

Attachment B

Methodology for Determining IMPG Attainment for Insectivorous Birds and Piscivorous Mammals for SED/FP Combinations under the Alternate Ecological Evaluation

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B.1 Introduction

As described in Section 2.3 of the foregoing *Evaluation of Remedial Alternatives Using Sound Ecological Assumptions* (referred to herein as the Alternate Ecological Evaluation) and in Section 4.2.3.5 of the Revised CMS Report, the procedure for evaluating Interim Media Protection Goals (IMPGs) for two groups of animals – insectivorous birds (represented by wood duck) and piscivorous mammals (represented by mink) – is complicated by the fact that these animals consume a mix of aquatic and terrestrial prey sources, which causes their IMPGs to be expressed in terms of prey concentrations that are tied to both sediment and floodplain soil PCB concentrations. In the Revised CMS Report, the procedure for evaluating IMPG attainment for these receptors (as described in Section 4.2.3.5 of that report) for a given combination of sediment and floodplain alternatives involved the following steps: (1) determination of the sediment PCB concentration predicted by the EPA model at the end of the projection period for the sediment component of the combination in the relevant averaging area(s); (2) for each such area and sediment concentration, calculation of an associated target floodplain soil level that would allow attainment of the relevant IMPG using the methods described in Appendices D (wood duck) and E (mink) to the Revised CMS Report; and (3) comparison of the post-remediation floodplain soil concentration achieved by the combination in that averaging area to the target floodplain soil concentration calculated for that area.

For purposes of assessing IMPG attainment for these groups of animals in the Alternate Ecological Evaluation, these same procedures were used, except that certain modifications were made to reflect the alternate IMPG values and averaging areas discussed in the text of the Alternate Ecological Evaluation. These modifications are described in this Attachment, along with the results, which include the model-predicted sediment levels and the calculated associated target floodplain soil levels for insectivorous birds and piscivorous mammals under each of the alternative combinations evaluated in the Alternate Ecological Evaluation (i.e., SED 2/FP 1, SED 3/FP 3, and SED 10/FP 9).

B.2 Calculation of Floodplain Target Levels for Insectivorous Birds

B.2.1 Methodology

For purposes of the Alternate Ecological Evaluation, the procedure used in the Revised CMS Report for evaluating attainment of the insectivorous bird IMPGs (described in Appendix D to the latter report) was modified as follows:

- As discussed in Section 2.3 of the Alternate Ecological Evaluation, the IMPGs used for PCB concentrations in prey items consisted of a lower-bound value of 6.1 mg/kg, a midpoint value of 37 mg/kg, and an upper-bound value of 68 mg/kg.
- As discussed in Section 2.4 of the Alternate Ecological Evaluation, the calculations were performed for the entire PSA as a single averaging area (rather than the various smaller areas evaluated in the Revised CMS Report). Use of the entire PSA as a single averaging area affected the calculation of target floodplain soil levels in two ways. First, model-predicted sediment concentrations were calculated as a spatial average over the entire PSA. Second, certain input values used in the equations to calculate target floodplain soil levels (e.g., see Equation 7 in Appendix D of the Revised CMS Report) were specified as PSA-wide averages rather than the reach-specific values used in the Revised CMS Report (see also Table D-1 of the Revised CMS Report). These inputs included the total organic carbon (TOC) content of the sediments and biota-sediment accumulation factors (BSAFs). The PSA-wide averages for these parameters were calculated using the same data and procedures used to develop the reach-specific values, as described in Appendix D of the Revised CMS Report. The resulting area-weighted average sediment TOC content for the PSA is 6.9%. For the BSAFs, EPA's model was used to generate BSAFs applicable to the entire PSA.¹ The resulting PSA-wide average BSAFs were 0.452 for water column invertebrates and 1.047 for epibenthic invertebrates.

All other input values, equations, and assumptions were the same as those described in Appendix D to the Revised CMS Report.

B.2.2 Results

The model-predicted sediment levels and the associated target floodplain soil levels for insectivorous birds calculated based on the above procedure are provided below in Table B-1 for each of the combinations of sediment and floodplain alternatives evaluated herein (SED 2/FP 1, SED 3/FP 3, and SED 10/FP 9).

Table B-1. Target Floodplain Soil Levels for Alternate Insectivorous Bird IMPG Assessment

¹ Average PSA-wide invertebrate BSAFs were computed by dividing area-weighted average tissue concentrations predicted by EPA's model by the area-weighted average sediment concentrations (also from EPA's model) on a daily time step. The overall average BSAFs were computed over the 26-year simulation based on April - July values (i.e., the same method as described in Appendix D of the Revised CMS Report).

Model-Predicted Sediment Endpoint PCB Concentrations (mg/kg) ¹			IMPG (PCB Concentration in Prey Items)	Calculated Target Floodplain Soil Levels (mg/kg)		
SED 2/ FP 1	SED 3/ FP 3	SED 10/ FP 9		SED 2/ FP 1	SED 3/ FP 3	SED 10/ FP 9
15	5.1	11	Lower Bound: 6.1 mg/kg	49	67	57
			Midpoint: 37 mg/kg	436	454	443
			Upper Bound: 68 mg/kg	824	841	831

¹ Model-predicted 0-6" sediment concentration, area-weighted average over the PSA.

To evaluate achievement of the alternate insectivorous bird IMPGs, the target floodplain soil levels shown in Table B-1 for each of these combinations were compared against the average floodplain levels achieved by that combination in the overall PSA, as discussed in Section 3.1.2 of the Alternate Ecological Evaluation.

B.3 Calculation of Floodplain Target Levels for Piscivorous Mammals

B.3.1 Methodology

The procedure used in the Revised CMS Report for evaluating attainment of the piscivorous mammal IMPGs (described in Appendix E to that report) was likewise modified in certain respects. First, as discussed in Section 2.3 of the Alternate Ecological Evaluation, the IMPG assessment was based on an IMPG of 3.7 mg/kg PCBs in mink prey items. Second, the averaging area used for assessing IMPGs consisted of the entire PSA, as discussed in Section 2.4 of the Alternate Ecological Evaluation. As a result, model-predicted sediment concentrations were calculated as a spatial average over the entire PSA, and several of the reach-specific input parameters used in the calculation of floodplain soil target levels (see Equation 16 and Table E-1 in Appendix E of the Revised CMS Report) were modified to represent average values over the entire PSA. These parameters were bioaccumulation factors (BAFs) and BSAFs for prey items, lipid contents of prey items, and the organic carbon fraction in sediment. The PSA-wide averages for these parameters were calculated using the same data sets, procedures, and assumptions used to develop the reach-specific values (see Table E-1 in Appendix E to the Revised CMS Report). The resulting PSA-wide values are shown below in Table B-2.

Table B-2. PSA-Wide Average Input Parameters used in Alternate Calculation of Target Floodplain Soil Levels for Piscivorous Mammal IMPG Assessment.

Parameter	Description	Values used in Revised CMS Report		PSA-wide Average Value used in Alternate Ecological Evaluation
		Reaches 5A/5B	Reaches 5C/5D/6	
BSAF _i	Invertebrate BSAF	0.56	1.23	0.79
BSAF _f	Fish BSAF	1.32	1.33	1.33
BSAF _a	Amphibian and reptile BSAF	0.55	2.36	1.32

BSAF _{ab}	Aquatic bird BSAF	1.72	0.318	0.574
BAF _{tb}	Terrestrial bird BAF	2.43	1.13	2.13
BAF _{tm}	Terrestrial mammal BAF	0.339	0.918	0.440
BAF _{ab}	Aquatic bird BAF	0.348	0.208	0.300
LIPID _i	Invertebrate lipid fraction	0.011	0.009	0.010
LIPID _f	Fish lipid fraction	0.030	0.030	0.030
LIPID _a	Amphibian and reptile lipid fraction	0.017	0.011	0.013
LIPID _{ab}	Aquatic bird lipid fraction	0.017	0.062	0.044
FOC _{sed}	Sediment organic carbon fraction	0.025	0.089	0.069

In addition to using these PSA-wide averages, the calculation of target floodplain soil levels took into account the portion of the mink's foraging range that is outside of the defined floodplain in the PSA – i.e., the 1 mg/kg PCB isopleth. To do so, GE used a “foraging area” that better represents the foraging range of mink that use the PSA. As discussed in Section 2.3 of the Alternate Ecological Evaluation, mink have home ranges in riverine habitats that extend laterally about 200 meters from the shoreline and also include tributaries as well as the main stem of the River. Thus, the foraging area used herein, shown on Figure B-1, includes a corridor that extends 200 meters from the shoreline on both sides of the River in the PSA (which goes beyond the 1 mg/kg PCB isopleth in many areas) and also includes such corridors along a number of tributaries to the River, extending a distance of 0.75 km up each tributary from its mouth – excluding from these corridors areas delineated as unsuitable mink habitat. This area covers approximately 2,100 acres, of which the portion within the 1 mg/kg isopleth covers 726 acres, or 35% of the total area. As such, the equation used to calculate the target floodplain soil levels that would result in achievement of the alternate piscivorous mammal IMPG (i.e., Equation 16 in Appendix E of the Revised CMS Report) was divided by a factor of 0.35 for the Alternate Ecological Evaluation to account for the proportion of mink diet that would come from areas outside the 1 mg/kg PCB isopleth (and therefore assumed to have no detectable PCBs).

All other inputs and assumptions used in the calculation of target floodplain soil levels for piscivorous mammals were the same as those described in Appendix E of the Revised CMS Report.

B.3.2 Results

Using the modifications described above with the approach described in Appendix E of the Revised CMS Report, target floodplain soil PCB concentrations associated with achieving the alternate mink IMPG value of 3.7 mg/kg were computed for each of the combinations of sediment and floodplain alternatives evaluated herein (SED 2/FP 1, SED 3/FP 3, and SED 10/FP 9). The model-predicted sediment levels within the PSA averaging area and the associated target floodplain soil levels calculated based on the above procedure are provided below in Table B-3 for these combinations.

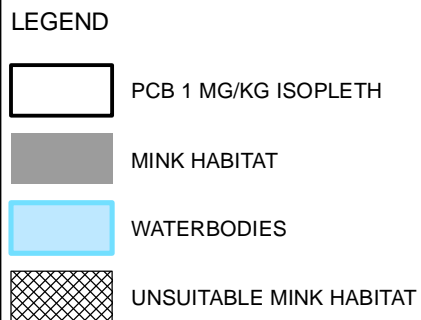
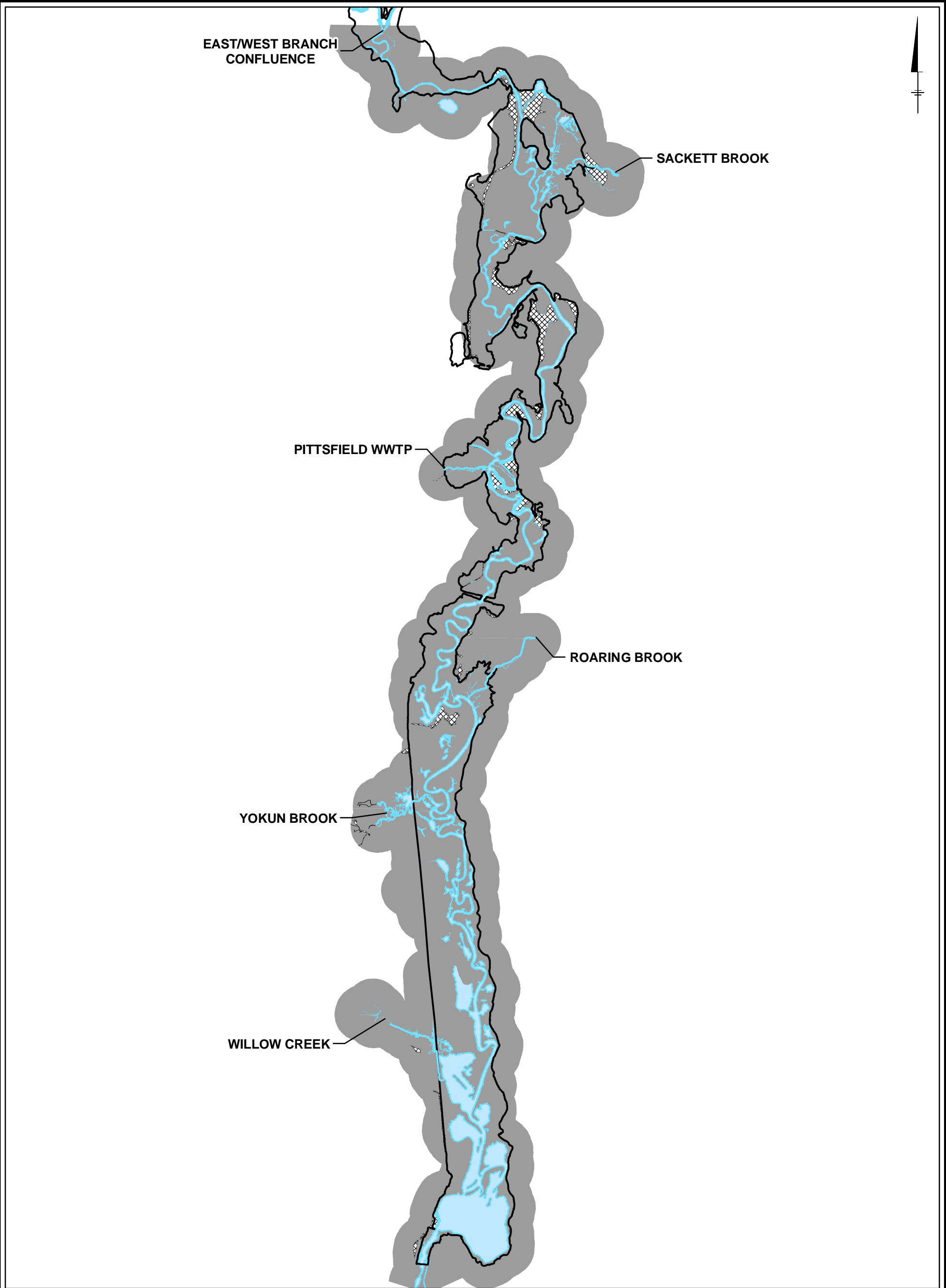
Table B-3. Calculated Target Floodplain Soil Levels for Alternate Piscivorous Mammal IMPG Assessment.

Model-Predicted Sediment Endpoint PCB Concentrations (mg/kg) ¹			IMPG (PCB Concentration in Prey Items)	Calculated Target Floodplain Soil Levels (mg/kg)		
SED 2/FP 1	SED 3/FP 3	SED 10/FP 9		SED 2/FP 1	SED 3/FP 3	SED 10/FP 9
15	5.1	11	3.7 mg/kg	n/a ²	66	27

¹ Model-predicted 0-6" sediment concentration, area-weighted average over the PSA.

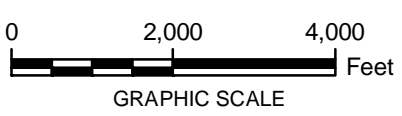
² n/a indicates that attainment of the IMPG is not possible because, at the given sediment concentration, PCB levels in aquatic prey alone would exceed the IMPG, regardless of the floodplain concentration.

To evaluate achievement of the alternate piscivorous mammal IMPG, as discussed in Section 3.1.2 of the Alternate Ecological Evaluation, the target floodplain soil level shown in Table B-3 for SED 3/FP 3 and SED 10/FP 9 was compared against the average floodplain level achieved in the PSA by each of those combinations. As shown in Table B-3, under SED 2/FP 1, no floodplain level would achieve the IMPG for piscivorous mammals, since that IMPG would be exceeded based on the predicted sediment concentration alone.



NOTES:

1. MINK HABITAT (GRAY) IS DEFINED AS SUITABLE HABITAT WITHIN A 200-M DISTANCE OF ALL WATERBODIES INCLUDING THE RIVER MAINSTEM, BACKWATERS, PONDS, AND TRIBUTARIES (EXTENDING APPROXIMATELY 0.75 KM FROM THE MAINSTEM).
2. TRIBUTARIES ARE LABELED



HOUSATONIC RIVER - REST OF RIVER

LOCATION OF MINK HABITAT AND 1 MG/KG PCB ISOPLETH




FIGURE
B-1