**TABLE 7**
**RECOMMENDED AND ADOPTED FISH/SHELLFISH CONSUMPTION RATES ***

| Chemical | EPA Recommended Fish Consumption Rate (g/day) | ADEM Adopted Fish Consumption Rate (g/day) |
|---|---|---|
| 1,1,1-Trichloroethane 71556 | 22 | |
| 1,1,2,2-Tetrachloroethane 79345 | 22 | 30 |
| 1,1,2-Trichloroethane 79005 | 22 | 30 |
| 1,1-Dichloroethylene 75354 | 22 | 30 |
| 1,2,4-Trichlorobenzene 120821 | 22 | 30 |
| 1,2-Dichlorobenzene 95501 | 22 | 30 |
| 1,2-Dichloroethane 107062 | 22 | 30 |
| 1,2-Dichloropropane 78875 | 22 | 30 |
| 1,2-Diphenylhydrazine 122667 | 22 | 30 |
| 1,3-Dichlorobenzene 541731 | 22 | 30 |
| 1,3-Dichloropropene 542756 | 22 | 30 |
| 1,4-Dichlorobenzene 106467 | 22 | 30 |
| 2,3,7,8-TCDD (Dioxin) 1746016 | 17.5 | 30 |
| 2,4,6-Trichlorophenol 88062 | 22 | 30 |



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| Chemical | EPA Recommended Fish Consumption Rate (g/day) | ADEM Adopted Fish Consumption Rate (g/day) |
|---|---|---|
| 2,4-Dichlorophenol<br>120832 | 22 | 30 |
| 2,4-Dimethylphenol<br>105679 | 22 | 30 |
| 2,4-Dinitrophenol<br>51285 | 22 | 30 |
| 2,4-Dinitrotoluene<br>121142 | 22 | 30 |
| 2-Chloronaphthalene<br>91587 | 22 | 30 |
| 2-Chlorophenol<br>95578 | 22 | 30 |
| 2-Methyl-4,6-Dinitrophenol<br>534521 | 22 | |
| 3,3'-Dichlorobenzidine<br>91941 | 22 | 30 |
| 3-Methyl-4-Chlorophenol<br>59507 | 22 | 30 |
| Acenaphthene<br>83329 | 22 | 30 |
| Acrolein<br>107028 | 22 | 30 |
| Acrylonitrile<br>107131 | 22 | 30 |
| Aldrin<br>309002 | 22 | 30 |
| alpha-Hexachlorocyclohexane (HCH)<br>319846 | 22 | 30 |
| alpha-Endosulfan<br>959988 | 22 | 30 |

| Chemical | EPA Recommended Fish Consumption Rate (g/day) | ADEM Adopted Fish Consumption Rate (g/day) |
|---|---|---|
| Anthracene<br>120127 | 22 | 30 |
| Antimony<br>7440360 | 17.5 | 30 |
| Arsenic<br>7440382 | 6.5 | 30 |
| Asbestos<br>1332214 | | |
| Benzene<br>71432 | 22 | 30 |
| Benzidine<br>92875 | 22 | 30 |
| Benzo(a)anthracene<br>56553 | 22 | 30 |
| Benzo(a)pyrene<br>50328 | 22 | 30 |
| Benzo(b)fluoranthene<br>205992 | 22 | 30 |
| Benzo(k)fluoranthene<br>207089 | 22 | 30 |
| beta-Hexachlorocyclohexane (HCH)<br>319857 | 22 | 30 |
| beta-Endosulfan<br>33213659 | 22 | 30 |
| Bis(2-Chloro-1-methylethyl) Ether<br>108601 | 22 | 30 |
| Bis(2-Chloroethyl) Ether<br>111444 | 22 | 30 |
| Bis(2-Ethylhexyl) Phthalate<br>117817 | 22 | 30 |

| Chemical | EPA Recommended Fish Consumption Rate (g/day) | ADEM Adopted Fish Consumption Rate (g/day) |
|---|---|---|
| Bromoform<br>75252 | 22 | 30 |
| Butylbenzyl Phthalate<br>85687 | 22 | 30 |
| Carbon Tetrachloride<br>56235 | 22 | 30 |
| Chlordane<br>57749 | 22 | 30 |
| Chlorobenzene<br>108907 | 22 | 30 |
| Chlorodibromomethane<br>124481 | 22 | 30 |
| Chloroform<br>67663 | 22 | 30 |
| Chrysene<br>218019 | 22 | 30 |
| Copper<br>7440508 | | |
| Cyanide<br>57125 | 22 | 30 |
| Dibenzo(a,h)anthracene<br>53703 | 22 | 30 |
| Dichlorobromomethane<br>75274 | 22 | 30 |
| Dieldrin<br>60571 | 22 | 30 |
| Diethyl Pthalate<br>84662 | 22 | 30 |
| Dimethyl Phthalate<br>131113 | 22 | 30 |

Table 7 - Alabama (page 4 of 12)

| Chemical | EPA Recommended Fish Consumption Rate (g/day) | ADEM Adopted Fish Consumption Rate (g/day) |
|---|---|---|
| Di-n-Butyl Phthalate<br>84742 | 22 | 30 |
| Endosulfan Sulfate<br>1031078 | 22 | 30 |
| Endrin<br>72208 | 22 | 30 |
| Endrin Adehyde<br>7421934 | 22 | 30 |
| Ethylbenzene<br>100414 | 22 | 30 |
| Fluoranthene<br>206440 | 22 | 30 |
| Fluorene<br>86737 | 22 | 30 |
| gamma-Hexachlorocyclohexane (HCH) [Lindane]<br>58899 | 22 | 30 |
| Heptachlor<br>76448 | 22 | 30 |
| Heptahlor Epoxide<br>1024573 | 22 | 30 |
| Hexachloroenzene<br>118741 | 22 | 30 |
| Hexachlorobutadiene<br>87683 | 22 | 30 |
| Hexachlorocyclopentadiene<br>77474 | 22 | 30 |
| Hexachloroethane<br>67721 | 22 | 30 |
| Indeno(1,2,3-cd)pyrene<br>193395 | 22 | 30 |

Table 7 - Alabama (page 5 of 12)

| Chemical | EPA Recommended Fish Consumption Rate (g/day) | ADEM Adopted Fish Consumption Rate (g/day) |
|---|---|---|
| Isophorone<br>78591 | 22 | 30 |
| Methylmercury<br>22967926 | 17.5 | |
| Methyl Bromide<br>74839 | 22 | 30 |
| Methylene Chloride<br>75092 | 22 | 30 |
| Nickel<br>744000 | 6.5 | 30 |
| Nitrobenzene<br>98953 | 22 | 30 |
| N-Nitrosodimethylamine<br>62759 | 17.5 | 30 |
| N-Nitrosodi-n-Propylamine<br>621647 | 17.5 | |
| N-Nitrosodiphenylamine<br>86306 | 17.5 | 30 |
| Pentachlorophenol<br>87865 | 22 | 30 |
| Phenol<br>108952 | 22 | 30 |
| p,p'-Dichlorodiphenyldichloroethane (DDD)<br>72548 | 22 | 30 |
| p,p<br>-Dichlorodiphenyldichloroethylene (DDE)<br>72559 | 22 | 30 |

| Chemical | EPA Recommended Fish Consumption Rate (g/day) | ADEM Adopted Fish Consumption Rate (g/day) |
|---|---|---|
| p,p'-Dichlorodiphenyltrichloroethane (DDT)<br>50293 | 22 | 30 |
| Polychlorinated Biphenyls (PCBs)<br>1336363 | 17.5 | 30 |
| Pyrene<br>129000 | 22 | 30 |
| Selenium<br>7782492 | 17.5 | 30 |
| Tetrachloroethylene<br>127184 | 22 | 30 |
| Thallium<br>7440280 | 17.5 | 30 |
| Toluene<br>108883 | 22 | 30 |
| Toxaphene<br>8001352 | 22 | 30 |
| trans-1,2-Dichloroethylene<br>156605 | 22 | 30 |
| Trichloroethylene<br>79016 | 22 | 30 |
| Vinyl Chloride<br>75014 | 22 | 30 |
| Zinc<br>7440666 | 17.5 | 30 |

*** Summary:**

Table 7 identifies the fish/shellfish consumption rates used by EPA to calculate national recommended water quality criteria for 97 toxic pollutants to protect human health and by ADEM to calculate adopted water quality criteria for 93 toxic pollutants to protect human health. The former are based on individual water quality criteria documents for toxic

pollutants hyperlinked in *National Recommended Water Quality Criteria - Human Health Criteria Table*, https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table (accessed Dec. 31, 2021). The latter are based on ADEM Admin. Code r. 335-6-10-.07(1)(d).

ADEM has not adopted water quality criteria to protect human health for 3 toxic pollutants: 1,1,1-Trichloroethane, 3-Methyl-4-Chlorophenol, and Methylmercury. As discussed below, ADEM's adoption and use of a fish consumption rate of 30 grams per day underestimates human consumption of fish and shellfish and underestimates human exposure to toxic pollutants.

**Comments:**

Human exposure to toxic pollutants in water is primarily through consumption of contaminated water and contaminated aquatic organisms (fish and shellfish). Aquatic organisms become contaminated when they ingest and accumulate toxic pollutants. The magnitude of human exposure to contaminated aquatic organisms is a function of the amount of human consumption of contaminated aquatic organisms.

In November 1980, EPA recommended a national fish/shellfish consumption rate of 6.5 grams per day based on an analysis of the National Purchase Diary Fish Consumption Survey conducted by NPD Research, Inc. in 1973-74 for the Tuna Research Institute. *Seafood consumption data analysis, Stanford Research Institute International, Menlo Park, California, Final report, Task 11, Contract No. 08-01-3887* (1980); *Guidelines and Methodology Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents*, 45 Fed. Reg. 79347, 79324, 79348 (Nov. 28, 1980); *Exposure Factors Handbook* (EPA/600/8-89/043, March 1990), at 2-28 & 2-31.

In October 2000, EPA revised its national recommended fish/shellfish consumption rate to 17.5 grams per day based on the *1994–1996 Continuing Survey of Food Intakes by Individuals and 1994–1996 Diet and Health Knowledge Survey* (USDA, 1998); *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, Oct. 2000), at 4-25. See 65 Fed. Reg. 66444, 66452 (Nov. 3, 2000).

In April 2014, EPA revised its national recommended fish/shellfish consumption rate to 22 grams per day based on an analysis of NHANES data from 2003 to 2010. *Estimated Fish*

*Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, Apr. 2014), at Table 9b; 80 Fed. Reg. 36986 (June 29, 2015).
In *Human Health Ambient Water Quality Criteria: 2015 Update* (EPA 820-F-15-001 June 2015), EPA reported:

> **Fish Consumption**
>
> EPA updated the default fish consumption rate to 22 grams per day. This rate represents the 90th percentile consumption rate of fish and shellfish from inland and nearshore waters for the U.S. adult population 21 years of age and older, based on NHANES data from 2003 to 2010 (USEPA 2014). EPA's previously recommended rate of 17.5 grams per day was based on the 90th percentile consumption rate of fish and shellfish from inland and nearshore waters for the U.S. adult population and was derived from 1994-1996 CSFII data.
>
> As described in EPA's human health criteria methodology (USEPA 2000), the level of fish consumption in highly exposed populations varies by geographical location. Therefore, EPA suggests a four preference hierarchy for states and authorized tribes that encourages use of the best local, state, or regional data available to derive fish consumption rates. EPA recommends that states and authorized tribes consider developing criteria to protect highly exposed population groups and use local or regional data in place of a default value as more representative of their target population group(s). The preferred hierarchy is: (1) use of local data; (2) use of data reflecting similar geography/ population groups; (3) use of data from national surveys; and (4) use of EPA's default consumption rates.

*Id.* (citing *Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, Apr. 2014), at Table 9b; *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, Oct. 2000), at 4-25).

The 90th percentile consumption rate of fish and shellfish from inland and nearshore waters for the U.S. adult population 21 years of age and older in the South (including Alabama) is 26.3 grams per day. *Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, Apr. 2014), at Table 9b.

On August 29, 1994, ADEM Admin. Code r. 335-6-10-.07(d) was amended to revise the fish consumption rate for development of Alabama water quality criteria for the protection of human health from 6.5 grams per day to 30 grams per day based on local data reported in *Estimation of Daily Per Capita Freshwater Fish Consumption of Alabama Anglers* (Auburn Univ., Dep't of Fisheries and Aquaculture, 1994).

*Estimation of Daily Per Capita Freshwater Fish Consumption of Alabama Anglers* explains that surveys of anglers were conducted at "[t]wenty-three (23) locations distributed across Alabama . . . (Figure 1). These locations included twenty-nine (29) primary sampling sites: twenty–three (23) tailwater sites and 6 reservoir sites, representing 11 river drainages in Alabama (Tables 1 and 5)." *Id.* at 3. "Anglers were intercepted and interviewed at access points at the completion of their fishing trips." *Id.* at 4.

> Two methods were used to estimate $C_{daily}$: (1) Anglers with harvested fish were asked if they planned to consume their fish that day (Question 3). If the answer was 'yes', then $C_{daily}$ was calculated for that interview using the quantity of fish that would be eaten at the next meal as specified by the interviewee. This method [was] termed the 'Harvest Method'. * * * (2) For all anglers who indicated that they consumed fish from the study site, the number of 4-oz servings typically eaten at a meal was determined by equating the entire surface (palm side) of the flat, open hand to a single 4-oz serving. * * * This gave the angler a visual frame of reference for the serving size being addressed. This method [was] termed the '4-oz Serving Method'."

*Id.* at 4.

Estimated daily per capita freshwater fish consumption ($C_{daily}$) was calculated using the Harvest Method based on "the number of meals eaten in the past month of fish caught at that landing or study site only (site meals), and the number of meals eaten in the past month of fish caught from the sample site plus all other lakes and rivers in Alabama (all meals), not including farm ponds." *Id.* at 9. Estimated daily per capita freshwater fish consumption ($C_{daily}$) was calculated using the 4-oz Serving Method based on "sample site meals, and also [on] all meals comprised of fish caught from Alabama lakes and rivers." *Id.* at 10.

The authors of *Estimation of Daily Per Capita Freshwater Fish Consumption of Alabama Anglers* concluded:

> Annual estimates of mean daily per capita consumption ($C_{annual}$) for anglers from the current ADEM study were 43 g/d for the Harvest Method and 46 g/d for the 4-oz Serving Method, respectively. These two estimates of $C_{annual}$ corroborated one another.
>
> If estimates of $C_{annual}$ are based only on the meals of fish caught at the study sites (primarily river tailwater areas just below dams), then estimates of $C_{annual}$ dropped to 33 g/d using the Harvest Method, and to 30 g/d using the 4–oz Serving Method. Again, the estimates from the two methods corroborated one another.

*Id.* at 24. See also *Exposure Factors Handbook: 2011 Edition* (EPA/600/R-09/052F, Sep. 2011) at § 10.5.7 (summarizing the methods and findings of *Estimation of Daily Per Capita Freshwater Fish Consumption of Alabama Anglers*). The authors further explained:

> There was no significant difference ($p > .05$) between the estimates of $C_{annual}$ derived from the Harvest Method and the 4-oz Serving Method. This was the case whether $C_{annual}$ was based only on study site meals, or on all meals (Table 4). There was a significant difference ($p < .05$) between estimates of $C_{annual}$ based on site meals vs. all meals, as might be expected, whether $C_{annual}$ was estimated using the Harvest Method or the 4-oz Serving Method (Table 4). Meals eaten with fish harvested from the sample sites represented 60% of all meals eaten with fish caught from rivers and reservoirs in Alabama.
>
> These results imply that the Harvest Method and the 4-oz Serving Method provided estimates of $C_{annual}$ that corroborated one another. The significant difference between $C_{annual}$ based on site meals vs. all meals indicates that the values based only on study site meals could underestimate the true per capita consumption rate of all freshwater fish by anglers.

*Estimation of Daily Per Capita Freshwater Fish Consumption of Alabama Anglers*, at 15. Notably, the authors offered no justification for basing $C_{annual}$ on study site meals only. The exclusion of fish consumption from "other lakes and rivers" is impermissible. "EPA has consistently implemented the Clean Water Act to ensure that the total rate of consumption of freshwater and estuarine fish and shellfish (including estuarine species harvested in near coastal waters) reflects consumption rates demonstrated by the population of concern. In other words, EPA expects that the standards will be set to enable residents to safely consume

from local waters the amount of fish they would normally consume from *all fresh and estuarine waters* (including estuarine species harvested in near coastal waters)." *Human Health Ambient Water Quality Criteria and Fish Consumption Rates: Frequently Asked Questions* (EPA, Jan. 18, 2013) at 2 (Exhibit 15) (emphasis added). "Because the overall goal of the criteria is to allow for a consumer to safely consume from local waters the amount of fish they would normally consume from *all fresh and estuarine waters*, the FCR [should reflect consumption of fish and shellfish from all] local, commercial, aquaculture, interstate, and international sources." *Id.*, at 2 (emphasis added).

*Estimation of Daily Per Capita Freshwater Fish Consumption of Alabama Anglers* makes clear that the true mean per capita consumption rate of all freshwater fish by anglers is 43.1 grams per day to 45.8 grams per day. Moreover, the analysis in *Estimation of Daily Per Capita Freshwater Fish Consumption of Alabama Anglers* omits any consideration of shellfish consumption. The 90$^{th}$ percentile shellfish consumption rates for the Gulf of Mexico, Coastal, and South regions of the United States are 20.1, 15.7, and 20.0 grams per day, respectively. *Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations* (NHANES 2003-2010) (EPA-820-R-14-002, April 2014), at Table 12b.