

Woodward-Clyde Consultants

Memorandum

To: Marshall Sonksen, ALCOA

From: Jane R. Knox

Office: Bristol, TN

Date: April 2, 1992

Subject: Polycyclic Aromatic Hydrocarbon Analysis of Pool 15 Standard Reference Material.

The following report from Environmental Science and Engineering (ESE) summarizes results of analysis of polycyclic aromatic hydrocarbon (PAH) compounds in the standard reference material composed of carp and carpsucker collected in 1990 from Pool 15 of the Mississippi River. These results are summarized in Table 1. Please note that triphenylene was used as a surrogate compound for quality control purposes. The percent recovery on surrogate spike samples ranged from 53.7% to 114.7% with an average of 85.8%. The total PAH concentration ranged from 2.53 ug/g to 8.94 ug/g, excluding non-detect values.

These data were briefly reviewed by Dr. Brad Droy (WCC) to assess human health risks. The detected PAH compounds were separated into carcinogenic and non-carcinogenic compounds (to humans) as follows:

~~Non~~-Carcinogens
(Group D)

Acenaphthene
Acenaphthylene
Anthracene
Benzo(ghi)perylene
Fluoroanthene
Fluorene
Phenanthrene
Pyrene
Naphthalene

~~Non~~-Carcinogens
(Group B2)

Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (k) fluoranthene
Chrysene
Indeno (1,2,3-C,D) pyrene
Dibenzo (a,h) anthracene

The total carcinogenic PAH's in SRM samples 6 through 11 ranged from 30.1 ppb to 62.3 ppb as shown in Table 1. Based on an acceptable (i.e., 10^{-6} cancer risk estimation) recommended EPA water concentration of 31.1 ng/L and an estimated bioconcentration factor (BCF) of 25,119, a total carcinogenic PAH concentration of 778.7 ppb or less should be acceptable in regard to human health as calculated below:

$$0.031 \text{ ppb} * 25,119 = 778.7 \text{ ppb}$$



137968

Site: Alcoa
ID# IAD005270160
Break: 3.3
Other: WWC
4/2/92

137968

For non-carcinogens, a conservative calculation using the highest concentration of non-carcinogenic PAHs of 9.7189 ppm (see Table 1) and the lowest reported reference dose for the list of non-carcinogenic PAHs detected of 0.004 mg/kg/day for naphthalene, a hazard quotient of 0.698 is generated as follows:

$$9.7189 \text{ mg/kg} * \frac{20 \text{ gm fish/day}}{70 \text{ kg}} * \frac{1 \text{ kg}}{1,000 \text{ g}} = 0.00277 \text{ mg/kg/day intake}$$

$$0.00277 \text{ mg/kg/day intake} / 0.004 \text{ mg/kg/day RFD} = 0.698 \text{ Hazard Quotient}$$

This calculation is based on an average intake of 20 gm of fish per day for a 70 kg adult. A Hazard Quotient of less than 1.0 is indicative of insignificant non-carcinogen hazard in humans.

Based on these results, the PAHs detected in the 1990 SRM are not likely to jeopardize human health. Although the SR material should represent a worst case scenario (i.e., composed of fish with the highest reported PCB concentrations), only six fish were analyzed.

Please give me a call once you've had time to review these results to discuss the next course of action.

TABLE 1. Polycyclic Aromatic Hydrocarbon Analysis of Standard Reference Material – Pool 15 Fish

Not Classified as to Human Carcinogenicity	SRM #6 (UG/G)	SRM #7 (UG/G)	SRM #8 (UG/G)	SRM #9 (UG/G)	SRM #10 (UG/G)	SRM #11 (UG/G)
ACENAPHTHENE	< 0.44	2.7	0.91	< 0.45	2.6	3.3
ACENAPHTHYLENE	< 0.5	< 0.51	< 0.5	6.3	1.3	< 0.51
ANTHRACENE	0.2	0.04	< 0.02	< 0.02	< 0.02	< 0.02
BENZO(GHI)PERYLENE	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009	< 0.0009
FLOUROANTHENE	0.01	0.009	0.008	0.02	0.02	0.01
FLOURENE	2.2	1.9	2.1	2.5	1.8	3.0
PHENANTHRENE	0.08	0.07	0.09	0.06	0.07	0.08
PYRENE	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008
NAPHTHALENE	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36	< 0.36
TOTAL	3.7989	5.5979	3.9969	9.7189	6.1789	7.2889

Probable Human Carcinogens

BENZO(A)ANTHRACENE	0.0009	0.0006	0.0005	< 0.0003	0.0003	0.0008
BENZO(A)PYRENE	0.002	0.002	0.002	0.002	0.002	0.002
BENZO(B)FLOUROANTHENE	0.0005	0.0006	0.0005	0.0007	0.0005	0.0006
BENZO(K)FLOUROANTHENE	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002
CHRYSENE	0.03	0.03	0.03	0.05	0.02	0.02
INDENO(1,2,3-CD)PYRENE	0.006	0.005	0.006	0.007	0.006	0.007
DIBENZO(A,H)ANTHRACENE	0.002	0.002	0.002	0.002	0.001	0.002
TOTAL	0.0416	0.0404	0.0412	0.0623	0.0301	0.0326



Environmental
Science &
Engineering, Inc.

March 20, 1992
Project No.: 3924010V-L201

Ms. Jane R. Knox
Woodward-Clyde Consultants
P.O. Box 67
Bristol, TN 37621

Dear Jane:

Enclosed is the ESE Data Report for the Fish SRM samples submitted for determination of polynuclear aromatic hydrocarbons (PAH's).

A surrogate, triphenylene, was added to each sample prior to extraction. The samples were extracted with methylene chloride in Soxhlet extractors for 16 hours. The extracts were dried over sodium sulfate and reduced to a final volume of 10 milliliters (mL) in acetonitrile. The extracts were analyzed using HPLC with ultraviolet and fluorescence detection (USEPA method 8310, SW-846). A 25 microliter (μ L) aliquot of the extract was injected onto the HPLC system. A C-18 precolumn was utilized to separate the lipid materials from the extract.

Recoveries of all analytes and surrogates were within the acceptable range of recoveries for this analysis.

Thank you for choosing ESE to provide these analytical services. Please call me anytime at (904) 332-3318 extension 1458 if you have questions concerning this report or if I may be of further service.

Sincerely,

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

David H. Greer, Jr.
Senior Project Scientist

/dhg

Enclosure

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	SRM#6 WCC001 6	SRM#7 WCC001 7	SRM#8 WCC001 8	SRM#9 WCC001 9	SRM#10 WCC001 10	SRM#11 WCC001 11
DATE TIME		03/02/92 16:20	03/02/92 16:20	03/02/92 16:20	03/02/92 16:20	03/02/92 16:20	03/02/92 16:20
ACENAPHTHENE, TISS. UG/G-WET LC	34209	<0.44	2.7	0.91	<0.45	2.6	3.3
ACENAPHTHYLENE, TISS. UG/G-WET LC	34204	<0.50	<0.51	<0.50	6.3	1.3	<0.51
ANTHRACENE, TISS. UG/G-WET LC	34224	0.20	0.04	<0.02	<0.02	<0.02	<0.02
BENZO(A)ANTHRACENE, TISS. UG/G-WET LC	34530	0.0009	0.0006	0.0005	<0.0003	0.0003	0.0008
BENZO(A)PYRENE, TISS. UG/G-WET LC	34251	0.002	0.002	0.002	0.002	0.002	0.002
BENZO(B)FLUORANTHENE, TISS. UG/G-WET LC	34234	0.0005	0.0006	0.0005	0.0007	0.0005	0.0006
BENZO(GHI)PERYLENE, TISS. UG/G-WET LC	34525	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
BENZO(K)FLUORANTHENE, TISS. UG/G-WET LC	34246	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002
CHRYSENE, TISS. UG/G-WET LC	34324	0.03	0.03	0.03	0.05	0.02	0.02
FLUORANTHENE, TISS. UG/G-WET LC	34380	0.01	0.009	0.008	0.02	0.02	0.01
FLUORENE, TISS. UG/G-WET LC	34385	2.2	1.9	2.1	2.5	1.8	3.0
INDENO(1,2,3-CD)PYR N, TISS. UG/G-WET LC	34407	0.006	0.005	0.006	0.007	0.006	0.007
NAPHTHALENE, TISS. UG/G-WET LC	34446	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36
PHENANTHRENE, TISS. UG/G-WET LC	34465	0.08	0.07	0.09	0.06	0.07	0.08
PYRENE, TISS. UG/G-WET LC	34473	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
DIBENZO(A,H)ANTHRACE NE, TISS. UG/G-WET LC	34560	0.002	0.002	0.002	0.002	0.001	0.002
TRIPHENYLENE, TISS. UG-G-WET SUR	96518	0.725	0.738	0.862	0.489	0.802	1.05

RECEIVED
APR 16 REC'D
REME SECTION