7. Analysis of Remedial Alternatives for Floodplain Soils

This section provides detailed descriptions of each of the nine alternatives for addressing floodplain soils in the Rest of River area and includes a detailed evaluation of each using the nine Permit criteria described in Section 2.

As discussed in Sections 1.7 and 4.1, these alternatives (apart from FP 1, the no action alternative) are of three types: (1) IMPG-based alternatives (FP 2, FP 3, FP 4, FP 7, and FP 9, which involve soil removal and backfilling as necessary to achieve different sets of IMPGs; (2) threshold-based alternatives (FP 5 and FP 6), based on removing all soils having PCB concentrations exceeding certain thresholds; and (3) EPA's requested alternative (FP 8), which involves a combination of the first two types, including removal and backfill of soil as necessary to achieve certain PCB IMPGs and the removal of any additional soils having PCB concentrations above a certain concentration threshold. The nine floodplain soil remedial alternatives are as follows:[326]

- FP 1 – No action.
- FP 2 – Removal and backfill of soil to achieve the upper-bound human health-based IMPGs in all human-use averaging areas.
- FP 3 – Removal and backfill of soil to achieve the mid-range human health-based IMPGs in certain frequently used areas and agricultural areas, the upper-bound human health-based IMPGs in the remaining human-use averaging areas, and upper-bound IMPGs for ecological receptors.
- FP 4 – Removal and backfill of soil to achieve the mid-range human health-based IMPGs in all human-use averaging areas, as well as upper-bound IMPGs for ecological receptors.

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[326] In the descriptions of these alternatives in this report, as previously noted, the following conventions are used:

- For the human health-based IMPGs, the upper bounds of the ranges refer to the RME IMPGs based on a 10^{-4} cancer risk or non-cancer HI of 1, whichever is lower; the mid-range values refer to the RME IMPGs based on a 10^{-5} cancer risk or non-cancer HI of 1, whichever is lower; and the lower bounds of the ranges refer to the RME IMPGs based on a 10^{-6} cancer risk, except that, for human direct contact, they are no lower than 2 mg/kg, the CD standard for residential use.
- The target floodplain soil concentrations that have been derived to achieve certain tissue-based IMPGs (as described in Section 2.2.2.3) are included within the term "IMPGs" when used generally, and are sometimes referred to as "floodplain soil IMPGs."

- FP 5 – Removal of all floodplain soils within the specified depth(s) that contain PCB concentrations at or above 50 mg/kg, with backfill of the excavations.

- FP 6 – Removal of all floodplain soils within the specified depth(s) that contain PCB concentrations at or above 25 mg/kg, with backfill of the excavations.

- FP 7 – Removal and backfill of soil to achieve the lower-bound human health-based IMPGs in all human-use averaging areas (but no lower than 2 mg/kg for direct human contact, which is the CD standard for residential use), as well as the lower-bound IMPGs for ecological receptors.

- FP 8 – Removal and backfill of soil to achieve the mid-range human health-based IMPGs in all human-use averaging areas, as well as the lower-bound IMPG for amphibians in vernal pools, and removal of any additional soils within the top foot that contain PCB concentrations at or above 50 mg/kg.

- FP 9 - Removal and backfill of soil to achieve the human upper-bound health-based IMPGs in all human-use averaging areas (including Heavily Used Subareas).

As also noted previously, each of these alternatives is aimed at achieving the specified target levels in the top foot of soil. In addition, FP 3 through FP 7 and FP 9 designed to achieve those levels in the top three feet of soil in the "Heavily Used Subareas" of Frequent-Use Areas (as defined in Section 4.2.1), while FP 8 is designed to achieve the specified IMPG levels in the top three feet of soil in those Heavily Use Subareas but does not include removal of soil with PCB concentrations ≥ 50 mg/kg at depths between 1 and 3 feet in those subareas. Also included in each alternative (except the no action alternative) are associated interim soil handling, the assumed implementation of restoration methods (as described in Section 5.3), and OMM activities, as well as use of EREs and Conditional Solutions where appropriate (as discussed in Section 4.6). This analysis of floodplain alternatives does not address the treatment or disposition of removed soils, which is addressed separately in Section 9.

Each alternative was evaluated in detail based on the nine Permit criteria. The results of these detailed evaluations are presented in Sections 7.1 through 7.9, respectively, for each of the nine floodplain alternatives. These evaluations are supported by the maps and tables described in Section 4.4.4.

For the purposes of the evaluations in this section, it has been assumed that the floodplain remedial alternatives would be conducted independently from the sediment remedial alternatives, rather than conducting remediation of sediment and floodplain areas

simultaneously. However, it would be more effective and efficient to implement floodplain remediation in conjunction with sediment remediation. For example, the construction of access roads and establishment of staging areas would be less disruptive if the floodplain soil removal were implemented in coordination with sediment remediation. Since any selected remedy for the Rest of River will involve both a sediment remediation component and a floodplain remediation component, this Revised CMS Report presents comparative evaluations for selected combinations of sediment and floodplain alternatives (listed in Section 1.8), rather than providing separate comparative analyses for the sediment and floodplain alternatives (as in the original CMS Report). Those comparative evaluations are presented in Section 8.

7.1 Evaluation of Floodplain Alternative 1

7.1.1 Description of Alternative

The no action alternative (FP 1) is included in the evaluation of floodplain alternatives as a baseline, consistent with the NCP (40 CFR 300.430(e)(6)). FP 1 would involve no removal of floodplain soil from the Rest of River area. Additionally, monitoring would not be conducted under FP 1.

7.1.2 Overall Protection of Human Health and the Environment - Introduction

The first General Standard in the Permit, "Overall Protection of Human Health and the Environment," requires an evaluation of whether a remedial alternative "would provide human health and environmental protection, taking into account EPA's Human Health and Ecological Risk Assessments." As discussed in Section 2.1.1, application of this standard to a particular floodplain soil remedial alternative relies heavily on the consideration of several other Permit criteria – notably: (a) a comparison of the floodplain soil PCB concentrations that would result from implementation of the alternative to the human health and ecological IMPGs based on EPA's HHRA and ERA; (b) compliance with ARARs; (c) long-term effectiveness and permanence, including long-term adverse impacts on health or the environment; and (d) short-term effectiveness. For FP 1, these evaluations have been based on existing floodplain soil levels, which are assumed to remain unchanged under this alternative. The overall evaluation of whether FP 1 would be protective of human health and the environment is presented at the end of Section 7.1 so that it can take into account the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.1.3 Control of Sources of Releases

The floodplain is predominantly depositional in nature and thus floodplain soils are not considered a significant source of PCBs to the River. The floodplain is generally flat and well vegetated (i.e., the root mat and vegetation serve to stabilize and cover the soil). During high flow events when the floodplain is inundated with water, these conditions greatly reduce the potential for PCBs in the floodplain soil to scour and be transported to the River. The conceptual site models presented in the RFI Report (BBL and QEA, 2003, Section 8) and EPA's FMDR (EPA, 2006b, Section 1.3) both acknowledge that the floodplain is a depositional environment and thus not a significant source of PCBs to the River. For example, EPA states in the FMDR that while "it is possible that some of the material deposited in the floodplain could be remobilized during subsequent flood or runoff events, the extent and significance of remobilization from the floodplain is expected to be small, particularly in comparison to bed sediment or bank erosion." Furthermore, EPA's model mass balance indicates that the annual PCB flux due to erosion of floodplain soil is less than 0.2% of the PCB deposition flux within the floodplain (EPA, 2006b, Figures 2 and 4 of the Errata). FP 1 would not change that current situation.

7.1.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 1 are listed in Tables F-1.a through F-1.c in Appendix C. No chemical-specific ARARs were identified for FP 1, although several guidances to be considered are listed in Table F-1.a. Further, since FP 1 would not involve any remedial actions, there are no location-specific or action-specific ARARs for this alternative.

7.1.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness of an alternative has included evaluation of the magnitude of residual risk associated with implementation of the alternative, the adequacy and reliability of the alternative, and any potential long-term adverse impacts associated with the alternative on human health or the environment. Each of these considerations is evaluated below for FP 1.

7.1.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk includes consideration of the length of time and extent to which the alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure.

Since FP 1 would not involve remediation, PCB concentrations in the floodplain soils would remain similar to current concentrations (shown in the tables discussed in Section 7.1.6 below), and any residual risk would remain largely the same as it is today.[327] However, there could be some decrease in surface soil concentrations over time as relatively "cleaner" sediments are deposited in the floodplain during flood events (e.g., as a result of upstream remediation/source control or implementing an in-river sediment remedy).

7.1.5.2 Adequacy and Reliability of Alternative

The no action alternative has been adopted for use at other sites in areas where cleanup goals are already met. For example, no action was a remedy component for floodplain areas adjacent to the Upper ½-Mile and 1½-Mile Reaches of the River where PCB concentrations were below the applicable soil-related performance standards. Since this alternative would not involve any remedial activities, considerations relating to the adequacy and reliability of specific remedial technologies are not applicable.

7.1.5.3 Potential Long-Term Adverse Impacts on Human Health or the Environment

Since FP 1 would not involve any construction or excavation activities, it would not cause any long-term adverse impacts.

7.1.6 Attainment of IMPGs

This section describes the extent to which FP 1 would meet the IMPGs for human health and ecological protection. Since this alternative involves no remediation, current floodplain soil PCB levels are assumed to remain largely unchanged. Current floodplain soil PCB EPCs for the pertinent human and ecological averaging areas are shown in Tables 7-1 through 7-6, along with a comparison to the applicable IMPGs.

7.1.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, as shown in Table 7-1, current floodplain soil PCB levels in the top foot achieve the RME IMPGs associated with a 10^{-4} cancer risk in all 120 direct contact EAs and achieve the RME IMPGs associated with the non-cancer impacts in 96 of those areas. In addition, these levels achieve the RME IMPGs associated with a 10^{-5} cancer risk in 66 of the EAs. For the Heavily Used Subareas, average floodplain soil PCB levels in the top 3 feet achieve the RME IMPGs associated with a 10^{-4} cancer risk in 11 of the 12

[327] As discussed in Section 1.2, GE does not agree that current floodplain PCB concentrations present a risk to human health or the environment.

subareas and the non-cancer IMPGs in 7 of those subareas. They also achieve the RME IMPGs associated with a 10^{-5} cancer risk in 5 of the 12 subareas.[328]

For agricultural products consumption, as shown in Table 7-2, current floodplain soil PCB levels achieve the RME IMPGs associated with a 10^{-5} cancer risk and non-cancer impacts in all farm areas.[329]

7.1.6.2 Comparison to Ecological IMPGs

Comparison of the EPCs in the ecological averaging areas to the relevant floodplain IMPGs for ecological receptors (amphibians, omnivorous/carnivorous mammals, insectivorous birds, and piscivorous mammals) shows the following:

- For amphibians, existing floodplain soil concentrations are below the upper-bound IMPG (5.6 mg/kg) in 7 of the 66 vernal pools in the PSA; they are also below the lower-bound IMPG (3.27 mg/kg) in 5 of those 7 pools (Table 7-3).

- For omnivorous/carnivorous mammals, existing floodplain soil concentrations are below the upper-bound IMPG (34.3 mg/kg) in 6 of the 7 averaging areas; they are also below the lower-bound IMPG (21.1 mg/kg) in 4 of those 6 areas (Table 7-4).

- For insectivorous birds (for which the target floodplain soil IMPGs vary depending on the associated sediment concentrations), existing floodplain soil concentrations would meet the floodplain soil IMPGs in 11 of the 12 averaging areas in the PSA if the associated sediment concentration in those areas were 3 mg/kg or less, and in 8 of the 12 averaging areas if the associated sediment concentration were 5 mg/kg (Table 7-5).

- For piscivorous mammals (for which the target floodplain soil IMPGs also vary depending on the associated sediment concentrations), existing floodplain soil concentrations would exceed the upper- and lower-bound floodplain soil IMPGs in both averaging areas at any of the three sediment target levels evaluated (1, 3, or 5 mg/kg),

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[328] Current floodplain PCB levels are below the RME IMPGs based on a 10^{-6} cancer risk in 7 EAs and one Heavily Used Subarea. With respect to the CTE IMPGs, current PCB levels achieve the CTE IMPGs associated with a 10^{-5} cancer risk in all EAs and those based on non-cancer impacts in all but one EA, and they achieve the CTE IMPGs associated with a 10^{-6} cancer risk in more than 85% of these areas. Further, current PCB levels in the Heavily Used Subareas (top 3 feet) achieve the CTE IMPGs based on a 10^{-4} cancer risk in all subareas, those based on a 10^{-5} cancer risk in 11 of the 12 subareas, and those based on a 10^{-6} cancer risk and non-cancer impacts in 8 of those subareas.

[329] These levels achieve the RME IMPGs based on a 10^{-6} cancer risk in 5 of the 14 farm areas.

except that they would achieve the upper-bound soil IMPG level in one (Reach 5C/5D/6) of the two averaging areas at the 1 mg/kg sediment target level (Table 7-6).[330]

7.1.7 Reduction of Toxicity, Mobility, or Volume

FP 1 would not result in any active reduction of toxicity, mobility, or volume of PCBs in the near term, as no remedial activities would be performed under this alternative. Any reduction would occur in the long term through naturally occurring processes.

7.1.8 Short-Term Effectiveness

Short-term effectiveness considers short-term impacts on the environment, local communities, and the workers during remedy implementation. There would be no short-term effects associated with FP 1 as this alternative does not involve any construction or excavation activities.

7.1.9 Implementability

Since FP 1 involves no remedial action or associated activities, there would be no technical or administrative implementability issues associated with this alternative.

7.1.10 Cost

Since FP 1 does not include any remediation or monitoring of floodplain soils, there would be no cost associated with this alternative.

7.1.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.1.2, the evaluation of whether FP 1 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: Since FP 1 would not involve any remediation of floodplain soil, it would not reduce soil PCB concentrations, and would therefore not reduce exposure of

[330] As noted in Table 7-6, there are several cases where the soil IMPG levels (particularly the lower bound) could not be achieved at any floodplain soil concentration since the PCB concentrations in the aquatic food items at the target sediment level would by themselves exceed the IMPGs for mink prey.

humans and ecological receptors to the PCBs that are currently present in floodplain soils. However, as shown in Section 7.1.6, any residual risks (even as EPA would define them) from exposure to floodplain soils under current conditions are limited. Further, PCB concentrations in floodplain surface soil in certain areas may decrease over time due to deposition of cleaner sediments on top of them and other natural attenuation processes.

Compliance with ARARs: As discussed in Section 7.1.4, there are no ARARs for FP 1.

Human Health Protection: As discussed in Section 7.1.6.1, PCB levels in floodplain soil under FP 1 are within the range of the RME IMPGs based on EPA's cancer risk range in all direct contact EAs and achieve the RME IMPGs associated with non-cancer impacts in 96 of the 120 EAs. In addition, average floodplain soil PCB levels in the top 3 feet in the Heavily Used Subareas are within the range of the RME IMPGs based on EPA's cancer risk range in 11 of those 12 subareas and are below the non-cancer RME IMPGs in 7 of those 12 subareas. Current floodplain soil PCB levels in all the farm areas evaluated based on agricultural products consumption (for commercial dairy farms) are within the range of adjusted RME IMPG levels based on EPA's cancer risk range and below the adjusted RME IMPG levels for non-cancer.

Environmental Protection: As discussed in Section 7.1.6.2, floodplain soil PCB EPCs under FP 1 achieve some of the ecological IMPGs but not others. Specifically, these EPCs: (a) are within or below the IMPG range for omnivorous/carnivorous mammals (21.1 mg/kg to 34.3 mg/kg) in 6 of the 7 averaging areas; (b) exceed the upper bound of the amphibian IMPG range (5.6 mg/kg) in 59 of the 66 of vernal pools in the PSA; (c) are below the floodplain soil IMPGs for insectivorous birds in 11 of 12 averaging areas if the associated sediment concentrations in those areas were 3 mg/kg or less and in 8 of those areas if the associated sediment concentrations were 5 mg/kg; and (d) exceed the upper- and lower-bound floodplain soil IMPGs for piscivorous mammals in both averaging areas, except that they would meet the upper-bound IMPG in the Reach 5C/5D/6 averaging area if the associated sediment concentration were 1 mg/kg or less.

As discussed in Section 2.1.1, since achievement of IMPGs is only one of the Selection Decision Factors under the Permit, it is not determinative of whether an alternative would provide overall protection of the environment, but rather is a consideration to be balanced against the other Selection Decision Factors. The fact that there are exceedances of the IMPGs for certain receptors does not translate into adverse impacts on the local populations of those receptors, let alone adverse impacts on the overall wildlife community in the Rest of River area. This is true, first, because of the highly conservative nature of the averaging areas and the fact that the local populations of these receptors extend beyond

the individual averaging areas.[331] Moreover, field surveys conducted by both EPA and GE, as well as other existing ecological information identified in Section 5.1.1, have documented the presence of numerous and diverse plant and animal species, including state-listed rare species, that continue to reproduce and inhabit the floodplain despite the fact that PCBs have been present in the floodplain soil for over 70 years. Thus, even accepting the IMPGs based on EPA's ERA, the impact of the IMPG exceedances under FP 1 on the maintenance of healthy local populations of these receptors is uncertain.

Moreover, as EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d – quoted in Section 2.1.1 above). Thus, it is critical that any uncertain risks that may be evidenced by IMPG exceedances be weighed against the certain adverse environmental impacts of floodplain soil removals, as discussed in Section 5.3. In this case, since FP 1 does not involve any remedial activities, it would avoid those short-term and long-term adverse environmental impacts.

Summary: Since FP 1 would not involve any removal of floodplain soils, it is assumed that current floodplain soil PCB concentrations would remain largely unchanged. Based on GE's evaluation of the data, current PCB concentrations in the floodplain do not pose a significant risk to human health or the environment. However, EPA's HHRA and ERA concluded that those concentrations do present certain human health and environmental risks. As discussed above, while current PCB concentrations in the direct contact EAs are within EPA's acceptable cancer risk range in all EAs, they exceed the non-cancer IMPGs based on EPA's HHRA in several EAs. From an ecological standpoint, those concentrations are within the range of the IMPGs based on EPA's ERA for some receptors and areas, but exceed those IMPGs for other receptors (e.g., amphibians, piscivorous mammals) in the majority of averaging areas. On the other hand, implementation of FP 1 would not cause the adverse environmental impacts inherent in floodplain soil removal.

In summary, based on EPA's conclusions in the HHRA and ERA (which GE has been directed to follow by EPA), FP 1 would not completely eliminate the human health and ecological risks identified by EPA. However, GE disputes EPA's conclusions and notes the disruptive actions that those conclusions would require.

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[331] For example, as discussed in Section 4.2.3, the local populations of wood frogs, wood ducks, and shrews (as representative of amphibians, insectivorous birds, and omnivorous/carnivorous mammals, respectively) extend throughout the PSA (in areas of suitable habitat); and the local population of mink (as representative of piscivorous mammals) extends beyond the PSA to areas near the shoreline but outside the 1 mg/kg isopleth, as well as to tributaries of the River and to other riverine areas in the vicinity.

7.2 Evaluation of Floodplain Alternative 2

7.2.1 Description of Alternative

FP 2 would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet upper-bound RME IMPGs for human health. Specifically, this alternative has been developed to achieve the following IMPGs:

- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a non-cancer HI of 1, whichever is lower) based on direct contact with floodplain soils; and

- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a non-cancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.

This alternative would involve removing and replacing floodplain soils as necessary to achieve average PCB concentrations in the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. Average concentrations have been based on the 95% UCL of the spatially weighted mean, as discussed in Section 4.4.2.

Summary of Removal Areas and Volumes

FP 2 would involve the removal of approximately 22,000 cy of soil from approximately 13 acres of the floodplain. The locations of these removal areas are shown on Figure 7-1 and a detailed breakdown of the removal areas and volumes associated with FP 2 is included in Tables 7-7 through 7-12. All 22,000 cy of removal under FP 2 have been based on achieving the human direct contact IMPGs shown in Table 7-7. However, FP 2 would also achieve certain other IMPGs, as discussed in Section 7.2.6 below.

Summary of Affected Habitat

FP 2 would involve the removal and backfill of floodplain soil across approximately 13 acres in various types of habitats. The approximate acreages of those general habitat types with associated removal volumes, are as follows:[332]

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[332] This detailed breakdown of removal areas and volumes by habitat type was conducted using the habitat community mapping performed by Woodlot Alternatives, Inc. on behalf of EPA (Woodlot, 2002) of the River and floodplain between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. The same procedure was used to describe the habitat

- 6.2 acres (10,000 cy) of floodplain wetland forest habitats (consisting of transitional floodplain forest and red maple swamp);
- 1.2 acres (2,000 cy) of shrub and emergent wetland habitats (consisting mainly of wet meadow and shallow emergent marsh habitats); and
- 3.0 acres (5,000 cy) of disturbed upland habitats (consisting of cultural grasslands [defined in Section 5.3.8.1 as open fields dominated by grass-like vegetation that is periodically disturbed, generally by mowing]);
- <0.1 acre of upland forested habitat (consisting of northern hardwoods-hemlock-white pine forest); and
- 2.3 acres (4,000 cy) of habitat of currently unmapped community type.[333]

No vernal pools would be affected by the implementation of this remedial alternative, although some areas adjacent to vernal pools (which serve as non-breeding habitat, for vernal pool amphibians) would be adversely affected, as discussed below.

In addition to the above-described areas associated with removal/backfill activities, additional floodplain habitat would be adversely affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 2 would require 8 staging areas, which would occupy a total of approximately 3.7 acres (0.5 acre of which would be within the floodplain), and 4.1 miles of temporary access roads covering 9.8 additional acres assuming a 20-foot road width (1.9 miles and 4.6 acres of which would be within the floodplain). Within the boundaries of the Woodlot (2002) natural community mapping, these facilities would be located largely in the floodplain forest (1.3 acres), shrub

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types affected by all subsequent floodplain alternatives. The impacted acreages have been rounded to one decimal place for acreages below 10 acres and to the nearest whole number for larger acreages. Also, as discussed in Section 5.3.4, given the uncertainty in the estimated removal volumes (due to the use of the modified Halls Bootstrap method in calculating EPCs), total removal volumes presented in the text for all alternatives have been rounded. Due to these rounding procedures, the sum of the impacted acreages and removal volumes for the detailed breakdowns by habitat type does not always exactly match the total impacted acreage and removal volume for the alternatives.

[333] These impacts would occur in the Reach 7 floodplain, where the Woodlot habitat community mapping is absent. Based on review of information from MassGIS and aerial photography, remediation activities under FP 2 within Reach 7 would be conducted mainly in forested uplands (1 acre) and wet meadow/emergent marsh (1.3 acres).

and shallow emergent wetlands (1.6 acres), and disturbed upland habitat (1.5 acres).[334] The locations of these staging areas and access roads are shown on Figure 7-1.

Conceptual Remedial Approach

The following summarizes the general remedial approach (and associated assumptions) related to implementation of FP 2. It should be noted that while details on equipment and processes are provided in this description for purposes of the evaluations in this Revised CMS Report, modifications to these specifics may be made during the design and implementation phases after a more detailed assessment of engineering considerations and site conditions.

Prior to implementation of excavation activities, access roads and staging areas would be constructed. The staging areas and access roads would remain in place to support the backfill activities. Clearing and grubbing activities would be conducted in the targeted soil removal areas. It is assumed that soil removal would be conducted using conventional backhoes or similar construction equipment. Appropriate erosion control measures would be implemented prior to and during the completion of these actions, and construction in and near wetland areas would be implemented so as to minimize, to the extent practicable, adverse impacts to wetland areas.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 2 were selected considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs in an effort to minimize impacts on sensitive habitats and local communities, to the extent practical (see Section 5.2.2). Areas were specifically selected based on accessibility, existing land use, habitat use, and location relative to the floodplain. An effort was made, where practicable, to avoid sensitive habitats (e.g., forested floodplain areas, vernal pools, other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. To minimize the footprint of construction and impacts to sensitive habitats and densely populated areas, access to some floodplain removal areas has been assumed from the opposite side of the river

[334] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 2 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed upland areas (e.g., agricultural fields and cultural grasslands) (5 acres), with additional impacts occurring in forested uplands (1.5 acres), forested wetlands (0.1 acre) and wet meadow/emergent marsh (0.3 acre). Access roads and staging areas in Reach 7 would affect approximately 1.5 acres (1.1 acres of forested uplands and 0.4 acre of wetlands). There would be no impacts in Reach 8 from construction of access roads or staging areas.

through the construction of temporary river crossings. The evaluation has lead to the locations of staging areas and access roads shown on Figure 7-1. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

Material would be loaded into lined trucks and transported to temporary staging areas. Material would then be treated and/or disposed of based on the selected treatment/disposition alternative.

Following excavation, backfill material would be brought to the construction area by trucks and placed using backhoes and bulldozers. Excavated areas would be filled to the pre-existing grade with backfill and would then be replanted.

If needed during construction, engineering controls and BMPs would be implemented to reduce impacts to the surrounding community and environment. These would include fencing or other barricades to deter trespassers, and hay bales and silt fencing around wetland areas to control construction site runoff during storm events. Dust control measures, if needed, would include water, foam sprays, or similar approaches.

For purposes of the evaluation in this Revised CMS Report, it is assumed that FP 2 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. The restoration methods that are assumed to be utilized under FP 2, subject to development of a more detailed restoration plan during design, would include the conceptual methods described in Section 5.3.4.3 for the floodplain forests, Section 5.3.5.3 for the shrub and emergent wetlands, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that implementation of FP 2 could be completed within 1 year if implemented independently from River-related remedial activities. However, floodplain remediation would, for the reasons discussed above, be coordinated with sediment remediation. In that case, the time to complete FP 2 would likely be different, depending on the sediment remediation alternative selected. Nevertheless, for purposes of the evaluations in this section, it has been assumed that implementation of FP 2 would take less than 1 year.

In addition to soil removal and backfilling, FP 2 would include institutional controls and other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted for the cover and restored vegetation. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program would include those described in Section 4.5 and outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.2.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs; (b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 2 would be protective of human health and the environment is presented at the end of Section 7.2 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.2.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River, and FP 2 would not change that fact. As stated previously, the floodplain is generally flat, well vegetated, and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and transport to the River.

Open excavations during construction could serve as a short-term, temporary source of some releases during an extreme weather event. Such potential releases would be controlled using conventional engineering practices.

7.2.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 2 in accordance with directions from EPA are listed in Tables F-2.a through F-2.c in Appendix C.[335] No chemical-specific ARARs have been identified for FP 2, although several guidances to be considered are listed in Table F-2.a. With respect to the potential

[335] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

location-specific and action-specific ARARs, Tables F-2.b and F-2.c indicate that FP 2 could be designed and implemented to achieve most of those ARARs, assuming that any necessary EPA approval determinations are obtained.[336] However, as also indicated in those tables, there are some potential location- and action-specific ARARs that would not be met by FP 2. These include the following:

- The requirement of the Massachusetts water quality certification regulations (314 CMR 9.06) that a project involving the discharge of dredged or fill material to wetlands (such as FP 2) not affect the Estimated Habitat of wildlife species listed by the State under MESA;

- The requirements of the Massachusetts Wetlands Protection Act and its implementing regulations that implementation of the project not affect the Estimated Habitat of state-listed wildlife species (310 CMR 10.59), and, if this project does not constitute a "limited project" under 310 CMR 10.53(3)(q), certain additional requirements as well (e.g., the prohibition on work that results in loss of > 5000 square feet of bordering vegetated wetlands or that impairs such wetlands within an ACEC [310 CMR 10.55(4)], and potentially the requirement to maintain a 100-foot wide area of undisturbed vegetation along the river in a Riverfront Area, subject to certain exceptions [310 CMR 10.58(4)(d)1.]); and

- The requirement of MESA and its implementing regulations that the project not result in a take of a state-listed species.[337]

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[336] For example, while EPA's regulations under § 402 of the Clean Water Act require discharges from treatment facilities to meet the state water quality standards in the receiving waters, it allows discharges that do not do so if they are in compliance with instructions from EPA's On Scene Coordinator (OSC). In this case, it is assumed that the discharges of treated water from dewatering/treatment facilities in the floodplain would be in compliance with the instructions from EPA's OSC (which would authorize such discharges even if they do not meet state water quality standards in the river water). Similarly, although it is uncertain whether the temporary on-site staging areas for PCB-containing soil would meet all the default conditions of EPA's TSCA regulations for storage of PCB remediation waste at the cleanup site or site of generation (40 CFR § 761.65(c)(9)),it is assumed that, if necessary, an EPA determination that these storage areas meet the TSCA regulations' substantive requirements for a risk-based approval (40 CFR § 761.61(c)) would be obtained.

[337] The MESA evaluations in Appendix L indicate that FP 2 would involve a take of 18 state-listed species. The MESA regulations contain a provision authorizing the Director of the MDFW to permit a take of a state-listed species if (a) the project proponent has adequately assessed alternatives, (b) the take would not affect a significant portion of the local population of the species, and (c) a long-term Net Benefit plan for the species is developed and agreed to (321 CMR 10.23). However, as discussed in Section 5.4, this provision does not constitute an ARAR for the Rest of River remedial action.

Thus, to the extent that the above-listed requirements constitute ARARs, they would need to be waived by EPA under CERCLA and the NCP as technically impracticable to meet (or on some other ground).

In addition to the ARARs discussed above, it is possible that some of the temporary staging areas for excavated floodplain soils may not meet certain requirements that could potentially apply to those areas in the event that the excavated soils should be found to constitute hazardous waste under RCRA criteria or comparable state criteria. Based on prior experience at other portions of this site (e.g., the floodplain adjacent to the 1½-Mile Reach), it is not anticipated that the excavated soils would constitute RCRA hazardous waste (see Section 6.3.4 above). However, TCLP testing of representative soils would be conducted to confirm that result.

Further, even if some excavated soils should be found to constitute hazardous waste under RCRA, the federal RCRA requirements would not apply to staging areas within the Rest of River boundary, since those areas would be covered by EPA's Area of Contamination (AOC) policy (EPA, 1995), which excludes from the RCRA land disposal restrictions and other RCRA technical requirements the movement of wastes within an overall area that includes discrete areas of generally dispersed contamination. However, in the unlikely event that such materials were staged at areas that are located outside the Rest of River boundary and to which EPA's AOC policy would not apply, those staging areas would not meet all the substantive requirements of EPA's RCRA regulations for hazardous waste storage facilities. For example, waste pile staging areas would not be constructed with the double liner/leachate collection systems specified for new waste pile units to be used for storage of hazardous waste (40 CFR § 264.251(c)), nor would they have groundwater monitoring systems such as is required for regular hazardous waste management facilities (40 CFR Part 264, Subpart F). It would not be practical or necessary for these temporary staging facilities to be constructed and operated to comply with all the regular RCRA storage requirements (which are designed for permanent storage facilities). Accordingly, if such requirements were deemed applicable to any staging areas, they should be waived by EPA as technically impracticable to meet.

Similarly, although not anticipated, it is possible that some excavated floodplain soils may constitute hazardous waste under the Massachusetts hazardous waste regulations on grounds other than containing PCBs ≥ 50 mg/kg.[338] In that event, the staging areas would

[338] Although wastes with PCB concentrations ≥ 50 mg/kg are listed hazardous wastes in Massachusetts, the Massachusetts hazardous waste regulations exempt facilities that manage such wastes so long as such facilities comply with EPA's TSCA regulations (310 CMR 30.501(3)(a)), and the staging facilities would meet substantive TSCA requirements (provided that any necessary risk-

not meet certain requirements of the Massachusetts hazardous waste regulations. For example, since these areas need to be located close to the River and would contain waste piles, some of them could not feasibly meet the requirement that waste piles used for hazardous waste storage may not be constructed within the 500-year floodplain (310 CMR 30.701(6)). In addition, depending on the locations of the staging areas, some of those areas may not meet other location standards set forth in these regulations for such waste piles (e.g., 310 CMR 30.704(3), 30.705(3) & (6)) or certain design requirements for such waste piles (e.g., that the liner must be a minimum of 4 feet above the probable high groundwater table) (310 CMR 30.641). Further, construction of groundwater monitoring systems (per 310 CMR 30.660) for these temporary staging areas is not practical. In these circumstances, if these requirements were deemed applicable to any particular temporary staging areas, they should be waived by EPA as technically impracticable to meet.

7.2.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness of FP 2 includes evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

7.2.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 2 includes consideration of the length of time and extent to which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 2 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 22,000 cy of PCB-containing soil over approximately 13 acres of floodplain (see Figure 7-1). The reduction in potential exposure and associated risk would occur upon completion of the remediation in a given area.

Following implementation of FP 2, the average post-remediation floodplain soil concentrations in the human health averaging areas would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a cancer risk of 10^{-4} and a non-cancer HI of 1. The average PCB EPCs that would remain in the top foot

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based determination is obtained from EPA under those regulations). The other pertinent bases for characterizing a waste as hazardous are the same under state regulations as those under RCRA.

within the human health and ecological averaging areas are shown in Tables 7-7 through 7-12. Comparison of these EPCs to the IMPGs based on EPA's HHRA and ERA is discussed in Section 7.2.6.[339]

PCBs would also remain at depths below the top foot. However, such deeper soil would not be available for exposure under current uses. In the event that exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional Solutions would be implemented where necessary to address potential risks from future uses that are reasonably anticipated based on realistic assumptions.

7.2.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 2 has included an assessment of the use of the technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace technical components, as discussed below.

Use of Technology Under Similar Conditions

FP 2 relies primarily on the removal of floodplain soils, followed by backfilling and restoration activities. Of the 13 acres to be removed under FP 2, the majority (over 7 acres) would consist of wetland areas (including floodplain wetland forests and shrub and emergent wetlands). Work in all these areas would likely be conducted using conventional construction techniques and equipment, with more specialized equipment such as smaller, low ground pressure excavators and access mats (to cross wetlands if not being excavated) used in wetland areas, as necessary, to minimize the impacts of remedy implementation.

Excavation of floodplain environments has been implemented at a number of sites across the country. Examples of sites where floodplain remediation has been conducted include the 1½-Mile Reach of the Housatonic River; Bryant Mill Pond (MI; EPA, 2005d); Town Branch (KY; ARCADIS BBL, 2007); Fields Brook Superfund Site (OH; EPA, 2004e); Kress Creek/West Branch DuPage River (IL; EPA, 2005f); and Little Mississinewa River Site (EPA, 2004d). Remediation of the floodplains at these sites has included excavation of soils from the floodplain using conventional earth-moving equipment (as would be used in FP 2). Restoration was discussed separately in Section 5.3.

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[339] As discussed in Section 1.2, GE does not agree with many of the EPA assumptions and inputs on which the IMPGs are based and thus does not agree that exceedances of those IMPGs are indicative of a risk to human health or the environment.

General Reliability and Effectiveness

The removal and backfill of soil would reliably, effectively, and permanently reduce the concentrations of PCBs in soils in removal areas. Following backfilling, it is assumed that excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. However, there are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, and 5.3.6.4 for deep marsh habitat. For example, replacement of a mature forested community would take at least 50 to 100 years before it resembles current conditions and could be delayed by various intervening events, such as floods or the proliferation of invasive species. Restoration of shrub and emergent wetlands, as well as deep marshes, is subject to numerous uncertainties that could delay or prevent the return of pre-remediation conditions. However, since the habitat impacts from FP 2 would occur in a smaller overall area than would be affected by alternatives involving a greater extent of removal, these constraints would have less overall impact on habitat conditions than under such larger alternatives.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 2, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, and to identify areas (if any) where the backfill has eroded and needs repair. Any deficiencies noted during the inspections would be subject to maintenance, repair, and other corrective actions performed as necessary. Periodic inspection of replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and perform any maintenance activities required following implementation of FP 2 are readily available.

Technical Component Replacement Requirements

Restoration of the areas affected under FP 2, including access roads and staging areas, is assumed to include placement of backfill to pre-existing grade in remediated areas, removal of temporary road materials, and revegetation. If significant erosion, plant loss, or other problematic conditions were observed in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for and methods of repair or replacement. It is anticipated that if repair or replacement were necessary, it could be

implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological receptors that use/inhabit the floodplain in these areas.

7.2.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 2 on human health or the environment has included consideration of the following:

Potentially Affected Populations

Implementation of FP 2 would remove and replace areas of several habitat types, as described in Section 7.2.1. This would have long-term effects on humans by altering the aesthetics and recreational use of the floodplain and on the wildlife that use affected habitats. Wildlife associated with these habitats includes a variety of mammals, birds, reptiles, and amphibians. In particular, FP 2 would affect portions of the mapped Priority Habitats of 21 state-listed species, as described in Appendix L. The long-term impacts of FP 2 on the affected habitats and their associated biota are discussed in the next sections. These impacts would be limited due to the fact that this alternative would leave much of the floodplain undisturbed.

Overview of Long-Term Ecological Impacts

FP 2 would impact a total of approximately 27 acres, including 13 acres due to floodplain soil removal and 14 acres (of which 5 are in the floodplain) for the construction and use of access roads and staging areas. The most significant long-term ecological impacts would be expected to occur in the forested floodplain habitats and the shrub and emergent wetlands, as described below.

Long-Term Impacts on Floodplain Forest Habitats and Biota

FP 2 would impact a total of approximately 7.5 acres of floodplain wetland forest habitats (within the Woodlot habitat mapping coverage), including 6.2 acres due to soil removal and 1.3 additional acres for access roads and staging areas. These disturbances would be in several discrete areas (as shown on Figure 7-1) and together would affect approximately 1.5% of the total floodplain forest habitats in the PSA. Within these limited areas, despite the implementation of restoration measures, the forested habitats and the biota that use them would experience a number of long-term adverse impacts. The long-term post-restoration impacts of remediation activities on floodplain forest habitats were described generally in Section 5.3.4.4. An assessment of those impacts for FP 2 is presented below.

Change in Vegetative Cover/Loss of Mature Trees. FP 2 would require removal of all mature trees in the forested floodplain areas subject to soil removal or to the construction of access roads and staging areas. As discussed in Section 5.3.4.4, assuming the replanting of these forested areas, the plant community succession in these areas is expected to take 5 to 15 years to progress to the sapling/shrub stage, 20 to 25 years to reach the young forest stage, and at least 50 to 100 years to return to the mature forest stage – assuming that the process is not negatively affected by floods, colonization by invasive species, or browsing by deer or beaver. In addition, the removal of trees would result in the loss of woody debris and annual leaf litter that are important to the wildlife using the forested areas. On the other hand, the extensive undisturbed forest surrounding the disturbed areas would promote recolonization of the latter areas. Moreover, given the limited areas of impact on these forested areas, the effect of floods would be less than under alternatives involving a greater extent of removal, the likelihood of controlling invasive species would be greater, and the reduction in coarse woody debris and leaf litter would not be as widespread.

Changes in Hydrology and in Soil Composition, Chemistry, and Stratigraphy. The loss of woody vegetation, reduction of coarse woody debris, presence of thinly vegetated area, and altered microtopography in the remediated areas would result in a decrease in floodplain roughness and a corresponding increase in flood flow velocities, with more erosion and less infiltration, in those areas. These alterations could affect the hydrologic conditions in those localized portions of the floodplain. In addition, although an effort would be made to secure replacement soil for backfill that is similar to existing soil, it is unlikely that commercially available soil would match existing soil in terms of organic content and the presence of viable seeds and other propagules from native floodplain plants. Further, the use of heavy equipment in these areas would result in a long-term impact to soils in the form of compaction. Again, however, given the limited and discrete areas in which these impacts would occur, they would not be expected to have a major long-term impact on the hydrology, flood flow alteration function, or soil conditions in the floodplain as a whole.

Impacts on Floodplain Forest Wildlife Community. In the floodplain forest areas that are cleared, there would be a long-term impact on the ability of species that depend on the availability of mature trees and forested habitat to use those areas. However, these discrete long-lasting openings in the floodplain under FP 2 are not expected to be substantial enough (affecting 1.5% of the forested floodplain in the PSA) to alter the overall suitability of the forested habitat in the PSA to support a diverse interior forest wildlife community (such as currently exists) over an extended period. Impacts on state-listed species are discussed separately below.

In summary, while FP 2 would have significant long-term negative impacts in the mature forested areas that are cleared for soil remediation or access roads or staging areas, lasting for at least 50 to 100 years, such impacts would affect only a small percentage (1.5%) of

the total forested floodplain in the PSA, and thus would not be expected to cause widespread harm to the overall forested habitat of the PSA.

Long-Term Impacts on Shrub and Emergent Wetland Habitats and Biota

FP 2 would impact a total of 2.8 acres of shrub and shallow emergent wetland habitats (within the Woodlot habitat mapping coverage), including approximately 1.2 acres due to soil removal and 1.6 additional acres for access roads and staging areas. This amounts to less than 1% of the total shrub and shallow emergent wetland habitats in the PSA. The long-term post-restoration impacts of remediation activities on these wetland types were described generally in Section 5.3.5.4. They include changes in soil stratigraphy, changes in soil composition and chemistry, changes in drainage patterns and hydrology, changes in vegetative characteristics, and changes in the wildlife community – all of which could last for an unpredictable period of time. However, since FP 2 would affect only a small portion of these wetlands (< 1%), these negative effects would not be expected to be substantial enough to have a wide-ranging long-term adverse impact on these wetland habitats in the PSA or the biota they support.

Long-Term Impacts on Non-Breeding Amphibian Habitat Around Vernal Pools

Although FP 2 would not involve remediation in any vernal pools, it would affect portions of the habitats adjacent and proximate to some vernal pools in the PSA, which provide providing shade and leaf litter for the pool and a variety of protective cover, temperature and moisture regulation, and overwintering habitat functions for the vernal pool amphibians. As discussed in Section 5.3.7.1, management guidelines recommend that impacts to such non-breeding habitats within 100 feet of a vernal pool should be avoided, and that impacts to non-breeding habitats between 100 feet and approximately 750 feet from the pools should be substantially minimized (Calhoun and Klemens, 2002; Calhoun and deMaynadier, 2004). FP 2 would affect varying portions of the 100-foot and 100- to 750-foot zones around a number of the vernal pools in the PSA due to floodplain soil removal and construction of access roads. These impacts would range up to 30% for the 100-foot zone and up to 5% for the 100-750 foot zone for individual pools. In total, FP 2 would affect approximately 2 acres within 100 feet and 9 acres within the 100- to 750-foot zones of the vernal pools in the PSA. These disturbances would disrupt aspects of those areas' non-breeding functions for the vernal pool amphibians. Again, however, given the limited extent of these disturbances relative to the disturbances inherent in alternatives involving a greater extent of removal, the resulting disruptions would likewise be limited relative to those alternatives.

Long-Term Impacts on Upland Habitats

FP 2 would impact 4.5 acres of upland habitats (within the Woodlot habitat mapping coverage), including approximately 3 acres due to soil removal and 1.5 additional acres for access roads and staging areas. Nearly all of this acreage consists of disturbed upland habitat – namely, cultural grasslands (open, mowed fields). In general, as these areas support altered or early successional plant communities that have limited ecological value, no significant long-term impacts would be expected from the remediation in these areas. However, since even this habitat type may provide specific ecological functions, such as serving as nesting habitat for wood turtles, some individual effects may occur.[340]

Long-Term Impacts on State-Listed Species

As noted above, FP 2 would affect portions of the Priority Habitats of 21 state-listed species. As discussed in the MESA assessments in Appendix L, FP 2 would involve a take of at least 18 of these species, but would not be expected to adversely affect a significant portion of the local population of any of them (except possibly one – black maple). The table below lists the 21 stated-listed species whose Priority Habitat would be affected by FP 2, along with those for which FP 2 would result in a take and the species as to which FP 2 could impact a significant portion of the local population:

Table 7-13 – Impacts of FP 2 on State-Listed Species

Species with Priority Habitat Affected by FP 2	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	No
Arrow clubtail	Yes	No
Black maple	Yes	Possibly
Bristly buttercup	Yes	No
Brook snaketail	Yes	No
Bur oak	Yes	No
Foxtail sedge	Yes	No
Intermediate spike-sedge	Unlikely	No
Jefferson salamander	Yes	No

[340] In addition, as noted in Section 7.3.1, FP 2 would affect some upland areas outside the Woodlot habitat mapping coverage, including 5 acres of disturbed uplands and 3.6 acres of upland forest (where the impacts would be greater and longer lasting than in previously disturbed areas).

Species with Priority Habitat Affected by FP 2	Take?	Impact on Significant Portion of Local Population?
Mustard white	Yes	No
Narrow-leaved spring beauty	Unlikely	No
Ostrich fern borer moth	Yes	No
Rapids clubtail	Yes	No
Riffle snaketail	Yes	No
Skillet clubtail	Yes	No
Spine-crowned clubtail	Yes	No
Stygian shadowdragon	Yes	No
Triangle floater	Unlikely	No
Wapato	Yes	No
Wood turtle	Yes	No
Zebra clubtail	Yes	No

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 2 would have some long-term impacts on the aesthetic features of the natural environment. The natural appearance of the floodplain after the remediation would be altered in those areas where excavation was performed and where access roads and staging areas were located. As noted above, FP 2 would result in the removal of approximately 7.5 acres of mature forested communities in the floodplain. These areas would look markedly different for a long time after remediation, because some of these trees are over 50 to 100 years old and the time for a replanted forest community to develop an appearance comparable to its current appearance would be generally commensurate with the age of the pre-removal community. However, the areas that would be affected by implementation of FP 2 are small relative to the overall floodplain environment and the remediation would thus not be significantly detrimental to the overall aesthetics of the PSA floodplain in the long term.

Most of the floodplain areas that would be remediated under FP 2 are characterized as general recreational areas. However, the affected areas also include canoe launch areas, a bank fishing area, a waterfowl hunting area, and dirt biking/ATVing areas. Recreational activities in these areas would be disrupted by implementation of FP 2. These impacts would be expected to last not only during the remediation period, but for some time afterwards, until the areas have sufficiently recovered to support such uses.

Potential Measures to Mitigate Long-Term Adverse Impacts

In an effort to mitigate long-term impacts to the floodplain following remedy implementation, a variety of restoration measures are available.[341] The restoration methods for the types of habitats that would be affected by FP 2 are described in the restoration methods subsections in Section 5.3.

7.2.6 Attainment of IMPGs

This section describes the extent to which FP 2 would achieve the IMPGs for both human health and ecological receptors. These comparisons are presented in Tables 7-7 through 7-12 for the pertinent human and ecological averaging areas. The time frame to achieve any IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.2.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, as shown in Table 7-7, FP 2 would achieve, at a minimum, the RME IMPGs based on a 10^{-4} cancer risk and a non-cancer HI of 1 in all 120 direct contact EAs. In addition, FP 2 would achieve the RME IMPGs based on a 10^{-5} cancer risk in 71 of those EAs (including the top 3 feet in 5 of the 12 Heavily Used Subareas). Further, FP 2 would achieve the CTE IMPGs based on a 10^{-5} cancer risk and non-cancer impacts in all of the direct contact EAs.

For human consumption of agricultural products, FP 2 would achieve the RME IMPGs based on a 10^{-5} cancer risk and non-cancer impacts in all 14 of the farm areas evaluated for such consumption (Table 7-8).

These comparisons are shown in detail in Tables 7-7 and 7-8 for all human exposure areas in Reaches 5 through 8.[342]

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[341] Potential measures to avoid or minimize the adverse impacts were described in Section 5.2.

[342] In addition to the comparisons mentioned in the text, as shown in Tables 7-7 and 7-8, FP 2 would achieve the RME IMPGs based on a 10^{-6} cancer risk in 7 EAs and 1 Heavily Used Subarea and in 5 farm areas evaluated for consumption of agricultural products. However, it would achieve the CTE IMPGs based on a 10^{-6} cancer risk in 116 EAs and 8 Heavily Used Subareas and in 13 farm areas evaluated for consumption of agricultural products.

7.2.6.2 Comparison to Ecological IMPGs

FP 2 would achieve some of the ecological IMPGs in some areas:

- For amphibians, FP 2 would achieve the upper-bound IMPG (5.6 mg/kg) in 7 of the 66 vernal pools in the PSA, and would also achieve the lower-bound IMPG (3.27 mg/kg) in 5 of those 7 pools (Table 7-9).

- For omnivorous/carnivorous mammals, FP 2 would achieve the upper-bound IMPG (34.3 mg/kg) in all of the 7 averaging areas; it would also achieve the lower-bound IMPG (21.1 mg/kg) in 4 of those areas (Table 7-10).

- For insectivorous birds, FP 2 would achieve the target floodplain soil IMPGs in each of the 12 averaging areas in the PSA if the associated sediment concentrations in those areas were 3 mg/kg or less, and would achieve those levels in 9 of the averaging areas (all except the 3 in Reach 5B) if the associated sediment concentrations were 5 mg/kg (Table 7-11).

- For piscivorous mammals, FP 2 would achieve the upper-bound soil IMPG level in one (Reach 5C/5D/6) of the two averaging areas at the 1 mg/kg sediment target level (Table 7-12).[343]

These comparisons are shown in detail in Tables 7-9 through 7-12 for all ecological averaging areas in the PSA.

7.2.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 2 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

Reduction of Toxicity: FP 2 does not include any treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during floodplain excavation (which is not anticipated), those wastes would be segregated and sent off-site for treatment and disposal.

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[343] There are several cases where the piscivorous mammal IMPGs (particularly the lower bound) could not be achieved at any floodplain soil concentration since the PCB concentrations in the aquatic food items at the target sediment level would by themselves exceed the IMPGs for mink prey.

Reduction of Mobility: As previously noted, the existing conditions of the floodplain are predominantly depositional and stable due to the presence of vegetation and the generally low water velocities during periods of inundation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 2 would reduce the volume of PCB-containing soils and the mass of PCBs present in the floodplain by removing 22,000 cy of soils containing approximately 2,600 lbs of PCBs from approximately 13 acres of the floodplain.

7.2.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 2 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and on workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the performance of the remedial activities in a given area.

Impacts on the Environment – Ecological Effects

As previously discussed, implementation of FP 2 would impact a total of approximately 27 acres (both within and outside the PSA), including 13 acres due to floodplain soil removal and 14 acres (of which 5 are in the floodplain) for access roads and staging areas. The short-term effects on the environment resulting from these activities include the removal of plant and wildlife habitat in those areas of the floodplain where remediation or the construction of access roads and staging areas would occur. Short-term impacts specifically associated with each habitat type are described below.

Floodplain Forest Habitat. Short-term impacts of FP 2 in the affected floodplain forest areas (as discussed generally in Section 5.3.4.2) would include the removal of all trees, shrubs, and other vegetation, as well as dead tree snags and downed woody debris. Existing native soil and leaf litter would be replaced with commercial backfill that has different characteristics, affecting plant growth and hydraulic conductivity; and the soil would be compacted due to use of heavy machinery, with consequent impacts on the permeability of the soil. There would be a loss of cover, nesting, and feeding habitat for wildlife species that rely on such forested areas (including state-listed species). There would also be an increase in construction and equipment traffic, which could disrupt some forest animals or result in mortality to certain slow-moving smaller animals.

Shrub and Emergent Marsh Habitats. Short-term impacts of FP 2 on the affected shrub and emergent marsh areas (as discussed generally in Sections 5.3.5.2 and 5.3.6.2) would

include the removal of all vegetation in those areas, with consequent impacts on nesting, burrowing, and/or escape habitat and food for birds, amphibians, reptiles, mammals, and invertebrates that use these wetland areas. The existing silty organic soils would be replaced with imported soils having different characteristics (with consequent effects on plant growth and hydraulic conductivity), the soils would be compacted by heavy machinery, and the hydrology of these wetlands could be altered. Again, the increase in construction and equipment traffic could disrupt some forest animals or result in mortality to certain slow-moving smaller animals.

Disturbed Upland Habitat: The short-term impacts associated with the disturbance of already disturbed upland habitat would be limited as the amount of area affected by the removal is relatively small and the quality of the habitat is low relative to the undisturbed areas of the floodplain.

In summary, implementation of FP 2 would have a number of adverse short-term effects on the habitats of the Rest of River, but those effects would be limited due to the relatively limited extent of the floodplain remediation under FP 2.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 2.

The total carbon footprint associated with FP 2 has been estimated to be 3,000 tonnes of GHG emissions. Most of this total (2,600 tonnes) is associated with direct emission sources (primarily construction activities and tree removal). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 600 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 2 would result in short-term impacts to the local communities along the River. These short-term effects would include disruption of recreational activities along the River and within the floodplain (including enjoyment of visually undisturbed areas) due to the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities. As previously noted, the floodplain areas that would be remediated under FP 2 include general recreational areas, canoe launch areas, a bank

fishing area, a waterfowl hunting area, and dirt biking/ATVing areas. Implementation of FP 2 would disrupt recreational activities in these areas.

Increase in Truck Traffic. Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would significantly increase during the construction period. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment areas, it would take approximately 1,950 truck trips to do so.[344] Additional truck trips would be necessary to transport backfill materials, as well as materials for the construction of staging areas and access roads, to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 3,000 truck trips would be required for that purpose. This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the construction zone could affect those residents and businesses located in the immediate vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport backfill materials to the site and to dispose of used staging area/access road materials.[345] The analysis for FP 2 indicates that the increased truck traffic for this alternative (an estimated 480,000 vehicle miles) would result in an estimated 0.23 non-fatal injuries due to accidents (with a probability of 20% of at least one injury) and an estimated 0.01 fatalities from accidents (with a probability of 1% of at least one fatality).

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts. A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 2 on the affected communities.[346] These measures would consist of the ones identified in Section 5.7 above, including: (a) avoidance of construction activities at night except where necessary and minimization of such activities on weekends and holidays; (b) proper vehicle maintenance; (c) efforts to avoid travel through densely populated areas where practical; (d)

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[344] Since it is estimated that FP 2 could be completed in one year, the total numbers given in this section for truck trips, injuries and fatalities from truck traffic, and injuries and fatalities to on-site workers are annual numbers for comparison to the annualized estimates presented for other floodplain alternatives.

[345] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

[346] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2.

where such travel is necessary, implementation of measures to ensure the safety of the impacted communities (e.g., traffic control, consultation with local public officials); (e) performance of routine air monitoring during construction activities in accordance with a project-specific community air monitoring plan; (f) use of dust control measures as needed; (g) implementation of a public information program prior to and during the construction process; and (h) implementation of engineering controls and other measures as needed on a case-by-case basis. Despite the implementation of these measures, however, some short-term impacts of construction on the local communities from FP 2 would be inevitable.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 2. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 2 is estimated to involve 40,232 labor-hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 2 would result in an estimated 0.37 non-fatal injuries to workers, with a probability of 31% of at least one injury, and an estimated 0.003 worker fatalities, with a probability of 0.3% of at least one fatality.

7.2.9 Implementability

7.2.9.1 Technical Implementability

The technical implementability of FP 2 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

General Availability of Technology: The equipment, materials, technology, procedures, and personnel necessary to implement FP 2 are expected to be readily available. FP 2 would use conventional heavy construction equipment to excavate and transport floodplain soils, as well as to bring in and place backfill and restoration materials. Such equipment would include excavators, bulldozers, and dump trucks. Other construction equipment might be used (e.g., roll-off containers) to assist with removal, transport, storage, and materials replacement. In some cases, it may be appropriate to use more specialized equipment and materials, such as low ground pressure excavators and special matting to access certain locations or otherwise to perform construction in specific areas. These technologies have been used at other sites.

Given the physical characteristics of the floodplain and the availability and known reliability of construction equipment and materials (with the exception of commercially available soils that would replicate existing wetland soils, as discussed in Section 7.2.5.3), FP 2 would be technically implementable. Support areas would be constructed using commonly available construction technologies. Methods to implement monitoring and institutional controls are all considered readily available.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be used for FP 2 is suitable for implementation in the areas where it would be applied. The construction of access roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. In addition, restoration activities would be conducted to reduce the long-term impacts of such changes, including the return of removal areas to existing grade elevations to maintain the flood storage capacity of the floodplain.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country, as described in Section 7.2.5.2 above. However, restoration efforts may not result in re-establishment of the pre-remediation conditions and functions of at least some of the affected habitats, as noted above and discussed in the relevant subsections of Section 5.3.

Availability of Support Facilities and Resources: Implementation of FP 2 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 14 acres would be needed for such facilities, and appear to be available based on a conceptual site layout. In addition, sufficient backfill (albeit not soil that would match existing wetland soil) and planting materials are expected to be readily available implementation of FP 2.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available and their use and effectiveness for this type of material removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measure (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 2 would be assessed by visual observation to evaluate such factors as vegetation growth (e.g., plant survivorship) and any signs of erosion of restored areas. Monitoring procedures would be straightforward and implementable.

7.2.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 2 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 2 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 2 is provided in Tables F-2a and F-2c in Appendix C and summarized in Section 7.2.4.

Access Agreements: Implementation of FP 2 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is anticipated that access agreements would be required from approximately 15 to 20 other landowners. Obtaining such access agreements could be difficult and time-consuming in some cases. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 2 would require coordination with EPA and MDEP. In addition, obtaining access to state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 2, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.2.10 Cost

The estimated total cost to implement FP 2 is $11.2 M (excluding the costs of treatment/disposition of excavated soil). The estimated capital cost for implementation of FP 2 is $10.7 M. Estimated annual OMM costs (for a 5-year inspection and maintenance program for restored excavation and staging/access road areas) range from $3,000 to $58,000 per year (depending on which reach is being monitored), resulting in a total cost of $460,000. The following summarizes the total costs estimated for FP 2.

FP 2	Est. Cost	Description
Total Capital Cost	$10.7 M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$0.46 M	Costs for performance of the OMM programs
Total Cost for Alternative	$11.2 M	Total cost of FP 2 in 2010 dollars

The total estimated present worth of FP 2, which was developed using a discount factor of 7%, a 1-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $10.8 M (which, in this case, is nearly the same as the total cost in light of the assumed short duration for implementing this alternative). More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of treatment/disposition of the removed floodplain soils. The estimated costs for combinations of FP 2 with the various treatment/disposition alternatives are presented in Section 10.

7.2.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.2.2, the evaluation of whether FP 2 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 2 would result in a reduction in the potential for human and ecological exposure to PCBs in floodplain soils by the removal of 22,000 cy of PCB-containing soil, containing 2,600 lbs of PCBs, from the floodplain, followed by backfilling of the excavations.

Compliance with ARARs: As discussed in Section 7.2.4, FP 2 could be designed and implemented to achieve most of the ARARs for this alternative, but a few potential ARARs would not or may not be met. Thus, to the extent that those regulatory requirements constitute ARARs, those that would not be met would need to be waived as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: Even accepting EPA's HHRA, FP 2 would be protective of human health. As discussed in Section 7.2.6.1, implementation of this alternative would achieve the RME IMPGs based on a 10^{-4} cancer risk or lower (i.e., levels within EPA's cancer risk range) and a non-cancer HI of 1 in all direct-contact EAs. It would also achieve, in all farm areas evaluated for agricultural products consumption, PCB concentrations that are at or below the adjusted RME IMPG levels based on a 10^{-5} cancer risk and a non-cancer HI of 1. FP 2 would further ensure protection of human health through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses based on realistic assumptions.

Environmental Protection: As discussed in Section 7.2.6.2, FP 2 would achieve some of the ecological IMPGs, but not others. Specifically, it would achieve: (a) levels within or below the IMPG range for omnivorous/carnivorous mammals in all 7 averaging areas; and (b) the target floodplain soil IMPG levels for insectivorous birds in all 12 averaging areas if the associated sediment concentration in those areas is 3 mg/kg or less, and in 9 of those areas if the associated sediment concentration is 5 mg/kg. FP 2 would achieve the upper bound of the amphibian IMPGs (5.6 mg/kg) in 7 of the 66 vernal pools in the PSA, and it would achieve levels within the range of the target floodplain soil levels for piscivorous mammals in one of the two averaging areas but only if the associated sediment concentration is 1 mg/kg or less.

As discussed in Section 2.1.1, since achievement of IMPGs is one of the Selection Decision Factors under the Permit, it is not determinative of whether an alternative would provide overall protection of the environment, but rather is a consideration to be balanced against the other Selection Decision Factors. The fact that there are exceedances of the IMPGs for certain receptors does not translate into adverse impacts on the local populations of those receptors, let alone adverse impacts on the overall wildlife community in the Rest of River area. This is true, first, because of the highly conservative nature of the averaging areas and the fact that the local populations of these receptors extend beyond the individual averaging areas.[347] Moreover, field surveys conducted by both EPA and GE, as well as other existing ecological information identified in Section 5.1.1, have documented the presence in the PSA of numerous and diverse plant and animal species, including state-listed rare species, that continue to reproduce and inhabit the floodplain despite the fact that PCBs have been present in the floodplain soil for over 70 years. Thus, even accepting the

[347] For example, as discussed in Section 4.2.3, the local populations of wood frogs, wood ducks, and shrews (as representative of amphibians, insectivorous birds, and omnivorous/carnivorous mammals, respectively) extend throughout the PSA (in areas of suitable habitat); and the local population of mink (as representative of piscivorous mammals) extends beyond the PSA to areas near the shoreline but outside the 1 mg/kg isopleth, as well as to tributaries of the River and to other riverine areas in the vicinity.

IMPGs based on EPA's ERA, the impact of the IMPG exceedances under FP 2, including those for amphibians and piscivorous mammals, on the maintenance of healthy local populations of these receptors is at best uncertain.

Moreover, as EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d – quoted in Section 2.1.1 above). Thus, it is critical that any uncertain risks that may be evidenced by IMPG exceedances be weighed against the certain adverse impacts of further efforts to achieve the ecological IMPGs, as discussed in Section 5.3. For example, while FP 2 would not achieve the amphibian IMPGs in about 90% of the vernal pools in the PSA, neither would it destroy those pools through excavation and replacement, with the resulting more definite and severe adverse impacts on the amphibians that inhabit those pools (see Section 5.3.7.4 above).

Indeed, implementation of FP 2 would involve fewer and less severe adverse impacts on the ecological receptors that the ecological IMPGs are designed to protect than more extensive remedial alternatives. As discussed in Section 7.2.8, while implementation of FP 2 would result in short-term adverse environmental impacts on the habitats where the remediation and associated activities would take place, these impacts would be limited in areal extent. Further, as discussed in Section 7.2.5.3, implementation of FP 2 would not produce significant long-term adverse effects on the overall environment in the PSA, because the areas of sensitive habitat subject to remediation are very small relative to the same types of habitat that would remain unaffected by the remediation. For example, FP 2 would affect only 1.5% of the floodplain forests and less than 1% of the shrub and emergent wetlands in the PSA and would not directly impact the vernal pools in the PSA.

Summary: For the reasons discussed above, FP 2 would provide overall protection of human health by achieving average PCB concentrations associated with cancer risks within EPA's acceptable risk range and non-cancer impacts at or below an HI of 1 (under EPA's assumptions in the HHRA). From an environmental standpoint, FP 2 would achieve levels within the IMPG range for some ecological receptors but not others. At the same time, however, FP 2 would minimize the substantial adverse effects on the local populations of biota that would result from more extensive floodplain alternatives. Thus, based on the balancing called for by EPA guidance, FP 2 would provide overall protection of the environment.

7.3 Evaluation of Floodplain Alternative 3

7.3.1 Description of Alternative

FP 3 would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet the upper-bound RME IMPGs for human health in all areas and the mid-range RME IMPGs for human health in many such areas, including frequently used areas. In addition, soils would be removed to meet upper-bound IMPGs for ecological receptors. Specifically, this alternative has been developed to achieve the following IMPGs:

- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a non-cancer HI of 1, whichever is lower) based on direct contact with floodplain soils in the frequently used areas (Frequent-Use EAs) identified in Section 4.2.1, and the upper-bound RME IMPGs (i.e., those based on a 10^{-4} cancer risk or a non-cancer HI of 1, whichever is lower) in the remaining direct-contact EAs;

- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a non-cancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain; and

- The upper-bound floodplain IMPGs for ecological receptors – i.e., amphibians (represented by wood frogs), omnivorous/carnivorous mammals (represented by shrews), insectivorous birds (represented by wood ducks), and piscivorous mammals (represented by mink) – using, for the latter two receptors, the floodplain soil IMPGs associated with a sediment target level of 1 mg/kg.

This alternative would involve removing and replacing floodplain and vernal pool soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use EAs (described in Section 4.2.1 and shown on Figures 4-3a-d) as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increments in these areas that are equal to or less than the mid-range IMPGs based on human direct contact. Average concentrations have been based on the 95% UCL of the spatially weighted mean, as discussed in Section 4.4.2.

<u>Summary of Removal Areas and Volumes</u>

FP 3 would involve the removal of approximately 74,000 cy of floodplain soil from approximately 44 acres of the floodplain. The locations of these removal areas are shown

on Figure 7-2, and a detailed breakdown of the removal areas, volumes, and resulting EPCs associated with FP 3 are included in Tables 7-14 through 7-19. This 74,000 cy removal volume includes 34,000 cy (19 acres) associated with achieving the IMPGs for human health; 24,000 cy (15 acres) associated with achieving the upper-bound IMPG for amphibians in vernal pools; and 16,000 cy (10 acres) associated with achieving the upper-bound IMPG for piscivorous mammals (associated with a sediment target level of 1 mg/kg).

Summary of Affected Habitat

FP 3 would involve the removal and backfill of soil across approximately 44 acres in various types of habitats. The approximate acreages of those general habitat types, with associated removal volumes are as follows:[348]

- 15 acres (24,000 cy) of vernal pool habitat, which include portions of 58 different vernal pools;
- 14 acres (25,000 cy) of floodplain wetland forest habitats (consisting mainly of transitional floodplain forest, red maple swamp, and high-terrace floodplain forest);
- 6.1 acres (10,000 cy) of shrub and shallow emergent wetland habitats (consisting of shrub swamp, wet meadow, and shallow emergent marsh);
- 1.8 acres (3,000 cy) of deep marsh habitat;
- 3.3 acres (6,000 cy) of disturbed upland habitats (consisting of agricultural field habitat and cultural grasslands habitat);
- 0.8 acre (2,000 cy) of upland forested habitats (consisting mainly of northern hardwoods-hemlock-white pine forest and red oak-sugar maple transition forest); and
- 2.5 acres (4,000 cy) of habitat of currently unmapped community type.[349]

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[348] This detailed breakdown of removal areas and volumes by habitat type was generally conducted using the Woodlot (2002) habitat community mapping between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. As noted above, both the acreages of impact and the removal volumes have been rounded, with the result that the sum of the numbers given for each habitat type may not exactly match the total impacted acreage and removal volume for the alternative.

[349] These impacts would occur mostly in the Reach 7 floodplain, where the Woodlot habitat community mapping is absent. Based on review of information from MassGIS and aerial photography,

In addition to the above-described areas associated with excavation/backfill activities, floodplain habitat would also be adversely affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 3 would require 19 staging areas, which would occupy a total of 8.7 acres (2.7 acres of which would be within the floodplain), and 9.3 miles of temporary access roads covering 23 additional acres assuming a 20-foot road width (5.0 miles and 12 acres of which would be within the floodplain). These facilities would be located in all of the above habitats, with those located within the Woodlot (2002) mapping coverage situated mainly in the floodplain forest (4.0 acres), shrub and shallow emergent wetlands (3.6 acres), and disturbed upland habitats (5.0 acres).[350] The locations of these staging areas and access roads are shown on Figure 7-2.

Conceptual Remedial Approach

The remedial approach for FP 3 would be essentially the same as described for FP 2. Conventional construction equipment would be used to construct access roads and staging areas, clear and grub existing vegetation, remove and replace soil, and conduct restoration activities.

The primary difference between FP 3 and FP 2 is that FP 3 would involve significantly more area as well as work in and around sensitive wetland areas and, in particular, 15 acres of vernal pools. For this work, some specialized construction equipment, materials, and specific engineering practices (e.g., use of low ground pressure excavation equipment) would be used in an effort to mitigate the potentially negative impacts of construction to those sensitive areas.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 3 were selected, considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs, in an effort to minimize impacts on sensitive habitats and local communities to the extent practical (see Section 5.2.2). Areas were specifically selected

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remediation activities under FP 3 within Reach 7 would be conducted mainly in forested uplands (1 acre) and wet meadow/emergent marsh habitats (1.3 acre).

[350] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 3 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed upland areas (11 acres), with additional impacts occurring in forested uplands (3.6 acres), forested wetlands (0.3 acre) and wet meadow/emergent marsh (0.5 acre). Access roads and staging areas in Reach 7 would impact approximately 1.5 acres (1.1 acres of forested uplands and 0.4 acre of wetlands). There would be no impacts in Reach 8 from construction of access roads or staging areas.

based on accessibility, existing land use, habitat use, and location relative to the floodplain. An effort was made, where practicable, to avoid sensitive wildlife habitats (e.g., forested floodplain areas, vernal pools, other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. To minimize the footprint of construction and impacts to sensitive habitats and densely populated areas, access to some floodplain removal areas has been assumed from the opposite side of the river through the construction of temporary river crossings. This evaluation has lead to the locations of staging areas and access roads shown on Figure 7-2. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

For purposes of the evaluations in this Revised CMS Report, it is assumed that FP 3 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. The restoration methods that are assumed to be utilized under FP 3, subject to development of a more detailed restoration plan during design, would include the conceptual methods described in Section 5.3.4.3 for the floodplain forest habitat, Section 5.3.5.3 for the shrub and shallow emergent wetlands, Section 5.3.6.3 for the deep marshes, Section 5.3.7.3 for the vernal pools, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that FP 3 would take approximately 3 years to complete if implemented independently from River-related remedial activities. However, assuming that floodplain remediation would be coordinated with sediment remediation, the time to complete FP 3 would likely be different, depending on the sediment remediation alternative selected. Nevertheless, for purposes of the evaluations in this section, it has been assumed that implementation of FP 3 would take 3 years.

In addition to soil removal and backfill, FP 3 would include institutional controls and/or other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted for the cover and restored vegetation. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program are anticipated to include those described in Section 4.5 and

outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.3.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs; (b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 3 would be protective of human health and the environment is presented at the end of Section 7.3 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.3.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River. As stated previously, the floodplain is generally flat, well vegetated, and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and be transported to the River.

Open excavations during construction could serve as a short-term, temporary source of some releases during an extreme weather event. Such potential releases would be controlled using conventional engineering practices.

7.3.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 3 in accordance with directions from EPA are listed in Tables F-3.a through F.3-c in Appendix C.[351] FP 3 could be designed and implemented to achieve many of those ARARs,[352] but there are a number of potential location-specific and action-specific ARARs that would not be met by FP 3. These include the following:

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[351] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

[352] As discussed for FP 2 in Section 7.2.4 (footnote 336), it is assumed that EPA would make the determinations necessary in connection with certain requirements.

- The requirements of EPA's and the U.S. Army Corps of Engineers' regulations under Section 404 of the Clean Water Act (40 CFR Part 230, 33 CFR Parts 320-323) that there be no practicable alternative with less adverse on wetlands (since there are practicable alternatives with less adverse impact – i.e., FP 2 and FP 9) and that a project involving the discharge of dredged or fill material to wetlands (such as FP 3) not cause significant adverse effects on wetlands;

- The requirements of the federal Executive Orders for Wetlands Protection (E.O. 11990) and Floodplain Management (E.O. 11988) that there be no practicable alternative with less adverse impacts on wetlands and floodplains;[353]

- The requirements of the Massachusetts water quality certification regulations (314 CMR 9.06) that there be no practicable alternative with less adverse impact on wetlands, that a project involving the discharge of dredged or fill material to wetlands (such as FP 3) not affect the Estimated Habitat of wildlife species listed by the State under MESA, and that such a project not involve a discharge to Outstanding Resource Waters, which include certified vernal pools (several of which would be remediated under FP 3);

- The requirements of the Massachusetts Wetlands Protection Act and its implementing regulations that there be no practicable alternative with less adverse impact on resource areas (310 CMR 10.53(3)(q)), that implementation of the project not affect the Estimated Habitat of state-listed wildlife species (310 CMR 10.59), and, if this project does not constitute a "limited project" under 310 CMR 10.53(3)(q), certain additional requirements as well (e.g., the prohibition on work that results in loss of > 5000 square feet of bordering vegetated wetlands or that impairs such wetlands within an ACEC [310 CMR 10.55(4)], and potentially the requirement to maintain a 100-foot wide area of undisturbed vegetation along the river in a Riverfront Area, subject to certain exceptions [310 CMR 10.58(4)(d)1.]); and

- The requirements of MESA and its implementing regulations that the project not result in a take of a state-listed species.[354]

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[353] Since these Executive Orders were not formally promulgated after notice-and-comment rulemaking, they are to be considered (TBC), rather than ARARs. However, as orders of the President, they are applicable to and binding on EPA.

[354] The MESA evaluations in Appendix L indicate that FP 3 would involve a take of 26 state-listed species. As discussed in Section 5.4, the provision of the MESA regulations that authorizes the Director of the MDFW to permit a take of such species under certain conditions does not constitute an ARAR for the Rest of River remedial action.

Thus, FP 3 would not meet a number of federal and state regulatory requirements relating to ecological protection (including regulations applicable to the Upper Housatonic ACEC). To the extent that these requirements constitute ARARs, they would need to be waived by EPA under CERCLA and the NCP as technically impracticable to meet (or on some other ground).

In addition, for the same reasons discussed for FP 2 in Section 7.2.4, it is possible that, in the unlikely event that particular floodplain soils should be found to constitute hazardous waste under RCRA or comparable state criteria (which is not anticipated), and that the temporary staging areas for such excavated soils are subject to federal and/or state hazardous waste regulations, the staging areas may not meet certain locational and/or technical requirements for the storage of hazardous waste. In that unlikely event, as also discussed in Section 7.2.4, those requirements should be waived by EPA as technically impracticable to meet.

7.3.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness for FP 3 includes evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

7.3.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 3 includes consideration of the length of time and extent to which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 3 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 74,000 cy of PCB-containing soil over 44 acres of floodplain (see Figure 7-2). The reduction in potential exposure and associated risk would occur upon the completion of remediation in a given area.

As discussed further in Section 7.3.6.1, as with FP 2, the average post-remediation floodplain soil concentrations in all of the human health averaging areas following implementation of FP 3 would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a cancer risk of 10^{-4} and a non-cancer HI of 1. In addition, as discussed in Section 7.3.6.2, implementation of FP 3 would result in average concentrations equivalent to or lower than the upper-bound ecological IMPGs

based on EPA's ERA (depending, in some cases, on the associated sediment concentrations).[355] The average post-remediation PCB EPCs in the top foot within the human health and ecological averaging areas are shown in Tables 7-14 through 7-19. (Table 7-14 also shows the post-remediation concentrations in the top 3 feet in Heavily Used Subareas.)

PCBs would remain at depths below those described above. Such deeper soil is generally not anticipated to be available for exposure under current uses. In the event that future exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional Solutions would be implemented where necessary to address potential risks from future uses that are reasonably anticipated based on realistic assumptions.

7.3.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 3 has included an assessment of the use of technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace technical components, as discussed below. Most aspects of the evaluation for this criterion are similar to those for FP 2 in that implementation would use conventional excavation, backfilling, and planting. However, FP 3 would be more complex than FP 2 in that it would impact 15 acres of vernal pools and 34 additional acres of various other habitats.

Use of Technology Under Similar Conditions

FP 3 relies primarily on the removal of floodplain soils followed by backfilling of the excavations and performance of restoration activities. Excavation of soils from floodplain environments has been implemented at a number of sites across the country, as discussed under FP 2 in Section 7.2.5.2. Restoration was discussed separately in Section 5.3.

General Reliability and Effectiveness

The removal and backfill of soil would reliably, effectively, and permanently reduce the concentrations of PCBs in the removal areas. Following backfilling, it is assumed that excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. However, there

[355] As discussed in Section 1.2, GE does not agree with many of the assumptions and inputs used in EPA's HHRA and ERA and thus does not agree that levels based on those risk assessments are an appropriate measure of risks to human health or the environment.

are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, 5.3.6.4 for deep marsh habitat, 5.3.7.4 for vernal pools, and 5.3.8.4 for forested upland habitats. For example, replacement of a mature forested community would take at least 50 to 100 years before it resembles current conditions and could be delayed by various intervening events, such as floods, the proliferation of invasive species, and/or browsing by deer or beaver. Restoration of shrub and emergent wetlands, as well as deep marshes, is subject to numerous uncertainties that could delay or prevent the return of pre-remediation conditions. Perhaps most significantly, due to the impacts of vernal pool remediation on the hydrology of the vernal pools, as well as on numerous other variables that control the functions of those pools, the ability to restore vernal pools to their full complement of pre-remediation functions is limited and highly susceptible to failure. This is particularly true for FP 3, since it would involve excavation in portions of 58 of the 66 vernal pools in the PSA, affecting a significant portion (43%) of the vernal pool acreage in the PSA. These issues are discussed further in Section 7.3.5.3.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 3, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, to identify areas (if any) where the backfill has eroded and needs repair, and to evaluate the conditions of the affected vernal pools and other wetlands. Any deficiencies noted during the inspections would subject to maintenance, repair, and other corrective actions performed as necessary and practicable. Periodic inspection of replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and perform any maintenance activities required following implementation of FP 3 are considered readily available. Because access roadways will be removed after construction, maintenance, if required, could be difficult to implement in certain areas of the floodplain, due to remoteness, wet areas, and vegetation growth. The ease of access may change based on seasonal conditions. It could be especially difficult to conduct supplemental planting activities in difficult-to-access locations, to which plant materials would have to be carried from the closest roadways.

Technical Component Replacement Requirements

If significant erosion, plant loss, or other problematic conditions were observed as part of the OMM program in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for, methods of, and practicability of repair. Depending on the timing and location of the repair, access roads and staging areas may need to be temporarily constructed in the floodplain. It is anticipated that if small repairs or replacement were necessary, they could be implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological receptors that use/inhabit the floodplain in these areas. The repair or replacement of larger areas could require more extensive disturbance in the floodplain.

7.3.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 3 on human health or the environment has included consideration of the following:

Potentially Affected Populations

Implementation of FP 3 would have long-term effects on humans and wildlife populations through changes in the natural environment and habitat. For humans, implementation of FP 3 would affect the aesthetics and recreational use of the floodplain. For wildlife, implementation of FP 3 would remove and replace several habitat types (described in Section 7.3.1). Wildlife associated with these habitats includes a variety of mammals, birds, reptiles, and amphibians. In particular, FP 3 would affect portions of the mapped Priority Habitats of 28 state-listed species, as described in Appendix L. The long-term impacts of FP 3 on the affected habitats and their associated biota are discussed in the next sections.

Overview of Long-Term Ecological Impacts

FP 3 would impact a total of approximately 76 acres, including 44 acres due to floodplain soil removal and an additional 32 acres (of which 15 acres are in the floodplain) for the construction and use of access roads and staging areas. The great majority of these impacts would occur in the PSA, particularly in Reach 5A. The most significant long-term ecological impacts would be expected to occur in the forested floodplain habitats, vernal pools, and the shrub and emergent wetlands, as described below.

Long-Term Impacts on Floodplain Forest Habitats and Biota

FP 3 would impact a total of approximately 18 acres of floodplain wetland forest habitats in the PSA (within the Woodlot habitat mapping coverage), including approximately 14 acres due to soil removal and 4 additional acres for access roads and staging areas. Within these affected areas, despite the implementation of restoration measures (as described in Section 5.3.4.3 above), the forested habitats and the biota that use them would experience a number of long-term adverse impacts. The long-term post-restoration impacts of remediation activities on floodplain forest habitats were described generally in Section 5.3.4.4. In summary, under FP 3, these impacts would include the following:

- *Change in Vegetative Cover/Loss of Mature Trees*. FP 3 would require the clearing and removal of all mature trees in the forested floodplain areas subject to soil removal or to the construction of access roads and staging areas. As discussed in Section 5.3.4.4, given the replanting of these forested areas, the plant community succession in these areas is expected to take at least 50 years to 100 years to return to the mature forest stage. However, even this estimate assumes that the succession process is not impeded by floods, colonization by invasive species, or browsing by mammals, all of which are uncertain. Moreover, even under optimum conditions, the developing forest would be an even-aged community for more than 25 years, with minimal structural profile diversity.

- *Loss of Coarse Woody Debris and Annual Leaf Litter.* The removal of trees would also result in the loss of woody debris that is used as structural wildlife habitat (i.e., for perching, basking, denning, nesting, cover, or escape habitat) and the loss of yearly leaf litter that is common on the floor of a forested wetland and that affects soil permeability, provides cover habitat for amphibians, reptiles, small mammals and invertebrates, and regulates soil temperatures and relative humidity in a wetland system.

- *Changes in Hydrology.* The loss of woody vegetation, reduction of coarse woody debris, presence of thinly vegetated area, and altered microtopography in the remediated areas would result in a decrease in floodplain roughness and a corresponding increase in flood flow velocities, with more erosion and less infiltration, in those areas. These alterations could affect the hydrologic conditions, including the flood flow alteration function, in localized portions of the floodplain, and could impede vegetative progression in those areas.

- *Changes in Soil Composition, Chemistry, and Stratigraphy.* Although an effort would be made to secure replacement soil for backfill that is as similar to existing soil, it is unlikely that commercially available soil would match existing soil, which has been created as a

result of countless flood events depositing sands and silts across the floodplain, with organic content increasing commensurate with the extent of biological activity and moisture regimes and containing viable seeds and other propagules from native floodplain plants. These changes in soil composition and chemistry would last in the affected areas for a considerable period of time. In addition, the use of heavy equipment in these areas would result in a long-term impact to soils in the form of compaction.

- *Impacts on Floodplain Forest Wildlife Community.* In the floodplain forest areas that are cleared, there would be a long-term impact on the ability of species that depend on the availability of mature trees and forested habitat to use those areas. In some portions of the PSA floodplain, these long-lasting openings in the floodplain under FP 3 would be substantial enough (see Figure 7-2a) that they would be expected to alter the suitability of the forested habitat to support a diverse interior forest wildlife community. Impacts on state-listed species are discussed separately below.

- *Fragmentation of Forested Floodplain*. In portions of the PSA where FP 3 would involve substantial clearing (see Figure 7-2), FP 3 would cause fragmentation of the existing forested floodplain/riparian corridor. This fragmentation would disrupt the dispersal and migratory movements of many wildlife species. For example, wildlife such as neotropical migratory song birds and some mammals like the fisher and bobcat rely on the forested nature of the floodplain to facilitate access and movement in the currently largely unfragmented forested riparian corridor. Such species could experience a long-term adverse impact to such movements from the loss of forested habitat in the floodplain under FP 3.

In summary, FP 3 would have significant long-term negative impacts in the forested areas that are cleared for soil remediation or access roads or staging areas, likely lasting for at least 50 to 100 years. However, since FP 3 would impact approximately 4% of the forested floodplain in the PSA, the forested floodplain impacts described in this section would not be widespread.

Long-Term Impacts on Vernal Pools and Vernal Pool Biota

FP 3 includes excavation and replacement of surface soils in 58 of the 66 vernal pools in the PSA. It would impact a total of approximately 15 acres of vernal pool habitat. It would also involve soil excavation and replacement and construction of access roads in portions of the areas around these vernal pools, as discussed further below. While these areas would be subject to restoration measures (as described in Section 5.3.7.3 above), they would experience a number of long-term adverse impacts that would substantially affect the biotic communities that rely on these vernal pools. The long-term post-restoration impacts

of remediation activities on vernal pools and their surrounding habitats were described generally in Section 5.3.7.4. In summary, under FP 3, these impacts would include the following:

- *Change in Hydrology*: The excavation and replacement of the surface soil and vegetation within and around portions of 58 vernal pools would change the sediment types and stratigraphy, microtopography, and foliage cover of these pools, as well as the surface flow patterns into and out of the pools. These changes would alter the hydrology of these pools. As discussed in Section 5.3.7.3 and noted above, the ability to restore the specific seasonal hydrology currently present within these vernal pools is limited and susceptible to failure. As a result, the remediated vernal pools may be wetter than desirable, allowing predator species such as green frogs, bullfrogs, certain invertebrates, or even fish, to colonize at the expense of existing vernal pool species; or the pools may dry faster than desirable, resulting in hydroperiods too short for obligate vernal pool species to successfully reproduce. Additionally, degraded water quality (e.g., from unstable soils), extended hydroperiods, and temperature increases due to loss of mature tree canopy can cause adverse effects on the developing amphibians; and they can cause excessive growth of filamentous algae or aquatics such as duckweed, which may adversely affect the pools' suitability for amphibian breeding.

- *Change in Vegetation*: While restoration of the vernal pools would include establishing vegetative cover, along with placement of other organic material such as leaf litter and coarse woody debris, the complex and mature organic vegetative composition (alive and dead) of these pools cannot be re-established in a predictable period of time, and numerous factors could derail the plant succession process and result in undesirable vegetative growth (e.g., invasive or other aggressive species). Moreover, some vegetation strata, such as mature trees around the periphery of the pools, which provide shade and organic matter (woody debris and falling leaves) to the pools, would take at least 50 to 100 years to recover if not impeded by floods or invasive species encroachment. Since FP 3 would involve excavation in so many vernal pools, there is a high potential for the proliferation of invasive or other undesirable species in many of those pools, which would further undermine the restoration efforts.

- *Changes in Soil Composition, Chemistry, and Stratigraphy.* As noted above, it is unlikely that replacement soils would have similar characteristics (including permeability, chemistry, and seed bank) to those of the current vernal pools in the PSA, which have formed over many years. This could lead to long-term changes in the composition of these soils. Moreover, the use of heavy equipment in the

remediation and restoration would result in a long-term impact to soils in the form of compaction.

- *Impacts on Surrounding Habitat*. As discussed in Section 5.3.7, habitats immediately adjacent to vernal pools are critical for maintaining water quality and providing shade and litter for the pool; and the proximate non-breeding terrestrial habitats, with features such as coarse woody debris and the burrows of small mammals, provide a variety of protective cover, temperature and moisture regulation, and overwintering habitat functions for the vernal pool amphibians. Even small impacts to these non-breeding habitats have the potential to reduce the value of these habitats. Thus, management guidelines recommend that impacts to non-breeding habitats within 100 feet of a vernal pool should be avoided, and that impacts to non-breeding habitats between 100 feet and approximately 750 feet from the pools should be substantially minimized – e.g., that in such areas, a development project should maintain a minimum of 75% of the zone in unfragmented forest with undisturbed ground cover (Calhoun and Klemens, 2002). FP 3 would affect varying portions of the 100-foot and 100- to 750-foot zones around the vernal pools in the PSA due to floodplain soil removal and construction of access roads. These impacts would range up to 49% of the 100-foot zone and up to 15% of the 100-750 foot zone around individual pools. In total, FP 3 would affect 12 acres within 100 feet and 50 acres within the 100- to 750-foot zones of the vernal pools in the PSA. These disturbances would disrupt important aspects of those areas' non-breeding functions for the vernal pool amphibians.

- *Impacts on Vernal Pool Biotic Community*. Re-establishment of the obligate vernal pool species community in the affected vernal pools would depend on the site-specific re-establishment of the variables described above – i.e., the hydrologic conditions in those pools, the substrate and topography within the pool, the composition and structure of the vegetation within and adjacent to those pools, and the extent of unfragmented forested habitat in the non-breeding habitats around the pools. Since FP 3 would impact the great majority of the vernal pools in the PSA, as well as portions of the surrounding non-breeding habitat, it is highly unlikely that the factors necessary to re-establish all these variables would coalesce to return all those pools to their pre-remediation function as breeding habitat for obligate vernal pool species. Moreover, these disturbances would create a high potential for predators (e.g., green frogs, bullfrogs) to invade individual vernal pools where they did not previously exist, and these predators could further undermine the re-establishment of the vernal pool functions. As a result of these factors, there would likely be a long-term or permanent loss of the sensitive vernal pool species (including wood frogs, spotted salamanders, and the state-listed Jefferson salamanders) from at least many of the vernal pools in the PSA. In particular, since FP 3 includes remedial measures

within the only cluster of vernal pools in the PSA documented to support the state-listed Jefferson salamander (46-VP-1 to 46-VP-5), it would undermine the long-term viability of this species within the PSA.

- *Loss of Connectivity to the Network*. Since FP 3 would involve remediation of most of the vernal pools in the PSA, as well as portions of the habitats between these pools, it would likely cause a long-term loss of connectivity among the vernal pools in the PSA and between vernal pools and other habitats used by the vernal pool species. This would, in turn, have a long-term adverse impact on the vernal pool animals in the PSA. For example, just north of the Pittsfield WWTP, the FP 3 remediation would impact over 10 vernal pools that occur in a concentrated network along the west side of the River. Under such circumstances, the network's ability to provide refugia for enough of the vernal pool community among these pools to sustain the long-term viability of this community is limited and improbable.

For the reasons discussed above, given the extensive vernal pool remediation under FP 3, it is unlikely that the full complement of characteristics that contribute to vernal pool functions would be re-established for many, if not most, of the 58 affected vernal pools.

Long-Term Impacts on Shrub and Emergent Marsh Habitats and Biota

FP 3 would impact a total of approximately 12 acres of shrub and emergent marsh habitats in the PSA (within the Woodlot habitat mapping coverage), including shrub swamp, shallow emergent marsh, wet meadow, and deep marsh habitats. These impacted areas include approximately 8 acres due to soil removal and approximately 4 additional acres for access roads and staging areas. While some of these impacts would be short-term in nature, others would last longer. The long-term post-restoration impacts of remediation activities on these wetland types were described generally in Sections 5.3.5.4 (for shrub and shallow emergent wetlands) and 5.3.6.4 (for deep marshes). In summary, under FP 3, these impacts could include the following in the areas subject to soil remediation or construction of access roads and staging areas:

- *Changes in Soil Stratigraphy.* The use of heavy mechanized equipment in remediation and restoration would result in compaction of the soils. This would make soils less friable and conducive to the formation of the necessary subterranean burrows required by certain animals for overwintering, would hinder or prolong the re-establishment of a native plant community, and would facilitate proliferation of invasive plant species. While scarification of the soils after placement of backfill or removal of the access roads would reduce the adverse effects from compaction, it would not eliminate such effects, which could last for a considerable period of time.

- *Changes in Soil Composition and Chemistry.* It is unlikely that replacement soils would match the existing soils of the shrub and emergent wetlands, which contain high organic content soils (typically silty muck or organic soils) that have formed over many decades and contain native seed banks. Pre-existing soil conditions would not return until the natural pattern of flooding has deposited enough silt and organic material over the backfilled areas, mainly from surrounding portions of the floodplain, to approximate their prior condition. This would be a slow process that depends on the frequency and extent of sufficiently large depositional flood events, which are irregular and unpredictable. It could take a decade or more for organic matter to build up to a point at which soil conditions would be comparable to prior conditions. As a result, the changes in soil composition could significantly affect the extent and type of plant growth and hydraulic conductivity in the affected areas for many years.

- *Changes in Hydrology.* The hydrology of these wetlands is complex since it is governed by the flow paths of the multiple sources of water that feed these systems, as well as topographic features of the wetlands themselves and the surrounding floodplain. The remedial construction activities in and around these wetlands would likely affect at least some of these flow paths and features and thus alter the hydrology of the wetlands. The ability to replace all these features in a way that would re-establish the pre-existing hydrology of the affected wetlands, and the length of time for that to occur, are uncertain.

- *Change in Vegetative Characteristics.* Due to the changes in soil composition and chemistry and in hydrological conditions (as described above), the vegetation currently present in the shrub and emergent wetlands is likely to change. These changes would last at least until soil and hydrological conditions comparable to pre-remediation conditions return so as to support a vegetative community similar to the pre-remediation community. Given the unpredictable and likely slow rate of organic soil accumulation and the uncertainty that the pre-existing hydrology of affected wetlands can be restored, it could take at least a decade to reach conditions that would support plant communities comparable to those now present; and it is uncertain whether certain sensitive species, such as the state-listed species, would return. Moreover, invasive species could expand into these disturbed areas, which would further interfere with the recovery process.

- *Impacts on Wildlife Community*. The return of wildlife communities comparable to the pre-remediation communities in these shrub and emergent wetlands would depend on the return of soil, hydrological, and vegetative conditions. As discussed above, the time for that to occur is uncertain, but could be a decade or more. During this period, many of the species that previously used these wetlands, including rare species (e.g., American bittern, common moorhen, wood turtle), would be absent,

and the return of the rare species is doubtful. At least 13 different state-listed species have the potential to utilize the shrub and emergent wetlands in the PSA, and would be adversely affected by the remediation in these habitats.

Overall, it is expected that the shrub and emergent marsh habitats disturbed by FP 3 would, over time, return to a condition where they would provide at least most of their current functions. However, this recovery time is uncertain and could take a decade or more. Further, the biotic communities that are re-established in these areas may not match pre-remediation communities in some respects. For example, there would be high potential for proliferation of invasive plants, and the return of certain sensitive species, including state-listed wildlife species, would be doubtful. In particular areas where a significant amount of these habitats would be disturbed, there is a higher likelihood that existing hydrological and soil conditions would not be fully restored and thus a higher likelihood of long-term adverse impacts on these habitats and the wildlife that use them. On the other hand, on an overall basis, as the extent of these shrub and emergent marsh habitats is relatively limited under FP 3 (amounting to about 3% of those habitats in the PSA), the impacts described in this section would not be widespread.

Long-Term Impacts on Upland Habitats

FP 3 would impact approximately 10 acres of various upland habitats (within the Woodlot habitat mapping coverage), including approximately 4 acres due to soil removal and the remaining 6 acres for access roads and staging areas. The impacted areas would include 8.3 acres of disturbed upland habitats (e.g., agricultural fields and cultural grasslands) and 1.7 acres of upland forest habitats.[356] The potential for long-term post-restoration impacts of remediation activities on these upland habitat types was described generally in Section 5.3.8.4 and is summarized below.

As indicated above, the majority of the upland acreage affected by FP 3 consists of already disturbed upland habitats, such as agricultural fields and cultural grasslands. Although certain individual effects could occur in these areas (such as disruption of nesting habitat for wood turtles), these habitats support altered or early successional plant communities that have limited ecological value, and thus no significant long-term adverse impacts would be expected from the remediation in these areas.

The remaining impact would occur to upland forest habitats, broadly dispersed through the PSA. The upland forest habitats provide good quality forest that is part of the overall

[356] In addition, as noted in Section 7.3.1, FP 3 would affect some upland areas outside the Woodlot habitat mapping coverage, including 11 acres of disturbed uplands and 5.7 acres of forested uplands.

wooded riparian/floodplain corridor of the Housatonic River. The clearing and removal of trees in these areas would have long-term adverse impacts on this habitat and the wildlife that use it due to the lengthy time necessary for the regrowth of mature trees, as discussed above for floodplain forests. Due to the limited extent and dispersed nature of these impacts, FP 3 would not be expected to have a major overall long-term impact on the upland forested habitats in the PSA, considered by themselves. However, these dispersed effects, in connection with the long-term impacts to floodplain forests, would contribute to the overall loss of forested habitats in the PSA.

Long-Term Impacts on State-Listed Species

As noted above, FP 3 would affect portions of the Priority Habitats of 28 state-listed species. As discussed in the MESA assessments in Appendix L, it is anticipated that FP 4 would involve a take of at least 26 of these species and would adversely affect a significant portion of the local population of at least 2 of them (Jefferson salamander and Tuckerman's sedge). The table below lists the 28 stated-listed species whose Priority Habitats would be affected by FP 3, along with those for which FP 3 would result in a take and those for which FP 3 would impact a significant portion of the local population:

Table 7-20 – Impacts of FP 3 on State-Listed Species

Species with Priority Habitat Affected by FP 3	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	Possibly
Arrow clubtail	Yes	No
Bald eagle	Possibly	No
Black maple	Yes	Possibly
Bristly buttercup	Yes	Possibly
Brook snaketail	Yes	Possibly
Bur oak	Yes	No
Common moorhen	Yes	No
Crooked-stem aster	Yes	Unlikely
Foxtail sedge	Yes	Unlikely
Gray's sedge	Yes	No
Hairy wild rye	Yes	Unlikely
Intermediate spike-sedge	Yes	Unlikely
Jefferson salamander	Yes	Yes

Species with Priority Habitat Affected by FP 3	Take?	Impact on Significant Portion of Local Population?
Mustard white	Yes	Unlikely
Narrow-leaved spring beauty	Yes	Unlikely
Ostrich fern borer moth	Yes	Unlikely
Rapids clubtail	Yes	No
Riffle snaketail	Yes	No
Skillet clubtail	Yes	No
Spine-crowned clubtail	Yes	No
Stygian shadowdragon	Yes	No
Triangle floater	Unlikely	No
Tuckerman's sedge	Yes	Yes
Wapato	Yes	Unlikely
Water shrew	Yes	Unlikely
Wood turtle	Yes	Likely
Zebra clubtail	Yes	No

Long-Term Impacts on Other Floodplain Functions

In addition to affecting the wildlife habitat functions described above, FP 3 would impair other functions provided by the floodplain for at least some period of time. As discussed in Section 5.3.4.1, these functions include groundwater recharge/discharge, flood flow alteration, and water quality maintenance, nutrient processing, and production exposure. The long-term impacts of floodplain soil removal and the construction of access roads and staging areas on these functions were described generally in Section 5.3.4.4. For example:

- Floodplain soil removal would alter soil moisture levels, soil infiltration rates, and groundwater flow. These changes, together with the sediment removal in the River, would alter the groundwater recharge/discharge function of the affected floodplain areas. While this function should return as flood deposition restores soil conditions and the disturbed areas become vegetated and root systems stabilize the floodplain soils, such a return could take many years and is dependent upon unpredictable flood dynamics.

- By removing coarse woody debris and vegetation and altering microtopography in the disturbed areas, remedial construction activities would reduce the floodplain roughness that produces flow resistance and thus contributes to the important flood

flow alteration function of the floodplain. These conditions could last for decades in the affected portions of the floodplain, during which time the floodplain's capacity to moderate flood flows would be reduced.

- The related functions of water quality maintenance, nutrient processing, and production export are dependent on hydrology, sediment transport and deposition, and plant productivity. The extent and duration of impacts on these functions would be influenced by the effects of riverbank stabilization/restoration measures on overbank flooding patterns, the loss of the floodplain plant community, and the rate and successional progression of regrowth of that community – all of which are unpredictable and could take decades.

Under FP 3, these impacts would occur in the disturbed areas and would have a long-term effect on these floodplain functions, at least in those localized areas.

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 3 would have some long-term impacts on the aesthetic features of the natural environment. The natural appearance of the floodplain after the remediation and restoration would not be the same as prior to remediation. As noted above, FP 3 would result in the loss of over 20 acres of forested communities (including both floodplain and upland forested areas). These areas would look markedly different for a long time after remediation because the time for a replanted forest community to develop an appearance comparable to its current appearance would be generally commensurate with the age of the community prior to remediation, which would be 50 to 100 years or more.

The floodplain areas that would be remediated under FP 3 include areas used for bank fishing, canoeing (canoe launches), hiking, general recreation, and both waterfowl and other game hunting. These recreational activities would be disrupted by the implementation of FP 3. These disruptions would last not only during the remediation period, but until the areas have sufficiently recovered to support such uses.

Potential Measures to Mitigate Long-Term Adverse Impacts

In an effort to mitigate long-term impacts to the floodplain following remedy implementation, a variety of restoration measures are available.[357] The restoration methods for the types of habitats that would be affected by FP 3 are described in the restoration methods

[357] Potential measures to avoid or minimize the adverse impacts were described in Section 5.2.

subsections in Section 5.3. However, as also described in that section and discussed above, implementation of these restoration methods would not prevent long-term impacts from the remediation, especially on the affected forested floodplain habitats and the vernal pools and the biota that depend on those habitats.

7.3.6 Attainment of IMPGs

This section describes the extent to which FP 3 would achieve the IMPGs for human health and ecological protection. These comparisons are presented in Tables 7-14 through 7-19 for the pertinent human and ecological averaging areas. The time frame to achieve the IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.3.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, as shown in Table 7-14, FP 3 (like FP 2) would achieve, at a minimum, the RME IMPGs based on a 10^{-4} cancer risk and a non-cancer HI of 1 in all 120 direct contact EAs. In addition, FP 3 would achieve the RME IMPGs based on a 10^{-5} cancer risk in 83 of these areas (including all the Frequent-Use EAs). Further, FP 3 would achieve the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all 12 of the Heavily Used Subareas.

FP 3 also would achieve the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all 14 of the farm areas evaluated for consumption of agricultural products (Table 7-15).

These comparisons are shown in greater detail in Tables 7-14 and 7-15 for all of the human direct contact exposure areas and agricultural products consumption averaging areas evaluated in Reaches 5 through 8.[358]

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[358] In addition to the comparisons mentioned in the text, as shown in Tables 7-14 and 7-15, FP 3 would achieve the RME IMPGs based on a 10^{-6} cancer risk in 9 EAs and 3 Heavily Used Subareas and in 5 farm areas evaluated for consumption of agricultural products. However, it would achieve the CTE IMPGs based on a 10^{-6} cancer risk in 118 EAs and all 12 Heavily Used Subareas and in 13 farm areas evaluated for consumption of agricultural products.

Note that the post-remediation EPCs listed in these tables were not calculated based solely on the human health removal volumes shown on the tables. The post-remediation EPCs were calculated based on the entire removal for FP 3 (including that which occurred for ecological receptors and overlapped the human health areas). The amount of removal shown on the human health IMPG tables is only what would be needed to achieve the human health IMPGs.

7.3.6.2 Comparison to Ecological IMPGs

FP 3 would achieve levels within (or below) the IMPG ranges for amphibians and omnivorous/carnivorous mammals in all averaging areas and would achieve levels within the IMPG ranges for insectivorous birds and piscivorous mammals depending on the associated sediment concentrations,[359] as described below:

- For amphibians, FP 3 would achieve the upper-bound amphibian IMPG (5.6 mg/kg) in all 66 of the vernal pools evaluated in the PSA; it would also achieve the lower-bound IMPG (3.27 mg/kg) in 17 of those pools (Table 7-16).[360]

- For omnivorous/carnivorous mammals, FP 3 would achieve the upper-bound IMPG (34.3 mg/kg) in all 7 of the averaging areas; it would also achieve the lower-bound IMPG (21.1 mg/kg) in 5 of those areas (Table 7-17).

- For insectivorous birds, FP 3 would achieve the target floodplain soil IMPGs in all 12 of the averaging areas in the PSA if the associated sediment concentration in those areas were 3 mg/kg or less, and in 10 of those 12 areas if the associated sediment concentration were 5 mg/kg (Table 7-18).[361]

- For piscivorous mammals, FP 3 would achieve the upper-bound target floodplain soil IMPG levels in both averaging areas if the associated sediment concentration in those areas were 1 mg/kg or less (Table 7-19). It would also achieve the upper-bound target floodplain soil IMPG level in one of the two averaging areas (Reaches 5C/5D/6) if the associated sediment concentration in that area were 3 mg/kg, but would not achieve

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[359] In the evaluation of combined sediment and floodplain alternatives presented in Section 8, FP 3 has been paired with SED 3. The evaluation of that combination of alternatives in Section 8.2.5.2 has assessed the attainment of the IMPGs for insectivorous birds and piscivorous mammals based on the actual sediment concentrations achieved under SED 3, thus avoiding the need to consider the pre-determined target sediment levels of 1, 3, and 5 mg/kg (see also Section 2.2.2.3).

[360] The attainment of PCB levels below the upper-bound amphibian IMPG in all vernal pools under FP 3 would be achieved only through extensive excavation and soil replacement in most (58) of those pools and their associated non-breeding habitat. As shown in Section 7.3.5.3, those activities would have substantial and long-lasting adverse impacts on the vernal pool amphibians that the IMPGs are designed to protect, including the potential permanent loss of those amphibians from the pools.

[361] FP 3 would not achieve the insectivorous bird soil IMPGs in 2 of the 3 averaging areas in Reach 5B if the associated sediment concentration were 5 mg/kg. In such a case, the removal of an additional 17,000 cy of soil from those 2 averaging areas would be needed to achieve the floodplain soil IMPG level for insectivorous birds in those areas.

those target levels in either averaging area if the associated sediment concentration were higher.[362]

These comparisons are shown in detail in Tables 7-16 through 7-19 for all ecological averaging areas in the PSA.

7.3.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 3 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

Reduction of Toxicity: FP 3 does not include any treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during the excavations (which is not anticipated), those wastes would be segregated and sent off-site for treatment and disposal.

Reduction of Mobility: As previously noted, the existing conditions of the floodplain are predominantly depositional and stable due to generally low water velocities during inundation and the presence of vegetation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 3 would reduce the volume of PCB containing soils and the mass of PCBs in the floodplain by removing 74,000 cy of soils containing approximately 9,800 lbs of PCBs from 44 acres of the floodplain.

7.3.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 3 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and on workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the

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[362] At an assumed sediment concentration of 3 mg/kg, FP 3 would require the removal/backfill of an additional 201,000 cy (approximately 124 acres) of floodplain soil to achieve the upper-bound piscivorous mammal IMPG in the Reach 5C/5D/6 averaging area. If the sediment concentration were 5 mg/kg, attainment of the upper-bound IMPG could be achieved in the Reach 5C/5D/6 averaging area with the removal of an additional 14,000 cy (approximately 9 acres) of floodplain soil; however, the IMPG for the Reach 5A/5B averaging area could not be achieved with any amount of additional soil removal because the PCBs levels in aquatic prey items alone would exceed the IMPG at that sediment concentration.

performance of the remedial activities in a given area. Since the remedial activities associated with FP 3 would be spread out over the overall remedial action period and area, the short-term impacts would not last for the entire duration of the project in all affected areas. However, since the geographical extent and overall duration of remediation activities under FP 3 would be greater than under FP 2, the short-term impacts would be more extensive and would occur over a longer time period in the Rest of River area.

Impacts on the Environment – Ecological Effects

As previously discussed, construction activities under FP 3 would impact a total of approximately 76 acres (both within and outside the PSA), including 44 acres due to floodplain soil removal and 32 acres (of which 15 acres are in the floodplain) for access roads and staging areas. The short-term effects on the environment resulting from these construction activities include the removal of plant and wildlife habitat in those areas of the floodplain where such construction activities would occur. Short-term ecological impacts specifically associated with each habitat type are described below.

Floodplain Forest Habitat. Short-term impacts would include the direct loss of 14 acres of forested floodplain habitat in the PSA due to soil removal, plus the loss of 4 acres due to construction of access roads and staging areas. As discussed generally in Section 5.3.4.2, these activities would involve or cause the following immediate and near-term impacts in those areas:

- Removal of all living trees, shrubs, and other vegetation, as well as associated biomass (e.g., limbs, stumps, roots);
- Removal of dead tree snags and downed woody debris;
- Replacement of existing native soil and leaf litter with commercial backfill that has different characteristics, affecting plant growth and hydraulic conductivity;
- Compaction of soil due to use of heavy machinery, with consequent impacts on the permeability of the soils;
- Loss of cover, nesting, and feeding habitat for wildlife species that rely on forested floodplains (including state-listed rare species);
- Likely increase in colonization of the disturbed areas by invasive plant species;
- Reduction in the floodplain roughness (created by the dense woody and herbaceous vegetation, woody debris, varied microtopographic surface features, and sinuous flow

paths) that produces flow resistance, resulting in a likely change in the floodplain's flood flow alteration function in the affected area; and

- Increase in construction and equipment traffic, which could disrupt some forest animals or result in mortality to certain slow-moving smaller animals.

Vernal Pool Habitat. FP 3 would involve remedial construction activities in portions of 58 different vernal pools in the PSA, covering an area of 15 acres, as well as in 12 acres (for soil remediation and access roads) within 100 feet of those pools and 50 acres within the 100- to 750-foot zones of the pools. As discussed generally in Section 5.3.7.2, these activities would involve or cause the following immediate and near-term impacts:

- Removal and replacement of the surface soil, together with the vegetative cover, tree stumps and roots, and woody debris, in portions of a majority of the vernal pools in the PSA, resulting in the mortality of any amphibian and invertebrate eggs, larvae, or adults in those portions of the pools at the time of construction and removal of physical components of the pools (organic soils and other organic materials) that are critical to their ecology;

- Alteration of the hydrology of the vernal pools by changing the in-pool characteristics that determine the hydrology (e.g., sediment types and stratigraphy, microtopography, foliage cover), as well as characteristics that determine flows into and out of the pools;

- Replacement of existing vernal pool sediment/soil and leaf litter with soils with different characteristics, as well as compaction of the sediment/soil due to use of heavy machinery;

- Tree clearing within and adjacent to these vernal pools, reducing the shade and infusion of biomass (woody debris and falling leaves) provided to the pools;

- Loss of obligate vernal pool breeding species from all or parts of these pools, including the state-listed Jefferson salamander;

- Likely increase in colonization by invasive species;

- Negative impacts on the non-breeding terrestrial habitats surrounding the vernal pools, disrupting the protective cover, temperature and moisture regulation, and overwintering habitat functions provided by those habitats for the vernal pool amphibians; and

- Due to the large number of vernal pools affected, loss or fragmentation of landscape connectivity among networks of vernal pools in the PSA and between vernal pools and non-breeding habitats.

Shrub and Emergent Marsh Habitats. FP 3 would affect a total of 12 acres of shrub and emergent marsh habitats in the PSA (including shrub swamp, shallow emergent marsh, wet meadow, and deep marsh), including approximately 8 acres due to soil removal and 4 acres for access roads and staging areas. As discussed generally in Sections 5.3.5.2 (for shrub and shallow emergent wetlands) and 5.3.6.2 (for deep marshes), these activities would involve or cause the following immediate and near-term impacts in those areas:

- Clearing of all vegetation, with consequent impacts on nesting, burrowing, and/or escape habitat and food for birds, amphibians, reptiles, mammals, and invertebrates that use these wetland areas;

- Replacement of existing silty organic soils with imported soils having different characteristics, with consequent adverse effects on plant growth and hydraulic conductivity;

- Compaction of the soils of these wetlands by heavy machinery, affecting the permeability of these soils, which influences plant colonization;

- Alteration of the hydrology of the wetlands due to impacts on the flow paths into and out of the wetlands and on the topography within and around the wetlands;

- Loss of rare species;

- Likely colonization by invasive species; and

- Increase in construction and equipment traffic, which could disrupt some wetland animals or result in mortality to certain slow-moving smaller animals.

Upland Habitat: The short-term impacts associated with the removal of 8.3 acres of disturbed upland habitat and 1.7 acres of upland forest in the PSA would be limited as the amount of area impacted by that removal is relatively small. While FP 3 would further disturb the disturbed upland habitats, the short-term ecological significance of those disturbances would be lower than those that would occur in the habitats discussed above due to the relatively lower value of these upland habitats. On the other hand, the removal of the upland forest habitats (which are part of the overall wooded riparian/floodplain corridor of the Housatonic River), while small by itself, would contribute incrementally to the overall

loss of forested habitat resulting from FP 3, as described above, and the consequent effects on wildlife that depend on that corridor.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 3.

The total carbon footprint associated with FP 3 has been estimated to be 8,600 tonnes of GHG emissions. Of this total, approximately 7,400 tonnes are associated with direct emission sources (primarily construction activities, tree removal, and restoration/replanting), while approximately 1,200 tonnes are associated with off-site emissions (primarily refinement of diesel fuel and excavation of backfill materials, gravel, and sand). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 1,600 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 3 would result in short-term impacts to the local communities along the River. These short-term effects would include disruption of recreational activities along the River and within the floodplain due to the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities. Construction activities would affect certain recreational areas along the River. As noted above, these include areas of bank fishing, canoeing (canoe launches), hiking, general recreation, and both waterfowl and other game hunting. During the period of active construction, restrictions on recreational use of the floodplain would be imposed in the areas in which remediation-related activities are taking place. Due to safety considerations, boaters, anglers, hikers, and other recreational users would not be able to use the floodplain in the areas where remediation-related activities are being conducted. In addition, the presence of heavy construction equipment and cleared areas would adversely affect the visually undisturbed nature of the area.

Increase in Truck Traffic. Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would significantly increase during the construction period. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment facilities, it would take a total of 6,110 trips to do so (an average of 2,040 truck trips per year for a three-year remediation project). Additional truck trips would be necessary to transport backfill

materials, as well as materials for the construction of staging areas and access roads, to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 8,500 truck trips (2,800 truck trips per year) would be necessary for that purpose. This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the construction zone could affect any residents and businesses located in the immediate vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport backfill to the site and to dispose of used staging area/access road materials.[363] This analysis indicates that the increased truck traffic associated with FP 3 (an estimated total of 810,000 vehicle miles, 266,000 average vehicle miles per year) would result in an estimated 0.38 non-fatal injuries due to accidents (average annual non-fatality injury estimate of 0.13) with a probability of 32% of at least one such injury, and an estimated 0.02 fatalities from accidents (average annual fatality estimate of 0.006) with a probability of 2% of at least one such fatality.

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts. A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 3 on the affected communities.[364] These measures would consist of the ones identified in Section 5.7 and summarized in Section 7.2.8 above. Despite the implementation of these measures, however, short-term impacts of construction activities on the local communities from FP 3 would be inevitable.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 3. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 3 is estimated to involve 138,810 labor-hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 3 would result in an estimated

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[363] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

[364] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2.

1.29 non-fatal injuries to workers (average annual non-fatality injury estimate of 0.43) with a probability of 72% of at least one such injury, and an estimated 0.011 worker fatalities (average annual fatality estimate of 0.004) with a probability of 1.1% of at least one such fatality.

7.3.9 Implementability

7.3.9.1 Technical Implementability

The technical implementability of FP 3 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

General Availability of Technology: The equipment, materials, technology, procedures, and personnel necessary to implement FP 3 are expected to be readily available. FP 3 would use conventional heavy construction equipment to excavate and transport floodplain soils, as well as to bring in and place backfill and restoration materials. Such equipment would include excavators, bulldozers, and dump trucks. In wetlands and vernal pool settings, smaller pieces of excavating equipment and low ground pressure excavators that could more easily move into soft soils, or long-reach excavators able to reach from dry areas into wetlands, may be more efficient. In some settings, it may be necessary to use conventional construction equipment along with wetland mats to support the weight of the equipment.

These technologies have been used at other sites. Given the physical characteristics of the floodplain and the availability and known reliability of construction equipment and materials (with the exception of commercially available soils that would replicate existing wetland soils, as discussed in Section 7.3.5.3), FP 3 would be technically implementable. Further, methods to implement monitoring and institutional controls are expected to be readily available.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be utilized in FP 3 is suitable for implementation in the areas where it would be applied. The construction of access roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. In the long term, floodplain areas would be backfilled and returned to approximate original elevations, to the extent practical, to maintain the flood storage capacity of the floodplain.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country, as described in Sections 7.2.5.2 and 7.3.5.2. However, restoration efforts would not reliably result in re-establishment of the pre-remediation conditions and functions of at least some of the affected habitats, as noted above and discussed the relevant subsections of Section 5.3. Under FP 3, this is particularly true for the numerous vernal pools that would be affected.

Availability of Support Facilities and Resources: Implementation of FP 3 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 32 acres of space would be needed for such facilities and appear to be available based on a conceptual site layout. In addition, sufficient backfill (albeit not soil that would match existing wetland soil) and planting materials are expected to be readily available for implementation of FP 3.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available and their use and effectiveness for this type of material removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measure (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 3 would be assessed by visual observation to evaluate such factors as vegetation re-growth and any signs of erosion or disturbance of restored areas. Monitoring procedures would be straightforward and implementable.

7.3.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 3 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 3 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 3 is provided in Tables F-3.a through F.3-c in Appendix C and summarized in Section 7.3.4.

Access Agreements: Implementation of FP 3 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is currently anticipated that access agreements would be required from approximately 25 to 30 other landowners. Obtaining such access agreements could be difficult and time-consuming in some cases. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 3 would require coordination with EPA and MDEP. In addition, obtaining access to state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 3, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.3.10 Cost

The estimated total cost for implementation of FP 3 is $29.5 M (excluding the costs of treatment/disposition of excavated soil). The estimated capital cost for implementation of FP 3 is $28.2 M, assumed to occur over a 3-year construction period. Estimated annual OMM costs (for a 5-year inspection and maintenance program for restored excavation and staging/access road areas) range from $3,000 to $143,000 per year (depending on which reach is being monitored), resulting in a total cost of $1.3 M. The following summarizes the total costs estimated for FP 3.

FP 3	Est. Cost	Description
Total Capital Cost	$28.2M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$1.3 M	Costs for performance of the OMM programs
Total Cost for Alternative	$29.5 M	Total cost of FP 3 in 2010 dollars

The total estimated present worth of FP 3, which was developed using a discount factor of 7%, a 3-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $26.4 M. More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of associated sediment/riverbank remediation or the costs of treatment/disposition of the removed floodplain soils. The estimated costs for the combination of FP 3 and SED 3 is presented in Section 8.2.9, and the estimated costs for combinations of FP 3 with the various treatment/disposition alternatives are presented in Section 10.

7.3.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.3.2, the evaluation of whether FP 3 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 3 would be effective in reducing the potential for human and ecological exposure to PCBs in floodplain soils by the removal of 74,000 cy of PCB-containing soil containing 9,800 lbs of PCBs. The removed soil would be replaced with clean backfill, which would be revegetated. However, FP 3 would also have substantial long-term adverse impacts on many species, including the likely loss of some sensitive species from portions of the PSA, as discussed in Section 7.4.5.3, and thus would actually increase the risks to biota in the Rest of River as a result of habitat loss.

Compliance with ARARs: As discussed in Section 7.3.4, FP 3 could be designed and implemented to achieve many of the ARARs pertinent to this alternative, but several potential ARARs would not be met. As a result, to the extent that those regulatory requirements constitute ARARs, those that would not be met would need to be waived by EPA as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: Accepting EPA's HHRA, FP 3 would be protective of human health. As discussed in Section 7.3.6.1, implementation of this alternative would achieve the RME IMPGs based on a 10^{-4} cancer risk or lower (i.e., levels within EPA's acceptable risk range) and a non-cancer HI of 1 in all direct-contact EAs. It would also achieve levels that are at or below the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in the majority of direct contact EAs, including all Frequent-Use Areas and all Heavily Used Subareas, and in all farm areas evaluated. FP 3 would further ensure protection of human health through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses based on realistic assumptions.

Environmental Protection: As discussed in Section 7.3.6.2, FP 3 would achieve floodplain soil levels within the range of IMPGs for ecological receptors, depending, in some cases, on the associated sediment concentrations. Specifically, FP 3 would achieve soil PCB levels

within or below the range of the IMPGs for amphibians in all 66 vernal pools evaluated and within or below the IMPG range for omnivorous/carnivorous mammals in all seven averaging areas. In addition, FP 3 would achieve the target floodplain soil IMPG levels for insectivorous birds in all 12 averaging areas if the associated sediment concentration in those areas is 3 mg/kg or less, and it would achieve levels within the range of the target floodplain soil IMPG levels for piscivorous mammals in both of the PSA averaging areas if the associated sediment concentration in those areas is 1 mg/kg or less. FP 3 would not achieve the IMPG for insectivorous birds in 2 of 12 averaging areas if the associated sediment concentration were 5 mg/kg, and would not achieve the IMPGs for piscivorous mammals in one or both of the two averaging areas if the associated sediment concentration were 3 or 5 mg/kg.

As previously noted, achievement of IMPGs is a balancing factor under the Permit; it is not determinative of whether an alternative would provide overall environmental protection. For similar reasons to those discussed in Section 7.2.11, the IMPG exceedances for certain animals would not be expected to prevent the maintenance of healthy local populations of these animals, let alone adversely impact the overall wildlife community in the Rest of River area. This is shown by the fact that the local populations of these animals extend beyond the individual averaging areas and by the field survey information documenting the presence of numerous and diverse plant and animal species, including state-listed rare species, in the PSA despite the fact that PCBs have been present in the floodplain soil for over 70 years.

On the other hand, as EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d). In this case, as discussed in Sections 7.3.8 and 7.3.5.3, implementation of FP 3 would result in substantial short-term and long-term adverse impacts on the environment as a result of its removal or disturbance of 76 acres of land, including 18 acres of mature floodplain forest, 15 acres of vernal pools, and 12 acres of shrub and emergent wetlands in the floodplain of the PSA.[365] The removals and disturbances in these sensitive floodplain habitats would have long-lasting negative consequences for the plants and animals that utilize those habitats. In particular, given the extensive vernal pool excavations to achieve levels within the range of

[365] Further, as discussed in Section 7.3.6.2, very extensive additional removals would be necessary to achieve the IMPGs that would not already be achieved by FP 3 (e.g., up to an additional 200,000+ cy of floodplain soil to address piscivorous mammals). These removals would cause massive additional long-term and short-term adverse ecological impacts that would clearly be unjustified.

the amphibian IMPGs, FP 3 would cause severe harm to the vernal pool amphibians that those IMPGs are designed to protect, and it is unlikely at least many of those pools would ever return to their current level of function for those amphibians. As stated by EPA (2005d, p. 6-6), "it is important to determine whether the loss of a contaminated habitat is a greater impact than the benefit of providing a new, modified but less contaminated habitat." That is exactly the situation for the vernal pools in the PSA under FP 3.

Summary: Based on the above considerations, FP 3 would meet the standard of providing overall protection of human health. However, due to the substantial short-term and long-term ecological harm that would result from implementation of that alternative, particularly to the vernal pools in the PSA, FP 3 would not meet the standard of providing overall protection of the environment.

7.4 Evaluation of Floodplain Alternative 4

7.4.1 Description of Alternative

FP 4 would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet the mid-range RME IMPGs for human health and upper-bound IMPGs for ecological receptors. Specifically, this alternative has been developed to achieve the following IMPGs:

- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a non-cancer HI of 1, whichever is lower) based on direct contact with floodplain soils;

- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a non-cancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain; and

- The upper-bound floodplain IMPGs for ecological receptors – i.e., amphibians (represented by wood frogs), omnivorous/carnivorous mammals (represented by shrews), insectivorous birds (represented by wood ducks), and piscivorous mammals (represented by mink) – using for the latter two receptors, the floodplain soil IMPGs associated with a sediment target level of 1 mg/kg.

This alternative would involve removing and replacing floodplain and vernal pool soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use EAs (described in Section 4.2.1 and shown on Figures 4-

3a-d) as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment in these areas that are equal to or less than the mid-range IMPGs based on human direct contact. Average concentrations have been based on the 95% UCL of the spatially weighted mean, as discussed in Section 4.4.2.

Summary of Removal Areas and Volumes

FP 4 would involve the removal of approximately 121,000 cy of soil from 72 acres of the floodplain (including approximately 15 acres of vernal pools). The locations of these removal areas are shown on Figure 7-3, and a detailed breakdown of the removal areas, volumes, and resulting EPCs associated with FP 4 is included in Tables 7-21 through 7-26.

The areas of soil removal under FP 4 would be similar to those for FP 3 plus removal from an additional 28 acres to achieve the mid-range human health IMPGs. The 121,000 cy removal volume includes 97,000 cy (57 acres) associated with achieving the direct contact IMPGs for human health and 24,000 cy (15 acres) associated with achieving the upper-bound IMPG for amphibians in vernal pools.

Summary of Affected Habitat

FP 4 would involve the removal and backfill of soil across approximately 72 acres in various types of habitats. The approximate acreages of those general habitat types, with associated removal volumes, are as follows:[366]

- 15 acres (24,000 cy) of vernal pool habitat, which include portions of 58 different vernal pools;
- 40 acres (67,000 cy) of floodplain wetland forest habitats (consisting of high-terrace floodplain forest, transitional floodplain forest, red maple swamp, and black ash-red maple-tamarack calcareous seepage swamp);
- 9.2 acres (15,000 cy) of shrub and shallow emergent wetland habitats (consisting of shrub swamp, wet meadow, and shallow emergent marsh);

[366] This detailed breakdown of removal areas and volumes by habitat type was generally conducted using the Woodlot (2002) habitat community mapping between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. As noted above, both the acreages of impact and the removal volumes have been rounded, with the result that the sum of the numbers given for each habitat type may not exactly match the total impacted acreage and removal volume for the alternative.

- 0.2 acre (300 cy) of deep marsh habitat;
- 4.0 acres (7,000 cy) of disturbed upland habitats (consisting of agricultural field habitat and cultural grasslands habitat);
- 1.2 acres (3,000 cy) of upland forested habitats (consisting mainly of northern hardwoods-hemlock-white pine forest and red oak-sugar maple transition forest); and
- 2.8 acres (5,000 cy) of habitat of currently unmapped community type.[367]

In addition to the above-described areas associated with excavation/backfill activities, floodplain habitat would be affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 4 would require 21 staging areas, which would occupy a total of 9.5 acres (about 2.7 acres of which would be within the floodplain), and 11 miles of temporary access roads covering 27 additional acres assuming a 20-foot road width (5.9 miles and 14 acres of which would be within the floodplain). These facilities would be located in all of the above habitats, with those located within the Woodlot (2002) mapping coverage situated mainly in floodplain forest (4.5 acres), shrub and shallow emergent wetlands (4.5 acres), and disturbed upland habitats (5.6 acres).[368] The locations of these staging areas and access roads are shown on Figure 7-3.

Conceptual Remedial Approach

The conceptual remedial approach for FP 4 would be generally the same as that described for FP 2 and FP3, except that it would cover a greater area. Conventional construction equipment would be used to construct access roads and staging areas, clear and grub existing vegetation, remove and replace soil, and conduct restoration activities. As described for FP 3, some specialized construction equipment, materials, and specific

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[367] These impacts would occur mostly in the Reach 7 floodplain, where the Woodlot habitat community mapping is absent. Based on review of information from MassGIS and aerial photography, remediation activities under FP 4 within Reach 7 would be conducted mainly in forested uplands (1.2 acre) and wet meadow/emergent marsh habitats (1.3 acre).

[368] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 4 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed upland areas (12 acres), with additional impacts occurring in forested uplands (4.7 acres), forested wetlands (0.2 acre) and wet meadow/emergent marsh (0.5 acre). Access roads and staging areas in Reach 7 would impact approximately 1.5 acres (1.1 acres of forested uplands and 0.4 acre of wetlands). There would be no impacts in Reach 8 from construction of access roads or staging areas.

engineering practices would be used in an effort to mitigate the potentially negative impacts of construction in and around vernal pools and other wetland areas.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 4 were selected, considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs, in an effort to minimize impacts on sensitive habitats and local communities to the extent practical (see Section 5.2.2). As described for the alternatives discussed above, areas were specifically selected based on accessibility, existing land use, habitat use, and location relative to the floodplain; and an effort was made, where practicable, to avoid sensitive wildlife habitats (e.g., forested floodplain areas, vernal pools, other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. This evaluation has lead to the locations of staging areas and access roads shown on Figure 7-3. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

For purposes of the evaluations in this Revised CMS Report, it is assumed that FP 4 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. The restoration methods that are assumed to be utilized under FP 4, subject to development of a more detailed restoration plan during design, would include the conceptual methods described in Section 5.3.4.3 for the floodplain forest habitat, Section 5.3.5.3 for the shrub and shallow emergent wetlands, Section 5.3.6.3 for the deep marshes, Section 5.3.7.3 for the vernal pools, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that FP 4 would take approximately 5 years to complete if implemented independently from River-related remedial activities. However, assuming that floodplain remediation would be coordinated with sediment remediation, the time to complete FP 4 could be different, depending on the sediment remediation alternative selected. Nevertheless, for purposes of the evaluations in this section, it has been assumed that implementation of FP 4 would take 5 years.

In addition to soil removal and backfill, FP 4 would include institutional controls and/or other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted of the backfilled/restored areas. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program are anticipated to include those described in Section 4.5 and outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.4.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs; (b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 4 would be protective of human health and the environment is presented at the end of Section 7.4 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.4.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River. As stated previously, the floodplain is generally flat, well vegetated and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and be transported to the River.

Open excavations during construction could serve as a short-term temporary source of some releases during an extreme weather event. Such potential releases would be controlled using conventional engineering practices.

7.4.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 4 in accordance with directions from EPA are listed in Tables F-4.a through F-4.c in Appendix C.[369] FP 4 could be designed and implemented to achieve many of those

[369] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

ARARs,[370] but, as with FP 3, there are a number of potential location-specific and action-specific ARARs that would not be met by FP 4. These are the same potential ARARs as described in Section 7.3.4 for FP 3 and include a number of federal and state regulatory requirements relating to ecological protection (including regulations applicable to the Upper Housatonic ACEC). To the extent these requirements would constitute ARARs, they would need to be waived by EPA as technically impracticable to meet (or on some other ground) under CERCLA and the NCP.

In addition, for the same reasons discussed for FP 2 in Section 7.2.4, it is possible that, in the unlikely event that excavated floodplain soils should be found to constitute hazardous waste (which is not anticipated) and that the temporary staging areas for the handling of those soils are subject to federal and/or state hazardous waste regulations, the staging areas may not meet certain locational and/or technical requirements for the storage of hazardous waste. In that unlikely event, as also discussed in Section 7.2.4, those requirements should be waived by EPA as technically impracticable to meet.

7.4.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness for FP 4 includes evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

7.4.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 4 includes consideration of the extent to which and time over which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 4 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 121,000 cy of PCB-containing soil over 72 acres of floodplain (see Figure 7-3). The reduction in potential exposure and associated risk would occur upon completion of the remediation in a given area.

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[370] As discussed for FP 2 in Section 7.2.4 (footnote 336), it is assumed that EPA would make the determinations necessary in connection with certain requirements.

As discussed further in Section 7.4.6.1, the average floodplain soil concentrations in all of the human health averaging areas following implementation of FP 4 would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a cancer risk of 10^{-5} and a non-cancer HI of 1. In addition, as discussed in Section 7.4.6.2, implementation of FP 4 would result in average concentrations equivalent to or lower than the upper-bound ecological IMPGs based on EPA's ERA (depending, in some cases, on the associated sediment concentrations).[371] The average post-remediation PCB EPCs in the top foot within the human health and ecological averaging areas following implementation of FP 4 are shown in Tables 7-21 through 7-26. (Table 7-21 also shows the post-remediation concentrations in the top 3 feet in Heavily Used Subareas.)

PCBs would also remain at depths below those described above. Such deeper soil is generally not anticipated to be available for exposure under current uses. In the event that future exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional Solutions would be implemented where necessary to address potential risks from future uses that are reasonably anticipated based on realistic assumptions.

7.4.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 4 has included an assessment of the use of technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace technical components, as discussed below. The technology and implementation of FP 4 would be generally the same as described for FP 3.

Use of Technology Under Similar Conditions

FP 4 relies primarily on the removal of floodplain soils, followed by backfilling of the excavations and performance of restoration activities. Excavation of soils from floodplain environments has been implemented at a number of sites across the country, as discussed under FP 2 in Section 7.2.5.2. Restoration was discussed separately in Section 5.3.

General Reliability and Effectiveness

The removal and backfill of soil would reliably, effectively, and permanently reduce the concentrations of PCBs in the removal areas. Following backfilling, it is assumed that

[371] As discussed in Section 1.2, GE does not agree with many of the assumptions and inputs used in EPA's HHRA and ERA and thus does not agree that levels based on those risk assessments are an appropriate measure of risks to human health or the environment.

excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. However, there are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, 5.3.6.4 for deep marsh habitat, 5.3.7.4 for vernal pools, and 5.3.8.4 for upland habitats. These constraints are generally similar to those discussed for FP 3 in Sections 7.3.5.2 and 7.3.5.3 and are discussed further for FP 4 in Section 7.4.5.3.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 4, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, to identify areas (if any) where the backfill is eroding and in need of repair, and to evaluate the conditions of the affected vernal pools and other wetlands. Any deficiencies noted during the inspections would be subject to maintenance, repair, and other corrective actions performed as necessary and practicable. Periodic inspection of the replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and perform any maintenance activities required following implementation of FP 4 are considered readily available. Because access roadways will be removed after construction, maintenance, if required, could be difficult to implement in certain areas of the floodplain, due to remoteness, wet areas, and vegetation growth. The ease of access may change based on seasonal conditions. It could be especially difficult to conduct supplemental planting activities in difficult-to-access locations, to which plant materials would have to be carried from the closest roadways.

Technical Component Replacement Requirements

If significant erosion, plant loss, or other problematic conditions were observed as part of the OMM program in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for, methods of, and practicability of repair. Depending on the timing and location of the repair, access roads and staging areas may need to be temporarily constructed in the floodplain. It is anticipated that if small repairs or replacement were necessary, they could be implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological

receptors that use/inhabit the floodplain in these areas. The repair or replacement of larger areas could require more extensive disturbance in the floodplain.

7.4.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 4 on human health or the environment has included consideration of the items discussed below. The primary difference between FP 4 and the alternatives discussed above is that FP 4 would adversely impact more of the PSA.

Potentially Affected Populations

Implementation of FP 4 would have long-term effects on human and wildlife populations through changes in the natural environment and habitat. Since this alternative involves more extensive floodplain disturbance than FP 3, the potential for such impacts is correspondingly greater. For humans, implementation of FP 4 would affect the aesthetics and recreational use of the floodplain. For wildlife, implementation of FP 4 would remove and replace several habitat types (described in Section 7.4.1). Wildlife associated with these habitats includes a variety of mammals, birds, reptiles, and amphibians. In particular, FP 4 would affect portions of the mapped Priority Habitats of 29 state-listed rare species, as described in Appendix L. The long-term impacts of FP 4 on the affected habitats and their associated biota are discussed below.

Long-Term Ecological Impacts

FP 4 would impact a total of approximately 109 acres, including 72 acres due to floodplain soil removal and an additional 37 acres (of which 17 are in the floodplain) for the construction and use of access roads and staging areas. This is 82 more acres than would be adversely affected by FP 2 and 33 more acres than would be adversely affected by FP 3.

The majority of the increase in impacts over FP 3 would occur in floodplain wetland forest habitats. FP 4 would impact a total of 45 acres of floodplain forest habitat in the PSA (within the Woodlot habitat mapping coverage), including approximately 40 acres due to soil removal and 4.5 acres for access roads and staging areas. FP 4 would have the same direct impacts on vernal pools as FP 3, and it would have slightly more impacts on the other habitat types, as discussed further below.

The types of long-term impacts associated with the loss of over 45 acres of floodplain forest habitats would be the same as those described in Section 5.3.4.4 and summarized for FP 3 in Section 7.3.5.3, but the extent of those impacts would be greater. FP 4 would

involve the clearing of more and larger forested areas than FP 3, particularly in Reaches 5A and 5B, as shown on Figure 7-3. In these areas, the removal of more mature trees and the creation of larger open areas would increase the extent and duration of long-term degradation of the floodplain forest community, despite the implementation of restoration measures. While the general progression of a replanted community in the affected areas would be largely the same as in FP 3, the path and rate of such succession could take longer and would be even more unreliable due to the greater area of disturbance and greater proportion of floodplain habitat altered and the consequent increase in cumulative stresses from changes in microclimate, hydrology, and invasive species.

The longer and more uncertain recovery of the forested floodplain in these areas would translate into corresponding impacts on the wildlife that currently utilize the mature forest within these areas. In such areas, these long-lasting openings in the floodplain under FP 4 would be substantial enough that they would be expected to alter the suitability of the forested habitat to support a diverse interior forest wildlife community. In addition, the increased extent of clearing under this alternative would cause greater fragmentation of the existing forested floodplain/riparian corridor, with greater disruption of the dispersal and migratory movements of many wildlife species in the PSA.

Like FP 3, FP 4 would include excavation and replacement of the surface soils and vegetation in 58 of the 66 vernal pools in the PSA, impacting 15 acres of vernal pool habitat. The direct long-term impacts on these pools would be same as described in Sections 5.3.7.4 and 7.3.5.3. These impacts include long-lasting changes in the hydrology of the vernal pools (which is extremely difficult to reproduce), in soil conditions in the pools (due to the inability of replacement soils to match the characteristics of the existing vernal pool soils), and in the vegetative characteristics of the pools (due to the loss of the complex and mature organic vegetative composition of the pools). There is also a high probability that invasive or other undesirable plant species and animal predators (such as green frogs, bullfrogs, and invertebrates) would invade pools where they did not previously exist. These alterations would, in all likelihood, result in the loss of obligate vernal pool species from at least many of the pools.

Moreover, the additional forest disturbance associated with FP 4 would cause even greater disruption than under FP 3 to the critical non-breeding amphibian habitat around the vernal pools. FP 4 would affect varying portions of the 100-foot and 100- to 750-foot zones around the vernal pools in the PSA due to floodplain soil removal and construction of access roads. These impacts would range up to 94% of the 100-foot zone and up to 24% of the 100-750 foot zone around individual pools. In total, FP 4 would affect 16 acres within 100 feet and 64 acres within the 100- to 750-foot zones of the vernal pools in the PSA. For the reasons discussed in Section 5.3.7.4, these disturbances would disrupt important aspects of those areas' non-breeding functions for the vernal pool amphibians.

Given the extensive impacts of FP 4 on the vernal pools in the floodplain and on the forested habitats around the vernal pools, it is highly likely that the full complement of characteristics that contribute to vernal pool functions would not be re-established for many, if not most, of the affected pools.

FP 4 would also affect larger areas of other habitat types than FP 3. These include (within the Woodlot habitat mapping coverage) nearly 14 acres of shrub and emergent wetlands (including 9.4 acres due to soil removal and 4.6 acres for access roads and staging areas) (compared to a total of 12 acres under FP 3) and 2.4 acres of upland forested habitats (including 1.2 acres due to soil removal and 1.2 acres for access roads and staging areas) (compared to a total of 1.7 acres under FP 3).[372] The long-term impacts on these habitats would be generally similar to, but slightly greater than, those of FP 3, as described in Section 7.3.5.3.

As noted above, FP 4 would affect portions of the Priority Habitats of 29 state-listed species. As discussed in the MESA assessments in Appendix L, it is anticipated that FP 4 would involve a take of at least 26 of these species and would adversely affect a significant portion of the local population of at least 4 of them. The table below lists the 29 stated-listed species whose Priority Habitat would be affected by FP 4, along with those for which FP 4 would result in a take and those for which FP 4 would impact a significant portion of the local population:

Table 7-27 – Impacts of FP 4 on State-Listed Species

Species with Priority Habitat Affected by FP 4	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	Possibly
Arrow clubtail	Yes	No
Bald eagle	Possibly	No
Black maple	Yes	Yes
Bristly buttercup	Yes	Yes
Brook snaketail	Yes	Possibly
Bur oak	Yes	No
Common moorhen	Yes	No

[372] In addition, as noted in Section 7.4.1, FP 4 would affect approximately 2.4 acres of wetlands, 7 acres of upland forest, and 12 acres of disturbed upland habitats outside the Woodlot habitat mapping coverage.

Species with Priority Habitat Affected by FP 4	Take?	Impact on Significant Portion of Local Population?
Crooked-stem aster	Yes	Unlikely
Foxtail sedge	Yes	Unlikely
Gray's sedge	Yes	No
Hairy wild rye	Yes	Unlikely
Intermediate spike-sedge	Yes	Unlikely
Jefferson salamander	Yes	Yes
Longnose sucker	No	No
Mustard white	Yes	Unlikely
Narrow-leaved spring beauty	Yes	Possibly
Ostrich fern borer moth	Yes	Possibly
Rapids clubtail	Yes	No
Riffle snaketail	Yes	Possibly
Skillet clubtail	Yes	No
Spine-crowned clubtail	Yes	Unlikely
Stygian shadowdragon	Yes	No
Triangle floater	Unlikely	No
Tuckerman's sedge	Yes	Yes
Wapato	Yes	Unlikely
Water shrew	Yes	Unlikely
Wood turtle	Yes	Likely
Zebra clubtail	Yes	No

Finally, in addition to these impacts on wildlife habitat, the greater extent of disturbance under FP 4 would increase the adverse impacts on other floodplain functions described in Section 7.3.5.3 (groundwater recharge/discharge, flood flow alteration, and water quality maintenance, nutrient processing, and production export).

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 4 would have greater long-term impacts on the aesthetic features of the natural environment than the alternatives discussed above. The natural appearance of the floodplain after the remediation and restoration would not be the same as prior to remediation. FP 4 would result in the loss of approximately 47 acres of forested

communities (including both floodplain and upland forested areas) – 39 acres more than FP 2 and 27 acres more than FP 3. These areas would look markedly different for a long time after remediation because the time for a replanted forest community to develop an appearance comparable to its current appearance would be generally commensurate with the age of the community prior to remediation, which would be 50 to 100 years or more.

The floodplain areas that would be remediated under FP 4 include areas used for bank fishing, canoeing (canoe launches), hiking, general recreation, and both waterfowl and other game hunting. These recreational activities would be disrupted by the implementation of FP 4. These disruptions would last not only during the remediation period, but until the areas have sufficiently recovered to support such uses. Those disruptions would be greater in extent and duration than under FP 2 and FP 3.

Potential Measures to Mitigate Long-Term Adverse Impacts

In an effort to mitigate the long-term impacts to the floodplain following remedy implementation, various restoration measures are available.[373] The restoration methods for the types of habitats that would be affected by FP 4 are described in the restoration methods subsections in Section 5.3. However, as also described in that section and discussed above, implementation of these restoration methods would not prevent long-term impacts from the remediation, especially on the affected forested floodplain habitats and the vernal pools and the biota that depend on those habitats.

7.4.6 Attainment of IMPGs

This section describes the extent to which FP 4 would achieve the IMPGs for human health and ecological protection. These comparisons are presented in Tables 7-21 through 7-26 for the pertinent human and ecological averaging areas. The time frame to achieve any IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.4.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, FP 4 would achieve, at a minimum, the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all 120 direct contact EAs, and in all Heavily Used Subareas (Table 7-21). FP 4 would also achieve the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all 14 of the farm areas evaluated for consumption

[373] Potential measures to avoid or minimize the adverse impacts were described in Section 5.2.

of agricultural products (Table 7-22). These comparisons are shown in greater detail in Tables 7-21 and 7-22 for all human exposure areas in Reaches 5 through 8.[374]

7.4.6.2 Comparison to Ecological IMPGs

FP 4 would achieve levels within (or below) the IMPG ranges for amphibians and omnivorous/carnivorous mammals in all averaging areas and would achieve levels within the IMPG ranges for insectivorous birds and piscivorous mammals depending on the associated sediment concentrations,[375] as described below:

- For amphibians, FP 4 would achieve the upper-bound amphibian IMPG (5.6 mg/kg) in all 66 of the vernal pools in the PSA; it would also achieve the lower-bound IMPG (3.27 mg/kg) in 17 of those pools (Table 7-23).[376]

- For omnivorous/carnivorous mammals, FP 4 would achieve the lower-bound IMPG (21.1 mg/kg) in all of the 7 averaging areas (Table 7-24).

- For insectivorous birds, FP 4 would achieve the target floodplain soil IMPG levels in all averaging areas in the PSA if the associated sediment concentration in those areas were 3 mg/kg or less, and in 10 of those 12 areas if the associated sediment concentration were 5 mg/kg (Table 7-25).[377]

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[374] In addition to the comparisons mentioned in the text, as shown in Tables 7-21 and 7-22, FP 4 would achieve the RME IMPGs based on a 10^{-6} cancer risk in 10 EAs and 3 Heavily Used Subareas and in 5 farm areas evaluated for consumption of agricultural products. However, it would achieve the CTE IMPGs based on a 10^{-6} cancer risk in 119 of the 120 EAs, in all 12 Heavily Used Subareas, and in 13 of the 14 farm areas evaluated for consumption of agricultural products.

[375] In the evaluation of combined sediment and floodplain alternatives presented in Section 8, FP 4 has been paired separately with both SED 5 and SED 6. The evaluation of those two combinations of alternatives (i.e., SED 5/FP 4 and SED 6/FP 4) in Section 8.2.5.2 has assessed the attainment of the IMPGs for insectivorous birds and piscivorous mammals based on the actual sediment concentrations achieved under SED 5 and SED 6, thus avoiding the need to consider the pre-determined target sediment levels of 1, 3, and 5 mg/kg (see also Section 2.2.2.3).

[376] The attainment of PCB levels below the upper-bound amphibian IMPG in all vernal pools under FP 3 would be achieved only through extensive excavation and soil replacement in most (58) of those pools and their associated non-breeding habitats. As discussed in Section 7.3.5.3, those activities would have substantial and long-lasting adverse impacts on the vernal pool amphibians that the IMPGs are designed to protect, including the potential permanent loss of those amphibians from the pools.

[377] FP 4 would not achieve the insectivorous bird soil IMPGs in 2 of the 3 averaging areas in Reach 5B if the associated sediment concentration were 5 mg/kg. In such a case, the removal of an additional 5,000 cy of soil from those 2 averaging areas would be needed to achieve the floodplain soil IMPG level for insectivorous birds in those areas.

- For piscivorous mammals, FP 4 would achieve the upper-bound floodplain soil IMPGs in both averaging areas if the associated sediment concentration in those areas were 1 mg/kg or less (Table 7-26). It would also achieve the upper-bound floodplain soil IMPG in one of the two areas (Reaches 5C/5D/6) if the associated sediment concentration were 3 mg/kg, but would not achieve those target levels in either averaging area if the associated sediment concentration were higher.[378]

These comparisons are shown in detail in Tables 7-23 through 7-26 for all ecological averaging areas in the PSA.

7.4.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 4 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

Reduction of Toxicity: FP 4 does not include any treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during the excavations (which is not anticipated, those wastes would be segregated and sent off-site for treatment and disposal.

Reduction of Mobility: As previously noted, the existing conditions of the floodplain are predominantly depositional and stable due to generally low water velocities during inundation and the presence of vegetation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 4 would reduce the volume of PCB-containing soils and the mass of PCBs in the floodplain by removing 121,000 cy of soils containing approximately 14,500 lbs of PCBs from 72 acres of the floodplain.

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[378] At an assumed sediment concentration of 3 mg/kg, FP 4 would require the removal/backfill of an additional 147,000 cy (approximately 91 acres) of floodplain soil to achieve the upper-bound piscivorous mammal IMPG in the Reach 5A/5B averaging area. If the sediment concentration were 5 mg/kg, attainment of the upper-bound IMPG could be achieved in the Reach 5C/5D/6 averaging area with the removal of an additional 7,000 cy (approximately 4 acres) of floodplain soil; however, the IMPG for the Reach 5A/5B averaging area could not be achieved with any amount of additional soil removal because the PCBs levels in aquatic prey items alone would exceed the IMPG at that sediment concentration.

7.4.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 4 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and on workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the performance of the remedial activities in a given area. Since the remedial activities associated with FP 4 would be spread out over the overall remedial action period and area, the short-term impacts would not last for the entire duration of the project in all affected areas. However, since the geographical extent and overall duration of remediation activities under FP 4 would be greater than under FP 2 or FP 3, the short-term impacts would be more extensive and would occur over a longer time period in the Rest of River area.

Impacts on the Environment – Ecological Effects

As previously discussed, implementation of FP 4 would impact a total of approximately 109 acres (both within and outside the PSA), including 72 acres due to floodplain soil removal and 37 additional acres (of which 17 are in the floodplain) for the construction and use of access roads and staging areas. The short-term ecological effects resulting from implementation of FP 4 would include the removal of plant and wildlife habitat in those areas of the floodplain where remediation or construction of access roads or staging areas would occur. The short-term impacts of FP 4 would consist of those described for the various habitat types in Section 5.3 and summarized for FP 3 in Section 7.3.8. However, these impacts would be even more widespread under FP 4, particularly in the floodplain forests in the PSA. Thus, there would more and larger areas of tree and vegetation removal, a greater adverse impact on floodplain soil conditions, a greater reduction in floodplain roughness (which affects the floodplain's flood flow alteration function), and a greater likelihood of invasive species colonization. There would also be a more extensive loss of cover, nesting, and feeding habitat for wildlife species that rely on floodplain forest habitat. This would be particularly disruptive to wildlife with small home ranges. Likewise, birds that are dependent on the plant community for the placement of their nests would be forced to attempt to move elsewhere during nesting season.

FP 4, like FP 3, would involve remedial construction activities in 58 of the 66 vernal pools in the PSA. As described in Section 7.3.8, this would cause substantial alteration in the hydrological, soil, and vegetative conditions of the great majority of the PSA vernal pools, with a consequent loss of the vernal pool species, including obligate species, from all or parts of these pools. FP 4 would have an even greater impact on the non-breeding forested habitats around these vernal pools, disrupting the protective cover, temperature and moisture regulation, and overwintering functions of those habitats for the vernal pool

amphibians. It would also cause a further loss in the connectivity among the network of vernal pools in the PSA and between those pools and non-breeding habitats.

For the other habitat types, the short-term ecological effects of FP 4 would be comparable to or slightly greater than those described for FP 3 in Section 7.3.8.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 4.

The total carbon footprint associated with FP 4 has been estimated to be 16,000 tonnes of GHG emissions. Of this total, approximately 14,000 tonnes are associated with direct emission sources (primarily construction activities, tree removal, associated mulch decay/sequestration of the vegetation, and restoration/replanting), while approximately 1,800 tonnes are associated with off-site emissions (primarily refinement of diesel fuel and excavation of backfill materials, gravel, and sand). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 3,100 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 4 would result in short-term impacts to the local communities along the River. These short-term effects would be qualitatively the same as described for FP 2 and FP 3, but would affect a greater area and would last longer. These short-term effects would include disruption of recreational activities along the River and within the floodplain due to the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities: As noted above, recreational activities that would be affected by construction include bank fishing, canoeing (canoe launches), hiking, general recreation, and both waterfowl and other game hunting. During the period of active construction, restrictions on recreational use of the floodplain would be imposed in the areas in which remediation-related activities are taking place. Due to safety considerations, boaters, anglers, hikers, and other recreational users would not be able to use the floodplain in the areas where remediation-related activities are being conducted. In addition, the presence of heavy construction equipment and cleared or disturbed areas would adversely affect the visually undisturbed nature of the area.

Increase in Truck Traffic: Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would significantly increase during the construction period. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment facilities, it would take a total of 10,300 trips to do so (an average of 2,100 truck trips per year for a 5-year remediation project). Additional truck trips would be necessary to transport backfill materials, as well as materials for the construction of staging areas and access roads, to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 13,500 truck trips (average of 2,800 truck trips per year) would be required for that purpose. This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the construction zone could affect those residents and businesses located in the immediate vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport backfill to the site and to dispose of used staging area/access road materials.[379] This analysis indicates that the increased truck traffic associated with FP 4 (an estimated total of 1.1 M vehicle miles, 235,000 average vehicle miles per year) would result in an estimated 0.52 non-fatal injuries due to accidents (average annual non-fatality injury estimate of 0.11) with a probability of 41% of at least one such injury, and an estimated 0.02 fatalities from accidents (average annual fatality estimate of 0.005) with a probability of 2% of at least one such fatality.

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts: A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 4 on the affected communities.[380] These measures would consist of the ones identified in Section 5.7 and summarized in Section 7.2.8 above. Despite the implementation of these measures, however, short-term impacts of construction activities on the local communities from FP 4 would be inevitable.

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[379] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

[380] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 4. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 4 is estimated to involve 213,549 labor-hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 4 would result in an estimated 1.98 non-fatal injuries to workers (average annual non-fatality injury estimate of 0.41) with a probability of 86% of at least one such injury, and an estimated 0.02 worker fatalities (average annual fatality estimate of 0.003) with a probability of 2% of at least one such fatality.

7.4.9 Implementability

7.4.9.1 Technical Implementability

The technical implementability of FP 4 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

General Availability of Technology: The equipment, materials, technology, procedures, and personnel necessary to implement FP 4 are expected to be readily available (with the exception of commercially available soils that would replicate existing wetland soils, as discussed in Section 7.3.5.3). In wetlands and vernal pool settings, specialized technologies would be used, as appropriate, to mitigate adverse impacts. These technologies have been used at other sites. Given the physical characteristics of the floodplain and the availability and known reliability of construction equipment and materials (with the exception noted above), FP 4 would be technically implementable.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be utilized in FP 4 is suitable for implementation in the areas where it would be applied. The construction of access roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. In the long term, floodplain areas would be backfilled and returned to approximate original elevations, to the extent practical, to maintain the flood storage capacity of the floodplain.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country, as described for FP 2 in Section 7.2.5.2. However, restoration efforts would not reliably result in re-establishment of the pre-remediation conditions and functions of at least some of the affected habitats, as noted above and discussed in the relevant subsections of Section 5.3. Under FP 4, this is particularly true for the numerous vernal pools that would be affected.

Availability of Support Facilities and Resources: Implementation of FP 4 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 37 acres of space would be needed for such facilities and appear to be available based on a conceptual site layout. In addition, sufficient backfill (albeit not soil that would match existing wetland soil) and planting materials are expected to be readily available for implementation of FP 4.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available and their use and effectiveness for this type of material removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measures (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 4 would be assessed by visual observation to evaluate such factors as vegetation re-growth and any signs of erosion or disturbance of restored areas. Monitoring procedures would be straightforward and implementable.

7.4.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 4 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 4 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 4 is provided in the Tables F-4.a- through F-4.c in Appendix C and summarized in Section 7.4.4.

Access Agreements: Implementation of FP 4 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is anticipated that access agreement would be required from 30 to 40 other landowners. Obtaining such access agreements could be difficult and time-consuming in some cases. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 4 would require coordination with EPA and MDEP. In addition, obtaining access to state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 4, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.4.10 Cost

The estimated total cost to implement FP 4 is $43.1 M (excluding the costs of treatment/disposition of excavated soils). The estimated capital cost for implementation of FP 4 is $41.2 M, assumed to occur over a 5-year construction period. Estimated annual OMM costs (for a 5-year inspection and maintenance program for restored excavation and staging/access road areas) range from $3,000 to $204,000 per year (depending on which reach is being monitored), resulting in a total cost of approximately $1.9 M. The following summarizes the total costs estimated for FP 4.

FP 4	Est. Cost	Description
Total Capital Cost	$41.2 M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$1.9 M	Costs for performance of the OMM programs
Total Cost for Alternative	$43.1 M	Total cost of FP 4 in 2010 dollars

The total estimated present worth of FP 4, which was developed using a discount factor of 7%, a 5-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $38.3 M. More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of associated sediment/riverbank remediation or the costs of treatment/disposition of the removed floodplain soils. The estimated costs for combinations of FP 4 with both SED 5 and SED 6 are presented in Sections 8.2.9, and the estimated costs for combinations of FP 4 with the various treatment/disposition alternatives are presented in Section 10.

7.4.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.4.2, the evaluation of whether FP 4 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 4 would be effective in reducing the potential for human and ecological exposure to PCBs in floodplain soils by the removal of 121,000 cy of PCB-containing soil containing approximately 14,500 lbs of PCBs**.** The removed soil would be replaced with clean backfill, which would be revegetated. However, FP 4 would also have substantial long-term adverse impacts on many species, including the likely loss of some sensitive species from portions of the PSA, as discussed in Section 7.4.5.3, and thus would actually increase the risks to biota in the Rest of River as a result of habitat loss.

Compliance with ARARs: As discussed in Section 7.4.4, FP 4 could be designed and implemented to achieve the ARARs pertinent to this alternative, but several potential ARARs would not be met. As a result, to the extent that those regulatory requirements constitute ARARs, the ones that would not be met would need to be waived by the EPA as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: Accepting EPA's HHRA, FP 4 would be protective of human health. As discussed in Section 7.4.6.1, implementation of this alternative would achieve the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all human use exposure areas, including all Heavily Used Subareas. FP 4 would further ensure protection of human health through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses based on realistic assumptions.

Environmental Protection: As discussed in Section 7.4.6.2, FP 4 would achieve floodplain soil levels within the range of the ecological IMPGs based on EPA's ERA, depending, in some cases, on the associated sediment concentrations. Specifically, FP 4 would achieve soil PCB levels within or below the range of the IMPGs for amphibians in all 66 vernal pools evaluated, and would achieve the lower-bound IMPG for omnivorous/carnivorous mammals in all 7 averaging areas. In addition, FP 4 would achieve the target floodplain soil IMPG

levels for insectivorous birds in all 12 averaging areas if the associated sediment concentration in those areas is 3 mg/kg or less. It would also achieve levels within the range of the target floodplain soil IMPG levels for piscivorous mammals in both of the averaging areas if the associated sediment concentration in those areas is 1 mg/kg or less, and in one of those areas (Reaches 5C/5D/6) if the associated sediment concentration is 3 mg/kg or less.

As previously noted, achievement of IMPGs is a balancing factor under the Permit; it is not determinative of whether an alternative would provide overall environmental protection. For similar reasons to those discussed in Section 7.2.11, the IMPG exceedances for certain animals would not be expected to prevent the maintenance of healthy local populations of these animals, let alone adversely impact the overall wildlife community in the Rest of River area. This is shown by the fact that the local populations of these animals extend beyond the individual averaging areas and by the field survey information documenting the presence of numerous and diverse plant and animal species, including state-listed rare species, in the PSA despite the fact that PCBs have been present in the floodplain soil for over 70 years.

On the other hand, as EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d). In this case, as discussed in Sections 7.4.8 and 7.4.5.3, implementation of FP 4 would result in substantial short-term and long-term adverse impacts on the environment as a result of its removal or disturbance of 109 acres of land, including 45 acres of mature floodplain forest, 15 acres of vernal pools, and 14 acres of shrub and emergent wetlands in the floodplain of the PSA.[381] The removals and disturbances in these sensitive floodplain habitats would have long-lasting negative consequences for the plants and animals that utilize those habitats. For example, given the extensive excavations within vernal pools and adjacent critical non-breeding habitats, FP 4 would cause severe harm to the vernal pool amphibians that the IMPGs are designed to protect, and it is unlikely at least many of those pools would ever return to their current level of function for those amphibians. As stated by EPA (2005d, p. 6-6), "it is important to determine whether the loss of a contaminated habitat is a greater impact than the benefit of providing a new, modified but less contaminated habitat." That is the situation for the vernal pools, as well as the floodplain forest habitats, in the PSA under FP 4.

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[381] Further, as discussed in Section 7.4.6.2, very extensive additional removals would be necessary to achieve the IMPGs that would not already be achieved by FP 4 (e.g., up to an additional 147,000 cy of floodplain soil to address piscivorous mammals). These removals would cause massive additional long-term and short-term adverse ecological impacts that would clearly be unjustified.

Summary: Based on the above considerations, FP 4 would meet the standard of providing overall protection of human health. However, due to the substantial short-term and long-term ecological harm that would result from implementation of that alternative, particularly to the floodplain forest and the vernal pools in the PSA, FP 4 would not meet the standard of providing overall protection of the environment.

7.5 Analysis of Floodplain Alternative 5

7.5.1 Description of Alternative

FP 5 would involve the removal of all floodplain soils with PCB concentrations at or above 50 mg/kg in the top foot of soil, as well as in the top 3 feet of soil in the Heavily Used Subareas of Frequent-Use EAs (described in Section 4.2.1 and shown on Figures 4-3a-j). The excavated areas would be replaced with backfill and revegetated.

Summary of Removal Areas and Volumes

FP 5 would involve the removal of approximately 104,000 cy of soil from approximately 63 acres of the floodplain, as shown on Figure 7-4. A total of 101,000 cy would be removed from the top foot of soil in those areas, and an additional 3,000 cy would be removed from depths between 1 and 3 feet in the Heavily Used Subareas. The volume and extent of removals in FP 5 are approximately the same as those in FP 4 (121,000 cy over 72 acres). However, because the alternatives have different objectives, some of the removal areas are different for the two alternatives (see Figures 7-3 and 7-4).

Summary of Affected Habitat

FP 5 would involve the removal and backfill of soil across approximately 63 acres in various types of habitats within the floodplain of the PSA. The approximate acreages of those general habitat types, with associated removal volumes, are as follows:[382]

- 3.4 acres (5,000 cy) of vernal pool habitat, which include portions of 20 different vernal pools;

[382] This detailed breakdown of removal areas and volumes by habitat type was generally conducted using the Woodlot (2002) habitat community mapping between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. As noted above, both the acreages of impact and the removal volumes have been rounded, with the result that the sum of the numbers given for each habitat type may not exactly match the total impacted acreage and removal volume for the alternative.

- 31 acres (52,000 cy) of floodplain wetland forest habitats (consisting mainly of transitional floodplain forest and red maple swamp);
- 21 acres (35,000 cy) of shrub and shallow emergent wetland habitats (consisting of shrub swamp, wet meadow, and shallow emergent marsh);
- 3.0 acre (5,000 cy) of deep marsh habitat;
- 0.7 acre (1,000 cy) of disturbed upland habitats (consisting of agricultural field habitat and cultural grasslands habitat);
- 0.6 acre (1,000 cy) of upland forested habitats (consisting mainly of northern hardwoods-hemlock-white pine forest); and
- 3.1 acres (5,000 cy) of habitat of currently unmapped community type.[383]

In addition to the above-described areas associated with excavation/backfill activities, floodplain habitat would be affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 5 would require 17 staging areas, which would occupy a total of 7.8 acres (1.4 acres of which would be within the floodplain), and 8.7 miles of temporary access roads covering 21 additional acres assuming a 20-foot road width (4.6 miles and 11 acres of which would be within the floodplain). These facilities would be located in all of the above habitats, with those located within the Woodlot (2002) mapping coverage situated mainly in floodplain forest (3.2 acres), shrub and shallow emergent wetlands (4.6 acres), and disturbed upland habitats (2.5 acres).[384] The locations of these staging areas and access roads are shown on Figure 7-4.

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[383] These impacts would occur mostly in the Reach 7 floodplain, where the Woodlot habitat community mapping is absent. Based on review of information from MassGIS and aerial photography, remediation activities under FP 5 within Reach 7 would be conducted within disturbed/developed areas just below Woods Pond Dam (3 acres).

[384] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 5 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed upland areas (11 acres), with additional impacts occurring in forested uplands (4.4 acres), forested wetlands (0.2 acre) and wet meadow/emergent marsh (0.6 acre). There would be no impacts in Reaches 7 and 8 from construction of access roads or staging areas.

Conceptual Remedial Approach

The conceptual remedial approach for FP 5 would be generally the same as described for FP 2, FP 3, and FP 4. Conventional construction equipment would be used to construct access roads and staging areas, clear and grub existing vegetation, remove and replace soil, and conduct restoration activities, with material loaded into lined trucks for transport to staging areas. As described for FP 3 and FP 4, some specialized construction equipment, materials, and engineering practices would be used in an effort to mitigate the potentially negative impacts of construction in and around vernal pools and other wetland areas.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 5 were selected, considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs, in an effort to minimize impacts on sensitive habitats and local communities to the extent practical (see Section 5.2.2). As described for the alternatives discussed above, areas were specifically selected based on accessibility, existing land use, habitat use, and location relative to the floodplain; and an effort was made, where practicable, to avoid sensitive wildlife habitats (e.g., forested floodplain areas, vernal pools, other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. This evaluation has lead to the locations of staging areas and access roads shown on Figure 7-4. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

For purposes of the evaluations in this Revised CMS Report, it is assumed that FP 5 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. Conceptual restoration methods, subject to development of a more detailed restoration plan during design, are described in Section 5.3.4.3 for the floodplain forest habitat, Section 5.3.5.3 for the shrub and shallow emergent wetlands, Section 5.3.6.3 for the deep marshes, Section 5.3.7.3 for the vernal pools, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that FP 5 would take 4 years to complete if implemented independently from River-related remedial activities. However, assuming that floodplain remediation would be coordinated with sediment remediation, the time to complete FP 5 would likely be different, depending on the sediment remediation alternative selected. Nevertheless, for purposes of the evaluations in this section, it has been assumed that implementation of FP 5 would take 4 years.

FP 5 would include institutional controls and/or other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and

Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted of the backfilled/restored areas. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program are anticipated to include those described in Section 4.5 and outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.5.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs; (b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 5 would be protective of human health and the environment is presented at the end of Section 7.5 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of human health and the environment.

7.5.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River. As stated previously, the floodplain is generally flat, well vegetated and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and transport to the River.

Open excavations during construction could serve as a short-term temporary source of some releases during an extreme weather event. Such potential releases would be controlled using conventional engineering practices.

7.5.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 5 in accordance with directions from EPA are listed in Tables F-5.a through F-5.c

in Appendix C.[385] FP 5 could be designed and implemented to achieve many of those ARARs;[386] but, as with FP 3 and FP 4, there are a number of potential location-specific and action-specific ARARs that would not be met by FP 5. These are the same potential ARARs as described for FP 3 in Section 7.3.4 and include a number of federal and state regulatory requirements relating to ecological protection (including regulations applicable to the Upper Housatonic ACEC). To the extent these requirements would constitute ARARs, they would need to be waived by EPA as technically impracticable to meet (or on some other ground) under CERCLA and the NCP.

In addition, for the same reasons discussed for FP 2 in Section 7.2.4, it is possible that, in the unlikely event that excavated floodplain soils should be found to constitute hazardous waste (which is not anticipated) and that the temporary staging areas for the handling of those soils are subject to federal and/or state hazardous waste regulations, the staging areas may not meet certain locational and/or technical requirements for the storage of hazardous waste. In that unlikely event, as also discussed in Section 7.2.4, those requirements should be waived by EPA as technically impracticable to meet.

7.5.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness for FP 5 has included evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

7.5.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 5 includes consideration of the length of time and extent to which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 5 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 104,000 cy of PCB-containing soil over 63 acres

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[385] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

[386] As discussed for FP 2 in Section 7.2.4 (footnote 226), it is assumed that EPA would make the determinations necessary in connection with certain requirements. .

of floodplain (see Figure 7-4). The reduction in potential exposure and associated risks would occur upon completion of the floodplain remediation in a given area.

Implementation of FP 5 would result in the removal of soil with PCB concentrations at or above 50 mg/kg. As discussed further in Section 7.5.6.1, the average floodplain soil concentrations in the human health averaging areas following implementation of FP 5 would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a 10^{-4} cancer risk in all such areas and a 10^{-5} cancer risk and a non-cancer HI of 1 in most (but not all) of those areas. As discussed in Section 7.5.6.2, the average concentrations in the ecological averaging areas would achieve the IMPGs based on the ERA for some receptors/areas.[387] The average post-remediation soil EPCs in the top foot within the human health and ecological averaging areas for FP 5 are shown in Tables 7-28 through 7-33. (Table 7-28 also shows the post-remediation concentrations in the top 3 feet in Heavily Used Subareas.)

PCBs would also remain at depths below those described above. Such deeper soil is generally not anticipated to be available for exposure under current uses. In the event that future exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional Solutions would be implemented where necessary to address potential risks from future activities and uses that are reasonably anticipated based on realistic assumptions.

7.5.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 5 has included an assessment of the use of technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace technical components, as discussed below. The technology and implementation of FP 5 would be generally the same as described for FP 3 and FP 4.

Use of Technology Under Similar Conditions

FP 5 relies primarily on the removal of floodplain soils, followed by backfill of the excavations and performance of restoration activities. Excavation of soils from floodplain environments has been implemented at a number of other sites across the country, as

[387] As discussed in Section 1.2, GE does not agree with many of the assumptions and inputs used in EPA's HHRA and ERA and thus does not agree that levels based on those risk assessments are an appropriate measure of risks to human health or the environment.

discussed under FP 2 in Section 7.2.5.2. Restoration was discussed separately in Section 5.3.

General Reliability and Effectiveness

The removal and backfill of soil for FP 5 would reliably, effectively, and permanently reduce the concentrations of PCBs in the removal areas. Following backfilling, it is assumed that excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. However, there are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, 5.3.6.4 for deep marsh habitat, 5.3.7.4 for vernal pools, and 5.3.8.4 for forested upland habitats. These issues are discussed further for FP 5 in Section 7.5.5.3.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 5, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, to identify areas (if any) where the backfill is eroding and in need of repair, and to evaluate the conditions of the affected wetlands, including vernal pools. Any deficiencies noted during the inspections would be subject to maintenance, repair, and other corrective actions performed as necessary and practicable. Periodic inspection of the replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and perform any maintenance activities required following implementation of FP 5 are considered readily available.

Because access roadways will be removed after construction, maintenance, if required, could be difficult to implement in certain areas of the floodplain, due to remoteness, wet areas, and vegetation growth. The ease of access may change based on seasonal conditions. It could be especially difficult to conduct supplemental planting activities in difficult-to-access locations, to which plant materials would have to be carried from the closest roadways.

Technical Component Replacement Requirements

If significant erosion, plant loss, or other problematic conditions were observed as part of the OMM program in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for, methods of, and practicability of repair. Depending on the timing and location of the repair, access roads and staging areas may need to be temporarily constructed in the floodplain. It is anticipated that if small repairs or replacement were necessary, they could be implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological receptors that use/inhabit the floodplain in these areas. The repair or replacement of larger areas could require more extensive disturbance in the floodplain.

7.5.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 5 on human health or the environment has included consideration of the items discussed below. In general, the extent of those impacts would be greater than those of FP 2 and FP 3 and comparable to those of FP 4, but distributed differently, affecting more emergent wetlands habitat and less vernal pool habitat than FP 4.

Potentially Affected Populations

Implementation of FP 5 would have long-term effects on humans and wildlife populations through changes in the natural environment and habitat. For humans, implementation of FP 5 would affect the aesthetics and recreational use of the floodplain. For wildlife, implementation of FP 5 would remove and replace several habitat types (listed in Section 7.5.1), which contain a variety of mammals, birds, and herptiles. In particular, FP 5 would affect portions of the mapped Priority Habitats of 24 state-listed rare species, as described in Appendix L. The long-term impacts of FP 5 on the affected habitats and their associated biota are discussed below.

Long-Term Ecological Impacts

FP 5 would impact a total of approximately 92 acres, including 63 acres due to floodplain soil removal and an additional 29 acres (of which 12 are in the floodplain) for the construction and use of access roads and staging areas. These impacts would exceed those of FP 2 (27 acres) and FP 3 (76 acres) and would be distributed differently from those under FP 4. For example (within the Woodlot habitat mapping coverage), compared to FP 4, FP 5 would affect a lesser amount of vernal pool habitat (3.4 acres in 20 pools), a slightly

lesser amount of floodplain forest habitats (approximately 34 acres), and substantially more shrub and shallow and deep emergent wetlands habitats (approximately 29 acres).[388]

The types of long-term impacts associated with the removal of floodplain forest habitats were described in Section 5.3.4.4. They include the loss of mature forested communities for at least 50 to 100 years, loss of coarse woody debris and annual leaf litter, changes in hydrological and soil conditions in the affected areas, loss or reduction in the interior forest wildlife species (including state-listed species), and fragmentation of the existing forested floodplain/riparian corridor in the PSA, with resulting disruption to the dispersal and migratory movements of wildlife species that rely on that corridor. Under FP 5, these impacts would occur over 34 acres of the floodplain forest habitats in the PSA.

The long-term impacts associated with the removal of shrub and shallow emergent wetlands were described in Section 5.3.5.4 and those associated with such activities in deep marshes were described in Section 5.3.6.3. These impacts include changes in soil stratigraphy, composition, and chemistry; changes in the drainage patterns and hydrology of these wetlands; and resulting changes in vegetative characteristics. These impacts would change the characteristics of the wetlands and would last until soil and hydrological conditions similar to pre-remediation conditions return through flooding and the other natural processes that originally formed these habitats. This time is uncertain and could take a decade or more. During this period, the wildlife that use these wetlands would be displaced. In fact, even after the return of soil and hydrological conditions resembling prior conditions, the biotic communities that are re-established may not match the pre-remediation communities in certain respects. For example, there would be high potential for proliferation of invasive plants, and the return of certain sensitive species, including state-listed wildlife species, would be doubtful. Under FP 5, these impacts would occur over 29 acres of shrub and shallow and deep emergent wetland habitat in the PSA.

FP 5 would affect less vernal pool habitat than FP 3 and FP 4, as it would involve soil excavation and replacement in 20 vernal pools covering a total of 3.4 acres. In many cases, only a portion of the pool would be excavated; for example, 15 of the 20 pools would have less than 50% of their surface area impacted and 9 of those pools would have less than 20% of their surface area impacted. However, nearly the entire surface area of five pools would be excavated, and one pool would be completely excavated along with most of its 100-foot buffer zone. While the long-term direct effects of remedial activities would no doubt be greater in these pools, even pools subject to less excavation could experience long-term effects on their hydrology, soil conditions, and vegetation, thus impacting the

[388] In addition, as noted in Section 7.5.1, FP 5 would impact 0.6 acre of wetlands, 4.4 acres of upland forest, and 14 acres of disturbed upland habitats outside the Woodlot habitat mapping coverage.

amphibian and other animal species that depend on or utilize these vernal pools (see Section 5.3.7.3). Overall, since the number and area of the vernal pools that would be affected under this alternative are smaller than those under FP 3 and FP 4 (removal of 3.4 acres from portions of 20 pools for FP 5 versus removal of 15 acres from 58 pools for FP 3 and FP 4), the direct impacts on vernal pools would not be as widespread as those of FP 3 and FP 4. However, FP 5 would affect portions of the 100-foot and 100- to 750-foot zones around vernal pools in the PSA – ranging up to 92% of the 100-foot zone and 24% of the 100-750 foot zone for individual pools – due to floodplain soil removal and construction of access roads. In total, FP 5 would affect 16 acres within 100 feet and 56 acres within the 100- to 750-foot zones of the vernal pools in the PSA. For the reasons discussed in Section 5.3.7.4, these disturbances could disrupt important aspects of those areas' non-breeding functions for the vernal pool amphibians.

As noted above, FP 5 would affect portions of the Priority Habitats of 24 state-listed species. As discussed in the MESA assessments in Appendix L, it is anticipated that FP 4 would involve a take of at least 21 of these species and would adversely affect a significant portion of the local population of at least 1 of them (Jefferson salamander). The table below lists the 24 stated-listed species whose Priority Habitat would be affected by FP 5, along with those for which FP 5 would result in a take and those for which FP 5 would impact a significant portion of the local population:

Table 7-34 – Impacts of FP 5 on State-Listed Species

Species with Priority Habitat Affected by FP 5	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	Possibly
Arrow clubtail	Yes	No
Bald eagle	Possibly	No
Black maple	Likely	No
Bristly buttercup	Yes	Possibly
Brook snaketail	Yes	Possibly
Bur oak	Yes	No
Common moorhen	Yes	No
Crooked-stem aster	Yes	Possibly
Foxtail sedge	Yes	Unlikely
Gray's sedge	Yes	No
Intermediate spike-sedge	Yes	Unlikely
Jefferson salamander	Yes	Yes

Species with Priority Habitat Affected by FP 5	Take?	Impact on Significant Portion of Local Population?
Mustard white	Yes	Unlikely
Narrow-leaved spring beauty	Yes	Unlikely
Ostrich fern borer moth	Yes	Unlikely
Rapids clubtail	Yes	No
Riffle snaketail	Yes	No
Spine-crowned clubtail	Yes	No
Triangle floater	Unlikely	No
Wapato	Yes	Unlikely
Water shrew	Yes	Unlikely
Wood turtle	Yes	Likely
Zebra clubtail	Yes	No

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 5 would have long-term impacts on the aesthetic features of the natural environment. The natural appearance of the floodplain after the remediation and restoration would not be the same as prior to remediation. FP 5 would result in the loss of over 36 acres of forested communities – more than FP 2 and FP 3 but somewhat less than FP 4. These areas would look markedly different for a long time after remediation because the time for a replanted forest community to develop an appearance comparable to its pre-remediation appearance would be generally commensurate with the age of the community prior to remediation, which would be 50 to 100 years or more.

The floodplain areas that would be remediated under FP 5 include areas used for bank fishing, canoeing (canoe launches), hiking, general recreation, dirt biking/ATVing, and both waterfowl and other game hunting. These recreational activities would be disrupted by the implementation of FP 5. These disruptions would last not only during the remediation period, but until the areas have sufficiently recovered to support such uses. Again, these disruptions would be greater than those under FP 2 and FP 3 and somewhat less than those of FP 4.

Potential Measures to Mitigate Long-Term Adverse Impacts

Various restoration measures are available to attempt to mitigate the long-term adverse impacts from implementation of FP 5.[389] These restoration methods are described in the restoration methods subsections in Section 5.3. However, as also described in that section and discussed above, implementation of these restoration methods would not prevent long-term impacts from the remedial construction activities undertaken under FP 5.

7.5.6 Attainment of IMPGs

As described in Section 7.5.1, FP 5 is a threshold-based alternative (i.e., removal of PCBs at or above 50 mg/kg) and was therefore not designed to achieve any particular set of IMPGs. This section describes the extent to which FP 5 would nonetheless achieve the IMPGs for human health and ecological protection. These comparisons are presented in Tables 7-28 through 7-33 for the pertinent human and ecological averaging areas. The time frame to achieve any IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.5.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, as shown in Table 7-28, FP 5 would achieve, at a minimum, the RME IMPGs based on a 10^{-4} cancer risk in all 120 direct contact EAs, and in all 12 Heavily Used Subareas. In addition, FP 5 would achieve the RME IMPGs based on a 10^{-5} cancer risk in 81 of the 120 EAs and in 8 of the Heavily Used Subareas. It would also achieve the RME non-cancer IMPGs in 108 of the 120 EAs and in 11 of the Heavily Used Subareas.

FP 5 would achieve the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all 14 farm areas evaluated for consumption of agricultural products (Table 7-29).

Overall, implementation of FP 5 would achieve levels within EPA's cancer risk range in all human health exposure areas, but would not achieve the non-cancer RME IMPGs in 12 of the direct contact EAs, which together cover approximately 94 acres of the floodplain. The

[389] Potential measures to avoid or minimize the adverse impacts were described in Section 5.2.

IMPG comparisons for FP 5 are shown in greater detail in Tables 7-28 and 7-29 for all human exposure areas in Reaches 5 through 8.[390]

7.5.6.2 Comparison to Ecological IMPGs

FP 5 would achieve a number of ecological IMPGs as described below:

- For amphibians, FP 5 would achieve the upper-bound IMPG (5.6 mg/kg) in 13 of the 66 vernal pools in the PSA, and would also achieve the lower-bound IMPG (3.27 mg/kg) in 8 of those 13 pools (Table 7-30).

- For omnivorous/carnivorous mammals, FP 5 would achieve the lower-bound IMPG (21.1 mg/kg) in all averaging areas (Table 7-31).

- For insectivorous birds, FP 5 would achieve the target floodplain soil IMPG levels in all averaging areas in the PSA if the associated sediment concentration in those areas were 3 mg/kg or less, and would achieve those levels all but one averaging area if the associated sediment concentration were 5 mg/kg (Table 7-32).

- For piscivorous mammals, FP 5 would achieve the upper-bound floodplain soil IMPGs in both of the PSA averaging areas if the associated sediment concentration in those areas were 1 mg/kg or less, but would not achieve the lower-bound IMPGs in either averaging area at this sediment target level (Table 7-33). It would also achieve the upper-bound floodplain soil IMPG in one of the two averaging areas (Reaches 5C/5D/6) if the associated sediment concentration were 3 or 5 mg/kg.

These comparisons are shown in detail in Tables 7-30 through 7-33 for all ecological averaging areas in the PSA.

7.5.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 5 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

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[390] In addition to the comparisons mentioned in the text, as shown in Tables 7-28 and 7-29, FP 5 would achieve the RME IMPGs based on a 10^{-6} cancer risk in 7 EAs and 2 Heavily Used Subareas and in 5 farm areas evaluated for consumption of agricultural products. However, it would achieve the CTE IMPGs based on a 10^{-6} cancer risk in 114 EAs and 10 Heavily Used Subareas and in 13 farm areas evaluated for consumption of agricultural products.

Reduction of Toxicity: FP 5 does not include treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during the excavations (which is not anticipated), those wastes would be segregated and sent off-site for treatment and disposal.

Reduction of Mobility: As previously discussed, the existing conditions of the floodplain are predominantly depositional and stable due to the presence of vegetation and generally low flow velocities during inundation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 5 would reduce the volume of PCB-containing soils and the mass of PCBs in the floodplain by removing 104,000 cy of soils containing approximately 17,000 lbs of PCBs from 63 acres of the floodplain.

7.5.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 5 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the performance of the remedial activities in a given area. These impacts would be generally similar to those associated with FP 4, although the magnitude of some impacts would differ based on differences in geographical extent of some affected habitat areas.

Impacts on the Environment – Ecological Effects

As discussed above, FP 5 would impact a total of approximately 92 acres (both within and outside the PSA), including 63 acres due to floodplain soil removal and 29 additional acres (of which 12 are in the floodplain) for the construction and use of access roads and staging areas. The short-term ecological effects resulting from implementation of FP 5 would include the removal of plant and wildlife habitat in those areas of the floodplain where remediation or construction of access roads or staging areas would occur. Short-term impacts specifically associated with each habitat type are described below.

Floodplain Forest Habitats. The largest short-term impacts would occur from the removal of a total of 34 acres of floodplain forest in the PSA, including 31 acres due to soil removal and an additional 3.2 acres for access roads and staging areas. The immediate and near-term impacts of such activities were discussed generally in Section 5.3.4.2 and summarized for FP 3 in Section 7.3.8. In brief, the clearing of these areas and subsequent soil removal would remove all trees and other vegetation in these areas, alter the soil characteristics of

the areas, result in a loss of cover, nesting and feeding habitat for the wildlife species that rely on these forested floodplains, decrease the floodplain roughness that produces resistance to flood flows, and increase the potential for invasive species colonization. Under FP 5, these impacts would occur in 26 more acres than in FP 2, 16 more acres than in FP 3, and 11 fewer acres than in FP 4.

Shrub and Emergent Wetlands. Short-term impacts would also be associated with the disturbance of 29 acres of shrub and emergent wetlands in the PSA (including shrub swamp, wet meadow, shallow emergent marsh, and deep marsh). The short-term impacts of remedial activities in these habitats were discussed generally in Sections 5.3.5.2 and 5.3.6.2 and summarized for FP 3 in Section 7.3.8. In brief, soil removal and construction/use of access roads and staging areas in these wetland habitats would alter the soil, hydrological, and vegetative characteristics in these areas, resulting in the loss or displacement of the species that use these wetlands. Under FP 5, these impacts would occur in 26 more acres than in FP 2, 17 more acres than in FP 3, and 15 more acres than in FP 4.

Vernal Pools. As noted previously, FP 5 would involve remediation in portions of 20 different vernal pools in the PSA, covering a total of 3.4 acres. Within these areas, the remedial construction activities would have the short-term impacts discussed generally in Sections 5.3.7.2 and summarized for FP 3 in Section 7.3.8. In brief, they would alter the hydrological, soil, and vegetative characteristics of the affected portions of the vernal pools, resulting in the loss or displacement of the vernal pool species that use those areas.

Upland Habitat. FP 5 would affect a total of 4.6 acres of upland habitat in the PSA, including both previously disturbed upland habitats (3.2 acres) and forested uplands (1.4 acres). While the disturbed upland areas would experience short-term impacts, the ecological significance of those impacts would be less than that of the impacts to the habitats discussed above due to the relatively lower value of these upland habitats. On the other hand, the loss of forested uplands would contribute to the overall loss of forested habitat resulting from FP 5 in various portions of the existing forested floodplain/riparian corridor of the Housatonic River, and the consequent negative impacts on the many wildlife species that depend on that corridor.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 5.

The total carbon footprint associated with FP 5 has been estimated to be 13,000 tonnes of GHG emissions. Of this total, approximately 11,000 tonnes are associated with direct emission sources (primarily construction activities, tree removal, associated mulch decay/sequestration of the vegetation, and restoration/replanting), while approximately 1,500 tonnes are associated with off-site emissions (primarily refinement of diesel fuel and excavation of backfill materials, gravel, and sand). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 2,500 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 5 would result in short-term impacts to the local communities along the River. As described for the previous removal/backfill alternatives, these short-term effects would include disruption of recreational activities along the River and within the floodplain due to the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities. As noted above, recreational activities that would be affected by construction activities under FP 5 include bank fishing, canoeing (canoe launches), hiking, general recreation, dirt biking/ATVing, and both waterfowl and other game hunting. During the period of active construction, restrictions on recreational use of the floodplain would be imposed in the areas in which remediation-related activities are taking place. Due to safety considerations, boaters, hikers, ATV riders, anglers, hunters, and other recreational users would not be able to use the floodplain in the areas where remediation-related activities are being conducted. In addition, the presence of heavy construction equipment and cleared or disturbed areas would adversely affect the visually undisturbed nature of the area.

Increase in Truck Traffic. Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would significantly increase during the construction period. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment facilities, it would take a total of approximately 8,680 truck trips to do so (an average of 2,170 truck trips per year for a four-year remediation project). Additional truck trips would be necessary to transport backfill materials, as well as materials for the construction of staging areas and access roads to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 11,700 truck trips (2,800 truck trips per year) would also be anticipated to be required for that purpose.

This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the construction zone could affect those residents and businesses located in the immediate vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport backfill to the site and to dispose of used staging area/access road materials.[391] This analysis indicates that the increased truck traffic associated with FP 5 (an estimated 1.0 M vehicle miles, 244,000 average vehicle miles per year) would result in an estimated 0.48 non-fatal injuries due to accidents (average annual non-fatality injury estimate of 0.11) with a probability of 38% of at least one such injury, and an estimated 0.02 fatalities from accidents (average annual fatality estimate of 0.005) with a probability of 2% of at least one such fatality.

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts. A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 5 on the affected communities.[392] These measures would consist of the ones identified in Section 5.7 and summarized in Section 7.2.8 above. Despite the implementation of these measures, however, short-term impacts of construction activities on the local communities from FP 5 would be inevitable.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 5. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 5 is estimated to involve 193,033 labor hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 5 would result in an estimated 1.79 non-fatal injuries to workers (average annual non-fatality injury estimate of 0.43) with a probability of 83% of at least one such injury, and an estimated 0.02 worker fatalities

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[391] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

[392] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2.

(average annual fatality estimate of 0.004) with a probability of 2% of at least one such fatality).

7.5.9 Implementability

7.5.9.1 Technical Implementability

The technical implementability of FP 5 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

General Availability of Technology: The technical methods for implementing FP 5 are basically the same as detailed for FP 4 in Section 7.4.9.1. For the reasons discussed in that section, the equipment, materials (with the exception of commercially available soils that would replicate existing wetland soils), technology, procedures, and personnel necessary to implement FP 5 are expected to be available, and this alternative should be technically implementable.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be utilized in FP 5 is suitable for implementation in the areas where it would be applied. The construction of haul roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. In the long term, floodplain areas would be backfilled and returned to approximate original elevations, to the extent practical, to maintain the flood storage capacity of the floodplain.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country, as described in Section 7.2.5.2. However, restoration efforts would not reliably result in re-establishment of the pre-remediation conditions and functions of at least some of the affected habitats, as noted above and discussed in the relevant subsections of Section 5.3.

Availability of Support Facilities and Resources: Implementation of FP 5 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 29 acres of space would be needed for such facilities and appear to be available based on a conceptual site layout. In addition, sufficient backfill (albeit not soil that

would match existing wetland soil) and planting materials are expected to be readily available for implementation of FP 5.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available, and their use and effectiveness for this type of material removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measure (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 5 would be assessed by visual observation to evaluate such factors as vegetation re-growth and any signs of erosion or disturbance of restored areas. Monitoring procedures would be straightforward and implementable.

7.5.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 5 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 5 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 5 is provided in the Tables F-5.a through F-5.c in Appendix C and summarized in Section 7.5.4.

Access Agreements: Implementation of FP 5 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is anticipated that access agreements would be required from 25 to 35 other landowners. Obtaining such access agreements could be difficult and time-consuming in some cases. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 5 would require coordination with EPA and MDEP. In addition, obtaining access to

state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 5, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.5.10 Cost

The estimated total cost to implement FP 5 is $39.0 M (excluding treatment/disposition costs). The estimated total capital cost for implementation of FP 5 is $37.4 M, assumed to occur over 4 years. Estimated annual OMM costs (for a 5-year inspection and maintenance program for the restored excavation and staging/access road areas) range from $7,000 to $143,000 per year (depending on which reach is being monitored), resulting in a total cost of approximately $1.6 M. The following summarizes the total costs estimated for FP 5.

FP 5	Est. Cost	Description
Total Capital Cost	$37.4 M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$1.6 M	Costs for performance of the OMM programs
Total Cost for Alternative	$39.0 M	Total cost of FP 5 in 2010 dollars

The total estimated present worth of FP 5, which was developed using a discount factor of 7%, a 4-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $35.7 M. More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of associated sediment/riverbank remediation or the costs of treatment/disposition of the removed floodplain soils. The estimated costs for combinations of FP 5 with the various treatment/disposition alternatives are presented in Section 10.

7.5.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.5.2, the evaluation of whether FP 5 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 5 would be effective in reducing the potential for human and ecological exposure to PCBs in floodplain soils by the removal of approximately 104,000 cy (63 acres) of soil with PCB concentrations greater than 50 mg/kg, resulting in the removal of 17,000 lbs of PCBs. The removed soil would be replaced with clean backfill, which would be revegetated. However, FP 5 would also have substantial long-term adverse impacts on many species, including the likely loss of some sensitive species from portions of the PSA, as discussed in Section 7.5.5.3, and thus would actually increase the risks to biota in the Rest of River as a result of habitat loss.

Compliance with ARARs: As discussed in Section 7.5.4, FP 5 could be designed and implemented to achieve many of the ARARs pertinent to this alternative, but several potential ARARs would not be met. As a result, to the extent that those regulatory requirements constitute ARARs, the ones that would not be met would need to be waived by the EPA as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: As discussed in Section 7.5.6.1, implementation of FP 5 would achieve the RME IMPGs based on a 10^{-4} cancer risk in all direct contact EAs and those based on a 10^{-5} cancer risk in approximately 68% of those EAs and in all farm areas evaluated for agricultural products consumption. With respect to the non-cancer IMPGs, FP 5 would achieve the RME IMPGs in 108 of the 120 EAs and in all farm areas, and would achieve the CTE IMPGs in all areas. However, it would not achieve the non-cancer RME IMPGs in 12 direct contact EAs. (FP 5 would also provide health protection through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses based on realistic assumptions.) In these circumstances, if one accepts EPA's assumptions and conclusions in the HHRA, FP 5 would provide substantial overall protection of human health, but would not provide protection from potential non-cancer risks for the most highly exposed individuals in a few areas of the floodplain.

Environmental Protection: As discussed in Section 7.5.6.2, FP 5 would achieve floodplain soil levels within the range of the ecological IMPGs (based on EPA's ERA) for most, but not all, ecological receptors. Specifically, FP 5 would achieve: (1) the lower-bound IMPG for omnivorous/carnivorous mammals in all 7 averaging areas; (2) the target floodplain soil IMPG levels for insectivorous birds in all 12 averaging areas if the associated sediment concentration in those areas were 3 mg/kg or less, and in 11 of those areas if the associated sediment concentration were 5 mg/kg; and (3) the upper-bound target floodplain soil IMPGs for piscivorous mammals in both averaging areas if the associated sediment concentration were 1 mg/kg or less, and in one (but not the other) of those areas if the associated sediment concentration were 3 or 5 mg/kg. However, FP 5 would not achieve levels within the amphibian IMPG range in 53 of the 66 vernal pools in the PSA.

As previously noted, achievement of IMPGs is a balancing factor under the Permit; it is not determinative of whether an alternative would provide overall environmental protection. In this case, the exceedance of the amphibian IMPGs in 53 vernal pools is not indicative of adverse effects that would prevent the maintenance of healthy local amphibian populations, as shown by the fact that the local populations extend beyond the individual pools and by the field information documenting the presence of amphibian populations in the PSA despite the fact PCBs have been present in the floodplain for over 70 years.

On the other hand, as EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d). In this case, as discussed in Sections 7.5.8 and 7.5.5.3, implementation of FP 5 would result in substantial short-term and long-term adverse impacts on the environment as a result of its removal or disturbance of 92 acres of land, including 34 acres of floodplain forest, 29 acres of shrub and emergent wetlands, and 3.4 acres of vernal pools in the floodplain of the PSA. The removals and disturbances in these sensitive floodplain habitats would have long-lasting negative consequences for the plants and animals that utilize those habitats. Due to those substantial adverse impacts, based on the balancing called for by EPA guidance, FP 5 would have a net negative impact on the environment and thus would not provide overall protection of the environment.

Summary: Based on the above considerations, FP 5 would provide general protection of human health from the asserted risks of PCBs, although it would not achieve the non-cancer RME IMPGs based on EPA's HHRA in a few areas of the floodplain. From an environmental standpoint, due to the substantial short-term and long-term ecological harm that would result from implementation of FP 5, FP 5 would not meet the standard of providing overall protection of the environment.

7.6 Analysis of Floodplain Alternative 6

7.6.1 Description of Alternative

FP 6 would involve the removal of floodplain soils with concentrations greater than or equal to 25 mg/kg in the top foot of soil, as well as in the top 3 feet of soil in the Heavily Used Subareas (described in Section 4.2.1 and shown on Figures 4-3a-d). The excavated areas would be replaced with backfill and revegetated.

Summary of Removal Areas and Volumes

FP 6 would involve the removal of approximately 320,000 cy of floodplain soil from 197 acres of the floodplain. The locations of these removal areas are shown on Figure 7-5. The majority of removal (315,000 cy) would be from the top foot of soil in those areas and 5,000 cy would be from depths between 1 and 3 feet in the Heavily Used Subareas.

Summary of Affected Habitat

FP 6 would involve the removal and backfill of soil across approximately 197 acres in various types of habitats. The approximate acreages of those general habitat types, with associated removal volumes, are as follows:[393]

- 10 acres (17,000 cy) of vernal pool habitat, which include portions of 36 different vernal pools;
- 96 acres (157,000 cy) of floodplain wetland forest habitats (consisting of high-terrace floodplain forest, transitional floodplain forest, red maple swamp, and black ash-red maple-tamarack calcareous seepage swamp);
- 73 acres (117,000 cy) of shrub and shallow emergent wetland habitats (consisting of shrub swamp, wet meadow, and shallow emergent marsh);
- 5.3 acres (9,000 cy) of deep marsh habitat;
- 6.1 acres (10,000 cy) of disturbed upland habitats (consisting of agricultural field habitat and cultural grasslands habitat);
- 2.7 acres (5,000 cy) of upland forested habitats (consisting of northern hardwoods-hemlock-white pine forest, red oak-sugar maple transition forest, rich mesic forest, and successional northern hardwoods habitat); and
- 3.6 acres (6,000 cy) of habitat of currently unmapped community type.[394]

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[393] This detailed breakdown of removal areas and volumes by habitat type was generally conducted using the Woodlot (2002) habitat community mapping between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. As noted above, both the acreages of impact and the removal volumes have been rounded, with the result that the sum of the numbers given for each habitat type may not exactly match the total impacted acreage and removal volume for the alternative.

In addition to the above-described areas associated with excavation/backfill activities, floodplain habitat would be affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 6 would require 29 staging areas, which would occupy a total of 13 acres (2.3 acres of which would be within the floodplain), and 10 miles of temporary access roads covering 24 additional acres assuming a 20-foot road width (5.0 miles and 12 acres of which would be within the floodplain). These facilities would be located in all of the above habitats, with those located within the Woodlot (2002) mapping coverage situated mainly in floodplain forest habitats (3.3 acres), shrub and emergent wetlands (4.2 acres), and upland habitats (6.1 acres).[395] The locations of these staging areas and access roads are shown on Figure 7-5.

Conceptual Remedial Approach

The conceptual remedial approach for FP 6 would be generally the same as described for FP 2 through FP 5, although it would involve much more extensive removal and disruption. Conventional construction equipment would be used to construct access roads and staging areas, clear and grub existing vegetation, remove and replace soil, and conduct restoration activities. As described for FP 3, FP 4 and FP 5, some specialized construction equipment, materials, and specific engineering practices would be used in an attempt to mitigate the potentially negative impacts of construction in and around vernal pools and other wetland areas.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 6 were selected, considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs, in an effort to minimize impacts on sensitive habitats and local communities to the extent practical (see Section 5.2.2). As noted for the alternatives discussed above, areas were specifically selected based on accessibility, existing land use, habitat use, and location relative to the floodplain; and an effort was made, where practicable, to avoid sensitive wildlife habitats (e.g., forested floodplain areas, vernal pools,

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[394] These impacts would occur mostly in the Reach 7 floodplain, where the Woodlot habitat community mapping is absent. Based on review of information from MassGIS and aerial photography, remediation activities under FP 6 within Reach 7 would be conducted mainly within disturbed/developed areas just below Woods Pond Dam (3.2 acres).

[395] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 6 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed upland areas (15 acres), with additional impacts occurring in forested uplands (5.8 acres), forested wetlands (0.2 acre) and wet meadow/emergent marsh habitats (0.6 acre). There would be no impacts in Reaches 7 and 8 from construction of access roads or staging areas.

other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. This evaluation has lead to the locations of staging areas and access roads shown on Figure 7-5. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

For purposes of the evaluations in this Revised CMS Report, it is assumed that FP 6 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. The restoration methods that are assumed to be utilized under FP 6, subject to development of a more detailed restoration plan during design, would involve the conceptual methods described in Section 5.3.4.3 for the floodplain forest habitat, Section 5.3.5.3 for the shrub and shallow emergent wetlands, Section 5.3.6.3 for the deep marshes, Section 5.3.7.3 for the vernal pools, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that FP 6 would take approximately 13 years to complete if implemented independently from other River-related remedial activities. However, assuming that floodplain remediation would be coordinated with sediment remediation, the time to complete FP 6 would likely be different than if conducted independently, depending on the sediment remediation alternative selected. Nevertheless, for purposes of the evaluations in this section, it has been assumed that FP 6 would take 13 years.

As described for the other alternatives, FP 6 would include institutional controls and/or other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted of the backfilled/restored areas. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program are anticipated to include those described in Section 4.5 and outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.6.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs;

(b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 6 would be protective of human health and the environment is presented at the end of Section 7.6 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.6.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River. As stated previously, the floodplain is generally flat, well vegetated and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and transport to the River.

Open excavations during construction could serve as a short-term temporary source of some releases during an extreme weather event. As with the other alternatives, such potential releases would be controlled using conventional engineering practices. However, because FP 6 would involve such a large area (197 acres) over such a long time (assumed individually to take 13 years), the potential for such short-term releases are much greater.

7.6.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 6 in accordance with directions from EPA are listed in Tables F-6.a through F-6.c in Appendix C.[396] FP 6 could be designed and implemented to achieve many of those ARARs,[397] but, as with FP 3 through FP 5, there are a number of potential location-specific and action-specific ARARs that would not be met by FP 6. These are the same potential ARARs as described for FP 3 in Section 7.3.4 and include a number of federal and state regulatory requirements relating to ecological protection (including regulations applicable to the Upper Housatonic ACEC). To the extent that these requirements constitute ARARs, they would need to be waived by EPA as technically impracticable to meet (or on some other ground) under CERCLA and the NCP.

In addition, for the same reasons discussed for FP 2 in Section 7.2.4, it is possible that, in the unlikely event that excavated floodplain soils should be found to constitute hazardous

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[396] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

[397] As discussed for FP 2 in Section 7.2.4 (footnote 336), it is assumed that EPA would make the determinations necessary in connection with certain requirements.

waste (which is not anticipated) and that the temporary staging areas for the handling of those soils are subject to federal and/or state hazardous waste regulations, the staging areas may not meet certain locational and/or technical requirements for the storage of hazardous waste. In that unlikely event, as also discussed in Section 7.2.4, those requirements should be waived by EPA as technically impracticable to meet.

7.6.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness for FP 6 has included evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

7.6.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 6 includes consideration of the length of time and extent to which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 6 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 320,000 cy of PCB-containing soil over 197 acres of floodplain (see Figure 7-5). The reduction in potential exposure and risk would occur upon completion of the remediation in a given area.

Implementation of FP 5 would result in the removal of soils containing PCB concentrations at or above 25 mg/kg. As discussed further in Section 7.6.6.1, the average floodplain soil concentrations in the human health averaging areas following implementation of FP 6 would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a 10^{-4} cancer risk in all such areas and a 10^{-5} cancer risk and a non-cancer HI of 1 in most (but not all) of those areas. As discussed in Section 7.6.6.2, the average concentrations in the ecological averaging areas would achieve the IMPGs for most, but not all, ecological receptors.[398] The average post-remediation EPCs in the top foot within the human health and ecological averaging areas for FP 6 are shown in Tables

[398] As discussed in Section 1.2, GE does not agree with many of the assumptions and inputs used in EPA's HHRA and ERA and thus does not agree that levels based on those risk assessments are an appropriate measure of risks to human health or the environment.

7-35 through 7-40. (Table 7-35 also shows the post-remediation concentrations in the top 3 feet in Heavily Used Subareas.)

PCBs would also remain at depths below those described above. In the event that future exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional Solutions would be implemented where necessary to address potential risks from future activities and uses that are reasonably anticipated based on realistic assumptions.

7.6.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 6 has included an assessment of the use of technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace technical components. The technology and implementation steps for FP 6 would be generally the same as described for the other floodplain removal alternatives. However, because FP 6 would affect so much more of the floodplain, and because so much of the area affected under FP 6 is wetland, the logistical issues associated with such a large remediation project would be much more complex.

Use of Technology Under Similar Conditions

FP 6 relies primarily on the removal of floodplain soils, followed by backfilling of the excavations and performance of restoration activities. Excavation of soils from floodplain environments containing various habitats has been implemented at a number of sites across the country, as discussed in Section 7.2.5.2. Restoration was discussed separately in Section 5.3.

General Reliability and Effectiveness

The removal and backfill of soil for FP 6 would reliably, effectively and permanently reduce the concentrations of PCBs in the removal areas. Following backfilling, it is assumed that excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. However, there are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, 5.3.6.4 for deep marsh habitat, 5.3.7.4 for vernal pools, and 5.3.8.4 for forested upland habitats. Given the very extensive portions of the floodplain that would be disturbed by FP 6, these constraints are correspondingly more severe, and the likelihood of re-establishing pre-remediation conditions and functions throughout these habitats is correspondingly reduced, as discussed further in Section 7.6.5.3.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 6, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, to identify areas (if any) where the backfill is eroding and in need of repair, and to evaluate the conditions of the affected vernal pools and other wetlands. Any deficiencies noted during the inspections would be subject to maintenance, repair, and other corrective actions performed as necessary and practicable. Periodic inspection of the replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and perform any maintenance activities required following implementation of FP 6 are considered readily available.

Because access roadways would be removed after construction, maintenance, if required, could be difficult to implement in certain areas of the floodplain, due to remoteness, wet areas, and vegetation growth. The ease of access may change based on seasonal conditions. It could be especially difficult to conduct supplemental planting activities in difficult-to-access locations, to which plant materials would have to be carried from the closest roadways.

Technical Component Replacement Requirements

If significant erosion, plant loss, or other problematic conditions were observed as part of the OMM program in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for, and methods of, and practicability of repair. Because of the size of the overall area that would require OMM, it is likely that some areas would require repair or replacement. Depending on the timing and location of the repair, access roads and staging areas may again need to be temporarily constructed in the floodplain. It is anticipated that if small repairs or replacement were necessary, they could be implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological receptors that use/inhabit the floodplain in these areas. The repair or replacement of larger areas could require more extensive disturbance in the floodplain.

7.6.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 6 on human health or the environment has included consideration of the items discussed below.

Potentially Affected Populations

Implementation of FP 6 would have long-term effects on human and wildlife populations through changes in the natural environment and habitat. Since this alternative involves more extensive floodplain disturbance than the alternatives discussed above, the impacts would be correspondingly greater. For humans, implementation of FP 6 would affect the aesthetics and recreational use of the floodplain. For wildlife, implementation of FP 6 would remove and replace several habitat types (described in Section 7.6.1), which would affect the mammals, birds, amphibians, and reptiles inhabiting those habitats. In particular, FP 6 would affect portions of the mapped Priority Habitats of 25 state-listed rare species, as described in Appendix L. The long-term impacts of FP 6 on the affected habitats and their associated biota are discussed in the next subsections.

Overview of Long-Term Ecological Impacts

FP 6 would impact a total of approximately 234 acres, including 197 acres due to floodplain soil removal and an additional 37 acres (14 of which are in the floodplain) for the construction and use of access roads and staging areas. These impacts represent an increase of 125 to 142 acres over the impacted areas under FP 4 and FP 5. The great majority of these impacts would occur in the PSA. The most significant long-term impacts would occur in the forested floodplain habitats, vernal pools, and the shrub and emergent wetlands, as described below.

Long-Term Impacts on Floodplain Forest Habitats and Biota

FP 6 would adversely impact a total of approximately 99 acres of floodplain wetland forest habitats in the PSA (within the Woodlot habitat mapping coverage), including 96 acres due to soil removal and an additional 3.3 acres for access roads and staging areas. This would include the clearing of numerous large forested areas. As a result, despite the implementation of restoration measures, the forested floodplain habitats and the biota that use them would experience a number of long-term adverse effects. The long-term impacts of remediation activities on floodplain forest habitats were described generally in Section 5.3.4.4 and summarized for FP 3 in Section 7.3.5.3. However, due to the far more extensive disturbances under FP 6, these impacts would be more widespread and severe under FP 6 than under any of the floodplain alternatives discussed previously.

This increased area of floodplain forest impact, including the removal of more mature trees and the creation of larger open areas, would increase the extent and duration of the long-term degradation of the floodplain forest community. Due to the greater extent of clearing (with the consequent removal of the tree canopy and lack of windbreaks) and the greater proportion of altered forested floodplain habitat, there would be an increase in cumulative stresses from changes in microclimate, hydrology, and invasive species, which would affect the new plantings. With large contiguous exposed areas, the initial establishment of vegetative cover would be constrained due to soil moisture and dessication issues, and subsequent plant growth would limited by temperature extremes, ongoing soil moisture issues, wind fetch, distance from native plant repositories, and proliferation of invasive species. As a result of these changes, the plant community succession from the sapling/shrub stage to the young transitional forest stage to a mature forest, which would take at least 50 to 100 years under the best of circumstances, would be highly unreliable and could take longer than that, if it occurs at all.

In this situation, there would be a long-term loss of or major changes in the wildlife in large portion of the floodplain forest in the PSA. Due to the large-scale gaps in the existing forested habitat that would be created by FP 6, this alternative would not only result in a loss of forest-interior wildlife (including reptiles, amphibians, birds, and small mammals) in large portions of the PSA, but would also create fragmentation that would eliminate or greatly reduce the connectivity among habitat patches and alter wildlife corridors and migration patterns within the PSA for a variety of species (such as neotropical migratory songbirds and mammals like the fisher and bobcat) for a long time, if not permanently. Although forested habitat conditions may eventually be re-established in 50 to 100 years, the length and severity of the species losses and extensive change in character of the floodplain riparian corridor during that period raise significant doubts as to whether some of the affected species (including state-listed species, discussed separately below) would ever return.

Long-Term Impact on Vernal Pools and Vernal Pool Biota

FP 6 includes excavation and replacement of surface soils in 10 acres of vernal pool habitat, including portions of 36 of the 66 vernal pools in the PSA. While these overall impacts are somewhat less than the overall vernal pool impacts under FP 3 and FP 4, they would still constitute a major threat to many of the vernal pools in the PSA. The direct long-term impacts on the vernal pools subject to remediation under FP 6 would be same as described in Sections 5.3.7.4 and 7.3.5.3. These impacts include long-lasting changes in the hydrology of the vernal pools (which is extremely difficult to reproduce), in soil conditions in the pools (due to the inability of replacement soils to match the characteristics of the existing vernal pool soils), and in the vegetative characteristics of the pools (due to the loss of the complex and mature organic vegetative composition of

the pools). There is also a high probability that invasive or other undesirable plant species and animal predators (such as green frogs, bullfrogs, and invertebrates) would invade pools where they did not previously exist. These alterations would, in all likelihood, result in the loss of obligate vernal pool species from at least many of the pools.

In addition, FP 6 would cause substantial disturbances to the forested non-breeding amphibian habitat around the vernal pools. FP 6 would affect varying portions of the 100-foot and 100- to 750-foot zones around the vernal pools in the PSA – ranging up to 100% of the 100-foot zone and 43% of the 100-750 zone for individual pools – due to floodplain soil removal and construction of access roads. In total, FP 6 would affect 40 acres within 100 feet and 128 acres within the 100- to 750-foot zones of the vernal pools in the PSA. For the reasons discussed in Section 5.3.7.4, these disturbances would disrupt important aspects of those areas' non-breeding functions for the vernal pool amphibians.

Given the impacts of FP 6 on the vernal pools in the floodplain and on the forested habitats around the vernal pools, it is unlikely that the full complement of characteristics that contribute to vernal pool functions would be re-established for many, if not most, of the affected pools.

Long-Term Impacts on Shrub and Emergent Wetland Habitats and Biota

FP 6 would impact a total of approximately 82 acres of shrub and emergent wetland habitats in the PSA (within the Woodlot habitat mapping coverage), including shrub swamp, wet meadow, shallow emergent marsh, and deep marsh habitats. These impacted areas include 78 acres due to soil removal and 4.4 additional acres for access roads and staging areas. The long-term adverse impacts of remediation activities on these wetland habitats were described generally in Sections 5.3.5.4 (for shrub and shallow emergent wetlands) and 5.3.6.4 (for deep marshes). These adverse impacts include changes in soil stratigraphy, composition, and chemistry; changes in the drainage patterns and hydrology of these wetlands; and resulting changes in vegetative characteristics. These impacts would change the characteristics of the wetlands and would last until soil and hydrological conditions similar to pre-remediation conditions return through flooding and the other natural processes that originally formed these habitats. The time necessary for this recovery is uncertain and could be a decade or more. During this period, the wildlife that use these wetlands would be lost. In fact, even after the return of soil and hydrological conditions resembling prior conditions, the biotic communities that are re-established may not match the pre-remediation communities in certain respects. For example, there would be high potential for proliferation of invasive plants, and the return of certain sensitive species, including state-listed wildlife species,

would be doubtful. Under FP 6, these adverse impacts would occur over to a much greater extent than under any of the previously discussed alternatives.

Long-Term Impacts on Upland Habitats

FP 6 would adversely impact a total of approximately 15 acres of upland habitats in the PSA (within the Woodlot habitat mapping coverage), including approximately 8.8 acres due to soil removal and 6.1 acres for access roads and staging areas. The impacted areas would include approximately 11 acres of disturbed upland habitats (agricultural fields and cultural grasslands) and 4.1 acres of upland forest habitats.[399] The potential for long-term post-restoration impacts of remediation activities on these upland habitat types was described generally in Section 5.3.8.4 and is summarized below.

For disturbed upland habitats such as agricultural fields and cultural grasslands, there could be some individual impacts, since even these disturbed habitats may provide specific ecological functions, such as serving as nesting habitat for wood turtles. In general, however, as these areas support altered or early successional plant communities that have limited ecological value, no significant long-term adverse ecological impacts would be expected from the remediation in these areas, By contrast, the clearing and removal of trees in the upland forest habitats would have long-term negative impacts on these habitats and the wildlife species that use them due to the lengthy time necessary for the regrowth of mature trees, as discussed previously. Moreover, the loss of this upland forest habitat would contribute to the overall loss of forested habitats resulting from FP 6 throughout the existing forested floodplain/riparian corridor of the Housatonic River, and the consequent impacts on the wildlife that depend on that corridor, as described above.

Long-Term Impact on State-Listed Species

As noted above, FP 6 would affect portions of the Priority Habitats of 25 state-listed species. As discussed in the MESA assessments in Appendix L, it is anticipated that FP 6 would involve a take of at least 24 of these species and would adversely affect a significant portion of the local population of at least 16 of them. The table below lists the 25 stated-listed species whose Priority Habitat would be affected by FP 6, along with those for which FP 6 would result in a take and those for which FP 6 would impact a significant portion of the local population:

[399] In addition, as noted in Section 7.6.1, FP 6 would affect 18 acres of disturbed/developed upland areas and 6 acres of upland forest habitat outside the Woodlot habitat mapping coverage.

Table 7-41 – Impacts of FP 6 on State-Listed Species

Species with Priority Habitat Affected by FP 6	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	Yes
Arrow clubtail	Yes	Yes
Bald eagle	Yes	Unlikely
Black maple	Yes	Yes
Bristly buttercup	Yes	Yes
Brook snaketail	Yes	Yes
Bur oak	Yes	Possibly
Common moorhen	Yes	Unlikely
Crooked-stem aster	Yes	Possibly
Foxtail sedge	Yes	Yes
Gray's sedge	Yes	Unlikely
Hairy wild rye	Yes	Unlikely
Intermediate spike-sedge	Yes	Yes
Jefferson salamander	Yes	Yes
Mustard white	Yes	Yes
Narrow-leaved spring beauty	Yes	Yes
Ostrich fern borer moth	Yes	Likely
Rapids clubtail	Yes	Yes
Riffle snaketail	Yes	Yes
Spine-crowned clubtail	Yes	Yes
Triangle floater	Unlikely	No
Wapato	Yes	Possibly
Water shrew	Yes	Yes
Wood turtle	Yes	Yes
Zebra clubtail	Yes	Yes

Long-Term Impact on Other Floodplain Functions

In addition to the above-described impacts on wildlife habitat, due to the substantially greater extent of the floodplain disturbances, FP 6 would have greater impacts on the other floodplain functions described above (see Sections 5.3.4.1 and 5.3.4.4). For example, with

the greater extent of floodplain forest removal, there would be more widespread reduction in floodplain roughness, which could alter the floodplain's flood flow alteration functions, leading to faster flows, more erosion, and less infiltration during flood events. Similarly, FP 6 would have greater impacts on the floodplain's functions of groundwater recharge/discharge and water quality maintenance, nutrient processing, and production export.

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 6 would have long-term negative impacts on the aesthetic features of the natural environment. The natural appearance of the floodplain after remediation and restoration would not be the same as prior to remediation. FP 6 would result in the loss of 103 acres of forested communities (including both floodplain and upland forested areas) – far more than under FP 2 through FP 5. These areas would look markedly different for at least a long time after remediation because the time for a replanted forest community to develop an appearance comparable to its current appearance would be generally commensurate with the age of the community prior to remediation, which would be 50 to 100 years or more, if it occurs at all.

FP 6 would impact floodplain areas used for bank fishing, canoeing (canoe launches), hiking, general recreation, dirt biking/ATVing, and both waterfowl and other game hunting. These recreational activities would be disrupted by the implementation of FP 6. Since the extent of the disturbances under FP 6 would be considerably greater than under the previously discussed alternatives, the disruptions of these recreational activities would correspondingly be greater. These disruptions would last not only during the remediation period, but until the areas have sufficiently recovered to support such uses.

Potential Measures to Mitigate Long-Term Adverse Impacts

Various restoration measures are available to attempt to mitigate the long-term adverse impacts from implementation of FP 6.[400] The restoration methods for the types of habitats that would be affected by this alternative are described in the restoration methods subsections in Section 5.3. However, as also described in that section and discussed above, implementation of these restoration methods would not prevent long-term impacts from the remediation, particularly given the large impacted areas to which they would have to be applied under FP 6.

[400] Potential measures to avoid or minimize the adverse impacts were described in Section 5.2.

7.6.6 Attainment of IMPGs

As described in Section 7.6.1, FP 6 is a threshold-based alternative (i.e., removal of PCBs at or above 25 mg/kg) and was therefore not designed to achieve any particular set of IMPGs. This section describes the extent to which FP 6 would nonetheless achieve the human health and ecological IMPGs. These comparisons are presented in Tables 7-35 through 7-40 for the pertinent human and ecological averaging areas. The time frame to achieve any IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.6.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, as shown in Table 7-35, FP 6 would achieve, at a minimum, the RME IMPGs based on a 10^{-4} cancer risk in all 120 direct contact EAs and in all 12 Heavily Used Subareas. In addition, FP 6 would achieve the RME IMPGs based on a 10^{-5} cancer risk in 107 of the 120 EAs and in 10 of the Heavily Used Subareas. It would also achieve the RME non-cancer IMPGs in 115 of the 120 EAs and in all 12 Heavily Used Subareas.

FP 6 would also achieve the RME IMPGs based on a 10^{-5} cancer risk and non-cancer impacts in all 14 farm areas evaluated for consumption of agricultural products (Table 7-36).

Overall, implementation of FP 6 would achieve levels within EPA's cancer risk range in all human health exposure areas, but would not achieve the non-cancer RME IMPGs in 5 of those direct contact areas, which together cover approximately 79 acres of the floodplain. The IMPG comparisons for FP 6 are shown in detail in Tables 7-35 and 7-36 for all human exposure areas in Reaches 5 through 8.[401]

7.6.6.2 Comparison to Ecological IMPGs

The extent to which FP 6 would achieve the ecological IMPGs is as follows:

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[401] In addition to the comparisons mentioned in the text, as shown in Tables 7-35 and 7-36, FP 6 would achieve the RME IMPGs based on a 10^{-6} cancer risk in 15 EAs and 2 Heavily Used Subareas and in 5 farm areas evaluated for consumption of agricultural products. It would achieve the CTE IMPGs based on a 10^{-6} cancer risk in 117 EAs and 11 Heavily Used Subareas and in 13 farm areas evaluated for consumption of agricultural products.

- For amphibians, FP 6 would achieve the upper-bound IMPG (5.6 mg/kg) in 24 of the 66 vernal pools in the PSA, and would also achieve the lower-bound IMPG (3.27 mg/kg) in 18 of those 24 pools (Table 7-37).

- For omnivorous/carnivorous mammals, FP 6 would achieve the lower-bound IMPG (21.1 mg/kg) in all averaging areas (Table 7-38).

- For insectivorous birds, FP 6 would achieve the target floodplain soil IMPG levels in all averaging areas in the PSA at any of the 3 sediment target levels evaluated (1, 3, and 5 mg/kg) (Table 7-39).

- For piscivorous mammals, FP 6 would achieve the upper-bound floodplain soil IMPGs in both of the PSA averaging areas if the associated sediment concentration in those areas were 1 mg/kg or less, and would achieve the lower-bound IMPG in the Reach 5C/5D/6 averaging area (but not the Reaches 5A/5B area) at this sediment target level (Table 7-40). It would also achieve the upper-bound floodplain soil IMPG in one of the two averaging areas (Reaches 5C/5D/6) if the associated sediment concentration were 3 or 5 mg/kg.

These comparisons are shown in detail in Tables 7-37 through 7-40 for all ecological averaging areas in the PSA.

7.6.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 6 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

Reduction of Toxicity: FP 6 does not include any treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during the excavations (which is not anticipated), those wastes would be segregated and sent off-site for treatment and disposal.

Reduction of Mobility: As previously noted, the existing conditions of the floodplain are predominantly depositional and stable due to generally low flow velocities during inundation and the presence of vegetation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 6 would reduce the volume of PCB-containing soils and the mass of PCBs in the floodplain by removing 320,000 cy of soils containing approximately 33,300 lbs of PCBs from 197 acres of the floodplain.

7.6.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 6 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and on workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the performance of the remedial activities in a given area. Since the remedial activities associated with FP 6 would be spread out over the overall remedial action period and area, the short-term impacts would not last for the entire duration of the project in all affected areas. However, the impacts of FP 6 would be substantially greater than those of the previously discussed floodplain alternatives since FP 6 would affect a much larger area and last a much longer time. Specifically, FP 6 would impact a total of 234 acres (197 for soil removal and 37 for access roads and staging areas), of which 211 acres are located within the floodplain; and it would take many years longer to implement than FP 2 through FP 5.

Impacts on the Environment – Ecological Effects

As discussed above, FP 6 would impact a total of approximately 234 acres (both within and outside the PSA), including 197 acres due to floodplain soil removal and an additional 37 acres (14 of which are in the floodplain) for the construction and use of access roads and staging areas. The short-term ecological effects resulting from implementation of FP 6 would include the removal of plant and wildlife habitat in those areas of the floodplain where remediation or construction of access roads or staging areas would occur. Short-term impacts specifically associated with each habitat type are described below.

Floodplain Forest Habitats. The largest short-term impacts would occur from the removal of a total of 99 acres of floodplain forest in the PSA, including 96 acres due to soil removal and an additional 3.3 acres for access roads and staging areas. The short-term impacts of such activities were discussed generally in Section 5.3.4.2. In brief, the clearing of these areas and subsequent soil removal would remove all mature trees and other vegetation in these areas, alter the soil characteristics of the areas, result in a loss of cover, nesting and feeding habitat for the wildlife species that rely on these forested floodplains, decrease the floodplain roughness that produces resistance to flood flows, and increase the potential for invasive species colonization. The clearing of these areas would be particularly disruptive to wildlife that would not be likely to migrate out of the construction zone and to birds that are dependent on the forested community for the placement of their nests. It would also cause habitat fragmentation that would further disrupt the movement and interactions of various wildlife species. All of these impacts would be substantially greater under FP 6 than under any of the above-discussed alternatives.

Shrub and Emergent Wetlands. Short-term impacts would also be associated with the disturbance of 82 acres of shrub and emergent wetlands in the PSA (encompassing shrub swamp, wet meadow, shallow emergent marsh, and deep marsh habitats), including 78 acres due to soil removal and an additional 4.4 acres for access roads and staging areas. The short-term impacts of remedial activities in these habitats were discussed generally in Sections 5.3.5.2 and 5.3.6.2. In brief, soil removal and construction/use of access roads and staging areas in these wetland habitats would alter the soil conditions, hydrology (including drainage patterns), and vegetative characteristics in these areas, resulting in the inability of these areas to support mammals, birds, reptiles, and amphibians that are dependent on these wetlands for nesting, breeding, and feeding. Again, these impacts would be substantially greater under FP 6 than under any of the above-discussed alternatives.

Vernal Pools. As noted previously, FP 6 would involve remediation in portions of 36 different vernal pools in the PSA, covering a total of 10 acres. Within these areas, the remedial construction activities would have the short-term impacts discussed generally in Sections 5.3.7.2. In brief, they would alter the hydrological, soil, and vegetative characteristics of the affected portions of the vernal pools, resulting in the loss or displacement of the vernal pool species that use those areas. In addition, FP 6 would cause widespread disturbances to the forested non-breeding habitats around the vernal pools, which would disrupt those areas' non-breeding functions for the vernal pool amphibians.

Upland Habitat. FP 6 would affect a total of 15 acres of upland habitat in the PSA, including both previously disturbed upland habitats (11 acres) and forested uplands (4.1 acres). While FP 6 would further disturb the already disturbed habitats, the short-term ecological significance of those disturbances would be less than that of the impacts to the habitats discussed above due to the relatively lower ecological value of those upland habitats. On the other hand, the loss of forested uplands would result in a loss of the wildlife species that use these forested areas. It would also contribute to the overall loss of forested habitat resulting from FP 6 throughout the existing forested floodplain/riparian corridor of the Housatonic River, with the consequent impacts on the wildlife that depend on that corridor.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 6.

The total carbon footprint associated with FP 6 has been estimated to be 41,000 tonnes of GHG emissions. Of this total, approximately 36,000 tonnes are associated with direct

emission sources (primarily construction activities, tree removal, associated mulch decay/sequestration of the vegetation, and restoration/replanting), while approximately 4,500 tonnes are associated with off-site emissions (primarily refinement of diesel fuel and excavation of backfill materials, gravel, and sand). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 7,800 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 6 would result in short-term impacts to the local communities along the River. As described for the previous removal/backfill alternatives, these short-term effects would include disruption of recreational activities along the River and within the floodplain due to the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities. As noted above, recreational activities that would be affected by construction activities under FP 6 include bank fishing, canoeing (canoe launches), hiking, general recreation, dirt biking/ATVing, and both waterfowl and other hunting. During the period of active construction, restrictions on recreational use of the floodplain would be imposed in the areas in which remediation-related activities are taking place. Due to safety considerations, boaters, hikers, ATV riders, anglers, hunters, and other recreational users would not be able to use the floodplain in the areas where remediation-related activities are being conducted. In addition, the presence of heavy construction equipment and cleared or disturbed areas would adversely affect the visually undisturbed nature of the area.

Increase in Truck Traffic. Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would increase substantially, and that increase would persist for the duration of the project. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment facilities, it would take a total of approximately 26,600 truck trips to do so (2,050 truck trips per year for a 13-year remediation project). Additional truck trips would be necessary to transport backfill materials, as well as materials for the construction of staging areas and access roads, to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 34,600 truck trips (an average of 2,700 truck trips per year) would be required for that purpose.

This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the

construction zone could affect those residents and businesses located in the immediate vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport backfill to the site and to dispose of used staging area/access road materials.[402] This analysis indicates that the increased truck traffic associated with FP 6 (an estimated 2.4 M vehicle miles, 188,000 average vehicle miles per year) would result in an estimated 1.15 non-fatal injuries due to accidents (average annual non-fatality injury estimate of 0.09) with a probability of 68% of at least one such injury, and an estimated 0.05 fatalities from accidents (average annual fatality estimate of 0.004) with a probability of 5% of at least one such fatality.

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts. A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 6 on the affected communities.[403] These measures would consist of the ones identified in Section 5.7 and summarized in Section 7.2.8 above. Despite the implementation of these measures, however, there would be substantial short-term impacts of construction activities under FP 6 on the local communities, especially given the widespread extent of impacts and the duration of implementation of that alternative.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 6. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 6 is estimated to involve 570,478 labor hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 6 would result in an estimated 5.28 non-fatal injuries to workers (average annual non-fatality injury estimate of 0.41) with a

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[402] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

[403] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2. However, it should be noted that since the size of the area affected by FP 6 is large and, in many places, contiguous, this alternative would have less space than the above-discussed alternatives for the implementation of engineering measures and BMPs designed to minimize impacts, such as relocating a road or diverting a stream bed.

probability of 99% of at least one such injury, and an estimated 0.04 worker fatalities (average annual fatality estimate of 0.003) with a probability of 4% of at least one such fatality.

7.6.9 Implementability

7.6.9.1 Technical Implementability

The technical implementability of FP 6 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

The differences between FP 6 and the previously discussed alternatives are that FP 6 would involve the removal and backfilling of nearly 3 times the acreage and volume of soil than FP 4 or FP 5, over 4 times more than FP 3, and approximately 15 times more than FP 2. The area and volume of remediation in wetlands areas would also be correspondingly greater. As a result, the logistical and technical difficulties in remediation and restoration efforts would increase as well.

General Availability of Technology: FP 6 would use conventional construction equipment, engineering procedures, and controls to conduct the remediation and restoration efforts. The equipment, material, technology, procedures, and personnel necessary to implement such activities are expected to be readily available (with the exception of commercially available soils that would replicate existing wetland soils). Some specialized equipment would be used in and around environmentally sensitive areas, including vernal pools and wetlands, but these are also commercially available. Further, methods to implement monitoring and institutional controls are expected to be readily available.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be utilized for FP 6 is suitable for implementation in the areas where it would be applied. The construction of haul roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. Although these would be designed to mitigate the potential impacts, the size and the contiguous nature of the remediation areas would make the success of such controls more uncertain than for the smaller alternatives. In the long term, floodplain areas would be backfilled and returned to approximate original elevations, to the extent practical, thereby minimizing effects on flood storage capacity.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country, as described in Section 7.2.5.2. However, given the extent of disturbances under FP 6 and the fact that removal of the various wetlands habitats would be over contiguous areas in many cases, re-establishment of pre-remediation conditions and functions through restoration measures is unlikely for some affected habitats and uncertain for others, as discussed in the relevant subsections of Section 5.3 and in Section 7.6.5.3.

Availability of Support Facilities and Resources: Implementation of FP 6 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 37 acres of space would be needed for such facilities and appear to be available based on a conceptual site layout. Development of access roads and staging areas would be sequenced and constructed appropriately over the implementation period for FP 6. The volume and duration of necessary material storage (including final disposition) would depend upon the selected treatment/disposition alternative. Backfill (albeit not soil that would match existing wetland soil) and planting materials should be available with sufficient planning and coordination with sources. To provide sufficient materials for FP 6, multiple suppliers of backfill and planting materials may need to be used to fully support the project. An evaluation would be performed during design activities to assess suitable material availability.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available, and their use and effectiveness for this type of materials removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measure (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 6 would be assessed by visual observation to evaluate such factors as vegetation re-growth and any signs of erosion or disturbance of restored areas. Monitoring procedures would be straightforward and implementable, although the size of the area to be covered is large and may be difficult to access in certain areas.

7.6.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 6 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 6 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 6 is provided in the Tables F-6.a through F-6.c in Appendix C and summarized in Section 7.6.4.

Access Agreements: Implementation of FP 6 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is anticipated that access agreements would be required from 40 to 50 other landowners. Obtaining access to all these properties for the type of work and length of time that may be needed would likely be difficult and time-consuming. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 6 would require coordination with EPA and MDEP. In addition, obtaining access to state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 6, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.6.10 Cost

The estimated total cost to implement FP 6 is $107 M (excluding the costs of treatment/disposition of excavated soils). The estimated capital cost for implementation of FP 6 is $103 M, assumed to occur over a 13-year construction period. Estimated annual OMM costs (for a 5-year inspection and maintenance program for the restored excavation and staging/access road areas) range from $10,000 to $340,000 per year (depending on which reach is being monitored), resulting in a total cost of $4.0 M. The following summarizes the total costs estimated for FP 6.

FP 6	Est. Cost	Description
Total Capital Cost	$103 M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$4.0 M	Costs for performance of the OMM programs
Total Cost for Alternative	$107 M	Total cost of FP 6 in 2010 dollars

The total estimated present worth of FP 6, which was developed using a discount factor of 7%, a 13-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $71.7 M. More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of associated sediment/riverbank remediation or the costs of treatment/disposition of the removed floodplain soils. The estimated costs for combinations of FP 6 with the various treatment/disposition alternatives are presented in Section 10.

7.6.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.6.2, the evaluation of whether FP 6 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 6 would be effective in reducing the potential for human and ecological exposure to PCBs in floodplain soils by the removal of approximately 320,000 cy (197 acres) of soil with PCB concentrations greater than 25 mg/kg, resulting in the removal of 33,300 lbs of PCBs. The removed soil would be replaced with clean backfill, which would be revegetated. However, FP 6 would have substantial long-term adverse impacts on many species, including the likely loss of some sensitive species from portions of the PSA, as discussed in Section 7.6.5.3, and thus would actually increase the risks to biota in the Rest of River as a result of habitat loss.

Compliance with ARARs: As discussed in Section 7.6.4, FP 6 could be designed and implemented to achieve many of the ARARs pertinent to this alternative, but several potential ARARs would not be met. As a result, to the extent that those regulatory requirements constitute ARARs, the ones that would not be met would need to be waived

by the EPA as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: As discussed in Section 7.6.6.1, implementation of FP 6 would achieve the RME IMPGs based on a 10^{-4} cancer risk in all direct contact EAs, and would achieve those based on a 10^{-5} cancer risk in 89% of those EAs and in all farm areas evaluated for agricultural products consumption. With respect to the non-cancer IMPGs, FP 6 would achieve the RME IMPGs in 115 of the 120 EAs and in all farm areas, and would achieve the CTE IMPGs in all areas. However, it would not achieve the non-cancer RME IMPGs in 5 direct contact EAs. (FP 6 would also provide health protection through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses based on realistic assumptions.) In these circumstances, if one accepts EPA's assumptions and conclusions in the HHRA, FP 6 would provide substantial overall protection of human health, but would not provide protection from potential non-cancer risks for the most highly exposed individuals in a few areas of the floodplain.

Environmental Protection: As discussed in Section 7.6.6.2, FP 6 would achieve floodplain soil levels within the range of the ecological IMPGs (based on EPA's ERA) for most, but not all, ecological receptors. Specifically, FP 6 would achieve: (1) the lower-bound IMPG for omnivorous/carnivorous mammals in all seven of the averaging areas; (2) the target floodplain soil IMPG levels for insectivorous birds in all 12 averaging areas at all target sediment levels evaluated; and (3) the upper-bound target floodplain soil IMPGs for piscivorous mammals in both averaging areas if the associated sediment concentration were 1 mg/kg or less, and in one (but not the other) of those areas if the associated sediment concentration were 3 or 5 mg/kg. However, FP 6 would not achieve levels within the amphibian IMPG range in 42 of the 66 vernal pools in the PSA.

As previously noted, achievement of IMPGs is a balancing factor under the Permit; it is not determinative of whether an alternative would provide overall environmental protection. In this case, the exceedance of the amphibian IMPGs in 42 vernal pools is not indicative of adverse effects that would prevent the maintenance of healthy local amphibian populations, as shown by the fact that the local populations extend beyond the individual pools and by the field information documenting the presence of amphibian populations in the PSA despite the fact PCBs have been present in the floodplain for over 70 years.

On the other hand, as EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d). In this case, as discussed in Sections 7.6.8 and 7.6.5.3, implementation of FP 6 would result in substantial and widespread short-term and long-term adverse impacts on the environment as a result of its removal or disturbance of 234 acres of land, including 99 acres of floodplain forest, 82

acres of shrub and emergent wetlands, and 10 acres of vernal pools in the floodplain of the PSA. The removals and disturbances in these sensitive floodplain habitats would have long-lasting negative consequences for the plants and animals that utilize those habitats. Due to these substantial adverse ecological impacts, based on the balancing called for by EPA guidance, FP 6 would have a net negative impact on the environment and thus would not provide overall protection of the environment.

Summary: Based on the above considerations, FP 6 would provide general protection of human health from the asserted risks of PCBs, although it would not achieve the non-cancer RME IMPGs based on EPA's HHRA in a few areas of the floodplain. With respect to the environment, FP 6 would cause substantial and widespread short-term and long-term ecological harm. As such, FP 6 would not meet the standard of providing overall protection of the environment.

7.7 Analysis of Floodplain Alternative 7

7.7.1 Description of Alternative

FP 7 would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet lower-bound RME IMPGs for human health and the lower-bound IMPGs for ecological receptors. Specifically, this alternative has been developed to achieve the following IMPGs:

- The lower-bound RME IMPGs for human health (i.e., those based on a 10^{-6} cancer risk or a non-cancer HI of 1, whichever is lower) based on direct contact with floodplain soils, but not lower than 2 mg/kg (the residential standard specified in the CD);

- The lower-bound RME IMPGs for human health (i.e., those based on a 10^{-6} cancer risk or a non-cancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain; and

- The lower-bound floodplain IMPGs for ecological receptors – i.e., amphibians (represented by wood frogs), omnivorous/carnivorous mammals (represented by shrews), insectivorous birds (represented by wood ducks), and piscivorous mammals (represented by mink) – using for the latter two receptors, the floodplain soil IMPGs associated with a sediment target level of 1 mg/kg.

This alternative would involve removing and replacing floodplain soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would

involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of the Frequent-Use EAs as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment that meet the lower-bound IMPGs based on human direct contact, but not lower than 2 mg/kg. Average concentrations would be based on the 95% UCL of the spatially weighted mean, as discussed in Section 4.4.2.

Summary of Removal Areas and Volumes

FP 7 would involve the removal and backfill of approximately 631,000 cy of soil across approximately 387 acres. Approximately 297 acres of this removal (480,000 cy) would occur within the PSA; the remaining 90 acres of removal (151,000 cy) would occur in the Reach 7 floodplain. The locations of these removal areas are shown on Figure 7-6 and a detailed breakdown of the removal areas and volumes associated with FP 7 is included in Tables 7-42 through 7-47. The 631,000 cy removal volume includes 599,000 cy (367 acres) associated with achieving human health IMPGs and an additional 32,000 cy (20 acres) associated with achieving amphibian and piscivorous mammal IMPGs.

Summary of Affected Habitat

FP 7 would involve the removal and backfill of soil across approximately 387 acres (including 297 acres in the PSA) in various types of habitats. The approximate acreages of those general habitat types, with associated removal volumes, are as follows:[404]

- 17 acres (28,000 cy) of vernal pool habitat, which include portions of 61 different vernal pools;
- 172 acres (279,000 cy) of floodplain wetland forest habitats (consisting of high-terrace floodplain forest, transitional floodplain forest, red maple swamp, and black ash-red maple-tamarack calcareous seepage swamp);
- 64 acres (104,000 cy) of shrub and shallow emergent wetland habitats (consisting of shrub swamp, wet meadow, and shallow emergent marsh);
- 4.6 acres (8,000 cy) of deep marsh habitat;

[404] This detailed breakdown of removal areas and volumes by habitat type was generally conducted using the Woodlot (2002) habitat community mapping between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. As noted above, both the acreages of impact and the removal volumes have been rounded, with the result that the sum of the numbers given for each habitat type may not exactly match the total impacted acreage and removal volume for this alternative.

- 15 acres (25,000 cy) of backwater areas in the floodplain that are characterized as open water stream/pond habitat;[405]

- 16 acres (27,000 cy) of disturbed upland habitats (consisting of agricultural field habitat and cultural grasslands habitat);

- 3.9 acres (6,000 cy) of upland forested habitats (consisting of northern hardwoods-hemlock-white pine forest, red oak-sugar maple transition forest, and successional northern hardwoods habitat); and

- 95 acres (155,000 cy) of habitat of currently unmapped community type (the majority of which is located in agricultural areas in Reach 7).[406]

In addition to the above-described areas associated with excavation/backfill activities, floodplain habitat would be affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 7 would require 47 staging areas, which would occupy a total of 22 acres (7.8 acres of which would be within the floodplain), and 11 miles of temporary access roads covering 27 additional acres assuming a 20-foot road width (5.3 miles and 13 acres of which would be within the floodplain). These facilities would be located in all of the above habitats, with those located within the Woodlot (2002) mapping coverage situated mainly in floodplain forest (2.7 acres), shrub and emergent wetlands (3.7 acres), and disturbed upland habitats (4.7 acres).[407] The locations of these staging areas and access roads are shown on Figure 7-6.

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[405] The floodplain removal that occurs in backwaters under FP 7 is associated with human direct contact in waterfowl hunting areas. These EPA-defined floodplain exposure areas overlap with backwater areas addressed as part of sediment remediation under certain individual SED alternatives. In the evaluation of the SED 8/FP 7 combination in Section 8, this overlap has been removed.

[406] The Woodlot habitat community mapping is absent from Reach 7, where most of these unmapped impacts would occur. Based on review of information from MassGIS and aerial photography, remediation activities under FP 7 within Reach 7 would be conducted primarily within existing disturbed upland areas (largely agricultural fields) (60 acres), with additional impacts occurring in forested uplands (18 acres), forested wetlands (1.7 acres), shrub swamp/wet meadow/emergent marsh habitats (13 acres), and developed areas adjacent to Glendale Dam (1.4 acres).

[407] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 7 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed uplands (16 acres), with additional impacts occurring in forested uplands (6 acres), forested wetlands (0.2 acre), and wet meadow/emergent marsh (0.3 acre). Impacts associated with access roads and staging areas in Reach 7 would total approximately 12 acres (i.e., 7.6 acres of disturbed upland, 3.5 acres of

Conceptual Remedial Approach

The conceptual remedial approach for FP 7 would be generally the same as that described for the other removal alternatives, but at a much greater scale than even FP 6. Conventional construction equipment would be used to construct access roads and staging areas, clear and grub existing vegetation, remove and replace soil, and conduct restoration activities. As described for FP 3 through FP 6, some specialized construction equipment and materials and specific engineering practices would be used in an attempt to mitigate the potentially negative impacts of construction in and around vernal pools and other wetland areas.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 7 were selected, considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs, in an effort to minimize impacts on sensitive habitats and local communities to the extent practical (see Section 5.2.2). As noted for the alternatives discussed above, areas were specifically selected based on accessibility, existing land use, habitat use, and location relative to the floodplain; and an effort was made, where practicable, to avoid sensitive wildlife habitats (e.g., forested floodplain areas, vernal pools, other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. This evaluation has lead to the locations of staging areas and access roads shown on Figure 7-6. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

For purposes of the evaluations in this Revised CMS Report, it is assumed that FP 7 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. The restoration methods that are assumed to be utilized under FP 7, subject to development of a more detailed restoration plan during design, would include the conceptual methods described in Section 5.3.4.3 for the floodplain forest habitat, Section 5.3.5.3 for the shrub and shallow emergent wetlands, Section 5.3.6.3 for the deep marshes, Section 5.3.7.3 for the vernal pools, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that FP 7 would take approximately 24 years to complete if implemented independently from other River-related remedial activities. However, assuming that floodplain remediation would be coordinated with sediment remediation, the actual time to complete FP 7 would likely be different, depending on the sediment remediation alternative

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forested uplands and 1.1 acres of wetlands). There would be no impacts in Reach 8 from construction of access roads or staging areas.

selected. Nevertheless, for the purposes of the evaluations in this section, it has been assumed that implementation of FP 7 would take 24 years.

As described for the other alternatives, FP 7 would include institutional controls and/or other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted of the backfilled/restored areas. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program are anticipated to include those described in Section 4.5 and outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.7.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs; (b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 7 would be protective of human health and the environment is presented at the end of Section 7.7 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.7.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River. As stated previously, the floodplain is generally flat, well vegetated and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and transport to the River.

Open excavations during construction could serve as a short-term temporary source of some releases during an extreme weather event. As with the other alternatives, such potential releases would be controlled using conventional engineering practices. However, because FP 7 would involve such a large area (387 acres) over such a long time (assumed

individually to take 24 years), the potential for such short-term releases is much greater than for alternatives that would affect a smaller overall area and take less time to implement.

7.7.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 7 in accordance with directions from EPA are listed in Tables F-7.a through F-7.c in Appendix C.[408] FP 7 could be designed and implemented to achieve many of those ARARs,[409] but, as with FP 3 through FP 6, there are a number of potential location-specific and action-specific ARARs that would not be met by FP 7. These are the same potential ARARs as described for FP 3 in Section 7.3.4, and include a number of federal and state regulatory requirements relating to ecological protection (including regulations applicable to the Upper Housatonic ACEC). To the extent that these requirements constitute ARARs, they would need to be waived by EPA as technically impracticable to meet (or on some other ground) under CERCLA and the NCP.

In addition, for the same reasons discussed for FP 2 in Section 7.2.4, it is possible that, in the unlikely event that excavated floodplain soils should be found to constitute hazardous waste (which is not anticipated) and that the temporary staging areas for the handling of those soils are subject to federal and/or state hazardous waste regulations, the staging areas may not meet certain locational and/or technical requirements for the storage of hazardous waste. In that unlikely event, as also discussed in Section 7.2.4, those requirements should be waived by EPA as technically impracticable to meet.

7.7.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness for FP 7 includes evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

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[408] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

[409] As discussed for FP 2 in Section 7.2.4 (footnote 336), it is assumed that EPA would make the determinations necessary in connection with certain requirements.

7.7.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 7 includes consideration of the length of time and extent to which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 7 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 631,000 cy of PCB-containing soil over 387 acres of floodplain (see Figure 7-6). The reduction in potential exposure and associated risk would occur upon completion of the remediation in a given area.

As discussed further in Section 7.7.6.1, the average floodplain soil concentrations in the human health averaging areas following implementation of FP 7 would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a cancer risk of 10^{-6} and a non-cancer HI of 1, but not less than 2 mg/kg in most human direct contact EAs. As discussed in Section 7.7.6.2, the average post-remediation soil concentrations in the ecological averaging areas would be equivalent to or lower than the lower-bound ecological IMPGs based on EPA's ERA (depending, in some cases, on the associated sediment concentrations).[410] The average post-remediation PCB EPCs for the soil within the human health and ecological averaging areas under FP 7 are shown in Tables 7-42 through 7-47. (Table 7-42 also shows the post-remediation concentrations in the top 3 feet in Heavily Used Subareas.)

PCBs would also remain at depths below those described above. In the event that future exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional Solutions would be implemented where necessary to address potential risks from future activities and uses that are reasonably anticipated based on realistic assumptions.

7.7.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 7 has included an assessment of the use of technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace components. The technology and implementation

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[410] As discussed in Section 1.2, GE does not agree with many of the assumptions and inputs used in EPA's HHRA and ERA and thus does not agree that levels based on those risk assessments are an appropriate measure of risks to human health or the environment.

steps that would be used for FP 7 would be the same as described for the other removal/backfill alternatives. However, FP 7 would involve remediation of a much greater area than even FP 6, comprising a greater portion of the floodplain in the PSA and a greater area of wetlands, and would take a much longer time. These components bring additional concerns and complexity to assessing adequacy and reliability.

The primary difference between FP 7 and the other floodplain removal alternatives is the areal extent of remediation. This alternative would impact approximately 48% of the existing surface area of the entire floodplain in the PSA (excluding the river and backwater areas), and an additional 93 acres in Reach 7. This alternative would remediate twice as much area as FP 6, approximately 5 to 6 times more area than FP 4 or FP 5, 9 times more area than FP 3, and 29 times more than FP 2. The logistics of remediation in the many different and diverse habitats over so much contiguous land area would be difficult, as would OMM over such a large area.

Use of Technology Under Similar Conditions

FP 7 relies primarily on the removal of floodplain soils, followed by backfilling of the excavations and performance of restoration activities. Excavation of soils from floodplain environments containing various habitats has been implemented at a number of other sites across the country, as discussed in Section 7.2.5.2. However, GE is unaware of any sites similar to the Rest of River floodplain where floodplain soil removal has been conducted at the scale that would be involved in FP 7. Restoration was discussed separately in Section 5.3. Here again, it should be noted that comparable inland riverine floodplain restoration has never been attempted at the scale that would be involved in FP 7.

General Reliability and Effectiveness

The removal and backfill of soil for FP 7 would reliably, effectively, and permanently reduce the concentrations of PCBs in the removal areas. Following backfilling, it is assumed that excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. However, there are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, 5.3.6.4 for deep marsh habitat, 5.3.7.4 for vernal pools, and 5.3.8.4 for forested upland habitats. Given the very extensive portions of the floodplain that would be disturbed by FP 7, these constraints are correspondingly more severe, and the likelihood of re-establishing pre-remediation conditions and functions throughout these habitats is further reduced, as discussed in Section 7.7.5.3.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 7, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, to identify areas (if any) where the backfill is eroding and in need of repair, and to evaluate the conditions of the affected vernal pools and other wetlands. Any deficiencies noted during the inspections would be subject to maintenance, repair, and other corrective actions performed as necessary and practicable. Periodic inspection of the replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and perform any maintenance activities required following implementation of FP 7 are considered available.

Because of the size of the area, the differing types of habitat that would be restored, access issues, and the amount of wetlands involved, maintenance and monitoring would be more difficult and time-consuming than under the other floodplain alternatives. Given the removal of access roadways after construction, maintenance, if required, could be difficult to implement in certain areas of the floodplain, due to remoteness, wet areas, and vegetation growth. The ease of access may change based on seasonal conditions. It could be especially difficult to conduct supplemental planting activities in difficult-to-access locations, to which plant materials would have to be carried from the closest roadways.

Technical Component Replacement Requirements

If significant erosion, plant loss, or other problematic conditions were observed as part of the OMM program in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for, methods of, and practicability of repair. Because of the size of the overall area that would require OMM, it is likely that some areas would require repair or replacement. Depending on the timing and location of the repair, access roads and staging areas may again need to be temporarily constructed in the floodplain. It is anticipated that if small repairs or replacement were necessary, they could be implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological receptors that use/inhabit the floodplain in these areas. Replacement of larger remedy components could require more extensive disturbance in the floodplain.

7.7.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 7 on human health or the environment has included consideration of the items discussed below.

Potentially Affected Populations

Implementation of FP 7 would have long-term effects on human and wildlife populations through changes in the natural environment and habitat. Since this alternative involves much more extensive floodplain disturbance than the alternatives discussed above, the impacts would be correspondingly greater. For humans, implementation of FP 7 would affect the aesthetics and recreational use of the floodplain. For wildlife, implementation of FP 7 would remove and replace several habitat types (described in Section 7.7.1), which would affect the mammals, birds, amphibians, and reptiles inhabiting those habitats. In particular, FP 7 would affect portions of the mapped Priority Habitats of 33 state-listed rare species, as described in Appendix L. The long-term impacts of FP 7 on the affected habitats and their associated biota are discussed in the next subsections.

Overview of Long-Term Ecological Impacts

FP 7 would impact a total of approximately 436 acres (within and outside the PSA), including 387 acres due to floodplain soil removal and an additional 49 acres (21 of which are in the floodplain) for the construction and use of access roads and staging areas. These impacts represent a massive increase over the impacted areas under the previously discussed alternatives, as noted in Section 7.7.5.2. The impacts within the PSA would cover a total of nearly 300 acres. The most significant long-term impacts would occur in the forested floodplain habitats, vernal pools, the shrub and shallow emergent wetlands, and the deep marshes and backwaters, as described below.

Long-Term Impacts on Floodplain Forest Habitats and Biota

FP 7 would adversely impact a total of approximately 175 acres of floodplain wetland forest habitats in the PSA (within the Woodlot habitat mapping coverage), including 172 acres due to soil removal and an additional 2.7 acres for access roads and staging areas. This would include the clearing of many large forested areas throughout the floodplain (see Figure 7-6). As a result, despite the implementation of restoration measures, the forested floodplain habitats the biota that use them would experience a number of long-term adverse effects. The long-term impacts of remediation activities on floodplain forest habitats were described generally in Section 5.3.4.4. Due to the very extensive disturbances under FP 7, these impacts would be more widespread and severe under FP 7 than under any of the floodplain alternatives discussed previously.

This increased area of floodplain forest impact, including the removal of more mature trees and the creation of larger open areas than under prior alternatives, would produce long-term degradation of the floodplain forest community throughout the PSA. As discussed for FP 6, but to an even greater extent, the widespread clearing of floodplain forests (with the consequent removal of the tree canopy and lack of windbreaks) would increase cumulative stresses from changes in microclimate, hydrology, and invasive species, which would affect the new plantings. Given the large contiguous exposed areas, the initial establishment of vegetative cover would be constrained due to soil moisture and dessication issues, and subsequent plant growth would limited by temperature extremes, ongoing soil moisture issues, wind fetch, distance from native plant repositories, and proliferation of invasive species. As a result of these changes, the plant community succession from the sapling/shrub stage to the young transitional forest stage to a mature forest, which would take at least 50 to 100 years under the best of circumstances, would be highly unreliable and could take longer than that if it occurs at all.

In this situation, there would be a long-term loss of or major changes in the wildlife in large portion of the floodplain forest in the PSA. Due to the large-scale gaps in the existing forested habitat that would be created by FP 7, this alternative would not only result in a loss of forest-interior wildlife (including reptiles, amphibians, birds, and small mammals) in large portions of the PSA, but would also create wide-ranging fragmentation that would eliminate the connectivity among habitat patches and alter wildlife corridors and migration patterns within the PSA for a variety of species (such as neotropical migratory songbirds and mammals like the fisher and bobcat) for a long time, if not permanently. Although forested habitat conditions may eventually be re-established in 50 to 100 years, the length and severity of the species losses and extensive change in character of the floodplain riparian corridor during that period raise significant doubts as to whether some of the affected species (including state-listed species, discussed separately below) would ever return.

Long-Term Impact on Vernal Pools and Vernal Pool Biota

FP 7 includes excavation and replacement of surface soils in 17 acres of vernal pool habitat, including portions of 61 of the 66 vernal pools in the PSA. The direct long-term impacts on vernal pools subject to remediation were described in Section 5.3.7.4 and summarized in Section 7.3.5.3. For FP 7, these include long-lasting changes in the hydrology of the vernal pools (which is extremely difficult to reproduce), in soil conditions in the pools (due to the inability of replacement soils to match the characteristics of the existing vernal pool soils), and in the vegetative characteristics of the pools (due to the loss of the complex and mature organic vegetative composition of the pools). There is also a high probability that invasive or other undesirable plant species and animal predators (such as green frogs, bullfrogs, and invertebrates) would invade pools where

they did not previously exist. These alterations would, in all likelihood, result in the loss of obligate vernal pool species from at least many of the pools.

In addition, due to the widespread removal of forested habitats in the PSA, FP 7 would cause major disturbances to the forested non-breeding amphibian habitat around the vernal pools. FP 7 would affect varying portions of the 100-foot and 100- to 750-foot zones around the vernal pools in the PSA due to floodplain soil removal and construction of access roads. For individual pools, these impacts would range up to 100% of the 100-foot zone and up to 64% of the 100-750 foot zone. In total, FP 7 would affect 48 acres within 100 feet and 178 acres within the 100- to 750-foot zones of the vernal pools in the PSA. For the reasons discussed in Section 5.3.7.4, these disturbances would likely disrupt important aspects of those areas' non-breeding functions for the vernal pool amphibians. Similarly, FP 7 would substantially reduce or eliminate the connectivity among the various vernal pools in the floodplain and between the vernal pools and the nearby non-breeding habitats.

Overall, given the extensive impacts of FP 7 on the vernal pools in the floodplain and on the forested habitats around the vernal pools, it is highly likely that the characteristics that contribute to vernal pool functions would not be re-established for many, if not most, of the affected pools.

Long-Term Impacts on Shrub and Shallow Emergent Wetland Habitats and Biota

FP 7 would impact a total of approximately 68 acres of shrub and shallow emergent wetland habitats in the PSA (within the Woodlot habitat mapping coverage) encompassing shrub swamp, wet meadow, and shallow emergent marsh habitats. These impacted areas include 64 acres due to soil removal and 3.7 additional acres for access roads and staging areas.[411] The long-term post-remediation impacts of remediation activities on these wetland habitats were described generally in Section 5.3.5.4. These impacts include changes in soil stratigraphy, composition, and chemistry; changes in the drainage patterns and hydrology of these wetlands; and resulting changes in vegetative characteristics. These impacts would change the characteristics of the wetlands and would last until soil and hydrological conditions similar to pre-remediation conditions return through flooding and the other natural processes that originally formed these habitats. This time necessary for this recovery uncertain and could be a decade or more. During this period, the wildlife that use these wetlands would be lost. In fact, even after the return of soil and hydrological conditions resembling prior conditions, the biotic

[411] In addition, as noted in Section 7.7.1, FP 7 would also affect approximately 14 acres of such habitats outside the Woodlot habitat mapping coverage.

communities that are re-established may not match the pre-remediation communities in certain respects. For example, there would be high potential for proliferation of invasive plants, and the return of certain sensitive species, including state-listed wildlife species, would be doubtful.

Long-Term Impacts on Deep Marsh and Backwater Habitats and Biota

FP 7 would impact a total of approximately 20 acres of deep marsh and backwater habitats in the PSA due to soil removal. The long-term impacts of remediation activities on these habitats were described generally in Section 5.3.6.4. These impacts are generally similar to those discussed for shrub and shallow emergent wetlands. They include long-term changes in substrate conditions, hydrology, and vegetative characteristics of these marshes and backwaters, with consequent negative impacts to the birds and other wildlife that use these areas. As discussed in Section 5.3.6.4, while it is expected that many of the conditions and functions of these areas would return to pre-remediation levels at some point, the length of time for such recovery is uncertain; and the biotic communities that are re-established may not match the pre-remediation communities in some respects, with a high potential for proliferation of invasive plants and a doubtful return of certain sensitive (e.g., state-listed) wildlife species.

Long-Term Impacts on Upland Habitats

FP 7 would impact a total of approximately 26 acres of upland habitats in the PSA, including approximately 20 acres due to soil removal and 5.8 acres for access roads and staging areas. The impacted areas would include approximately 21 acres of disturbed upland habitats (agricultural fields and cultural grasslands) and 5.0 acres of upland forest habitats.[412] The potential for long-term post-restoration impacts of remediation activities on these upland habitat types was described generally in Section 5.3.8.4 and is summarized below.

For disturbed upland habitats such as agricultural fields and cultural grasslands, there could be some individual impacts, since even these disturbed habitats may provide specific ecological functions, such as serving as nesting habitat for wood turtles. In general, however, as these areas support altered or early successional plant communities that have limited ecological value, no significant long-term adverse ecological impacts would be expected from the remediation in these areas, By contrast, the clearing and

[412] In addition, as noted in Section 7.7.1, FP 7 would also affect a considerable amount of such habitats outside the Woodlot habitat mapping coverage, including approximately 84 acres of disturbed upland areas (e.g., agricultural fields and cultural grasslands) and 27 acres of upland forested habitats.

removal of trees in the upland forest habitats would have long-term negative impacts on these habitat and the wildlife species that use them due to the lengthy time necessary for the regrowth of mature trees, as discussed previously. Moreover, the loss of this upland forest habitat in the PSA would contribute to the overall widespread loss of forested habitats resulting from FP 7 throughout the existing forested floodplain/riparian corridor of the Housatonic River, and the consequent impacts on the wildlife that depend on that corridor, as described above.

Long-Term Impact on State-Listed Species

As noted above, FP 7 would affect portions of the Priority Habitats of 33 state-listed species. As discussed in the MESA assessments in Appendix L, it is anticipated that FP 7 would involve a "take" of at least 29 of these species and would adversely affect a significant portion of the local population of at least 20 of them. The table below lists the 33 stated-listed species whose Priority Habitat would be affected by FP 7, along with those for which FP 7 would result in a take and those for which FP 7 would impact a significant portion of the local population:

Table 7-48 – Impacts of FP 7 on State-Listed Species

Species with Priority Habitat Affected by FP 7	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	Yes
Arrow clubtail	Yes	Yes
Bald eagle	Yes	Unlikely
Black maple	Yes	Yes
Bristly buttercup	Yes	Yes
Brook snaketail	Yes	Yes
Bur oak	Yes	Possibly
Common moorhen	Yes	Unlikely
Creeper	No	No
Crooked-stem aster	Yes	Possibly
Dion skipper	Yes	No
Dwarf scouring rush	Yes	Unlikely
Foxtail sedge	Yes	Yes
Frank's lovegrass	No	No
Gray's sedge	Yes	Unlikely

Species with Priority Habitat Affected by FP 7	Take?	Impact on Significant Portion of Local Population?
Hairy wild rye	Yes	Yes
Intermediate spike-sedge	Yes	Yes
Jefferson salamander	Yes	Yes
Longnose sucker	No	No
Mustard white	Yes	Yes
Narrow-leaved spring beauty	Yes	Yes
Ostrich fern borer moth	Yes	Yes
Rapids clubtail	Yes	Yes
Riffle snaketail	Yes	Yes
Skillet clubtail	Yes	No
Spine-crowned clubtail	Yes	Yes
Stygian shadowdragon	Yes	No
Triangle floater	Unlikely	No
Tuckerman's sedge	Yes	Yes
Wapato	Yes	Yes
Water shrew	Yes	Yes
Wood turtle	Yes	Yes
Zebra clubtail	Yes	Yes

Long-Term Impact on Other Floodplain Functions

In addition to the impacts on wildlife habitat, due to the much greater extent of the floodplain disturbances, FP 7 would have greater impacts on the other floodplain functions described above (see Sections 5.3.4.1 and 5.3.4.4). For example, with the widespread extent of floodplain forest removal, there would be a widespread reduction in floodplain roughness, which would alter the floodplain's flood flow alteration functions, leading to faster flows, more erosion, and less infiltration during flood events. Similarly, FP 7 would have greater impacts on the floodplain's functions of groundwater recharge/discharge and water quality maintenance, nutrient processing, and production export.

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 7 would have long-term negative impacts on the aesthetic features of the natural environment. The natural appearance of the floodplain after the remediation

and restoration would not be the same as prior to remediation, FP 7 would result in the loss of approximately 180 acres of forested communities (including both floodplain and uplands forested areas – far more than under the previously discussed alternatives. These areas would look markedly different for at least a long time after mediation because time for a replanted forest community to develop an appearance comparable to its current appearance would be generally commensurate with the age of the community prior to remediation, which would be 50 to 100 years or more, if it occurs at all.

FP 7 would impact numerous floodplain areas used for bank fishing, canoeing (canoe launches), hiking, general recreation, dirt biking/ATVing, and both waterfowl and other game hunting. These recreational activities would be disrupted by the implementation of FP 7. Since the extent of the disturbances under FP 7 would be greater than under the previously discussed alternatives, the disruptions of these recreational activities would correspondingly be greater. These disruptions would last not only during the remediation period, but until the areas have sufficiently recovered to support such uses.

Potential Measures to Mitigate Long-Term Adverse Impacts

Restoration methods that are available to attempt to mitigate long-term adverse impacts to the floodplain from implementation of FP 7 are the same as those for the other alternatives, but would need to be applied over the much larger area included in FP 7. The restoration methods for the types of habitats that would be affected by FP 7 are described in Section 5.3. However, as also described in that section and discussed above, implementation of these restoration methods would not prevent long-term impacts from the remediation, especially on the affected forested habitats and the vernal pools and the biota that depend on those habitats. This is particularly true given the large impacted area under FP 7.

7.7.6 Attainment of IMPGs

This section describes the extent to which FP 7 would achieve the IMPGs for human health and ecological protection. These comparisons are presented in Tables 7-42 through 7-47 for the pertinent human and ecological averaging areas. The time frame to achieve any IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.7.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, as shown in Table 7-42, FP 7 would achieve the RME IMPGs based on a 10^{-6} cancer risk and a non-cancer HI of 1 in all direct contact EAs and Heavily

Used Subareas, except that where those levels are below 2 mg/kg, the remediation would reduce the EPCs to (or in some cases somewhat below) 2 mg/kg.[413]

FP 7 would also achieve the RME IMPGs based on a 10^{-6} cancer risk and a non-cancer HI of 1 in all 14 farm areas evaluated for consumption of agricultural products (Table 7-43).

These comparisons are shown in detail in Tables 7-42 and 7-43 for all human exposure areas in Reaches 5 through 8.

7.7.6.2 Comparison to Ecological IMPGs

FP 7 would achieve the ecological IMPGs in all averaging areas (depending, for piscivorous mammals, on the associated sediment concentrations),[414] as described below:

- For amphibians, FP 7 would achieve the lower-bound IMPG in all 66 of the vernal pools in the PSA (covering approximately 34 acres) (Table 7-44).

- For omnivorous/carnivorous mammals, FP 7 would achieve the lower-bound IMPG in all averaging areas (Table 7-45).

- For insectivorous birds, FP 7 would achieve the target floodplain soil IMPG levels in all averaging areas for all three of the sediment target levels evaluated (Table 7-46).

- For piscivorous mammals, FP 7 would achieve the lower-bound floodplain soil IMPGs in both averaging areas if the associated sediment concentration in those areas were 1 mg/kg or less (Table 7-47). If the sediment level were 3 mg/kg, FP 7 would achieve the upper-bound soil IMPG in both averaging areas, but would not achieve the lower-bound IMPG in either. If the sediment level were 5 mg/kg, FP 7 would achieve the upper-bound soil IMPG in the Reach 5C/5D/6 averaging area, but not in the Reach 5A/5B area.[415]

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[413] The CD specifies the 2 mg/kg level as the standard for residential use.

[414] In the evaluation of combined sediment and floodplain alternatives presented in Section 8, FP 7 has been paired with SED 8. The evaluation of that combination of alternatives in Section 8.2.5.2 has assessed the attainment of the IMPGs for insectivorous birds and piscivorous mammals based on the actual sediment concentrations achieved under SED 8, thus avoiding the need to consider the pre-determined target sediment levels of 1, 3, and 5 mg/kg (see also Section 2.2.2.3).

[415] At a sediment level of 3 mg/kg, the lower-bound soil IMPG for piscivorous mammals would not be attainable at all in the Reach 5A/5B averaging area and would require an additional removal of 49,000 cy of floodplain soil in the Reach 5C/5D/6 area to be attained. At a sediment level of 5 mg/kg, the

These comparisons are shown in detail in Tables 7-44 through 7-47 for all ecological averaging areas in the PSA.

7.7.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 7 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

Reduction of Toxicity: FP 7 does not include any treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during the excavations (which is not anticipated), those wastes would be segregated and sent off-site for treatment and disposal.

Reduction of Mobility: As previously discussed, the existing conditions of the floodplain are predominantly depositional and stable due to generally low flow velocities during inundation and the presence of vegetation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 7 would reduce the volume of PCB-containing soils and the mass of PCBs in the floodplain by removing 631,000 cy of soils containing approximately 38,900 lbs of PCBs from 387 acres of the floodplain.

7.7.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 7 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and on workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the performance of the remedial activities in a given area. Since the remedial activities associated with FP 7 would be spread out over the overall remedial action period and area, the short-term impacts would not last for the entire duration of the project in all affected areas. Nevertheless, these impacts would be substantially greater overall than those of the other floodplain remedial alternatives since FP 7 would affect a much larger area and have a much longer overall duration. Specifically, FP 7 would impact a total approximately 436 acres, including 387 acres due to floodplain soil removal and an additional 49 acres (21 of

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upper-bound soil IMPG in the Reach 5A/5B area and the lower-bound soil IMPG in both averaging areas would not be attainable at all. As previously discussed, floodplain soil IMPGs for piscivorous mammals are considered not attainable when PCB levels in aquatic prey items alone would exceed the IMPG at a given sediment concentration.

which are in the floodplain) for the construction and use of access roads and staging areas; and it would take much longer to implement than any of the prior alternatives.

Impacts on the Environment – Ecological Effects

As discussed above, FP 7 would impact a total of approximately 436 acres (both within and outside the PSA), including 387 acres due to floodplain soil removal and an additional 49 acres (21 of which are in the floodplain) for the construction and use of access roads and staging areas. The short-term ecological effects resulting from implementation of FP 7 would include the removal of plant and wildlife habitat in those areas of the floodplain where remediation or construction of access roads or staging areas would occur. Short-term impacts specifically associated with each habitat type are described below.

Floodplain Forest Habitats. The largest short-term impacts would occur from the removal of a total of 175 acres of floodplain forest in the PSA, including 172 acres due to soil removal and an additional 2.7 acres for access roads and staging areas. The short-term impacts of such activities were discussed generally in Section 5.3.4.2. In brief, the clearing of these areas and subsequent soil removal would remove all mature trees and other vegetation in these areas, alter the soil characteristics of the areas, result in a loss of cover, nesting and feeding habitat for the wildlife species that rely on these forested floodplains, decrease the floodplain roughness that produces resistance to flood flows, and increase the potential for invasive species colonization. The clearing of these areas would be particularly disruptive to wildlife that would not be likely to migrate out of the construction zone and to birds that are dependent on the forested community for the placement of their nests. It would also cause habitat fragmentation that would further disrupt the movement and interactions of various wildlife species. All of these impacts would be substantially greater under FP 7 than under any of the above-discussed alternatives.

Vernal Pools and Surrounding Habitat. As noted previously, FP 7 would involve remediation in portions of 61 different vernal pools in the PSA, covering a total of 17 acres. The short -term impacts of remedial activities in vernal pools were discussed generally in Sections 5.3.7.2. In brief, they would alter the hydrological, soil, and vegetative characteristics of the vernal pools, resulting in the loss or displacement of the vernal pool species that use those areas. In addition, as noted in Section 7.7.5.3, FP 7 would cause widespread disturbances to the forested non-breeding habitats around the vernal pools (affecting a total of 48 acres within 100 feet and 178 acres within the 100- to 750-foot zones of those pools), which would disrupt those areas' non-breeding functions for the vernal pool amphibians. Overall, FP 7 would have greater negative impacts on the habitats within and surrounding the vernal pools in the PSA than any of the previously discussed alternatives, with correspondingly greater impacts on the vernal pool animals.

Shrub and Emergent Wetlands. Short-term impacts would also be associated with the disturbance of 68 acres of shrub and shallow emergent wetlands in the PSA, including 64 acres due to soil removal and an additional 3.7 acres for access roads and staging areas, plus 20 more acres of deep marshes and backwaters, all due to soil removal. The short-term impacts of remedial activities in these habitats were discussed generally in Sections 5.3.5.2 (for shrub and shallow emergent wetlands) and 5.3.6.2 (for deep marshes and backwaters). In brief, soil removal and construction/use of access roads and staging areas in these wetland habitats would alter the soil conditions, hydrology (including drainage patterns), and vegetative characteristics in these areas, resulting in the inability of these areas to support mammals, birds, reptiles, and amphibians that are dependent on these wetlands for nesting, breeding, and feeding. The impacts of FP 7 on these habitats would be generally comparable to those of FP 6 and substantially greater under than under any of the other above-discussed alternatives.

Upland Habitat. FP 7 would affect a total of 25 acres of upland habitat in the PSA, including both previously disturbed upland habitats (21 acres) and forested uplands (5.0 acres), plus approximately 90 acres of such habitats in the Reach 7 floodplain, consisting of 68 acres of disturbed habitats and 22 acres of upland forests. In the already disturbed habitats, FP 7 would cause further disturbances, although the ecological significance of those disturbances would be less than in the habitats discussed above due to the relatively lower ecological value of those disturbed habitats. On the other hand, the loss of forested uplands would result in a loss of the wildlife species that use these forested areas. It would also contribute to the widespread loss of forested habitat resulting from FP 7 throughout the existing forested floodplain/ wooded riparian corridor of the Housatonic River, with the consequent impacts on the wildlife that depend on that corridor.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 7.

The total carbon footprint associated with FP 7 has been estimated to be 78,000 tonnes of GHG emissions. Of this total, approximately 70,000 tonnes are associated with direct emission sources (primarily construction activities, tree removal, associated mulch decay/sequestration of the vegetation, and restoration/replanting), while approximately 8,400 tonnes are associated with off-site emissions (primarily refinement of diesel fuel and excavation of backfill materials, gravel, and sand). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 14,900 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 7 would result in short-term impacts to the local communities along the River. These short-term effects would include disruption of recreational activities along the River and within the floodplain due to the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities. As noted above, recreational activities that would be affected by construction activities under FP 7 include bank fishing, canoeing (canoe launches), hiking, general recreation, dirt biking/ATVing, and both waterfowl and other game hunting. During the period of active construction, restrictions on recreational use of the floodplain would be imposed in the areas in which remediation-related activities are taking place. Due to safety considerations, boaters, hikers, ATV riders, anglers, hunters, and other recreational users would not be able to use the floodplain in the areas where remediation-related activities are being conducted. Similarly, work in other upland disturbed areas, including agricultural areas, would prevent use of these areas during construction. In addition, the presence of heavy construction equipment and cleared or disturbed areas would adversely affect the visually undisturbed nature of the area.

Increase in Truck Traffic. Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would significantly increase during the construction period. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment facilities, it would take a total of 54,360 truck trips to do so (an average of 2,270 truck trips per year for a 24-year remediation project). Additional truck trips would be necessary to transport backfill materials, as well as materials for the construction of staging areas and access roads, to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 67,600 truck trips (an average of 2,800 truck trips per year) would be required for that purpose.

This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the construction zone could affect those residents and businesses located in the vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport backfill to the site and to dispose of used staging

area/access road materials.[416] This analysis indicates that the increased truck traffic associated with FP 7 (an estimated 4.5 M vehicle miles, 184,000 average vehicle miles per year) would result in an estimated 2.11 non-fatal injuries due to accidents (average annual non-fatality injury estimate of 0.09) with a probability of 88% of at least one such injury, and an estimated 0.1 fatalities from accidents (average annual fatality estimate of 0.004) with a probability of 9% of at least one such fatality.

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts. A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 7 on the affected communities.[417] These measures would consist of the ones identified in Section 5.7 and summarized in Section 7.2.8 above. Despite the implementation of these measures, however, there would be substantial short-term impacts of construction activities under FP 7 on the local communities, especially given the widespread extent of impacts and the lengthy duration of implementation of that alternative.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 7. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 7 is estimated to involve 1,031,747 labor hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 7 would result in an estimated 9.52 non-fatal injuries to workers (average annual non-fatality injury estimate of 0.39) with a probability of 100% of at least one such injury, and an estimated 0.08 worker fatalities (average annual fatality estimate of 0.003), with a probability of 8% of at least one such fatality.

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[416] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

[417] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2. However, it should be noted that since the size of the area affected by FP 7 is large and, in many places, contiguous, this alternative would have less space than the above-discussed alternatives for the implementation of engineering measures and BMPs designed to minimize impacts, such as relocating a road or diverting a stream bed.

7.7.9 Implementability

7.7.9.1 Technical Implementability

The technical implementability of FP 7 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

The differences between FP 7 and the previously discussed alternatives are that FP 7 would involve the removal and backfilling of almost twice the acreage and volume of soil as would be involved in FP 6, over 5 times more than FP 4 or FP 5, over 9 times more than FP 3, and about 29 times more than FP 2. The area and volume of remediation in wetlands areas would also be correspondingly greater. As a result, the logistical and technical difficulties in remediation and restoration efforts would increase substantially as well.

General Availability of Technology: FP 7 would use conventional construction equipment, engineering procedures, and controls to conduct the remediation and restoration efforts. The equipment, materials (with the exception of commercially available soils that would replicate existing wetland soils), technology, procedures, and personnel necessary to implement such activities are expected to be readily available. Some specialized equipment would be used in and around environmentally sensitive areas, including vernal pools and wetlands, but these are also commercially available. Further, methods to implement monitoring and institutional controls are expected to be readily available.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be utilized in FP 7 is suitable for implementation in the areas where it would be applied. The construction of access roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. Although these would be designed to mitigate the potential impacts, the size and the contiguous nature of the remediation areas would make the success of these controls more uncertain than for the smaller alternatives. In the long term, floodplain areas would be backfilled and returned to approximate original elevations, to the extent practical, thereby minimizing effects on flood storage capacity.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country as

described in Section 7.2.5.2. However, given the extent of disturbances under FP 7 and the fact that removal of the various wetlands habitats would frequently be over contiguous areas, re-establishment of pre-remediation conditions and functions of affected habitats through restoration measures is even more unlikely for this alternative than for those discussed above, as indicated in Section 7.7.5.3. Similarly, the issues of OMM and replacement, if needed, would be complicated by the physical size of the affected area.

Availability of Support Facilities and Resources: Implementation of FP 7 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 49 acres of space would be needed for such facilities and appear to be available based on a conceptual site layout. Development of access roads and staging areas would be sequenced and constructed appropriately over the implementation period for FP 7. The volume and duration of necessary material storage (including final disposition) would depend upon the selected treatment/disposition alternative. To provide sufficient materials for FP 7, multiple suppliers of backfill and planting materials may need to be used to fully support the project. An evaluation would be performed during design activities to assess suitable material availability.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available, and their use and effectiveness for this type of materials removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measure (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 7 would be assessed by visual observation to evaluate such factors as vegetation re-growth and any signs of erosion or disturbance of restored areas. Monitoring procedures would be straightforward and implementable, although the amount of area to be covered is large and may be difficult to access in certain areas.

7.7.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 7 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 7 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 7 is provided in the Tables F-7.a through F-7.c in Appendix C and summarized in Section 7.7.4.

Access Agreements: Implementation of FP 7 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is anticipated that access agreements would be required from 70 to 80 other landowners. Obtaining access to all these properties for the type of work and length of time that may be needed would likely be difficult and time-consuming. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 7 would require coordination with EPA and MDEP. In addition, obtaining access to state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 7, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.7.10 Cost

The estimated total cost to implement FP 7 is $195 M (excluding the costs of treatment/disposition of excavated soils). The estimated capital cost for implementation of FP 7 is $188 M, assumed to occur over a 24-year construction period. Estimated annual OMM costs (for a 5-year inspection and maintenance program for the restored excavation and staging/access road areas) range from $20,000 to $558,000 per year (depending on which reach is being monitored) resulting in a total cost of $7.2 M. The following summarizes the total costs estimated for FP 7.

FP 7	Est. Cost	Description
Total Capital Cost	$188 M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$7.2 M	Costs for performance of the OMM programs
Total Cost for Alternative	$195 M	Total cost of FP 7 in 2010 dollars

The total estimated present worth of FP 7, which was developed using a discount factor of 7%, a 24-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $97.1 M. More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of associated sediment/riverbank remediation or the costs of treatment/disposition of the removed floodplain soils. The estimated cost for the combination of FP 7 and SED 8 is presented in Section 8.2.9, and the estimated costs for combinations of FP 7 with the various treatment/disposition alternatives are presented in Section 10.

7.7.11 Overall Protectiveness of Human Health and the Environment - Conclusion

As explained in Section 7.7.2, the evaluation of whether FP 7 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 7 would be effective in reducing the potential for human and ecological exposure to PCBs in floodplain soils by the removal of 631,000 cy of PCB-containing soil over 387 acres, containing 38,900 lbs of PCBs. The removed soil would be replaced with clean backfill, which would be revegetated. However, FP 7 would have substantial long-term adverse impacts on many species, including the likely loss of some sensitive species from portions of the PSA, as discussed in Section 7.7.5.3, and thus would actually increase the risks to biota in the Rest of River as a result of habitat loss.

Compliance with ARARs: As discussed in Section 7.7.4, FP 7 could be designed and implemented to achieve many of the ARARs pertinent to this alternative, but several potential ARARs would not be met. As a result, to the extent that those regulatory requirements constitute ARARs, the ones that would not be met would need to be waived by the EPA as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: Accepting EPA's HHRA, FP 7 would be protective of human health. As discussed in Section 7.7.6.1, implementation of FP 7 would achieve, in all human exposure areas, either: (1) the RME IMPGs based on a 10^{-6} cancer risk and a non-cancer HI of 1; or (2) in certain direct-contact EAs, an average of 2 mg/kg (the residential standard specified in the CD). FP 7 would further ensure protection of human health through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses.

Environmental Protection: As discussed in Section 7.7.6.2, FP 7 would achieve the ecological IMPGs based on EPA's ERA (depending, for piscivorous mammals, on the associated sediment concentrations). Specifically, FP 7 would achieve the following: (1) the lower-bound IMPG for amphibians in all 66 vernal pools evaluated; (2) the lower-bound IMPG for omnivorous/carnivorous mammals in all averaging areas in the PSA; (3) the target floodplain soil IMPG levels for insectivorous birds in all averaging areas in the PSA; and (4) the target floodplain soil level associated with the lower-bound IMPG for piscivorous mammals in both of the PSA averaging areas if the associated sediment concentration in those areas is 1 mg/kg or less, and the upper-bound target floodplain soil level if the associated sediment concentration is at or below 3 mg/kg (or 5 mg/kg in Reaches 5C/5D/6).

As previously noted, however, achievement of IMPGs is a balancing factor under the Permit; it is not determinative of whether an alternative would provide overall environmental protection. As EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d). In particular, "it is important to determine whether the loss of a contaminated habitat is a greater impact than the benefit of providing a new, modified but less contaminated habitat" (EPA, 2005d, p. 6-6).

In this case, as discussed in Sections 7.7.8 and 7.7.5.3, implementation of FP 7 would result in substantial and widespread short-term and long-term adverse impacts on the environment as a result of its removal or disturbance of 436 acres of land, including 175 acres of floodplain forest, 68 acres of shrub and shallow emergent wetlands, 20 acres of deep marshes and backwaters, and 17 acres from 61 vernal pools in the floodplain of the PSA. The removals and disturbances in these sensitive floodplain habitats would have long-lasting negative consequences for the plants and animals that utilize those habitats, including those subject to the IMPGs that would be achieved. For example, the attainment of the lower-bound amphibian IMPGs in all vernal pools would require extensive excavation and soil replacement in most of those pools. As discussed in Section 7.3.5.3, those activities would have substantial and long-lasting adverse impacts on the vernal pool amphibians that the IMPGs are designed to protect, including the potential loss of such amphibians from the pools. Similar considerations apply to other wildlife receptor groups as well. Due to these substantial adverse ecological impacts, based on the balancing called by EPA guidance, FP 7 would have a net negative impact on the environment and thus would not provide overall protection of the environment.

Summary: Based on the above considerations, FP 7 would provide overall protection of human health. However, due to the substantial and widespread short-term and long-term ecological harm that would result from its implementation, FP 7 would not provide overall protection of the environment.

7.8 Evaluation of Floodplain Alternative 8

7.8.1 Description of Alternative

FP 8 would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet the mid-range RME IMPGs for human health and lower-bound IMPGs for amphibians in vernal pools, as well as removal of any additional soils within the top foot that contain PCB concentrations at or above 50 mg/kg. Specifically, this alternative has been developed to achieve the following IMPGs:

- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a non-cancer HI of 1, whichever is lower) based on direct contact with floodplain soils;
- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a non-cancer HI of 1, whichever is lower) based consumption of agricultural products from the floodplain; and
- The lower-bound IMPG for amphibians in vernal pools.

This alternative would involve removing and replacing floodplain and vernal pool soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would involve the removal and backfill of any additional soils within the top foot that contain PCB concentrations at or above 50 mg/kg. Lastly, this alternative would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use EAs (described in Section 4.2.1 and shown on Figures 4-3a-d) as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment in these areas that are equal to or less than the mid-range IMPGs based on human direct contact. Average concentrations have been based on the 95% UCL of the spatially weighted mean, as discussed in Section 4.4.2.

<u>Summary of Removal Areas and Volumes</u>

FP 8 would involve the removal and backfill of approximately 177,000 cy of soil across approximately 108 acres of the floodplain. The locations of these removal areas are shown on Figure 7-7, and a detailed breakdown of the removal areas, volumes and resulting EPCs associated with FP 8 is included in Tables 7-49 through 7-54. This 177,000 cy removal volume includes 97,000 cy (58 acres) associated with achieving the IMPGs for human health; 29,000 cy (18 acres) associated with achieving the lower-bound IMPG for amphibians in vernal pools; and 51,000 cy (32 acres) associated with removal of the top foot of soil with PCB concentrations at or above 50 mg/kg.

Summary of Affected Habitat

FP 8 would involve the removal and backfill of soil across approximately 108 acres in various types of habitats. The approximate acreages of those general habitat types with associated removal volumes, are as follows:[418]

- 18 acres (29,000 cy) of vernal pool habitat, which include portions of 61 different vernal pools;
- 50 acres (83,000 cy) of floodplain wetland forest habitats (consisting mainly of transitional floodplain forest and red maple swamp);
- 25 acres (41,000 cy) of shrub and shallow emergent wetland habitats (consisting of shrub swamp, wet meadow, and shallow emergent marsh);
- 2.9 acres (5,000 cy) of deep marsh habitat;
- 3.9 acres (7,000 cy) of disturbed upland habitats (consisting of agricultural field habitat and cultural grasslands habitat);
- 1.2 acres (3,000 cy) of upland forested habitats (consisting mainly of northern hardwoods-hemlock-white pine forest and red oak-sugar maple transition forest); and
- 5.6 acres (10,000 cy) of habitat of currently unmapped community types.[419]

In addition to the above-described areas associated with excavation/backfill activities, floodplain habitat would also be affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 8 would require 23 staging areas, which would occupy a total of 11 acres (2.8 acres of which would be within the floodplain), and 13 miles of temporary access roads covering 31 additional acres assuming

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[418] This detailed breakdown of removal areas and volumes by habitat type was generally conducted using the Woodlot (2002) habitat community mapping between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. As noted above, both the acreages of impact and the removal volumes have been rounded, with the result that the sum of the numbers given for each habitat type may not exactly match the total impacted acreage and removal volume for this alternative.

[419] These impacts would occur mostly in the Reach 7 floodplain, where the Woodlot habitat community mapping is absent. Based on review of information from MassGIS and aerial photography, remediation activities under FP 8 within Reach 7 would be conducted primarily within existing disturbed upland areas (3 acres), with additional impacts occurring in forested uplands (1.2 acres) and wet meadow/emergent marsh (1.3 acres).

a 20-foot road width (7.2 miles and 17 acres of which would be within the floodplain). These facilities would be located in all of the above habitats, with those located within the Woodlot (2002) mapping coverage situated mainly in floodplain forest (5.1 acres), shrub and shallow emergent wetlands (6.3 acres), and disturbed upland habitats (5.7 acres).[420] The locations of these staging areas and access roads are shown on Figure 7-7.

Conceptual Remedial Approach

The conceptual remedial approach for FP 8 would be generally the same as that described for the other floodplain removal alternatives. Conventional construction equipment would be used to construct access roads and staging areas, clear and grub existing vegetation, remove and replace soil, and conduct restoration activities. As previously described, some specialized construction equipment, materials, and specific engineering practices would be used in an attempt to mitigate the potentially negative impacts of construction in and around vernal pools and other wetland areas.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 8 were selected, considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs, in an effort to minimize impacts on sensitive habitats and local communities to the extent practical (see Section 5.2.2). As noted for the alternatives discussed above, areas were specifically selected based on accessibility, existing land use, habitat use, and location relative to the floodplain; and an effort was made, where practicable, to avoid sensitive wildlife habitats (e.g., forested floodplain areas, vernal pools, other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. This evaluation has lead to the locations of staging areas and access roads shown on Figure 7-7. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

For purposes of the evaluations in this Revised CMS Report, it is assumed that FP 8 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. The restoration methods that are

[420] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 8 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed upland areas (13 acres), with additional impacts occurring in forested uplands (5.2 acres), forested wetlands (0.2 acre), and wet meadow/emergent marsh (0.5 acre). Impacts associated with access roads and staging areas in Reach 7 would total approximately 2 acres (i.e., 0.1 acre of disturbed upland, 1.5 acres of forested uplands and 0.4 acres of wetlands). There would be no impacts in Reach 8 from construction of access roads or staging areas.

assumed to be utilized under FP 8, subject to development of a more detailed restoration plan during design, would include the conceptual methods described in Section 5.3.4.3 for the floodplain forest habitat, Section 5.3.5.3 for the shrub and shallow emergent wetlands, Section 5.3.6.3 for the deep marshes, Section 5.3.7.3 for the vernal pools, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that FP 8 would take approximately 7 years to complete if implemented independently from other River-related remedial activities. However, assuming that floodplain remediation would be coordinated with sediment remediation, the time to complete FP 8 would likely be different depending on the sediment remediation alternative selected. Nevertheless, for purposes of the evaluations in this section, it has been assumed that FP 8 would take 7 years.

As described for the other removal alternatives, FP 8 would include institutional controls and/or other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted of the backfilled/restored areas. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program are anticipated to include those described in Section 4.5 and outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.8.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs; (b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 8 would be protective of human health and the environment is presented at the end of Section 7.8 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.8.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River. As stated previously, the floodplain is generally flat, well vegetated and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and be transported to the River.

Open excavations during construction could serve as a short-term temporary source of some releases during an extreme weather event. Such potential releases would be controlled using conventional engineering practices.

7.8.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 8 in accordance with directions from EPA are listed in Tables F-8.a through F-8.c in Appendix C.[421] FP 8 could be designed and implemented to achieve many of those ARARs,[422] but, as with FP 3 through FP 7, there are a number of potential location-specific and action-specific ARARs that would not be met by FP 8. These are the same potential ARARs as described in Section 7.3.4, and include a number of federal and state regulatory requirements relating to ecological protection (including regulations applicable to the Upper Housatonic ACEC). To the extent that these requirements constitute ARARs, they would need to be waived by EPA as technically impracticable to meet (or on some other ground) under CERCLA and the NCP.

In addition, for the same reasons discussed for FP 2 in Section 7.2.4, it is possible that, in the unlikely event that excavated floodplain soils should be found to constitute hazardous waste (which is not anticipated) and that the temporary staging areas for the handling of those soils are subject to federal and/or state hazardous waste regulations, the staging areas may not meet certain locational and/or technical requirements for the storage of hazardous waste. In that unlikely event, as also discussed in Section 7.2.4, those requirements should be waived by EPA as technically impracticable to meet.

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[421] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

[422] As discussed for FP 2 in Section 7.2.4 (footnote 336), it is assumed that EPA would make the determinations necessary in connection with certain requirements.

7.8.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness for FP 8 includes evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

7.8.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 8 includes consideration of the length of time and extent to which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 8 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 177,000 cy of PCB-containing soil over approximately 108 acres of floodplain (see Figure 7-8). The reduction in potential exposure and associated risk would occur upon completion of the remediation in a given area.

As discussed further in Section 7.8.6.1, the average floodplain soil concentrations in all of the human health averaging areas following implementation of FP 8 would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a cancer risk of 10^{-5} and a non-cancer HI of 1. In addition, as discussed in Section 7.8.6.2, implementation of FP 8 would result in average concentrations equivalent to or lower than all ecological IMPGs based on EPA's ERA in all averaging areas (depending, for piscivorous mammals, on the associated sediment concentrations).[423] The average post-remediation PCB EPCs in the top foot within the human health and ecological averaging areas following implementation of FP 8 are shown in Tables 7-49 through 7-54. (Table 7-49 also shows the post-remediation concentrations in the top 3 feet in Heavily Used Subareas.)

PCBs would also remain at depths below those described above. In the event that future exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional

[423] As discussed in Section 1.2, GE does not agree with many of the assumptions and inputs used in EPA's HHRA and ERA and thus does not agree that levels based on those risk assessments are an appropriate measure of risks to human health or the environment.

Solutions would be implemented where necessary to address potential risks from future uses that are reasonably anticipated based on realistic assumptions.

7.8.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 8 has included an assessment of the use of technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace technical components. The technology and implementation of FP 8 would be generally the same as described for the other removal alternatives. However, because FP 8 would affect more of the floodplain than most of the other alternatives (all except for FP 6 and FP 7), the logistical issues associated with such a large remediation project would be much more complex. For example, FP 8 would remediate approximately 1½ times the area of FP 4 and FP 5, 2½ times more area than FP 3, and 8 times more area than FP 2.

Use of Technology Under Similar Conditions

FP 8 relies primarily on the removal of floodplain soils, followed by backfilling of the excavations and performance of restoration activities. Excavation of soils from floodplain environments has been implemented at a number of sites across the country, as discussed in Section 7.2.5.2. Restoration was discussed separately in Section 5.3.

General Reliability and Effectiveness

The removal and backfill of soil would reliably, effectively, and permanently reduce the concentrations of PCBs in the removal areas. Following backfilling, it is assumed that excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. However, there are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, 5.3.6.4 for deep marsh habitat, 5.3.7.4 for vernal pools, and 5.3.8.4 for forested upland habitats. These issues are discussed further in Section 7.8.5.3.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 8, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging

areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, to identify areas (if any) where the backfill is eroding and in need of repair, and to evaluate the conditions of the affected vernal pools and other wetlands. Any deficiencies noted during the inspections would subject to maintenance, repair, and other corrective actions performed as necessary and practicable. Periodic inspection of the replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and perform any maintenance activities required following implementation of FP 8 are considered readily available.

Because access roadways will be removed after construction, maintenance, if required, could be difficult to implement in certain areas of the floodplain, due to remoteness, wet areas, and vegetation growth. The ease of access may change based on seasonal conditions. It could be especially difficult to conduct supplemental planting activities in difficult-to-access locations, to which plant materials would have to be carried from the closest roadways.

Technical Component Replacement Requirements

If significant erosion, plant loss, or other problematic conditions were observed as part of the OMM program in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for, methods of, and practicability of repair. Depending on the timing, and location of the repair, access roads and staging areas may need to be temporarily constructed in the floodplain. It is anticipated that if small repairs or replacement were necessary, they could be implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological receptors that use/inhabit the floodplain in these areas. The repair or replacement of larger areas could require more extensive disturbance in the floodplain.

7.8.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 8 on human health or the environment has included consideration of the items discussed below.

Potentially Affected Populations

Implementation of FP 8 would have long-term effects on humans and wildlife populations through changes in the natural environment and habitat. For humans, implementation of FP 8 would affect the aesthetics and recreational use of the floodplain. For wildlife, implementation of FP 8 would remove and replace several habitat types (described in

Section 7.8.1). Wildlife associated with these habitats includes a variety of mammals, birds, reptiles, and amphibians. In particular, FP 8 would affect portions of the mapped Priority Habitats of 29 state-listed rare species, as described in Appendix L. The long-term impacts of FP 8 on the affected habitats and their associated biota are discussed in the next sections.

Overview of Long-Term Ecological Impacts

FP 8 would impact a total of approximately 150 acres, including 108 acres due to floodplain soil removal and an additional 42 acres (20 of which are in the floodplain) for the construction and use of access roads and staging areas. The great majority of these impacts would occur in the PSA and would affect all habitat types. Overall, the long-term impacts on vernal pools would be similar to those of FP 7, and the long-term impacts on the other habitat types would fall between those of FP 4 and FP 6. Those long-term impacts described further in the following sections.

Long-Term Impacts on Floodplain Forest Habitats and Biota

FP 8 would impact a total of approximately 55 acres of floodplain wetland forest habitats in the PSA (within the Woodlot habitat mapping coverage), including 50 acres due to soil removal and 5.1 acres for access roads and staging areas. These disturbances would include the clearing of a number of large forested areas. As a result, despite the implementation of restoration measures, the forested floodplain habitats and the biota that use them would experience various long-term adverse effects. The long-term impacts of remediation activities on floodplain forest habitats were described generally in Section 5.3.4.4. Since the extent of the cleared areas under FP 8 would be greater than under all other floodplain alternatives except FP 6 and FP 7, the long-term impacts would be correspondingly greater and the path and rate of recovery could take longer and would be even more uncertain. For FP 8, the long-term impacts on floodplain forests would include the following:

- Due to the removal of mature trees from various areas comprising 55 acres of the forested floodplain, a loss of mature forested habitat in those areas for the lengthy period until such a forest is re-established – which would be expected to be at least 50 to 100 years, but could well take longer and would be unreliable in large cleared areas due to cumulative stresses from floods, changes in microclimate, changes in hydrology, and colonization of invasive species;

- Loss of coarse woody debris that is used as structural wildlife habitat and of the annual leaf litter that provides cover habitat for numerous woodland species;

- Changes in soil composition, chemistry, and stratigraphy due to the replacement of existing forested wetland soils with soils that would not match the characteristics of those existing soils and due to the soil compaction that would result from the use of heavy equipment;

- Loss of the forest wildlife species (including state-listed rare species, discussed separately below) that currently utilize the mature forested habitats that would be removed; and

- Fragmentation of the existing largely undisturbed forested floodplain/riparian corridor in the PSA, thereby disrupting the dispersal and migratory movements of wildlife species that depend on that corridor.

Long-Term Impact on Vernal Pools and Vernal Pool Biota

FP 8 includes excavation and replacement of surface soils in 18 acres of vernal pool habitat, including portions of 61 of the 66 vernal pools in the PSA. This extensive direct impact to the vernal pools would be comparable to that of FP 7 and greater than that of any of the other floodplain alternatives. The direct long-term impacts on the vernal pools subject to remediation under FP 8 would be essentially same as those described in Section 5.3.7.4 and discussed for FP 7 in Section 7.7.5.3. These include long-lasting changes in the hydrology of the vernal pools (which is extremely difficult to reproduce), soil conditions in the pools (due to the inability of replacement soils to match the characteristics of the existing vernal pool soils), and the vegetative characteristics of the pools (due to the loss of the complex and mature organic vegetative composition of the pools). There is also a high probability that invasive or other undesirable plant species and animal predators (such as green frogs, bullfrogs, and invertebrates) would invade pools where they did not previously exist. These alterations would, in all likelihood, result in the loss of obligate vernal pool species from at least many of the pools.

In addition, FP 8 would affect varying portions of the 100-foot and 100 to 750-foot zones around the vernal pools in the PSA – ranging up to 94% of the 100-foot zone and 26% of the 100-750 foot zone around individual pools – due to floodplain soil removal and construction of access roads. In total, FP 8 would affect 22 acres within 100 feet and 88 acres within the 100- to 750-foot zones of the vernal pools in the PSA. For the reasons discussed in Section 5.3.7.4, these disturbances would likely disrupt important aspects of those areas' non-breeding functions for the vernal pool amphibians. Similarly, FP 8 would reduce the connectivity among the various vernal pools in the floodplain and between the vernal pools and the nearby non-breeding habitats.

Overall, given the extensive impacts of FP 8 on the vernal pools in the floodplain and on the forested habitats around the vernal pools, it is highly likely that the characteristics that contribute to vernal pool functions would not be re-established for many, if not most, of the affected pools.

Long-Term Impacts on Shrub and Emergent Wetland Habitats and Biota

FP 8 would impact a total of approximately 34 acres of shrub and emergent wetland habitats in the PSA (within the Woodlot habitat mapping coverage), encompassing shrub swamp, wet meadow, shallow emergent marsh, and deep marsh habitats). These impacted areas include 28 acres due to soil removal and 6.4 acres for access roads and staging areas. The long-term impacts of remediation activities on these wetland habitats were described generally in Sections 5.3.5.4 (for shrub and shallow emergent wetlands) and 5.3.6.4 (for deep marshes). These impacts include: changes in soil stratigraphy due to the soil compaction that would result from the use of heavy equipment; changes in soil composition and chemistry due to the replacement of existing wetland soils with soils that would not match the characteristics of those existing soils; changes in the hydrology of these wetlands due to impacts on the swales, drainage features, and microtopography that influence the hydrology; and changes in vegetative characteristics due to the changes in soil and hydrological conditions. These impacts would alter the characteristics of the wetlands and their wildlife communities and would last until soil and hydrological conditions similar to pre-remediation conditions return through flooding and the other natural processes that originally formed these habitats. The time necessary for this recovery is uncertain and could be a decade or more. During this period, the wildlife that use these wetlands would be lost. In fact, even after the return of soil and hydrological conditions resembling prior conditions, the biotic communities that are re-established may not match the pre-remediation communities in certain respects. For example, there would be high potential for proliferation of invasive plants, and the return of certain sensitive species, including state-listed wildlife species, would be doubtful.

Long-Term Impacts on Upland Habitats

FP 8 would impact a total of approximately 12 acres of upland habitats in the PSA (within the Woodlot habitat mapping coverage), including approximately 5.1 acres due to soil removal and 7.0 acres for access roads and staging areas. The impacted areas would include 9.6 acres of disturbed upland habitats (agricultural fields and cultural grasslands)

and 2.5 acres of upland forest habitats.[424] The potential for long-term post-restoration impacts of remediation activities on these upland habitat types was described generally in Section 5.3.8.4 and is summarized below.

The majority of the upland acreage affected by FP 8 consists of already disturbed upland habitats, such as agricultural fields and cultural grasslands. In those areas, there could be some individual impacts, since even these disturbed habitats may provide specific ecological functions, such as serving as nesting habitat for wood turtles. In general, however, as these areas support altered or early successional plant communities that have limited ecological value, no significant long-term impacts would be expected from the remediation in these areas. The remaining impact would occur to upland forest habitats, broadly dispersed through the PSA. The clearing and removal of trees in these areas would have long-term adverse impacts on this habitat and the wildlife that use it due to the lengthy time necessary for the regrowth of mature trees. Due to the limited extent and dispersed nature of these impacts, FP 8 would not be expected to have a major overall long-term impact on the upland forested habitats in the PSA, considered by themselves. However, it would contribute to the overall loss of forested habitats in the PSA resulting from FP 8, with the long-term impacts discussed above for floodplain forests.

Long-Term Impact on State-Listed Species

As noted above, FP 8 would affect portions of the Priority Habitats of 29 state-listed species. As discussed in the MESA assessments in Appendix L, it is anticipated that FP 8 would involve a take of at least 26 of these species and would adversely affect a significant portion of the local population of at least 5 of them. The table below lists the 29 stated-listed species whose Priority Habitat would be affected by FP 8, along with those for which FP 8 would result in a take and those for which FP 8 would impact a significant portion of the local population:

Table 7-55 – Impacts of FP 8 on State-Listed Species

Species with Priority Habitat Affected by FP 8	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	Likely
Arrow clubtail	Yes	No
Bald eagle	Possibly	No

[424] In addition, as noted in Section 7.8.1, FP 7 would also affect approximately 24 acres of upland habitats outside the Woodlot community mapping coverage (16 acres of disturbed upland habitats and 8 acres of upland forest).

Species with Priority Habitat Affected by FP 8	Take?	Impact on Significant Portion of Local Population?
Black maple	Yes	Yes
Bristly buttercup	Yes	Yes
Brook snaketail	Yes	Likely
Bur oak	Yes	No
Common moorhen	Yes	No
Crooked-stem aster	Yes	Possibly
Foxtail sedge	Yes	Unlikely
Gray's sedge	Yes	No
Hairy wild rye	Yes	Unlikely
Intermediate spike-sedge	Yes	Yes
Jefferson salamander	Yes	Yes
Longnose sucker	No	No
Mustard white	Yes	Unlikely
Narrow-leaved spring beauty	Yes	Possibly
Ostrich fern borer moth	Yes	Likely
Rapids clubtail	Yes	Unlikely
Riffle snaketail	Yes	Possibly
Skillet clubtail	Yes	No
Spine-crowned clubtail	Yes	Unlikely
Stygian shadowdragon	Yes	No
Triangle floater	Unlikely	No
Tuckerman's sedge	Yes	Yes
Wapato	Yes	Possibly
Water shrew	Yes	Possibly
Wood turtle	Yes	Likely
Zebra clubtail	Yes	No

Long-Term Impact on Other Floodplain Functions

FP 8 would also affect the other floodplain functions described above (see Sections 5.3.4.1 and 5.3.4.4). For example, the floodplain forest removal would cause a decrease in floodplain roughness due to the loss of woody vegetation and coarse woody debris, presence of sparsely vegetated areas, and altered microtopography, resulting in a long-

term reduction in the floodplain's flood flow alteration function, with increased flood flow velocities, more erosion, and less infiltration, at least in some areas. Similarly, FP 8 could have a long-term term impact of uncertain length on the floodplain's functions of groundwater recharge/discharge and water quality maintenance, nutrient processing, and production export.

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 8 would have long-term impacts on the aesthetic features of the natural environment. The natural appearance of the floodplain after the remediation and restoration would not be the same as prior to remediation, FP 8 would result in the loss of approximately 58 acres of forested communities (including both floodplain and upland forested areas – more than FP 2 through FP 5. These areas would look markedly different for a long time after remediation because the time for a replanted forest community to develop an appearance comparable to its current appearance would be generally commensurate with the age of the community prior to remediation, which would be 50 to 100 years or more.

The floodplain areas that would be remediated under FP 8 include areas used for bank fishing, canoeing (canoe launches), hiking, general recreation, and hunting. As a result, these recreational activities would be substantially disrupted by the implementation of FP 8. These disruptions would last not only during the remediation period, but until the areas have sufficiently recovered to support such uses. Those disruptions would be greater in extent and duration than under FP 2 through FP 5, but less than under FP 6 and FP 7.

Potential Measures to Mitigate Long-Term Adverse Impacts

In an effort to mitigate long-term impacts to the floodplain resulting from implementation of FP 8, a variety of restoration measures are available.[425] The restoration methods for the types of habitats that would be affected by this alternative are described in the restoration methods subsections in Section 5.3. However, as also described in that section and discussed above, implementation of these restoration methods would not prevent long-term impacts from the remediation, especially on the affected forested floodplain habitats and the vernal pools and the biota that depend on those habitats.

[425] Potential measures to avoid or minimize the adverse impacts were described in Section 5.2.

7.8.6 Attainment of IMPGs

This section describes the extent to which FP 8 would achieve the IMPGs for both human health and ecological protection. These comparisons are presented in Tables 7-49 through 7-54 for the pertinent human and ecological averaging areas. The time frame to achieve any IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.8.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, FP 8 would achieve, at a minimum, the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all 120 direct contact EAs, and in all 12 Heavily Used Subareas (Table 7-49). Similarly, FP 8 would achieve the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all 14 farm areas evaluated for consumption of agricultural products (Table 7-50). These comparisons are shown in detail in Tables 7-49 and 7-50 for all human exposure areas evaluated in Reaches 5 through 8.[426]

7.8.6.2 Comparison to Ecological IMPGs

FP 8 would achieve the ecological IMPGs in all averaging areas (depending, for piscivorous mammals, on the associated sediment concentrations),[427] as described below:

- For amphibians, FP 8 would achieve the lower-bound IMPG in all 66 of the vernal pools in the PSA (covering approximately 34 acres) (Table 7-51).

- For omnivorous/carnivorous mammals, FP 8 would achieve the lower-bound IMPG in all averaging areas (Table 7-52).

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[426] In addition to the comparisons mentioned in the text, as shown in Tables 7-49 and 7-50, FP 8 would achieve the RME IMPGs based on a 10^{-6} cancer risk in 10 EAs and 3 Heavily Used Subareas and in 5 farm areas evaluated for consumption of agricultural products. However, it would achieve the CTE IMPGs based on a 10^{-6} cancer risk in 119 EAs and all 12 Heavily Used Subareas and in 13 farm areas evaluated for consumption of agricultural products.

[427] In the evaluation of combined sediment and floodplain alternatives presented in Section 8, FP 8 has been paired with SED 9. The evaluation of that combination of alternatives in Section 8.2.5.2 has assessed the attainment of the IMPGs for insectivorous birds and piscivorous mammals based on the actual sediment concentrations achieved under SED 9, thus avoiding the need to consider the pre-determined target sediment levels of 1, 3, and 5 mg/kg (see also Section 2.2.2.3).

- For insectivorous birds, FP 8 would achieve the target floodplain soil IMPG levels in all averaging areas for all three of the sediment target levels evaluated (Table 7-53).

- For piscivorous mammals, FP 8 would achieve the upper-bound floodplain soil IMPGs in both averaging areas if the associated sediment concentration in those areas were 1 mg/kg or less (Table 7-54). If the sediment level were 3 or 5 mg/kg, FP 8 would achieve the upper-bound soil IMPG in one of the averaging areas (5C/5D/6), but would not achieve the lower-bound IMPG in either.[428]

These comparisons are shown in detail in Tables 7-51 through 7-54 for all ecological averaging areas in the PSA.

7.8.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 8 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

Reduction of Toxicity: FP 8 does not include any treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during floodplain excavation (which is not anticipated), those wastes would be segregated and sent off-site for treatment and disposal.

Reduction of Mobility: As previously noted, the existing conditions of the floodplain are predominantly depositional and stable due to generally low water velocities during inundation and the presence of vegetation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 8 would reduce the volume of PCB-containing soils and the mass of PCBs in the floodplain by removing 177,000 cy of soils containing approximately 22,000 lbs of PCBs from 108 acres of the floodplain.

7.8.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 8 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both

[428] There are some cases where the piscivorous mammal IMPGs (particularly the lower bound) could not be achieved at any floodplain soil concentration since the PCB concentrations in the aquatic food items at the target sediment level of 3 or 5 mg/kg would by themselves exceed the IMPGs for mink prey.

ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and on workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the performance of the remedial activities in a given area. Since the remedial activities associated with FP 8 would be spread out over the overall remedial action period and area, the short-term impacts would not last for the entire duration of the project in all affected areas. Nevertheless, these impacts would occur over a wide area of the floodplain and for a substantial length of time in the Rest of River area.

Impacts on the Environment – Ecological Effects

As discussed above, FP 8 would impact a total of approximately 150 acres (both within and outside the PSA), including 108 acres due to floodplain soil removal and an additional 42 acres (20 of which are in the floodplain) for the construction and use of access roads and staging areas. The short-term effects on the environment resulting from implementation of FP 8 would include the removal of plant and wildlife habitat in those areas of the floodplain where remediation or construction of access roads or staging areas would occur. Short-term impacts specifically associated with each habitat type are described below.

Floodplain Forest Habitats. The largest short-term impacts would occur from the removal of a total of 55 acres of floodplain forest in the PSA, including 50 acres due to soil removal and an additional a for access roads and staging areas. The short-term impacts of such activities were discussed generally in Section 5.3.4.2. In brief, the clearing of these areas and subsequent soil removal would remove all mature trees and other vegetation in these areas, alter the soil characteristics of the areas, result in a loss of cover, nesting and feeding habitat for the wildlife species that rely on these forested floodplains, decrease the floodplain roughness that produces resistance to flood flows, and increase the potential for invasive species colonization. The clearing of these areas would be particularly disruptive to wildlife that would not be likely to migrate out of the construction zone and to birds that are dependent on the forested community for the placement of their nests. It would also cause habitat fragmentation that would further disrupt the movement and interactions of various wildlife species.

Vernal Pools and Surrounding Habitat. As noted previously, FP 8 would involve soil removal in portions of 61 different vernal pools in the PSA, covering a total of 18 acres. The short-term impacts of remedial activities in vernal pools were discussed generally in Sections 5.3.7.2. In brief, those activities would alter the hydrological, soil, and vegetative characteristics of the vernal pools, resulting in the loss of the vernal pool species that use those areas. In addition, FP 8 would cause considerable disturbances to the forested non-breeding habitats around the vernal pools, which would disrupt those areas' non-breeding functions for the vernal pool amphibians.

Shrub and Emergent Wetlands. Short-term impacts would also be associated with the disturbance of 34 acres of shrub and emergent wetlands in the PSA (encompassing shrub swamp, wet meadow, shallow emergent marsh, and deep marsh habitats), including 28 acres due to soil removal and an additional 6.4 acres for access roads and staging areas. The immediate and near-term impacts of remedial activities in these habitats were discussed generally in Sections 5.3.5.2 and 5.3.6.2. In brief, remedial construction activities in these wetland habitats would alter the soil conditions, hydrology (including drainage patterns), and vegetative characteristics in these areas, resulting in the inability of these areas to support mammals, birds, reptiles, and amphibians that are dependent on these wetlands for nesting, breeding, and feeding.

Upland Habitat. FP 8 would affect a total of 12 acres of upland habitat in the PSA, including both previously disturbed upland habitats (9.6 acres) and forested uplands (2.5 acres). While FP 8 would further disturb the already disturbed upland habitats, the short-term ecological significance of those disturbances would be lower than those that would occur in the habitats discussed above due to the relatively lower value of these upland habitats. On the other hand, the removal of the upland forest habitats (which are part of the overall forested floodplain/riparian corridor of the Housatonic River), while relatively small by itself, would contribute incrementally to the overall loss of forested habitat resulting from FP 8, as described above, and the resulting effects on wildlife that depend on that corridor.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 8.

The total carbon footprint associated with FP 8 has been estimated to be 22,000 tonnes of GHG emissions. Of this total, approximately 19,000 tonnes are associated with direct emission sources (primarily construction activities, tree removal, associated mulch decay/sequestration of the vegetation, and restoration/replanting), while approximately 2,600 tonnes are associated with off-site emissions (primarily refinement of diesel fuel and excavation of backfill materials, gravel, and sand). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 4,200 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 8 would result in short-term impacts to the local communities along the River. As described for the previous removal/backfill alternatives, these short-term effects would include disruption of recreational activities along the River and within the floodplain due to

the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities. As noted above, recreational activities that would be affected by construction activities under FP 8 include bank fishing, canoeing (canoe launches), hiking, general recreation, and hunting. During the period of active construction, restrictions on recreational use of the floodplain would be imposed in the areas in which remediation-related activities are taking place. Due to safety considerations, boaters, anglers, hikers, and other recreational users would not be able to use the floodplain in the areas where remediation-related activities are being conducted. In addition, the presence of heavy construction equipment and cleared or disturbed areas would detract from the visually undisturbed nature of the area.

Increase in Truck Traffic. Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would significantly increase during the construction period. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment facilities, it would take a total of 14,790 trips to do so (an average of 2,110 truck trips per year for a seven-year remediation project). Additional truck trips would be necessary to transport backfill materials, as well as materials for the construction of staging areas and access roads, to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 19,500 truck trips (an average of 2,700 truck trips per year) would be required for that purpose.

This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the construction zone could affect those residents and businesses located in the immediate vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport backfill to the site and to dispose of used staging area/access road materials.[429] This analysis indicates that the increased truck traffic associated with FP 8 (an estimated total of 1.5 M vehicle miles, 214,000 average vehicle miles per year) would result in an estimated 0.72 non-fatal injuries due to accidents (average annual non-fatality injury estimate of 0.1) with a probability of 51% of at least

[429] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

one such injury, and an estimated 0.03 fatalities from accidents (average annual fatality estimate of 0.005) with a probability of 3% of at least one such fatality.

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts. A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 8 to the affected communities.[430] These measures would consist of the ones identified in Section 5.7 and summarized in Section 7.2.8 above. Despite the implementation of these measures, however, short-term impacts of construction activities on the local communities from FP 8 would be inevitable.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 8. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 8 is estimated to involve 316,344 labor-hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 8 would result in an estimated 2.93 non-fatal injuries to workers (average annual non-fatality injury estimate of 0.41 with a probability of 95% of at least one such injury and an estimated 0.02 worker fatalities (average annual fatality estimate of 0.003) with a probability of 2% of at least one such fatality.

7.8.9 Implementability

7.8.9.1 Technical Implementability

The technical implementability of FP 8 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

General Availability of Technology: As discussed for the other removal alternatives, the equipment, technology, procedures, and personnel necessary to implement FP 8 are

[430] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2.

expected to be readily available (with the exception of commercially available soils that would replicate existing wetland soils). In wetlands and vernal pool settings, specialized technologies would be used, as appropriate, to mitigate adverse impacts. These technologies have been used at other sites. Given the physical characteristics of the floodplain and the availability and known reliability of construction equipment and materials (except as noted above), FP 8 would be technically implementable. Further, methods to implement monitoring and institutional controls are expected to be readily available.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be used for FP 8 is suitable for implementation in the areas where it would be applied. The construction of access roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. In the long term, floodplain areas would be backfilled and returned to approximate original elevations, to the extent practical, to maintain the flood storage capacity of the floodplain.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country, as described in Section 7.2.5.2. However, given the extent of disturbances under FP 8, re-establishment of pre-remediation conditions and functions through restoration measures is unlikely for some affected habitats (e.g., vernal pools) and uncertain for others, as discussed in the relevant subsections of Section 5.3 and in Section 7.8.5.3.

Availability of Support Facilities and Resources: Implementation of FP 8 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 42 acres would be needed for such facilities, and appear to be available based on a conceptual site layout. In addition, sufficient backfill (albeit not soil that would match existing wetland soil) and planting materials are expected to be readily available implementation of FP 8.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available and their use and effectiveness for this type of material removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measure (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 8 would be assessed by visual observation to evaluate such factors as vegetation re-growth and any signs of erosion or disturbance of restored areas. Monitoring procedures would be straightforward and implementable.

7.8.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 8 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 8 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 8 is provided in Tables F-8a through F-8c in Appendix C and summarized in Section 7.8.4.

Access Agreements: Implementation of FP 8 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is anticipated that access agreements would be required from35 to 45 other landowners. Obtaining such access agreements could be difficult and time-consuming in some cases. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 8 would require coordination with EPA and MDEP. In addition, obtaining access to state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 8, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.8.10 Cost

The estimated total cost to implement FP 8 is $62.7 M (excluding the costs of treatment/disposition of excavated soil). The estimated capital cost for implementation of FP 8 is $60.1 M, assumed to occur over an approximately 7-year construction period. Estimated annual OMM costs (for a 5-year inspection and maintenance program for restored excavation and staging/access road areas) range from $3,000 to $248,000 per

year (depending on which reach is being monitored), resulting in a total cost of $2.6 M. The following summarizes the total costs estimated for FP 8.

FP 8	Est. Cost	Description
Total Capital Cost	$60.1 M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$2.6 M	Costs for performance of the OMM programs
Total Cost for Alternative	$62.7 M	Total cost of FP 8 in 2010 dollars

The total estimated present worth of FP 8, which was developed using a discount factor of 7%, a 7-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $41.7 M. More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of associated sediment/riverbank remediation or the costs of treatment/disposition of the removed floodplain soils. The estimated costs for the combination of FP 8 and SED 9 is presented in Section 8.2.9, and the estimated costs for combinations of FP 8 with the various treatment/disposition alternatives are presented in Section 10.

7.8.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.8.2, the evaluation of whether FP 8 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 8 would be effective in reducing the potential for human and ecological exposure to PCBs in floodplain soils by the removal of 177,000 cy of PCB-containing soil containing approximately 22,000 lbs of PCBs. The removed soil would be replaced with clean backfill, which would be revegetated. However, FP 8 would also have substantial long-term adverse impacts on many species, including the likely loss of some sensitive species from portions of the PSA, as discussed in Section 7.8.5.3, and thus would actually increase the risks to biota in the Rest of River as a result of habitat loss.

Compliance with ARARs: As discussed in Section 7.8.4, FP 8 could be designed and implemented to achieve many of the ARARs pertinent to this alternative, but several

potential ARARs would not be met. As a result, to the extent that those regulatory requirements constitute ARARs, the ones that would not be met would need to be waived by the EPA as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: Accepting EPA's HHRA, FP 8 would be protective of human health. As discussed in Section 7.8.6.1, implementation of this alternative would achieve the RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in all human use exposure areas, including all Heavily Used Subareas. FP 8 would further ensure protection of human health through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses based on realistic assumptions.

Environmental Protection: As discussed in Section 7.8.6.2, FP 8 would achieve the ecological IMPGs based on EPA's ERA (depending, for piscivorous mammals, on the associated sediment concentrations). Specifically, FP 8 would achieve the following: (1) the lower-bound IMPG for amphibians in all 66 vernal pools evaluated; (2) the lower-bound IMPG for omnivorous/carnivorous mammals in all averaging areas in the PSA; (3) the target floodplain soil IMPG levels for insectivorous birds in all averaging areas in the PSA; and (4) the target floodplain soil level associated with the upper-bound IMPG for piscivorous mammals in both of the PSA averaging areas if the associated sediment concentration in those areas is 1 mg/kg or less.

As previously noted, however, achievement of IMPGs is a balancing factor under the Permit; it is not determinative of whether an alternative would provide overall environmental protection. As EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d). In particular, "it is important to determine whether the loss of a contaminated habitat is a greater impact than the benefit of providing a new, modified but less contaminated habitat" (EPA, 2005d, p. 6-6).

In this case, as discussed in Sections 7.8.8 and 7.8.5.3, implementation of FP 8 would result in substantial short-term and long-term adverse impacts on the environment as a result of its removal or disturbance of 150 acres of land, including 55 acres of mature floodplain forest, 18 acres of vernal pools, and 34 acres of shrub and emergent wetlands in the floodplain of the PSA. The removals and disturbances in these sensitive floodplain habitats would have long-lasting negative consequences for the plants and animals that utilize those habitats, including those subject to the IMPGs that would be achieved. For example, the attainment of the lower-bound amphibian IMPGs in all vernal pools would require extensive excavation and soil replacement in most of those pools. As discussed in Section 7.3.5.3, those activities would cause severe harm to the vernal pool amphibians

that the IMPGs are designed to protect, and it is unlikely that at least many of those pools would ever return to their current level of function for those amphibians. Due to these substantial adverse ecological impacts, based on the balancing called for by EPA guidance, FP 8 would have a net negative impact on the environment and thus would not provide overall protection of the environment.

Summary: Based on the above considerations, FP 8 would meet the standard of providing overall protection of human health. However, due to the substantial long-term ecological harm that would result from implementation of that alternative, FP 8 would not meet the standard of providing overall protection of the environment.

7.9 Evaluation of Floodplain Alternative 9

7.9.1 Description of Alternative

FP 9 would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet upper-bound RME IMPGs for human health. Specifically, this alternative has been developed to achieve the following IMPGs:

- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a non-cancer HI of 1, whichever is lower) based on direct contact with floodplain soils; and

- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a non-cancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.

This alternative would involve removing and replacing floodplain soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use EAs (described in Section 4.2.1 and shown on Figures 4-3a-d) as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment that are equal to or less than the upper-bound IMPGs based on human direct contact. Average concentrations have been based on the 95% UCL of the spatially weighted mean, as discussed in Section 4.4.2.

Summary of Removal Areas and Volumes

FP 9 would involve the removal of approximately 26,000 cy of soil from approximately 14 acres of the floodplain. The locations of these removal areas are shown on Figure 7-8 and

a detailed breakdown of the removal areas and volumes associated with FP 9 is included in Tables 7-56 through 7-61. All 26,000 cy of removal under FP 9 have been based on achieving the human direct-contact IMPGs shown in Table 7-56. However, FP 9 would also achieve certain other IMPGs, as discussed in Section 7.9.6 below.

Summary of Affected Habitat

FP 9 would involve the removal and backfill of floodplain soil across approximately 14 acres in various types of habitats. The approximate acreages of those general habitat types with associated removal volumes, are as follows:[431]

- 6.7 acres (13,000 cy) of floodplain wetland forest habitats (consisting of transitional floodplain forest and red maple swamp);
- 1.2 acres (3,000 cy) of shrub and emergent wetland habitats (consisting of wet meadow and shallow emergent marsh habitats);
- 3.3 acres (6,000 cy) of disturbed upland habitats (consisting of cultural grasslands);
- 0.2 acre (1,000 cy) of upland forested habitats (consisting mainly of red oak-sugar maple transition forest); and
- 2.5 acres (4,000 cy) of habitat of currently unmapped community type.[432]

No vernal pools would be affected by the implementation of FP 9, although some areas adjacent to vernal pools (which serve as non-breeding habitat for vernal pool amphibians) would be adversely affected, as discussed below.

In addition to the above-described areas associated with excavation/backfill activities, floodplain habitat would also be affected by the construction and use of access roads and staging areas. Conceptual construction plans indicate that FP 9 would require 11 staging

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[431] This detailed breakdown of removal areas and volumes by habitat type was generally conducted using the Woodlot (2002) habitat mapping between the Confluence and Woods Pond Dam, with revisions based on the habitat categories described in Section 5.3. As noted above, both the acreages of impact and the removal volumes have been rounded, with the result that the sum of the numbers given for each habitat type may not exactly match the total impacted acreage and removal volume for this alternative.

[432] These impacts would occur mostly in the Reach 7 floodplain, where the Woodlot habitat community mapping is absent. Based on review of information from MassGIS and aerial photography, remediation activities in Reach 7 under FP 9 would be similar to those described for FP 2 through FP 4, affecting forested uplands (1 acre) and wet meadow/emergent marsh habitats (1.3 acre).

areas, which would occupy a total of 5.0 acres (0.5 acres of which would be within the floodplain), and 4.6 miles of temporary access roads covering 11 additional acres assuming a 20-foot road width (2.2 miles and 5.3 acres of which would be within the floodplain). Within the Woodlot (2002) mapping coverage, these facilities would be located largely in the floodplain forest (1.7 acres), shrub and shallow emergent wetlands (1.5 acres), and disturbed upland habitats (1.8 acres).[433] The locations of these staging areas and access roads are shown on Figure 7-8.

Conceptual Remedial Approach

The conceptual remedial approach for FP 9 would be generally the same as that described for the previous floodplain removal alternatives. Conventional construction equipment would be used to construct access roads and staging areas, clear and grub existing vegetation, remove and replace soil, and conduct restoration activities.

During development of the conceptual plans for this Revised CMS Report, the locations of the staging areas and access roads for FP 9 were selected, considering site conditions (e.g., topography, habitat type, presence of residential areas, etc.) observed through site visits and aerial photographs, in an effort to minimize impacts on sensitive habitats and local communities to the extent practical (see Section 5.2.2). As described for the alternatives discussed above, areas were specifically selected based on accessibility, existing land use, habitat use, and location relative to the floodplain; and an effort was made, where practicable, to avoid sensitive wildlife habitats (e.g., forested floodplain areas, vernal pools, other wetlands) and to utilize existing infrastructure, while avoiding (where practical) travel through densely populated areas. To minimize the footprint of construction and impacts to sensitive habitats and densely populated areas, access to some floodplain removal areas has been assumed from the opposite side of the river through the construction of temporary river crossings. This evaluation has lead to the locations of staging areas and access roads shown on Figure 7-8. Further evaluations of the locations for staging areas, access roads, and other supporting infrastructure would be conducted during design.

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[433] Many of the access roads and staging areas required to complete remediation activities in Reaches 5 and 6 under FP 9 are situated outside of the PSA floodplain and not included in the Woodlot habitat community mapping. Based on review of information from MassGIS and aerial photography, it appears most of these facilities would be located in existing disturbed upland areas (6.4 acres), with additional impacts occurring in forested uplands (2 acres), forested wetlands (0.1 acre), and wet meadow/emergent marsh (0.5 acre). Impacts associated with access roads and staging areas in Reach 7 would total approximately 1.8 acres (i.e., 1.4 acres of forested uplands and 0.4 acre of wetlands). There would be no impacts in Reach 8 from construction of access roads or staging areas.

For purposes of the evaluations in this Revised CMS Report, it is assumed that FP 9 would include restoration of areas that are directly impacted by the floodplain removal activities and associated access roads and staging areas. The restoration methods that are assumed to be utilized under FP 9, subject to development of a more detailed restoration plan during design, would include the conceptual methods described in Section 5.3.4.3 for the floodplain forest habitat, Section 5.3.5.3 for the shrub and emergent wetlands, and Section 5.3.8.3 for the affected upland habitats.

It is estimated that FP 9 would take approximately 1 year to complete if implemented independently from other River-related remedial activities. However, assuming that floodplain remediation would be coordinated with sediment remediation, the time to complete FP 9 could be different depending on the sediment remediation alternative selected. Nevertheless, for purposes of the evaluations in this section, it has been assumed that FP 9 would take 1 year.

As described for the other alternatives, FP 9 would include institutional controls and/or other mechanisms to address reasonably anticipated future uses and activities for which this alternative would not meet otherwise applicable standards. These controls/mechanisms would include the use of EREs and Conditional Solutions where appropriate, as well as periodic inspections and reviews of floodplain properties to assess any changes in use, followed by additional remediation if necessary to be protective for the new use, as described in Section 4.6.

After remediation activities within a given area are completed, periodic monitoring and maintenance would be conducted of the backfilled/restored areas. For the purposes of this Revised CMS Report, monitoring and maintenance are assumed to occur for 5 years following remedy implementation within a given area. The components of this OMM program are anticipated to include those described in Section 4.5 and outlined for the affected floodplain habitats in the restoration methods subsections in Section 5.3.

7.9.2 Overall Protection of Human Health and the Environment - Introduction

As discussed in Section 7.1.2, the evaluation of whether a floodplain soil remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria – notably: (a) comparison to IMPGs; (b) compliance with ARARs; (c) long-term effectiveness and permanence (including long-term adverse impacts); and (d) short-term effectiveness. For that reason, the evaluation of whether FP 9 would be protective of human health and the environment is presented at the end of Section 7.9 so that it can take account of the evaluations under those other criteria, as well as other aspects of the alternative and other factors relevant to the protection of health and the environment.

7.9.3 Control of Sources of Releases

Existing floodplain soil conditions are not a significant source of PCB releases to the River. As stated previously, the floodplain is generally flat, well vegetated and depositional in nature, greatly reducing the potential for PCBs in the floodplain soil to scour and be transported to the River.

Open excavations during construction could serve as a short-term temporary source of some releases during an extreme weather event. Such potential releases would be controlled using conventional engineering practices.

7.9.4 Compliance with Federal and State ARARs

The potential chemical-specific, location-specific, and action-specific ARARs identified by GE for FP 9 in accordance with directions from EPA are listed in Tables F-9.a through F-9.c in Appendix C.[434] No chemical-specific ARARs have been identified for FP 9, although several guidances to be considered are listed in Table F-2.a. With respect to the potential location-specific and action-specific ARARs, Tables F-2.b and F-2.c indicate that FP 9 could be designed and implemented to achieve most of those ARARs, assuming that any necessary EPA approval determinations are obtained.[435] However, as also indicated in those tables, there are a few potential location- and action-specific ARARs that would not be met by FP 9. These are the same as those listed for FP 2 in Section 7.2.4 and would need to be waived by EPA as technically impracticable to meet (or on some other ground) under CERCLA and the NCP.

In addition, for the same reasons discussed for FP 2 in Section 7.2.4, it is possible that, in the unlikely event that excavated floodplain soils should be found to constitute hazardous waste (which is not anticipated) and that the temporary staging areas for the handling of those soils are subject to federal and/or state hazardous waste regulations, the staging areas may not meet certain locational and/or technical requirements for the storage of hazardous waste. In that unlikely event, as also discussed in Section 7.2.4, such requirements should be waived by EPA as technically impracticable to meet.

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[434] For the reasons discussed in Section 2.1.3, a number of the regulatory requirements listed as location- or action-specific ARARs do not constitute ARARs for the Rest of River remedial action, but are listed in these tables as potential ARARs per EPA's direction.

[435] As discussed for FP 2 in Section 7.2.4 (footnote 336), it is assumed that EPA would make the determinations necessary in connection with certain requirements.

7.9.5 Long-Term Reliability and Effectiveness

The assessment of long-term reliability and effectiveness for FP 9 includes evaluation of the magnitude of residual risk, the adequacy and reliability of the alternative, and any potential long-term adverse impacts on human health or the environment. Each of these considerations is discussed below.

7.9.5.1 Magnitude of Residual Risk

Evaluation of the magnitude of residual risk associated with FP 9 includes consideration of the length of time and extent to which this alternative would reduce potential exposure to PCBs, estimated concentrations of remaining PCBs available for such exposure, and other aspects of the alternative that would reduce potential exposure, such as institutional controls.

FP 9 would reduce potential exposures of humans and ecological receptors to PCBs in floodplain soil by removing approximately 26,000 cy of PCB-containing soil over approximately 14 acres of floodplain (see Figure 7-8). The reduction in potential exposure and associated risk would occur upon completion of the remediation in a given area.

As discussed further in Section 7.9.6.1, the average floodplain soil concentrations in all of the human health averaging areas following implementation of FP 9 would be equivalent to or lower than those associated, based on EPA's HHRA (under RME assumptions), with a cancer risk of 10^{-4} and a non-cancer HI of 1. The average post-remediation PCB EPCs in the top foot within the human health and ecological averaging areas following implementation of FP 9 are shown in Tables 7-56 through 7-61. (Table 7-56 also shows the post-remediation concentrations in the top 3 feet in Heavily Used Subareas.) Comparison of these EPCs to the IMPGs based on EPA's HHRA and ERA is discussed in Section 7.9.6.[436]

PCBs would also remain at depths below those described above. In the event that future exposure to such deeper soil were reasonably anticipated in particular areas, it would be addressed by EREs and/or Conditional Solutions. Additionally, EREs and Conditional Solutions would be implemented where necessary to address potential risks from future uses that are reasonably anticipated based on realistic assumptions.

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[436] As discussed in Section 1.2, GE does not agree with many of the EPA assumptions and inputs on which the IMPGs are based and thus does not agree that exceedances of those IMPGs are indicative of a risk to human health or the environment.

7.9.5.2 Adequacy and Reliability of Alternative

Evaluation of the adequacy and reliability of FP 9 has included an assessment of the use of technologies under similar conditions, the general reliability of those techniques, reliability of OMM, and the potential need to replace technical components. The evaluation of these factors for FP 9 is similar to that presented for FP 2 in Section 7.2.5.2.

Use of Technology Under Similar Conditions

FP 9 relies primarily on the removal of floodplain soils, followed by backfilling of the excavations and performance of restoration activities. Excavation of soils from floodplain environments has been implemented at a number of sites across the country, as discussed in Section 7.2.5.2. Restoration was discussed separately in Section 5.3.

General Reliability and Effectiveness

The removal and backfill of soil for FP 9 would reliably, effectively, and permanently reduce the concentrations of PCBs in the removal areas. Following backfilling, as described above, it is assumed that excavated and other disturbed areas would be subject to restoration and replanting, using the restoration methods described for the affected habitats in Section 5.3. There are significant constraints on the ability to re-establish the pre-remediation conditions and functions of such habitats. Those constraints and the consequent likelihood of restoration success are discussed in Sections 5.3.4.4 for forested floodplain habitats, 5.3.5.4 for shrub and shallow emergent wetlands, and 5.3.8.4 for forested upland habitats. However, since the habitat impacts from FP 9 would occur in a smaller overall area than would be affected by the other removal alternatives except for FP 2, these constraints would have less overall impact on habitat conditions than under those larger alternatives.

Reliability of Operation, Monitoring, and Maintenance Requirements/Availability of Labor and Materials

Following the construction phase of FP 9, a monitoring and maintenance program would be implemented for those areas subject to restoration measures. Both the removal areas and those portions of the floodplain disturbed during construction of access roads and staging areas would be monitored through periodic inspections to ensure that the planted vegetation is surviving and growing, and to identify areas (if any) where the backfill is eroding and in need of repair. Any deficiencies noted during the inspections would be subject to maintenance, repair, and other corrective actions performed as necessary. Periodic inspection of the replanted, backfilled, and restored areas is considered a reliable means of tracking the restoration activities. Labor and materials needed to monitor and

perform any maintenance activities required following implementation of FP 9 are considered readily available.

Technical Component Replacement Requirements

If significant erosion, plant loss, or other problematic conditions were observed as part of the OMM program in the restored floodplain areas, an assessment would be conducted to determine the cause, as well as the need for and methods of repair. Depending on the timing, and location of the repair, access roads and staging areas may need to be temporarily constructed in the floodplain. It is anticipated that if small repairs or replacement were necessary, they could be implemented using the same types of methods and materials used during the initial backfilling/restoration activities. Periodic small-scale inspections and repairs would pose no appreciable risks to humans and ecological receptors that use/inhabit the floodplain in these areas. While not anticipated, the repair or replacement of larger areas could require more extensive disturbance in the floodplain.

7.9.5.3 Long-Term Adverse Impacts on Human Health or the Environment

The evaluation of potential long-term adverse impacts of FP 9 on human health or the environment has included consideration of the items discussed below.

Potentially Affected Populations

Implementation of FP 9 would have potential long-term effects on humans and wildlife populations through changes in the natural environment and habitat. For humans, implementation of FP 9 would affect the aesthetics and recreational use of the floodplain. For wildlife, implementation of FP 9 would remove and replace several habitat types (described in Section 7.9.1). Wildlife associated with these habitats includes a variety of mammals, birds, reptiles, and amphibians. In particular, FP 9 would affect portions of the mapped Priority Habitats of 24 state-listed rare species, as described in Appendix L. The long-term impacts of FP 9 on the affected habitats and their associated biota are discussed below.

Long-Term Ecological Impacts

FP 9 would impact a total of approximately 30 acres, including 14 acres due to floodplain soil removal and 16 acres (of which approximately 6 acres are in the floodplain) for the construction and use of access roads and staging areas. The great majority of these impacts would occur in the PSA.

The impacts of FP 9 on the various habitat types would be similar, both in total extent and in the specific locations, to those of FP 2. Thus, for areas within the Woodlot habitat mapping coverage, FP 9 would impact a total of approximately 8.4 acres of floodplain wetland forest habitats, compared to a total of 7.5 acres for FP 2; a total of approximately 2.7 acres of shrub and emergent wetlands, compared to a total of 2.8 acres for FP 2; and a total of approximately 5.4 acres of upland habitats (mainly in already disturbed areas), compared to a total of 4.5 acres for FP 2.[437] As such, the long-term impacts of FP 9 on these habitats would be comparable to those discussed for these habitat types in Section 7.2.5.3.

In addition, like FP 2, although FP 9 would not involve remediation in any vernal pools, it would affect portions of the habitats adjacent and proximate to some vernal pools in the PSA, which provide providing shade and leaf litter for the pool and a variety of protective cover, temperature and moisture regulation, and overwintering habitat functions for the vernal pool amphibians. FP 9 would affect varying portions of the 100-foot and 100- to 750-foot zones around a number of the vernal pools in the PSA – ranging up to 31% of the 100-foot zone and 5% of the 100-750 foot zone for individual pools – due to floodplain soil removal and construction of access roads. In total, FP 9 would affect 3 acres within 100 feet and 12 acres within the 100- to 750-foot zones of the vernal pools in the PSA. These disturbances would disrupt aspects of those areas' non-breeding functions for the vernal pool amphibians. Again, however, given the limited extent of these disturbances relative to the disturbances inherent in alternatives involving a greater extent of removal, the resulting disruptions would likewise be limited relative to those alternatives.

As noted above, FP 9 would affect portions of the Priority Habitats of 24 state-listed species. As discussed in the MESA assessments in Appendix L, it is anticipated that FP 9 would involve a take of at least 18 of these species, but would not adversely affect a significant portion of the local population of any of them (except possibly one – black maple). The table below lists the 24 stated-listed species whose Priority Habitat would be affected by FP 9, along with those for which FP 9 would result in a take and the species as to which FP 9 could impact a significant portion of the local population:

[437] In addition, as noted in Section 7.9.1, FP 9 would affect 2.3 acres of wetlands, 4.4 acres of upland forest, and 6.4 acres of disturbed upland habitats outside the Woodlot habitat mapping coverage.

Table 7-62 – Impacts of FP 9 on State-Listed Species

Species with Priority Habitat Affected by FP 9	Take?	Impact on Significant Portion of Local Population?
American bittern	Yes	No
Arrow clubtail	Yes	No
Bald eagle	No	No
Black maple	Yes	Possibly
Bristly buttercup	Yes	No
Brook snaketail	Yes	No
Bur oak	Yes	No
Common moorhen	Unlikely	No
Foxtail sedge	Yes	No
Intermediate spike-sedge	Unlikely	No
Jefferson salamander	Yes	No
Mustard white	Yes	No
Narrow-leaved spring beauty	Unlikely	No
Ostrich fern borer moth	Yes	No
Rapids clubtail	Yes	No
Riffle snaketail	Yes	No
Skillet clubtail	Yes	No
Spine-crowned clubtail	Yes	No
Stygian shadowdragon	Yes	No
Triangle floater	Unlikely	No
Wapato	Yes	No
Water shrew	No	No
Wood turtle	Yes	No
Zebra clubtail	Yes	No

In summary, while FP 9 would have significant long-term negative impacts in certain areas that are cleared for soil remediation or access roads or staging areas, such impacts would affect only small percentages of the total habitats in the PSA (e.g., 1.5% of the total forested floodplain in the PSA and less than 1% of the shrub and emergent wetlands in the PSA) and thus would not be expected to cause widespread harm to those overall habitats.

Similarly, apart from impacts on wildlife habitat, FP 9 would have considerably less impact than the other removal alternatives (except for FP 2) on the other floodplain functions described above (groundwater recharge/discharge, flood flow alteration, and water quality maintenance, nutrient processing, and production export).

Long-Term Impact on Aesthetics and Recreational Use

Implementation of FP 9 would have some long-term impacts on the aesthetic features of the natural environment. The natural appearance of the floodplain after the remediation would be altered in those areas where excavation was performed and where access roads and staging areas were located. FP 9 would result in the removal of approximately 8.7 acres of mature forested communities in the floodplain (including both floodplain and upland forested areas). These areas would look markedly different for a long time after remediation, because some of these trees are over 50 to 100 years old and the time for a replanted forest community to develop an appearance comparable to its current appearance would be generally commensurate with the age of the pre-removal community. However, the areas that would be affected by implementation of FP 9 are small relative to the overall floodplain environment, and the remediation would thus not be significantly detrimental to the overall aesthetics of the PSA floodplain in the long term.

As with FP 2, most of the floodplain areas that would be remediated under FP 9 are characterized as general recreational areas, although the affected areas also include canoe launch areas, bank fishing areas, and dirt biking/ATVing areas. Recreational activities in these areas would be disrupted by the implementation of FP 9. These disruptions would last not only during the remediation period, but until the areas have sufficiently recovered to support such uses.

Potential Measures to Mitigate Long-Term Adverse Impacts

In an effort to mitigate long-term impacts to the floodplain following remedy implementation, a variety of restoration measures are available.[438] The restoration methods for the types of habitats that would be affected by FP 9 are described in the restoration methods subsections in Section 5.3.

[438] Potential measures to avoid or minimize the adverse impacts were described in Section 5.2.

7.9.6 Attainment of IMPGs

This section describes the extent to which FP 9 would achieve the IMPGs for both human health and ecological receptors. These comparisons are presented in Tables 7-56 through 7-61 for the pertinent human and ecological averaging areas. The time frame to achieve any IMPGs would be the same as that required to complete the remedy in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement).

7.9.6.1 Comparison to Human Health-Based IMPGs

For direct contact with soils, as shown in Table 7-56, FP 9 would achieve, at a minimum, the RME IMPGs based on a 10^{-4} cancer risk and a non-cancer HI of 1 in all 120 direct contact EAs, and in all 12 Heavily Used Subareas. In addition, FP 9 would achieve the RME IMPGs based on a 10^{-5} cancer risk in 71 of those EAs, including the top 3 feet in 8 of the 12 Heavily Used Subareas.

For human consumption of agricultural products, FP 9 would achieve the RME IMPGs based on a 10^{-5} cancer risk and non-cancer impacts in all 14 of the farm areas evaluated for such consumption (Table 7-57).

The comparisons above are shown in detail in Tables 7-56 and 7-57 for all human exposure areas evaluated in Reaches 5 through 8.[439]

7.9.6.2 Comparison to Ecological IMPGs

FP 9 would achieve some of the ecological IMPGs in some areas:

- For amphibians, FP 9 would achieve the upper-bound IMPG (5.6 mg/kg) in 7 of the 66 vernal pools in the PSA, and would also achieve the lower-bound IMPG (3.27 mg/kg) in 5 of those 7 pools (Table 7-58).

- For omnivorous/carnivorous mammals, FP 9 would achieve the upper-bound IMPG (34.3 mg/kg) in all of the 7 averaging areas; it would also achieve the lower-bound IMPG (21.1 mg/kg) in 4 of those areas (Table 7-59).

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[439] In addition to the comparisons mentioned in the text, as shown in Tables 7-56 and 7-57, FP 9 would achieve the RME IMPGs based on a 10^{-6} cancer risk in 7 EAs and 1 Heavily Used Subarea and in 5 farm areas evaluated for consumption of agricultural products. However, it would achieve the CTE IMPGs based on a 10^{-6} cancer risk in 116 of the 120 EAs and 11 of the 12 Heavily Used Subareas and in 13 of the 14 farm areas evaluated for consumption of agricultural products.

- For insectivorous birds, FP 9 would achieve the target floodplain soil IMPGs in each of the 12 averaging areas in the PSA if the associated sediment concentrations in those areas were 3 mg/kg or less, and would achieve those levels in 9 of the averaging areas (all except the three in Reach 5B) if the associated sediment concentrations were 5 mg/kg (Table 7-60).

- For piscivorous mammals, FP 9 would achieve the upper-bound soil IMPG level in one (Reach 5C/5D/6) of the two averaging areas at the 1 mg/kg sediment target level (Table 7-61).[440]

These comparisons are shown in detail in Tables 7-60 through 7-61 for all ecological averaging areas in the PSA.[441]

7.9.7 Reduction of Toxicity, Mobility, or Volume

The degree to which FP 9 would reduce the toxicity, mobility, or volume of PCBs in floodplain soils is discussed below.

Reduction of Toxicity: FP 9 does not include any treatment processes that would reduce the toxicity of the PCBs in the floodplain soils. However, if NAPL, drums of liquid, or the like should be encountered during floodplain excavation (which is not anticipated), those wastes would be segregated and sent off-site for treatment and disposal.

Reduction of Mobility: As previously noted, the existing conditions of the floodplain are predominantly depositional and stable due to the presence of vegetation and the generally low water velocities during periods of inundation. Therefore, PCBs in existing floodplain soils do not represent a significant potential source for mobility and migration.

Reduction of Volume: FP 9 would reduce the volume of PCB-containing soils and the mass of PCBs in the floodplain by removing 26,000 cy of soils containing approximately 3,300 lbs of PCBs from 14 acres of the floodplain.

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[440] There are several cases where the soil IMPG levels for piscivorous mammals (particularly the lower bound) could not be achieved at any floodplain soil concentration since the PCB concentrations in the aquatic food items at the target sediment level would by themselves exceed the IMPGs for mink prey.

[441] In the evaluation of combined sediment and floodplain alternatives presented in Section 8, FP 9 has been paired with SED 10. The evaluation of that combination of alternatives in Section 8.2.5.2 has assessed the attainment of the IMPGs for insectivorous birds and piscivorous mammals based on the actual sediment concentrations achieved under SED 10, thus avoiding the need to consider the pre-determined target sediment levels of 1, 3, and 5 mg/kg (see also Section 2.2.2.3).

7.9.8 Short-Term Effectiveness

Evaluation of the short-term effectiveness of FP 9 has included consideration of the short-term impacts of implementing this alternative on the environment (in terms of both ecological effects and increases in GHG emissions), on the local communities (as well as communities along truck transport routes), and on workers involved in the remedial activities. Short-term impacts are those that would occur during and immediately after the performance of the remedial activities in a given area. These impacts would be similar to those associated with FP 2 since the same type of activities and habitats would be affected.

Impacts on the Environment – Ecological Effects

As discussed above, FP 9 would impact a total of approximately 30 acres (both within and outside the PSA), including 14 acres due to floodplain soil removal and 16 acres (of which approximately 6 acres are in the floodplain) for the construction and use of access roads and staging areas. The short-term effects on the environment resulting from implementation of FP 9 would include the removal of plant and wildlife habitat in those areas of the floodplain where remediation or construction of access roads or staging areas would occur. Since, as discussed above, the habitats affected by FP 9 are similar to those affected by FP 2, both in overall extent and in specific areas, the short-term ecological impacts from implementation of FP 9 would be similar to those described for FP 2 in Section 7.2.8. In summary, as with FP 2, implementation of FP 2 would have a number of adverse short-term effects on the habitats of the Rest of River, but those effects would be limited due to the relatively limited extent of the floodplain remediation under FP 9.

Carbon Footprint – GHG Emissions

As described in Section 5.6 and Appendix M, an estimate has been developed of the carbon footprint composed of GHG emissions anticipated to occur through floodplain soil and tree removal and related ancillary activities during the implementation of FP 9.

The total carbon footprint associated with FP 9 has been estimated to be 3,500 tonnes of GHG emissions. Of this total, the great majority (3,000 tonnes) are associated with direct emission sources (primarily construction activities and tree removal). The total greenhouse gas emissions estimated for this alternative are equivalent to the annual output of 700 passenger vehicles.

Impacts on Local Communities and Communities Along Truck Transport Routes

FP 9 would result in short-term impacts to the local communities along the River. As described for the previous removal/backfill alternatives, these short-term effects would

include disruption of recreational activities along the River and within the floodplain due to the remediation as well as the construction of access roads and staging areas. They would also include increased construction traffic and noise during excavation and backfilling activities.

Impacts on Recreational Activities. As previously noted, the floodplain areas that would be affected by construction activities under FP 9 include areas used for general recreation, canoeing, bank fishing, and dirt biking/ATVing. Implementation of FP 9 would disrupt recreational activities in these areas. In addition, the presence of heavy construction equipment and cleared or disturbed areas would detract from the visually undisturbed nature of the area.

Increase in Truck Traffic. Due to the need to remove excavated materials and deliver backfill materials and equipment, truck traffic would significantly increase during the construction period. As an example, if 20-ton capacity trucks were used to transport excavated material from the staging areas to the disposal or treatment facilities, it would take a total of 2,300 trips to do so.[442] Additional truck trips would be necessary to transport backfill materials, as well as materials for the construction of staging areas and access roads, to the site. Assuming the use of 16-ton trucks for such local hauling, an additional 3,400 truck trips would be required for that purpose.

This additional traffic would increase the likelihood of accidents, noise levels, emissions of vehicle/equipment exhaust, and nuisance dust to the air. In addition, noise in and near the construction zone could affect those residents and businesses located in the immediate vicinity of work areas.

The increased truck traffic would also increase the risk of traffic accidents along transport routes. Appendix N includes an analysis of potential risks from the increased truck traffic that would be necessary to transport clean materials to the site and to dispose of used staging area/access road materials.[443] This analysis indicates that the increased truck traffic associated with FP 9 (an estimated total of 500,000 vehicle miles) would result in an estimated 0.24 non-fatal injuries due to accidents with a probability of 21% of at least one

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[442] Since it is estimated that FP 9 could be completed in one year, the total numbers given in this section for truck trips, injuries and fatalities from truck traffic, and injuries and fatalities to on-site workers are annual numbers for comparison to the annualized estimates presented for other floodplain alternatives.

[443] The risks from transport of excavated materials to the staging areas are evaluated as part of risks to workers, discussed below; and the risks from transport of such materials from the staging areas to disposal or treatment facilities are evaluated under the relevant treatment/disposition alternatives.

such injury, and an estimated 0.01 fatalities from accidents with a probability of 1% of at least one such fatality.

Potential Measures to Avoid, Minimize, or Mitigate Short-Term Community Impacts. A number of measures would be employed in an effort to avoid, minimize, or mitigate potential detrimental effects and short-term risks of construction activities associated with FP 9 to the affected communities.[444] These measures would consist of the ones identified in Section 5.7 and summarized in Section 7.2.8 above. Despite the implementation of these measures, however, short-term impacts of construction activities on the local communities from FP 9 would be inevitable.

Risks to Remediation Workers

There would be potential health and safety risks to site workers implementing FP 9. Engineering controls and OSHA procedures designed to mitigate risks to remediation workers would be instituted. Implementation of FP 9 is estimated to involve 48,947 labor-hours.

The analysis in Appendix N of potential risks to workers from implementation of the floodplain alternatives indicates that implementation of FP 9 would result in an estimated 0.46 non-fatal injuries to workers with a probability of 37% of at least one such injury, and an estimated 0.004 worker fatalities with a probability of 0.4% of at least one such fatality.

7.9.9 Implementability

7.9.9.1 Technical Implementability

The technical implementability of FP 9 has been evaluated in terms of the general availability of the technology involved (soil excavation and backfilling), the ability of this technology to be constructed and operated given site characteristics, the reliability of this technology, the availability of support facilities and resources, ease of undertaking corrective measures if necessary, and ability to monitor effectiveness.

General Availability of Technology: As discussed for FP 2 in Section 7.2.9.1, the equipment, materials, technology, procedures, and personnel necessary to implement FP 9 are expected to be readily available. Given the physical characteristics of the floodplain and the availability and known reliability of construction equipment and materials (with the

[444] The measures considered to avoid or minimize adverse short-term ecological effects were described in Section 5.2.

exception of commercially available soils that would replicate existing wetland soils), FP 9 would be technically implementable. Methods to implement monitoring and institutional controls are all considered readily available.

Ability To Be Implemented: Based on site characteristics, the excavation/backfill technology that would be used for FP 9 is suitable for implementation in the areas where it would be applied. The construction of access roads and staging areas may temporarily affect flood storage and drainage characteristics during seasonal high water conditions and during periodic storm and flood events. Engineering practices would be implemented to reduce the temporary impacts of such hydrology changes. Floodplain areas would be backfilled and returned to approximate original elevations, to the extent practical, to maintain the flood storage capacity of the floodplain.

Reliability: Soil excavation with backfilling is considered a reliable means of reducing the potential for human and ecological exposure to soils containing PCBs. Floodplain soil excavation has been implemented at other PCB-impacted sites across the country, as described in Section 7.2.5.2. However, restoration efforts may not result in re-establishment of the pre-remediation conditions and functions of all of the affected habitats, as noted above and discussed the relevant subsections of Section 5.3.

Availability of Support Facilities and Resources: Implementation of FP 9 would require construction of access roads and staging areas at various locations. As noted previously, an estimated 16 acres would be needed for such facilities, and appear to be available based on a conceptual site layout. In addition, sufficient backfill (albeit not soil that would match existing wetland soil) and planting materials are expected to be readily available implementation of FP 9.

Ease of Conducting Additional Corrective Measures: If necessary, performing additional remediation at a later date would be possible using the same types of tools, equipment, and materials as in the original round of remediation. Construction equipment, personnel, and materials are commercially available and their use and effectiveness for this type of material removal and backfill project are well known and documented. Ease of implementation of the corrective measures would be directly related to the extent of the necessary additional corrective measure (i.e., area and/or volume to be addressed) and the ease of access (e.g., remoteness from roads, wetlands crossings, size and type of construction equipment).

Ability to Monitor Effectiveness: The effectiveness of FP 9 would be assessed by visual observation to evaluate such factors as vegetation growth (e.g., plant survivorship) and any signs of erosion of restored areas. Monitoring procedures would be straightforward and implementable.

7.9.9.2 Administrative Implementability

The evaluation of administrative implementability of FP 9 has included consideration of regulatory requirements, the need for access agreements, and coordination with governmental agencies.

Regulatory Requirements: Implementation of FP 9 would need to comply with the substantive requirements of regulations that are designated as ARARs for the performance of the remedial action, unless those requirements are waived. An evaluation of compliance with potential ARARs for FP 9 is provided in Tables F-9a through F-9c in Appendix C and summarized in Section 7.9.4.

Access Agreements: Implementation of FP 9 would require GE to obtain permission for access to the properties where the work would be conducted or where the ancillary facilities would be located. Although many of these areas are owned by the Commonwealth or the City of Pittsfield (which have agreed to provide access), it is anticipated that access agreements would be required from 20 to 25 other landowners. Obtaining such access agreements could be difficult and time-consuming in some cases. If GE should be unable to obtain access agreements with particular landowners, GE would request EPA's assistance.

Coordination with Agencies: Implementation of EREs and Conditional Solutions as part of FP 9 would require coordination with EPA and MDEP. In addition, obtaining access to state-owned lands would require coordination with the state agencies that own that land. Finally, both prior to and during implementation of FP 9, GE would need to coordinate with EPA, as well as state and local agencies, to provide as-needed support with public/community outreach programs.

7.9.10 Cost

The estimated total cost to implement FP 9 is $12.9 M (excluding the costs of treatment/disposition of excavated soil). The estimated capital cost for implementation of FP 9 is $12.3 M. Estimated annual OMM costs (for a 5-year inspection and maintenance program for restored excavation and staging/access road areas) range from $3,000 to $65,000 per year (depending on which reach is being monitored), resulting in a total cost of $600,000. The following summarizes the total costs estimated for FP 9.

FP 9	Est. Cost	Description
Total Capital Cost	$12.3 M	Costs for engineering, labor, equipment, and materials associated with implementation
Total OMM Cost	$0.60 M	Costs for performance of the OMM programs
Total Cost for Alternative	$12.9M	Total cost of FP 9 in 2010 dollars

The total estimated present worth of FP 9, which was developed using a discount factor of 7%, a 1-year construction period, and an OMM period of 5 years on a reach-specific basis, is approximately $12.5 M (which, in this case, is almost the same as the total cost in light of the assumed short duration for implementing this alternative). More detailed cost estimate information and assumptions for each of the floodplain alternatives are included in Appendix Q.

As noted above, these costs do not include the costs of associated sediment/riverbank remediation or the costs of treatment/disposition of the removed floodplain soils. The estimated costs for the combination of FP 9 and SED 10 is presented in Section 8.2.9, and the estimated costs for combinations of FP 9 with the various treatment/disposition alternatives are presented in Section 10.

7.9.11 Overall Protection of Human Health and the Environment – Conclusions

As explained in Section 7.9.2, the evaluation of whether FP 9 would provide overall protection of human health and the environment draws upon the evaluations under several other Permit criteria, discussed in prior sections, as well as other factors relevant to the protection of health and the environment. The key considerations relevant to this criterion are discussed below.

General Effectiveness: FP 9 would result in a reduction in the potential for human and ecological exposure to PCBs in floodplain soils by the removal of 26,000 cy of PCB-containing soil containing approximately 3,300 lbs of PCBs. The removed soil would be replaced with clean backfill, which would be revegetated.

Compliance with ARARs: As discussed in Section 7.9.4, FP 9 could be designed and implemented to achieve most of the ARARs for this alternative, but a few potential ARARs would not or may not be met. To the extent that those regulatory requirements constitute ARARs, those that would not be met would need to be waived by EPA as technically impracticable (or on some other ground) under CERCLA and the NCP.

Human Health Protection: Even accepting EPA's HHRA, FP 9 would be protective of human health. As discussed in Section 7.9.6.1, implementation of this alternative would achieve the RME IMPGs based on a 10^{-4} cancer risk or lower (i.e., levels within EPA's cancer risk range) and a non-cancer HI of 1 in all direct-contact EAs. It would also achieve, in all farm areas evaluated for agricultural products consumption, PCB concentrations that are at or below the adjusted RME IMPG levels based on a 10^{-5} cancer risk and a non-cancer HI of 1. FP 9 would further ensure protection of human health through implementation of EREs and Conditional Solutions where necessary to address reasonably anticipated future uses based on realistic assumptions.

Environmental Protection: As discussed in Section 7.9.6.2, FP 9 would achieve some of the ecological IMPGs, but not others. Specifically, it would achieve: (a) levels within or below the IMPG range for omnivorous/carnivorous mammals in all 7 averaging areas; and (b) the target floodplain soil IMPG levels for insectivorous birds in all 12 averaging areas if the associated sediment concentration in those areas is 3 mg/kg or less, and in 9 of those areas if the associated sediment concentration is 5 mg/kg. FP 9 would achieve the upper bound of the amphibian IMPGs (5.6 mg/kg) in 7 of the 66 vernal pools in the PSA, and it would achieve levels within the range of the target floodplain soil levels for piscivorous mammals in one of the 2 averaging areas but only if the associated sediment concentration is 1 mg/kg or less.

As discussed in Section 2.1.1, since achievement of IMPGs is only one of the Selection Decision Factors under the Permit, it is not determinative of whether an alternative would provide overall protection of the environment, but rather is a consideration to be balanced against the other Selection Decision Factors. The fact that there are exceedances of the IMPGs for certain receptors does not translate into adverse impacts on the local populations of those receptors, let alone adverse impacts on the overall wildlife community in the Rest of River area. This is true, first, because of the highly conservative nature of the averaging areas and the fact that the local populations of these receptors extend beyond the individual averaging areas.[445] Moreover, field surveys conducted by both EPA and GE, as well as other existing ecological information identified in Section 5.1.1, have documented the presence in the PSA of numerous and diverse plant and animal species, including state-listed rare species, that continue to reproduce and inhabit the floodplain despite the fact that PCBs have been present in the floodplain soil for over 70 years. Thus, even accepting the

[445] For example, as discussed in Section 4.2.3., the local populations of wood frogs, wood ducks, and shrews (as representative of amphibians, insectivorous birds, and omnivorous/carnivorous mammals, respectively) extend throughout the PSA (in areas of suitable habitat); and the local population of mink (as representative of piscivorous mammals) extends beyond the PSA to areas near the shoreline but outside the 1 mg/kg isopleth, as well as to tributaries of the River and to other riverine areas in the vicinity.

IMPGs based on EPA's ERA, the impact of the IMPG exceedances under FP 9, including those for amphibians and piscivorous mammals, on the maintenance of healthy local populations of these receptors is at best uncertain.

Moreover, as EPA guidance makes clear, the standard of "overall protection" of the environment includes a balancing of the short-term and long-term ecological impacts of the alternatives with the residual risks (EPA, 1990a, 1997a, 1999, 2005d – quoted in Section 2.1.1 above). Thus, it is critical that any uncertain risks that may be evidenced by IMPG exceedances be weighed against the certain adverse impacts of further efforts to achieve those ecological IMPGs, as discussed in Section 5.3. For example, while FP 9 would not achieve the amphibian IMPGs in about 90% of the vernal pools in the PSA, neither would it destroy those pools through excavation and replacement, with the resulting more definite and severe adverse impacts on the amphibians that inhabit those pools (see Section 5.3.7.4 above).

Indeed, implementation of FP 9, like FP 2, would involve fewer and less severe adverse impacts on the ecological receptors that the ecological IMPGs are designed to protect than more extensive remedial alternatives. As noted in Section 7.9.8, while implementation of FP 9 would result in short-term adverse environmental impacts on the habitats where the remediation and associated activities would take place, these impacts would be limited in extent. Further, as discussed in Section 7.9.5.3, implementation of FP 9 would not produce significant long-term adverse effects on the overall environment in the PSA, because the areas of sensitive habitat subject to remediation are very small relative to the same types of habitat that would remain unaffected by the remediation. For example, FP 9 would affect only 1.5% of the floodplain forests and less than 1% of the shrub and emergent wetlands in the PSA and would not directly impact the vernal pools in the PSA.

Summary: For the reasons discussed above, FP 9 would provide overall protection of human health by achieving average PCB concentrations associated with cancer risks within EPA's acceptable risk range and non-cancer impacts at or below an HI of 1 (under EPA's assumptions in the HHRA). From an environmental standpoint, FP 9 would achieve levels within the IMPG range for some ecological receptors but not others. At the same time, however, FP 9 would minimize the substantial adverse effects on the local populations of biota that would result from more extensive floodplain remedial alternatives. Thus, based on the balancing called for by EPA guidance, FP 9 would provide overall protection of the environment.

Section 7 Tables

Table 7-1. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 1.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	---	---	---	32	2.1	51	21	514	215	5143	40	176
2	27	High-use general recreation, adult / older child	25	---	---	---	25	1.4	51	14	514	143	5143	27	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	52	12	103	116	1029	1165	10286	80	353
2b	2.0	High-use general recreation, older child	31	---	---	---	31	3.9	51	39	514	388	5143	27	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	14	630	143	6305	38	234
4	3.2	High-use general recreation, adult / older child	27	---	---	---	27	1.4	37	14	368	143	3684	27	63
5	2.5	High-use general recreation, adult / older child	58	---	---	---	58	1.4	51	14	514	143	5143	27	176
6	3.8	Low-use general recreation, adult	75	---	---	---	75	4.3	126	43	1261	429	12610	115	468
7	5.9	High-use general recreation, adult / older child	25	---	---	---	25	1.4	51	14	514	143	5143	27	176
8	0.60	Recreational canoeist	40	---	---	---	40	1.2	13	12	129	121	1286	28	73
9	0.042	Low-use general recreation, older child	27	---	---	---	27	12	103	116	1029	1165	10286	80	353
10	59	High-use general recreation, young child (high use)	10	---	---	---	10	1.3	18	13	184	134	1842	4.6	32
10a	8.0	High-use general recreation, young child (high use)	22	---	---	---	22	1.3	18	13	184	134	1842	4.6	32
11	2.5	High-use general recreation, adult	18	---	---	---	18	1.4	63	14	630	143	6305	38	234
12	4.8	High-use general recreation, adult / older child	14	---	---	---	14	1.4	37	14	368	143	3684	27	63
13	5.9	High-use general recreation, adult	28	---	---	---	28	1.4	63	14	630	143	6305	38	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.7	1.4	63	14	630	143	6305	38	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	14	630	143	6305	38	234
16	2.5	High-use general recreation, adult	41	---	---	---	41	1.4	63	14	630	143	6305	38	234
17	8.5	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	38	234
18	17	Medium-use general recreation, adult	46	---	---	---	46	2.1	63	21	630	215	6305	58	234
19	36	High-use general recreation, adult	83	---	---	---	83	1.4	63	14	630	143	6305	38	234
20	9.1	High-use general recreation, adult	34	---	---	---	34	1.4	63	14	630	143	6305	38	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5.7	1.4	51	14	514	143	5143	27	176
22	19	High-use general recreation, adult / older child	28	---	---	---	28	1.4	51	14	514	143	5143	27	176
22a	1.8	Dirt biking/ATVing	93	---	---	---	93	2.0	29	20	290	205	2901	14	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	11	5.8	51	58	514	582	5143	40	176
24	10	High-use general recreation, adult	31	---	---	---	31	1.4	63	14	630	143	6305	38	234
25	0.51	High-use general recreation, older child	30	---	---	---	30	3.9	51	39	514	388	5143	27	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	7.0	1.4	51	14	514	143	5143	27	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	12	419	118	4195	43	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	27	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	14	514	143	5143	27	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	14	99
28	0.21	High-use general recreation, adult / older child	21	---	---	---	21	1.4	37	14	368	143	3684	27	63
28a	0.071	Dirt biking/ATVing	21	---	---	---	21	2.0	29	20	290	205	2901	14	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	43	1029	429	10286	80	353
30	0.19	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	27	176
31	5.0	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	27	176
31a	0.61	High-use general recreation, adult / older child	42	---	---	---	42	1.4	51	14	514	143	5143	27	176
32	6.8	High-use general recreation, adult	50	---	---	---	50	1.4	63	14	630	143	6305	38	234
33	30	High-use general recreation, adult	21	---	---	---	21	1.4	63	14	630	143	6305	38	234
34	7.8	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	58	234
35	25	High-use general recreation, adult / older child	22	---	---	---	22	1.4	51	14	514	143	5143	27	176
35a	1.2	High-use general recreation, adult / older child	44	---	---	---	44	1.4	51	14	514	143	5143	27	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	25	8.9	166	89	1664	885	16642	126	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	---	---	---	15	1.2	42	12	419	118	4195	43	348
37	20	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	27	176
37a	1.4	Bank fishing	61	---	---	---	61	2.6	52	26	524	256	5237	42	180
37b	2.3	High-use general recreation, adult / older child	27	---	---	---	27	1.4	51	14	514	143	5143	27	176
38	13	High-use general recreation, adult	23	---	---	---	23	1.4	63	14	630	143	6305	38	234
38a	1.4	Bank fishing	71	---	---	---	71	2.6	52	26	524	256	5237	42	180

Table 7-1. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 1.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
39	3.5	Marathon canoeist	30	---	---	---	30	0.78	5.8	7.8	58	78	575	13	25
40	98	High-use general recreation, adult / older child	19	---	---	---	19	1.4	37	14	368	143	3684	27	63
40a	4.6	Bank fishing	120	---	---	---	120	2.6	52	26	524	256	5237	42	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	27	63
41	20	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	58	234
41a	2.4	Bank fishing	53	---	---	---	53	2.6	52	26	524	256	5237	42	180
42	14	Medium-use general recreation, adult	32	---	---	---	32	2.1	63	21	630	215	6305	58	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	26	524	256	5237	42	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	58	234
43a	0.24	Bank fishing	69	---	---	---	69	2.6	52	26	524	256	5237	42	180
44	2.2	High-use general recreation, adult	27	---	---	---	27	1.4	63	14	630	143	6305	38	234
45	17	High-use general recreation, adult	40	---	---	---	40	1.4	63	14	630	143	6305	38	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	9.2	1.4	63	14	630	143	6305	38	234
47	1.0	Recreational canoeist	18	---	---	---	18	1.2	13	12	129	121	1286	28	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8.0	1.2	13	12	129	121	1286	28	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	3.4	1.4	63	14	630	143	6305	38	234
49	7.7	Low-use general recreation, adult	63	---	---	---	63	4.3	126	43	1261	429	12610	115	468
50	69	Low-use general recreation, adult	7.4	---	---	---	7.4	4.3	126	43	1261	429	12610	115	468
50a	11	Waterfowl hunting	21	---	---	---	21	9.0	75	90	752	904	7518	140	399
51	87	Low-use general recreation, adult	7.1	---	---	---	7.1	4.3	126	43	1261	429	12610	115	468
51a	32	Waterfowl hunting	23	---	---	---	23	9.0	75	90	752	904	7518	140	399
52	0.9	Recreational canoeist	6.5	---	---	---	6.5	1.2	13	12	129	121	1286	28	73
53	0.7	Recreational canoeist	18	---	---	---	18	1.2	13	12	129	121	1286	28	73
54	13	High-use general recreation, adult	6.5	---	---	---	6.5	1.4	63	14	630	143	6305	38	234
55	18	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	27	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	90	752	904	7518	140	399
56	32	Medium-use general recreation, adult / older child	37	---	---	---	37	2.1	51	21	514	215	5143	40	176
56a	10	Waterfowl hunting	51	---	---	---	51	9.0	75	90	752	904	7518	140	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	5.8	1.4	37	14	368	143	3684	27	63
58	1.3	High-use general recreation, adult	65	---	---	---	65	1.4	63	14	630	143	6305	38	234
59	1.9	High-use general recreation, adult / older child	18	---	---	---	18	1.4	37	14	368	143	3684	27	63
59a	0.83	Bank fishing	23	---	---	---	23	2.6	52	26	524	256	5237	42	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	13	---	---	---	13	1.2	13	12	129	121	1286	28	73
61	3.3	Utility worker	42	---	---	---	42	17	209	169	2093	1694	20933	242	718
62	1.6	Utility worker	280	---	---	---	280	17	209	169	2093	1694	20933	242	718
63	0.67	Utility worker	84	---	---	---	84	17	209	169	2093	1694	20933	242	718
64	0.61	Utility worker	42	---	---	---	42	17	209	169	2093	1694	20933	242	718
65	3.9	Utility worker	18	---	---	---	18	17	209	169	2093	1694	20933	242	718
66	1.7	Utility worker	25	---	---	---	25	17	209	169	2093	1694	20933	242	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	14	630	143	6305	38	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	14	630	143	6305	38	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	14	630	143	6305	38	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	3.1	1.3	18	13	184	134	1842	4.6	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	26	524	256	5237	42	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	26	524	256	5237	42	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	26	524	256	5237	42	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	63	14	630	143	6305	38	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	14	630	143	6305	38	234
75	3.4	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	38	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	14	630	143	6305	38	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	14	630	143	6305	38	234

Table 7-1. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 1.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	27	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	14	630	143	6305	38	234
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	115	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	12	419	118	4195	43	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	43	1261	429	12610	115	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	115	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	18	166	177	1664	25	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	43	1261	429	12610	115	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	12	129	121	1286	28	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	27	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	18	166	177	1664	25	57
87	10	High-use general recreation, young child (high use)	15	---	---	---	15	1.3	18	13	184	134	1842	4.6	32
87a	0.88	Bank fishing	9.1	---	---	---	9.1	2.6	52	26	524	256	5237	42	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	40	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	14	630	143	6305	38	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	27	176
				Subtotal:	**0**	**0**									
Heavily Used Subareas															
Exposure Area ID[1]	**Area of Exposure Area (acre)[2]**	**IMPG Scenario**	**Pre-Remediation EPC (mg/kg)[3]**	**Removal[4]**			**Post-Remediation EPC (mg/kg)[3]**	**IMPG[5] (mg/kg)**							
				10^{-6} Cancer Risk						**10^{-5} Cancer Risk**		**10^{-4} Cancer Risk**		**Non-Cancer**	
				Depth (ft)	**Volume (cy)**	**Area (acre)**		**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**
4	0.71	High-use general recreation, adult / older child	67	---	---	---	67	1.4	37	14	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	15	---	---	---	15	1.4	37	14	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	14	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.40	51	14	514	143	5143	27	176
39	0.15	Marathon canoeist	52	---	---	---	52	0.8	6	8	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	---	---	---	90	1.4	37	14	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	6.4	1.2	13	12	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	---	---	---	6.6	1.2	13	12	129	121	1286	28	73
53	0.35	Recreational canoeist	408	---	---	---	408	1.2	13	12	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	22	1.4	63	14	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	---	---	---	28	1.4	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	---	---	---	7.4	1.2	13	12	129	121	1286	28	73
				Subtotal:	**0**	**0**									
				Total:	**0**	**0**									

Notes:

[1] See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.

[2] Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] For scenarios containing more than one receptor (e.g. adult and older child), the lowest IMPG was utilized in the comparison to post-remediation EPCs. The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-2. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for agricultural products consumption areas under FP 1.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.78	0.68	3.1	6.8	31	68	312	7.7	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	14	2.59	11.9	25.9	119	259	1187	29.1	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	2.9	13	29	132	3.2	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	3.4	15	34	154	3.8	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	3.1	14	31	143	3.5	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	20.6	95	206	946	23.2	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	61	279	610	2794	68.6	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	3.8	18	38	176	4.3	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	5.5	25	55	253	6.2	9.9	29.4	35.9
				Total:	**0**	**0**											

Notes:

[1] See Figure 4-4 for farm areas in Reaches 5 through 8.

[2] Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for the top 1 ft of floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-3. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for amphibian averaging areas (vernal pools) under FP 1.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	---	---	---	73	3.27	5.6
5-VP-1	0.044	1.7	---	---	---	1.7	3.27	5.6
8-VP-5	0.043	23	---	---	---	23	3.27	5.6
8-VP-4	0.24	3.9	---	---	---	3.9	3.27	5.6
8-VP-3	0.024	7.7	---	---	---	7.7	3.27	5.6
8-VP-2	0.57	69	---	---	---	69	3.27	5.6
18-VP-2	0.61	7.2	---	---	---	7.2	3.27	5.6
18-VP-1	0.28	8.1	---	---	---	8.1	3.27	5.6
19-VP-7	0.068	0.84	---	---	---	0.84	3.27	5.6
19-VP-2	0.0080	34	---	---	---	34	3.27	5.6
19-VP-1	0.18	32	---	---	---	32	3.27	5.6
19-VP-3	0.031	10	---	---	---	10	3.27	5.6
19-VP-4	0.094	6.0	---	---	---	6.0	3.27	5.6
19-VP-8	0.057	91	---	---	---	91	3.27	5.6
19-VP-5	0.51	45	---	---	---	45	3.27	5.6
19-VP-6	1.2	24	---	---	---	24	3.27	5.6
23-VP-2	0.18	47	---	---	---	47	3.27	5.6
23-VP-1	0.30	75	---	---	---	75	3.27	5.6
23A-VP-1	0.45	10	---	---	---	10	3.27	5.6
23B-VP-1	0.068	7.2	---	---	---	7.2	3.27	5.6
23B-VP-2	0.091	0.34	---	---	---	0.34	3.27	5.6
27B-VP-2	0.28	11	---	---	---	11	3.27	5.6
27B-VP-3	0.062	16	---	---	---	16	3.27	5.6
27B-VP-1	0.072	12	---	---	---	12	3.27	5.6
27-VP-2	0.47	21	---	---	---	21	3.27	5.6
27A-VP-1	0.20	31	---	---	---	31	3.27	5.6
27-VP-1	1.3	23	---	---	---	23	3.27	5.6
26-VP-1	0.036	40	---	---	---	40	3.27	5.6
33-VP-1	0.022	9.5	---	---	---	9.5	3.27	5.6
33-VP-2	0.12	70	---	---	---	70	3.27	5.6
38-VP-1	0.43	36	---	---	---	36	3.27	5.6
38A-VP-1	0.020	5.0	---	---	---	5.0	3.27	5.6
38-VP-3	0.046	28	---	---	---	28	3.27	5.6
38-VP-2	0.17	46	---	---	---	46	3.27	5.6
40-VP-3	0.46	67	---	---	---	67	3.27	5.6
40-VP-2	0.36	18	---	---	---	18	3.27	5.6
40A-VP-1	0.11	68	---	---	---	68	3.27	5.6
40-VP-1	0.47	57	---	---	---	57	3.27	5.6
42-VP-1	0.22	64	---	---	---	64	3.27	5.6
42-VP-2	0.28	46	---	---	---	46	3.27	5.6
42-VP-3	0.050	41	---	---	---	41	3.27	5.6
42-VP-5	0.58	73	---	---	---	73	3.27	5.6
42-VP-4	1.0	34	---	---	---	34	3.27	5.6
42A-VP-1	1.5	35	---	---	---	35	3.27	5.6
46-VP-2	7.1	140	---	---	---	140	3.27	5.6
46-VP-1	0.52	1.3	---	---	---	1.3	3.27	5.6
46-VP-5	0.056	125	---	---	---	125	3.27	5.6
46-VP-3	1.4	153	---	---	---	153	3.27	5.6
46-VP-4	0.011	125	---	---	---	125	3.27	5.6
49A-VP-1	0.019	16	---	---	---	16	3.27	5.6
49-VP-1	1.2	18	---	---	---	18	3.27	5.6
49B-VP-1	0.0044	26	---	---	---	26	3.27	5.6
66A-VP-1	0.032	0.73	---	---	---	0.73	3.27	5.6
69-VP-1	0.0074	12	---	---	---	12	3.27	5.6
8-VP-6	0.086	47	---	---	---	47	3.27	5.6
12-VP-1	0.080	14	---	---	---	14	3.27	5.6
39-VP-1	2.0	39	---	---	---	39	3.27	5.6
54-VP-1	0.20	21	---	---	---	21	3.27	5.6
55-VP-1	0.59	7.6	---	---	---	7.6	3.27	5.6
55A-VP-1	2.0	40	---	---	---	40	3.27	5.6
58A-VP-1	0.32	25	---	---	---	25	3.27	5.6
67A-VP-1	0.12	51	---	---	---	51	3.27	5.6
61A-VP-1	0.19	18	---	---	---	18	3.27	5.6
61A-VP-2	1.2	19	---	---	---	19	3.27	5.6
56A-VP-1	0.58	73	---	---	---	73	3.27	5.6
23-VP-3	1.3	22	---	---	---	22	3.27	5.6
			Total:	**0**	**0**			

Notes:

[1] See Figure 4-5 for locations of vernal pools.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-4. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for omnivorous/carnivorous mammal averaging areas under FP 1.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	20	21.1	34.3
G2	87	51	---	---	---	51	21.1	34.3
G3	86	19	---	---	---	19	21.1	34.3
G4	86	27	---	---	---	27	21.1	34.3
G5	88	28	---	---	---	28	21.1	34.3
G6	87	12	---	---	---	12	21.1	34.3
G7	73	18	---	---	---	18	21.1	34.3
			Total:	**0**	**0**			

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-5. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for insectivorous bird (wood duck) averaging areas under FP 1.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	29	50	39	29
K2		63	9.8	---	---	---	9.8	50	39	29
K3		85	53	---	---	---	53	50	39	29
K4		60	16	---	---	---	16	50	39	29
K5		25	22	---	---	---	22	50	39	29
K6	5B	55	25	---	---	---	25	48	33	18
K7		47	30	---	---	---	30	48	33	18
K8		92	24	---	---	---	24	48	33	18
K9	5C/5D	69	25	---	---	---	25	53	49	46
K10		83	13	---	---	---	13	53	49	46
K11		61	14	---	---	---	14	53	49	46
K12	6	28	23	---	---	---	23	53	50	46
				Total:	**0**	**0**				

Notes:

[1] See Figure 4-7 for wood duck averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-6. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for piscivorous mammal (mink) averaging areas under FP 1.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	---	---	---	22	3.4	16.6	*n/a*	5.12	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	17	6.9	19.6	3.0	15.7	*n/a*	11.8
			Total:	**0**	**0**							

Notes:

[1] See Figure 4-8 for mink averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] (n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-7. Summary of pre-, post-remediation EPCs, removal volumes and acreages and IMPGs for human direct contact exposure areas under FP 2.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	---	---	---	32	2.1	51	21	514	215	5143	**40**	176
2	27	High-use general recreation, adult / older child	25	---	---	---	25	1.4	51	14	514	143	5143	**27**	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	52	12	103	116	1029	1165	10286	**80**	353
2b	2.0	High-use general recreation, older child	31	1	40	0.02	27	3.9	51	39	514	388	5143	**27**	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	14	630	143	6305	**38**	234
4	3.2	High-use general recreation, adult / older child	27	1	7	0	27	1.4	37	14	368	143	3684	**27**	63
5	2.5	High-use general recreation, adult / older child	58	1	500	0.28	27	1.4	51	14	514	143	5143	**27**	176
6	3.8	Low-use general recreation, adult	75	---	---	---	75	4.3	126	43	1261	429	12610	**115**	468
7	5.9	High-use general recreation, adult / older child	25	---	---	---	25	1.4	51	14	514	143	5143	**27**	176
8	0.60	Recreational canoeist	40	1	80	0.05	28	1.2	13	12	129	121	1286	**28**	73
9	0.042	Low-use general recreation, older child	27	---	---	---	27	12	103	116	1029	1165	10286	**80**	353
10	59	High-use general recreation, young child (high use)	10	1	8000	5.3	4.6	1.3	18	13	184	134	1842	**4.6**	32
10a	8.0	High-use general recreation, young child (high use)	22	1	400	0.23	4.5	1.3	18	13	184	134	1842	**4.6**	32
11	2.5	High-use general recreation, adult	18	---	---	---	18	1.4	63	14	630	143	6305	**38**	234
12	4.8	High-use general recreation, adult / older child	14	---	---	---	14	1.4	37	14	368	143	3684	**27**	63
13	5.9	High-use general recreation, adult	28	---	---	---	28	1.4	63	14	630	143	6305	**38**	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.7	1.4	63	14	630	143	6305	**38**	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	14	630	143	6305	**38**	234
16	2.5	High-use general recreation, adult	41	1	400	0.24	38	1.4	63	14	630	143	6305	**38**	234
17	8.5	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	**38**	234
18	17	Medium-use general recreation, adult	46	---	---	---	46	2.1	63	21	630	215	6305	**58**	234
19	36	High-use general recreation, adult	83	1	800	0.52	38	1.4	63	14	630	143	6305	**38**	234
20	9.1	High-use general recreation, adult	34	---	---	---	34	1.4	63	14	630	143	6305	**38**	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5.7	1.4	51	14	514	143	5143	**27**	176
22	19	High-use general recreation, adult / older child	28	---	---	---	26	1.4	51	14	514	143	5143	**27**	176
22a	1.8	Dirt biking/ATVing	93	1	3000	1.6	8.2	2.0	29	20	290	205	2901	**14**	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	11	5.8	51	58	514	582	5143	**40**	176
24	10	High-use general recreation, adult	31	---	---	---	31	1.4	63	14	630	143	6305	**38**	234
25	0.51	High-use general recreation, older child	30	1	90	0.05	27	3.9	51	39	514	388	5143	**27**	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	7.0	1.4	51	14	514	143	5143	**27**	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	12	419	118	4195	**43**	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	**27**	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	14	514	143	5143	**27**	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	**14**	99
28	0.21	High-use general recreation, adult / older child	21	---	---	---	21	1.4	37	14	368	143	3684	**27**	63
28a	0.071	Dirt biking/ATVing	21	1	40	0.02	4.3	2.0	29	20	290	205	2901	**14**	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	43	1029	429	10286	**80**	353
30	0.19	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	**27**	176
31	5.0	High-use general recreation, adult / older child	18	---	---	---	17	1.4	51	14	514	143	5143	**27**	176
31a	0.61	High-use general recreation, adult / older child	42	1	200	0.11	25	1.4	51	14	514	143	5143	**27**	176
32	6.8	High-use general recreation, adult	50	1	1000	0.67	38	1.4	63	14	630	143	6305	**38**	234
33	30	High-use general recreation, adult	21	---	---	---	21	1.4	63	14	630	143	6305	**38**	234
34	7.8	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	**58**	234
35	25	High-use general recreation, adult / older child	22	---	---	---	22	1.4	51	14	514	143	5143	**27**	176
35a	1.2	High-use general recreation, adult / older child	44	1	50	0.03	27	1.4	51	14	514	143	5143	**27**	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	25	8.9	166	89	1664	885	16642	**126**	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	---	---	---	15	1.2	42	12	419	118	4195	**43**	348
37	20	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	**27**	176
37a	1.4	Bank fishing	61	1	100	0.07	42	2.6	52	26	524	256	5237	**42**	180
37b	2.3	High-use general recreation, adult / older child	27	---	---	---	24	1.4	51	14	514	143	5143	**27**	176
38	13	High-use general recreation, adult	23	---	---	---	22	1.4	63	14	630	143	6305	**38**	234
38a	1.4	Bank fishing	71	1	200	0.1	42	2.6	52	26	524	256	5237	**42**	180

Table 7-7. Summary of pre-, post-remediation EPCs, removal volumes and acreages and IMPGs for human direct contact exposure areas under FP 2.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
39	3.5	Marathon canoeist	30	1	900	0.54	13	0.78	5.8	7.8	58	78	575	**13**	25
40	98	High-use general recreation, adult / older child	19	---	---	---	19	1.4	37	14	368	143	3684	**27**	63
40a	4.6	Bank fishing	120	1	400	0.26	42	2.6	52	26	524	256	5237	**42**	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	**27**	63
41	20	Medium-use general recreation, adult	27	---	---	---	26	2.1	63	21	630	215	6305	**58**	234
41a	2.4	Bank fishing	53	1	100	0.07	42	2.6	52	26	524	256	5237	**42**	180
42	14	Medium-use general recreation, adult	32	---	---	---	32	2.1	63	21	630	215	6305	**58**	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	26	524	256	5237	**42**	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	**58**	234
43a	0.24	Bank fishing	69	1	10	0.01	32	2.6	52	26	524	256	5237	**42**	180
44	2.2	High-use general recreation, adult	27	---	---	---	27	1.4	63	14	630	143	6305	**38**	234
45	17	High-use general recreation, adult	40	1	200	0.14	38	1.4	63	14	630	143	6305	**38**	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	9.2	1.4	63	14	630	143	6305	**38**	234
47	1.0	Recreational canoeist	18	---	---	---	18	1.2	13	12	129	121	1286	**28**	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8.0	1.2	13	12	129	121	1286	**28**	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	3.4	1.4	63	14	630	143	6305	**38**	234
49	7.7	Low-use general recreation, adult	63	---	---	---	63	4.3	126	43	1261	429	12610	**115**	468
50	69	Low-use general recreation, adult	7.4	---	---	---	7.4	4.3	126	43	1261	429	12610	**115**	468
50a	11	Waterfowl hunting	21	---	---	---	21	9.0	75	90	752	904	7518	**140**	399
51	87	Low-use general recreation, adult	7.1	---	---	---	7.1	4.3	126	43	1261	429	12610	**115**	468
51a	32	Waterfowl hunting	23	---	---	---	23	9.0	75	90	752	904	7518	**140**	399
52	0.9	Recreational canoeist	6.5	---	---	---	6.5	1.2	13	12	129	121	1286	**28**	73
53	0.7	Recreational canoeist	18	---	---	---	18	1.2	13	12	129	121	1286	**28**	73
54	13	High-use general recreation, adult	6.5	---	---	---	6.5	1.4	63	14	630	143	6305	**38**	234
55	18	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	**27**	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	90	752	904	7518	**140**	399
56	32	Medium-use general recreation, adult / older child	37	---	---	---	37	2.1	51	21	514	215	5143	**40**	176
56a	10	Waterfowl hunting	51	---	---	---	51	9.0	75	90	752	904	7518	**140**	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	5.8	1.4	37	14	368	143	3684	**27**	63
58	1.3	High-use general recreation, adult	65	1	100	0.08	37	1.4	63	14	630	143	6305	**38**	234
59	1.9	High-use general recreation, adult / older child	18	---	---	---	18	1.4	37	14	368	143	3684	**27**	63
59a	0.83	Bank fishing	23	---	---	---	23	2.6	52	26	524	256	5237	**42**	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	14	368	143	3684	**27**	63
60a	0.16	Recreational canoeist	13	---	---	---	13	1.2	13	12	129	121	1286	**28**	73
61	3.3	Utility worker	42	---	---	---	41	17	209	169	2093	1694	20933	**242**	718
62	1.6	Utility worker	280	---	---	---	68	17	209	169	2093	1694	20933	**242**	718
63	0.67	Utility worker	84	---	---	---	84	17	209	169	2093	1694	20933	**242**	718
64	0.61	Utility worker	42	---	---	---	25	17	209	169	2093	1694	20933	**242**	718
65	3.9	Utility worker	18	---	---	---	18	17	209	169	2093	1694	20933	**242**	718
66	1.7	Utility worker	25	---	---	---	24	17	209	169	2093	1694	20933	**242**	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	14	630	143	6305	**38**	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	14	630	143	6305	**38**	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	14	630	143	6305	**38**	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	3.1	1.3	18	13	184	134	1842	**4.6**	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	26	524	256	5237	**42**	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	26	524	256	5237	**42**	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	26	524	256	5237	**42**	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	63	14	630	143	6305	**38**	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	14	630	143	6305	**38**	234
75	3.4	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	**38**	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	14	630	143	6305	**38**	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	14	630	143	6305	**38**	234

Table 7-7. Summary of pre-, post-remediation EPCs, removal volumes and acreages and IMPGs for human direct contact exposure areas under FP 2.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	**27**	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	14	630	143	6305	**38**	234
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	**115**	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	12	419	118	4195	**43**	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	43	1261	429	12610	**115**	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	**115**	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	18	166	177	1664	**25**	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	43	1261	429	12610	**115**	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	12	129	121	1286	**28**	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	**27**	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	18	166	177	1664	**25**	57
87	10	High-use general recreation, young child (high use)	15	1	4000	2.3	4.6	1.3	18	13	184	134	1842	**4.6**	32
87a	0.88	Bank fishing	9.1	---	---	---	6.6	2.6	52	26	524	256	5237	**42**	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	**40**	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	14	630	143	6305	**38**	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	**27**	176
				Subtotal:	**22,000**	**13**									

Heavily Used Subareas

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
4	0.71	High-use general recreation, adult / older child	67	---	---	---	67	1.4	37	14	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	15	---	---	---	15	1.4	37	14	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	14	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.4	51	14	514	143	5143	27	176
39	0.15	Marathon canoeist	52	---	---	---	52	0.8	6	8	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	---	---	---	90	1.4	37	14	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	6.4	1.2	13	12	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	---	---	---	6.6	1.2	13	12	129	121	1286	28	73
53	0.35	Recreational canoeist	408	---	---	---	408	1.2	13	12	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	22	1.4	63	14	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	---	---	---	28	1.4	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	---	---	---	7.4	1.2	13	12	129	121	1286	28	73
				Subtotal:	**0**	**0**									
				Total:	**22,000**	**13**									

Notes:

[1] *See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.*

[2] *Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).*

[3] *EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.*

[4] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-8. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for agricultural products consumption areas under FP 2.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.78	0.68	3.1	6.8	31	68	312	**7.7**	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	14	2.59	11.9	25.9	119	259	1187	**29.1**	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	2.9	13	29	132	**3.2**	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	3.4	15	34	154	**3.8**	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	3.1	14	31	143	**3.5**	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	20.6	95	206	946	**23.2**	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	61	279	610	2794	**68.6**	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	3.8	18	38	176	**4.3**	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	5.5	25	55	253	**6.2**	9.9	29.4	35.9
				Total:	**0**	**0**											

Notes:

[1] *See Figure 4-4 for farm areas in Reaches 5 through 8.*

[2] *Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).*

[3] *EPC is calculated for top 1 ft floodplain soil.*

[4] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[5] *IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-9. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for amphibian averaging areas (vernal pools) under FP 2.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	---	---	---	73	3.27	5.6
5-VP-1	0.044	1.7	---	---	---	1.7	3.27	5.6
8-VP-5	0.043	23	---	---	---	23	3.27	5.6
8-VP-4	0.24	3.9	---	---	---	3.9	3.27	5.6
8-VP-3	0.024	7.7	---	---	---	7.7	3.27	5.6
8-VP-2	0.57	69	---	---	---	69	3.27	5.6
18-VP-2	0.61	7.2	---	---	---	7.2	3.27	5.6
18-VP-1	0.28	8.1	---	---	---	8.1	3.27	5.6
19-VP-7	0.068	0.84	---	---	---	0.84	3.27	5.6
19-VP-2	0.0080	34	---	---	---	34	3.27	5.6
19-VP-1	0.18	32	---	---	---	32	3.27	5.6
19-VP-3	0.031	10	---	---	---	10	3.27	5.6
19-VP-4	0.094	6.0	---	---	---	6.0	3.27	5.6
19-VP-8	0.057	91	---	---	---	91	3.27	5.6
19-VP-5	0.51	45	---	---	---	45	3.27	5.6
19-VP-6	1.2	24	---	---	---	24	3.27	5.6
23-VP-2	0.18	47	---	---	---	47	3.27	5.6
23-VP-1	0.30	75	---	---	---	75	3.27	5.6
23A-VP-1	0.45	10	---	---	---	10	3.27	5.6
23B-VP-1	0.068	7.2	---	---	---	7.2	3.27	5.6
23B-VP-2	0.091	0.34	---	---	---	0.34	3.27	5.6
27B-VP-2	0.28	11	---	---	---	11	3.27	5.6
27B-VP-3	0.062	16	---	---	---	16	3.27	5.6
27B-VP-1	0.072	12	---	---	---	12	3.27	5.6
27-VP-2	0.47	21	---	---	---	21	3.27	5.6
27A-VP-1	0.20	31	---	---	---	31	3.27	5.6
27-VP-1	1.3	23	---	---	---	23	3.27	5.6
26-VP-1	0.036	40	---	---	---	40	3.27	5.6
33-VP-1	0.022	9.5	---	---	---	9.5	3.27	5.6
33-VP-2	0.12	70	---	---	---	70	3.27	5.6
38-VP-1	0.43	36	---	---	---	36	3.27	5.6
38A-VP-1	0.020	5.0	---	---	---	5.0	3.27	5.6
38-VP-3	0.046	28	---	---	---	28	3.27	5.6
38-VP-2	0.17	46	---	---	---	46	3.27	5.6
40-VP-3	0.46	67	---	---	---	67	3.27	5.6
40-VP-2	0.36	18	---	---	---	18	3.27	5.6
40A-VP-1	0.11	68	---	---	---	68	3.27	5.6
40-VP-1	0.47	57	---	---	---	57	3.27	5.6
42-VP-1	0.22	64	---	---	---	64	3.27	5.6
42-VP-2	0.28	46	---	---	---	46	3.27	5.6
42-VP-3	0.050	41	---	---	---	41	3.27	5.6
42-VP-5	0.58	73	---	---	---	73	3.27	5.6
42-VP-4	1.0	34	---	---	---	34	3.27	5.6
42A-VP-1	1.5	35	---	---	---	35	3.27	5.6
46-VP-2	7.1	140	---	---	---	140	3.27	5.6
46-VP-1	0.52	1.3	---	---	---	1.3	3.27	5.6
46-VP-5	0.056	125	---	---	---	125	3.27	5.6
46-VP-3	1.4	153	---	---	---	153	3.27	5.6
46-VP-4	0.011	125	---	---	---	125	3.27	5.6
49A-VP-1	0.019	16	---	---	---	16	3.27	5.6
49-VP-1	1.2	18	---	---	---	18	3.27	5.6
49B-VP-1	0.0044	26	---	---	---	26	3.27	5.6
66A-VP-1	0.032	0.73	---	---	---	0.73	3.27	5.6
69-VP-1	0.0074	12	---	---	---	12	3.27	5.6
8-VP-6	0.086	47	---	---	---	47	3.27	5.6
12-VP-1	0.080	14	---	---	---	14	3.27	5.6
39-VP-1	2.0	39	---	---	---	39	3.27	5.6
54-VP-1	0.20	21	---	---	---	21	3.27	5.6
55-VP-1	0.59	7.6	---	---	---	7.6	3.27	5.6
55A-VP-1	2.0	40	---	---	---	40	3.27	5.6
58A-VP-1	0.32	25	---	---	---	25	3.27	5.6
67A-VP-1	0.12	51	---	---	---	51	3.27	5.6
61A-VP-1	0.19	18	---	---	---	18	3.27	5.6
61A-VP-2	1.2	19	---	---	---	19	3.27	5.6
56A-VP-1	0.58	73	---	---	---	73	3.27	5.6
23-VP-3	1.3	22	---	---	---	22	3.27	5.6
			Total:	**0**	**0**			

Notes:

[1] See Figure 4-5 for locations of vernal pools.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-10. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for omnivorous/carnivorous mammal averaging areas under FP 2.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	19	21.1	34.3
G2	87	51	---	---	---	23	21.1	34.3
G3	86	19	---	---	---	18	21.1	34.3
G4	86	27	---	---	---	27	21.1	34.3
G5	88	28	---	---	---	28	21.1	34.3
G6	87	12	---	---	---	12	21.1	34.3
G7	73	18	---	---	---	17	21.1	34.3
			Total:	**0**	**0**			

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-11. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for insectivorous bird (wood duck) averaging areas under FP 2.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	28	50	39	29
K2		63	9.8	---	---	---	7.9	50	39	29
K3		85	53	---	---	---	26	50	39	29
K4		60	16	---	---	---	16	50	39	29
K5		25	22	---	---	---	21	50	39	29
K6	5B	55	25	---	---	---	25	48	33	18
K7		47	30	---	---	---	28	48	33	18
K8		92	24	---	---	---	23	48	33	18
K9	5C/5D	69	25	---	---	---	25	53	49	46
K10		83	13	---	---	---	13	53	49	46
K11		61	14	---	---	---	14	53	49	46
K12	6	28	23	---	---	---	23	53	50	46
				Total:	**0**	**0**				

Notes:

[1] See Figure 4-7 for wood duck averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-12. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for piscivorous mammal (mink) averaging areas under FP 2.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	---	---	---	20	3.4	16.6	*n/a*	5.1	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	17	6.9	19.6	3.0	15.7	*n/a*	11.8
			Total:	**0**	**0**							

Notes:

[1] See Figure 4-8 for mink averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] (n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-14. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 3.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	---	---	---	23	2.1	51	21	514	215	5143	**40**	176
2	27	High-use general recreation, adult / older child	25	---	---	---	20	1.4	51	14	514	143	5143	**27**	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	42	12	103	116	1029	1165	10286	**80**	353
2b	2.0	High-use general recreation, older child	31	1	40	0.02	27	3.9	51	39	514	388	5143	**27**	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	14	630	143	6305	**38**	234
4	3.2	High-use general recreation, adult / older child	27	1	1000	0.7	14	1.4	37	**14**	368	143	3684	27	63
5	2.5	High-use general recreation, adult / older child	58	1	500	0.3	25	1.4	51	14	514	143	5143	**27**	176
6	3.8	Low-use general recreation, adult	75	---	---	---	28	4.3	126	43	1261	429	12610	**115**	468
7	5.9	High-use general recreation, adult / older child	25	---	---	---	25	1.4	51	14	514	143	5143	**27**	176
8	0.60	Recreational canoeist	40	1	80	0.05	28	1.2	13	12	129	121	1286	**28**	73
9	0.042	Low-use general recreation, older child	27	---	---	---	27	12	103	116	1029	1165	10286	**80**	353
10	59	High-use general recreation, young child (high use)	10	1	8000	5	4.6	1.3	18	13	184	134	1842	**4.6**	32
10a	8.0	High-use general recreation, young child (high use)	22	1	400	0.2	4.5	1.3	18	13	184	134	1842	**4.6**	32
11	2.5	High-use general recreation, adult	18	---	---	---	18	1.4	63	14	630	143	6305	**38**	234
12	4.8	High-use general recreation, adult / older child	14	1	4	0	14	1.4	37	**14**	368	143	3684	27	63
13	5.9	High-use general recreation, adult	28	---	---	---	27	1.4	63	14	630	143	6305	**38**	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.6	1.4	63	14	630	143	6305	**38**	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	14	630	143	6305	**38**	234
16	2.5	High-use general recreation, adult	41	1	400	0.2	38	1.4	63	14	630	143	6305	**38**	234
17	8.5	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	**38**	234
18	17	Medium-use general recreation, adult	46	---	---	---	46	2.1	63	21	630	215	6305	**58**	234
19	36	High-use general recreation, adult	83	1	800	0.5	20	1.4	63	14	630	143	6305	**38**	234
20	9.1	High-use general recreation, adult	34	---	---	---	22	1.4	63	14	630	143	6305	**38**	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5.1	1.4	51	14	514	143	5143	**27**	176
22	19	High-use general recreation, adult / older child	28	---	---	---	23	1.4	51	14	514	143	5143	**27**	176
22a	1.8	Dirt biking/ATVing	93	1	3000	2	8.2	2.0	29	20	290	205	2901	**14**	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	11	5.8	51	58	514	582	5143	**40**	176
24	10	High-use general recreation, adult	31	---	---	---	26	1.4	63	14	630	143	6305	**38**	234
25	0.51	High-use general recreation, older child	30	1	90	0.05	27	3.9	51	39	514	388	5143	**27**	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	6.9	1.4	51	**14**	514	143	5143	27	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	12	419	118	4195	**43**	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	6.0	1.4	51	14	514	143	5143	**27**	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	14	514	143	5143	**27**	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	**14**	99
28	0.21	High-use general recreation, adult / older child	21	---	---	---	21	1.4	37	14	368	143	3684	**27**	63
28a	0.071	Dirt biking/ATVing	21	1	40	0.02	4.3	2.0	29	20	290	205	2901	**14**	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	43	1029	429	10286	**80**	353
30	0.19	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	**27**	176
31	5.0	High-use general recreation, adult / older child	18	---	---	---	17	1.4	51	14	514	143	5143	**27**	176
31a	0.61	High-use general recreation, adult / older child	42	1	200	0.1	25	1.4	51	14	514	143	5143	**27**	176
32	6.8	High-use general recreation, adult	50	1	1000	0.7	38	1.4	63	14	630	143	6305	**38**	234
33	30	High-use general recreation, adult	21	---	---	---	19	1.4	63	14	630	143	6305	**38**	234
34	7.8	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	**58**	234
35	25	High-use general recreation, adult / older child	22	---	---	---	22	1.4	51	14	514	143	5143	**27**	176
35a	1.2	High-use general recreation, adult / older child	44	1	100	0.06	13	1.4	51	**14**	514	143	5143	27	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	24	8.9	166	89	1664	885	16642	**126**	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	---	---	---	15	1.2	42	12	419	118	4195	**43**	348
37	20	High-use general recreation, adult / older child	18	---	---	---	16	1.4	51	14	514	143	5143	**27**	176
37a	1.4	Bank fishing	61	1	90	0.05	26	2.6	52	**26**	524	256	5237	42	180
37b	2.3	High-use general recreation, adult / older child	27	1	100	0.09	4.3	1.4	51	14	514	143	5143	**27**	176
38	13	High-use general recreation, adult	23	---	---	---	22	1.4	63	14	630	143	6305	**38**	234
38a	1.4	Bank fishing	71	1	200	0.1	42	2.6	52	26	524	256	5237	**42**	180
39	3.5	Marathon canoeist	30	1	1000	0.9	6.8	0.78	5.8	**7.8**	58	78	575	13	25

Table 7-14. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 3.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
40	98	High-use general recreation, adult / older child	19	1	4000	3	13	1.4	37	**14**	368	143	3684	27	63
40a	4.6	Bank fishing	120	1	7	0	42	2.6	52	26	524	256	5237	**42**	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	**27**	63
41	20	Medium-use general recreation, adult	27	---	---	---	24	2.1	63	21	630	215	6305	**58**	234
41a	2.4	Bank fishing	53	1	100	0.06	39	2.6	52	26	524	256	5237	**42**	180
42	14	Medium-use general recreation, adult	32	---	---	---	32	2.1	63	21	630	215	6305	**58**	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	26	524	256	5237	**42**	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	**58**	234
43a	0.24	Bank fishing	69	1	10	0.01	32	2.6	52	26	524	256	5237	**42**	180
44	2.2	High-use general recreation, adult	27	---	---	---	27	1.4	63	14	630	143	6305	**38**	234
45	17	High-use general recreation, adult	40	1	300	0.2	38	1.4	63	14	630	143	6305	**38**	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	9.1	1.4	63	14	630	143	6305	**38**	234
47	1.0	Recreational canoeist	18	1	80	0.05	12	1.2	13	**12**	129	121	1286	28	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8.0	1.2	13	12	129	121	1286	**28**	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	3.4	1.4	63	14	630	143	6305	**38**	234
49	7.7	Low-use general recreation, adult	63	---	---	---	63	4.3	126	43	1261	429	12610	**115**	468
50	69	Low-use general recreation, adult	7.4	---	---	---	7.4	4.3	126	43	1261	429	12610	**115**	468
50a	11	Waterfowl hunting	21	---	---	---	17	9.0	75	90	752	904	7518	**140**	399
51	87	Low-use general recreation, adult	7.1	---	---	---	7.1	4.3	126	43	1261	429	12610	**115**	468
51a	32	Waterfowl hunting	23	---	---	---	23	9.0	75	90	752	904	7518	**140**	399
52	0.9	Recreational canoeist	6.5	---	---	---	5.9	1.2	13	**12**	129	121	1286	28	73
53	0.7	Recreational canoeist	18	1	200	0.09	11	1.2	13	**12**	129	121	1286	28	73
54	13	High-use general recreation, adult	6.5	---	---	---	6.3	1.4	63	14	630	143	6305	**38**	234
55	18	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	**27**	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	90	752	904	7518	**140**	399
56	32	Medium-use general recreation, adult / older child	37	---	---	---	37	2.1	51	21	514	215	5143	**40**	176
56a	10	Waterfowl hunting	51	---	---	---	51	9.0	75	90	752	904	7518	**140**	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	5.7	1.4	37	**14**	368	143	3684	27	63
58	1.3	High-use general recreation, adult	65	1	200	0.1	12	1.4	63	**14**	630	143	6305	38	234
59	1.9	High-use general recreation, adult / older child	18	1	600	0.4	14	1.4	37	**14**	368	143	3684	27	63
59a	0.83	Bank fishing	23	---	---	---	18	2.6	52	26	524	256	5237	**42**	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	14	368	143	3684	**27**	63
60a	0.16	Recreational canoeist	13	1	10	0.01	12	1.2	13	**12**	129	121	1286	28	73
61	3.3	Utility worker	42	---	---	---	27	17	209	169	2093	1694	20933	**242**	718
62	1.6	Utility worker	280	---	---	---	68	17	209	169	2093	1694	20933	**242**	718
63	0.67	Utility worker	84	---	---	---	65	17	209	169	2093	1694	20933	**242**	718
64	0.61	Utility worker	42	---	---	---	25	17	209	169	2093	1694	20933	**242**	718
65	3.9	Utility worker	18	---	---	---	17	17	209	169	2093	1694	20933	**242**	718
66	1.7	Utility worker	25	---	---	---	12	17	209	169	2093	1694	20933	**242**	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	14	630	143	6305	**38**	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	14	630	143	6305	**38**	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	14	630	143	6305	**38**	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	3.1	1.3	18	13	184	134	1842	**4.6**	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	26	524	256	5237	**42**	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	26	524	256	5237	**42**	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	26	524	256	5237	**42**	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	63	14	630	143	6305	**38**	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	14	630	143	6305	**38**	234
75	3.4	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	**38**	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	14	630	143	6305	**38**	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	14	630	143	6305	**38**	234
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	**27**	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	14	630	143	6305	**38**	234

Table 7-14. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 3.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	**115**	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	12	419	118	4195	**43**	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	43	1261	429	12610	**115**	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	**115**	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	18	166	177	1664	**25**	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	43	1261	429	12610	**115**	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	12	129	121	1286	**28**	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	**27**	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	18	166	177	1664	**25**	57
87	10	High-use general recreation, young child (high use)	15	1	4000	2	4.6	1.3	18	13	184	134	1842	**4.6**	32
87a	0.88	Bank fishing	9.1	---	---	---	6.6	2.6	52	26	524	256	5237	**42**	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	**40**	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	14	630	143	6305	**38**	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	**27**	176
				Subtotal:	**27,600**	**17**									
Heavily Used Subareas															
Exposure Area ID[1]	**Area of Exposure Area (acre)[2]**	**IMPG Scenario**	**Pre-Remediation EPC (mg/kg)[3]**	**Removal[4]**			**Post-Remediation EPC (mg/kg)[3]**	**IMPG[5] (mg/kg)**							
								10^{-6} Cancer Risk		**10^{-5} Cancer Risk**		**10^{-4} Cancer Risk**		**Non-Cancer**	
				Depth (ft)	**Volume (cy)**	**Area (acre)**		**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**
4	0.71	High-use general recreation, adult / older child	67	3	500	0.13	9.3	1.4	37	**14**	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	15	3	1000	0.35	11	1.4	37	**14**	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	**14**	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.4	51	**14**	514	143	5143	27	176
39	0.15	Marathon canoeist	52	3	400	0.09	4.9	0.8	6	**8**	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	3	4000	0.96	3.5	1.4	37	**14**	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	0.62	1.2	13	**12**	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	3	200	0.11	4.4	1.2	13	**12**	129	121	1286	28	73
53	0.35	Recreational canoeist	408	3	200	0.06	5.3	1.2	13	**12**	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	0.59	1.4	63	**14**	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	3	10	0	1.8	1.4	37	**14**	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	3	4	0	7.2	1.2	13	**12**	129	121	1286	28	73
				Subtotal:	**6,800**	**1.7**									
				Total:	**34,000**	**19**									

Notes:

[1] *See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.*

[2] *Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).*

[3] *EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.*

[4] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-15. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for agricultural products consumption areas under FP 3.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.78	0.68	3.1	**6.8**	31	68	312	7.7	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	14	2.59	11.9	**25.9**	119	259	1187	29.1	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	**2.9**	13	29	132	3.2	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	**3.4**	15	34	154	3.8	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	**3.1**	14	31	143	3.5	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	**20.6**	95	206	946	23.2	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	**61**	279	610	2794	68.6	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	**3.8**	18	38	176	4.3	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	**5.5**	25	55	253	6.2	9.9	29.4	35.9
				Total:	**0**	**0**											

Notes:

[1] See Figure 4-4 for farm areas in Reaches 5 through 8.

[2] Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for top 1 ft floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-16. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for amphibian averaging areas (vernal pools) under FP 3.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	1	3000	1.7	5.6	3.27	**5.6**
5-VP-1	0.044	1.7	---	---	---	1.7	3.27	**5.6**
8-VP-5	0.043	23	1	60	0.04	5.6	3.27	**5.6**
8-VP-4	0.24	3.9	---	---	---	3.9	3.27	**5.6**
8-VP-3	0.024	7.7	1	40	0.02	0.021	3.27	**5.6**
8-VP-2	0.57	69	1	700	0.43	5.6	3.27	**5.6**
18-VP-2	0.61	7.2	1	80	0.05	5.6	3.27	**5.6**
18-VP-1	0.28	8.1	1	60	0.04	5.6	3.27	**5.6**
19-VP-7	0.068	0.84	---	---	---	0.84	3.27	**5.6**
19-VP-2	0.0080	34	1	10	0.01	0.021	3.27	**5.6**
19-VP-1	0.18	32	1	200	0.13	5.6	3.27	**5.6**
19-VP-3	0.031	10	1	20	0.01	5.6	3.27	**5.6**
19-VP-4	0.094	6.0	1	10	0.01	5.6	3.27	**5.6**
19-VP-8	0.057	91	1	90	0.05	0.021	3.27	**5.6**
19-VP-5	0.51	45	1	500	0.3	5.6	3.27	**5.6**
19-VP-6	1.2	24	1	800	0.47	5.6	3.27	**5.6**
23-VP-2	0.18	47	1	300	0.17	5.6	3.27	**5.6**
23-VP-1	0.30	75	1	400	0.24	5.6	3.27	**5.6**
23A-VP-1	0.45	10	1	300	0.16	5.6	3.27	**5.6**
23B-VP-1	0.068	7.2	1	50	0.03	5.6	3.27	**5.6**
23B-VP-2	0.091	0.34	---	---	---	0.34	3.27	**5.6**
27B-VP-2	0.28	11	1	200	0.14	5.6	3.27	**5.6**
27B-VP-3	0.062	16	1	100	0.06	0.021	3.27	**5.6**
27B-VP-1	0.072	12	1	60	0.04	5.6	3.27	**5.6**
27-VP-2	0.47	21	1	200	0.1	5.6	3.27	**5.6**
27A-VP-1	0.20	31	1	300	0.16	5.6	3.27	**5.6**
27-VP-1	1.3	23	1	800	0.52	5.6	3.27	**5.6**
26-VP-1	0.036	40	1	30	0.02	5.6	3.27	**5.6**
33-VP-1	0.022	9.5	1	30	0.02	0.021	3.27	**5.6**
33-VP-2	0.12	70	1	100	0.09	5.6	3.27	**5.6**
38-VP-1	0.43	36	1	500	0.31	5.6	3.27	**5.6**
38A-VP-1	0.020	5.0	---	---	---	5.0	3.27	**5.6**
38-VP-3	0.046	28	1	40	0.02	5.6	3.27	**5.6**
38-VP-2	0.17	46	1	200	0.13	5.6	3.27	**5.6**
40-VP-3	0.46	67	1	600	0.4	5.6	3.27	**5.6**
40-VP-2	0.36	18	1	300	0.18	5.6	3.27	**5.6**
40A-VP-1	0.11	68	1	200	0.09	5.6	3.27	**5.6**
40-VP-1	0.47	57	1	300	0.21	5.6	3.27	**5.6**
42-VP-1	0.22	64	1	300	0.19	5.6	3.27	**5.6**
42-VP-2	0.28	46	1	400	0.26	5.6	3.27	**5.6**
42-VP-3	0.050	41	1	60	0.04	5.6	3.27	**5.6**
42-VP-5	0.58	73	1	300	0.2	5.6	3.27	**5.6**
42-VP-4	1.0	34	1	900	0.56	5.6	3.27	**5.6**
42A-VP-1	1.5	35	1	1000	0.89	5.6	3.27	**5.6**
46-VP-2	7.1	140	1	1000	0.71	5.6	3.27	**5.6**
46-VP-1	0.52	1.3	---	---	---	1.3	3.27	**5.6**
46-VP-5	0.056	125	1	40	0.02	0.021	3.27	**5.6**
46-VP-3	1.4	153	1	600	0.35	3.2	3.27	**5.6**
46-VP-4	0.011	125	1	4	0	0.021	3.27	**5.6**
49A-VP-1	0.019	16	1	30	0.02	0.021	3.27	**5.6**
49-VP-1	1.2	18	1	600	0.37	5.6	3.27	**5.6**
49B-VP-1	0.0044	26	1	7	0	0.021	3.27	**5.6**
66A-VP-1	0.032	0.73	---	---	---	0.73	3.27	**5.6**
69-VP-1	0.0074	12	1	10	0.01	0.021	3.27	**5.6**
8-VP-6	0.086	47	1	100	0.08	5.6	3.27	**5.6**
12-VP-1	0.080	14	1	100	0.07	0.021	3.27	**5.6**
39-VP-1	2.0	39	1	2000	1.4	5.6	3.27	**5.6**
54-VP-1	0.20	21	1	300	0.17	5.6	3.27	**5.6**
55-VP-1	0.59	7.6	1	4	0	5.6	3.27	**5.6**
55A-VP-1	2.0	40	1	3000	1.6	5.6	3.27	**5.6**
58A-VP-1	0.32	25	1	400	0.25	5.6	3.27	**5.6**
67A-VP-1	0.12	51	1	100	0.07	5.6	3.27	**5.6**
61A-VP-1	0.19	18	1	4	0	5.3	3.27	**5.6**
61A-VP-2	1.2	19	1	100	0.08	5.5	3.27	**5.6**
56A-VP-1	0.58	73	1	700	0.41	5.6	3.27	**5.6**
23-VP-3	1.3	22	1	1000	0.73	5.6	3.27	**5.6**
			Total	**24,000**	**15**			

Notes:

[1] *See Figure 4-5 for locations of vernal pools.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-17. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for omnivorous/carnivorous mammal averaging areas under FP 3.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	14	21.1	**34.3**
G2	87	51	---	---	---	18	21.1	**34.3**
G3	86	19	---	---	---	17	21.1	**34.3**
G4	86	27	---	---	---	24	21.1	**34.3**
G5	88	28	---	---	---	23	21.1	**34.3**
G6	87	12	---	---	---	12	21.1	**34.3**
G7	73	18	---	---	---	17	21.1	**34.3**
			Total:	**0**	**0**			

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-18. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for insectivorous bird (wood duck) averaging areas under FP 3.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	21	**50**	39	29
K2		63	9.8	---	---	---	7.9	**50**	39	29
K3		85	53	---	---	---	19	**50**	39	29
K4		60	16	---	---	---	15	**50**	39	29
K5		25	22	---	---	---	18	**50**	39	29
K6	5B	55	25	---	---	---	24	**48**	33	18
K7		47	30	---	---	---	22	**48**	33	18
K8		92	24	---	---	---	18	**48**	33	18
K9	5C/5D	69	25	---	---	---	23	**53**	49	46
K10		83	13	---	---	---	12	**53**	49	46
K11		61	14	---	---	---	14	**53**	49	46
K12	6	28	23	---	---	---	23	**53**	50	46
				Total:	**0**	**0**				

Notes:

[1] See Figure 4-7 for wood duck averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-19. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for piscivorous mammal (mink) averaging areas under FP 3.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	1	16000	10	17	3.4	**16.6**	*n/a*	5.1	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	15	6.9	**19.6**	3.0	15.7	*n/a*	11.8
			Total:	**16,000**	**10**							

Notes:

[1] See Figure 4-8 for mink averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] (n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-21. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 4.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	1	2000	1.4	21	2.1	51	**21**	514	215	5143	40	176
2	27	High-use general recreation, adult / older child	25	1	6000	4.0	14	1.4	51	**14**	514	143	5143	27	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	21	12	103	116	1029	1165	10286	**80**	353
2b	2.0	High-use general recreation, older child	31	1	30	0.020	27	3.9	51	39	514	388	5143	**27**	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	**14**	630	143	6305	38	234
4	3.2	High-use general recreation, adult / older child	27	1	1000	0.69	14	1.4	37	**14**	368	143	3684	27	63
5	2.5	High-use general recreation, adult / older child	58	1	600	0.37	14	1.4	51	**14**	514	143	5143	27	176
6	3.8	Low-use general recreation, adult	75	1	1000	0.75	28	4.3	126	**43**	1261	429	12610	115	468
7	5.9	High-use general recreation, adult / older child	25	1	1000	0.68	14	1.4	51	**14**	514	143	5143	27	176
8	0.60	Recreational canoeist	40	1	200	0.10	12	1.2	13	**12**	129	121	1286	28	73
9	0.042	Low-use general recreation, older child	27	---	---	---	27	12	103	116	1029	1165	10286	**80**	353
10	59	High-use general recreation, young child (high use)	10	1	8000	5.3	4.6	1.3	18	13	184	134	1842	**4.6**	32
10a	8.0	High-use general recreation, young child (high use)	22	1	400	0.23	4.5	1.3	18	13	184	134	1842	**4.6**	32
11	2.5	High-use general recreation, adult	18	1	300	0.17	14	1.4	63	**14**	630	143	6305	38	234
12	4.8	High-use general recreation, adult / older child	14	---	---	---	5.3	1.4	37	**14**	368	143	3684	27	63
13	5.9	High-use general recreation, adult	28	1	400	0.22	13	1.4	63	**14**	630	143	6305	38	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.6	1.4	63	**14**	630	143	6305	38	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	**14**	630	143	6305	38	234
16	2.5	High-use general recreation, adult	41	1	700	0.46	14	1.4	63	**14**	630	143	6305	38	234
17	8.5	High-use general recreation, adult	15	1	200	0.15	14	1.4	63	**14**	630	143	6305	38	234
18	17	Medium-use general recreation, adult	46	1	3000	1.9	21	2.1	63	**21**	630	215	6305	58	234
19	36	High-use general recreation, adult	83	1	8000	4.8	14	1.4	63	**14**	630	143	6305	38	234
20	9.1	High-use general recreation, adult	34	1	4000	2.2	14	1.4	63	**14**	630	143	6305	38	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5.7	1.4	51	**14**	514	143	5143	27	176
22	19	High-use general recreation, adult / older child	28	1	5000	3.1	14	1.4	51	**14**	514	143	5143	27	176
22a	1.8	Dirt biking/ATVing	93	1	3000	1.6	8.2	2.0	29	20	290	205	2901	**14**	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	11	5.8	51	58	514	582	5143	**40**	176
24	10	High-use general recreation, adult	31	1	4000	2.5	13	1.4	63	**14**	630	143	6305	38	234
25	0.51	High-use general recreation, older child	30	1	90	0.050	27	3.9	51	39	514	388	5143	**27**	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	6.9	1.4	51	**14**	514	143	5143	27	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	**12**	419	118	4195	43	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	6.0	1.4	51	**14**	514	143	5143	27	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	**14**	514	143	5143	27	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	**14**	99
28	0.21	High-use general recreation, adult / older child	21	1	90	0.060	13	1.4	37	**14**	368	143	3684	27	63
28a	0.071	Dirt biking/ATVing	21	1	40	0.020	4.3	2.0	29	20	290	205	2901	**14**	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	**43**	1029	429	10286	80	353
30	0.19	High-use general recreation, adult / older child	18	1	100	0.070	14	1.4	51	**14**	514	143	5143	27	176
31	5.0	High-use general recreation, adult / older child	18	1	400	0.23	14	1.4	51	**14**	514	143	5143	27	176
31a	0.61	High-use general recreation, adult / older child	42	1	500	0.30	3.9	1.4	51	**14**	514	143	5143	27	176
32	6.8	High-use general recreation, adult	50	1	2000	1.0	14	1.4	63	**14**	630	143	6305	38	234
33	30	High-use general recreation, adult	21	1	4000	2.3	14	1.4	63	**14**	630	143	6305	38	234
34	7.8	Medium-use general recreation, adult	27	1	800	0.50	21	2.1	63	**21**	630	215	6305	58	234
35	25	High-use general recreation, adult / older child	22	1	5000	3.4	14	1.4	51	**14**	514	143	5143	27	176
35a	1.2	High-use general recreation, adult / older child	44	1	100	0.060	4.4	1.4	51	**14**	514	143	5143	27	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	24	8.9	166	**89**	1664	885	16642	126	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	1	40	0.020	12	1.2	42	**12**	419	118	4195	43	348
37	20	High-use general recreation, adult / older child	18	1	1000	0.88	13	1.4	51	**14**	514	143	5143	27	176
37a	1.4	Bank fishing	61	1	600	0.35	26	2.6	52	**26**	524	256	5237	42	180
37b	2.3	High-use general recreation, adult / older child	27	1	100	0.070	6.7	1.4	51	**14**	514	143	5143	27	176
38	13	High-use general recreation, adult	23	1	2000	1.3	14	1.4	63	**14**	630	143	6305	38	234
38a	1.4	Bank fishing	71	1	400	0.28	18	2.6	52	**26**	524	256	5237	42	180

Table 7-21. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 4.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
39	3.5	Marathon canoeist	30	1	1000	0.91	6.8	0.78	5.8	**7.8**	58	78	575	13	25
40	98	High-use general recreation, adult / older child	19	1	4000	2.3	13	1.4	37	14	368	143	3684	27	63
40a	4.6	Bank fishing	120	1	1000	0.61	25	2.6	52	**26**	524	256	5237	42	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	27	63
41	20	Medium-use general recreation, adult	27	1	1000	0.85	21	2.1	63	**21**	630	215	6305	58	234
41a	2.4	Bank fishing	53	1	1000	0.60	26	2.6	52	**26**	524	256	5237	42	180
42	14	Medium-use general recreation, adult	32	1	2000	1.4	21	2.1	63	**21**	630	215	6305	58	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	**26**	524	256	5237	42	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	14	2.1	63	**21**	630	215	6305	58	234
43a	0.24	Bank fishing	69	1	60	0.040	25	2.6	52	**26**	524	256	5237	42	180
44	2.2	High-use general recreation, adult	27	1	800	0.47	14	1.4	63	**14**	630	143	6305	38	234
45	17	High-use general recreation, adult	40	1	5000	3.3	14	1.4	63	**14**	630	143	6305	38	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	9.1	1.4	63	**14**	630	143	6305	38	234
47	1.0	Recreational canoeist	18	1	80	0.050	12	1.2	13	**12**	129	121	1286	28	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8.0	1.2	13	**12**	129	121	1286	28	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	3.4	1.4	63	**14**	630	143	6305	38	234
49	7.7	Low-use general recreation, adult	63	1	100	0.080	43	4.3	126	**43**	1261	429	12610	115	468
50	69	Low-use general recreation, adult	7.4	---	---	---	7.4	4.3	126	**43**	1261	429	12610	115	468
50a	11	Waterfowl hunting	21	---	---	---	17	9.0	75	**90**	752	904	7518	140	399
51	87	Low-use general recreation, adult	7.1	---	---	---	7.1	4.3	126	**43**	1261	429	12610	115	468
51a	32	Waterfowl hunting	23	---	---	---	23	9.0	75	**90**	752	904	7518	140	399
52	0.9	Recreational canoeist	6.5	---	---	---	5.9	1.2	13	**12**	129	121	1286	28	73
53	0.7	Recreational canoeist	18	1	200	0.090	11	1.2	13	**12**	129	121	1286	28	73
54	13	High-use general recreation, adult	6.5	---	---	---	6.3	1.4	63	**14**	630	143	6305	38	234
55	18	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	**14**	368	143	3684	27	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	**90**	752	904	7518	140	399
56	32	Medium-use general recreation, adult / older child	37	1	1000	0.74	21	2.1	51	**21**	514	215	5143	40	176
56a	10	Waterfowl hunting	51	---	---	---	45	9.0	75	**90**	752	904	7518	140	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	5.7	1.4	37	**14**	368	143	3684	27	63
58	1.3	High-use general recreation, adult	65	1	200	0.10	12	1.4	63	**14**	630	143	6305	38	234
59	1.9	High-use general recreation, adult / older child	18	1	600	0.40	14	1.4	37	**14**	368	143	3684	27	63
59a	0.83	Bank fishing	23	---	---	---	18	2.6	52	**26**	524	256	5237	42	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	**14**	368	143	3684	27	63
60a	0.16	Recreational canoeist	13	1	10	0.010	12	1.2	13	**12**	129	121	1286	28	73
61	3.3	Utility worker	42	---	---	---	23	17	209	**169**	2093	1694	20933	242	718
62	1.6	Utility worker	280	1	20	0.010	37	17	209	**169**	2093	1694	20933	242	718
63	0.67	Utility worker	84	---	---	---	24	17	209	**169**	2093	1694	20933	242	718
64	0.61	Utility worker	42	---	---	---	3.9	17	209	**169**	2093	1694	20933	242	718
65	3.9	Utility worker	18	---	---	---	17	17	209	**169**	2093	1694	20933	242	718
66	1.7	Utility worker	25	---	---	---	11	17	209	**169**	2093	1694	20933	242	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	**14**	630	143	6305	38	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	**14**	630	143	6305	38	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	**14**	630	143	6305	38	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	3.1	1.3	18	13	184	134	1842	**4.6**	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	**26**	524	256	5237	42	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	**26**	524	256	5237	42	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	**26**	524	256	5237	42	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	63	**14**	630	143	6305	38	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	**14**	630	143	6305	38	234
75	3.4	High-use general recreation, adult	15	1	200	0.15	14	1.4	63	**14**	630	143	6305	38	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	**14**	630	143	6305	38	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	**14**	630	143	6305	38	234

Table 7-21. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 4.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	**27**	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	**14**	630	143	6305	38	234
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	**43**	1261	429	12610	115	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	**12**	419	118	4195	43	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	**43**	1261	429	12610	115	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	**43**	1261	429	12610	115	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	**18**	166	177	1664	25	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	**43**	1261	429	12610	115	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	**12**	129	121	1286	28	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	**27**	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	**18**	166	177	1664	25	57
87	10	High-use general recreation, young child (high use)	15	1	4000	2.3	4.6	1.3	18	13	184	134	1842	**4.6**	32
87a	0.88	Bank fishing	9.1	---	---	---	6.6	2.6	52	**26**	524	256	5237	42	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	**40**	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	**14**	630	143	6305	38	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	**14**	514	143	5143	27	176
				Subtotal:	**90,500**	**56**									
Heavily Used Subareas															
Exposure Area ID[1]	**Area of Exposure Area (acre)[2]**	**IMPG Scenario**	**Pre-Remediation EPC (mg/kg)[3]**	**Removal[4]**			**Post-Remediation EPC (mg/kg)[3]**	**IMPG[5] (mg/kg)**							
				Depth (ft)	**Volume (cy)**	**Area (acre)**		**10^{-6} Cancer Risk**		**10^{-5} Cancer Risk**		**10^{-4} Cancer Risk**		**Non-Cancer**	
								RME	**CTE**	**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**
4	0.71	High-use general recreation, adult / older child	67	3	500	0.13	9.3	1.4	37	**14**	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	15	3	1000	0.35	11	1.4	37	**14**	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	**14**	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.40	51	**14**	514	143	5143	27	176
39	0.15	Marathon canoeist	52	3	400	0.090	4.9	0.8	6	**8**	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	3	4000	0.96	3.5	1.4	37	**14**	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	0.62	1.2	13	**12**	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	3	200	0.11	4.4	1.2	13	**12**	129	121	1286	28	73
53	0.35	Recreational canoeist	408	3	200	0.060	5.3	1.2	13	**12**	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	0.59	1.4	63	**14**	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	3	30	0.0	1.8	1.4	37	**14**	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	3	10	0.0	7.2	1.2	13	**12**	129	121	1286	28	73
				Subtotal:	**6,800**	**1.7**									
				Total:	**97,000**	**57**									

Notes:

[1] See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.

[2] Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] For scenarios containing more than one receptor (e.g. adult and older child), the lowest IMPG was utilized in the comparison to post-remediation EPCs. The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-22. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for agricultural products consumption areas under FP 4.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.78	0.68	3.1	**6.8**	31	68	312	7.7	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	13	2.59	11.9	**25.9**	119	259	1187	29.1	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	**2.9**	13	29	132	3.2	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	**3.4**	15	34	154	3.8	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	**3.1**	14	31	143	3.5	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	**20.6**	95	206	946	23.2	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	**61**	279	610	2794	68.6	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	**3.8**	18	38	176	4.3	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	**5.5**	25	55	253	6.2	9.9	29.4	35.9
				Total:	**0**	**0**											

Notes:

[1] See Figure 4-4 for farm areas in Reaches 5 through 8.

[2] Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for the top 1 ft of floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-23. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for amphibian averaging areas (vernal pools) under FP 4.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	1	3000	1.7	5.6	3.27	**5.6**
5-VP-1	0.044	1.7	---	---	---	1.7	3.27	**5.6**
8-VP-5	0.043	23	1	60	0.040	5.6	3.27	**5.6**
8-VP-4	0.24	3.9	---	---	---	3.9	3.27	**5.6**
8-VP-3	0.024	7.7	1	40	0.020	0.021	3.27	**5.6**
8-VP-2	0.57	69	1	700	0.43	5.6	3.27	**5.6**
18-VP-2	0.61	7.2	1	100	0.060	5.6	3.27	**5.6**
18-VP-1	0.28	8.1	1	60	0.040	5.6	3.27	**5.6**
19-VP-7	0.068	0.84	---	---	---	0.84	3.27	**5.6**
19-VP-2	0.0080	34	1	10	0.010	0.021	3.27	**5.6**
19-VP-1	0.18	32	1	200	0.13	5.6	3.27	**5.6**
19-VP-3	0.031	10	1	20	0.010	5.6	3.27	**5.6**
19-VP-4	0.094	6.0	1	10	0.010	5.6	3.27	**5.6**
19-VP-8	0.057	91	---	---	---	0.021	3.27	**5.6**
19-VP-5	0.51	45	1	500	0.29	5.6	3.27	**5.6**
19-VP-6	1.2	24	1	800	0.47	5.6	3.27	**5.6**
23-VP-2	0.18	47	1	200	0.14	3.7	3.27	**5.6**
23-VP-1	0.30	75	1	200	0.11	5.3	3.27	**5.6**
23A-VP-1	0.45	10	1	300	0.16	5.6	3.27	**5.6**
23B-VP-1	0.068	7.2	1	50	0.030	5.6	3.27	**5.6**
23B-VP-2	0.091	0.34	---	---	---	0.34	3.27	**5.6**
27B-VP-2	0.28	11	1	200	0.14	5.6	3.27	**5.6**
27B-VP-3	0.062	16	1	100	0.060	0.021	3.27	**5.6**
27B-VP-1	0.072	12	1	60	0.040	5.6	3.27	**5.6**
27-VP-2	0.47	21	1	200	0.10	5.6	3.27	**5.6**
27A-VP-1	0.20	31	1	300	0.16	5.6	3.27	**5.6**
27-VP-1	1.3	23	1	800	0.52	5.6	3.27	**5.6**
26-VP-1	0.036	40	1	30	0.020	5.6	3.27	**5.6**
33-VP-1	0.022	9.5	1	30	0.020	0.021	3.27	**5.6**
33-VP-2	0.12	70	1	70	0.040	4.8	3.27	**5.6**
38-VP-1	0.43	36	1	500	0.28	5.6	3.27	**5.6**
38A-VP-1	0.020	5.0	---	---	---	5.0	3.27	**5.6**
38-VP-3	0.046	28	1	40	0.020	5.6	3.27	**5.6**
38-VP-2	0.17	46	1	200	0.11	5.1	3.27	**5.6**
40-VP-3	0.46	67	1	600	0.40	5.6	3.27	**5.6**
40-VP-2	0.36	18	1	300	0.18	5.6	3.27	**5.6**
40A-VP-1	0.11	68	1	200	0.090	5.6	3.27	**5.6**
40-VP-1	0.47	57	1	300	0.21	5.6	3.27	**5.6**
42-VP-1	0.22	64	1	300	0.19	5.6	3.27	**5.6**
42-VP-2	0.28	46	1	400	0.26	5.6	3.27	**5.6**
42-VP-3	0.050	41	1	60	0.040	5.6	3.27	**5.6**
42-VP-5	0.58	73	1	300	0.21	5.6	3.27	**5.6**
42-VP-4	1.0	34	1	900	0.56	5.6	3.27	**5.6**
42A-VP-1	1.5	35	1	1000	0.89	5.6	3.27	**5.6**
46-VP-2	7.1	140	1	1000	0.71	5.6	3.27	**5.6**
46-VP-1	0.52	1.3	---	---	---	1.3	3.27	**5.6**
46-VP-5	0.056	125	1	40	0.020	0.021	3.27	**5.6**
46-VP-3	1.4	153	1	600	0.35	3.2	3.27	**5.6**
46-VP-4	0.011	125	1	4.	0.0	0.021	3.27	**5.6**
49A-VP-1	0.019	16	1	30	0.020	0.021	3.27	**5.6**
49-VP-1	1.2	18	1	600	0.37	5.6	3.27	**5.6**
49B-VP-1	0.0044	26	1	7.	0.0	0.021	3.27	**5.6**
66A-VP-1	0.032	0.73	---	---	---	0.73	3.27	**5.6**
69-VP-1	0.0074	12	1	10	0.010	0.021	3.27	**5.6**
8-VP-6	0.086	47	1	100	0.080	5.6	3.27	**5.6**
12-VP-1	0.080	14	1	100	0.070	0.021	3.27	**5.6**
39-VP-1	2.0	39	1	2000	1.4	5.6	3.27	**5.6**
54-VP-1	0.20	21	1	300	0.17	5.6	3.27	**5.6**
55-VP-1	0.59	7.6	1	4.	0.0	5.6	3.27	**5.6**
55A-VP-1	2.0	40	1	3000	1.6	5.6	3.27	**5.6**
58A-VP-1	0.32	25	1	400	0.25	5.6	3.27	**5.6**
67A-VP-1	0.12	51	1	100	0.070	5.6	3.27	**5.6**
61A-VP-1	0.19	18	1	4.	0.0	5.3	3.27	**5.6**
61A-VP-2	1.2	19	1	100	0.080	5.5	3.27	**5.6**
56A-VP-1	0.58	73	1	700	0.41	5.6	3.27	**5.6**
23-VP-3	1.3	22	1	1000	0.73	5.6	3.27	**5.6**
			Total:	**24,000**	**15**			

Notes:

[1] *See Figure 4-5 for locations of vernal pools.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-24. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for omnivorous/carnivorous mammal averaging areas under FP 4.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	12	21.1	**34.3**
G2	87	51	---	---	---	14	21.1	**34.3**
G3	86	19	---	---	---	14	21.1	**34.3**
G4	86	27	---	---	---	21	21.1	**34.3**
G5	88	28	---	---	---	19	21.1	**34.3**
G6	87	12	---	---	---	12	21.1	**34.3**
G7	73	18	---	---	---	14	21.1	**34.3**
			Total:	**0**	**0**			

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-25. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for insectivorous bird (wood duck) averaging areas under FP 4.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	17	**50**	39	29
K2		63	9.8	---	---	---	6.7	**50**	39	29
K3		85	53	---	---	---	18	**50**	39	29
K4		60	16	---	---	---	12	**50**	39	29
K5		25	22	---	---	---	14	**50**	39	29
K6	5B	55	25	---	---	---	19	**48**	33	18
K7		47	30	---	---	---	22	**48**	33	18
K8		92	24	---	---	---	18	**48**	33	18
K9	5C/5D	69	25	---	---	---	17	**53**	49	46
K10		83	13	---	---	---	12	**53**	49	46
K11		61	14	---	---	---	13	**53**	49	46
K12	6	28	23	---	---	---	15	**53**	50	46
				Total:	**0**	**0**				

Notes:

[1] *See Figure 4-7 for wood duck averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-26. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for piscivorous mammal (mink) averaging areas under FP 4.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	---	---	---	14	3.4	**16.6**	*n/a*	5.12	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	14	6.9	**19.6**	3.0	15.7	*n/a*	11.8
			Total:	**0**	**0**							

Notes:

[1] See Figure 4-8 for mink averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] (n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-28. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 5.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	---	---	---	6.7	2.1	51	21	514	215	5143	40	176
2	27	High-use general recreation, adult / older child	25	---	---	---	16	1.4	51	14	514	143	5143	27	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	24	12	103	116	1029	1165	10286	80	353
2b	2.0	High-use general recreation, older child	31	---	---	---	31	3.9	51	39	514	388	5143	27	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	14	630	143	6305	38	234
4	3.2	High-use general recreation, adult / older child	27	---	---	---	18	1.4	37	14	368	143	3684	27	63
5	2.5	High-use general recreation, adult / older child	58	---	---	---	14	1.4	51	14	514	143	5143	27	176
6	3.8	Low-use general recreation, adult	75	---	---	---	25	4.3	126	43	1261	429	12610	115	468
7	5.9	High-use general recreation, adult / older child	25	---	---	---	17	1.4	51	14	514	143	5143	27	176
8	0.60	Recreational canoeist	40	---	---	---	39	1.2	13	12	129	121	1286	28	73
9	0.042	Low-use general recreation, older child	27	---	---	---	27	12	103	116	1029	1165	10286	80	353
10	59	High-use general recreation, young child (high use)	10	---	---	---	10	1.3	18	13	184	134	1842	4.6	32
10a	8.0	High-use general recreation, young child (high use)	22	---	---	---	22	1.3	18	13	184	134	1842	4.6	32
11	2.5	High-use general recreation, adult	18	---	---	---	18	1.4	63	14	630	143	6305	38	234
12	4.8	High-use general recreation, adult / older child	14	---	---	---	13	1.4	37	14	368	143	3684	27	63
13	5.9	High-use general recreation, adult	28	---	---	---	28	1.4	63	14	630	143	6305	38	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.7	1.4	63	14	630	143	6305	38	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	14	630	143	6305	38	234
16	2.5	High-use general recreation, adult	41	---	---	---	41	1.4	63	14	630	143	6305	38	234
17	8.5	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	38	234
18	17	Medium-use general recreation, adult	46	---	---	---	46	2.1	63	21	630	215	6305	58	234
19	36	High-use general recreation, adult	83	---	---	---	17	1.4	63	14	630	143	6305	38	234
20	9.1	High-use general recreation, adult	34	---	---	---	19	1.4	63	14	630	143	6305	38	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5.1	1.4	51	14	514	143	5143	27	176
22	19	High-use general recreation, adult / older child	28	---	---	---	18	1.4	51	14	514	143	5143	27	176
22a	1.8	Dirt biking/ATVing	93	---	---	---	50	2.0	29	20	290	205	2901	14	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	10	5.8	51	58	514	582	5143	40	176
24	10	High-use general recreation, adult	31	---	---	---	17	1.4	63	14	630	143	6305	38	234
25	0.51	High-use general recreation, older child	30	---	---	---	16	3.9	51	39	514	388	5143	27	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	7.0	1.4	51	14	514	143	5143	27	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	12	419	118	4195	43	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	27	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	14	514	143	5143	27	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	14	99
28	0.21	High-use general recreation, adult / older child	21	---	---	---	21	1.4	37	14	368	143	3684	27	63
28a	0.071	Dirt biking/ATVing	21	---	---	---	21	2.0	29	20	290	205	2901	14	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	43	1029	429	10286	80	353
30	0.19	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	27	176
31	5.0	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	27	176
31a	0.61	High-use general recreation, adult / older child	42	---	---	---	42	1.4	51	14	514	143	5143	27	176
32	6.8	High-use general recreation, adult	50	---	---	---	50	1.4	63	14	630	143	6305	38	234
33	30	High-use general recreation, adult	21	---	---	---	15	1.4	63	14	630	143	6305	38	234
34	7.8	Medium-use general recreation, adult	27	---	---	---	18	2.1	63	21	630	215	6305	58	234
35	25	High-use general recreation, adult / older child	22	---	---	---	19	1.4	51	14	514	143	5143	27	176
35a	1.2	High-use general recreation, adult / older child	44	---	---	---	44	1.4	51	14	514	143	5143	27	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	25	8.9	166	89	1664	885	16642	126	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	---	---	---	15	1.2	42	12	419	118	4195	43	348
37	20	High-use general recreation, adult / older child	18	---	---	---	13	1.4	51	14	514	143	5143	27	176
37a	1.4	Bank fishing	61	---	---	---	50	2.6	52	26	524	256	5237	42	180
37b	2.3	High-use general recreation, adult / older child	27	---	---	---	10	1.4	51	14	514	143	5143	27	176
38	13	High-use general recreation, adult	23	---	---	---	19	1.4	63	14	630	143	6305	38	234
38a	1.4	Bank fishing	71	---	---	---	41	2.6	52	26	524	256	5237	42	180

Table 7-28. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 5.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
39	3.5	Marathon canoeist	30	---	---	---	9.1	0.78	5.8	7.8	58	78	575	13	25
40	98	High-use general recreation, adult / older child	19	---	---	---	5.2	1.4	37	14	368	143	3684	27	63
40a	4.6	Bank fishing	120	---	---	---	23	2.6	52	26	524	256	5237	42	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	27	63
41	20	Medium-use general recreation, adult	27	---	---	---	21	2.1	63	21	630	215	6305	58	234
41a	2.4	Bank fishing	53	---	---	---	34	2.6	52	26	524	256	5237	42	180
42	14	Medium-use general recreation, adult	32	---	---	---	32	2.1	63	21	630	215	6305	58	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	26	524	256	5237	42	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	6.3	2.1	63	21	630	215	6305	58	234
43a	0.24	Bank fishing	69	---	---	---	6.7	2.6	52	26	524	256	5237	42	180
44	2.2	High-use general recreation, adult	27	---	---	---	27	1.4	63	14	630	143	6305	38	234
45	17	High-use general recreation, adult	40	---	---	---	11	1.4	63	14	630	143	6305	38	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	8.8	1.4	63	14	630	143	6305	38	234
47	1.0	Recreational canoeist	18	---	---	---	18	1.2	13	12	129	121	1286	28	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8.0	1.2	13	12	129	121	1286	28	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	3.4	1.4	63	14	630	143	6305	38	234
49	7.7	Low-use general recreation, adult	63	---	---	---	33	4.3	126	43	1261	429	12610	115	468
50	69	Low-use general recreation, adult	7.4	---	---	---	5.8	4.3	126	43	1261	429	12610	115	468
50a	11	Waterfowl hunting	21	---	---	---	18	9.0	75	90	752	904	7518	140	399
51	87	Low-use general recreation, adult	7.1	---	---	---	6.7	4.3	126	43	1261	429	12610	115	468
51a	32	Waterfowl hunting	23	---	---	---	20	9.0	75	90	752	904	7518	140	399
52	0.9	Recreational canoeist	6.5	---	---	---	6.3	1.2	13	12	129	121	1286	28	73
53	0.7	Recreational canoeist	18	---	---	---	17	1.2	13	12	129	121	1286	28	73
54	13	High-use general recreation, adult	6.5	---	---	---	5.6	1.4	63	14	630	143	6305	38	234
55	18	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	27	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	90	752	904	7518	140	399
56	32	Medium-use general recreation, adult / older child	37	---	---	---	22	2.1	51	21	514	215	5143	40	176
56a	10	Waterfowl hunting	51	---	---	---	45	9.0	75	90	752	904	7518	140	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	5.6	1.4	37	14	368	143	3684	27	63
58	1.3	High-use general recreation, adult	65	---	---	---	3.6	1.4	63	14	630	143	6305	38	234
59	1.9	High-use general recreation, adult / older child	18	---	---	---	18	1.4	37	14	368	143	3684	27	63
59a	0.83	Bank fishing	23	---	---	---	23	2.6	52	26	524	256	5237	42	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	13	---	---	---	13	1.2	13	12	129	121	1286	28	73
61	3.3	Utility worker	42	---	---	---	26	17	209	169	2093	1694	20933	242	718
62	1.6	Utility worker	280	---	---	---	49	17	209	169	2093	1694	20933	242	718
63	0.67	Utility worker	84	---	---	---	47	17	209	169	2093	1694	20933	242	718
64	0.61	Utility worker	42	---	---	---	42	17	209	169	2093	1694	20933	242	718
65	3.9	Utility worker	18	---	---	---	18	17	209	169	2093	1694	20933	242	718
66	1.7	Utility worker	25	---	---	---	19	17	209	169	2093	1694	20933	242	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	14	630	143	6305	38	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	14	630	143	6305	38	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	14	630	143	6305	38	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	3.1	1.3	18	13	184	134	1842	4.6	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	26	524	256	5237	42	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	26	524	256	5237	42	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	26	524	256	5237	42	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	63	14	630	143	6305	38	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	14	630	143	6305	38	234
75	3.4	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	38	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	14	630	143	6305	38	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	14	630	143	6305	38	234

Table 7-28. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 5.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	27	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	14	630	143	6305	38	234
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	115	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	12	419	118	4195	43	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	43	1261	429	12610	115	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	115	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	18	166	177	1664	25	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	43	1261	429	12610	115	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	12	129	121	1286	28	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	27	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	18	166	177	1664	25	57
87	10	High-use general recreation, young child (high use)	15	---	---	---	15	1.3	18	13	184	134	1842	4.6	32
87a	0.88	Bank fishing	9.1	---	---	---	9.1	2.6	52	26	524	256	5237	42	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	40	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	14	630	143	6305	38	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	27	176

Heavily Used Subareas

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
4	0.71	High-use general recreation, adult / older child	67	---	---	---	12	1.4	37	14	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	15	---	---	---	11	1.4	37	14	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	14	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.40	51	14	514	143	5143	27	176
39	0.15	Marathon canoeist	52	---	---	---	12	0.8	6	8	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	---	---	---	18	1.4	37	14	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	6.4	1.2	13	12	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	---	---	---	6.6	1.2	13	12	129	121	1286	28	73
53	0.35	Recreational canoeist	408	---	---	---	18	1.2	13	12	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	0.59	1.4	63	14	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	---	---	---	28	1.4	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	---	---	---	7.4	1.2	13	12	129	121	1286	28	73

Notes:

[1] *See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.*

[2] *Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).*

[3] *EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.*

[4] *Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.*

[5] *For scenarios containing more than one receptor (e.g. adult and older child), the lowest IMPG was utilized in the comparison to post-remediation EPCs. The lowest IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-29. Summary of IMPGs and pre- and post-remediation EPCs for agricultural products consumption areas under FP 5.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.77	0.68	3.1	6.8	31	68	312	7.7	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	13	2.59	11.9	25.9	119	259	1187	29.1	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	2.9	13	29	132	3.2	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	3.4	15	34	154	3.8	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	3.1	14	31	143	3.5	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	20.6	95	206	946	23.2	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	61	279	610	2794	68.6	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	3.8	18	38	176	4.3	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	5.5	25	55	253	6.2	9.9	29.4	35.9

Notes:

[1] See Figure 4-4 for farm areas in Reaches 5 through 8.

[2] Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for the top 1 ft of floodplain soil.

[4] Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.

[5] IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-30. Summary of IMPGs and pre- and post-remediation EPCs for amphibian averaging areas (vernal pools) under FP 5.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	---	---	---	25	3.27	5.6
5-VP-1	0.044	1.7	---	---	---	1.7	3.27	5.6
8-VP-5	0.043	23	---	---	---	23	3.27	5.6
8-VP-4	0.24	3.9	---	---	---	3.9	3.27	5.6
8-VP-3	0.024	7.7	---	---	---	7.7	3.27	5.6
8-VP-2	0.57	69	---	---	---	34	3.27	5.6
18-VP-2	0.61	7.2	---	---	---	7.2	3.27	5.6
18-VP-1	0.28	8.1	---	---	---	8.1	3.27	5.6
19-VP-7	0.068	0.84	---	---	---	0.84	3.27	5.6
19-VP-2	0.0080	34	---	---	---	34	3.27	5.6
19-VP-1	0.18	32	---	---	---	32	3.27	5.6
19-VP-3	0.031	10	---	---	---	10	3.27	5.6
19-VP-4	0.094	6.0	---	---	---	6.0	3.27	5.6
19-VP-8	0.057	91	---	---	---	0.021	3.27	5.6
19-VP-5	0.51	45	---	---	---	45	3.27	5.6
19-VP-6	1.2	24	---	---	---	24	3.27	5.6
23-VP-2	0.18	47	---	---	---	37	3.27	5.6
23-VP-1	0.30	75	---	---	---	26	3.27	5.6
23A-VP-1	0.45	10	---	---	---	10	3.27	5.6
23B-VP-1	0.068	7.2	---	---	---	7.2	3.27	5.6
23B-VP-2	0.091	0.34	---	---	---	0.34	3.27	5.6
27B-VP-2	0.28	11	---	---	---	11	3.27	5.6
27B-VP-3	0.062	16	---	---	---	16	3.27	5.6
27B-VP-1	0.072	12	---	---	---	12	3.27	5.6
27-VP-2	0.47	21	---	---	---	21	3.27	5.6
27A-VP-1	0.20	31	---	---	---	31	3.27	5.6
27-VP-1	1.3	23	---	---	---	23	3.27	5.6
26-VP-1	0.036	40	---	---	---	40	3.27	5.6
33-VP-1	0.022	9.5	---	---	---	9.5	3.27	5.6
33-VP-2	0.12	70	---	---	---	46	3.27	5.6
38-VP-1	0.43	36	---	---	---	28	3.27	5.6
38A-VP-1	0.020	5.0	---	---	---	5.0	3.27	5.6
38-VP-3	0.046	28	---	---	---	28	3.27	5.6
38-VP-2	0.17	46	---	---	---	29	3.27	5.6
40-VP-3	0.46	67	---	---	---	34	3.27	5.6
40-VP-2	0.36	18	---	---	---	18	3.27	5.6
40A-VP-1	0.11	68	---	---	---	48	3.27	5.6
40-VP-1	0.47	57	---	---	---	4.2	3.27	5.6
42-VP-1	0.22	64	---	---	---	4.8	3.27	5.6
42-VP-2	0.28	46	---	---	---	46	3.27	5.6
42-VP-3	0.050	41	---	---	---	41	3.27	5.6
42-VP-5	0.58	73	---	---	---	24	3.27	5.6
42-VP-4	1.0	34	---	---	---	26	3.27	5.6
42A-VP-1	1.5	35	---	---	---	21	3.27	5.6
46-VP-2	7.1	140	---	---	---	3.0	3.27	5.6
46-VP-1	0.52	1.3	---	---	---	1.3	3.27	5.6
46-VP-5	0.056	125	---	---	---	4.5	3.27	5.6
46-VP-3	1.4	153	---	---	---	35	3.27	5.6
46-VP-4	0.011	125	---	---	---	0.021	3.27	5.6
49A-VP-1	0.019	16	---	---	---	16	3.27	5.6
49-VP-1	1.2	18	---	---	---	18	3.27	5.6
49B-VP-1	0.0044	26	---	---	---	26	3.27	5.6
66A-VP-1	0.032	0.73	---	---	---	0.73	3.27	5.6
69-VP-1	0.0074	12	---	---	---	12	3.27	5.6
8-VP-6	0.086	47	---	---	---	47	3.27	5.6
12-VP-1	0.080	14	---	---	---	14	3.27	5.6
39-VP-1	2.0	39	---	---	---	39	3.27	5.6
54-VP-1	0.20	21	---	---	---	21	3.27	5.6
55-VP-1	0.59	7.6	---	---	---	7.6	3.27	5.6
55A-VP-1	2.0	40	---	---	---	34	3.27	5.6
58A-VP-1	0.32	25	---	---	---	25	3.27	5.6
67A-VP-1	0.12	51	---	---	---	11	3.27	5.6
61A-VP-1	0.19	18	---	---	---	18	3.27	5.6
61A-VP-2	1.2	19	---	---	---	19	3.27	5.6
56A-VP-1	0.58	73	---	---	---	22	3.27	5.6
23-VP-3	1.3	22	---	---	---	22	3.27	5.6

Notes:

[1] *See Figure 4-5 for locations of vernal pools.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-31. Summary of IMPGs and pre- and post-remediation EPCs for omnivorous/carnivorous mammal averaging areas under FP 5.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	12	21.1	34.3
G2	87	51	---	---	---	14	21.1	34.3
G3	86	19	---	---	---	16	21.1	34.3
G4	86	27	---	---	---	20	21.1	34.3
G5	88	28	---	---	---	11	21.1	34.3
G6	87	12	---	---	---	9.3	21.1	34.3
G7	73	18	---	---	---	12	21.1	34.3

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-32. Summary of IMPGs and pre- and post-remediation EPCs for insectivorous bird (wood duck) averaging areas under FP 5.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	16	50	39	29
K2		63	9.8	---	---	---	9.3	50	39	29
K3		85	53	---	---	---	14	50	39	29
K4		60	16	---	---	---	13	50	39	29
K5		25	22	---	---	---	18	50	39	29
K6	5B	55	25	---	---	---	22	48	33	18
K7		47	30	---	---	---	17	48	33	18
K8		92	24	---	---	---	12	48	33	18
K9	5C/5D	69	25	---	---	---	12	53	49	46
K10		83	13	---	---	---	10	53	49	46
K11		61	14	---	---	---	11	53	49	46
K12	6	28	23	---	---	---	12	53	50	46

Notes:

[1] See Figure 4-7 for wood duck averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-33. Summary of IMPGs and pre- and post-remediation EPCs for piscivorous mammal (mink) averaging areas under FP 5.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	---	---	---	14	3.4	16.6	*n/a*	5.12	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	10	6.9	19.6	3.0	15.7	*n/a*	11.8

Notes:

[1] See Figure 4-8 for mink averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.

[4] (n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-35. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 6.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	---	---	---	3.2	2.1	51	21	514	215	5143	40	176
2	27	High-use general recreation, adult / older child	25	---	---	---	5.6	1.4	51	14	514	143	5143	27	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	8.1	12	103	116	1029	1165	10286	80	353
2b	2.0	High-use general recreation, older child	31	---	---	---	4.7	3.9	51	39	514	388	5143	27	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	14	630	143	6305	38	234
4	3.2	High-use general recreation, adult / older child	27	---	---	---	7.3	1.4	37	14	368	143	3684	27	63
5	2.5	High-use general recreation, adult / older child	58	---	---	---	7.0	1.4	51	14	514	143	5143	27	176
6	3.8	Low-use general recreation, adult	75	---	---	---	21	4.3	126	43	1261	429	12610	115	468
7	5.9	High-use general recreation, adult / older child	25	---	---	---	8.0	1.4	51	14	514	143	5143	27	176
8	0.60	Recreational canoeist	40	---	---	---	20	1.2	13	12	129	121	1286	28	73
9	0.042	Low-use general recreation, older child	27	---	---	---	19	12	103	116	1029	1165	10286	80	353
10	59	High-use general recreation, young child (high use)	10	---	---	---	5.3	1.3	18	13	184	134	1842	4.6	32
10a	8.0	High-use general recreation, young child (high use)	22	---	---	---	19	1.3	18	13	184	134	1842	4.6	32
11	2.5	High-use general recreation, adult	18	---	---	---	12	1.4	63	14	630	143	6305	38	234
12	4.8	High-use general recreation, adult / older child	14	---	---	---	5.3	1.4	37	14	368	143	3684	27	63
13	5.9	High-use general recreation, adult	28	---	---	---	6.9	1.4	63	14	630	143	6305	38	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.7	1.4	63	14	630	143	6305	38	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	14	630	143	6305	38	234
16	2.5	High-use general recreation, adult	41	---	---	---	24	1.4	63	14	630	143	6305	38	234
17	8.5	High-use general recreation, adult	15	---	---	---	8.3	1.4	63	14	630	143	6305	38	234
18	17	Medium-use general recreation, adult	46	---	---	---	16	2.1	63	21	630	215	6305	58	234
19	36	High-use general recreation, adult	83	---	---	---	5.7	1.4	63	14	630	143	6305	38	234
20	9.1	High-use general recreation, adult	34	---	---	---	14	1.4	63	14	630	143	6305	38	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5.1	1.4	51	14	514	143	5143	27	176
22	19	High-use general recreation, adult / older child	28	---	---	---	7.3	1.4	51	14	514	143	5143	27	176
22a	1.8	Dirt biking/ATVing	93	---	---	---	25	2.0	29	20	290	205	2901	14	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	10	5.8	51	58	514	582	5143	40	176
24	10	High-use general recreation, adult	31	---	---	---	8.6	1.4	63	14	630	143	6305	38	234
25	0.51	High-use general recreation, older child	30	---	---	---	8.2	3.9	51	39	514	388	5143	27	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	5.0	1.4	51	14	514	143	5143	27	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	12	419	118	4195	43	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	4.4	1.4	51	14	514	143	5143	27	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	14	514	143	5143	27	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	14	99
28	0.21	High-use general recreation, adult / older child	21	---	---	---	21	1.4	37	14	368	143	3684	27	63
28a	0.071	Dirt biking/ATVing	21	---	---	---	21	2.0	29	20	290	205	2901	14	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	43	1029	429	10286	80	353
30	0.19	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	27	176
31	5.0	High-use general recreation, adult / older child	18	---	---	---	12	1.4	51	14	514	143	5143	27	176
31a	0.61	High-use general recreation, adult / older child	42	---	---	---	25	1.4	51	14	514	143	5143	27	176
32	6.8	High-use general recreation, adult	50	---	---	---	6.8	1.4	63	14	630	143	6305	38	234
33	30	High-use general recreation, adult	21	---	---	---	7.8	1.4	63	14	630	143	6305	38	234
34	7.8	Medium-use general recreation, adult	27	---	---	---	13	2.1	63	21	630	215	6305	58	234
35	25	High-use general recreation, adult / older child	22	---	---	---	5.2	1.4	51	14	514	143	5143	27	176
35a	1.2	High-use general recreation, adult / older child	44	---	---	---	2.5	1.4	51	14	514	143	5143	27	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	6.7	8.9	166	89	1664	885	16642	126	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	---	---	---	3.7	1.2	42	12	419	118	4195	43	348
37	20	High-use general recreation, adult / older child	18	---	---	---	6.0	1.4	51	14	514	143	5143	27	176
37a	1.4	Bank fishing	61	---	---	---	25	2.6	52	26	524	256	5237	42	180
37b	2.3	High-use general recreation, adult / older child	27	---	---	---	2.7	1.4	51	14	514	143	5143	27	176
38	13	High-use general recreation, adult	23	---	---	---	7.0	1.4	63	14	630	143	6305	38	234
38a	1.4	Bank fishing	71	---	---	---	14	2.6	52	26	524	256	5237	42	180

Table 7-35. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 6.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
39	3.5	Marathon canoeist	30	---	---	---	4.8	0.78	5.8	7.8	58	78	575	13	25
40	98	High-use general recreation, adult / older child	19	---	---	---	2.5	1.4	37	14	368	143	3684	27	63
40a	4.6	Bank fishing	120	---	---	---	9.2	2.6	52	26	524	256	5237	42	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	27	63
41	20	Medium-use general recreation, adult	27	---	---	---	6.3	2.1	63	21	630	215	6305	58	234
41a	2.4	Bank fishing	53	---	---	---	25	2.6	52	26	524	256	5237	42	180
42	14	Medium-use general recreation, adult	32	---	---	---	12	2.1	63	21	630	215	6305	58	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	26	524	256	5237	42	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	0.19	2.1	63	21	630	215	6305	58	234
43a	0.24	Bank fishing	69	---	---	---	0.25	2.6	52	26	524	256	5237	42	180
44	2.2	High-use general recreation, adult	27	---	---	---	7.7	1.4	63	14	630	143	6305	38	234
45	17	High-use general recreation, adult	40	---	---	---	7.3	1.4	63	14	630	143	6305	38	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	4.2	1.4	63	14	630	143	6305	38	234
47	1.0	Recreational canoeist	18	---	---	---	18	1.2	13	12	129	121	1286	28	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8.0	1.2	13	12	129	121	1286	28	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	2.3	1.4	63	14	630	143	6305	38	234
49	7.7	Low-use general recreation, adult	63	---	---	---	16	4.3	126	43	1261	429	12610	115	468
50	69	Low-use general recreation, adult	7.4	---	---	---	4.3	4.3	126	43	1261	429	12610	115	468
50a	11	Waterfowl hunting	21	---	---	---	17	9.0	75	90	752	904	7518	140	399
51	87	Low-use general recreation, adult	7.1	---	---	---	4.6	4.3	126	43	1261	429	12610	115	468
51a	32	Waterfowl hunting	23	---	---	---	18	9.0	75	90	752	904	7518	140	399
52	0.9	Recreational canoeist	6.5	---	---	---	3.3	1.2	13	12	129	121	1286	28	73
53	0.7	Recreational canoeist	18	---	---	---	11	1.2	13	12	129	121	1286	28	73
54	13	High-use general recreation, adult	6.5	---	---	---	5.6	1.4	63	14	630	143	6305	38	234
55	18	High-use general recreation, adult / older child	11	---	---	---	6.8	1.4	37	14	368	143	3684	27	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	90	752	904	7518	140	399
56	32	Medium-use general recreation, adult / older child	37	---	---	---	4.3	2.1	51	21	514	215	5143	40	176
56a	10	Waterfowl hunting	51	---	---	---	37	9.0	75	90	752	904	7518	140	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	4.6	1.4	37	14	368	143	3684	27	63
58	1.3	High-use general recreation, adult	65	---	---	---	3.6	1.4	63	14	630	143	6305	38	234
59	1.9	High-use general recreation, adult / older child	18	---	---	---	15	1.4	37	14	368	143	3684	27	63
59a	0.83	Bank fishing	23	---	---	---	15	2.6	52	26	524	256	5237	42	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	13	---	---	---	13	1.2	13	12	129	121	1286	28	73
61	3.3	Utility worker	42	---	---	---	17	17	209	169	2093	1694	20933	242	718
62	1.6	Utility worker	280	---	---	---	22	17	209	169	2093	1694	20933	242	718
63	0.67	Utility worker	84	---	---	---	24	17	209	169	2093	1694	20933	242	718
64	0.61	Utility worker	42	---	---	---	25	17	209	169	2093	1694	20933	242	718
65	3.9	Utility worker	18	---	---	---	9.2	17	209	169	2093	1694	20933	242	718
66	1.7	Utility worker	25	---	---	---	6.4	17	209	169	2093	1694	20933	242	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	14	630	143	6305	38	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	14	630	143	6305	38	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	14	630	143	6305	38	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	3.1	1.3	18	13	184	134	1842	4.6	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	26	524	256	5237	42	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	26	524	256	5237	42	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	26	524	256	5237	42	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	63	14	630	143	6305	38	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	14	630	143	6305	38	234
75	3.4	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	38	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	14	630	143	6305	38	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	14	630	143	6305	38	234

Table 7-35. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 6.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	27	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	14	630	143	6305	38	234
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	115	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	12	419	118	4195	43	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	43	1261	429	12610	115	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	115	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	18	166	177	1664	25	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	43	1261	429	12610	115	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	12	129	121	1286	28	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	27	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	18	166	177	1664	25	57
87	10	High-use general recreation, young child (high use)	15	---	---	---	15	1.3	18	13	184	134	1842	4.6	32
87a	0.88	Bank fishing	9.1	---	---	---	9.1	2.6	52	26	524	256	5237	42	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	40	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	14	630	143	6305	38	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	27	176

Heavily Used Subareas

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
4	0.71	High-use general recreation, adult / older child	67	---	---	---	5.7	1.4	37	14	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	15	---	---	---	5.4	1.4	37	14	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	14	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.40	51	14	514	143	5143	27	176
39	0.15	Marathon canoeist	52	---	---	---	10	0.8	6	8	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	---	---	---	18	1.4	37	14	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	6.4	1.2	13	12	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	---	---	---	6.6	1.2	13	12	129	121	1286	28	73
53	0.35	Recreational canoeist	408	---	---	---	6.8	1.2	13	12	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	0.59	1.4	63	14	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	---	---	---	12	1.4	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	---	---	---	7.4	1.2	13	12	129	121	1286	28	73

Notes:

[1] See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.

[2] Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.

[4] Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.

[5] For scenarios containing more than one receptor (e.g. adult and older child), the lowest IMPG was utilized in the comparison to post-remediation EPCs. The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-36. Summary of IMPGs and pre- and post-remediation EPCs for agricultural products consumption areas under FP 6.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.77	0.68	3.1	6.8	31	68	312	7.7	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	13	2.59	11.9	25.9	119	259	1187	29.1	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	2.9	13	29	132	3.2	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	3.4	15	34	154	3.8	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	3.1	14	31	143	3.5	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	20.6	95	206	946	23.2	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	61	279	610	2794	68.6	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	3.8	18	38	176	4.3	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	5.5	25	55	253	6.2	9.9	29.4	35.9

Notes:

[1] *See Figure 4-4 for farm areas in Reaches 5 through 8.*

[2] *Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).*

[3] *EPC is calculated for the top 1 ft of floodplain soil.*

[4] *Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.*

[5] *IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-37. Summary of IMPGs and pre- and post-remediation EPCs for amphibian averaging areas (vernal pools) under FP 6.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	---	---	---	7.7	3.27	5.6
5-VP-1	0.044	1.7	---	---	---	1.7	3.27	5.6
8-VP-5	0.043	23	---	---	---	20	3.27	5.6
8-VP-4	0.24	3.9	---	---	---	3.9	3.27	5.6
8-VP-3	0.024	7.7	---	---	---	7.7	3.27	5.6
8-VP-2	0.57	69	---	---	---	4.2	3.27	5.6
18-VP-2	0.61	7.2	---	---	---	7.2	3.27	5.6
18-VP-1	0.28	8.1	---	---	---	8.1	3.27	5.6
19-VP-7	0.068	0.84	---	---	---	0.84	3.27	5.6
19-VP-2	0.0080	34	---	---	---	0.021	3.27	5.6
19-VP-1	0.18	32	---	---	---	24	3.27	5.6
19-VP-3	0.031	10	---	---	---	10	3.27	5.6
19-VP-4	0.094	6.0	---	---	---	6.0	3.27	5.6
19-VP-8	0.057	91	---	---	---	0.021	3.27	5.6
19-VP-5	0.51	45	---	---	---	11	3.27	
19-VP-6	1.2	24	---	---	---	7.8	3.27	5.6
23-VP-2	0.18	47	---	---	---	19	3.27	5.6
23-VP-1	0.30	75	---	---	---	7.1	3.27	5.6
23A-VP-1	0.45	10	---	---	---	10	3.27	5.6
23B-VP-1	0.068	7.2	---	---	---	7.2	3.27	5.6
23B-VP-2	0.091	0.34	---	---	---	0.34	3.27	5.6
27B-VP-2	0.28	11	---	---	---	11	3.27	5.6
27B-VP-3	0.062	16	---	---	---	16	3.27	5.6
27B-VP-1	0.072	12	---	---	---	12	3.27	5.6
27-VP-2	0.47	21	---	---	---	21	3.27	5.6
27A-VP-1	0.20	31	---	---	---	11	3.27	5.6
27-VP-1	1.3	23	---	---	---	23	3.27	5.6
26-VP-1	0.036	40	---	---	---	15	3.27	5.6
33-VP-1	0.022	9.5	---	---	---	9.5	3.27	5.6
33-VP-2	0.12	70	---	---	---	4.8	3.27	5.6
38-VP-1	0.43	36	---	---	---	22	3.27	5.6
38A-VP-1	0.020	5.0	---	---	---	5.0	3.27	5.6
38-VP-3	0.046	28	---	---	---	5.0	3.27	5.6
38-VP-2	0.17	46	---	---	---	9.4	3.27	5.6
40-VP-3	0.46	67	---	---	---	12	3.27	5.6
40-VP-2	0.36	18	---	---	---	18	3.27	5.6
40A-VP-1	0.11	68	---	---	---	17	3.27	5.6
40-VP-1	0.47	57	---	---	---	4.2	3.27	5.6
42-VP-1	0.22	64	---	---	---	0.021	3.27	5.6
42-VP-2	0.28	46	---	---	---	1.7	3.27	5.6
42-VP-3	0.050	41	---	---	---	1.9	3.27	5.6
42-VP-5	0.58	73	---	---	---	24	3.27	5.6
42-VP-4	1.0	34	---	---	---	6.2	3.27	5.6
42A-VP-1	1.5	35	---	---	---	11	3.27	5.6
46-VP-2	7.1	140	---	---	---	3.0	3.27	5.6
46-VP-1	0.52	1.3	---	---	---	1.3	3.27	5.6
46-VP-5	0.056	125	---	---	---	0.021	3.27	5.6
46-VP-3	1.4	153	---	---	---	3.2	3.27	5.6
46-VP-4	0.011	125	---	---	---	0.021	3.27	5.6
49A-VP-1	0.019	16	---	---	---	16	3.27	5.6
49-VP-1	1.2	18	---	---	---	11	3.27	5.6
49B-VP-1	0.0044	26	---	---	---	0.021	3.27	5.6
66A-VP-1	0.032	0.73	---	---	---	0.73	3.27	5.6
69-VP-1	0.0074	12	---	---	---	12	3.27	5.6
8-VP-6	0.086	47	---	---	---	0.021	3.27	5.6
12-VP-1	0.080	14	---	---	---	14	3.27	5.6
39-VP-1	2.0	39	---	---	---	1.8	3.27	5.6
54-VP-1	0.20	21	---	---	---	21	3.27	5.6
55-VP-1	0.59	7.6	---	---	---	2.2	3.27	5.6
55A-VP-1	2.0	40	---	---	---	6.5	3.27	5.6
58A-VP-1	0.32	25	---	---	---	25	3.27	5.6
67A-VP-1	0.12	51	---	---	---	11	3.27	5.6
61A-VP-1	0.19	18	---	---	---	18	3.27	5.6
61A-VP-2	1.2	19	---	---	---	6.2	3.27	5.6
56A-VP-1	0.58	73	---	---	---	9.7	3.27	5.6
23-VP-3	1.3	22	---	---	---	22	3.27	5.6

Notes:

[1] *See Figure 4-5 for locations of vernal pools.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-38. Summary of IMPGs and pre- and post-remediation EPCs for omnivorous/carnivorous mammal averaging areas under FP 6.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	5.2	21.1	34.3
G2	87	51	---	---	---	6.0	21.1	34.3
G3	86	19	---	---	---	7.3	21.1	34.3
G4	86	27	---	---	---	6.5	21.1	34.3
G5	88	28	---	---	---	6.5	21.1	34.3
G6	87	12	---	---	---	4.5	21.1	34.3
G7	73	18	---	---	---	6.6	21.1	34.3

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-39. Summary of IMPGs and pre- and post-remediation EPCs for insectivorous bird (wood duck) averaging areas under FP 6.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	5.3	50	39	29
K2		63	9.8	---	---	---	6.2	50	39	29
K3		85	53	---	---	---	5.9	50	39	29
K4		60	16	---	---	---	6.2	50	39	29
K5		25	22	---	---	---	9.2	50	39	29
K6	5B	55	25	---	---	---	6.4	48	33	18
K7		47	30	---	---	---	6.4	48	33	18
K8		92	24	---	---	---	5.4	48	33	18
K9	5C/5D	69	25	---	---	---	7.8	53	49	46
K10		83	13	---	---	---	5.0	53	49	46
K11		61	14	---	---	---	6.6	53	49	46
K12	6	28	23	---	---	---	5.0	53	50	46

Notes:

[1] *See Figure 4-7 for wood duck averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-40. Summary of IMPGs and pre- and post-remediation EPCs for piscivorous mammal (mink) averaging areas under FP 6.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	---	---	---	5.8	3.4	16.6	*n/a*	5.12	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	5.9	6.9	19.6	3.0	15.7	*n/a*	11.8

Notes:

[1] See Figure 4-8 for mink averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] Removal volumes for threshold-based alternatives are not shown by exposure/averaging areas.

[4] (n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-42. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 7.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)								
								10^{-6} Cancer Risk			10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	RME*[6]	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	1	9000	5.9	1.6	2.1	**2.1**	51	21	514	215	5143	40	176
2	27	High-use general recreation, adult / older child	25	1	19000	12	1.9	1.4	**2.0**	51	14	514	143	5143	27	176
2a	2.3	Low-use general recreation, older child	52	1	2000	1.3	1.5	**12**	**12**	103	116	1029	1165	10286	80	353
2b	2.0	High-use general recreation, older child	31	1	400	0.26	3.8	**3.9**	**3.9**	51	39	514	388	5143	27	176
3	0.38	High-use general recreation, adult	7.8	1	300	0.20	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
4	3.2	High-use general recreation, adult / older child	27	1	3000	1.6	1.6	1.4	**2.0**	37	14	368	143	3684	27	63
5	2.5	High-use general recreation, adult / older child	58	1	2000	1.5	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
6	3.8	Low-use general recreation, adult	75	1	5000	3.0	1.3	**4.3**	**4.3**	126	43	1261	429	12610	115	468
7	5.9	High-use general recreation, adult / older child	25	1	5000	3.1	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
8	0.60	Recreational canoeist	40	1	200	0.14	2.0	1.2	**2.0**	13	12	129	121	1286	28	73
9	0.042	Low-use general recreation, older child	27	1	30	0.020	12	**12**	**12**	103	116	1029	1165	10286	80	353
10	59	High-use general recreation, young child (high use)	10	1	16000	9.7	2.0	1.3	**2.0**	18	13	184	134	1842	4.6	32
10a	8.0	High-use general recreation, young child (high use)	22	1	400	0.24	2.0	1.3	**2.0**	18	13	184	134	1842	4.6	32
11	2.5	High-use general recreation, adult	18	1	2000	1.4	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
12	4.8	High-use general recreation, adult / older child	14	1	1000	0.66	1.6	1.4	**2.0**	37	14	368	143	3684	27	63
13	5.9	High-use general recreation, adult	28	1	3000	1.8	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
14	4.1	High-use general recreation, adult	2.7	1	1000	0.92	1.6	1.4	**2.0**	63	14	630	143	6305	38	234
15	0.87	High-use general recreation, adult	2.2	1	30	0.020	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
16	2.5	High-use general recreation, adult	41	1	2000	1.5	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
17	8.5	High-use general recreation, adult	15	1	5000	3.3	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
18	17	Medium-use general recreation, adult	46	1	8000	4.7	2.1	**2.1**	**2.1**	63	21	630	215	6305	58	234
19	36	High-use general recreation, adult	83	1	28000	17	1.6	1.4	**2.0**	63	14	630	143	6305	38	234
20	9.1	High-use general recreation, adult	34	1	10000	6.4	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
21	2.9	High-use general recreation, adult / older child	5.7	1	1000	0.88	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
22	19	High-use general recreation, adult / older child	28	1	18000	11	1.5	1.4	**2.0**	51	14	514	143	5143	27	176
22a	1.8	Dirt biking/ATVing	93	1	3000	1.8	2.0	**2.0**	**2.0**	29	20	290	205	2901	14	99
23	0.28	Medium-use general recreation, older child	11	1	100	0.060	5.8	**5.8**	**5.8**	51	58	514	582	5143	40	176
24	10	High-use general recreation, adult	31	1	11000	6.8	1.3	1.4	**2.0**	63	14	630	143	6305	38	234
25	0.51	High-use general recreation, older child	30	1	500	0.31	3.9	**3.9**	**3.9**	51	39	514	388	5143	27	176
26a	48	High-use general recreation, adult / older child	7.0	1	12000	7.7	1.9	1.4	**2.0**	51	14	514	143	5143	27	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	0.68	1.2	**2.0**	42	12	419	118	4195	43	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	1.7	1.4	**2.0**	51	14	514	143	5143	27	176
27	6.3	High-use general recreation, adult / older child	2.5	1	500	0.28	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
27a	0.38	Dirt biking/ATVing	4.3	1	100	0.090	2.0	**2.0**	**2.0**	29	20	290	205	2901	14	99
28	0.21	High-use general recreation, adult / older child	21	1	200	0.11	2.0	1.4	**2.0**	37	14	368	143	3684	27	63
28a	0.071	Dirt biking/ATVing	21	1	90	0.050	2.0	**2.0**	**2.0**	29	20	290	205	2901	14	99
29	0.34	Low-use general recreation, adult / older child	21	1	200	0.11	4.3	**4.3**	**4.3**	103	43	1029	429	10286	80	353
30	0.19	High-use general recreation, adult / older child	18	1	100	0.090	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
31	5.0	High-use general recreation, adult / older child	18	1	4000	2.5	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
31a	0.61	High-use general recreation, adult / older child	42	1	20	0.010	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
32	6.8	High-use general recreation, adult	50	1	6000	3.8	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
33	30	High-use general recreation, adult	21	1	28000	17	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
34	7.8	Medium-use general recreation, adult	27	1	9000	5.5	2.1	**2.1**	**2.1**	63	21	630	215	6305	58	234
35	25	High-use general recreation, adult / older child	22	1	22000	14	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
35a	1.2	High-use general recreation, adult / older child	44	1	1000	0.69	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
36a	16	Low-use commercial (groundskeeper scenario)	25	1	7000	4.1	8.0	**8.9**	**8.9**	166	89	1664	885	16642	126	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	1	2000	0.99	2.0	1.2	**2.0**	42	12	419	118	4195	43	348
37	20	High-use general recreation, adult / older child	18	1	14000	8.5	1.7	1.4	**2.0**	51	14	514	143	5143	27	176
37a	1.4	Bank fishing	61	1	2000	0.95	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
37b	2.3	High-use general recreation, adult / older child	27	1	2000	0.97	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
38	13	High-use general recreation, adult	23	1	10000	6.1	1.6	1.4	**2.0**	63	14	630	143	6305	38	234
38a	1.4	Bank fishing	71	1	2000	1.2	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
39	3.5	Marathon canoeist	30	1	3000	2.1	2.0	0.78	**2.0**	5.8	7.8	58	78	575	13	25
40	98	High-use general recreation, adult / older child	19	1	26000	16	1.5	1.4	**2.0**	37	14	368	143	3684	27	63

Table 7-42. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 7.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)								
								10^{-6} Cancer Risk			10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	RME*[6]	CTE	RME	CTE	RME	CTE	RME	CTE
40a	4.6	Bank fishing	120	1	6000	3.7	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
40b	1.1	High-use general recreation, adult / older child	11	1	200	0.090	2.0	1.4	**2.0**	37	14	368	143	3684	27	63
41	20	Medium-use general recreation, adult	27	1	17000	10	1.8	**2.1**	**2.1**	63	21	630	215	6305	58	234
41a	2.4	Bank fishing	53	1	3000	2.1	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
42	14	Medium-use general recreation, adult	32	1	10000	6.3	2.1	**2.1**	**2.1**	63	21	630	215	6305	58	234
42a	0.94	Bank fishing	25	1	1000	0.78	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
43	1.5	Medium-use general recreation, adult	27	1	1000	0.76	2.1	**2.1**	**2.1**	63	21	630	215	6305	58	234
43a	0.24	Bank fishing	69	1	200	0.14	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
44	2.2	High-use general recreation, adult	27	1	2000	1.4	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
45	17	High-use general recreation, adult	40	1	15000	9.5	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
46	7.2	High-use general recreation, adult	9.2	1	2000	1.5	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
47	1.0	Recreational canoeist	18	1	4.	0.0	2.0	1.2	**2.0**	13	12	129	121	1286	28	73
47_F	0.12	Recreational canoeist	8.0	1	500	0.30	2.0	1.2	**2.0**	13	12	129	121	1286	28	73
48	6.5	High-use general recreation, adult	3.4	1	1000	0.78	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
49	7.7	Low-use general recreation, adult	63	1	4000	2.5	4.3	**4.3**	**4.3**	126	43	1261	429	12610	115	468
50	69	Low-use general recreation, adult	7.4	1	4000	2.5	4.3	**4.3**	**4.3**	126	43	1261	429	12610	115	468
50a	11	Waterfowl hunting	21	1	4000	2.3	7.5	**9.0**	**9.0**	75	90	752	904	7518	140	399
51	87	Low-use general recreation, adult	7.1	1	5000	3.0	4.3	**4.3**	**4.3**	126	43	1261	429	12610	115	468
51a	32	Waterfowl hunting	23	1	14000	8.6	8.4	**9.0**	**9.0**	75	90	752	904	7518	140	399
52	0.9	Recreational canoeist	6.5	1	400	0.25	2.0	1.2	**2.0**	13	12	129	121	1286	28	73
53	0.7	Recreational canoeist	18	1	200	0.11	2.0	1.2	**2.0**	13	12	129	121	1286	28	73
54	13	High-use general recreation, adult	6.5	1	5000	3.2	1.9	1.4	**2.0**	63	14	630	143	6305	38	234
55	18	High-use general recreation, adult / older child	11	1	4000	2.3	2.0	1.4	**2.0**	37	14	368	143	3684	27	63
55a	5.0	Waterfowl hunting	42	1	3000	2.0	8.6	**9.0**	**9.0**	75	90	752	904	7518	140	399
56	32	Medium-use general recreation, adult / older child	37	1	6000	3.9	2.1	**2.1**	**2.1**	51	21	514	215	5143	40	176
56a	10	Waterfowl hunting	51	1	9000	5.5	9.0	**9.0**	**9.0**	75	90	752	904	7518	140	399
57	13	High-use general recreation, adult / older child	5.8	1	4000	2.4	2.0	1.4	**2.0**	37	14	368	143	3684	27	63
58	1.3	High-use general recreation, adult	65	1	600	0.34	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
59	1.9	High-use general recreation, adult / older child	18	1	800	0.47	2.0	1.4	**2.0**	37	14	368	143	3684	27	63
59a	0.83	Bank fishing	23	1	900	0.54	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
60	0.84	High-use general recreation, adult / older child	7.4	1	200	0.13	2.0	1.4	**2.0**	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	13	1	200	0.11	0.95	1.2	**2.0**	13	12	129	121	1286	28	73
61	3.3	Utility worker	42	1	2000	1.0	0.77	**17**	**17**	209	169	2093	1694	20933	242	718
62	1.6	Utility worker	280	1	700	0.46	5.4	**17**	**17**	209	169	2093	1694	20933	242	718
63	0.67	Utility worker	84	1	400	0.23	8.6	**17**	**17**	209	169	2093	1694	20933	242	718
64	0.61	Utility worker	42	1	500	0.30	1.5	**17**	**17**	209	169	2093	1694	20933	242	718
65	3.9	Utility worker	18	1	90	0.060	17	**17**	**17**	209	169	2093	1694	20933	242	718
66	1.7	Utility worker	25	1	100	0.070	5.6	**17**	**17**	209	169	2093	1694	20933	242	718
67	0.31	High-use general recreation, adult	11	1	300	0.17	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
68	0.090	High-use general recreation, adult	9.1	1	100	0.080	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
69	1.9	High-use general recreation, adult	9.9	1	1000	0.78	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
70	19	High-use general recreation, young child (high use)	3.1	1	2000	1.3	2.0	1.3	**2.0**	18	13	184	134	1842	4.6	32
70a	1.2	Bank fishing	5.8	1	900	0.58	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
71	1.8	Bank fishing	5.5	1	1000	0.68	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
72	2.3	Bank fishing	11	1	300	0.20	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	**2.0**	63	14	630	143	6305	38	234
74	5.3	High-use general recreation, adult	5.4	1	400	0.28	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
75	3.4	High-use general recreation, adult	15	1	1000	0.72	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	**2.0**	63	14	630	143	6305	38	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	**2.0**	63	14	630	143	6305	38	234
78	6.2	High-use general recreation, older child	3.9	1	200	0.14	3.8	**3.9**	**3.9**	51	39	514	388	5143	27	176
79	17	High-use general recreation, adult	3.1	1	3000	1.9	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
80a	9.5	Low-use general recreation, adult	7.7	1	800	0.49	3.9	**4.3**	**4.3**	126	43	1261	429	12610	115	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.12	1.2	**2.0**	42	12	419	118	4195	43	348

Table 7-42. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 7.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)								
								10^{-6} Cancer Risk			10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	RME*[6]	CTE	RME	CTE	RME	CTE	RME	CTE
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	**4.3**	**4.3**	126	43	1261	429	12610	115	468
82	15	Low-use general recreation, adult	7.7	1	3000	2.0	4.3	**4.3**	**4.3**	126	43	1261	429	12610	115	468
83	22	High-use commercial (groundskeeper scenario)	6.5	1	7000	4.6	2.0	1.8	**2.0**	17	18	166	177	1664	25	57
84	8.5	Low-use general recreation, adult	4.7	1	200	0.11	4.3	**4.3**	**4.3**	126	43	1261	429	12610	115	468
85a	0.25	Recreational canoeist	8.5	1	300	0.20	2.0	1.2	**2.0**	13	12	129	121	1286	28	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	**3.9**	**3.9**	51	39	514	388	5143	27	176
86	118	High-use commercial (groundskeeper scenario)	2.5	1	18000	11	2.0	1.8	**2.0**	17	18	166	177	1664	25	57
87	10	High-use general recreation, young child (high use)	15	1	15000	9.6	2.0	1.3	**2.0**	18	13	184	134	1842	4.6	32
87a	0.88	Bank fishing	9.1	1	700	0.46	2.6	**2.6**	**2.6**	52	26	524	256	5237	42	180
88	1.1	Medium-use general recreation, older child	13	1	1000	0.83	5.8	**5.8**	**5.8**	51	58	514	582	5143	40	176
89	4.3	High-use general recreation, adult	6.3	1	4000	2.6	2.0	1.4	**2.0**	63	14	630	143	6305	38	234
90	8.9	High-use general recreation, adult / older child	6.1	1	7000	4.4	2.0	1.4	**2.0**	51	14	514	143	5143	27	176
				Subtotal:	**504,200**	**313**										
Heavily Used Subareas																
Exposure Area ID[1]	**Area of Exposure Area (acre)[2]**	**IMPG Scenario**	**Pre-Remediation EPC (mg/kg)[3]**	**Removal[4]**			**Post-Remediation EPC (mg/kg)[3]**	**IMPG[5] (mg/kg)**								
								10^{-6} Cancer Risk			**10^{-5} Cancer Risk**		**10^{-4} Cancer Risk**		**Non-Cancer**	
				Depth (ft)	**Volume (cy)**	**Area (acre)**		**RME**	**RME*[6]**	**CTE**	**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**
4	0.71	High-use general recreation, adult / older child	67	3	600	0.20	0.64	1.4	**2.0**	37	14	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	11	3	3000	0.66	1.3	1.4	**2.0**	37	14	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	3	700	0.21	0.27	1.4	**2.0**	51	14	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.40	**2.0**	51	14	514	143	5143	27	176
39	0.15	Marathon canoeist	52	3	600	0.12	2.0	0.8	**2.0**	6	8	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	3	4000	0.73	1.4	1.4	**2.0**	37	14	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	0.62	1.2	**2.0**	13	12	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	3	1000	0.23	2.0	1.2	**2.0**	13	12	129	121	1286	28	73
53	0.35	Recreational canoeist	408	3	1000	0.34	0.80	1.2	**2.0**	13	12	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	0.59	1.4	**2.0**	63	14	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	3	90	0.010	0.70	1.4	**2.0**	37	14	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	3	200	0.070	0.84	1.2	**2.0**	13	12	129	121	1286	28	73
				Subtotal:	**11,300**	**2.5**										
				Total:	**515,500**	**316**										

Notes:

[1] See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.

[2] Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] For scenarios containing more than one receptor (e.g. adult and older child), the lowest IMPG was utilized in the comparison to post-remediation EPCs. The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

[6] RME = same as 10^{-6} RME IMPGs, with no values less than 2 mg/kg, for which this alternative was designed to achieve.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-43. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for agricultural products consumption areas under FP 7.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	1	1000	0.72	0.65	**0.68**	3.1	6.8	31	68	312	7.7	12.2	36.4	44.3
FA 2	3.3		14	1	1000	0.67	2.59	**2.59**	11.9	25.9	119	259	1187	29.1	46.4	138.1	168.3
FA 3	4.1		0.34	1	200	0.090	0.22	**0.29**	1.3	2.9	13	29	132	3.2	5.2	15.4	18.7
FA 4	64		0.38	1	29000	18	0.24	**0.24**	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 5	12		0.25	1	20000	12	0.02	**0.24**	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 6	8		0.25	1	9000	5.7	0.13	**0.24**	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 7	24		0.25	1	7000	4.4	0.13	**0.24**	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	**0.34**	1.5	3.4	15	34	154	3.8	6.0	17.9	21.8
FA 9	26		0.91	1	9000	5.6	0.31	**0.31**	1.4	3.1	14	31	143	3.5	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	**2.06**	9.5	20.6	95	206	946	23.2	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	**6.10**	27.9	61	279	610	2794	68.6	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	**0.38**	1.8	3.8	18	38	176	4.3	6.9	20.5	25.0
FA 13	4.0		0.25	1	700	4	0.02	**0.24**	1.1	2.4	11	24	110	2.7	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	**0.55**	2.5	5.5	25	55	253	6.2	9.9	29.4	35.9
				Total:	**83,000**	**51**											

Notes:

[1] See Figure 4-4 for farm areas in Reaches 5 through 8.

[2] Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for the top 1 ft of floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-44. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for amphibian averaging areas (vernal pools) under FP 7.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	1	3000	1.7	3.1	**3.27**	5.6
5-VP-1	0.044	1.7	---	---	---	1.7	**3.27**	5.6
8-VP-5	0.043	23	1	60	0.040	0.45	**3.27**	5.6
8-VP-4	0.24	3.9	1	20	0.010	3.27	**3.27**	5.6
8-VP-3	0.024	7.7	1	40	0.020	0.021	**3.27**	5.6
8-VP-2	0.57	69	---	---	---	3.1	**3.27**	5.6
18-VP-2	0.61	7.2	1	70	0.040	3.27	**3.27**	5.6
18-VP-1	0.28	8.1	1	200	0.11	3.27	**3.27**	5.6
19-VP-7	0.068	0.84	---	---	---	0.84	**3.27**	5.6
19-VP-2	0.0080	34	---	---	---	0.021	**3.27**	5.6
19-VP-1	0.18	32	1	200	0.13	3.27	**3.27**	5.6
19-VP-3	0.031	10	1	50	0.030	3.27	**3.27**	5.6
19-VP-4	0.094	6.0	1	200	0.10	0.021	**3.27**	5.6
19-VP-8	0.057	91	---	---	---	0.021	**3.27**	5.6
19-VP-5	0.51	45	1	500	0.31	3.27	**3.27**	5.6
19-VP-6	1.2	24	1	800	0.48	3.27	**3.27**	5.6
23-VP-2	0.18	47	1	200	0.10	3.27	**3.27**	5.6
23-VP-1	0.30	75	---	---	---	0.021	**3.27**	5.6
23A-VP-1	0.45	10	1	600	0.37	3.27	**3.27**	5.6
23B-VP-1	0.068	7.2	1	50	0.030	3.27	**3.27**	5.6
23B-VP-2	0.091	0.34	---	---	---	0.34	**3.27**	5.6
27B-VP-2	0.28	11	1	200	0.15	3.27	**3.27**	5.6
27B-VP-3	0.062	16	---	---	---	0.021	**3.27**	5.6
27B-VP-1	0.072	12	1	70	0.040	3.27	**3.27**	5.6
27-VP-2	0.47	21	1	300	0.18	3.27	**3.27**	5.6
27A-VP-1	0.20	31	1	300	0.16	3.27	**3.27**	5.6
27-VP-1	1.3	23	1	1000	0.83	3.27	**3.27**	5.6
26-VP-1	0.036	40	1	40	0.030	3.27	**3.27**	5.6
33-VP-1	0.022	9.5	---	---	---	0.021	**3.27**	5.6
33-VP-2	0.12	70	1	40	0.030	0.021	**3.27**	5.6
38-VP-1	0.43	36	1	200	0.11	3.27	**3.27**	5.6
38A-VP-1	0.020	5.0	1	30	0.020	0.021	**3.27**	5.6
38-VP-3	0.046	28	1	40	0.020	0.021	**3.27**	5.6
38-VP-2	0.17	46	1	200	0.10	3.1	**3.27**	5.6
40-VP-3	0.46	67	1	200	0.14	2.7	**3.27**	5.6
40-VP-2	0.36	18	1	400	0.24	3.27	**3.27**	5.6
40A-VP-1	0.11	68	1	200	0.10	3.27	**3.27**	5.6
40-VP-1	0.47	57	1	90	0.050	3.27	**3.27**	5.6
42-VP-1	0.22	64	1	10	0.010	2.8	**3.27**	5.6
42-VP-2	0.28	46	1	400	0.25	3.27	**3.27**	5.6
42-VP-3	0.050	41	1	70	0.040	0.021	**3.27**	5.6
42-VP-5	0.58	73	1	400	0.25	3.27	**3.27**	5.6
42-VP-4	1.0	34	1	1000	0.68	3.27	**3.27**	5.6
42A-VP-1	1.5	35	1	2000	1.1	3.27	**3.27**	5.6
46-VP-2	7.1	140	---	---	---	3.0	**3.27**	5.6
46-VP-1	0.52	1.3	---	---	---	1.3	**3.27**	5.6
46-VP-5	0.056	125	1	10	0.050	0.021	**3.27**	5.6
46-VP-3	1.4	153	1	300	0.16	3.27	**3.27**	5.6
46-VP-4	0.011	125	---	---	---	0.021	**3.27**	5.6
49A-VP-1	0.019	16	1	7.	0.0	0.021	**3.27**	5.6
49-VP-1	1.2	18	1	900	0.57	3.27	**3.27**	5.6
49B-VP-1	0.0044	26	---	---	---	0.021	**3.27**	5.6
66A-VP-1	0.032	0.73	---	---	---	0.73	**3.27**	5.6
69-VP-1	0.0074	12	---	---	---	0.021	**3.27**	5.6
8-VP-6	0.086	47	1	40	0.020	0.021	**3.27**	5.6
12-VP-1	0.080	14	1	100	0.070	0.021	**3.27**	5.6
39-VP-1	2.0	39	1	2000	1.4	2.3	**3.27**	5.6
54-VP-1	0.20	21	1	300	0.17	3.0	**3.27**	5.6
55-VP-1	0.59	7.6	1	4.	0.0	3.27	**3.27**	5.6
55A-VP-1	2.0	40	1	800	0.50	3.2	**3.27**	5.6
58A-VP-1	0.32	25	1	400	0.22	3.27	**3.27**	5.6
67A-VP-1	0.12	51	1	100	0.080	3.27	**3.27**	5.6
61A-VP-1	0.19	18	1	40	0.020	3.2	**3.27**	5.6
61A-VP-2	1.2	19	1	400	0.26	3.27	**3.27**	5.6
56A-VP-1	0.58	73	1	600	0.38	3.27	**3.27**	5.6
23-VP-3	1.3	22	1	1000	0.73	3.0	**3.27**	5.6
			Total:	**21,000**	**13**			

Notes:

[1] *See Figure 4-5 for locations of vernal pools.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-45. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for omnivorous/carnivorous mammal averaging areas under FP 7.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	3.3	**21.1**	34.3
G2	87	51	---	---	---	2.7	**21.1**	34.3
G3	86	19	---	---	---	3.5	**21.1**	34.3
G4	86	27	---	---	---	5.0	**21.1**	34.3
G5	88	28	---	---	---	6.3	**21.1**	34.3
G6	87	12	---	---	---	7.1	**21.1**	34.3
G7	73	18	---	---	---	8.3	**21.1**	34.3
			Total:	**0**	**0**			

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-46. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for insectivorous bird (wood duck) averaging areas under FP 7.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	3.4	**50**	39	29
K2		63	9.8	---	---	---	4.6	**50**	39	29
K3		85	53	---	---	---	2.7	**50**	39	29
K4		60	16	---	---	---	4.6	**50**	39	29
K5		25	22	---	---	---	6.0	**50**	39	29
K6	5B	55	25	---	---	---	5.7	**48**	33	18
K7		47	30	---	---	---	4.5	**48**	33	18
K8		92	24	---	---	---	4.7	**48**	33	18
K9	5C/5D	69	25	---	---	---	8.3	**53**	49	46
K10		83	13	---	---	---	7.4	**53**	49	46
K11		61	14	---	---	---	6.1	**53**	49	46
K12	6	28	23	---	---	---	11	**53**	50	46
				Total:	**0**	**0**				

Notes:

[1] *See Figure 4-7 for wood duck averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-47. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for piscivorous mammal (mink) averaging areas under FP 7.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	1.0	11000	6.7	3.4	**3.4**	16.6	*n/a*	5.12	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	6.7	**6.9**	19.6	3.0	15.7	*n/a*	11.8
			Total:	**11,000**	**6.7**							

Notes:

[1] *See Figure 4-8 for mink averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *(n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-49. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 8.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	---	---	---	6.3	2.1	51	**21**	514	215	5143	40	176
2	27	High-use general recreation, adult / older child	25	---	---	---	14	1.4	51	**14**	514	143	5143	27	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	21	12	103	116	1029	1165	10286	**80**	353
2b	2.0	High-use general recreation, older child	31	---	---	---	27	3.9	51	39	514	388	5143	**27**	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	**14**	630	143	6305	38	234
4	3.2	High-use general recreation, adult / older child	27	---	---	---	14	1.4	37	**14**	368	143	3684	27	63
5	2.5	High-use general recreation, adult / older child	58	---	---	---	14	1.4	51	**14**	514	143	5143	27	176
6	3.8	Low-use general recreation, adult	75	---	---	---	25	4.3	126	**43**	1261	429	12610	115	468
7	5.9	High-use general recreation, adult / older child	25	---	---	---	14	1.4	51	**14**	514	143	5143	27	176
8	0.60	Recreational canoeist	40	---	---	---	12	1.2	13	**12**	129	121	1286	28	73
9	0.042	Low-use general recreation, older child	27	---	---	---	27	12	103	116	1029	1165	10286	**80**	353
10	59	High-use general recreation, young child (high use)	10	---	---	---	4.6	1.3	18	13	184	134	1842	**4.6**	32
10a	8.0	High-use general recreation, young child (high use)	22	---	---	---	4.5	1.3	18	13	184	134	1842	**4.6**	32
11	2.5	High-use general recreation, adult	18	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
12	4.8	High-use general recreation, adult / older child	14	---	---	---	5.3	1.4	37	**14**	368	143	3684	27	63
13	5.9	High-use general recreation, adult	28	---	---	---	13	1.4	63	**14**	630	143	6305	38	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.6	1.4	63	**14**	630	143	6305	38	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	**14**	630	143	6305	38	234
16	2.5	High-use general recreation, adult	41	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
17	8.5	High-use general recreation, adult	15	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
18	17	Medium-use general recreation, adult	46	---	---	---	19	2.1	63	**21**	630	215	6305	58	234
19	36	High-use general recreation, adult	83	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
20	9.1	High-use general recreation, adult	34	---	---	---	9	1.4	63	**14**	630	143	6305	38	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5	1.4	51	**14**	514	143	5143	27	176
22	19	High-use general recreation, adult / older child	28	---	---	---	13	1.4	51	**14**	514	143	5143	27	176
22a	1.8	Dirt biking/ATVing	93	---	---	---	8.2	2.0	29	20	290	205	2901	**14**	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	10	5.8	51	58	514	582	5143	**40**	176
24	10	High-use general recreation, adult	31	---	---	---	12	1.4	63	**14**	630	143	6305	38	234
25	0.51	High-use general recreation, older child	30	---	---	---	16	3.9	51	**39**	514	388	5143	**27**	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	6.9	1.4	51	**14**	514	143	5143	27	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	**12**	419	118	4195	43	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	6	1.4	51	14	514	143	5143	**27**	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	**14**	514	143	5143	27	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	**14**	99
28	0.21	High-use general recreation, adult / older child	21	---	---	---	13	1.4	37	**14**	368	143	3684	27	63
28a	0.071	Dirt biking/ATVing	21	---	---	---	4.3	2.0	29	20	290	205	2901	**14**	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	**43**	1029	429	10286	80	353
30	0.19	High-use general recreation, adult / older child	18	---	---	---	14	1.4	51	**14**	514	143	5143	27	176
31	5.0	High-use general recreation, adult / older child	18	---	---	---	14	1.4	51	**14**	514	143	5143	27	176
31a	0.61	High-use general recreation, adult / older child	42	---	---	---	3.9	1.4	51	**14**	514	143	5143	27	176
32	6.8	High-use general recreation, adult	50	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
33	30	High-use general recreation, adult	21	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
34	7.8	Medium-use general recreation, adult	27	---	---	---	18	2.1	63	**21**	630	215	6305	58	234
35	25	High-use general recreation, adult / older child	22	---	---	---	14	1.4	51	**14**	514	143	5143	27	176
35a	1.2	High-use general recreation, adult / older child	44	---	---	---	4.4	1.4	51	**14**	514	143	5143	27	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	24	8.9	166	**89**	1664	885	16642	126	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	---	---	---	12	1.2	42	**12**	419	118	4195	43	348
37	20	High-use general recreation, adult / older child	18	---	---	---	12	1.4	51	**14**	514	143	5143	27	176
37a	1.4	Bank fishing	61	---	---	---	26	2.6	52	**26**	524	256	5237	42	180
37b	2.3	High-use general recreation, adult / older child	27	---	---	---	4.3	1.4	51	**14**	514	143	5143	27	176
38	13	High-use general recreation, adult	23	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
38a	1.4	Bank fishing	71	---	---	---	18	2.6	52	**26**	524	256	5237	42	180

Table 7-49. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 8.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
39	3.5	Marathon canoeist	30	---	---	---	6.3	0.78	5.8	**7.8**	58	78	575	13	25
40	98	High-use general recreation, adult / older child	19	---	---	---	4.9	1.4	37	**14**	368	143	3684	27	63
40a	4.6	Bank fishing	120	---	---	---	22	2.6	52	**26**	524	256	5237	42	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	**14**	368	143	3684	27	63
41	20	Medium-use general recreation, adult	27	---	---	---	20	2.1	63	**21**	630	215	6305	58	234
41a	2.4	Bank fishing	53	---	---	---	25	2.6	52	**26**	524	256	5237	42	180
42	14	Medium-use general recreation, adult	32	---	---	---	21	2.1	63	**21**	630	215	6305	58	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	**26**	524	256	5237	42	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	6.3	2.1	63	**21**	630	215	6305	58	234
43a	0.24	Bank fishing	69	---	---	---	6.7	2.6	52	**26**	524	256	5237	42	180
44	2.2	High-use general recreation, adult	27	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
45	17	High-use general recreation, adult	40	---	---	---	11	1.4	63	**14**	630	143	6305	38	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	8.7	1.4	63	**14**	630	143	6305	38	234
47	1.0	Recreational canoeist	18	---	---	---	12	1.2	13	**12**	129	121	1286	28	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8	1.2	13	**12**	129	121	1286	28	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	3.4	1.4	63	**14**	630	143	6305	38	234
49	7.7	Low-use general recreation, adult	63	---	---	---	33	4.3	126	**43**	1261	429	12610	115	468
50	69	Low-use general recreation, adult	7.4	---	---	---	5.9	4.3	126	**43**	1261	429	12610	115	468
50a	11	Waterfowl hunting	21	---	---	---	15	9.0	75	**90**	752	904	7518	140	399
51	87	Low-use general recreation, adult	7.1	---	---	---	6.7	4.3	126	**43**	1261	429	12610	115	468
51a	32	Waterfowl hunting	23	---	---	---	20	9.0	75	**90**	752	904	7518	140	399
52	0.9	Recreational canoeist	6.5	---	---	---	5.9	1.2	13	**12**	129	121	1286	28	73
53	0.7	Recreational canoeist	18	---	---	---	6.1	1.2	13	**12**	129	121	1286	28	73
54	13	High-use general recreation, adult	6.5	---	---	---	5	1.4	63	**14**	630	143	6305	38	234
55	18	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	**14**	368	143	3684	27	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	**90**	752	904	7518	140	399
56	32	Medium-use general recreation, adult / older child	37	---	---	---	21	2.1	51	**21**	514	215	5143	40	176
56a	10	Waterfowl hunting	51	---	---	---	45	9.0	75	**90**	752	904	7518	140	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	5.6	1.4	37	**14**	368	143	3684	27	63
58	1.3	High-use general recreation, adult	65	---	---	---	3.6	1.4	63	**14**	630	143	6305	38	234
59	1.9	High-use general recreation, adult / older child	18	---	---	---	14	1.4	37	**14**	368	143	3684	27	63
59a	0.83	Bank fishing	23	---	---	---	18	2.6	52	**26**	524	256	5237	42	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	**14**	368	143	3684	27	63
60a	0.16	Recreational canoeist	13	---	---	---	12	1.2	13	**12**	129	121	1286	28	73
61	3.3	Utility worker	42	---	---	---	23	17	209	**169**	2093	1694	20933	242	718
62	1.6	Utility worker	280	---	---	---	37	17	209	**169**	2093	1694	20933	242	718
63	0.67	Utility worker	84	---	---	---	24	17	209	**169**	2093	1694	20933	242	718
64	0.61	Utility worker	42	---	---	---	3.9	17	209	**169**	2093	1694	20933	242	718
65	3.9	Utility worker	18	---	---	---	17	17	209	**169**	2093	1694	20933	242	718
66	1.7	Utility worker	25	---	---	---	11	17	209	**169**	2093	1694	20933	242	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	**14**	630	143	6305	38	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	**14**	630	143	6305	38	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	**14**	630	143	6305	38	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	2.9	1.3	18	13	184	134	1842	**4.6**	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	**26**	524	256	5237	42	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	**26**	524	256	5237	42	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	**26**	524	256	5237	42	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.5	1.4	63	**14**	630	143	6305	38	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	**14**	630	143	6305	38	234
75	3.4	High-use general recreation, adult	15	---	---	---	14	1.4	63	**14**	630	143	6305	38	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	**14**	630	143	6305	38	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	**14**	630	143	6305	38	234

Table 7-49. Summary of IMPGs and pre- and post-remediation EPCs for human direct contact exposure areas under FP 8.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	**27**	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	**14**	630	143	6305	38	234
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	**43**	1261	429	12610	115	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	**12**	419	118	4195	43	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	**43**	1261	429	12610	115	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	**43**	1261	429	12610	115	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	**18**	166	177	1664	25	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	**43**	1261	429	12610	115	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	**12**	129	121	1286	28	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	**27**	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	**18**	166	177	1664	25	57
87	10	High-use general recreation, young child (high use)	15	---	---	---	4.6	1.3	18	13	184	134	1842	**4.6**	32
87a	0.88	Bank fishing	9.1	---	---	---	6.6	2.6	52	**26**	524	256	5237	42	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	**40**	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	**14**	630	143	6305	38	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	**14**	514	143	5143	27	176

Heavily Used Subareas

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
4	0.71	High-use general recreation, adult / older child	67	---	---	---	9.3	1.4	37	**14**	368	143	3684	27	63
12	1.5	High-use general recreation, adult / older child	15	---	---	---	11	1.4	37	**14**	368	143	3684	27	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	**14**	514	143	5143	27	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.40	51	**14**	514	143	5143	27	176
39	0.15	Marathon canoeist	52	---	---	---	4.9	0.8	6	**8**	58	78	575	13	25
40	5.2	High-use general recreation, adult / older child	90	---	---	---	3.5	1.4	37	**14**	368	143	3684	27	63
47	0.18	Recreational canoeist	6.4	---	---	---	0.61	1.2	13	**12**	129	121	1286	28	73
52	0.25	Recreational canoeist	6.6	---	---	---	4.4	1.2	13	**12**	129	121	1286	28	73
53	0.35	Recreational canoeist	408	---	---	---	5.2	1.2	13	**12**	129	121	1286	28	73
58	0.16	High-use general recreation, adult	22	---	---	---	0.59	1.4	63	**14**	630	143	6305	38	234
59	0.15	High-use general recreation, adult / older child	28	---	---	---	1.8	1.4	37	**14**	368	143	3684	27	63
60a	0.16	Recreational canoeist	7.4	---	---	---	7.2	1.2	13	**12**	129	121	1286	28	73

Notes:

[1] See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.

[2] Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.

[4] Removal volumes not shown by exposure/averaging areas for FP 8 since alternative is a combination risk-based and threshold-based alternative.

[5] For scenarios containing more than one receptor (e.g. adult and older child), the lowest IMPG was utilized in the comparison to post-remediation EPCs. The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-50. Summary of IMPGs and pre- and post-remediation EPCs for agricultural products consumption areas under FP 8.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.78	0.68	3.1	**6.8**	31	68	312	7.7	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	13	2.59	11.9	**25.9**	119	259	1187	29.1	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	**2.9**	13	29	132	3.2	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	**3.4**	15	34	154	3.8	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	**3.1**	14	31	143	3.5	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	**20.6**	95	206	946	23.2	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	**61**	279	610	2794	68.6	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	**3.8**	18	38	176	4.3	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	**2.4**	11	24	110	2.7	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	**5.5**	25	55	253	6.2	9.9	29.4	35.9

Notes:

[1] *See Figure 4-4 for farm areas in Reaches 5 through 8.*

[2] *Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).*

[3] *EPC is calculated for the top 1 ft of floodplain soil.*

[4] *Removal volumes not shown by exposure/averaging areas for FP 8 since alternative is a combination risk-based and threshold-based alternative.*

[5] *IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-51. Summary of IMPGs and pre- and post-remediation EPCs for amphibian averaging areas (vernal pools) under FP 8.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	---	---	---	3.27	**3.27**	5.6
5-VP-1	0.044	1.7	---	---	---	1.7	**3.27**	5.6
8-VP-5	0.043	23	---	---	---	0.45	**3.27**	5.6
8-VP-4	0.24	3.9	---	---	---	3.27	**3.27**	5.6
8-VP-3	0.024	7.7	---	---	---	0.021	**3.27**	5.6
8-VP-2	0.57	69	---	---	---	3.2	**3.27**	5.6
18-VP-2	0.61	7.2	---	---	---	3.0	**3.27**	5.6
18-VP-1	0.28	8.1	---	---	---	3.27	**3.27**	5.6
19-VP-7	0.068	0.84	---	---	---	0.84	**3.27**	5.6
19-VP-2	0.0080	34	---	---	---	0.021	**3.27**	5.6
19-VP-1	0.18	32	---	---	---	2.4	**3.27**	5.6
19-VP-3	0.031	10	---	---	---	2.8	**3.27**	5.6
19-VP-4	0.094	6.0	---	---	---	0.021	**3.27**	5.6
19-VP-8	0.057	91	---	---	---	0.021	**3.27**	5.6
19-VP-5	0.51	45	---	---	---	3.27	**3.27**	5.6
19-VP-6	1.2	24	---	---	---	3.27	**3.27**	5.6
23-VP-2	0.18	47	---	---	---	0.76	**3.27**	5.6
23-VP-1	0.30	75	---	---	---	2.2	**3.27**	5.6
23A-VP-1	0.45	10	---	---	---	3.27	**3.27**	5.6
23B-VP-1	0.068	7.2	---	---	---	3.27	**3.27**	5.6
23B-VP-2	0.091	0.34	---	---	---	0.34	**3.27**	5.6
27B-VP-2	0.28	11	---	---	---	3.27	**3.27**	5.6
27B-VP-3	0.062	16	---	---	---	0.021	**3.27**	5.6
27B-VP-1	0.072	12	---	---	---	3.27	**3.27**	5.6
27-VP-2	0.47	21	---	---	---	3.27	**3.27**	5.6
27A-VP-1	0.20	31	---	---	---	3.27	**3.27**	5.6
27-VP-1	1.3	23	---	---	---	3.27	**3.27**	5.6
26-VP-1	0.036	40	---	---	---	1.4	**3.27**	5.6
33-VP-1	0.022	9.5	---	---	---	0.021	**3.27**	5.6
33-VP-2	0.12	70	---	---	---	0.021	**3.27**	5.6
38-VP-1	0.43	36	---	---	---	3.27	**3.27**	5.6
38A-VP-1	0.020	5.0	---	---	---	0.021	**3.27**	5.6
38-VP-3	0.046	28	---	---	---	0.021	**3.27**	5.6
38-VP-2	0.17	46	---	---	---	3.1	**3.27**	5.6
40-VP-3	0.46	67	---	---	---	2.7	**3.27**	5.6
40-VP-2	0.36	18	---	---	---	3.27	**3.27**	5.6
40A-VP-1	0.11	68	---	---	---	3.27	**3.27**	5.6
40-VP-1	0.47	57	---	---	---	3.27	**3.27**	5.6
42-VP-1	0.22	64	---	---	---	2.8	**3.27**	5.6
42-VP-2	0.28	46	---	---	---	3.27	**3.27**	5.6
42-VP-3	0.050	41	---	---	---	0.021	**3.27**	5.6
42-VP-5	0.58	73	---	---	---	3.27	**3.27**	5.6
42-VP-4	1.0	34	---	---	---	3.27	**3.27**	5.6
42A-VP-1	1.5	35	---	---	---	3.27	**3.27**	5.6
46-VP-2	7.1	140	---	---	---	3.27	**3.27**	5.6
46-VP-1	0.52	1.3	---	---	---	1.3	**3.27**	5.6
46-VP-5	0.056	125	---	---	---	0.021	**3.27**	5.6
46-VP-3	1.4	153	---	---	---	3.2	**3.27**	5.6
46-VP-4	0.011	125	---	---	---	0.021	**3.27**	5.6
49A-VP-1	0.019	16	---	---	---	0.021	**3.27**	5.6
49-VP-1	1.2	18	---	---	---	3.27	**3.27**	5.6
49B-VP-1	0.0044	26	---	---	---	0.021	**3.27**	5.6
66A-VP-1	0.032	0.73	---	---	---	0.73	**3.27**	5.6
69-VP-1	0.0074	12	---	---	---	0.021	**3.27**	5.6
8-VP-6	0.086	47	---	---	---	0.021	**3.27**	5.6
12-VP-1	0.080	14	---	---	---	0.021	**3.27**	5.6
39-VP-1	2.0	39	---	---	---	2.3	**3.27**	5.6
54-VP-1	0.20	21	---	---	---	3.0	**3.27**	5.6
55-VP-1	0.59	7.6	---	---	---	3.27	**3.27**	5.6
55A-VP-1	2.0	40	---	---	---	3.2	**3.27**	5.6
58A-VP-1	0.32	25	---	---	---	3.27	**3.27**	5.6
67A-VP-1	0.12	51	---	---	---	3.27	**3.27**	5.6
61A-VP-1	0.19	18	---	---	---	3.2	**3.27**	5.6
61A-VP-2	1.2	19	---	---	---	3.27	**3.27**	5.6
56A-VP-1	0.58	73	---	---	---	2.7	**3.27**	5.6
23-VP-3	1.3	22	---	---	---	3.0	**3.27**	5.6

Notes:

[1] See Figure 4-5 for locations of vernal pools.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] Removal volumes not shown by exposure/averaging areas for FP 8 since alternative is a combination risk-based and threshold-based alternative.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-52. Summary of IMPGs and pre- and post-remediation EPCs for omnivorous/carnivorous mammal averaging areas under FP 8.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	9.9	21.1	34.3
G2	87	51	---	---	---	11	21.1	34.3
G3	86	19	---	---	---	13	21.1	34.3
G4	86	27	---	---	---	18	21.1	34.3
G5	88	28	---	---	---	10	21.1	34.3
G6	87	12	---	---	---	9.3	21.1	34.3
G7	73	18	---	---	---	12	21.1	34.3

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes not shown by exposure/averaging areas for FP 8 since alternative is a combination risk-based and threshold-based alternative.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-53. Summary of IMPGs and pre- and post-remediation EPCs for insectivorous bird (wood duck) averaging areas under FP 8.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	13	50	39	29
K2		63	9.8	---	---	---	6.7	50	39	29
K3		85	53	---	---	---	11	50	39	29
K4		60	16	---	---	---	11	50	39	29
K5		25	22	---	---	---	14	50	39	29
K6	5B	55	25	---	---	---	18	48	33	18
K7		47	30	---	---	---	15	48	33	18
K8		92	24	---	---	---	11	48	33	18
K9	5C/5D	69	25	---	---	---	12	53	49	46
K10		83	13	---	---	---	9.5	53	49	46
K11		61	14	---	---	---	11	53	49	46
K12	6	28	23	---	---	---	12	53	50	46

Notes:

[1] *See Figure 4-7 for wood duck averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes not shown by exposure/averaging areas for FP 8 since alternative is a combination risk-based and threshold-based alternative.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-54. Summary of IMPGs and pre- and post-remediation EPCs for piscivorous mammal (mink) averaging areas under FP 8.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	---	---	---	12	3.4	16.6	*n/a*	5.12	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	9.8	6.9	19.6	3.0	15.7	*n/a*	11.8

Notes:

[1] *See Figure 4-8 for mink averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *Removal volumes not shown by exposure/averaging areas for FP 8 since alternative is a combination risk-based and threshold-based alternative.*

[4] *(n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-56. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 9.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
1	15	Medium-use general recreation, adult / older child	32	---	---	---	32	2.1	51	21	514	215	5143	**40**	176
2	27	High-use general recreation, adult / older child	25	---	---	---	25	1.4	51	14	514	143	5143	**27**	176
2a	2.3	Low-use general recreation, older child	52	---	---	---	51	12	103	116	1029	1165	10286	**80**	353
2b	2.0	High-use general recreation, older child	31	1	40	0.02	27	3.9	51	39	514	388	5143	**27**	176
3	0.38	High-use general recreation, adult	7.8	---	---	---	7.8	1.4	63	14	630	143	6305	**38**	234
4	3.2	High-use general recreation, adult / older child	27	1	7	0	26	1.4	37	14	368	143	3684	**27**	63
5	2.5	High-use general recreation, adult / older child	58	1	500	0.28	27	1.4	51	14	514	143	5143	**27**	176
6	3.8	Low-use general recreation, adult	75	---	---	---	75	4.3	126	43	1261	429	12610	**115**	468
7	5.9	High-use general recreation, adult / older child	25	---	---	---	25	1.4	51	14	514	143	5143	**27**	176
8	0.60	Recreational canoeist	40	1	80	0.05	28	1.2	13	12	129	121	1286	**28**	73
9	0.042	Low-use general recreation, older child	27	---	---	---	27	12	103	116	1029	1165	10286	**80**	353
10	59	High-use general recreation, young child (high use)	10	1	8000	5.3	4.6	1.3	18	13	184	134	1842	**4.6**	32
10a	8.0	High-use general recreation, young child (high use)	22	1	400	0.23	4.5	1.3	18	13	184	134	1842	**4.6**	32
11	2.5	High-use general recreation, adult	18	---	---	---	18	1.4	63	14	630	143	6305	**38**	234
12	4.8	High-use general recreation, adult / older child	14	---	---	---	14	1.4	37	14	368	143	3684	**27**	63
13	5.9	High-use general recreation, adult	28	---	---	---	28	1.4	63	14	630	143	6305	**38**	234
14	4.1	High-use general recreation, adult	2.7	---	---	---	2.7	1.4	63	14	630	143	6305	**38**	234
15	0.87	High-use general recreation, adult	2.2	---	---	---	2.2	1.4	63	14	630	143	6305	**38**	234
16	2.5	High-use general recreation, adult	41	1	400	0.24	38	1.4	63	14	630	143	6305	**38**	234
17	8.5	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	**38**	234
18	17	Medium-use general recreation, adult	46	---	---	---	46	2.1	63	21	630	215	6305	**58**	234
19	36	High-use general recreation, adult	83	1	800	0.52	38	1.4	63	14	630	143	6305	**38**	234
20	9.1	High-use general recreation, adult	34	---	---	---	34	1.4	63	14	630	143	6305	**38**	234
21	2.9	High-use general recreation, adult / older child	5.7	---	---	---	5.7	1.4	51	14	514	143	5143	**27**	176
22	19	High-use general recreation, adult / older child	28	---	---	---	26	1.4	51	14	514	143	5143	**27**	176
22a	1.8	Dirt biking/ATVing	93	1	3000	1.6	8.2	2.0	29	20	290	205	2901	**14**	99
23	0.28	Medium-use general recreation, older child	11	---	---	---	11	5.8	51	58	514	582	5143	**40**	176
24	10	High-use general recreation, adult	31	---	---	---	31	1.4	63	14	630	143	6305	**38**	234
25	0.51	High-use general recreation, older child	30	1	90	0.05	27	3.9	51	39	514	388	5143	**27**	176
26a	48	High-use general recreation, adult / older child	7.0	---	---	---	7.0	1.4	51	14	514	143	5143	**27**	176
26b	7.6	Agricultural use (based on direct contact by farmer)	1.3	---	---	---	1.3	1.2	42	12	419	118	4195	**43**	348
26_F	55	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	**27**	176
27	6.3	High-use general recreation, adult / older child	2.5	---	---	---	2.5	1.4	51	14	514	143	5143	**27**	176
27a	0.38	Dirt biking/ATVing	4.3	---	---	---	4.3	2.0	29	20	290	205	2901	**14**	99
28	0.21	High-use general recreation, adult / older child	21	---	---	---	21	1.4	37	14	368	143	3684	**27**	63
28a	0.071	Dirt biking/ATVing	21	1	40	0.02	4.3	2.0	29	20	290	205	2901	**14**	99
29	0.34	Low-use general recreation, adult / older child	21	---	---	---	21	4.3	103	43	1029	429	10286	**80**	353
30	0.19	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	**27**	176
31	5.0	High-use general recreation, adult / older child	18	---	---	---	17	1.4	51	14	514	143	5143	**27**	176
31a	0.61	High-use general recreation, adult / older child	42	1	200	0.11	25	1.4	51	14	514	143	5143	**27**	176
32	6.8	High-use general recreation, adult	50	1	1000	0.67	38	1.4	63	14	630	143	6305	**38**	234
33	30	High-use general recreation, adult	21	---	---	---	21	1.4	63	14	630	143	6305	**38**	234
34	7.8	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	**58**	234
35	25	High-use general recreation, adult / older child	22	---	---	---	22	1.4	51	14	514	143	5143	**27**	176
35a	1.2	High-use general recreation, adult / older child	44	1	50	0.03	27	1.4	51	14	514	143	5143	**27**	176
36a	16	Low-use commercial (groundskeeper scenario)	25	---	---	---	25	8.9	166	89	1664	885	16642	**126**	571
36b	2.2	Agricultural use (based on direct contact by farmer)	15	---	---	---	15	1.2	42	12	419	118	4195	**43**	348
37	20	High-use general recreation, adult / older child	18	---	---	---	18	1.4	51	14	514	143	5143	**27**	176
37a	1.4	Bank fishing	61	1	100	0.07	42	2.6	52	26	524	256	5237	**42**	180
37b	2.3	High-use general recreation, adult / older child	27	---	---	---	24	1.4	51	14	514	143	5143	**27**	176
38	13	High-use general recreation, adult	23	---	---	---	22	1.4	63	14	630	143	6305	**38**	234
38a	1.4	Bank fishing	71	1	200	0.1	42	2.6	52	26	524	256	5237	**42**	180

Table 7-56. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 9.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
39	3.5	Marathon canoeist	30	1	900	0.54	13	0.78	5.8	7.8	58	78	575	**13**	25
40	98	High-use general recreation, adult / older child	19	---	---	---	19	1.4	37	14	368	143	3684	**27**	63
40a	4.6	Bank fishing	120	1	400	0.26	42	2.6	52	26	524	256	5237	**42**	180
40b	1.1	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	**27**	63
41	20	Medium-use general recreation, adult	27	---	---	---	26	2.1	63	21	630	215	6305	**58**	234
41a	2.4	Bank fishing	53	1	100	0.07	42	2.6	52	26	524	256	5237	**42**	180
42	14	Medium-use general recreation, adult	32	---	---	---	32	2.1	63	21	630	215	6305	**58**	234
42a	0.94	Bank fishing	25	---	---	---	25	2.6	52	26	524	256	5237	**42**	180
43	1.5	Medium-use general recreation, adult	27	---	---	---	27	2.1	63	21	630	215	6305	**58**	234
43a	0.24	Bank fishing	69	1	10	0.01	32	2.6	52	26	524	256	5237	**42**	180
44	2.2	High-use general recreation, adult	27	---	---	---	27	1.4	63	14	630	143	6305	**38**	234
45	17	High-use general recreation, adult	40	1	200	0.14	38	1.4	63	14	630	143	6305	**38**	234
46	7.2	High-use general recreation, adult	9.2	---	---	---	9.2	1.4	63	14	630	143	6305	**38**	234
47	1.0	Recreational canoeist	18	---	---	---	18	1.2	13	12	129	121	1286	**28**	73
47_F	0.12	Recreational canoeist	8.0	---	---	---	8.0	1.2	13	12	129	121	1286	**28**	73
48	6.5	High-use general recreation, adult	3.4	---	---	---	3.4	1.4	63	14	630	143	6305	**38**	234
49	7.7	Low-use general recreation, adult	63	---	---	---	63	4.3	126	43	1261	429	12610	**115**	468
50	69	Low-use general recreation, adult	7.4	---	---	---	7.4	4.3	126	43	1261	429	12610	**115**	468
50a	11	Waterfowl hunting	21	---	---	---	21	9.0	75	90	752	904	7518	**140**	399
51	87	Low-use general recreation, adult	7.1	---	---	---	7.1	4.3	126	43	1261	429	12610	**115**	468
51a	32	Waterfowl hunting	23	---	---	---	23	9.0	75	90	752	904	7518	**140**	399
52	0.9	Recreational canoeist	6.5	---	---	---	6.5	1.2	13	12	129	121	1286	**28**	73
53	0.7	Recreational canoeist	18	---	---	---	15	1.2	13	12	129	121	1286	**28**	73
54	13	High-use general recreation, adult	6.5	---	---	---	6.5	1.4	63	14	630	143	6305	**38**	234
55	18	High-use general recreation, adult / older child	11	---	---	---	11	1.4	37	14	368	143	3684	**27**	63
55a	5.0	Waterfowl hunting	42	---	---	---	42	9.0	75	90	752	904	7518	**140**	399
56	32	Medium-use general recreation, adult / older child	37	---	---	---	37	2.1	51	21	514	215	5143	**40**	176
56a	10	Waterfowl hunting	51	---	---	---	51	9.0	75	90	752	904	7518	**140**	399
57	13	High-use general recreation, adult / older child	5.8	---	---	---	5.8	1.4	37	14	368	143	3684	**27**	63
58	1.3	High-use general recreation, adult	65	1	100	0.08	37	1.4	63	14	630	143	6305	**38**	234
59	1.9	High-use general recreation, adult / older child	18	---	---	---	18	1.4	37	14	368	143	3684	**27**	63
59a	0.83	Bank fishing	23	---	---	---	23	2.6	52	26	524	256	5237	**42**	180
60	0.84	High-use general recreation, adult / older child	7.4	---	---	---	7.4	1.4	37	14	368	143	3684	**27**	63
60a	0.16	Recreational canoeist	13	---	---	---	13	1.2	13	12	129	121	1286	**28**	73
61	3.3	Utility worker	42	---	---	---	42	17	209	169	2093	1694	20933	**242**	718
62	1.6	Utility worker	280	---	---	---	68	17	209	169	2093	1694	20933	**242**	718
63	0.67	Utility worker	84	---	---	---	84	17	209	169	2093	1694	20933	**242**	718
64	0.61	Utility worker	42	---	---	---	25	17	209	169	2093	1694	20933	**242**	718
65	3.9	Utility worker	18	---	---	---	18	17	209	169	2093	1694	20933	**242**	718
66	1.7	Utility worker	25	---	---	---	24	17	209	169	2093	1694	20933	**242**	718
67	0.31	High-use general recreation, adult	11	---	---	---	11	1.4	63	14	630	143	6305	**38**	234
68	0.090	High-use general recreation, adult	9.1	---	---	---	9.1	1.4	63	14	630	143	6305	**38**	234
69	1.9	High-use general recreation, adult	9.9	---	---	---	9.9	1.4	63	14	630	143	6305	**38**	234
70	19	High-use general recreation, young child (high use)	3.1	---	---	---	3.1	1.3	18	13	184	134	1842	**4.6**	32
70a	1.2	Bank fishing	5.8	---	---	---	5.8	2.6	52	26	524	256	5237	**42**	180
71	1.8	Bank fishing	5.5	---	---	---	5.5	2.6	52	26	524	256	5237	**42**	180
72	2.3	Bank fishing	11	---	---	---	11	2.6	52	26	524	256	5237	**42**	180
73	3.9	High-use general recreation, adult	0.50	---	---	---	0.50	1.4	63	14	630	143	6305	**38**	234
74	5.3	High-use general recreation, adult	5.4	---	---	---	5.4	1.4	63	14	630	143	6305	**38**	234
75	3.4	High-use general recreation, adult	15	---	---	---	15	1.4	63	14	630	143	6305	**38**	234
76	1.1	High-use general recreation, adult	0.79	---	---	---	0.79	1.4	63	14	630	143	6305	**38**	234
77	4.2	High-use general recreation, adult	1.2	---	---	---	1.2	1.4	63	14	630	143	6305	**38**	234

Table 7-56. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for human direct contact exposure areas under FP 9.

Exposure Area ID[1]	Area of Exposure Area (acre)[2]	IMPG Scenario	Pre-Remediation EPC (mg/kg)[3]	Removal[4]			Post-Remediation EPC (mg/kg)[3]	IMPG[5] (mg/kg)							
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer	
				Depth (ft)	Volume (cy)	Area (acre)		RME	CTE	RME	CTE	RME	CTE	RME	CTE
78	6.2	High-use general recreation, older child	3.9	---	---	---	3.9	3.9	51	39	514	388	5143	**27**	176
79	17	High-use general recreation, adult	3.1	---	---	---	3.1	1.4	63	14	630	143	6305	**38**	234
80a	9.5	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	**115**	468
80b	20	Agricultural use (based on direct contact by farmer)	0.77	---	---	---	0.77	1.2	42	12	419	118	4195	**43**	348
81	33	Low-use general recreation, adult	2.3	---	---	---	2.3	4.3	126	43	1261	429	12610	**115**	468
82	15	Low-use general recreation, adult	7.7	---	---	---	7.7	4.3	126	43	1261	429	12610	**115**	468
83	22	High-use commercial (groundskeeper scenario)	6.5	---	---	---	6.5	1.8	17	18	166	177	1664	**25**	57
84	8.5	Low-use general recreation, adult	4.7	---	---	---	4.7	4.3	126	43	1261	429	12610	**115**	468
85a	0.25	Recreational canoeist	8.5	---	---	---	8.5	1.2	13	12	129	121	1286	**28**	73
85b	10	High-use general recreation, older child	1.9	---	---	---	1.9	3.9	51	39	514	388	5143	**27**	176
86	118	High-use commercial (groundskeeper scenario)	2.5	---	---	---	2.5	1.8	17	18	166	177	1664	**25**	57
87	10	High-use general recreation, young child (high use)	15	1	4000	2.3	4.6	1.3	18	13	184	134	1842	**4.6**	32
87a	0.88	Bank fishing	9.1	---	---	---	6.6	2.6	52	26	524	256	5237	**42**	180
88	1.1	Medium-use general recreation, older child	13	---	---	---	13	5.8	51	58	514	582	5143	**40**	176
89	4.3	High-use general recreation, adult	6.3	---	---	---	6.3	1.4	63	14	630	143	6305	**38**	234
90	8.9	High-use general recreation, adult / older child	6.1	---	---	---	6.1	1.4	51	14	514	143	5143	**27**	176
				Subtotal:	**22,000**	**13**									
Heavily Used Subareas															
Exposure Area ID[1]	**Area of Exposure Area (acre)[2]**	**IMPG Scenario**	**Pre-Remediation EPC (mg/kg)[3]**	**Removal[4]**			**Post-Remediation EPC (mg/kg)[3]**	**IMPG[5] (mg/kg)**							
				10^{-6} Cancer Risk						**10^{-5} Cancer Risk**		**10^{-4} Cancer Risk**		**Non-Cancer**	
				Depth (ft)	**Volume (cy)**	**Area (acre)**		**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**	**RME**	**CTE**
4	0.71	High-use general recreation, adult / older child	67	3	500	0.1	21	1.4	37	14	368	143	3684	**27**	63
12	1.5	High-use general recreation, adult / older child	15	---	---	---	11	1.4	37	14	368	143	3684	**27**	63
26a	2.2	High-use general recreation, adult / older child	1.9	---	---	---	1.9	1.4	51	14	514	143	5143	**27**	176
37b	0.31	High-use general recreation, adult / older child	0.44	---	---	---	0.44	1.4	51	14	514	143	5143	**27**	176
39	0.15	Marathon canoeist	52	3	200	0.05	8.6	0.8	6	8	58	78	575	**13**	25
40	5.2	High-use general recreation, adult / older child	90	3	3000	0.77	27	1.4	37	14	368	143	3684	**27**	63
47	0.18	Recreational canoeist	6.4	---	---	---	6.4	1.2	13	12	129	121	1286	**28**	73
52	0.25	Recreational canoeist	6.6	---	---	---	6.6	1.2	13	12	129	121	1286	**28**	73
53	0.35	Recreational canoeist	408	3	200	0.05	8.3	1.2	13	12	129	121	1286	**28**	73
58	0.16	High-use general recreation, adult	22	---	---	---	22	1.4	63	14	630	143	6305	**38**	234
59	0.15	High-use general recreation, adult / older child	28	---	---	---	8.1	1.4	37	14	368	143	3684	**27**	63
60a	0.16	Recreational canoeist	7.4	---	---	---	7.4	1.2	13	12	129	121	1286	**28**	73
				Subtotal:	**3,900**	**1**									
				Total:	**26,000**	**14**									

Notes:

[1] See Figures 4-1 and 4-2 for direct contact exposure areas in Reaches 5 through 8, and Heavily Used Subareas, respectively.

[2] Area only includes the portion of the exposure area within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for top 1-ft floodplain soil, except in Heavily Used Subareas where it is calculated for top 3-ft floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] For scenarios containing more than one receptor (e.g. adult and older child), the lowest IMPG was utilized in the comparison to post-remediation EPCs. The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-57. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for agricultural products consumption areas under FP 9.

Farm ID[1]	Area of farm (acre)[2]	IMPG Scenario	Pre-Remediation EPC[3] (mg/kg)	Removal[4]			Post-Remediation EPC[3] (mg/kg)	IMPG[5] (mg/kg)									
								10^{-6} Cancer Risk		10^{-5} Cancer Risk		10^{-4} Cancer Risk		Non-Cancer (Child)		Non-Cancer (Adult)	
				Depth (ft)	Volume (cy)	Area (acres)		RME	CTE	RME	CTE	RME	CTE	RME	CTE	RME	CTE
FA 1	8.0	Commercial Dairy	0.78	---	---	---	0.78	0.68	3.1	6.8	31	68	312	**7.7**	12.2	36.4	44.3
FA 2	3.3		14	---	---	---	14	2.59	11.9	25.9	119	259	1187	**29.1**	46.4	138.1	168.3
FA 3	4.1		0.34	---	---	---	0.34	0.29	1.3	2.9	13	29	132	**3.2**	5.2	15.4	18.7
FA 4	64		0.38	---	---	---	0.38	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 5	12		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 6	8		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 7	24		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 8	9.4		0.19	---	---	---	0.19	0.34	1.5	3.4	15	34	154	**3.8**	6.0	17.9	21.8
FA 9	26		0.91	---	---	---	0.91	0.31	1.4	3.1	14	31	143	**3.5**	5.6	16.6	20.3
FA 10	0.3		0.50	---	---	---	0.50	2.06	9.5	20.6	95	206	946	**23.2**	37.0	110.1	134.2
FA 11	0.14		0.25	---	---	---	0.25	6.10	27.9	61	279	610	2794	**68.6**	109.2	325.1	396.2
FA 12	8.0		0.25	---	---	---	0.25	0.38	1.8	3.8	18	38	176	**4.3**	6.9	20.5	25.0
FA 13	4.0		0.25	---	---	---	0.25	0.24	1.1	2.4	11	24	110	**2.7**	4.3	12.8	15.6
FA 14	2.6		0.30	---	---	---	0.30	0.55	2.5	5.5	25	55	253	**6.2**	9.9	29.4	35.9
				Total:	**0**	**0**											

Notes:

[1] See Figure 4-4 for farm areas in Reaches 5 through 8.

[2] Farm area only includes the portion within the 1 mg/kg PCB isopleth (Reaches 5/6) or the 100-year floodplain (Reaches 7/8).

[3] EPC is calculated for the top 1 ft of floodplain soil.

[4] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[5] IMPG values for agricultural products consumption include a multiplier to account for the areas outside the 1 mg/kg PCB isopleth/100-year floodplain (see Table 5-2). The lowest IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-58. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for amphibian averaging areas (vernal pools) under FP 9.

Vernal Pool ID[1]	Area of Vernal Pool (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
5-VP-3	1.9	73	---	---	---	73	3.27	5.6
5-VP-1	0.044	1.7	---	---	---	1.7	3.27	5.6
8-VP-5	0.043	23	---	---	---	23	3.27	5.6
8-VP-4	0.24	3.9	---	---	---	3.9	3.27	5.6
8-VP-3	0.024	7.7	---	---	---	7.7	3.27	5.6
8-VP-2	0.57	69	---	---	---	69	3.27	5.6
18-VP-2	0.61	7.2	---	---	---	7.2	3.27	5.6
18-VP-1	0.28	8.1	---	---	---	8.1	3.27	5.6
19-VP-7	0.068	0.84	---	---	---	0.84	3.27	5.6
19-VP-2	0.0080	34	---	---	---	34	3.27	5.6
19-VP-1	0.18	32	---	---	---	32	3.27	5.6
19-VP-3	0.031	10	---	---	---	10	3.27	5.6
19-VP-4	0.094	6.0	---	---	---	6.0	3.27	5.6
19-VP-8	0.057	91	---	---	---	91	3.27	5.6
19-VP-5	0.51	45	---	---	---	45	3.27	5.6
19-VP-6	1.2	24	---	---	---	24	3.27	5.6
23-VP-2	0.18	47	---	---	---	47	3.27	5.6
23-VP-1	0.30	75	---	---	---	75	3.27	5.6
23A-VP-1	0.45	10	---	---	---	10	3.27	5.6
23B-VP-1	0.068	7.2	---	---	---	7.2	3.27	5.6
23B-VP-2	0.091	0.34	---	---	---	0.34	3.27	5.6
27B-VP-2	0.28	11	---	---	---	11	3.27	5.6
27B-VP-3	0.062	16	---	---	---	16	3.27	5.6
27B-VP-1	0.072	12	---	---	---	12	3.27	5.6
27-VP-2	0.47	21	---	---	---	21	3.27	5.6
27A-VP-1	0.20	31	---	---	---	31	3.27	5.6
27-VP-1	1.3	23	---	---	---	23	3.27	5.6
26-VP-1	0.036	40	---	---	---	40	3.27	5.6
33-VP-1	0.022	9.5	---	---	---	9.5	3.27	5.6
33-VP-2	0.12	70	---	---	---	70	3.27	5.6
38-VP-1	0.43	36	---	---	---	36	3.27	5.6
38A-VP-1	0.020	5.0	---	---	---	5.0	3.27	5.6
38-VP-3	0.046	28	---	---	---	28	3.27	5.6
38-VP-2	0.17	46	---	---	---	46	3.27	5.6
40-VP-3	0.46	67	---	---	---	67	3.27	5.6
40-VP-2	0.36	18	---	---	---	18	3.27	5.6
40A-VP-1	0.11	68	---	---	---	68	3.27	5.6
40-VP-1	0.47	57	---	---	---	57	3.27	5.6
42-VP-1	0.22	64	---	---	---	64	3.27	5.6
42-VP-2	0.28	46	---	---	---	46	3.27	5.6
42-VP-3	0.050	41	---	---	---	41	3.27	5.6
42-VP-5	0.58	73	---	---	---	73	3.27	5.6
42-VP-4	1.0	34	---	---	---	34	3.27	5.6
42A-VP-1	1.5	35	---	---	---	35	3.27	5.6
46-VP-2	7.1	140	---	---	---	140	3.27	5.6
46-VP-1	0.52	1.3	---	---	---	1.3	3.27	5.6
46-VP-5	0.056	125	---	---	---	125	3.27	5.6
46-VP-3	1.4	153	---	---	---	153	3.27	5.6
46-VP-4	0.011	125	---	---	---	125	3.27	5.6
49A-VP-1	0.019	16	---	---	---	16	3.27	5.6
49-VP-1	1.2	18	---	---	---	18	3.27	5.6
49B-VP-1	0.0044	26	---	---	---	26	3.27	5.6
66A-VP-1	0.032	0.73	---	---	---	0.73	3.27	5.6
69-VP-1	0.0074	12	---	---	---	12	3.27	5.6
8-VP-6	0.086	47	---	---	---	47	3.27	5.6
12-VP-1	0.080	14	---	---	---	14	3.27	5.6
39-VP-1	2.0	39	---	---	---	39	3.27	5.6
54-VP-1	0.20	21	---	---	---	21	3.27	5.6
55-VP-1	0.59	7.6	---	---	---	7.6	3.27	5.6
55A-VP-1	2.0	40	---	---	---	40	3.27	5.6
58A-VP-1	0.32	25	---	---	---	25	3.27	5.6
67A-VP-1	0.12	51	---	---	---	51	3.27	5.6
61A-VP-1	0.19	18	---	---	---	18	3.27	5.6
61A-VP-2	1.2	19	---	---	---	19	3.27	5.6
56A-VP-1	0.58	73	---	---	---	73	3.27	5.6
23-VP-3	1.3	22	---	---	---	22	3.27	5.6
			Total:	**0**	**0**			

Notes:

[1] See Figure 4-5 for locations of vernal pools.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-59. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for omnivorous/carnivorous mammal averaging areas under FP 9.

Averaging Area ID[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2](mg/kg)	IMPG[4] (mg/kg)	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound
G1	88	20	---	---	---	19	21.1	34.3
G2	87	51	---	---	---	23	21.1	34.3
G3	86	19	---	---	---	18	21.1	34.3
G4	86	27	---	---	---	27	21.1	34.3
G5	88	28	---	---	---	28	21.1	34.3
G6	87	12	---	---	---	12	21.1	34.3
G7	73	18	---	---	---	17	21.1	34.3
			Total:	**0**	**0**			

Notes:

[1] *See Figure 4-6 for shrew averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

Table 7-60. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for insectivorous bird (wood duck) averaging areas under FP 9.

Averaging Area ID[1]	Reach	Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)		
				Depth (ft)	Volume (cy)	Area (acre)		Sediment Target Level		
								1 mg/kg	3 mg/kg	5 mg/kg
K1	5A	52	29	---	---	---	28	50	39	29
K2		63	9.8	---	---	---	7.9	50	39	29
K3		85	53	---	---	---	26	50	39	29
K4		60	16	---	---	---	16	50	39	29
K5		25	22	---	---	---	21	50	39	29
K6	5B	55	25	---	---	---	25	48	33	18
K7		47	30	---	---	---	28	48	33	18
K8		92	24	---	---	---	23	48	33	18
K9	5C/5D	69	25	---	---	---	25	53	49	46
K10		83	13	---	---	---	13	53	49	46
K11		61	14	---	---	---	14	53	49	46
K12	6	28	23	---	---	---	23	53	50	46
				Total:	**0**	**0**				

Notes:

[1] See Figure 4-7 for wood duck averaging areas.

[2] EPC is calculated for the top 1 ft of floodplain soil.

[3] As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.

[4] The IMPG value for which the alternative was designed to achieve is shown in bold.

Key

= post-remediation EPC is lower than the IMPG

Table 7-61. Summary of IMPGs, pre- and post-remediation EPCs, and removal volumes and acreages for piscivorous mammal (mink) averaging areas under FP 9.

Averaging Area[1]	Area of Averaging Area (acre)	Pre-Remediation EPC[2] (mg/kg)	Removal[3]			Post-Remediation EPC[2] (mg/kg)	Floodplain IMPG[4] (mg/kg)					
							Sediment Target Level					
							1 mg/kg		3 mg/kg		5 mg/kg	
			Depth (ft)	Volume (cy)	Area (acre)		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
5A/5B	435	22	---	---	---	20	3.4	16.6	*n/a*	5.12	*n/a*	*n/a*
5C/5D/6	291	17	---	---	---	17	6.9	19.6	3.0	15.7	*n/a*	11.8
			Total:	**0**	**0**							

Notes:

[1] *See Figure 4-8 for mink averaging areas.*

[2] *EPC is calculated for the top 1 ft of floodplain soil.*

[3] *As stated in Section 4.4.5, the total and subtotal volumes shown are consistent with those described in the text, but due to roundoff for the individual averaging areas, do not always agree with the sum of the individual averaging areas.*

[4] *(n/a) denotes IMPG values not attainable in given reach for the sediment target level. The IMPG value for which the alternative was designed to achieve is shown in bold.*

Key

= post-remediation EPC is lower than the IMPG

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Section 7 Figures

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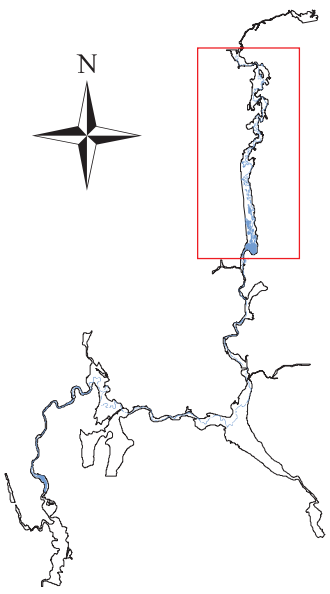

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LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Direct Contact
- Access Road/ Staging Area

Figure 7-1a.
Floodplain Alternative 2 (FP 2) in Reaches 5 and 6.

Remediation to achieve upper-bound health-based RME IMPGs (based on 10^{-4} cancer risk or non-cancer).

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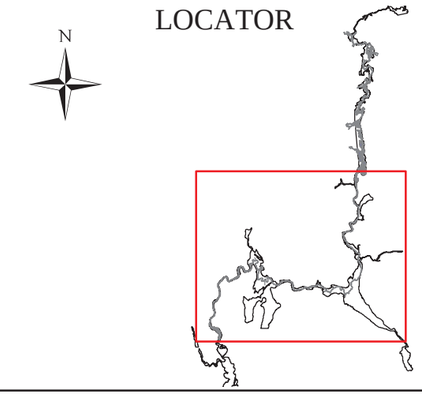

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Types

- Direct Contact
- Access Road/ Staging Area

Figure 7-1b.
Floodplain Alternative 2 (FP 2)
in Reaches 7 and 8.

Remediation to achieve upper-bound health-based RME IMPGs (based on 10^{-4} cancer risk or non-cancer).

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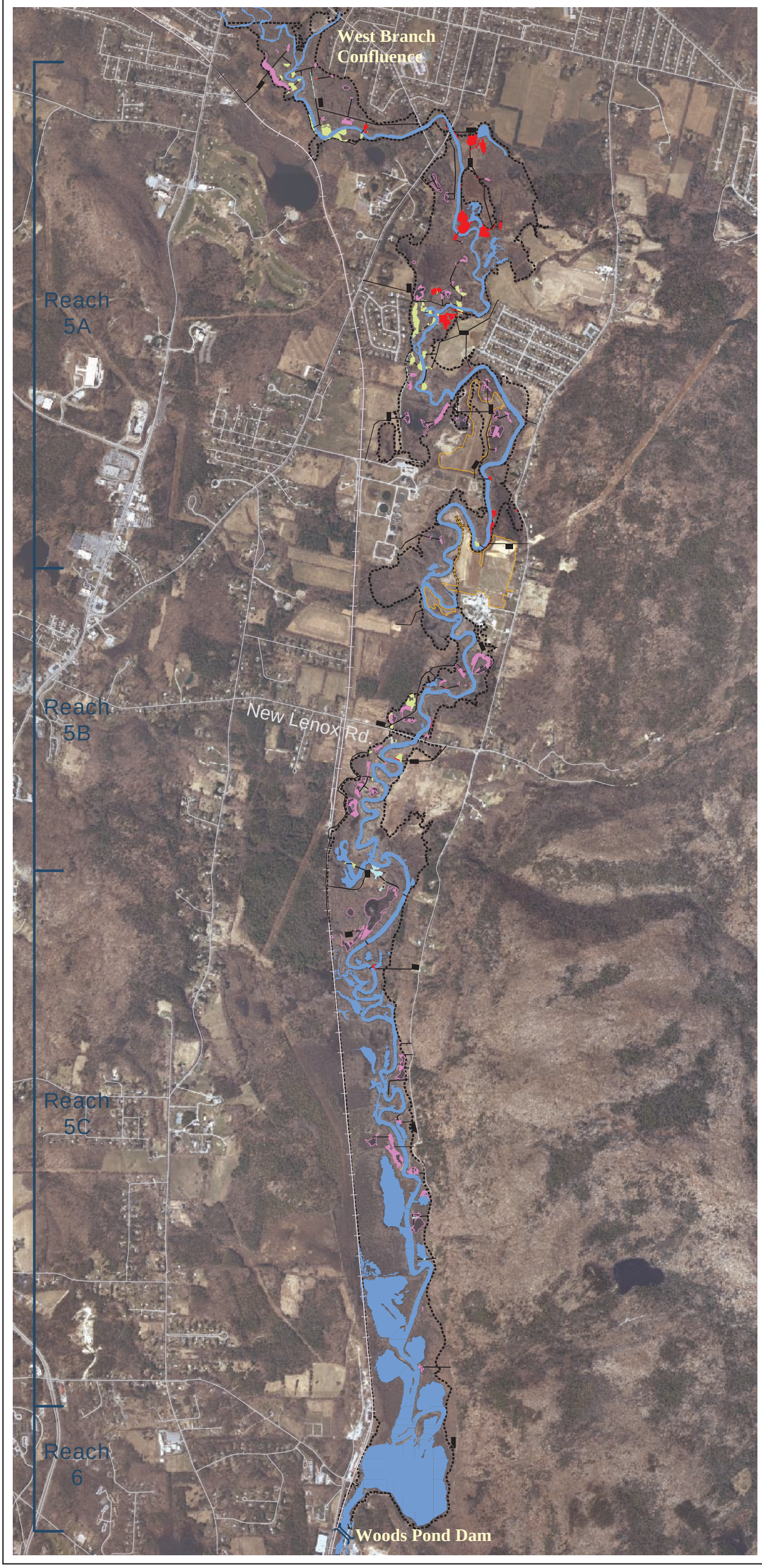

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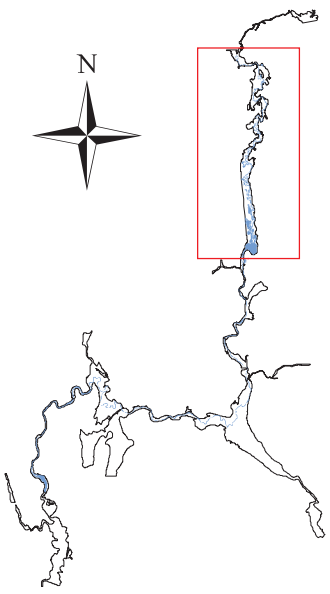

SCALE

0 0.25 0.5 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Direct Contact
- Heavily Used Subarea
- Amphibian
- Piscivorous Mammal*
- Access Road/ Staging Area

** Floodplain soil removal shown for piscivorous mammal corresponds to a sediment target level of 1 mg/kg.*

Figure 7-2a.
Floodplain Alternative 3 (FP 3) in Reaches 5 and 6.

Remediation to achieve mid-range (frequently used and agricultural areas) and upper-bound (other human-use areas) health-based RME IMPGs (based on 10^{-5}, 10^{-4} cancer risk or non-cancer), and upper-bound IMPGs for ecological receptors.

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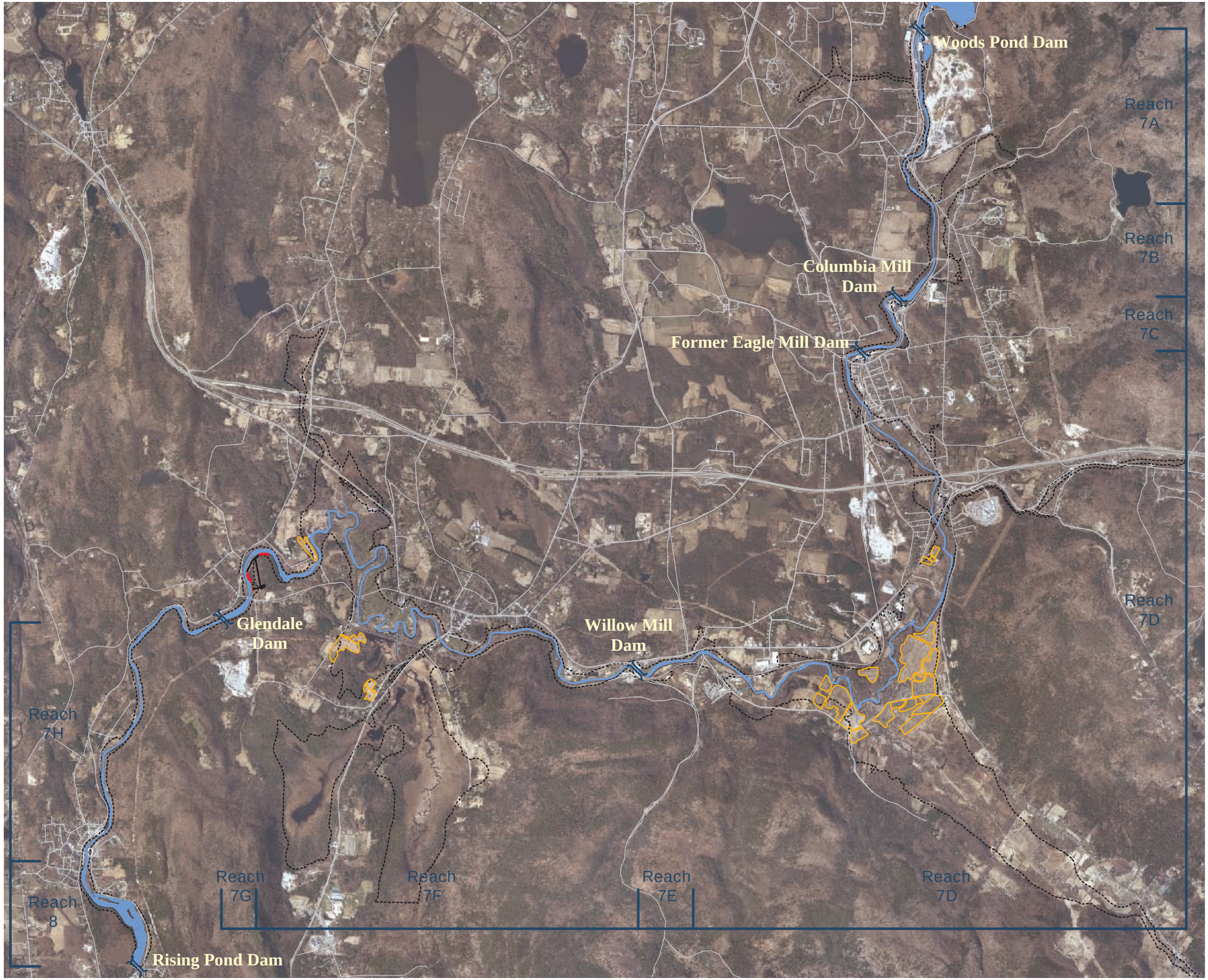

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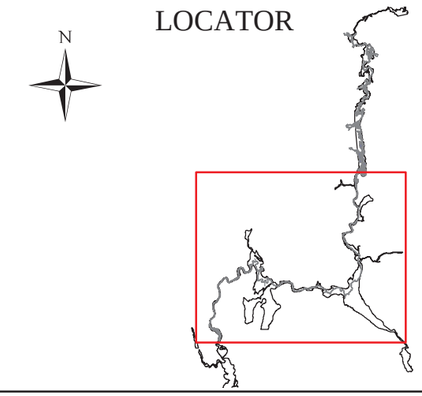

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Types

- Direct Contact
- Heavily Used Subarea
- Amphibian
- Piscivorous Mammal*
- Access Road/ Staging Area

** Floodplain soil removal shown for piscivorous mammal corresponds to a sediment target level of 1 mg/kg.*

Figure 7-2b.
Floodplain Alternative 3 (FP 3)
in Reaches 7 and 8.

Remediation to achieve mid-range (frequently used and agricultural areas) and upper-bound (other human-use areas) health-based RME IMPGs (based on 10^{-5}, 10^{-4} cancer risk or non-cancer), and upper-bound IMPGs for ecological receptors.

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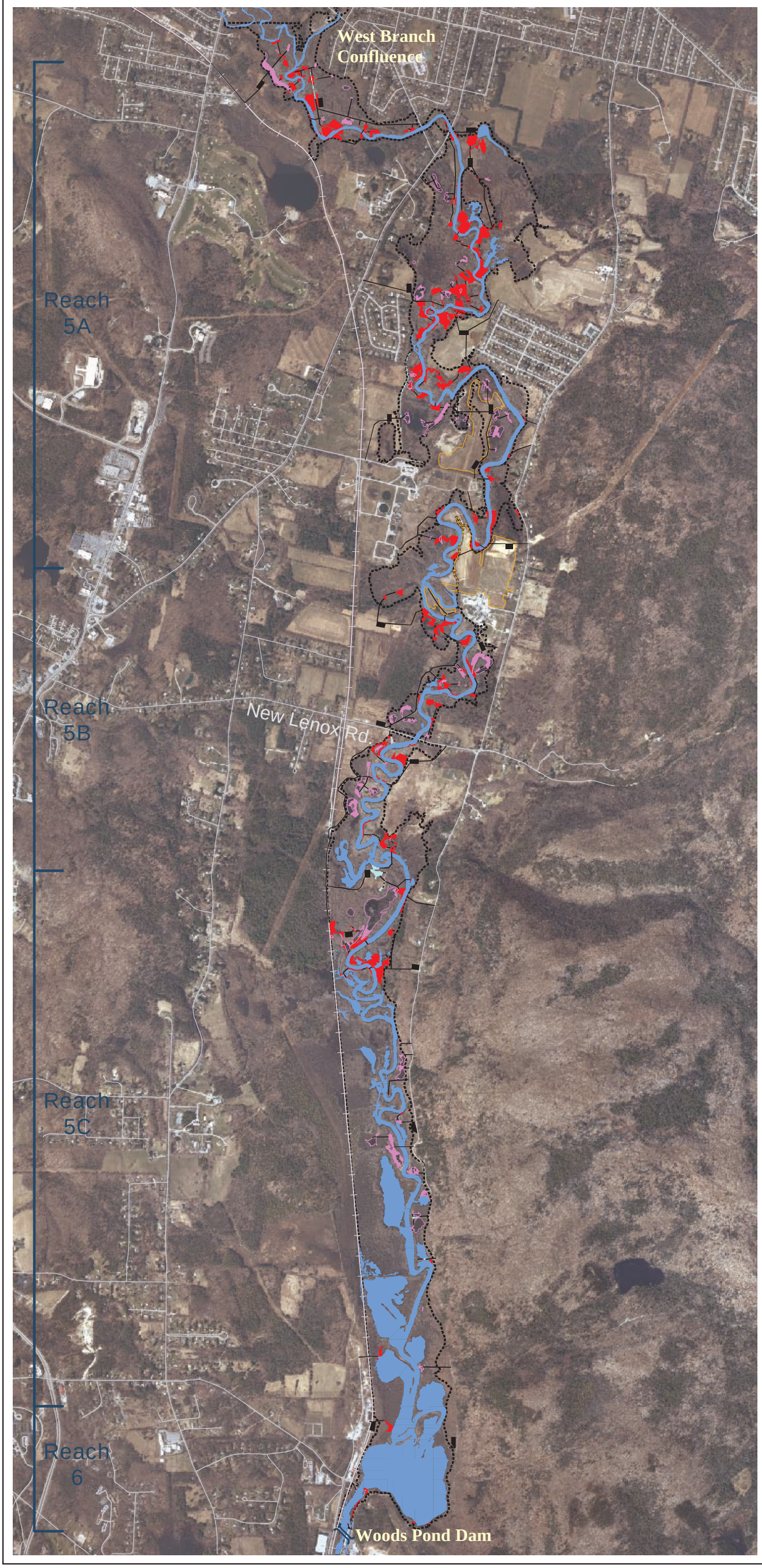

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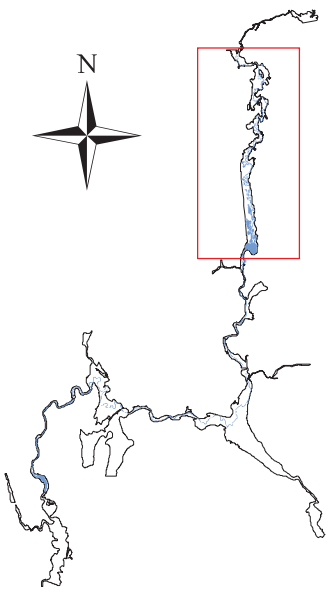

SCALE

0 0.25 0.5 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Direct Contact
- Heavily Used Subarea
- Amphibian
- Access Road/ Staging Area

Figure 7-3a.
Floodplain Alternative 4 (FP 4) in Reaches 5 and 6.

Remediation to achieve mid- range health-based RME IMPGs (based on 10^{-5} cancer risk or non-cancer) and upper-bound IMPGs for ecological receptors.

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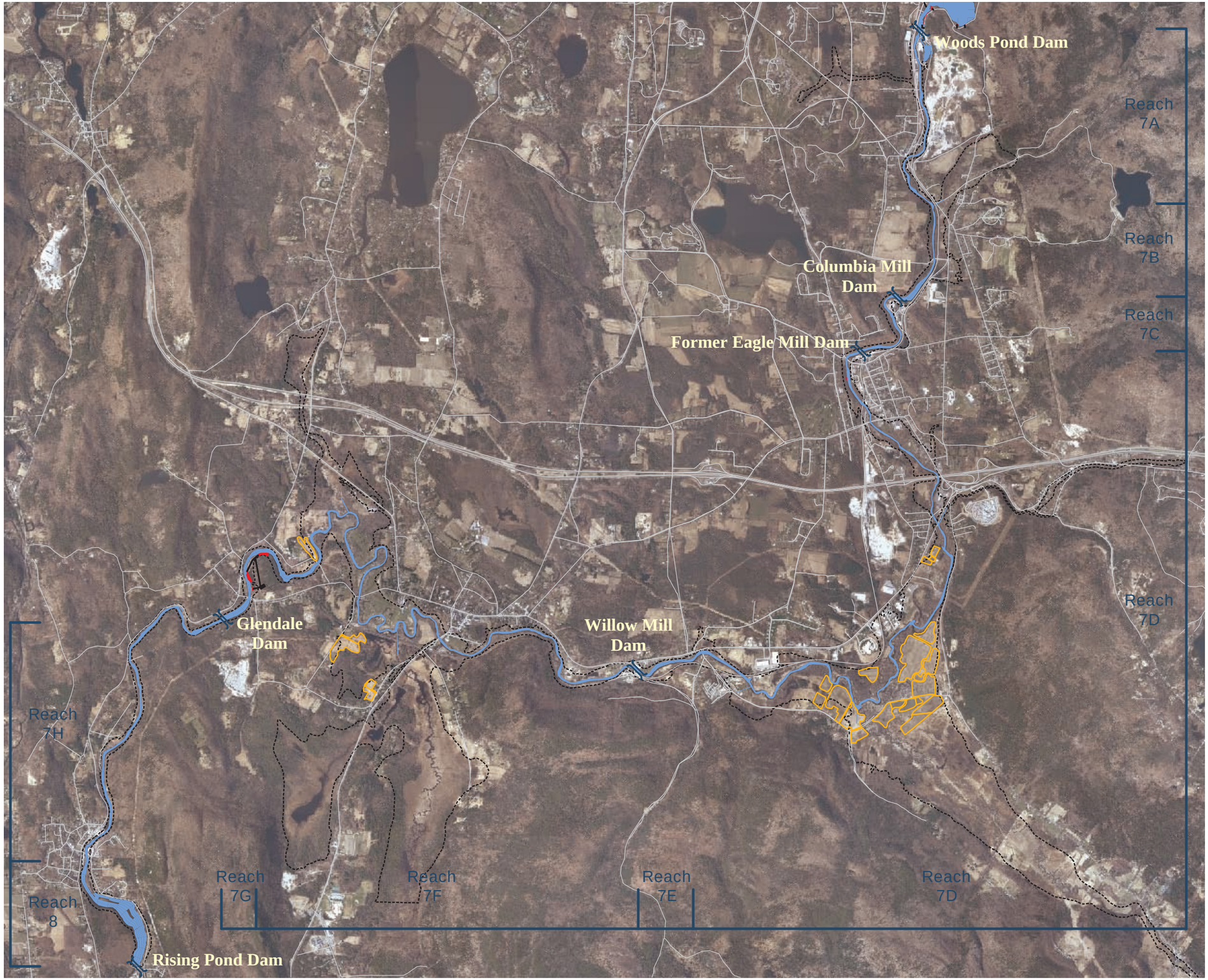

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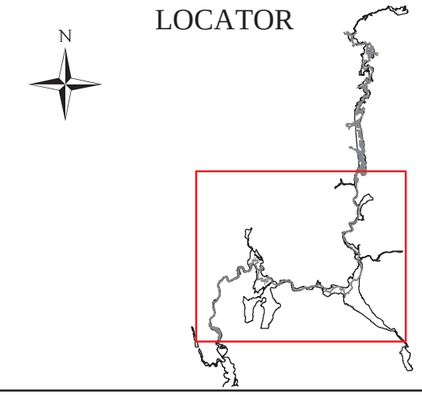

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Types

- Direct Contact
- Heavily Used Subarea
- Amphibian
- Access Road/ Staging Area

Figure 7-3b.
Floodplain Alternative 4 (FP 4)
in Reaches 7 and 8.

Remediation to achieve mid- range health-based RME IMPGs (based on 10^{-5} cancer risk or non-cancer) and upper-bound IMPGs for ecological receptors.

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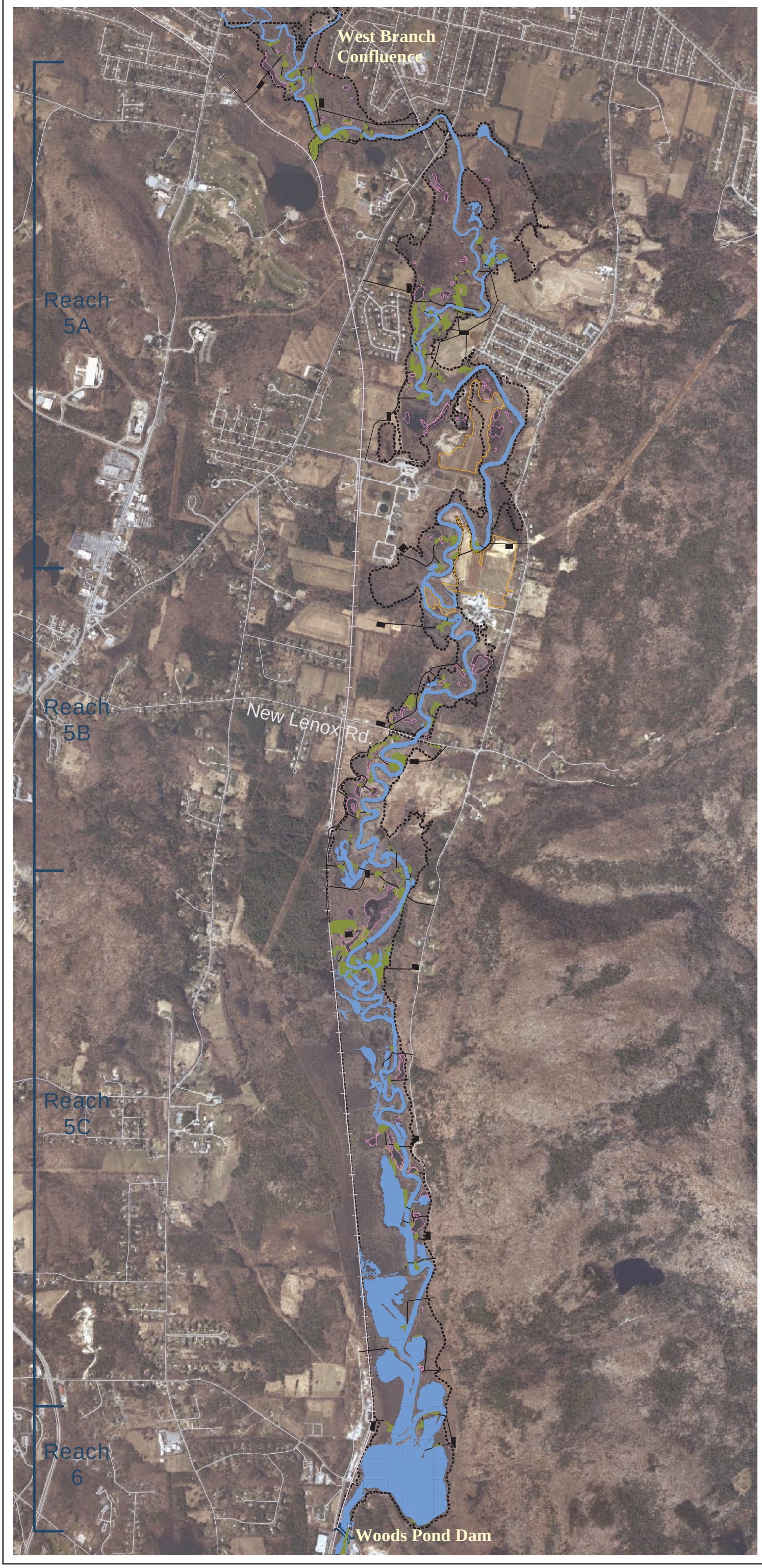

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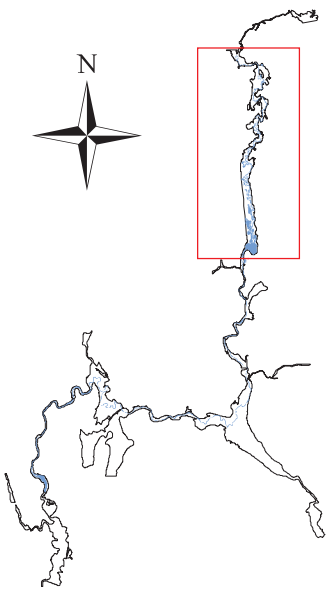

SCALE

0 0.25 0.5 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Exceeds 50 mg/kg PCBs
- Access Road/ Staging Area

Figure 7-4a.
Floodplain Alternative 5 (FP 5) in Reaches 5 and 6.

Remediation to address PCBs greater than 50 mg/kg.

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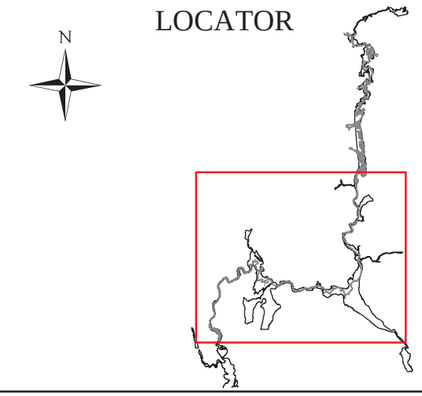

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Types

- Exceeds 50 mg/kg PCBs
- Access Road/ Staging Area

Figure 7-4b.
Floodplain Alternative 5 (FP 5)
in Reaches 7 and 8.

Remediation to address PCBs greater than 50 mg/kg.

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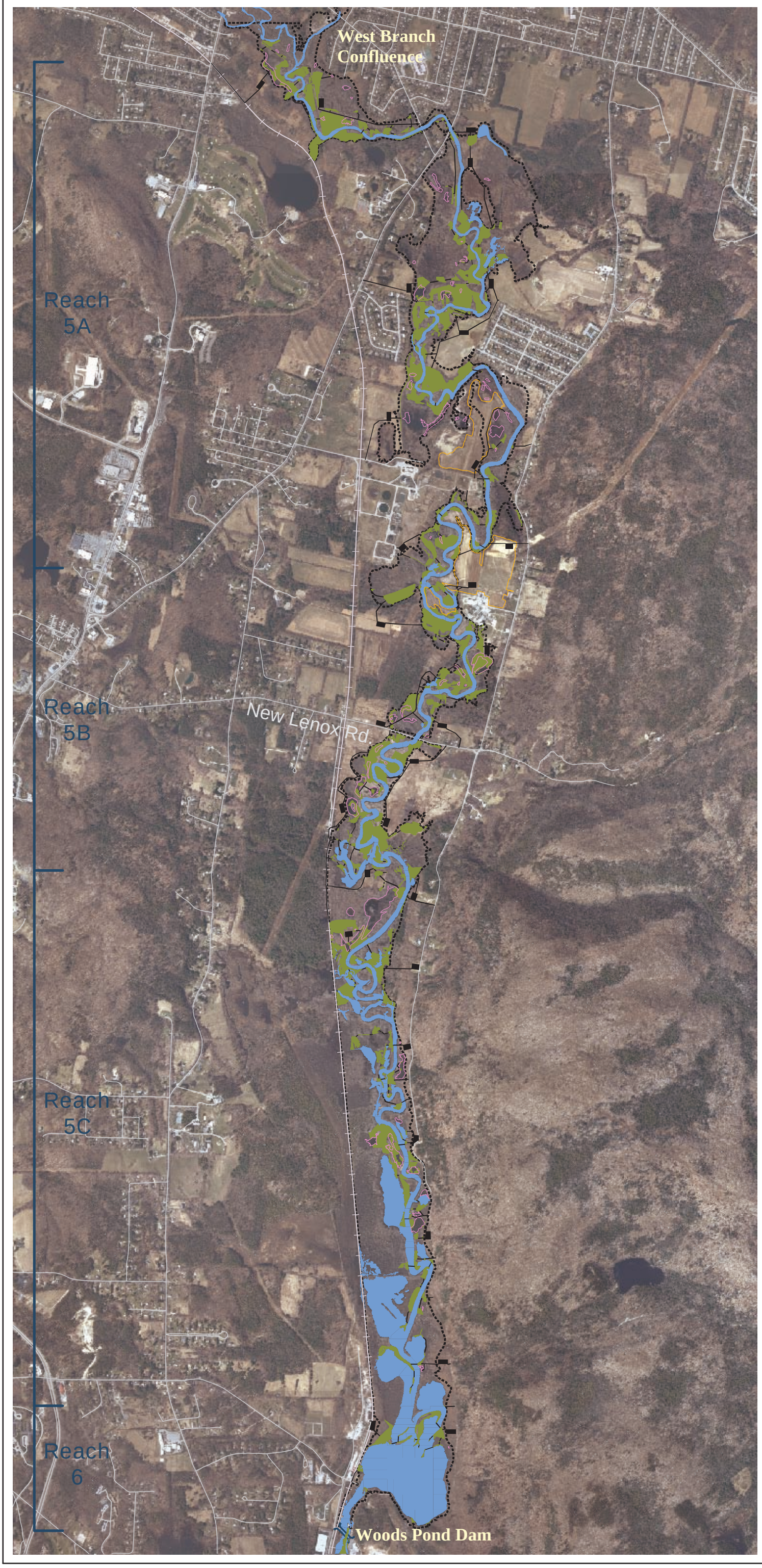

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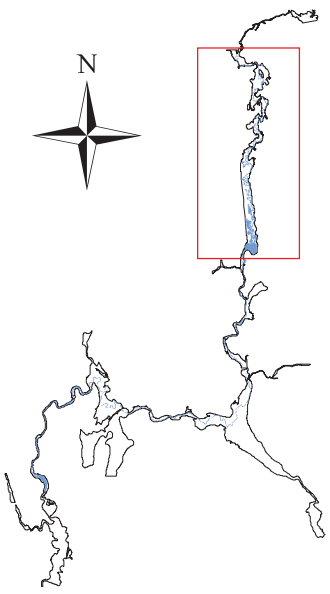

SCALE

0 0.25 0.5 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Exceeds 25 mg/kg PCBs
- Access Road/ Staging Area

Figure 7-5a.
Floodplain Alternative 6 (FP 6) in Reaches 5 and 6.

Remediation to address PCBs greater than 25 mg/kg.

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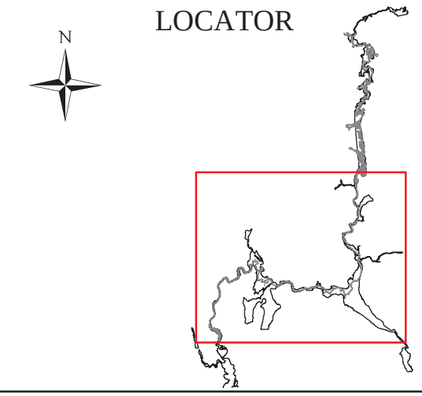

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Types

- Exceeds 25 mg/kg PCBs
- Access Road/ Staging Area

Figure 7-5b.
Floodplain Alternative 6 (FP 6)
in Reaches 7 and 8.

Remediation to address PCBs greater than 25 mg/kg.

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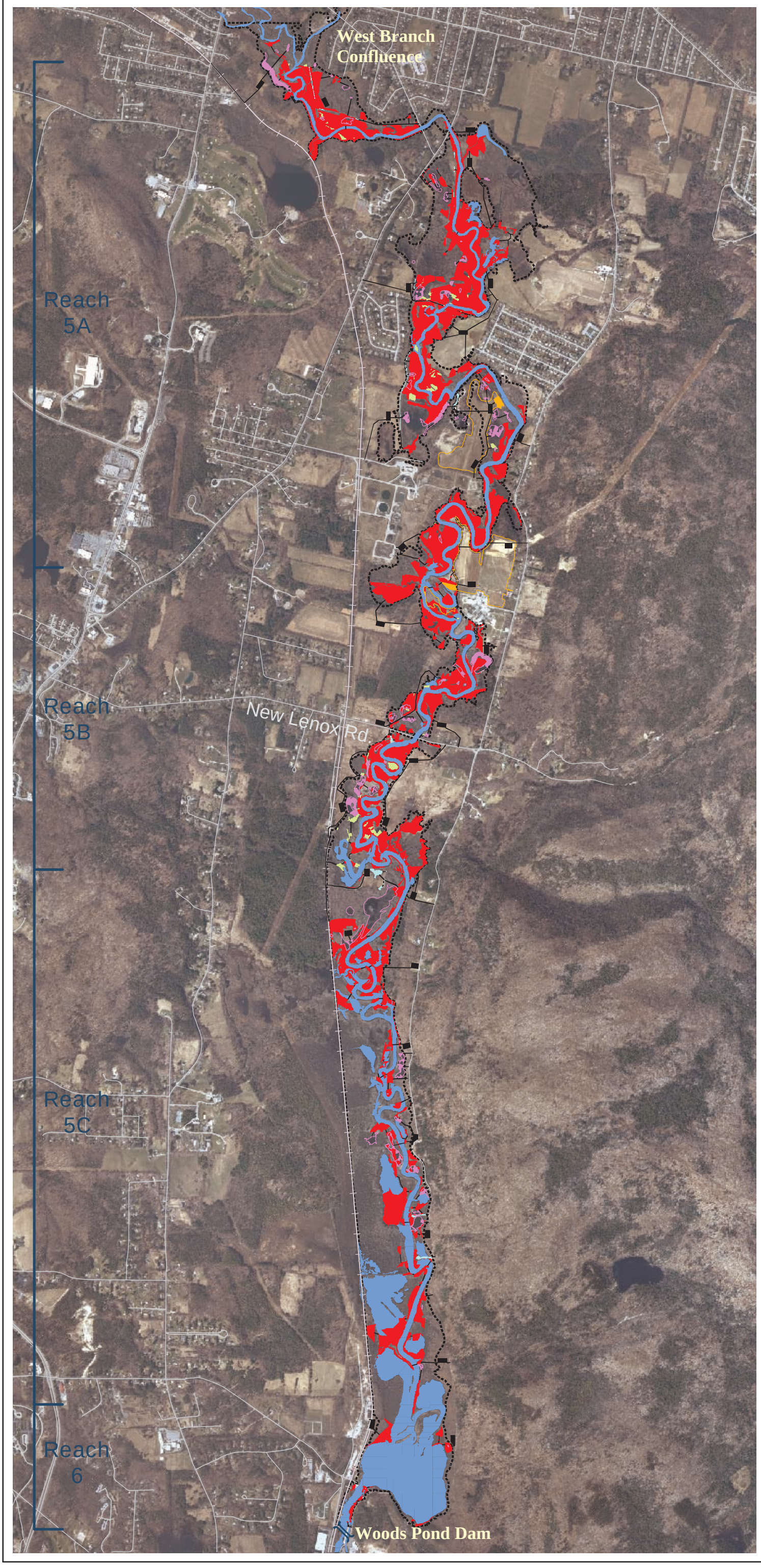

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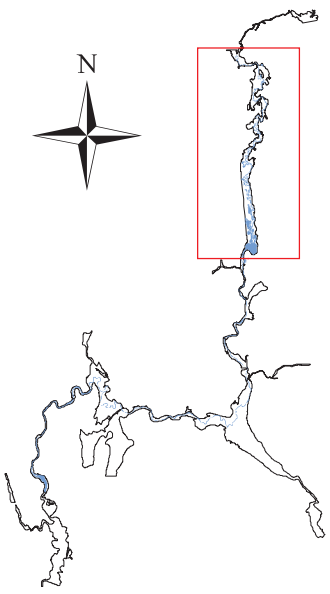

SCALE

0 0.25 0.5 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Direct Contact
- Heavily Used Subarea
- Agriculture
- Amphibian
- Piscivorous Mammal*
- Access Road/ Staging Area

** Floodplain soil removal shown for piscivorous mammal corresponds to a sediment target level of 1 mg/kg.*

Figure 7-6a.
Floodplain Alternative 7 (FP 7) in Reaches 5 and 6.

Remediation to achieve upper-range health-based RME IMPGs (based on 10^{-6} cancer risk or non-cancer), and lower-bound IMPGs for ecological receptors.

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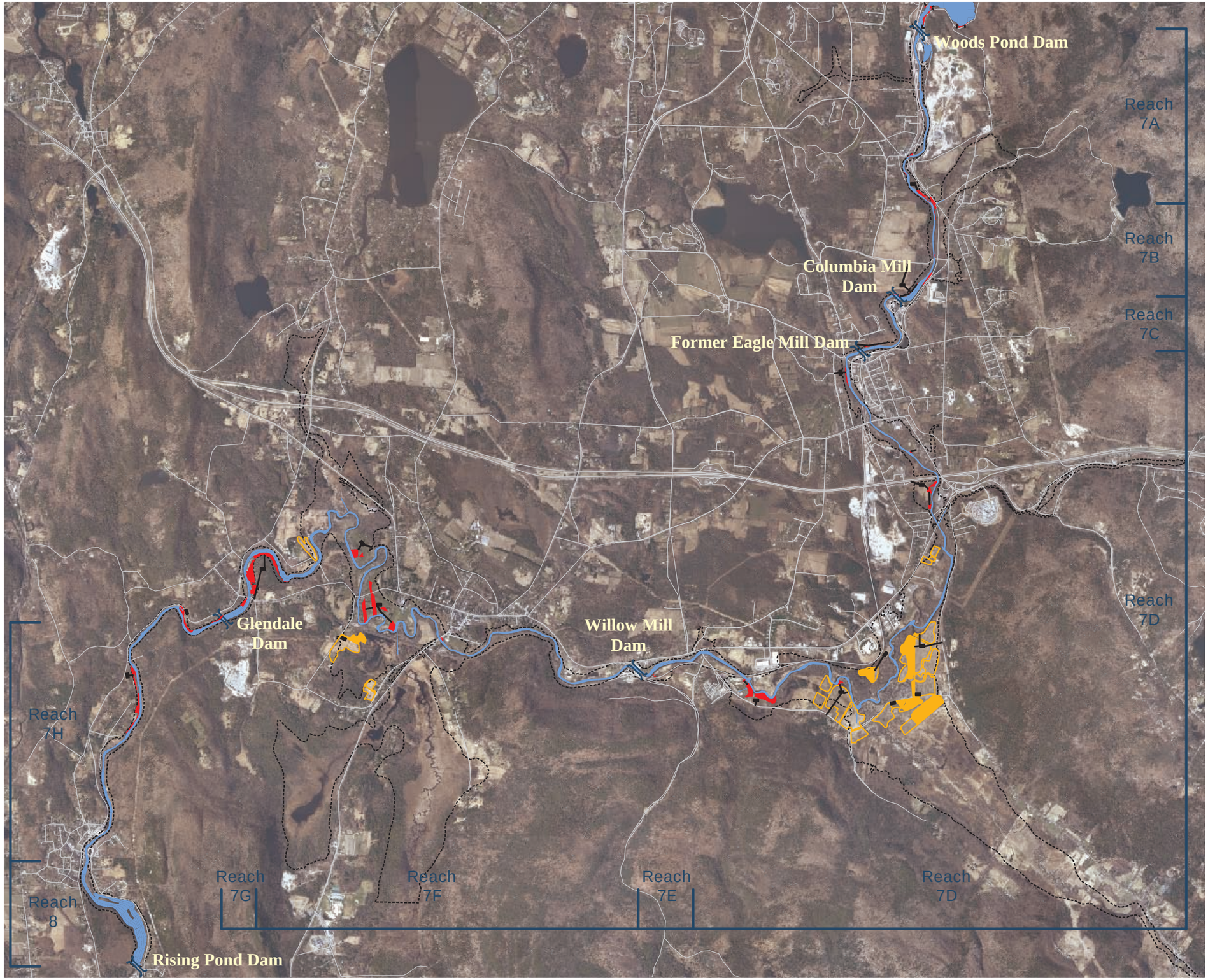

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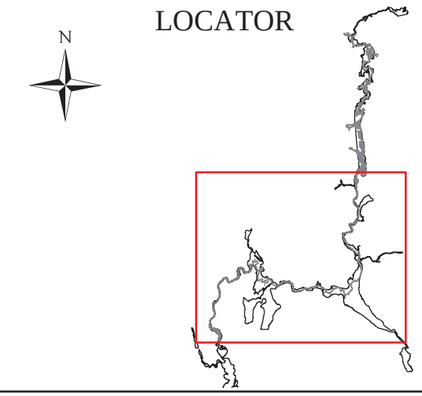

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Types

- Direct Contact
- Heavily Used Subarea
- Agriculture
- Amphibian
- Piscivorous Mammal*
- Access Road/ Staging Area

** Floodplain soil removal shown for piscivorous mammal corresponds to a sediment target level of 1 mg/kg.*

Figure 7-6b.
Floodplain Alternative 7 (FP 7)
in Reaches 7 and 8.

Remediation to achieve upper-range health-based RME IMPGs (based on 10^{-6} cancer risk or non-cancer), and lower-bound IMPGs for ecological receptors.

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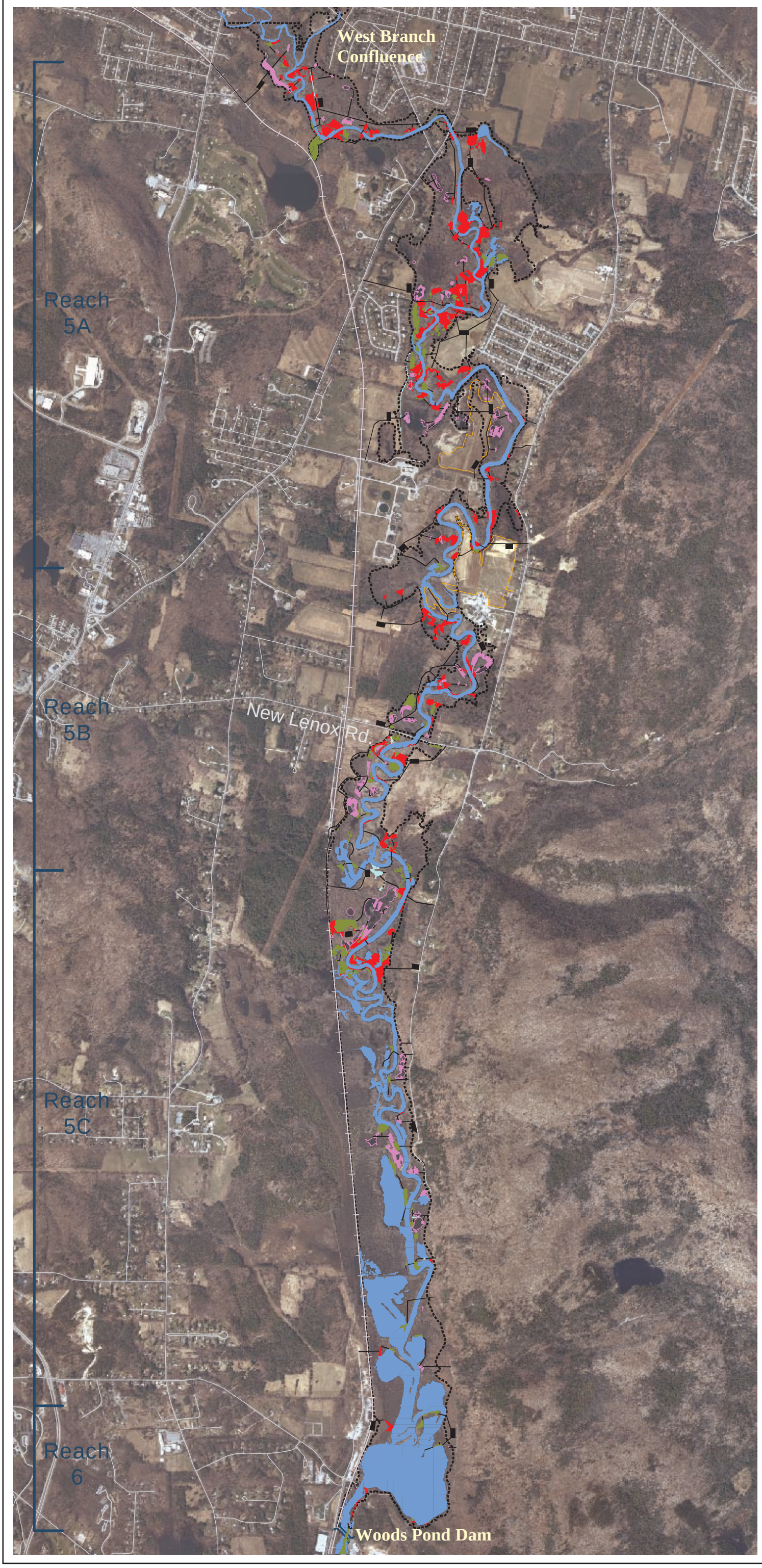

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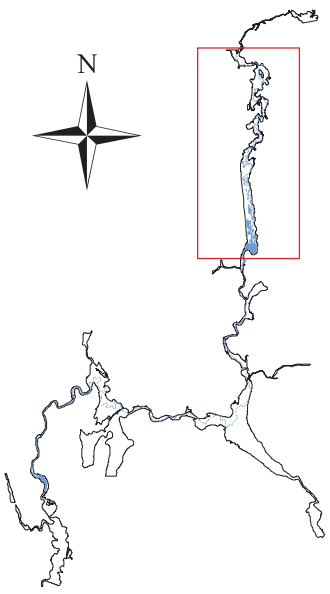

SCALE

0 0.25 0.5 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Direct Contact
- Heavily Used Subarea
- Amphibian
- Exceeds 50 mg/kg PCBs
- Access Road/ Staging Area

Figure 7-7a.
Floodplain Alternative 8 (FP 8) in Reaches 5 and 6.

Remediation to achieve mid-range health-based RME IMPGs (based on 10^{-5} cancer risk or non-cancer), and lower-bound IMPGs for amphibians; also removal of additional soils within top foot containing PCB concentrations at or above 50 mg/kg.

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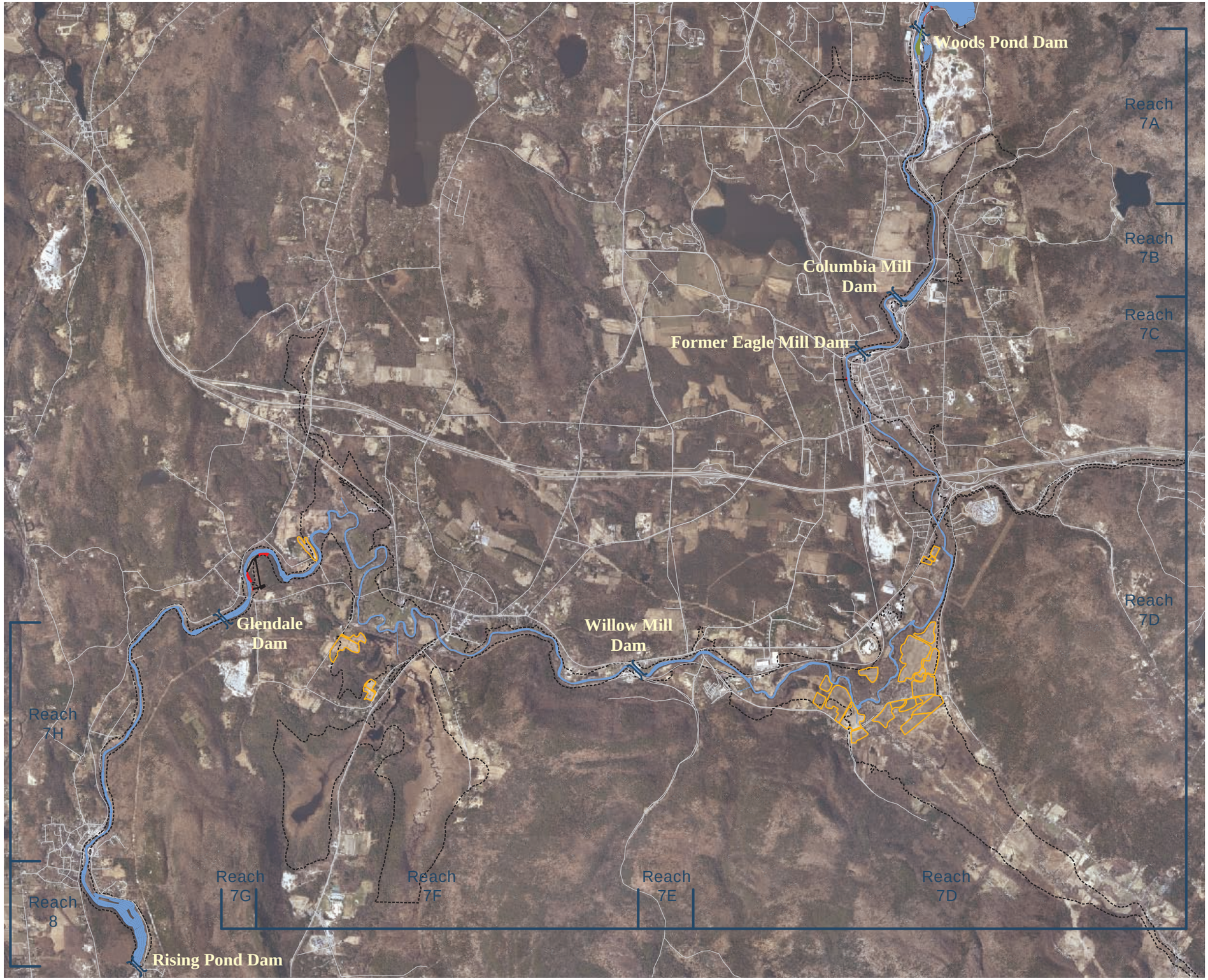

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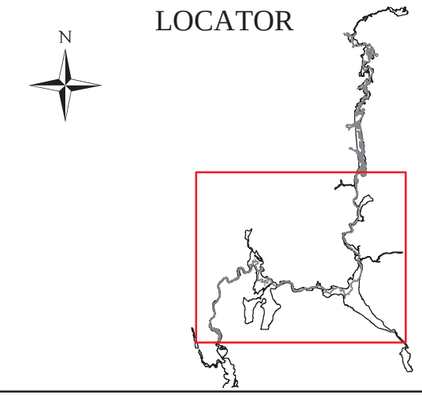

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information
Floodplain Removal Types

- Direct Contact
- Heavily Used Subarea
- Amphibian
- Exceeds 50 mg/kg PCBs
- Access Road/ Staging Area

Figure 7-7b.
Floodplain Alternative 8 (FP 8) in Reaches 7 and 8.

Remediation to achieve mid-range health-based RME IMPGs (based on 10^{-5} cancer risk or non-cancer), and lower-bound IMPGs for amphibians; also removal of additional soils within top foot containing PCB concentrations at or above 50 mg/kg.

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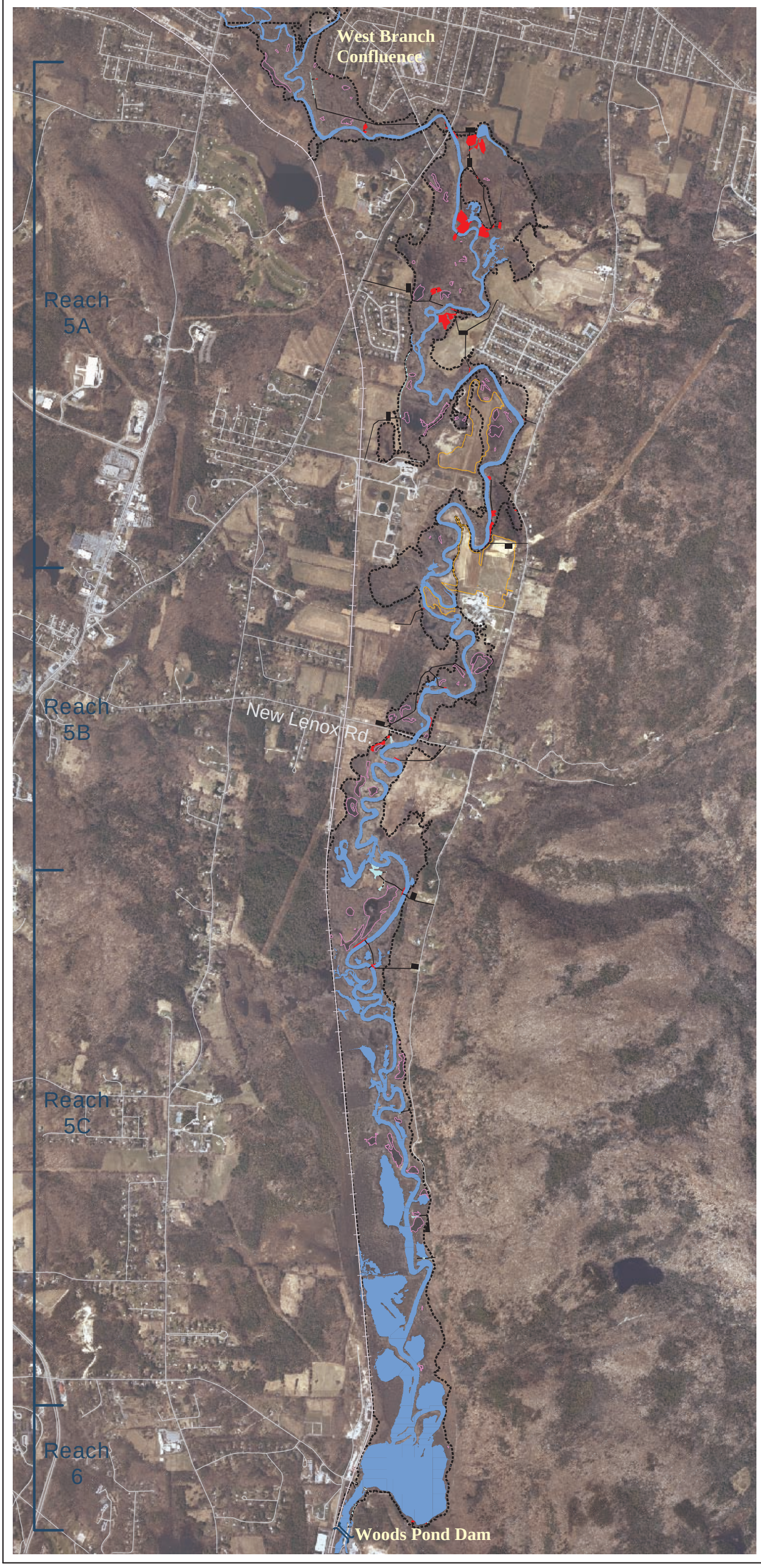

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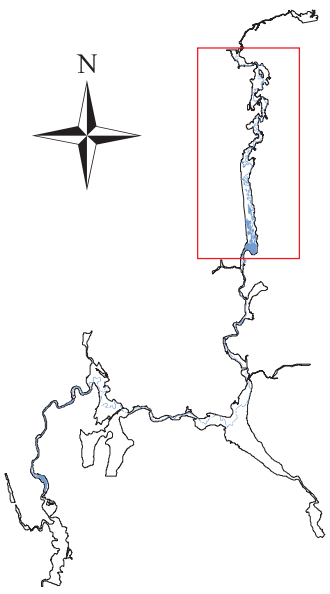

SCALE

0 0.25 0.5 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 1 mg/kg PCB Isopleth
- Housatonic Railroad
- Major Road
- Dam

Remediation Information

Floodplain Removal Type(s)

- Direct Contact
- Heavily Used Subarea
- Access Road/ Staging Area

Figure 7-8a.
Floodplain Alternative 9 (FP 9) in Reaches 5 and 6.

Remediation to achieve upper-bound health-based RME IMPGs (based on 10^{-4} cancer risk or non-cancer), including heavily-used subareas.

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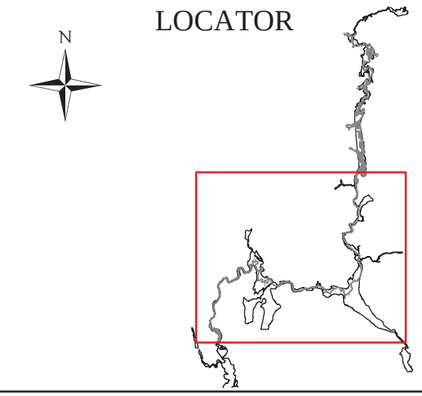

SCALE

0 0.5 1 2 Miles

LEGEND

Basemap Information

- Housatonic River
- Vernal Pool
- Agricultural Area
- 100-yr Floodplain
- Housatonic Railroad
- Major Road
- Dam

Remediation Information
Floodplain Removal Types

- Direct Contact
- Heavily Used Subarea
- Access Road/ Staging Area

Figure 7-8b.
Floodplain Alternative 9 (FP 9)
in Reaches 7 and 8.

Remediation to achieve upper-bound health-based RME IMPGs (based on 10^{-4} cancer risk or non-cancer), including heavily-used subareas.

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