Appendix F

Methodology Used for Calculating
“Blended” Fish Concentrations

Human Health

Primary Study Area (Reaches 5 and 6)

In the HHRA, the exposure point concentrations (EPCs) were derived considering the data for brown bullhead, largemouth bass, sunfish, and yellow perch, skinned and trimmed fillet. Only largemouth bass ≥12 inches [30.45 cm] were considered in the EPC calculations.

In the MDPH survey, respondents indicated an approximately equal preference for bass/bullhead and perch/sunfish. Therefore, the concentration data for these two data groups (*i.e.*, bass/bullhead and perch/sunfish) were given equal weight to calculate EPCs in the PSA for the HHRA, as follows:

$$Blended_{human} = (0.5 \times BassBullhead) + (0.5 \times SunfishPerch)$$

To apply the FCM model output to the above equation, the following assumptions were required:

- Surrogate species for perch – Perch are not directly modeled in FCM; therefore a surrogate species was required. During calibration and validation, FCM simulations have indicated an approximate equivalence between yellow perch concentrations and largemouth bass concentrations; therefore FCM estimates of largemouth bass were substituted for perch;

- Age of largemouth bass – Age versus length assessment of site-specific largemouth bass data suggests that Age 9+ bass are an appropriate age class for fish greater than 12 inches in length. Field samples indicate that largemouth bass exceed an average of 12 inches length for all age classes between Age 5+ and 14+, with approximately equal representation across all age classes. The largest age class simulated in the model (9+) was therefore considered a reasonable estimate of the average for all fish above 12 inches length.

- Age of brown bullhead – Brown bullheads are medium-sized catfishes that usually reach about 8 to 14 inches (20 to 36 cm) in length, with a maximum age of 6 to 8 years. Based on site-specific data from the Housatonic River (most specimens aged at 3+ to 6+ years), the typical age of a harvested adult brown bullhead was estimated to be 5+ years.

- Proportion of "Sunfish/Perch" consisting of sunfish species – Although these species were combined in the HHRA statistical analyses of field samples, the

consumption survey data used to develop relative weighting of species consumed for the Massachusetts reaches (Table 4-4 of the HHRA) indicates that perch and bass were strongly preferred over sunfish. Fewer than 2% of the respondents preferred sunfish to other resident species. Therefore, for the purposes of FCM modeling, the sunfish contribution was set to zero, and this group was therefore assigned 100% largemouth bass (used as surrogate for perch).

- Proportion of "Bass/Bullhead" consisting of bass – In the Exposure Prevalence phase of the HHRA, approximately half the respondents in the "all respondents" group and in the group who had consumed fish from the Housatonic River expressed a preference for predators (perch and bass), whereas approximately 15% of the respondents considered bullhead to be one of their top three fish preferences. However, the preferences were somewhat different for the respondents in the volunteer phase of the survey, with notably fewer individuals preferring bass and more preferring bullhead. Based on the joint consideration of these studies, this fish subgroup was assigned 50% bass and 50% bullhead.

Integrating the above information, the FCM comparisons to IMPGs were calculated using the following equation:

$$EPC = (0.25 \times Age\ 9\ Bass) + (0.25 \times Age\ 5\ Bullhead) + (0.5 \times Age\ 9\ Bass)$$

Which simplifies to:

$$Blended_{human} = (0.75 \times Age\ 9\ Bass) + (0.25 \times Age\ 5\ Bullhead)$$

Rising Pond

In the HHRA, the exposure point concentrations (EPCs) were derived considering Reach 8 brown bullhead, largemouth bass, pumpkinseed (sunfish), and yellow perch, skinned and trimmed fillet. Only largemouth bass ≥12 inches [30.45 cm] were considered in the EPC calculations.

In the HHRA, the combined fish exposure point concentration was calculated by summing one-half of the brown bullhead/largemouth bass/pumpkinseed EPC and one-half the yellow perch EPC.

$$Blended = (0.5 \times BassBullheadPumpkinseed) + (0.5 \times Perch)$$

As noted in the discussion for the PSA, in the MDPH survey, respondents indicated a similar preference for bass/bullhead and perch/sunfish. In the HHRA, the concentration data for these two data groups (*i.e.*, bass/bullhead/sunfish and perch), were given equal weight to calculate EPCs.

In applying the FCM model:

- Because sunfish comprise a small portion of the species preference (0 to 3%), the pumpkinseed contribution was omitted. Therefore, the bass/bullhead/sunfish group was parameterized using an assumption of 50% largemouth bass and 50% adult bullhead;

- As with the PSA, largemouth bass was used as a surrogate for perch;

- Age assumptions were the same as for the PSA;

- The consumption model is appropriate for Rising Pond, but may require customization for faster-flowing reaches of the downstream area due to the presence of trout in these reaches.

Integrating the above information, the FCM comparisons to IMPGs in Rising Pond were calculated using the following equation (same as PSA):

$$Blended_{human} = (0.75 \times Age\ 9\ Bass) + (0.25 \times Age\ 5\ Bullhead)$$