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**COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES  
FOR THE  
GENERAL ELECTRIC (GE)-PITTSFIELD/HOUSATONIC RIVER PROJECT  
REST OF RIVER**

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**U.S. ENVIRONMENTAL PROTECTION AGENCY**  
New England Region  
Boston, Massachusetts



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New England District  
Concord, Massachusetts

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**Table 22 Cost Summary for Alternatives**

Total Cost	SED 2/ FP 1	SED 3/ FP 3	SED 5/ FP 4	SED 6/ FP 4	SED 8/ FP 7	SED 9/ FP 8	SED 10/ FP 9	SED 9/ FP 4 MOD
Capital (\$ M)	0	167	307	384	900	381	84	314
OMM (\$ M)	5	10	12	13	17	13	10	12
Total (\$ M)	5	177	319	397	917	394	94	326
Present Worth (\$M)	1.8	133	193	219	300	251	78	228

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Notes:

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1. All costs are in 2010 dollars. \$ M = million dollars.

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2. Total capital costs are for engineering, labor, equipment, and materials associated with implementation.

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3. Total OMM costs include costs for monitoring, post-construction inspections and repair activities (if necessary), long-term monitoring (fish, sediment, water column, visual), and for the maintenance of institutional controls and EREs.

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4. Total present worth cost is based on using a discount factor of 7%, considering the length of the construction period and an OMM period of 100 years on a reach-specific basis.

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5. Estimates do not include costs for treatment or disposition of any soil/sediment removed; those costs are outlined in Section 3.

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## 11 2.11 OVERALL CONCLUSION FOR REMEDIATION ALTERNATIVES

12 For the reasons discussed above, EPA believes that of all the remediation alternatives, SED 9/FP  
13 4 MOD is best suited to meet the General Standards in consideration of the Selection Decision  
14 Factors.

## 15 3 COMPARATIVE ANALYSIS OF TREATMENT/DISPOSITION 16 ALTERNATIVES

17 This section presents a comparative evaluation of the five alternatives for treatment and/or  
18 disposition of excavated contaminated river sediment and floodplain soil that were presented in  
19 GE's RCMS, plus an additional alternative that was developed by EPA in consultation with the  
20 states of Massachusetts and Connecticut subsequent to the RCMS. The treatment/disposition  
21 alternatives were evaluated using the same criteria that were used for the sediment/floodplain  
22 remediation alternatives.

23 This comparative analysis evaluates the relative performance of the various treatment/disposition  
24 alternatives under the permit criteria to identify the relative advantages and disadvantages of  
25 each alternative. The tables present information from GE's RCMS for the five alternatives  
26 included in that document. Information for a new sub-alternative (TD 1 RR) was developed by  
27 EPA using, where possible, GE's underlying cost assumptions.

### 28 3.1 OVERVIEW OF ALTERNATIVES

29 All five alternatives would involve some disposition of the sediment and floodplain soil in a  
30 disposal facility, either directly or after treatment. The three alternatives involving disposal only  
31 are: (1) disposal in off-site permitted landfills (TD 1); (2) disposal in an on-site confined disposal  
32 facility (CDF) in a local waterbody, e.g., Woods Pond or one or more backwaters (TD 2); and (3)

1 disposal in an on-site upland disposal facility, for which three potential locations have been  
2 identified by GE (TD 3). The other two alternatives would involve treatment, either by a  
3 chemical extraction process (TD 4) or by thermal desorption (TD 5). EPA also evaluated an  
4 additional alternative based on TD 1 but specifying transport of excavated material by rail be  
5 maximized; this variation is termed TD 1 RR.

6 The results of a bench-scale test of a representative chemical extraction process indicate that  
7 PCB concentrations in the treated sediment and soil would not be sufficiently low to allow reuse  
8 on-site; therefore, the treated sediment and soil resulting from TD 4 would have to be transported  
9 to a landfill for disposal. For TD 5, it is assumed that the thermal desorption process would  
10 reduce the concentrations of PCBs in the treated solid materials to levels (around 1 to 2 mg/kg)  
11 that could allow reuse in the floodplain<sup>11</sup> and that it would not increase the leachability of metals  
12 from those materials so as to preclude such use. However, due to uncertainties regarding the  
13 ultimate effectiveness of the treatment process (as well as issues relating to the reuse of the  
14 treated soil), TD 5 has also been evaluated based on the additional alternate assumption that all  
15 the treated material would be transported to an off-site landfill for disposal.

16 All of the treatment/disposition alternatives except TD 2 were evaluated considering the same  
17 range of sediment and soil volumes that could be removed under any combination of the  
18 individual sediment and floodplain alternatives, not just the combinations of alternatives  
19 evaluated in Section 2. This range extends from 191,000 cy, based on a combination of SED 3  
20 and FP 2, to 2.9 million cy, based on a combination of SED 8 and FP 7. Under TD 2, however,  
21 the in-water CDF(s) would be used only for the disposition of hydraulically dredged sediment  
22 from Reaches 5C and 6, which would be generated only under SED 6, SED 7, SED 8, or SED 9.  
23 Thus, TD 2 was evaluated for a range of hydraulically dredged sediment volumes from 300,000  
24 cy for SED 6 to 1,240,000 cy for SED 8. For cost comparison purposes, the TD 2 analysis  
25 assumes that the sediment and soil not placed in the CDF(s) would be transported off-site for  
26 disposal. Under this assumption, the lower-bound costs for TD 2 are based on the combined  
27 volumes from SED 6 and FP 2, and the upper-bound costs are based on the combined volumes  
28 from SED 8 and FP 7.

29 All five alternatives were evaluated against the nine criteria discussed in Section 2.1. There is no  
30 comparison or evaluation of attainment of IMPGs because this is not applicable to material  
31 treatment/disposition.

32 **3.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT**

33 As with the SED and FP alternatives, the evaluation of whether the treatment/disposition  
34 alternatives would provide overall human health and environmental protection draws on the  
35 evaluations under several other permit criteria, notably long-term effectiveness and permanence  
36 (including long-term adverse impacts), and short-term effectiveness.

37 TD 1 (off-site disposal) would provide protection of human health and the environment by  
38 providing for permanent disposal of the PCB-contaminated sediment and soil in permitted off-

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<sup>11</sup> For reuse as backfill in the floodplain, only 50% of the volume is assumed to be the treated material because following thermal treatment the material would be sterile, requiring amendments to be suitable for floodplain restoration.

1 site landfills. Relative to other alternatives, only minor on-site short-term impacts would occur  
2 under TD 1.

3 TD 1 RR (off-site disposal with rail transport) would provide protection of human health and the  
4 environment equivalent to TD 1 with respect to PCB-contaminated sediment and soil, with some  
5 additional protection afforded by the rail transport component, which would reduce the effects on  
6 surrounding neighborhoods from truck traffic. There would be somewhat greater on-site short-  
7 term impacts due to the need to construct a small rail yard and loading facility at some point  
8 along the existing rail right-of-way.

9 TD 2 (disposition in on-site CDF[s]) would provide protection of human health by permanently  
10 isolating the hydraulically dredged sediment from Reaches 5C and 6 in covered in-water CDF(s),  
11 which would be subject to monitoring and maintenance to verify their long-term integrity.  
12 However, this alternative would not provide for disposition of any remaining sediment or the  
13 excavated floodplain soil, which would need to be disposed of elsewhere. Although CDFs have  
14 been successfully implemented in other settings, implementation of TD 2 in the Housatonic  
15 River could cause significant long-term environmental impacts because the CDF(s) would result  
16 in a permanent loss of the aquatic habitat in a large portion of Woods Pond and/or one or more of  
17 the backwaters where the CDF(s) would be constructed, and potentially could be breached in the  
18 future should a catastrophic event occur. TD 2 would result in a permanent loss of flood storage  
19 capacity in those areas (assuming that sufficient compensatory flood storage could not be  
20 provided).

21 TD 3 (on-site upland disposal) would provide protection of human health and the environment  
22 by permanently isolating the PCB-contaminated sediment and soil in an upland disposal facility,  
23 which would be constructed with an appropriate double liner, cover, and double leachate  
24 collection system. Although this alternative would cause a change in existing habitat within the  
25 operational footprint of the upland disposal facility, the capped landfill area would be replanted  
26 with grass, and the support areas that are no longer needed after closure would be restored. The  
27 significance of the long-term or permanent change in habitat would depend on the existing  
28 habitat at the selected location and the size of the facility. This alternative would have additional  
29 short-term impacts such as truck transport of landfill leachate over public roads to GE's  
30 groundwater treatment plant (GWTP) located in Pittsfield, and the operation of the landfill for  
31 the duration of the remedy. Alternatively, GE would have to construct, operate, and maintain a  
32 treatment facility at each of the upland disposal facilities. If these treatment facilities were not  
33 operated properly, there would be the potential for releases of PCBs into the area where the  
34 facility is located or into the Housatonic River.

35 TD 4 (chemical extraction) would provide protection of human health and the environment by  
36 reducing the PCB concentrations in the sediment and soil, followed by off-site disposal of the  
37 treated material. However, the long-term reliability and effectiveness of the chemical extraction  
38 process have not been demonstrated for Housatonic River sediment. A bench-scale study for this  
39 technology using material from Rest of River failed to demonstrate that site sediment and soil  
40 can be treated effectively, in part due to a failure to achieve reasonable mass balance calculations  
41 as well as acceptable residual concentrations.

1 TD 5 (thermal desorption) would provide human health protection by reducing the PCB  
2 concentrations in the sediment and soil, followed by on-site reuse and/or off-site disposal of  
3 those treated materials and off-site disposal/destruction of the liquids containing the condensed  
4 PCBs. On-site reuse of a portion of the treated soil would be protective of human health because  
5 the treated solids would be sufficiently characterized to ensure that residual PCB concentrations  
6 would not cause adverse human health effects. However, if a portion of the treated soil is reused  
7 as backfill in the floodplain, that reuse would potentially result in long-term adverse  
8 environmental impacts in the forested floodplain and other wetland areas due to the differences  
9 in soil characteristics between those materials and the existing natural soil in those wetland areas  
10 unless the treated soil is properly amended. In addition, regardless of whether treated soil is  
11 reused in the floodplain, TD 5 would produce the greatest amount of GHG emissions of any of  
12 the alternatives.

### 13 **3.3 CONTROL OF SOURCES OF RELEASES**

14 All of the treatment/disposition alternatives would control the potential for PCB-contaminated  
15 sediment and soil to be released and transported within the river or onto the floodplain, although  
16 some alternatives would provide more effective control of such releases than others. TD 1 (or  
17 TD 1RR) best meet this criterion, followed by TD 3.

18 Under both TD 1 and TD 1 RR, placement of the removed PCB-contaminated sediment and soil  
19 in a permitted off-site landfill or landfills would effectively isolate those materials from being  
20 released into the environment.

21 Under TD 2, placement of the PCB-contaminated sediment and soil into CDF(s) would most  
22 likely effectively isolate the removed materials from being released into the environment.  
23 However, there is a potential for releases of sediment into the river during the CDF construction  
24 process.

25 TD 3 would address future releases through the placement of the materials in an upland disposal  
26 facility and the implementation of a long-term monitoring and maintenance program. Placement  
27 of the PCB-contaminated sediment and soil into an upland disposal facility would most likely  
28 effectively isolate the removed materials from being released into the environment. However,  
29 the potential remains for releases to occur to the Housatonic River watershed both during  
30 operations and in the long term if the facility, including potentially a water treatment plant, was  
31 not properly operated and maintained.

32 Under TD 4 and TD 5, the potential for the PCB-contaminated sediment and soil to be released  
33 within the river or onto the floodplain during treatment operations would be minimal. However,  
34 the potential remains for releases to occur to the Housatonic River watershed both during  
35 operations and in the long term if the facilities were not properly operated and maintained.  
36 Under TD 4, the treated solid materials would be transported to an off-site landfill for disposal,  
37 the wastewater would be subject to treatment prior to discharge to the river, and the water  
38 treatment sludge would also be transported to an off-site landfill for disposal. Under TD 5, to the  
39 extent that some of the treated solids are used as backfill in the floodplain, chemical  
40 characterization sampling would be performed to verify that those materials would not present  
41 concerns regarding future releases or exposure. The remainder of the treated solids, or all such

1 solids if none are reused as floodplain backfill, would be transported to an off-site landfill for  
2 disposal, and the concentrated PCB-contaminated liquid condensate from the thermal desorption  
3 process would be sent off-site for incineration.

#### 4 **3.4 COMPLIANCE WITH FEDERAL AND STATE ARARs**

5 Each of the TD alternatives would involve moving the sediment, bank soil, and floodplain soil  
6 from the point of excavation to the treatment/disposition point, and each TD alternative would  
7 attain the ARARs, except as discussed below.

8 TD 1, with disposal off-site at one or more permitted disposal sites, would have fewer additional  
9 ARARs than the other treatment/disposition alternatives, and would attain the requirements.  
10 TD 1 RR would have all the same ARARs as TD 1. TD 2, an in-water CDF, would be  
11 considered a hazardous waste and solid waste disposal site, and would have ARARs associated  
12 with its location in the river, and with being in a potential habitat area for state-listed species.  
13 TD 2 would not meet wetland and floodplain requirements. TD 3, on-site landfiling, has  
14 ARARs associated with being a hazardous waste and solid waste disposal site, and possibly  
15 impacts on wetland areas. In addition, two of the potential locations for the TD 3 upland  
16 disposal facility, along with the CDFs, are in, or in close proximity to, a state-designated Area of  
17 Critical Environmental Concern (ACEC). As such, not all potential locations of TD 2 or TD 3  
18 will meet the requirements of 310 CMR 30.708 or the site suitability criteria in the  
19 Commonwealth's Site Assignment Regulations for Solid Waste Facilities, 310 CMR 16.40(3)(4),  
20 which prohibit hazardous waste and solid waste facilities in an ACEC, or adjacent to or in close  
21 proximity to an ACEC such that it would fail to protect the outstanding resources of an ACEC.  
22 Furthermore, certain locations of TD 3 would not meet the Massachusetts Hazardous Waste  
23 Facility Site Safety Council Regulations (990 CMR 5.04), which provide criteria for evaluation  
24 of a notice of intent for siting a hazardous waste facility, including that it is not within an ACEC.

25 TD 4 and TD 5 have ARARs related to the treatment of toxic substances/hazardous waste, and  
26 depending on their location, would have wetland, floodplain, and/or species habitat ARARs to  
27 attain.

28 Additional information on federal and state ARARs is provided in Attachment 13.

#### 29 **3.5 LONG-TERM RELIABILITY AND EFFECTIVENESS**

30 The assessment of long-term reliability and effectiveness for the treatment/disposition  
31 alternatives included an evaluation of the magnitude of residual risk, the adequacy and reliability  
32 of the alternatives, and the potential long-term adverse impacts on human health or the  
33 environment.

##### 34 **3.5.1 Magnitude of Residual Risk**

35 Placement of PCB-contaminated sediment/soil in off-site permitted landfills (TD 1 and TD 1  
36 RR), in one or more CDF(s) (TD 2), or in an upland disposal facility (TD 3) would permanently  
37 isolate those materials from direct contact with human and ecological receptors. Under TD 2, as  
38 noted above, there is a greater potential for releases and resulting risk than under TD 1 and TD 3,  
39 although there is some risk of releases from TD 3.

1 Under TD 4 and TD 5, it is not expected that there would be any significant residual risks,  
2 because: (1) all treatment operations would be performed within secured areas, and residual  
3 PCBs associated with the operations would be removed following completion of the treatment  
4 operations; (2) all treated materials would be subject to verification sampling and successfully  
5 and unsuccessfully treated material would be transported off-site for disposal, except for any  
6 such material reused on-site under TD 5; and (3) any such treated materials reused on-site under  
7 TD 5 would be sampled to verify that the material to be reused would not pose a residual risk.

8 In summary, all of the treatment/disposition alternatives would minimize future residual risk  
9 from exposure to the PCB-contaminated materials, although there would be a greater potential  
10 for such exposure under TD 2 and TD 3 than under the other alternatives, for the reasons noted  
11 above.

### 12 **3.5.2 Adequacy and Reliability of Alternatives**

13 There are considerable differences in the adequacy and reliability of the five  
14 treatment/disposition alternatives. Based on these differences, the adequacy and reliability  
15 criterion favors either TD 1, TD 1 RR, or TD 3 for disposal of the excavated materials under all  
16 alternatives.

17 Use of off-site disposal facilities (TD 1 and TD 1 RR) is a common and effective means for  
18 permanent disposition of PCB-contaminated material. As the volume of materials requiring  
19 disposal increases, multiple facilities may be required, but that is not expected to be a major  
20 consideration.

21 In-water CDFs (TD 2) have been used to dispose of dredged PCB-contaminated sediment at  
22 some sites. In this case, as discussed above, there is a somewhat greater potential for releases  
23 from the CDF(s) than from off-site or local upland disposal facilities.

24 On-site disposal of PCB-contaminated materials in an upland facility (TD 3) has been used as  
25 part of a final remedy at a number of sites and is an effective and reliable means for permanently  
26 isolating such materials, provided the facility is properly constructed, monitored, and maintained.  
27 However, the potential extended duration of the operation of such a facility for the range of  
28 volumes of sediment and soil and the length of remedy implementation could necessitate that the  
29 facility operate for an extended period of time. In addition, GE proposes to truck the leachate  
30 generated under TD 3 to its water treatment facility located in Pittsfield. This involves a one-  
31 way trip of between 10 and 20 miles along public roads for the foreseeable future. The proposed  
32 facility near Woods Pond could generate as much as 600,000 gallons of leachate per month  
33 (based on its maximum size of 18 acres for 2,000,000 cy) for 10 to 20 years, requiring over 1,000  
34 truck trips per year (120 per month) while the facility is still receiving material. Based on  
35 SED 8/FP 7, which has a volume of 2,900,000 cy, the amount of leachate could be as high as  
36 1,000,000 gallons per month (based on the maximum landfill footprint at the site near Rising  
37 Pond). This volume could occur for up to 52 years and would require 200 truck trips per month  
38 or 2,400 per year. Alternatively, GE would have to construct, operate, and maintain a treatment  
39 facility at each of the upland disposal facilities. If these treatment facilities were not operated  
40 properly, there would be the potential for releases of PCBs into the area where the facility is

1 located or into the Housatonic River. TD 3 relies heavily on proper long-term operation,  
2 maintenance, and monitoring activities.

3 The use of chemical extraction (TD 4) has not been demonstrated at full scale on sediment and  
4 soil representative of the Rest of River. The results of bench-scale testing using site sediment  
5 and soil did not demonstrate that this technology would be effective. As a result, there are  
6 uncertainties about the long-term reliability and effectiveness of operating such a system for a  
7 project of the size and duration, and with the range of PCB concentrations, that would be  
8 involved at the Rest of River. These and other factors create uncertainties regarding the  
9 effectiveness and reliability of using the chemical extraction process in a full-scale application.

10 Thermal desorption (TD 5) has been used at several sites to treat PCB-contaminated soil;  
11 however, there is only limited precedent for use of this technology on sediment due in part to the  
12 time and cost of removing moisture from the sediment prior to treatment. At the sites identified  
13 where thermal desorption has been used, the volumes of materials that were treated were  
14 substantially smaller and the duration of the treatment operations was substantially shorter than  
15 the volumes and duration that could be required at the Rest of River. Furthermore, when on-site  
16 reuse of treated materials has occurred, the materials have typically been placed in a small area  
17 and covered with clean backfill. For these reasons, the adequacy and reliability of this process  
18 for a long-term treatment operation with a large volume of materials such as sediment/soil from  
19 the Rest of River is uncertain.

### 20 **3.5.3 Potential Long-Term Adverse Impacts on Human Health or the Environment**

21 Implementation of TD 1, TD 1 RR, TD 2, and TD 3 would isolate the removed sediment/soil  
22 from potential human and ecological exposure because the material would be contained in  
23 structures designed specifically for that purpose. Under TD 4, removed material would first be  
24 treated, and then disposed of off-site. For TD 5, materials would be treated, and then a portion  
25 might be reused in the floodplain, assuming that it has acceptable residual levels of  
26 contaminants, with the remainder disposed of off-site. Thus, under all the treatment/disposition  
27 alternatives, no long-term adverse impacts on humans or ecological receptors from exposure to  
28 the PCB-contaminated materials are expected, with the potential exception of TD 2 if a release  
29 were to occur (e.g., during an extreme storm event).

30 TD 1 would not cause any adverse long-term environmental impacts in the Rest of River area  
31 because it would involve off-site transport and disposal of the PCB-contaminated materials.

32 TD 1 RR would also not result in adverse long-term environmental impacts in the Rest of River  
33 area. The rail yard and loading facility would be demobilized following completion of the  
34 remedy and the area restored to its former condition.

35 For TD 2, the placement of an in-water CDF in Woods Pond and/or one of the two identified  
36 backwaters would have the most significant long-term adverse environmental impacts, including  
37 a permanent loss of the aquatic habitat in those areas. Depending on the location and size of the  
38 CDF(s), TD 2 could adversely affect the priority habitat of up to nine state-listed species. In  
39 addition, the CDF(s) would raise the topography of the CDF area(s), reduce available  
40 shoreline/wetland habitat, and produce a loss of the existing flood storage capacity.



1 For TD 3, the construction of the upland disposal facility, which, for the Woods Pond site, is  
2 located within an Area of Critical Environmental Concern, would result in the alteration of  
3 existing habitat within the operational footprint of that facility. In the landfill area itself, as well  
4 as any support areas (e.g., access roads) that would remain after closure, the habitat alteration  
5 would be permanent, although the landfill would be capped and planted. The significance of the  
6 change in habitat would depend on the existing habitat at the location of the facility, as well as  
7 the size of the facility.

8 Under TD 4 and TD 5, the construction and operation of a 5-acre treatment facility at the former  
9 DeVos property would result in some loss of the relatively low-quality habitat within that area (a  
10 former agricultural area that is now open grassland with scattered shrubs) during the period of  
11 treatment operations and for a few years thereafter. That loss, as well as increased noise and  
12 human presence in the area, would affect the wildlife in the area (which includes the priority  
13 habitat for some state-listed species) during that period. However, given the relatively small size  
14 of the facility, the altered nature of the habitat, and the planned reseeded of the area with a  
15 grassland mix following removal of the facility, long-term ecological impacts associated with  
16 construction and operation of the facility would be minimal.

17 Based on this analysis of the treatment/disposition alternatives, TD 2, and to a lesser extent TD 3  
18 (depending on the actual landfill location selected), would have the greatest long-term adverse  
19 environmental impacts. TD 4 and TD 5 would have similar environmental impacts, but less than  
20 TD 3 because they would be in place only for the duration of the remedial construction. TD 1  
21 and TD 1 RR would have the least long-term impacts.

### 22 **3.6 ATTAINMENT OF IMPGs**

23 Attainment of IMPGs is not applicable to evaluation of treatment and disposition alternatives.

### 24 **3.7 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME**

25 The degree to which the treatment/disposition alternatives would reduce the TMV of PCBs is  
26 discussed below.

#### 27 **3.7.1 Treatment Process Used and Materials Treated**

28 TD 1 through TD 3 (including TD 1 RR) would not include any treatment processes that would  
29 reduce the toxicity of, or directly affect, PCB concentrations in the removed sediment and soil.  
30 TD 4 and TD 5 would incorporate treatment processes that can, to varying degrees, reduce  
31 concentrations of PCBs. Under TD 4, the chemical treatment process would reduce the toxicity  
32 of the sediment and soil by permanently removing some PCBs from these materials, although the  
33 effectiveness of this technology is questionable. Under TD 5, the indirect-fired thermal  
34 desorption system would reduce the toxicity of the PCB-contaminated sediment and soil by  
35 permanently removing PCBs from these materials, and the PCBs in the liquid stream would be  
36 sent to a permitted off-site disposal facility for destruction. The volume and nature of the  
37 materials to be treated would be determined by the selected remediation alternative and are,  
38 therefore, identical for all treatment/disposition alternatives.

1 **3.7.2 Amount of Hazardous Materials Destroyed or Treated**

2 As noted above, only TD 4 and TD 5 specify the treatment and/or destruction of PCBs. TD 4  
3 would remove PCBs from contaminated soil and sediment via chemical treatment but would not,  
4 in itself, destroy any of the PCBs so removed. In addition, the effectiveness of this process on  
5 site materials has not been demonstrated. TD 5 would similarly not destroy PCBs on-site, but  
6 only separate them from the site soil and sediment. Subsequent destruction of PCBs could be  
7 accomplished on-site via further treatment of the waste stream from either TD 4 or TD 5, but is  
8 not an inherent component of either alternative.

9 **3.7.3 Degree of Expected Reductions in Toxicity, Mobility, or Volume**

10 Reduction of Toxicity: TD 1 through TD 3 (including TD 1 RR) would not include any treatment  
11 processes that would reduce the toxicity of, or directly affect, PCB concentrations in the removed  
12 sediment and soil. TD 4 and TD 5 would incorporate treatment processes that can, to varying  
13 degrees, reduce concentrations of PCBs and therefore reduce toxicity, as discussed above.

14 Reduction of Mobility: All of the alternatives would reduce the mobility of PCBs in the sediment  
15 and soil. In TD 1, TD 1 RR, TD 2, and TD 3, these materials would be removed and disposed of  
16 in off-site permitted landfill(s) (TD 1 and TD 1 RR) or permanently contained within on-site  
17 CDF(s) (TD 2) or an upland disposal facility (TD 3). TD 4 and TD 5 would reduce the mobility  
18 of PCBs present in the sediment/soil via chemical extraction or thermal desorption.

19 Reduction of Volume: TD 1, TD 1 RR, TD 2, and TD 3 would not reduce the volume of PCB-  
20 contaminated material. For TD 4, treatment of sediment/soil would reduce the volume of PCBs  
21 present in those materials by transferring some of the PCBs to an aqueous waste stream for  
22 subsequent treatment. PCB-contaminated sludge would be generated from the wastewater  
23 treatment system and would be sent to a permitted off-site facility for disposal. For TD 5,  
24 treatment of sediment/soil in the thermal desorption system would reduce the volume of PCBs  
25 present in those materials, with the liquid condensate transported to an off-site facility for  
26 destruction.

27 **3.7.4 Degree to Which Treatment Is Irreversible**

28 This criterion is not applicable to TD 1 through TD 3 because these alternatives do not involve  
29 treatment. For TD 4 and TD 5, off-site treatment of the extracted PCB waste streams would  
30 result in the permanent and irreversible destruction of PCBs.

31 **3.7.5 Type and Quantity of Residuals Remaining After Treatment**

32 This criterion applies only to alternatives TD 4 and TD 5. Because the materials to be treated  
33 would be determined by the remediation alternative selected and the details would be determined  
34 in the final design of the remediation, both treatment alternatives would begin with the same type  
35 and quantity of material. As discussed above, thermal absorption (TD 5) is a more proven  
36 technology than chemical extraction and, recognizing that dewatering of sediment may present  
37 additional technical complexity for this process, it is believed that TD 5 will result in residual  
38 materials that may be sufficiently low in PCB concentration to be reused on-site. In the case of

1 TD 4, the chemical extraction process is believed to result in residuals of PCB concentration that  
2 will require landfilling following treatment.

### 3 **3.8 SHORT-TERM EFFECTIVENESS**

4 Evaluation of the short-term effectiveness of the treatment/disposition alternatives includes  
5 consideration of the short-term impacts of implementing these alternatives on the environment  
6 (considering both ecological effects and increases in GHG emissions), on the local communities  
7 (as well as communities along truck transportation corridors), and on the workers involved in the  
8 treatment and disposition activities.

#### 9 **3.8.1 Impacts on the Environment**

10 All the treatment/disposition alternatives would produce some short-term adverse impacts on the  
11 environment, but to varying degrees depending on the duration and scope of the alternative.  
12 TD 1 would have the least impacts of all the TD alternatives, requiring only access roads and  
13 staging areas for loading of vehicles for off-site transport. TD 1 RR would require the  
14 construction of a rail yard and loading facility at some point along the existing rail right-of-way  
15 and would require approximately the same amount of access roads and staging areas as TD 1.  
16 The short-term impacts of TD 2 through TD 5 would include loss of habitat and loss or  
17 displacement of aquatic biota and other wildlife in the areas where the disposition or treatment  
18 facilities are located, as well as in adjacent areas, during construction and operations. TD 2  
19 would affect a portion of Woods Pond and/or one of the two backwaters identified for a CDF, as  
20 well as the adjacent floodplain. Specific short-term impacts associated with TD 3 would depend  
21 on the habitat at the selected location and the operational footprint of the facility. Construction  
22 of a treatment facility for TD 4 or TD 5 on the former DeVos property would result in the  
23 temporary reduction of open field habitat on that property.

24 All of the treatment/disposition alternatives could also have short-term effects on the  
25 environment due to the potential for accidental releases of PCB-contaminated materials. In  
26 particular, TD 3 has the risk of the release of leachate during its transport from the upland  
27 disposal facility(s) to the GE GWTP in Pittsfield if an alternate treatment facility is not  
28 constructed. In addition, TD 4 and TD 5 have the potential for failure of process and control  
29 equipment during operations, which could result in a release of PCB-contaminated materials.  
30 The potential for these types of effects would increase with the volume of materials removed and  
31 the length of the implementation period.

#### 32 **3.8.2 Carbon Footprint – GHG Emissions**

33 GHG emission estimates were developed based on the ranges of the potential volumes of  
34 sediment and soil that would require disposal or treatment. Table 23 summarizes the resulting  
35 ranges of total GHG emissions associated with each TD alternative. To provide context  
36 regarding the emissions reported, the number of passenger vehicles that would emit an  
37 equivalent quantity of CO<sub>2-eq</sub> in 1 year is also presented in the table.

38 As shown in Table 23 for the TD alternatives evaluated in the RCMS (excluding TD 2, which is  
39 not comparable, and TD 1 RR for which estimates were not available), TD 5 would have the  
40 greatest amount of total GHG emissions for the range of volumes; TD 4 would have the next

1 largest amount; followed by TD 1. TD 3 would have lowest amount of total GHG emissions for  
 2 the range of volumes, approximately 3 to 5 times less than the next lowest alternative (TD 1).  
 3 TD 1 RR would have significantly lower GHG emissions than TD 1 because the emissions due  
 4 to off-site truck transport would be replaced by the much lower emissions resulting from off-site  
 5 transport via rail. It should be noted, however, that the magnitude of the differences among  
 6 alternatives varies with the removal volume. For example, the lower-bound estimates for TD 1  
 7 and TD 3 are 19,000 and 5,500 tonnes, respectively, a difference of 13,500 tonnes. However, the  
 8 upper-bound estimates are 290,000 tonnes for TD 1 and 61,000 tonnes for TD 3, a difference of  
 9 229,000 tonnes (17 times more than the difference at the lower bound). The differences in GHG  
 10 emissions between TD 1 and TD 3 are due to the distance that materials need to be trucked  
 11 before ultimate disposition. Such differences are even more pronounced when comparing TD 3  
 12 with TD 4 and TD 5.

13 **Table 23 Calculated GHG Emissions Anticipated to Result from**  
 14 **Treatment/Disposition Alternatives**

Alternative	Total GHG Emissions (tonnes)	No. Vehicles with Equivalent Emissions
TD 1	19,000 – 290,000	3,600 – 55,400
TD 2	See Note 1	See Note 1
TD 3 (see Note 2)	5,500 – 61,000	1,100 – 11,700
TD 4	27,000 – 370,000	5,200 – 70,700
TD 5 (with reuse)	66,000 – 1,000,000	12,600 – 191,200
TD 5 (without reuse)	66,000 – 1,100,000	12,600 – 210,300

- 15 Notes:
- 16 1. Emissions estimated for TD 2 range from 2,700 to 8,800 tonnes and do not include the emissions that would be necessary  
 17 for off-site transport and disposal of materials that are not placed in the CDF(s). As such, these estimates are not  
 18 comparable to the emissions listed for the other alternatives.
- 19 2. The lower bound of this range for TD 3 is based on disposal of the minimum potential removal volume at the Woods Pond  
 20 site (which would have the lowest GHG emissions of the identified sites) and the upper bound is based on disposal of the  
 21 maximum potential removal volume at the Rising Pond site, which is the only one of the identified local disposal sites that  
 22 could accommodate that maximum volume. Note also that the Woods Pond site is located within the State-designated Area  
 23 of Critical Environmental Concern.

24 **3.8.3 Impacts on Local Communities**

25 All the alternatives would also result in short-term impacts to the local communities in the Rest  
 26 of River area. These impacts would include disruption, noise, and other impacts resulting from  
 27 the increased truck traffic and from the construction and operation of the on-site disposition or  
 28 treatment facilities. TD 1 RR, due to its use of rail transport, would result in a significant  
 29 decrease in impacts to local communities due to reduced off-site truck traffic. In addition,  
 30 unique to TD 3, leachate potentially being transported via truck from the upland disposal  
 31 facility(s) could be released en route due to malfunctioning equipment or an accident, creating  
 32 impacts to the local communities, and the operation of the landfill for the duration of the remedy.

1 The estimated numbers of off-site truck trips for each alternative, based on the estimated range of  
 2 volumes that could be involved, are shown in Table 24.<sup>12</sup>

3 **Table 24 Estimated Off-Site Truck Trips for Treatment/Disposition Alternatives**

Alternative	Off-Site Truck Trips for Lower-Bound Volume	Off-Site Truck Trips for Upper-Bound Volume
TD 1	15,900 (2,000)	243,000 (6,100)
TD 2	See Note 3	See Note 3
TD 3 (see Note 4)	1,450 (180)	68,000 (3,600)
TD 4	15,900 (2,000)	243,000 (6,100)
TD 5 (with reuse)	13,300 (1,700)	190,500 (4,800)
TD 5 (without reuse)	14,300 (1,800)	218,900 (5,500)
TD 1 RR	0 (0) Note 7	0 (0)

4 Notes:

- 5 1. Truck trips estimated assuming 16-ton capacity trucks for importing material and equipment to the site, 20-ton capacity  
 6 trucks for transporting excavated materials, and 20% bulking factor in the trucks.
- 7 2. The number in parentheses represents average annual truck trips.
- 8 3. Truck trips estimated for TD 2 range from 5,600 to 19,500 and do not include the truck trips that would be necessary for off-  
 9 site transport and disposal of materials that are not placed in the CDF(s). As such, these estimates are not comparable to the  
 10 numbers of truck trips listed for the other alternatives.
- 11 4. The lower bound of this range for TD 3 is based on construction of an upland disposal facility at the Woods Pond site and  
 12 the upper bound is based on construction of such a facility at the Forest Street site. Note that the Woods Pond site is located  
 13 in a State-designated Area of Critical Environmental Concern, and Forest Street is in close proximity to the ACEC.
- 14 5. A 10% volume reduction of sediment/soil after treatment has been assumed for thermal desorption treatment (TD 5).
- 15 6. For TD 5 with reuse, it is assumed that approximately 50% of the floodplain soil treated by thermal desorption would be  
 16 reused on-site and that all remaining materials would be transported off-site for disposal.
- 17 7. It was assumed for the purpose of this analysis that there would be zero off-site truck trips; however, use of trucks may be  
 18 necessary under certain conditions.

19 As shown in this table, excluding TD 2, which is not comparable, TD 3 would involve the fewest  
 20 off-site truck trips for the range of volumes, whereas those for the other alternatives are roughly  
 21 comparable, with somewhat more for TD 1 and TD 4 than for TD 5. TD 1 RR will maximize the  
 22 transport of the contaminated soil via rail; therefore, off-site truck traffic will be minimized.  
 23 Again, however, the magnitude of the differences among alternatives varies with the removal  
 24 volume. The additional truck traffic would also increase the risk of traffic accidents along  
 25 transport routes. An analysis of potential risks from the increased off-site truck traffic that would  
 26 be associated with the treatment/disposition alternatives in terms of potential fatalities and non-  
 27 fatal injuries is presented in Table 25.

28 The incidence of potential injuries and fatalities resulting from accidents associated with  
 29 increased off-site truck traffic would be the greatest for TD 1 and TD 4, followed closely by

<sup>12</sup> For comparability among alternatives, this table shows only off-site truck trips, i.e., those for importation of construction materials and equipment to the site over public roads for construction and closure of a local disposal or treatment facility, as well as those for transport of excavated or treated soil/sediment to off-site disposal facilities. It does not include transport of excavated materials from the staging areas to the local disposal or treatment facility.

1 TD 5, and would be far lower for TD 3. As with the number of off-site truck trips, the  
 2 differences in estimated injuries and fatalities resulting from such traffic become more  
 3 pronounced as the removal volumes increase. Because TD 1 RR would require no off-site truck  
 4 traffic, no injuries or fatalities are associated with this alternative because it was assumed for the  
 5 purpose of this analysis that there would be zero off-site truck trips; however, it may be  
 6 necessary to use trucks instead of rail under certain conditions.

7 **Table 25 Incidence of Accident-Related Injuries/Fatalities**  
 8 **Due to Increased Off-Site Truck Traffic**

Impacts	TD 1	TD 2	TD 33	TD 4	TD 5 (with Reuse)	TD 5 (without Reuse)	TD 1 RR
<b>Non-Fatal Injuries</b>							
Number	4.34 – 67.03	See Note 2	0.03 – 1.60	4.11 – 62.87	3.44 – 49.24	3.70 – 56.59	Note 4
Average Annual Number	0.45 – 1.28	See Note 2	0.0002 – 0.084	0.51 – 1.57	0.43 – 1.23	0.46 – 1.41	0
Probability <sup>1</sup>	99 – 100%	See Note 2	3 – 80%	98 – 100%	97 – 100%	98 – 100%	-
<b>Fatalities</b>							
Number	0.20 – 3.14	See Note 2	0.002 – 0.07	0.19 – 2.94	0.16 – 2.31	0.17 – 2.65	0
Average Annual Number	0.02 – 0.06	See Note 2	0.0002 – 0.004	0.02 – 0.07	0.02 – 0.06	0.02 – 0.07	0
Probability <sup>1</sup>	18 – 96%	See Note 2	0.2 – 7%	18 – 95%	15 – 90%	16 – 93%	-

9 Notes:

- 10 1. Probability indicates the probability of at least one injury/fatality.  
 11 2. The estimated risks of accidents for TD 2 are based only on the truck trips necessary to transport materials to the site for the  
 12 construction of the CDF(s) and do not consider the truck trips for off-site transport of the materials that would not be placed  
 13 in the CDF(s). As such, those risks are not comparable to the estimated risks for the other treatment/disposition alternatives  
 14 (which consider all removed materials). Under the scenario evaluated, the risks estimated for TD 2 are 0.01 to 0.02  
 15 fatalities (with a 1% to 2% probability of at least one fatality) and 0.13 to 0.46 non-fatal injuries (with a 12% to 37%  
 16 probability of at least one injury).  
 17 3. The lower bound of this range for TD 3 is based on construction of an upland disposal facility at the Woods Pond site and  
 18 the upper bound is based on construction of such a facility at the Forest Street site.  
 19 4. It was assumed for the purpose of this analysis that there would be zero off-site truck trips; however, use of trucks may be  
 20 necessary under certain conditions.

21 **3.8.4 Potential Measures to Avoid, Minimize, or Mitigate Short-Term**  
 22 **Environmental and Community Impacts**

23 A number of measures would be employed in an effort to avoid, minimize, or mitigate the short-  
 24 term impacts of the treatment/disposition alternatives on the environment and the affected  
 25 communities. As would be expected, the level of impact and thus the scope and duration of

1 mitigation measures are related to the scale/scope of the alternative and the duration of  
 2 implementing the alternative. For TD 1, the mitigation measures would relate to the increased  
 3 truck traffic, whereas for the other TD alternatives, mitigation measures would address the  
 4 increase in truck traffic as well as the impacts associated with the construction and operation of  
 5 the different facilities.

6 **3.8.5 Risks to Remediation Workers**

7 There would also be health and safety risks to site workers implementing each of these  
 8 alternatives. For TD 1 and TD 1 RR, these risks would consist of risks to the truck drivers and,  
 9 in the case of TD 1 RR, railroad employees, and to the employees of the off-site disposal  
 10 facilities, rather than to on-site remediation workers, and thus, were not quantified. For TD 2  
 11 through TD 5, an analysis of estimated risks to site workers is summarized in Table 26.

12 Estimated risks to site workers for the range of volumes would be lowest for TD 2 (due to its  
 13 fewer years of operation) and higher for the other alternatives, with TD 3 slightly higher than  
 14 TD 4 and TD 5. In this case, there are no substantial differences among TD 3, TD 4, and TD 5 at  
 15 the same volumes, but there are significant differences between the lower and upper bounds.

16 **Table 26 Incidence of Potential Accidents/Injuries Due to**  
 17 **Implementation of Alternatives TD 2 through TD 5**

Impacts	TD 2	TD 3 <sup>a</sup>	TD 4	TD 5
Labor-hours (hours)	73,000 – 259,000	306,000 – 1,836,000	160,600 – 1,673,600	160,600 – 1,673,600
Years of Operation	6 – 20	8 – 40	8 – 40	8 – 40
<b>Non-Fatal Injuries</b>				
Number	0.70 – 2.50	2.69 – 16.4	1.27 – 13.1	1.27 – 13.1
Average Annual Number	0.12 – 0.13	0.34 – 0.41	0.16 – 0.33	0.16 – 0.33
Probability <sup>b</sup>	50 – 92%	93 – 100%	72 – 100%	72 – 100%
<b>Fatalities</b>				
Number	0.01 – 0.03	0.02 – 0.11	0.007 – 0.08	0.007 – 0.08
Average Annual Number	0.0012 – 0.0013	0.002 – 0.003	0.0009 – 0.002	0.0009 – 0.002
Probability <sup>b</sup>	1 – 3%	2 – 11%	0.7 – 8%	0.7 – 8%

18 <sup>a</sup> The lower bound of this range for TD 3 is based on disposal of the minimum potential removal volume at the Woods Pond  
 19 site, and the upper bound is based on disposal of the maximum potential removal volume at the Rising Pond site, which is  
 20 the only one of the identified local disposal sites that could accommodate that maximum volume and thus, has the longest  
 21 period of operations.  
 22 <sup>b</sup> Probability indicates the probability of at least one injury/fatality.

23 **3.8.6 Summary of Short-Term Effectiveness**

24 All of the treatment/disposition alternatives would have some short-term negative impacts on the  
 25 environment, local communities, and communities along transport routes. TD 2 through TD 5  
 26 would cause a loss of habitat and loss or displacement of wildlife in the area where the disposal  
 27 or treatment facility is located, as well as in adjacent areas, during construction and operation of

1 the facility. In addition, all alternatives would involve the potential for accidental releases of  
2 various PCB-contaminated materials during transportation to off-site or local disposal or  
3 treatment facilities. This potential would increase with TD 2, TD 3, TD 4, and TD 5 because  
4 those alternatives would pose additional risks associated with the potential for failure of process  
5 and control equipment during operations, and releases of process byproducts/chemicals/leachate  
6 to the environment. Although all alternatives would generate GHG emissions, for the range of  
7 volumes (excluding TD 2, which is not comparable), TD 5 would produce the most such  
8 emissions and TD 3 would produce the least.

9 Estimates of off-site truck trips and traffic accident risks from that truck traffic indicate that, for  
10 the range of volumes (excluding TD 2), TD 1 and TD 4 would involve the most off-site truck  
11 trips and cause the most injuries related to such transport, followed closely by TD 5, with far  
12 fewer off-site truck trips and transport-related injuries for TD 1 RR and TD 3. In terms of risks  
13 to on-site workers, excluding TD 1 (which would not affect site workers) and TD 2 (which is not  
14 comparable), the estimated injuries for the other three TD alternatives are roughly comparable  
15 for the same volumes.

## 16 **3.9 IMPLEMENTABILITY**

17 The relative implementability of the treatment/disposition alternatives is evaluated below using  
18 the eight specific components of this criterion specified in the RCRA Permit.

### 19 **3.9.1 Ability to Construct and Operate the Technology**

20 Each of the technologies under evaluation can be constructed and operated as necessary. For the  
21 alternatives involving landfilling, hazardous materials landfills are routinely constructed and  
22 operated and the techniques involved are well known and of demonstrated effectiveness. Any  
23 necessary transportation infrastructure, including construction of a small rail yard and loading  
24 facility in the case of TD 1 RR, would similarly present no difficulties.

25 In the case of TD 2, the construction and operation of in-water CDFs has also been implemented  
26 at many locations, particularly in the Great Lakes. Although construction and operation of a  
27 CDF in a flowing river is less common, the locations proposed for the CDF(s) in the Rest of  
28 River are in non-flowing, or very slightly flowing, areas.

29 Although the effectiveness of thermal desorption and of chemical extraction technology has not  
30 yet been demonstrated for Housatonic River soil and sediment, both basic processes are in use in  
31 other locations. Construction and operation of facilities in the Rest of River area may present  
32 some minor logistical issues, but none of these issues is believed to present unusual problems.

### 33 **3.9.2 Reliability of the Technology**

34 For the alternatives involving landfilling, hazardous waste landfills have been proven to be  
35 reliable in reducing and/or eliminating exposure to hazardous materials placed in them.  
36 Similarly, transportation of hazardous materials via truck or rail is a routine and accepted  
37 technology with appropriate controls to safeguard the public and workers. CDFs have similarly  
38 been shown to be reliable when constructed and operated properly. In the case of TD 2,  
39 construction of CDFs in an area that could be subject to flooding and stronger river flow in the



1 case of extreme storm events makes this technology less reliable than it would be when applied  
2 to non-riverine situations.

3 Chemical extraction is of unknown, but somewhat questionable, reliability in the case of PCB-  
4 contaminated soil and sediment from Rest of River. A pilot-scale study of one technology using  
5 site-specific materials failed to demonstrate the effectiveness of chemical extraction for these  
6 materials; therefore, chemical extraction cannot be considered reliable at this time. Thermal  
7 desorption, although generally accepted as a reliable technology for removing contaminants from  
8 soil, has similarly not been demonstrated on Housatonic River materials and, in addition, would  
9 involve prior dewatering of contaminated sediment. Although sediment dewatering is a  
10 generally proven and accepted technology, its effectiveness in conjunction with thermal  
11 desorption has not been demonstrated on sediment from Rest of River. Accordingly, thermal  
12 desorption cannot be considered a reliable technology for the proposed application at this time.

### 13 **3.9.3 Regulatory and Zoning Restrictions**

14 TD 1 and TD 1 RR would be conducted in accordance with the requirements of applicable  
15 federal, state, and local regulations relating to the off-site transport and disposal. The four other  
16 alternatives would be “on-site” activities for the purposes of the permit exemption set forth in  
17 Section 121(e) of the Comprehensive Environmental Response, Compensation, and Liability Act  
18 (CERCLA) and Paragraph 9.a of the Consent Decree. As such, no federal, state, or local permits  
19 or approvals would be required. However, implementation of these alternatives would need to  
20 comply with the substantive requirements of applicable or relevant and appropriate regulations  
21 (i.e., ARARs) (unless waived), and as noted above, two of the three sites proposed for an upland  
22 disposal landfill would likely be affected by ACEC and Massachusetts regulations restricting  
23 siting of such facilities within or in close proximity to an ACEC.

24 Implementation of TD 1 would not require access agreements beyond those necessary to conduct  
25 the remediation. Implementation of TD 2 and TD 3 would require permanent access to the  
26 location(s) selected for the disposal facility(ies). Implementation of TD 4 and TD 5 would  
27 require access to the location selected for the treatment facility; GE is the current owner of the  
28 potential location identified for TD 4 and TD 5, as well as one potential location for TD 3. It is  
29 EPA’s understanding that GE has negotiated the right to acquire the other two sites identified as  
30 potential locations for TD 3. Therefore, assuming use of one or more of these locations, no site  
31 access agreements would be required for implementation of TD 3 through TD 5, but such  
32 agreements may be required for TD 2. TD 1 RR would require an access agreement for the rail  
33 siding and loading facility, which would be assumed to be temporary.

34 In conclusion, there is a clear distinction among the alternatives with respect to this criterion:  
35 TD 1 would be easiest to implement, followed closely by TD 1 RR, with TD 2 and TD 3 being  
36 the most difficult and time consuming to implement from an administrative perspective, whereas  
37 TD 4 and TD 5 would experience similar difficulties from a technical perspective. Construction  
38 of either an in-water CDF (TD 2) or an on-site hazardous waste landfill (TD 3) would face  
39 considerable public opposition and would also potentially conflict with the designation of the  
40 area as an ACEC.

1 **3.9.4 Ease of Undertaking Additional Corrective Measures**

2 The primary constraint on the ability of any of the treatment/disposition alternatives to  
3 accommodate additional corrective measures relates to their ability to deal with increased  
4 volumes of contaminated material. In the case of TD 1 and TD 1 RR, there is some uncertainty  
5 regarding the future availability of the necessary capacity in off-site landfills, which could  
6 present issues if it was deemed necessary to undertake additional corrective measures that would  
7 require removal of additional volumes of contaminated soil and/or sediment. Capacity would be  
8 an even greater issue with TD 2 because there is some question whether the proposed CDF(s)  
9 have sufficient capacity to deal with the volume of material that would be generated by the  
10 remedial alternatives already under consideration.

11 In the case of TD 3, the capacity of the proposed on-site landfills is known and is sufficient to  
12 receive a volume of material considerably greater than the most extensive remedial alternative  
13 under consideration (SED 8/FP 7). However, the capacity is finite, and if additional remediation  
14 well beyond that alternative is proposed, landfill capacity would represent a constraint on the  
15 ability to undertake such an expanded remediation.

16 TD 4 (chemical extraction) does not appear to be capable of lowering PCB concentrations in  
17 treated material to a level that would allow treated materials to be reused on site. Because such  
18 material would require removal to an off-site landfill and would not be decreased in volume as  
19 compared with non-treated material, TD 4 is subject to the same potential issues discussed for  
20 TD 1 and TD 1 RR. It is believed that TD 5 (thermal desorption) may produce material that  
21 could be reused on-site, so there is decreased concern over landfill capacity limitations, but it  
22 remains uncertain that such low concentrations can be achieved.

23 **3.9.5 Ability to Monitor Effectiveness of Remedy**

24 All of the treatment/disposition alternatives can readily be monitored with existing and well-  
25 established techniques, and such monitoring would be part of any comprehensive OMM program  
26 for the remediation of the river. For an in-river CDF (TD 2), more intensive monitoring to  
27 ensure the integrity of the facility would likely be required, but no special techniques would be  
28 necessary. Similarly, in the case of TD 4 or TD 5, additional monitoring of the treatment process  
29 performance would presumably be part of the monitoring program, but such additional  
30 monitoring presents no unique technical challenges.

31 **3.9.6 Coordination with Other Agencies**

32 All alternatives would require coordination with EPA, as well as state and local agencies. TD 2  
33 and TD 3 would require extensive coordination with local government and the public. Based on  
34 past public input received, these options could encounter substantial local and state opposition,  
35 likely rendering these alternatives difficult, and potentially not feasible, to implement. TD 4 and  
36 TD 5 would require similar coordination; however, the level of coordination would likely be less  
37 than that for TD 2 and TD 3. The Commonwealth of Massachusetts has expressed a strong  
38 preference for treatment/disposition alternatives that will permanently relocate contaminated  
39 materials in licensed out-of-state facilities, with a strong preference for the use of rail. Of the  
40 evaluated alternatives, only TD 1 and TD 1 RR could satisfy this requirement.

1 **3.9.7 Availability of On-Site or Off-Site Treatment, Disposal, and Storage**  
2 **Facilities**

3 For TD 1 and TD 1 RR, there are uncertainties regarding the future availability of the necessary  
4 capacity in off-site landfills for the alternatives that have the larger volumes and longer  
5 durations. In addition, TD 1 RR has some additional uncertainty related to the timing and  
6 availability of rail transport capacity.

7 For TD 2, it would likely not be feasible to obtain sufficient flood storage compensation at the  
8 appropriate elevations/areas to provide for construction of a CDF(s) large enough to hold the  
9 necessary sediment disposal volumes. For TD 3, construction and use of an upland disposal  
10 facility would be technically implementable, but practically very difficult, if not impossible, to  
11 implement. Three potential locations for such a facility, with varying maximum capacities  
12 (ranging from 1.0 to 2.9 million cy), have been identified.

13 TD 4 and TD 5 would be implementable provided that vendors are available to operate the  
14 treatment process. The former DeVos property could be used as a potential area to locate a  
15 treatment facility. However, there are several uncertainties regarding full-scale application of  
16 both chemical and thermal processes to sediment (e.g., moisture content), particularly with some  
17 of the volumes associated with the sediment alternatives.

18 **3.9.8 Availability of Prospective Technologies**

19 The availability of additional and/or innovative treatment/disposition technologies during the life  
20 of the project is possible, but at this time, none has been demonstrated. In general, any  
21 technologies that become available during the implementation of the remediation would be  
22 evaluated in a manner similar to that discussed above for Alternatives TD 4 and TD 5. Such an  
23 ex situ technology has been proposed and may be tested during the implementation of the  
24 preferred remedy.

25 **3.10 COST**

26 The estimated cost ranges for each treatment/disposition alternative, including total capital cost,  
27 estimated annual OMM cost, and total estimated present worth are summarized in Table 27 and  
28 are taken from GE's RCMS, except for TD 1 RR, which is summarized in Attachment 8. Note  
29 that, in this case, the costs presented for TD 2 include not only the costs for disposition in the  
30 CDF(s) of the hydraulically dredged sediment from Reaches 5C and 6 under SED 6 through SED  
31 9, but also the estimated costs for off-site transport and disposal of the remaining sediment  
32 removed under those alternatives, as well as the excavated floodplain soil (lower-bound costs  
33 consider SED 6 and FP 2, and upper-bound costs consider SED 8 and FP 7). In addition, for  
34 TD 3, the range of costs presented are for an upland disposal facility constructed at the Rising  
35 Pond site because that is the only single location with the capability to hold the maximum  
36 potential volume of 2.9 million cy. As shown in Table 27, TD 3 is the least costly alternative.  
37 At the low end of the volume range, it would cost about 2 to 4 times less than the other  
38 alternatives; and at the high end of the range, it would cost about 2 to 10 times less. TD 1,  
39 TD 1RR, and TD 2 are more costly than TD 3, but less costly than TD 4 and TD 5. TD 5 is the  
40 most expensive alternative.

1 **3.11 OVERALL CONCLUSION FOR TREATMENT/DISPOSITION ALTERNATIVES**

2 For the reasons discussed above, EPA believes that of all the treatment/disposition alternatives,  
3 TD 1 RR is best suited to meet the General Standards in consideration of the Selection Decision  
4 Factors.