4. Edwin van Wijngaarden (EVW)

Peer review of draft proposed rule for Mercury Water Quality Objectives and Program of Implementation

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Thank you for the opportunity to review the draft proposed rule for Mercury Water Quality Objectives. I have a Ph.D. in Epidemiology and am a Fellow of the American College of Epidemiology. I have extensive experience in managing and conducting epidemiologic studies and have published 95 peer-reviewed manuscripts with a focus on neurobehavioral outcomes and environmental and occupational health. In the past decade, my primary research efforts have focused on the influence of environmental exposures (in particular mercury and lead) on cognitive outcomes in children and adults. Because of my expertise in Public Health Toxicology, I will comment on the following three conclusions of the draft proposed rule:

1. The proposed Sport Fish Water Quality Objective was derived using sound scientific information and methods;
2. The California Tribes Fish Use Study (Shilling et al. 2014) contains a sound data set to use to establish a default water quality objective to protect tribes;
3. The consumption rate of 4 to 5 meals per week (142 grams per day) is a sound basis from which to derive a subsistence fishing water quality objective that would be applied to the highest trophic level fish.

The basis for my comments are sections of the draft staff report (dated June 2016) and supplementary appendices that are relevant to the three conclusions above (as identified in the request for scientific peer review, Attachment 2), the Shilling 2014 report, the San Francisco Bay Seafood Consumption 2000 report, the US EPA 2002 report estimating fish consumption in the United States and the related 2000 methods report, and literature pertaining to the health effects of mercury. References cited in this review are provided at the end of the document.

The proposed Sport Fish Water Quality Objective was derived using sound scientific information and methods.

The Sport Fish Water Quality Objective for mercury is intended to protect the beneficial uses of commercial and sport fishing, wildlife habitat, and marine habitat. The Sport Fish Water Quality Objective is expressed as follows: the average methylmercury concentrations shall not exceed 0.2 milligrams per kilogram (mg/kg) fish tissue within a calendar year. This fish tissue concentration (FTC) is the methylmercury water quality objective. The objective must be applied to TL3 or TL4 fish, whichever trophic level is the highest existing level in the water body.

The objective for human health was derived using U.S. EPA’s equation for calculating the fish tissue criterion (US EPA 2001):

\[ FTC = BW \times (RfD - RSC)/FI \]  
(see page H-1)

where FTC is as defined above, BW = human body weight, RfD = the reference dose for methylmercury established by EPA (as described in Rice et al. 2003 and Dourson et al. 2001), RSC = the relative source distribution to account for store bought marine fish and other sources,
and FI = fish intake. The FTC is affected by uncertainties in all these parameters, but RSC and especially BW do not appear to greatly impact the water quality objective, especially since the objective will be rounded to one digit (Tables H-2A and H-2B). Therefore, my comments here will focus on the two remaining parameters of the equation: the RfD and the FI estimate.

COMMENT EVW 1
As mentioned in Appendix H, the RfD was derived from a study of maternal-child dyads in Faroe Islands reporting on the adverse association between prenatal methylmercury exposure (as measured in cord blood) and child developmental outcomes (Grandjean et al. 1997). As noted elsewhere (e.g. Dourson et al. 2001; Grandjean et al. 2001; Weihe et al. 1996; Jacobson et al. 2015), the primary source of mercury exposure in this study population was through the traditional consumption of whale meat, not fish, and co-exposure to other contaminants such as polychlorinated bi-phenyls (PCBs) are of concern. It would be helpful if the staff report could discuss the generalizability of the findings from this study for the purpose of the proposed Sport Fish Water Quality Objective.

RESPONSE TO EVW 1
A paragraph on this topic has been added to the staff report in Section 4.7 (now the 4th paragraph):

“In the Faroe Islands, the primary source of mercury exposure in the study population was through the traditional consumption of whale meat, not fish, and co-exposure to other contaminants such as polychlorinated bi-phenyls (PCBs) are of concern. However, in California PCBs also a contaminate fish tissue at levels that limit advised consumption (Davis et al. 2010, Davis et al. 2012). One hypothesis as to why adverse effects of mercury were not found in the Seychelles, but adverse effects were found in the Faroe Islands is that there are other neuroprotective nutrients in seafood, such as selenium and iodine, long chain polyunsaturated fatty acids, (Oken 2012, Meyers 2009). Freshwater fish do not have these nutrients in the same amounts as marine fish (Haldimann et al. 2005, Steffens 1997), and many Californians are exposed to mercury by consuming freshwater fish. While many people in the Faroe Islands and the Seychelles ate fish several times a week, in the Faroe Islands most of the methylmercury exposure was from infrequent (twice a month) consumption of pilot whale meat (Dourson 2001). Recreational fishers in California may also have infrequent high methylmercury exposure from weekend fishing trips, along with a steady methylmercury exposure from regularly purchased commercial fish. There are other theories as to why the two studies found conflicting results, such as study design (Oken et al. 2008, Debes etal . 2006). Ultimately, mercury is a known neurotoxin and the Faroes Island study provides data to support a reference dose.”

COMMENT EVW 2
Furthermore, since the derivation of the US EPA’s RfD several additional studies have been published reporting on the association between prenatal methylmercury exposure and child development. There appears to be substantial uncertainty regarding the consequences of maternal consumption of fish with naturally-acquired MeHg contamination. For example, several studies in the Faroe Islands (Grandjean et al. 1997), New Zealand (Crump et al. 1998), United States (Sagiv et al. 2012) and Arctic Quebec (Jacobson et al. 2015) have reported adverse associations with cognition and behavior, but other studies in the Republic of Seychelles (van Wijngaarden et al. 2013; Strain et al. 2015), United States (Oken et al. 2016), the United Kingdom (Daniels et al. 2004), and Spain (Llop et al. 2012) have found no consistent evidence of
adverse consequences of prenatal methylmercury exposure from fish consumption on children’s development. It is likely that differences in study design, co-exposure to nutrients and contaminants, and genetic factors partially account for the inconsistencies in study findings which consequently may result in different RfD values (van Wijngaarden et al. 2006). RfDs vary by regulatory body and are often higher than US EPA’s value; for example, it is four times higher in Alaska (https://dec.alaska.gov/water/wqsar/wqs/pdfs/FishConsumption.pdf) and the provisional tolerable intake is two times greater in Canada (http://www.hc-sc.gc.ca/fn-an/pubs/mercur/merc_fish_poison- eng.php). Given the FTC equation, the water quality objective will increase or decrease as the RfD increases or decreases, respectively. While the lower US EPA RfD will result in a more protective FTC, the draft report could acknowledge the uncertainty and variability in determining the RfD and how this would influence the water quality objective.

RESPONSE TO EVW 2
The Staff Report does contain very brief paragraph (Section 4.7) on the conflicting evidence considered when U.S. EPA derived the reference dose—that while adverse effects were seen in the Faroe Islands, no effects were found in the Seychelles. The following sentence will be added to section 4.7: “While other studies in the Seychelles (van Wijngaarden et al. 2013; Strain et al. 2015), United States (Oken et al. 2016), the United Kingdom (Daniels et al. 2004), and Spain (Llop et al. 2012) have found no consistent evidence of adverse consequences of prenatal methylmercury exposure from fish consumption on children’s development.” The staff report also includes additional references that indicate adverse effects of mercury.

The references the reviewer provided on Canada and Alaska concern the development of fish consumption advisories, not water quality criteria. In the Alaska reference it states “The RfD was 2.5 times greater than EPA’s to account for health benefits of eating fish” (slide 8). The Alaska reference also correctly states that fish consumption advisories are not equivalent to water quality criteria, and that water quality criteria “do not account for health benefits of eating fish”. Therefore these references are not entirely relevant to the mercury Provisions, but to fish advisories. In California, fish consumption advisories are developed by another agency, the Office of Environmental Health Hazard Assessment, and the advisories are developed considering the beneficial effects of consuming fish (see Appendix E, Section 4).

COMMENT EVW 3
The RfD was derived based on data demonstrating adverse associations with prenatal methylmercury exposure. However, exposure occurs both prenatally and postnatally and throughout the life course. The health effects of postnatal methylmercury exposure are uncertain (Karagas et al. 2012), with no clear impact on cardiovascular disease and hypertension (e.g. Mozafarian et al. 2011, 2012), and limited evidence of adverse associations with neurodevelopment and cognition in children (e.g. Myers et al. 2009; Boucher et al. 2016) and older adults (e.g. Weil et al. 2005; Yokoo et al. 2003). Use of evidence pertaining to risks in pregnant women and women of childbearing age results in a lower RfD and thus a more protective water quality objective. The draft report does not appear to distinguish between prenatal exposure (from fish consumption during pregnancy) and postnatal exposure (in either children or adults), and chronic vs. developmental risk. The U.S. EPA 2000 guidance document distinguishes between chronic human health risks and developmental health risks when discussing the default parameters but the water quality objective draft report is not clear on this point. Therefore, it may be informative to discuss the demographics of fish consumers targeted in the objective types (i.e. sport fish, tribal subsistence, subsistence) and the proportion of the
target population that may be at the highest risk.

RESPONSE TO EVW 3
The text of the Staff Report was clarified as to how the reference dose was derived. In the section on “Methylmercury Effects on Human Health” (Section 4.7 of the Staff Report) after the sentence, “Toxicity to the developing nervous system of the fetus is considered the most critical endpoint” New text was added to clarify “The water quality objectives were derived from a U.S. EPA reference dose, which was based on protecting the developing fetus.” There was already mention in this same section of the Staff Report about possible effects on cardiovascular health. Nonetheless, U.S. EPA considers that the reference dose for the entire population, not only for women of child bearing age (U.S. EPA 2001, Rice 2003).

Additionally, another California agency, the Office of Environmental Health hazard Assessment is responsible for communicating to the public the risk of consuming mercury contaminated fish to the public and which segment of the population might be at the greatest risk of mercury toxicity.

COMMENT EVW 4
The San Francisco Bay Seafood Consumption study (hereafter called “SFEI 2000”) was considered to be one of the highest-quality studies of fish consumption in California done to date. This study provided the FI estimate of 32 grams per day which has already been used in various regulatory settings. The primary goal of the study was to collect quantitative data to characterize exposures to contaminants in fish and shellfish caught in the Bay among the general fishing population of San Francisco Bay. The study included on-site personal interviews of 1,331 participants (77% response rate which is adequate) who were fishing at piers, beaches and banks, or private or party boats. Interviews were conducted over a 12-month period (summer of 1998 – summer of 1999), and asked about four-week recall of fish consumption. The recruitment approach was reasonable given the lack of a comprehensive list of anglers and the need to conduct in-person interviews to increase participation and understanding of the questions. Fish consumption rates were adjusted for avidity (i.e. how frequently anglers go fishing) in an effort to reduce bias; avidity-adjusted rates are lower than unadjusted rates. The magnitude and direction of any other biases in the fish consumption rate would be unknown. The SFEI 2000 report includes a comprehensive discussion of the study’s strengths and limitations.

RESPONSE TO EVW 4
The reviewer’s agreement with the approach is noted.

COMMENT EVW 5
As discussed in Appendix G of the draft report, short-term recall such as a four-week period may result in a skewed distribution as shown in Table 5 of the SFEI 2000 report, with a mean of 6.3 grams per day but a median of 0 grams per day. The SFEI 2000 report considers the 12-month recall to be less reliable because longer recall periods are more difficult for respondents to answer accurately. The rate of 32 grams per day is the 95th percentile in Table 5 and represents the rate among all consumers of Bay fish. The 95th percentile of the per-angler consumption rate in Table 6 is lower (24 grams per day) and represents consumption among all survey respondents including anglers that do not eat fish. For the purpose of the water quality objective, utilizing the results from Table 5 results in a more stringent FTC as it assumes that all anglers will eat the fish caught. (As noted in the report, it is also more conservative than utilizing the EPA default consumption rate of 17.5 grams per day apparently based on the 90th percentile of the fish intake data obtained in a national survey.) In all, the study’s methods and design appear to
be scientifically sound.

**RESPONSE TO EVW 5**
The reviewer’s agreement with the approach is noted.

**COMMENT EVW 6**
Since the time of the SFEI 2000 report, health advisories regarding fish intake have been promulgated which may have affected fish consumption rates (e.g. Oken et al. 2003, Rehm et al. 2016). The impact of temporal trends in fish consumption, if any, on the water quality objective should be discussed, as should be the generalizability of the SFEI 2000 study to other angler communities in California.

**RESPONSE TO EVW 6**
Recent fish consumption studies will always be valuable, and the Water Boards are obligated to review water quality standards on a regular basis.

While public awareness of contaminants in fish and advisories may reduce fish consumption rates, the Water Boards are not mandated to revise water quality objectives to reflect artificially suppressed fish consumption rates. When agencies set environmental standards using a fish consumption rate based upon a suppressed consumption level, they may set in motion a downward spiral whereby the resulting standards permit further contamination of the fish. The mission of the Water Boards, set forth by the Porter-Cologne Water Quality Control Act, is to protect past, present, and probable future beneficial uses (in this instance the beneficial use is fish consumption). Therefore, if fish consumption rates are lower in the future, the Water Boards would need to carefully consider all information before altering the level of protection.

Rather than trying to estimate how representative the SFEI 2000 study may be, Appendix G provides data from other fish consumption studies from California for comparison to the SFEI study. Also Section 4.9 of the Staff Report summarizes these data, and Section 6.2 discusses why the data from the SFEI 2000 study was used as the fish intake parameter for California as opposed to another value.

**COMMENT EVW 7**
To compare methylmercury concentrations in fish tissue to the FTC, fish mercury samples are collected within a calendar year and subsequently combined into one value. The rationale for summarizing values over a longer period of time is that potential adverse consequences of methylmercury exposure are believed to be chronic in nature, and methylmercury exposure in fish are believed to not fluctuate strongly across seasons. Secondarily, combining multiple values into one result is a statistically more precise estimate of concentration. This rationale sounds reasonable, although it may be necessary to add more references to support the statements about the chronic nature of toxic effects and lack of seasonal fluctuations. If there is empirical fish tissue data available (even if the sample size is small) to provide additional support for the latter assumption, it would be good to present those.

**RESPONSE TO EVW 7**
Agree that more data would be helpful. However, the Water Boards do not have data that can be used to compare the mercury levels in fish in different seasons. The statewide monitoring program generally captures a group of about ten fish on one day and then the water body is not sampled again for several years. Also, the sample locations, fish sizes
and years all vary. For example, for Lake Berryessa, a water body with one of our largest
data sets, there is data available from only one sampling event in the summer and five
sampling events in winter, from the past 30 years. Data from one summer is hardly
representative of the seasons. In another example Clear Lake, the largest natural
freshwater lake in California, useful data are available from just three sampling events:
one for May, September and October in various years. There is additional older data, but,
should not be used to answer this question, since there is no accompanying data on the
length of the fish. The mercury levels in fish are related to the size of the fish, so size is a
confounding factor in determining if mercury levels vary by season. Overall, with the
small number of fish sampling events, it would be hard to attribute differences in fish
mercury levels to the season, when a number of factors could have been the cause.

Staff also consulted a California researcher to attempt to find such data in the peer
reviewed literature. That researcher didn’t know of such data, but stated that the
seasonal fluctuations of mercury concentrations in fish are unlikely to be statically
significant in larger sport fish. The Staff Report includes the references that were
originally found on the stability of mercury level in fish, in Section H.4.

The California Tribes Fish Use Study (Shilling et al. 2014) contains a sound data set to use to
establish a default water quality objective to protect tribes

COMMENT EVW 8
To derive the Tribal Subsistence Fishing Water Quality Objective, the draft report incorporates
the fish intake estimates reported in the California Tribes Fish Study report (Shilling et al. 2014)
into the FTC equation shown above. In this study, participants were recruited and interviewed
across California in tribal offices or at tribal or inter-tribal events from May, 2013 to June, 2014. A
strength of the study is its community-based participatory research (CBPR) approach, i.e., tribes
identified the need to collect tribe-specific information about fish use, and questionnaires and
field methods were developed in collaboration with tribes. Despite the CBPR approach, only 24 of
147 tribes (federally- and state-recognized except for one) participated in the project (16%). A
variety of reasons for non-participation were provided, but there was no in-depth discussion of
how this may have impacted the generalizability of the findings, both in terms of geographic
representativeness of the participating tribes (although figures were provided) and whether
factors related to tribal non-participation may be correlated with actual fish consumption. An
additional uncertainty about the generalizability of the data is that participants were recruited
using non-random sampling methods. While obtaining a random sample is difficult in
epidemiologic surveys, volunteers may be non-representative of the target populations (i.e.
participating tribes) which may result in biased fish intake estimates if factors that are related to
volunteering are also related to fish consumption. It is believed that incidentally a random sample
of each tribe was obtained, but no data were provided to support this statement. More discussion
of participation bias, at the tribal level as well as the individual level (e.g. some tribes are only
represented in the study by one participant), would provide a better understanding of any
uncertainty associated with the fish intake data. This appears to be potentially important because
Figures 2, 7 and 8, for example, show that the number of types of aquatic organisms and the
number of places as fish sources increase with an increasing number of participants interviewed.

RESPONSE TO EVW 8
Agree- Including more discussion on bias could improve the report. However, the Water
Boards are not the authors of that report. The Staff Report acknowledges that the study
only surveyed a portion of the tribes in California. This was repeated in the discussion on
the water quality objective for tribal subsistence and subsistence fishing, in Section 6.5. “The survey includes 40 California tribes, while there are more than 100 federally recognized tribes in California and many others (see Section 4.10).”

Discussion on the generalizability of the data to all tribes would be fairly speculative and difficult to determine. Discussion on the biases / uncertainties from the study has been added included in the Staff Report. See also Comment EVW 11.

COMMENT EVW 9
In addition to collecting information about traditional fish use, thirty-day recall of fish intake was collected for contemporary use which allows for direct comparison with estimates obtained in the other surveys used in the draft report for estimating the FTC. The coding of narrative responses is not described in detail in terms of both methodology (e.g. groupings established a priori?) and findings. As in previous studies, the 95th percentile was emphasized as a value that would protect most users. The 99th percentile was also reported though inherently this does not protect all users (only the maximum value would do so), which seems to be the intended use of this value. The mean use rate was not reported because this is not being used in regulatory policies; however, by presenting the mean and median, amongst others, a better understanding of the distribution of the data would have been achieved. Given the lack of information about this distribution, it would have been especially helpful to report the sample size (i.e. the number of respondents) upon which the data in Table 6 of the Shilling report are based, because those data (142 grams per day) are the basis for the tribal subsistence water quality objective and upper percentiles may be sensitive to small sample size.

RESPONSE TO EVW 9
Agree- Including the mean fish consumption rate would aid in understanding the distribution of the data better. However, the Water Boards are not the authors of that report.

The study author is correct that the 95th percentile is a value that would protect most users. When a 95th or a 99th percentile is used for population estimates, the goal is not literally to exclude 1 to 5 percent of the population. These estimates are often used because of the difficulty of accurately calculating a 100th percentile (a maximum value) from a limited subsample. Therefore, high end estimates are generally used (e.g. 95th, 99th percentiles) to protect the whole population.

Yes, sample size should have been reported in the tables with the 95th percentile (Table 6), but the sample size was reported earlier in the report. This information is also reported in the summary of fish consumption studies (Appendix G) included in the Staff Report.

COMMENT EVW 10
Though traditional fish consumption is not a primary variable, it would be helpful to clarify the frequencies reported (page 14 of Shilling et al. 2014) as it appears that there are missing categories (e.g. 2-3 times/month and 4-6 times/week).

RESPONSE TO EVW 10
Agree- However, the Water Boards are not the authors of that report.

COMMENT EVW 11
The research described in the Shilling report does a commendable job of addressing the study
goals. However, unlike the SFEI 2000 report, its discussion and conclusion section does not provide a comprehensive discussion of the extent to which the fish consumption estimates could have been influenced by various study limitations. The draft staff water quality objective report would benefit from including such a discussion to provide a sense of uncertainty in the fish intake estimate used.

RESPONSE TO EVW 11
Agree. This study provided information beyond our expectations and the authors are to be commended for that. New text was added to the end of Section 4.9 of the Staff Report (second to last paragraph) about this study to describe some of the uncertainties/biases. This new text follows the discussion on the uncertainty in estimates used for recreational fishing, and the difficulties in deriving a rate for subsistence fishers in general:

“To derive a numeric water quality objective for the Tribal Subsistence Fishing (T-SUB) beneficial use, however, the California Tribes Fish-Use study (Tribes Fish Use study) provides a significant summary of statewide fish consumption by California tribes (Shilling et al. 2014). While the Tribes Fish Use study includes data from 40 tribes throughout the state, the study cannot be assumed to represent every tribe, since there are many other tribes in California. There are 109 tribes that are recognized by the federal government and 72 more communities are petitioning for recognition (California Environmental Protection Agency 2009). This study was somewhat unique in that study participants were volunteers, which may result in biased fish intake estimates. One obvious source of bias could be that people who eat large amounts are more motivated to participate in the study. However, the study authors list reasons why some tribe members would not participate, including resistance to governmental intrusion, and knowledge of past failure of government to act to protect tribal interests (Shilling et al. 2014). These may be more significant for a person for whom fish use is very important (and frequently eats fish), resulting in underrepresentation of those who eat large amounts of fish. The effects of various sources of bias are complex and difficult to predict. Nevertheless, the rate of 142 g/day for contemporary fish consumption for California tribes found by Shilling matches the US. EPA recommended subsistence rate of 142 g/day (U.S. EPA 2002).

COMMENT EVW 12
As discussed above (see 1.), use of a calendar year averaging period seems reasonable but could be better supported with additional references and/or data if available.

RESPONSE TO EVW 12
See response to Comment EVW 7.

The consumption rate of 4 to 5 meals per week (142 grams per day) is a sound basis from which to derive a subsistence fishing water quality objective that would be applied to the highest trophic level fish.

COMMENT EVW 13
To derive the Subsistence Fishing Water Quality Objective, the draft report incorporates the fish intake value of 142 grams per day as recommended by U.S. EPA (2000); it appears that this value is based on analysis of the 1994-1996 Continuing Survey of Food Intakes by Individuals (CSFII) and uses the 99th percentile of freshwater/estuarine uncooked fish consumption. When the 1998 CSFII data are included, the value 99th percentile value is similar at 143 grams per day
(see U.S. EPA 2002, page 5-6). The CSFII was an annual survey conducted by the United States Department of Agriculture obtained survey estimates of food consumption from nationally-representative samples of non-institutionalized U.S. individuals, using an approach to sampling design and use of survey weights that is similar to other federal government surveys (e.g. National Health and Nutrition Examination Survey). CSFII response rates varied from 75.9% in 1996 to 81.7% in 1998 which are acceptable, and non-response was accounted for in survey weights. Average daily fish consumption data were collected for two non-consecutive 24-hr days, which is a different scale than the 30-day period used in the studies discussed above and may have resulted in lower precision of the estimated daily average consumption. However, the CSFII survey methodology appears to be scientifically sound and should have resulted in reasonable estimates of fish intake at the time the surveys were conducted (also emphasized on the USDA website: https://www.ars.usda.gov/northeast-area/beltsville-md/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/past-surveys/). It should be noted that subsequent trends in fish consumption rates in response to health advisories regarding fish intake (e.g. Oken et al. 2003, Rehm et al. 2016) may have impacted the extent to which the CSFII fish consumption estimates are representative of current fish intake in the general adult population and subsistence anglers.

RESPONSE TO EVW 13
See response to Comment EVW 6.

COMMENT EVW 14
Because it is difficult to define and identify subsistence fishing population, the 99 percentile of uncooked freshwater fish consumption estimate in the CSFII survey was used as a somewhat arbitrary cut point (the 95th percentile is 50 grams per day). This percentile is different from U.S. EPA’s recommendation to use the CSFII 90th percentile for general adult population and sport fishers, from the 95th percentile in SFEI 2000 report for sport anglers, and from the 95th percentile of the SFEI 2014 study for tribal subsistence fishers. Nevertheless, the value of 142 grams per day used for the subsistence fishing water quality objective is the same as that derived for Tribal Subsistence Fishing in Schilling et al. 2014 (see above) which gives confidence that this is a reasonable estimate to use for human health protection of subsistence fishing populations and it provides consistency across beneficial use types.

RESPONSE TO EVW 14
The reviewer’s agreement with the approach is noted, as well as the reviewer’s concerns on the difficulty of defining and identifying subsistence fishing populations. This requirement has been modified in manner that matches some of the reviewer’s (and other reviewers’) concerns. A different approach is now recommended to better address the variability and uncertainty in establishing one subsistence fish consumption rate. In Section 6.5 of the Staff Report, Option 6 is now recommended, which is the narrative water quality objective. Previously, a numeric water quality objective was recommended. A narrative water quality objective has the advantage of allowing permit specific implementation. A site-specific fish consumption rate could be used to implement the water quality objective or the provided default fish consumption rate (142 g/ day) could be used to implement the water quality objective. See also Comment MWB 17 for other advantages, and MBS 8.

COMMENT EVW 15
As stated above, use of a calendar year averaging period appears reasonable but could be better supported with references and/or data if available.
RESPONSE TO EVW 15
See response to Comment EVW 7.