FINAL

FISH SAMPLING AND ANALYSIS PLAN FOR MISSISSIPPI RIVER POOL 15

FOR 1992 FISH STUDY

Prepared for
Aluminum Company of America
(ALCOA)

Woodward-Clyde

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1992 FISH SAMPLING AND ANALYSIS PLAN

FOR MISSISSIPPI RIVER POOL 15

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIXES

1.0
INTRODUCTION/SITE BACKGROUND

1.1 SITE BACKGROUND

Woodward-Clyde Consultants (WCC)[1] was requested by the Aluminum Company of America (ALCOA) to develop a Fish Sampling and Analysis Plan (SAP) to further characterize fish polychlorinated biphenyl (PCB) concentrations within Pool 15 of the Mississippi River. This SAP summarizes sampling and analytical techniques to be employed in the 1992 fish study. The Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HSP) procedures can be found in the 1990 Fish Sampling and Analysis Work Plan (Young-Morgan & Associates, Inc. 1990) (see Appendices A and B). Methods and procedures described in this SAP will be employed to characterize PCB concentrations in fish within Pool 15 of the Mississippi River offshore of the Aluminum Company of America's (ALCOA) Davenport, Iowa, facility. This SAP complies with the Environmental Protection Agency's (EPA) stipulations in the Consent Order between ALCOA and EPA. The objectives of the Mississippi River Pool 15 Fish Sampling Investigation, as outlined by EPA, are "... to determine the need to continue or expand current advisories, to evaluate the risk to human health or the environment, and to determine if response actions for Pool 15 are necessary".

This SAP will serve as a guide for future sampling efforts by ALCOA within Pool 15. The use of Standard Reference Materials (SRMs) and statistical analyses of the data provided in this SAP are consistent with the methodologies outlined in the 1988 and 1990 studies.

[1] Young-Morgan & Associates (YMA) was retained by ALCOA to perform the fish collections. YMA merged with WCC in October 1991.

1.2 SITE DESCRIPTION

ALCOA owns and operates an aluminum product manufacturing facility near Davenport, Iowa, adjacent to Pool 15 of the Mississippi River, as shown in Figure 1. The areas of concern for the 1992 fish study are the sampling sites identified by EPA in the Consent Order. The sampling sites, shown in Figure 2, are described as:

- One site along the Illinois side of the river, previously known as Site 5 from the 1990 fish study and Site 6 from the 1988 fish study. For the 1992 study, this site will be referenced as **Site 5.**

- Site 2 from the 1988 and 1990 studies (just offshore from ALCOA's closed lagoon), centered approximately 500 feet downstream of groundwater monitoring well MW 9. For the 1992 study, this site will be referenced as **Site 2.**

- Site 3 from the 1988 and 1990 studies, expanded downstream to include Outfall 005. For the 1992 study, this site will be referenced as **Site 3.**

- Site 4 from the 1988 and 1990 studies (area surrounding the mouth of Duck Creek). For the 1992 study, this site will be referenced as **Site 4.**

Results from the 1990 study indicated that the concentration of fish PCBs were not significantly different between Sites 1 and 5 (alpha = 0.05). Therefore, Site 5 will be used as the background site because it is more heavily fished than Site 1. Site 1 will be excluded from the 1992 sampling effort. Actual site numbers will remain the same as for 1990 survey, i.e., Sites 2 - 5.

1.3 POTENTIAL CONTAMINANT SOURCES

The primary contaminants of concern are polychlorinated biphenyl (PCBs). Historical use of PCBs at the facility has resulted in measurable concentrations of PCBs on the plant site, within the sediments in plant outfalls and in near-field sediments just offshore from the Ash Pond, within Pool 15 (WCC, 1992). All PCB results for this study will be reported as individual Aroclors (i.e., 1016, 1221, 1232, 1242, 1248, 1254 and 1260) and total PCBs.

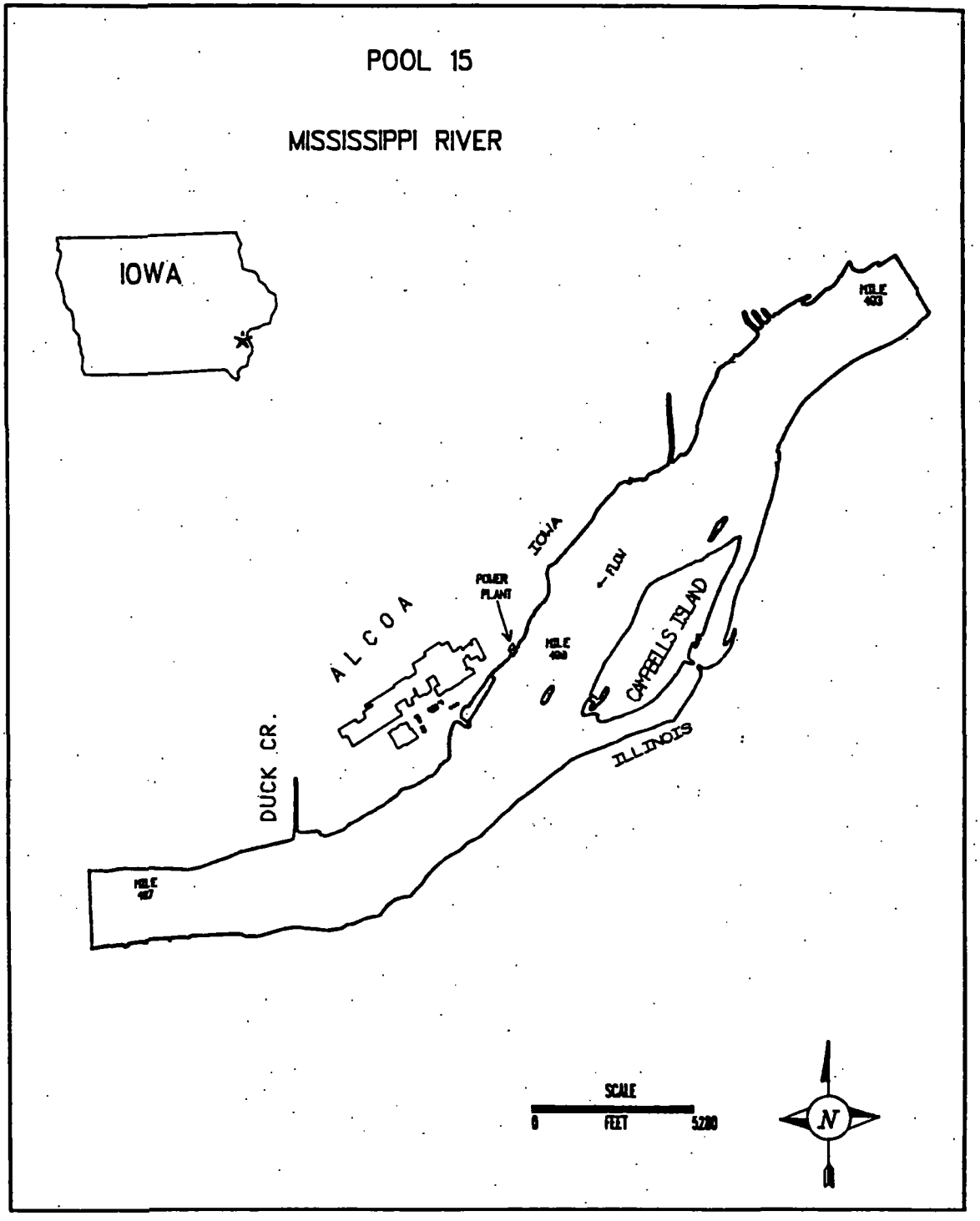

Figure 1. Location of ALCOA Davenport Works.

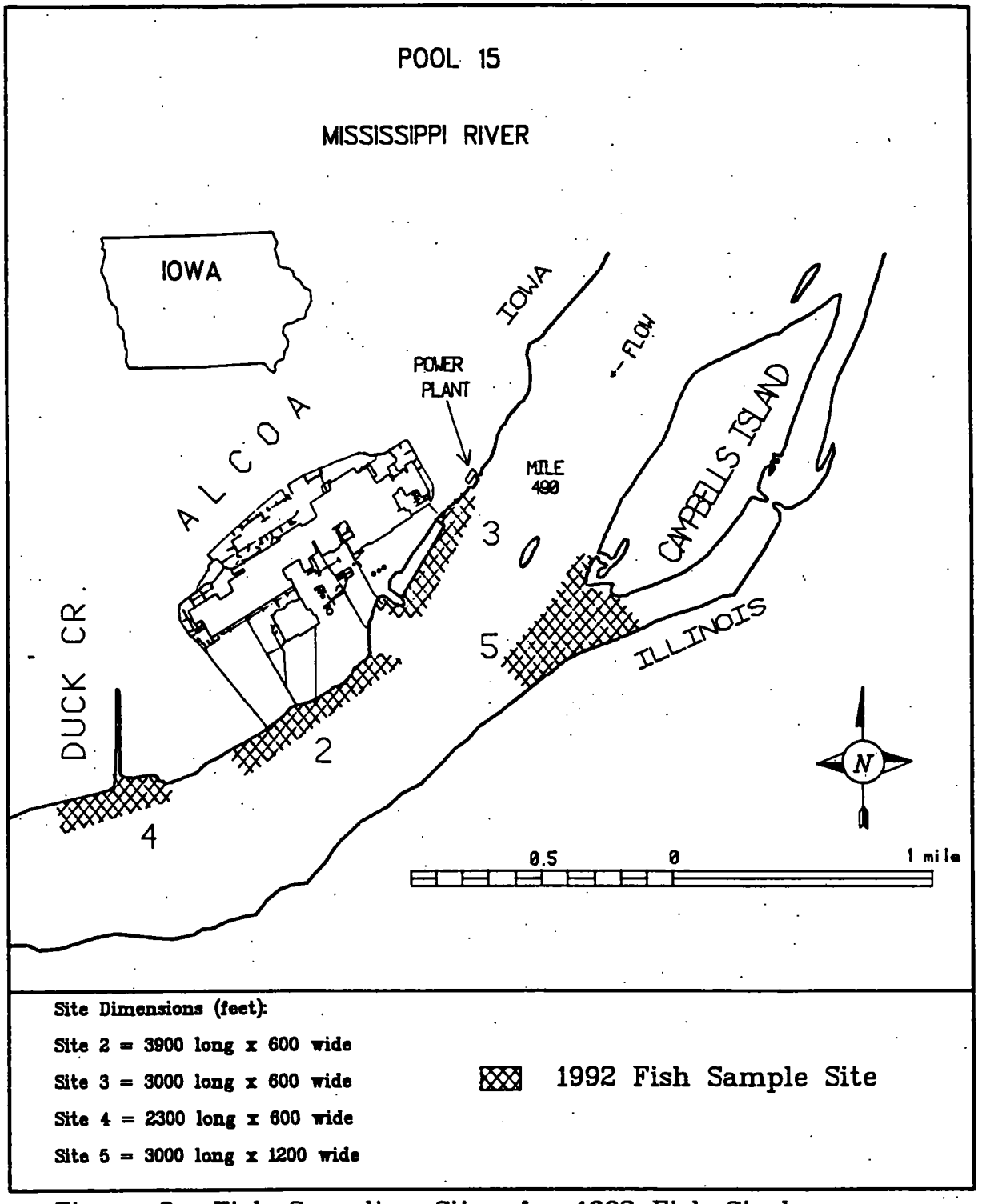

Figure 2. Fish Sampling Sites for 1992 Fish Study.

1.4 SUMMARY OF PREVIOUS STUDIES

An extensive fish collection was performed by ALCOA in October 1988. Carp, freshwater drum, channel catfish, bluegill/crappie and white bass were sampled at five sites within Pool 15; more than 400 fish were analyzed for PCBs. Results of this study showed that PCB concentrations in carp, on the Iowa side of Pool 15, exceeded the Food and Drug Administration (FDA) limit of 2.0 ppm. Measurable concentrations of PCBs also were reported in channel catfish and carpsucker on the Iowa side of Pool 15, although sample sizes were insufficient to draw statistically valid conclusions from these datasets.

The fish collection was repeated by ALCOA in October 1990. Carp, carpsucker and channel catfish were collected in sufficient numbers from the five sites, and freshwater drum from the two background sites, to yield statistically valid results. More than 250 fish were analyzed for PCBs. No statistical analyses were performed on flathead catfish, shovelnose sturgeon, and smallmouth buffalo at any site and freshwater drum at Sites 2 ,3 and 4 due to inadequate sample sizes. Results of the 1990 study showed that the Consent Order value of 2.0 ppm total PCB concentration was exceeded by the upper 95% Confidence Interval (CI) of the mean PCB concentration in fillets for carp at Sites 2 and 3 and carpsucker at Sites 2, 3 and 4. The upper 95% CI of the mean PCB concentration in fillets did not exceed 2.0 ppm total PCBs for channel catfish at Sites 1, 2, 3, 4 and 5; carp at Sites 1, 4, and 5; freshwater drum at Sites 1 and 5; and carpsucker at Sites 1 and 5 (Table 1). In accordance with the Consent Order, fish in which the upper 95 % CI of the mean PCB concentration is < 1.0 ppm during the first sampling event can be excluded from the sampling target list for subsequent sampling events. Site 4 channel catfish tested < 1.0 ppm total PCB (upper 95 % of mean = 0.37), and therefore may be removed from the species list at Site 4 (Table 2).

PCB concentrations of fillets in channel catfish, common carp, freshwater drum and river carpsucker at Sites 1 and 5 (background sites) were statistically compared using the Students t-Test. The results of the test showed no statistical differences exist between PCB concentrations at the two background sites ($\alpha = 0.05$). Therefore, fish from only one background site will need to be collected during future sampling events. Site 5 was selected as the background site because 1) data from 1988 and 1990 are available for this site.

Table 1. Sites at which the upper 95% CI of the mean exceeded 2.0 ppm PCB in fish fillets, October 1990.

SITE	Carp	Carpsucker	Channel Catfish	Freshwater Drum
1	NO	NO	NO	NO
2	YES	YES	NO	*
3	YES	YES	NO	*
4	NO	YES	NO	*
5	NO	NO	NO	NO

YES: Exceeded 2.0 ppm PCB

NO : Did not exceed 2.0 ppm PCB

* : Inadequate sample size for statistical analysis

Table 2. Sites at which the upper 95% CI of the mean exceeded 1.0 ppm PCB in fish fillets, October 1990.

SITE	Carp	Carpsucker	Channel Catfish	Freshwater Drum
1	NO	NO	NO	NO
2	YES	YES	YES	*
3	YES	YES	YES	*
4	YES	YES	NO	*
5	NO	NO	NO	NO

YES: Exceeded 1.0 ppm PCB

NO : Did not exceed 1.0 ppm PCB

* : Inadequate sample size for statistical analysis

and 2) substantial fishing pressure occurs within the site. Based on the 1990 dataset, the fish collection schedule for 1992 must include Sites 2, 3, 4 and 5 and all species specified during the 1990 sampling except channel catfish at Site 4.

During the three years since the 1988 fish study, ALCOA has been investigating potential sources of PCBs from the facility that may have contributed to the PCB concentrations observed in Pool 15 carp and carpsucker. Results from sediment sampling of the six plant outfalls have shown measurable concentrations of PCBs. Results of the sediment studies will be summarized in the sediment investigation report to be submitted in January 1992.

2.0
SAMPLING OBJECTIVES

2.1 SPECIFIC OBJECTIVES

The objectives of the Mississippi River Pool 15 Fish Sampling Investigation, as outlined by EPA, are "... to determine the need to continue or expand current advisories, to evaluate the risk to human health or the environment, and to determine if response actions for Pool 15 are necessary". Specifically, this SAP defines the recommended protocol for characterization of PCB concentrations in seven species of fish, at four sample locations, as specified by EPA in the Consent Order. The species of concern are:

1. carp (Cyprinus carpio)
2. flathead catfish (Pylodictis olivaris)
3. channel catfish (Ictalurus punctatus)
4. river carpsucker (Carpiodes carpio)
5. shovelnose sturgeon (Scaphirhynchus platorynchus)
6. shovelnose sturgeon eggs (when available)
7. smallmouth buffalo (Ictiobus bubalus)
8. freshwater drum (Aplodinotus grunniens)

For each of the target species, specimens will be collected which are equal to or larger than the following minimum adult sizes, as specified by the American Fisheries Society (Nielsen and Johnson 1985):

SPECIES	MINIMUM LENGTH (mm)
Carp	280
Flathead Catfish	380
Channel Catfish	280
River Carpsucker	280
Shovelnose Sturgeon	500
Smallmouth Buffalo	280
Freshwater Drum	280

No sturgeon and only a single smallmouth buffalo were collected during the 1990 fish collection. Appropriate habitat is lacking for these two species at all of the specified sample sites. If a minimum of ten (10) specimens of these species cannot be collected during the 1992 sampling effort, inclusion of sturgeon and smallmouth buffalo in future sampling events will be reconsidered.

2.2 USES OF DATA

The fish data will be summarized in report format and submitted to EPA within thirty (30) days following receipt of final laboratory results. The data will be used by the Iowa Department of Natural Resources (IDNR) or other agencies to determine the need to continue or expand current fishing advisories for Pool 15 and by EPA in determining if response actions for Pool 15 are necessary. Species in which the upper 95% confidence limit of the mean PCB concentration was below 1 ppm at all individual sampling sites during the 1990 sampling were removed from the target species list for future sampling events. Site 4 channel catfish was the only site/species eliminated from the target list.

15 channel catfish were caught in 1992 Fish Sampling Event

Additional investigations or studies of Pool 15 fish, as addressed in the Consent

Order, shall be conducted on a biennial basis following the 1992 study, until the upper 95% confidence limit of the mean total PCB concentration drops below 2.0 ppm at each sampling location for each species of fish for two successive sampling events. Upon meeting this criterion, ALCOA will continue fish sampling, as specified in the Consent Order, every three years until the mean total PCB concentration drops below 1.0 ppm for each species of fish at each individual sampling location for two successive sampling events.

3.0
SAMPLE LOCATION AND FREQUENCY

The objective of the 1992 fish investigation is to obtain samples that accurately describe the current PCB concentrations in fish fillet for the species and sites identified by EPA within Pool 15 of the Mississippi River. EPA has specified a minimum sample size requirement of ten (10) specimens of each species at each site, if possible. For this study, a reasonable effort will be expended to collect between ten (10) and fifteen (15) adult members of each of the seven (7) species at each site. A reasonable effort is defined as six (6) person days per site (i.e., a field crew of four members sampling for one and one-half days). This estimate was derived from experience during the two previous surveys and is a seasonal projection. If 10 individuals of a given species cannot be obtained at a given site after six (6) man days, the fish collected will be analyzed and the results presented in a separate appendix in the final report. These data will not be statistically analyzed or used to interpret compliance with the Consent Order.

Fish species identification and documentation will be conducted in the field by an experienced fisheries biologist. If more than fifteen (15) specimens are caught for a species at a site, the first fifteen (15) which satisfy the size requirements specified in this SAP will be randomly selected and submitted for analysis. The remainder will be released at the location caught. Every effort will be made to release the extra fish unharmed.

3.1 COLLECTION SITES

The sampling sites as specified by EPA are shown in Figure 2. For the 1992 sampling, background samples will be collected from Site 5 (Site 6 in the 1988 study). Site 5 was selected as the background site because ALCOA has collected fish samples from this location in both the 1988 and 1990 sampling events and because substantial fishing pressure occurs within this site.

3.2 QUALITY ASSURANCE

The Quality Assurance Project Plan (QAPP) approved for the 1990 fish study will also be used during the 1992 sampling (Young-Morgan & Associates, Inc. 1990) (see Appendix A). The QAPP addresses the organization, objectives, activities and specific quality assurance and quality control activities designed to achieve the data quality goals of the 1992 fish collection.

Field quality assurance is the responsibility of the Sampling Coordinator. Frequent verification of adherence to sampling protocols will help ensure that the data will be precise, accurate, representative, comparable and complete. Operation of all equipment used during the fish collection will follow each manufacturer's specifications. Copies of all field notes and chain of custody forms will be included in the 1992 Fish Sampling and Analysis Report.

Detailed record keeping techniques include field notes, identification of sampling locations through reference to a permanent marker and photographs. The field log will provide sufficient detail so that an independent party could reconstruct the sampling effort. Custody procedures are outlined in the QAPP.

Laboratory quality assurance will include as a minimum the analysis of ten (10) percent of all samples as analytical duplicates. In addition, approximately ten (10) percent of all samples will be split and sent to the secondary lab for analysis. Percent recovery of spiked decachlorobiphenyl (DCBP) will be reported on all samples.

4.0
SAMPLE DESIGNATION

Each fish sample collected will be assigned a unique sample identification number following identification in the field by an experienced fisheries biologist:

Site X - Species - Zz - Mo/Da/Yr

Where: Site X = Sampling Site Number 2 - 5.

Species = Common name for each of the seven target species (i.e., carp, channel catfish, etc.).

Zz = Consecutive sample number issued within each species, at each site (i.e., 1 - 15).

Mo/Da/Yr = Date of collection

Sample identification numbers will be recorded on the sample labels, the field log and the chain of custody form.

5.0
SAMPLING PROCEDURES AND EQUIPMENT

A variety of sampling methods will be employed to collect the range of species required. Collection methods may include a combination of the following: gill nets, fyke/hoop nets, trot lines, electroshocking equipment, dip nets and bottom trawls. Details of sampling methods are provided in the following section. Specific Standard Operating Procedures (SOPs) are included in Appendix C for each type of collection method that may be employed.

5.1 PRESAMPLING ACTIVITIES

Field personnel will be properly trained and experienced in the collection of fish samples. Supervisory personnel will have a minimum of two years of experience and advanced degrees in environmentally related fields. All crew members will receive training in equipment operation prior to execution of field work.

The ALCOA Project Manager will be responsible for notifying appropriate contacts of field activities (i.e., security, IDNR, EPA). EPA will be notified at least two weeks prior to sampling so that provisions can be made to collect split samples. A scientific collecting permit will be obtained from IDNR prior to sampling. The Sampling Coordinator will determine if collections are possible prior to mobilizing to the site (i.e., evaluation of weather conditions, river flows, etc). If conditions exist that would jeopardize field crews or prohibit sampling, ALCOA will advise EPA and reschedule.

All equipment will be tested prior to initiation of field activities to ensure proper function. Spare parts and operating manuals will be taken with equipment to the field. Arrangements for shipping/delivery of samples to the labs will be made prior to mobilization to the field.

5.2 FIELD PROCEDURES

Landmarks used to delineate each sampling site during the 1990 study will be used as reference points to pinpoint exact sampling locations during the 1992 fish collection. Fish will be collected following the SOPs specified in Appendix C using the previously mentioned techniques. Copies of these SOPs will be taken to the field and maintained in the field notebook for reference. Although the written SOPs are very specific, decisions as to which procedures are appropriate will have to be made in the field by the experienced fisheries biologist. A field station summary sheet, as shown in Figure 3, will be completed at each sampling station to ensure that the particular SOPs and any deviations employed are noted. Copies of these sheets will be archived and included as QA/QC documents in the final report.

At least 10 fish of each of the seven species will be collected at each sampling station, if possible. Upon capture, the fish will be measured to the nearest millimeter to ensure that minimum size requirements are met; undersized individuals will be released immediately. Specimens collected for analysis will be weighed to the nearest gram, measured to the nearest millimeter, tagged and individually wrapped in a plastic bag and placed on dry ice to expedite sample freezing. Scales will be removed in the field from the following fish: common carp, river carpsucker, smallmouth buffalo and freshwater drum in the field. The sample identification tags will contain the following information:

1) fish species
2) sampling location
3) collector
4) sampling date and time
5) identification number.

DATE: _____ COLLECTOR (s): _____

JOB #: _____

COLL. DATE: _____ IDENTIFIER (s): _____

LOCATION: _____

ID # (SITE # – SPECIES – Zz – MM/DD/YY)	TL (MM)	WT (G)	COLL. METHOD	COMMENTS

SITE #: 2, 3, 4 OR 5

SPECIES: CC = carp, FHC = flathead catfish, CCF = channel catfish, SNS = shovelnose sturgeon, SMB = smallmouth buffalo, FWD = drum, RCS = river carpsucker

Zz: Consecutive sample numbers issued with each species, at each site (1 – 10).

DATE: Month/Day/Year (01/01/92).

Figure 3. Sample Field Station Summary Sheet.

Fish will be frozen immediately on dry ice in coolers. A chain of custody form will be completed for each cooler, itemizing each fish contained therein. Custody forms will document sample integrity from the field through analysis. Custody forms will be included in the final report. Species identification will be verified in the field before shipment to the lab and noted on the chain of custody form.

At each sampling station, a sample fish blank will be included to quantify any contamination occurring during sample collection, storage and transport to the laboratory. Uncontaminated fish will be purchased from a hatchery or grocery store and transported to the field in decontaminated containers. The fish blanks will be weighed, measured and stored using the same techniques used for fish collected from Pool 15. One fish blank will be analyzed per station following the same QA/QC protocol, and the results included in the final report. A minimum of seven fish blanks will be obtained from a hatchery or grocery store to reflect the sizes specified in the SAP. Samples will be prescreened to verify that no background PCB contamination exists. A minimum of 10 percent of the fish blanks will be analyzed prior to initiation of field activities. Fish blanks will be submitted to both laboratories.

Samples will be delivered to American Analytical Laboratory in Cleveland, Tennessee, for processing and analysis. Fillet samples will be collected from each fish. All samples will be analyzed discretely with the skin on except flathead catfish, channel catfish and shovelnose sturgeon. Skin will be removed from these fish to simulate actual conditions of consumption. Using decontaminated equipment, fillet samples will be diced, mixed and subsampled and stored as discussed in the analytical protocol (Young-Morgan & Associates, Inc. 1990). Split samples will be made available to EPA at their request.

5.3 EQUIPMENT REQUIRED

The following equipment will be required during fish collections:

Electrofishing boat
Work Boat
AC/DC control box
Gill nets
Dip nets
Spool of rope
Fyke/Hoop Nets
Trot lines
Seines
Bottom trawls
Gasoline cans
Funnel
Spare fuses
Electrodes
Repair tools
Field log, clipboard, forms and pencils
Maps
Scales
Calibration weights
Measuring board
Buckets
Life jackets
First Aid Kit
Fire extinguisher
Identification keys
Flagging tape
Camera with film
Copies of SOP's
Waterproof labels
Plastic bags
Rubber gloves
Waders and rubber boots
Coolers
Ice

6.0
SAMPLING QUALITY ASSURANCE/QUALITY CONTROL

The major components of the field sampling QA/QC program include:

1) Detailed, written standard operating procedures (SOPs)
2) Use of field station summary sheets for written documentation of deviations from SOPs
3) Sample identification tags
4) Chain of custody forms and
5) Sample fish blanks.

Each of these components contributes to the assurance of the integrity of the sampling program.

6.1 SAMPLE PREPARATION

In the field, whole fish samples will be wrapped in plastic bags with identification labels and custody forms, and sealed in coolers with dry ice for delivery to American Analytical Labs by WCC personnel. Offal samples will be wrapped in plastic bags with identification labels and archived at or below 4°C. Samples will be filleted, diced, mixed and subsampled at American Analytical Labs (AAL) in Cleveland, Tennessee. American Analytical Labs will prepare all samples to be analyzed, and send the required splits and duplicates to the secondary lab using AAL chain of custody procedures.

All equipment used to fillet and prepare samples for analysis will be decontaminated with detergent, rinsed with tap water, rinsed with distilled water and rinsed with methanol in accordance with EPA SW-846 protocols. An equipment blank will be prepared each day by rinsing the decontaminated equipment with laboratory grade distilled water and collecting the blank in a glass jar with Teflon lined cap provided by the analytical laboratory. Decontamination fluids will be collected, segregated and managed as potentially hazardous wastes.

6.2 SHIPPING REQUIREMENTS

Samples will remain in the custody of WCC until released to the laboratory. Samples will be shipped overnight or hand delivered by WCC personnel. Prior to analysis, all samples will be stored at or below 4°C.

6.3 LABORATORY PROTOCOL

Two analytical laboratories have been selected to conduct the PCB analyses. American Analytical Laboratory in Cleveland, Tennessee, is the primary test laboratory and EMS Heritage Laboratory of Kansas City, Missouri, will provide secondary laboratory services. American Analytical will perform all sample preparation and will ship prepared samples under custody to EMS Labs. Both laboratories have extensive experience in the analysis of PCB and PCB type compounds in fish tissue and have analyzed fish samples for ALCOA previously. Samples will be analyzed using a capillary DB5 column using the same methods of quantitation (i.e. same peaks and peak areas). A minimum of five standard reference material (SRM) samples will be analyzed by each laboratory. These results will be submitted to EPA for approval of analytical technique prior to analysis of Pool 15 fish samples. A SRM also will be run with each batch of samples. If necessary, samples will be concentrated to achieve the required detection limit. There is no approved EPA method for analyzing PCB compounds in fish tissue. The proposed method is a modified version of EPA Method 608 which has been employed in projects approved by EPA Region IV for evaluation of DDT compounds in Alabama and was used for monitoring at several sites for ALCOA projects in eastern Tennessee and western North Carolina (Appendix D).

6.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The objective of the laboratory QA/QC program is to ensure that the data used in the assessment are of the quality to satisfy the program objectives. The major components of the laboratory QA/QC program include:

1) specific chain-of-custody protocol and archiving procedures;

2) internal QC samples;
3) external QC samples;
4) quality assessment samples;
5) use of detailed, written SOPs for analytical methods.

Upon delivery to the laboratory, the samples and chain of custody forms will be signed over to the laboratory receiving agent. The chain of custody forms will accompany the samples throughout sample preparation, extraction and analysis to document handling. Any samples collected and not analyzed will be archived for retrospective analysis if necessary.

Internal QC samples are prepared by the analyst, run with each analytical batch, and compared to the control limits during the run. Internal QC samples include (1) calibration or reagent blanks, (2) detection limit QC check samples, (3) calibration QC check samples, (4) analytical splits and (5) use of specific matrix standard reference materials. A SRM material will be sent to both labs for calibration prior to analysis of field samples to assure the integrity of laboratory results.

External QC samples are employed with the secondary laboratory to assess performance and to minimize the potential for interlaboratory biases. This process includes analysis of 10% of all samples by the secondary laboratory, use of matrix blanks, sample blinding and most importantly the use of SRMs.

These audit samples will be the primary means of assessing detection limits, accuracy, interlaboratory bias, and precision relative to the data quality objectives. In addition, the laboratory records summarizing sample preparation, extraction, analysis and interpretation will be included in the final report.

The previously referenced SOP for PCB analysis of fish tissue will be used by both primary and secondary laboratories. Any deviations from the specified SOP will be reported in the laboratory records and noted in the final report. Both primary and secondary labs shall attempt to achieve a working detection limit of 0.1 μg/g to maximize interpretation of the data.

6.5 CHAIN-OF-CUSTODY RECORD

The following sample custody procedures will be used:

1) Empty sample containers will be prepared and relinquished by the laboratory on a chain-of-custody record or purchased certified pure from the manufacturer.

2) Each sample collected for the project will be entered on the chain-of-custody record.

3) The original chain-of-custody record will accompany the sample containers during transport to document controlled custody.

4) If custody is relinquished through a common parcel carrier for delivery to the laboratory, the following protocol will be followed:

- The original chain-of-custody record will be placed inside the shipping package.

- The shipping package will be sealed with a custody seal. The seal will be placed on the package in such a manner that the package cannot be opened without breaking the seal. The seal will serve to document that the samples remained unaltered during shipment through the common parcel carrier.

5) After sample preparation by American Analytical Labs, required split and duplicate samples will be shipped to the secondary lab under AAL chain of custody.

6) The laboratory will assume custody of the samples upon receipt. A designated Sample Custodian will be charged with sample care and receipt and verification of custody seal condition. These observations will be noted by the Sample Custodian on the chain-of-custody form upon receipt.

7) Sample preparation and analysis custody will be tracked by laboratory worksheets.

8) The laboratory will retain custody of the samples in a secure area until such time as the samples are ordered destroyed.

9) A copy of the chain-of-custody record will be retained.

Sample custody procedures are modifications of those established by the U.S. EPA National Enforcement Investigation Center (NEIC) which were developed for bulk transfer of samples.

6.6 HOLDING TIMES

Based on conversations with EPA Region VII during our April 5, 1990, meeting, adherence to the holding times specified by EPA Method 8080 is not required for this study. Archived samples will be stored at or below 4°C.

6.7 RECORD KEEPING

All records will be maintained in bound books. A master log will be established to identify and trace each sample. The same sample identification number will be used from sample acquisition through final data tabulation. Detailed notebooks will be maintained by laboratory personnel for samples, instruments and calibration records.

6.8 ASSESSMENT OF DATA USEABILITY

The laboratory results will be thoroughly reviewed prior to inclusion of the data in the statistical analysis. Each result will be evaluated in terms of quantitative and qualitative characteristics.

6.8.1 Assessment of Quantitative Characteristics

The analytical results will be evaluated for the following quantitative characteristics:

1) Precision - the agreement or reproducibility of individual measurements of the same property performed under specified similar conditions. Precision will

be evaluated within and between laboratories. The range of duplicate analyses, the range of split samples and/or the relative range of the mean concentration will be used to evaluate precision,

2) Accuracy - the deviation of a result from a true value.
The reported percent recovery interval will be used as an indication of accuracy. Data will be deemed acceptable if percent recovery ranges from 70 to 130 percent (i.e., +/- 30%). Decachlorobiphenyl will be used as the spiking compound as stated in the laboratory protocol,

3) Method Detection Limit - the minimum concentration of a substance that can be measured and reported with 99 % confidence that the true value of that substance is above zero. Method Detection Limits will be reported for all results. A MDL of 0.10 μg/g is typically obtainable by the referenced laboratory method.

Each of these quantitative characteristics will be addressed in the final report.

6.8.2 Assessment of Qualitative Characteristics

The analytical results will be evaluated for the following qualitative characteristics:

1) Representativeness - the degree by which data express an environmental condition. The field notebook, sampling station summary sheets, SOPs and chain of custody forms will be evaluated to assure that the data are representative of the current environmental situation,

2) Comparability - the measure of confidence with which data are equivalent. Review of the field and laboratory procedures used will enable a determination of the comparability of the collected data from each station with the specified FDA standard of 2.0 ppm PCB in fish fillets,

3) Completeness - the measure of confidence with which the data meet the specific objectives of the study. A review of the field activities, laboratory analyses, and statistical evaluation will be performed to assure the completeness of the dataset.

A summary of these qualitative characteristics will be included in the final report.

The specified QA/QC steps included in this study plan are intended to ensure the acceptability of all collected data. However, any data that fail to meet the quantitative and qualitative criteria of data assessment will be excluded.

7.0
DATA INTERPRETATION AND REPORTING

The resulting data will be statistically analyzed to calculate the mean PCB concentration for each species at each site. The results will be presented in a final report within 30 days of completion of laboratory analysis. Results of all fish data, analyses and statistical calculations will be summarized in tabular form within the report, in the format requested by EPA. The final report will include all procedures, QA/QC results, field documentation, laboratory documentation, statistical analysis and recommendations regarding future sampling events, as specified in the Consent Order. All data summarized in the report also will be provided to EPA in digital format.

7.1 PROJECT SCHEDULE

The 1992 fish collection can be completed within twenty-one (21) days. Study initiation can commence within thirty (30) days of receipt of notification to proceed. A schedule of projected sampling dates will be provided to EPA for provision of split samples at least two weeks prior to sample initiation. The draft "Fish Sampling and Analysis Report" will be submitted to EPA within thirty (30) days following receipt of final laboratory results. Scheduling projections are based on favorable weather conditions.

8.0
REFERENCES

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APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

ADDENDUM

ADDENDUM

FISH SAMPLING AND ANALYSIS WORK PLAN
Mississippi River - Pool 15

Appendix 1
Quality Assurance Project Plan

September 1990

Objectives, functional activities and specific quality assurance and quality control activities for the 1992 fish study will be as described in the previously submitted *Quality Assurance Project Plan, Appendix 1* of the *Fish Sampling and Analysis Plan* September 1990.

The following changes in project organization should be noted. Tim Thompson will serve as Sample Custodian for the 1992 fish study. EMS Heritage Laboratory, Kansas City, Missouri will be the secondary laboratory. The analytical coordinator representing EMS Heritage Laboratory will be Sherry Landreth.

APPENDIX B

HEALTH AND SAFETY PLAN

ADDENDUM

FISH SAMPLING AND ANALYSIS WORK PLAN
Mississippi River - Pool 15

Appendix 2
Health and Safety Plan

September 1990

Health and safety procedures and standards for the 1992 fish study will be in accordance with the previously submitted *Health and Safety Plan, Appendix 2* of the *Fish Sampling and Analysis Plan* September 1990.

APPENDIX C

STANDARD OPERATING PROCEDURES

Bottom Trawl Sampling

BACKGROUND

Trawls are specialized submarine seines used in large, open-water areas of reservoirs, lakes, large rivers, estuaries and in the ocean. The nets are towed by a boat at sufficient speed to overtake and enclose fish. Three common types of trawls are beam, otter and mid-depth. Each type of gear is selective for a particular group of fish (benthic, pelagic or surface). Specifically, otter trawls derive their name from the otter boards attached to the forward end of each wing to keep the mouth of the net open. An otter trawl is an effective method for obtaining qualitative and quantitative fisheries data. Quantitative data (timed tows) can be obtained via timed tows to determine relative and seasonal abundance of species regularly collected. Otherwise, otter trawls can be used to selectively collect for near-bottom or bottom dwelling fish (i.e., freshwater drum, sturgeon, etc.).

PROCEDURES

Sampling Equipment

The otter board is a large, rectangular board usually 1 to 2.5 m long, 1 to 1.5 m high, and 5 to 10 cm thick. One edge is heavily shod with an iron runner to slide over the bottom. The front edge is usually rounded on the bottom to aid in the bounding over obstructions. The towing bridle or wrap is attached to the board by four heavy chains or short heavy rods. The tow forward rods are shortened, so that when towed the board sheers to the side. As the tow boards sheer in opposite directions, the mouth of the net opens. Floats along the headrope keep the net from snagging, and the weights on the lead-line keep the net on the bottom. The entrapped fish are funneled back into the bag of the trawl.

Sampling Strategy

If areas of sufficient length and depth (~ 500 ft. long x 20 ft. deep) are available within a site, trawling may be used to collect target fish species. Sampling effort will consist of a successive tows per site, designated by the experienced fisheries biologists conducting the sampling. Fish collected in the cod end of the trawl will be positively identified and specimens other than the target species will be returned to the river.

Electrofishing

BACKGROUND

Electrofishing is the use of electricity to capture fish. As electrical current passes through water, a fish within the effective field creates an area of resistance. According to Nielsen and Johnson (1983), the resistance produces a voltage gradient in the fish and causes the organisms musculature to react involuntarily. Typically, three responses are observed 1) electrotaxis (forced swimming), 2) electrotetanus (muscle contractions), and 3) electronarcosis (muscle relaxation).

Electrofishing techniques vary from situation to situation and no one method will be successful in al cases. Generally, accepted applications of this technique are used successfully in lakes, rivers and streams. Efficiency of electrofishing is affected by many variables including fish species and size, water quality characteristics and clarity, and habitat characteristics of a sample site. For example, this fish sampling techniques typically is not used for areas with water depths greater than 10 feet because retrieval becomes difficult with increasing depth.

PROCEDURES

Sampling Equipment

The electrofishing unit consists of a boat equipped with a portable heavy-duty generator powered by a gasoline engine, an electrical control section consisting of a modified commercially-sold, variable-voltage pulsator, and two electrodes (anode and cathode). The electrical section permits AC voltage outputs between 50 to 700 and DC voltages between 25 to 350. Voltage options allow for better control of electrical fields required to immobilize many fish found in various types of water (EPA, 1973).

Sampling Strategy

Decisions on the use of AC, DC, pulsed DC, and the selection of the electrode shape, electrode spacing, amount of voltage, and proper equipment is dependant on the resistance, temperature, and total dissolved solids of the water. However, pulsating DC is typically the most efficient form and will be the preferred method of electrofishing (EPA 1973).

Target fish species will be sampled at designated sites. Sampling efforts will be concentrated in structured, near shore areas within the sites. Habitats of this type tend to

attract fish and therefore catch per unit of effort is greater than sampling open-water zones (Nielsen and Johnson, 1983).

Two dip netters will be positioned at each side of the bow while the electrofishing boat makes repeated passes through the site. Target fish will be collected and kept alive in water until processing (described previously) procedures are complete.

Gill Netting

BACKGROUND

Gill netting is a passive capture technique frequently used by fishery biologists and commercial fishermen. This approach for collecting fish is most effective in lakes and slow moving bodies of water. Gill nets, unlike electrofishing, can be successfully employed at depths greater than 10 feet. There are typically three methods of capture 1) wedged (held by mesh around the body), 2) gilled (held by mesh slipping over opercula) and 3) tangled (held by teeth, spines, maxillaries or other body parts without penetration of the mesh) (Nielsen and Johnson, 1983). Typically in attempts to struggle free, the fish becomes more entangled in the net which promotes capture success.

PROCEDURES

Sampling Equipment

Gill nets are constructed of monofilament or multifilament material and consist of a single vertical panel of webbing. Gill nets have a weighted lower line (lead line) which rests along the bottom, and a buoyant upper line (float line) which keeps the panel upright. Additional floats and weights are usually attached to ensure the mesh remains vertical in the water column.

Sampling Strategy

Stationary gill nets which are free of PCB contamination will be positioned perpendicular to suspected fish movements and at various depths from the surface to the bottom. Since mesh size determines the species and size of fish collected, appropriate mesh sizes required to capture adult members of the specified target species will be used.

Gill nets will be set at designated sites and will be checked for fish at least twice daily. Target fish collected will be processed as described previously, and non-target fish will be disposed of as required by regional regulations.

Hoop and Fyke Net Sampling

BACKGROUND

Hoop nets are cylindrical or conical shaped nets distended by a series of hoops or frames, covered by web netting. They have one or more internal funnel-shaped throats whose tapered ends are directed inward from the mouth. Hoop diameter varies from 0.5 meter to over 3 meters with four to eight hoops in each net. Webbing tied around the hoops can range from 10 millimeter to over 100 millimeter bar mesh. Generally, two funnel shaped throats are attached, one to the first hoop and a second to the third hoop from the mouth. The closed end of the net, where fish accumulate, is called the cod end or the "pot". A drawstring is attached to the cod end for removing captured fish. Fyke nets are modified hoop nets with one or two wings or a leader of webbing attached to the mouth to guide fish into the enclosure.

PROCEDURES

In riverine habitats, hoop nets are set with the mouth opening downstream, at depths that entirely cover the hoops of the net, by attaching a rope to an anchor or stake at the stream bottom. Stakes can be set in water up to 5 meters deep using a "driver pole". Current keeps the hoops separated and the net stretched. Hoop nets are often baited with cheese scraps or soybean cake. Generally, hoop and fyke nets are set for 24-hour sampling periods. Fyke nets are generally used in shallow areas where cover seeking, mobile species such as escoids and centrarchids, seem to be most susceptible to capture.

SAMPLING STRATEGY

Hoop and/or fyke nets may be positioned in locations of suspected fish movement at various depths within designated sites to augment other sampling methods in the collection of target fish species. Unharmed non-target species will be released at the site of capture, damaged or dead fish will be disposed of as stated by regional regulations. Hoop nets may be more effective in the collection of certain species (i.e., channel catfish, flathead catfish and smallmouth buffalo).

Trot Line Sampling

BACKGROUND

Trot lines consist of a length of nylon line strung horizontally (main line), to which a series of vertical drop lines with baited hooks are attached (normally, 3 - 5 feet between drop lines). Trot lines are typically 100 - 200 feet in length (20 - 60 hooks per line). Twelve inch vertical drop lines are suspended from the main line on swivels. Trot lines are normally used by commercial fishermen because of their effectiveness in collecting catfish (i.e., channel catfish and flathead catfish), than other species.

PROCEDURE

Trot lines are fished perpendicular or parallel to shore in shallow to deep waters. The main line is set at the desired depth using a combination of floats and weights. Trot lines are checked for fish at a minimum of once every 12-hours.

SAMPLING STRATEGY

Trot lines may be used as a supplemental effort to obtain the required number of channel and flathead catfish at each site. One or more lines may be fished at each site. Baited lines will be set perpendicular or parallel to the shore at various depths at or below the legal minimum depth (local regulations may specify minimum depths) to avoid entanglement of recreational boaters, skiers etc. Lines will be checked at least once every 12-hours, target fish will be collected, non-target species will be released at the site of capture, damaged or dead fish will be disposed of as stated by regional regulations.

REFERENCES

Environmental Protection Agency. 1973. Biological field and laboratory methods for measuring the quality of surface waters and effluents. EPA - 670/4-73-001.

Nielsen, L.A. and D.L. Johnson. 1983. Fisheries techniques. Bethesda, Maryland: American Fisheries Society. 468 pp.

APPENDIX D

ANALYTICAL PROTOCOL

ADDENDUM

FISH SAMPLING AND ANALYSIS WORK PLAN
Mississippi River - Pool 15

Appendix 4
Analytical Protocol

September 1990

Analytical procedures for the 1992 fish study will be in accordance with the previously submitted *Analytical Protocol, Appendix 4* of the *Fish Sampling and Analysis Plan* September 1990.