Response to ADEM Comments on the
June 2000
Phase I Off-Site RFI/CS Investigation Report
Solutia Inc. Anniston, AL Facility
EPA ID No. ALD 004 019 048

Submitted January 11, 2002

Responses to ADEM Comments on the
September 26, 2001
Notice of Deficiency: Phase I Off-Site RFI/CS Investigation Report
Solutia Inc. Anniston, AL Facility
USEPA ID No. ALD 004 019 048

COMMENT 1:

Executive Summary, Page 1, Paragraph 1

The text states that this report focuses only on the in-stream portion of the study area and that floodplain areas will be evaluated separately. Individual receptors may be exposed to PCBs in both the in-stream and flood plain areas. Therefore, this report should be revised to acknowledge this fact and provide guidance as to how and in which report, total potential exposure to PCBs will be evaluated.

Response 1:

Consistent with the approved Off-Site RFI Work Plan, the Off-Site RFI report focused on the in-stream portions of Area of Concern (AOC) B. The Off-Site RFI Work Plan also described the process to evaluate the floodplain as a separate investigation (Sections 4.5.4 and 5.2.2.4). Once the investigation of the floodplain areas is complete, the overall Off-Site Conceptual Model (OCM) will be updated to reflect potential receptors that may be present in both the floodplain and in-stream areas. The Off-Site RFI report will be revised to reflect that the OCM for the Off-Site area as a whole, including receptors that may be present in both the floodplain and in-stream areas, will be presented in the Phase II Floodplain report. The Work Plan for the Phase II investigation of the floodplain will also be updated to reflect this approach.

COMMENT 2:

Executive Summary, Page 2, Paragraph 3

The first bullet on this page states that Lake Logan Martin is not affected by PCBs. PCBs have been found in fish and sediments from Lake Logan Martin, PCBs are not naturally occurring in the environment. Furthermore, the Alabama Department of Public health (ADPH) has continued the fish advisory based on Field Operation Division fish tissue monitoring samples having concentrations greater than the USFDA threshold concentration of 2-ppm. Therefore, the text should be revised to state that the lake has been affected since PCBs have been detected in various media in the lake. Furthermore, given the PCB bioaccumulation of fish tissue in Choccolocco Creek, greater-than-normal seasonal rainfall and associated increases in runoff and streamflow, Choccolocco Creek could once again influence PCB concentrations in the fish communities of downstream Logan Martin Lake.

Response 2:

The text of the report acknowledges that PCBs were detected in both fish tissue and deeper sediments of Lake Logan Martin. However, fish tissue PCB concentrations for the samples collected from the Lake during the 1999 RFI field program were on average below 2 mg/kg; and all of the surface sediment PCB concentrations were below the analytical quantitation limit of 0.06 mg/kg. Where PCBs were detected in the sediment of the Lake, they were at relatively low concentrations, and were in areas that were very stable (areas of sediment deposition). As a result, sediment bound PCBs were neither bioavailable, nor subject to erosion. Of the 121 sediment samples from the Lake, PCBs were only detected in approximately 25% of the samples. Assuming one half of the analytical detection limit as the PCB concentration for samples that were identified as non-detect, the overall average sediment PCB concentration for the Lake is 0.18 mg/kg. Moreover, the highest PCB concentration measured in the Lake's sediment (3.5 mg/kg) was from a sample taken more than 3 feet below the sediment water interface, and in an area of the Lake that is generally inaccessible (water depth greater than 50 feet). Given the data collected during the Off-Site RFI, the conclusion that the Lake is not significantly affected by PCBs remains unchanged. It is noted that a limited number of individual fish tissue samples collected during the Off-Site RFI did exceed 2 mg/kg. However, it is more appropriate to use an average PCB fish tissue concentration, on a per species basis, than individual samples results when conducting a comparison with the 2 mg/kg threshold. In addition, this method is consistent with procedures used by both ADEM and the Federal Drug Administration (FDA) to evaluate fish tissue data.

The results of recent fish tissue analyses conducted by ADEM (1999) and Solutia (i.e., Bayne, 1999 and 2000) also support the conclusions that fish tissue concentrations in Lake Logan Martin are generally below 2 mg/kg on average, and continue to decline with the passage of time. These three data sets were not included in the June 2000 version Off-Site RFI report due to timing, but will be integrated into the revised report. These data are included in Attachment A to this response to comments along with other available fish tissue data from ADEM (after 1988). The data are presented in table form including the sample collection location and date, the fish species, and measured PCB concentration. Attachment A also includes graphs that present the combination of the recent data, ADEM's historic data, and the fish tissue data presented in the June 2000 Off-Site RFI report [i.e., the fish tissue data collected to fulfill the Off-Site RFI Work Plan and the historic data collected by Solutia in 1996 (i.e., Bayne, 1996)]. The graphs included in Attachment A present the fish tissue PCB concentrations as a function of sample collection location and date, as well as species. Using this larger data set facilitates a trend analysis over a longer time-period than initially included in the Off-Site RFI report, which was limited to the period of 1996 to 1999 and included only two data sets.

Based on the compilation of several data sets contained in Attachment A, the conclusion of the Off-Site RFI report that fish tissue concentrations are on average below 2 mg/kg remains intact with the exception of striped bass that have average PCB concentrations just above 2 mg/kg. In addition, the average PCB for this species is declining over time. Using ADEM's data from 1996 and 1999, the average PCB concentrations in striped bass from the Lake (Stations 33 and 37) have declined by a factor between two and four to an average PCB concentration of approximately 3 mg/kg. For all other species collected at these sampling locations in 1999 and 2000, PCB concentrations were on average below 2 mg/kg.

In terms of Choccolocco Creek as a potential long-term source of PCBs to the Lake, the sediment-PCB data collected during the Off-Site RFI indicate the majority of PCBs are limited to two reaches of the creek, and are located in areas that would not appear to be susceptible to erosion and downstream transport. These two reaches of the creek include the backwater area upstream of Friendship Road near the confluence of Snow and Choccolocco Creeks, and the reach of Choccolocco Creek downstream of Jackson Shoals to the Lake. Both of these areas are locations where sediments have deposited over time and would not appear to have been eroded by high-flow events. As such, they would not appear to represent a long-term source to the Lake. In addition, the Off-Site RFI Report recommended additional investigation and a Corrective Measures Study (CMS) for the backwater area. Investigations of the backwater area would include studies to further document the long-term stability of sediment and the inability of potential high-flow events to mobilize PCB-containing sediment to downstream areas.

PCBs, while not naturally occurring in the environment are present in many aquatic systems throughout the United States (NRC, 2001). As a result, PCBs may be present in a given water body as part of regional background conditions. This is the case for Lake Logan Martin, where the data collected during the Off-Site RFI support the presence of PCB sources to the Coosa River upstream of Lake Logan Martin. These data include the presence of PCBs in fish samples obtained from Lake Neely Henry, as well as the surface water data collected just downstream of the Neely Henry dam. These surface water data identify that an estimated annual contribution of PCBs to Lake Logan Martin from upstream sources of approximately 10 kg/year.

This section of the report will be updated to reflect the inclusion of the additional fish tissue data sets discussed above. The conclusions will also be revised to reflect that PCBs while present in the fish and sediment of the Lake, have not significantly affected the Lake. The conclusions will also be updated to reflect that a CMS may be required for Lake Logan Martin pending the review of long-term fish tissue monitoring data that is currently being collected.

COMMENT 3:

Section 1.2, Page 1-2

The purpose of ecological risk assessment contained in this document is to determine the risks posed by chemical stressors to the ecological receptors. The additional information may be important to consider in the Corrective Measures Study.

Response 3:

As described in the ADEM-approved Supplemental RCRA Facility Investigation Work Plan (e.g., Section 2.1.4 of BBL, 1998), the focus of the investigation was PCBs in the sediments of Snow and Choccolocco Creeks. While it is acknowledged that there are multiple stressors present in these two creeks, such as urbanization, agricultural runoff, and habitat destruction, the RFI, and therefore the HEA, focused on the specific stressor to which any potential remedial action would address, and that is PCBs in the sediments.

COMMENT 4:

Section 2.1.2, Page 2-2

Based on the fact that the southeastern United States has been in a drought for the past three years, the statement that droughts are infrequent may not be technically correct. Therefore, extreme climatic conditions must be considered in the carrying out of the Baseline Risk Assessment (BRA).

Response 4:

Since the Health and Ecological Assessment (HEA) was focused on developing risk-based PCB sediment concentrations, which are not directly influenced by drought conditions, any reference to "infrequent droughts" will be removed from the RFI.

COMMENT 5:

Section 2.5, Page 2-10, Second Paragraph, and Figure 2-1 Initial Off-Site Conceptual Model

The model does not depict any other biota other than fish and ecoreceptors (i.e., benthic macroinvertebrates would serve as prey items to fish and avian receptors). Also, the text incorrectly references Figure 2-2 where Figure 2-1 should be referenced.

Response 5:

The figures illustrating the model and the text will be updated to reflect the comment.

COMMENT 6:

Section 2.5.1.2, Page 2-12

How were the fish samples analyzed, as whole body or fillet samples?

Response 6:

This section of the RFI report discusses the results of historic fish sampling data that was assembled in 1999 to aid in developing the Off-Site Conceptual Model and sampling strategy for the Off-Site RFI Work Plan. Given that the data were generated by ADEM, the Alabama Department of Agriculture and Solutia from the period of 1969 to 1993, it is likely that the majority of results are for fish tissue fillet samples, and not whole body samples. However, sampling plans for much of the earlier data were not available to identify the method of sample preparation. The uncertainties associated with this potential issue are inconsequential as this earlier data compilation was only used to develop the overall approach for the Off-Site RFI, and only fillet data are used within the Off-Site RFI report to evaluate the magnitude and trend of PCB concentrations.

The text of the report will be updated to reflect this uncertainty and use limitation of data where the sample preparation method is not documented.

COMMENT 7:

Section 2.5.2, Page 2-14

Were any samples analyzed for any organic Chemicals of Potential Concern (COPCs), including those that are known contaminants of PCB mixtures?

Response 7:

See Response to Comment No. 10.

COMMENT 8:

Section 2.5.1.1, Page 2-11, Paragraph 2

This paragraph draws conclusions on the patterns of distribution of PCBs in downstream sediments based on historical sampling results. This section states that "exponential rates of decline of approximately 17% per mile or 20% per year, respectively, were indicated when all sediment data not immediately adjacent to the facility were included in the calculations." The data set on which these conclusions were drawn includes data collected from 1969 to 1998. It is not apparent whether confounding factors that may influence data interpretation have been take in to consideration. These include, but are not limited to, different analytical methods and detection limits, impacts from dredging activities, and sample depth. The data should be reevaluated to determine the impact of these factors on the conclusions.

Response 8:

The conclusions discussed in this paragraph were based on historic data over nearly a 30 year-period. They were developed to reflect general trends for use in construction of a conceptual system model from which the scope and approach of the Off-Site RFI could be developed. The factors identified in the comment may have influenced discrete data points within the overall data set. However, these variations were not significant enough to invalidate the general conclusions and, hence, do not influence the conceptual model.

The text of the Off-Site RFI report will be updated to reflect the uncertainties identified in the comment.

COMMENT 9:

Section 2.5.1.2, Page 2-12, Paragraph 2

This paragraph draws conclusions concerning the decline in PCB concentrations in fish tissue over time, based on data collected from the 1970s through 1993, as shown in Figure 2-2. Figure 2-2 appears to be a composite of all of the fish tissue data available for Choccolocco Creek. The data set contains a number of different fish species, fish size, and tissue analyses (fillet versus whole body). Each of these factors affects analytical results and trend analysis. Data should be reevaluated and presented by species and type of tissue analyses, at a minimum.

The last sentence of this paragraph states "The decline in PCB concentration over time was likely due to natural attenuation associated with the deposition of non-PCB containing sediment in the creek beds and lake." The use of the term "natural attenuation" in this context is potentially misleading. An alternative explanation is that the PCBs are not being destroyed or diluted by the physical process discussed, but are slowly becoming more isolated from potential receptors as they are covered with less contaminated sediments. The use of the term "natural attenuation" requires further evaluation.

Response 9:

The conclusions discussed in this paragraph were based on historic data collected over a period of more than 20 years and were used to develop the Off-Site Conceptual Model and overall sampling strategy presented in the Off-Site RFI Work Plan. The data were again discussed in the Off-Site RFI report to reflect general trends only. Fish tissue data collected over the past 10 or so years by ADEM and Solutia are more relevant to a time trend analysis and are available to some extent on a species- and location-specific basis. As discussed in Response No. 2 above, only fish tissue fillet data by species and location were used within the Off-Site RFI report to evaluate the magnitude and trend of PCB concentrations in fish. The text of the Off-Site RFI report will be updated to clarify this point.

A further discussion of natural attenuation will be included in this section of the Off-Site RFI report. It will reflect that burial of PCB-containing sediment with other sediments to isolate the PCBs from the aquatic environment is just one of many processes occurring as a part of natural attenuation. This will include an expanded discussion of natural attenuation, or natural recovery, to highlight that sediment burial is just one of several potential process that could be responsible for reducing PCB exposure conditions, and hence fish tissue PCB-concentrations over time. Specifically, the text will be revised to discuss the range of potential processes that could be occurring as part of natural attenuation such as hydrolysis, photolysis, biodegradation, reduction dechlorination, sediment burial, dissolution, or solids transport.

COMMENT 10:

Section 2.5.2, Page 2-14

The analysis of constituents in sediments was limited to PCBs in all samples and 11 metals in 10 percent of the samples. The analysis of constituents in fish tissue was limited to PCBs in all samples and mercury in 10 percent of the samples. The analysis of surface water was limited to PCBs. These limited analyses were based on the selection of PCBs as the major focus of the investigation, based on the statement that "This focus on PCBs is supported by the likely similarity between physical and chemical characteristics of any other constituents which would have remained in the Snow Creek/Choccolocco Creek system and those of PCBs (i.e., low solubility, high adsorption to sediment). Accordingly, those other constituents, if any, would share the same fate and transport mechanisms and exposure pathways with the PCBs. Consequently, any corrective actions needed to address PCBs are expected to be sufficiently robust to address the other constituents as well."

The logic in these statements is flawed. Section 2.2 of the report indicates that a number of different inorganic and organic chemicals have been produced at the facility during its operation. The need for corrective action will primarily be determined by the risk posed by contaminants in the environment. Non-PCB contaminants may (1) have different toxicological effects and thresholds (2) affect different trophic levels of the environment, and (3) have different physical and chemical properties that would affect the bioaccumulation potential and applicable remedial technologies that could be used for corrective action. Therefore, areas that may not require corrective action for PCBs may pose an unacceptable risk because of other contaminants. Based on the analytical scheme used for this investigation, this potential cannot be assessed. Additional data are needed to adequately assess the risk posed by inorganic and organic chemicals released from the Solutia facility.

Response 10:

The data included in the Off-Site RFI report reflected the requirements of the ADEM-approved Off-Site RFI Work Plan and included, at ADEM's request, a "confirmatory sampling program" for other chemical constituents. In developing the scope and approach for the confirmatory program, an evaluation of potential chemical constituents was conducted as a part of preparing the Off-Site RFI Work Plan. The evaluation focused on chemical constituents that may have been used at the Facility throughout its history and used the list of constituents of potential concern (COPCs) developed for the On-Site RFI/CS program within the ADEM – approved On-Site RFI Work Plan (Golder, 1997). In developing the confirmatory sampling program, specific chemical constituents were selected as representative indicators from each of the four constituent groups included on the On-Site COPC list. These groups include Volatile Organic Compounds (VOCs), Organophosphorous Pesticides, Semi-Volatile Organic Compounds (SVOCs) including PCBs, and Inorganics. This evaluation was presented to ADEM prior to their approval of the Off-Site RFI Work Plan, and was contained in Solutia's response to comments on the October 28, 1998, Off-Site RFI Work Plan, dated February 4, 1999.

The information from the On-Site Studies indicated that there were no ongoing releases to the Off-Site Area and as such, the criteria for including additional constituents in the confirmatory sampling program included:

- Affinity of the constituents for solids (fined grained sediment);
- Overall persistence of the constituents in the environment;
- Likelihood of other potential sources to the watershed; and
- Knowledge that PCB-corrective measures will address other COPCs, if present.

The persistence of PCBs in the environment became the controlling factor in selecting PCBs as a conservative indicator of this grouping while evaluating the SVOCs on the COPC list. This conservatism was based on the strong affinity of PCBs for the fine-grained solids as compared to the other listed SVOCs, and that the other SVOC constituents were more amenable to breakdown from photo- and bio-degradation. Given the conservative bias associated with PCBs, they were used as the indicator constituent for the SVOC grouping.

For the inorganic group of chemical constituents on the COPC list, it was noted that these same constituents were also associated with numerous point and non-point sources within the watershed. As such, the confirmatory sampling program included the complete list of COPC inorganics, as well as upstream background samples for both Snow and Choccolocco Creeks.

When VOCs were evaluated for inclusion in the confirmatory sampling program, it was viewed as highly unlikely that VOCs would be present in the creek systems. This group of constituents has an extremely short half-life in surface water due to volatilization and photo-degradation. Given the lack of persistence in surface waters, VOCs were not included in the confirmational sampling program.

The On-Site COPC list also included three organophosphorous pesticides. In assessing this constituent group, parathion was considered as a representative indicator. Parathion is strongly sorbed to solid particles and is degraded by sunlight, plants and microorganisms. If present in surface water, the half-life of parathion is 1 to 10 days and is degraded by chemical hydrolysis and microbial activity. Given the lack of persistence of these constituents in a surface water environment, and that parathion was last manufactured at the facility in 1986, this category of chemical constituents was not included in the confirmatory sampling program.

In summary, the confirmatory sampling program approved by ADEM included sampling of fish and sediment for eleven select metals (i.e., arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium). The frequency of sediment samples analyzed for the eleven metals was 10% of the samples analyzed for PCBs. In addition, 50% of all of the adult largemouth bass samples collected were analyzed for mercury. The results of this program documented that mercury concentrations in fish were all below the 1 mg/kg threshold, and that other metals, while present to some degree in the sediment, were also observed in upstream background samples with distribution indicative of potential sources throughout the watershed.

COMMENT 11:

Page 2-16, Section 2.5.4, Page 2-16 Potential Exposure Pathways

- *Piscivorus [sic] birds and mammals bullet – Incidental ingestion of sediment and surface water are additional exposure pathways.*

- *Terrestrial organisms bullet – Contaminated prey species would be an additional exposure for predatory terrestrial receptors.*

Other trophic levels of ecological receptors have complete exposure pathways (e.g., avian insectivores).

Response 11:

For pisciverous birds and mammals, incidental ingestion of sediment is a quantitatively insignificant exposure pathway. The *Hudson River Baseline Ecological Risk Assessment* (TAMS and Menzie-Cura, 1999) determined incidental ingestion of sediment "to be limited." An incidental sediment ingestion value of 1% was used for mink. Similarly, the *Aquatic Ecological Risk Assessment for the Sheboygan River*, (USEPA, 1999) stated "because of the feeding behavior [of receptors of concern] and their prey, sediment was considered a minor component (2%) of the mink diet." Since studies suggest that this pathway is likely to represent only approximately 1% of the dietary intake of PCBs, inclusion of this pathway for the development of a RBAL would not substantially alter the current value.

Terrestrial organisms will be evaluated as part of the HEA for the Floodplain RFI.

COMMENT 12:

Section 2.5.4, Page 2-16, Paragraph 2

Exposure pathways discussed for the different classes of potential receptors do not adequately describe potential exposure routes for some of the receptors. The following classes of receptors should have additional exposure routes added, as follows:

- *Benthic organisms – These organisms live in the sediment of the streams. Many of them consume sediment and detritus. Therefore, the exposure pathways should include direct dermal exposure and ingestion of sediment.*

- *Piscivorous [sic] birds and mammals – Based on their feeding habits, many of these receptors ingest some volume of sediment along with their prey. Additionally, very few of* *these species feed only on fish. Most species represented by this assessment endpoint have some terrestrial component to their diet. Depending on the species selected for assessment, exposure pathways may also include ingestion of sediment, soil, surface water, and terrestrial prey. The exposure pathways should also include direct dermal exposure.*

- *Terrestrial organisms – The exposure pathways for this group should include ingestion of contaminated prey, surface water, and flood plain soils. The exposure pathways should also include direct dermal exposure.*

Response 12:

The model used to develop RBALs for benthic organisms, the Equilibrium Partitioning (EqP) approach, assumes that only PCBs freely dissolved in water represent the critical exposure pathway. It is acknowledged that this model does not explicitly evaluate direct contact with, and ingestion of, sediments. However, based on the theory proposed by (USEPA 1989), this exposure pathway represents a relatively small route of exposure (and potential dose) for highly lipophilic chemicals like PCBs.

For pisciverous birds and mammals, as described above, incidental ingestion of sediment is a quantitatively insignificant exposure pathway. The *Hudson River Baseline Ecological Risk Assessment* (TAMS and Menzie-Cura, 1999) determined incidental ingestion of sediment "to be limited." An incidental sediment ingestion value of 1% was used for mink. Similarly, in the *Aquatic Ecological Risk Assessment for the Sheboygan River*, USEPA (1999) stated, "because of the feeding behavior [of receptors of concern] and their prey, sediment was considered a minor component (2%) of the mink diet." Since studies suggest that this pathway is likely to represent only approximately 1% of the dietary intake of PCBs, inclusion of this pathway for the development of a RBAL would not substantially alter the current value.

The report will be updated to clarify this approach.

Terrestrial organisms and the terrestrial component of the pisciverous birds and mammals diet will be evaluated as part of the HEA for the Floodplain RFI.

COMMENT 13:

Section 2.5.5, Page 2-17; Section 8.2, Page 8-5

In several places within the report, it is mentioned that "the effects of recent dredging in Choccolocco Creek on PCB distribution and movement are uncertain." However, the CMS recommendations do not incorporate the possibility for future disturbances to remobilize PCBs within the water system despite the acknowledgement that "…negative impacts associated with dredging and the need to prevent its use within the Off-site area." The report seems to take the *overall position that, except for a couple of targeted reaches; natural attenuation has decreased the PCB concentrations in both sediment and fish.*

As the report states, the primary natural attenuation mechanism is mixing and burial of PCB containing sediment with non-PCB containing sediment. Therefore, although complete exposure pathways to PCBs might be declining, PCBs remain in the water system. Because of the observed decrease in PCB concentrations available for exposure to humans and non-human receptors, it appears that the report's recommendations fail to carry the Choccolocco Creek/Lake Logan Martin system for further consideration in the CMS. Natural Attenuation is not a standalone remedial option, and its existence cannot be used to exclude portions of the water system from the CMS. In fact, if natural attenuation is to be proposed as part of the remedial system, then further monitoring for effectiveness is needed.

Response 13:

It is agreed that prohibitions on dredging for certain portions of the creek may be appropriate. Clearly, dredging in the past has mobilized sediment-containing PCBs and resulted in an increase in fish tissue PCB concentrations. It is also agreed that monitoring is an important component of any corrective action that may be considered for PCB-containing sediment, including natural attenuation. To develop an appropriate base of data to support the CMS process for the Off-Site area, Solutia has implemented a long–term fish monitoring program in both Choccolocco Creek and Lake Logan Martin. Data collected during this annual program include PCB concentrations in fish tissue as a function of time (year), location within the water body, and species. Other parameters including weight, age, sex, and length are included in the monitoring program as well. The data generated by this program will be used to assess the magnitude and the trends of PCB concentrations in fish, including the effects of ongoing natural attenuation.

The Off-Site RFI report will be updated to reflect a wider set of fish tissue data, which indicate that the average fish tissue PCBs concentrations for striped bass in Lake Logan Martin are slightly above 2 mg/kg. The report will also be updated to reflect that a CMS may be required for Lake Logan Martin if the results of a recently implemented long-term monitoring program indicates that on average, fish tissue concentrations remain above 2 mg/kg. The report will also be modified to reflect that where a CMS is required, the study will consider the potential need for and extent of monitoring as well as potential institutional controls that prohibit sediment removal.

COMMENT 14:

Section 2.6.1, Page 2-17, First Paragraph

The PCB levels in other biota are of concern also, not just the PCB levels in fish.

Response 14:

PCB levels in fish were the primary focus of the RFI because they represented a primary exposure mechanism for sediment-associated PCBs. Consumption of fish represents the major route of exposure for humans, although they do have a potential for direct contact with sediments. Likewise, for upper trophic level ecological receptors, resident fish species represent the major way that these organisms become exposed to PCBs stored in sediments. Finally, the toxicological benchmark used to derive RBALs for lower trophic level organisms, specifically piscine species, was the critical body residue. Thus, the PCB levels in fish were used to model target sediment concentrations. Developing a database of fish tissue concentrations was important for the assessment of three separate exposure pathways. Consistent with USEPA recommendations (USEPA, 1989), for lower trophic levels, the critical exposure pathway is pore water. Therefore, for these receptors, tissue burdens were not a critical component of the exposure estimates.

COMMENT 15:

Section 3.5.1, Page 3-9, Paragraph 1

This paragraph assesses the number of detections against values of 1.0 and 10 mg/kg. The significance of these levels is unclear. The EPA Region 4 sediment screening value for total PCBs is 0.0216 mg/kg (EPA Region 4 Ecological Risk Assessment Bulletins). All comparisons should be done using the lowest human health or ecological screening criteria that is applicable.

Response 15:

The discussion in this section of the Off-Site RFI report is not related to any effort to screen the existing data. PCB concentration values of 1.0 and 10 mg/kg were used to texturally describe the distribution of sediment PCB data collected in Choccolocco Creek (shown in Figure 3-16). The intent of this section was to present the results of the PCB analyses performed and to describe the distribution of data. Reference to Figure 3-14 shows that selection of 1.0 mg/kg and 10 mg/kg is appropriate for describing where a majority of the data occur. The screening level of 0.0216 mg/kg was not compared to these data, as it is an inappropriate break point to describe the distribution. Additionally, screening values were not part of the HEA as discussed in Response No. 19.

COMMENT 16:

Section 3.5.1, Page 3-9, Paragraph 2

The third sentence of this paragraph defines surficial sediment as being from 0 to 2 inches in depth and subsurface sediments as being deeper than 2 inches. The justification for this distinction is unclear. In a flowing stream environment, some aquatic species will contact sediments greater than 2 inches in depth, some terrestrial receptors will dig deeper than 2 inches in search of prey, and high-flow events will scour sediment in some sections to a depth greater *than 2 inches. This distinction is critical in that the document makes the assumption that "The concentrations of PCBs in the surficial sediments of the creek are of primary interest as they directly influence potential ecological or human exposure". Assuming that exposure only occurs to the 0 to 2-inch-deep sediments may understate actual exposures. Additionally, the report makes conclusions on the attenuation of PCBs based on "surficial sediment" concentrations as related to historical data and "subsurface sediment" concentrations. Restricting the "surficial sediment" to the 0 to 2-inch interval may skew the conclusions. A more realistic definition of surficial and subsurface sediment must be developed and justified based on potential exposures and scouring potential. The general default interval for the biologically active zone is normally assumed to be 0 to 6 inches below the surface. For the purpose of assessing the report, the reviewer has assumed that surficial sediment is from 0 to 12 inches in depth and subsurface sediments are greater than 12 inches in depth. This is based strictly on available analytical data and does not represent an attempt to determine the exposure or scouring interval.*

Response 16:

The identification of the 0-2 inch sediment layer was initially made in the Off-Site RFI Work Plan after considerable discussion with ADEM. While it is acknowledged that some aquatic species will burrow beneath this interval, a majority of the biological activity occurs in the surficial zone, which is generally not 0 to 12 inches as recognized in the comment. Notwithstanding the depth of mixing, by definition the biologically active zone is well mixed and thus, using surface weighted average PCB concentrations from the 0 to 2 inch horizon to characterize exposure conditions is mathematically correct, irrespective of the actual depth of the biologically active zone (provided it is at least 2 inches deep). For example, if the biologically active zone were 0 to 6 inches, the sediment would be assumed to be well mixed within this horizon, and so the PCB concentration for the 0 to 6 inch layer would also be equal to the PCB concentration for the 0 to 2 inch layer. As such, the surface area weighted PCB concentrations presented in Off-Site RFI report are appropriate for evaluating potential exposure conditions.

Relative to the potential for high surface water flow events to uncover and mobilize PCB-containing sediment, the reaches of Choccolocco Creek with the highest potential for this to occur, are also the same areas with the lowest concentration of PCBs, irrespective of depth. Specifically, the inventory of PCBs presented in Figure 3-17 of the Off-Site RFI report demonstrates that the majority of PCBs (greater than 80% of the total mass) are in the two reaches of the creek that are depositional in nature (i.e., the backwater area at the confluence of Snow and Choccolocco Creeks and the area downstream of Jackson Shoals). Again, both of the reaches are locations where sediments deposit and thus not subject to the potential re-distribution of PCB-containing sediments due to high-flow events.

COMMENT 17:

Section 3.5.2, Page 3-10, Paragraph 3, Bullet 1

A significant finding of the investigation of sediments in Choccolocco Creek is stated as follows. "A majority of the PCBs are isolated from the environment at depth within the upstream backwater area of the creek. This area is depositional in nature and thus, the PCBs are not expected to be subject to disturbance and resuspension." Assuming that the surficial interval is 0 to 12 inches, the majority of PCBs do not appear to be isolated from the environment. This finding should be reevaluated.

Response 17:

As noted in the response to Comment No. 13, the backwater area is in the vicinity of the Snow and Choccolocco Creek confluence. During the Off-Site RFI, sediment samples were obtained at three transects in this general area. The results of this sampling indicated that sediment PCB concentrations were elevated, yet were contained in relatively thick deposits of fine-grained sediment. As such, the sediments were not subject to erosion and re-mobilization as a result of high-flow events. The response to Comment No. 2 also identifies the need for additional study in the backwater area before a CMS could be conducted. This study would include investigations to specifically address the long-term stability of sediment in this area.

Relative to the thickness of the surficial sediment layer, ADEM points out in Comment No. 16 that it would not be representative to use a 0 to 12 inch layer to represent the biologically active zone as is suggested above in Comment No. 17. Further, it was discussed in the response to Comment No. 16, that PCB concentrations for the 0 to 2-inch surface layer would be representative of the biologically active zone, or surface layer, irrespective of whether the zone was 0 to 2 inches, or 0 to 6 inches in thickness.

It is also noted that within the HEA, the exposure concentrations (i.e., the surface sediment PCB concentrations) are the most important data, and not the percentage or location of PCB mass. Nonetheless, the sediment data were re-evaluated using a 0 to 6-inch surface sediment layer identified by ADEM in Comment No. 16. The results of this evaluation demonstrate that the overall conclusions relative to PCB mass remain unchanged. Using a 0 to 6-inch horizon as the surface sediment layer, the percentage of PCB in the surface sediment of the backwater area is less than 14% of the total PCB mass present in the backwater area.

COMMENT 18:

Section 3.5.2, Page 3-10, Paragraph 3, Bullet 2

A significant finding of the investigation of sediments in Choccolocco Creek is stated as follows. "PCBs in the sediment downstream of Jackson Shoals are not of concern as average concentrations are well below 1 mg/kg (both surficial and at depth). The thickness of the *sediment deposits in this reach of the creek indicates that it is depositional in nature and not a potential long term source of PCBs to Lake Logan Martin." The maximum detected concentration in the 0 to 12-inch interval was plotted on a map for each transect, with available data. These data points indicate an area extending from about transect 176 to Transect 183, as shown in Figure 3-5, with concentrations in 5 of 7 transects in excess of EPA Region 4 sediment screening criteria. This conclusion should be reevaluated.*

Response 18:

The text in the report will be modified to reflect that sediments downstream of Jackson Shoals are not a concern from an erosional perspective, and as such, are not a potential source to Lake Logan Martin as a result of high-flow events. This conclusion is confirmed by the presence of thick, fined-grained sediment deposits within this reach of the creek. Further, surface water flow for this reach of the creek is more heavily influenced by water levels in Lake Logan Martin that remain relatively constant, than by creek flow per se, upstream of Jackson Shoals. The text of the Off-Site RFI report will also be modified to reflect that a comparison of the PCB exposure concentrations is contained in the HEA section of the report (Section 7.5).

COMMENT 19:

Page 3-10, Second Bullet

Region 4's screening value for PCB sediment concentrations is 0.0216 ppm. Levels below 1 ppm are of concern.

Response 19:

Use of the Region 4 screening value is appropriate in Step 1 (Screening Level Problem Formulation and Ecological Effects Evaluation) and Step 2 (Screening Level Preliminary Exposure Estimate and Risk Calculation) of a baseline ecological risk assessment (USEPA, 1997). However, Solutia opted to forego this preliminary step and assume that PCB levels in the sediments of Snow Creek and Choccolocco Creek represented a potential risk, and therefore required a detailed evaluation. In acknowledging this potential, a screening level assessment was not required. This approach was described in more detail in the ADEM approved RFI Work Plan (BBL, 1998).

The report will be updated to clarify this technical approach.

COMMENT 20:

Section 3.6, Page 3-13

Sampling locations are shown in Figures 3-18 through 3-31, and data is presented in Table 3-15. Figure 3-31 indicates that Sampling Location 6-28 was analyzed for PCBs. No data for Sampling Location 6-28 is presented in Table 3-15. This discrepancy needs to be resolved.

Response 20:

Figure 3-31 will be corrected to reflect that the core from location 6-28 was not analyzed. Table 3-15 is correct and is consistent with Table 3-12 that identifies cores that were processed for PCB analysis.

COMMENT 21:

Section 3.8.1, Page 3-16, Paragraph 3

This paragraph assesses the number of detections against values of 1.0 and 10 mg/kg. The significance of these levels is unclear. The EPA Region 4 sediment screening value for total PCBs is 0.0216 mg/kg. All comparisons should be done using the lowest human health or ecological screening criteria that is applicable.

Response 21:

See response for Comments 15 and 19.

COMMENT 22:

Section 3.8.2, Page 3-17, Paragraph 2

The first bullet states "PCBs are generally contained to two reaches of the creek with a majority of PCBs isolated from the environment in culvert pipes and do not appear to be susceptible to erosion or exposure." This statement does not appear to be supported by the data. Essentially, the entire length of Snow Creek has PCBs above applicable EPA Region 4 ecological screening criteria. Additionally, significant stretches of the creek were not sampled for PCBs.

Response 22:

As described in Section 4.2.1.1 of the approved Off-Site RFI Work Plan, sediment deposits over the entire length of Snow Creek downstream of the 11th Street Ditch were mapped in extensive detail. These maps were developed using information gathered while walking the entire length of the creek. Data collected during the sediment-mapping task included the location, size, and depth of each sediment deposit. This information was then transferred to aerial photographs (Figure 3-19 through 3-31 of the Off-Site RFI report). These figures also identify the specific locations for the sediment samples analyzed for PCBs and demonstrate that sediment is not present throughout much of the Snow Creek bed as it contains significant reaches of concrete lined channels (over two miles including the Quintand Mall area). These concrete lined channels are designed not to accumulate sediment. In developing an understanding of the distribution of PCBs within Snow Creek, analytical chemistry sampling efforts were focused on locations where sediment was present. This is confirmed by Figures 3-32 and 3-35 of the report that demonstrate the location and concentration of PCBs throughout the Creek and the focus on the upper one mile of the Creek downstream of the 11th Street Ditch and the area downstream of Highway 78.

COMMENT 23:

Section 3.13, Page 3-24, Paragraph 1; Section 4.6, Page 4-14 and Section 5.3, Page 5-5

The report does not present sufficient information to independently evaluate the quality of the laboratory data. Particularly in the case of metals data, significant data quality issues appear to have occurred based on qualifiers in the tables and the rejection of data from a number of samples. Additionally, many of the sample results are qualified as being quantified above the instrument calibration curve. This could result in an underestimation of concentrations present in the samples. Additional data must be presented, including original laboratory data sheets, so that the quality of laboratory data can be evaluated.

The samples for which the surrogate recovery was below the control limit, analysis was conducted outside the holding time, or matrix spike recoveries were outside the control limits must be re-sampled and analyzed to insure complete characterization.

Response 23:

Relative to the mercury data that were not reported in the June 2000 Off-Site RFI report, these data were initially not included in the report as the recommended holding times were exceeded. In the time since the Off-Site RFI report was submitted to ADEM, Solutia has re-evaluated this data and will be incorporating it within the revised Off-Site RFI report. The data will be qualified using a "T" qualifier. This qualifier indicates that the data are outside of their specified holding times, and are indicative of the presence of mercury in the sediment. The data are being qualified to reflect the potential that some amount of mercury may have volatilized while the samples were stored in the freezer, and thus may underestimate the concentration of mercury present in the sediment of the Creek. Given the relatively short time that these samples were frozen prior to analysis (on the order of six months or less), the magnitude of this underestimating may not be significant considering the research and recommendation of others summarized below.

The research by others includes the Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories (USEPA, 1997) in which the USEPA "recommend a maximum holding time of 6 months for all metals, including mercury". Additionally, the National Oceanic and

Atmospheric Administration (NOAA) procedures allow for freezing of the samples for up to one year from the date of collection (USEPA, 1997). These holding times are based on an unpublished study performed for the Washington Department of Fish and Wildlife by the King County Metro Environmental Laboratory, where environmental samples were analyzed for mercury before and after the 28-day holding time, at times ranging from 4 to 86 days after collection. This study found there were no significant differences in the mercury concentrations of these samples.

In further considering the use of the "T" qualified sediment data, a comparison of these data to the surface sediment mercury data (samples that did not exceed the laboratory holding times) was conducted. The results of this evaluation demonstrate that the results of the "T" qualified are consistent with the surface sediment results. This includes both the reported concentration range and average concentrations. In addition, the results of the fish tissue mercury data (also within the specified holding times) were in all cases, below the 1 mg/kg threshold. Further underscoring that mercury within Choccolocco Creek is not a concern.

Updated versions of Tables 3-10, 3-15 and 3-22 from the Off-Site RFI report including the "T" qualified data are included in Attachment B to this response to comments along with a figure presenting the average sediment mercury concentration for Snow and Choccolocco Creeks.

The footnote in the metals tables for the "E" qualifier is incorrect. The tables will be revised as none of the results from the metals analyses were qualified as being quantified above the instrument calibration curve. The laboratory documentation for the sediment samples is being copied and will be submitted to ADEM under separate cover.

COMMENT 24:

Section 3.14.2, Page 3-29, Paragraph 3

This section concludes "Over 80% of the estimated PCB mass is sequestered in the deep sediment found in the two low-energy, depositional reaches of the creek (upstream of the Snow Creek confluence and downstream of Jackson Shoals). Assuming that the surficial interval is 0 to 12 inches, the majority of PCBs do not appear to be "isolated from the environment." The paragraph further concludes that sediments downstream of Jackson Shoals are not a source of concern. These findings should be reevaluated.

Response 24:

As discussed above in Response No. 17, the surface sediment PCB exposure concentration is more important than the magnitude and location of the PCB mass per se. Further, Solutia agrees as it is stated in ADEM's Comment No. 16, that a 0 to 12-inch layer is not a reasonable estimate for the thickness of the surface sediment layer for purposes of exposure concentrations. As such, the sediment data were not re-evaluated on the basis of a surface layer being 0 to 12 inches. Rather, the concept of using a 0 to 6-inch layer was considered in responding to this comment.

As discussed in Response No. 17, the use of a 0 to 6-inch layer to describe the biologically active zone would not change the exposure concentrations developed for the 0 to 2-inch layer. As such, a change in the exposure concentrations is not required within the report.

The report will be updated to clarify this technical approach.

COMMENT 25:

Section 4.0

What was the depth of the surface water samples?
Response 25:

As stated in Section 4.3 of the Off-Site RFI Work Plan, the surface water samples were collected from approximately mid-channel at 0.2, 0.5, and 0.8 times the total water depth.

COMMENT 26:

Section 5.2.3

More than one year of sampling comparison is needed to determine if there is a clear and consistent pattern of decline in fish tissue PCB concentrations over time.

Response 26:

The Off-Site RFI report made the conclusion that PCB concentrations in fish were below 2 mg/kg on average and declining with the passage of time. These conclusions were based on two data sets taken nearly three years apart. As discussed in Response No. 2, these conclusions have been validated by sampling conducted by ADEM and Solutia over the past 10 years with the most recent sampling performed during the fall of 2000. In addition, Solutia has implemented a long-term fish monitoring plan to assess PCB concentration trends in fish tissue using methods approved by ADEM.

COMMENT 27:

Section 7.2.1, Page 7-2, Paragraph 1

The text states that "the source of PCBs is assumed to be the channel sediments." Similarly, Figures 7-1, 7-2, and 7-3 identify creek and lake sediments as the source of PCBs. The statement in the text and the presentations in Figures 7-1 through 7-3 are misleading. PCBs are not naturally occurring in the environment. PCBs are assumed to originate, at least in part, from Solutia operations. The text and Figures 7-1 through 7-3 should be revised to indicate that the primary source of PCBs is assumed to be Solutia operations.

Response 27:

From an exposure model perspective, the sediments *are* acting as the sink and ultimate source of PCBs. This section of the report is based on current exposure conditions and as such the sediments are the current source and sink. The investigation described in the report was designed to characterize the distribution of PCBs within the sediments of Snow and Choccolocco Creeks, and to evaluate the bioavailability and mobility of these sediments.

As discussed in Response No. 2, PCBs are often found as background constituents in aquatic systems and in the case of the Lake Logan Martin, there are documented upstream sources of PCBs to the Lake that contribute approximately 10 kg of PCB to the Lake on an annual basis.

COMMENT 28:

Section 7.2.1, Page 7-3, Paragraph 2

This paragraph states that the fish in Snow Creek are not of edible size and therefore the fish consumption pathway is considered to be incomplete. However, human receptors may consume small fish and other aquatic organisms, such as turtles and shellfish that live in the water bodies considered in the report, and may accumulate PCBs in their tissues. During field sample collection in the area, EPA's contractor, Tetra Tech, observed numerous local individuals fishing in Snow Creek. The report should be revised to include potential exposure through ingestion of aquatic organisms or discuss the uncertainty associated with not addressing potential exposure to PCBs by human receptors through ingestion of aquatic organisms.

Response 28:

The limited potential for humans to catch and consume fish residing in Snow Creek was discussed in detail at a November 19, 2001 meeting with ADEM and EPA Region 4. The discussion included that fish of consumable size may be present in the lower reach of Snow Creek, downstream of Highway 78, and that this area of the creek would be further evaluated as part of the investigation of the backwater area. Solutia also noted during these discussions that based on both habitat, and field observations of sampling staff, the reach of Snow Creek upstream of Highway 78 does not support fish of consumable size on a sustainable basis. As such, it does not appear appropriate to include this pathway for the reach of Snow Creek above Highway 78.

The report will be updated to reflect that the reach of Snow Creeks downstream of Highway 78 including this pathway will be evaluated as part of the study of the backwater area.

A potential site visit for representatives of the USEPA to walk Snow Creek with Solutia's biologist was also discussed at this meeting. As of January 11, 2002, a date for this site visit has not been established. Solutia will modify the final Off-Site RFI report as necessary to reflect any observations made during this upcoming meeting.

COMMENT 29:

Section 7.2.2.2, Page 7-4, Paragraph 2

This paragraph discusses the rationale for selecting receptors to consider for each water body. The text states that the age of 4 years is "conservatively assumed to be about the age that a child might venture off in an unsupervised manner to play in a potentially dangerous setting (i.e., a streambed with flowing water)." Children may be exposed while supervised, as well as during unsupervised periods. Parents may closely watch their children play in slowly moving water or in water that is essentially non flowing (such as Lake Logan Martin). The report should be revised to provide greater justification for not evaluating potential exposures to younger children, especially in Lake Logan Martin.

Response 29:

While a child under the age of 4 may be exposed while supervised as well as unsupervised, it is not expected that these occurrences would be very frequent. We currently have the 4 to 10 year old contacting stream sediments for 144 days a year for that 7-year period. These children are also ingesting sediment at a rate of 200 mg/day, which is considered by EPA "a conservative mean estimate" of soil ingestion for children (USEPA, 1997). Given that this is a high rate of *soil* ingestion, 200 mg/day must be considered an extremely high rate of ingestion for sediment. As such, developing an RBAL protective of this age group (i.e., 4 to 10 years) with these conservative exposure parameters would also be protective of younger children that may be infrequently exposed to creek or lake sediments.

The report will be updated to clarify this technical approach.

COMMENT 30:

Section 7.2.2.2, Page 7-5, Paragraph 2

The text states that Lake Logan Martin is accessible primarily by boat. This statement should be clarified. Specifically, the text should explain whether any boat landings, campsites, parks, or other public areas are located along Lake Logan Martin. If public areas are present, exposure to aquatic life and sediments in Lake Logan Martin may be easier than presented. In this instance, the text should be revised to soften the statements that the exposure assumptions used will overestimate actual exposures.

Response 30:

The exposure assumptions for direct contact with sediments are conservative and address all reasonable exposure scenarios, including the one described in the above comment. For example, the direct contact scenario for adults assumes that there are two events per week, every week of the year. This would address even an avid boater who spent both days of the weekend, all through the year, engaged in activities on the Lake. For young children and the adolescent, the exposure frequency is 4 times a week during the warmer months, assuming they are not in school, and twice a week during the colder months. It is difficult to envision "reasonably anticipated" exposure scenarios that would result in direct contact in excess of the parameters described here.

With regard to "exposure to aquatic life," the RBAL for fish consumption was not event-dependent, but rather addressed the PCB fish advisory action level of 2 ppm.

COMMENT 31:

Section 7.2.3.2, Page 7-11, Paragraph 2

This paragraph discusses calculation of the RBAL based on a target risk (TR) of 1E-05. This TR value was selected as the midpoint of EPA's target risk range of 1E –06 to 1E-04. In order to provide risk managers with a range of options, the report should be revised to develop RBALS based on TR values of 1E-06, 1E-05, and 1E-04.

Response 31:

Solutia agrees and the report will be updated accordingly.

COMMENT 32:

Section 7.3.1.1, Page 7-12, Paragraph 1

Most non-aquatic receptors will receive a dose from the terrestrial as well as from the aquatic environment. The conceptual model should be revised to reflect this issue.

Response 32:

While it is true that "most non-aquatic receptors will receive a dose from terrestrial environments," the focus of this portion of the Off-Site RFI was the in-stream environments. The rationale behind this approach was described in the ADEM-approved Off-Site RFI Work Plan (BBL, 1999). The contribution of terrestrial environments to the total exposure will be considered in the floodplain portion of the RFI that is currently underway. At the completion of this component of the overall evaluation, the site conceptual model will be revised to address the entire system. For additional information, please see Response No. 1.

COMMENT 33:

Section 7.3.1.1, Page 7-13, Paragraph 2

Bioaccumulation is identified as the primary exposure mechanism for PCBs and not direct exposure. This is true for upper-trophic-level receptors, but PCBs do have some toxic effects at lower trophic levels from direct exposure. The statements in this paragraph should be clarified.

Response 33:

The statement will be clarified to reflect the fact that a RBAL for PCBs in sediment was developed for lower trophic level organisms based on the equilibrium partition model, an approach that has been recommended by USEPA (1989) for highly lipophilic compounds.

COMMENT 34:

Section 7.3.1.3, Page 7-14, Paragraph 2

The Great Lakes Wildlife Criterion for PCBs is cited as the rationale for assuming that any ecological protection values (EPV) protective of mink reproduction will be suitably protective for all other upper-trophic-level organisms. This is not necessarily true. While the toxicity reference values (TRV) for no observed adverse effects levels (NOAEL) for mink are consistently lower than most other organisms, the wildlife values developed during the Great Lakes studies are based on specific exposures assumptions and TRVs. Exposure assumptions and TRVs used to develop EPV for the mink in this assessment are not the same as those used in the development of the Great Lakes Wildlife Criterion. Therefore, the assumption that EPVs protective of mink reproduction are protective of all upper-trophic-level receptors cannot be accepted without additional analyses. Evaluations should be conducted for additional assessment and measurements endpoints to validate the assumptions.

Response 34:

The comment correctly characterizes the reference to the Great Lakes Wildlife criterion as a *rationale* for the approach taken in developing the EPV for upper-trophic-level organisms. However, the GLWC was not the *basis* of the EPV. The reference to the GLWC was included to support the premise inherent in the evaluation that the RBAL based on the mink TRV would be protective of other organisms in the same trophic level. However, neither the final criterion, the model methodology, nor any of the exposure assumptions contained in the GLWC were used to develop the EPV_{mink}. Therefore, it is incorrect to suggest that differences in exposure assumptions between the EPV and the GLWC invalidate the hypothesis that the RBAL derived for this trophic level is adequately protective.

The exposure assumptions in the GLWC were used to derive a water concentration; the exposure assumptions in the EPV were used to derive a sediment concentration. However, the toxicological benchmark (the TRV) was used to derive both the GLWC and the EPV for mink. Intakes equal to or below this "safe" daily dose are considered protective of wildlife (USEPA, 1995). In the GLWC, the ultimate source of the PCBs is assumed to be the water column, and therefore bioaccumulation factors (BAFs) were used along with estimates of food ingestion (i.e., fish) and water intake to determine daily intakes. For the EPV, the source of the PCBs is assumed to be the sediments, and therefore biota-sediment accumulation factors (BSAFs) along with food intakes were used to quantify daily intakes. The assumption that the sediments drive the fish tissue levels is consistent with the Final Water Quality Guidance for the Great Lakes System (USEPA, 1995):

> *Based on comments received, the final Guidance modifies the proposed hierarchy by adding a predicted [bioaccumulation factor] based on a BSAF as the second method in the hierarchy. BSAFs may be used for predicting [bioaccumulation factors] from concentrations of chemicals in surface sediments.*

However, to reiterate, in both instances the target "safe" daily intake was based on the same toxicological benchmark, only the source of PCBs in the prey items was different. Since the reference dose (the TRV) was the same in either calculation, the differences in "specific exposure assumptions" are not germane to whether the EPV is adequately protective.

This TRV derived by USEPA (1995) for mammals is approximately 6 times lower than the benchmark for avian species (0.30 mg/kg-day and 1.8 mg/kg-day, respectively). Since similar modeling techniques such as BSAFs, area use factors, and fish ingestion rates would have been used if avian receptors had been the target species, the resulting risk-based EPV would have been higher using this ecological receptor. The daily intake of fish by mink as a function of body weight is generally higher than avian species. For example, as expressed in the parameters used in the GLWC (Table 4-4 and Table 4-8), the daily intake of fish for mink is 4.52 kg/kg body weight and for the bald eagle the daily intake is 0.1 kg/kg body weight. Therefore, since the toxicity threshold is 6-fold lower and the fish intake (i.e., exposure) is higher, an EPV protective of the mink would afford an adequate level of protection for avian species as well. As such, the assessment and measurement endpoints are adequate to validate the assumption that the EPV derived for this site is adequately protective of upper-trophic level organisms.

COMMENT 35:

Section 7.3.1.3, Page 7-14, Paragraph 5

Reproductive success in the raccoon was chosen as the only measurement endpoint for upper-trophic-level receptors in Snow Creek. No information was presented to validate this selection. Raccoons are significantly less sensitive to effects from PCBs than mink. Additionally, the same concerns described in the comment above also apply to the raccoon assessment. Therefore, the assumption that EPVs protective of raccoon reproduction are protective of all upper-trophic-level receptors cannot be accepted without additional analyses. Evaluations should be conducted for additional assessment and measurement endpoints to validate the assumptions.

Response 35:

Although the EPV for Snow Creek was based on the reproductive success in the raccoon, the toxicological data used to derive the dose-response curve were the same as the data used for the mink. The comment states that "Raccoons are significantly less sensitive to effects from PCBs than mink." We would agree with this statement as it further demonstrates the conservative nature of our approach. Applying the dose-response data derived from studies in mink directly to the raccoon overestimates the risks associated with exposure to PCBs in this species. Implicit in the analysis is that there are few, if any, upper trophic level receptors with exposure to fish and sediment in Snow Creek that substantially exceed the assumptions laid out for the raccoon. Based on a qualitative evaluation of Snow Creek's habitat, the raccoon is a representative receptor in terms of its direct and indirect (fish consumption) exposure to sediment. Due to Snow Creek's poor habitat quality, including a high level of human activity, it is unlikely that other upper trophic level species, (e.g., mink, bald eagle, great blue heron) would exceed the exposure parameters developed for the raccoon. Also inherent in this approach is the over estimation of toxicity through the use of the mink derived toxicity benchmark.

COMMENT 36:

Section 7.3.1.3, Page 7-14, Third Paragraph

A piscivorus [sic] mammalian receptor species model would be appropriate for the evaluation of fish contamination in Snow Creek. The receptor species model is meant to be representative of the risk to the assessment endpoint from the pathway being analyzed.

Response 36:

The only receptor that would likely feed in Snow Creek on a long-term basis is one capable of exploiting an urban environment. While it is true that raccoons are not strictly pisciverous, fish do constitute a portion of their diet. Therefore, this species was considered the applicable receptor to be evaluated for this exposure pathway.

COMMENT 37:

Section 7.3.1.3, Page 7-14

The reference document, The Great Lakes Wildlife Criterion for PCBs (USEPA, 1995) derives a surface water quality concentration protective of wildlife (mink) of 74 pg/L. All surface water concentrations appear to be equal to (1 sample) or exceed this value.

Response 37:

The comment correctly identifies the *Great Lakes Wildlife Criteria for PCBs* that applies to water column concentrations. However, in the ecological portion of the HEA, the focus of the evaluation was the sediments, since in the site conceptual exposure model, sediments were identified as the source of the PCBs into the aquatic environment. Additionally, Solutia expects that any corrective action that might be considered by ADEM in the Off-Site program would most likely target sediment, among other items. As such, the sampling and analysis program was directed toward this medium, and not the water column.

COMMENT 38:

Page 7-15, First Paragraph

The risk assessment should address all potential chemical stressors.

Response 38:

See Response No. 3.

COMMENT 39:

Section 7.3.1.6, Page 7-16

The use of fish ingestion as the only exposure pathway is not acceptable. Mink and raccoons both ingest a large variety of different food items in both terrestrial and aquatic habits. During the ingestion of these food items, sediment and surface soil may also be ingested. Additionally, contaminated surface water may be ingested. All exposure pathways must be considered in development of the exposure dose, unless information is provided that substantiates that an exposure pathway makes a negligible contribution to the dose.

Response 39:

The issues raised in this comment are similar to those identified in Comment No. 11. The terrestrial exposure pathways for organisms residing in the Choccolocco Creek watershed will be evaluated in the forthcoming Off-Site Flood Plain RFI. Regarding other aquatic exposure pathways, studies have shown that incidental ingestion of sediment by pisciverous mammals is minimal (estimated at 1% of the total dietary intake). Similarly, ingestion of PCBs via the water column is so low relative to fish ingestion, and this pathway would also not contribute significantly to the total daily intake of PCBs. Since PCBs are relatively insoluble in water, the primary pathway for sediment-associated PCBs to be ingested, as part of the animals' drinking water would be via suspended particulate matter in the water column. Based on site data, an estimate of the minimal contribution of this pathway can be developed. For example, an estimate of the total suspended solids in Choccolocco Creek, based on current and historical data, is approximately 50 mg/L (BBL, 1999). If sediments were at the maximum calculated RBAL for mink, 1.32 mg/kg based on bioaccumulation into prey items, the water column concentration would be 66 ng/L. Based on the allometric equation for drinking water ingestion for mammals provided in the Wildlife Exposure Factors Handbook (USEPA, 1993), a 1 kg mink will ingest approximately 100 ml of water a day. At a water concentration of 66 ng/L, this would represent a daily intake of 6.6 ng of PCBs. The toxicological benchmark for pisciverous mammals used in the HEA was 30 µg/kg/day, based on the methodology developed in the Great Lakes Wildlife Criteria (USEPA, 1993). Thus, the ingestion of creek water with sediments at the RBAL would represent approximately 0.02% of the "allowable" daily intake. ADEM has suggested the NOAEL of 10 µg/kg/day developed in the Hudson River BERA be used in the HEA. Even with this lower benchmark, ingestion of creek water with sediments at the RBAL for pisciverous mammals represents less than one tenth of one percent (0.06%) of the allowable PCB daily dose. Thus, PCB intake via ingestion of creek water does not represent a significant exposure pathway. As a consequence, inclusion of this exposure pathway in calculating a RBAL for sediments would not alter the final values derived in the HEA. Information substantiating these conclusions will be added to the Off-Site RFI report.

Concerning food items other than fish, data from other aquatic sites (e.g., the Fox River and Kalamazoo River) indicate that bioaccumulation of PCBs into other potential prey items (crayfish) is lower than in fish. Therefore, since we assumed the aquatic portion of the diet to be all fish, we overestimated the contribution from the other prey items. This assumes that any increase in the proportion of the diet comprised of invertebrates would correspond to a proportional reduction in fish ingestion. The result would be a lower dose of sediment-associated PCBs, since the accumulation from this source is lower.

COMMENT 40:

Sections 7.3.1.7 through 7.3.1.8.2, Pages 7-16 through 7-21

The conceptual model and food chain presented in these sections and in Figure 7-4 are incomplete. The information should be revised to include terrestrial receptors and exposures.

Response 40:

The Off-Site RFI focused exclusively on in-stream exposure pathways. The terrestrial exposure pathways and potential receptors will be addressed in the forthcoming Off-Site Floodplain RFI. Following this analysis of floodplain exposure pathways, a comprehensive exposure model incorporating the conceptual models from the in-stream and floodplain components will be developed and submitted to ADEM in the Off-Site Floodplain RFI report.

COMMENT 41:

Section 7.3.2.1.2, Pages 7-22 through 7-24

The information in this section was used to develop RBALs for protection of benthic invertebrates. RBALs developed by Solutia were compared to the consensus-based sediment effect concentrations (SECs) for PCBs in the Hudson River Basin that were developed by NOAA (1999) to support an assessment of potential impacts to sediment-dwelling organisms. The EC *for PCBs refers to all the PCBs found in the Hudson River, plus the degradation products and metabolites of these chemicals. SECs do not consider the potential for: (1) bioaccumulation in aquatic species or (2) potential effects that could occur throughout the food web as a result of PCB bioaccumulation. SEC levels were defined as follows. "The Hudson River SECs provide threshold effect concentration (TEC), mid-range effect concentration (MEC), and extreme effect concentration (EEC). The TEC is intended to identify the concentration of total PCBs below which adverse population-level effects (e.g., mortality, decreased growth, reproductive failure) on sediment-dwelling organisms are unlikely to be observed (NOAA, 1999a). The MEC represents the concentration of total PCBs above which adverse effects on sediment-dwelling organisms are expected to be frequently observed. Adverse effects are expected to be usually or always observed at PCB concentrations exceeding the EEC." TEC (0.04 mg/kg), MEC (0.4 mg/kg), and EEC (1.7 mg/kg) values for sediment are all significantly below RBALs developed by Solutia for protection of benthic invertebrates. In the case of the Jackson Shoals to Lake Logan Martin area, the RBAL is seven times higher than the Hudson River Basin EEC level. The values used by Solutia should be recalculated using the most current information and methodologies.*

Response 41:

The SEC approach develops a probability approach, not a dose-response curve. For example, Figure 1 of the Consensus Report indicates that the sediment PCB concentrations that fall between the MEC and the EEC result in a 48.7% probability that an effect will occur. Conversely, there exists a 51.3% probability that an adverse effect will *not* occur.

The approach taken in the HEA to develop RBALs protective of benthic organisms was site specific and specific to PCBs. The $RBAL_{Benthic}$ was based on site-specific data and toxicity information developed and endorsed by USEPA, and employed a methodology recommended by USEPA. Also, perhaps lending further credibility to the approach taken in the HEA, the authors of the "Consensus-Based Sediment Effects Concentrations" used this very method to validate their methodology:

> *Only the empirically derived SQGs were used to derive the consensus-based SECs; the theoretically derived SQGs were used subsequently to evaluate the reliability of the SECs* (NOAA, 1999).

One of the two "theoretical" methodologies used to test the reliability of the consensus approach was the equilibrium partitioning model, the very same model used to develop the $RBAL_{Benthic}$ for Snow and Choccolocco Creeks.

COMMENT 42:

Section 7.3.2.2, Pages 7-25 through 7-26

The process used to select the TRV resulted in the use of a value that is not sufficiently conservative. The study selected (Mayer and Others 1977) used reduced growth and fry *mortality as study endpoints. This resulted in a NOAEL value of 32 mg/kg of body weight. For the Hudson River PCB studies, NOAEL and TRVs were developed for the forage fish receptors (pumpkinseed and spottail shiner), as well as for fish that feed at higher trophic levels, such as the brown bullhead, yellow perch, white perch, largemouth bass, striped bass, and shortnose sturgeon. NOAEL TRVs ranged from 0.5 to 3.1-mg/kg body weight and were based on reproductive endpoints for fish. The brown bullhead and largemouth bass NOAELs were 1.5 and 0.5 mg/kg, respectively. The NOAEL TRV of 32 mg/kg used by Solutia should be reevaluated and a more conservative TRV developed for use in calculating RBALs for fish.*

Response 42:

On the basis of laboratory studies, the NOAEL TRV developed in the Hudson River Baseline Ecological Risk Assessment (USEPA, 1999) for both the largemouth bass (LMB) and the brown bullhead was 1.5 mg PCBs/kg tissue. The reported TRV of 0.5 mg/kg for the LMB was based on field studies in the redbreast sunfish (Adams et al., 1992). However, these studies were conducted on fish living in the East Fork Poplar Creek, in Oak Ridge Tennessee. The investigators reported the co-occurrence of other chemicals known to adversely impact fecundity and other reproductive/development endpoints. The results of the study simply reported the concentration of PCBs that were in fish expressing reduced fecundity. As such, a dose response, or cause and effect relationship, could not be drawn from these reports. Therefore, these data should not have been used to derive a NOAEL specific to PCBs.

For both of these species, the appropriate toxicological benchmark was a NOAEL in fish with an average tissue concentration of 15 mg/kg. The study by Bengtsson (1980) evaluating hatchability in the minnow was the basis of both the NOAEL TRV and the LOAEL TRV reported in the Hudson River BERA for the brown bullhead and the largemouth bass. In fact, this same study formed the basis of the laboratory derived NOAELs and LOAELs for *all* of the species identified by the commentor: pumpkinseed, spottail shiner, yellow perch, white perch, striped bass and shortnose sturgeon (a species not found in Choccolocco Creek watershed). In order to account for potential interspecies differences in sensitivity, the authors of the BERA applied a 10-fold uncertainty factor to the experimentally derived NOAEL.

The TRV developed in the Off-Site HEA is a NOAEL (32 mg/kg body weight) that falls between the NOAEL (15 mg/kg body weight) and LOAEL (170 mg/kg body weight) derived from the Bengtsson study, and in fact is only two-fold higher than the NOAEL. Additionally, since the NOAEL used in the HEA was derived from studies with a species known to inhabit Choccolocco Creek, and in fact a species for which site-specific PCB levels are reported in the HEA (the channel catfish), the application of an interspecies uncertainty factor is not required. The study by Bengtsson suggests that no adverse effects occur at 15 mg/kg body weight, and effects were not observed until tissue levels reached 170 mg/kg body weight. Therefore, the TRV of 32 mg/kg body weight in the Off-Site HEA is in agreement with the values used in the Hudson BERA and can be considered protective.

COMMENT 43:

Section 7.3.2.2.1, Pages 7-26 through 7-27

RBALs were calculated based only on catfish fingerlings. Lipid values used were those for largemouth bass. While these values may be representative of fingerling catfish, adult catfish have a significantly higher percentage of lipids. Therefore, the lipid content in adult catfish should have been used in the calculations. Additionally, because largemouth bass appear to be more sensitive to PCBs, RBALs should be calculated for both largemouth or spotted bass and catfish. The lowest value for each area should then be used as the RBAL.

Response 43:

The use of LMB YOY lipid values as surrogates for catfish fingerling levels did introduce a certain degree of uncertainty. However, the data from Choccolocco Creek do not support the statement that "adult catfish have significantly higher percentages of lipids." A preliminary evaluation can be conducted using data from the table on page 7-10 and the table on page 7-72 of the report. The mean of the three values for the "% Lipid" in adult catfish from the 3 sampling locations is 1.71%; the mean "% Lipid" from the LMB YOY collected in the 3 segments of the creek is 1.69%. These data suggest that the lipid content of the adult channel catfish and the LMB YOY are essentially identical.

Even if the comment were correct, there would not be a significant impact on the final RBAL. While it is true that using a low lipid content results in a higher RBAL (since this factor is in the denominator of the equation), this is only the case if the BSAF remains constant. However, the BSAF was calculated using the same lower lipid value. Replacing the "% Lipid" in the BSAF equation (see Appendix G) with a higher percentage of lipids would decrease the BSAF (because the higher % lipid reduces the lipid normalized tissue concentration in the numerator). A lower BSAF means a less efficient transfer of PCBs from sediment to fish, and therefore a higher PCB sediment concentration would be required to achieve the target fish tissue level (i.e., 32 mg/kg body weight). Therefore, changing the "% Lipid" value to a higher percentage would not have a dramatic impact on the final RBAL.

The comment also suggests that the growth and mortality of channel catfish might not be a sensitive enough endpoint for developing the RBAL for fish. The fact that the NOAEL for fingerling channel catfish (32 mg/kg body weight) so closely approximates the NOAEL in the minnow study by Bengtsson (15 mg/kg body weight) indicates that this is an appropriately sensitive endpoint. As stated in the HEA, the fry/fingerling represent a sensitive life stage, and therefore represent an appropriate measurement endpoint for the assessment endpoint of a healthy and thriving resident fish population.

Finally, the study by Bengtsson (1980) evaluating hatchability in the minnow was the basis of the experimentally derived NOAEL TRV and the LOAEL TRV reported in the Hudson River BERA for both the brown bullhead and the largemouth bass. The lower NOAEL identified in the comment was obtained from field studies in which redbreast sunfish were exposed to multiple chemical stressors. There were no comparable field studies identified for brown bullhead. Thus, there are no data contained in Hudson River BERA report to support the statement that the "largemouth bass appear to be more sensitive [than the brown bullhead] to PCBs."

COMMENT 44:

Sections 7.3.2.3.3, Page 7-29, Paragraph 1

The diet of a mink is composed of a large variety of terrestrial and aquatic prey. Based on the description of the proportion of fish in the diet variable, it appears that the simulation assumed that all non-fish items in the diet contained 0.0 mg/kg of PCBs. This is not realistic and must be revised. The contribution of PCBs in the diet from non-fish prey must be added to the model. Additionally, soil, sediment, and surface water ingestion must be incorporated for a realistic evaluation.

Response 44:

The contribution of terrestrial prey items is being evaluated in the HEA portion of the ongoing Floodplain RFI. The estimated intake of PCBs from the aquatic environment will be included in the development of cumulative exposure estimates associated with these terrestrial sources of PCBs.

COMMENT 45:

Section 7.3.2.3.4, Page 7-29

Based on the concerns expressed in the above comments, the results presented in this paragraph are not considered to be valid.

Response 45:

Comment Noted. Based on explanations provided in the above responses, the results and conclusions of the Off-Site RFI report are reasonable and scientifically defensible.

COMMENT 46:

Section 7.3.2.3.5, Page 7-30, Paragraph 4

The raccoon is an omnivore that has limited fish ingestion as a percentage of total diet. The same issues discussed in Specific Comment No. 44 apply to the raccoon.

Response 46:

See response to comment 44.

COMMENT 47:

Section 7.3.2.3.6, Page 7-31

Based on the concerns expressed in Specific Comments Nos. 23 and 32, the results presented in this paragraph are not considered to be valid.

Response 47:

Based on the explanations provided in the above responses, the results and conclusions of the Off-Site RFI report are reasonable and scientifically defensible.

COMMENT 48:

Section 7.3.3.1, Page 7-32, Paragraph 4:

The dose-response curve that was developed for the modeling may not be sufficiently conservative. The NOAEL value for this curve was about 33 microgram per kilogram per day (μg/kg-day) for the mink. The NOAEL value developed for the Hudson River Basin studies was 10 μg/kg-day. A consensus TRV must be determined for use in the analyses.

Response 48:

Solutia agrees that a consensus needs to be achieved regarding the mink TRV. Both the Great Lakes Water Quality Initiative (GLI) Wildlife Criteria (USEPA, 1995) and the Hudson River Baseline Ecological Risk Assessment (USEPA, 1999) based the mink benchmark toxicity value on the study by Aulerich and Ringer (1977). However, the interpretations of this study are very different in the two reports. The inconsistency identified in the comment is associated with the selection of different experimental data between the GLI and the Hudson River BERA. The GLI selected the *chronic* study in which female mink were exposed to only 1 PCB dose, diets supplemented with 2 ppm of either Aroclor 1254, Aroclor 1242, Aroclor 1221 or Aroclor 1016. Only mink fed Aroclor 1254 exhibited reproductive effects. Based on mink body weights and food consumption rates presented in the study, the 2 ppm Aroclor 1254 corresponded to a dose of 0.30 mg/kg-day. This is correctly identified as the LOAEL in the GLI. Since no other doses were tested, this is an unbounded LOAEL.

The Hudson River BERA identified a LOAEL of 0.7 mg/kg-day based on the same study, but a different experimental protocol. The authors of the Hudson River BERA used the results of a sub-chronic test in which the females were fed diets containing 1 ppm or 5 ppm Aroclor 1254 for only 4 months. Only the 5 ppm diet (i.e., 0.7 mg/kg-day) caused reproductive effects and therefore represented the LOAEL. The 1 ppm diet (approximately 0.1 mg/kg-d) represented a sub-chronic NOAEL.

The inconsistency identified in the comment highlights the uncertainty associated with uncertainty factors including:

- Using a LOAEL from a *chronic* study, obviates the need for the 10-fold subchronic-to-chronic uncertainty factor (UF), but requires the application of a 10-fold LOAEL-to-NOAEL UF. This results in a threshold dose of 30 µg/kg-day.

- However, using a NOAEL from a subchronic study eliminates the need for the LOAEL-to-NOAEL UF, but requires the application of a subchronic-to-chronic UF. This results in a threshold dose of 10 µg/kg-day.

Both approaches have a certain degree of uncertainty associated with them, and a review of the original study does not suggest which method might be best for quantitative risk estimates. However, the available data indicate that the 30µg/kg-day is adequately protective.

COMMENT 49:

Section 7.3.3.3, Page 7-32 through 7-34

Criteria used in this section to evaluate data are flawed. This section states that protection of a viable mink population inhabiting the Choccolocco Creek watershed was the primary consideration in the assessments. The suitability of the habitat for mink is then used to justify the percentages used in the assessment. This is not correct. The mink is a surrogate that is supposed to represent a sensitive receptor to establish concentrations that are protective of all the other upper-trophic-level receptors that may be exposed. Using the lack of suitable mink habitat to justify the criteria is inappropriate. Consensus criteria should be developed.

Response 49:

While the quality of the habitat was considered in developing a site utilization factor, the comment mischaracterizes the output of the analysis. The distribution for the "Fraction of Source" ranged from 10% to 100%, with a mean of 50%. This distribution function is not unreasonable for any ecosystem based on the reported mobility of this species, and the size of the creek relative to the watershed. There is a significant portion of the distribution that includes individuals of the population getting more than half of their aquatic prey items from the creek. As such, this approach is a reasonable approximation of the use of this water body by a *population* of local upper-trophic-level receptors and results in an RBAL that is adequately protective.

There are few if any upper trophic level receptors that could get a substantially higher proportion of their aquatic prey items from Choccolocco Creek than was assumed in the calculation, since the majority of the iterations included values for the Fraction of Source of over 50%. Given that mink are uniquely sensitive to the adverse effects of PCBs, and that the TRV is lower than required for other upper-trophic-level receptors, the combined effect results in a RBAL that would prevent any of these organisms from being exposed to harmful levels of PCBs from Choccolocco Creek.

COMMENT 50:

Section 7.3.3.4, Pages 7-34 through 7-36

Based on the concerns expressed in previous comments, the results presented in this section are not considered to be valid.

Response 50:

As noted in the responses above, Solutia will be revising the Off-Site RFI report to reflect the technical concerns identified in the comments. After careful review and consideration of these comments, and the associated responses, the overall results and conclusions of Section 7.3.3.4 of the Off-Site RFI report remain valid, and scientifically defensible.

COMMENT 51:

Section 7.5, Pages 7-38 through 7-40

Based on the concerns expressed in previous comments, RBALs presented in this section are not considered to be suitable for decision-making.

Response 51:

As noted in the responses above, Solutia will be revising the Off-Site RFI report to reflect the technical concerns identified in the comments. After careful review and consideration of these comments, and the associated responses, the overall results and conclusions of Section 7.5 of the Off-Site RFI report remain valid, and scientifically defensible.

COMMENT 52:

Section 8.0, Pages 8-1 through 8-6

Because of deficiencies identified in previous comments, the OCM, as presented, is not accurate. Identified deficiencies should be addressed and the OCM revised.

Response 52:

As noted in the responses above, Solutia will be revising the Off-Site RFI report to reflect the technical concerns identified in the comments. After careful review and consideration of these comments, and the associated responses, the overall results and conclusions of Section 8.0 of the Off-Site RFI report remain valid, and scientifically defensible.

COMMENT 53:

Section 9.0, Pages 9-1 through 9-3

Because of deficiencies identified in previous comments, the accuracy of the results and conclusions presented in this section cannot be verified.

Response 53:

As noted in the responses above, Solutia will be revising the Off-Site RFI report to reflect the technical concerns identified in the comments including the conclusions that Lake Logan Martin is not affected by PCBs, and that a CMS may be required for the Lake. After careful review and consideration of these comments, and the associated responses, the overall results and conclusions of Section 9.0 of the Off-Site RFI report remain valid, and scientifically defensible.

Attachment A

Fish Tissue PCB Data for Lake Logan Martin and Choccolocco Creek

Data Sources:
BBL, 1999
Bayne, 1996, 1999 and 2000
ADEM, 1989 to 1999

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Table 1

Summary of Fish Samples Collected by Bayne, BBL, and ADEM

Location	Species	Count	Source	PCB LCI	Avg PCB (ppm)	PCB UCI
ADEM 96	Channel Catfish	5	ADEM '96 Ind	20.26	29.90	39.61
ADEM 96	Channel Catfish	10	BBL '99 Ind	1.84	8.75	15.66
ADEM 96	Channel Catfish	10	Bayne '00 Comp		26.70	
ADEM 96	Spotted Bass	1	ADEM '96 Ind		11.60	
ADEM 96	Spotted Bass	10	BBL '99 Ind	1.04	5.43	9.81
ADEM 96	Spotted Bass	10	Bayne '00 Comp		14.30	
NEW 99	Channel Catfish	10	BBL '99 Ind	4.37	7.11	9.84
NEW 99	Channel Catfish	10	Bayne '00 Comp		2.80	
NEW 99	Spotted Bass	10	BBL '99 Ind	1.68	2.88	4.08
NEW 99	Spotted Bass	3	Bayne '00 Comp		5.02	
NEW 99	Spotted Bass	4	Bayne '00 Comp		1.05	
Station 30	Blue Catfish	8	Bayne '96 Ind	0.01	0.32	0.74
Station 30	Blue Catfish	6	BBL '99 Ind	0.03	0.13	0.24
Station 30	Channel Catfish	4	Bayne '96 Ind	0.01	1.10	2.78
Station 30	Channel Catfish	1	BBL '99 Ind		0.21	
Station 30	Largemouth Bass	12	Bayne '96 Ind	0.18	0.37	0.55
Station 30	Largemouth Bass	10	BBL '99 Ind	0.12	0.18	0.24
Station 33	Blue Catfish	6	ADEM '92 Comp		0.39	
Station 33	Blue Catfish	3	ADEM '95 Ind	1.85	1.95	2.04
Station 33	Blue Catfish	3	ADEM '95 Comp		4.47	
Station 33	Blue Catfish	6	ADEM '96 Ind	2.85	3.06	3.27
Station 33	Blue Catfish	12	Bayne '96 Ind	0.45	0.97	1.42
Station 33	Blue Catfish	5	ADEM '99 Comp		1.09	
Station 33	Blue Catfish	5	ADEM '99 Ind	0.84	1.10	1.36
Station 33	Blue Catfish	5	BBL '99 Ind	0.01	0.45	1.02
Station 33	Channel Catfish	10	ADEM '89 Ind	0.63	0.78	0.93
Station 33	Channel Catfish	5	ADEM '92 Comp		0.20	
Station 33	Channel Catfish	4	ADEM '95 Ind	1.59	2.22	2.84
Station 33	Channel Catfish	3	ADEM '95 Comp		4.23	
Station 33	Channel Catfish	8	Bayne '96 Ind	0.01	1.42	3.09

Table 1

Summary of Fish Samples Collected by Bayne, BBL, and ADEM

Location	Species	Count	Source	PCB LCI	Avg PCB (ppm)	PCB UCI
Station 33	Channel Catfish	5	BBL '99 Ind	0.01	1.39	3.71
Station 33	Channel Catfish	6	Bayne '00 Comp		0.74	
Station 33	Largemouth Bass	6	ADEM '89 Ind	0.18	0.25	0.31
Station 33	Largemouth Bass	6	ADEM '92 Comp		0.54	
Station 33	Largemouth Bass	6	ADEM '96 Ind	1.35	1.62	1.89
Station 33	Largemouth Bass	17	Bayne '96 Ind	0.50	0.79	1.08
Station 33	Largemouth Bass	6	ADEM '99 Ind	1.20	1.45	1.70
Station 33	Largemouth Bass	6	ADEM '99 Comp		1.85	
Station 33	Largemouth Bass		Bayne '99 Comp		0.47	
Station 33	Largemouth Bass	10	BBL '99 Ind	0.01	1.08	2.20
Station 33	Largemouth Bass	6	Bayne '00 Comp		0.05	
Station 33	Spotted Bass	4	ADEM '89 Ind	0.01	0.20	0.58
Station 33	Spotted Bass	6	ADEM '95 Comp		1.95	
Station 33	Spotted Bass	6	ADEM '95 Ind	1.10	1.41	1.72
Station 33	Spotted Bass	12	Bayne '96 Ind	0.87	1.47	2.06
Station 33	Spotted Bass		Bayne '99 Comp		0.82	
Station 33	Spotted Bass	6	Bayne '00 Comp		1.19	
Station 35	Blue Catfish	3	ADEM '94 Ind	8.15	10.71	13.27
Station 35	Blue Catfish	6	ADEM '96 Ind	19.39	21.90	24.41
Station 35	Blue Catfish	13	Bayne '96 Ind	2.38	3.85	5.32
Station 35	Blue Catfish	6	ADEM '99 Ind	5.39	7.59	9.79
Station 35	Blue Catfish	6	ADEM '99 Comp		6.98	
Station 35	Channel Catfish	2	ADEM '94 Ind	20.86	34.71	48.56
Station 35	Channel Catfish	9	Bayne '96 Ind	5.15	7.05	8.95
Station 35	Channel Catfish		Bayne '99 Comp		1.61	
Station 35	Channel Catfish	6	BBL '99 Ind	0.01	4.80	14.19
Station 35	Channel Catfish	6	Bayne '00 Comp		3.07	
Station 35	Largemouth Bass	6	ADEM '96 Ind	15.76	17.42	19.07
Station 35	Largemouth Bass	15	Bayne '96 Ind	2.38	5.07	7.76
Station 35	Largemouth Bass	6	ADEM '99 Ind	2.77	3.08	3.38
Station 35	Largemouth Bass	6	ADEM '99 Comp		2.46	
Station 35	Largemouth Bass		Bayne '99 Comp		0.40	

Table 1
Summary of Fish Samples Collected by Bayne, BBL, and ADEM

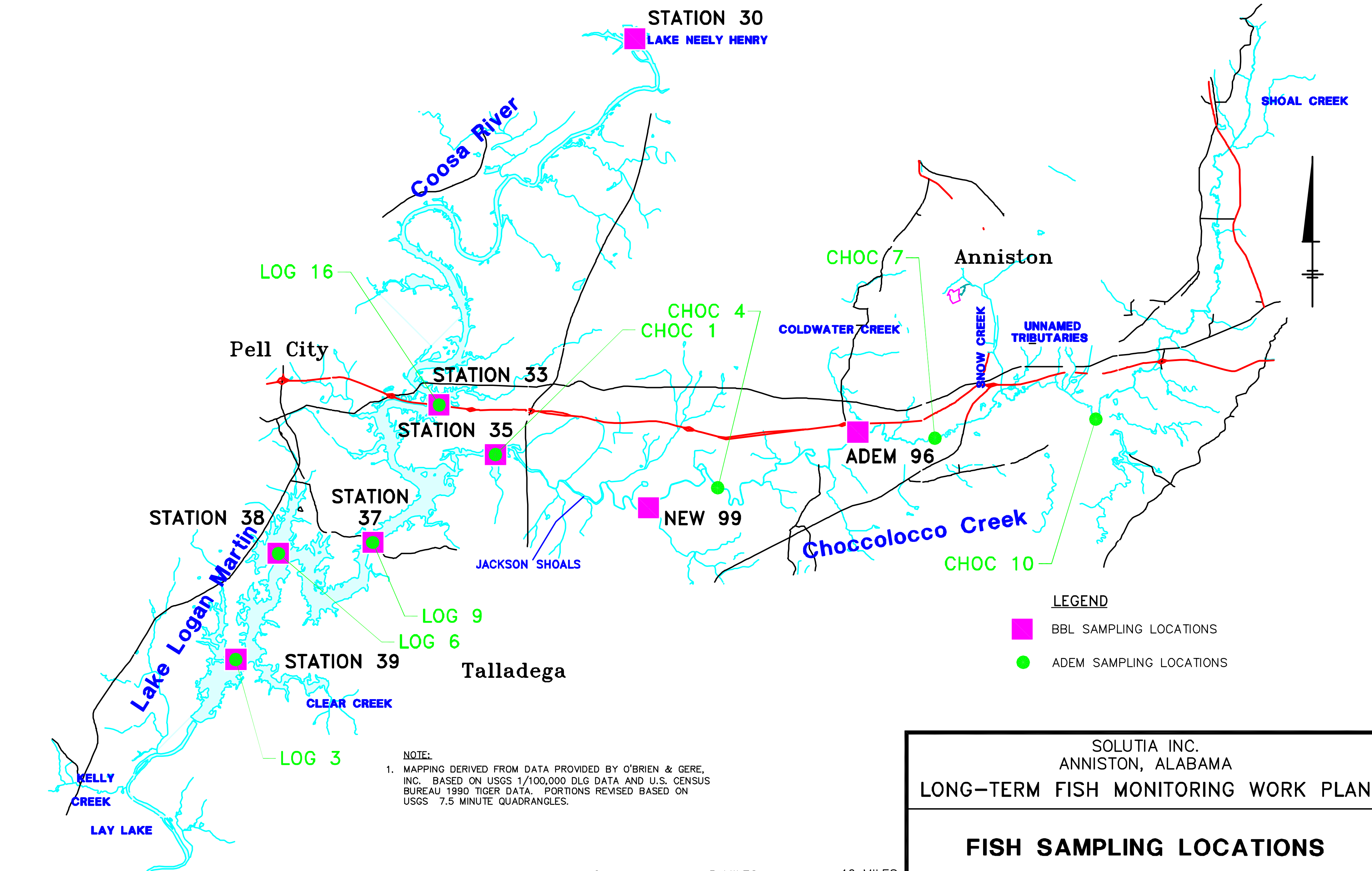
Location	Species	Count	Source	PCB LCI	Avg PCB (ppm)	PCB UCI
Station 35	Largemouth Bass	10	BBL '99 Ind	1.50	2.25	3.01
Station 35	Largemouth Bass	6	Bayne '00 Comp		3.08	
Station 35	Spotted Bass	6	ADEM '94 Ind	8.38	11.40	14.40
Station 35	Spotted Bass	12	Bayne '96 Ind	4.32	8.12	11.92
Station 35	Spotted Bass		Bayne '99 Comp		1.76	
Station 35	Spotted Bass	6	Bayne '00 Comp		2.11	
Station 38	Blue Catfish	6	ADEM '95 Comp		5.82	
Station 39	Blue Catfish	6	ADEM '95 Ind	1.35	2.38	3.40
Station 38	Blue Catfish	5	ADEM '96 Ind	3.13	3.86	4.59
Station 38	Blue Catfish	4	Bayne '96 Ind	0.59	0.97	1.35
Station 38	Blue Catfish	3	BBL '99 Ind	0.00	1.05	4.43
Station 38	Channel Catfish	3	ADEM '95 Comp		4.49	
Station 38	Channel Catfish	3	ADEM '95 Ind	3.30	4.20	5.09
Station 38	Channel Catfish	12	Bayne '96 Ind	0.71	1.77	2.83
Station 38	Channel Catfish	6	BBL '99 Ind	0.01	0.50	1.05
Station 38	Spotted Bass	6	ADEM '95 Comp		6.66	
Station 38	Spotted Bass	6	ADEM '95 Ind	2.59	3.30	4.01
Station 38	Spotted Bass	6	ADEM '96 Ind	3.81	4.70	5.60
Station 38	Spotted Bass	12	Bayne '96 Ind	1.55	1.96	2.38
Station 38	Spotted Bass	10	BBL '99 Ind	0.29	0.45	0.62
Station 39	Blue Catfish	1	ADEM '95 Ind		2.53	
Station 39	Blue Catfish	1	ADEM '96 Ind		5.50	
Station 39	Blue Catfish	4	Bayne '96 Ind	0.01	0.77	1.60
Station 39	Blue Catfish	3	BBL '99 Ind	0.01	0.63	1.89
Station 39	Channel Catfish	2	ADEM '95 Comp		1.34	
Station 39	Channel Catfish	3	ADEM '95 Ind	1.80	2.00	2.20
Station 39	Channel Catfish	1	ADEM '96 Ind		6.56	
Station 39	Channel Catfish	10	Bayne '96 Ind	0.19	1.02	1.85
Station 39	Channel Catfish	4	BBL '99 Ind	0.01	0.42	1.03
Station 39	Channel Catfish	8	Bayne '00 Comp		0.35	

Table 1

Summary of Fish Samples Collected by Bayne, BBL, and ADEM

Location	Species	Count	Source	PCB LCI	Avg PCB (ppm)	PCB UCI
Station 39	Largemouth Bass	12	Bayne '96 Ind		0.56	
Station 39	Largemouth Bass	8	Bayne '00 Comp		0.30	
Station 39	Spotted Bass	6	ADEM '95 Comp		4.88	
Station 39	Spotted Bass	6	ADEM '95 Ind	2.21	2.44	2.67
Station 39	Spotted Bass	6	ADEM '96 Ind	3.52	4.19	4.86
Station 39	Spotted Bass	11	Bayne '96 Ind	1.26	2.10	2.95
Station 39	Spotted Bass		Bayne '99 Comp		0.89	
Station 39	Spotted Bass	10	BBL '99 Ind	0.16	0.41	0.66
Station 39	Spotted Bass	9	Bayne '00 Comp		1.44	
Station 33	Striped Bass	4	ADEM '96	4.89	5.82	6.75
Station 33	Striped Bass	3	Bayne '96	1.70	3.09	4.48
Station 33	Striped Bass	2	ADEM '99 Comp		2.51	
Station 33	Striped Bass	2	ADEM '99	1.77	2.66	3.55
Station 35	Striped Bass	8	Bayne '96	6.26	9.49	12.72
Station 35	Striped Bass	2	ADEM '99 Comp		5.12	
Station 35	Striped Bass	2	ADEM '99	4.71	4.84	4.97
Station 37	Striped Bass	2	ADEM '96	3.64	11.67	19.70
Station 37	Striped Bass	2	Bayne '96	2.01	7.94	13.87
Station 37	Striped Bass	2	ADEM '99 Comp		3.53	
Station 37	Striped Bass	2	ADEM '99	0.83	3.22	5.61

Notes:
LCI indicates lower 95% confidence interval caluclated using the student's t method
UCI indicates Upper 95% confidence interval caluclated using the student's t method
Comp indicates one composite sample several fish fillets was analyzed
Ind indicates the average of individual fillet samples
Count indicates the number of samples averaged for individual samples and the number of fish composited in composite samples
Locations identified are consistent with the RFI sampling program and historic Bayne samples corresponding ADEM locations are shown on Figure 1.



NOTE:

1. MAPPING DERIVED FROM DATA PROVIDED BY O'BRIEN & GERE, INC. BASED ON USGS 1/100,000 DLG DATA AND U.S. CENSUS BUREAU 1990 TIGER DATA. PORTIONS REVISED BASED ON USGS 7.5 MINUTE QUADRANGLES.

SOLUTIA INC.
ANNISTON, ALABAMA
LONG-TERM FISH MONITORING WORK PLAN

FISH SAMPLING LOCATIONS

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1

X: 10285X00, 10285X02.DWG
L: ON=*, OFF=*REF*,*A*
P: STD AL OR FRY700AL.PCP
1/16/02 SYR-54-KMD DJP RCA
10285020/10285B05.DWG

Fish Tissue PCB Concentrations (mg/kg wet weight) for Bass and Catfish from Lake Logan Martin Stations 30, 33, 38 and 39

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Figure 2 - Station 30 - Mean PCB Concentration and 95% Confidence Interval for Bass and Catfish

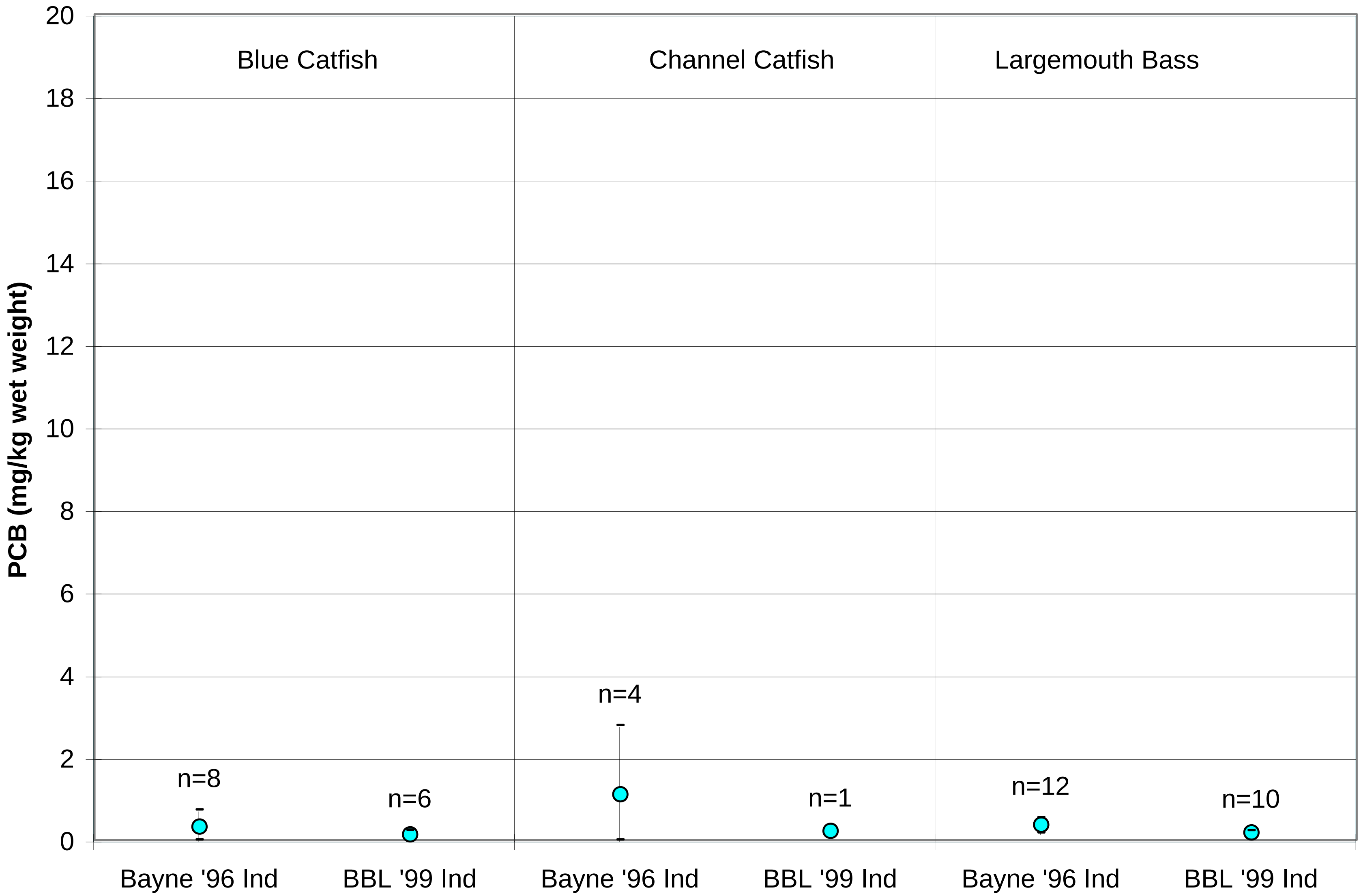


Figure 3 - Station 33 - Mean PCB Concentration and 95% Confidence Interval for Blue Catfish

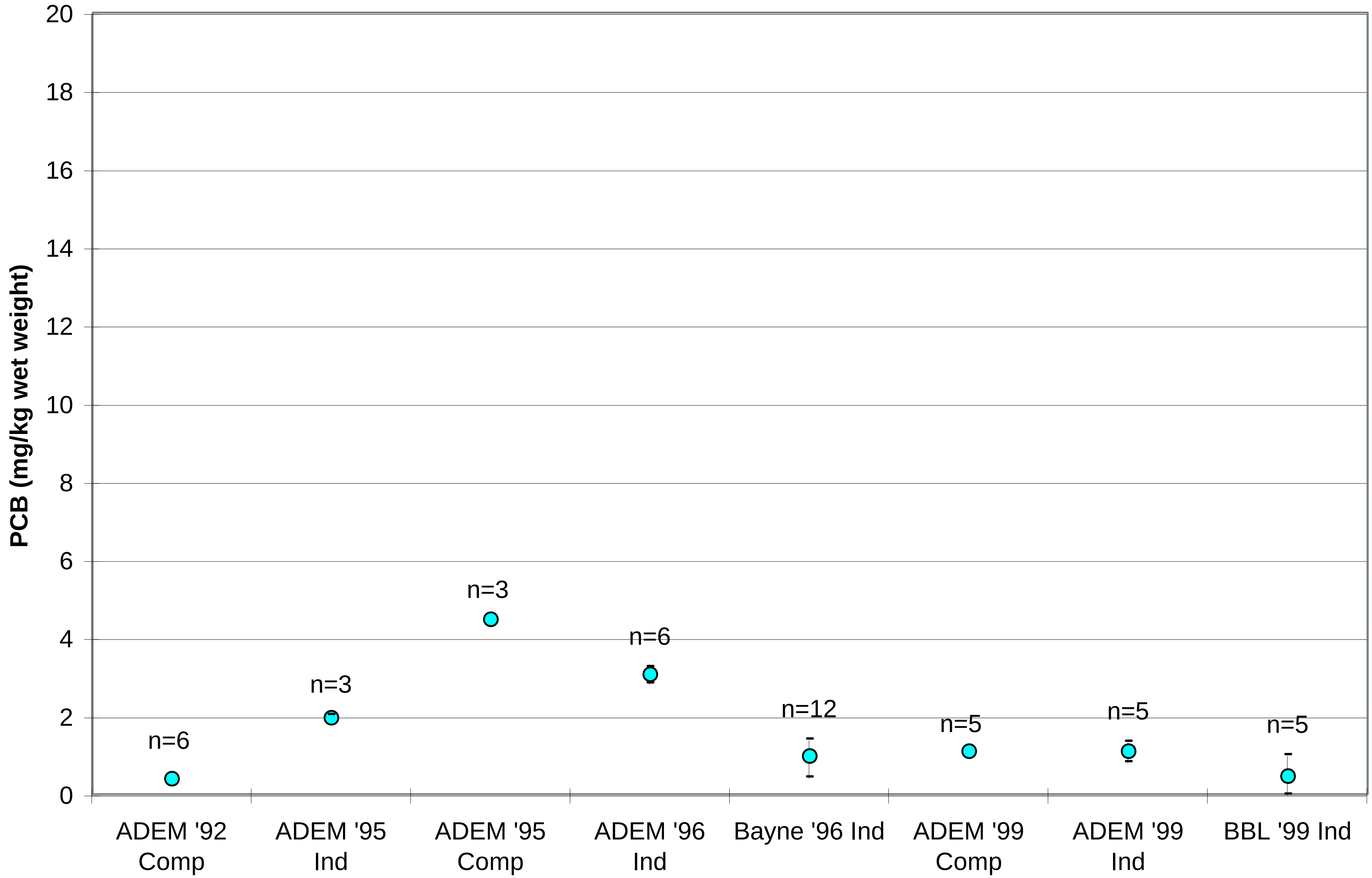


Figure 4 - Station 33 - Mean PCB Concentration and 95% Confidence Interval for Channel Catfish

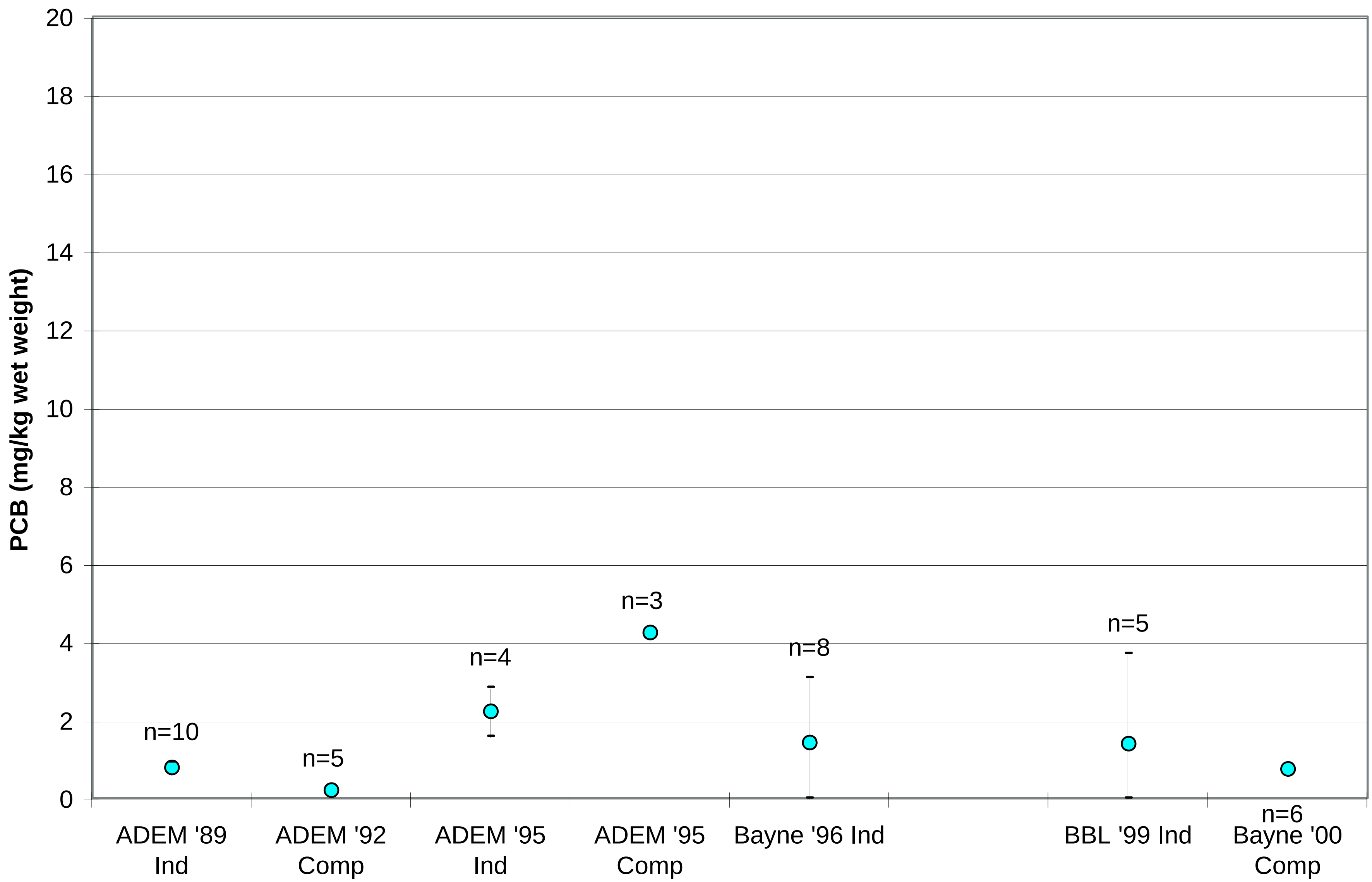


Figure 5 - Station 33 - Mean PCB Concentration and 95% Confidence Interval for Largemouth Bass

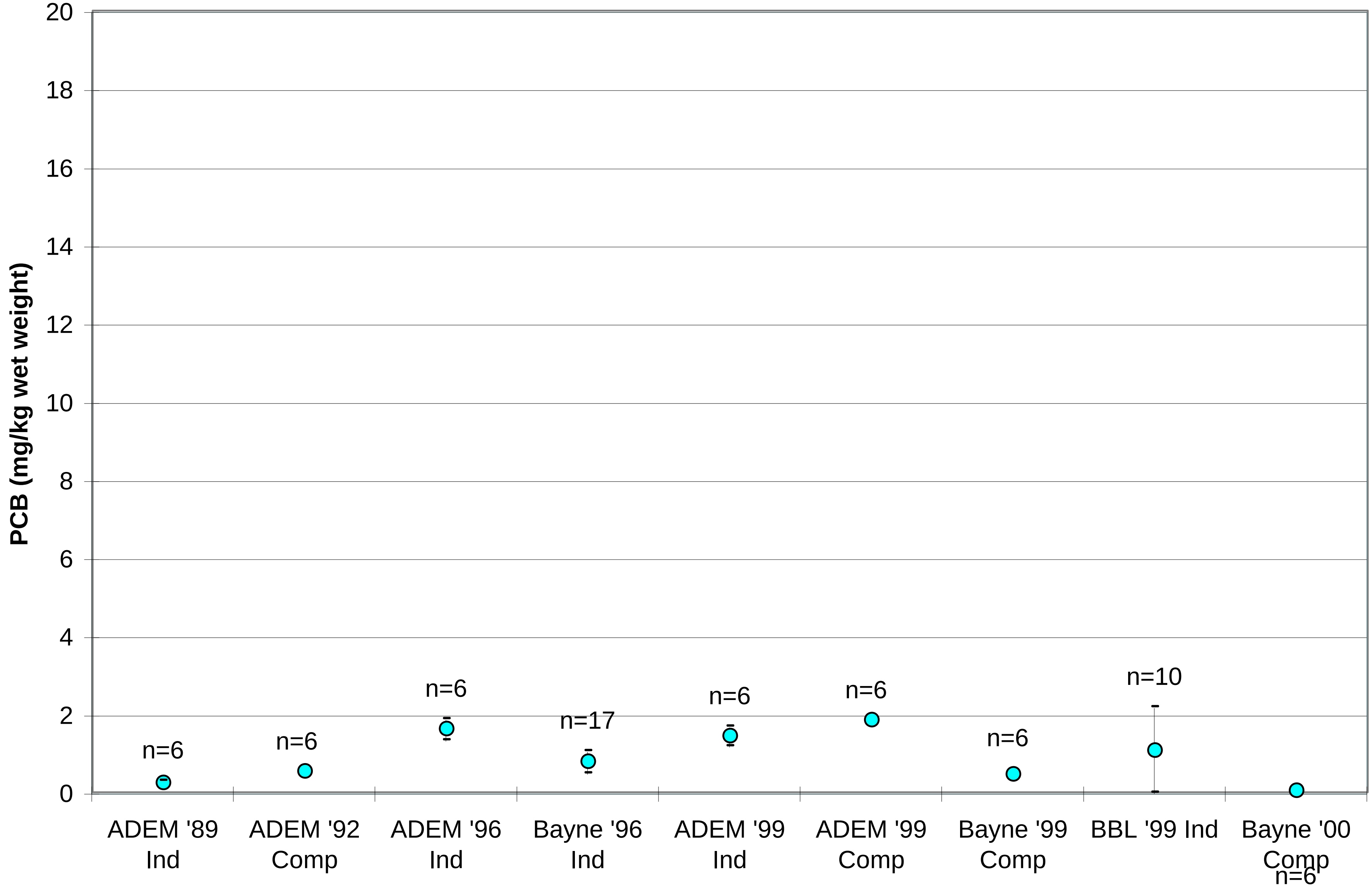


Figure 6 - Station 33 - Mean PCB Concentration and 95% Confidence Interval for Spotted Bass

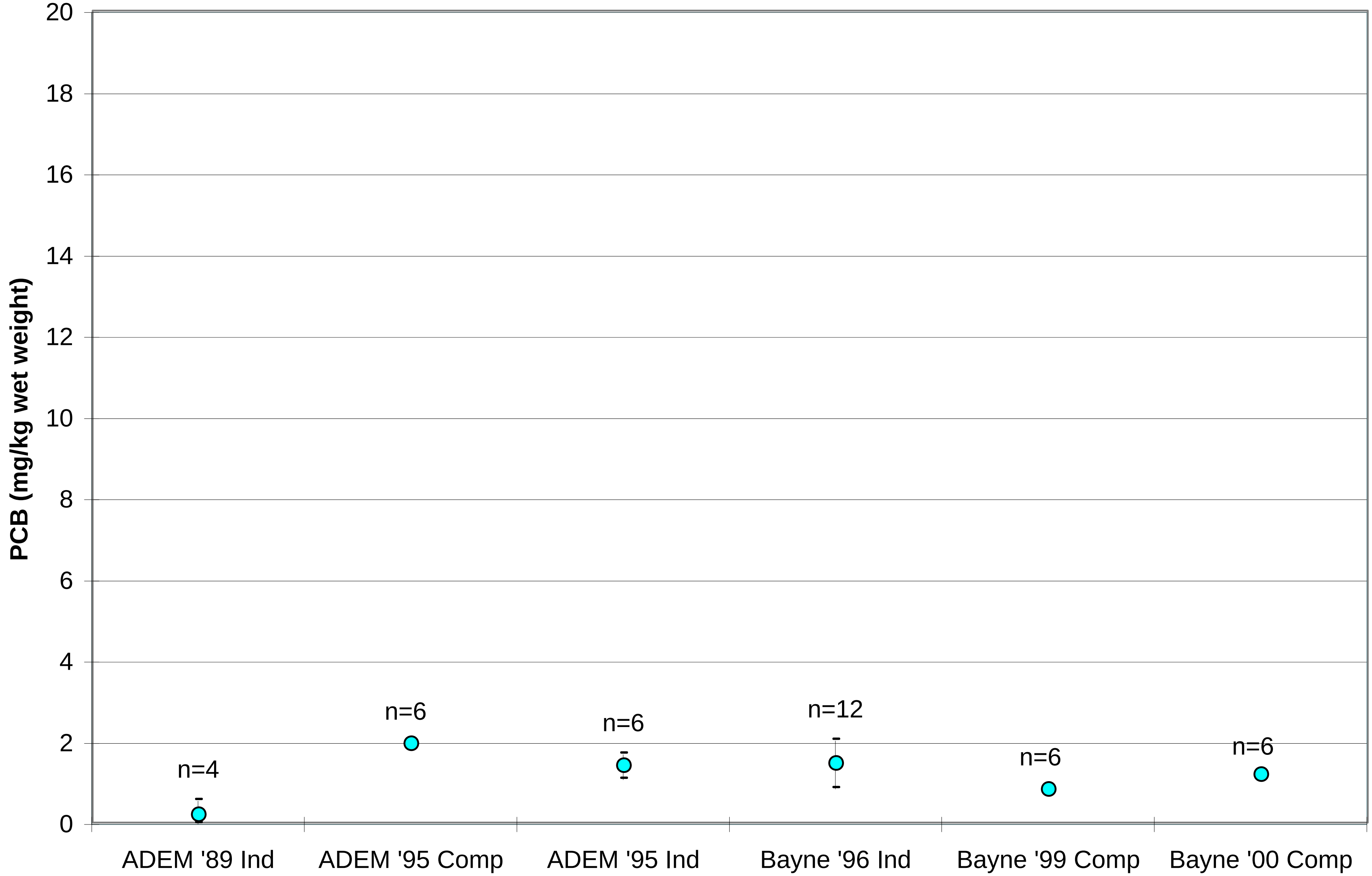


Figure 7 - Station 38 - Mean PCB Concentration and 95% Confidence Interval for Catfish

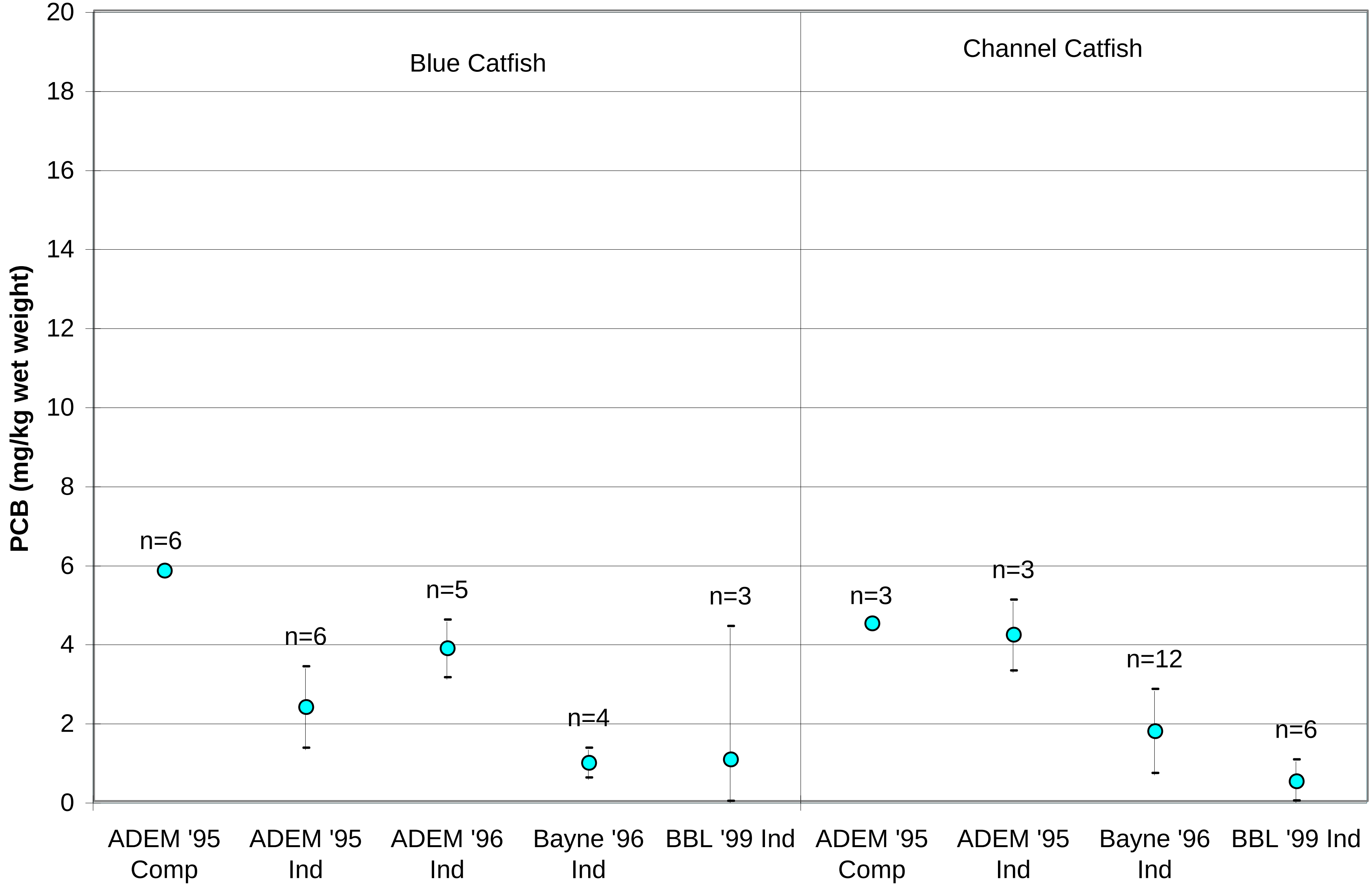


Figure 8 - Station 38 - Mean PCB Concentration and 95% Confidence Interval for Spotted Bass

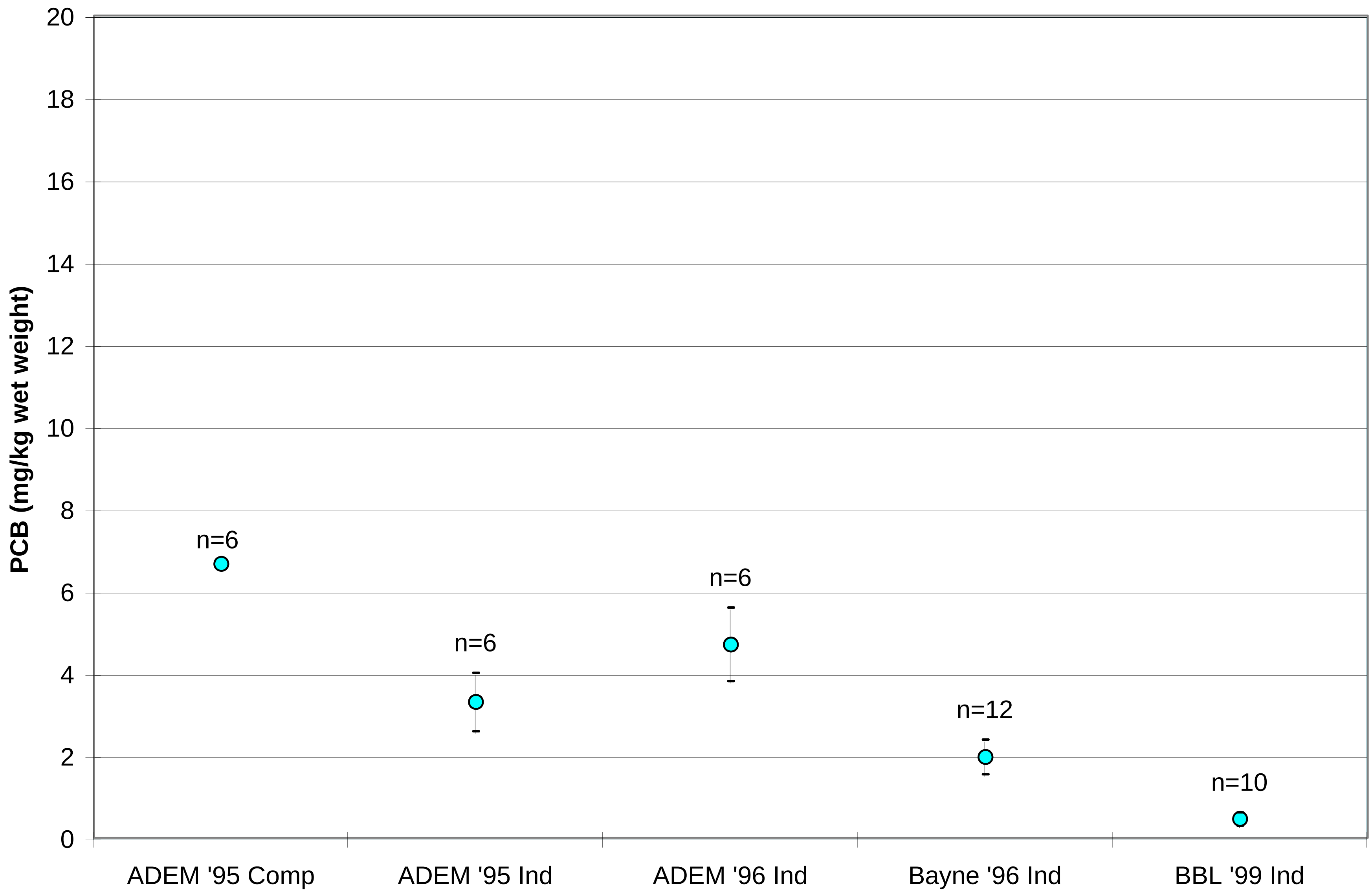


Figure 9 - Station 39 - Mean PCB Concentration and 95% Confidence Interval for Blue Catfish

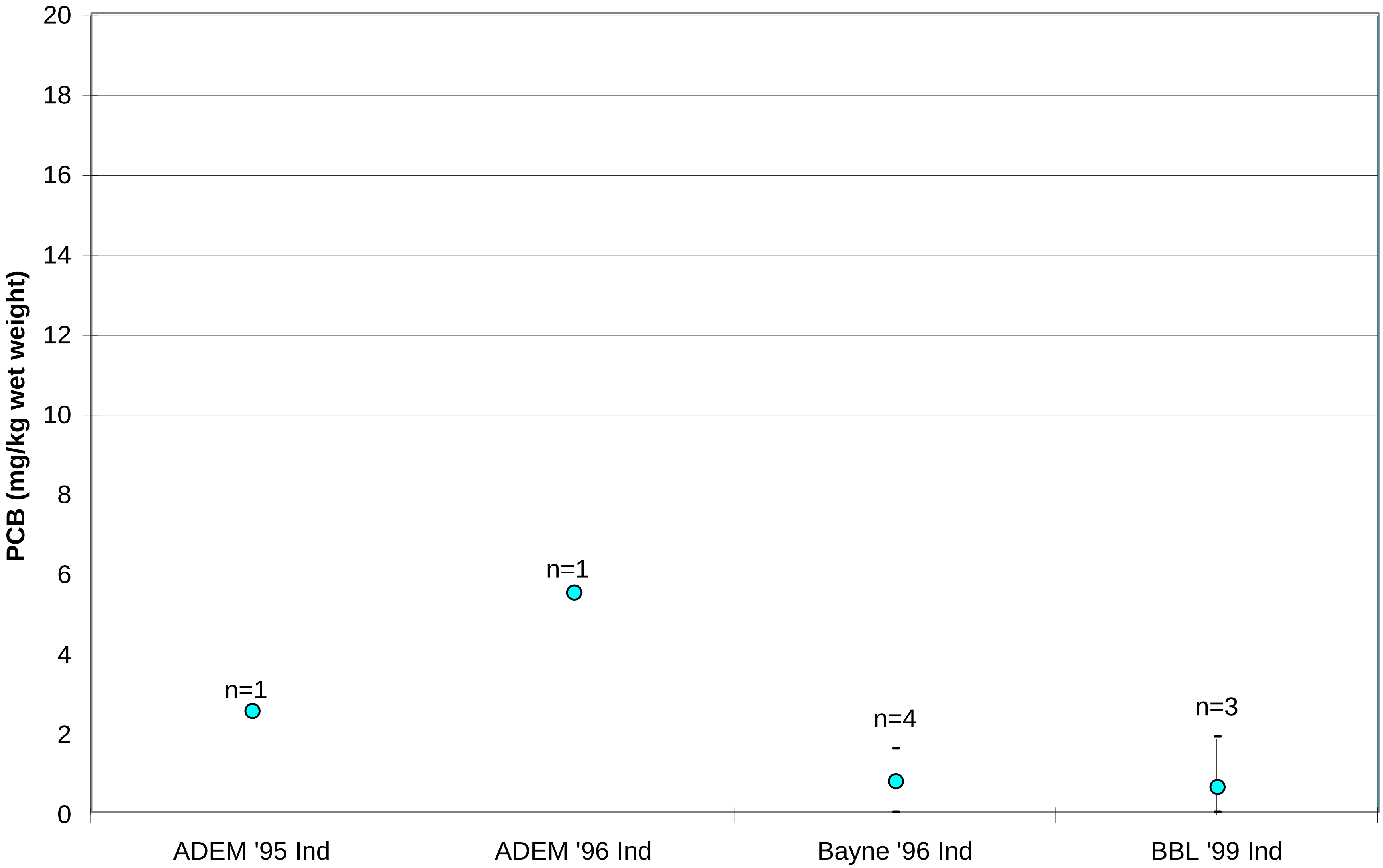


Figure 10 - Station 39 - Mean PCB Concentration and 95% Confidence Interval for Channel Catfish

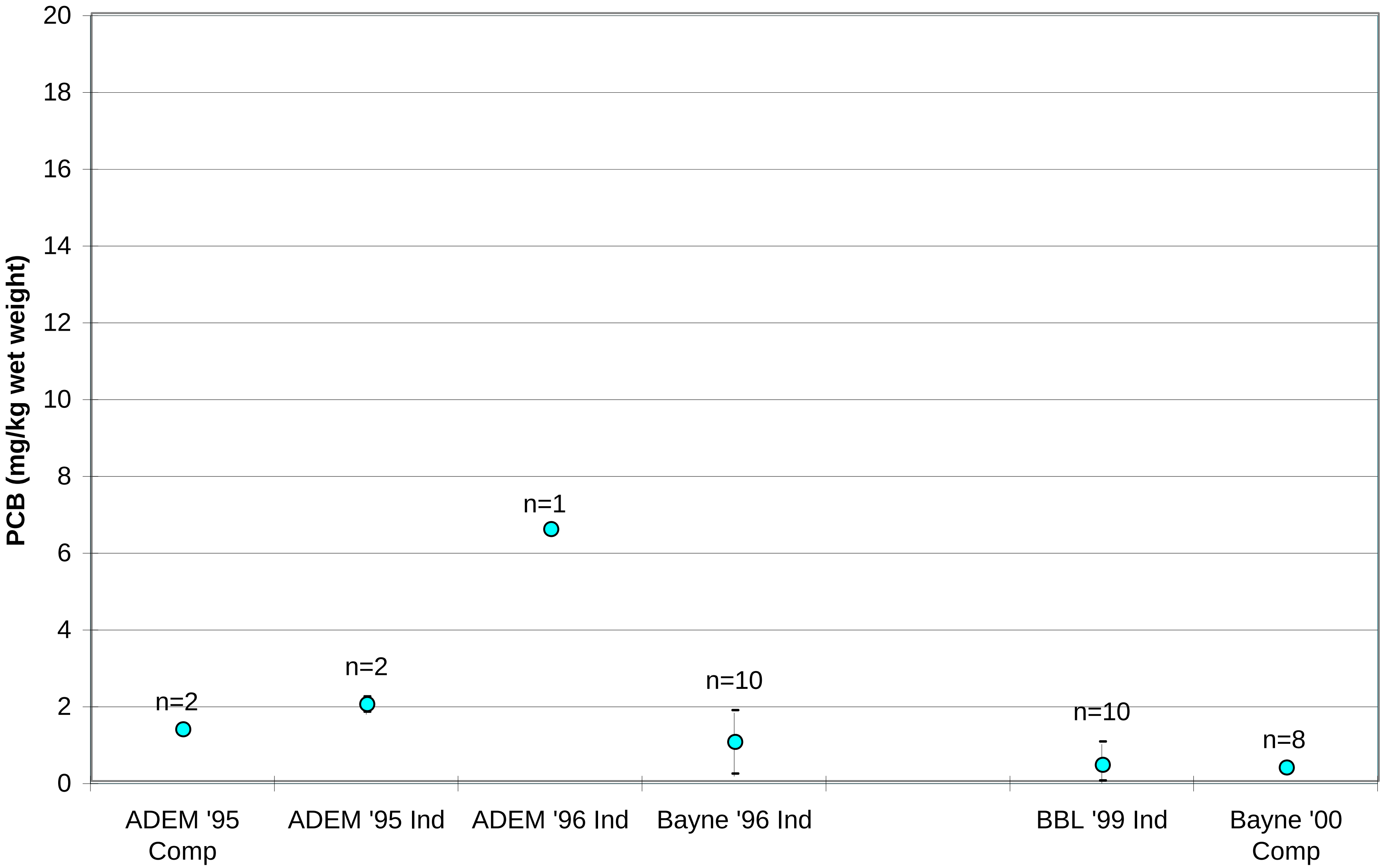
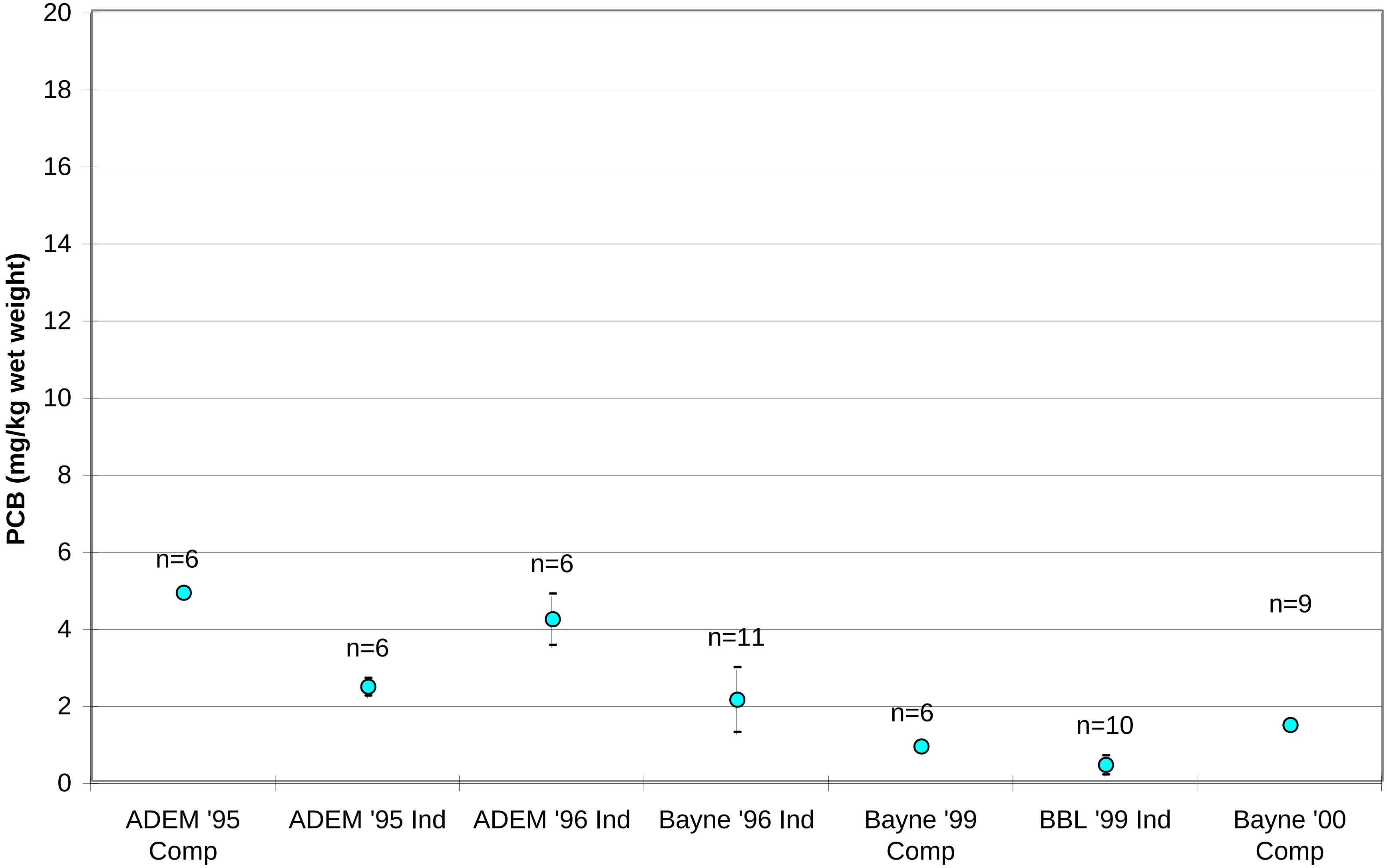


Figure 11 - Station 39 - Mean PCB Concentration and 95% Confidence Interval for Spotted Bass



Fish Tissue PCB Concentrations (mg/kg) for Striped Bass from Lake Logan Martin (Stations 33 and 37) and Chocolocco Creek (Station 35)

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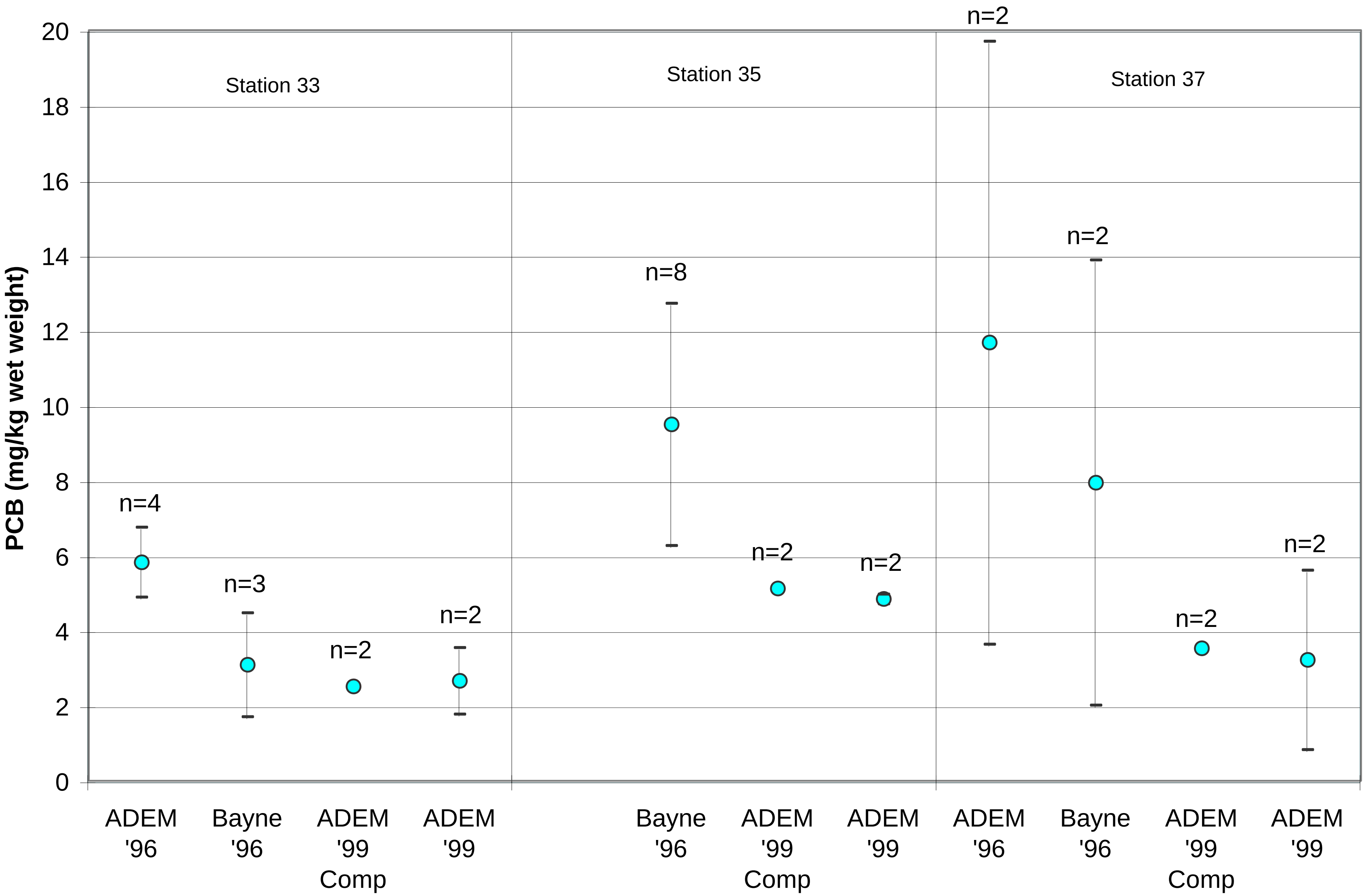
Figure 12 - Mean PCB Concentration and 95% Confidence Interval for Striped Bass



Fish Tissue PCB Concentrations (mg/kg wet weight) for Bass and Catfish from Choccolocco Creek Stations (ADEM 96, New 99 and 35

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Figure 13 - ADEM 96 - Mean PCB Concentration and 95% Confidence Interval for Bass and Catfish

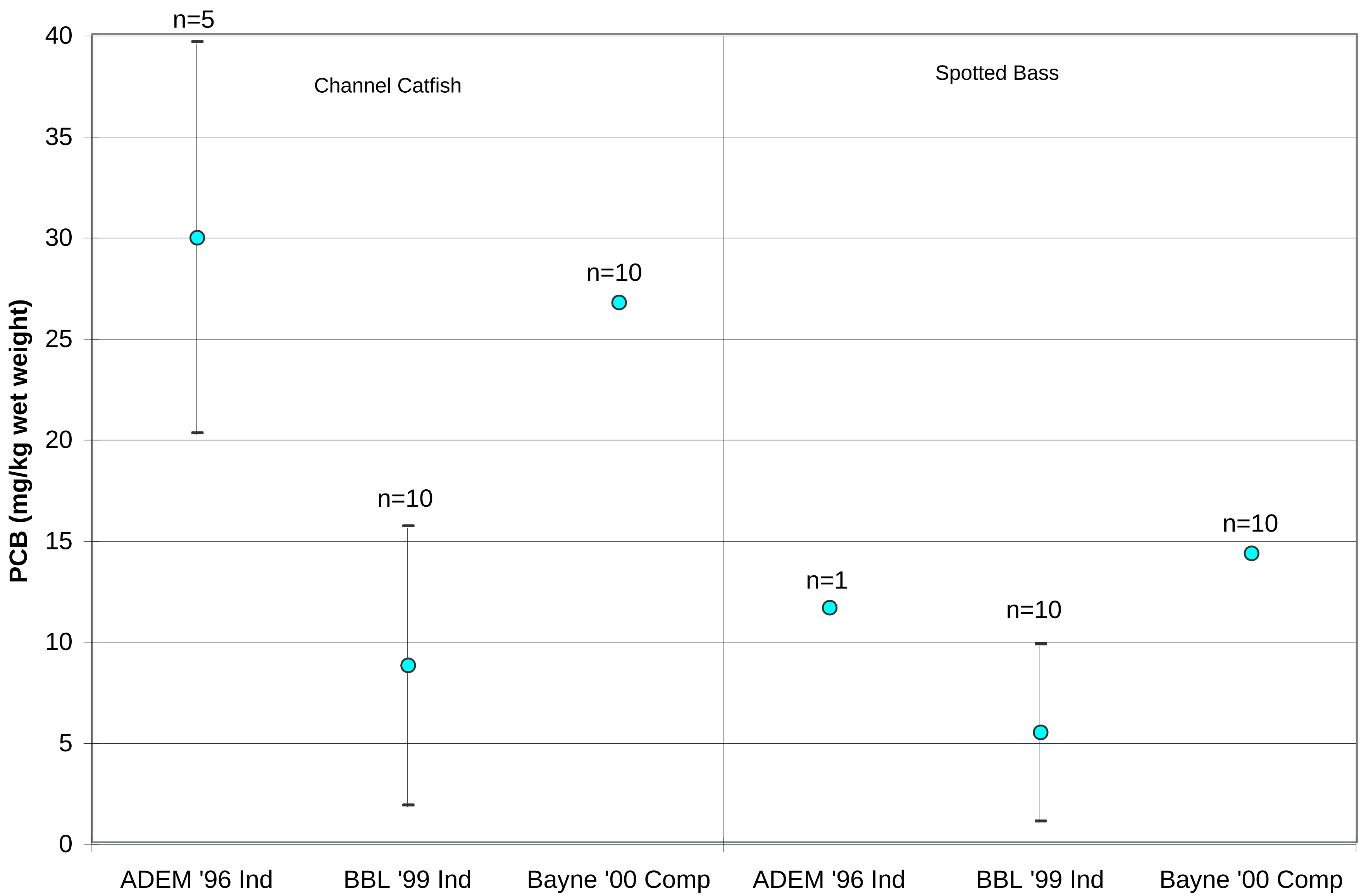


Figure 14 - New 99 - Mean PCB Concentration and 95% Confidence Interval for Bass and Catfish

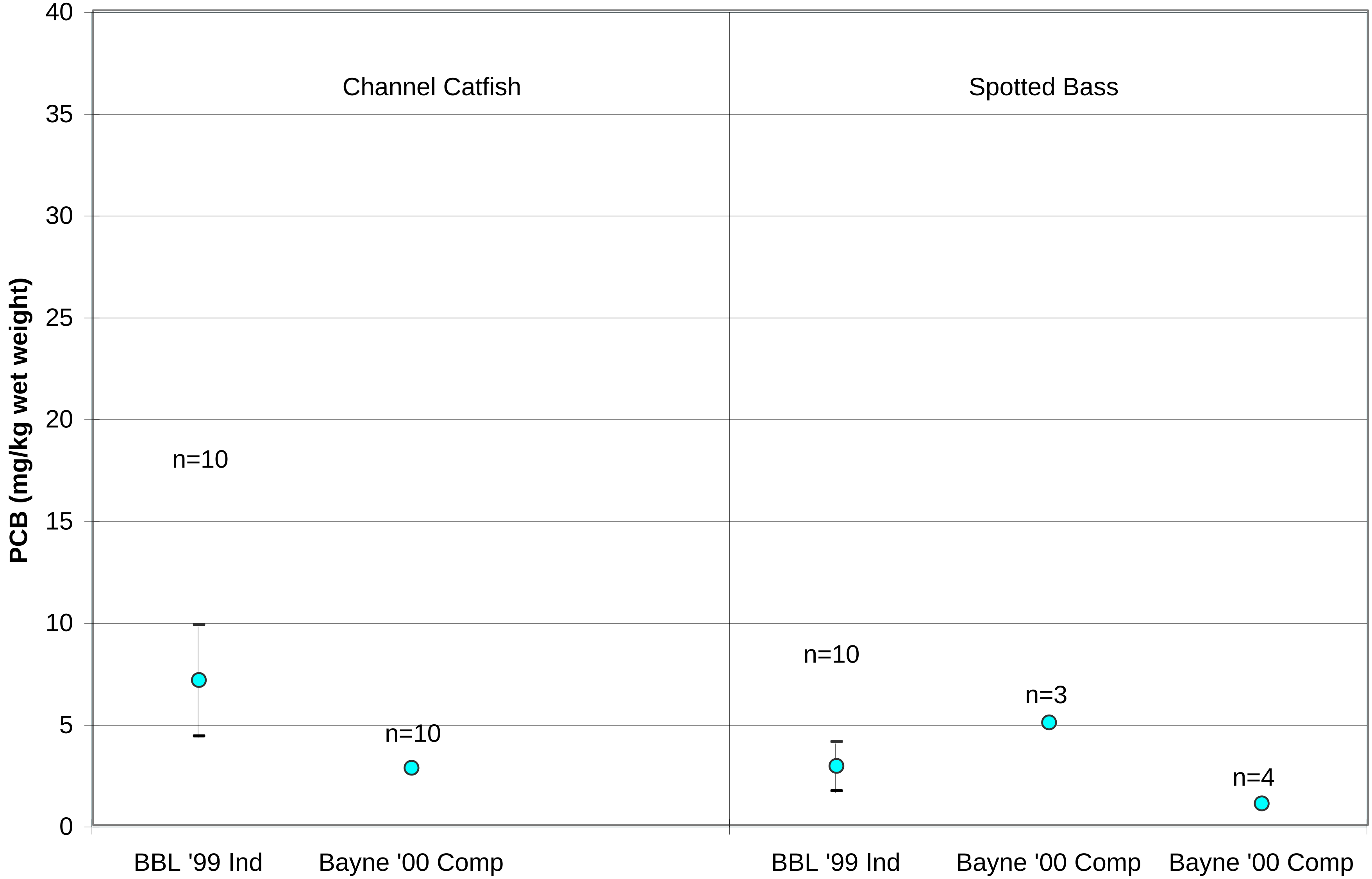


Figure 15 - Station 35 - Mean PCB Concentration and 95% Confidence Interval for Bass

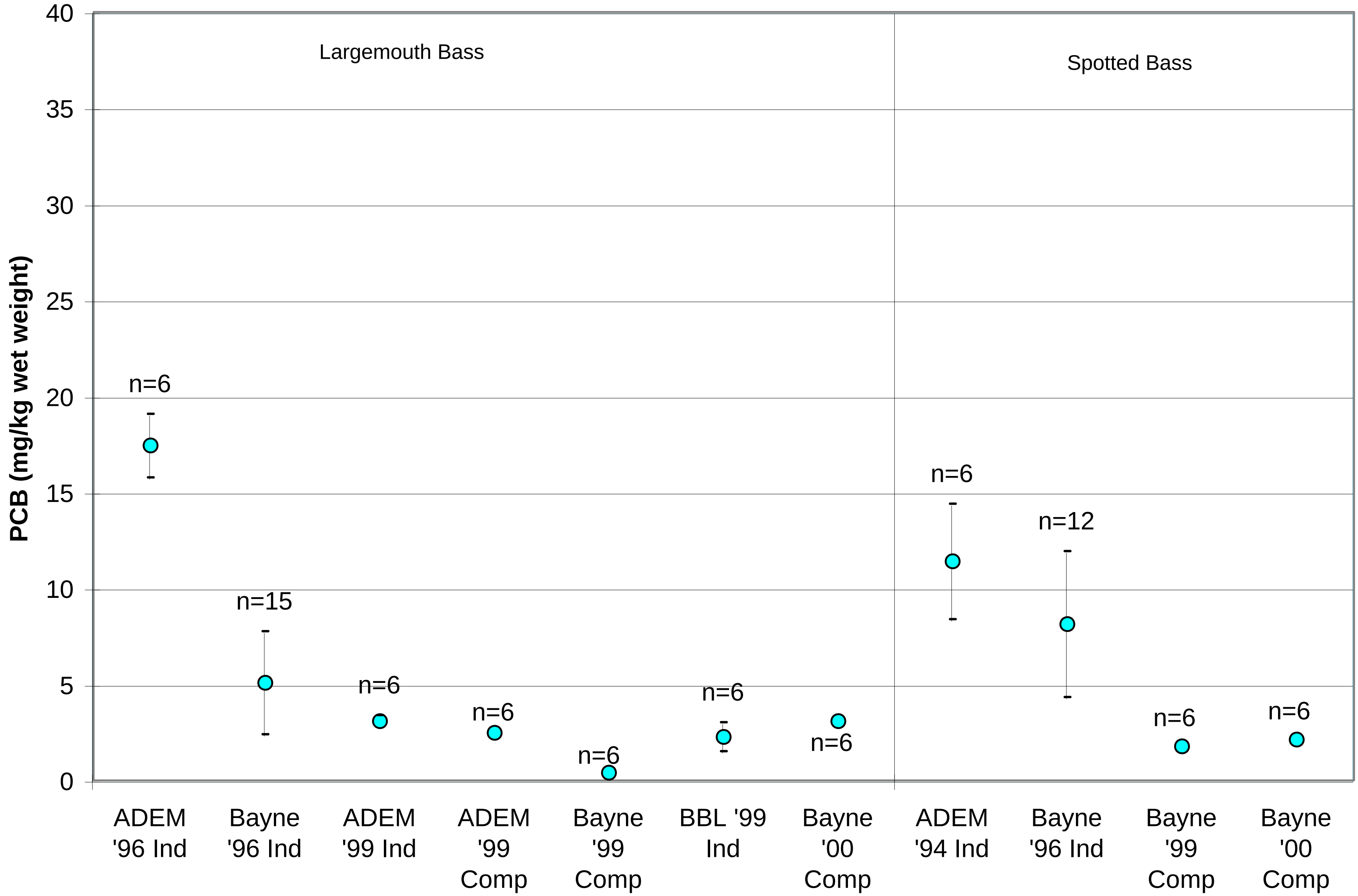
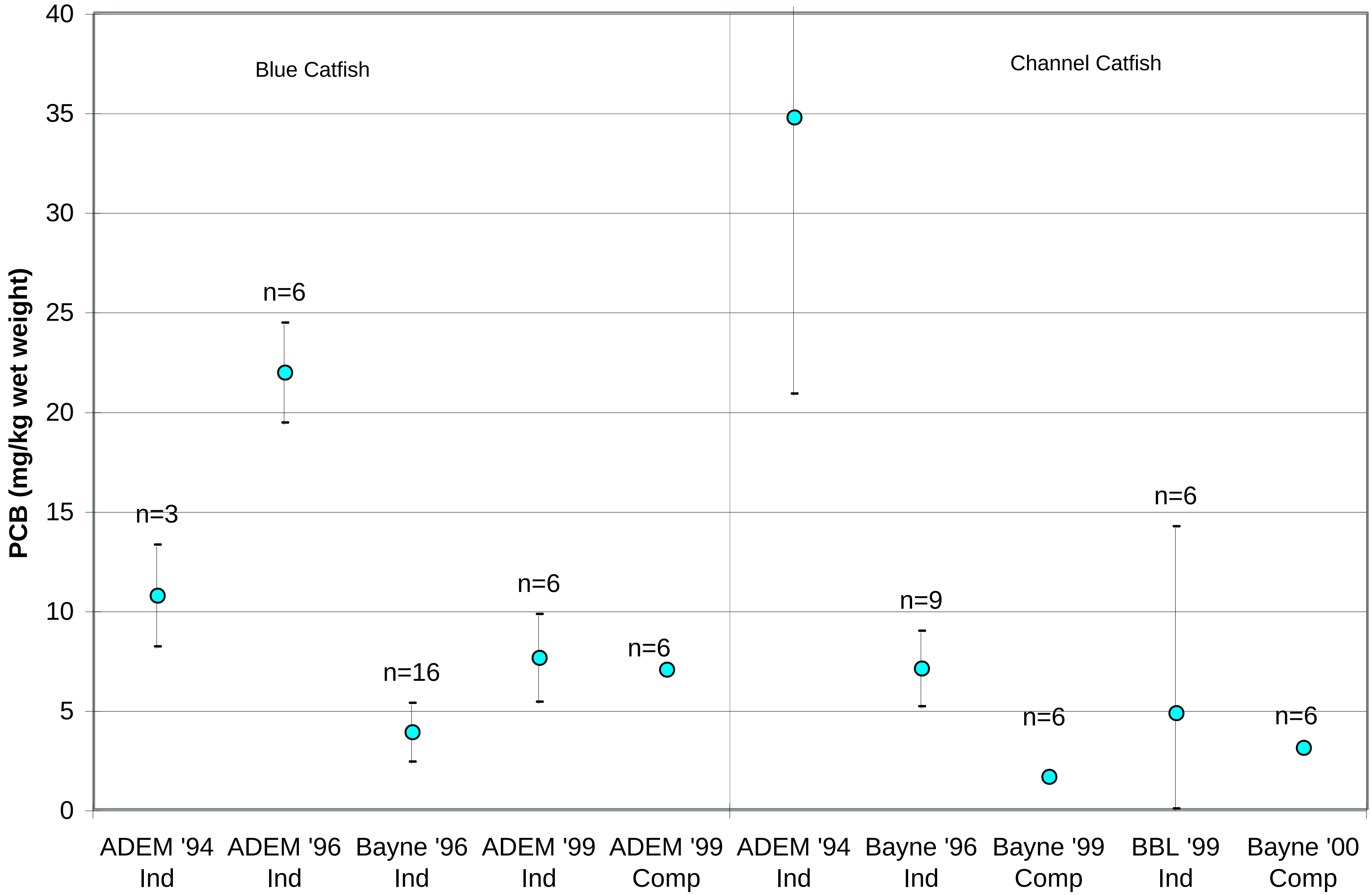


Figure 16 - Station 35 - Mean PCB Concentration and 95% Confidence Interval for Catfish



Attachment B

Revised RFI Tables

Includes:
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BLASLAND, BOUCK & LEE, INC.
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Table 3-10

Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Choccolocco Creek Metal Analysis Data

Location ID	Sample ID	Date	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Vanadium (mg/kg)
C-005-SED-2	C10007	20-Apr-99	0	2	3.1 J	48 J	0.53 J	ND(0.050) J	21 J	11 J	10 J	520 J	0.65 T	9.2 J	9.4 J
C-005-SED-2	C10008	20-Apr-99	2	12	9.9 J	99 J	1.9 J	ND(0.055) J	24 J	11 J	26 J	800 J	0.31 T	19 J	29 J
C-005-SED-2	C10009	20-Apr-99	12	20	9.5 J	91 J	2.2 J	ND(0.053) J	15 J	7.7 J	24 J	320 J	0.13 T	21 J	33 J
C-013-SED-4	C10010	21-Apr-99	0	2	1.5 J	48 J	0.33 J	ND(0.050) J	9.3 J	4.2 J	13 J	180 J	0.74 T	4.6 J	6.9 J
C-013-SED-4	C10011	21-Apr-99	2	13.5	1.4 J	36 J	0.30 J	ND(0.045) J	8.7 J	3.3 J	15 J	170 J	0.55 T	3.5 J	6.1 J
C-071-SED-1	C10012	25-May-99	0	2	11 J	250 J	2.3 J	0.91 J	55 J	34 J	71 J	1800 J	1.2 T	41 J	43 J
C-071-SED-1	C10013	25-May-99	2	13	17 J	380 J	3.7 J	2.2 J	82 J	55 J	110 J	3000 J	1.0 T	64 J	63 J
C-148-SED-4	C10021	5-Aug-99	0	2	5.0	89	0.67 B	0.28 B	23	9.3	24	610	0.71 T	9.6	16
C-148-SED-4	C10022	5-Aug-99	2	6	3.1	57	0.40 B	0.33 B	15	7.2	15	430	0.43 T	6.2	9.8
C-162-SED-3	C10258	14-Sep-99	0	2	4.5	76	0.49 B	ND(0.050)	9.7 J	7.5	13	1100	0.050 T	6.8	16
C-162-SED-3	C10261	14-Sep-99	0	2	4.8	75	0.50	ND(0.040)	9.7 J	7.2	13	1000	0.050 T	6.6	15
C-162-SED-3	C10259	14-Sep-99	2	12	4.5	85	0.55	ND(0.045)	9.8	7.4	12	1200	0.036 T	6.9	17
C-162-SED-3	C10260	14-Sep-99	12	22.5	2.7	110	0.72	ND(0.052)	8.4	5.9	8.5	360	0.024 T	6.2	12
C-162-SED-3	C10262	14-Sep-99	12	22.5	2.5	110	0.71	ND(0.052)	8.9	6.1	9.1	350	0.027 T	6.5	12
C-165-SED-2	C10269	14-Sep-99	0	2	3.3	39	0.31 B	0.58 B	13 J	5.9	8.2	340	0.34 T	4.4 B	7.5
C-165-SED-2	C10270	14-Sep-99	2	6	2.9	14	0.21 B	0.052 B	16	2.9	5.4	140	0.16 T	2.7	6.6
C-166-SED-6	C10271	15-Sep-99	0	2	8.7	100	0.85	ND(0.050)	17 J	9.1	14	330	0.030 T	11	31
C-166-SED-6	C10272	15-Sep-99	2	6	9.2	110	0.84	ND(0.050)	18	8.0	15	210	0.018 T	12	34
C-169-SED-5	C10027	19-Sep-99	0	2	4.8	97	0.61	0.51 B	23	7.2	25	730	0.090 T	8.2	16
C-169-SED-5	C10028	19-Sep-99	2	12	12	140	0.68	0.077 B	17	7.8	20	2100	0.27 T	10	36
C-169-SED-5	C10029	19-Sep-99	12	24	5.8	160	1.2	ND(0.052)	11	9.6	13	1300	0.025 T	9.8	22
C-169-SED-5	C10030	19-Sep-99	24	27	5.2	140	1.1	ND(0.050)	13	14	15	920	0.024 T	11	22
C-172-SED-2	C10283	21-Sep-99	0	2	7.3	130	1.0	0.90	41 J	13	36	1100	1.1 T	14	26
C-172-SED-2	C10284	21-Sep-99	2	12	8.1	140	1.0	1.6	36	12	43	1000	1.0 T	15	26
C-172-SED-2	C10285	21-Sep-99	12	15.5	7.3	200	0.95	2.4	30	11	45	900	1.7 T	13	22
C-174-SED-5	C10286	20-Sep-99	0	2	5.9	110	0.76	0.71 B	29 J	9.2	28	650	1.2 T	11	19
C-174-SED-5	C10287	20-Sep-99	2	12	6.3	79	0.51 B	0.69	19	7.2	21	670	0.77 T	6.7	15
C-174-SED-5	C10288	20-Sep-99	12	21	4.0	77	0.47	ND(0.045)	11	6.3	11	840	0.032 T	5.4	20

See notes on page 3.

Table 3-10

Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Choccolocco Creek Metal Analysis Data

Location ID	Sample ID	Date	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Vanadium (mg/kg)
C-176-SED-2	C10031	20-Sep-99	0	2	1.8	57	0.39 B	ND(0.050)	7.5	4.5	6.3	190	0.090 T	4 B	7.9
C-176-SED-2	C10032	20-Sep-99	2	12	1.9	59	0.42 B	ND(0.045)	7.1	4.5	6.6	190	0.098 T	4.1 B	8.2
C-176-SED-2	C10033	20-Sep-99	12	24	1.2 B	42	0.36 B	ND(0.048)	4.9	4.0	3.5	88	0.011 T	3 B	5.6
C-176-SED-2	C10034	20-Sep-99	24	28.5	1.2	42	0.34 B	ND(0.043)	4.5	4.2	4.3	99	0.013 T	3 B	5.5
C-177-SED-2	C10289	19-Sep-99	0	2	3.7	39	0.30 B	0.40 B	16 J	4.0	10	230	0.26 T	3.6 B	8.4
C-177-SED-2	C10290	19-Sep-99	2	12	3.6	80	0.53	ND(0.044)	12	6.8	11	120	0.095 T	7.9	22
C-177-SED-2	C10291	19-Sep-99	12	19	5.3	81	0.42 B	ND(0.043)	11	13	16	1000	0.040 T	7.7	26
C-180-SED-4	C10292	18-Sep-99	0	2	7.3	130	0.95	0.63 B	33 J	12	35	700	1.2 T	13	24
C-180-SED-4	C10293	18-Sep-99	2	12	7.1	140	0.95	1.2	30	12	39	780	1.3 T	14	25
C-180-SED-4	C10294	18-Sep-99	12	24	6.7	170	0.79	1.4	40	10	34	1200	5.8 T	13	27
C-180-SED-4	C10295	18-Sep-99	24	30.5	4.3	72	0.55	ND(0.044)	10	7.5	11	160	0.013 T	6.5	17
C-182-SED-4	C10035	17-Sep-99	0	2	4.8	110	0.68	0.42 B	27	8.1	26	480	0.12 T	10	20
C-182-SED-4	C10036	17-Sep-99	2	6.5	3.2	74	0.41 B	0.69	17	5.3	17	210	0.81 T	6.4	15
C-U3-SED-4	C10001	14-Apr-99	0	2	4.1 J	110 J	0.62 J	ND(0.070) J	10 J	7.8 J	16 J	740 J	0.040 T	6.5 J	14 J
C-U3-SED-4	C10002	14-Apr-99	2	12	3.8 J	96 J	0.59 J	ND(0.062) J	11 J	6.7 J	14 J	290 J	0.038 T	7.1 J	18 J
C-U3-SED-4	C10003	14-Apr-99	12	25	2.9 J	82 J	0.55 J	ND(0.065) J	10 J	7.3 J	9.8 J	160 J	0.031 T	6.7 J	19 J
C-U4-SED-1	C10328	16-Dec-99	0	2	2.9	23	ND(0.29)	ND(0.032)	5.3 J	2.5 J	2.5	73 J	0.0098 BJ	2.2 B	3.6 J
C-U4-SED-1	C10329	16-Dec-99	2	8.5	2.0	19	ND(0.30)	ND(0.034)	9.9 J	2.3 J	3.0	51 J	0.0099 BJ	2.5 B	4 J
C-U4-SED-1	C10337	16-Dec-00	2	8.5	2.2	19	ND(0.36)	ND(0.036)	10 J	2.4 J	2.8	56 J	ND(0.0060) J	2.2 B	3.9 J
C-U4-SED-1	C10337	16-Dec-99	2	8.5	2.2	19	ND(0.36)	ND(0.036)	10 J	2.4 J	2.8	56 J	ND(0.0060) J	2.2 B	3.9 J
C-U4-SED-2	C10330	16-Dec-99	0	2	3.4	32	ND(0.43)	ND(0.039)	6.3 J	4.1 J	3.7	260 J	0.010 BJ	3.5 B	5.2 J
C-U4-SED-2	C10331	16-Dec-99	2	4	2.7	17	ND(0.30)	ND(0.032)	3.6 J	2.2 J	2.0	110 J	0.0092 BJ	1.8 B	3.4 J
C-U4-SED-3	C10332	16-Dec-99	0	2	3.7	26	ND(0.37)	ND(0.032)	5.4 J	2.9 J	3.3	400 J	0.012 J	2.3 B	4.7 J
C-U4-SED-3	C10333	16-Dec-99	2	12	18	55	2.5 J	0.16 B	12 J	36 J	19	87 J	0.085 J	33 J	26 J
C-U4-SED-3	C10334	16-Dec-99	12	17.5	22	57	2.6 J	0.081 B	12 J	19 J	15	64 J	0.087 J	24 J	20 J
C-U4-SED-4	C10335	16-Dec-99	0	2	16	40	1.9 J	ND(0.038)	25 J	19 J	22	610 J	0.066 J	14 J	29 J
C-U4-SED-4	C10336	16-Dec-99	2	5	10	31	1.5 J	ND(0.035)	7.6 J	12 J	12	350 J	0.047 J	12 J	13 J

See notes on page 3.

Table 3-10

Solutia Inc.
Anniston, Alabama
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Choccolocco Creek Metal Analysis Data

<u>Notes:</u>
T - The sample was analyzed outside of the holding time and is indicative of the presence of mercury in sediment.
J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.
B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).
ND (500) - Not detected. Number in parentheses denotes the quantitation limit.

Table 3-15

Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Summary of Snow Creek Sediment Data

Field Sample ID	Sample ID	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Textural Class	Sediment Deposit Strata	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
14-SED-1 (0-2)	S10001	0	2		background	ND(0.0062)		0.40 J
14-SED-1 (2-8)	S10002	2	8		background	0.045		ND(0.081)
14-SED-2 (0-2)	S10003	0	2		background	0.035		0.41
14-SED-2 (2-8)	S10004	2	8		background	0.032		0.45 J
14-SED-2 (8-15)	S10005	8	15		background	0.028		0.064 J
14-SED-3 (0-2)	S10006	0	2		background	ND(0.0054)		0.24
14-SED-3 (2-9)	S10007	2	9		background	0.031		0.11 J
14-SED-3 (9-14)	S10008	9	14		background	0.039		ND(0.082)
14-SED-4 (0-2)	S10009	0	2		background	0.055		0.97
14-SED-4 (2-4)	S10010	2	4		background	0.023		0.14
14-SED-4 (4-15)	S10011	4	15		background	0.03		ND(0.082)
16-SED-1 (0-2)	S10012	0	2		background	0.011 B		ND(0.083)
16-SED-1 (2-7)	S10013	2	7		background	0.029		ND(0.077)
16-SED-2 (0-2)	S10014	0	2		background	0.013 B		ND(0.082)
16-SED-2 (2-8)	S10015	2	8		background	0.020 B		ND(0.079)
16-SED-3 (0-2)	S10016	0	2		background	0.0081 B		0.043 J
16-SED-3 (2-7)	S10017	2	7		background	0.013 B		ND(0.079)
16-SED-4 (0-2)	S10018	0	2		background	0.11		0.24 J
16-SED-4 (2-6.5)	S10019	2	6.5		background	0.017 B		ND(0.078)
S-SED-DUP-1	S10020	2	7		background	0.0083 B		

See notes on page 7.

Table 3-15

Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Summary of Snow Creek Sediment Data

Field Sample ID	Sample ID	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Textural Class	Sediment Deposit Strata	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
S-1-01 (0-2)	S10021	0	2	fine	terrace	ND(0.013)	24000	3.8 J
S-1-01 (2-8)	S10022	2	8	fine	terrace	8.6 J	33000	31 J
S-1-02 (0-2)	S10023	0	2	fine	terrace		17000	8
S-1-04 (0-2)	S10024	0	2	fine	terrace	0.26	91000	14
S-1-04 (2-5)	S10025	2	5	fine	terrace	1.3 J	7900	17
S-1-05 (0-2)	S10026	0	2	fine	terrace		36000	11 J
S-1-07 (0-2)	S10027	0	2	fine	channel		59000	16 J
S-1-07 (2-12)	S10028	2	12	fine	channel		3200	1.2 J
S-1-07 (12-23)	S10029	12	23	fine	channel		ND(500)	ND(0.17)
S-1-08 (0-2)	S10030	0	2	fine	other		70000	32 J
S-1-08 (2-12)	S10031	2	12	fine	other		27000	12
S-SED-D1	S10032	2	12	fine	other		28000	4.3
S-1-08 (12-14.5)	S10033	12	14.5	fine	other		57000	37 J
S-1-10 (0-2)	S10034	0	2	fine	terrace		44000	12 J
S-1-10 (2-12)	S10035	2	12	fine	terrace		46000	29 J
S-1-10 (12-16.5)	S10036	12	16.5	fine	terrace		44000	18
S-1-11A (0-2)	S10037	0	2	fine	terrace		6500	2.2
S-1-11A (2-12)	S10038	2	12	fine	terrace		ND(500)	ND(0.20)
S-1-11A (12-24)	S10039	12	24	fine	terrace		2700	0.39 J
S-1-11B (0-2.5)	S10040	0	2.5	coarse	terrace		18000	12

See notes on page 7.

Table 3-15

Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Summary of Snow Creek Sediment Data

Field Sample ID	Sample ID	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Textural Class	Sediment Deposit Strata	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
S-1-12 (0-2)	S10041	0	2	fine	terrace		7600	0.67
S-1-12 (2-5)	S10042	2	5	fine	terrace		ND(500)	2.1
S-1-16 (0-2)	S10043	0	2	coarse	terrace		2700	28
S-1-16 (2-5)	S10044	2	5	coarse	terrace		1200	32
S-2-02 (0-3.5)	S10045	0	3.5	fine	aggrading bar		16000	19
S-2-3A (0-3)	S10046	0	3	fine	channel	3.2 J	12000	3.8
S-SED-D2	S10047	0	3	fine	channel	1.2 J		
S-2-05 (0-2)	S10048	0	2	coarse	aggrading bar		ND(500)	5.4
S-2-05 (2-5)	S10049	2	5	coarse	aggrading bar		9600	6.4
S-2-08 (0-2)	S10050	0	2	coarse	channel		18000	20
S-2-08 (2-12)	S10051	2	12	coarse	channel		12000	20
S-2-08 (12-16)	S10052	12	16	coarse	channel		1600	4.0
S-2-06B (0-2)	S10053	0	2	coarse	other		ND(500)	13
S-2-06B (2-12)	S10054	2	12	coarse	other		1800	11
S-2-06B (12-20.5)	S10055	12	20.5	coarse	other		3000	34
S-2-06C (0-2)	S10056	0	2	coarse	other		2200	30
S-2-06C (2-12)	S10057	2	12	coarse	other		5000	14
S-2-06C (12-24)	S10058	12	24	coarse	other		5000	23
S-2-06C (24-27)	S10059	24	27	coarse	other		9600	15
S-2-06A (0-2)	S10060	0	2	coarse	other		12000	22

See notes on page 7.

Table 3-15

Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Summary of Snow Creek Sediment Data

Field Sample ID	Sample ID	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Textural Class	Sediment Deposit Strata	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
S-2-06A (2-5)	S10061	2	5	coarse	other		2700	8.9
S-2-16 (0-2)	S10062	0	2	coarse	channel		13000	4.0
S-2-16 (2-4)	S10063	2	4	coarse	channel		16000	3.3
S-3-01 (0-2)	S10064	0	2	coarse	channel		12000	3.3
S-3-01 (2-8)	S10065	2	8	coarse	channel		12000	4.8
S-3-02 (0-2)	S10066	0	2	coarse	terrace		22000	8.1
S-3-02 (2-12)	S10067	2	12	coarse	terrace		24000	11
S-3-02 (12-15.5)	S10068	12	15.5	coarse	terrace		32000	17
S-3-05 (0-2)	S10069	0	2	fine	channel		20000	1.4
S-3-05 (2-10.5)	S10070	2	10.5	fine	channel		11000	2.1
S-3-07 (0-2)	S10071	0	2	coarse	aggrading bar		9600	0.66
S-3-07 (2-8)	S10072	2	8	coarse	aggrading bar		18000	0.76
S-4-02 (0-2)	S10073	0	2	fine	terrace		15000	1.1
S-4-02 (2-4)	S10074	2	4	fine	terrace		3000	0.58 J
S-5-01 (0-3.5)	S10075	0	3.5	coarse	terrace		1400	0.65
S-SED-D4	S10076	0	3.5	coarse	terrace		ND(500)	0.76
S-5-02 (0-3.5)	S10077	0	3.5	fine	terrace		8700	4.5
S-5-03 (0-2)	S10078	0	2	fine	terrace		15000	5.8
S-5-03 (2-4)	S10079	2	4	fine	terrace		ND(500) J	1.6
S-5-04 (0-2)	S10080	0	2	coarse	terrace		ND(500) J	1.8

See notes on page 7.

Table 3-15

Solutia Inc.
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Summary of Snow Creek Sediment Data

Field Sample ID	Sample ID	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Textural Class	Sediment Deposit Strata	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
S-5-04 (2-6)	S10081	2	6	coarse	terrace		2300	1.9
S-5-05 (0-2)	S10082	0	2	coarse	aggrading bar		ND(500)	1.2
S-5-05 (2-4)	S10083	2	4	coarse	aggrading bar		ND(500)	1.9
S-5-06 (0-2)	S10084	0	2	fine	aggrading bar		ND(500)	2.7
S-5-06 (2-5)	S10085	2	5	fine	aggrading bar		ND(500)	2.3
S-5-13 (0-3.5)	S10086	0	3.5	coarse	aggrading bar		ND(500)	1.3
S-5-14A (0-2)	S10087	0	2	coarse	aggrading bar		1200	1.5
S-5-14A (2-5)	S10088	2	5	coarse	aggrading bar		ND(500)	0.92
S-5-14B (0-2)	S10089	0	2	coarse	aggrading bar		ND(500)	1.6
S-5-14B (2-5.5)	S10090	2	5.5	coarse	aggrading bar		ND(500)	1.6
S-5-24 (0-2)	S10091	0	2	coarse	channel		ND(500)	1.2
S-5-24 (2-12)	S10092	2	12	coarse	channel		ND(500)	1.2
S-6-01 (0-2)	S10093	0	2	coarse	aggrading bar		ND(500)	1.3
S-6-01 (2-12)	S10094	2	12	coarse	aggrading bar		ND(500)	4.7
S-6-02 (0-2)	S10095	0	2	fine	channel	0.51	4700	5.8
S-6-02 (2-5)	S10096	2	5	fine	channel	R	8300	5.6
S-6-03 (0-2)	S10097	0	2	fine	channel		36000	41 J
S-6-03 (2-12)	S10098	2	12	fine	channel		5600	7.3
S-SED-D5	S10099	2	12	fine	channel		4100	11 J
S-6-05 (0-2)	S10100	0	2	fine	terrace		13000	2.2 J

See notes on page 7.

Table 3-15

Solutia Inc.
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Summary of Snow Creek Sediment Data

Field Sample ID	Sample ID	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Textural Class	Sediment Deposit Strata	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
S-6-05 (2-6.5)	S10101	2	6.5	fine	terrace		19000	3.9
S-6-07 (0-2)	S10102	0	2	fine	channel		ND(500)	0.43
S-6-07 (2-12)	S10103	2	12	fine	channel		32000	0.077 J
S-6-07 (12-24)	S10104	12	24	fine	channel		32000	ND(0.22)
S-6-07 (24.26.5)	S10105	24	26.5	fine	channel		250000	ND(0.20)
S-6-09 (0-2)	S10106	0	2	fine	aggrading bar		3400	3.3
S-6-09 (2-6.5)	S10107	2	6.5	fine	aggrading bar		11000	2.1
S-6-10 (0-2)	S10108	0	2	fine	terrace	0.58	3100	1.5
S-6-10 (2-12)	S10109	2	12	fine	terrace	2.6 J	14000	4.9
S-6-13 (0-2)	S10110	0	2	fine	aggrading bar		5100	3.9
S-6-13 (2-7.5)	S10111	2	7.5	fine	aggrading bar		25000	8.1
S-6-15 (0-2)	S10112	0	2	fine	aggrading bar		ND(500)	1.3
S-6-15 (2-12.5)	S10113	2	12.5	fine	aggrading bar		13000	4.5
S-6-04 (0-3.5)	S10114	0	3.5	coarse	channel		1200	4.4
S-6-17 (0-2)	S10115	0	2	coarse	aggrading bar		8500	9.5
S-6-17 (2-10)	S10116	2	10	coarse	aggrading bar		16000	6.3
S-6-21 (0-2)	S10117	0	2	coarse	aggrading bar		5900	1.7
S-6-21 (2-4.5)	S10118	2	4.5	coarse	aggrading bar		6200	1.8
S-6-23 (0-2)	S10119	0	2	fine	aggrading bar		3600	1.1
S-6-23 (2-7)	S10120	2	7	fine	aggrading bar		9400	1.6

See notes on page 7.

Table 3-15

Solutia Inc.
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Summary of Snow Creek Sediment Data

Field Sample ID	Sample ID	Sediment Depth to Top (in)	Sediment Depth to Bottom (in)	Textural Class	Sediment Deposit Strata	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
S-6-25 (0-2.5)	S10121	0	2.5	coarse	aggrading bar		5500	4.4
S-6-26 (0-2)	S10122	0	2	fine	terrace		9100	ND(0.17)
S-6-26 (2-12)	S10123	2	12	fine	terrace		10000	ND(0.18)
S-6-26 (12-24)	S10124	12	24	fine	terrace		7000	ND(0.17)
S-6-26 (24-33)	S10125	24	33	fine	terrace		3800	ND(0.17)
S-SED-D6	S10126	2	12	fine	terrace		8100	ND(0.17)
S-6-27 (0-2)	S10127	0	2	coarse	aggrading bar		2400	2.1
S-6-27 (2-12)	S10128	2	12	coarse	aggrading bar		35000	2.8
S-6-27 (12-15.5)	S10129	12	15.5	coarse	aggrading bar		1600	5.6
S-SED-D7	S10130	2	12	coarse	aggrading bar		54000	5.0
S-SED-D3	S10131	12	20.5	coarse	other		8400	60

Notes:

J - The compound/analyte was positively identified; however, the associated numerical value is an estimated concentration only.
B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).
R - The sample results were rejected.
ND - Not detected. Number in parentheses denotes the quantitation limit.

Table 3-22

Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Surface Sediment Data Summary

Location ID	Sample ID	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
ADEM96-SS-1	C20011	1.40 J	ND(500)	0.17
ADEM96-SS-10	C20020		21000	1.2
ADEM96-SS-2	C20012		2400	0.48 J
ADEM96-SS-3	C20013		980	0.19 J
ADEM96-SS-4	C20014	1.40 J	ND(500)	ND(0.096)
ADEM96-SS-5	C20016	0.340 J	1400	0.24 J
ADEM96-SS-6	C20015		ND(500)	0.060 J
ADEM96-SS-7	C20017		2400	0.084 J
ADEM96-SS-8	C20018	0.650 J	1900	0.25 J
ADEM96-SS-9	C20019	0.490 J	7300	0.21
NEW99-SS-1	C20001	0.470 J	14000	0.25
NEW99-SS-10	C20010		19000	0.51 J
NEW99-SS-2	C20002		22000	0.22
NEW99-SS-3	C20003		18000	2.7
NEW99-SS-4	C20004	1.30 J	28000	1.1
NEW99-SS-5	C20005	0.270 J	4900	0.066 J
NEW99-SS-6	C20006		12000	0.32
NEW99-SS-7	C20007		10000	0.24
NEW99-SS-8	C20008	1.30 J	58000	0.38
NEW99-SS-9	C20009	0.900 J	30000	0.78
STA-30-SS-1	C20025	0.0420	17000	ND(0.12)
STA-30-SS-10	C20034		21000	ND(0.18)
STA-30-SS-2	C20026		6300	ND(0.10) J
STA-30-SS-3	C20027		18000	ND(0.14)
STA-30-SS-4	C20028	0.0530	13000	ND(0.13)
STA-30-SS-5	C20029		15000	ND(0.11)
STA-30-SS-6	C20030	0.0390	3400	ND(0.10)
STA-30-SS-7	C20031		21000	ND(0.20)
STA-30-SS-8	C20032	0.0760	18000	ND(0.14)
STA-30-SS-9	C20033	0.100	24000	ND(0.22)
STA-33-SS-1	C20035	0.0180 B	2100	ND(0.10)
STA-33-SS-10	C20044		1000	ND(0.095)
STA-33-SS-2	C20036		20000	ND(0.23)

See notes on page 3.

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Solutia Inc.
Anniston, Alabama
Off-Site RFI Report

Surface Sediment Data Summary

Location ID	Sample ID	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
STA-33-SS-2	C20077		22000	ND(0.15)
STA-33-SS-3	C20037	0.0830	23000	ND(0.24)
STA-33-SS-4	C20038	0.0700	17000	ND(0.16)
STA-33-SS-5	C20039		1800	ND(0.10)
STA-33-SS-6	C20040	0.110	26000	ND(0.24)
STA-33-SS-7	C20041		1600	ND(0.094)
STA-33-SS-8	C20042		7000	ND(0.10) J
STA-33-SS-9	C20043	0.0930	23000	ND(0.20)
STA-35-SS-1	C20065		17000	0.32
STA-35-SS-10	C20074		17000	0.34
STA-35-SS-2	C20066	1.20	28000	0.52
STA-35-SS-2	C20078	1.10	27000	0.59
STA-35-SS-3	C20067	1.70	54000	2.7
STA-35-SS-4	C20068		23000	0.36
STA-35-SS-5	C20069	0.570	16000	0.38
STA-35-SS-6	C20070	0.750	24000	0.42
STA-35-SS-7	C20071		23000	0.54 J
STA-35-SS-8	C20072		36000	1.5
STA-35-SS-9	C20073	0.780	23000	0.75
STA-38-SS-1	C20045		2500	ND(0.088)
STA-38-SS-10	C20054	0.0140 B	2000	ND(0.10)
STA-38-SS-2	C20046	0.0540	13000	ND(0.12)
STA-38-SS-2	C20076	0.0450	12000	ND(0.12)
STA-38-SS-3	C20047	0.0440	7000	ND(0.11)
STA-38-SS-4	C20048		3100	ND(0.092)
STA-38-SS-5	C20049		1600	ND(0.094)
STA-38-SS-6	C20050	0.0180 B	9100	ND(0.10)
STA-38-SS-7	C20051	0.0380	8500	ND(0.11)
STA-38-SS-8	C20052		1500	ND(0.094)
STA-38-SS-9	C20053		5600	ND(0.094)
STA-39-SS-1	C20055		4200	ND(0.093)
STA-39-SS-10	C20064		40000	ND(0.15)
STA-39-SS-2	C20056	0.210	26000	ND(0.26)

See notes on page 3.

Table 3-22

Solutia Inc.
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Surface Sediment Data Summary

Location ID	Sample ID	Mercury (mg/kg)	Total Organic Carbon (mg/kg)	Total PCB (mg/kg)
STA-39-SS-3	C20057		22000	ND(0.16)
STA-39-SS-4	C20058	0.100	19000	ND(0.22)
STA-39-SS-5	C20059		3200	ND(0.089)
STA-39-SS-6	C20060	0.0980	20000	ND(0.20)
STA-39-SS-7	C20061		16000	ND(0.13)
STA-39-SS-7	C20075		15000	ND(0.14)
STA-39-SS-8	C20062	0.160	26000	ND(0.26)
STA-39-SS-9	C20063	0.0580	16000	ND(0.15)

Notes:

J - The compound/analyte was positively identified; however, the associated numerica value is an estimated concentration only.

B - The reported value was obtained from a reading less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).

ND (500) - Not detected. Number in parentheses denotes quantitation limit.

Figure 1- Average Mercury Concentration in Snow and Choccolocco Creek Surficial Sediment (0-2 in)