEDIMENT**
**SAMPLE LOCATIONS**

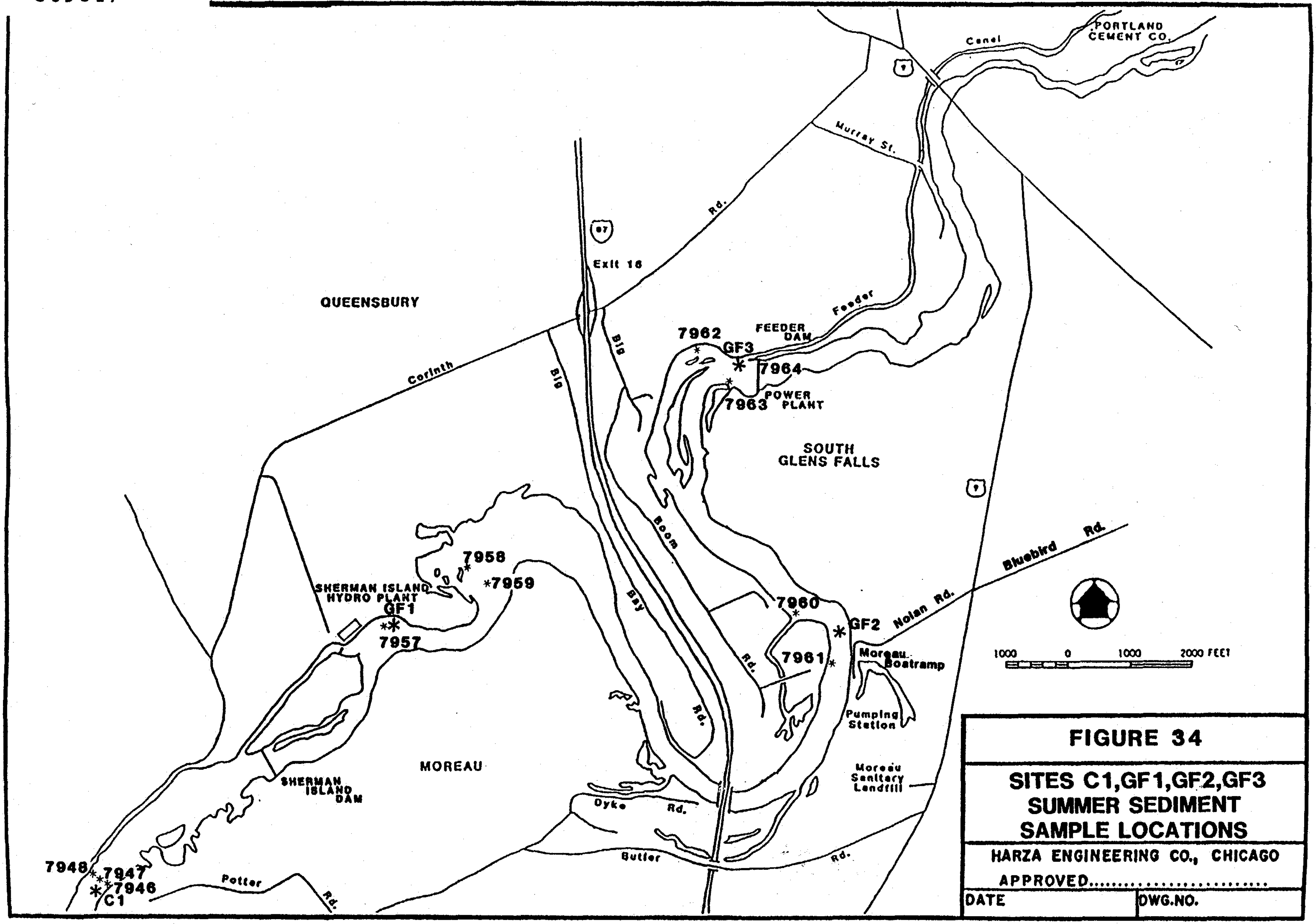
HARZA ENGINEERING CO., CHICAGO

APPROVED............................

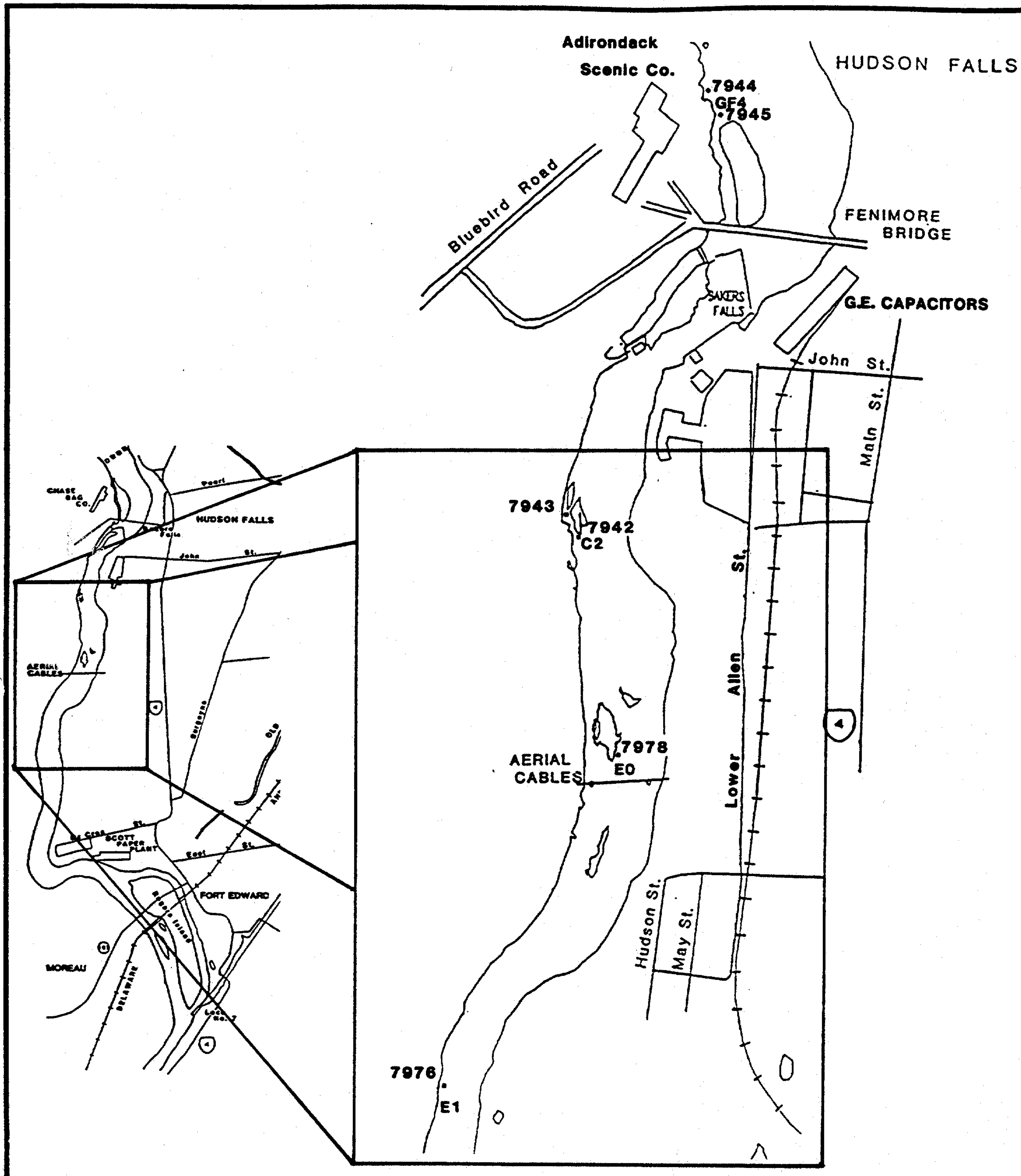
| DATE | DWG.NO. |
| --- | --- |

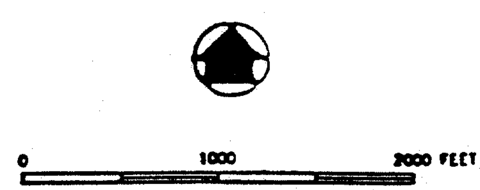
309846

309847




| FIGURE 34 | |
|---|---|
| SITES C1,GF1,GF2,GF3 SUMMER SEDIMENT SAMPLE LOCATIONS | |
| HARZA ENGINEERING CO., CHICAGO | |
| APPROVED........................ | |
| DATE | DWG.NO. |




# FIGURE 35

## SITES GF4,C2,E0,E1 SUMMER SEDIMENT SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

..................................PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

309848

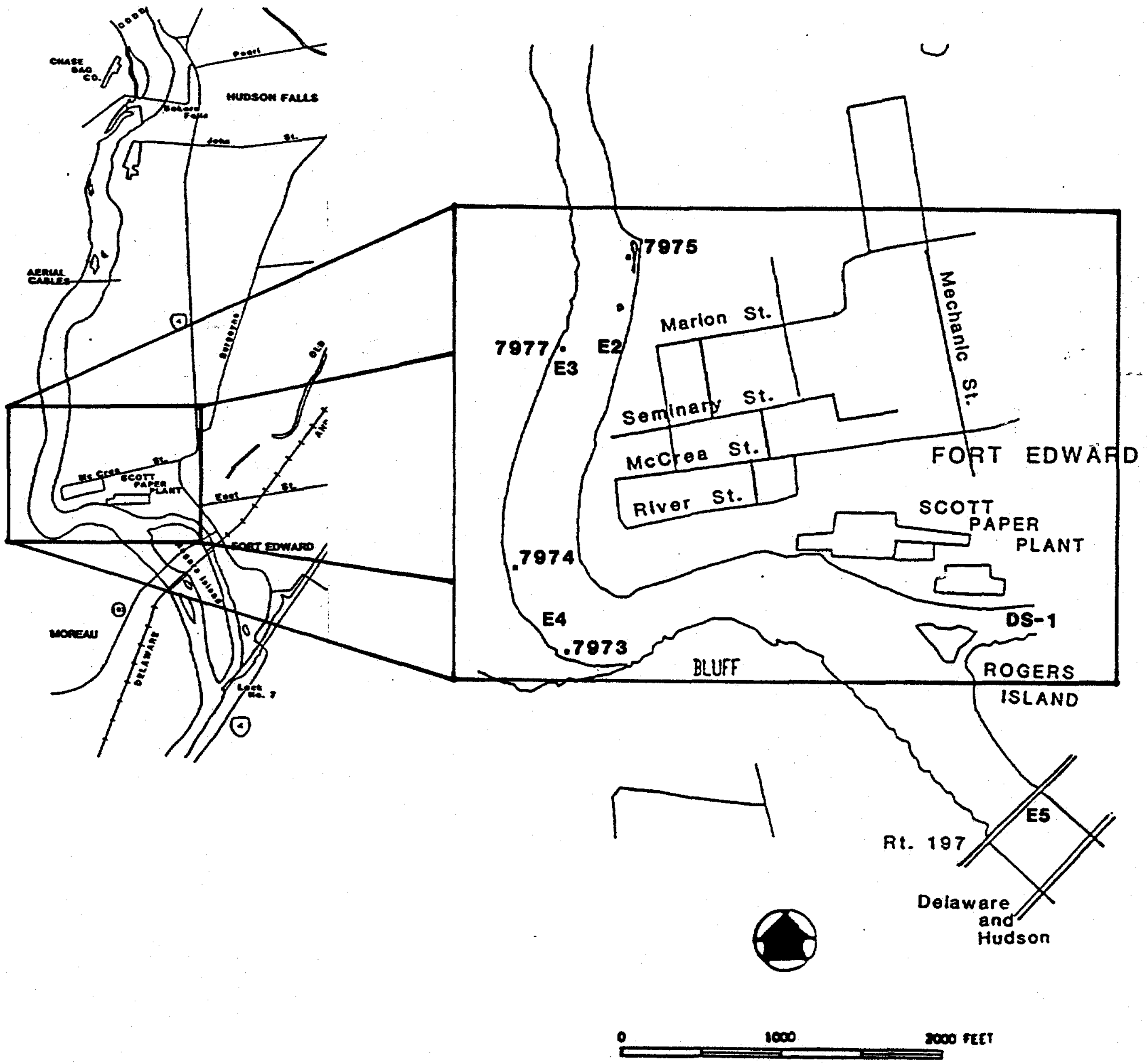



**FIGURE 36**

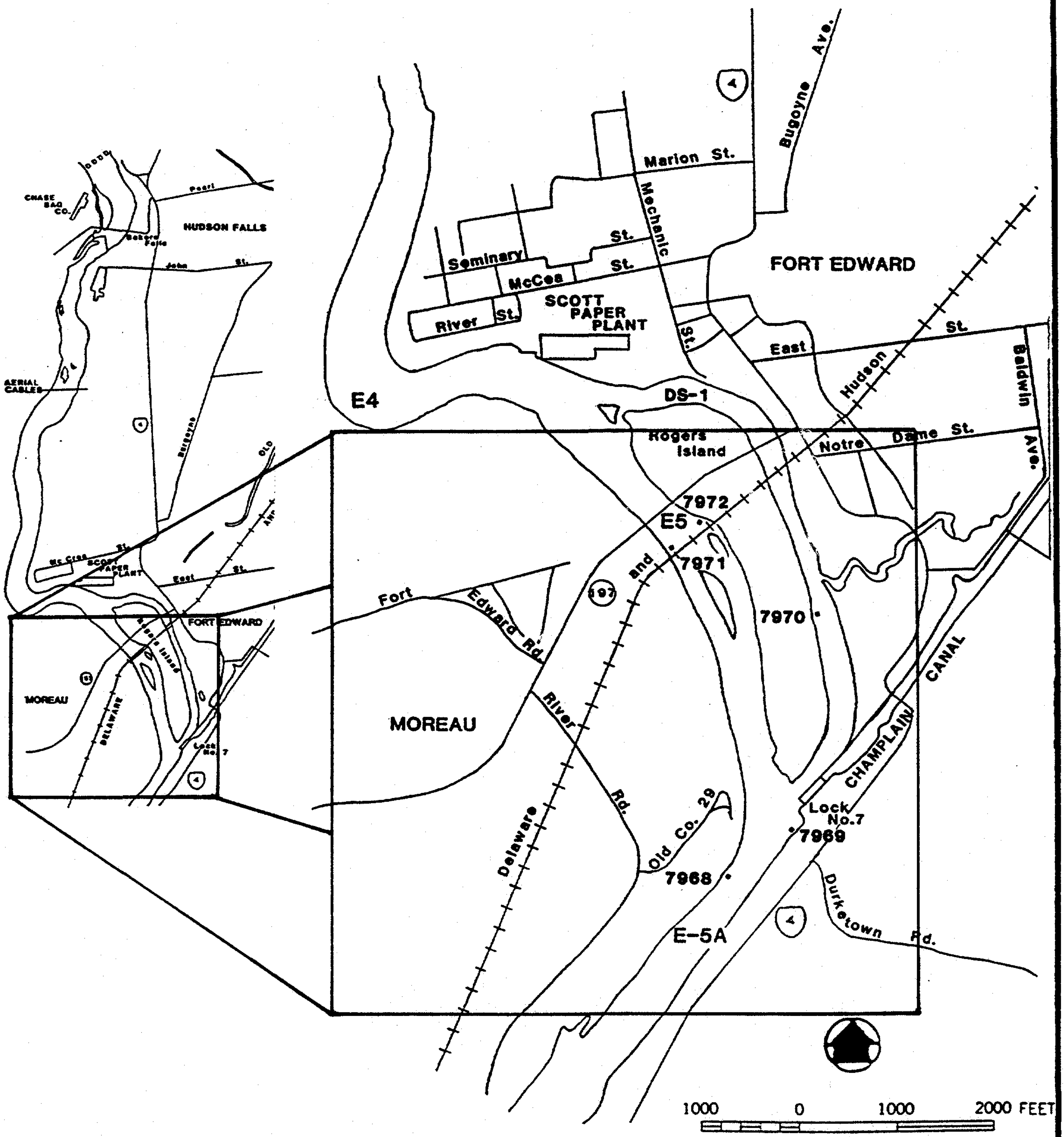
**SITES E2,E3,E4 SUMMER SEDIMENT SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

......................................PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

309849




# FIGURE 37

## SITES E5, E-5A SUMMER SEDIMENT SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

.................................. PROJECT MANAGE

| DATE | DWG. NO. |
|---|---|

309850

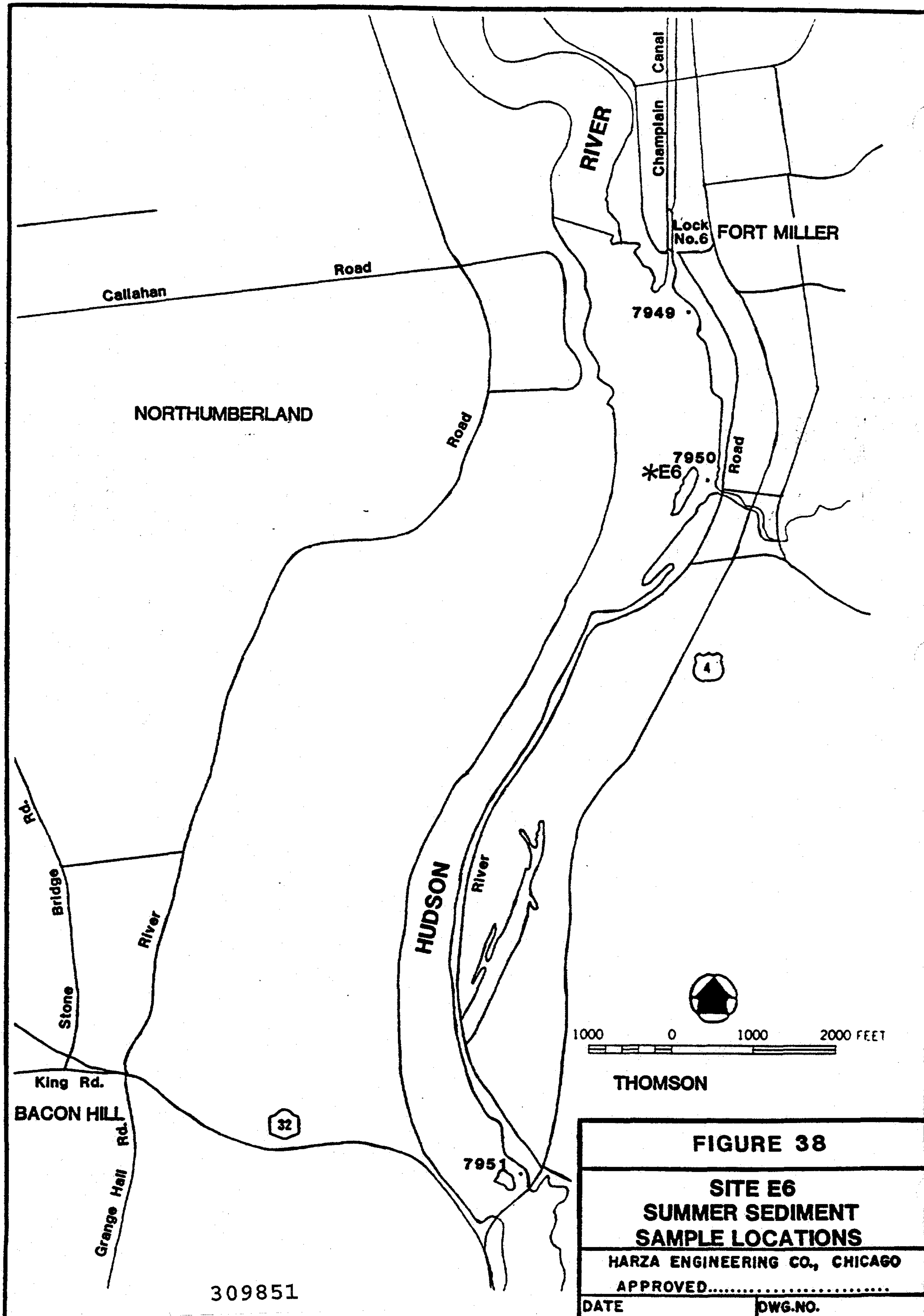



FIGURE 38

SITE E6
SUMMER SEDIMENT
SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

| DATE | DWG.NO. |
|---|---|

309851

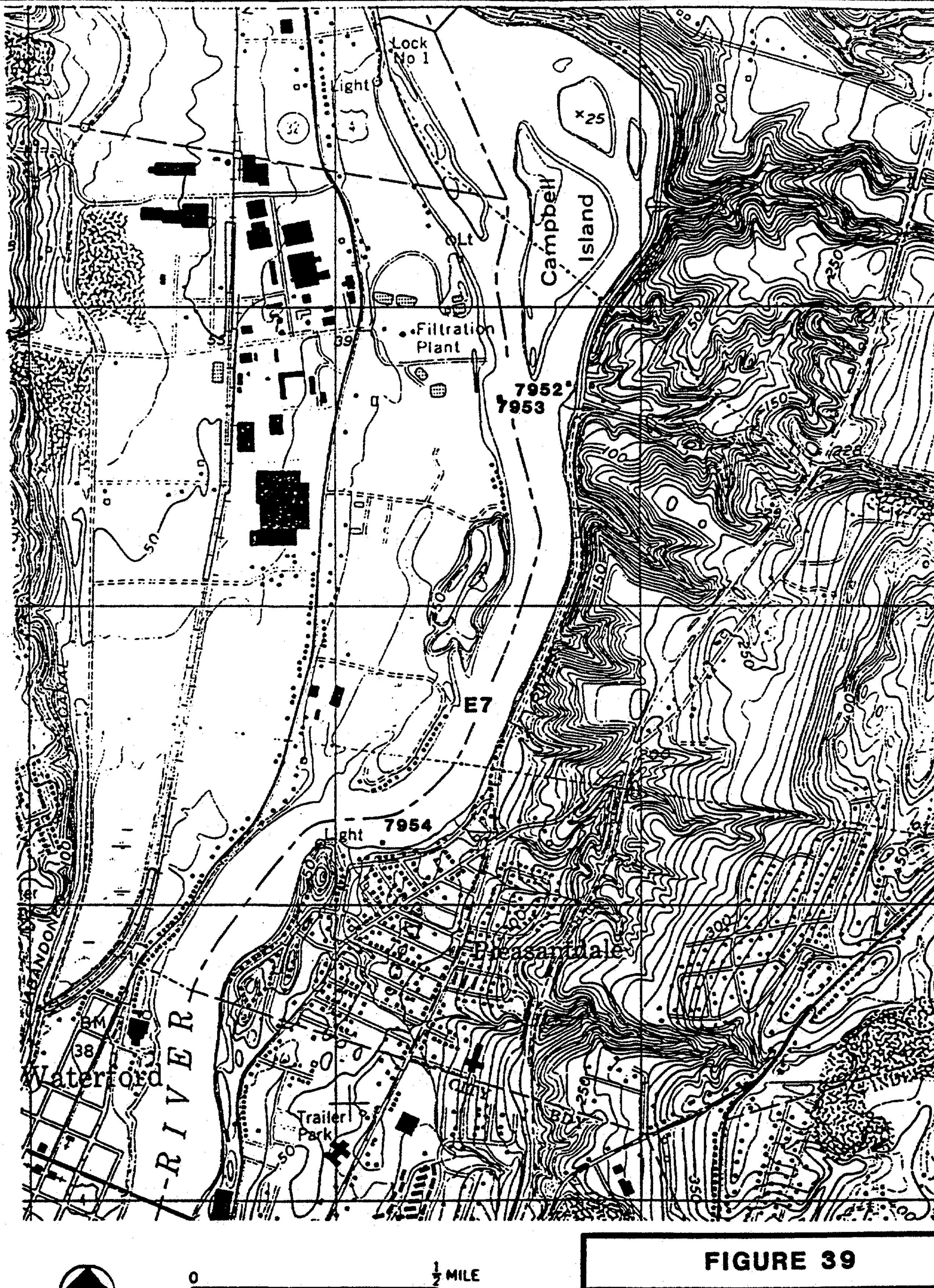



**FIGURE 39**

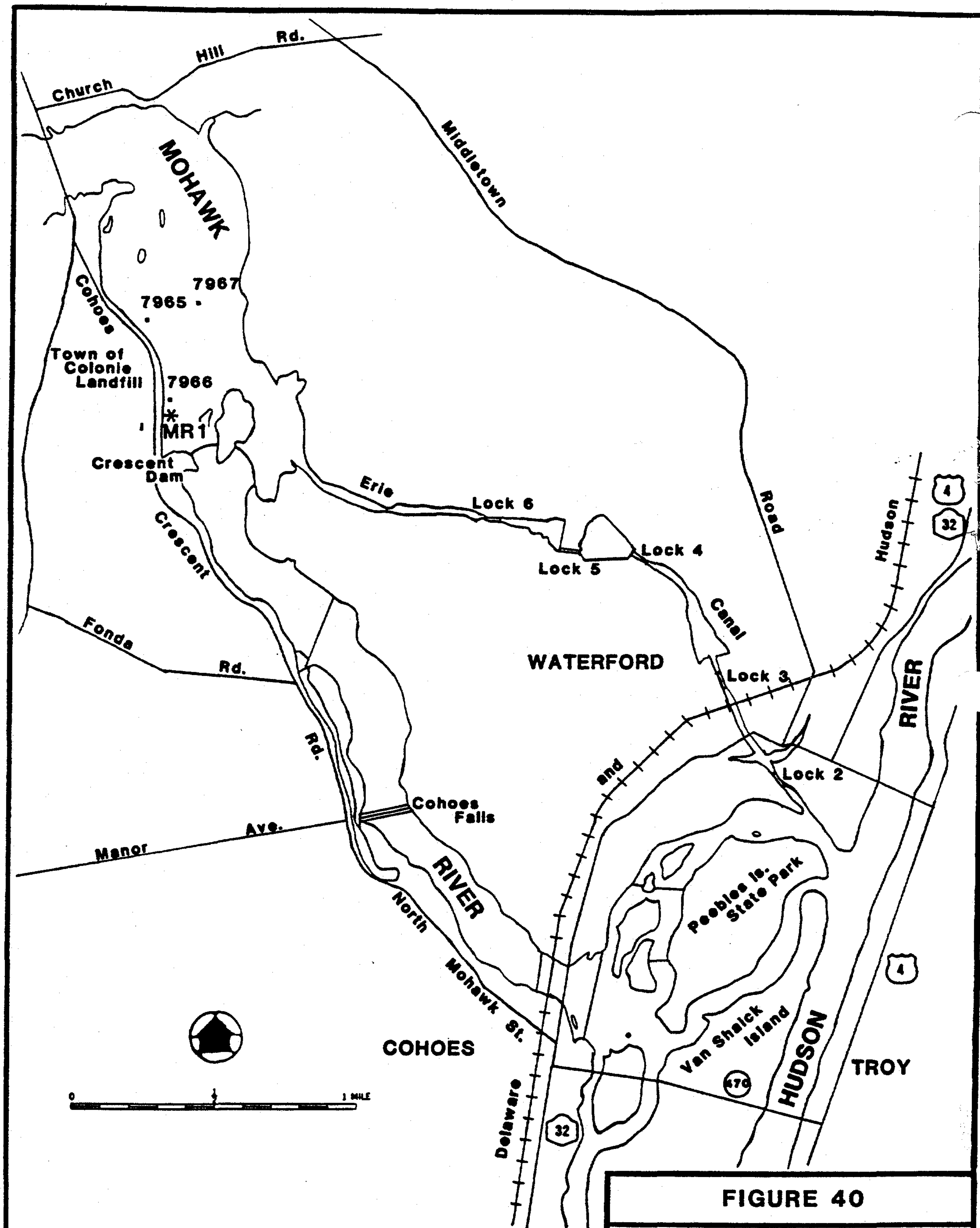
**SITE E7**
**SUMMER SEDIMENT**
**SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED.........................

| DATE | DWG.NO. |
|---|---|

309852




# FIGURE 40

## SITE MR1 SUMMER SEDIMENT SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

DATE

DWG.NO.

309853

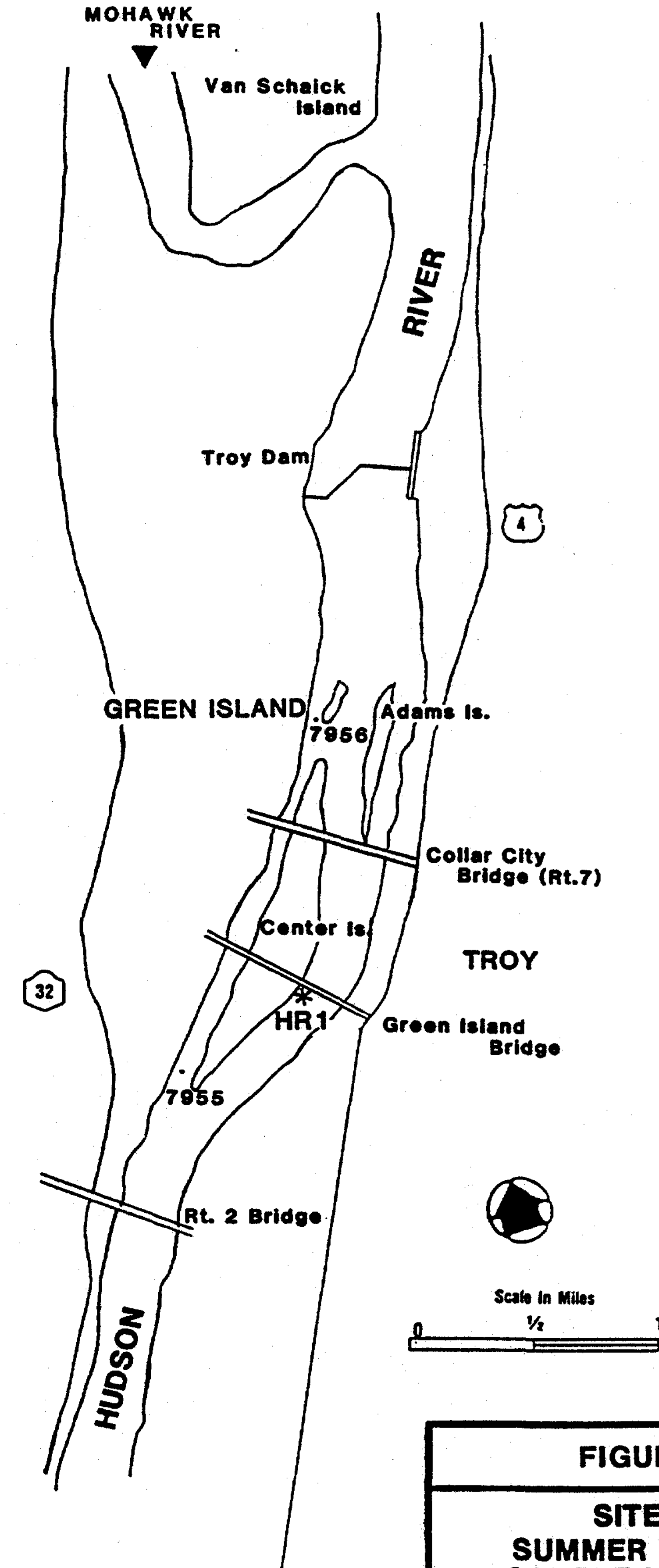



**FIGURE 41**

**SITE HR1**
**SUMMER SEDIMENT SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

| DATE | DWG.NO. |
|---|---|

309854

309855

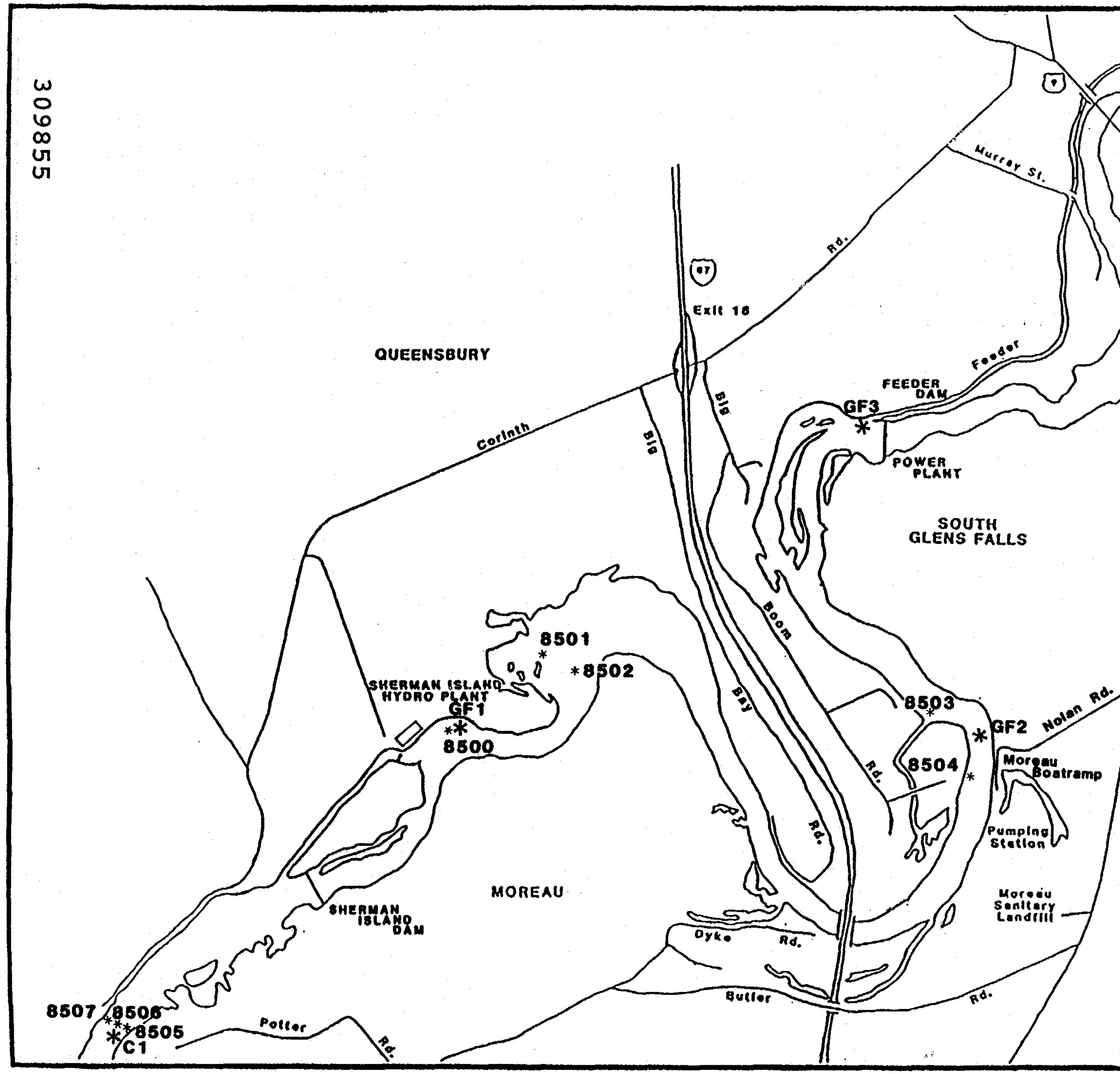


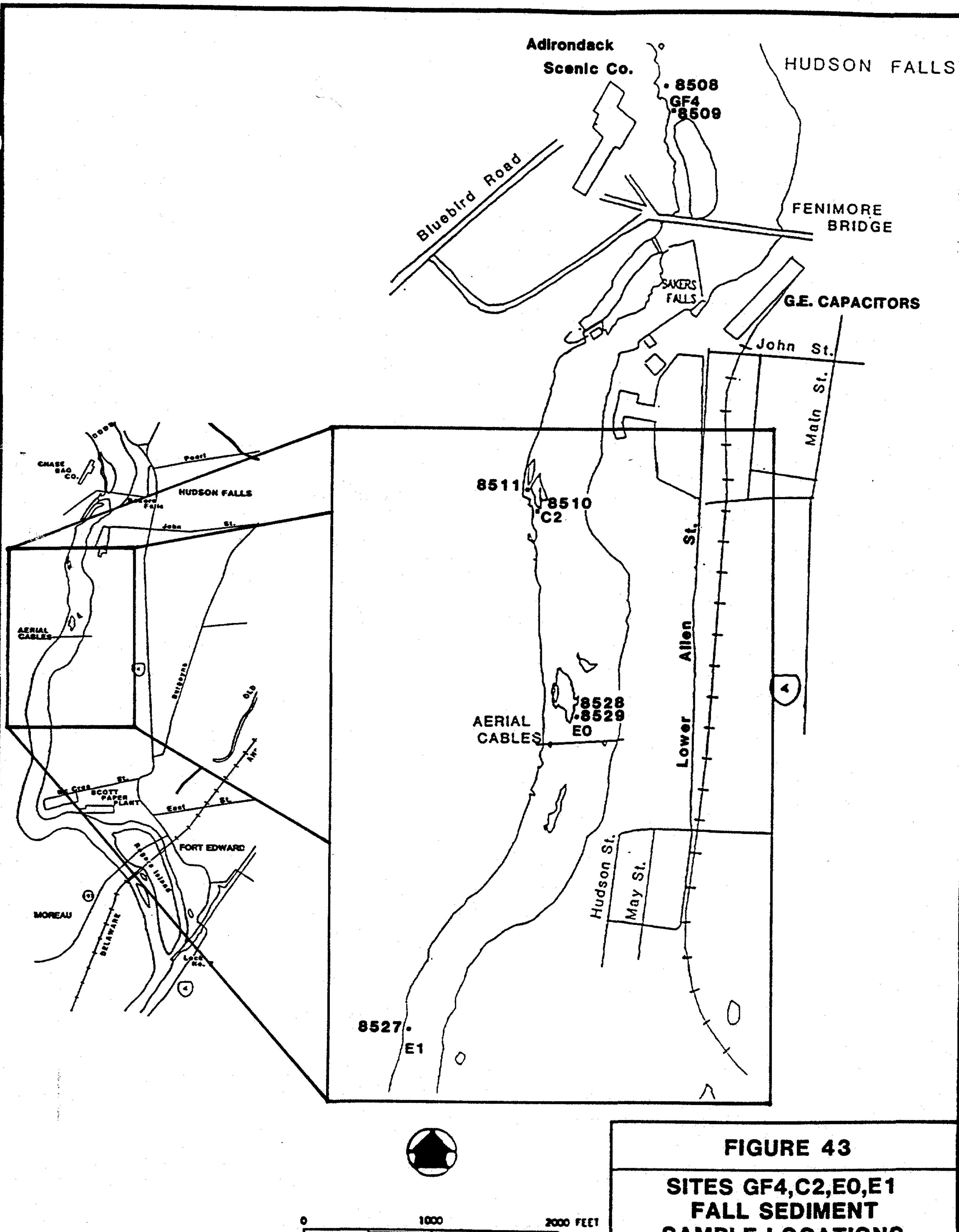

**FIGURE 42**

**SITES C1,GF1,GF2,GF3 FALL SEDIMENT SAMPLE LOCATIONS**

HARZA ENGINEERING CO., CHICAGO

APPROVED............................

| DATE | DWG.NO. |
|---|---|




# FIGURE 43

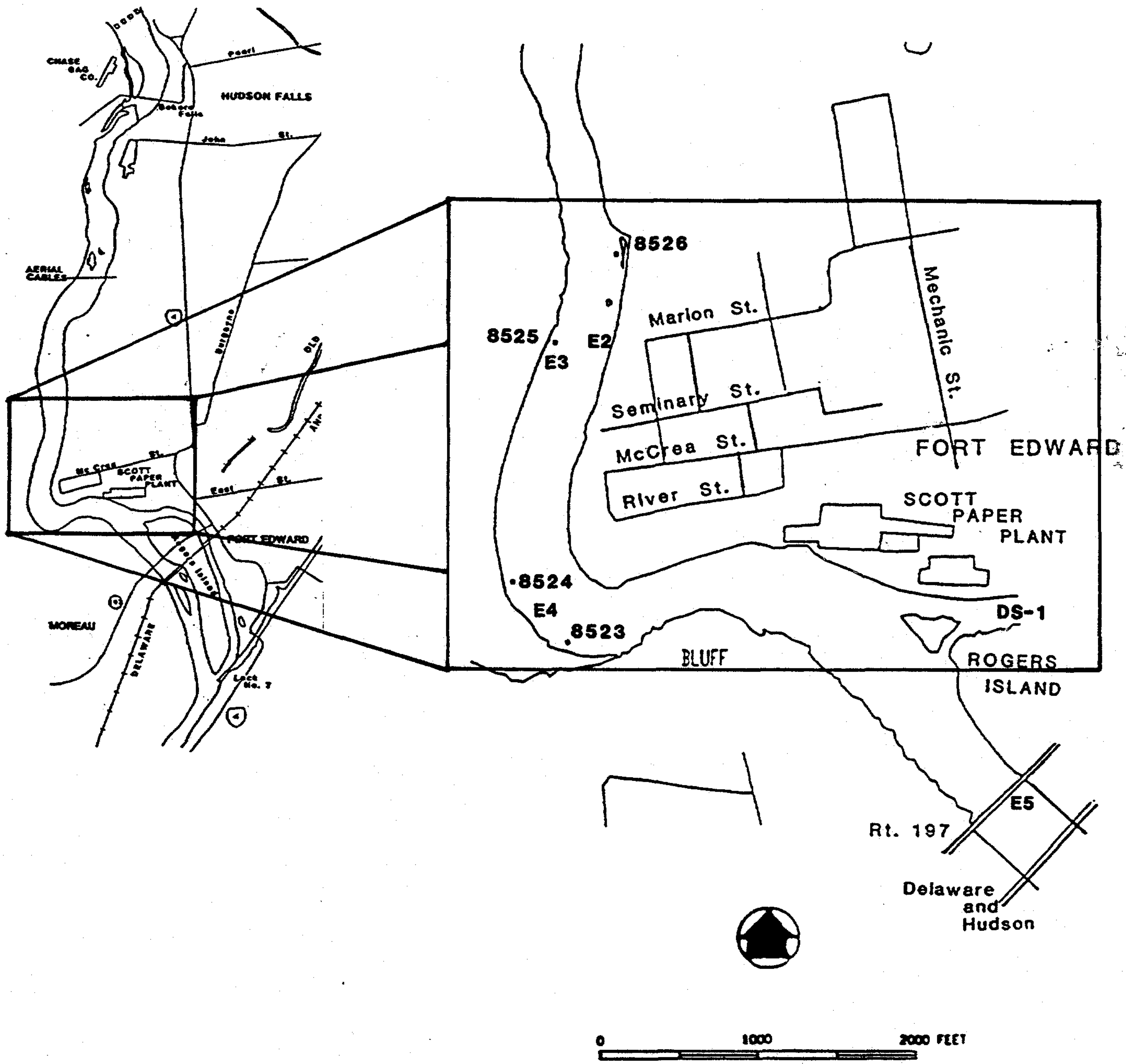
## SITES GF4,C2,E0,E1 FALL SEDIMENT SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

........................................ PROJECT MANAGER

| DATE | DWG. NO. |
|---|---|

309856




# FIGURE 44

## SITES E2,E3,E4 FALL SEDIMENT SAMPLE LOCATIONS

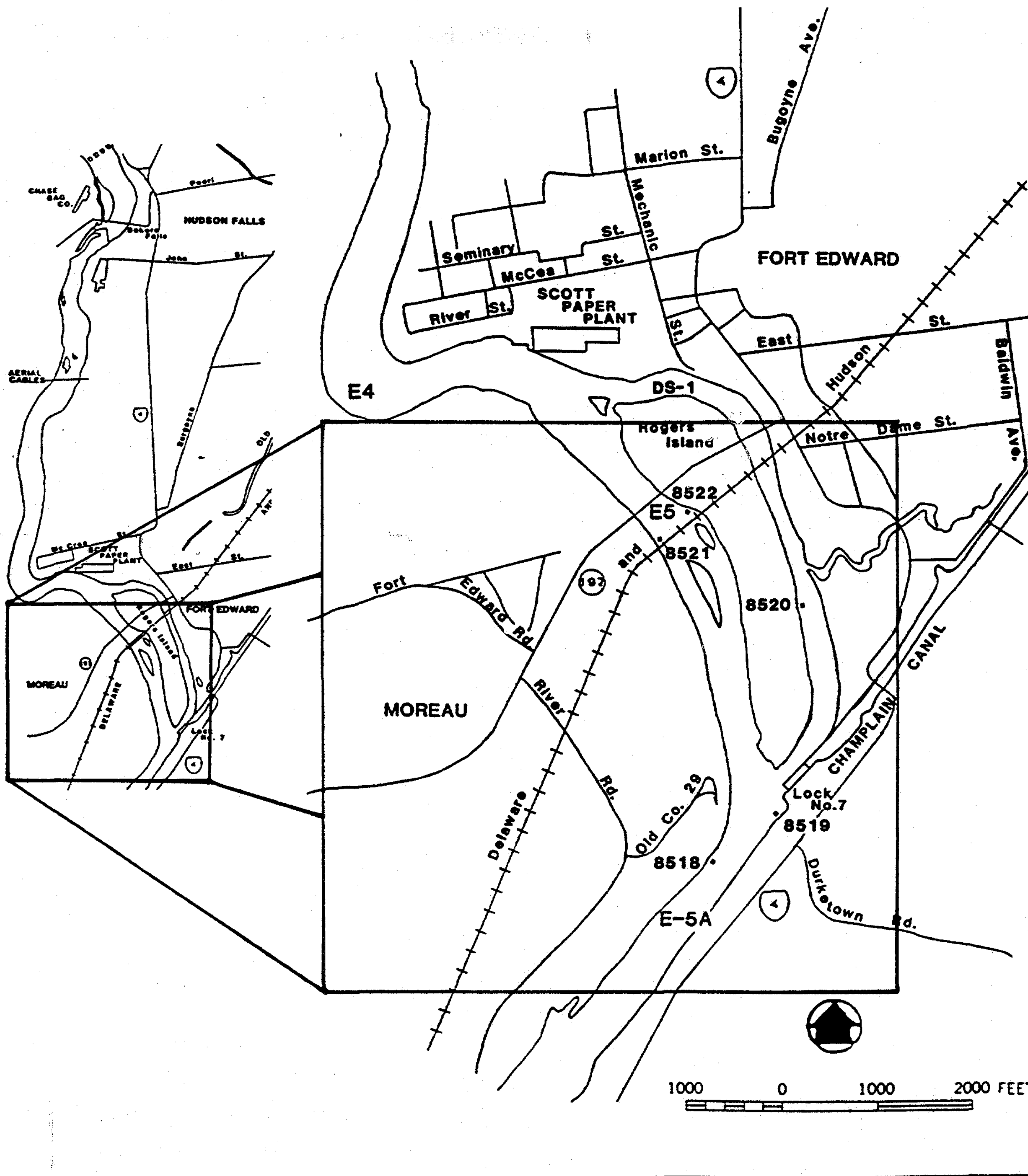
HARZA ENGINEERING CO., CHICAGO

............ PROJECT MANAGER

DATE

DWG. NO.

309857




| FIGURE 45 | |
|---|---|
| SITES E5,E-5A FALL SEDIMENT SAMPLE LOCATIONS | |
| HARZA ENGINEERING CO., CHICAGO | |
| ....................PROJECT MANAGER | |
| DATE | DWG. NO. |

309858

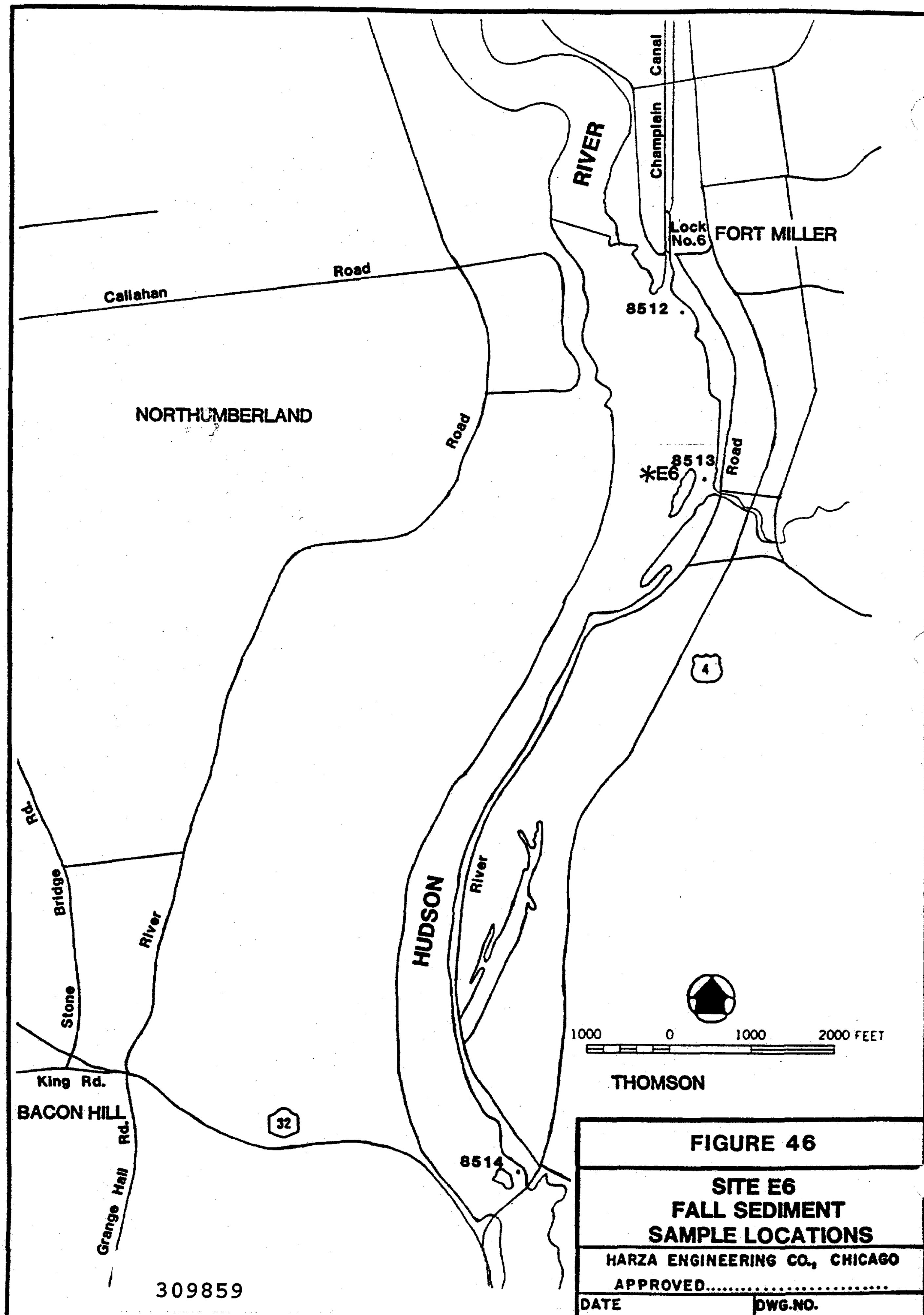



FIGURE 46

SITE E6
FALL SEDIMENT
SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

APPROVED..........................

DATE

DWG.NO.

309859

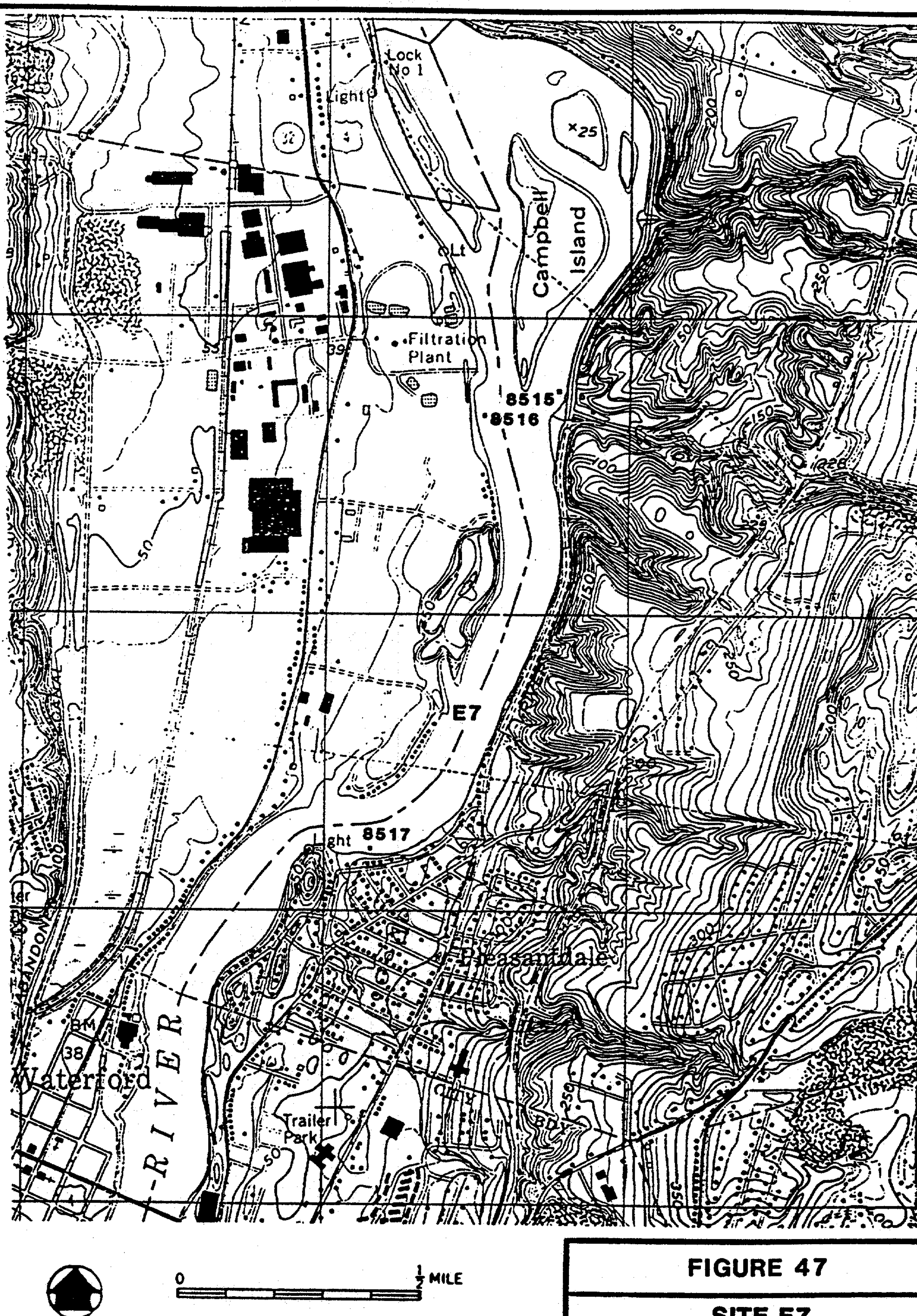



FIGURE 47

SITE E7
FALL SEDIMENT
SAMPLE LOCATIONS

HARZA ENGINEERING CO., CHICAGO

APPROVED........................

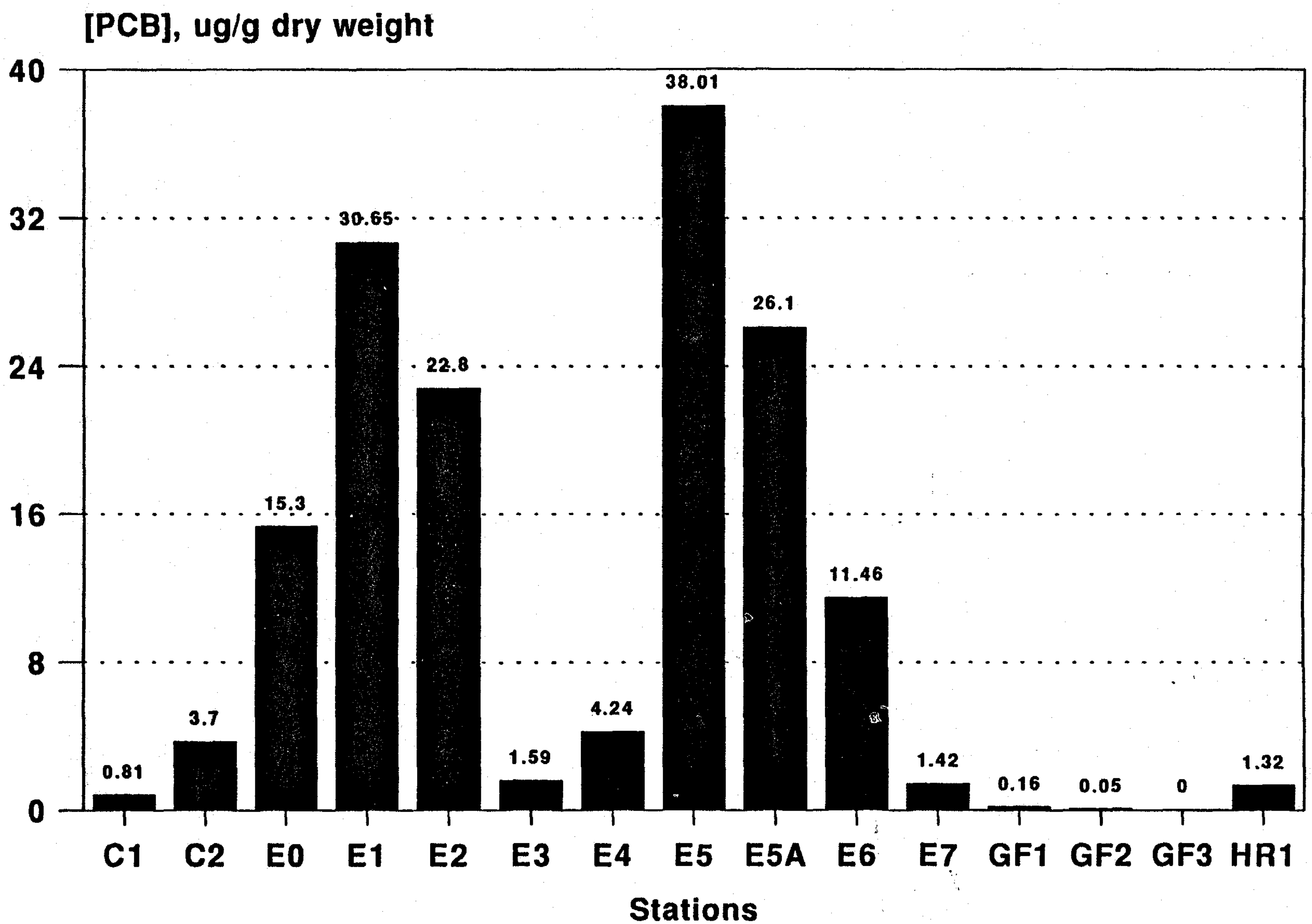
| DATE | DWG.NO. |
| --- | --- |

309860

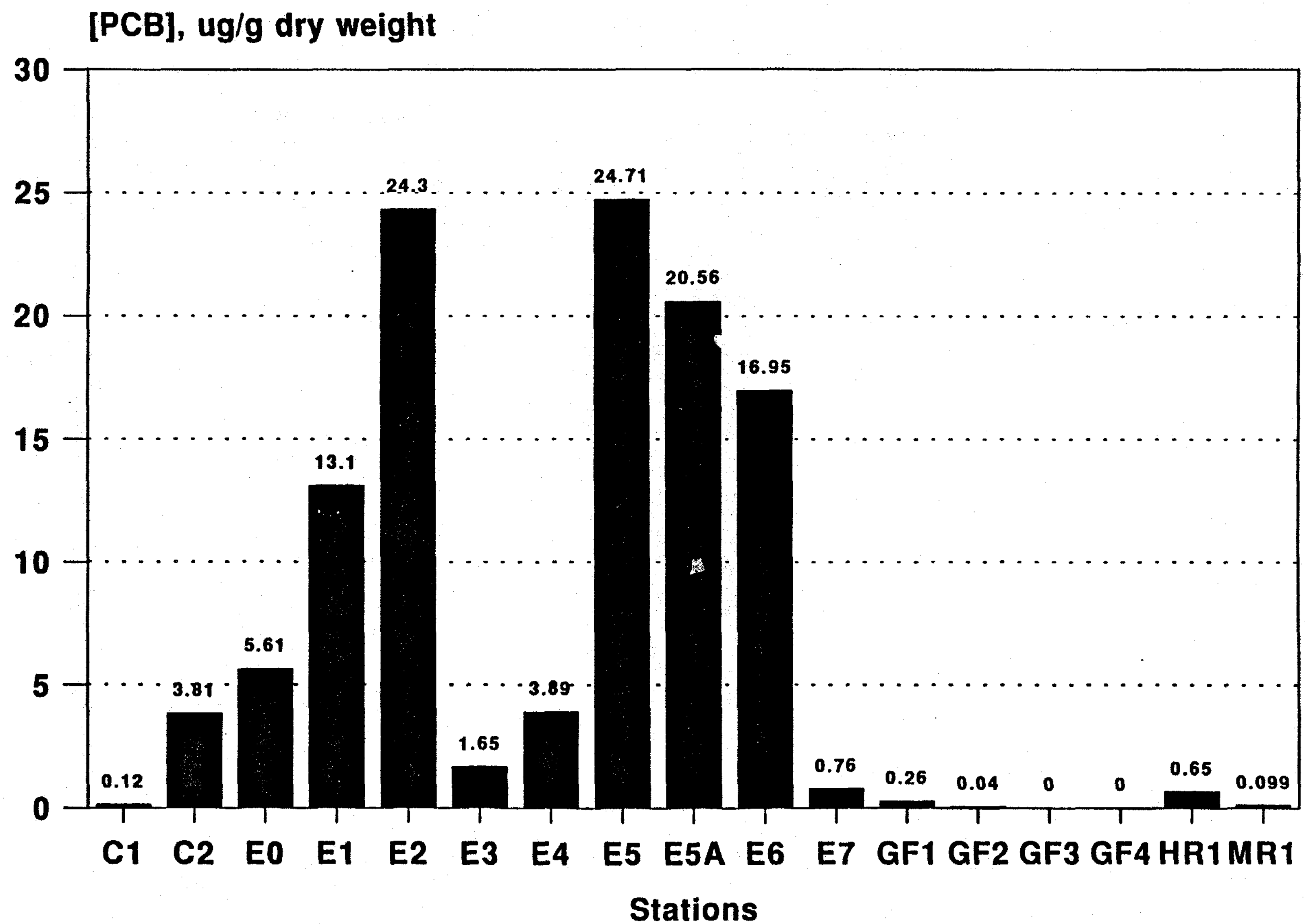
FIGURE 48

# Mean Total PCB Concentrations in Sediment Winter-Construction Monitoring 1991

309861



# Mean Total PCB Concentrations in Sediment
# Spring-Construction Monitoring 1991

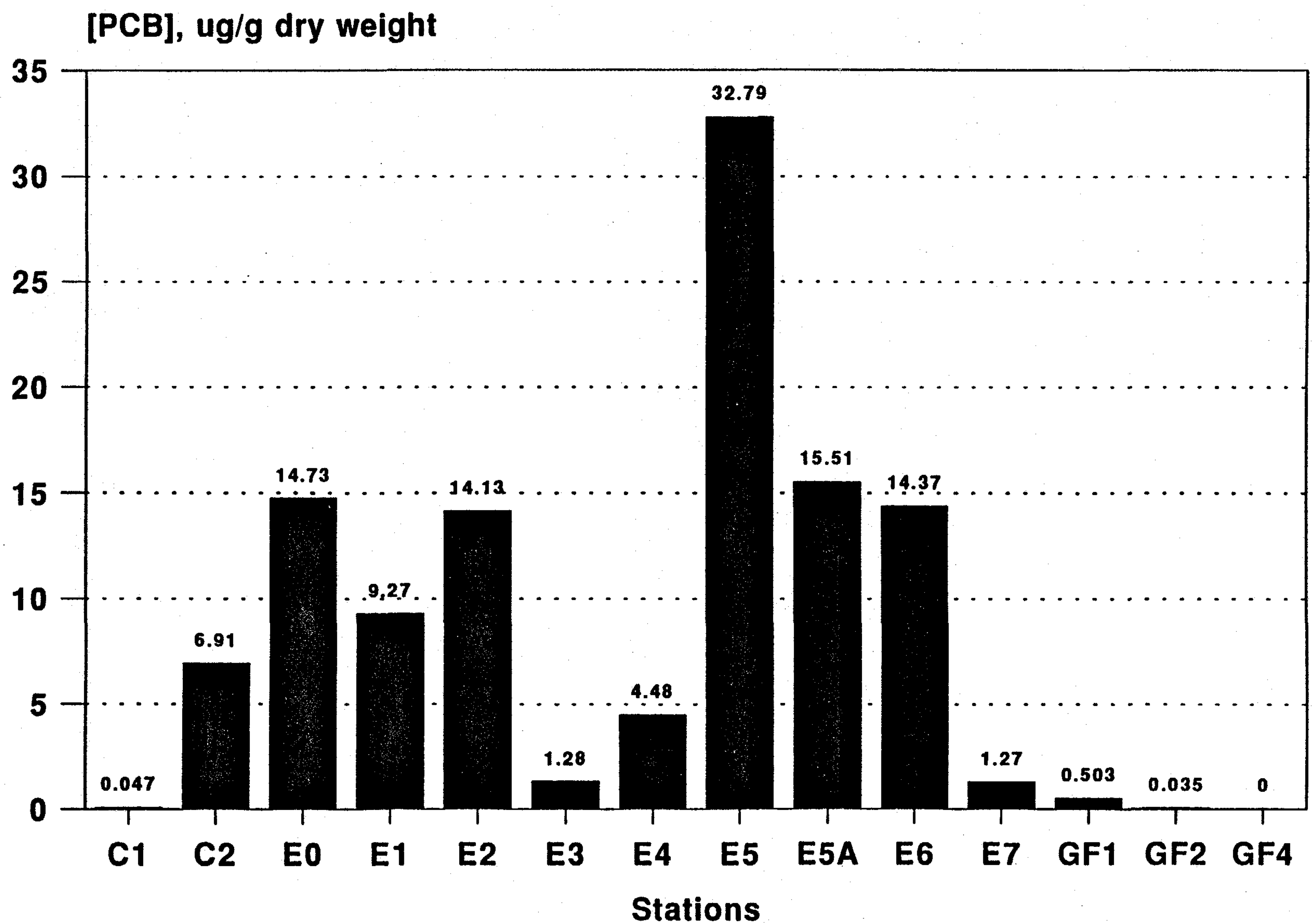



309862

309863

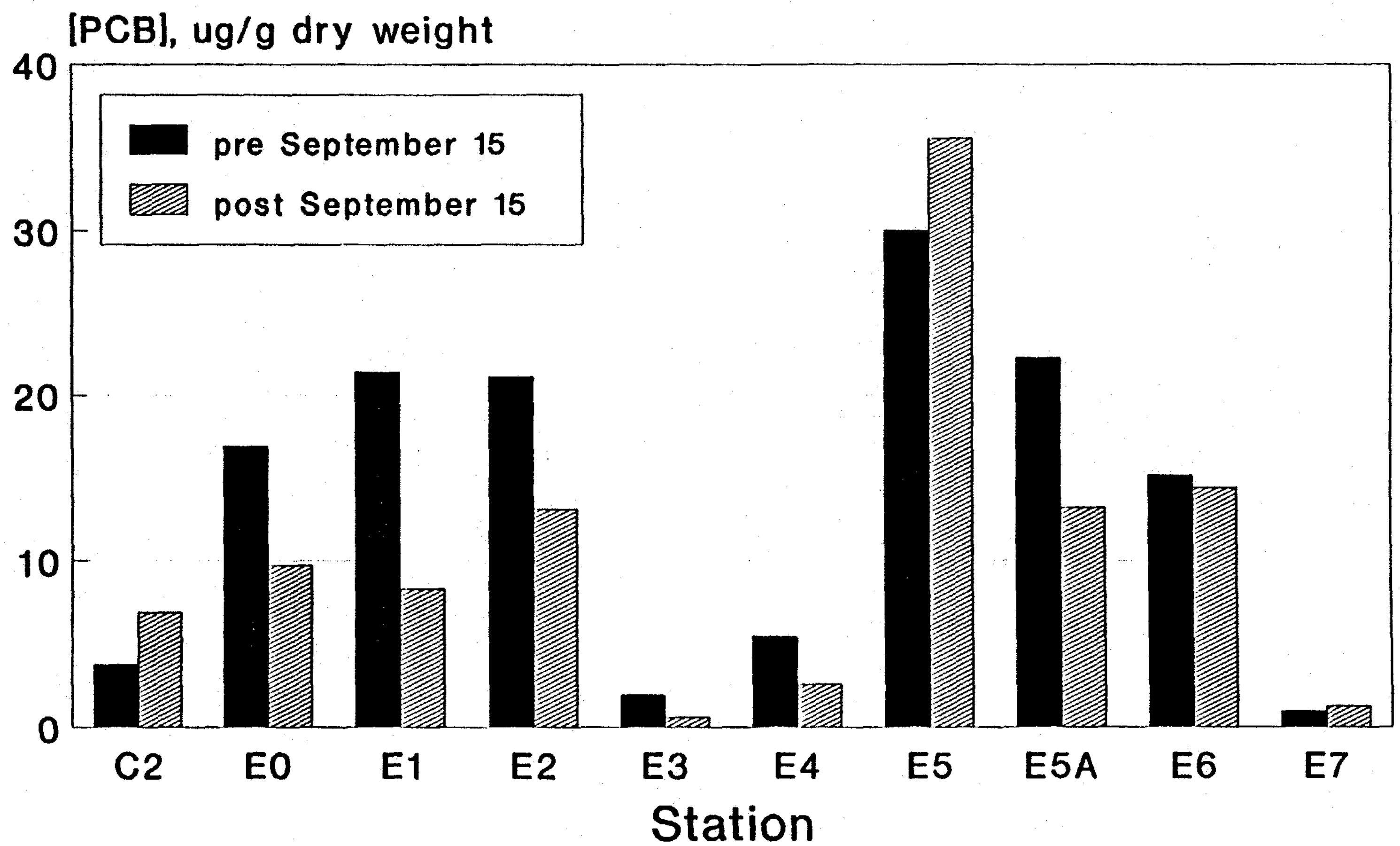
FIGURE 50

# Mean Total PCB Concentrations in Sediment Post-Containment Monitoring 1991



# Comparison of 1991 Mean Total PCB in Sediment

## Before and after September 15, 1991

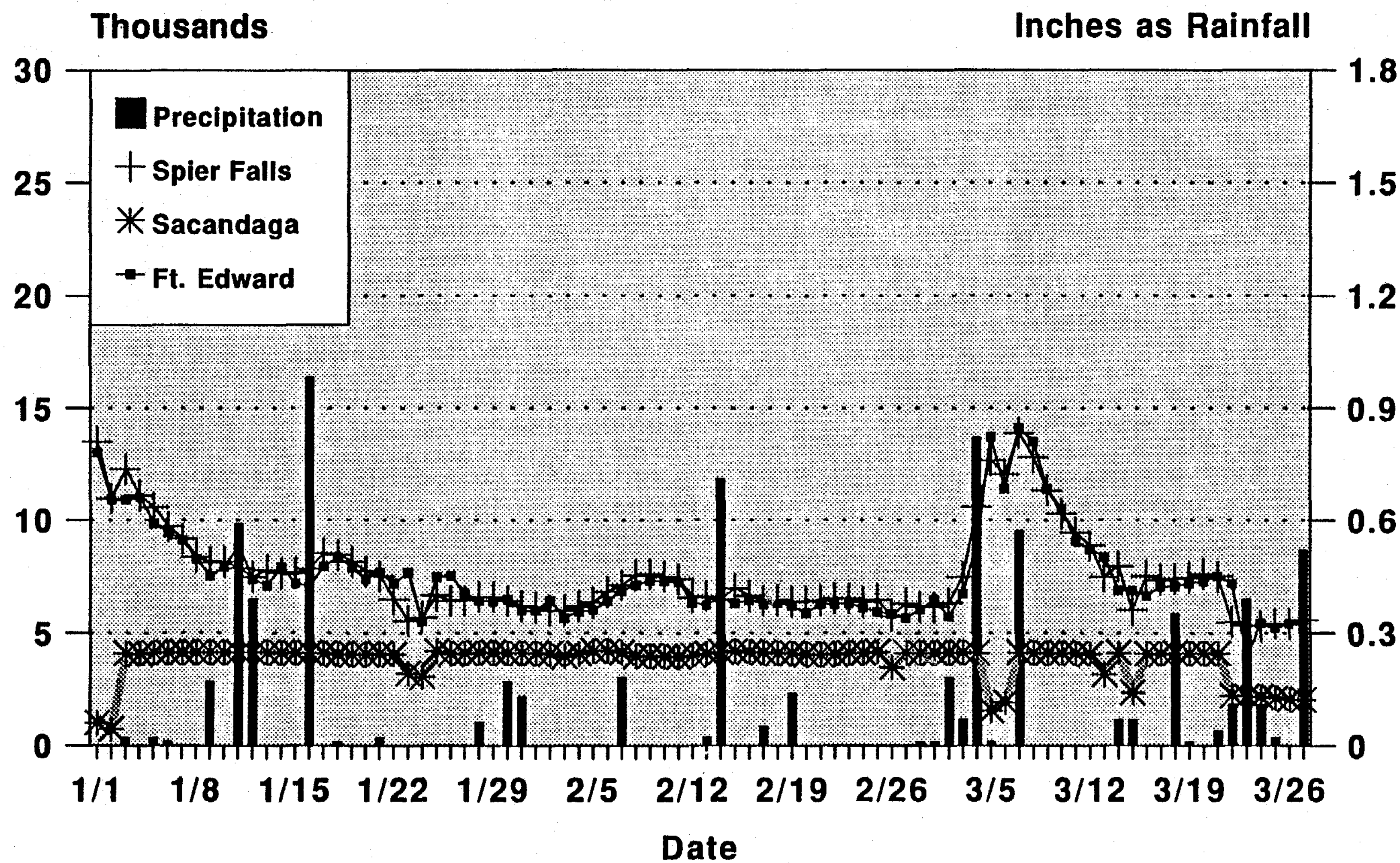



309864

309865

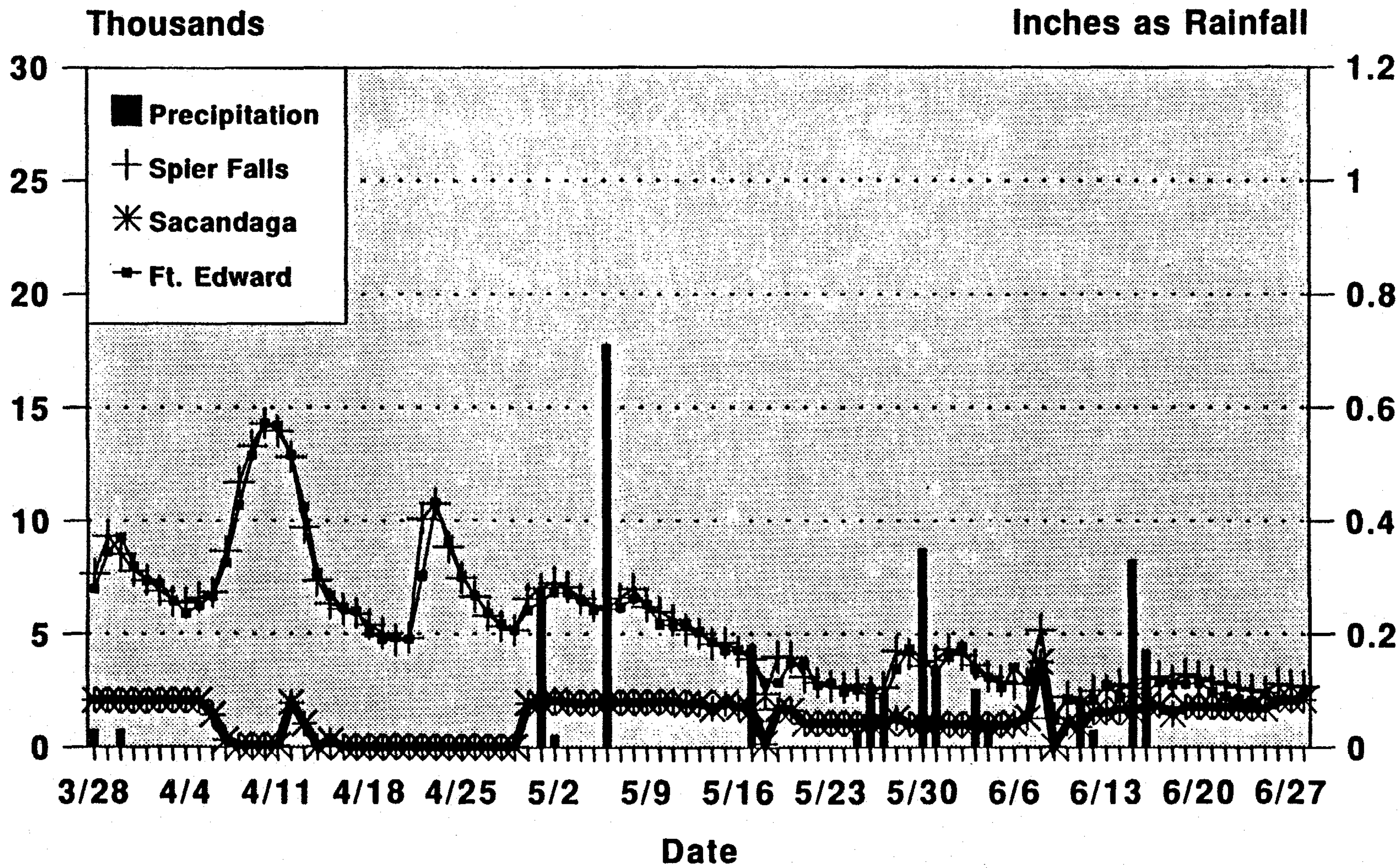
FIGURE 52

# Discharge and Precipitaion Relationship
# Upper Hudson River Watershed
# January 1 to March 27, 1991




**Discharge at USGS gage, Ft. Edward, NY**
**Precipitation at Glens Falls, NY**

# Discharge and Precipitation Relationship
# Upper Hudson River Watershed
# March 28 to June 28, 1991



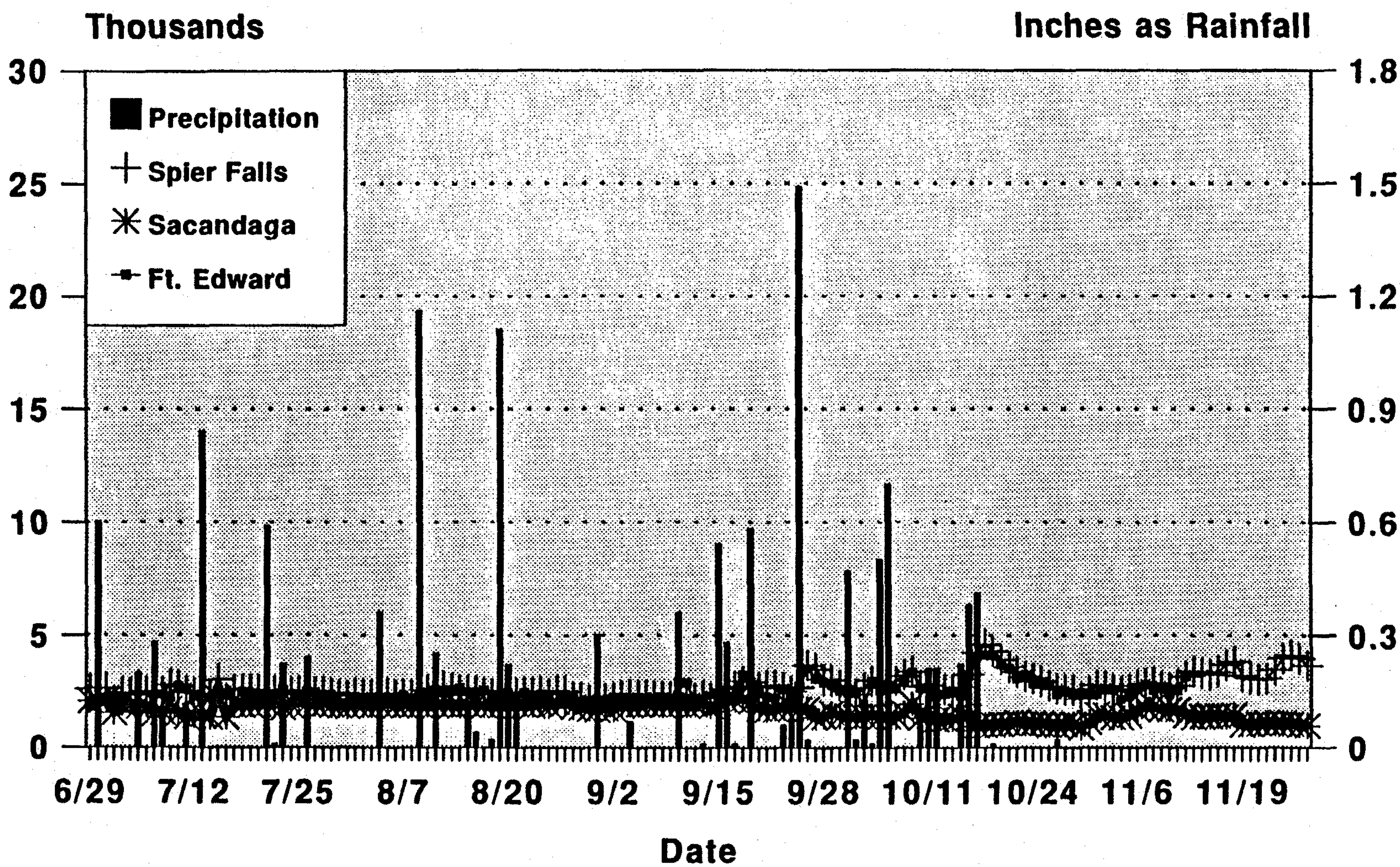

309866

Discharge at USGS gage, Ft. Edward, NY
Precipitaion at Glens Falls, NY

309867

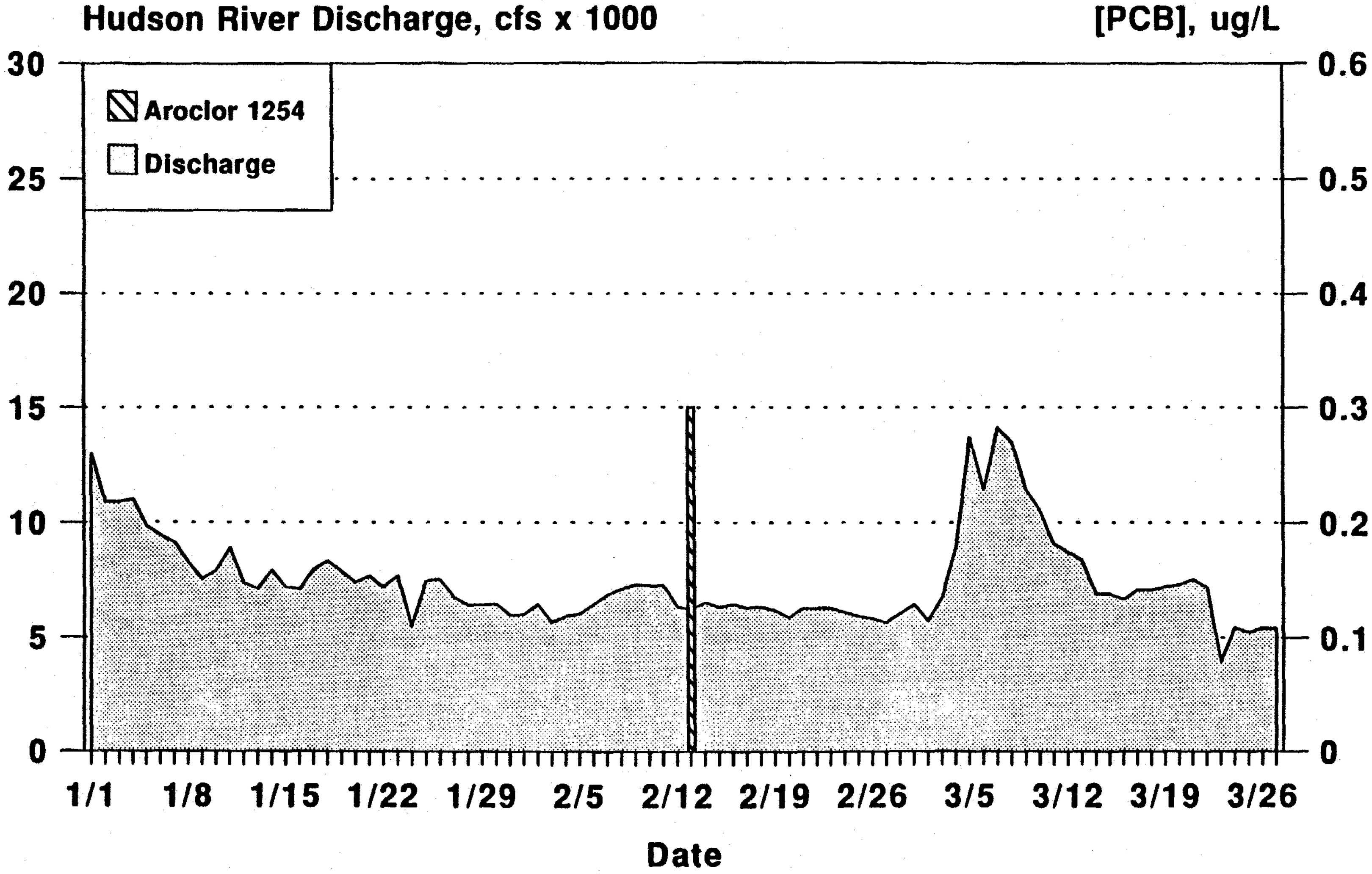
FIGURE 54

# Discharge and Precipitation Relationship Upper Hudson River Watershed June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY
Precipitation at Glens Falls, NY

# PCB in Water, Station GF4
# Winter-Construction Monitoring
# January 1 to March 27, 1991



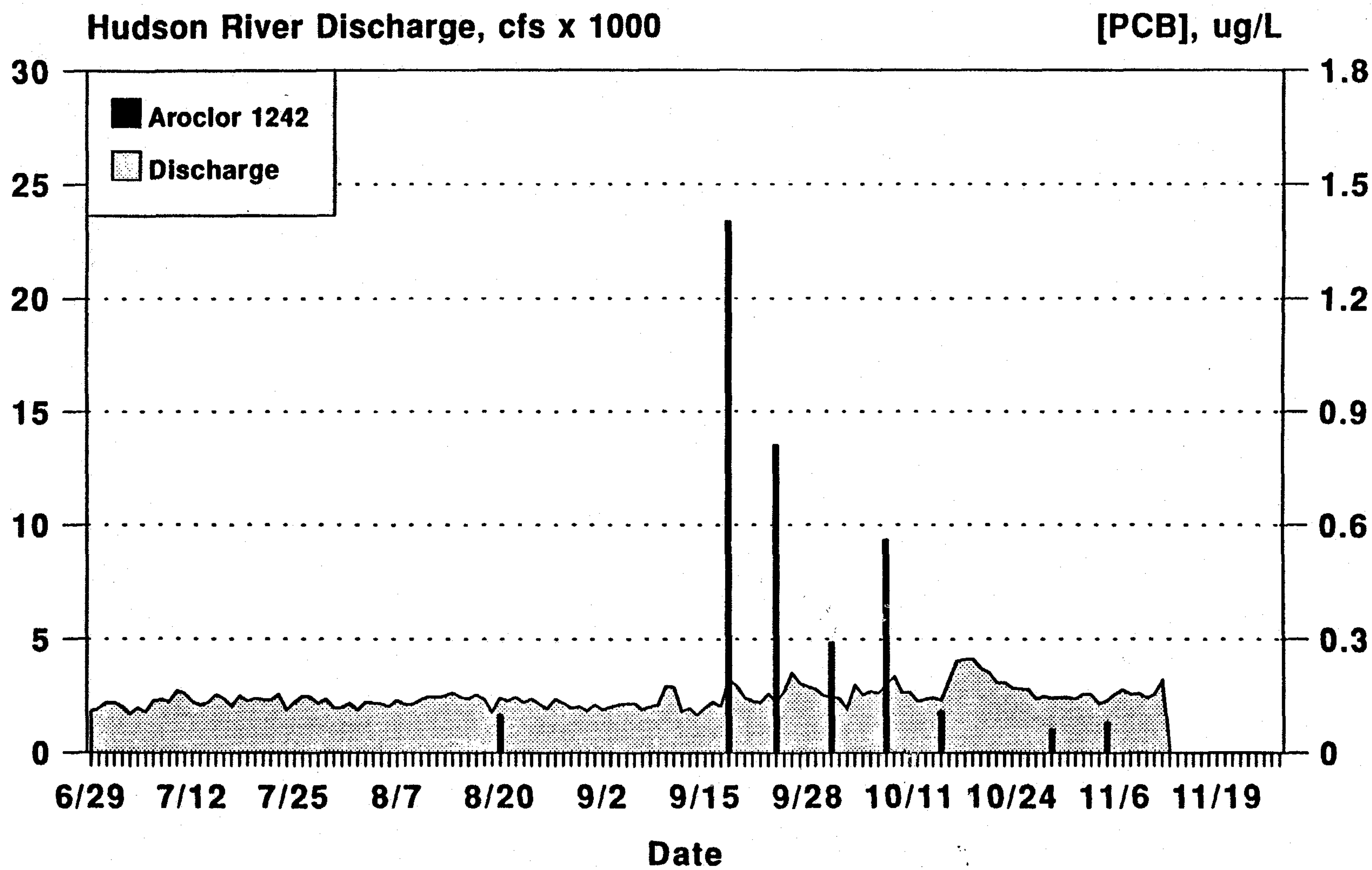

Discharge at USGS gage, Ft. Edward, NY

309868

FIGURE 56

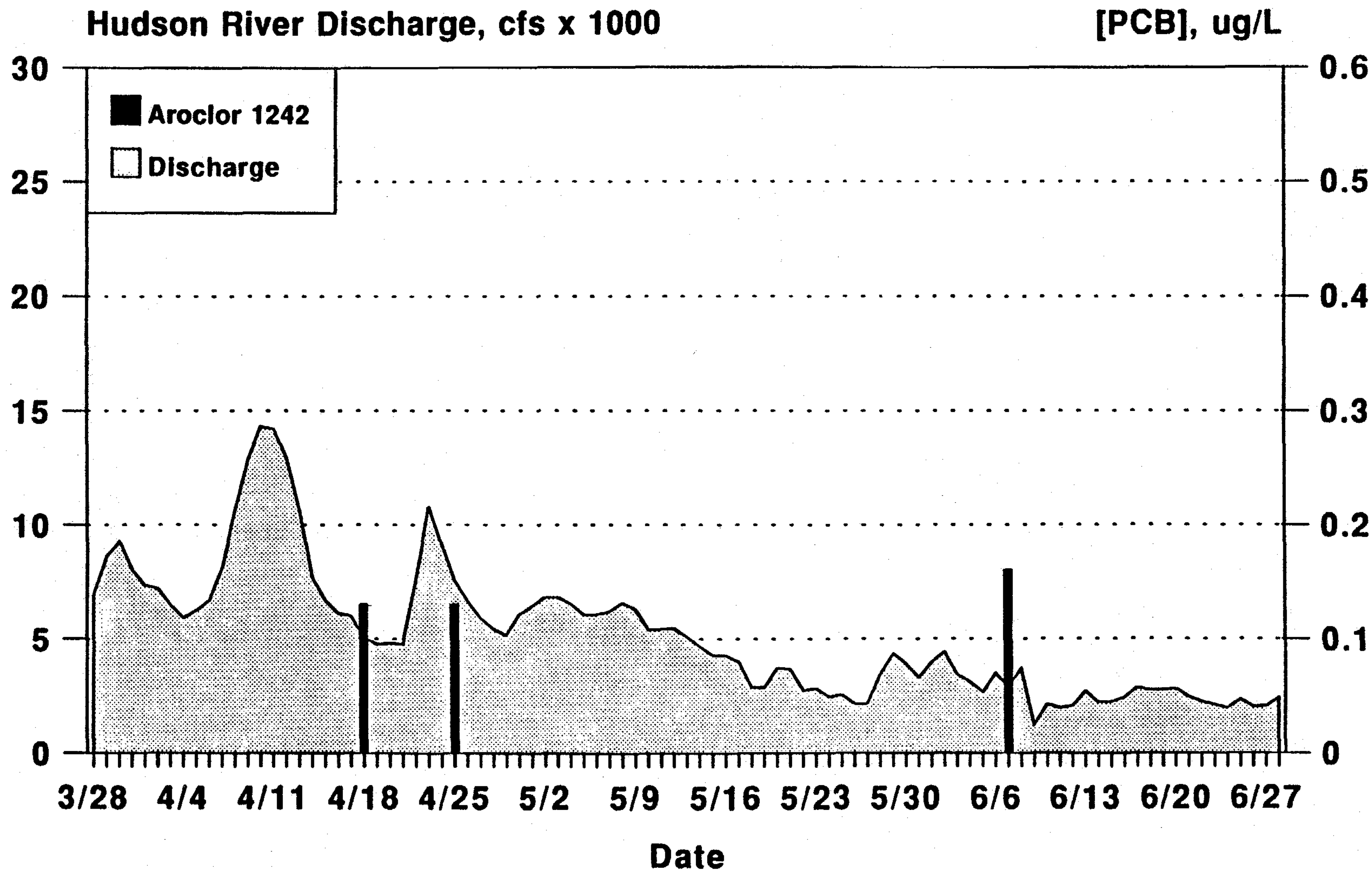
309869

# PCB in Water, Station C2
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station E0
# Spring-Construction Monitoring
# March 28 to June 28, 1991



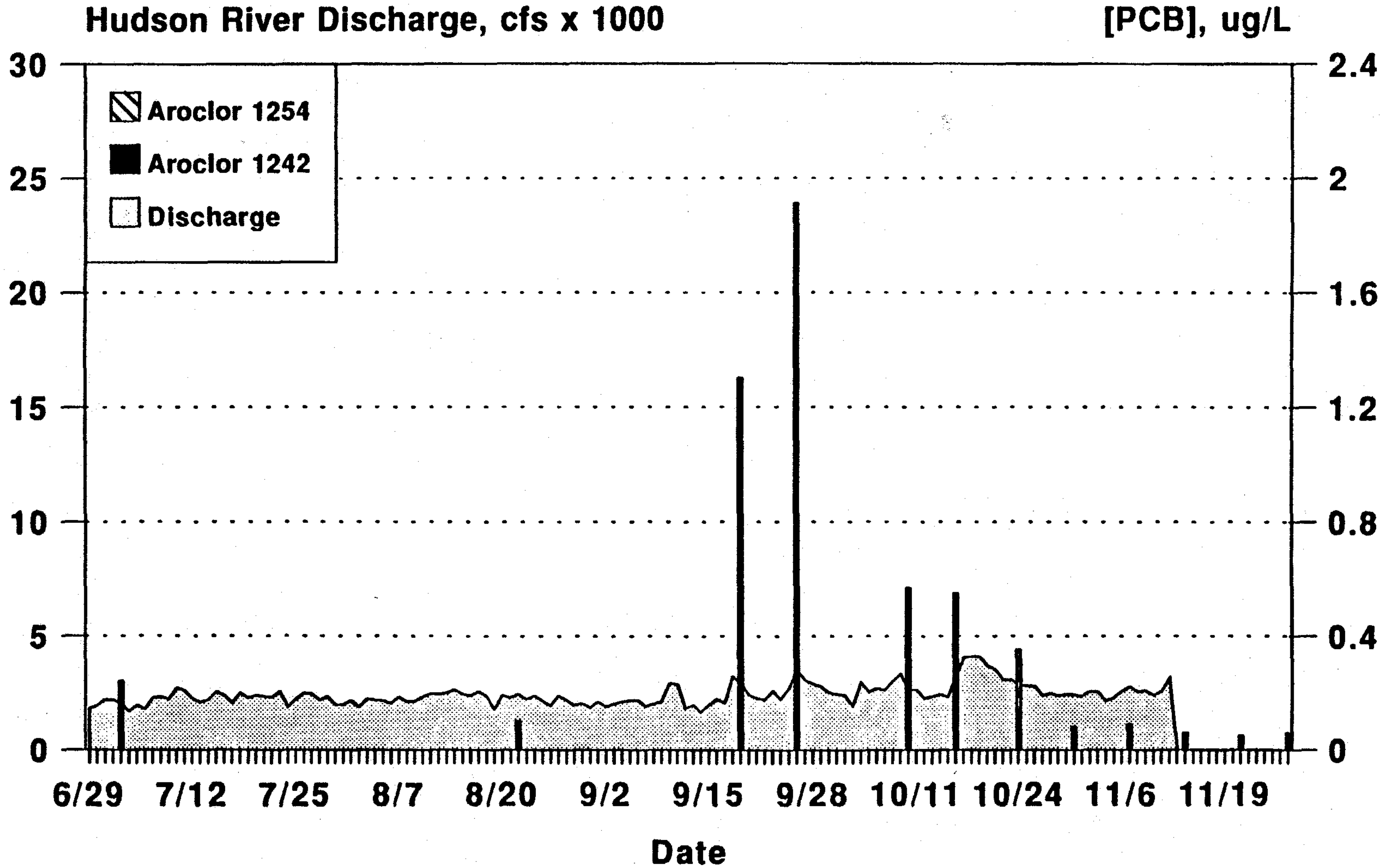

Discharge at USGS gage, Ft. Edward, NY

309870

309871

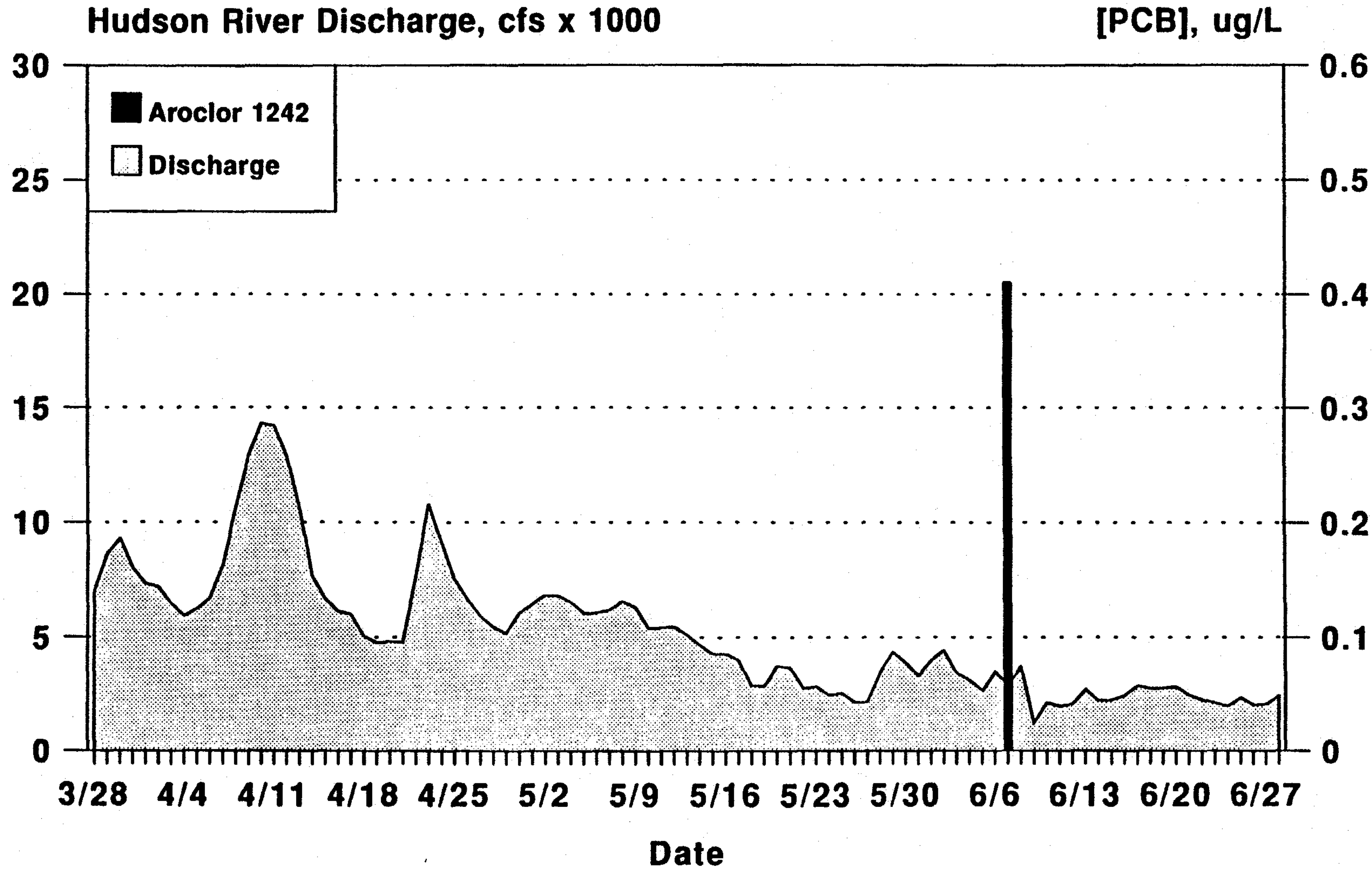
FIGURE 58

# PCB in Water, Station E0
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station E1
# Spring-Construction Monitoring
# March 28 to June 28, 1991

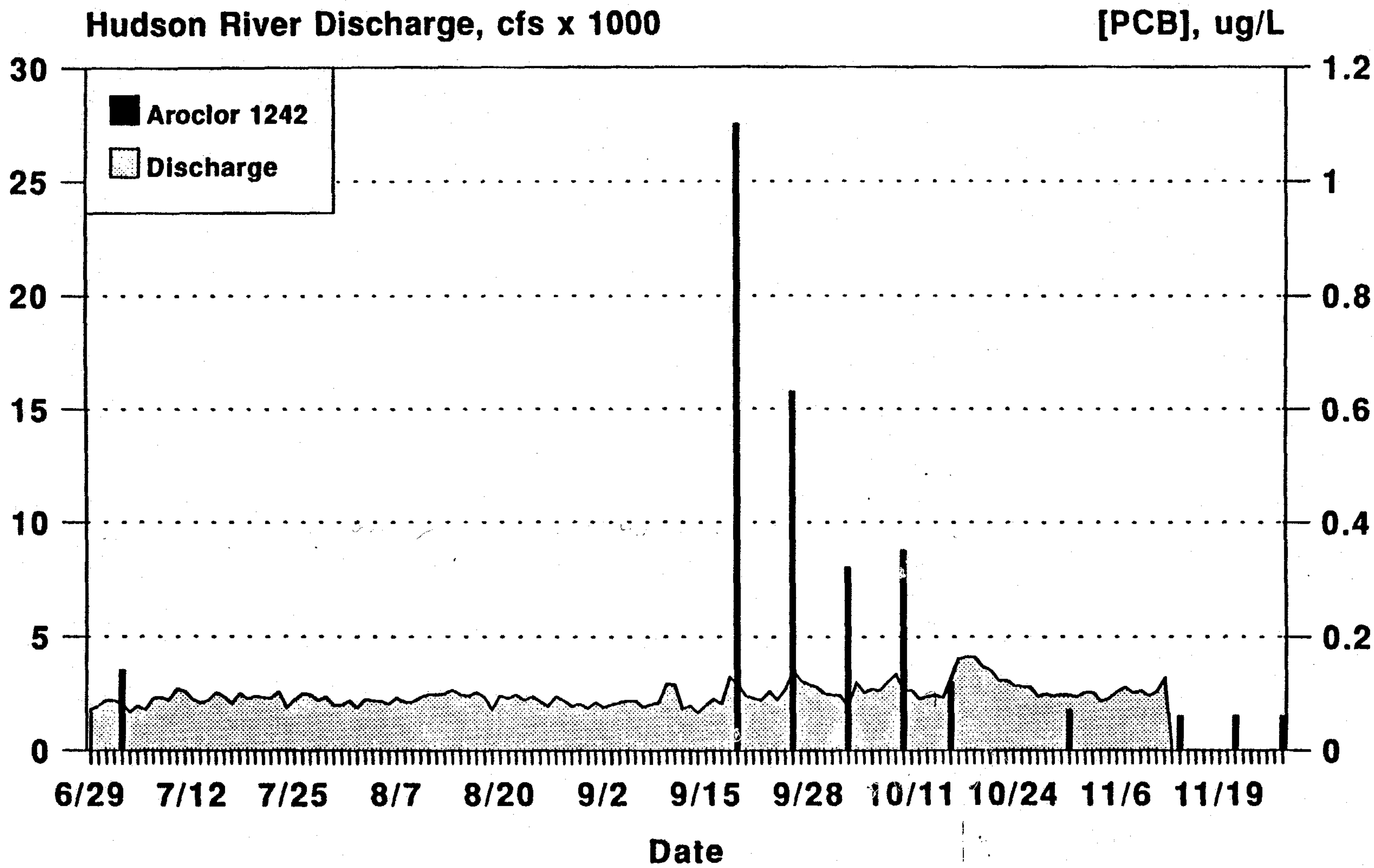



Discharge at USGS gage, Ft. Edward, NY

309872

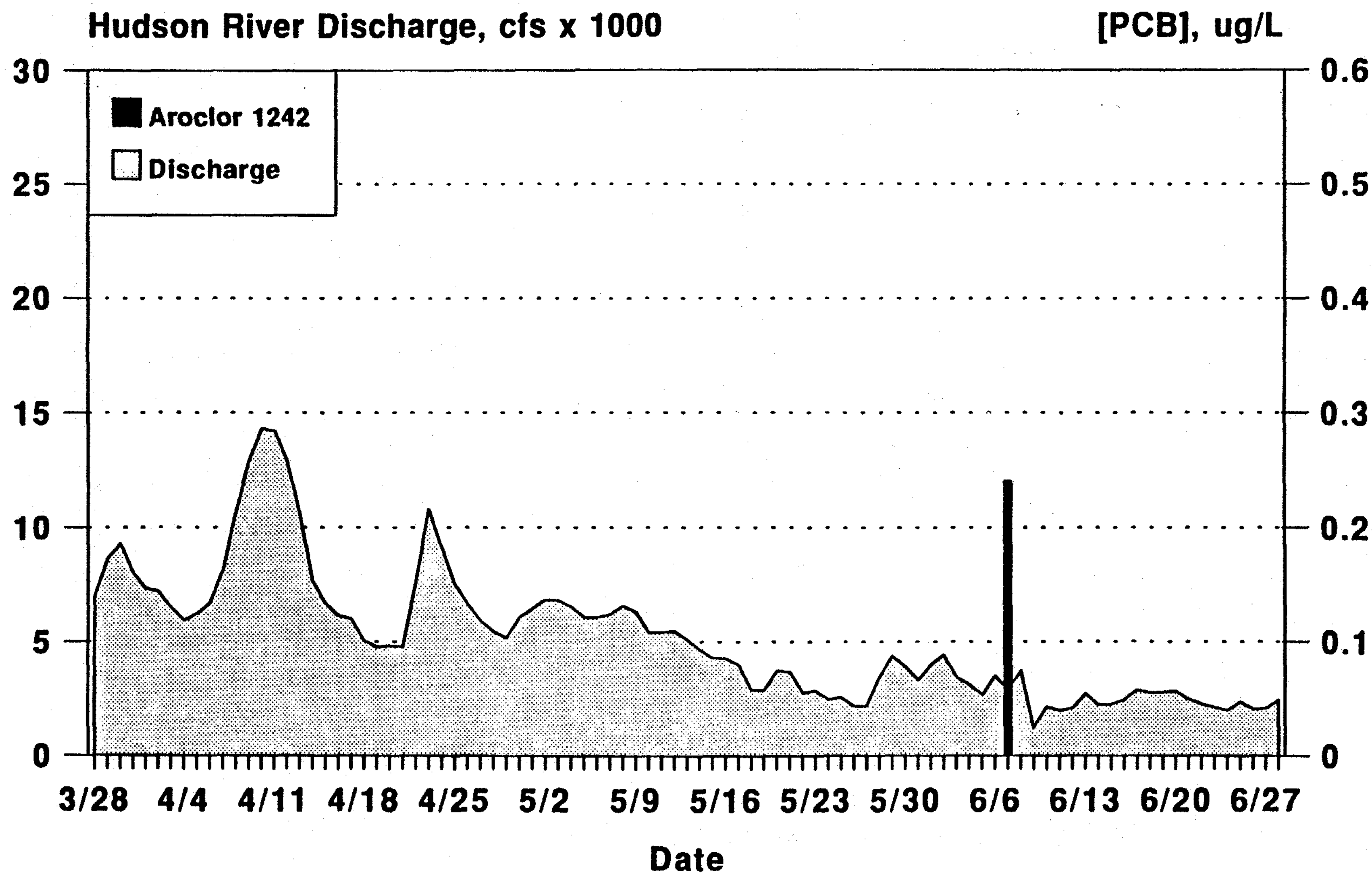
FIGURE 60

# PCB in Water, Station E1
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station E2
# Spring-Construction Monitoring
# March 28 to June 28, 1991



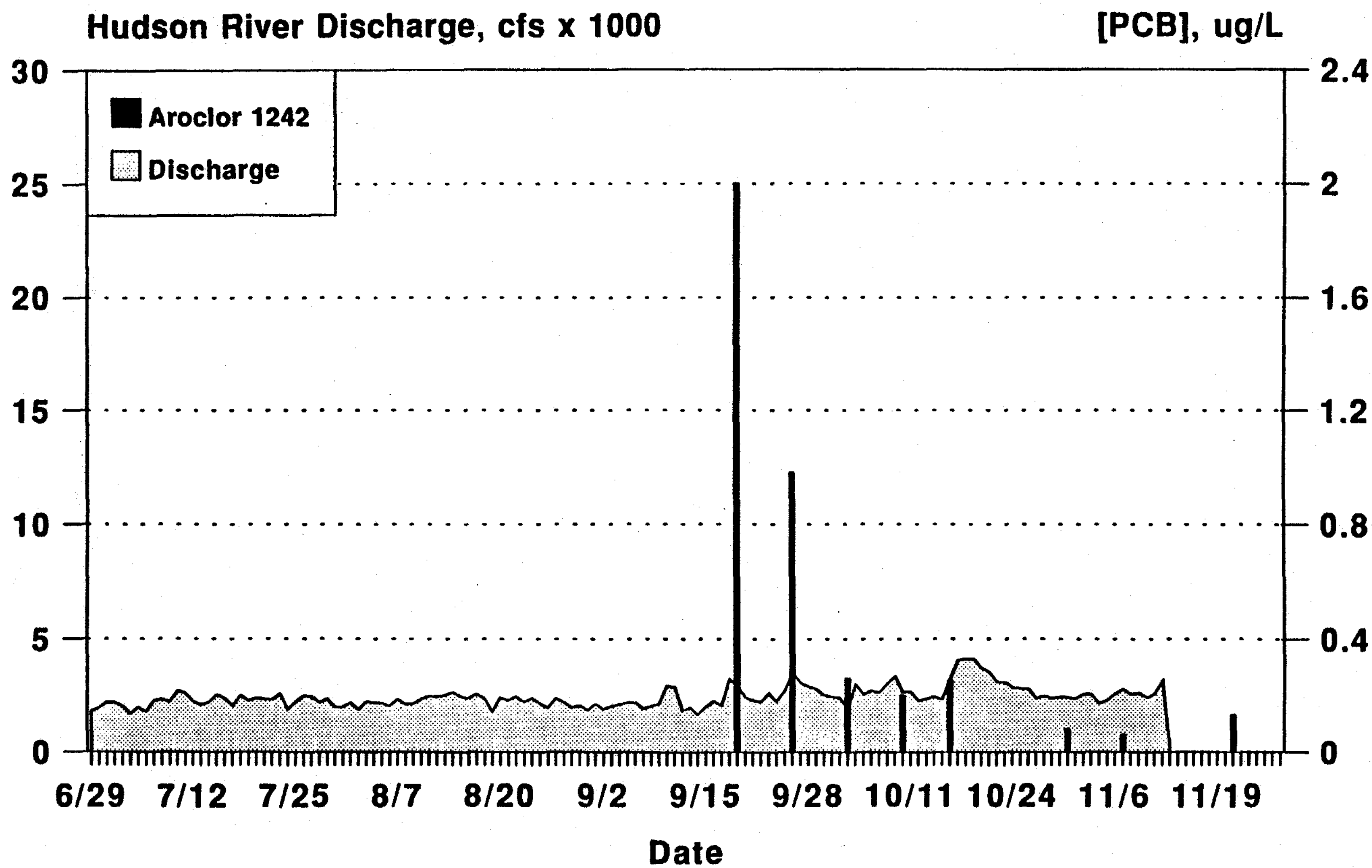

Discharge at USGS gage, Ft. Edward, NY

309874

309875

FIGURE 62

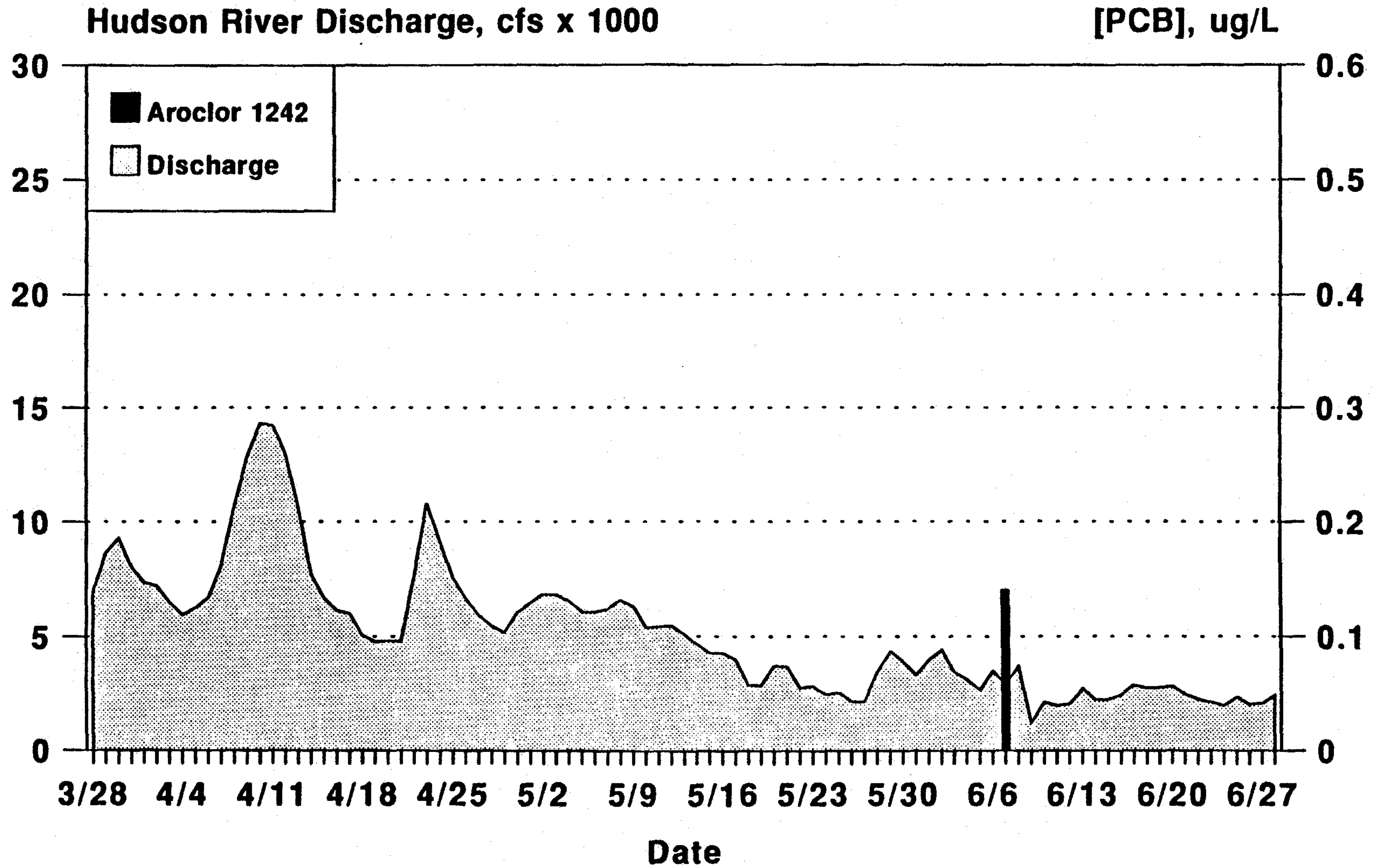
# PCB in Water, Station E2
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharg~ at USGS gage, Ft. Edward, NY

GURE 63

# PCB in Water, Station E3
# Spring-Construction Monitoring
# March 28 to June 28, 1991



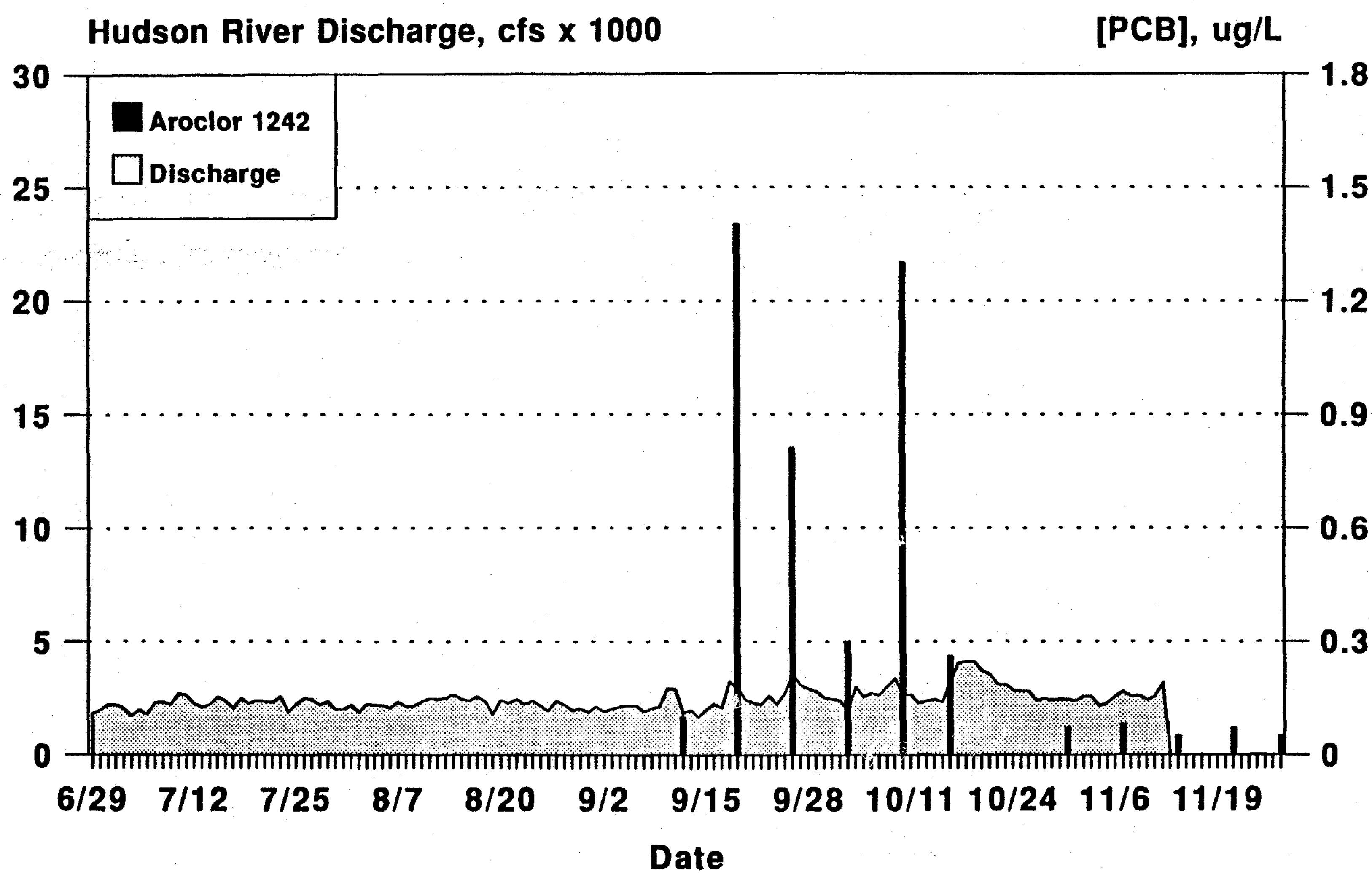

Discharge at USGS gage, Ft. Edward, NY

309876

309877

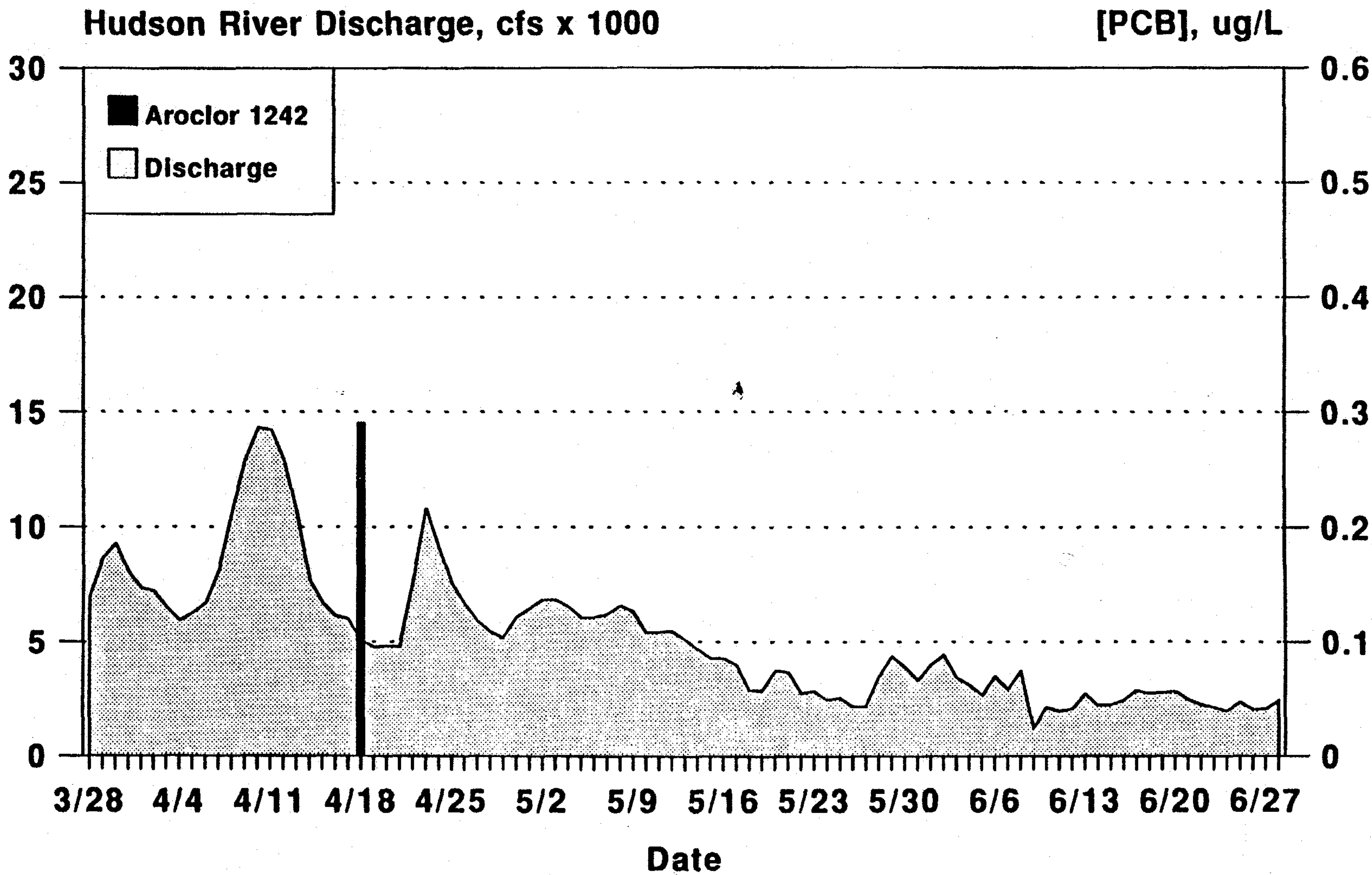
FIGURE 64

# PCB in Water, Station E3
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station E4
# Spring-Construction Monitoring
# March 28 to June 28, 1991



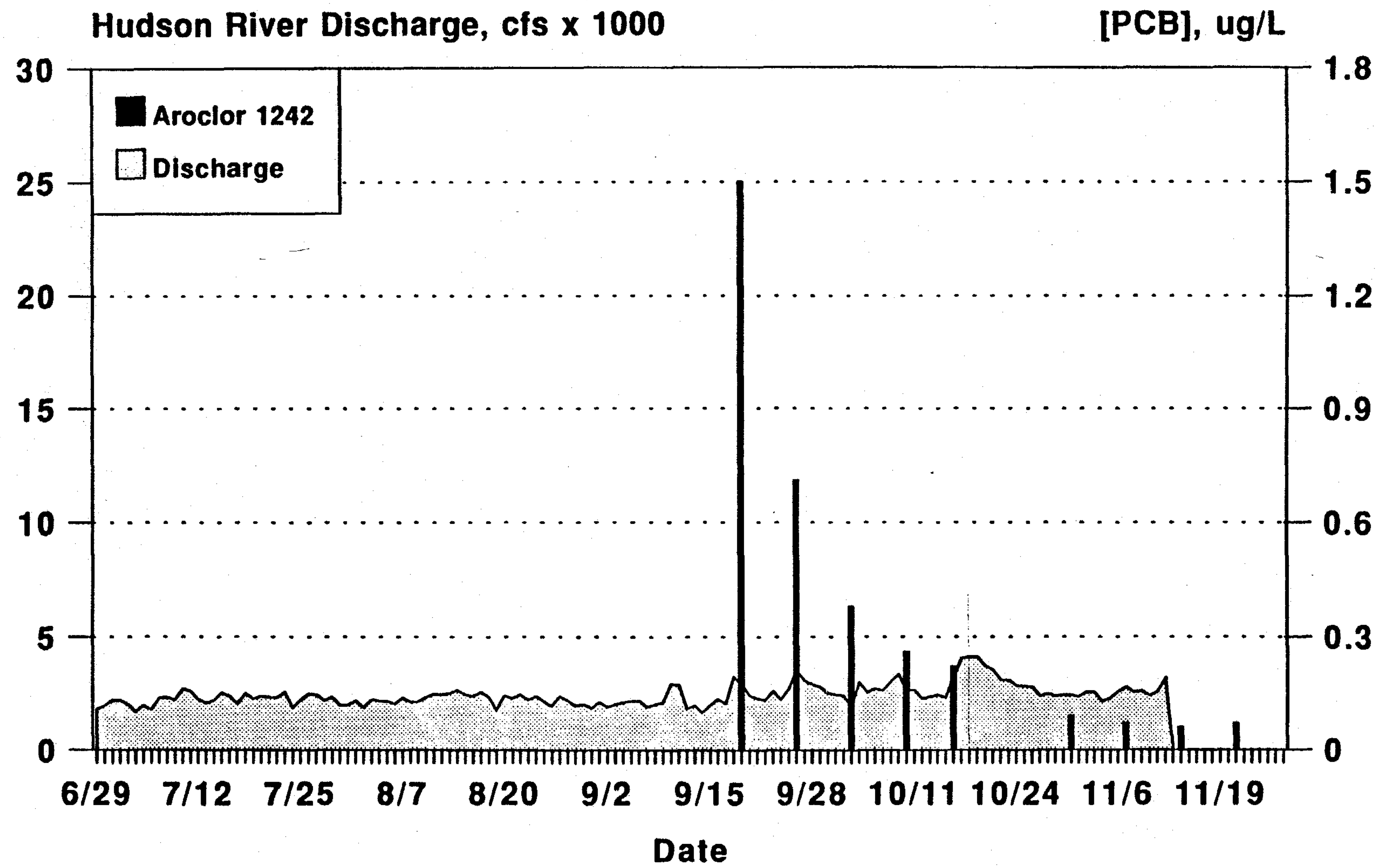

Discharge at USGS gage, Ft. Edward, NY

309878

309879

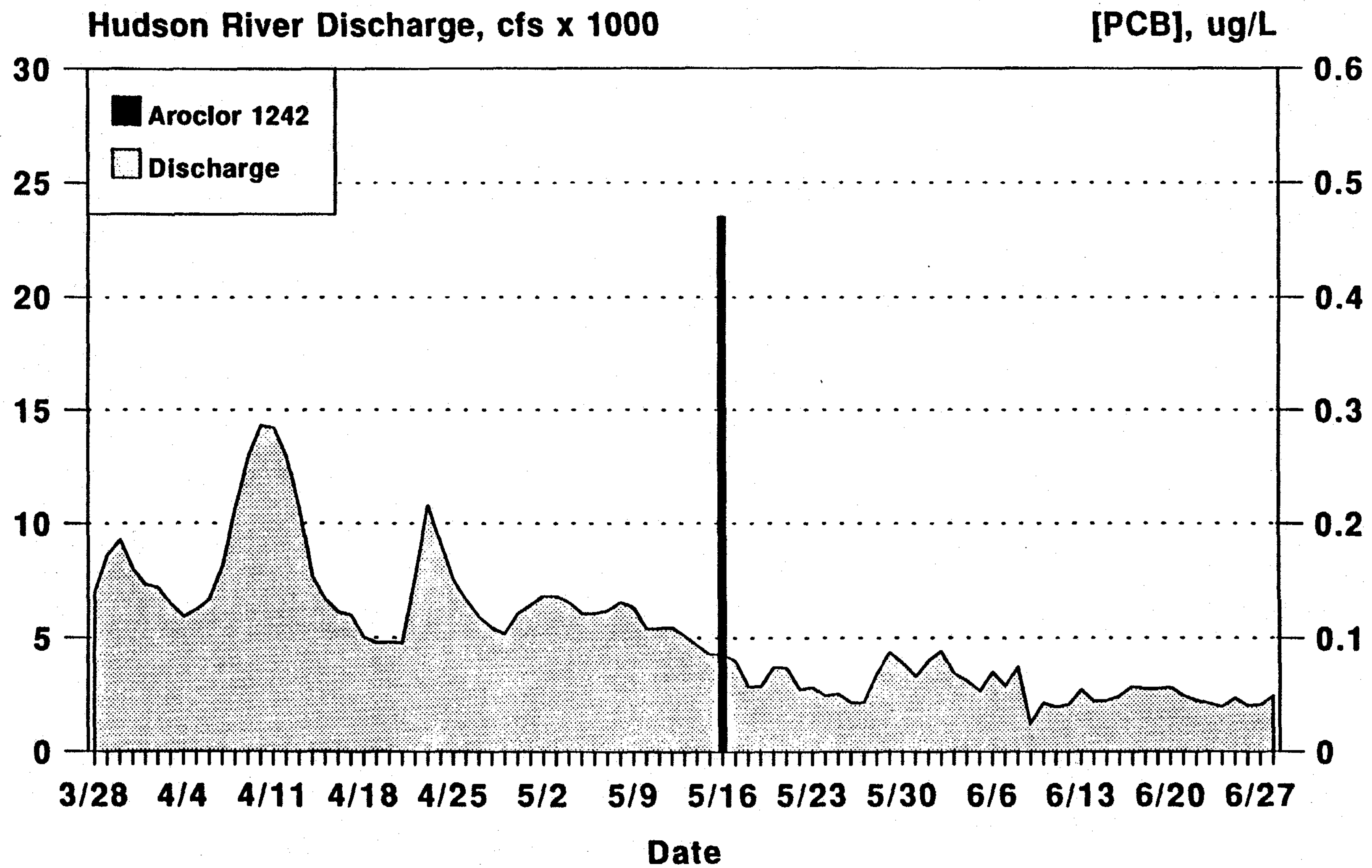
FIGURE 66

# PCB in Water, Station E4
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharg~ at USGS gage, Ft. Edward, NY

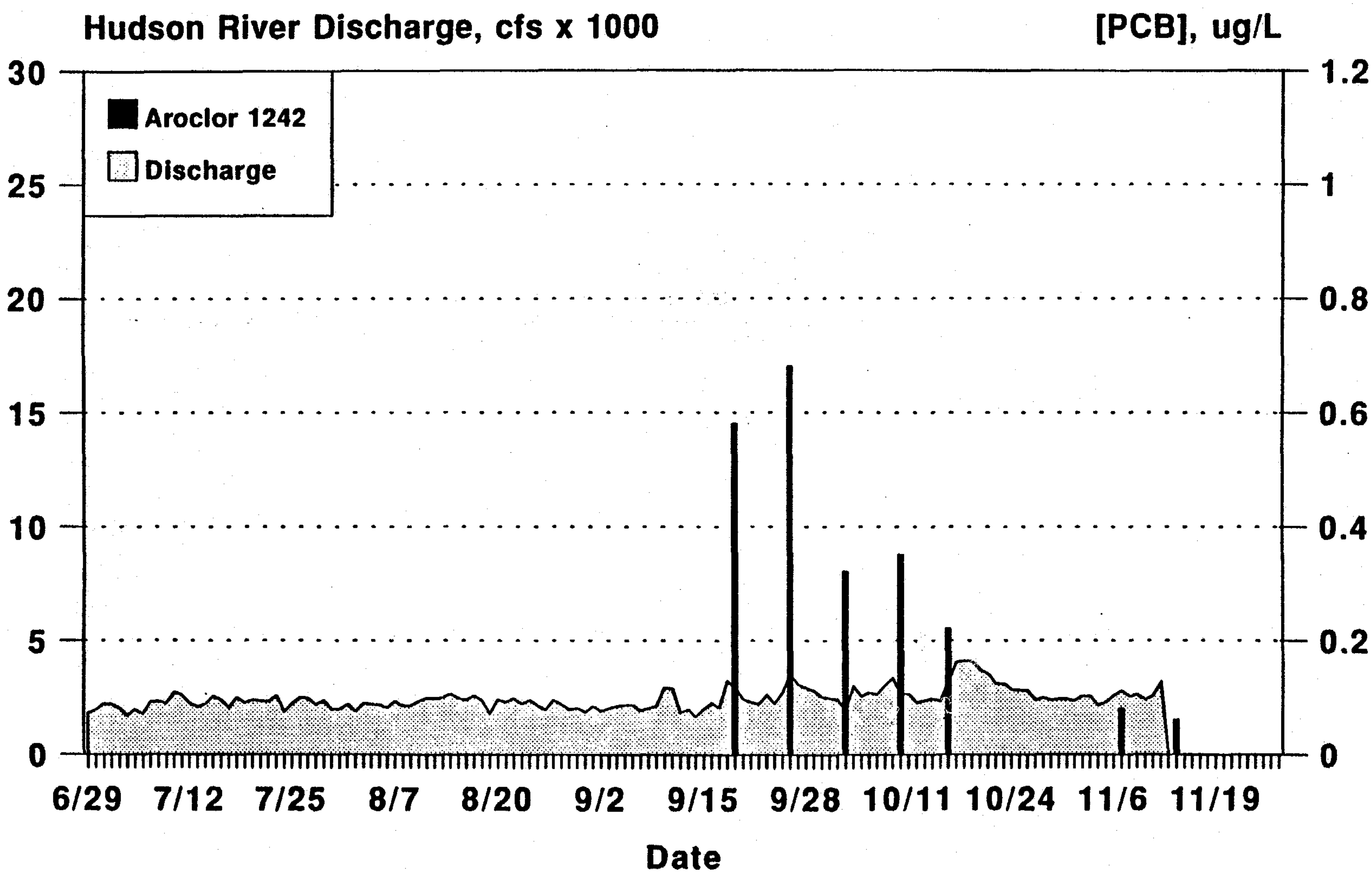
# PCB in Water, Station E5
# Spring-Construction Monitoring
# March 28 to June 28, 1991




Discharge at USGS gage, Ft. Edward, NY

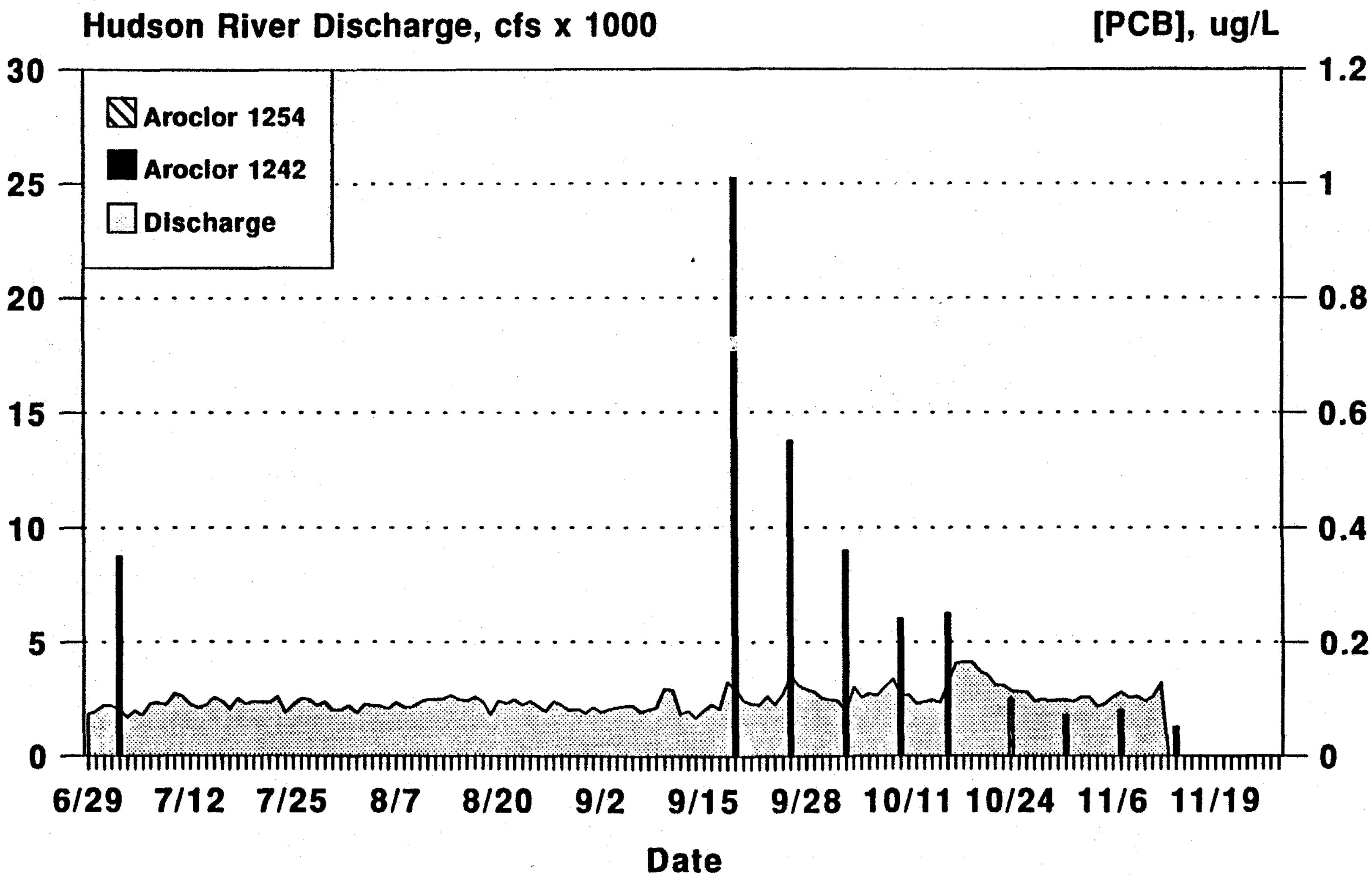
FIGURE 68

# PCB in Water, Station E5
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station E5A
# Post-Containment Monitoring
# June 29 to November 27, 1991



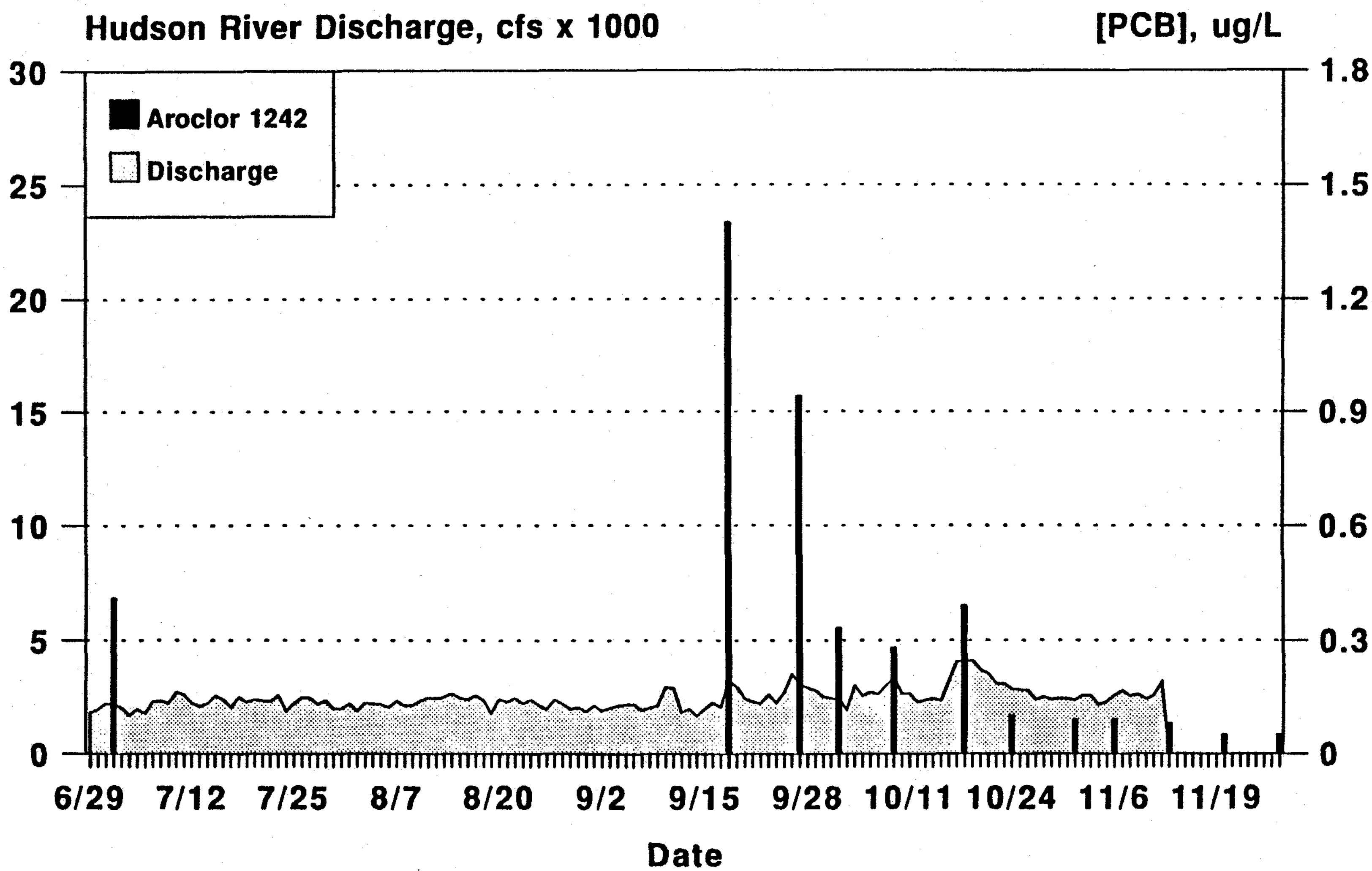

Discharge at USGS gage, Ft. Edward, NY

309882

309883

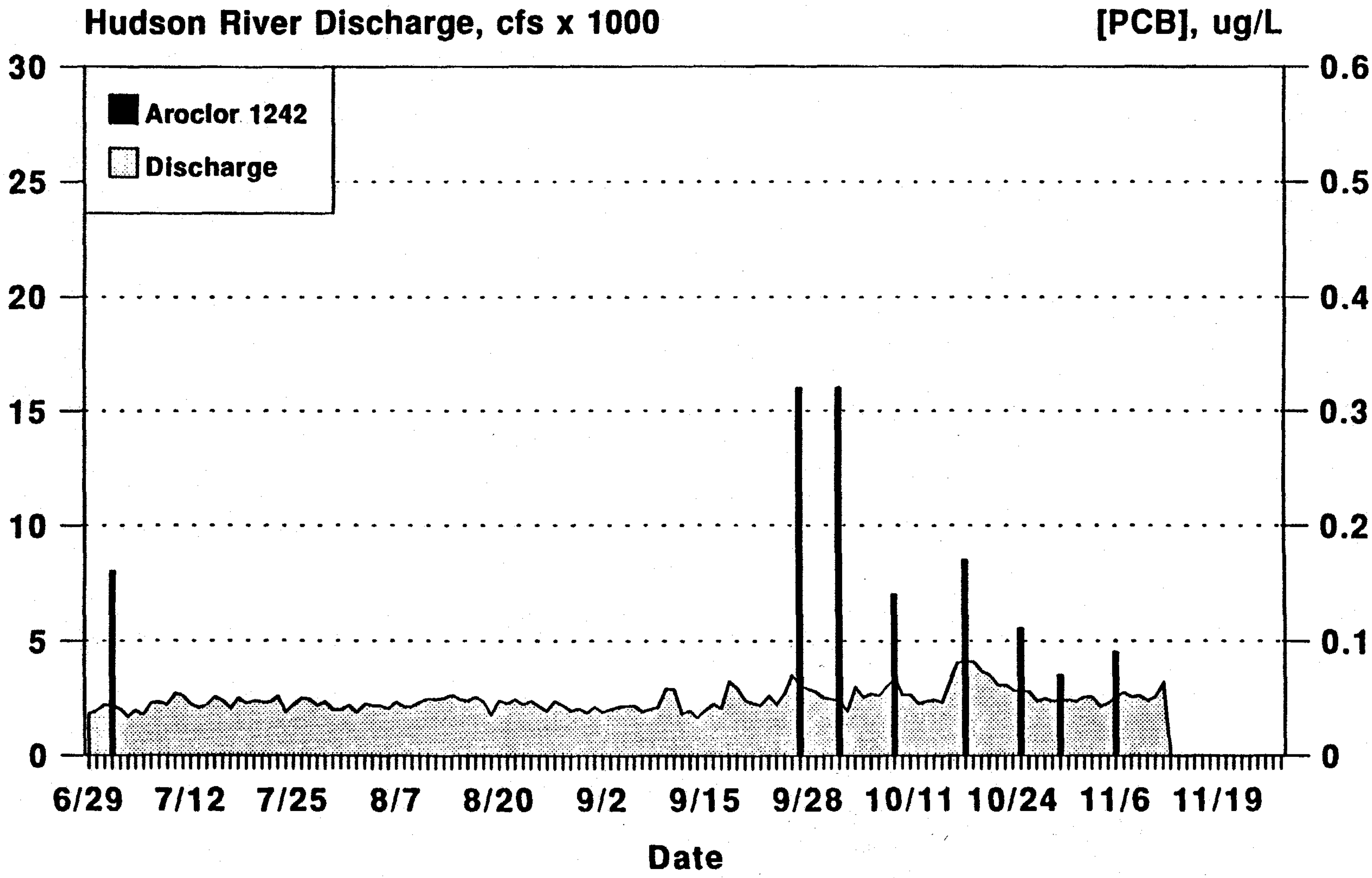
FIGURE 70

# PCB in Water, Station E6
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station E7
# Post-Containment Monitoring
# June 29 to November 27, 1991



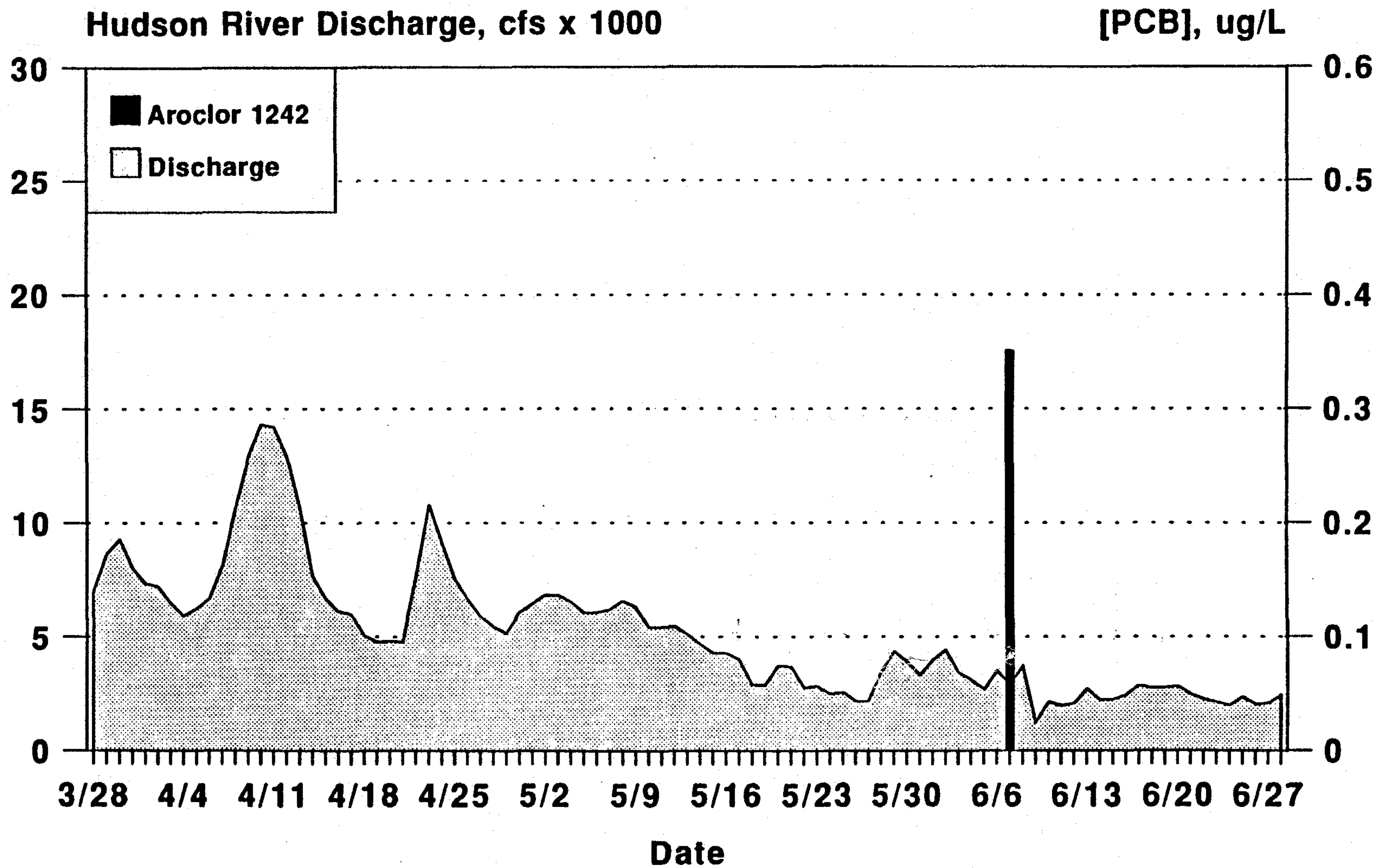

Discharge at USGS gage, Ft. Edward, NY

309884

309885

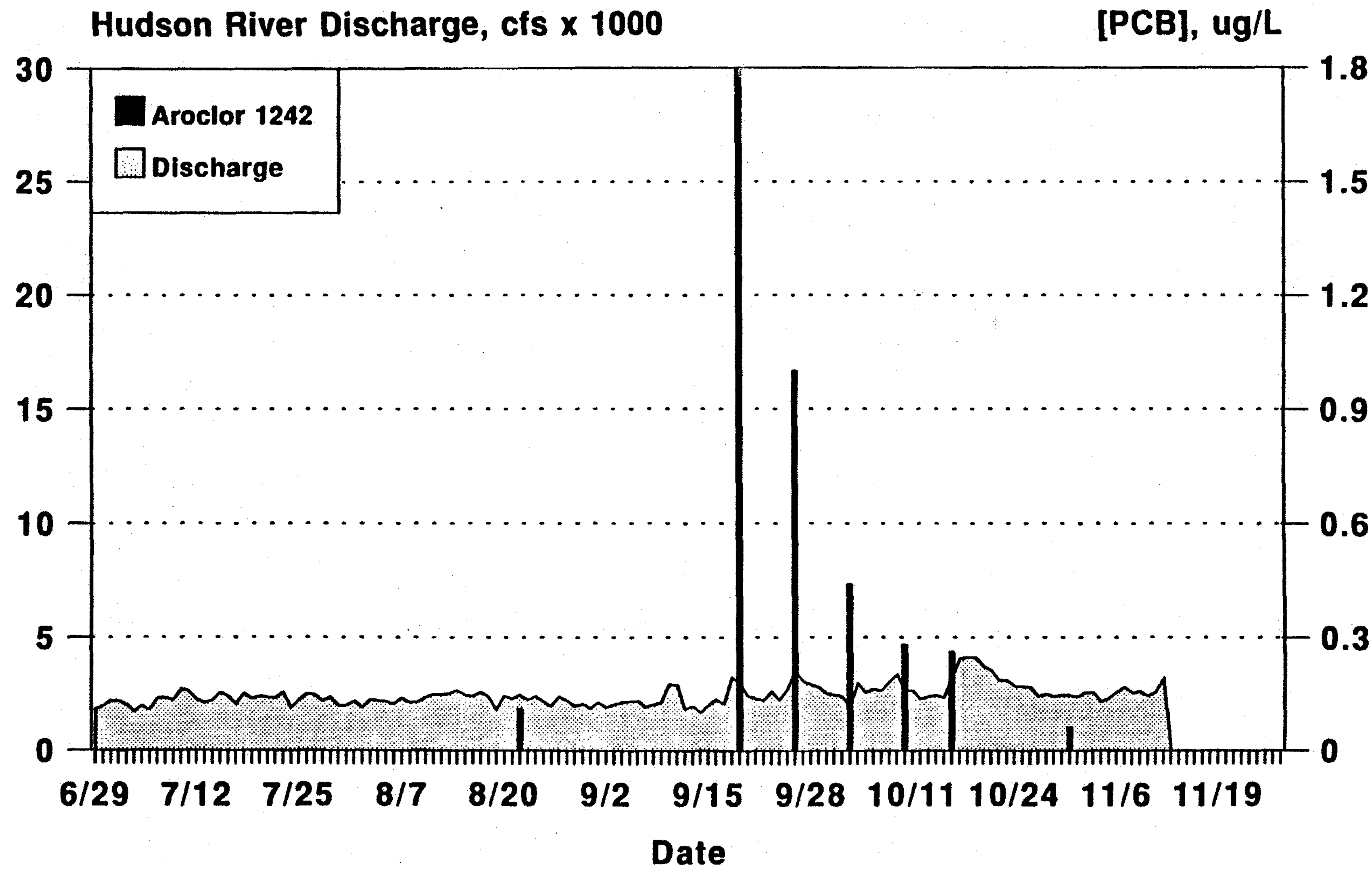
FIGURE 72

# PCB in Water, Station RS2W1 Spring-Construction Monitoring March 28 to June 28, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station RS2W1
# Post-Containment Monitoring
# June 29 to November 27, 1991



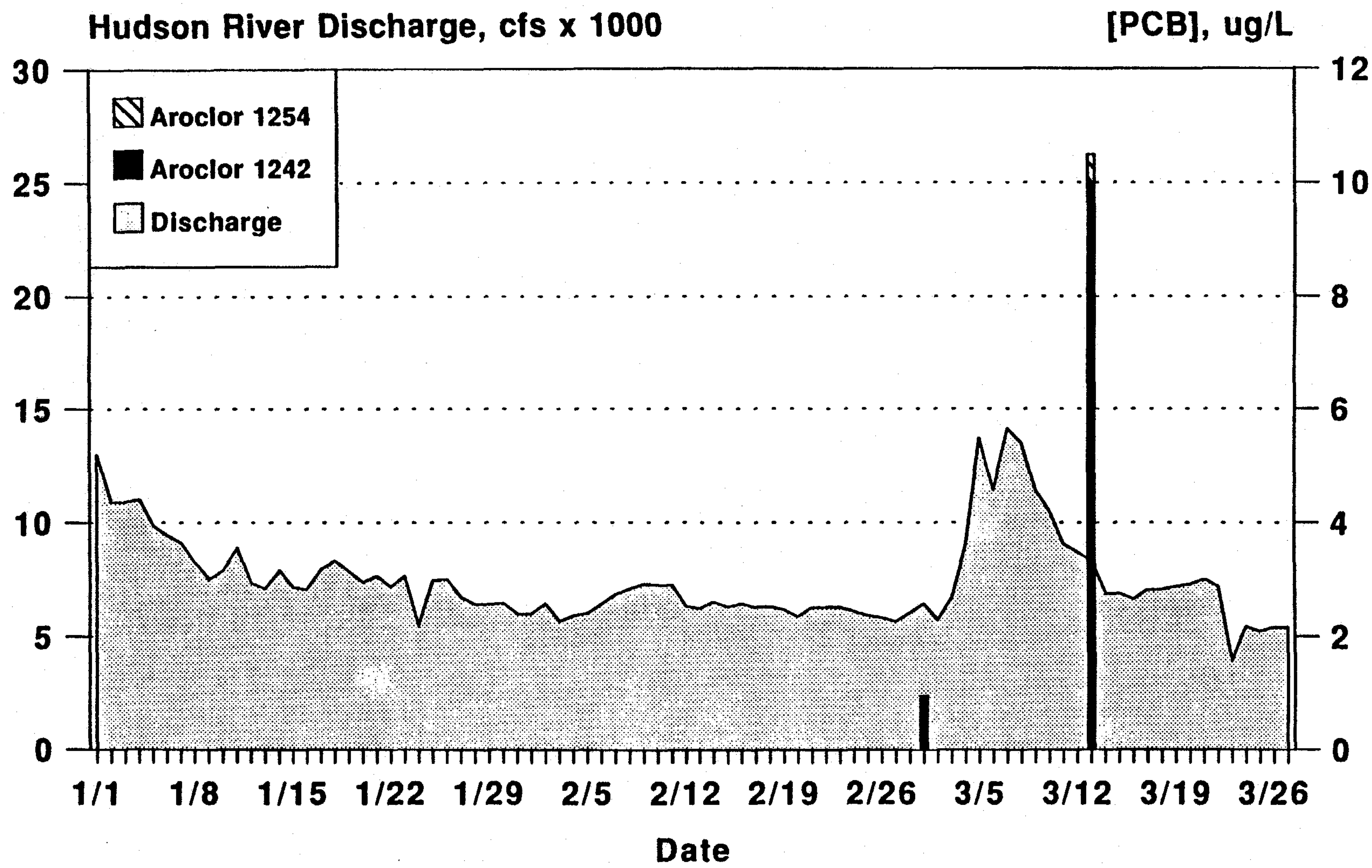

Discharge at USGS gage, Ft. Edward, NY

309886

309887

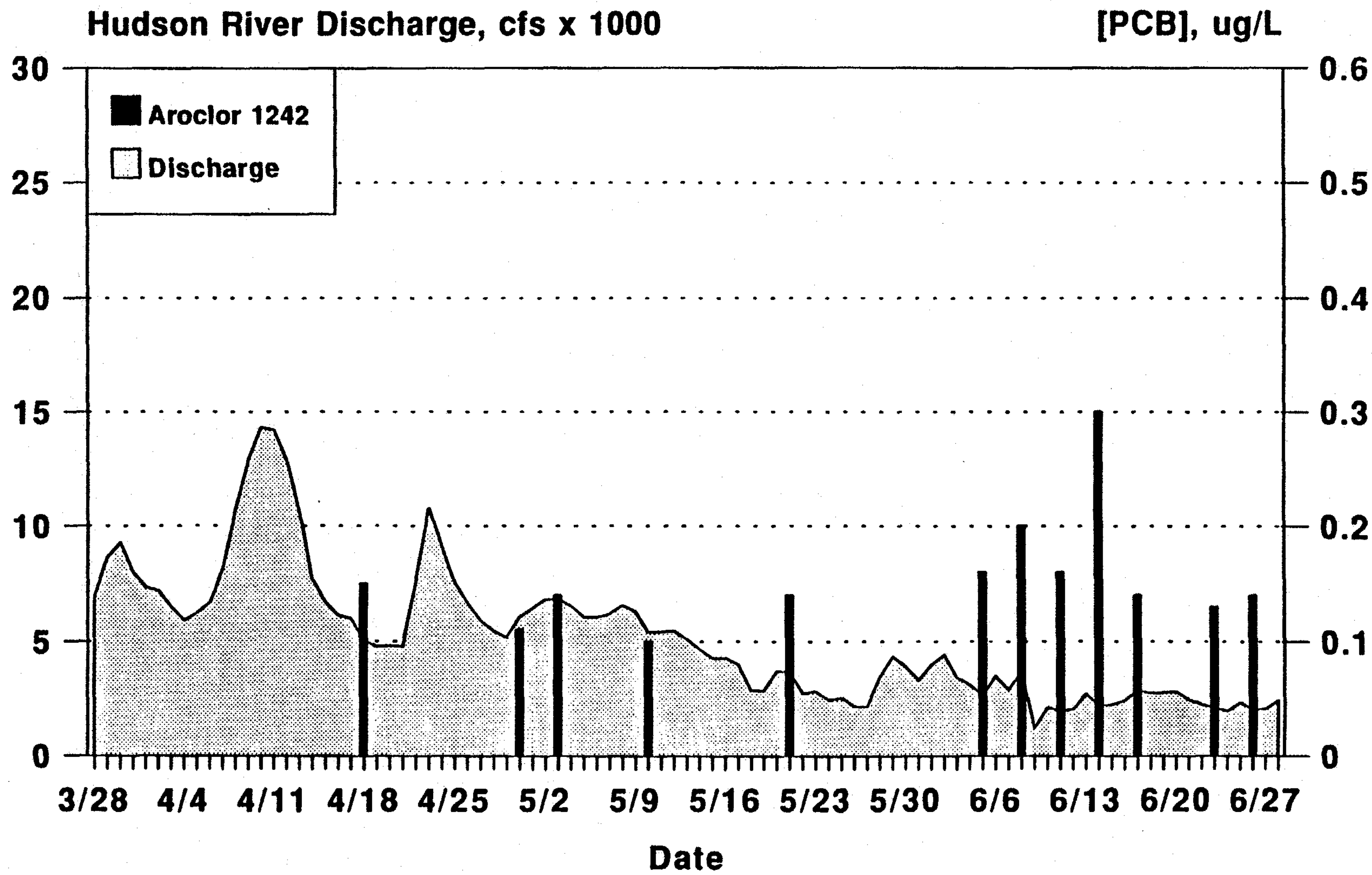
FIGURE 74

# PCB in Water, Station RS3W1 Winter-Construction Monitoring January 1 to March 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station RS3W1 Spring-Construction Monitoring March 28 to June 28, 1991



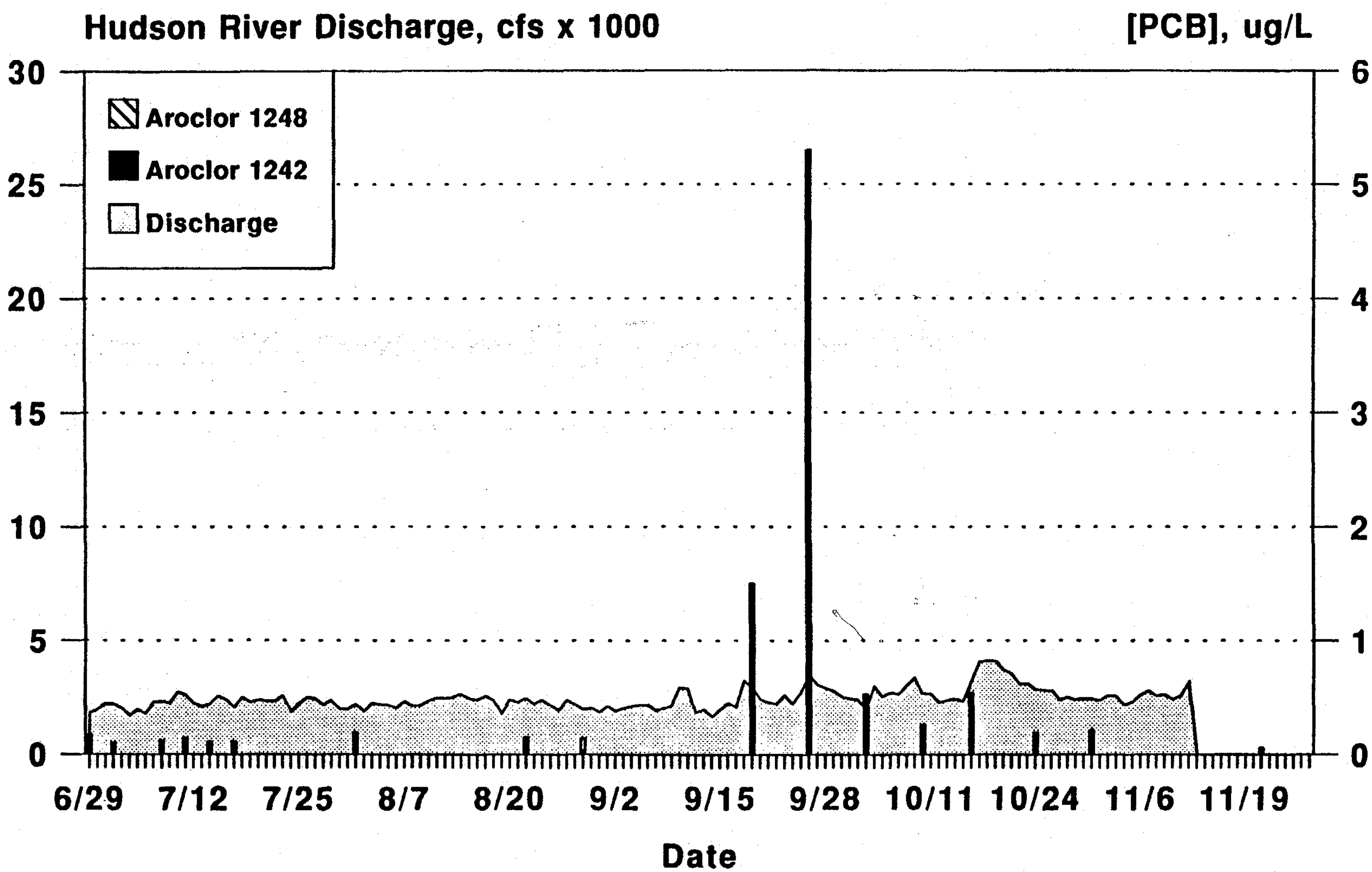

Discharge at USGS gage, Ft. Edward, NY

309888

309889

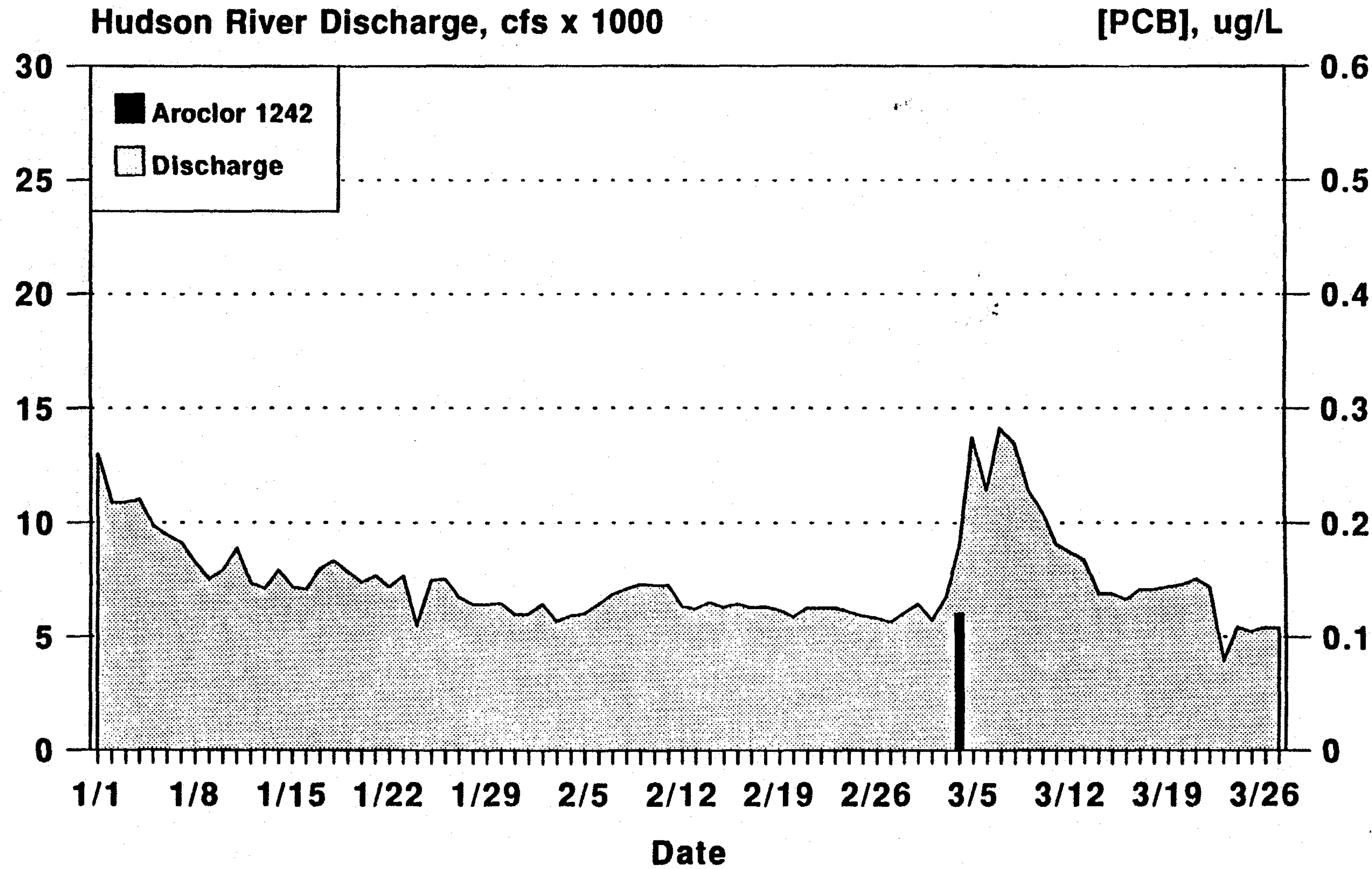
FIGURE 76

# PCB in Water, Station RS3W1 Post-Containment Monitoring June 29 to November 27, 1991




Dischar~~ at USGS gage, Ft. Edward, NY

# PCB in Water, Station RS3W2
# Winter-Construction Monitoring
# January 1 to March 27, 1991



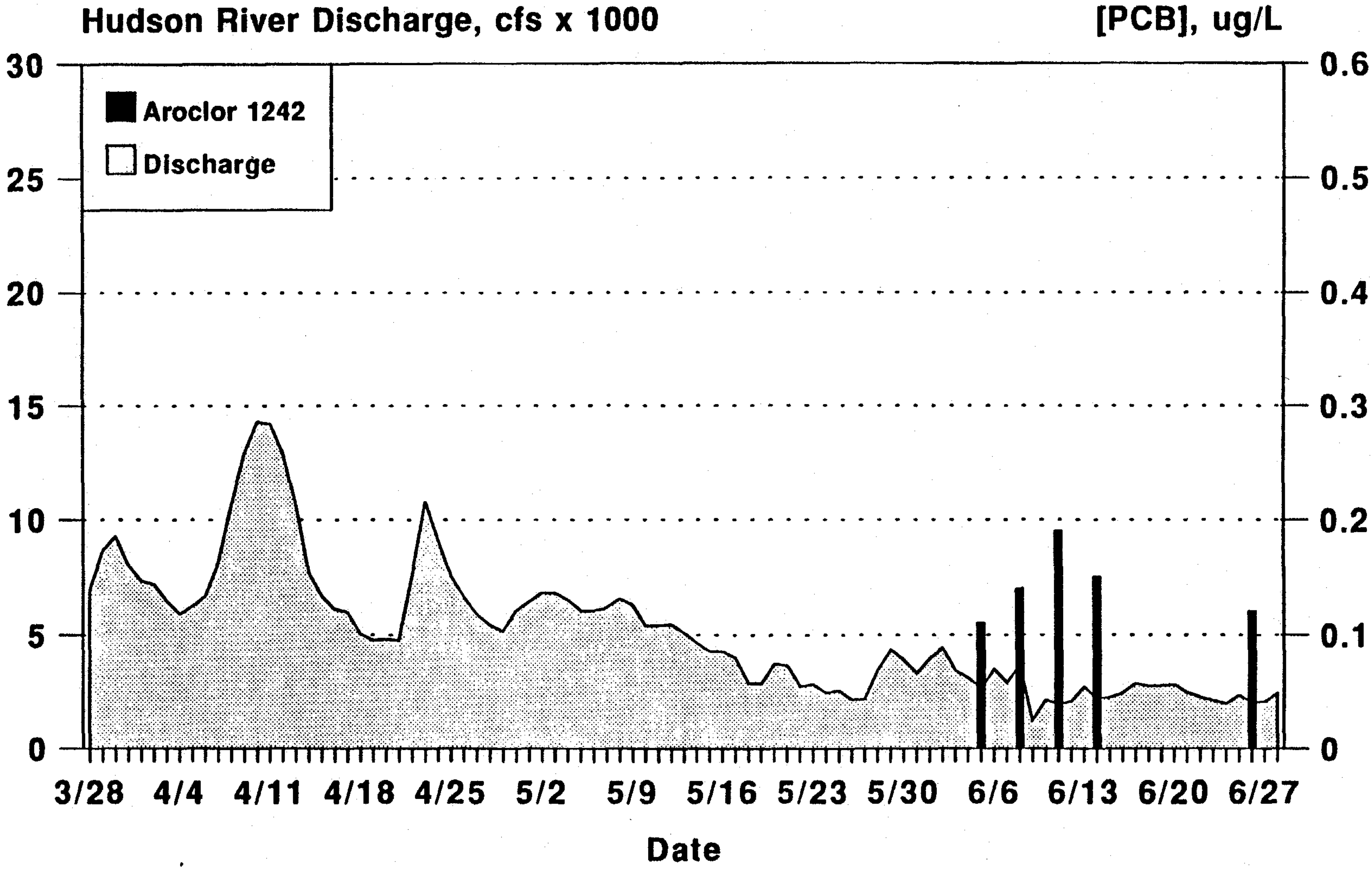

Discharge at USGS gage, Ft. Edward, NY

309890

309891

FIGURE 78

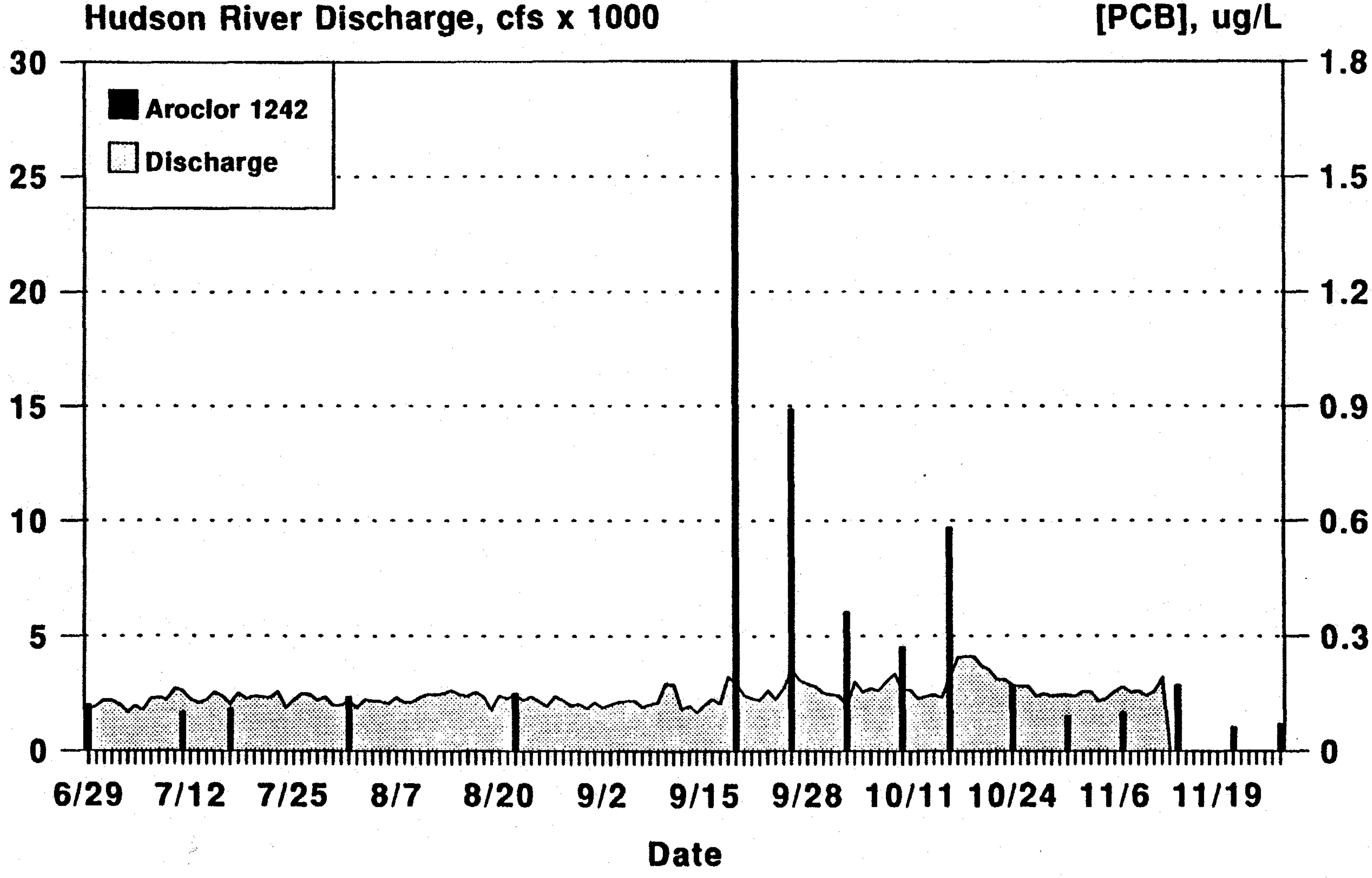
# PCB in Water, Station RS3W2 Spring-Construction Monitoring March 28 to June 28, 1991




Discharge at USGS gage, Ft. Edward, NY

FIGURE 79

# PCB in Water, Station RS3W2 Post-Containment Monitoring June 29 to November 27, 1991



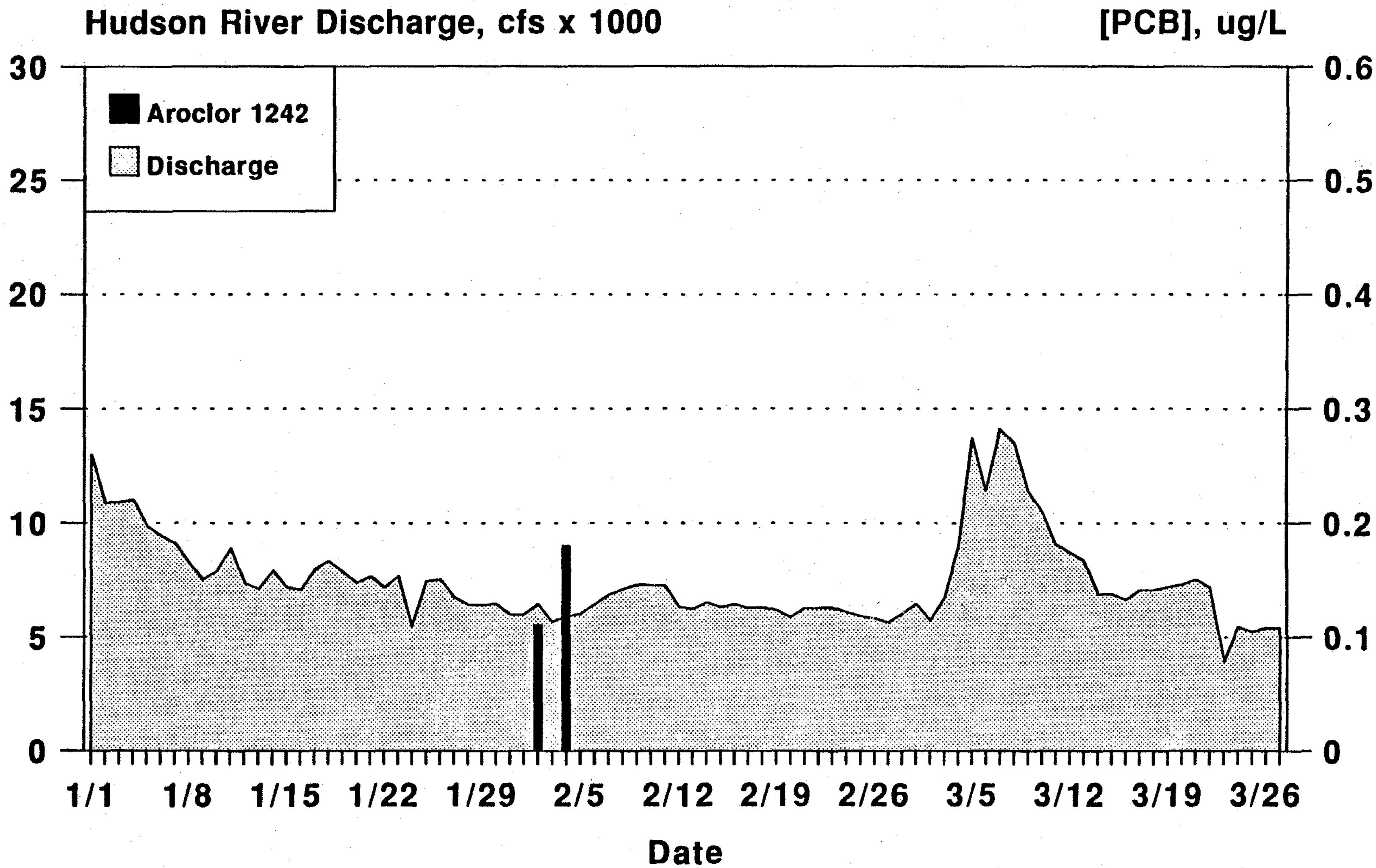

Discharge at USGS gage, Ft. Edward, NY

309892

309893

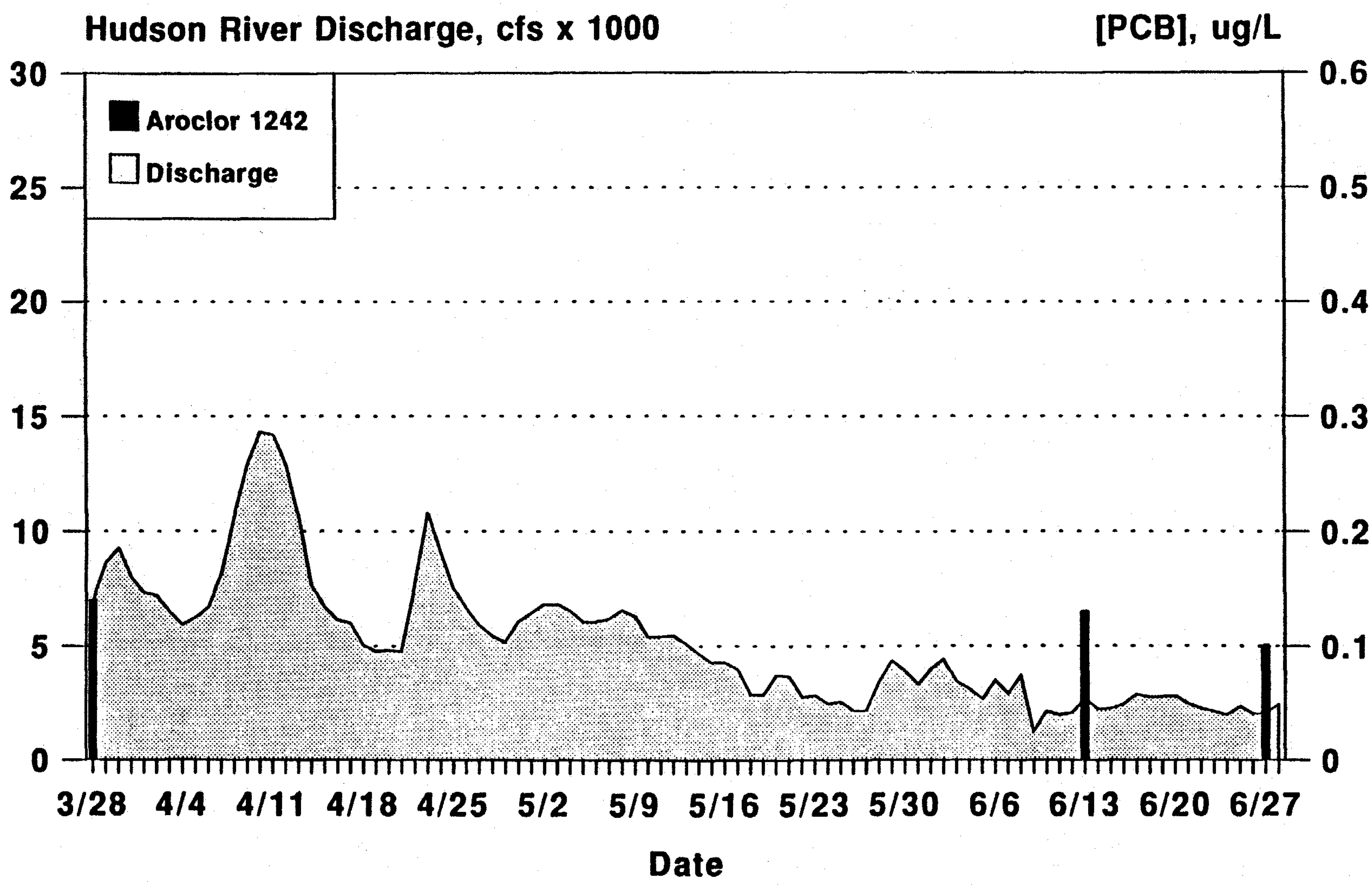
FIGURE 80

# PCB in Water, Station RS4W2
# Winter-Construction Monitoring
# January 1 to March 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station RS5W1 Spring-Construction Monitoring March 28 to June 28, 1991



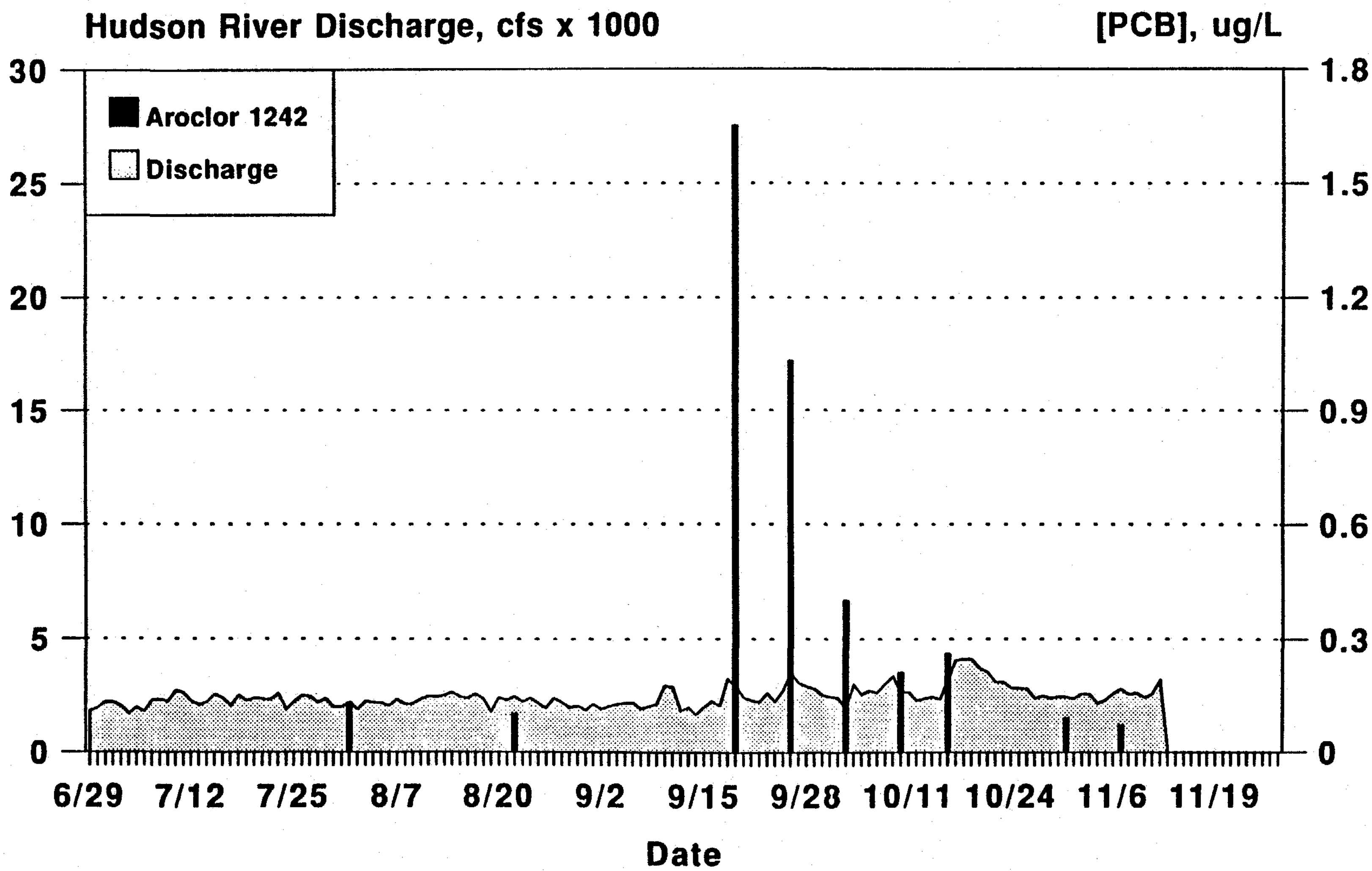

Discharge at USGS gage, Ft. Edward, NY

309894

309895

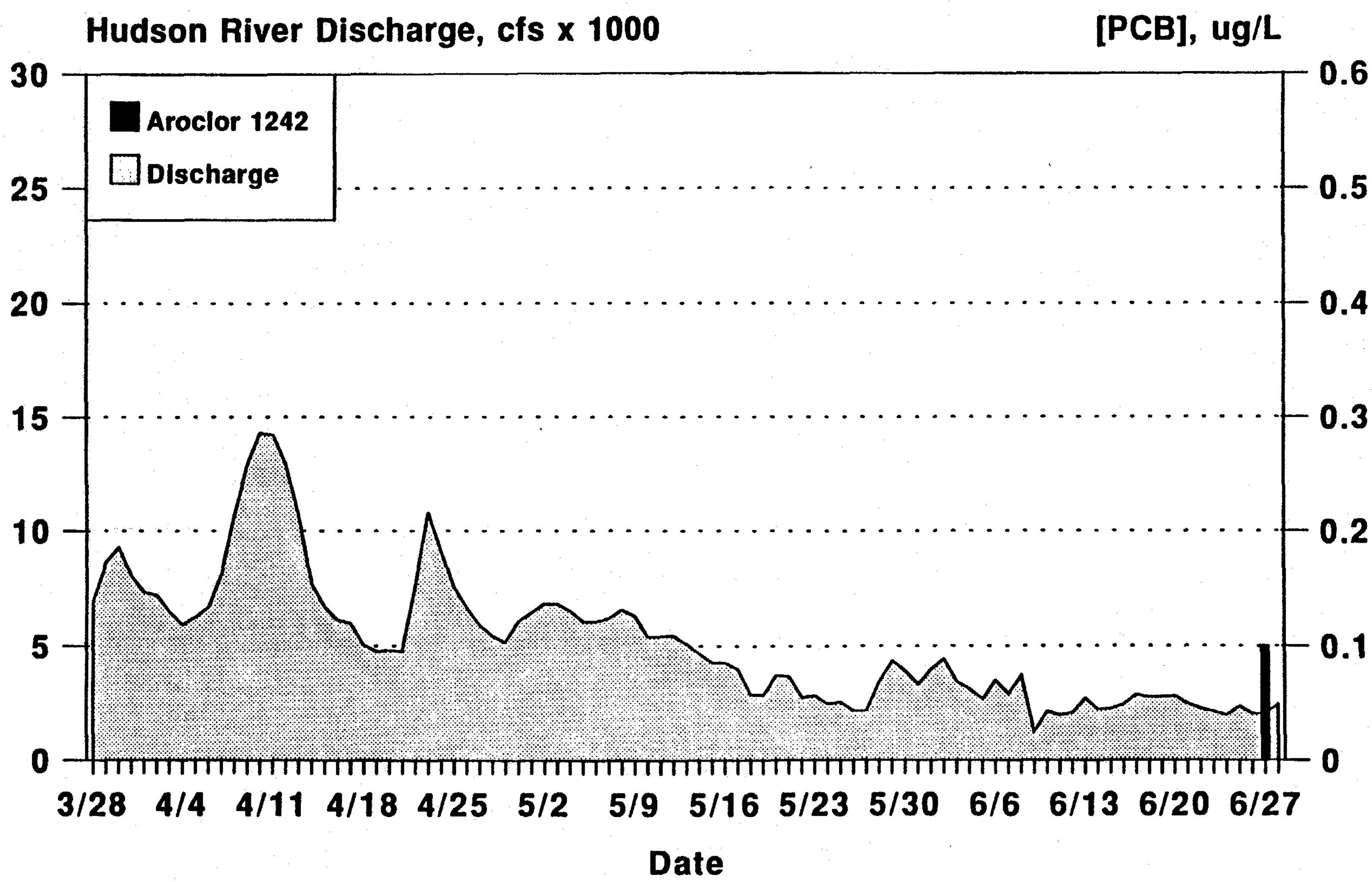
FIGURE 82

# PCB in Water, Station RS5W1
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station RS5W2 Spring-Construction Monitoring March 28 to June 28, 1991

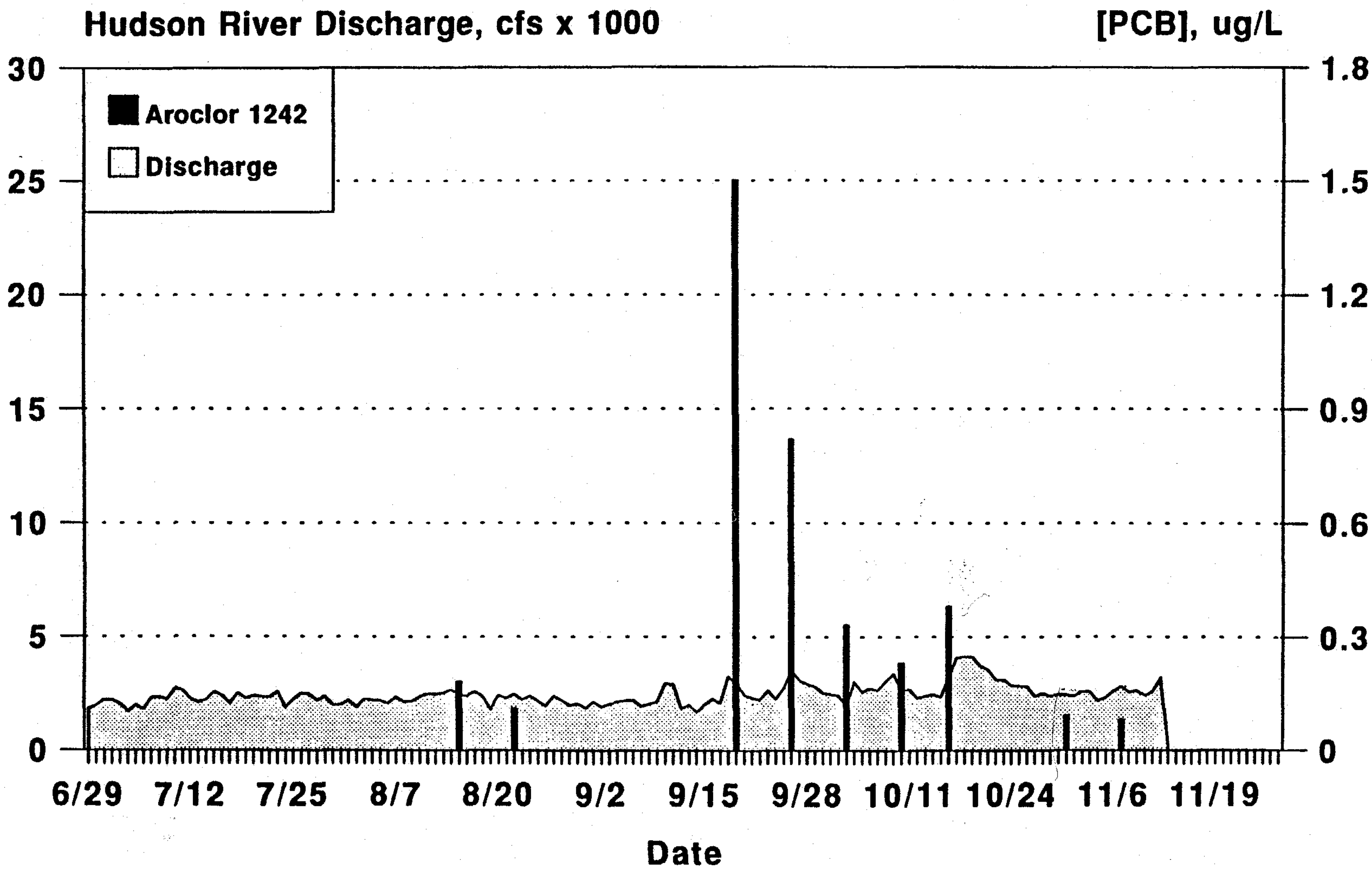



Discharge at USGS gage, Ft. Edward, NY

FIGURE 84

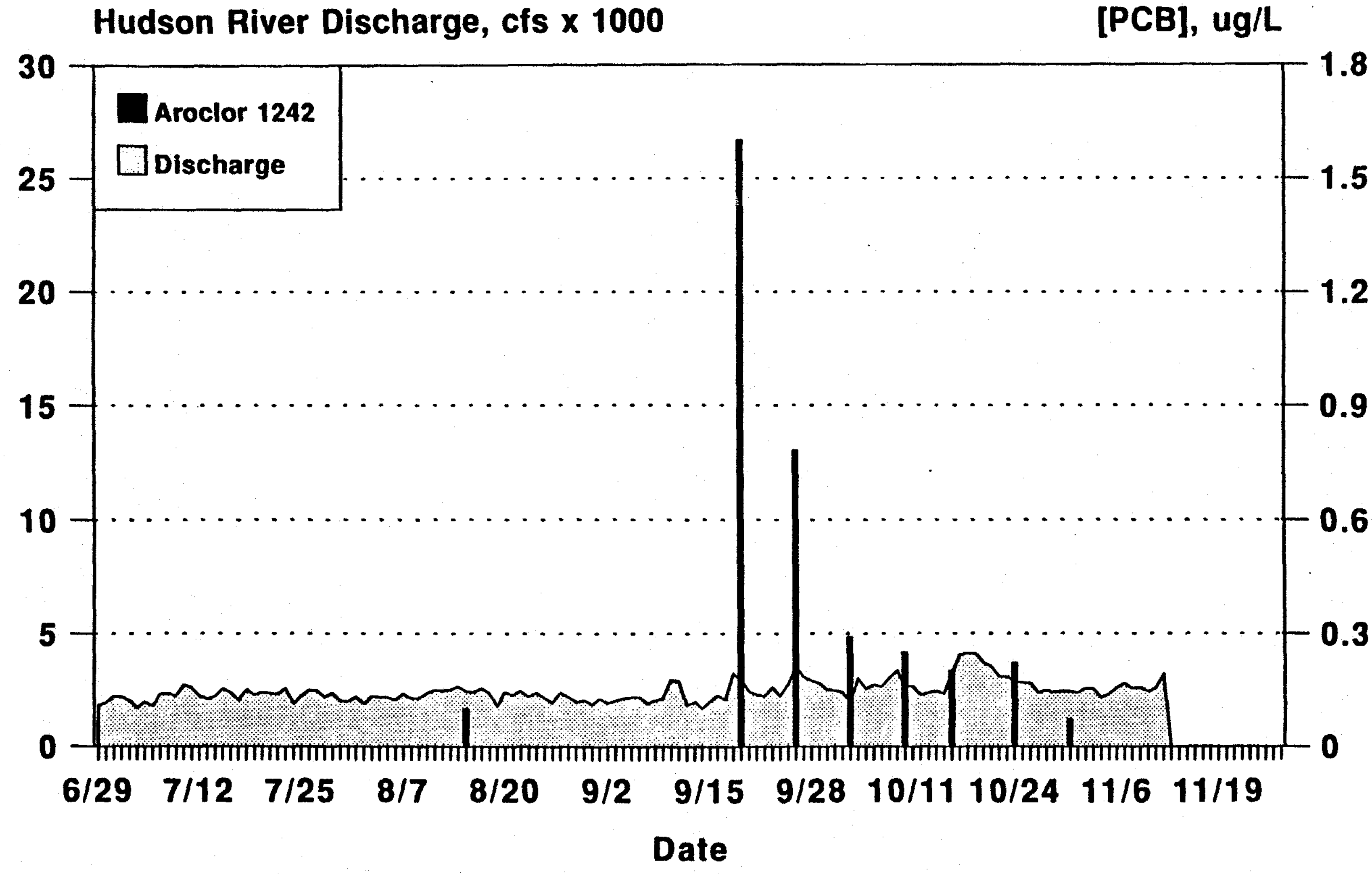
309897

# PCB in Water, Station RS5W2
# Post-Containment Monitoring
# June 29 to November 27, 1991




Discharge at USGS gage, Ft. Edward, NY

# PCB in Water, Station DS1
# Post-Containment Monitoring
# June 29 to November 27, 1991



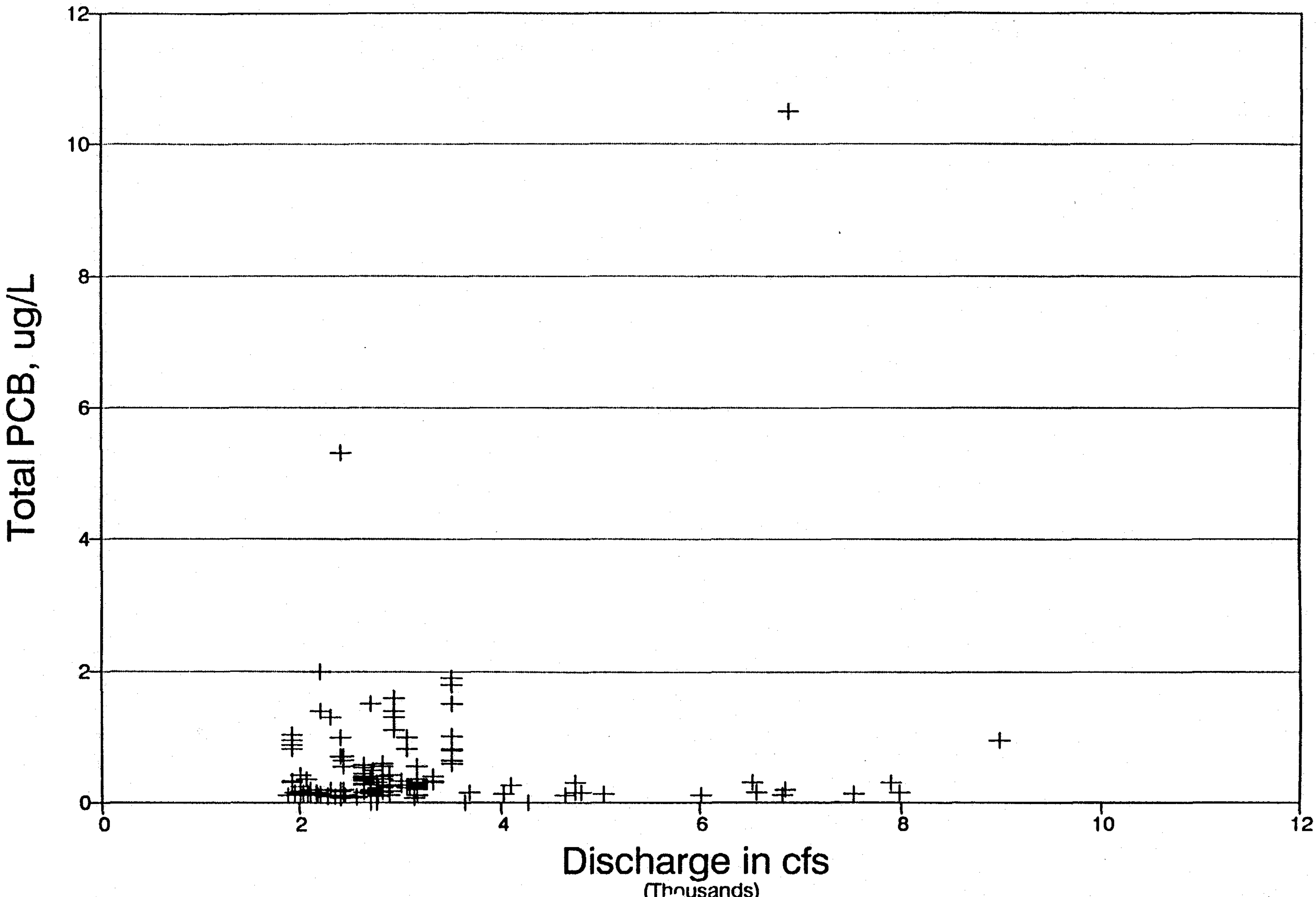

Discharge at USGS gage, Ft. Edward, NY

309898

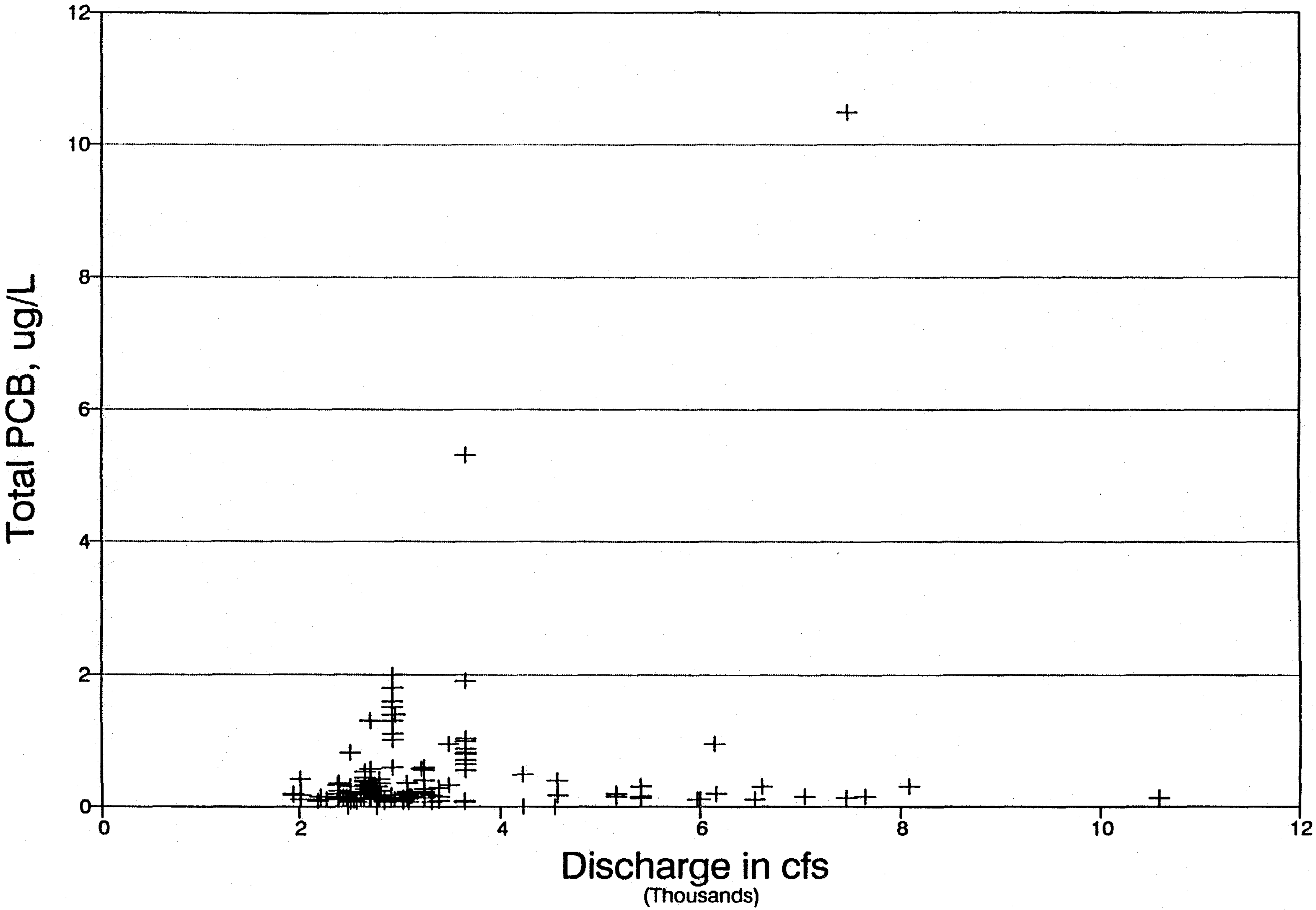
309899

FIGURE 86

# PCB in Water and Hudson River Discharge at Ft. Edward - All 1991 Samples



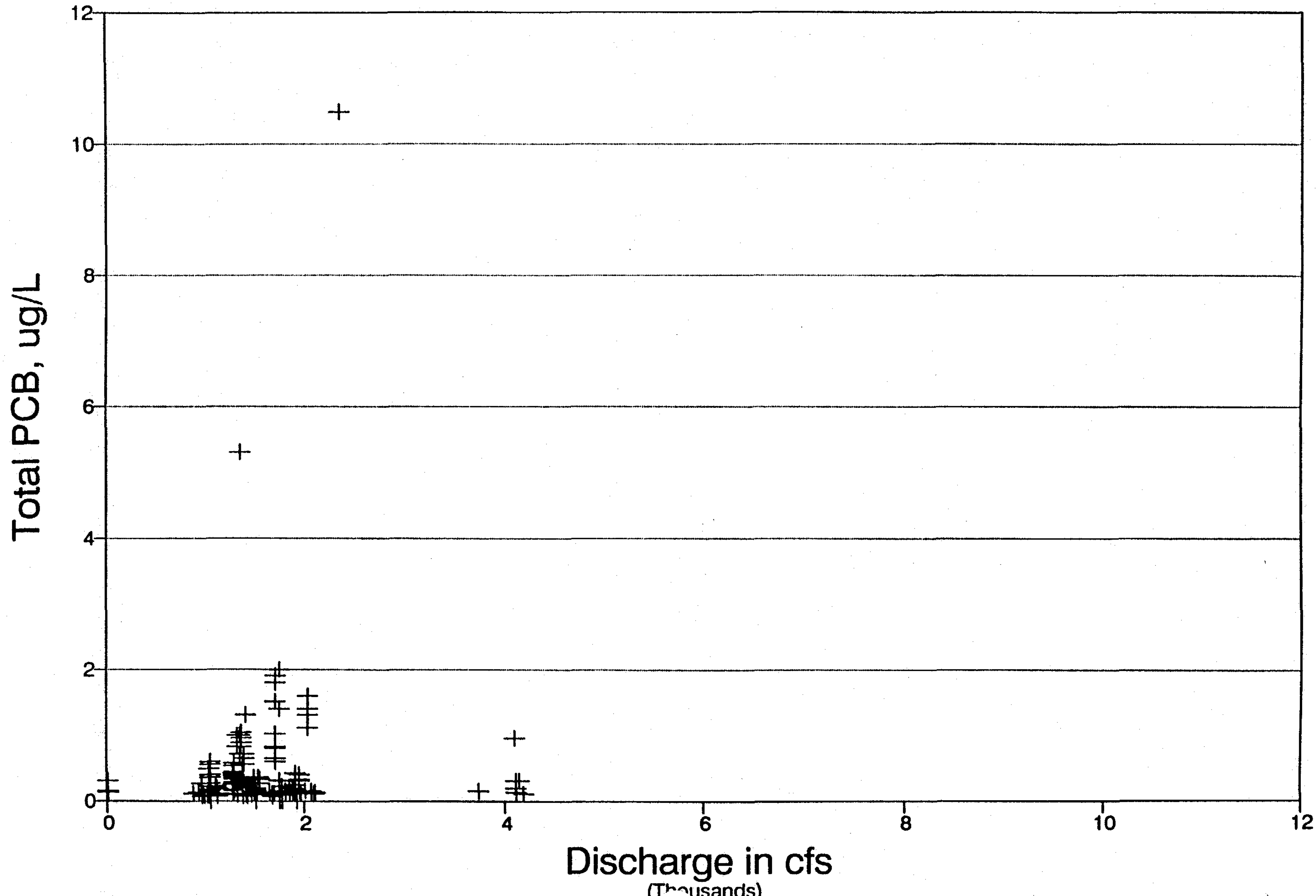
# PCB in Water and Discharge at Spier Falls - All 1991 Samples



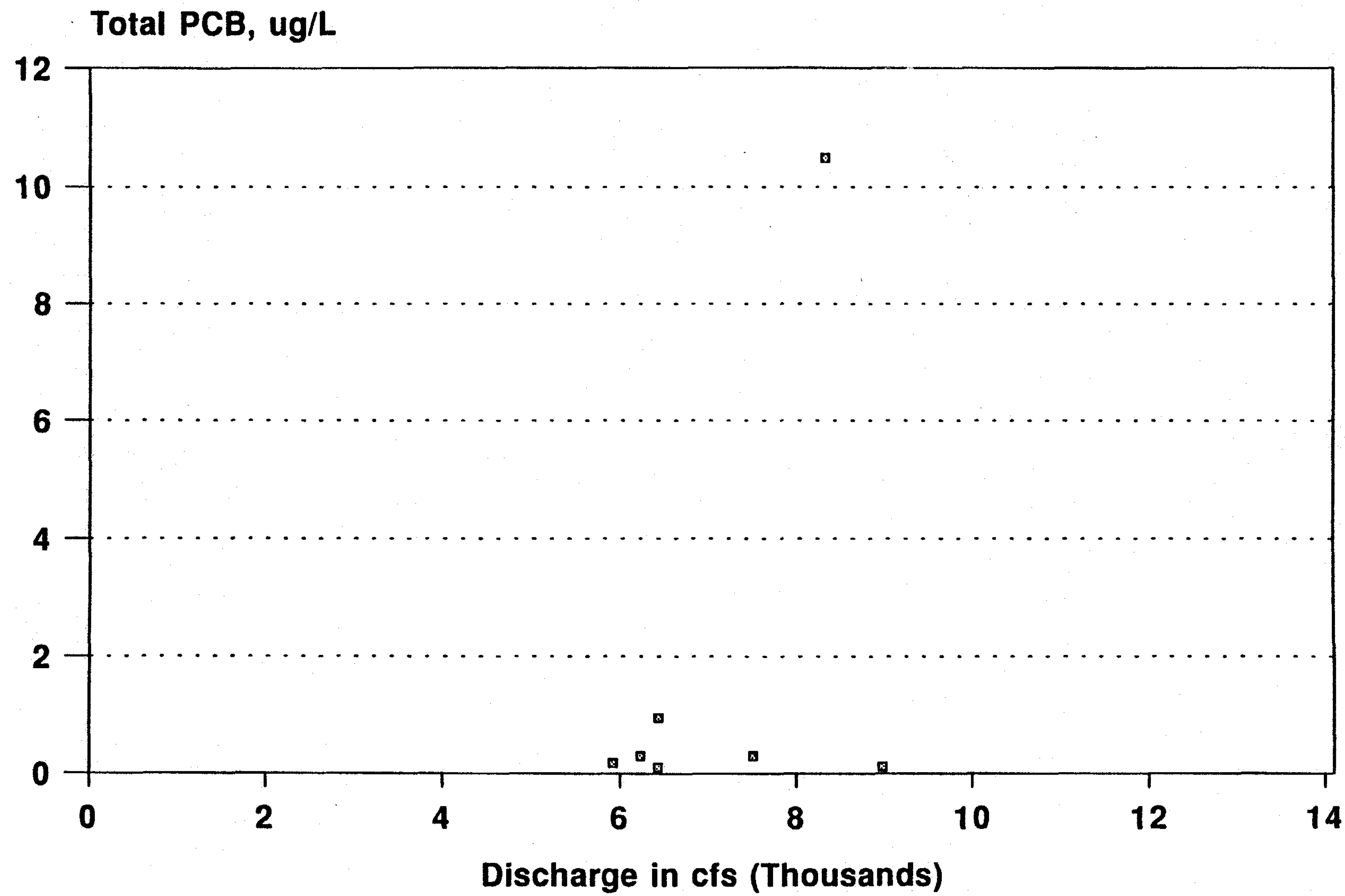
309901

FIGURE 88

# PCB in Water and Discharge at Sacandaga Reservior Falls - All 1991 Samples



# PCB in Water and Discharge at Ft. Edward
# Winter-Construction Monitoring



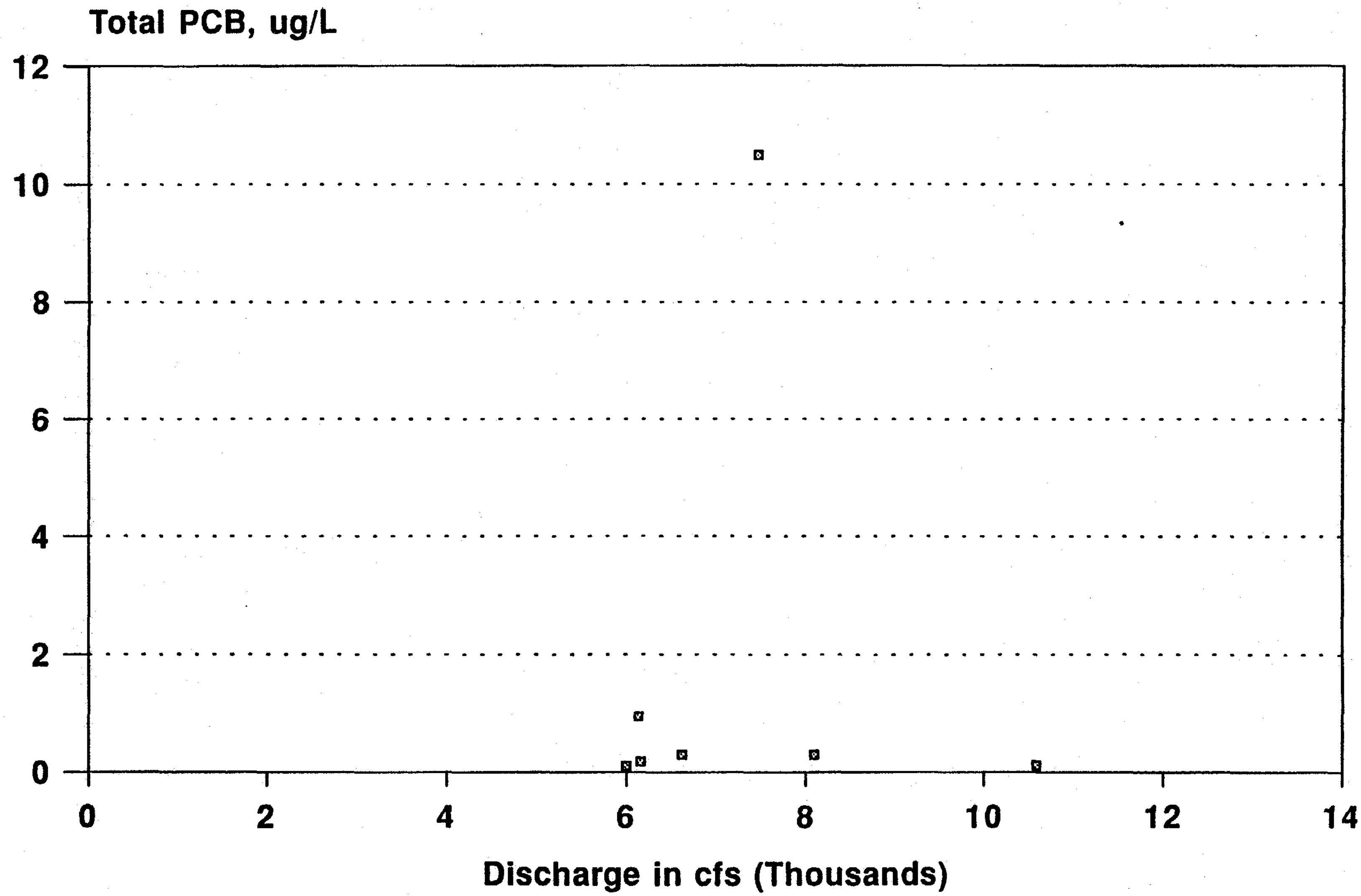

**Discharge at USGS gage, Ft. Edward, NY**
**Total PCB from all stations**

309902

309903

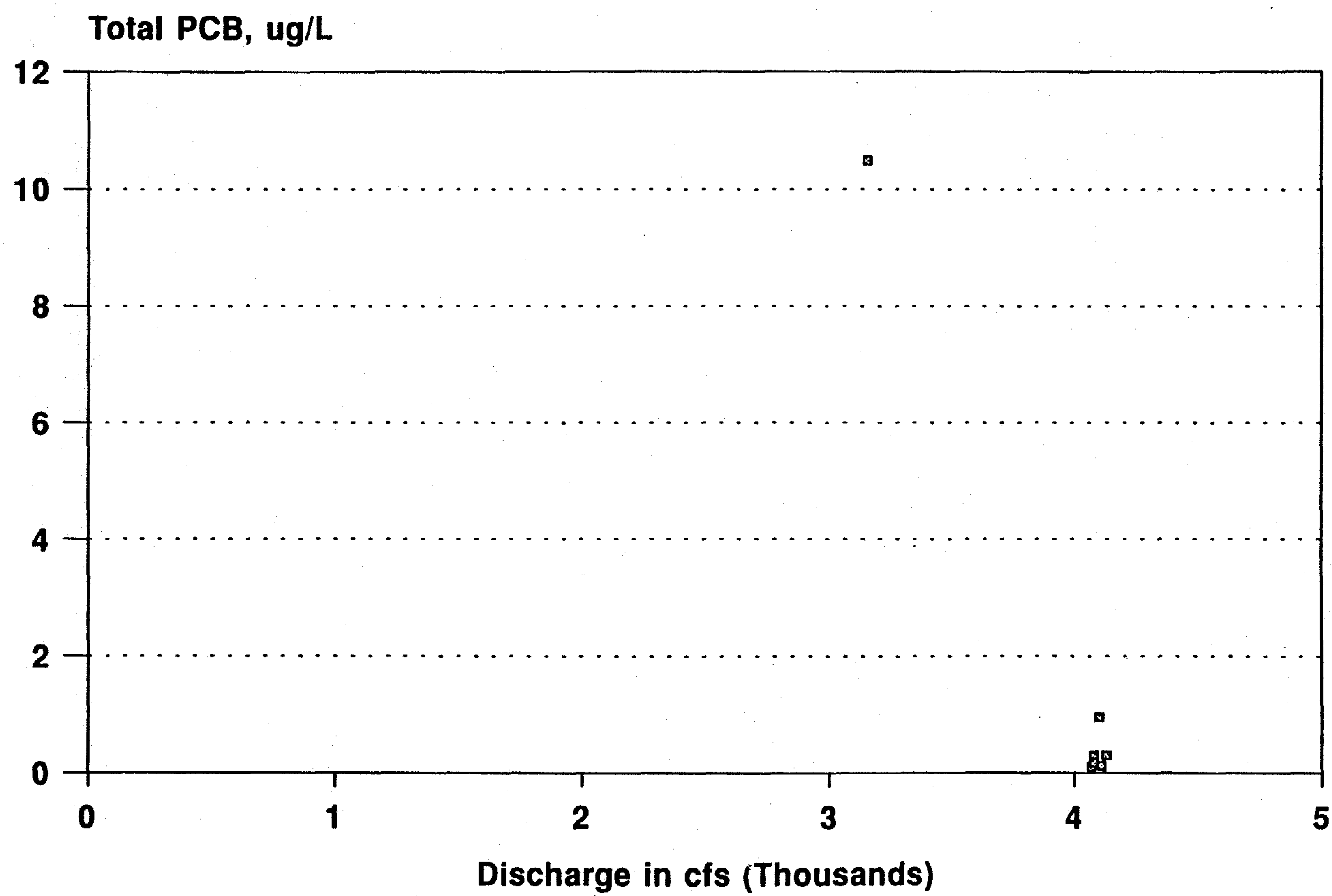
FIGURE 90

# PCB in Water and Discharge at Spier Falls Winter-Construction Monitoring




**Discharge from Hudson River-Black River Regulating District**
**Total PCB from all stations**

# PCB in Water and Discharge at Sacandaga Winter-Construction Monitoring



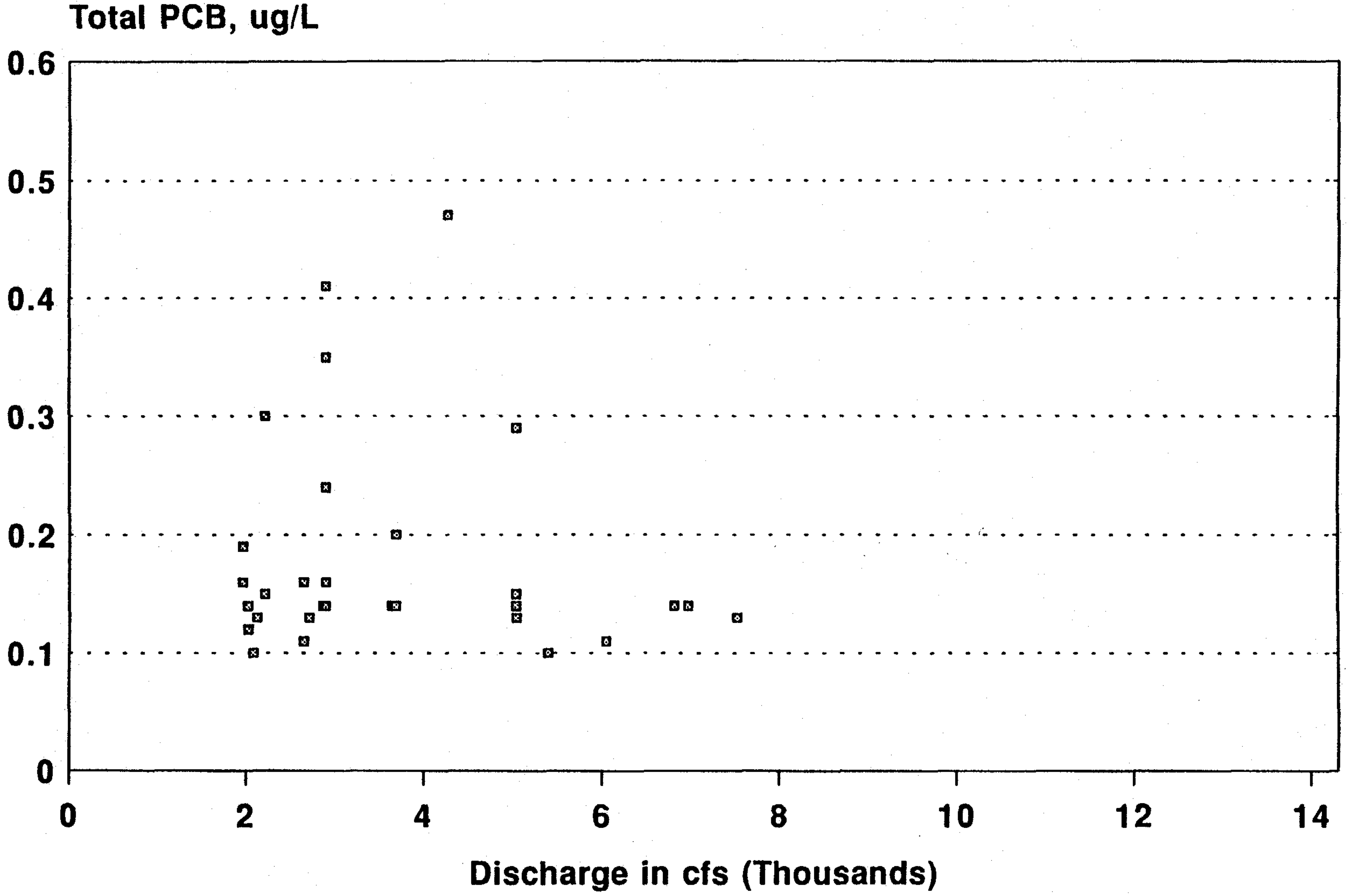

Discharge from Hudson River-Black River Regulating District
Total PCB from all stations

309904

309905

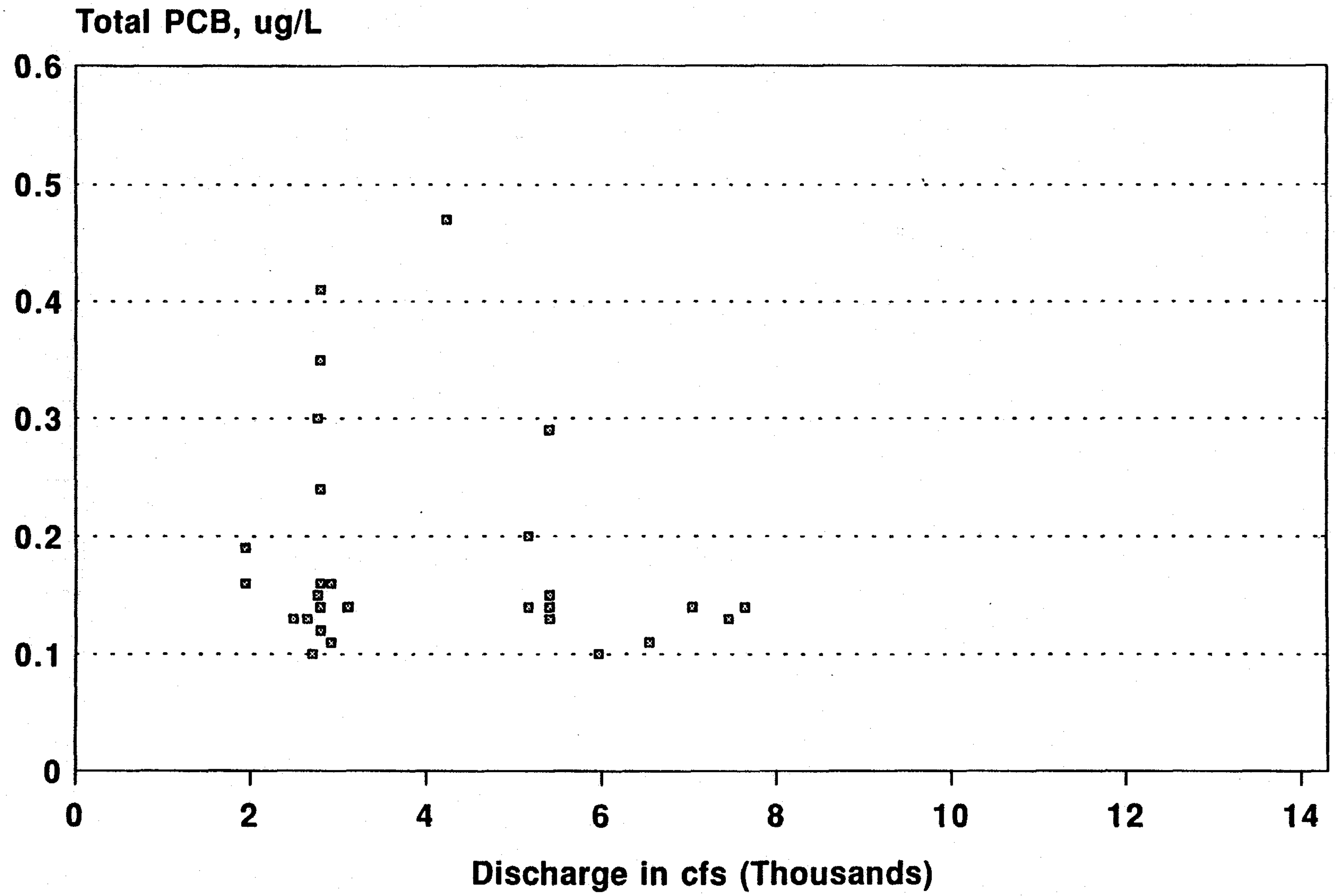
FIGURE 92

# PCB in Water and Discharge at Ft. Edward
# Spring-Construction Monitoring




Discharge at USGS gage, Ft. Edward, NY
Total PCB from all stations

# PCB in Water and Discharge at Spier Falls
# Spring-Construction Monitoring



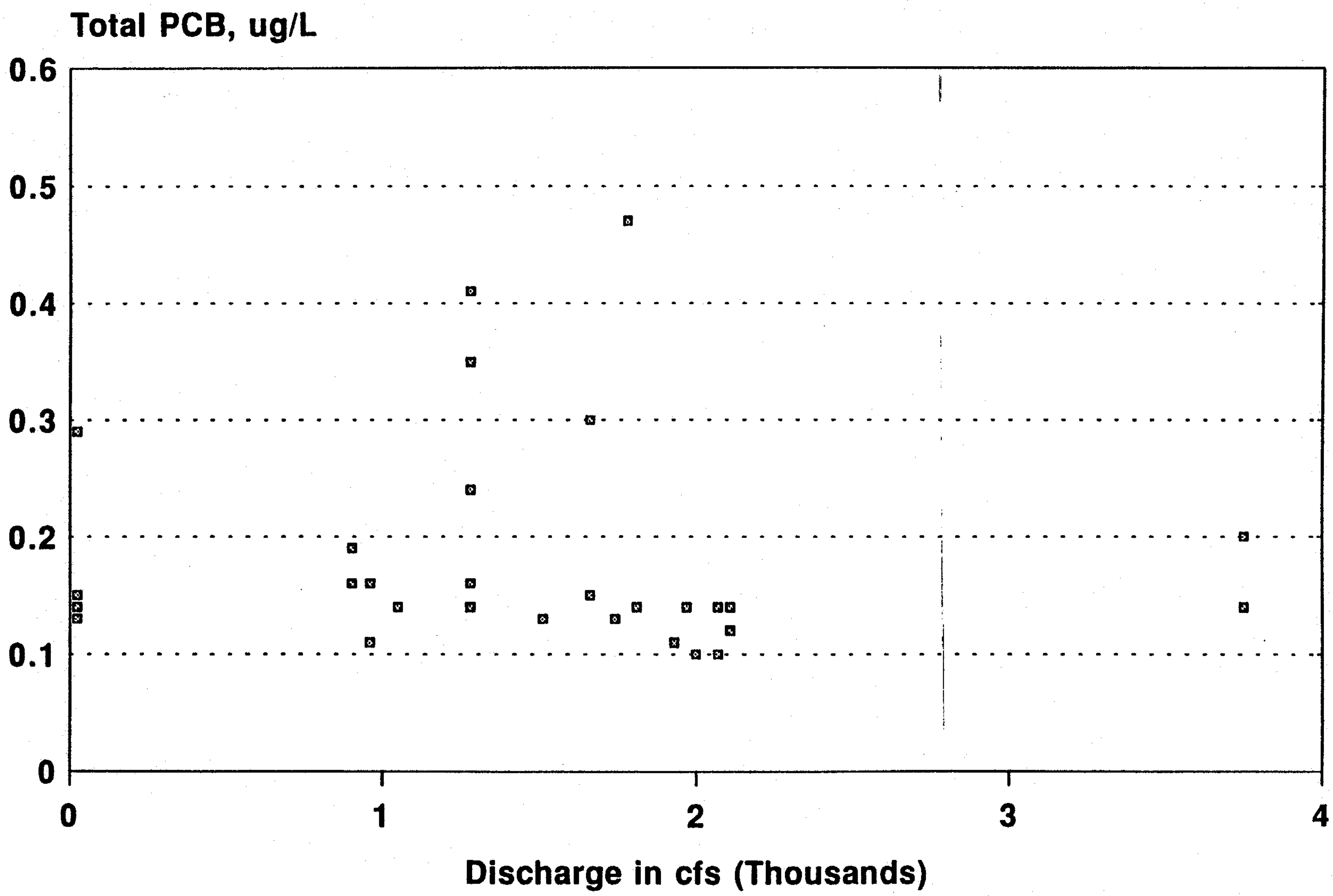

Discharge from Hudson River-Black River Regulating District
Total PCB from all stations

309906

309907

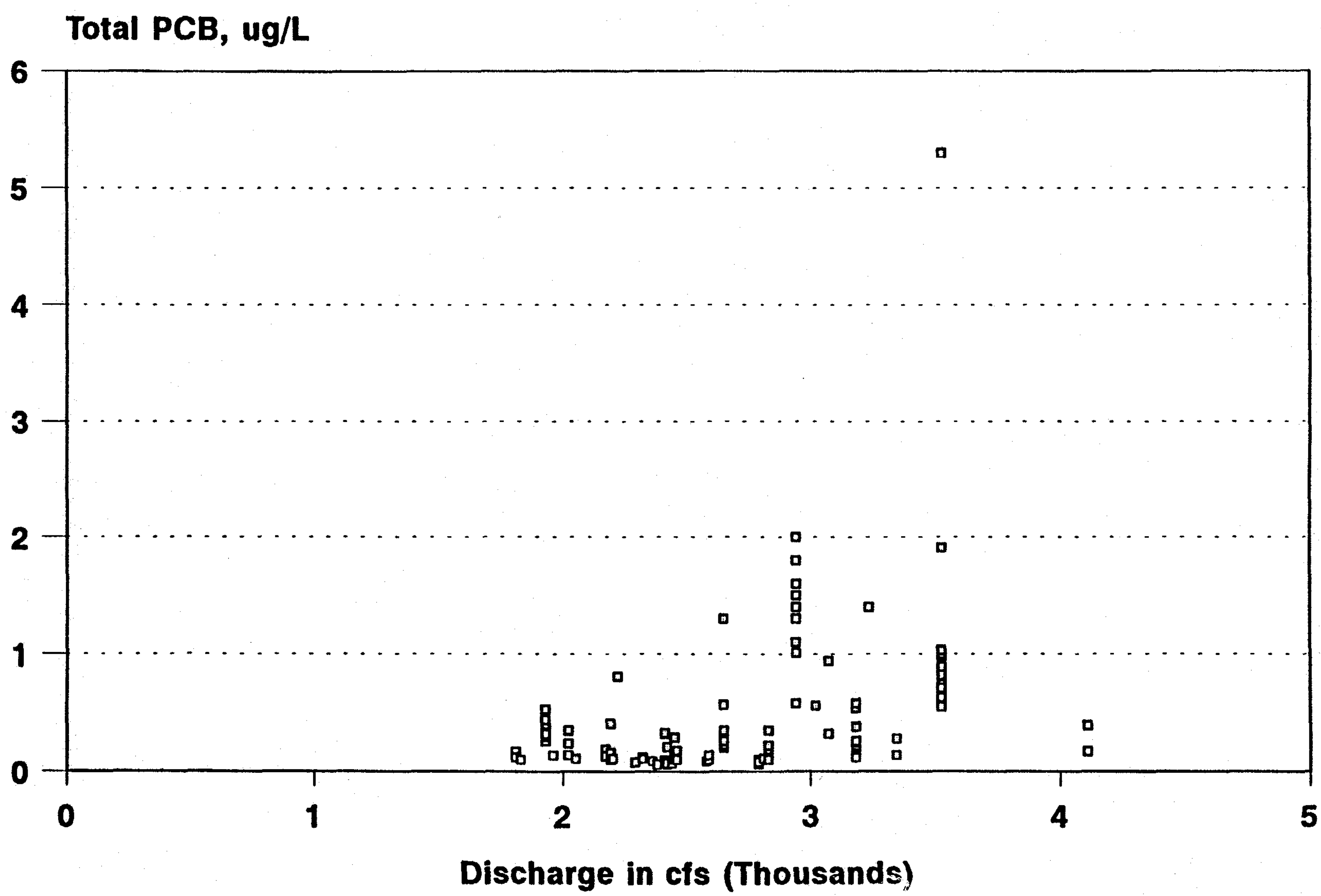
FIGURE 94

# PCB in Water and Discharge at Sacandaga Spring-Construction Monitoring




**Discharge from Hudson River-Black River Regulating District**
**Total PCB from all stations**

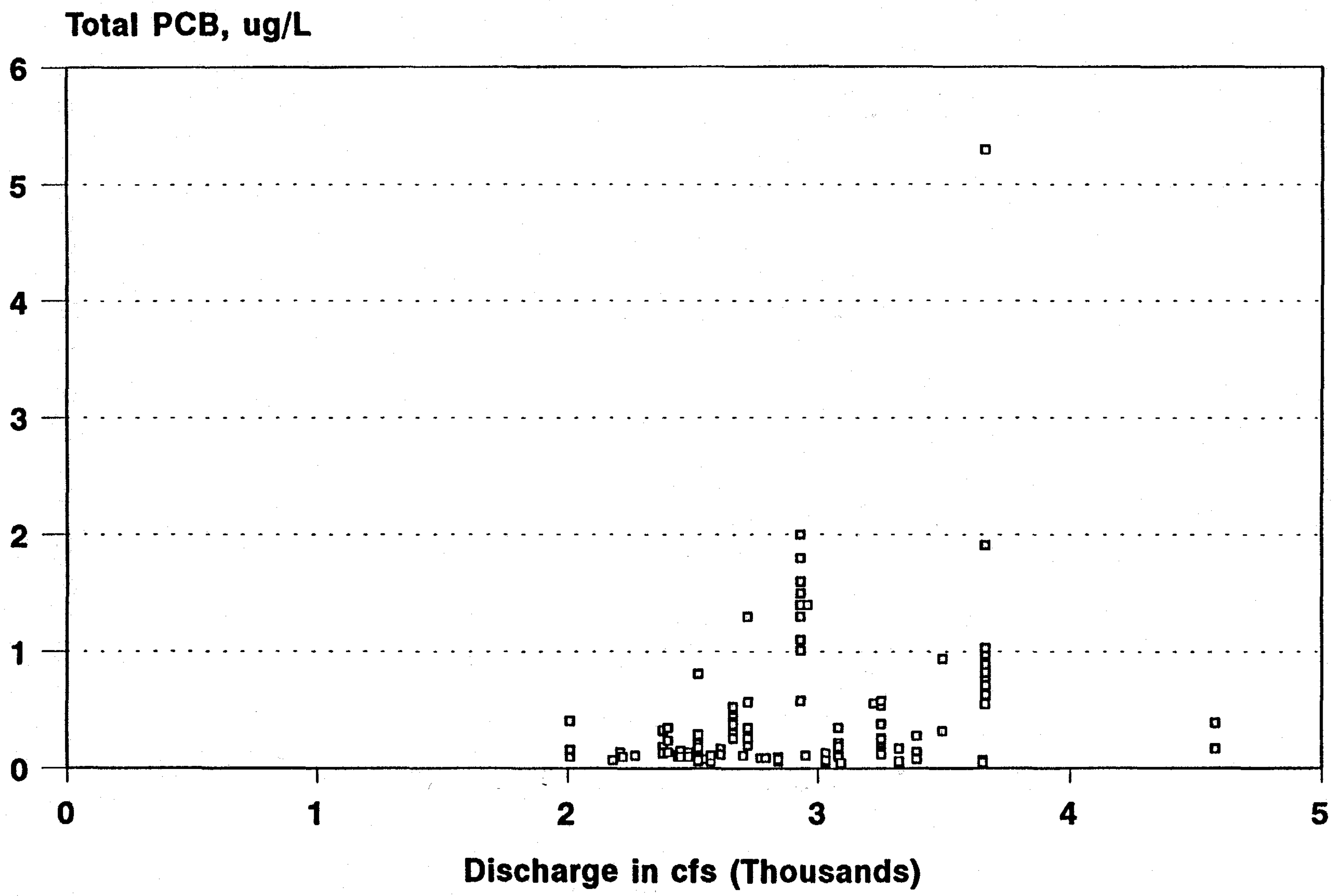
# PCB in Water and Dis‿harge at Ft. Edward
# Post-Containment Monitoring




**Discharge at USGS gage, Ft. Edward, NY**
**Total PCB from all stations**

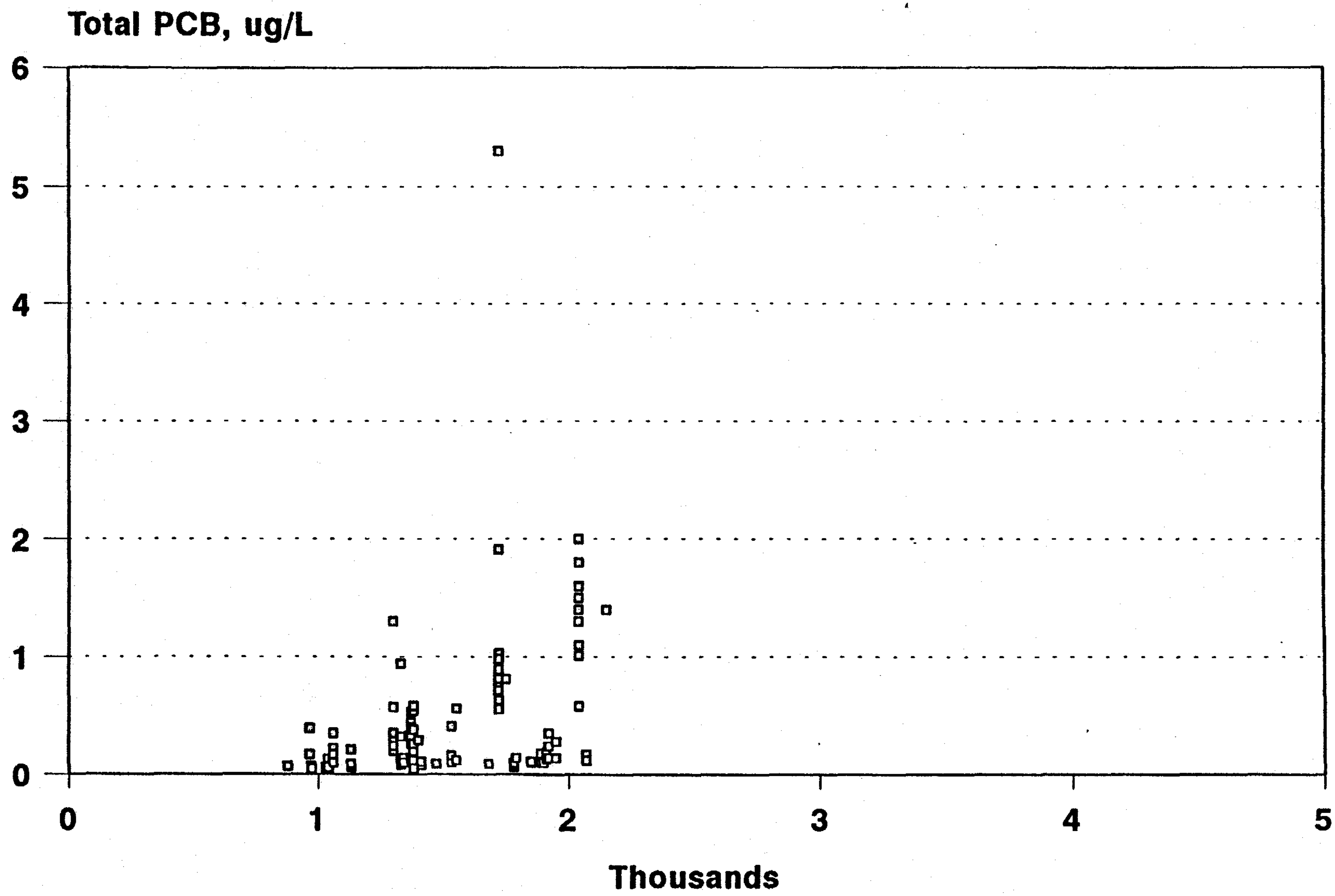
FIGURE 96

# PCB in Water and Discharge at Spier Falls Post-Containment Monitoring




Discharge from Hudson River-Black River Regulating District
Total PCB from all stations

# PCB in Water and Discharge at Sacandaga Post-Containment Monitoring



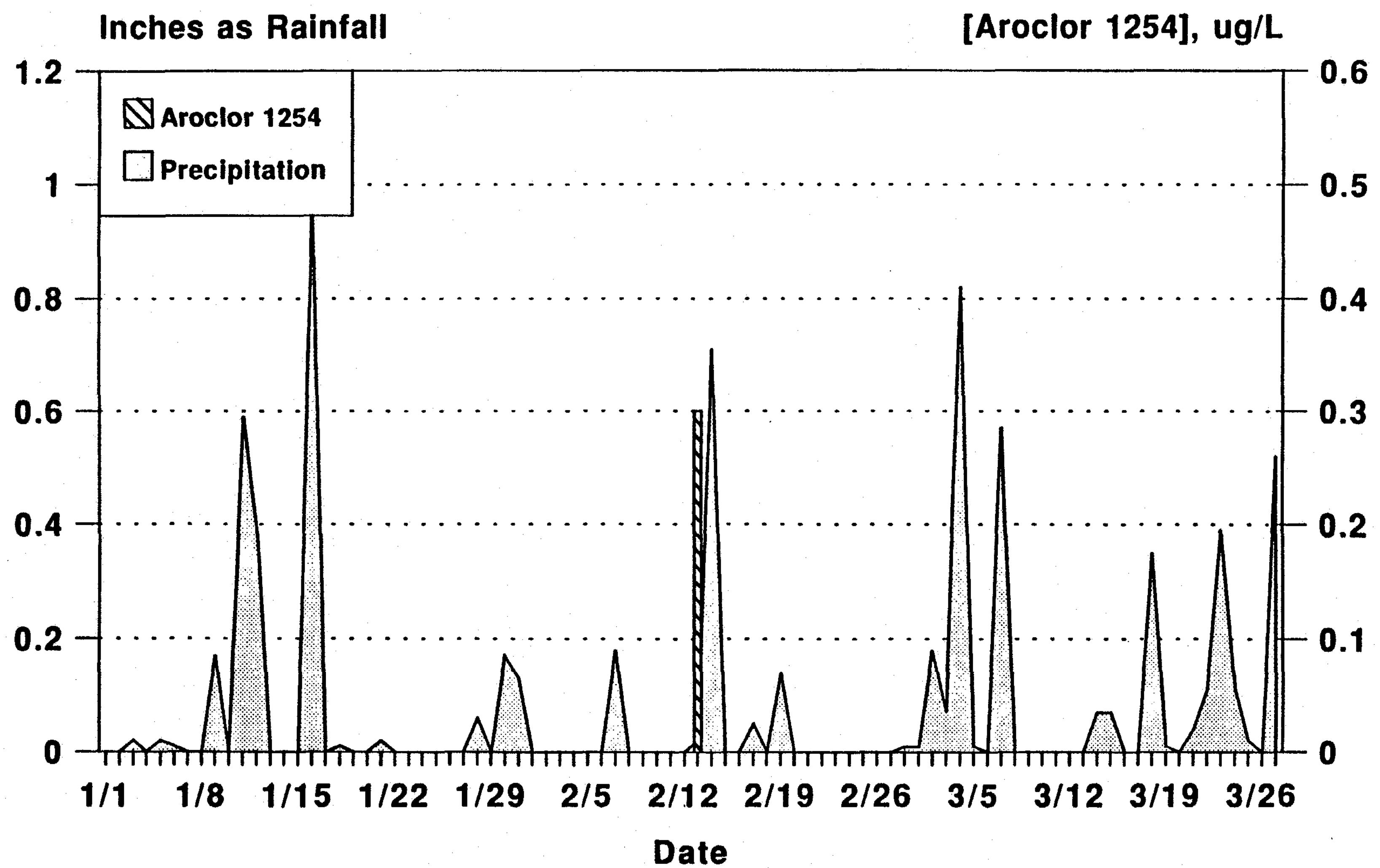

Discharge from Hudson River-Black River Regulating District
Total PCB from all stations

309910

309911

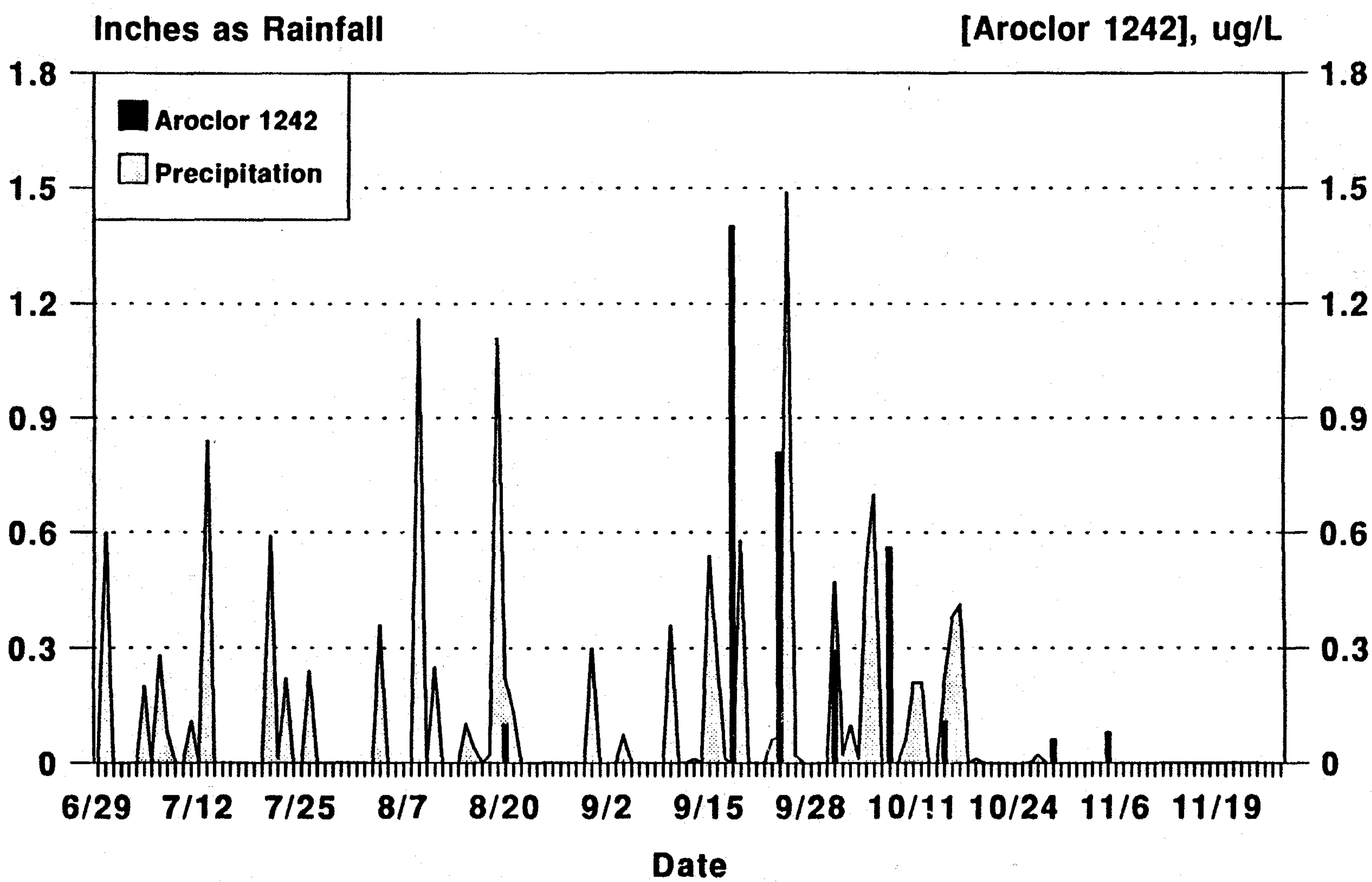
FIGURE 98

# Trends in Aroclor 1254 and Precipitation
# January 1 to March 27, 1991
# Station GF4




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation June 29 to November 27, 1991 Station C2



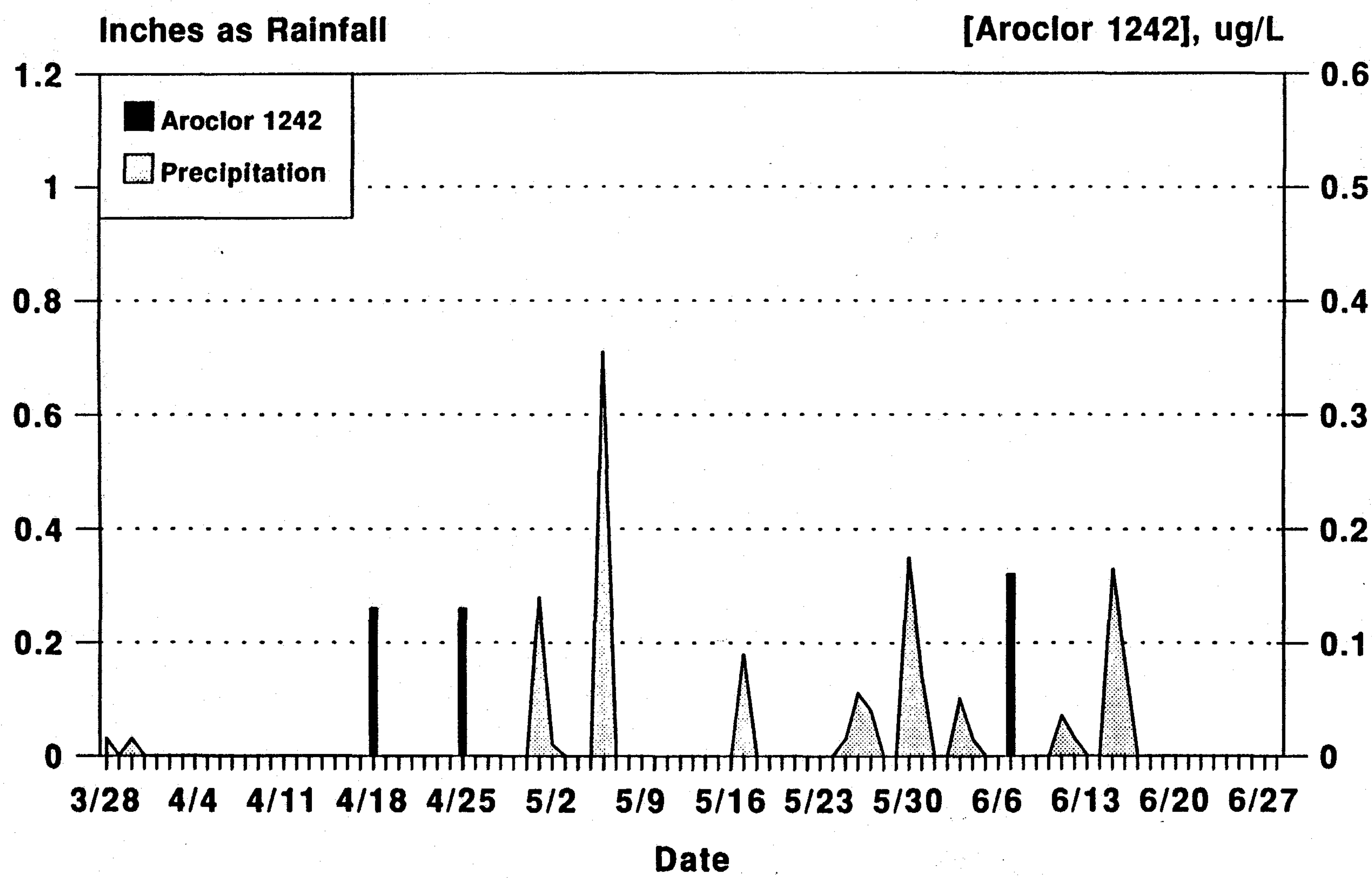

Precipitation at Glens Falls, NY

309912

309913

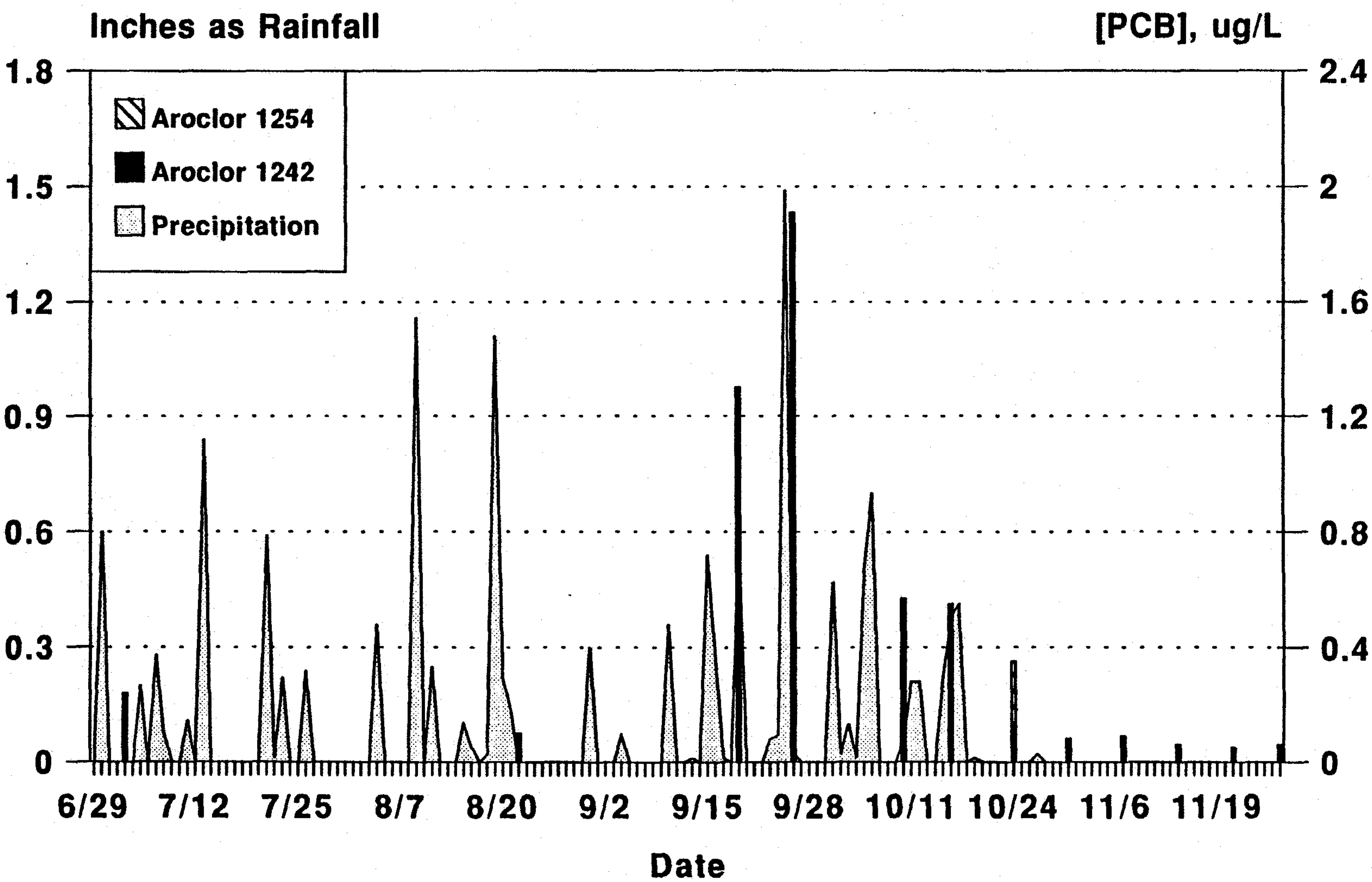
FIGURE 100

# Trends in Aroclor 1242 and Precipitation
# March 28 to June 28, 1991
# Station E0




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242, 1254, and Precipitation
# June 29 to November 27, 1991
# Station E0



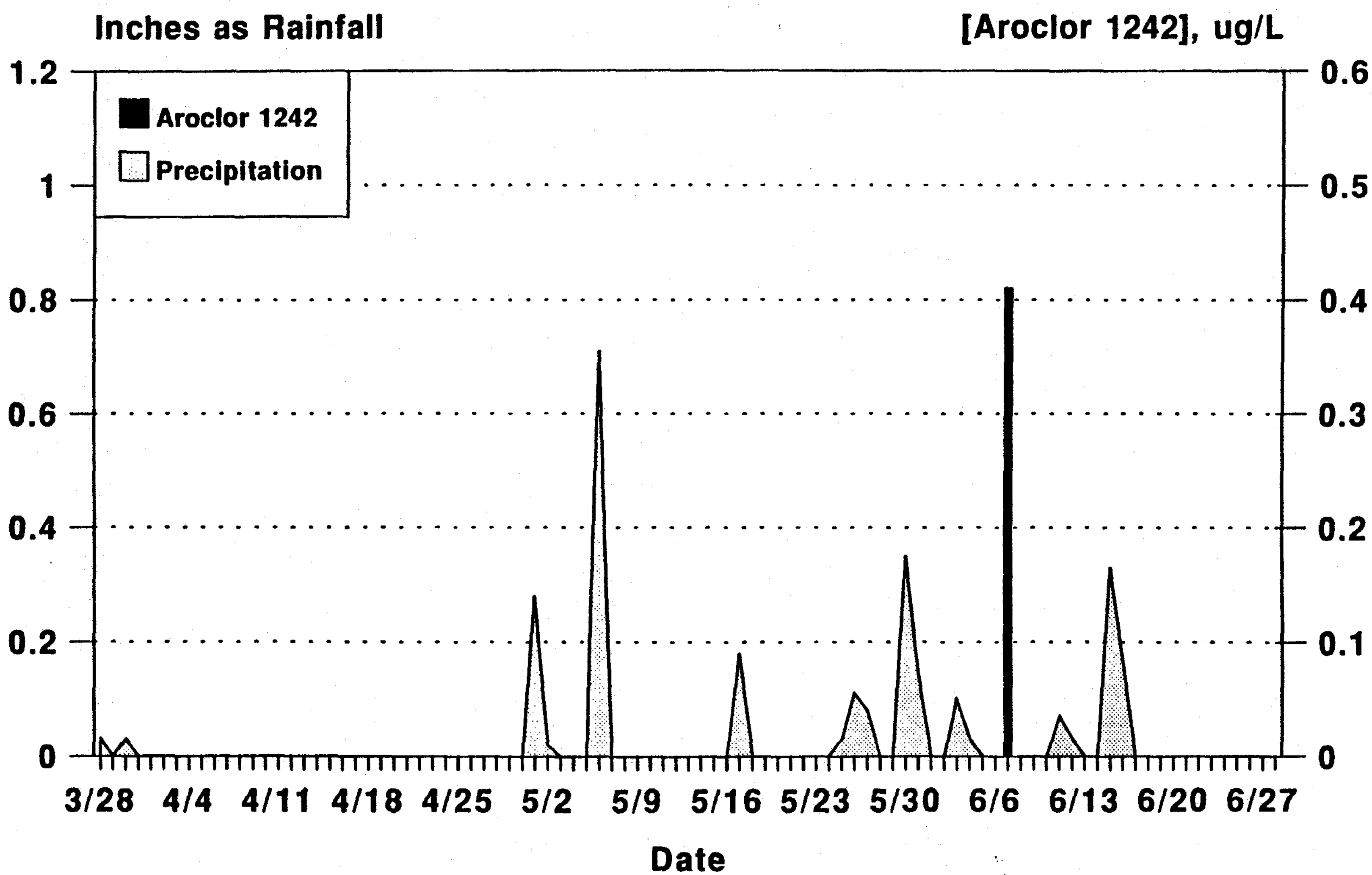

Precipitation at Glens Falls, NY

309914

309915

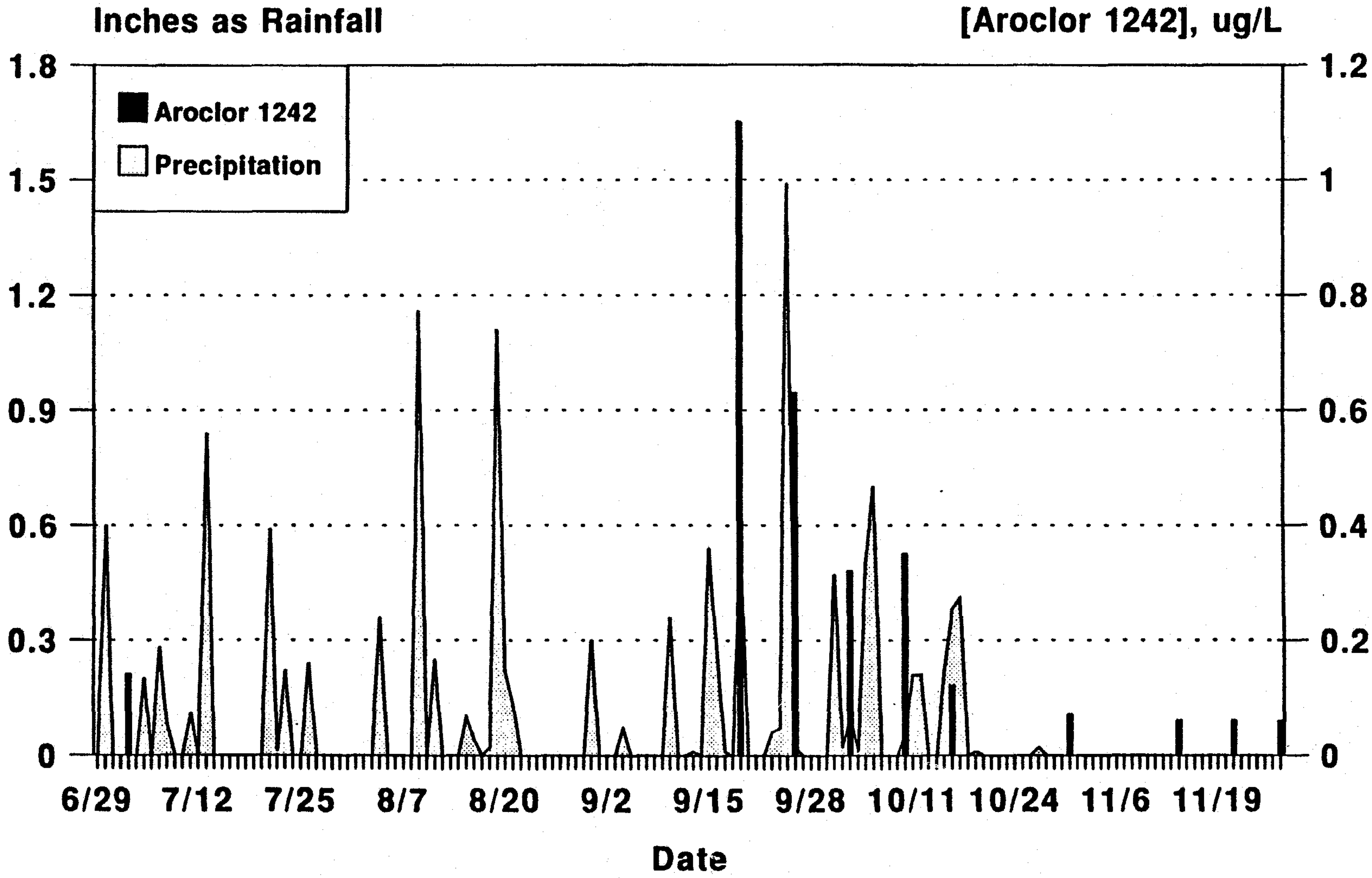
FIGURE 102

# Trends in Aroclor 1242 and Precipitation
# March 28 to June 28, 1991
# Station E1




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# June 29 to November 27, 1991
# Station E1

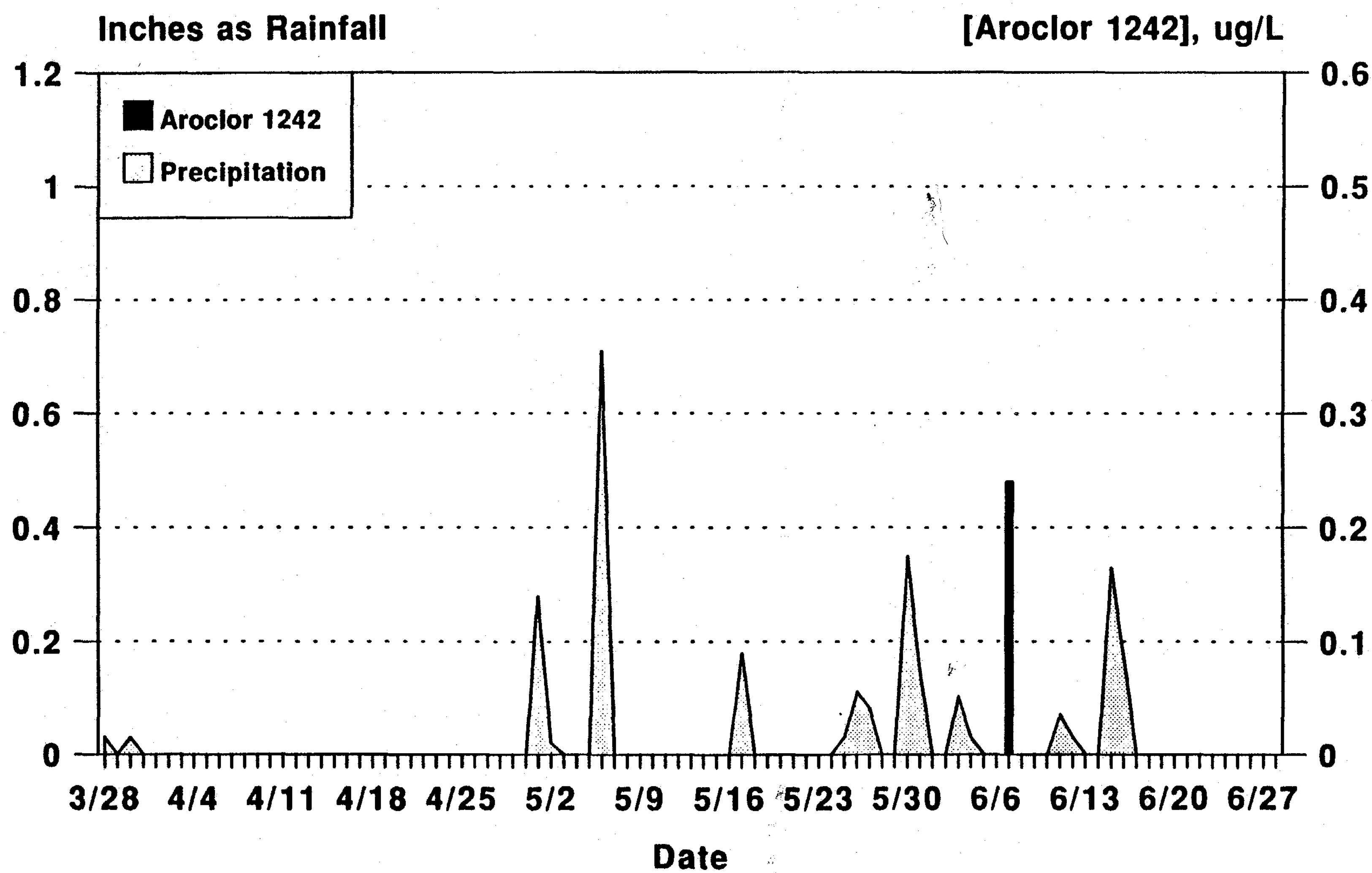



Precipitation at Glens Falls, NY

309917

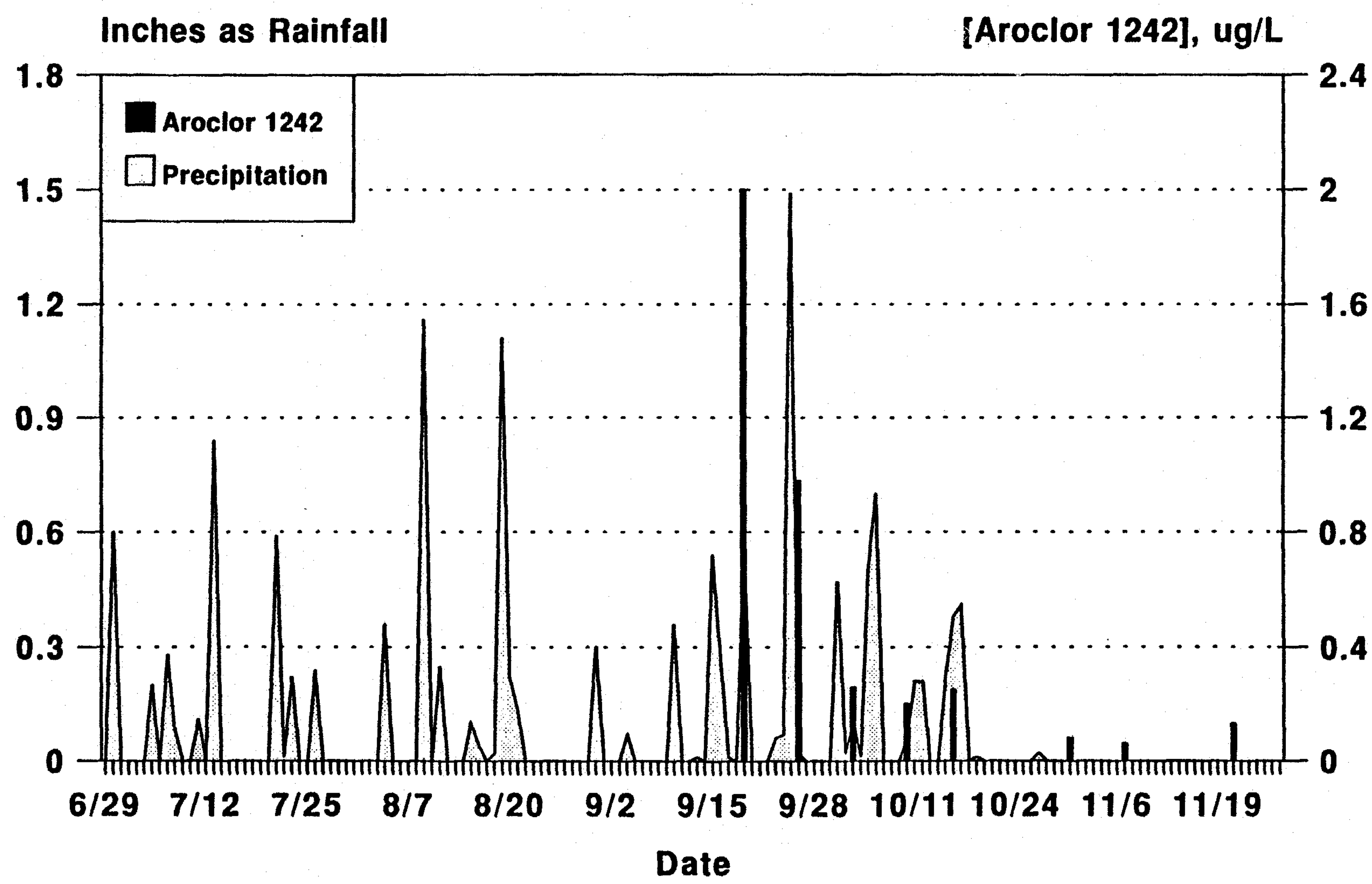
FIGURE 104

# Trends in Aroclor 1242 and Precipitation March 28 to June 28, 1991 Station E2




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation June 29 to November 27, 1991 Station E2

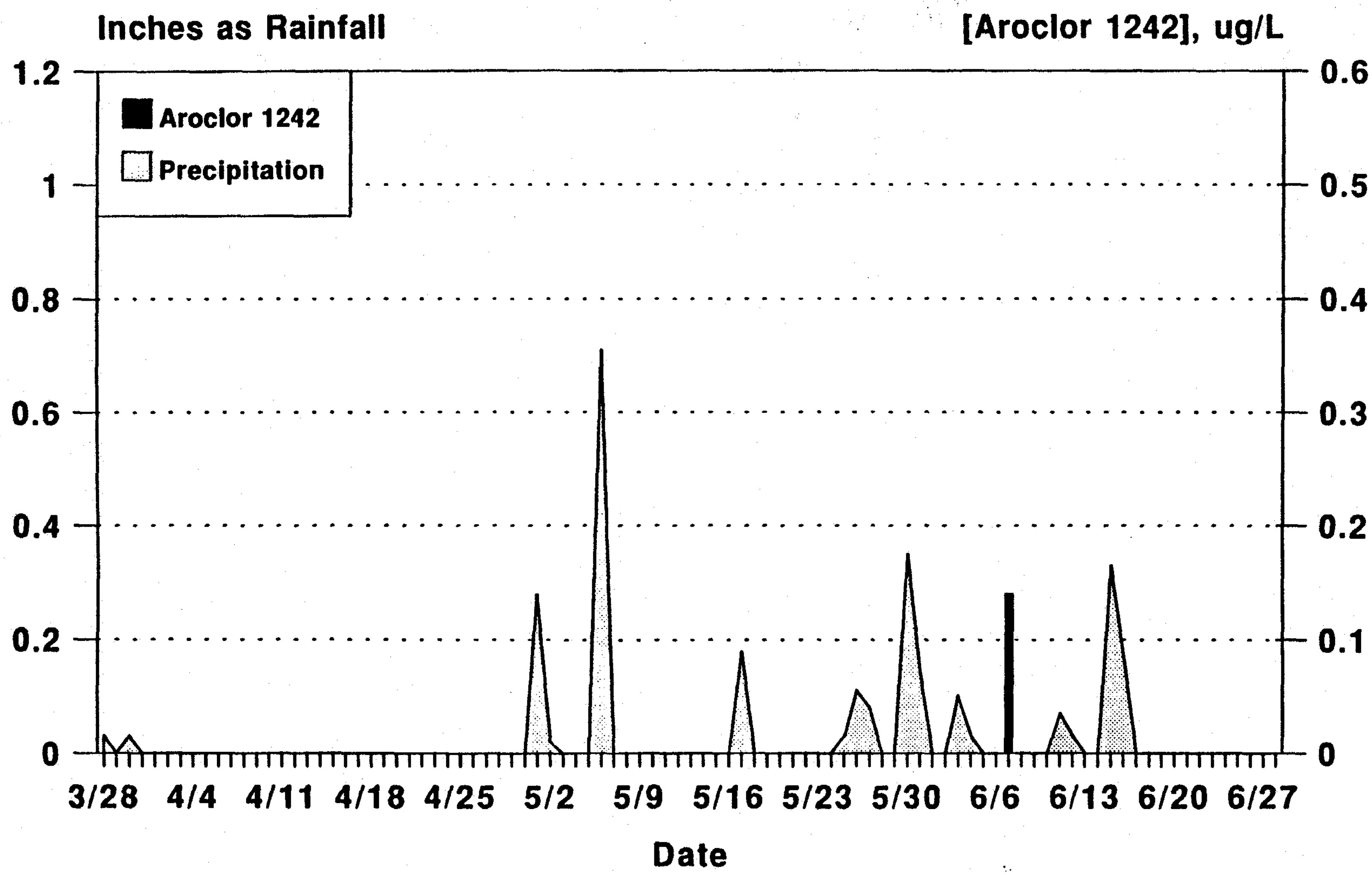



Precipitation at Glens Falls, NY

309918

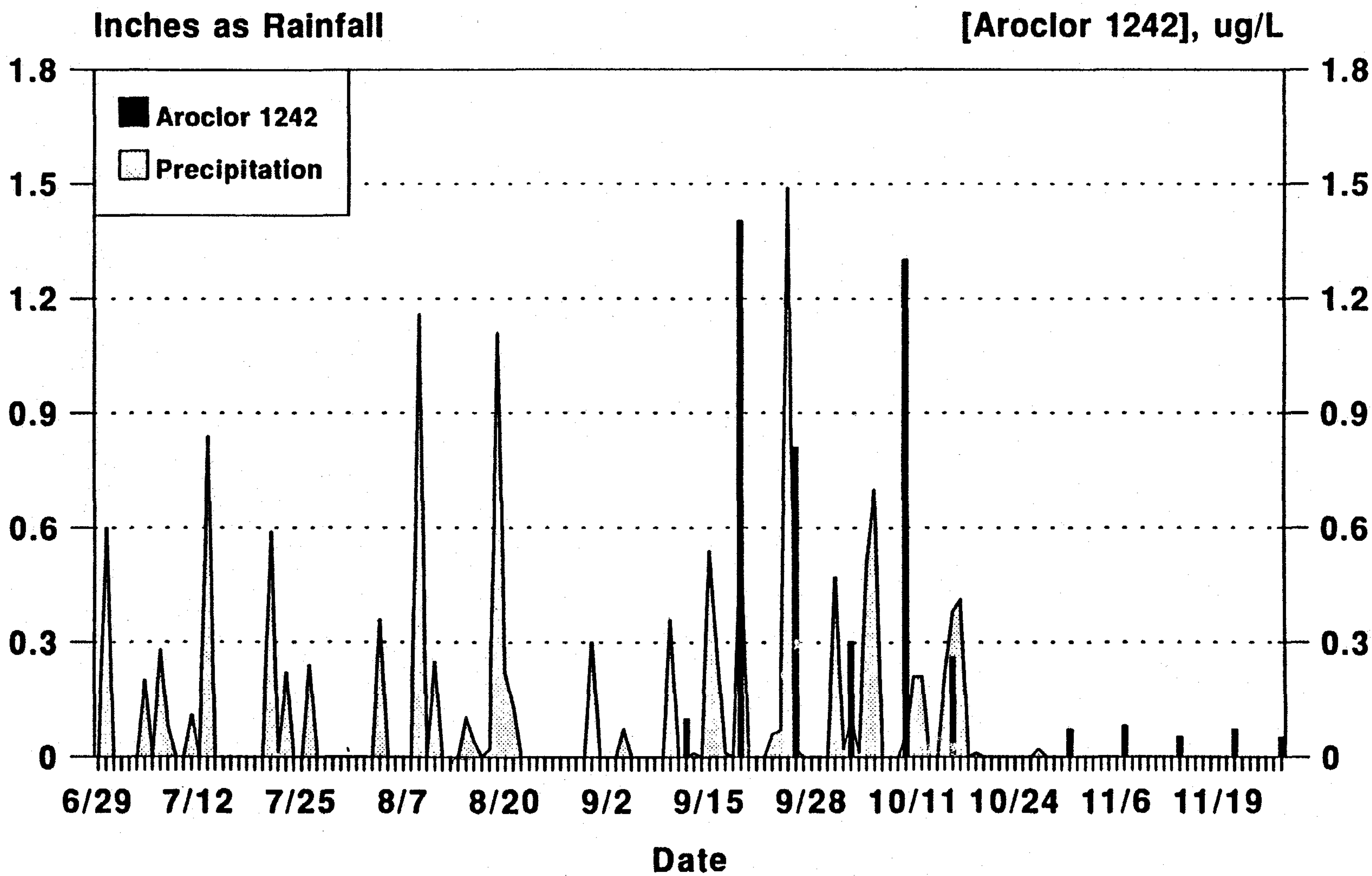
309919

# Trends in Aroclor 1242 and Precipitation
# March 28 to June 28, 1991
# Station E3




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# June 29 to November 27, 1991
# Station E3



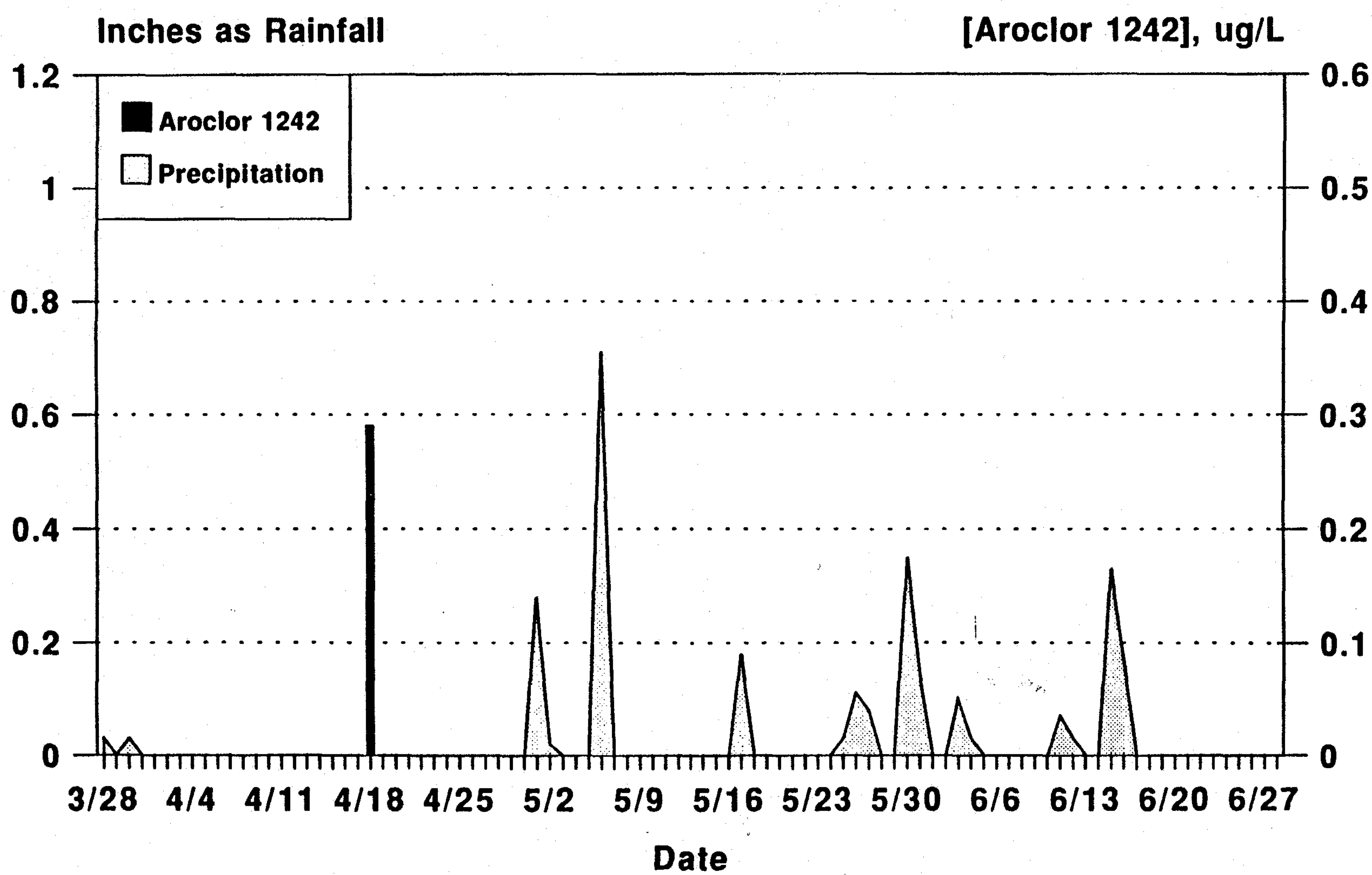

Precipitation at Glens Falls, NY

309920

309921

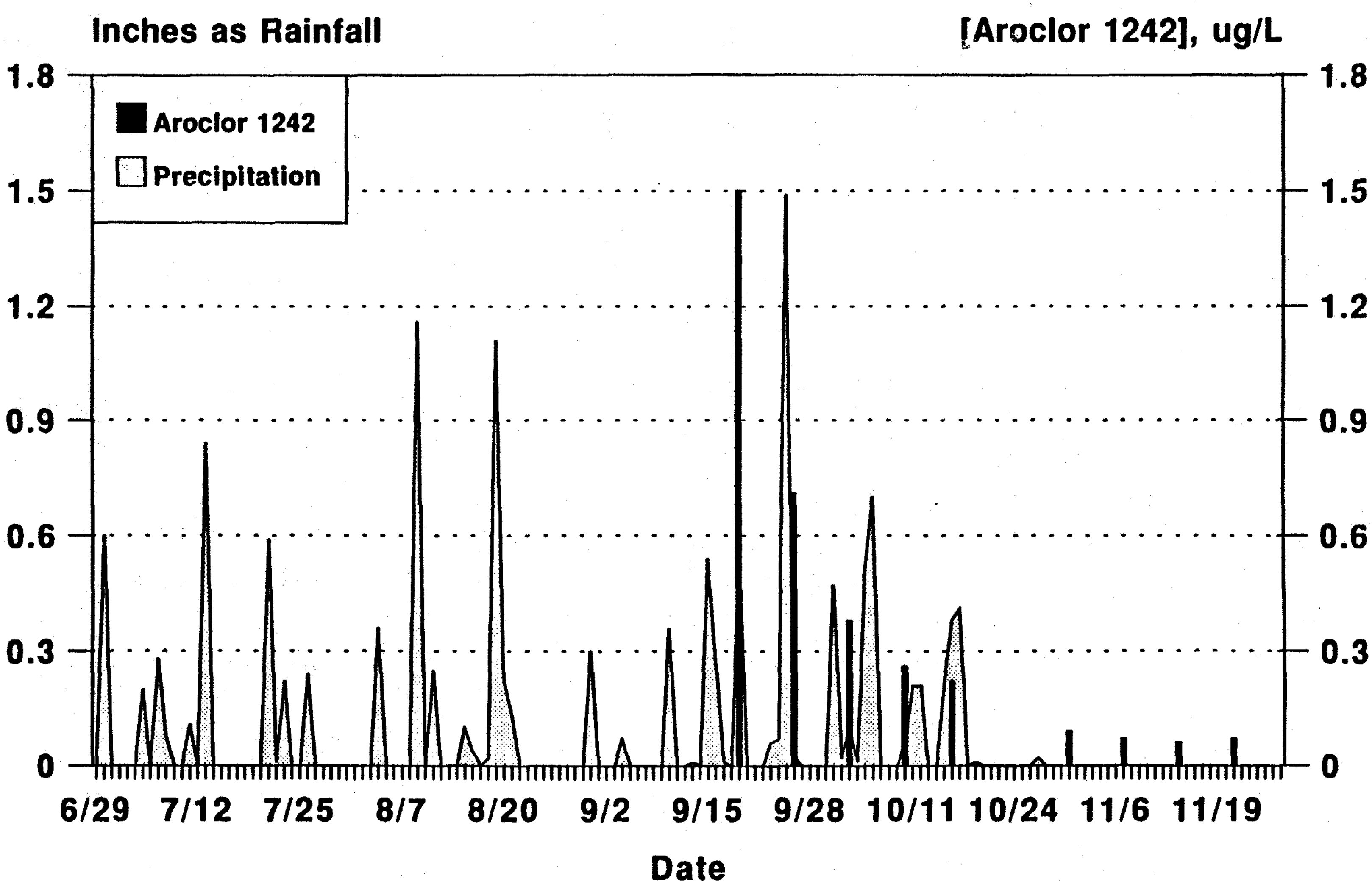
FIGURE 108

# Trends in Aroclor 1242 and Precipitation March 28 to June 28, 1991 Station E4




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation June 29 to November 27, 1991 Station E4



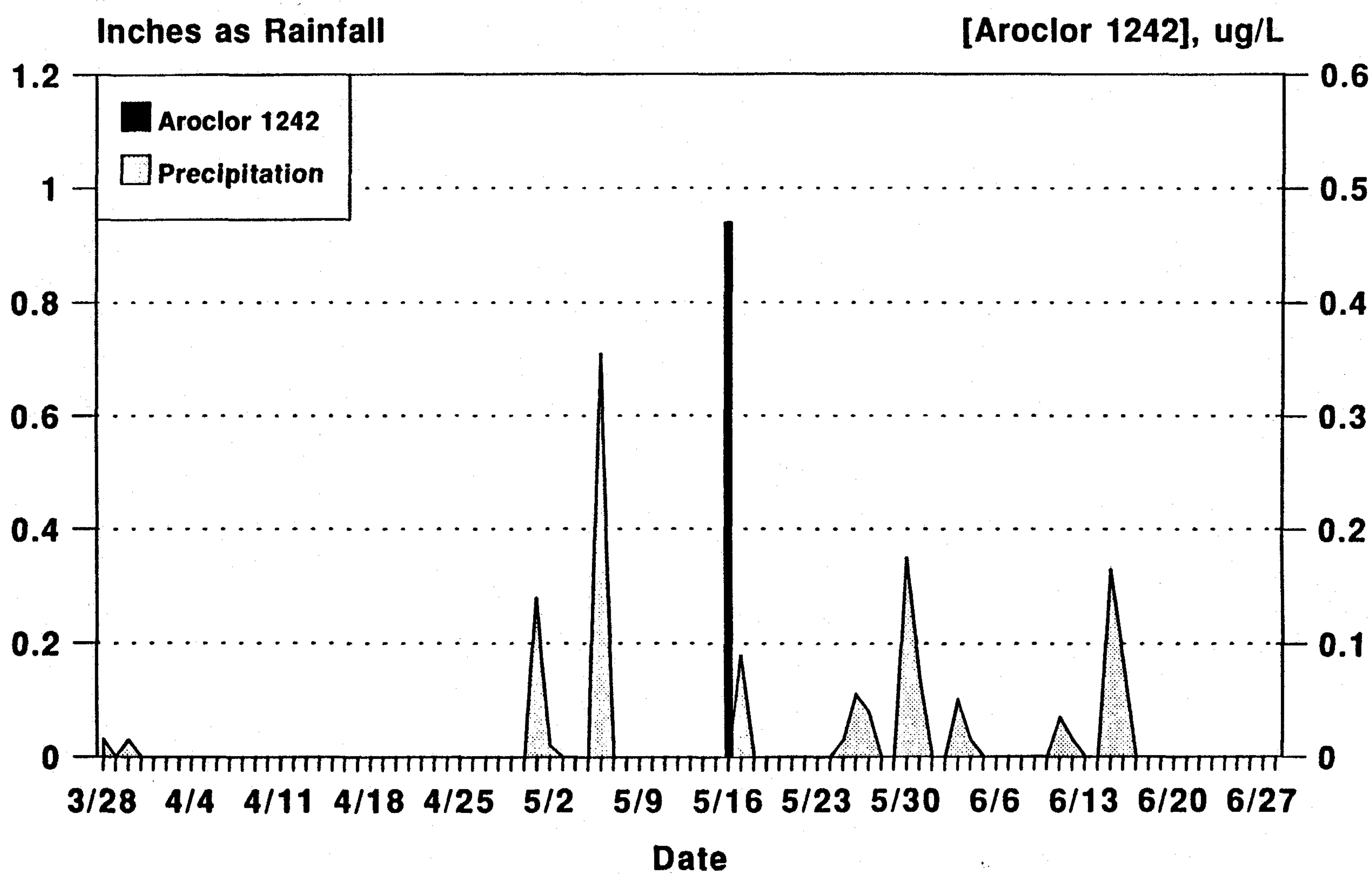

Precipitation at Glens Falls, NY

309922

309923

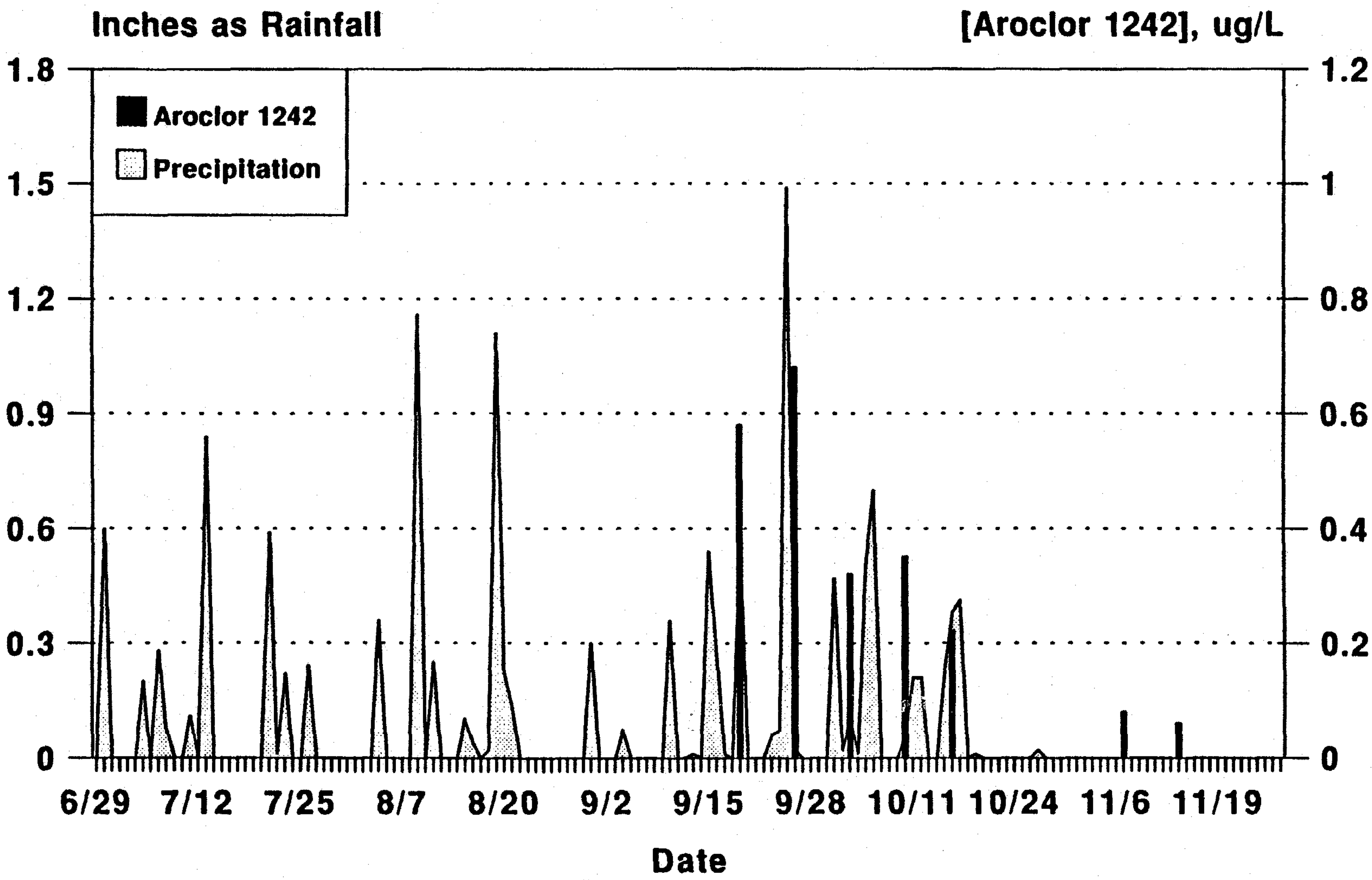
FIGURE 110

# Trends in Aroclor 1242 and Precipitation March 28 to June 28, 1991 Station E5




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# June 29 to November 27, 1991
# Station E5

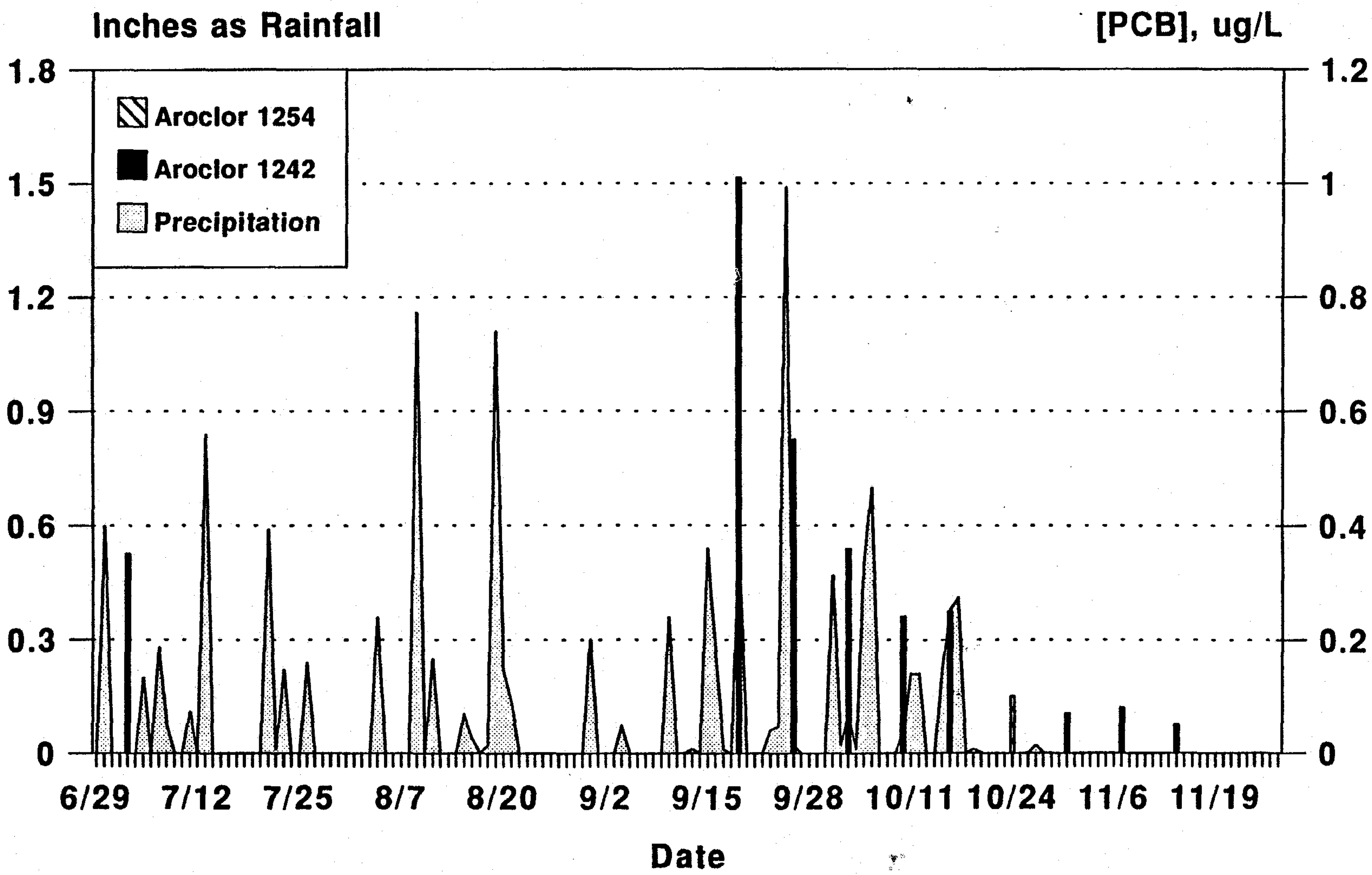



Precipitation at Glens Falls, NY

309925

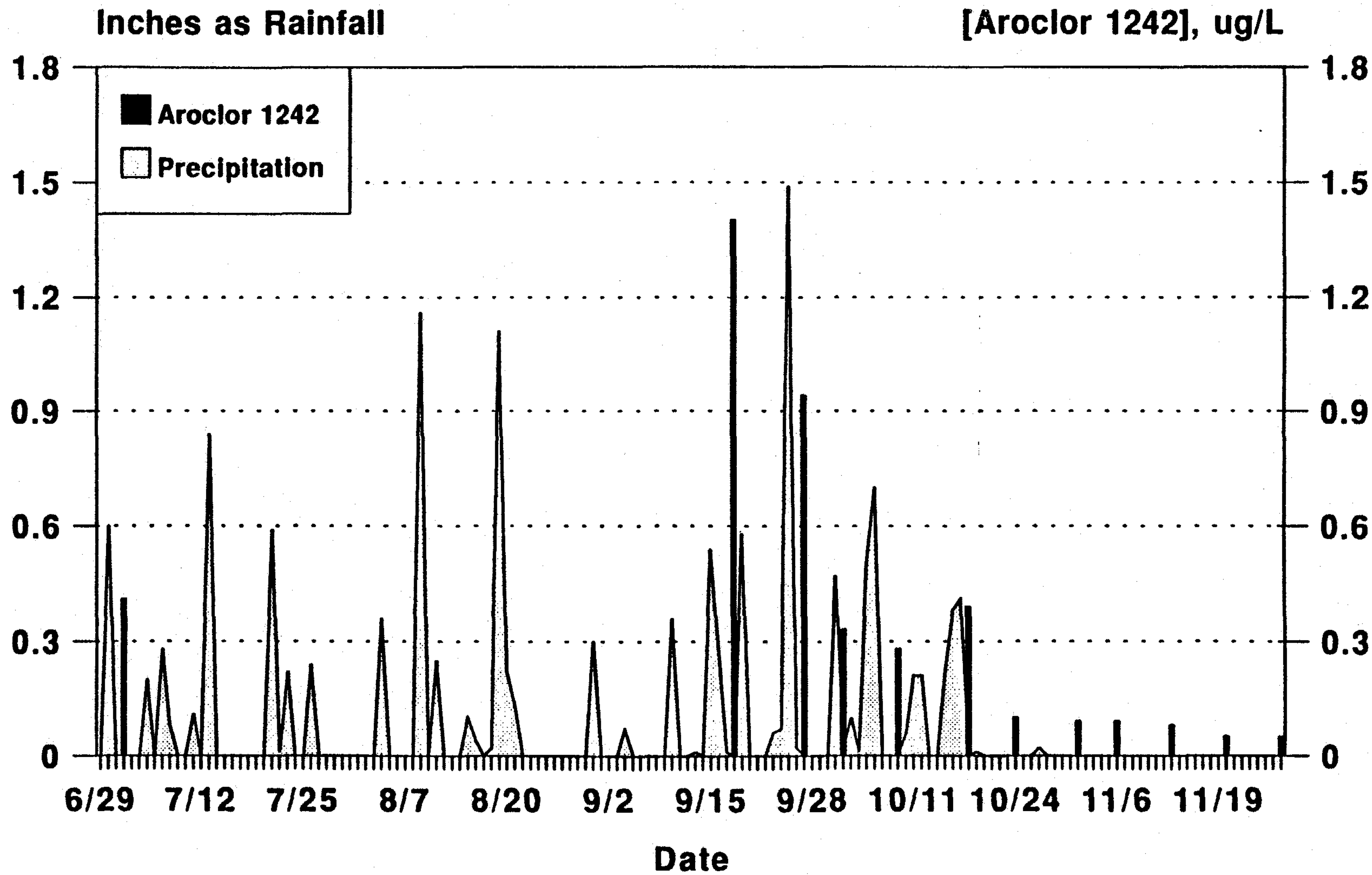
FIGURE 112

# Trends in Aroclor 1242, 1254, and Precipitation
# June 29 to November 27, 1991
# Station E5A




Precipit...n at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# June 29 to November 27, 1991
# Station E6



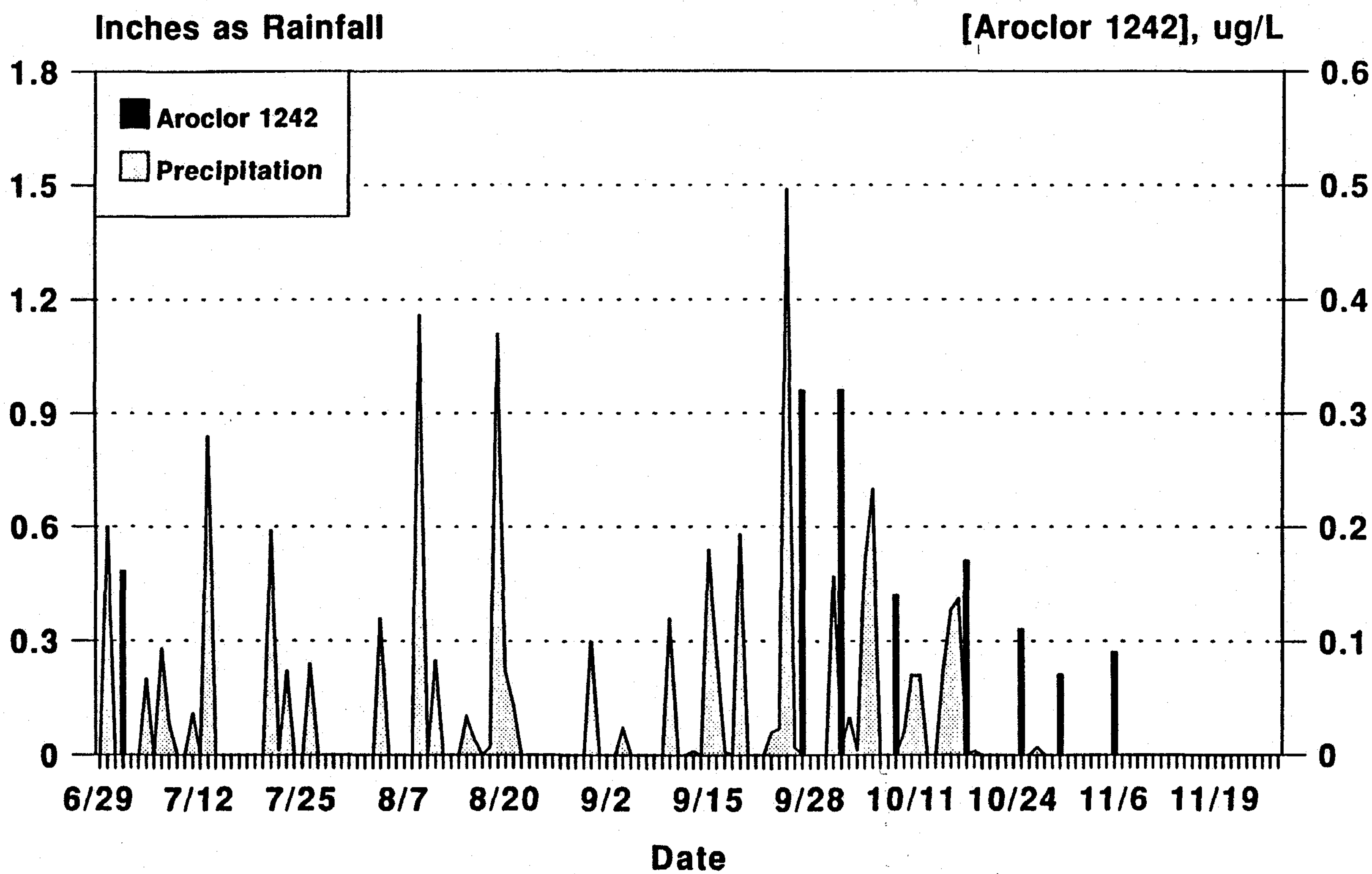

Precipitation at Glens Falls, NY

309926

309927

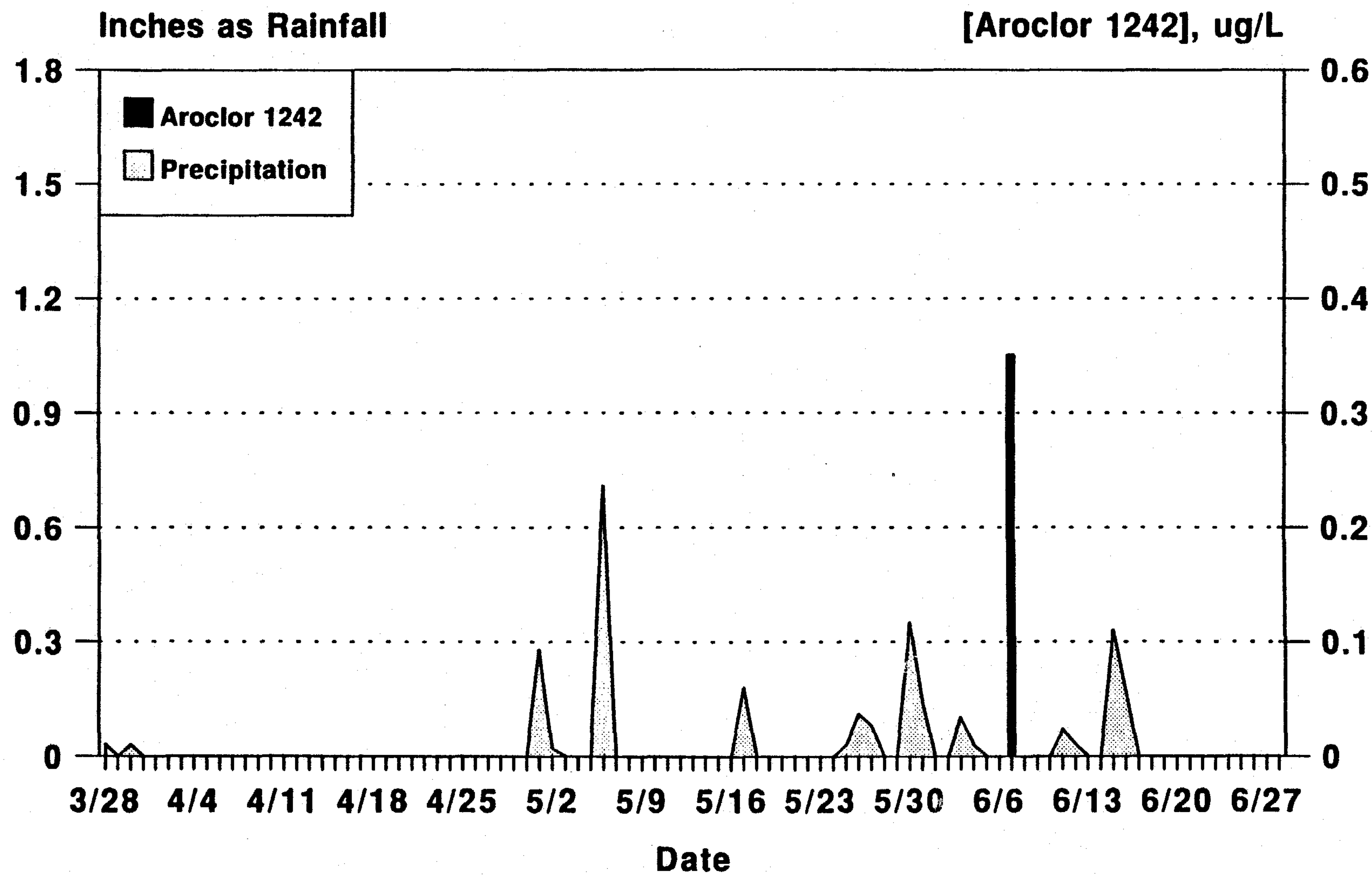
FIGURE 114

# Trends in Aroclor 1242 and Precipitation June 29 to November 27, 1991 Station E7




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# March 28 to June 28, 1991
# Station RS2W1

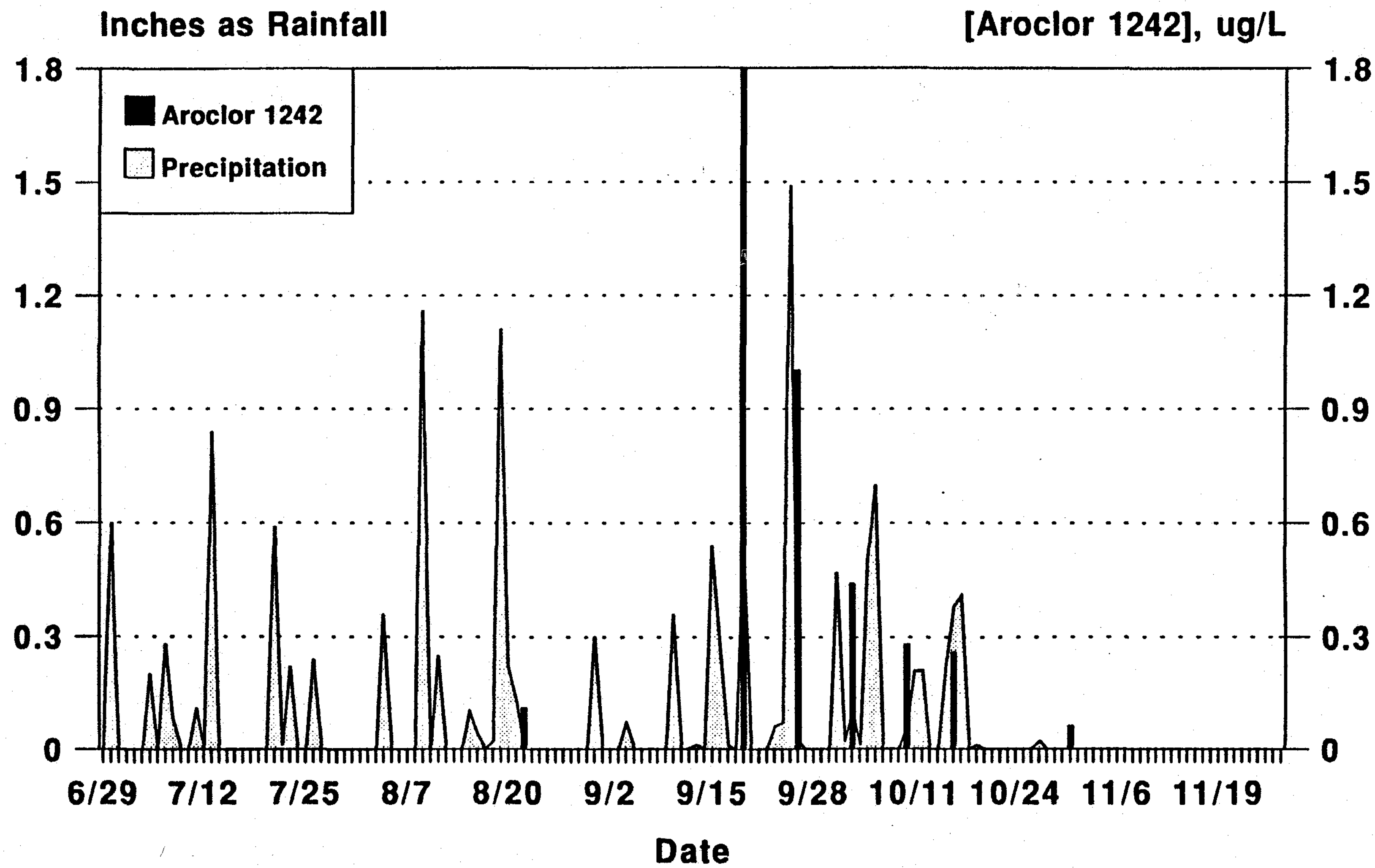



Precipitation at Glens Falls, NY

309928

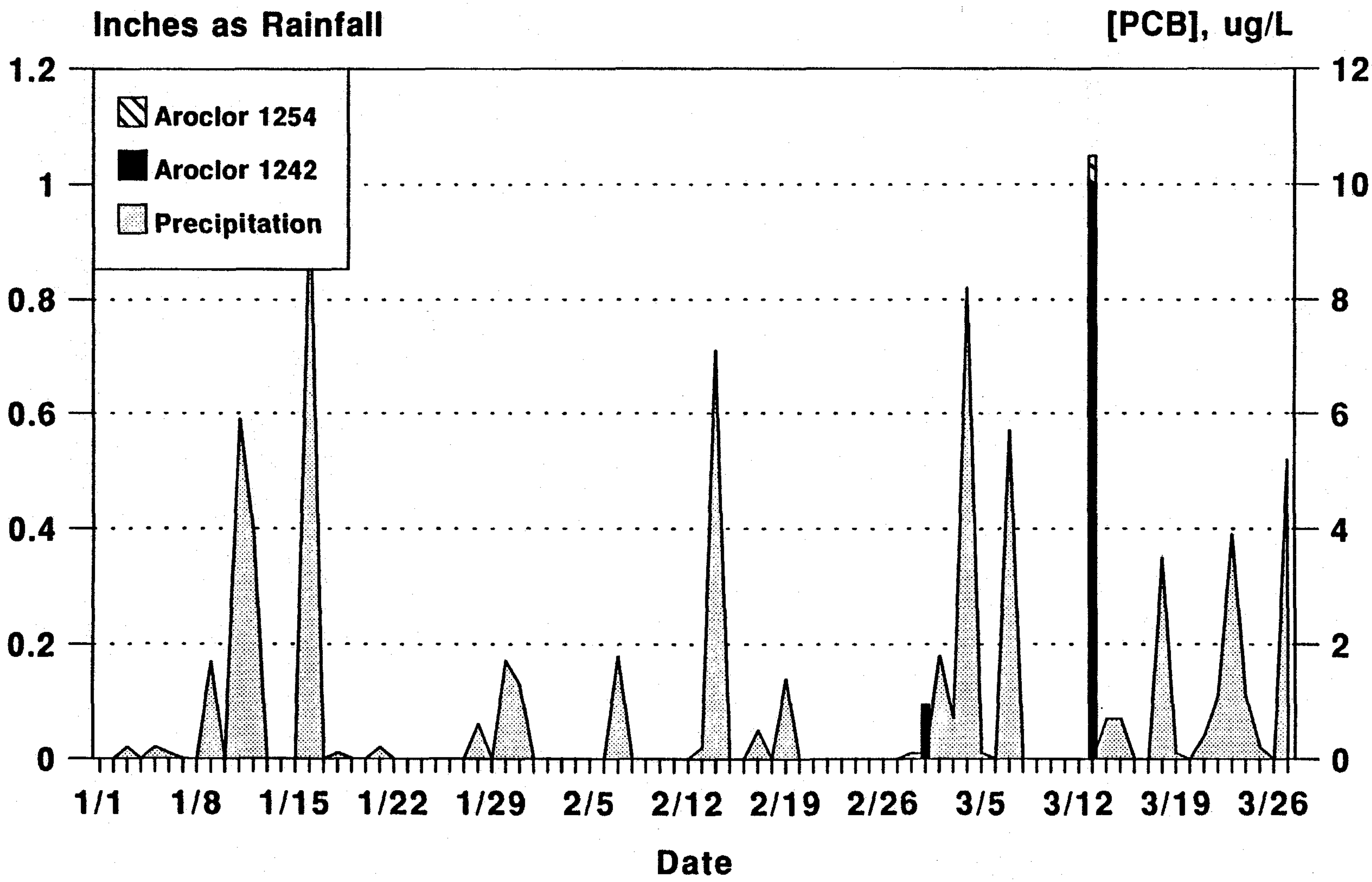
309929

# Trends in Aroclor 1242 and Precipitation June 29 to November 27, 1991 Station RS2W1




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242, 1254, and Precipitation
# January 1 to March 27, 1991
# Station RS3W1



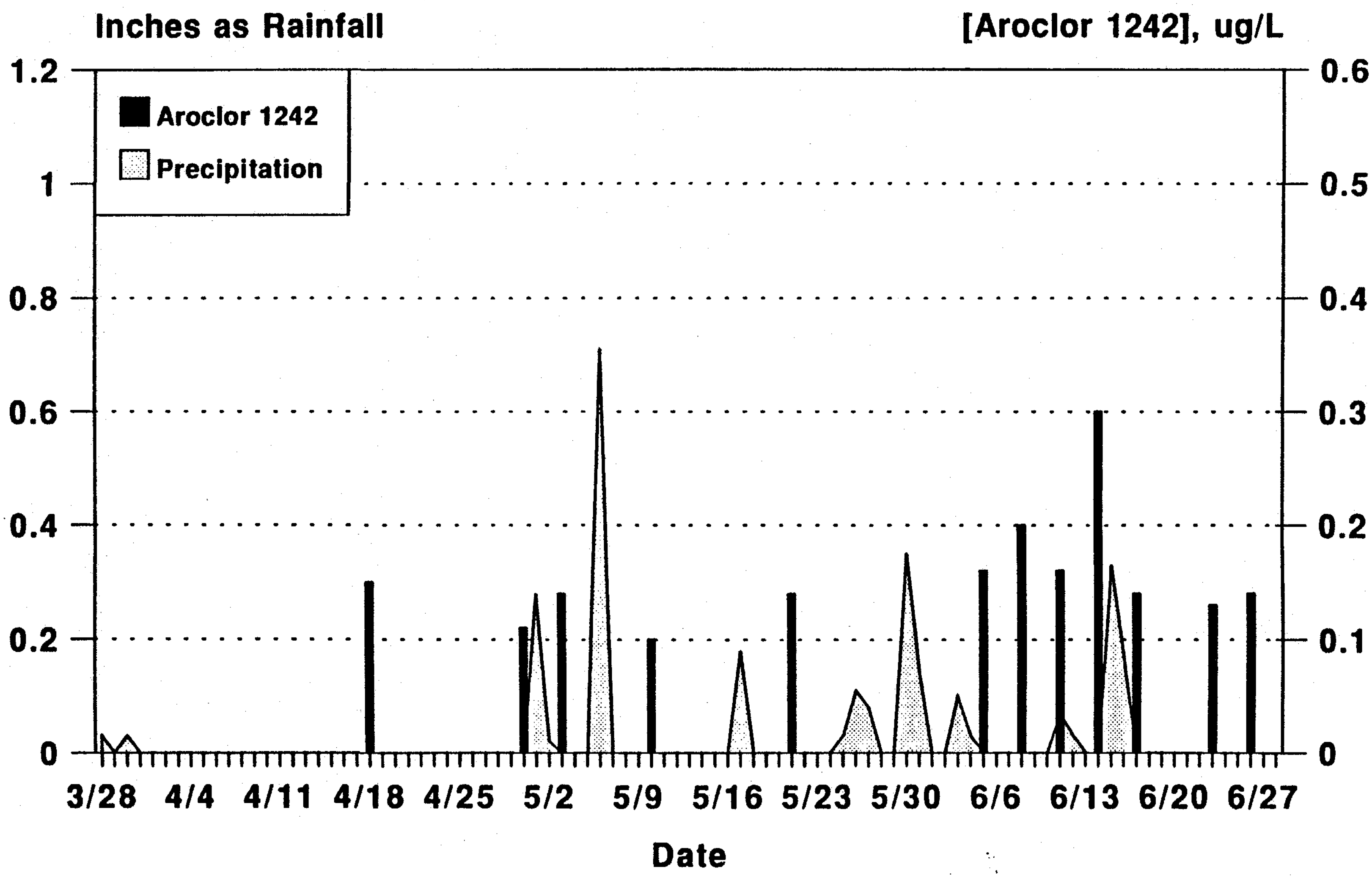

Precipitation at Glens Falls, NY

309930

309931

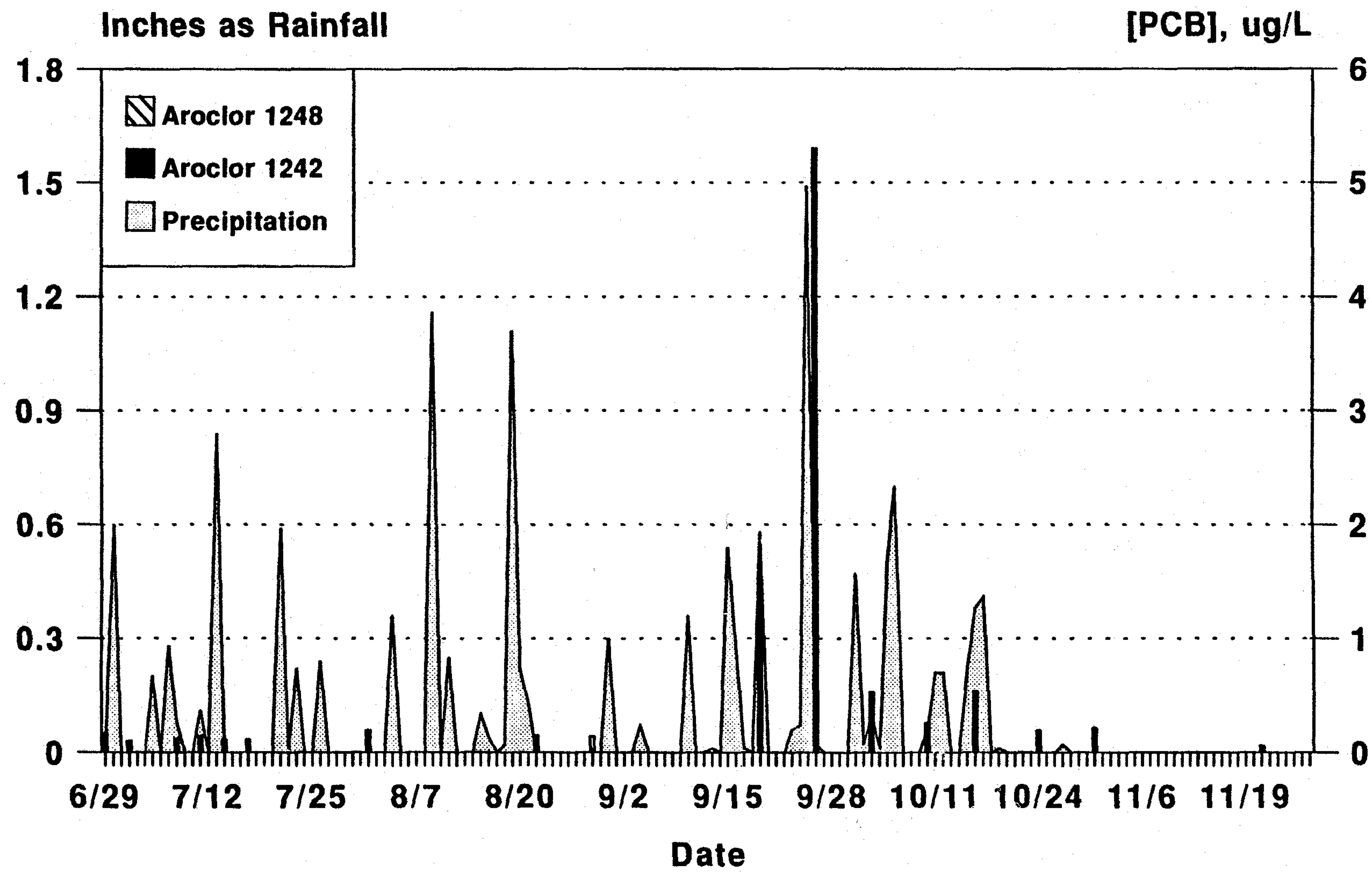
FIGURE 118

# Trends in Aroclor 1242 and Precipitation
# March 28 to June 28, 1991
# Station RS3W1




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242, 1248, and Precipitation
# June 29 to November 27, 1991
# Station RS3W1



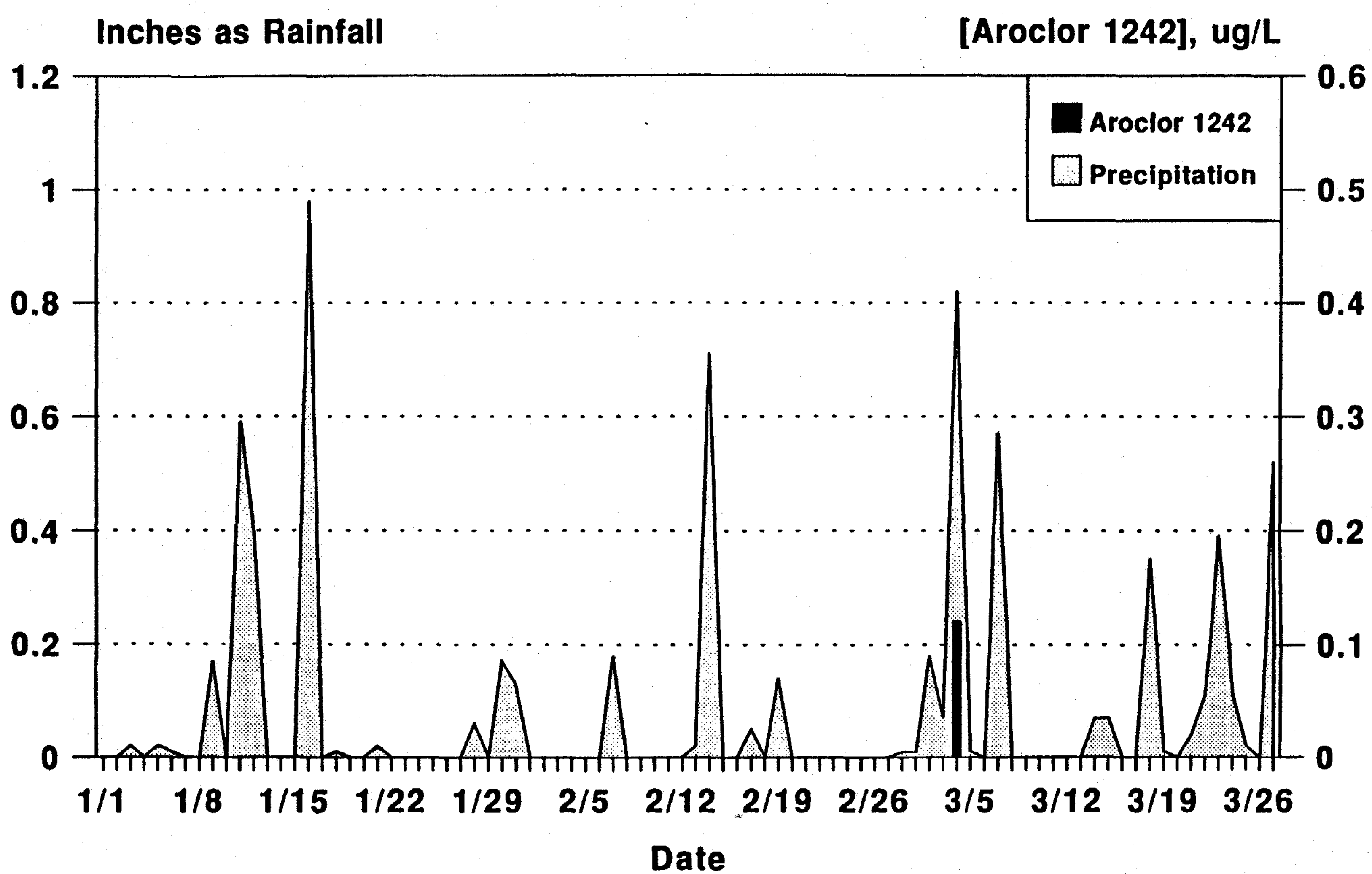

Precipitation at Glens Falls, NY

309932

FIGURE 120

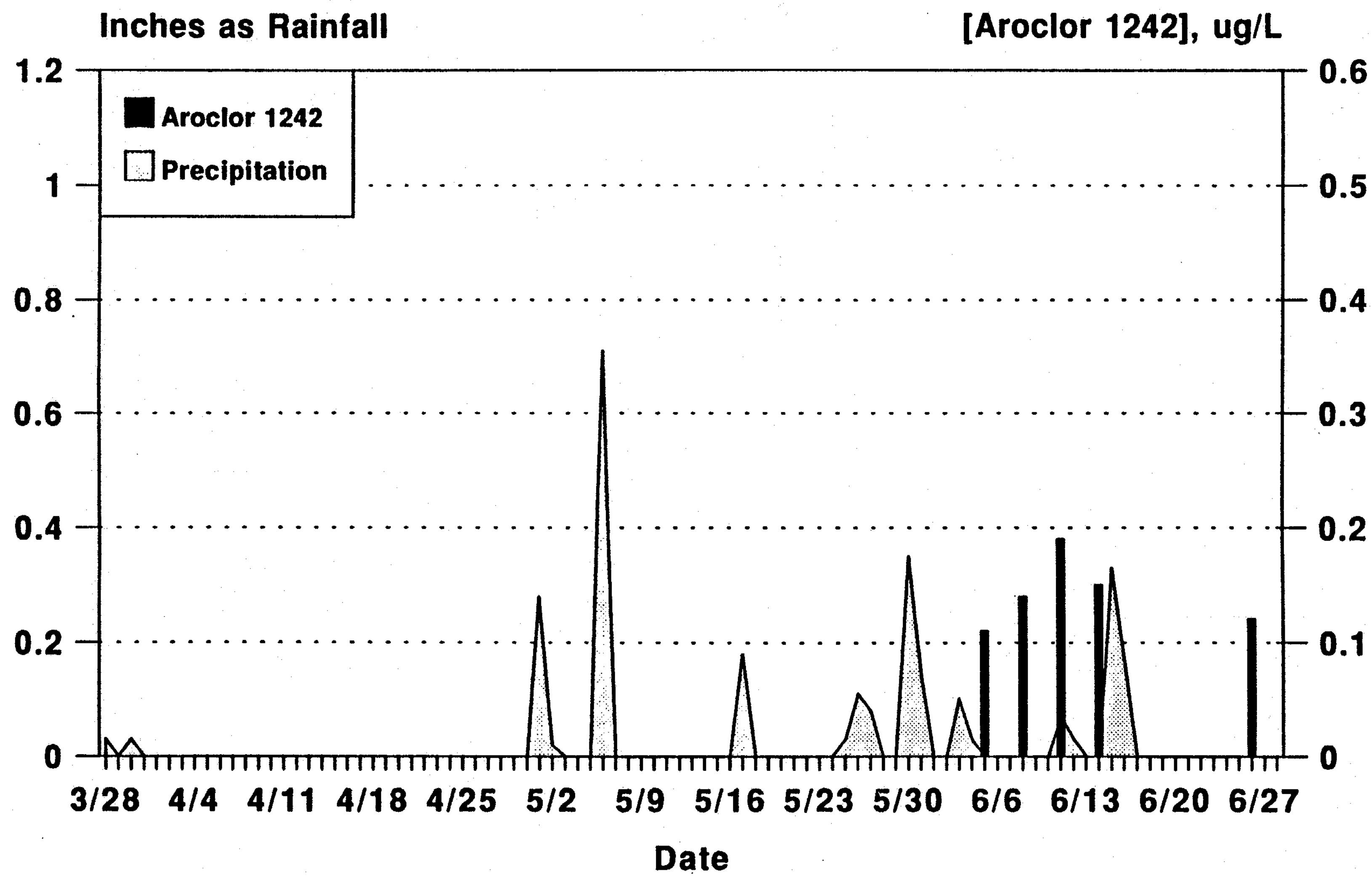
309933

# Trends in Aroclor 1242 and Precipitation
# January 1 to March 27, 1991
# Station RS3W2




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation March 28 to June 28, 1991 Station RS3W2



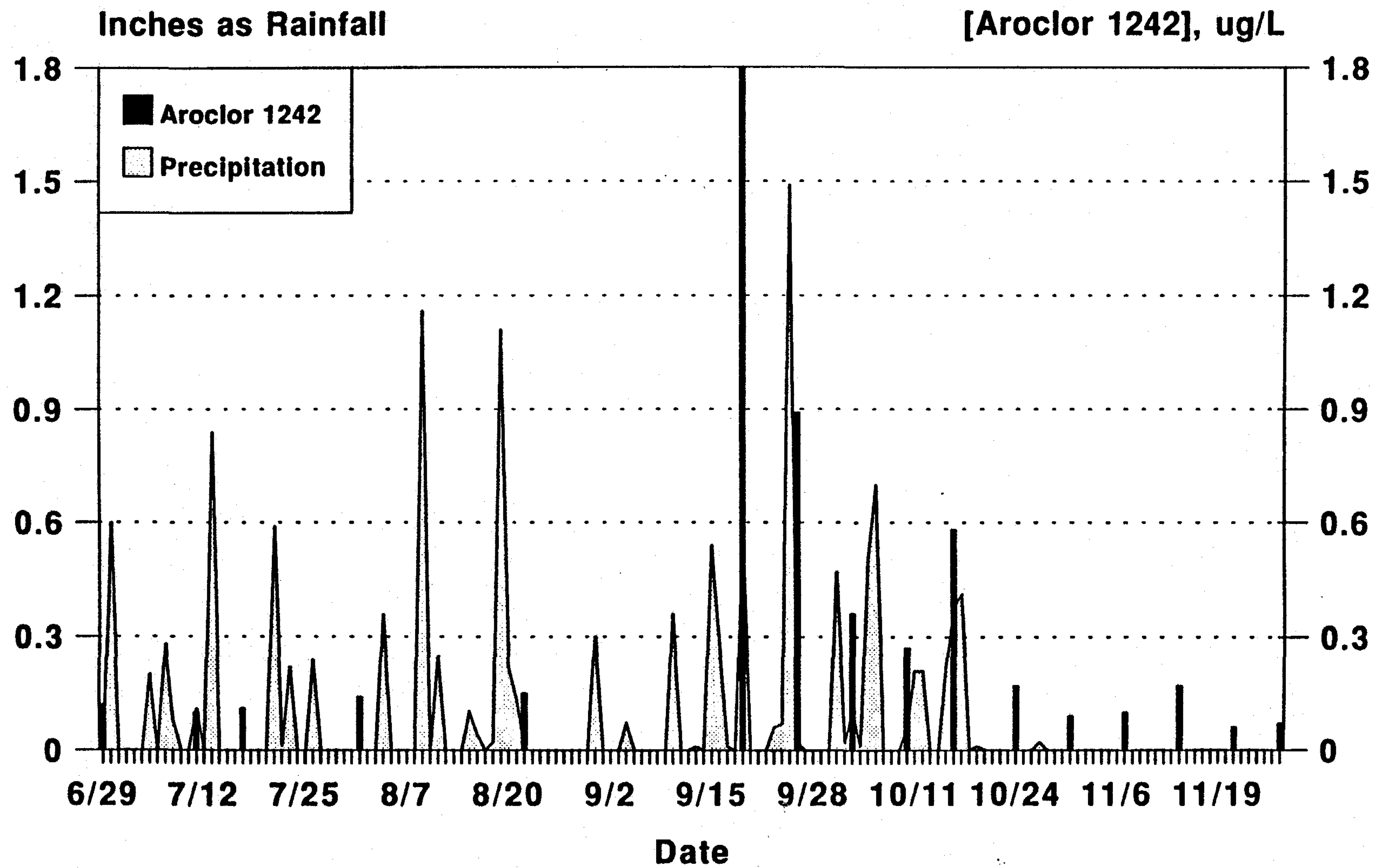

Precipitation at Glens Falls, NY

309934

309935

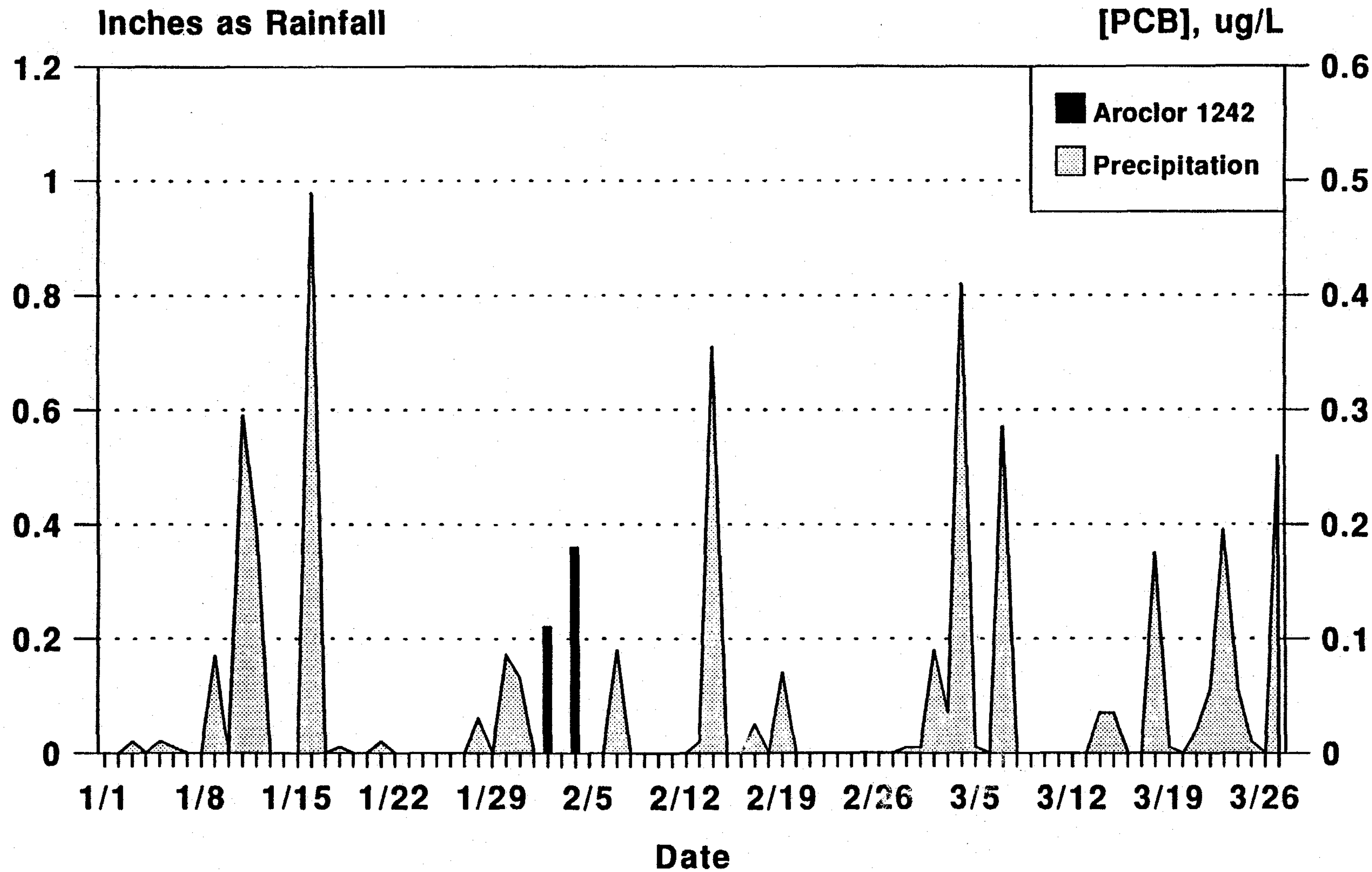
FIGURE 122

# Trends in Aroclor 1242 and Precipitation June 29 to November 27, 1991 Station RS3W2




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# January 1 to March 27, 1991
# Station RS4W2



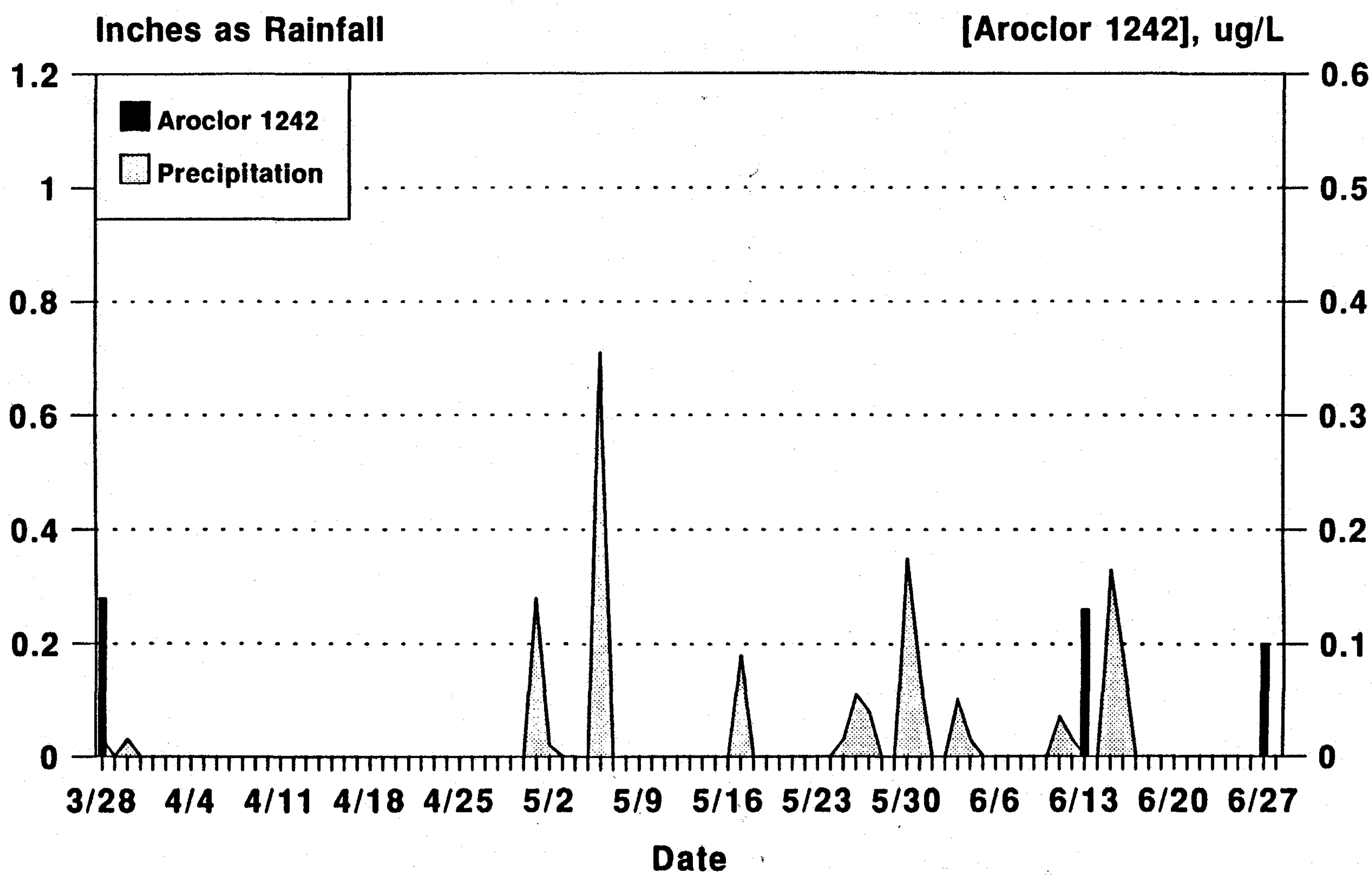

309936

Precipitation at Glens Falls, NY

FIGURE 124

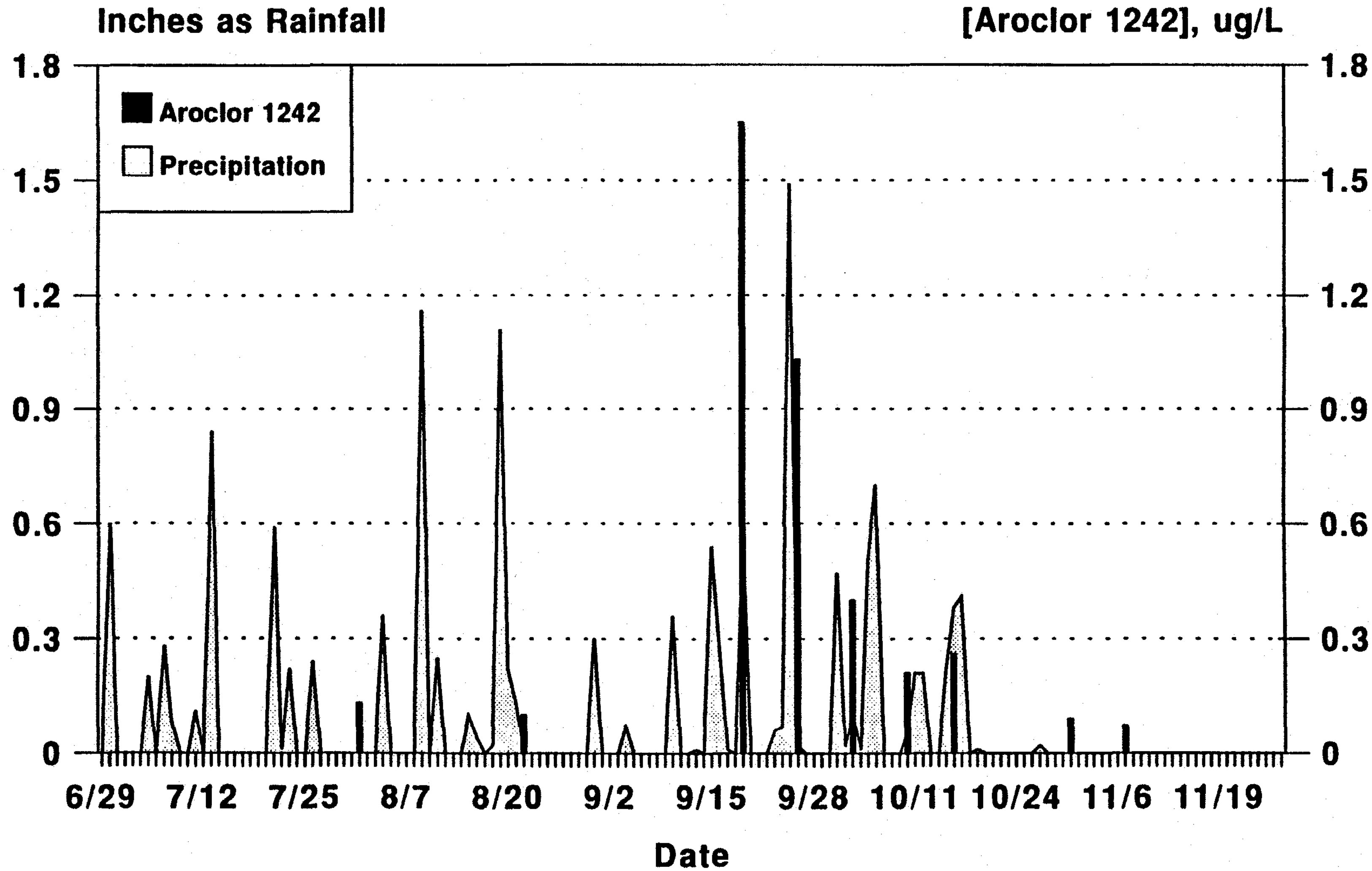
309937

# Trends in Aroclor 1242 and Precipitation
# March 28 to June 28, 1991
# Station RS5W1




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# June 29 to November 27, 1991
# Station RS5W1



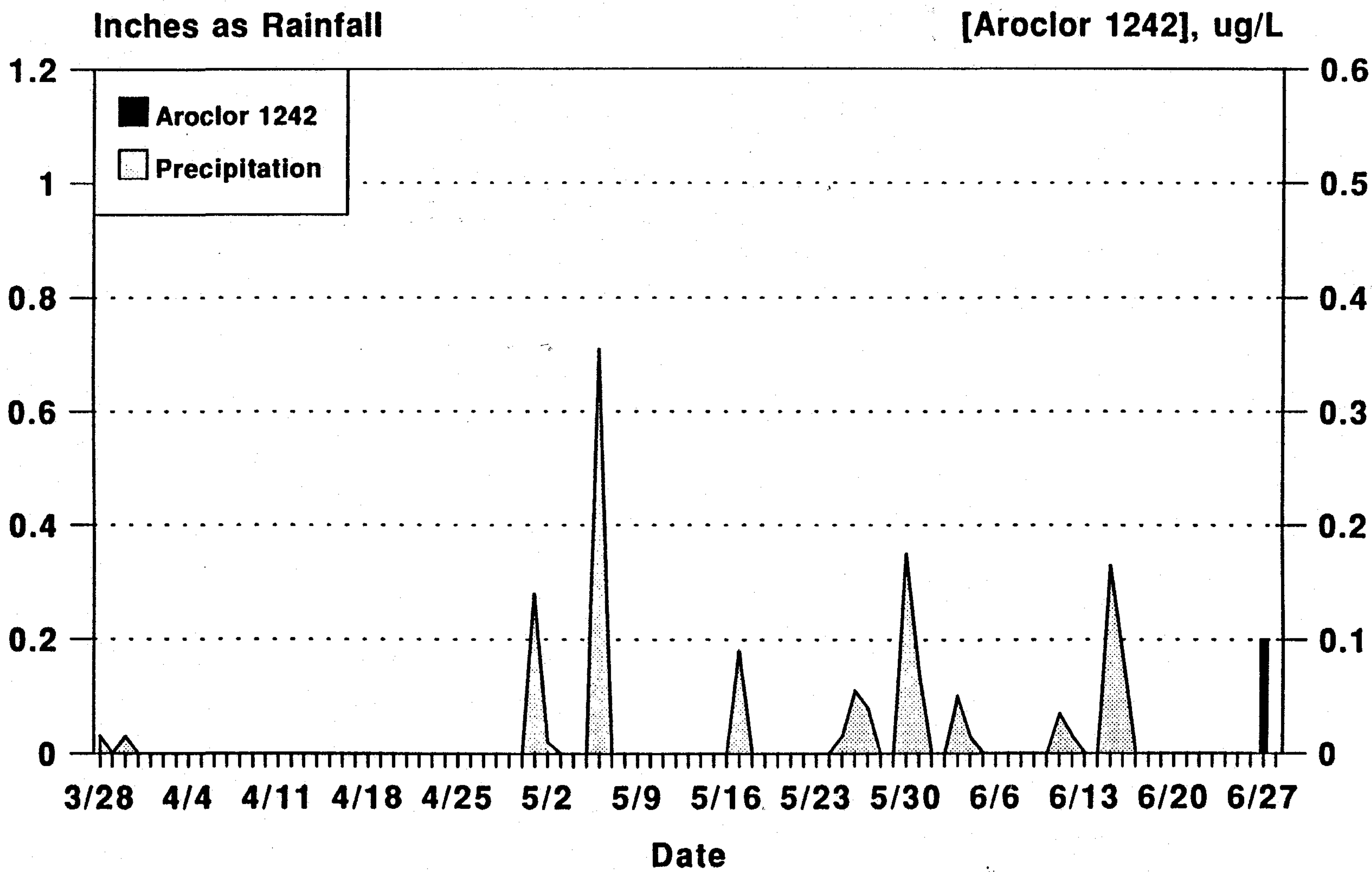

Precipitation at Glens Falls, NY

309938

309939

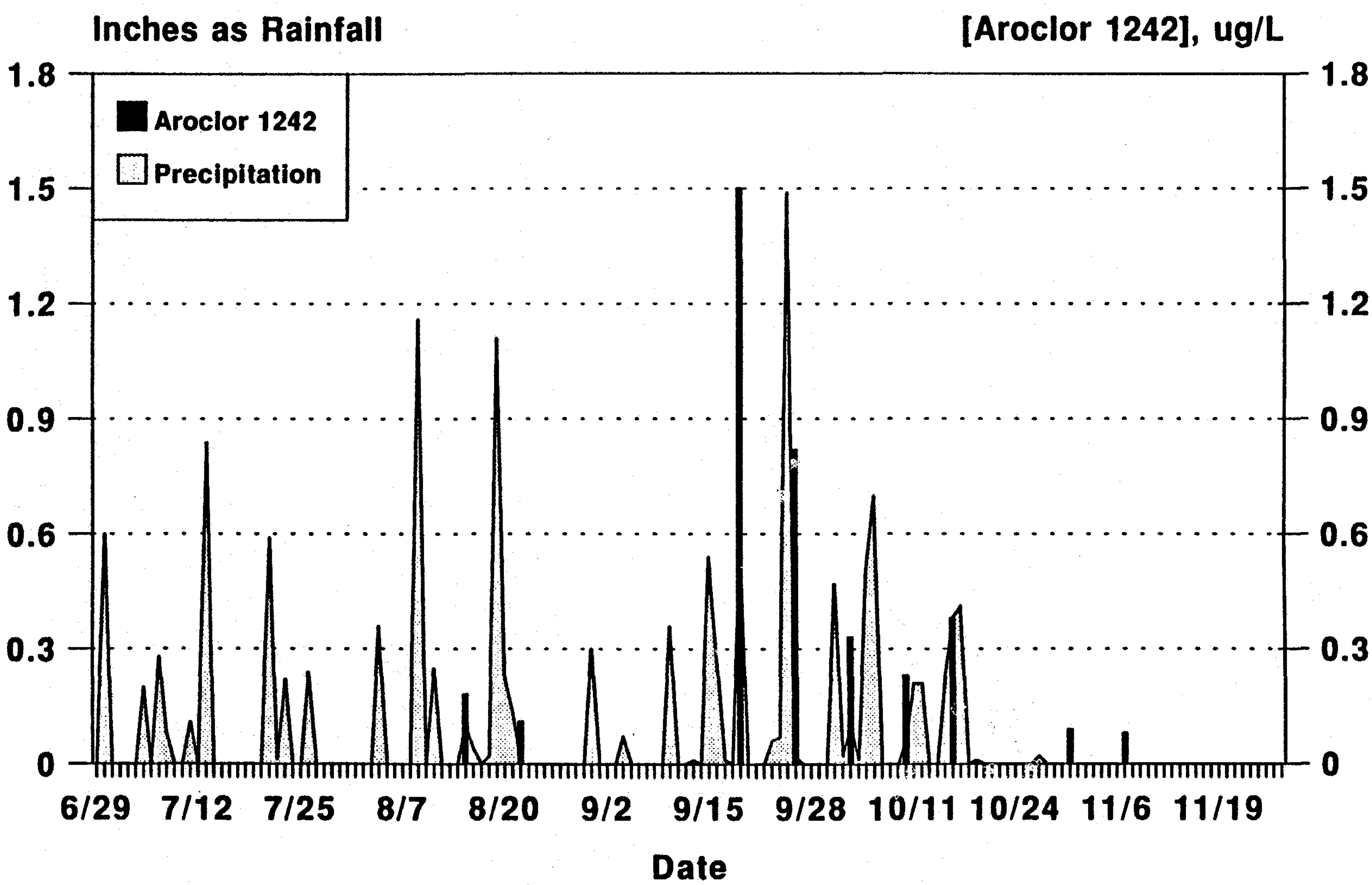
FIGURE 126

# Trends in Aroclor 1242 and Precipitation
# March 28 to June 28, 1991
# Station RS5W2




Precipitation at Glens Falls, NY

# Trends in Aroclor 1242 and Precipitation
# June 29 to November 27, 1991
# Station RS5W2



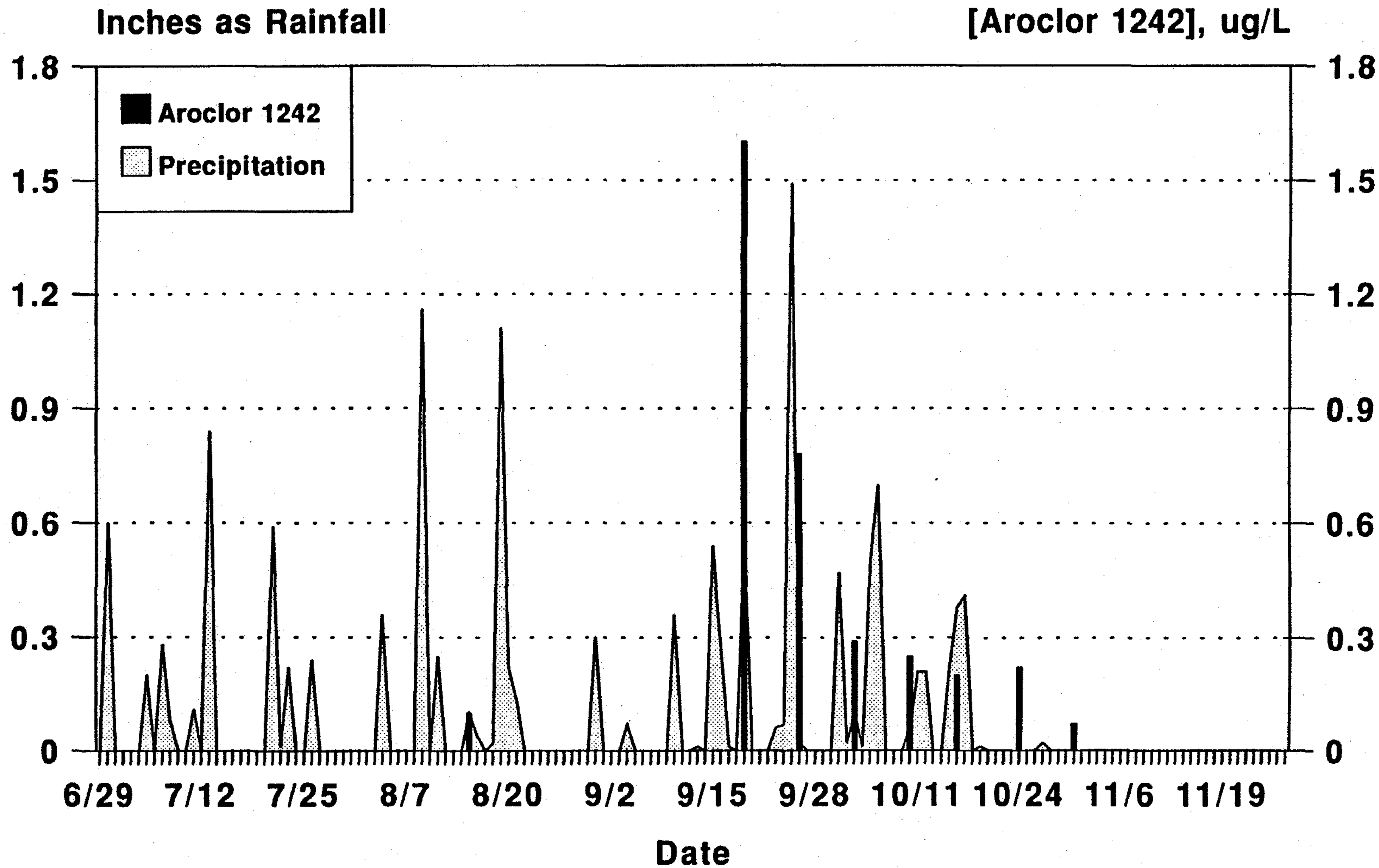

Precipitation at Glens Falls, NY

309940

FIGURE 128

309941

# Trends in Aroclor 1242 and Precipitation June 29 to November 27, 1991 Station DS1




Precipitation at Glens Falls, NY

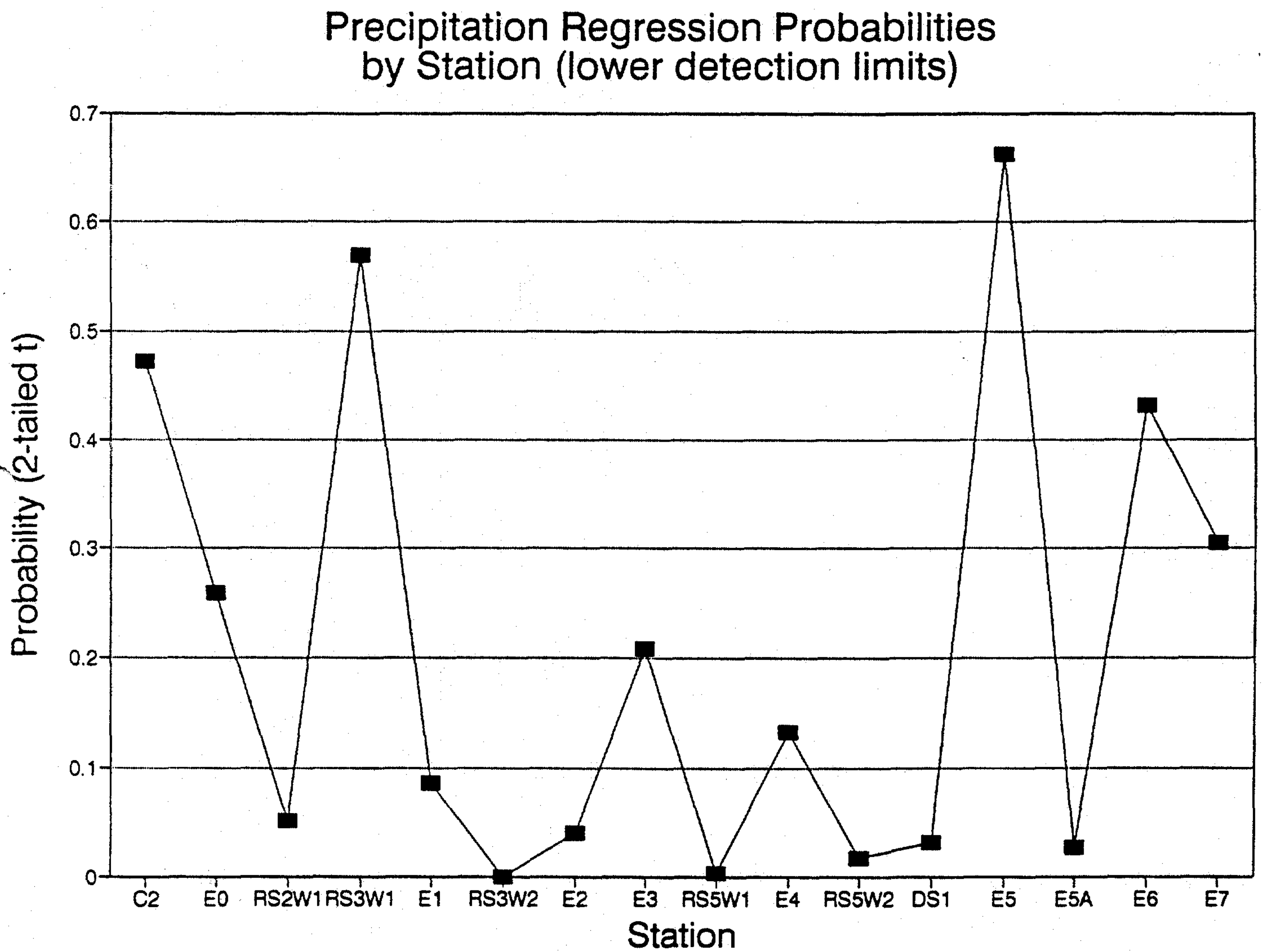
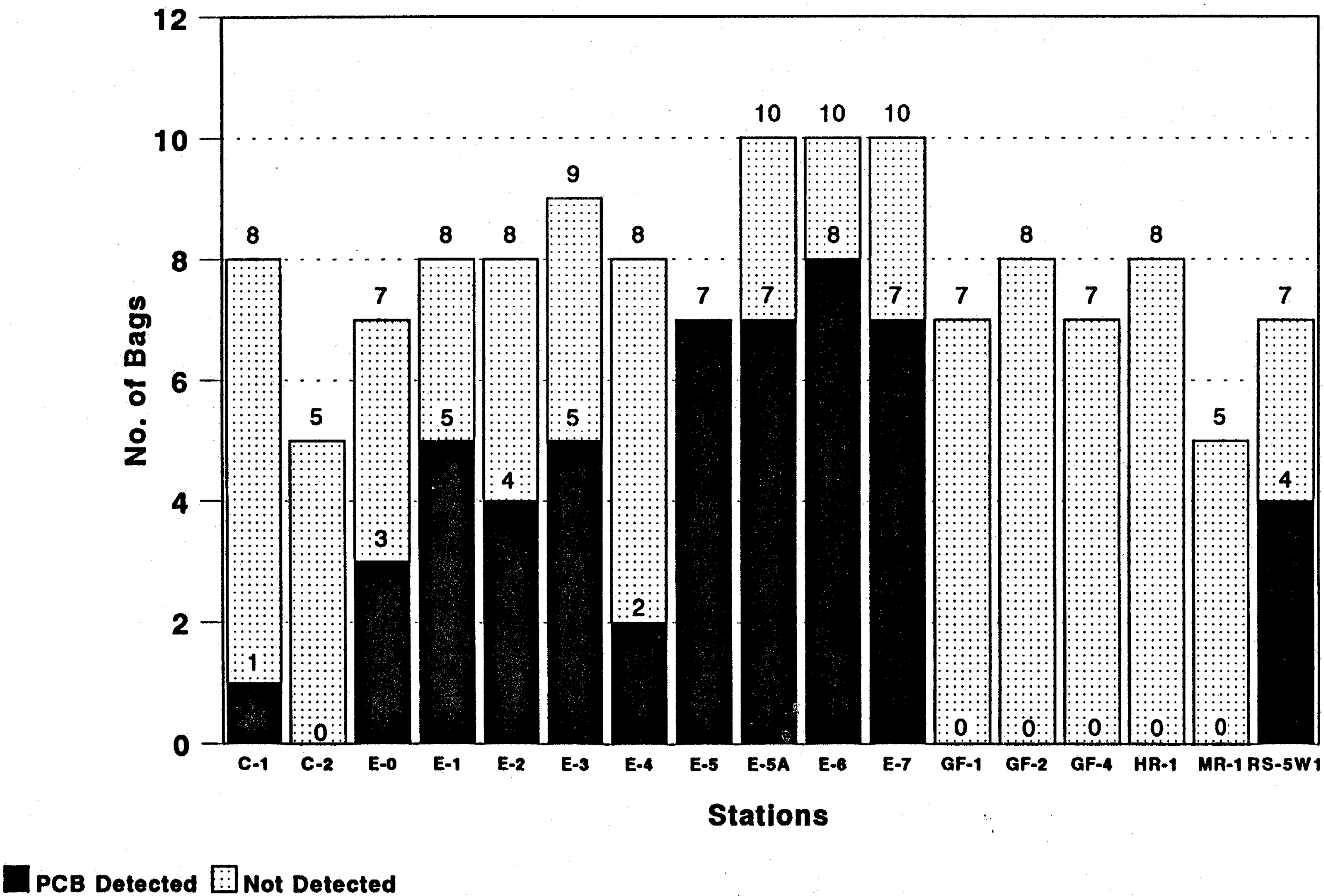

Precipitation Regression Probabilities
by Station (lower detection limits)
Probability (2-tailed t)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
C2
E0
RS2W1
RS3W1
E1
RS3W2
E2
E3
RS5W1
E4
RS5W2
DS1
E5
E5A
E6
E7
Station

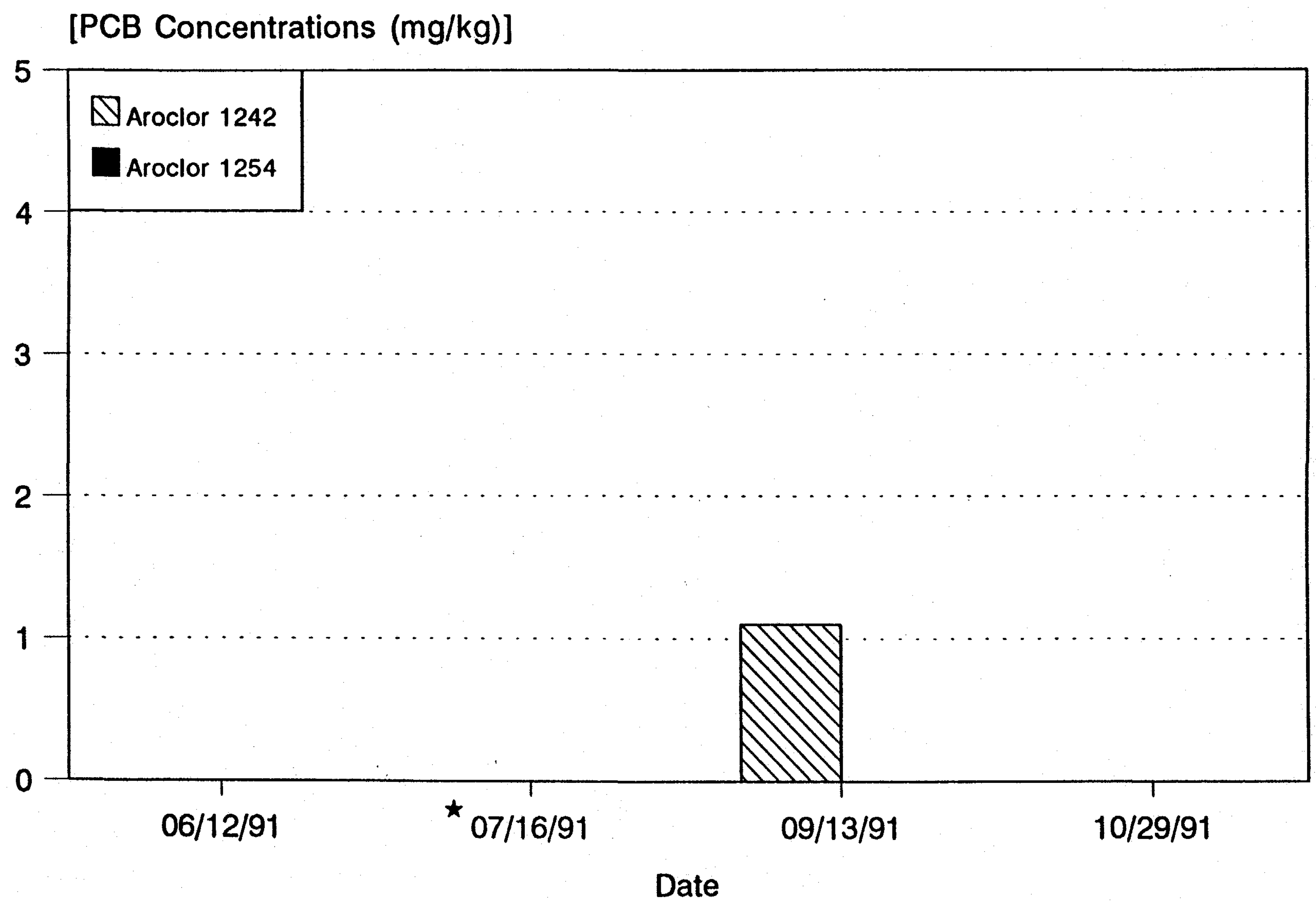
FIGURE 130

# Number of Solvent Bags at Stations Containing Detectable PCB Levels



URE 131

# Seasonal Trends in PCB in Periphyton
# Station GF4



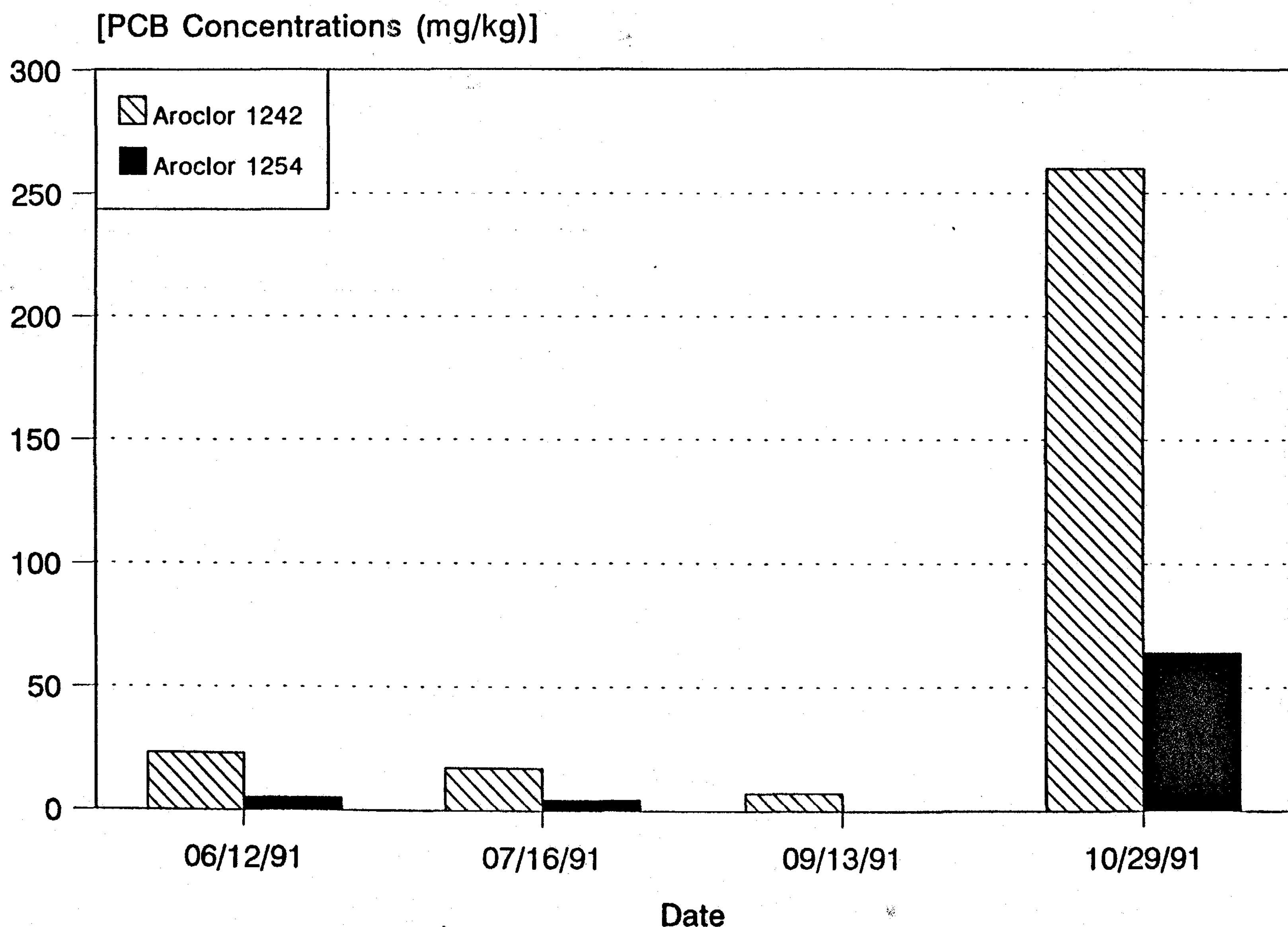

★ Sample Lost in Lab

309944

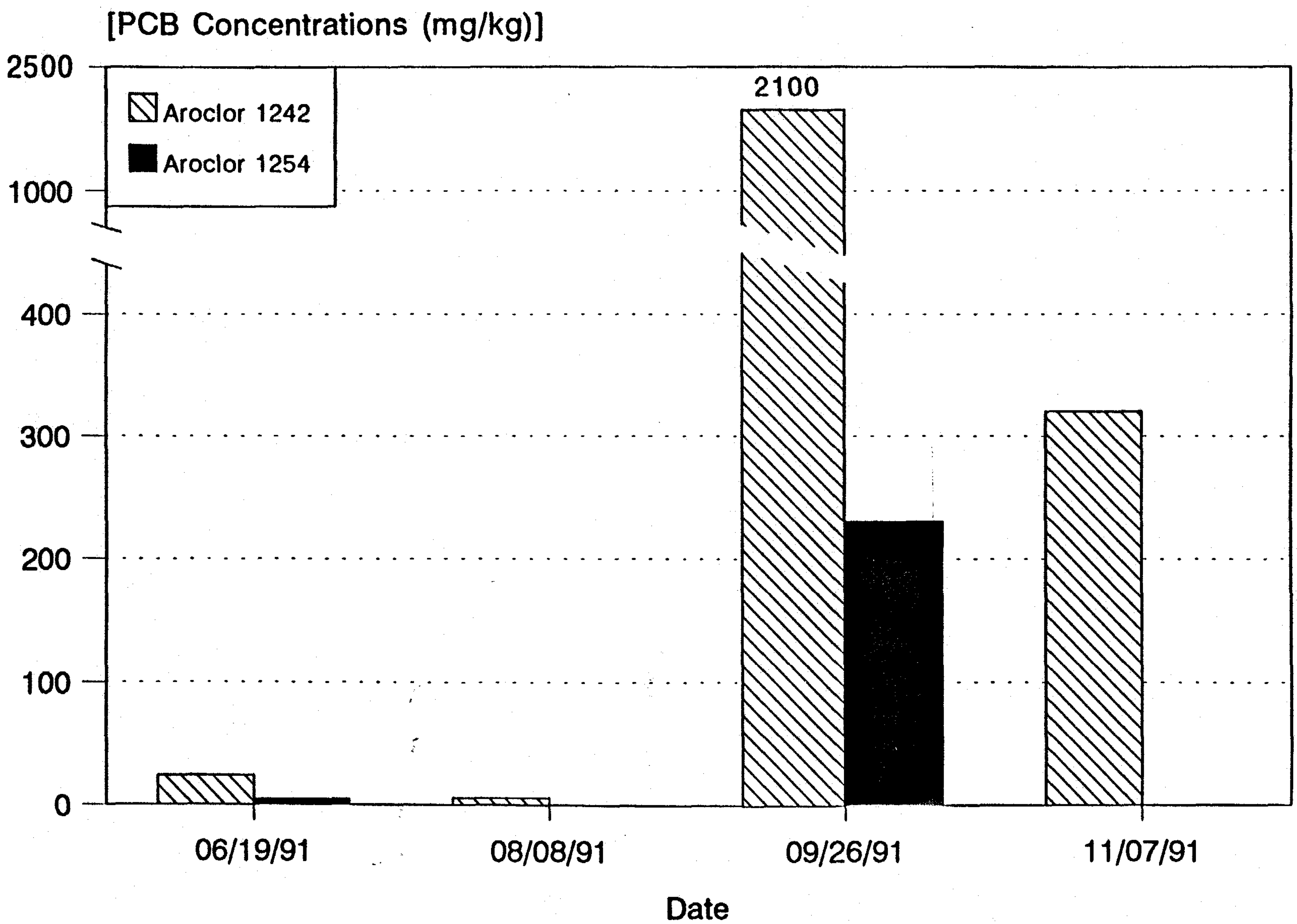
FIGURE 132

309945

# Seasonal Trends in PCB in Periphyton
# Station C2



# Seasonal Trends in PCB in Periphyton
# Station E0

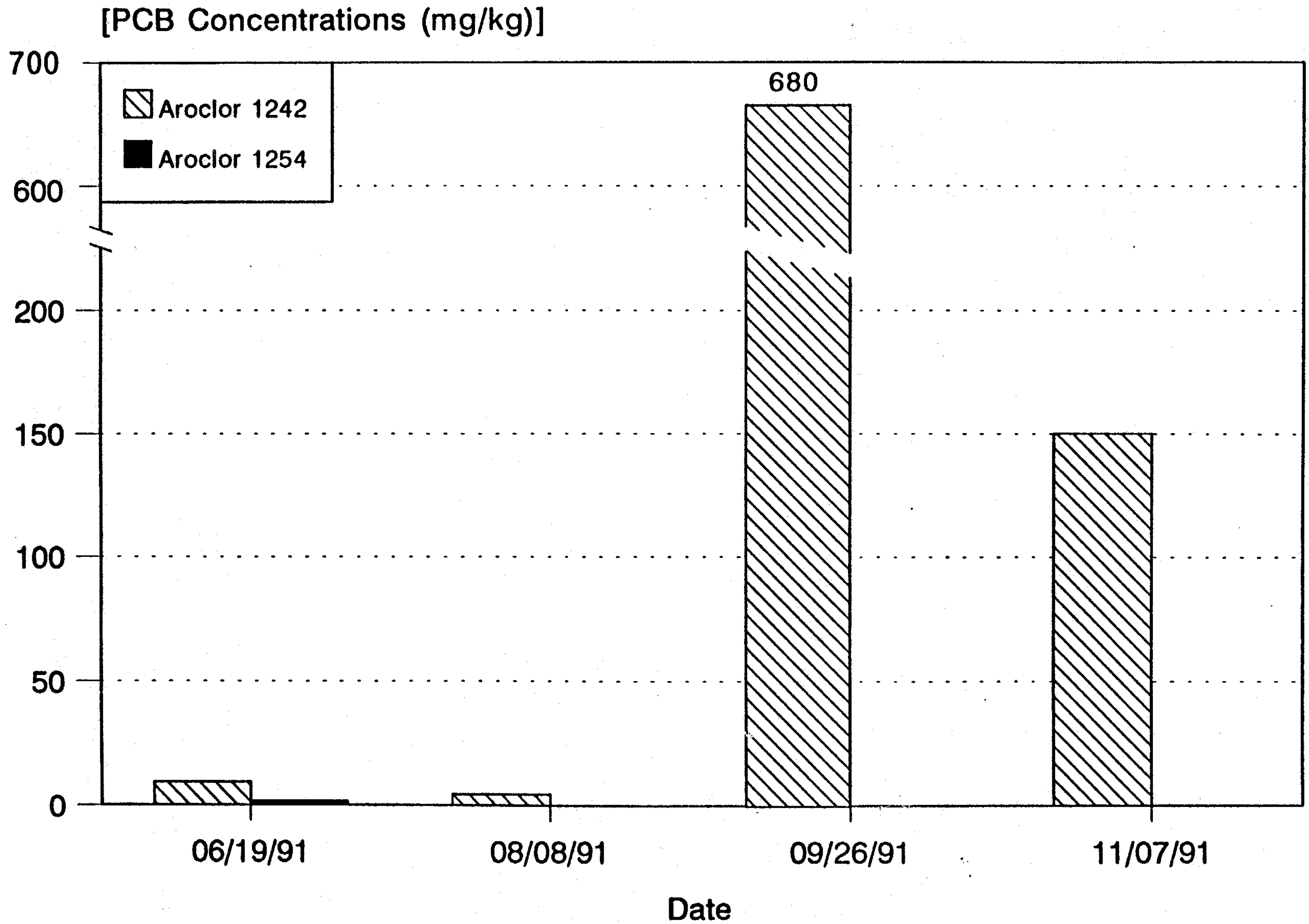



309946

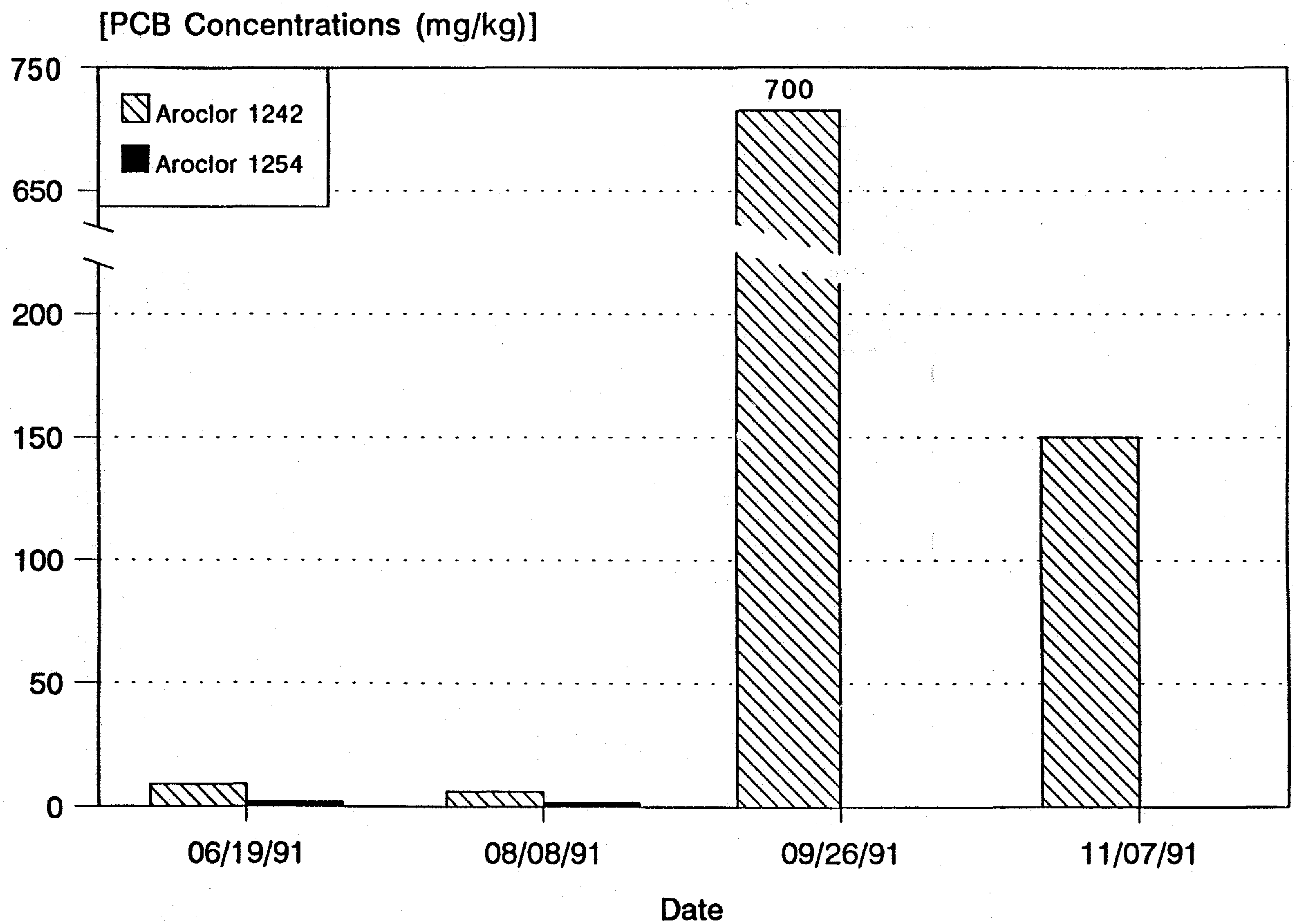
309947

FIGURE 134

# Seasonal Trends in PCB in Periphyton
# Station E1



# Seasonal Trends in PCB in Periphyton
# Station E2

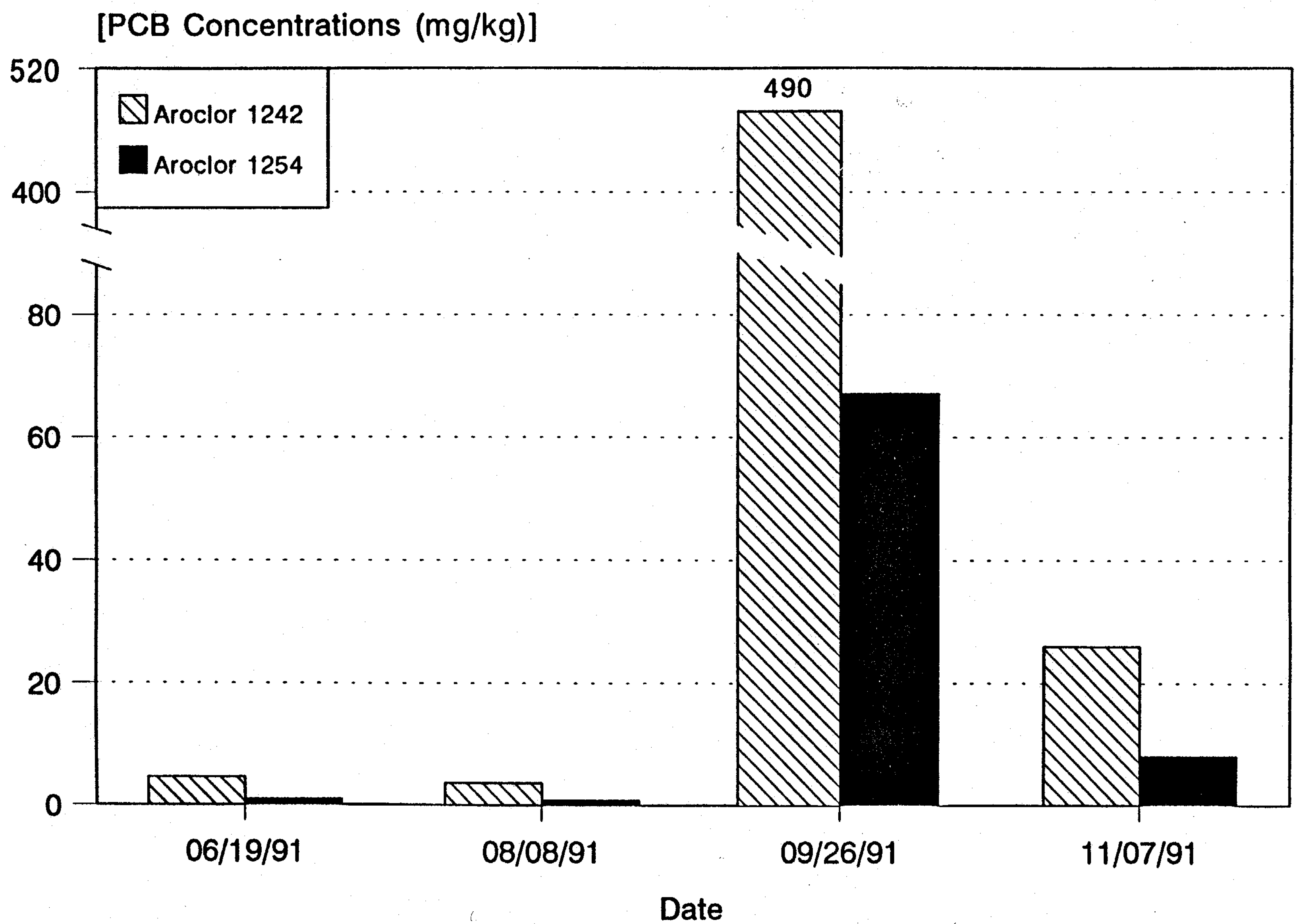



309948

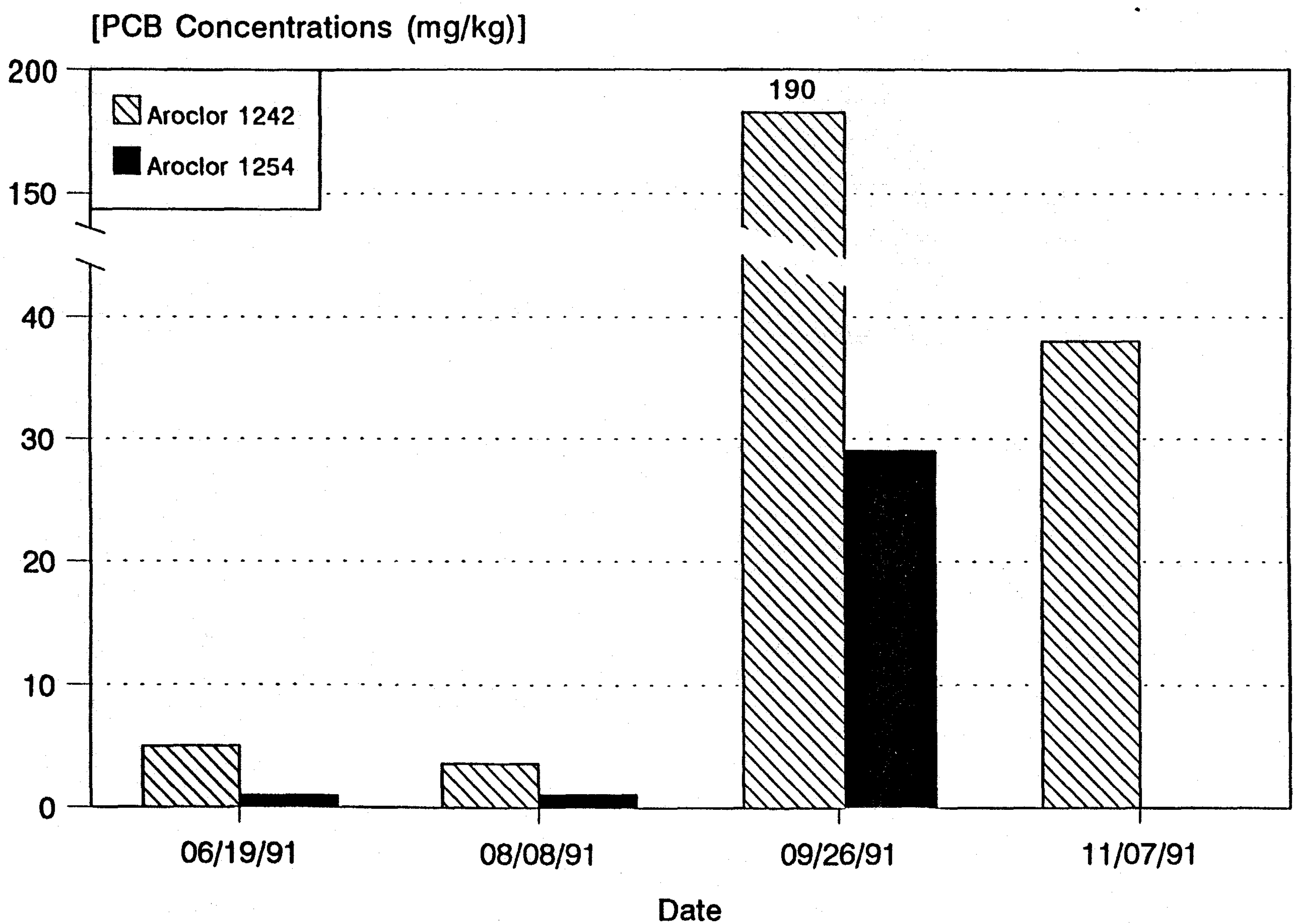
309949

FIGURE 136

# Seasonal Trends in PCB in Periphyton
## Station E3



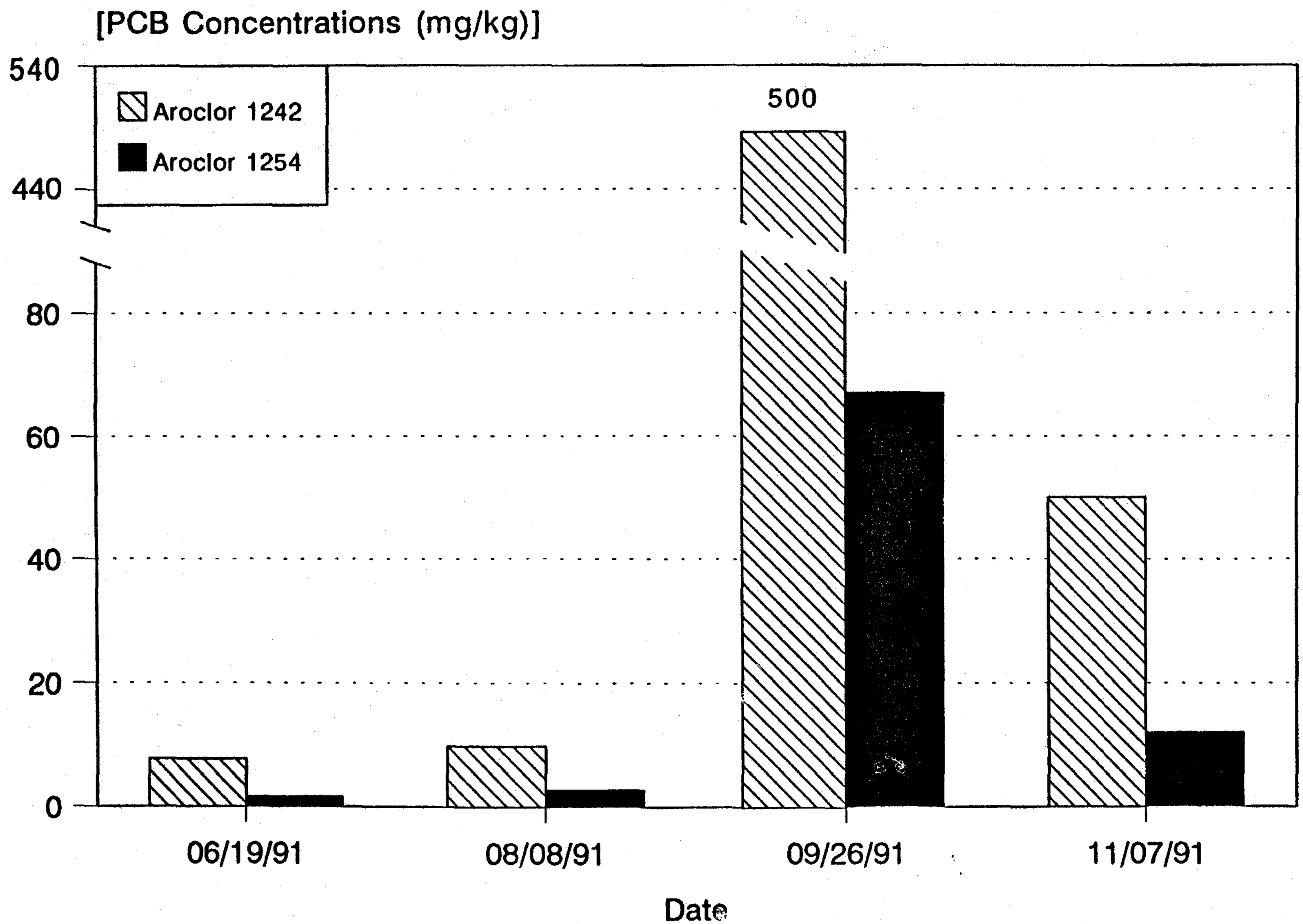
# Seasonal Trends in PCB in Periphyton
# Station E4



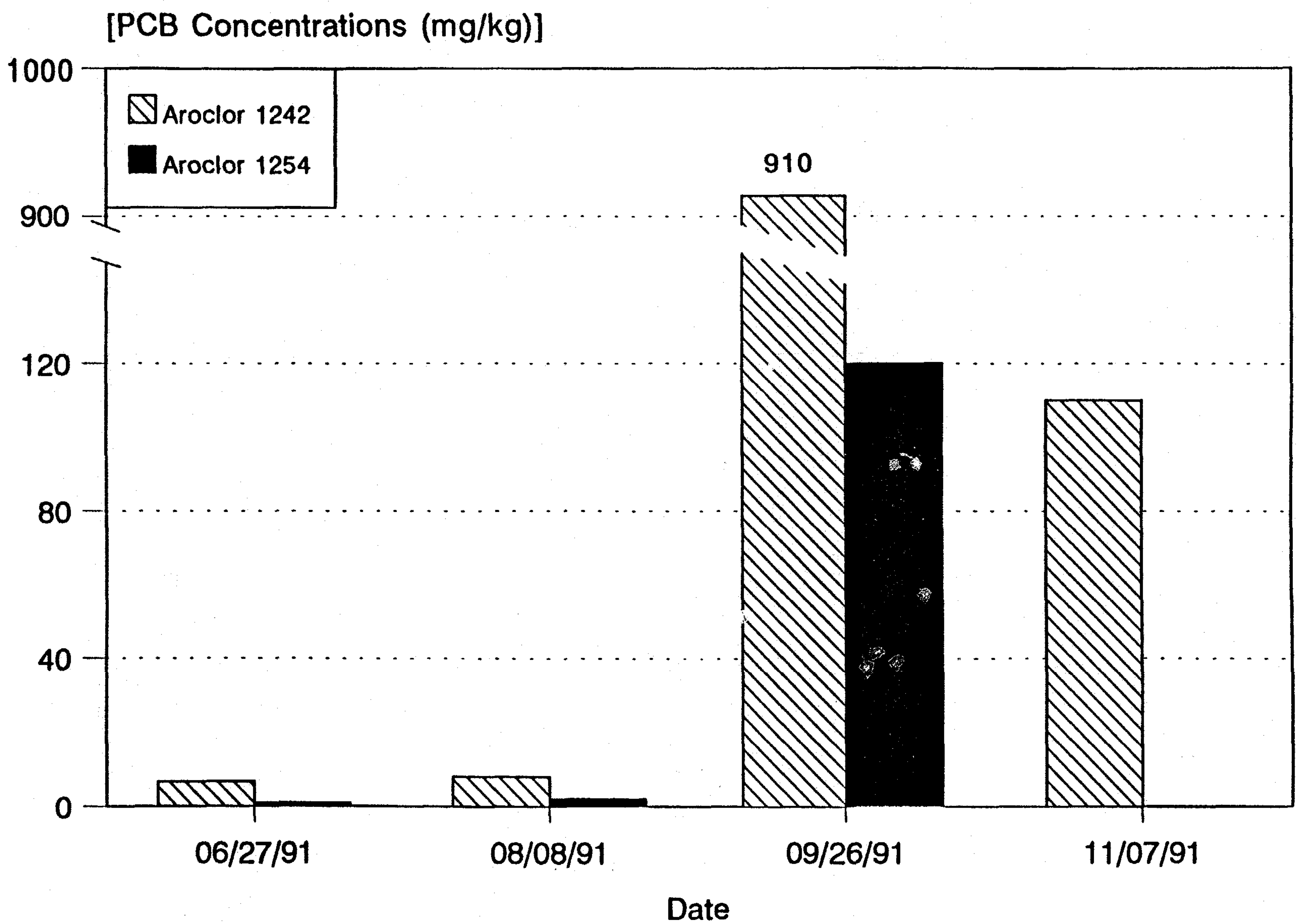

309950

309951

# Seasonal Trends in PCB in Periphyton Station RS5W1



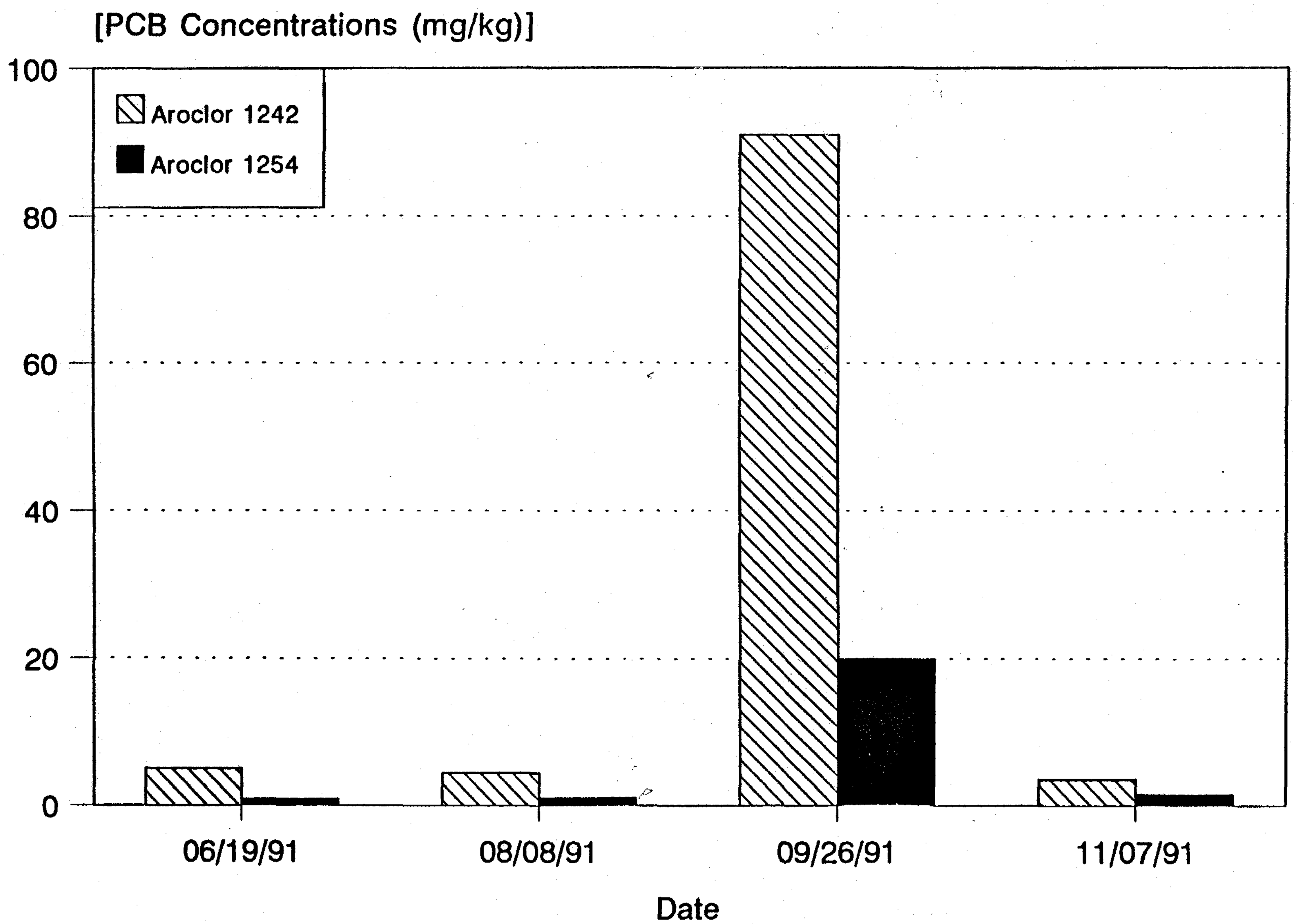
# Seasonal Trends in PCB in Periphyton
# Station E5



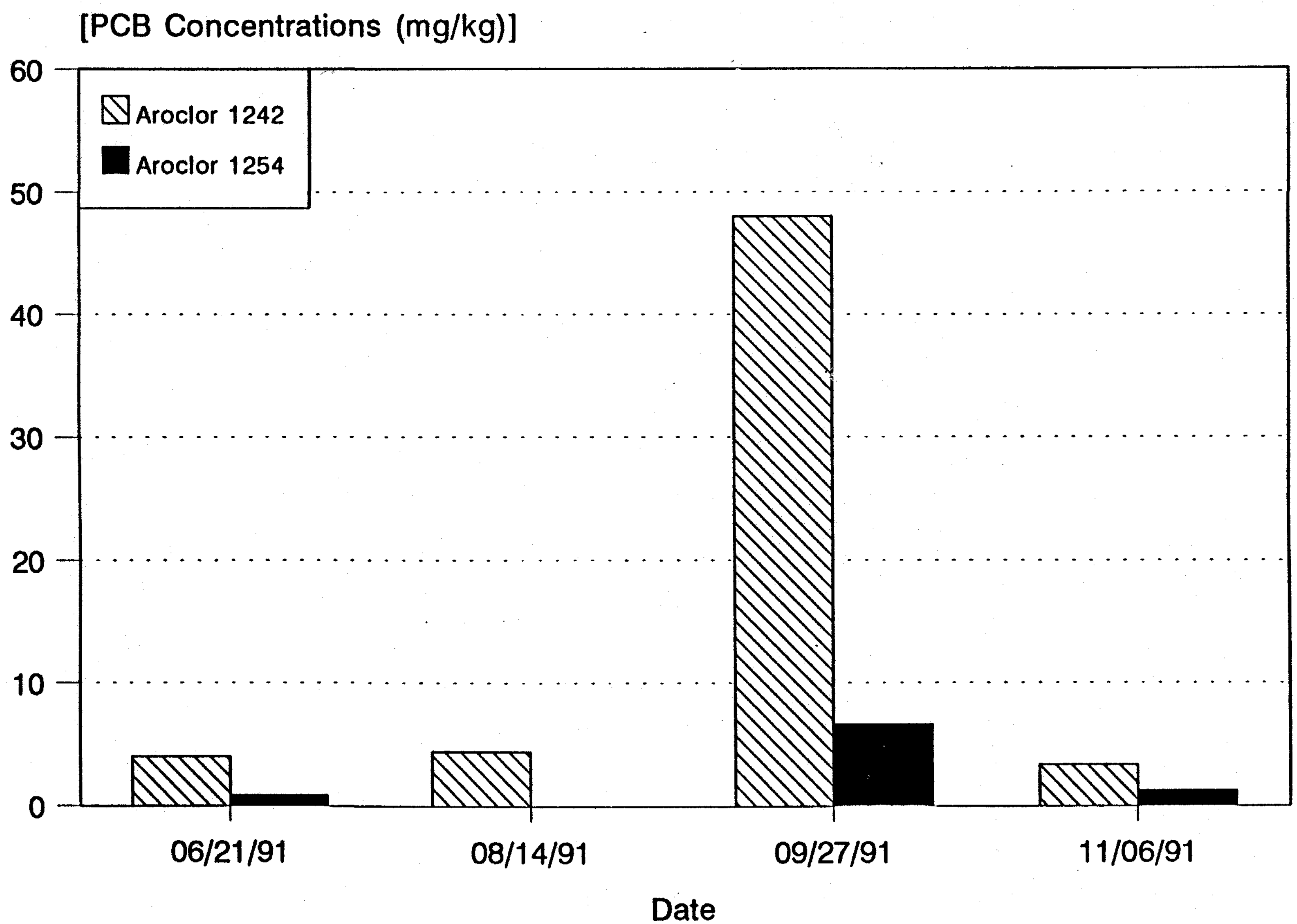
309953

FIGURE 140

# Seasonal Trends in PCB in Periphyton Station E5A

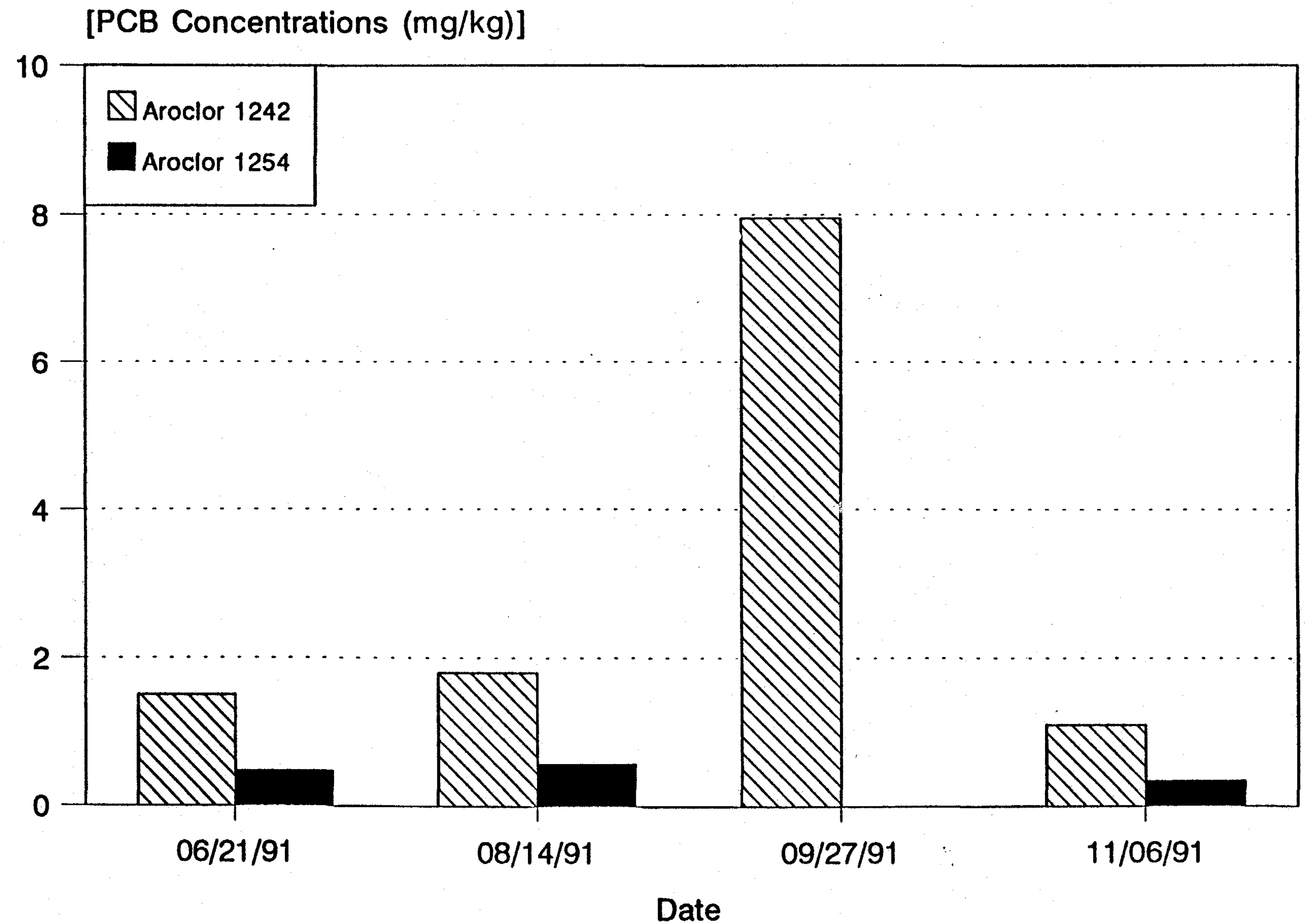


# Seasonal Trends in PCB in Periphyton
# Station E6



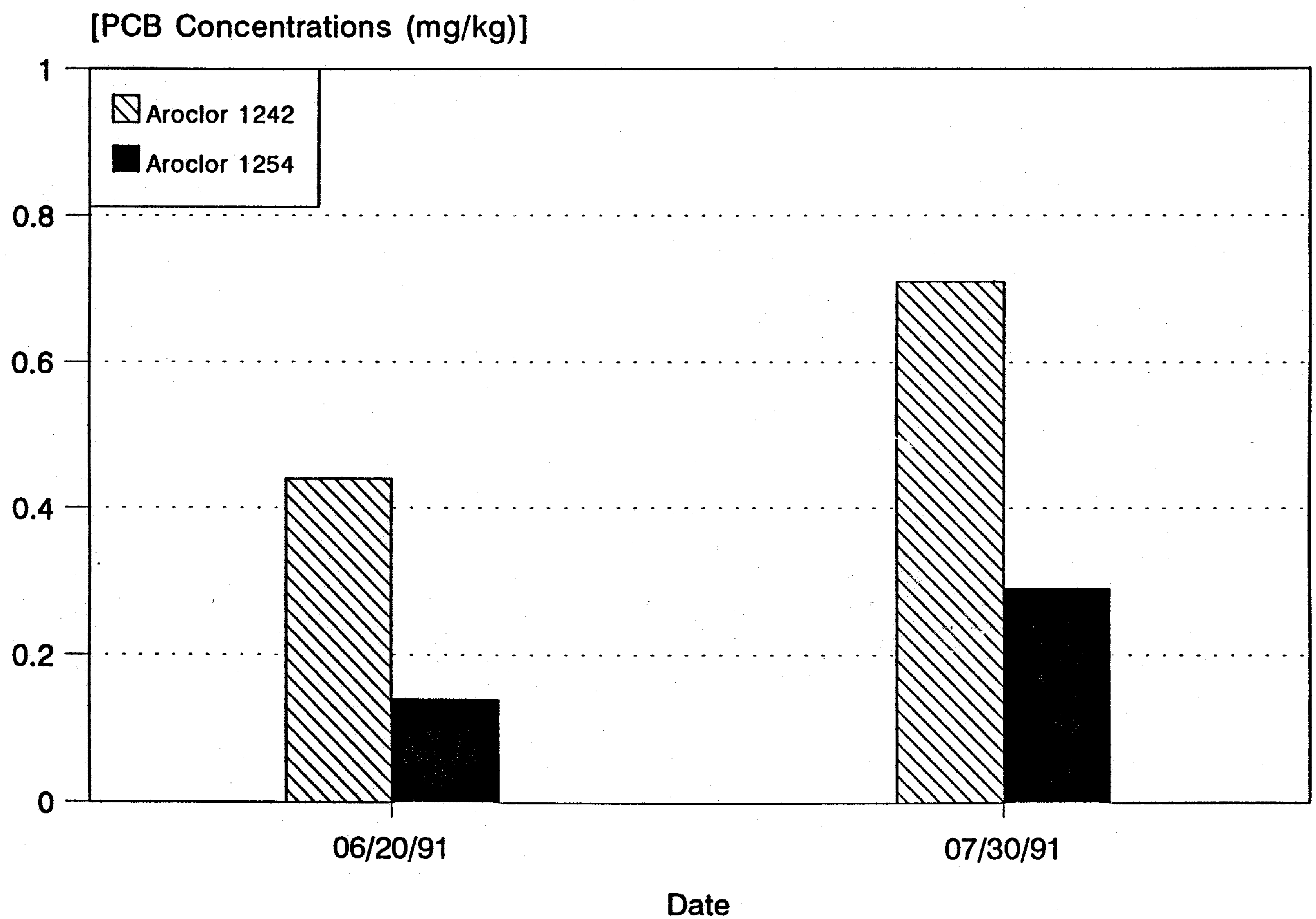

309954

# Seasonal Trends in PCB in Periphyton
# Station E7



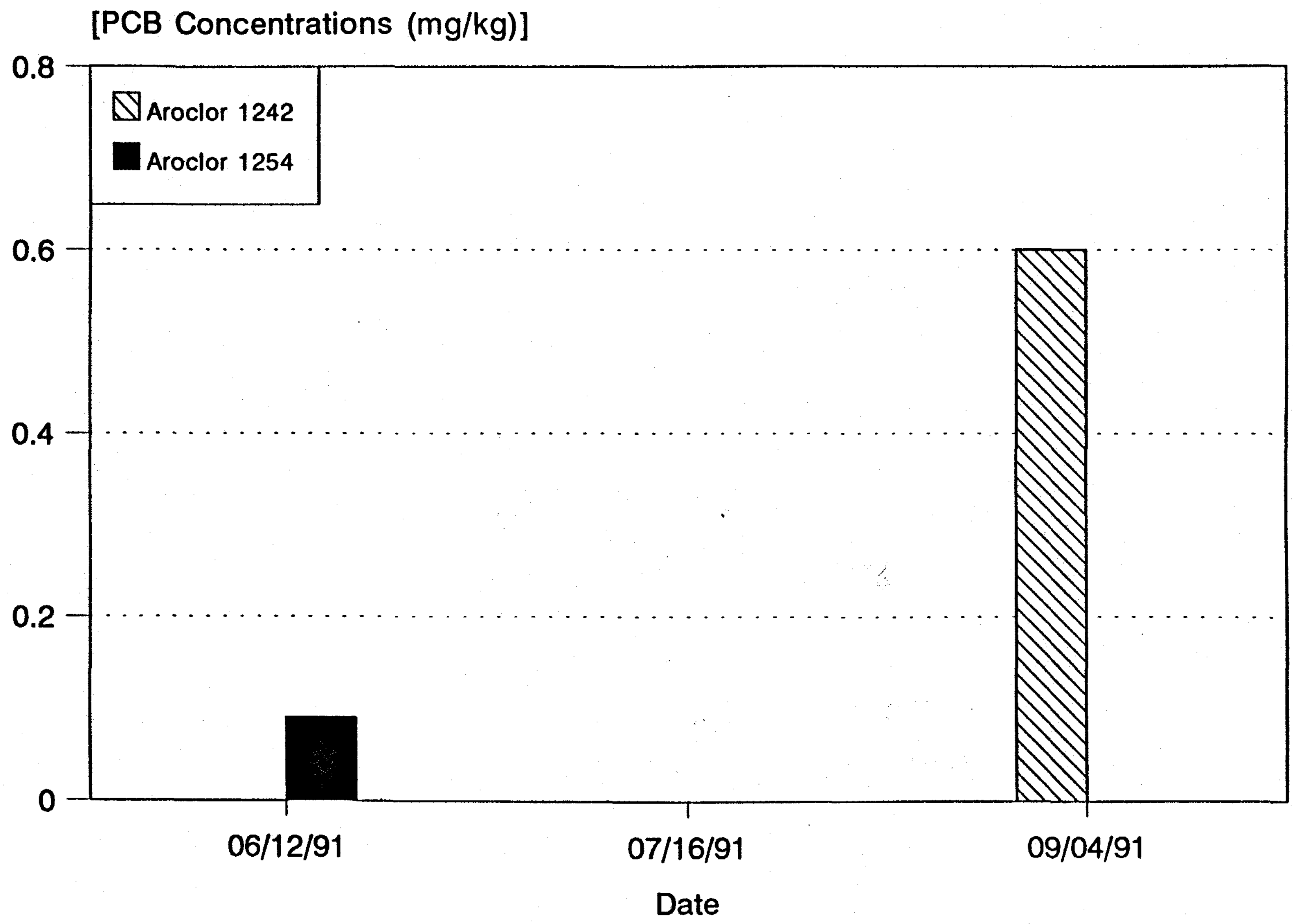

309955

# Seasonal Trends in PCB in Periphyton
# Station HR1




309956

# Seasonal Trends in PCB in Periphyton
# Station MR1



# Comparison of Mean PCB Levels in Caddisflies: 1989-1991

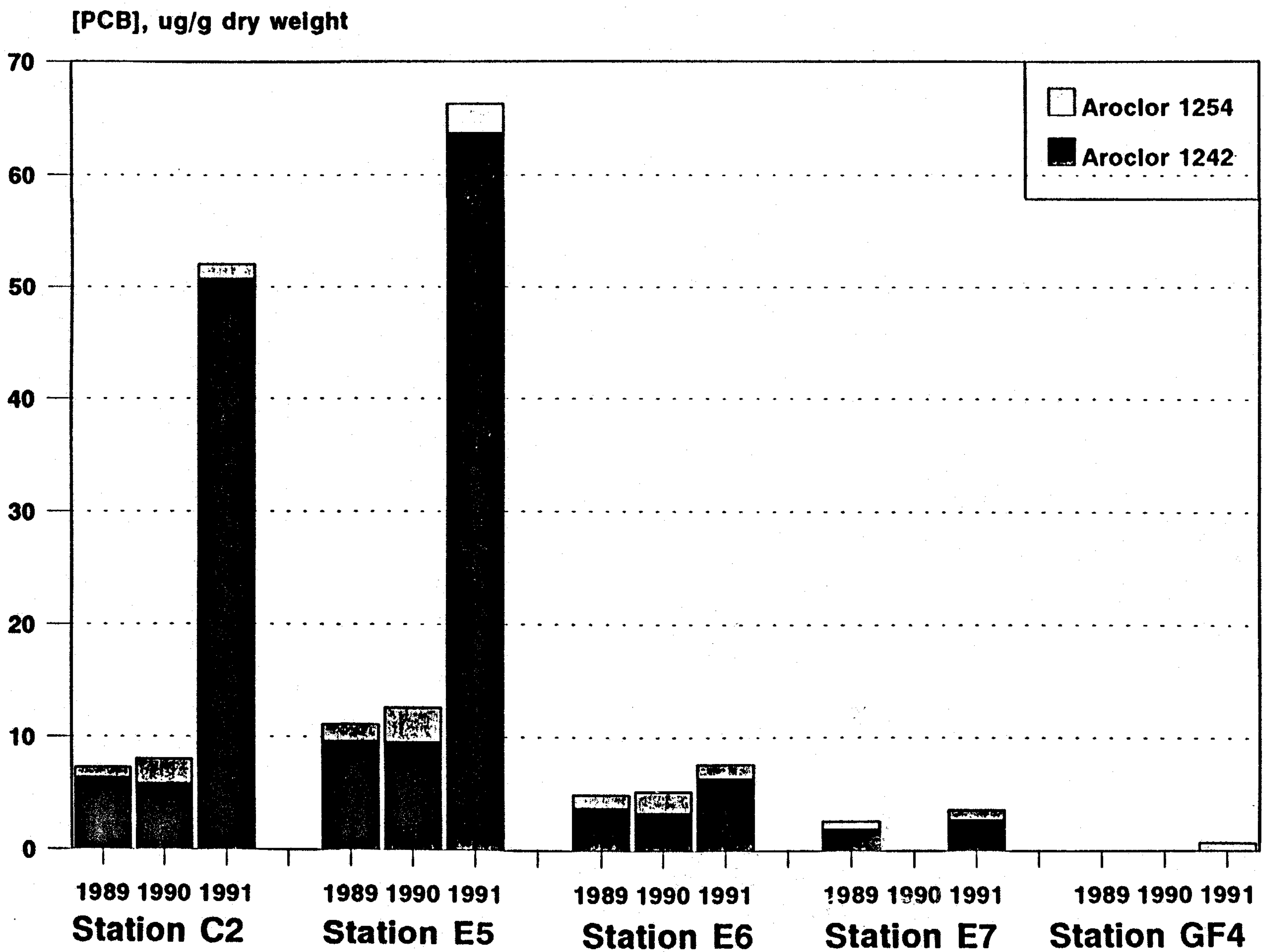
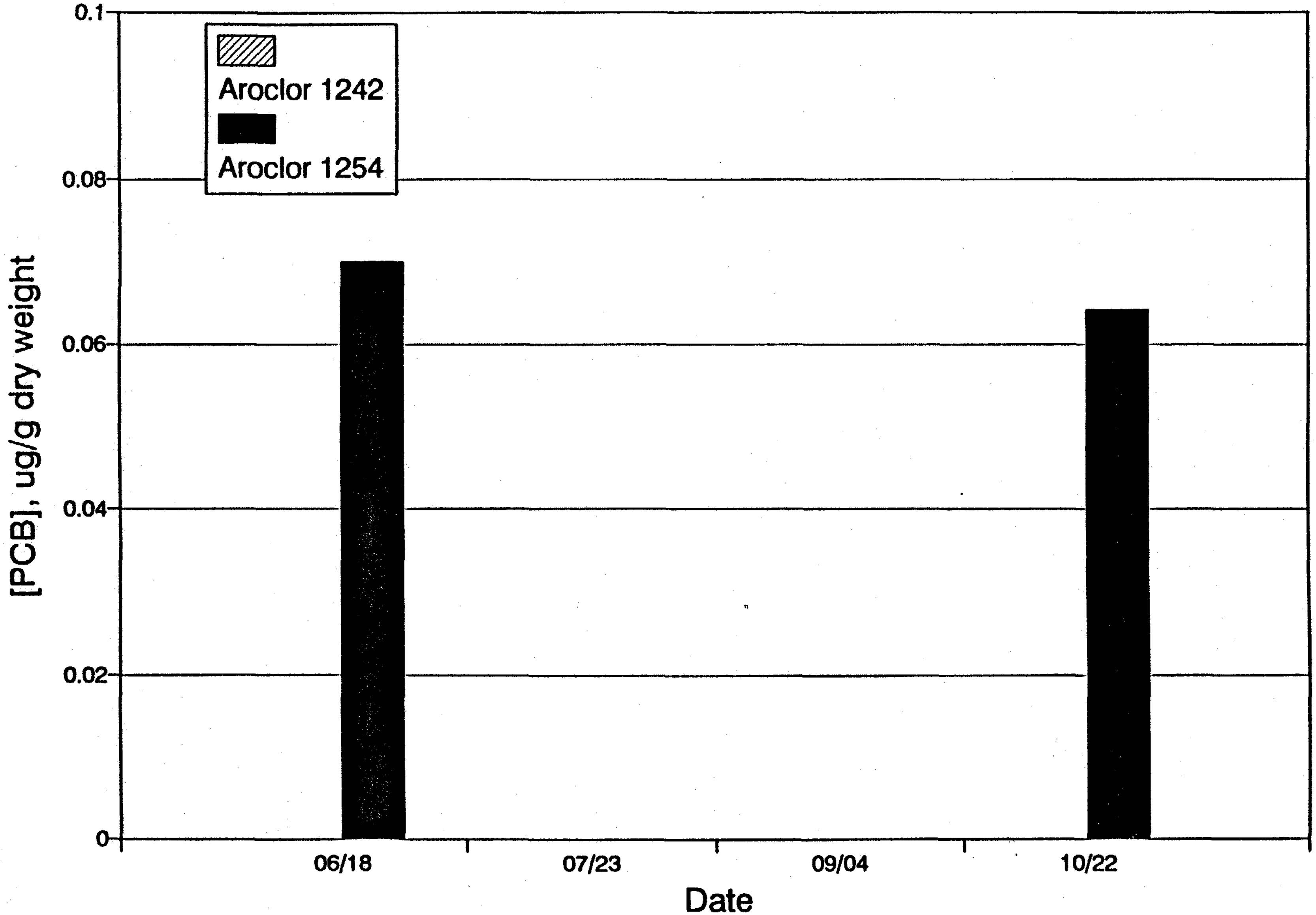


FIGURE 146

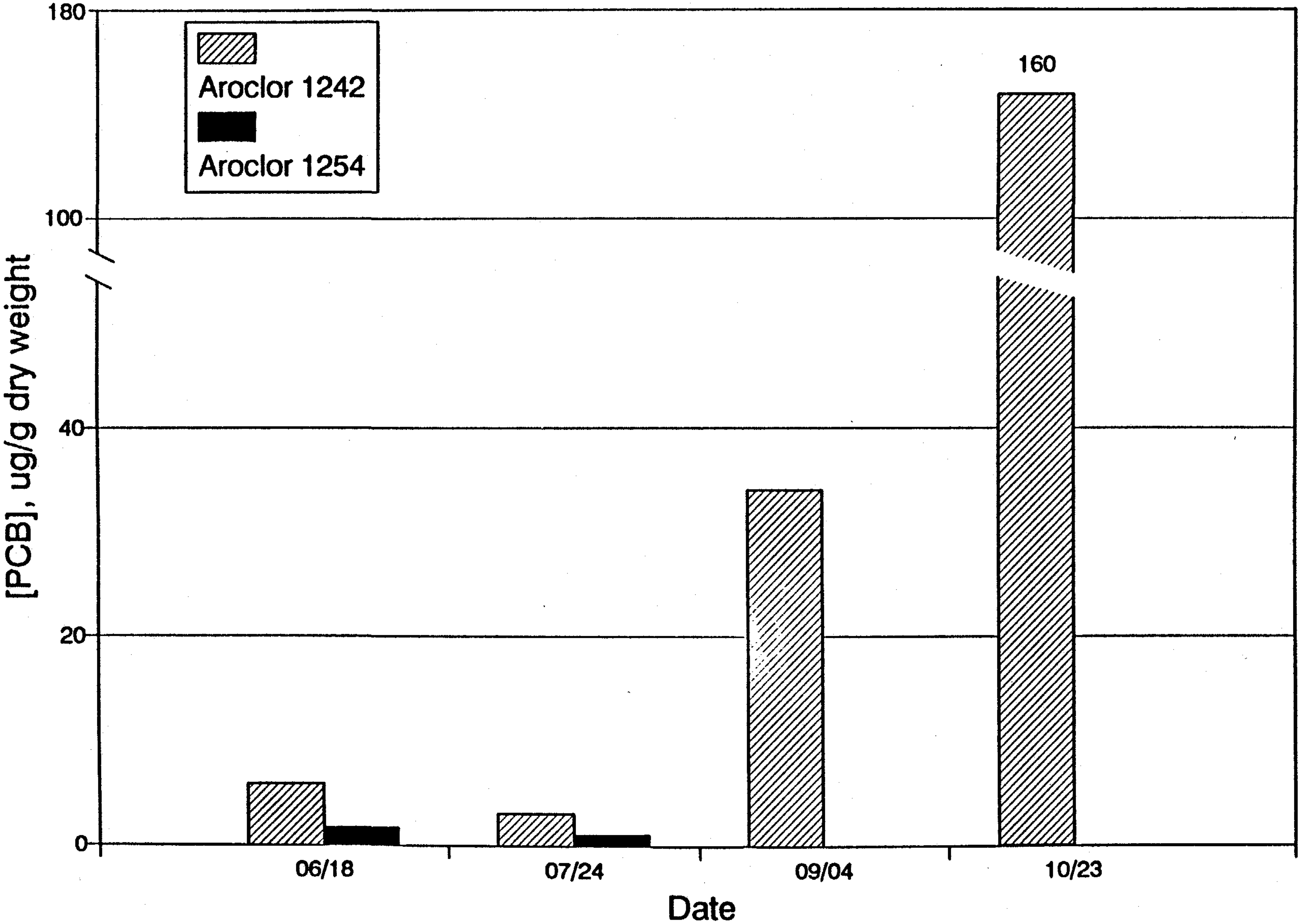
# Comparison of Aroclor 1242 and 1254 in Caddisfly at GF4 1991




309959

FIGURE 147

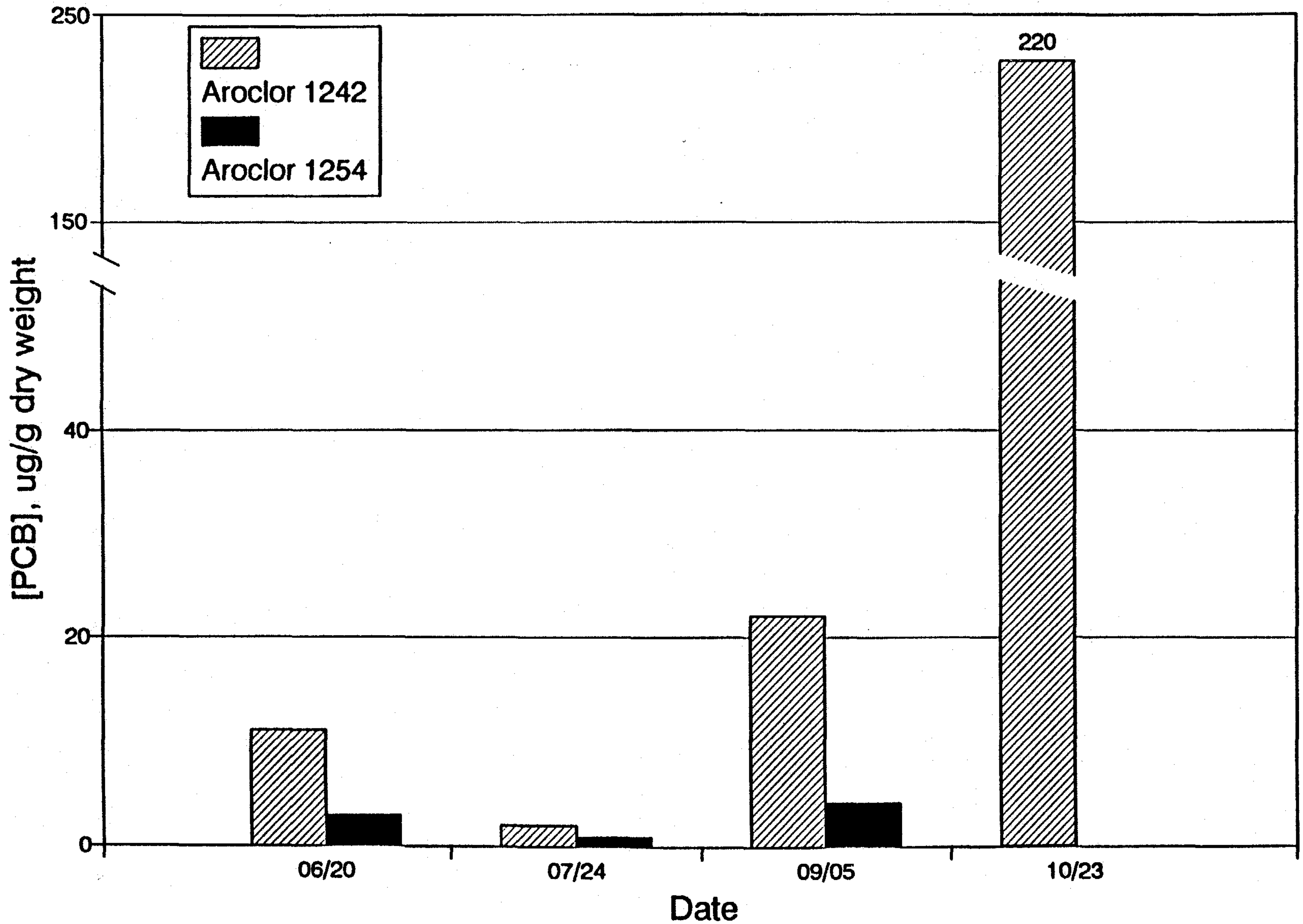
# Comparison of Aroclor 1242 and 1254 in Caddisfly at C2 1991




309960

FIGURE 148

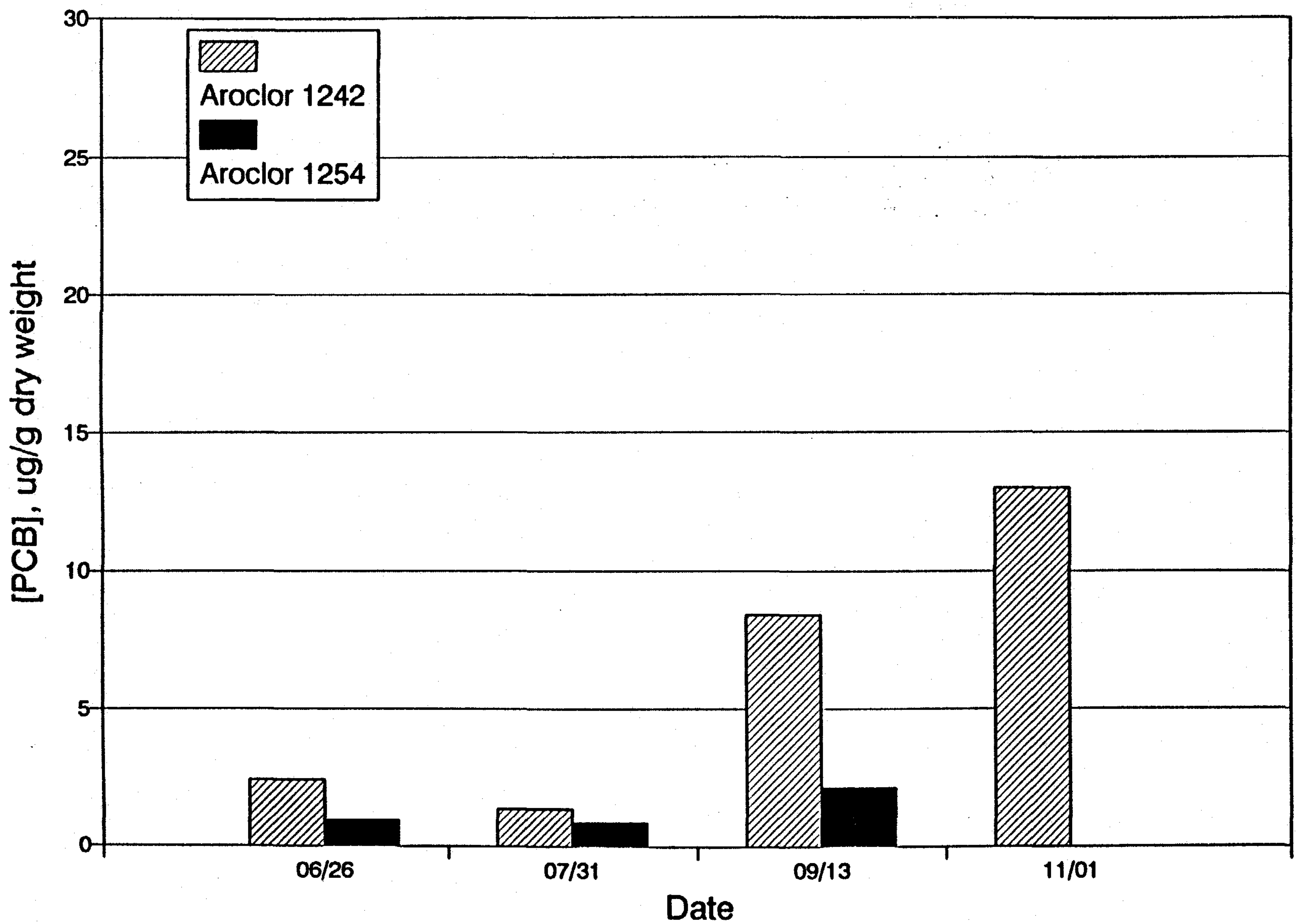
# Comparison of Aroclor 1242 and 1254 in Caddisfly at E5 1991




309961

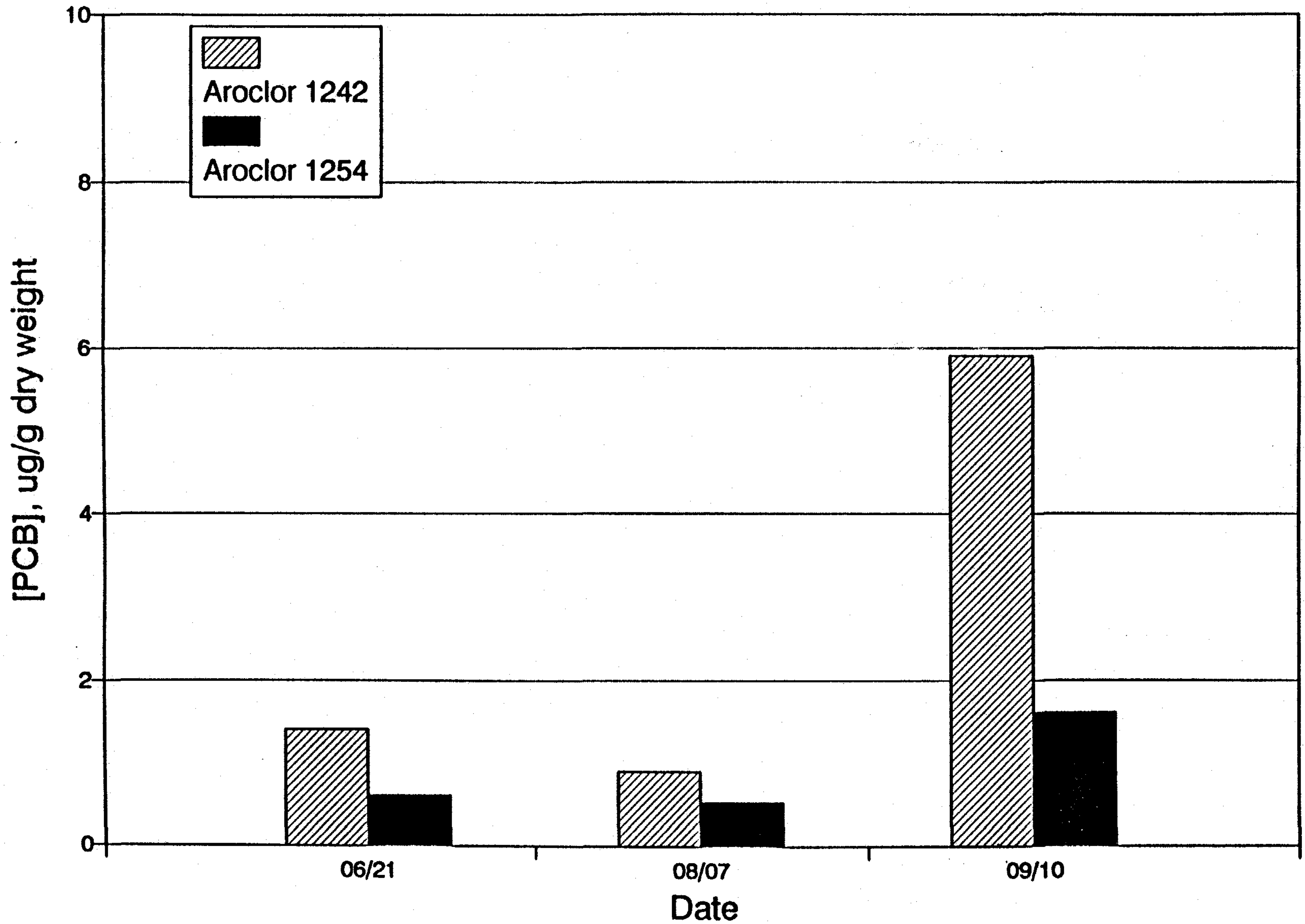
FIGURE 149

# Comparison of Aroclor 1242 and 1254 in Caddisfly at E6 1991



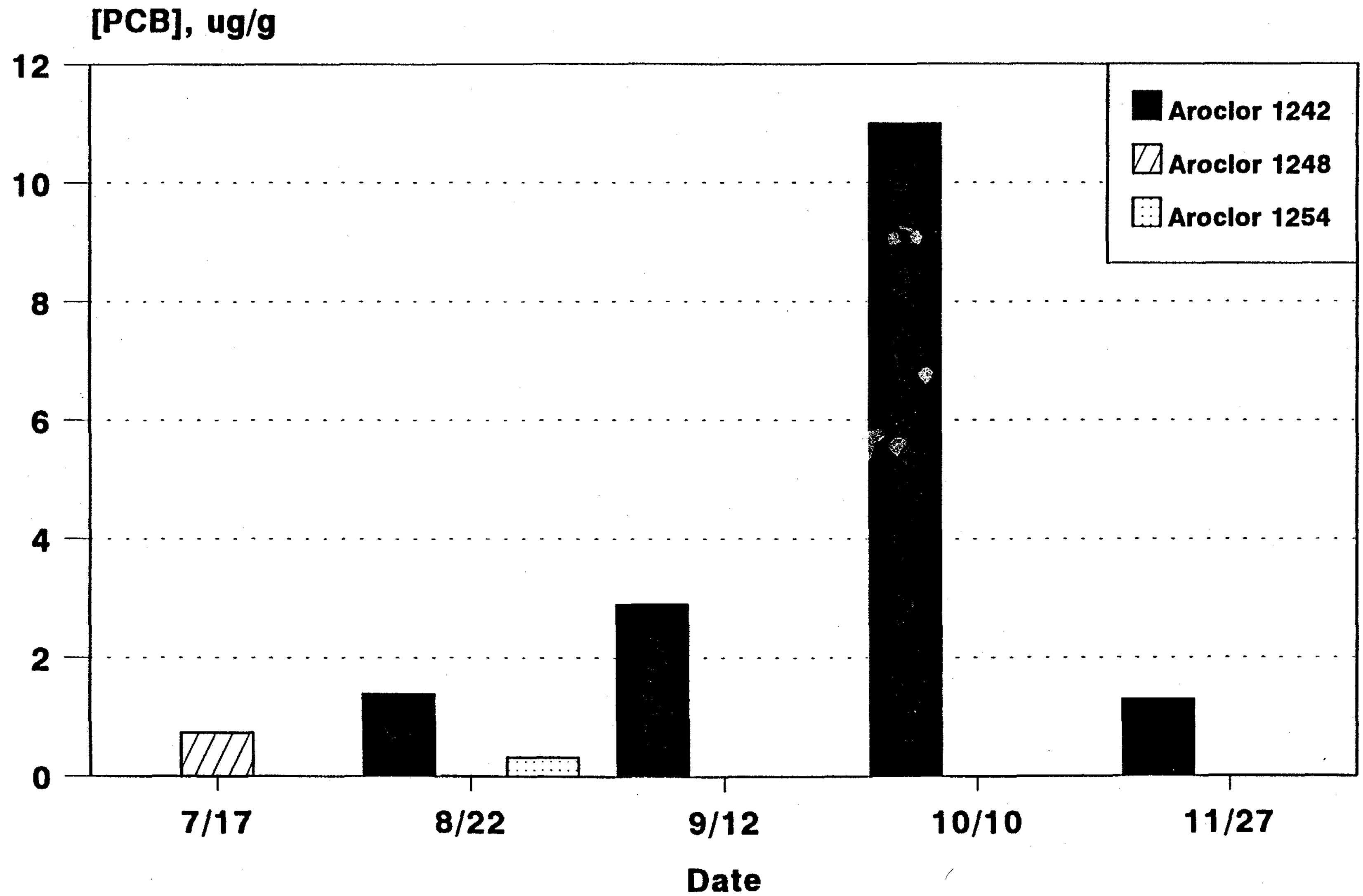

309962

# Comparison of Aroclor 1242 and 1254 in Caddisfly at E7 1991



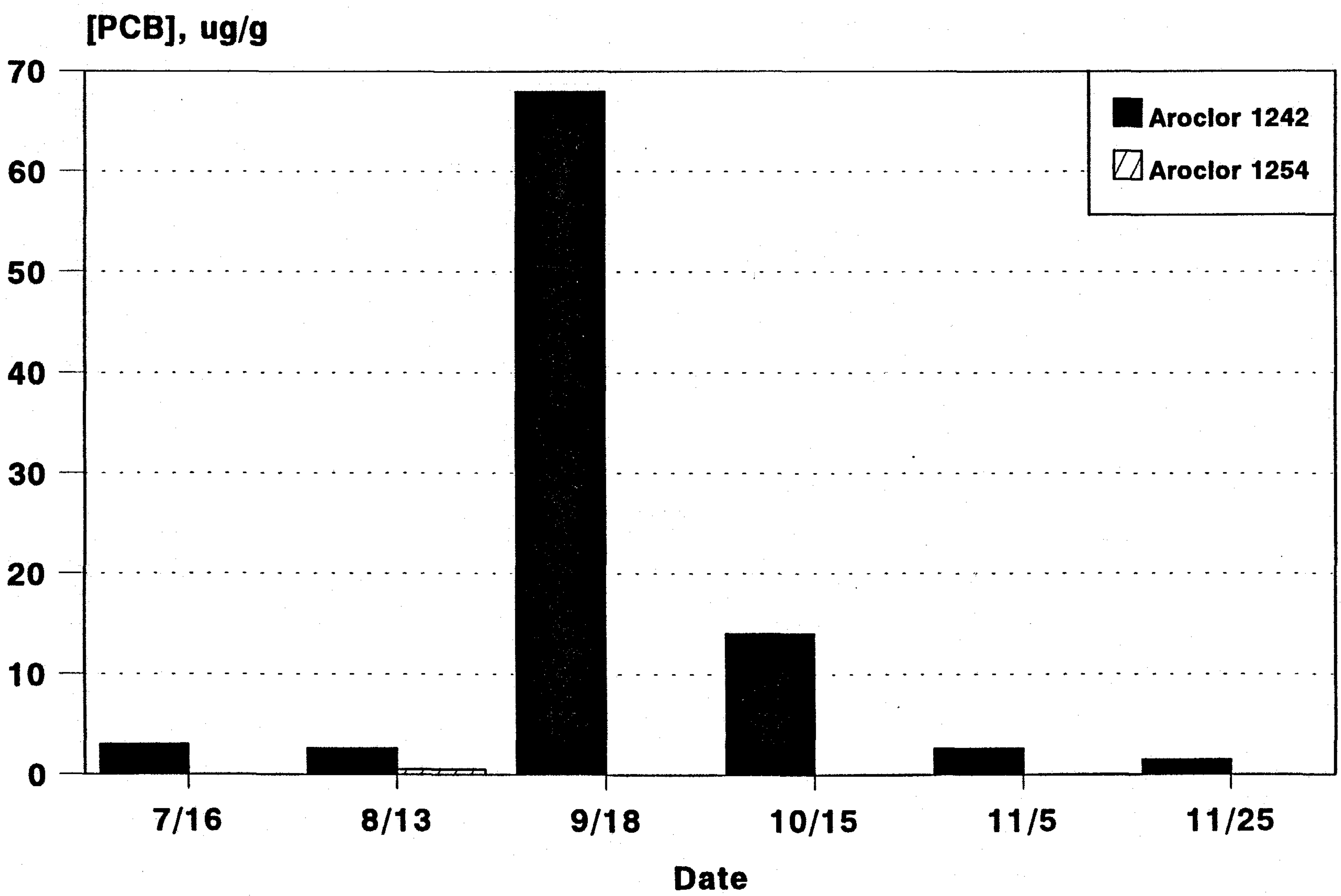

309963

# PCB in In-Situ Fathead Minnows at Station E5
# Post-Containment Monitoring
# June 29 to November 27, 1991



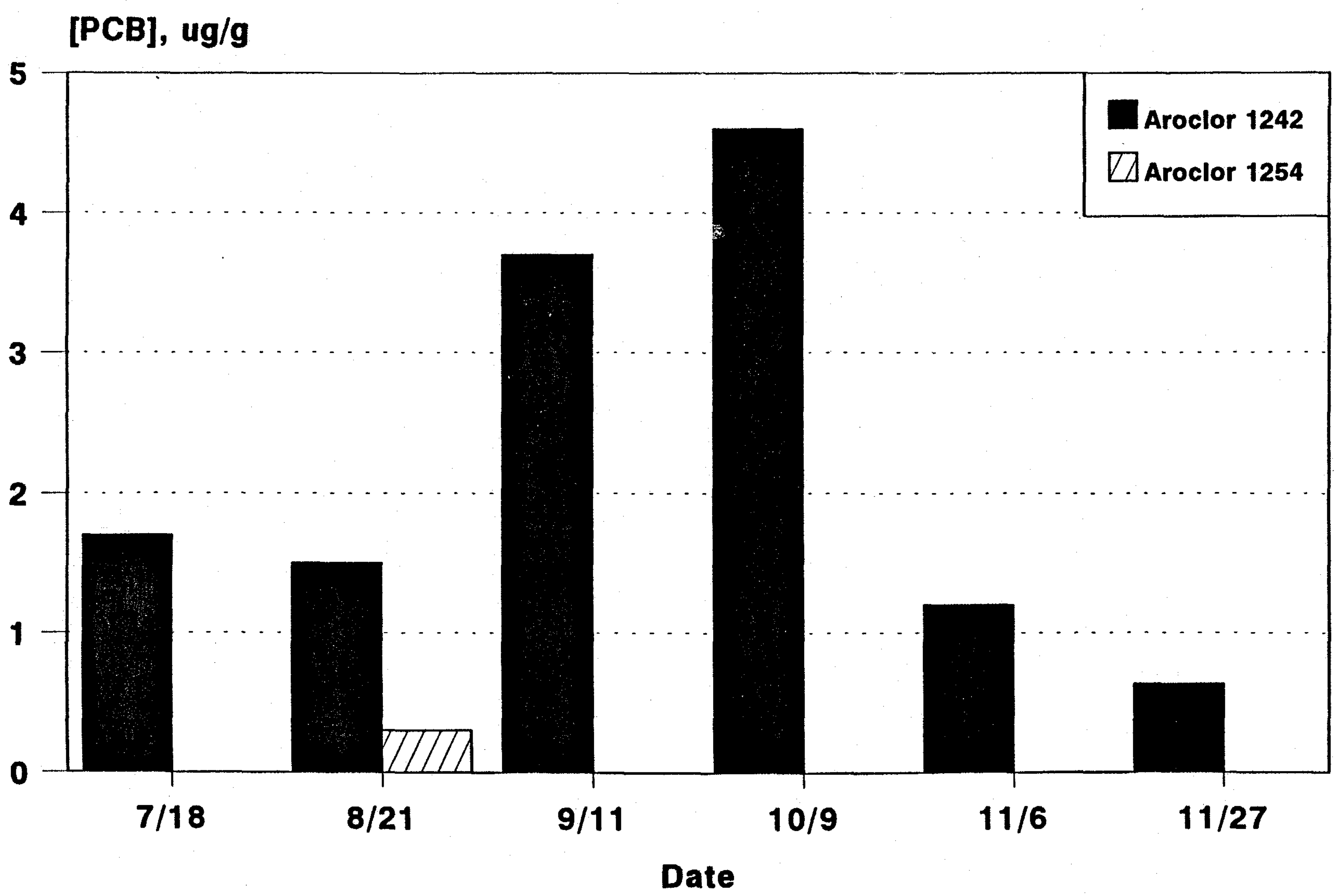

309964

# PCB in In-Situ Fathead Minnows at Station C2
# Post-Containment Monitoring
# June 29 to November 27, 1991



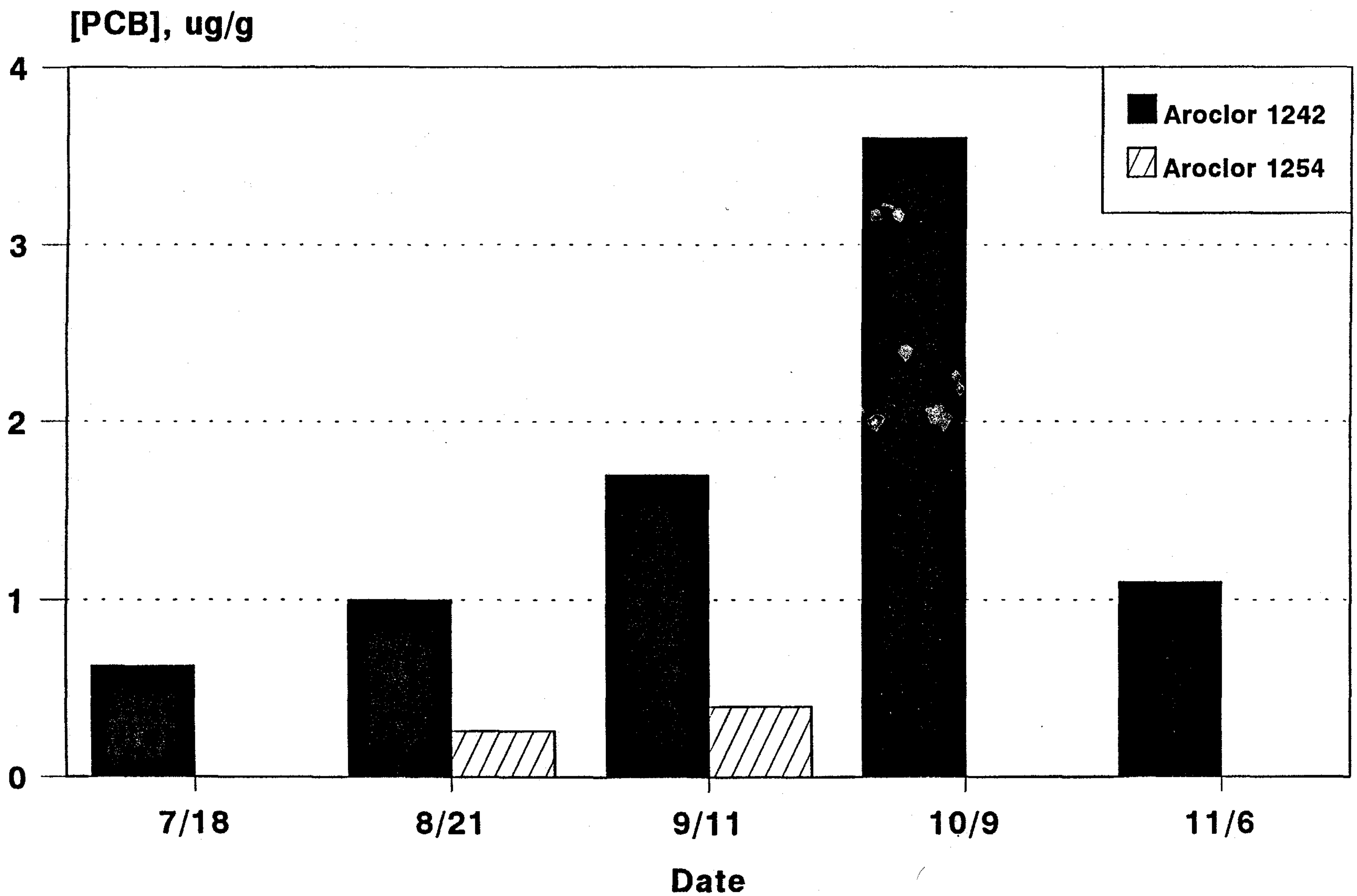

309965

# PCB in In-Situ Fathead Minnows at Station E6
# Post-Containment Monitoring
# June 29 to November 27, 1991




309966

# PCB in In-Situ Fathead Minnows at Station E7
# Post-Containment Monitoring
# June 29 to November 27, 1991




309967

# Longitudinal Trends in Hudson River Waterborne PCBs, Autumn 1991