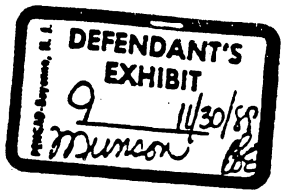
August 11, 1988

Mr. David S. McCrea
McCrea & McCrea
119 South Walnut Street
P. O. Box 1310
Bloomington, Indiana 47402



Dear Mr. McCrea:

This letter is written in response to the items a. through e. on page 2 of your letter of August 3, 1988. Several of the items merited rather extensive responses which were prepared in the form of separate documents which area referenced at the appropriate places in this letter and attached to it. I have attempted to respond to your listed items in order below.

a. **Reasons for testing:** The attached document "History of the Westinghouse PCB Survey" describes how the PCB testing came about and who was involved. The short answer is that some of us in Westinghouse felt that eventually those companies who were releasing to the environment chemicals which had serious adverse effects would eventually be made responsible for their actions. The chief executive officer (CEO) of Westinghouse wanted the company to be a "good citizen" and take this responsibility voluntarily (see the document cited above, page 3, line 20 to page 4, line 15; also see the attached document "Date of Meeting with Westinghouse CEO". Some of the rest of us thought it made good business sense: fixing the problem when only the company knew about it, before a hue and cry was raised, was bound to be much cheaper than being forced to take remedial measures later under public scrutiny and court order--essentially, fore-warned was fore-armed.

b. **Methods for testing:** A moderately detailed description of the methods for measuring PCB's in the collected samples is put forth in the attached document "Method Used For Measuring PCB's In The Samples From The Westinghouse PCB Survey".

c. **Decision-making process not to make the test data public:** I have discussed this point at some length in the attached document "Who Knew About The PCB Survey Data And By What Decision-Making Process Was It Decided Not To Make It Public?". A shortened answer is that I do not think such a decision-making process took place. The survey started out as secret to give those concerned time to react appropriately before the public

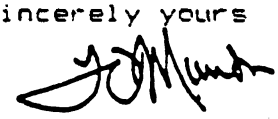
became inflamed. I do not think a corporate-wide, high-level assessment of the results ever took place.

d. **Description of your conference meeting with Westinghouse attorneys in New York, and**

e. **Description of telephone conferences with attorneys and what they communicated to you with regard to your serving as a consultant for Mr. and Mrs. Conard:** Both of these items (d. and e.) are dealt with in the attached document "My Contacts With the Law Firm Representing Westinghouse".

I hope that you find these materials both responsive to your requests and useful. Also attached to this letter you will find a bill for my services to date.

Sincerely yours



T. O. Munson, PhD

HISTORY OF THE WESTINGHOUSE PCB SURVEY

by T. O. Munson, PhD (8/6/1988)

I joined the Westinghouse Electric Corporation's Ocean Research Laboratory (WORL) then located in San Diego, CA in May of 1969. They didn't really have a project for me to work on but felt that a PhD Biochemist would add some needed breadth to the staff. I was given the task of coming up with a project which would augment ongoing WORL programs and possibly lead to some outside contract research money. At that time WORL was conducting an ecological study of a portion of the nearby nearshore marine environment. The project I came up with was to measure the residues of the pesticide DDT in the tissues of the animals in the study area. A few scattered bits of data suggested that the levels of DDT in the southern California marine environment were higher than one might expect simply from the input of urban waste.

In the last half of 1969 and the first half of 1970, with funds supplied by the Westinghouse Research and Development Laboratory in Pittsburgh PA (of which WORL was a part), I set up the necessary equipment to analyze for "hard"(or persistent) chlorinated pesticides and learned how to do the analysis. In the process of doing the necessary literature reading, I learned about polychlorinated biphenyls (PCB's) at this time.

Scientists around the world had been measuring the accumulation of "hard" chlorinated pesticides (especially DDT and its metabolites) in wild animal tissues since the

late 1950's. In certain areas of the world, unknown chlorinated substances occurred in the animal tissues at high enough levels to interfere with the chlorinated pesticide analyses. In the middle 1960's these substances were identified as PCB's by scientists in Sweden. I got a set of PCB standards from Monsanto and began measuring PCB levels in the marine organisms, as well as the DDT residues.

Sometime during the summer of 1970, I read an article on PCB's which listed their many and varied uses, and I learned to my surprise that by far the largest use was in the electrical industry as an electrical insulating fluid in transformers and capacitors. After making some inquiries, I learned that the electrical insulating fluid used by Westinghouse was called Inerteen, specially formulated by Monsanto and having as its main component Aroclor 1242, the PCB mixture containing 42 weight percent chlorine.

At about this time a very significant event took place at WORL--the manager, Dr. Roy C. Gaul left to take a position in the Office of Naval Research in Washington, D.C., and he was replaced by a career Westinghouse executive, Dr. J. C. R. Kelly, Jr. By virtue of his more than 20 years of service with Westinghouse and his elevated position (he was a Director, one step down from a Vice-President), Dr. Kelly knew everything and everybody in the Westinghouse Electric Corporation. It was evident later why such a high-level person had been chosen as our new leader: the decision had been made to terminate WORL in San Diego, and it was up to him to decide whether to move a remnant to the East Coast to continue the operation or to terminate it completely. The decision to move WORL (and as many of the

senior staff members as wished to go) to the Westinghouse site at the Bay Bridge near Annapolis MD. was announced November 1, 1970. The move was to be accomplished by the end of January, 1971.

In September or October of 1970, I expressed my concern to Dr. Kelly that the Westinghouse Electric Corporation might have a potentially very serious environmental problem related to the use of PCB's. Sweden had already begun regulating the use of PCB's, and the U. S. scientific community was beginning to pressure the U. S. government to do so also. I had been unable to determine whether anyone within Westinghouse knew that this was taking place or whether there were any environmental concerns associated with the use of PCB's. Dr. Kelly was able to ascertain very quickly that my concerns were not unfounded--Westinghouse did indeed have an "exposed flank" in this area. He wrote a memo summarizing our concerns and transmitted it to Dr. William E. Shoupp, the Westinghouse Vice-President who was the head of the Westinghouse R&D Laboratory.

The subsequent events were rather breath-taking for me. Within a few months of raising my "red flag" down near the bottom of the corporate ladder, the Chairman of the Board of the Westinghouse Electric Corporation (Donald Burnham) was standing in front of my equipment while I briefed him on the potential environmental problems concerning the use of PCB's--bioconcentration, biomagnification, and persistence in aquatic ecosystems. I do not remember very much specifically that Mr. Burnham said except that he assured me that if any Westinghouse plant were doing anything that might be deleterious to the environment, he wanted to know

about it and wanted it stopped. He said then and had said elsewhere that the Westinghouse Electric Corporation would be a "good citizen" with respect to the environment. I did not feel that this was just rhetoric--he struck me as a very sincere individual. I think at that time he was serving on some Presidential Advisory Panel for the Environment or something like that. All of this made an impression on me at the time because I was young and idealistic, and was a bit shaken to think that I might be working for one of the "black hat" corporations who where raping the environment in pursuit of the almighty buck. In the absence of documentation, I am unable to fix the time of this meeting closer than the period November, 1970 to September, 1971 (see associated document, "Date of Meeting With Westinghouse CEO").

That portion of the senior staff of WORL who chose to move East moved themselves and their families during the month of January, 1971, and for the following months conducted business out of rented rooms in a motel near the Bay Bridge site until the new office/laboratory spaces were completed in late March or April (1971). During this period of disruption, I made use of the time by completing the first trips to the Westinghouse sites at South Boston VA, Sharon PA, and Bloomington IN. Dr. Shoupp provided support for the project out of his discretionary funds until the new project funding cycle in September.

At each of these meetings I met with the plant manager and members of his staff to explain the program and gather information for planning the subsequent sampling phase of the survey. The purpose of this survey as stated to them

was to determine whether these manufacturing sites which incorporated PCB's into products were leaking significant levels of PCB's into the environment in the process. At each such meeting I emphasized the fact that we had the opportunity to locate problem areas and take remedial action before such problems became public knowledge and a panic situation might occur. At no location was the management in favor of conducting such a survey. The feeling seemed to be that there would not be a problem unless and until I uncovered one.

The field sampling portion of the survey was conducted during the Summer and Fall of 1971 to the best of my recollection. We drove to each site with the appropriate sampling gear, collected samples and carried them back to the laboratory for analysis. The samples were analyzed either directly by me, or by a chemist under my supervision. I did all of the data work-up and report preparation. If I am remembering correctly, the reports were distributed by mail and then I met with the management at each site to discuss their report in person.

The original concept of the survey had been to extend it to several other sites and the many repair facilities, but after this original effort, it sort of faded away. The funding for internally funded research programs at the Westinghouse R&D Laboratory was done on a competitive basis using priorities set up by the operating divisions within the company. If the operating divisions did not want a project, only strong support from the top level of the corporation would get it funded. This project apparently did not have such support after the first survey. If I am

remembering correctly, the project was funded for the September 1971-September 1972 period at the level of about 4 man-years of effort, and then hardly funded at all after that.

Date of Meeting with Westinghouse CEO

By T. O. Munson, PhD (8/9/88)

Upon initial consideration of this matter, I fixed the date of this meeting to the time period (November-December of 1970) by the following thought process, in spite of the absence of documentation. I specifically remember the speed at which the events unfolded from my first mentioning the problem to Dr. Kelly to the meeting with the CEO of Westinghouse--a matter of a few weeks or months. Giving a one-on-one presentation to the CEO of one of the country's major corporations makes a lasting impression when one is 29 years old as I was at that time. The February 24, 1971 memo from R. D. McClain of Bloomington to D. M. Sauter, Manager of the Distribution Apparatus Division (which you supplied me), makes it clear that the Westinghouse PCB survey was underway by that date. My specific memory of the presentation to Mr. Burnham was that it was in my lab, and my lab was packed in boxes from January, 1971 until after the spring thaw in Annapolis when the foundations could be poured for the new laboratory space--sometime in March or April of 1971. I was remembering that the project definitely did not begin until after the meeting with Mr. Burnham.

Also along these same lines was the fact that when I first visited Sharon PA (before February 24,1971 according to the above mentioned memo), I was sent packing by the plant manager when I explained what I wanted to do. His opinion was that they would not have a problem if I did not

sample the river. He knew that PCB's had been spilled into the river, but felt that no harm could have been done because Sharon Steel a short way further down river had totally wiped out the river. After I returned to Annapolis, Dr. Kelly reported to Dr. Shoupp, and Dr. Shoupp talked to the Vice-President of that particular manufacturing division. Subsequently, I was invited to return to Sharon by the plant manager (probably John Rissinger), and he took me to the country club for lunch where we planned the scope of the survey at Sharon. I'm do not think Dr. Shoupp could have turned that situation around without the involvement of higher management--Westinghouse was run very strictly by chain-of-command.

But on the other hand, upon reflection, a fairly clear image has formed in my mind of my standing in front of the equipment in my laboratory showing a chromatographic trace of a PCB formulation to Mr. Burnham. The problem is that I did not acquire that particular equipment until we got into the new lab space in Annapolis. If that picture is correct, the meeting could not have taken place in late 1970 in San Diego.

It also seems unlikely to me that the meeting was in San Diego for another reason. Westinghouse had very little manufacturing activity of any magnitude going on West of the Mississippi in 1970. Mr Burnham would have been unlikely to have flown 6 hours just to get a 10 minute briefing from me. It is much more likely that he was scheduled to visit the Oceanic Division facility at the Bay Bridge site near Annapolis (just across the parking lot from WQRL), and they scheduled a brief stop for him to get a first-hand look at

where the PCB survey was going on.

So I would have to say that I'm not sure when the meeting took place, but I am dead certain that it did take place. The most likely time was in the period November, 1970-September, 1971.

Method Used For Measuring PCB's In The Samples From The Westinghouse PCB Survey by T. O. Munson, PhD (8/10/88)

The analysis of these samples was performed before methods for PCB analysis were promulgated by the U.S. Environmental Protection Agency, but the method finally put forth by the USEPA reflects pretty closely the methods which had been used earlier, and which were used in this study. The procedure consists of a series of steps, each of which will be discussed in some detail below.

EXTRACTION: The first step in the procedure was to extract the PCB's from the sample matrix. Exactly how that was done depended upon what type of sample was being dealt with. Soil and sediment samples were first dried at room temperature, ground to a powder with a mortar and pestle, sieved to remove particles larger than 1 millimeter, and a weighed portion extracted about 8 hours in a Soxhlet extractor with an organic solvent mixture (2:1 hexane-acetone). Fish (and other tissue) samples were kept frozen until the beginning of the extraction step. They were then sawed into chunks with a frozen-food knife and reduced to a paste in a blender. A weighed portion of the paste was ground to a dry powder with 4 to 6 times its weight sodium sulfate (anhydrous). This dry powder was then extracted exactly like the dried soil or sediment samples.

CLEANUP: The extracts containing the PCB's also contained

many other extracted materials which needed to be removed prior to the gas chromatography step later on. Removal of the unwanted material was done at this cleanup step. Because PCB's are very stable chemicals, a single, very rigorous step can be used which will remove all but the most stable chemicals. Simply stated, the extracts were treated with a mixture of fuming sulfuric acid and concentrated sulfuric acid to oxidize and remove the unwanted materials. The treated extracts were then reduced to small volumes (a few milliliters) using a Kudurna-Danish evaporative concentrator.

IDENTIFICATION: The PCB's were identified using a gas chromatograph (GC) equipped with an electron-capture detector. The electron-capture detector was used because it gives very strong responses to halogen-carbon bonds such as the chlorine-carbon bonds in polychlorinated biphenyls (PCB's). A GC is an instrument which separates mixtures of organic chemicals based upon their volatilities. A particular PCB formulation, such as Aroclor 1242, will give a particular pattern of peaks on the strip chart recorder output from the GC. The location of each peak on the chart and the relative heights of the peaks are the identifying features which are used to determine whether a sample contained PCB's. If the sample contained PCB's the chart would exactly match that of a PCB standard or mixture of standards run under exactly the same GC conditions.

QUANTIFICATION: Determining which PCB was present, and how much, was done by comparing the sample charts with the PCB

standard charts. Which PCB or combination of PCB's was present was determined by the positions and relative peak heights of the peaks on the charts. How much PCB was present was determined by comparing the peak heights on the sample chart to the peak heights on the PCB standard charts. Using the known concentrations of the standards, the concentration of the PCB's in the sample extracts could be calculated and then the concentrations in the original samples.

CONFIRMATION: The identification of the PCB's was confirmed by running the extracts and standards on a GC with a different separation column which would give a different pattern to the peaks and these charts used to verify the initial identifications.

QUALITY CONTROL: To make sure that the procedure was working--finding no PCB's in samples which did not contain PCB's, and finding the right amounts of PCB's in samples which did contain PCB's, quality control samples were run. Some samples were run twice to see that the same result was obtained each time. A blank sample containing no PCB's was run with each group of samples to make sure that the analytical procedure was not adding PCB's to the samples (for tissue samples a sample of beef liver was run, and for sediment samples a sample of clean sand). Known amounts of PCB's were added to some samples to see that it was not lost during the analytical process.

Who Knew About The PCB Survey Data And By What Decision-Making Process WAs It Decided Not To Make It Public?

By T. O. Munson, PhD (8/11/88)

At the outset there was no question that the information which would be generated by this survey would be highly sensitive and potentially damaging if released prematurely before remedial actions could be taken. Some of these sites had used PCB's long before any environmental concerns were attached to it--it had been treated like motor oil. One could expect trouble for pouring it into streams in large quantity but it was fine for settling the dust on roads. I was instructed by Dr. Kelly (manager of the Westinghouse Ocean Research Laboratory) that all of the reports would be stamped "Company Proprietary, Class 1" in red ink, and they were. This designation meant that the reports were to be distributed inside the company only on a need-to-know basis, and not at all outside of the company. I was not to show the results from one site to the personnel from another site.

As you can see from the distribution list on the front of the Bloomington report, the report was fairly widely distributed within the company: four copies to Bloomington (Brittain, McClain, Shoaff and Sawyer), one to the R&D Lab (Shoupp), one to my boss (Kelly), one to the Environmental Systems Department (Terrill), and two to headquarters (Kerns and Boquist). Including my copy, there were then only ten original copies made, each with its big red stamp on the front. The red ink did not xerox well and is not visible on

the copy you sent me.

At the time these reports were generated, it seemed right and proper that this information be held closely within the company so that appropriate actions could be taken in the same way that the developmental data on a new product would not be discussed or published outside of the company. Why the data were not released later, if not to the public, at least to the Environmental Protection Agency, I do not know. Clearly, Mr. Wills, the attorney for Westinghouse who responded to the EPA interrogatory concerning the Westinghouse Electric Corporation's use of PCB's did not even allude to the existence of the PCB survey data. Since responding untruthfully to such an interrogatory from EPA was a rather serious offence, I would like to assume that Mr. Wills either did not know about the PCB survey or had forgotten about it in the ensuing years. I believe I have met Mr. Wills, but I cannot remember the context.

As a matter of fact, some of the data were made public, and various people in EPA knew of the existence of the PCB survey conducted by me. Consider:

--In 1972 sometime(I can't find the reference right now), EPA proposed some effluent standards for PCB's and held a hearing (in Washington, D.C., I think) at which time various interested parties testified. At that hearing, on behalf of the company, I testified that Westinghouse had done a PCB survey around some of their plants and mentioned some of the data.

--About 1973, the Westinghouse plant in South Boston VA was

contacted by State of VA officials because high levels of PCB's had been found in fish in the John Kerr Reservoir which received water from the Dan River near the plant. They showed the officials my report which showed the levels of PCB's in the Dan River sediments were just as high upstream from their plant as they were downstream, indicating a source upstream from the Westinghouse plant. The officials went on their way and found the source upstream (a furniture manufacturer, I think).

--On August 18, 1976, I provided Mr. Ridgway M. Hall, Jr., then Special Assistant to the General Counsel of the USEPA (by whom I was then employed), a sworn affidavit concerning the detection limit for PCB's in water. As part of the description of my experience, the following information was included in that document: "From that time until I left Westinghouse in 1976, my principal research interest was chlorinated hydrocarbons in the environment--particularly polychlorinated biphenyls (PCBs). This work involved primarily four general areas: ... 4). a study to determine the leakage to the environment of PCB's from Westinghouse Electric Co. transformer and capacitor manufacturing facilities. (All of the results of this program are of a proprietary nature. Prior to the preparation of this affidavit I mentioned the proprietary nature of this study to the EPA attorney, Mr. Ridgway Hall, and we agreed that I should not disclose the substance of it to anyone at EPA or anyone else, or discuss it in this testimony without the express permission of Westinghouse)."

At my level in the corporation, I was not a part of any decision-making process concerning anything other than my small group of people. The management process was done strictly by chain-of-command, very much top-down management. The ability to keep information to yourself and not discuss higher-level information with lower-level people with whom you worked was one of the personal attributes considered for being promoted up the management ladder.

It seems likely to me, based upon my experience with management in private industry and with the government, that a decision was never made not to make this information public. I think the specific responses to the reports at the sites where the samples were taken were left to the manager of the particular plant to decide. In my opinion, some of the responses were appropriate and some were not. I spent some late-night hours agonizing over whether I should make some of the information public but decided not to. Even if I were not sent to jail for violating the Industrial Secrets Act (if such a thing existed), at the very least, I would have lost my job.

Obviously, those inside EPA who knew about the existence of the PCB survey data did not convey the information to the appropriate persons, or the EPA interrogatory would have specifically requested it. Apparently, the reports were not shown to the appropriate people inside Westinghouse or Mr. Wills would have given them to EPA, and Mr. Westlake, the new plant manager at Bloomington would have known about them.

What started as a noble mission with the sanction of the Westinghouse CEO did not have the beneficial effects that it could have had for all concerned. It's an imperfect world!

January 29, 1971

Mr. R. F. Casey
Substation Operation & Maintenance Engineer
Ohio Edison Company
47 North Main Street
Akron, Ohio 44308

Dear Mr. Casey:

Your letter dated January 20, 1971 addressed to Mr. D. A. Olson was forwarded to me for response since I have been closely involved with the polychlorinated biphenyl environmental problem.

Since February, 1970 when Mr. Olson wrote his letter informing our customers of a potential problem, there has been increasing evidence that PCB's of chlorine content less than 54% have been found in the environment generally near the source of contamination. There is also increasing evidence that the PCB's being identified as Aroclor 1254 and Aroclor 1260 are probably the residues from lower chlorinated materials which had undergone degradation. Because of this limited information we have concluded that control of all PCB's is indicated.

A large percentage of our production has had a chlorine content of less than 54%. However since our Aroclor products are mixtures of many isomers, the higher chlorinated versions have been present in virtually every mixture in varying amounts. These higher chlorinated isomers are very resistant to degradation; therefore, will continue to build up in the environment unless controlled.

We have an active program for evaluating new materials for use in Askarel applications. The most promising material developed to date is a modified PCB from which the persistent higher chlorinated isomers have been virtually removed resulting in a fluid which has attractive dielectric properties but if it escapes into the environment is more biodegradable. Samples of this material, which we have designated as MCS 1016, are now being evaluated by many of

the capacitor manufacturers. If test results confirm that this material is an acceptable fluid we plan to produce it in commercial quantities by mid-year 1971.

An incinerator capable of destroying Askarels must operate at temperatures ranging from about 2000°F to 3000°F and must have facilities for scrubbing the stack gases to prevent hydrogen chloride gases from escaping to the atmosphere. This type of unit can be relatively costly to install and operate but if can be justified if the volume of material to be destroyed is great enough. It may be economically practical for several units of this type to be located throughout the country providing a service to the utilities nearby. We plan to operate our unit to gain experience to help evaluate the practicality for installing more units.

At present only one State, Pennsylvania, has objected to the disposal of Askarel contaminated solids in properly managed landfills. I recommend that landfills be used as long as they are authorized. Certainly if the liquid is drained from failed equipment the potential for migrating into the environment, already very small, is reduced considerably. In the meantime we are continuing our studies on the incineration of these solids and hope to have a unit in operation before the end of the year.

I recognize the many problems that the PCB environmental contamination problem has created; however, I am optimistic that Askarels with their many beneficial characteristics will continue to serve the industry if we all follow good housekeeping and disposal practices.

I recommend that you seriously consider participating in the NEMA-ANSI effort to coordinate the Askarel handling problem country-wide.

I hope this information is useful to you. If I can be of further service, please let me know.

Sincerely,

W. B. Papageorge
Manager
Environmental Control

WBP:ms