UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
New England Office – Region I
One Congress Street, Suite 1100
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September 9, 2008

Mr. Andrew T. Silfer, P.E.
General Electric Company
159 Plastics Avenue
Pittsfield, Massachusetts 01201

Sent via US Mail and Electronic Mail

RE: EPA Comments on GE's March 2008 Corrective Measures Study Report

Dear Mr. Silfer:

EPA has completed an extensive review of GE's March 21, 2008 report entitled "*Housatonic River - Rest of River Corrective Measures Study*" ("CMS"). As discussed below and in the attachment to this letter, there are a significant number of critical issues that are inadequately addressed or supported in the report. After all of these concerns are addressed and submitted to EPA in a CMS Supplement, EPA will make a final decision on the CMS. The CMS Supplement must be submitted to EPA within 90 days of the date of this letter.

EPA's primary concern is to ensure that GE's cleanup work on the Housatonic River will be fully protective of public health and the health of the surrounding river ecosystem in both Massachusetts and Connecticut.

As the Housatonic cleanup moves from an urban, channelized river upstream to a more natural, meandering and rural environment downstream, it is critical that the remedy seek to avoid and/or minimize negative impacts on sensitive areas and restore the river and floodplain to its current character to the greatest extent possible. This issue is of great concern to EPA, the states, and the general public. Consistent with this goal, the remedy must include a phased and adaptive cleanup approach that allows the flexibility to accommodate new knowledge and advances in technology over time. Further, EPA will continue with its robust outreach program throughout the lifespan of the project to ensure that the public continues to be actively involved as the cleanup progresses, and as new developments occur in science or technology.

An overriding concern with the CMS is that it failed to recognize the unique character of the Housatonic River below the confluence of the East and West Branches. The river and floodplain in the Massachusetts portion of the river where active cleanup measures are under consideration provide significant habitat for a great number of rare, threatened, or endangered

plant and animal species that must be protected. The analysis of alternatives in the CMS must provide a detailed discussion of how each alternative will provide species habitat protection through avoidance of negative impacts where possible or restoration where impacts are unavoidable, and if necessary, mitigation.

This area of the river also provides a wide variety of opportunities for recreation and aesthetic appreciation that are highly valued by residents and visitors to this area. The CMS falls far short in its analysis of the short term impacts of the various remedial alternatives on the community's use of the river, how those impacts can be avoided or minimized, and how the areas impacted would be restored following any intrusive activities. In particular, the restoration activities outlined in the CMS do not adequately take into account the unique character and value of the potentially impacted resources, and do not comply with EPA's Conditional Approval of the CMS Proposal.

Please note that an area that includes a portion of the Rest of the River was recently nominated for designation as an Area of Critical Environmental Concern (ACEC). If any portion of the study area is designated by the state as an ACEC, GE shall address this issue in the CMS Supplement.

EPA is not providing any comment at this time on the combination of river and floodplain alternatives that GE has identified as best satisfying the overall criteria in the RCRA permit. Until the CMS has been supplemented to satisfactorily address the concerns presented here, EPA believes it is premature to opine on which alternative or combinations of alternatives best satisfy the permit criteria. Because a detailed and complete alternatives analysis must form the primary basis for the remedy proposal and ultimate decision, that analysis needs to be done first. We strongly encourage GE to reconsider its current recommendation after addressing the CMS comments provided today, and to include any revised recommendation in the CMS Supplement.

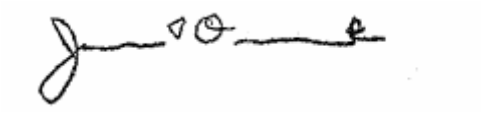
In the event that GE is interested in proposing and analyzing additional remedial alternatives beyond those in the CMS proposal, EPA is willing to consider the development and detailed analysis of additional remedial alternatives drawn from differing combinations or variations of the current remedial components, or of new components not currently discussed in the CMS. Before proceeding with any such development and analysis however, GE must meet with EPA and appropriate state agencies to outline and discuss any such proposals. EPA, the states, and GE should then consult with key stakeholders and the general public regarding such proposals. GE must then submit, for EPA approval, a plan for these additional analyses in the form of a Supplement to the CMS Proposal which EPA can then share with the public. If EPA approves a Supplement to the CMS Proposal, EPA may also consider a reasonable extension to the timeframe specified above for submittal of the CMS Supplement to incorporate these additional evaluations, if necessary.

Attached to this letter are EPA's comments on GE's CMS submittal, as well as EPA's reservations of rights in this regard. Also, today, under separate cover, EPA is providing comments on GE's Cost and Pricing Information submitted in conjunction with the CMS as Confidential Business Information (CBI). GE must address the comments on GE's

CBI submittal as part of, and within the same time frame as its submittal for EPA review and approval of the Supplement to the Corrective Measures Study pursuant to this letter.

We recommend that, following your review of the comments in this letter, EPA, GE and EPA's State partners meet to discuss any questions GE has on our comments.

Sincerely,



James T. Owens, III, Director
Office of Site Remediation and Restoration

Attachment

cc: Mike Carroll, GE
Rod McLaren, GE
Kevin Mooney, GE
James Bieke, Goodwin Procter
Mike Gorski, MassDEP
Susan Steenstrup, MassDEP
Anna Symington, MassDEP
Dale Young, MAEOEEA
Susan Peterson, CTDEP
Kenneth Munney, USFWS
Ken Finkelstein, NOAA
Holly Inglis, EPA
Tim Conway, EPA
Dean Tagliaferro, EPA
Susan Svirsky, EPA
James Woolford, EPA
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Thomas Hickey, PEDA
Mayor James Ruberto, City of Pittsfield
Ms. Brona Simon, Executive Director, MSHPO
Mr. Victor Mastone, Director, MBUAR
Ms. Cheryl Andrews-Maltais, THPO, Wampanoag Tribe of Gay Head (Aquinnah)
Ms. Kathleen Knowles, THPO, Mashantucket Pequot Tribe
Ms. Sherry White, THPO, Stockbridge-Munsee Community
Scott Campbell, Weston Solutions
Linda Palmieri, Weston Solutions
Public Information Repositories

ATTACHMENT

RESERVATION OF RIGHTS

- EPA reserves all of its rights under the Consent Decree, including compliance rights, with respect to the CMS, and other submittals pursuant to the Reissued RCRA Permit.
- In responding to GE's CMS, EPA has included some comments relating to specific remedial alternatives. Such comments are made in the context of the actions that would be necessary in design or implementation of that alternative, should it be selected as a component of a potential remedial action. However, EPA has not made any remedy selection decisions to date, and such comments should not be interpreted to mean anything in that regard.
- EPA, by making particular comments in this letter, is not in any way indicating that it is in agreement with other portions of the CMS for which no comment is specifically provided, including any advocacy, argument, or editorial comments presented by GE in the CMS.
- EPA's internal process for the Rest of River includes multiple steps following GE's submittal of the CMS, including review by EPA's Remedy Review Board and Contaminated Sediments Technical Advisory Group. EPA reserves its rights to require GE to address matters arising subsequent to this letter, including matters resulting from such reviews.

GENERAL COMMENTS

1. GE shall submit potential locations for the siting of an upland disposal facility with an evaluation of the suitability of each location with regard to PCB landfill siting criteria and compliance with ARARs. In addition, GE shall perform an analysis of ARARs, as specified in EPA's comments relating to ARARs in this letter, for each such upland disposal location(s).

   GE's analysis of ARARs for the Upland Disposal Facility location(s) shall include, but not be limited to, the following:
   - a discussion for each location of the attainment of ARARs, any potential application of the EPA Area of Contamination Policy, and the ability of the alternative to attain ARARs in the event the Area of Contamination Policy does not apply; and
   - the ability of an Upland Disposal Facility to be constructed with a double-liner system.

2. GE shall submit information on potential locations for the disposal of materials offsite, including but not limited to the following:

- the location(s) for disposal of material that, if subject to thermal desorption or chemical extraction, is not suitable for reuse.
- additional discussion of the potential for beneficial reuse of material post-processing, if subjected to thermal desorption.
- the location(s) for disposal of material not subject to thermal desorption or chemical extraction.

3. GE shall submit potential locations for a chemical oxidation/thermal desorption unit(s) and an analysis of how such locations comply with ARARs, in accordance with the ARARs evaluation requirements in this letter.

4. GE shall develop and submit the carbon footprint for each alternative being evaluated, including associated transportation, as a measure of short term effectiveness.

5. GE shall submit an evaluation of the use of rail as a transportation option for potential offsite disposal.

6. GE shall provide an analysis of an alternative(s) for bank stabilization that allows for greater use of bioengineering methods rather than armor stone/revetment for areas where adjacent floodplain land use, topography, and hydrodynamics allow. Such methods provide greater opportunities for more rapid and beneficial revegetation during the restoration process. This analysis shall include an evaluation of the reduction in bank slope to maximize the use of bioengineering/revegetation. GE shall also provide the assumptions used in estimating the remedial component for erodable banks (e.g. areas, slopes, bank height) both in the previous CMS submittal and in the reevaluation.

7. GE shall provide a conceptual approach for an institutional control pertaining to the monitoring, management and or disposal of sediment and/or bank soil containing PCBs associated with the maintenance, new construction, or removal of structures that are performed by another party, including but not limited to dams and bridges in the Rest of River. GE shall also discuss the assumptions made in the CMS regarding the status of the dams for each alternative and the effect of these assumptions on long-term effectiveness.

8. With respect to the May 2007 review of innovative technologies performed by GE in the CMS Proposal Supplement, GE shall provide a similarly detailed update to the discussion that reflects the current state of the science, including information on performance, removal efficiencies, applicability, relative costs, operations and maintenance, and implementability.

9. GE shall provide a more thorough analysis of the chemical extraction pilot study data and the efficacy of the technology, including a detailed analysis of the applicability of reuse and utilization of the processed material in river bottom, bank, or floodplain restoration.

10. EPA believes that the CMS does not address General Condition 4 of the April 13, 2007 Conditional Approval of the CMS-P, which directed GE as follows: "For each alternative being considered in the CMS evaluation, GE shall include restoration requirements

commensurate with the alternative being considered." GE shall provide a detailed description of the restoration process and methods that may be used to restore habitats affected by removal and other construction activities, including steps that include avoidance, minimization, and mitigation and control of invasive species. This discussion will follow the principles outlined by EPA at http://www.epa.gov/owow/wetlands/restore/principles.html, the *Massachusetts Wildlife Habitat Protection Guidelines for Inland Wetlands* (2006), and the Society for Ecological Restoration International *Guidelines for Developing and Managing Ecological Restoration Projects*, 2nd Edition (2005). GE shall use the area(s) identified in Specific Comment 42 to illustrate this process.

This discussion at a minimum shall include:

- the process that will be used to identify and document ecological functions, services, and existing conditions in the river (bank and bottom), floodplain, and special habitats prior to implementation of an alternative. For example, as mentioned in the CMS, vernal pools have special hydrologic features. To increase the likelihood of successfully restoring these pools following removal, detailed topographic survey and information on hydrology would be required. The discussion shall describe how existing conditions for river bathymetry may be established and then replaced following potential corrective actions to achieve the pre-existing hydrologic conditions in the river.
- The methods that will be used to evaluate options for an alternative to avoid, minimize, or mitigate the impacts of the alternative, including a description of the decision-making process, taking into account the need to avoid and minimize impacts to wetlands and biota, including but not limited to Massachusetts Endangered Species Act (MESA) species to the maximum extent practicable. These methods shall include but not be limited to the following to avoid or minimize impacts from construction: the ability to iteratively evaluate contaminant concentrations and risk, the sequencing and timing of construction activities, and emphasis on timely restoration of impacted habitats following remediation.
- The methods that can be used to restore or replicate the ecological functions and services of habitat (including short-term measures such as boulder clusters in channel, placement of woody debris on the floodplain) that are affected by implementation of an alternative.
- The process by which performance standards shall be established with stakeholder input to assess the success of the restoration, including the need for specific measures to evaluate the effectiveness and control of invasive species, and the success of bank stabilization (including consideration of the ecological functions and services).

11. GE shall revisit the operation, maintenance, and monitoring (OMM) described in the CMS for restoration and provide a more thorough description of the approach to OMM for restoration and costs including expanding the duration to a minimum of 5 years of active monitoring (these may or may not be sequential), dependent on the required restoration activities that are implemented for a given alternative. Use of the five-year period in the in

the evaluation is for cost estimate purposes only; EPA's selected remedy will not necessarily require or limit these activities to this time period.

12. EPA believes that the CMS does not address General Condition 5 of the April 13, 2007 Conditional Approval of the CMS-P, which directed GE as follows: "[f]or each alternative being considered in the CMS evaluation, GE shall include operation, maintenance, and monitoring requirements commensurate with the alternative being considered in the CMS evaluation." GE shall provide a discussion of the types of maintenance or corrective actions that could be required for each alternative (including river banks and large woody debris that may adversely impact remedy performance), and a plan for OMM to insure the ongoing performance of any remediation, particularly following large storm events. In addition, GE shall revise the costs of OMM to 100 years for the purpose of the CMS. Use of the 100-year period in the evaluation is for cost estimate purposes only; EPA's selected remedy will not necessarily require or limit these activities to this 100-year period but this will simply provide a more realistic expectation and costs associated with implementing OMM for alternatives such as those considered in the CMS.

13. EPA believes GE has placed too much weight on its analysis of "significant incremental reduction" in its CMS Report. "Significant incremental reduction" is not one of the Selection Decision Factors. While the descriptions of incremental reductions may be accurate (with the exception noted in Comment 18), such an argument is not appropriate for providing a discussion of reductions in residual risks (a component of the Standard for Protection of Human Health and the Environment) or achieving IMPGs (a Selection Decision Factor). Moreover, as, for example with the sediment alternatives, the first two alternatives evaluated included no sediment removal, the next alternative evaluated will necessarily have the greatest incremental reduction, regardless of whether it satisfies other evaluation criteria. As noted in the Recommendations provided by the NRC in the report *Sediment Dredging at Superfund Megasites: Assessing the Effectiveness* (2007), …"*remedies should be designed to meet long-term risk-reduction goals (as opposed to metrics not strictly related to risk, such as mass removal targets).*" EPA notes that language is used in the CMS in the discussion of more advanced/costly remediation alternatives describing the positive aspects as "relatively small additional reductions," even when such incremental reductions are more successful in achieving IMPGs.

    In addition, particular arguments or themes asserted by GE throughout the CMS do not represent a balanced assessment of the General Standards and Selection Decision Factors. Examples include:

    - GE's assertion that quicker and smaller remedies are better.
    - GE's assertion that longer remedies are more disruptive and more likely to encounter problems.

- GE's assertion that advective PCB loads and reductions in fish concentration are more important than attaining IMPGs or concentrations at which advisories can be modified to allow consumption of fish by humans[1].

An objective comparison of metrics such as percent of area attaining IMPGs or risk levels would provide a more balanced assessment of the alternatives. Examples of additional metrics include but are not limited to: PCB mass exported (gross or net), reach-average residual PCB concentrations, concentrations in water and a comparison to the Ambient Water Quality Criteria (AWQC), time to reach particular IMPGs or relaxing of consumption advisories, as well as PCB mass removed/remaining. GE shall include a presentation of additional metrics including those listed above which are constructed in a way such that the performance of all alternatives can be compared directly by subreach and for CT.

14. Specific Condition 48 in the April 13, 2007 Conditional Approval Letter for the CMS-P directed GE to recognize in the CMS that the vast majority of institutional controls are not effective for ecological exposures and may in some cases have limitations for humans. EPA was not able to locate such an acknowledgement in the text of the CMS. GE shall include a discussion of the effectiveness and limitations of institutional controls in minimizing ecological and human exposure to contaminants in the context of a Rest of River remedy. On Page 2-2, it is stated in the CMS text that "since human health may be protected through means other than achievement of the IMPGs (*e.g.*, through biota consumption advisories), such other means have been considered in applying the standard." GE shall provide in the Supplement a discussion of how such other means were considered, the consideration if active measures are determined not to be practicable, based on the balancing of tradeoffs among alternatives, and the difficulties that can be associated with institutional controls (e.g. enforceability, reliability, and effectiveness) as discussed in EPA's *Superfund Contaminated Sediment Remediation Guidance* (EPA 2005) and OSWER Directive 9355.0-7FS-P, *Institutional Controls: A Site Manger's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Correction Action Cleanups* (EPA 2000).

15. The discussion of thin-layer capping (TLC) in the CMS is confusing and at times contradictory. EPA and the Army Corps of Engineers regard TLC as a form of enhanced monitored natural recovery, not a means of isolating contaminants, yet in a number of locations in the CMS reference is made to the stability of a thin-layer cap. On Page 1-13, the definition of thin-layer capping (TLC) is consistent with EPA's *Superfund*

[1] Consumption Advisories are administered by the MA and CT Departments of Public Health (DPH). Concentrations of PCBs in fish tissue which would result in the placement or relaxing of a consumption advisory may differ from the human health IMPGs based upon EPA's risk assessment for fish consumption. Currently, the MA DPH PCB concentration for establishing an advisory is 1 mg/kg (1/2 the FDA Tolerance Level). In CT (taken from CTDPH, May 1999), the concentrations are:

<0.1	Unlimited Consumption
0.1-0.2	One meal per week
0.21 - 1.0	One meal per month
1.1 - 1.9	One meal every 2 months (high risk group - do not eat)
> 1.9 ppm	Do Not Eat (everyone).

Contaminated Sediment Remediation Guidance (EPA 2005), *OU1 Design Supplement Lower Fox River Operable Unit 1*, Project I.D.: 07G017, GW Partners, Neenah, Wisconsin, November 2007) and the *Fox River White Paper 6B* (Palermo et al. 2002) in describing TLC as a means of enhancing natural recovery via sediment mixing and dilution. TLC is typically considered appropriate only for situations where comparatively low levels of contamination are present in a relatively thin layer at the sediment surface. In later sections of the CMS, however (e.g. pp. 4-31, 4-32, 4-36, 4-40), TLC is variously discussed in terms of controlling releases, remaining stable, and/or providing a cover layer over PCB-contaminated sediments. None of the latter functions are considered by EPA or the Army Corps of Engineers to be goals of TLC, but are factors to be considered in designing an engineered cap.

In addition, there was no recognition in the CMS of the potential effects of deeper mixing processes such as storm events, boat traffic, or megafauna, the full magnitude of which may not be simulated in the hydrodynamic and sediment transport model. An evaluation of the data, along with engineering considerations, must be considered in concert with model output in assessing the effectiveness of any alternative because of processes not fully represented in the model, as well as uncertainties both with the model and model inputs. EPA recognizes however, that the model simulations used in the CMS did include an extreme storm event to evaluate the performance of alternatives under storm conditions. However, conditions influencing deeper mixing processes may change in the future, with the influence of currently unquantifiable factors such as global warming. GE shall include a discussion and literature review of the effect of megafauna on both TLC and engineered cap integrity and the potential influences of other deeper mixing processes or climatic change on the alternatives.

In addition, cap material is at times referred to as sand and at other times (specifically in the descriptions of the modeling simulations), is described as being similar to the underlying sediment, which is not sand in most of the ROR.

GE often cites *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005) when discussing MNR and TLC. With reference to SED 3 and other alternatives involving MNR, GE cites that EPA has stated that MNR should "receive detailed consideration" where site conditions are conducive to such a remedy (EPA, 2005, p 4-3). GE fails to mention that EPA lists the site conditions in Table 4-2 of the guidance document where MNR should be considered. Of the nine conditions described as especially conducive to MNR, it is questionable whether the following five conditions apply to the areas in Reaches 5 through 8 (with the general exception of the flowing subreaches in Reach 7) for which MNR and/or TLC are proposed:

- Sediment is resistant to resuspension
- Contaminant concentration in biota and in the biologically active zone of sediment are moving towards risk-based goals on their own
- Contaminants already biodegrade or transform to lower toxicity forms
- Contaminant concentrations are low and cover diffuse areas
- Contaminants have low ability to bioaccumulate.

GE shall provide a discussion of its understanding of the appropriate use and function of TLC, particularly in reference to the Rest of River, and justify any differences between that understanding and the generally accepted definition and function of TLC as used by EPA and the Corps of Engineers and the applicability of TLC to the areas selected by GE in the SED alternatives. GE shall also include a discussion of the purpose and application of MNR in specific areas selected by GE in Reaches 5 through 8 as it relates to the issues described above.

16. There are numerous references in the CMS to the detrimental effects of construction activities for the various alternatives, including specifically the effects of roads and staging areas in the floodplain, truck traffic related to removal of soil and sediment, and general disruption of local populations of biota. There is comparatively little discussion, however, of the numerous avoidance and minimization measures that should be implemented to lessen or eliminate these effects if a remedy were implemented.

    GE shall provide a detailed discussion of the procedures that will be followed to use existing infrastructure and minimize habitat loss or adverse effects to MESA species in the construction of staging areas and roads in coordination with the remediation to be performed in the alternative being evaluated. In addition, GE shall describe their process to avoid, minimize and mitigate the potential for detrimental effects of construction activities on the quality of life of affected communities as well as MESA species. As part of the discussion, GE shall provide a more detailed description of the decision process that will be used to balance considerations including but not limited to the following: the type of a removal action (e.g. dredge type), measures that can be taken to minimize the footprint of construction, requirements for supporting infrastructure such as roads, costs, and geomorphology of restored river. GE shall provide further discussion of the assumptions made in the CMS regarding staging areas, roads and infrastructure. The description shall include a graphic depicting the decision tree that will be followed during the decision process. Such decision trees have been used effectively to transparently outline these thought processes at other contaminated sediment sites (e.g. Fox River). GE shall use the area(s) identified in Specific Comment 42 to illustrate the implementation of such a decision tree.

17. The analysis of reductions in PCB concentrations in fish fillet compared with human health risk levels presented in the CMS used initial concentrations in biota at the end of the model validation simulation. At that time the East Branch had substantially higher PCB boundary loads than is currently the case following remediation, and therefore the initial concentrations used by GE are no longer applicable to the current PCB loading regime. As a result, PCB concentrations in biota presented in the CMS show a steep decline in the beginning of the simulations that is an artifact of the modeling, and GE's conclusion of large declines in the first ten years of the simulation is not consistent with current conditions and represents in part an artifact of the modeling. Such a decline exaggerates the benefit expected in SED 1/2 and the effectiveness of SED 3 relative to alternatives SED 4 and higher. When EPA calculated initial conditions in fish tissue by spinning up the first year of the simulation (i.e. using current boundary conditions to reflect the initial

condition rather than historical boundary conditions), the results appear considerably different. This alternate presentation reduces the apparent desirability of SED 1/2 and SED 3 and more clearly illustrates the differences between different sediment alternatives. GE shall provide a recognition of this issue and a discussion of the effect of this issue on the assessment of the SED alternatives.

18. EPA notes that many of the figures presented in the CMS showing residual concentrations, particularly in fish tissue, relative to human health IMPGs include only the IMPGs associated with 10^{-6} incremental cancer risk and/or Hazard Index of 1. Because of the very low exposure concentrations associated with the low end of the EPA risk range, and the consequent difficulty that most alternatives have in achieving the 10^{-6} IMPGs during the model simulation period given the bioaccumulative nature of PCBs at very low concentrations in sediment and water, such presentations tend to obscure the differences in risk reduction between alternatives. For incremental cancer risk, the EPA risk range is from 10^{-4} to 10^{-6}, and for noncancer risks a Hazard Index less than 1 is generally considered acceptable. GE shall revise these figures to include the IMPGs for the entire risk range.

19. The model output presented in the CMS shows a leveling off of sediment and/or fish concentrations at a particular concentration post-implementation of the alternatives. EPA notes that this is largely driven by the modeling assumptions regarding continued low concentrations of PCBs coming in upstream from the East and West Branches as well as from atmospheric loads from tributaries. In addition, the model simulations for some alternatives reflect assumptions that were made about resuspension and residuals associated with the type of technology being modeled (e.g. placement of an engineered cap, or dredging). EPA approved the assumptions in the CMS Proposal, but also directed GE to produce model output with alternative assumptions ("lower-bound" simulations). GE provided this output on a CD in the Appendix to the CMS. However the lower-bound simulations are not plotted on the same graph as the "upper-bound" simulations, and are often provided on physically different scales and very small scales. Therefore evaluation of the effect of the modeling assumptions (and the uncertainty associated with the assumptions) can not be evaluated. GE shall reproduce the graphics depicting the model simulations of alternatives provided in Section 4 with both the upper-bound and lower bound simulations plotted on the same graph in a readable format in hard copy as well as on a CD. In addition, GE shall provide a table that clearly shows the upper bound and lower bound values for the assumptions of model input parameters.

20. EPA believes that undue emphasis is assigned by GE in the CMS to the length of time required to implement a remedy. A shorter length of time for a remedial project only yields benefit if the three General Standards are addressed (protection of human health and the environment, controlling sources of releases, and achieving ARARs) with consideration given to the other Selection Decision Factors. Furthermore, it should be recognized that the "disruptions and impacts" discussed in the CMS not only would be spread out over time and space as implementation of active alternatives generally proceeds from upstream to downstream, but can also be to a large extent avoided, minimized or restored with proper implementation of a remedy. Therefore, describing remediation in

simple terms of length of time for implementation of an entire alternative, in the context in which it is discussed in the CMS, is misleading. In fact, any remedy selected other than SED 1/2 and FP 1 would impact a given area for only a portion of the duration of implementation of the entire alternative, a point which is not made in the CMS in any discussion of short-term effectiveness. Also, in general (with the exception of SED 8), each alternative builds on previous alternatives, therefore the length of time for remediation in a given reach is typically the same (e.g. the time to complete Reach 5A in SED 3 is the same as it is in SED 5). GE shall provide a timeline that shows the implementation of each sediment alternative and associated restoration on a reach level. Such a timeline shall assume that any floodplain actions are generally done concurrently with any sediment/bank remediation, depending on physical proximity to a sediment alternative, and that restoration of each affected area would be conducted as quickly as is feasible and advisable following remediation, including the restoration of areas of supporting infrastructure.

21. EPA notes that environmental improvements (reduced PCB concentrations) in select river reaches are highlighted in the CMS as justification for lack of action in remaining reaches in the evaluation of some alternatives. There is a tendency for the discussion presented in the CMS to be dismissive of the risk reduction and control of sources of releases of more aggressive alternatives in Reaches 5B, 5C, and 5D. In addition, EPA notes that GE's statements regarding the net incremental reductions attributable to SED 3 in comparison to more aggressive SED alternatives obscures the fact that it is the latter alternatives that in many cases are the only ones involving remediation in Reaches 7 and 8. Even if an alternative achieves substantial reductions in PCB concentrations when averaged over large areas, it may not be the best suited alternative if contamination in other reaches is only minimally reduced or unchanged. Many of the summary figures also do not depict the response of all reaches (e.g. Figure ES-3 does not include the response in Reach 7). To allow a complete evaluation of the effectiveness of each alternative, GE shall ensure that all figures representing the comparative effects of the alternatives include all river reaches including CT and shall provide such modified figures.

22. GE shall provide a single table or matrix and revised figures which present a more organized and clear comparison of the overall net risk reduction (as discussed in the *Sediment Dredging at Superfund Megasites: Assessing the Effectiveness* (NRC 2007)) associated with each alternative. There is some discussion in the CMS of many of the risk trade-offs that might be expected, but evaluating these competing factors would be much easier if they were organized into a single table or matrix. In addition, this organizational approach would help to reduce the potential for some risks (e.g., those from dredging) being emphasized over others (e.g., risk from residual PCB concentrations). GE mentions net risk reduction and attempts to address this goal in its comparison of remedies in Sections 4 and 6, but this comparison could be made more clearly and in an understandable manner. For example, predicted reductions in fish tissue concentration are presented in separate tables for each alternative. If these results were summarized across remedies in one place, the reader could more easily compare remedies with respect to this exposure reduction (and indirectly risk reduction) metric along with other metrics (e.g.,

worker health risk, PCB concentration reductions, habitat restoration benefits, habitat loss, etc.) that are also of concern.

23. EPA notes that GE's evaluations of residual risk to humans in the floodplain are based only on current uses, not reasonably foreseeable future use as was included in the Human Health Risk Assessment. Residual risks could change for some alternatives if land use changes in the future, particularly with regard to farming practices or development of new residential properties. In addition to the consideration of current uses, GE shall present a discussion of the actions and/or institutional controls that may be required if land uses change.

    EPA notes that in the Human Health Risk Assessment (WESTON 2005), portions of individual residential properties were evaluated as not having current residential exposure due to the definition of actual or potential lawns in the Consent Decree. GE shall submit a conceptual approach for obtaining restrictions on use of these portions of the properties, or for providing for unrestricted use.

    In this context, GE shall include additional discussion of the implementation of institutional controls, including but not limited to the following:
    - Requirements for inspection, maintenance and monitoring for institutional controls,
    - Requirements for expanded activities associated with biota advisories,
    - Revised costs which include the implementation of such institutional controls.

24. The approach used in the CMS (*i.e.*, simulation of sediment concentrations of 1, 3, and 5 mg/kg) to evaluate the effectiveness of the floodplain alternatives on ecological receptors exposed to both floodplain and sediment food sources for each floodplain alternative serves as a useful screening tool. However, for remedial alternatives that do not result in residual concentrations within the range of 1 to 5 mg/kg PCB in sediment, these scenarios do not provide sufficient information to determine whether the IMPGs can be attained. EPA believes that in several instances, the "not achievable" determinations made by GE for piscivorous mammals IMPGs are not valid in light of the actual sediment concentrations achieved by some SED alternatives. GE shall provide a more comprehensive evaluation of whether various combinations of sediment and floodplain remedial alternatives satisfy the IMPG values for insectivorous birds (wood duck) and piscivorous mammals (mink). In addition, the analysis shall include an explicit evaluation of both the upper-bound and lower-bound IMPGs, not simply whether the residual concentration is within the "range of IMPGs".

25. GE refers to a list of "challenges" that it claims have not been encountered at other sites and cites them collectively as a reason to favor alternatives with "a more reasonable scale and shorter duration." EPA notes that although alternatives SED 7 and SED 8 are certainly large-scale projects that may pose challenges, the discussion of lack of precedence with similar large-scale projects is overstated given the expanding scope of contaminated sediment remediation projects in recent years. For example, dredging has been performed as part or all of the remedy at a large number of so-called sediment

"megasites," resulting in an EPA-sponsored review of the effectiveness of dredging as an option at such sites (NRC 2007). EPA guidance (EPA 2005) also reflects lessons learned to date from remediation at sites of various sizes, including some very large projects. Based on this and other information, EPA rejects the conclusion that any of the evaluated alternatives should be eliminated based on technical implementability.

26. EPA notes that in comparing the simulated performance of the various remedial alternatives to each other and/or to the IMPGs, the discussion in the CMS in many cases implies that the model results have greater precision than EPA believes is appropriate. Fate and transport modeling necessarily involves numerous simplifications of natural processes, assumptions of values for various parameters, use of data, and associated data gaps; accordingly, model results must be viewed as having some uncertainty and be interpreted in the context of data, observations, and engineering considerations. To ensure that the selected alternative is adequately protective of human health and the environment, EPA will consider the potential effects of model uncertainty in its review of all results presented in the CMS.

27. GE shall, for all ARARs identified in the CMS Report, all additional ARARs identified in this letter, and any additional ARARs identified in response to this letter, provide a substantive analysis of each ARAR. GE's substantive analysis of each ARAR shall follow the five-column structure depicted below.

Statute/Regulation	Citation	Requirement Synopsis	Status (Applicable or Relevant and Appropriate, or TBCs)	Action(s) to be taken to achieve ARAR

28. GE shall produce one set of ARAR charts for each of the eight sediment alternatives, each of the seven floodplain alternatives, and each of the five treatment and disposition alternatives evaluated in the CMS Report as well as any alternatives identified in response to the this letter. Each set of ARAR charts is to include evaluations of Chemical-specific, Location-Specific, and Action-specific ARARs.

29. For requirements for which no permit is needed because the work is being conducted "on site", pursuant to CERCLA Section 121(e)(1), GE shall specify that GE remains required to comply with substantive requirements of a provision.

SPECIFIC COMMENTS

Specific Comments for ARARs

Chemical-Specific ARARs:

PCBs:

1. In its analysis of Connecticut Numeric Water Quality Criteria for PCBs, GE shall recognize that the Housatonic River within Connecticut is listed on the Impaired Waters List at Section 303(d) of the Clean Water Act due to PCBs from the GE Facility.

2. GE shall include as "To Be Considered" standards the following documents:
    - Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F (3/05); and
    - Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F (3/05)).

Particulate Matter:

3. GE shall evaluate the Massachusetts air pollution control requirements for activities that generate particulate emissions (310 CMR 7.09) as an Action-specific ARAR for each alternative for which it is applicable or relevant and appropriate.

Location-Specific ARARs:

4. GE shall provide an ARARs analysis of the Massachusetts Waterways Law and its implementing regulations (M.G.L. c.91 and 310 CMR 9.00).

5. Temporary Staging Areas for dewatering and handling of PCB-containing sediments, and for PCB-containing floodplain soils: GE asserts that it is uncertain whether these staging areas would meet the default conditions of EPA's TSCA regulations at 40 CFR Section 761.65(c)(9), and the requirements of RCRA for hazardous waste storage facilities. GE shall perform an ARAR evaluation based on the comments in this letter. In that analysis, GE shall include a discussion of what GE sees as the uncertainties, including design uncertainties, and how such uncertainties could be avoided so the staging areas would be compliant.

Rivers, Streams, Impoundments:

6. Clean Water Act 404, 33 CFR Parts 320-323, and 40 CFR 230: GE shall evaluate this ARAR under the following standards: there must be no practical alternative with less adverse impact on aquatic ecosystem; discharge cannot cause or contribute to violation of state water quality standard or toxic effluent standard or jeopardize threatened or endangered species; discharge cannot significantly degrade waters of U.S.; must take practicable steps to minimize and mitigate adverse impacts; must evaluate impacts on flood level, flood velocity, and flood storage capacity.

7. Fish and Wildlife Coordination Requirements: GE shall evaluate these requirements for each alternative. Any modification of a body of water requires consultation with the U.S. Fish

and Wildlife Service and the appropriate state wildlife agency to develop measures to prevent, mitigate or compensate for losses of fish and wildlife.

8. MA Clean Water Act regulations on discharges of dredged or fill material: GE shall evaluate as Action Specific ARARs, and shall evaluate this ARAR under the following standards: for discharge of dredged or fill material, there must be no practicable alternative with less adverse impact on aquatic ecosystem; must take practicable steps to minimize adverse impacts on wetlands or land under water; stormwater discharges must be controlled by best management practices; there must be no substantial adverse impact to physical, chemical, or biological integrity of surface waters.

9. In Table 2-2, GE identifies as "To Be Considered" three consumption advisories (MA Freshwater Fish and Biota Consumption Advisory List, MA Housatonic River, MA Provisional Waterfowl Consumption Advisory, and Advisory for Eating Fish from Connecticut Waterbodies). GE shall evaluate those as chemical-specific TBCs.

Floodplains, Wetlands, Banks:

10. Regulations and Executive Order 11990 regarding Wetlands Protection: GE identifies the 40 CFR Part 6 citation as "see also" provisions. To clarify, GE shall identify those provisions clearly as ARARs. Also, GE shall evaluate based on the standard that no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent.

11. Regulations and Executive Order 11988 regarding Floodplain Management: GE identifies the 40 CFR Part 6 citation as "see also" provisions. To clarify, GE shall identify those provisions clearly as ARARs. Also, GE shall evaluate based on the standard that requires action to avoid the long- and short-term impacts associated with the occupancy and modifications related to floodplain development, wherever there is a practicable alternative.

12. GE shall evaluate Resource Conservation and Recovery Act ("RCRA")(42 U.S.C. Section 6901 et seq.) Hazardous Waste Facility Standards Within a Floodplain (40 CFR 264.18(b)) as a location-specific ARAR.

13. Massachusetts Clean Water Act Water Quality Certification requirements: GE shall revise so the citation is to CWA 402, not 401.

14. Preservation of Historical and Archaeological Data Act and National Historic Preservation Act, 16 U.S.C. 469 et seq., 36 CFR Part 65; 16 U.S.C. 470 et seq., 36 CFR Part 800: GE shall evaluate these ARARs.

15. GE shall evaluate the following ARAR: Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed Reg 19594; 33 CFR 332; 40 CFR 230.91 et seq.

Action-Specific ARARs:

16. Massachusetts hazardous waste regulations on identification of hazardous waste, 310 CMR 30.100: GE shall include an analysis of how the alternatives will attain the requirements of these regulations.

17. Clean Water Act - NPDES Regulations: GE shall modify its citation to be "Clean Water Act and NPDES regulations, 33 U.S.C. 1342; 40 CFR 122, including but not limited to 122.44(a), (e), 40 CFR 125.1-125.3."

18. Discharge from Water Treatment facilities to the Housatonic River: GE shall include a discussion of whether GE will be able to meet the water quality standards at the point of discharge.

19. GE shall evaluate RCRA part AA: air emissions standards for process vents: where applicable or relevant and appropriate.

20. Federal and Massachusetts Stormwater Requirements: GE shall evaluate these requirements as Action-Specific ARARs for alternatives for which erosion control is necessary. Also, for the Massachusetts Stormwater Requirements, GE shall include identification of a buffer zone as part of the evaluation.

21. Massachusetts Endangered Species Act ("MESA"): GE shall submit a comprehensive evaluation of MESA and the MESA regulations in the evaluation of action-specific ARARs. In its evaluation, GE shall identify how each alternative complies with the substantive performance standards of MESA, including the compliance of each alternative with the performance standards associated with authorizing a "take" under MESA, and setting forth specific proposals on how compliance with the long-term Net Benefit standard will be achieved. In addition, GE shall acknowledge that compliance with MESA is not restricted to areas formally designated as Priority Habitats. GE's analysis of the MESA ARAR for each alternative must establish more definitively whether, or the extent to which, a particular alternative is predicated on a waiver of some or all of the substantive requirements of MESA. The heading in Table 2-2 should be corrected to read *Critical Habitat for MESA State Listed Species*. The table should acknowledge a third category of rare animals and plant species, "species of special concern".

22. GE shall submit an evaluation of the Connecticut statute on endangered and threatened species, CGS Section 26-303 through 26-316, in the evaluation of ARARs.

23. Upland Disposal Facility Option – TD 3: Under General Comment 1, GE is required to identify potential location(s) of an upland disposal facility. GE shall perform an analysis of ARARs as specified above in the overall ARARs for each such upland disposal facility location(s).

Executive Summary

24. Page ES-2 to ES-3: EPA notes that the discussion of the area between the Confluence and Woods Pond is incomplete. This habitat is correctly described in terms of the wide floodplains, extensive wetlands, and large backwaters that are present. However, potential impacts to these areas are described only in terms of the effects of remediation ("unavoidably impacting flora, fauna, and aesthetics"), but without recognition of the current impacts from risks posed by PCBs. Neither is the strategy to avoid, minimize or mitigate for impacts from remediation discussed.

25. Page ES-3, ES-15: It is stated in the CMS that "the less time that it takes to implement the remedy, the faster any potential benefits will be realized." The statement fails to recognize that, in general, alternatives involving greater amounts of remediation generally include additions to remediation already specified in the simpler alternatives. Thus, the benefits of the simpler alternatives and the benefits of the same remediation conducted as part of a more complex alternative are realized in approximately the same amount of time. It just may take longer in its entirety to implement a remedy that involves a greater area, or potential larger volumes of material. In addition, this comment, and the text that follows it, is biased toward consideration of only the negative consequences of remediation. The remedial alternatives that take 25-50 years to implement in their entirety are described as "extreme," whereas the presence of PCBs in the Housatonic River since the 1930's and associated risks (in the past, now, and/or in the future) is understated.

26. Page ES-5: EPA notes that the statement that "abundant, diverse, and thriving fish and wildlife population and communities" have been documented in the Rest of River is inconsistent with the findings of the Peer Review Panel for the ERA for some species in the ecosystem (e.g. benthic invertebrates, amphibians, mink/otter).

27. Page ES-6: The CMS mentions that "upstream remediation/source control activities, along with natural recovery processes, have significantly reduced the PCB loads in the Rest of River and those improvements are continuing." EPA notes that this comment should not be interpreted to mean that monitored natural recovery will result in rapid improvement of environmental conditions in all reaches. GE's fish tissue sampling program over the last decade shows no discernible reduction in PCB concentrations in young of the year fish at the sampling locations in the MA portion of Rest of River, even in light of the upstream remediation and source control activities and improvements measured in the remediated reaches. This is due to the large inventory of PCBs which exists in Rest of River and the exposure concentrations which result from this inventory being proportionally greater than the reductions made in loadings from sources located upstream.

28. Page ES-13: EPA disagrees with the statement that "all the sediment alternatives that would involve removal would meet the General Standards in the Permit." For example, this claim is not supported by the Risk Assessment findings, which indicate that components of the General Standard of "Overall Protection of Human Health and the Environment" would not be achieved for several receptor groups (including humans) in many of the sediment alternatives at various reaches.

29. Page ES-14: EPA notes that lack of feasibility of achieving thresholds for unlimited human consumption of fish is not a valid justification for not attempting to reduce risks for this pathway. This argument is invalid because it does not consider the value of risk reduction in either a limited consumption scenario (i.e., inability to achieve risk levels allowing unlimited consumption does not necessarily prevent regulators from changing total restrictions to partial restrictions), a scenario in which fishing restrictions are ignored, or a scenario where consumption could occur, but after a longer duration than the model simulations suggest.

30. Page ES-14: EPA notes that the discussion of short-term and long-term effectiveness must also recognize the existing impacts from PCB contamination, the length of time it will take for the system to be unaffected by PCBs via natural recovery, and the manner in which remediation is implemented. A well-crafted and carefully implemented remediation and restoration strategy will allow the plant and animal communities to recover rapidly. Arguments presented in the CMS inappropriately question the ability of a properly implemented environmental restoration program to recreate fully functional ecological habitats and communities.

31. Page ES-14: EPA disagrees with the statement that all sediment removal alternatives would address ecological risks identified in the ERA and would provide overall protection of the environment. The term "address ecological risks" is misleading because many receptors and areas of the river would continue to have ecological impairment following implementation of some of the sediment alternatives.

32. Page ES-14: EPA disagrees with GE's application of a dilution-based argument in their claim that "maintenance of healthy local populations" of mobile receptors would be achieved. This argument implicitly, but incorrectly, assumes that the contaminated area within the area of IMPG exceedances has no inherent ecological value to wildlife, and that there would only be a concern if the broader wildlife population outside the Rest of River area were threatened. The area affected by PCB concentrations exceeding IMPGs is sufficiently large that significant numbers of individual organisms would be affected in the Rest of River area, and as such cumulatively have implications for local subpopulations. In addition, the home ranges for some receptors fall entirely within the areas of IMPG exceedances. GE's implied definition of local population is so broad as to be a regional population.

33. Page ES-18: EPA disagrees with the implication that, in making determinations of net negative impact, restoration scenarios of many years or decades are inherently unacceptable. Because the effects of PCB contamination have been present for many decades already, and would be expected to remain present for many more decades if not centuries if not remediated, long-term adverse effects are present even for the no-action and MNR alternatives. In addition, EPA notes that adverse impacts are not simply a function "of the area impacted by remediation" but are also a function of the residual PCB risks. Such statements are also made in the context of no defined plan to avoid, minimize, or mitigate such impacts where possible, a defined plan to optimize restoration opportunities, or the recognition that restoration will follow on the heels of remediation for any given area, such that the entire area affected by an alternative is not impacted for the entire duration of implementation of the alternative.

Section 2: Description of Evaluation Criteria

34. Page 2-2: EPA notes that it is important to understand that the observation of one or more individuals of a given species does not in itself provide proof of suitable health of such ecological communities or subpopulations. In evaluating alternatives on the ability to reduce "ecological risks to levels that will result in the recovery and maintenance of healthy local populations and communities of biota," GE states that it has considered "the extent to which the alternatives would achieve that population- or community-level goal." EPA believes that GE has incorrectly interpreted the term "healthy local populations and communities" to be synonymous with simple occurrence of individuals. The latter does not, in isolation, achieve the narrative remedial action objective.

35. Page 2-2: EPA notes that it is important not to extend the definitions of populations and communities to include a spatial scale that is inconsistent with the Ecological Risk Assessment (ERA). The ROR between the Confluence and Woods Pond Dam contains more than 10 miles of high-quality wetland habitat for aquatic and terrestrial organisms. It is inappropriate to conclude that observation of organisms (e.g. mink) elsewhere in the Berkshires provides evidence of a lack of ecological harm in the ROR area.

36. Page 2-3: EPA recognizes that a remedial alternative that does not uniformly achieve all ecological IMPGs at all locations may be acceptable based on a balancing of other factors such as short- and long-term ecological impacts of implementation. However, EPA does not agree that an alternative that fails to achieve ecological IMPGs should be characterized without qualification as "protective of the environment."

37. Page 2-8: GE shall confirm if the PCB concentration in the top 6 inches of sediment was consistently used in estimating exposure to receptors other than those simulated in FCM, or if the depth evaluated was varied to be consistent with the food-chain model exposure depth.

38. Page 2-11: Here and elsewhere in the CMS, the "blended fish" calculations used for human health risk comparisons rely exclusively on concentrations in largemouth bass. Changes in fillet concentrations, therefore, show more sensitivity to changes in water column PCB concentrations than would have been the case if additional species, which derive more exposure from sediment sources (e.g., brown bullhead) were included in the calculation as was done in the Human Health Risk Assessment. GE shall include a discussion of the sensitivity of the model to the use of solely largemouth bass.

39. Page 2-12: It is stated in the CMS that ecologically based IMPGs "are considered to be protective of the range of species within each of the broader receptor groups." EPA notes that it is incorrect to assume that the representative species selected are necessarily protective of all other species within the functional groups (assessment endpoints), as many factors go into the selection of a representative species for the purpose of the risk assessment. The Rest of River ERA risk characterizations for each group of receptors specifically assessed whether the risk assessment findings for the surrogate organism are expected to be protective of other species in the Housatonic River. Table 12.4-1 of the ERA summarizes these findings. Although many of the comparisons indicate a level of risk similar to or lower than the representative

species, there are a number of cases for which higher risks are predicted for other species within an assessment endpoint (e.g. salamanders relative to wood frogs).

40. Page 2-17: It is not clear from the text whether the referenced "IMPG attainment factor" is a qualitative or quantitative metric. If quantitative, the basis for calculation of an IMPG attainment factor should be provided. GE shall provide additional detail on the "IMPG attainment factor", including the formula for its calculation, if appropriate.

41. Page 2-18: In addition to evaluating short-term impacts and risks to the environment, nearby communities, and workers, GE shall recognize the potential short-term impacts to cultural resources in and adjacent to the ROR.

Section 3 – Approach to Evaluating Remedial Alternatives for Sediments/Erodible Riverbanks

42. Page 3-1: EPA recognizes that it was appropriate to evaluate remedy components on a reach-wide basis in the CMS but notes that it will be necessary and appropriate in the final design to implement different remedies for smaller sections of a floodplain area or reach with unique characteristics. In addition, EPA intends to consult with appropriate state and federal resource agencies to identify one or more smaller sections of a floodplain area or reach with unique characteristics for more in-depth evaluation consistent with General Comments 10 and 16. GE shall conduct such additional evaluation(s) as directed by EPA.

43. Page 3-3: General Condition 12 of EPA's Conditional Approval of the CMS-P directed that "GE shall include in the CMS a discussion of the process for evaluating how such features as natural erosion of banks, lateral movement of banks, and bedload movement will be affected by each of the corrective measure alternatives." SED 4 includes a combination of removal and thin-layer capping in Reach 5B. It is stated in the CMS that the split between these technologies would be based on "consideration of hydrological parameters." Given the importance of bank stabilization on those hydrological parameters, it is unclear whether in SED 4 and the other alternatives, the factors described in General Condition 12 for the CMS-P have been thoroughly evaluated. GE shall provide a thorough evaluation of how these factors are affected by the implementation of each alternative, and also the decision criteria that were used in specifying particular areas to implement various technologies (e.g. capping without removal) beyond those specified in the revised Table 5-1 of the CMS-P.

44. Pages 3-3 to 3-6: In the review of computer files submitted to provide background detail on the model simulations conducted by GE as part of the CMS, EPA noted that GE's simulation of active remediation in Reach 7 & 8 impoundments did not include all of the grid cells in the impoundment reaches as defined by EPA. GE's more limited definition of the spatial extent of impoundments introduces an inconsistency between the spatial extent of elevated PCB concentrations (relative to the free-flowing reaches) and the spatial extent of elevated PCB concentrations affected by GE's simulation of active remediation in impoundments. The consequence of this inconsistency is that elevated PCB concentrations in the upstream ends of Reach 7B (Columbia Mill impoundment) and Reach 8 (Rising Pond), and all of Reach 7C (Former Lee/Eagle Mill impoundment) are not addressed by the

simulated alternatives that include activities beyond MNR in Reaches 7 and 8. GE shall restart model simulations for Reach 7 & 8 for alternatives SED 6, SED 7, and SED 8, with remediation simulated in all of the grid cells of Reaches 7B, 7C, 7E, 7G, and Reach 8 as defined by EPA. For the SED 5 alternative, GE shall restart the simulation for Reach 7 & 8 for the portion of the simulation beginning when remediation commences in Rising Pond, with remediation simulated in all grid cells in Reach 8. EPA notes further that if this alternative were selected, the actual extent of remediation in these and other areas may be defined during the design of the remedy and is not necessarily constrained by the boundaries used in the CMS simulations, but that these changes are necessary for comparison of the relative performance of the alternatives.

45. Page 3-7: EPA notes that for backwaters in Reach 5D, the basis for determination of the sediment volume removed for some alternatives may be flawed. For areas where data exist, a 3-foot removal depth is assumed, whereas for less well defined areas the removal depth is assumed to be 2 feet. Where uncertainty exists with respect to the depth of remediation, it is appropriate to use a more conservative estimate of removal depth in order to estimate sediment volumes and remediate costs. GE shall provide a description of the rationale for assuming a 2-foot removal depth in areas with insufficient data for full characterization, and estimates of the alternative volumes, areas, and costs using the more conservative assumption of 3 feet.

46. Page 3-9: EPA notes that the thickness of an engineered cap (and associated depth of excavation, if required), whether placed with or without prior removal, should be determined in final design based on site-specific requirements using factors such as described in *White Paper No. 6B – In-Situ Capping as a Remedy Component for the Lower Fox River* (Palermo et al, 2002) and other applicable guidance. The design should consider the underlying sediment PCB profile and associated needs for chemical isolation as well as the need for physical stability. GE shall provide a description of the design process (such as that described in Palermo et al, 2002) that will be used to determine the appropriate cap materials and thickness of materials to be placed.

47. Page 3-10: EPA has questions concerning the projected construction schedule. GE shall provide a Gantt chart for each alternative. These charts shall include sufficient detail to determine the individual timeframes for activities such as mobilization, access road construction, staging area construction, sheetpile installation, excavation, backfill, and restoration. The sequence of these activities and their interdependencies should be presented in the Gantt chart to allow EPA to readily ascertain the assumptions that have been made regarding construction sequencing from reach to reach.

48. Page 3-10: The basis for the assumption of an 8-hour work day is not clear. GE shall provide additional discussion of the selection of this assumption for the length of the work day for estimation of costing and construction duration, specifically addressing such issues as the whether the 8-hour day is based on consideration of quality of life issues and whether longer work days can be assumed for specific reaches or subreaches. Actual duration of the work days shall be determined in the design process.

49. Page 3-10 to 3-11: Daily average production rates are used to determine overall timeframes for the project, including mobilization, set-up, excavation, backfill, restoration, down time, etc. Based on this, EPA believes that the actual capacity of each work crew for excavation is higher than the stated average provided in the CMS. For example, the size of the excavation crew necessary to achieve the 110 cy/day may need to have a capacity closer to 300 to 400 cy/day to achieve the overall intended result of 110 cy/day assumption (agreed to by EPA in the CMS-P conditional approval) to account for all non-excavation activities. In addition to the overall productivities, GE shall include the capacity of the excavation crew expressed on a cy/day basis.

50. Page 3-12: EPA disagrees that additional time should be added to the schedule to account for backfill activities. In general, the agreed-upon productivities were developed to be inclusive of backfill activities. Similarly, for Reaches 5A and 5B, stabilization of banks should also not add to the overall schedule, and is included in the overall timeframe as determined from the average productivity rate assumed and agreed to by EPA in the CMS-P conditional approval. These assumptions suggest that there will be no concurrent excavation downstream of ongoing backfill activities. If the excavation percent completes are correct as shown in Table 3-4, and backfill work cannot begin until at least those percentages of excavation have been completed, then a second crew working solely on backfill would be justified working upstream of the active excavation area. GE shall re-evaluate the excavation percent completes and the possibility of adding backfill crews to reduce the overall timeframes of the alternatives, and include the results of the assessment in the Supplement.

51. Page 3-14: GE shall provide a table summarizing the volume calculations, including the areas, depths, and calculated volume for each alternative and each reach.

52. Page 3-14: EPA notes the following differences between the simulation modeling as implemented by EPA and as implemented by GE and reported in the CMS:

- Remediation is assumed by GE to occur between Mar. 1st and Nov. 31st of each year, not continuously as assumed by EPA.
- Backfill/capping is assumed to begin at 80% completion in a cell, but in an earlier presentation to EPA 73% was assumed.
- The spatial extent of the "deep hole" in Woods Pond used by GE is larger than used by EPA.
- GE has simulated the remediation of more backwaters than those considered part of Reach 5D; EPA restricted the definition of backwaters to Reach 5D only. However it appears that those backwaters are represented in the model as floodplain cells.
- Wet removal techniques can differ in Reaches 5C, 5D, 6, 7 & 8 between EPA and GE simulations.
- Cap thickness in the case of an engineered cap without prior removal differs between the EPA and GE simulations.
- The 15-ppm criterion for Reach 5D in SED 5 is applied by GE as a area-weighted average for each backwater as opposed to a cell-by-cell basis assumed by EPA.
- In cases where the CMS Proposal (Revised Table 5-1) included removal followed by backfill/capping, GE assumed capping whereas EPA assumed backfill.

GE shall propose a resolution to each of these differences for EPA's consideration prior to submittal of the Supplement with a discussion of these differences in model application, particularly as they relate to the evaluation of alternatives.

53. Page 3-25: EPA notes the assumption of 0.01 times the vertical average of the cut profile residual factor for alternatives with a 1.5-ft removal cut followed by cap or backfill is reasonable for comparative evaluation of alternatives in the CMS, however, it does not affect EPA's potential requirements for future OMM.

54. Page 3-26: EPA agrees that the assumption of backfill material of similar physical properties as sediment currently in place was reasonable for conducting the simulations in the CMS, however notes that in the event backfill becomes part of the selected remedy it may not be desirable or possible to obtain or use backfill with the same properties as underlying sediment. The selection of backfill material properties, if applicable, would be a component of the final remedy design subject to similar criteria as the engineered cap design.

55. Pages 3-28 through 3-33: EPA notes that there is a link between representation of the extreme storm event in the CMS model, the time required to implement an alternative, and method by which alternatives are evaluated, that can potentially lead to inconsistent evaluation of alternatives. For simplicity in model set-up, the extreme event was treated in a deterministic fashion and was inserted into year 26 of the hydrograph. Consequently, the extreme event is expected to have less impact on alternatives that are completed (or that are substantially complete) before year 26 of the simulation and to potentially have a larger impact on alternatives that take longer than 26 years to complete. However, despite any assumption regarding the timing of such an event, it is important to recognize that the occurrence of the extreme event is stochastic and that the probability of an event occurring in any given year is constant (e.g. there is a 1% probability of that a 1-in-100-year event will occur in any year). Thus, EPA notes that it is just as likely that an extreme event could occur in year 1 of the simulation before any alternative is completed or in year 53 after any alternative is completed. In addition, with the influence of factors such as global warming, it is possible that such storm events may increase in frequency and this will need to be considered in selection of a final remedy and final design.

56. Page 3-31: EPA disagrees with characterization of the assumed 1-km foraging range for wood ducks as "conservative;" this value reflects the home range information from the Peer-Reviewed ERA, which was based on an evaluation of the literature. In Section 5.2.3.3, the CMS suggests that wood ducks would not be expected to be broken into distinct local populations, and therefore averaging of exposures across the entire PSA is appropriate. However, this rationale reflects a lack of consideration of the important difference between a *home range* (or feeding range) and the local subpopulation range. The local subpopulation range of wood ducks (and many other animals) extends beyond the ROR, or the Berkshires. The home range, on the other hand, reflects the feeding radius of animals within the local subpopulation range during their residence in the Housatonic River. It is indicated in the ERA that, in productive areas, wood ducks stay within 1 km of their nesting areas (WESTON 2004, G-6 and G-43). This limited home range is applicable to pre-incubating females that forage

close to their nest sites. During this period, wood ducks would expand their home ranges only if habitat requirements are dispersed. Discussion in the CMS implies that animals such as wood duck and mink will naturally expand their feeding range to equal the area of the local population range, even where the literature indicates that this is not the case. It is also implied that a population level response is only possible if all individuals within the PSA are adversely affected, whereas EPA believes that local subpopulation level responses may occur with only a subset of PSA individuals affected.

57. EPA agrees that the use of largemouth bass alone represents a conservative assumption; however, use of largemouth bass of age classes 6 through 10 fails to recognize the importance of older, larger fish than are simulated by the model. EPA's analysis indicates that age 9+ fish are a better indicator of the average largemouth bass concentrations experienced by human consumers.

58. Page 3-32: EPA notes that the procedure used to evaluate the effect of the remedial alternatives on fish likely underestimates residual risk. The evaluation presented in the CMS is based on the average largemouth bass PCB concentration for all age classes (ages 0+ through 9+) as representative for warmwater fish species. The average modeled age class is an underestimate of expected PCB concentrations in the older modeled age classes (*i.e.*, Age 6+ through 9+), and is also an underestimate of PCB concentrations in older fish (Ages 10+ to 14+) not explicitly simulated by the model.

59. Page 3-32: The wet weight equivalency factor applied between largemouth bass and trout is not the correct procedure for extrapolation of residual risk to cold water species. The analyses presented in EPA's Peer-Reviewed Validation of FCM (WESTON 2006) indicated that trout concentrations are underpredicted by the largemouth bass model (see Figure 6.3-7). The correct procedure is to use a scaling factor to account for lipid differences between largemouth bass (surrogate species) and coldwater fish. GE shall recalculate residual risk to coldwater species using the correct procedure and report the corrected results, including a discussion of the implications of any changes for the evaluation of the remedial alternatives.

60. Page 3-33: EPA disagrees with the assignment of feeding preferences for osprey. Based on information developed in the ERA and calibration/validation of the food-chain model, EPA believes that an alternate parameterization is a better representation of the osprey diet:

$$Blended_{raptor} = (0.6 \times Age\ 4\ Sucker) + (0.15 \times Age\ 5\ Sunfish) + (0.25 \times Age\ 5\ Bass)$$

The parameterization in the CMS was based on the assumption that all modeled fish species would be consumed equally by osprey (CMS Table 3-15), but provided no rationale for that assumption. The data from the fish biomass study (Woodlot, 2002) and Table H.2-11 of the ERA strongly suggest that the contribution of bottom fish to osprey diet would exceed that of forage fish, rather than be equal across modeled fish categories. EPA believes that the prey preference matrix used for eagles would provide a more technically sound basis for parameterizing the osprey diet.

In addition, based on the size range of fish consumed by osprey, EPA believes it is more appropriate to assume a diet consisting of age 4+ white sucker, age 5+ sunfish, and age 5+ bass as surrogate age classes most representative of this range. The CMS used the average of multiple age classes, including ages 1+ to 5+ for white sucker, 2+ to 5+ for sunfish, and 1+ to 9+ for largemouth bass.

Overall, the differences in methods result in CMS-simulated fish tissue concentrations that are approximately 16% less than calculated by EPA. These differences derive mainly from: (1) greater assumed proportion of forage fish in osprey diet in the CMS, and (2) inclusion of younger age classes (on average) of white sucker and sunfish in osprey diet in the CMS.

Section 4 – Analysis of Remedial Alternatives for Sediments and Erodible Riverbanks

Alternative SED 1

61. Page 4-5: EPA notes that land use in the watershed can change over time and that changes in land use may result in changes in river transport processes. In contrast, the CMS assumes that all dams will be maintained but does not account for the influence that potential changes in land use may have on sediment delivery to the river or changes in the sediment trapping efficiency of impoundments over time.

62. Page 4-7: In this and similar sections for other SED alternatives (e.g., Pages 4-32, 4-70), annual average water column PCB concentrations are compared to the AWQC to evaluate compliance with the applicable ARAR. EPA notes that AWQCs are based on 4-day averages, not annual averages, and consequently these comparisons are invalid. GE shall include a section in the Supplement making the correct comparisons of simulated water column PCB concentrations vs. applicable AWQCs.

63. Page 4-9: EPA notes that reference is made to natural recovery processes "documented to be occurring in the River," but this statement does not reflect a balanced consideration of all lines of evidence, some of which indicate lack of natural recovery. Reference should also have been made to studies that show little or no change in PCB concentrations in environmental site media (*e.g.*, GE/BBL YOY fish tissue sampling since the 1990s).

64. Page 4-10: EPA notes that although it is true that SED 1, the no-action alternative, would not directly cause long-term impacts on human health or the environment, the demonstrated risks from the existing contamination would remain and only decrease slowly over time. This comment also applies to the similar statement on Page 4-21 with reference to SED 2.

65. Page 4-10: EPA notes that the discussion of IMPGs inappropriately emphasizes selected achievements of IMPGs without providing an appropriately balanced discussion of IMPGs that are not achieved. It is misleading to simply state (for SED 1) that "IMPGs would be achieved in some areas by the end of the 52-year simulation period." Some IMPGs for selected averaging areas and some endpoints would be achieved by SED 1, but the overall conclusion for most areas and most endpoints is that IMPGs would be exceeded even after 52 years. The exceedance of IMPGs for SED 1 is the rule, not the exception, and CMS language

such as "certain IMPGs would not be achieved by the end of the model projection period" downplays the risks under the baseline scenario.

66. Page 4-12: EPA notes that the discussion of target sediment levels for SED 1 inappropriately blurs the distinction between those concentrations and IMPGs. The CMS fails to clearly indicate that "target sediment levels" for insectivorous birds and piscivorous mammals do not equate with achievement of IMPGs. Later in the CMS, it becomes apparent that the 3 mg/kg and 5 mg/kg target levels do not generally achieve IMPGs, and in some cases even the lowest target level is inadequate to achieve select IMPGs without associated action in the floodplain.

Alternative SED 2

67. Page 4-20: EPA notes that under SED 2, due to the extremely site-specific nature of MNR, the fact that MNR has been successful in reducing contaminant concentrations and risks at some other sites has limited relevance to the ROR site without an analysis of the specific conditions present in Reaches 5 through 8 against the considerations described in Chapter 4 of Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA 2005) as discussed in General Comment 15.

68. Page 4-20: EPA notes that reference is made to the analysis of finely sectioned cores in Woods Pond and Rising Pond indicating "deposition of cleaner sediments on the surface of the ponds." While true for some cores, this statement represents only a selected result of the analysis of some cores. High-resolution cores collected in both Reach 6 and 8 exhibited a wide range of sediment profiles, including some with no discernible vertical trend and some with higher contamination at the surface relative to deeper strata.

69. Page 4-21: EPA notes that the description of impacts of SED 2 is misleading as it implies that the current PCBs are not posing risk to human health and the environment. It would be correct to say that SED 2 does not pose any additional impacts beyond those already occurring.

Alternative SED 3

70. Page 4-26: No details regarding the proposed design of the sheetpile system are provided. GE shall include a description of the design process to be followed for the installation of the sheetpile including but not limited to the geotechnical data which would need to be collected, decision on sheet length, embeddeness, and gage. (This comment applies to all alternatives.)

71. Page 4-27: GE shall provide in the Supplement the estimated capacity of the water treatment system which will be used to treat water from excavation and dewatering stockpile areas.

72. Page 4-27: GE shall provide the assumptions used in the derivation of the 33,000 cy volume of erodible banks referenced in this section.

73. Page 4-29: GE notes here that the post-construction monitoring program will include "visual observation in the thin-layer cap areas in Reach 5C and Woods Pond." It is unclear how a determination of cap thickness would be made given the influence of bioturbation over a 5-year period. GE shall provide a discussion describing how information from the "visual observation" program could be used to support a conclusion that the thin-layer cap is (or is not) effective, and the relationship of such monitoring to the definition of a TLC.

74. Page 4-31: EPA notes that the ability of dams to trap sediment may decline over time as sediment accumulates and those impoundments mature. Further, land use changes (urbanization) and other anthropogenic influences are expected to have long-term effects that are not necessarily quantifiable, but should be considered as uncertainties because such changes could increase sediment delivery to the system, or increase the potential for bank erosion. While increases in sediment loads may increase the rate of recovery by dilution to some extent, sediment accumulation also has the potential to reduce trap efficiency and slow the rate of recovery. Thus, the role of dams in limiting future PCB transport may depend on factors beyond the physical integrity of those structures.

75. Page 4-37: As discussed in General Comment 15, EPA considers thin-layer capping to be a component of monitored natural recovery and therefore does not recognize a thin-layer cap as providing any benefit in terms of isolation of contaminants. However, EPA notes that the claimed insignificant increase in exposure due to cap erosion following the storm event in fact represents a tripling in PCB concentrations in surficial sediment in Woods Pond (Figure G-1.2-2A), and the comparison is misleading as it was made using original (pre-remediation) rather than pre-storm concentrations.

76. Page 4-42: EPA notes that in the discussion of GE's recommended alternative for sediment remediation, SED 3, it is mentioned that habitat alterations "may actually improve habitat conditions." However, for other sediment alternatives, remediation effects are described mainly in terms of negative consequences. GE shall provide a discussion of why positive effects of habitat alteration are not considered to be relevant for other remediation alternatives other than SED 3.

77. Pages 4-42 and 4-43: The discussion here, and for other SED and FP alternatives, concerning Potentially Affected Populations and Adverse Impacts on Biota and Corresponding Habitat is not sufficient to provide a basis for conducting a relative evaluation of the alternatives because it fails to adequately discuss possible actions to mitigate adverse impacts. As currently prepared, the CMS assumes that any rare, threatened, or endangered species (including but not limited to MESA state-listed species, or "MESA species") in a work area may be permanently harmed. There are a number of actions that can be taken to avoid and minimize impacts to MESA species. For example, wood turtles (*Clemmys insculpta*) can be captured and then held in captivity until their habitat is restored, at which point they may be returned. Seeds or propagules can be collected from rare plants, stored, and then cultivated and replanted. Locations with rare plants can also be avoided. Vernal pools can be excavated and restored during the driest part of the summer, when amphibians are not in the pool but in the surrounding upland or wetland habitat. The non-pool amphibian habitats should be identified, mapped, and could then avoided to the maximum extent practicable.

As described in General Comment 16, GE shall include a detailed description of how effects to MESA species will be avoided and minimized to the maximum extent practicable in the potential implementation of an alternative. Specifically, GE shall identify a full range of proposed siting criteria and other design, construction, and restoration measures that would apply to each alterative. Consistent with the requirement in that General Comment, GE shall include a graphic depiction of the decision tree process which underlies the objective of avoidance and minimization.

GE's analysis shall also include a discussion of how these assumptions modify GE's analysis regarding the short- and long-term effectiveness of the alternative and cost implications.

78. Page 4-43: The discussion here, and for other SED alternatives, concerning Riverbank Restoration is not sufficient to provide a basis for conducting a relative evaluation of the alternatives. The river meander study and short- and long-term erosion studies indicated that the river channel is actively moving in the floodplain, and that movement is an integral part of the river. Sandy river banks, bars, and other soft river features provide habitat for a number of species that are obligate to the river. Exposed banks provide habitat for nesting belted kingfishers (*Ceryle alcyon*), several species of turtles, and dens for beaver (*Castor canadensis*). Intermediate spikerush (*Eleocharis intermedia*), which is rare, and a number of other wetland species grow on newly formed banks. Armoring the channel is expected to alter the erosion and accretion processes by stopping the river from moving. The short and long-term effects of armoring on river dynamics were not presented in the CMS. To provide the basis for evaluation of the SED alternatives, GE shall provide information on short and long-term bank habitat alteration and subsequent effect to obligate species, and on alternative approaches to river bank restoration that will eliminate or reduce negative impacts to these species.

Alternative SED 4

79. Page 4-95: In the evaluation of the SED 4 alternative, GE states that "this alternative would not achieve the ecological IMPGs for a couple of receptor groups in a few limited areas." EPA notes that this language is an understatement of the residual risks, because IMPGs for numerous receptor groups are exceeded, and some IMPGs (e.g., mink) are exceeded over large areas.

Alternative SED 5

80. Page 4-110: Mention is made in the CMS of the cumulative impacts of stressors to amphibian and wildlife populations. EPA notes that the stressors referred to by GE are described in terms of habitat alteration during remediation, however current and ongoing stresses due to the presence of PCBs are not discussed.

81. Page 4-110: GE shall provide a discussion, supported by appropriate references from the technical literature, for the claim that re-establishment of benthic invertebrates and aquatic

vegetation could require more time following implementation of SED 5 than for alternatives SED 1 through 4.

82. Page 4-119: There is an inconsistency in the CMS regarding the nature of the material to be used for thin-layer capping, described here as "sand" and elsewhere in the document as being similar in properties to the underlying native material. EPA's understanding is that the latter definition was used for the model simulations involving TLC, but notes that, if TLC becomes a component of the remedy, it may be neither practicable nor advisable to duplicate the underlying native material. The specific nature of the TLC capping material, if appropriate, would be a component of the final design and subject to review by EPA at that time.

83. Pages 4-120 and 4-121: EPA notes that the description of the number of truck trips, the disturbances they will generate, and the possible injuries and fatalities is lacking perspective (particularly for this and other more aggressive alternatives). The number of truck trips, expressed on a daily basis, would be 26 trucks per day. In addition, as the project progresses, the potential impact of these trucks will move from upstream areas to downstream areas, so that not all areas will be affected by the increased number of trucks over the entire duration of the alternative. The estimates of non-fatal and fatal injuries are also misleading because the timeframe over which these injuries would occur is omitted. GE shall provide a recalculation that expresses truck trips and injury estimates in terms of number of events per year to provide an alternative frame of reference with which to compare alternatives, rather than simply the total number of estimated events.

Alternative SED 6

84. Page 4-131: GE shall provide additional details regarding the process for dewatering hydraulically dredged sediments that was assumed for cost estimating purposes. In addition, GE shall provide conceptual process flow diagrams for each alternative (i.e., the movement of material from the river to its ultimate disposal, including any treatment and dewatering steps used, should be shown graphically).

Alternative SED 7

85. Page 4-164: It is EPA's understanding that while it is specified that backfill will be used in Reaches 5A and 5B in the text, for costing purposes an engineered cap was assumed. GE shall clarify if SED 7 consists of removal with backfill or removal with an engineered cap.

Alternative SED 8

86. Page 4-216: GE shall include a discussion of the applicability of the referenced "one to three orders of magnitude" increase in releases of contaminated sediments during dredging to the site-specific conditions in the ROR. The discussion shall also provide the quantitative basis for the statement that implementation of SED 8 would result in the loss of 1,000 to 1,500 lbs of PCB to the water column, which appears to be inconsistent with the loss rate cited and

the estimated PCB mass removed by reach (Page 4-215) when adjusted for operations to be performed in the dry.

Comparison of Sediment Alternatives

87. Page 4-233: It is stated in the CMS that "the most significant reductions in fish PCB concentrations" are achieved by SED 3. EPA notes, however, that this calculation was flawed (see General Comment 17) and the percent reductions associated with an alternative are only one aspect of its effectiveness. Of greater importance is the goal of reducing environmentally unacceptable concentrations to environmentally acceptable concentrations. It is the absolute concentrations that drive the residual risks, not the percent reductions.

88. Page 4-240: GE shall expand Table 4-56 to include the entire EPA risk range and reaches in Connecticut.

89. Page 4-241: CMS Figure 4-17 indicates the percentage of areas "meeting or within the range of IMPGs", and therefore, for IMPGs expressed as a range of concentrations, reflects meeting the upper IMPGs only, without any consideration of the point of departure, or lower IMPGs.

90. Page 4-242: Although the information on PCB mass removed under the various SED alternatives is valuable, EPA notes that mass removed *per se* is not necessarily correlated with risk reduction and should not be the focus of the efficacy of a particular alternative (NAS 2007).

91. Page 4-243: Table 4-58 is incomplete and potentially misleading because it presents information suggesting diminishing returns in terms of the removal of lbs of PCBs per volume removed without presenting a sense of the additional effort necessary to achieve those removals. This effort can be expressed in total estimated cost per cy and cost per lb of PCBs removed. In addition, the incremental cost for each of these factors can be calculated. EPA calculates that the cost per cy of removal decreases from a high of $886/cy for SED 3 to a low of $273/cy for SED 8. This decrease is related to the increased depths of excavation and consequent increases in productivities. In addition, the cost per lb of PCBs is relatively insensitive to the number of pounds removed, ranging from $11,300 for SED 8 to $13,900 for SED 6. GE shall present other data, such as cost, to provide a relative sense of the level of effort associated with the stated reductions in Table 4-58.

92. Page 4-251: GE concludes that SED 3 is the "most cost-effective alternative." EPA notes, however, that to be considered cost-effective, an alternative has to be effective. Numerous IMPGs for human and ecological receptors in most reaches are not met with SED 3, even when the upper end of the IMPG range is considered.

93. 4-255: EPA notes that the "substantial environmental harm" that GE claims to be associated with alternatives SED 5 through SED 8 has not been clearly demonstrated in the evaluations presented in the CMS, particularly in the absence of detailed procedures to avoid or minimize harm as required in General Comments 10 and 16.

94. Figures 4-16a through 4-16n: EPA notes a number of issues with this series of figures, the net effect of which is to minimize residual risks and/or differences between the remedial alternatives:

On reach-specific plots, the non-cancer IMPGs referenced are those for adults only, a concentration that is over twice that for children (0.43 vs. 0.19 mg/kg fillet). In addition, the range of IMPGs for "10-6 cancer to non-cancer range for 50 meals / yr (RME)" is shown incorrectly, making the bottom of the range appear to be 0.01. The bottom of the range is, in fact, 0.0019, nearly an order of magnitude less. GE shall revise the plots to include all IMPGs for consumption of fish.

Section 5 – Approach to Evaluating Remedial Alternatives for Floodplain Soils

95. Page 5-5: Regarding GE's delineation of the Heavily Used Subareas based on the Direct Contact figures presented in the Human Health Risk Assessment (HHRA) (WESTON 2005), GE did not delineate Heavily Used Subareas for EAs 35a, 37b, 57, 58, and 59. GE shall provide a discussion of the basis for not defining Heavily Used Subareas for these EAs, or alternatively define Heavily Used subareas for these EAs.

96. Page 5-15: In the footnote, GE repeats arguments made concerning a "fairly large foraging range of mink" relative to the ROR floodplain. EPA notes that these comments are contradictory to the habitat assessment of mink provided in the ERA (WESTON 2004) (I.2.1.5.1) that (1) describes the importance of foraging within close proximity of the shoreline, and (2) describes the length and area of mink foraging ranges, such that several mink could have their entire foraging ranges located in the PSA and within the 1-ppm isopleth.

97. Page 5-21: EPA notes that the conclusion regarding the assessment of mink IMPGs for downstream areas is inconsistent with the data presented in Table 5-3b. The attainment of IMPGs presented in the CMS shows that half of the subreaches do not achieve the lower-bound IMPGs, with Subreach 7C not achieving either the upper- or lower-bound IMPG. The argument used by GE to discount this result is to consider the upper-bound IMPG only and to average together adjacent reaches, even where such results in aggregation of areas that exceed mink home ranges identified in the literature. EPA believes that both approaches are inappropriate and fail to properly identify risks to mink.

98. Page 5-21: In Appendix D of the CMS-P, GE proposed the use of Thiessen polygons (TP), rather than the IDW method used by EPA, to spatially interpolate PCB concentrations in the floodplain. GE proposed the TP method because it claimed that (1) determination of removal areas and volumes in the floodplain required spatial interpolation in areas with limited data, which can be difficult to achieve using IDW, and (2) the TP method readily accommodates new data, which would likely be collected prior to initiation of a remedy. In its conditional approval of the CMS-P, EPA accepted GE's proposal.

In reviewing the calculated EA-specific area and volume of soil to be removed for each of the floodplain alternatives, EPA noticed that the projected removal volumes calculated by GE were considerably smaller for most of the EAs than the same volumes calculated by EPA, even when EPA used the TP methodology. Additional examination of this discrepancy indicated that the differences appeared to be due to two factors, as discussed below.

- In developing the removal areas and volumes, GE did not use the same data set that was used for the HHRA. New data collected since the date of the HHRA were added to the data set, which is appropriate. However, GE excluded data from side channels and oxbows (SCOX), terraces, and aggrading bars. Because each of these sample types is representative of an area that could result in exposure, GE shall use the same procedure followed in the HHRA and include all such data in the recalculation of EA-specific removal areas and volumes for the floodplain alternatives.

- In determining the degrees of freedom applied in the calculation of the 95th UCL EPC for an EA, GE used the number of polygons that intersect an EA as the degrees of freedom; EPA counted only the actual number of samples within an EA. The GE approach is statistically invalid and has the effect, when done for all EAs, of artifactually inflating the total number of degrees of freedom above the true sample size of PCB concentrations measured in the study area., thereby inappropriately underestimating the area and volume of soil necessary to meet risk-based IMPGs. The 95th UCL concentration is specifically used in risk assessment to account for uncertainty in the data and basing the UCL calculation on an invalid statistical procedure defeats this important safeguard on the process. GE shall use the appropriately conservative approach used by EPA in the recalculation of removal areas and volumes for the floodplain alternatives.

Section 6 – Analysis of Remedial Alternatives for Floodplain Soils

Alternative FP 1

99. Page 6-4: The discussion of residual risk for FP 1 here and on Page 6-7 claims that "residual risk presented by current floodplain conditions is limited." EPA disagrees with this conclusion given the ecological IMPGs that are not achieved (*cf.*, Section 6.1.6.2), even assuming the lowest target sediment level of 1 mg/kg.

Alternative FP 2

100. Page 6-21: Here, and in other locations in the CMS, GE claims that "there are several cases where the soil IMPG levels [for mink] could not be achieved at any floodplain soil concentration since the PCB concentrations in the aquatic food items at the target sediment level would be themselves exceed the IMPGs for mink prey." EPA notes that this statement is true only if the analysis is restricted to the three target sediment levels of 1, 3, and 5 mg/kg. Of interest is whether the soil IMPGs could be achieved if the sediment target level is reduced below 1 mg/kg, which occurs for several of the sediment remediation alternatives.

101. Page 6-29: EPA disagrees with the implication that because amphibians are known to inhabit the floodplain it can be concluded that IMPG exceedances do not prevent maintenance of "healthy local populations." Controlled studies and evaluations conducted as part of the Ecological Risk Assessment (ERA) (WESTON 2004) clearly demonstrated that IMPG exceedances impact amphibians to a degree that is inconsistent with maintenance of a healthy local population. EPA also disagrees with the claim that field studies indicate that local populations of piscivorous mammals inhabit and reproduce in the floodplain. EPA studies have documented a lack of resident mink and otter in the area.

Alternative FP 3

102. Pages 6-35 and 6-36: The study by Lichko and Calhoun 2003 on 15 vernal pool creations is cited in the CMS, with the observation that the projects were deficient due to failure of design and construction. EPA notes that these two factors are easily controlled with proper evaluation of existing conditions and implementation of appropriate restoration methods. GE shall include a discussion in the presentation of the restoration process specified in General Comment 10 of the design and construction practices that would be used to assure that vernal pools are constructed properly during any restoration activities.

103. Page 6-38: GE shall provide the basis for, and citations for previous studies that support the statement that "the potential loss of these 3 rare plant locations would not likely result in a permanent loss of the population or species across the floodplain."

104. Page 6-39: GE observes in the CMS that the extent of vernal pool remediation in FP 3 "could have long-term adverse impacts on the amphibian subpopulations that inhabit those pools and potentially on the local amphibian population in the area." EPA notes that the while the potential subpopulation-level consequences of habitat alteration is highlighted in the CMS, GE's comments on the effects of PCBs on local subpopulations of amphibians emphasize compensatory mechanisms that would result in no impacts on the local subpopulation. In addition, because many of the species utilizing vernal pools spend a portion of their life in other habitats, EPA does not agree that properly conducted remediation and restoration will likely have long-term adverse impacts on the amphibian subpopulations that use those pools.

105. Page 6-44: In describing potential impacts to vernal pools, it is stated that the loss could include amphibian eggs or larval stages. GE shall describe how work in vernal pools could be conducted to avoid impacts to special habitats and their indigenous species, as required by applicable ARARs such as MESA. For example, work in vernal pools could be performed late in the growing season after amphibians have left the pools. In addition, at this time, the pools are typically dry and easier to work in.

106. Page 6-44: GE shall provide a description of measures that will be taken during design and construction to insure that stormwater flows do not affect nearby wetlands. The discussion shall describe the Best Management Practices that will be implemented during construction to meet wetland-related ARARs, as well as a description of compensatory mitigation measures that will be implemented if there are impacts to neighbouring wetlands.

Alternative FP 6

107. Page 6-102: EPA notes that here and elsewhere in the document, the size of the area to be remediated associated with a particular alternative and the time to fully implement that alternative are presented together with the implication that the entire area would be affected for the entire time period. In fact, construction activity would be taking place only in a limited area at any one time proceeding in general from upstream to downstream, so issues described in the CMS over, for example, wildlife being displaced due to the "widespread extent of the excavations," are overstated.

108. Page 6-113: With regard to availability of resources for providing plants for restoration efforts, EPA notes that it is possible to arrange for nurseries to undertake contract growing of plants ahead of when they are needed to provide greater certainty of availability of indigenous species needed for restoration.

Alternative FP 7

109. Page 6-127: EPA disagrees with the characterization of alternative FP 7 in terms of "the cumulative impact of the removal of 62 vernal pools." As discussed elsewhere in this letter, restoration of vernal pools is not only possible but feasible and has been demonstrated at other sites. In addition, not all vernal pools would be affected simultaneously, and there are a wide range of measures that can be implemented to lessen the impacts from work being done in a relatively small number of pools at any one time.

110. Page 6-127: EPA notes that GE's claim that the loss of even a single vernal pool could have serious effects on local amphibian subpopulations is inconsistent with GE's position in the CMS and other documents that EPA's determination of impacts to amphibians due to PCB contamination in the floodplain is overstated.

Comparative Evaluation of FP Alternatives

111. Page 6-153: EPA notes that the percentages of averaging area acreage in Table 6-49 are based on achieving the upper-bound IMPGs, with no distinction made if an alternative achieves the lower-bound point of departure IMPG. This type of presentation is not conservative, and also masks the potential differences among options FP 3, FP 4, and FP 5. GE shall revise the table to indicate acreage for both lower-and upper-bound IMPGs.

112. Table 6-13: GE shall make the following modifications to the IMPGs. For Exposure Areas 4, 12, 37b, 40, 57, and 59 the IMPG shall be changed to 14 mg/kg to account for the 10^{-5} exposure for the Adult High-use general recreation exposure in a "heavily used areas". GE shall recalculate the removal volume, where necessary, to achieve the IMPG.

113. Table 6-19: GE shall make the following modifications to the IMPGs. For Exposure Areas 4, 12, 28, 40, 40b, 55, 57, 59, and 60 the IMPG shall be changed to 14 mg/kg to account for the 10^{-5} Adult High-use general recreation exposure. GE shall recalculate the removal volume, where necessary, to achieve the IMPG.

114. Table 6-21: GE shall correct the table to include vernal pool 23B-VP-1.

115. Table 6-37: GE shall make the following modifications to the IMPGs. For Exposure Areas 4, 12, 28, 40, 40b, 55, 59, and 60 the IMPG shall be changed to 2 mg/kg to account for the 10^{-6} Adult High-use general recreation exposure. GE shall recalculate the removal volume, where necessary, to achieve the IMPG.

Section 7 - Analysis of Remedial Alternatives for Treatment/Disposal of Removed Sediments and Soils

Alternative TD 2

116. Page 7-11: The citation (EPA 1992) is not related to the definition of CDFs. The intended citation is likely USACE/EPA 1992 (which was updated in 2004). The full reference is:

> USACE/EPA. 1992. Revised 2004. Evaluating Environmental Effects of Dredged Material Management Alternatives - A Technical Framework. EPA842-B-92-008, US Environmental Protection Agency and US Army Corps of Engineers, Washington, D.C. http://el.erdc.usace.army.mil/dots/pdfs/epa/tech-frame-rev04.pdf

117. Page 7-11: The citations for various manuals related to CDFs should include the CDF Testing Manual/ Upland Testing Manual (USACE 2003). The full reference is:

> U.S. Army Corps of Engineers. 2003. Evaluation Of Dredged Material Proposed For Disposal At Island, Nearshore, Or Upland Confined Disposal Facilities - Testing Manual (Upland Testing Manual). Technical Report ERDC/EL TR-03-1, U.S. Army Engineer Research and Development Center, Vicksburg, MS. http://el.erdc.usace.army.mil/dots/pdfs/trel03-1.pdf

118. Pages 7-12 and 7-14: A berm height of 5 ft above mean water elevation is mentioned on page 7-12, but on page 7-14 a final fill height of 5 ft above mean water is mentioned (which is assumed to include 1.5 feet for a surface cover). Note that for a final sediment fill height of +3.5 ft (+5.0 ft less 1.5 ft for the cover thickness), the berms and sheets must be higher by about 2.5 ft to account for 2 ft for freeboard, plus 2 feet for ponding during filling. This does not account for an undetermined allowance for consolidation. Either the berm/sheet elevation must be described as higher by a minimum of 2.5 ft, or the final fill elevation should be described as lower by 2.5 ft. This adjustment in berm/sheet elevation would result in an adjustment in confined volume for the CDF. GE shall clarify the preliminary design considerations for the CDF elevation.

Alternative TD 3

119. Page 7-33: There is insufficient detail in the CMS Report on potential sites (and consequent impacts) and construction methods and issues to allow a full evaluation relative to

the other alternatives. The brief description of the process by which a site for an on-site upland disposal facility would be selected and evaluated does not provide details commensurate with the likely complexity of the process that would be required to implement this alternative. There is no information provided in the text indicating the minimum and maximum land area required to site a landfill. GE shall provide additional detail regarding the evaluation and analysis of the effectiveness, implementability, and reliability of the on-site upland disposal alternative (TD 3). In addition, GE shall provide additional details regarding the process of obtaining and evaluating a site for this alternative, including the components of short- and long-term effectiveness such as distance, number of truck trips, impacts on habitat, etc. GE shall also revisit the cost estimate for this alternative based upon the new information and revise it if necessary. Also see General Comment 1.

120. Page 7-34: The assumed volume of leachate to be generated at the upland disposal facility for the various volumes is not discussed. EPA cannot determine based upon the information provided the validity of the assumption that the volume is small enough and the distance short enough that the leachate can be transported economically by truck and that GE's treatment facility has sufficient capacity to treat this additional waste stream. GE shall provide additional details regarding the volume of leachate to be generated, the capacity of the existing system to handle the anticipated volume, and the transport of the leachate to the facility.

Alternative TD 5

121. Page 7-72: In the discussion of the thermal desorption alternative, the CMS states that the excavated sediments would be reduced to 18 to 20% moisture content by the hot exhaust gas stream. Given that a significant volume of sediment will be generated from hydraulic dredging and will have moisture content of approximately 50% following dewatering via a plate and frame filter press, it does not seem practical or economical to assume that moisture can be reduced to 18 to 20% using this method. GE shall re-evaluate this assumption and ensure that the process is described appropriately and that adequate costs are included to meet this moisture content requirement of the feed material.

122. Page 7-86: No data for thermal desorption regarding the treatment cost per ton of material has been provided in the text. EPA anticipates significant variability in the cost to treat the material from various reaches due to the increasingly fine-grained nature of the material from Reach 5A to Reach 6 and impoundments in Reach 7 and 8. An assessment has not been provided of how the feasibility and cost-effectiveness of using this technology at all areas might vary. GE shall provide additional cost information, including details regarding the pre-treatment steps required to reduce moisture content and the related cost impacts.

Section 8 – Combined Cost Estimates

123. Page 8-1: GE has provided some details regarding how costs for the base alternatives were combined with the TD alternatives; however, the amount of information provided in Section 8 and Appendix E is insufficient for EPA to conduct a thorough review of the costs for the combined alternatives. GE shall provide detailed cost estimate build-up assumptions

for the combined alternatives, providing a separate subheading for costs associated with restoration and the unit rate assumptions used to develop the costs (e.g. tree and shrub densities). GE shall also discuss the uncertainties associated with these cost estimates, (e.g. EPA's FS guidance assumes that the costs will be within -30% to + 50%).

124. Page 8-1: EPA notes that the combined cost estimates (with modifications otherwise specified in these comments and also the comments provided on the CBI cost package) are adequate for comparison of alternatives. However, EPA is making no representation that the cost estimation procedure used by GE is accurate or contains assumptions EPA would use. For example, the costs provided by GE in 2008 dollars do not include an escalation assumption over the duration of implementation of the alternative, and are based on a series of assumptions made regarding implementation of alternatives that may need to be revisited during design, if necessary.

Appendix C – Methodology for Mink IMPGs

125. Page C-2: GE comments in the CMS that the habitat contained in the two averaging areas is be "too small to support a local population of mink." EPA notes, however, that the appropriate approach in developing an averaging area is not whether the area can support an entire local subpopulation. Rather, it is the area of a size relevant to the foraging area for a sufficient number of individuals, such that loss of such a number of individuals would have consequences for the local subpopulation. In the CMS, here and elsewhere, it is assumed that population-level impacts can only occur if all individuals in a local population are affected, but that is not the case. For mink, the concentration-response curve is also quite steep, and moderate PCB exceedances of thresholds for successful reproduction can lead to complete reproductive failure. Therefore, the consequences of not meeting the IMPGs for the averaging areas are significant in ecological terms.

Appendix F – CT 1-D Analysis

126. Page F-2: Concentrations of PCBs in smallmouth bass were extrapolated from the existing FCM predator model. Because the predator model was calibrated and validated for largemouth bass, this is a reasonable assumption, but only provided that the lipid contents of CT smallmouth bass are similar to largemouth bass upstream of Woods Pond Dam. GE shall provide an assessment of the applicable technical literature and data to support the assumption of similar lipid content.

127. Page F-12: There is discussion in the CMS of the factor of 2.3 to convert the fillet-only data to a whole body basis, claiming that EPA's use of this factor in the bioaccumulation modeling calibration and HHRA is inconsistent with directions provided to GE to use a factor of 5. EPA notes that there is no inconsistency. First, it is not correct that this factor was applied during model calibration or validation. The bioaccumulation model conducted fillet to whole body extrapolations based on an assumed equivalency on a lipid-normalized basis. For the area downstream of the PSA, an approximate 1:1 relationship between PCB concentrations in fillet lipids and whole body lipids was documented. Therefore, conversions were conducted on an individual fish basis using measurements or estimates of lipid contents.

With regard to EPA's directions to GE to use the factor of 5 in comparing whole body data from the simulations with fillet-based human health IMPGs, that direction was based on a comparison of whole-body data from fish collected upstream of Woods Pond Dam with paired (i.e., from the same fish) **skin-off** fillet samples. The factor of 2.3 comes from Bevelheimer et al. (1997) and was based on their comparison of whole body vs. **skin-on** fillets. The factor of 5 is appropriate for comparison with human health IMPGs because the IMPGs were developed largely using the **skin-off** data; the factor of 2.3 is appropriate for comparisons of CT 1-D output to downstream fish data because the CT fish data are derived from **skin-on** samples. Because the skin includes a quantity of lipid, it is expected that the ratio between skin and whole body concentrations will be smaller for skin-on fillets than for skin-off fillets.

128. Page F-14: EPA agrees that the calibration procedures undertaken by GE for this procedure seem reasonable. However some statistical comparisons would be helpful in addition to the graphical comparisons shown in Figures F-10 through F-15. Statistics to indicate overall model bias and precision would be useful in evaluating the model calibration. GE shall provide this additional information.

129. EPA notes that PCB concentrations in bass seem to be underpredicted at Bulls Bridge, with approximately 80% of the observations falling above the prediction line on both a wet-weight and lipid-normalized basis. This suggests that the Bulls Bridge attenuation factor may have been set too low (as a percentage of the Rising Pond Dam boundary condition). Other reaches seem to be reasonably well calibrated. GE shall provide a discussion of the apparent underprediction of concentrations in bass tissue at Bulls Bridge and a correction if necessary.

130. Additionally, EPA notes that the analysis would have been more robust if the 1D model results had been run through FCM for the period prior to the calibration period (i.e., add 1960-1989 to 1990-2004). This would be a relatively straightforward procedure because the 1D results for sediment are readily available and plotted on Figure F-8. In this manner, the FCM results could be used to validate (or calibrate) the 1D model for the years prior to the calibration period. GE shall provide this analysis.

Special Comments Related to Phase 1 Cultural Resources Assessment (CRA) Submitted in Conjunction with CMS

131. Page 14: EPA notes that the separation of the information on Cultural Contexts between this section and Appendix B is unnecessarily confusing to the reviewer and recommends that subsequent reports of this type include all such information in a single section.

132. Page 14: The majority of the reports used in the writing of this section are over 10 years old, with many seeming to have been written for eastern New York, with some speculative applicability to western Massachusetts. GE shall confirm that this section was developed specifically for this CRA and includes reference to all known applicable studies, and if not, revise the section to reflect the more current and/or applicable information.

133. Page 14: The most recent survey of the Housatonic River, by PAL in 2005, is not included in the section summarizing previous research in the region. Although PAL (2005) did not locate any sites, they did prepare pre-contact, contact, and post-contact contexts which could have proven useful in the writing of this chapter. GE shall include a brief review and summarization of this research study.

134. Page 20: EPA notes that Section 3.9 would more properly be titled "European Settlement . . ." because simply retitling it "Settlement . . ." implies that the area was not settled prior to the arrival of Europeans.

135. Page 56: Reference is made to two rock mounds in the river that could possibly be the remnants of a prehistoric fish weir. On the Archaeological Sensitivity maps, there is a notation for historic sensitivity for submerged resources. However, all figures show the river and millponds as having low sensitivity for prehistoric sites without indication of these two features. GE shall include a clarification and submit revised Archaeological Sensitivity map(s) as necessary.

136. Pages 73 through 80: Some of the references used in Appendix B are missing from the References section. EPA believes the missing references to be: Cassedy 1992, Kaeser 2006, Luedtke 1987, Moeller 1980, Nadeau and Bellantoni 2004, Strauss 1992, Tryon and Philpotts 1997, however GE should review the CRA thoroughly to ensure that list is complete. GE shall include revised CRA References that includes a complete listing of all references cited in the Phase 1 CRA.

137. Page 81: EPA notes that the individuals listed in Appendix A carry the title of Tribal Historic Preservation Officer (THPO), and that line should be added to each of the addresses. Also, Ms. Bettina Washington is the Acting THPO for the Wampanoag Tribe of Gay Head (Aquinnah); Ms. Andrews-Maltais is now the chairperson of the tribe. Any correspondence should be sent to Ms. Washington.

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