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Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site

Former Impoundment Approaches

February 2001

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

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1 Introduction

1.1 Purpose and Objectives

The approaches presented in this document were developed in response to a request by the Michigan Department of Environmental Quality (MDEQ) to provide cost estimates for the complete removal of all submerged and exposed sediments from the Michigan Department of Natural Resources' (MDNR)-owned former impoundments in Plainwell, Otsego and Trowbridge Michigan. Blasland, Bouck & Lee, Inc. (BBL) has prepared this document on behalf of the Kalamazoo River Study group (KRSG), which is composed of Millennium Holdings, Inc. (MHI), Georgia-Pacific Corporation (Georgia-Pacific), Fort James Corporation, and Plainwell, Inc.

Information used to prepare this document includes the "Feasibility Study Report – Phase I" prepared by Blasland, Bouck & Lee, Inc. (BBL), in October 2000 (BBL, 2000a); the "Remedial Investigation Report – Phase I" prepared by Blasland, Bouck & Lee, Inc. (BBL), in October 2000 (BBL, 2000b) and aerial photographs dated November 1999 (Lockwood Mapping), all of which contain information on the nature and extent of contaminants associated with the Site.

This report provides: a listing of the approaches considered; the basic assumptions and procedures used to develop the approaches; a discussion of the design concepts and construction sequencing necessary to implement the approaches; and the estimated costs of each approach. This report does not consider the remedial effectiveness of any approach, nor does it present a complete evaluation against the nine CERCLA criteria, as was performed in the Phase I FS. This analysis includes certain assumptions involving the removal of three former dams on the Kalamazoo River. These dams are owned by the Michigan Department of Natural Resources (MDNR), and the analysis and assumptions regarding removal of the dams has not been reviewed by the MDNR as to implementability, responsibility or cost. The KRSG does not believe that removal of the dams, or removal of the exposed or submerged sediment is necessary as a component of any CERCLA or Act 201 compliant remedy. By providing this information, the KRSG is not suggesting that submerged sediment or exposed sediment removal is necessary or appropriate and continues to believe that the preferred approach in the draft FS is the best approach to the River.

1.2 Approach to Former Impoundments

The approaches considered for the former impoundments are grouped as follows:

- *Approach A1 - Hydraulic Dredging of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Monitored Natural Attenuation, and Institutional Controls.*

  Removes PCB-containing submerged sediments and exposed sediments from within the former impoundments, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report. This approach is presented on Figures 1, 2, and 3.

- *Approach A2 – Hydraulic Dredging of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal Facilities (CDFs) built atop portions of the former exposed sediments.*

Same as A1, with Upland Confined Disposal Facilities (CDFs) built atop portions of the former exposed sediments. Removes PCB-containing submerged sediments and consolidates exposed sediments from within the former impoundments into CDFs built atop portions of the former sediments, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report.

- *Approach A3 – Hydraulic Dredging of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Dewatering, and Offsite Landfill Disposal of Removed Submerged and Exposed Sediments, Monitored Natural Attenuation, and Institutional Controls.*

  Same as A1, with Dewatering, and Offsite Landfill Disposal of Removed Submerged and Exposed Sediments, Monitored Natural Attenuation, and Institutional Controls. As above, removes PCB-containing submerged sediments and exposed sediments from within the former impoundments, dewaters and trucks them to commercial landfills, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report.

- *Approach A4 - Hydraulic Dredging of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments at the Former Impoundments along Shorelines (25-100 feet back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Monitored Natural Attenuation, and Institutional Controls.*

  Removes PCB-containing submerged sediments and exposed sediments from a portion of the eroding banks at the former impoundments, stabilizes the remaining banks, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report. This approach is depicted on Figures 4, 5, and 6.

- *Approach A5 - Hydraulic Dredging of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments at the Former Impoundments along Shorelines (25-100 feet back) and Removal of Dam Sills at the Former Impoundments with Dewatering, with Upland CDFs built atop portions of the former exposed sediments, Monitored Natural Attenuation, and Institutional Controls.*

  Removes PCB-containing submerged sediments and exposed sediments from a portion of the eroding banks at the former impoundments, stabilizes the remaining banks, consolidates the removed sediments into CDFs built atop portions of the former sediments, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report. This approach is depicted on Figures 4, 5, and 6.

- *Approach B1 - Dry Excavation of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Monitored Natural Attenuation, and Institutional Controls.*

  Removes PCB-containing submerged sediments and exposed sediments from within the former impoundments, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report. This approach is presented on Figures 7 through 19.

- *Approach B2 – Dry Excavation of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Confined Disposal Facility Built on Part of the Exposed Sediments.*

Same as B1, with Confined Disposal Facility Built on Part of the Exposed Sediments. Removes PCB-containing submerged sediments and part of the exposed sediments from within the former impoundments, sequesters the removed sediments within Confined Disposal Facilities built on the remaining areas of the exposed sediments, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report.

- *Approach B3 –Dry Excavation of Submerged Sediments at the Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Monitored Natural Attenuation, and Institutional Controls*

  Same as B1, with Dewatering, Offsite Landfill Disposal, Monitored Natural Attenuation, and Institutional Controls. Removes PCB-containing submerged sediments and exposed sediments from within the former impoundments, dewaters and trucks them to commercial landfills, returns the river sections to similar to their pre-impoundment conditions with full-site monitoring program as outlined in Alternative 3 of the FS Report.

- *Approach C1 – Rechannelization of the Former Impoundments as Practicable with Backfilling and Revegetating the Existing Channels, Monitored Natural Attenuation, and Institutional Controls.*

  Reroutes the channels at the Former Impoundments away from the PCB-containing submerged and exposed sediments and through adjacent clean overburden, sequesters submerged sediments under clean backfill and creates wetlands-type habitat within the current channels with full-site monitoring program as outlined in Alternative 3 of the FS Report. This approach is presented on Figures 20, 21, and 22.

Table 1 presents a cost summary of the approaches outlined above along with the approach presented in Appendix F of the FS Report (BBL, 2000a) for comparison purposes. Appendix F of the FS Report described the hydraulic dredging of submerged sediments at the former impoundments with upland CDF disposal within parts of the former impoundments and placing a soil cover on remaining former sediments.

2 Basic Assumptions and Procedures

2.1 Introduction

This section describes the basic assumptions and procedures that were applied to develop the approaches for the former impoundment areas. Where applicable, each approach was developed based on the assumptions and procedures as presented in the FS Report (BBL, 2000a). Where necessary, additional assumptions were made. The basic assumptions made and procedures applied are discussed below.

2.2 Hydraulic Dredging of Submerged Sediments

Hydraulic dredging would be performed in two passes using a shallow draft cutterhead dredge as outlined in the FS Report (BBL, 2000a). Given the water depths and debris-related issues at the three former impoundments, a 12-inch hydraulic cutterhead dredge would be used in all areas. The anticipated sediment removal rate for the Site using a single dredge is 600 cubic yards per day (cy/day). This removal rate is an upper-bound value based on a 10-hours per day dredging operation, 6 days per week, over a 10-month construction season.

The amount of submerged sediment that would be dredged from the three former impoundments is approach-specific and a function of the target dredging depths identified in the FS Report. The estimated dredged material volumes at the three Former Impoundments are 231,000; 487,000; and 653,000 cubic yards for the Plainwell, Otsego and Trowbridge Inpoundments, respectively. These volumes, however, do not include bank materials that may slough into the channel during dredging in the former impoundment reaches. Approximately 40,000; 73,000; and 150,000 cubic yards of bank materials are anticipated to slough into the channel at the Former Plainwell, Otsego and Trowbridge Impoundments, respectively. Bank slough materials are either added to the submerged sediment volumes indicated above where dredging of the submerged sediments is proposed without excavation of the former sediments or accounted for as part of the former exposed sediments if dry excavation of the exposed sediments is to be performed. The dry excavation of the exposed former sediments is discussed later.

To minimize the water quality impacts, the costs for hydraulic controls including double ring silt curtains surrounding the dredging area and water quality monitoring are also included.

2.3 Dry Excavation of Submerged and Exposed Former Sediments

In this document, dry excavation methods are considered under all the approaches for the removal of the exposed former sediments. Dry excavation of the submerged sediments is considered only in those approaches where all of the former exposed sediments would be removed. Removal would be by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. Removal would generally proceed from the perimeter of the exposed floodplains and progress in the direction of the Kalamazoo River, leaving the existing banks intact as a berm structure. Diversion channels would then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms would be constructed with locally available clean sand fills. In addition, some overburden excavation would be expected to achieve necessary grade and capacity in the diversion channel. Sheet piling would be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbances. Once the river is routed to a section of the temporary diversion channel, the remnants of the former dams would be removed and the channel drained by pumping and decanting. The sediments within the river and the banks would then be excavated in the dry.

Additional dewatering of excavated areas would likely be necessary during dry excavation of the riverbed sediments. For dry excavation of the submerged sediments, it is assumed that in situ solids are 77% weight/weight

and the excavated solids content is 38.5% w/w, to account for additional water that may recharge the excavated areas as well as water that would be entrained with in-situ sediments during excavation. It is anticipated that excess water would also be entrained during dry excavation of the exposed former sediments, specifically when excavation is to be conducted below the groundwater table. For dry excavation of the exposed and submerged sediments, passive dewatering and chemical stabilization, through the addition of lime, is assumed prior to off-site disposal.

It is assumed that excavation would be performed by two crews operating concurrently at the former Trowbridge Impoundment and one of the other two former impoundments. A production rate of 1,500 cy/day (in-situ) per excavation crew is assumed.

The estimated submerged sediment volumes that would be removed by dry excavation at the three Former Impoundments are 193,000; 423,000; and 556,000 cubic yards for the Plainwell, Otsego and Trowbridge Impoundments, respectively. These volumes do not include bank materials that may slough into the channel during dredging in the former impoundment reaches, as those materials would be excavated as part of the dry excavation of the former sediments. Approximately 360,000; 540,000; and 1,900,000 cubic yards of former sediments are anticipated to be excavated at the Former Plainwell, Otsego and Trowbridge Impoundments, respectively.

To minimize the water quality impacts, the costs for hydraulic controls including hay bales, silt fences, silt curtains and water quality monitoring are also included.

2.4 Extended Bank Excavation

Extended bank excavation along with submerged sediment dredging is proposed in the Approach A4 and A5 series. Under these scenarios, bank cutback by 25, 50 and 100 feet are assumed along the portions of the banks where they abut the exposed floodplains containing former sediments. Refer to Figures 4, 5, and 6 for an outline of banks where bank cut backs are proposed. The excavation methods would be as described under the dry excavation methods outlined previously. Necessary access areas/roads would be constructed along the riverbanks at some offset distances from the banks where excavation is proposed. Excavation would then proceed from the access roads progressing in the direction of the Kalamazoo River. The submerged sediments would then be dredged using hydraulic cutterhead dredges. The banks would then be restored using sheet piles and backfill placed in front of the sheet piles and revegetated (as described below).

The amount of bank sediments that would be dry excavated from the three former impoundments is approach-specific and a function of the bank cutback widths (25, 50, or 100 feet) identified above. Depending upon the cutback distance, the estimated bank volumes to be removed range from 28,000-111,000; 58,000-231,000; and 125,000-500,000 cubic yards for the Plainwell, Otsego and Trowbridge Impoundments, respectively.

To minimize water quality impacts, the costs for hydraulic controls, including hay bales, silt fences, silt curtains and water quality monitoring are also included.

2.5 Bank Stabilization

A riverbank stabilization component is included in the potential approaches if CDFs are proposed atop portions of the exposed former sediments. In these cases the riverbanks would be stabilized only along the areas where CDFs would be built. Riverbank stabilization would comprise one or more of the proposed bank stabilization methods illustrated in Figures 4 through 11 of Appendix B of the FS Report (BBL 2000a).

In approaches where bank cutbacks are proposed along the exposed former sediments, the remaining banks would be protected by installing sheet piles and placing about 25 feet of backfill materials in front of the sheeting followed

by habitat enhancement. These measures are proposed to eliminate bank sloughing as a source of PCB and to allow the river channel to meander in the former impoundment areas.

2.6 Confined Disposal Facilities

As part of some of the approaches outlined in this document, the dredged and/or dry excavated sediments would be transferred to upland CDFs for long-term disposal. The CDFs may be built atop portions of the exposed former sediments or outside the former impoundments at close proximity. The large quantity of decanted carriage water generated during the dredging process, as well as drainage from excavated material would be collected from the CDFs and treated prior to discharge back to the Kalamazoo River. The design of the CDFs is the same as described in the FS Report (BBL 2000a). The actual sizes of the CDFs are a function of the specific remedies outlined in this document. Assuming a 20-foot design height and side slopes of 3 horizontal: 1 vertical (3H: 1V), these CDFs would occupy anywhere from a low of 177 acres for Approach B2 to 241 acres total for Approach A1. The CDF sizes for various scenarios are shown on Figures 1, 2, 3, 10, 11, and 12. Following the completion of dredging and/or dry excavation, the sediments within the CDFs would be allowed to consolidate for three years or more to facilitate placement of a long-term cap or cover.

2.7 Dewatering/Stabilization of Sediments for Off-site disposal

It would be necessary to dewater and stabilize dredged sediments before shipping them to off-site landfill(s). Where off-site disposal is proposed, the dredged or dry excavated sediments would be transported to dewatering facilities built near each of the Former Impoundments. It is anticipated that there would be three dewatering facilities, one at each of the Former Impoundments. The sediments would be pumped as slurry and/or trucked to the dewatering facilities as needed. Once the sediments have been off-loaded, they would be processed to improve handling characteristics and achieve landfill acceptance criteria. The sediments removed via dry excavation methods would undergo gravity drainage and chemical stabilization. Hydraulically dredged sediments would be pumped as slurry to the dewatering facilities and undergo mechanical dewatering using filter presses and chemical stabilization. The processed sediments would be hauled to the final disposal facilities by trucks. The treatment of wastewater generated by the dewatering process would be as discussed below prior to discharge back to the Kalamazoo River.

2.8 Off-site Transport and Disposal

Off-site disposal of sediments removed from the three Former Impoundments of the Kalamazoo River would depend, in part, on their PCB concentrations. Sediment with PCB concentrations of 50 mg/kg or more is subject to specific regulation under TSCA (40 CFR 761.61, et seq.). However, for the purposes of this cost estimate it is assumed that all sediments removed from the three Former Impoundments would be below this limit and meet the criteria for non-TSCA sediments. The primary criteria for selecting a prospective landfill would then be the capacity to handle the potential volume of sediments, distance and competitive disposal costs. A number of landfills have been identified within a 36 to 188-mile distance from the three Former Impoundments with sufficient capacity that would accept PCB-containing sediments. It is anticipated that the dewatered and stabilized sediments would be transported via haul trucks for ultimate disposal. The off-site disposal approaches would generate from 164,000 truckloads (Approach A4.A) to 300,000 truckloads (Approach A3) over the duration of the program.

2.9 Water Treatment

Water treatment facilities (WTFs) would be located adjacent to each of the three CDFs or dewatering facilities. Treatment operation would consist of flocculation, sedimentation, dual-media filtration, and two-staged activated carbon adsorption with monitoring and discharge of the treated water to the Kalamazoo River. WTFs sized between 3 MGD and 6 MGD would be required if hydraulic dredging is involved and 0.5 MGD and 1 MGD would be required if dry excavation is involved for treatment of the wastewater generated during the removal actions.

2.10 Placement of Soil Cover on Exposed Sediments

Although covering of the exposed former sediments in the Former Impoundments is not necessary to address any remedial goals for the Site, soil cover placement on the exposed sediments was retained with some of the potential remedies presented herein. Soil cover placement would generally begin as soon as the sediment removal activities are completed. About one foot of sand and gravel would be placed on the exposed sediments (if not removed as part of the remedy) or on the cleared areas following exposed sediments removal. The surface would be vegetated by direct seeding or hydroseeding.

2.11 River Rerouting and Rechannelization

In addition to the above remediation methods that utilize removal as a primary remedy, river re-routing and rechannelization was also considered to bypass the PCB-containing sediments at the three Former Impoundments. Under this approach reaches at the three Former Impoundments would be diverted to newly constructed channels away from the former sediments and through clean soils. The existing channels would be backfilled using the new channel excavation soils and revegetated. It is estimated that approximately 360,000; 3,979,000; and 7,998,000 cubic yards of soil would be removed for construction of the new channels for the former Plainwell, Otsego, and Trowbridge impoundments, respectively. These estimated volumes are based on new channel alignments as shown on Figures 20, 21, and 22 and on an assumed trapezoidal channel having a bottom width of 200 feet and 2H:1V side slopes. Volumes of materials required to backfill the existing channels are estimated to be 180,000; 325,000; and 761,000 cubic yards for the former Plainwell, Otsego, and Trowbridge impoundments, respectively. It should be noted that rechannelization of an entire impoundment may not be feasible. This is clearly illustrated at the Former Plainwell Impoundment, where the proposed new channel would bypass only half the impoundment.

Costs do not include riverbed and bank stabilization measures within the former impoundments, as well as in the upstream and downstream stretches of the river. **The rechannelization approaches would require significant additional design considerations related to the impacts on system hydraulics and the required level of mitigation for these impacts. These additional mitigation requirements could double the costs provided in this document.**

2.12 Dam Removals

Removal of the existing dam sill structures is retained where removal of PCB-containing sediments sequestered behind the dam sills are proposed pursuant to the request from the Michigan Department of Environmental Quality (MDEQ). Removal of dam sill structures applies to all approaches presented herein except the River Rerouting and Rechannelization Approach (C1), because the PCB-containing sediments sequestered behind the current dam sills would not be removed as part of this approach.

2.13 Monitored Natural Attenuation and Institutional Controls

All approaches presented in this document would include monitored natural attenuation and long-term monitoring as presented in Approach 3 of the FS Report (BBL 2000a). This would consist of periodic sampling and analysis of fish, surface water, and surface sediment collected from the three Former Impoundments of the Kalamazoo River to track the progress of natural recovery and to permit modification of the Michigan Department of Community Health (MDCH) fish consumption advisories over time.

3 Cost Estimates

Estimated costs for the approaches considered for the Former Impoundments are presented in Table 1. The estimated costs are presented for each of the Former Impoundments individually, as well as for all three areas considered together. The costs include the supply and installation of all materials. Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075). A 20 percent (%) contingency amount has been included in the cost estimates to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs. All costs are reported in 2000 dollars. Present worth is estimated based on a 7% beginning-of-year discount rate, adjusted for the effect of inflation. The costs are expected to be accurate within –30%/+50% of the average contractor bid price if the work was put out for competitive bid under current economic conditions. These estimated costs were developed for use only in assessing the feasibility of approaches.

In addition, specific assumptions were made for each remediation approach based on the assumptions and procedures outlined in this document. Detailed cost estimates for each approach are presented in Appendix A of this document.

4 References

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Tables

Table 1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate - Supplemental Alternatives

Approach	Cost Components[1]	Plainwell	Otsego	Trowbridge	All Three Areas[3]
FS Appendix F - Hydraulically dredge submerged sediments, upland CDF disposal within former impoundments, soil cover on remaining former sediments	- total				$ 397 million ($ 243/cy)
	- present worth				$ 203 million ($ 124/cy)
A1 - Hydraulically dredge submerged sediments, dry excavation of former sediments, off-site upland CDF disposal	- removal	$ 27 million	$ 46 million	$ 120 million	$ 193 million
	- disposal	$ 53 million	$ 96 million	$ 209 million	$ 351 million
	- other	$ 13 million	$ 15 million	$ 37 million	$ 50 million
	- monitoring	$ 31 million	$ 33 million	$ 36 million	$ 44 million
	- total	$124 M ($ 210/cy)	$190 M ($ 185/cy)	$403 M ($ 158/cy)	$ 639 M ($ 153/cy)
	- present worth	$ 61 M ($ 103/cy)	$ 92 M ($ 90/cy)	$ 181 M ($ 71/cy)	$ 305 M ($ 73/cy)
A2 - Same as A1, with CDF built within parts of former imoundments	- removal	$ 25 million	$ 35 million	$ 124 million	$ 184 million
	- disposal	$ 41 million	$ 71 million	$ 155 million	$ 268 million
	- other	$ 9 million	$ 10 million	$ 38 million	$ 50 million
	- monitoring	$ 43 million	$ 43 million	$ 43 million	$ 44 million
	- total	$118 M ($ 257/cy)	$159 M ($ 224/cy)	$361 M ($ 173/cy)	$ 546 M ($ 168/cy)
	- present worth	$ 53 M ($ 116/cy)	$ 75 M ($ 106/cy)	$ 166 M ($ 80/cy)	$ 267 M ($ 82/cy)
A3 - Same as A1, with disposal in local landfills	- removal	$ 40 million	$ 66 million	$ 189 million	$ 295 million
	- disposal	$ 175 million	$ 315 million	$ 550 million	$ 1.06 billion
	- other	$ 7 million	$ 9 million	$ 34 million	$ 50 million
	- monitoring	$ 19 million	$ 24 million	$ 29 million	$ 43 million
	- total	$241 M ($ 408/cy)	$414 M ($ 403/cy)	$801 M ($ 314/cy)	$ 1.45 B ($ 348/cy)
	- present worth	$ 124 M ($ 210/cy)	$ 216 M ($ 210/cy)	$ 391 M ($ 153/cy)	$ 736 M ($ 177/cy)

Table 1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate - Supplemental Alternatives

Approach	Cost Components[1]	Plainwell	Otsego	Trowbridge	All Three Areas[3]
A-4A - Hydraulically dredge submerged sediments, cutback (dry) 25-ft. width of former sediments, disposal in local landfills, soil cover on remaining former sediments	- removal	$ 11 million	$ 24 million	$ 38 million	$ 73 million
	- disposal	$ 137 million	$ 262 million	$ 356 million	$ 777 million
	- other	$ 6 million	$ 6 million	$ 36 million	$ 53 million
	- monitoring	$ 16 million	$ 33 million	$ 34 million	$ 43 million
	- total	$170 M ($ 656/cy)	$325 M ($ 596/cy)	$463 M ($ 596/cy)	$ 945 M ($ 598/cy)
	- present worth	$ 97 M ($ 374/cy)	$ 174 M ($ 319/cy)	$ 241 M ($ 310/cy)	$ 529 M ($ 335/cy)
A-4B - Same as A-4A, with 50-ft bank cutback in the dry	- removal	$ 13 million	$ 27 million	$ 45 million	$ 85 million
	- disposal	$ 140 million	$ 270 million	$ 372 million	$ 805 million
	- other	$ 6 million	$ 7 million	$ 36 million	$ 53 million
	- monitoring	$ 16 million	$ 33 million	$ 34 million	$ 43 million
	- total	$ 176 M ($ 614/cy)	$ 337 M ($ 559/cy)	$487 M ($ 540/cy)	$ 986 M ($ 550/cy)
	- present worth	$ 100 M ($ 349/cy)	$ 181 M ($ 300/cy)	$ 255 M ($ 283/cy)	$ 553 M ($ 309/cy)
A-4C - Same as A-4A, with 100-ft bank cutback in the dry	- removal	$ 15 million	$ 34 million	$ 60 million	$ 110 million
	- disposal	$ 147 million	$ 285 million	$ 406 million	$ 861 million
	- other	$ 6 million	$ 7 million	$ 36 million	$ 53 million
	- monitoring	$ 16 million	$ 33 million	$ 34 million	$ 43 million
	- total	$185 M ($ 540/cy)	$ 359 M ($ 500/cy)	$ 535 M ($ 464/cy)	$ 1.1 B ($ 482/cy)
	- present worth	$ 106 M ($ 310/cy)	$ 193 M ($ 269/cy)	$ 281 M ($ 244/cy)	$ 600 M ($ 271/cy)
A-5A - Hydraulically dredge submerged sediments, cutback (dry) 25-ft. width of former sediments, disposal in CDFs built on top of former sediments, soil cover on remaining former sediments	- removal	$ 13 million	$ 28 million	$ 44 million	$ 85 million
	- disposal	$ 36 million	$ 68 million	$ 95 million	$ 201 million
	- other	$ 9 million	$ 11 million	$ 42 million	$ 61 million
	- monitoring	$ 31 million	$ 33 million	$ 35 million	$ 44 million
	- total	$ 88 M ($ 340/cy)	$ 140 M ($ 257/cy)	$ 216 M ($ 278/cy)	$ 391 M ($ 247/cy)
	- present worth	$ 43 M ($ 166/cy)	$ 69 M ($ 127/cy)	$ 106 M ($ 136/cy)	$ 201 M ($ 127/cy)

Table 1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate - Supplemental Alternatives

Approach	Cost Components[1]	Plainwell	Otsego	Trowbridge	All Three Areas[3]
A-5B - Same as A-5A, with 50-ft bank cutback in the dry	- removal	$ 17 million	$ 36 million	$ 62 million	$ 115 million
	- disposal	$ 36 million	$ 71 million	$ 99 million	$ 208 million
	- other	$ 8 million	$ 11 million	$ 41 million	$ 60 million
	- monitoring	$ 31 million	$ 33 million	$ 35 million	$ 44 million
	- total	$ 93 M ($ 324/cy)	$ 150 M ($ 249/cy)	$ 237 M ($ 263/cy)	$ 427 M ($ 238/cy)
	- present worth	$ 45 M ($ 157/cy)	$ 75 M ($ 125/cy)	$ 116 M ($ 129/cy)	$ 219 M ($ 122/cy)
A-5C - Same as A-5A, with 100-ft bank cutback in the dry	- removal	$ 25 million	$ 52 million	$ 96 million	$ 173 million
	- disposal	$ 38 million	$ 74 million	$ 108 million	$ 222 million
	- other	$ 8 million	$ 10 million	$ 40 million	$ 59 million
	- monitoring	$ 31 million	$ 33 million	$ 35 million	$ 44 million
	- total	$102 M ($ 298/cy)	$ 169 M ($ 235/cy)	$ 279 M ($ 242/cy)	$ 498 M ($ 225/cy)
	- present worth	$ 50 M ($ 146/cy)	$ 85 M ($ 118/cy)	$ 139 M ($ 121/cy)	$ 255 M ($ 116/cy)
B1 - Dry excavation of submerged sediments, dry excavation of exposed sediments, upland CDF disposal	- removal	$ 34 million	$ 57 million	$ 136 million	$ 227 million
	- disposal	$ 38 million	$ 70 million	$ 162 million	$ 273 million
	- other	$ 7 million	$ 9 million	$ 34 million	$ 50 million
	- monitoring	$ 31 million	$ 34 million	$ 36 million	$ 36 million
	- total	$ 110 M ($ 199/cy)	$ 170 M ($ 177/cy)	$ 368 M ($ 150/cy)	$ 587 M ($ 148/cy)
	- present worth	$ 57 M ($ 103/cy)	$ 87 M ($ 91/cy)	$ 188 M ($ 77/cy)	$ 312 M ($ 82/cy)
B2 - Same as B1, with CDF built on part of former exposed sediments	- removal	$ 28 million	$ 43 million	$ 111 million	$ 179 million
	- disposal	$ 28 million	$ 50 million	$ 125 million	$ 203 million
	- other	$ 9 million	$ 11 million	$ 39 million	$ 52 million
	- monitoring	$ 32 million	$ 34 million	$ 35 million	$ 36 million
	- total	$ 96 M ($ 232/cy)	$ 136 M ($ 208/cy)	$ 309 M ($ 159/cy)	$ 471 M ($ 157/cy)
	- present worth	$ 48 M ($ 116/cy)	$ 67 M ($ 103/cy)	$ 160 M ($ 83/cy)	$ 250 M ($ 83/cy)

Table 1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate - Supplemental Alternatives

Approach	Cost Components[1]	Plainwell	Otsego	Trowbridge	All Three Areas[3]
B3 - Same as B1, with offsite landfill disposal	- removal	$ 38 million	$ 63 million	$ 156 million	$ 256 million
	- disposal	$ 100 million	$ 182 million	$ 400 million	$ 655 million
	- other	$ 7 million	$ 9 million	$ 34 million	$ 50 million
	- monitoring	$ 31 million	$ 34 million	$ 35 million	$ 35 million
	- total	$ 176 M ($ 319/cy)	$ 288 M ($ 299/cy)	$ 626 M ($ 255/cy)	$ 996 M ($ 251/cy)
	- present worth	$ 95 M ($ 172/cy)	$ 152 M ($ 158/cy)	$ 329 M ($ 134/cy)	$ 532 M ($ 134/cy)
C1 - Rechannelization with backfill of existing channel[2]	- total	$ 36 million	$ 127 million	$ 180 million	
	- present worth	$ 16 million	$ 61 million	$ 76 million	

Notes

1- Removal- cost to dredge or dry excavate sediments, including costs of diversion structures for dry excavation.
Disposal- costs of CDF construction and operation (including water treatment) or costs of dewatering and stabilizing, haul and disposal at landfill.
Other- costs of bank stabilization, former sediment soil cover and habitat restoration, and dam removal.
Monitoring- costs of monitoring and maintenance program as detailed in Phase I FS.

2- Rechannelization of entire Former Plainwell Impoundment not feasible; alternative estimated here would bypass approximately half the impoundment.
Costs do not include riverbed and bank stabilization measures within the former impoundments as well as in the upstream and downstream stretches of the

3- Costs are for all three former impoundments implemented as one project. This would add four years to the schedule.

4- Blank spaces indicate that a cost has not been developed for the remedial scenario.

Table 2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Construction Schedule

Alternative	Plainwell[1]	Otsego[1]	Trowbridge[1]	All Three Areas[2]	Comments
FS Appendix F - Hydraulically dredge submerged sediments, upland CDF disposal within former impoundments, soil cover on remaining former sediments				10	Governed by hydraulic dredging.
A1 - Hydraulically dredge submerged sediments, dry excavation of former sediments, off-site upland CDF disposal	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation can occur concurrently.
A2 - Same as A1, with CDF built within parts of former imoundments	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation can occur concurrently.
A3 - Same as A1, with disposal in local landfills	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation can occur concurrently.
A-4A - Hydraulically dredge submerged sediments, cutback (dry) 25-ft. width of former sediments, disposal in local landfills, soil cover on remaining former sediments	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation of bank can occur concurrently.
A-4B - Same as A-4A, with 50-ft bank cutback in the dry	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation of bank can occur concurrently.
A-4C - Same as A-4A, with 100-ft bank cutback in the dry	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation of bank can occur concurrently.
A-5A - Hydraulically dredge submerged sediments, bank cutback (dry) 25-ft. width of former sediments, disposal in CDFs built on top of former sediments, soil cover on remaining former sediments	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation of bank can occur concurrently.
A-5B - Same as A-5A, with 50-ft bank cutback in the dry	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation of bank can occur concurrently.
A-5C - Same as A-5A, with 100-ft bank cutback in the dry	4	7	9	10	Governed by hydraulic dredging. Assume dry excavation of bank can occur concurrently.
B1 - Dry excavation of submerged sediments, dry excavation of exposed sediments, upland CDF disposal	5	7	10	12	Need to sequence dry excavation of exposed sediments followed by river rerouting and dry excavation of submerged sediments
B2 - Same as B1, with CDF built on part of former exposed sediments	4	6	9	11	Same as C1, with less excavation required for the exposed sediments
B3 - Same as B1, with offsite landfill disposal	5	7	10	12	Need to sequence dry excavation of exposed sediments followed by river rerouting and dry excavation of submerged sediments
C1 - Rechannelization with backfill of existing channel	3	6	10	13	Primarily depends on excavation volume

Notes

1- Construction schedules are prepared independent of activities that may be occurring at other impoundments.
Where dredging of submerged sediments and dry excavation of exposed sediments are proposed, it is assumed that both activities can occur concurrently.
Where dry excavation of both the submerged sediments and exposed sediments are proposed, it is assumed that exposed sediments will first be excavated, followed by river rerouting and dry excavation of the submerged sediments.
Rechannelization would be performed by first excavating a new channel, rerouting the river followed by backfilling and revegetating the current channel.

2- For remediation of all three areas, it is assumed that concurrent activities would occur at least at two or all of the impoundments.

3- This schedule does not include time spent for design and bid preparation. This would add four years to the schedule.

4- Where upland CDF is proposed add 3-4 years for solids consolidation before closure activities can take place. This will increase the above schedule accordingly.

Table 3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary CDF Sizing

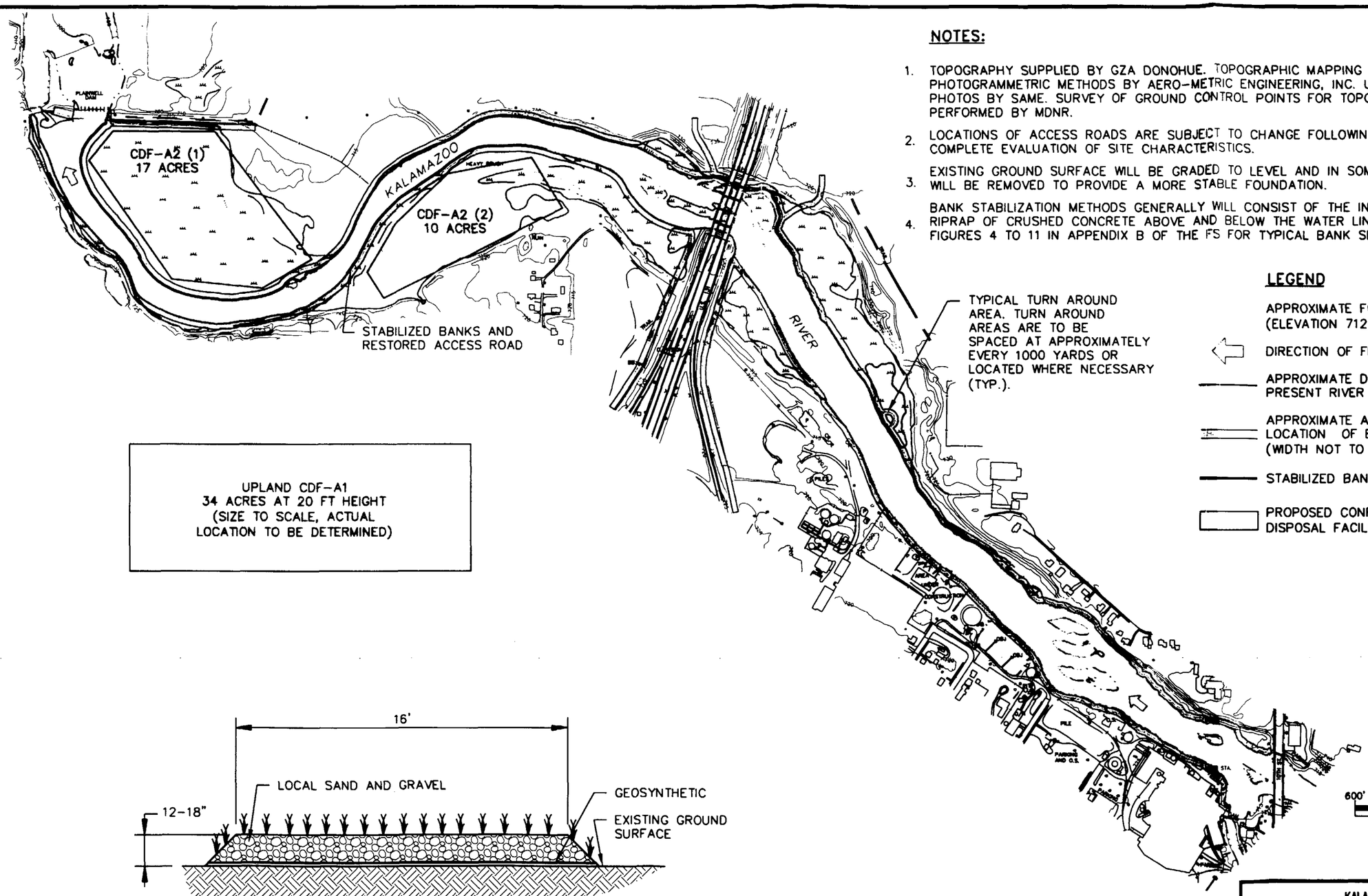
Alternative	CDF Sizes (Acres)				Comments
	Plainwell	Otsego	Trowbridge	All Three Areas	
FS Appendix F - Hydraulically dredge submerged sediments, upland CDF disposal within former impoundments, soil cover on remaining former sediments	17	44	61	122	CDFs on former sediments
A1 - Hydraulically dredge submerged sediments, dry excavation of former sediments, off-site upland CDF disposal	34 (738' x 1974')	67 (1026' x 2840')	143 (1467' x 4162')	241	Upland CDFs WTFs 3-6 MGD
A2 - Same as A1, with CDF built within parts of former imoundments	27	52	116	194	CDFs on former sediments WTFs 3-6 MGD
A3 - Same as A1, with disposal in local landfills	no CDF	no CDF	no CDF	no CDF	WTFs 3-6 MGD
A-4A - Hydraulically dredge submerged sediments, bank cutback (dry) 25-ft width of former sediments, disposal in local landfills, soil cover on remaining former sediments	no CDF	no CDF	no CDF	no CDF	WTFs 3-6 MGD
A-4B - Same as A-4A, with 50-ft bank cutback in the dry	no CDF	no CDF	no CDF	no CDF	WTFs 3-6 MGD
A-4C - Same as A-4A, with 100-ft bank cutback in the dry	no CDF	no CDF	no CDF	no CDF	WTFs 3-6 MGD
A-5A - Hydraulically dredge submerged sediments, bank cutback (dry) 25-ft width of former sediments, disposal in CDFs built on former sediments, soil cover on remaining former sediments	16	41	55	113	WTFs 3-6 MGD
A-5B - Same as A-5A, with 50-ft bank cutback in the dry	17	43	60	122	WTFs 3-6 MGD
A-5C - Same as A-5A, with 100-ft bank cutback in the dry	20	48	71	140	WTFs 3-6 MGD
B1 - Dry excavation of submerged sediments, dry excavation of exposed sediments, upland CDF disposal	32 (716' x 1910')	62 (990' x 2725')	130 (1415' x 4005')	224	Upland CDFs WTFs 0.5-1.0 MGD
B2 - Same as B1, with CDF built on part of former exposed sediments	25	47	106	177	CDFs on former sediments WTFs 0.5-1.0 MGD
B3 - Same as B1, with offsite landfill disposal	no CDF	no CDF	no CDF	no CDF	WTFs 0.5-1.0 MGD
C1 - Rechannelization with backfill of existing channel					

1. All CDFs are built to 20-ft height

Figures

NOTES:

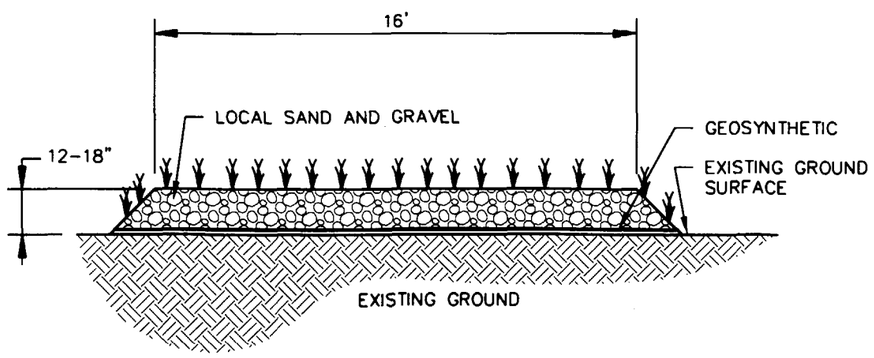
1. TOPOGRAPHY SUPPLIED BY GZA DONOHUE. TOPOGRAPHIC MAPPING PRODUCED USING PHOTOGRAMMETRIC METHODS BY AERO-METRIC ENGINEERING, INC. USING 1989 AERIAL PHOTOS BY SAME. SURVEY OF GROUND CONTROL POINTS FOR TOPOGRAPHIC MAPPING PERFORMED BY MDNR.
2. LOCATIONS OF ACCESS ROADS ARE SUBJECT TO CHANGE FOLLOWING A MORE COMPLETE EVALUATION OF SITE CHARACTERISTICS.
3. EXISTING GROUND SURFACE WILL BE GRADED TO LEVEL AND IN SOME AREAS, TOP SOIL WILL BE REMOVED TO PROVIDE A MORE STABLE FOUNDATION.
4. BANK STABILIZATION METHODS GENERALLY WILL CONSIST OF THE INSTALLATION OF RIPRAP OF CRUSHED CONCRETE ABOVE AND BELOW THE WATER LINE. REFER TO FIGURES 4 TO 11 IN APPENDIX B OF THE FS FOR TYPICAL BANK SECTIONS.



LEGEND

- APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)
- DIRECTION OF FLOW
- APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL
- APPROXIMATE ANTICIPATED LOCATION OF BANK ACCESS ROAD (WIDTH NOT TO SCALE)
- STABILIZED BANK
- PROPOSED CONFINED DISPOSAL FACILITY (CDF)

600' 0 600'
SCALE



RESTORED ACCESS ROAD
WITH HABITAT ENHANCEMENTS

NOT TO SCALE

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
FORMER IMPOUNDMENT APPROACHES

FORMER PLAINWELL IMPOUNDMENT CONCEPTUAL PLAN FOR CDF LOCATION (ALTERNATIVES A1, A2)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 1

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-KMD PGL LJP
64524310/64524001.DWG

UPLAND CDF-A1 67 ACRES
(SIZE TO SCALE, ACTUAL
LOCATION TO BE DETERMINED)

STABILIZED BANKS AND RESTORED ACCESS ROAD

TYPICAL TURN AROUND AREA. TURN AROUND AREAS ARE TO BE SPACED AT APPROXIMATELY EVERY 1000 YARDS OR LOCATED WHERE NECESSARY (TYP.)

CDF-A2 (3)
16 ACRES

CDF-A2 (1)
30 ACRES

CDF-A2 (2)
8 ACRES

KALAMAZOO RIVER

LEGEND

- APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)
- DIRECTION OF FLOW
- APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL
- APPROXIMATE ANTICIPATED LOCATION OF BANK ACCESS ROAD (WIDTH NOT TO SCALE)
- STABILIZED BANK
- PROPOSED CONFINED DISPOSAL FACILITY (CDF)

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3. EXISTING GROUND SURFACE WILL BE GRADED TO LEVEL AND IN SOME AREAS, TOP SOIL WILL BE REMOVED TO PROVIDE A MORE STABLE FOUNDATION.
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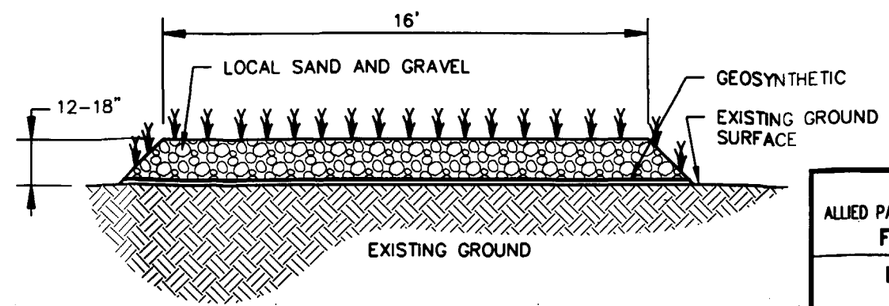


RESTORED ACCESS ROAD WITH HABITAT ENHANCEMENTS

NOT TO SCALE

600' 0 600'
SCALE

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
FORMER IMPOUNDMENT APPROACHES

FORMER OTSEGO IMPOUNDMENT CONCEPTUAL PLAN FOR CDF LOCATION (ALTERNATIVES A1, A2)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-KMD GMS LJP
64524310/64524G02.DWG

CDF-A1
143 ACRES AT 20 FT HEIGHT
(SIZE TO SCALE, ACTUAL LOCATION
TO BE DETERMINED)

CDF-A2 (1)
50 ACRES

CDF-A2 (2)
16 ACRES

CDF-A2 (3)
50 ACRES

KALAMAZOO RIVER

STABILIZED BANKS AND
RESTORED ACCESS ROAD

TYPICAL TURN AROUND AREA.
TURN AROUND AREAS ARE TO BE
SPACED AT APPROXIMATELY EVERY
1000 YARDS OR LOCATED WHERE NECESSARY.

LEGEND

APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)

DIRECTION OF FLOW

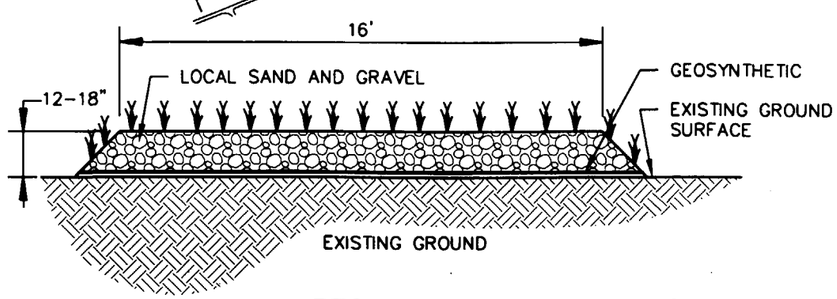
APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL

APPROXIMATE ANTICIPATED LOCATION OF BANK ACCESS ROAD (WIDTH NOT TO SCALE)

STABILIZED BANK

PROPOSED CONFINED DISPOSAL FACILITY (CDF)

1000' 0 1000'
SCALE



RESTORED ACCESS ROAD WITH HABITAT ENHANCEMENTS

NOT TO SCALE

NOTES:

1. TOPOGRAPHY SUPPLIED BY GZA DONOHUE. TOPOGRAPHIC MAPPING PRODUCED USING PHOTOGRAMMETRIC METHODS BY AERO-METRIC ENGINEERING, INC. USING 1989 AERIAL PHOTOS BY SAME. SURVEY OF GROUND CONTROL POINTS FOR TOPOGRAPHIC MAPPING PERFORMED BY MDNR.
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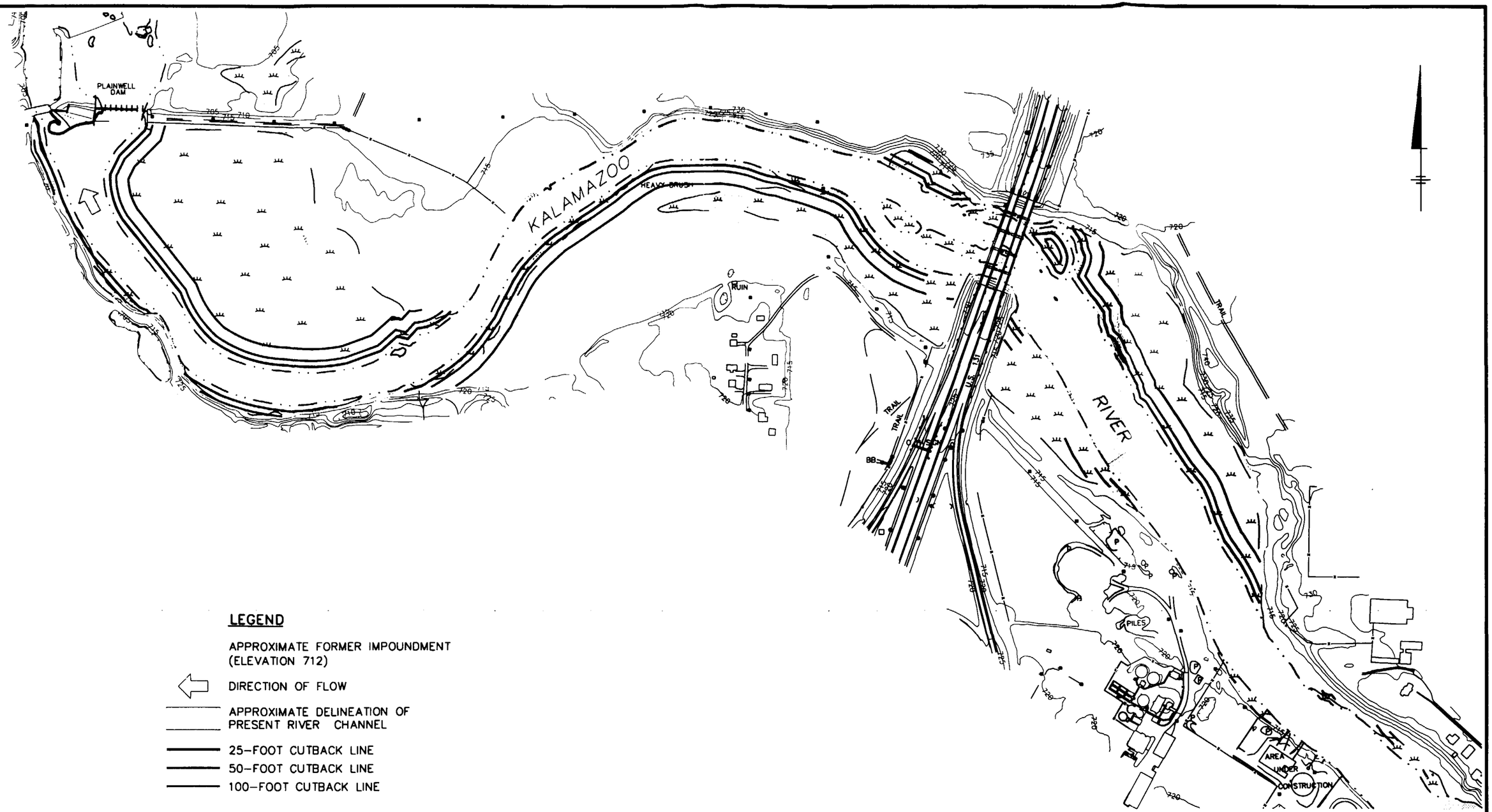
L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-S4-KMD PGL LJP
84524310/84524G03.DWG

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
FORMER IMPOUNDMENT APPROACHES

FORMER TROWBRIDGE IMPOUNDMENT CONCEPTUAL PLAN FOR CDF LOCATION (ALTERNATIVES A1, A2)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 3



LEGEND

APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)

DIRECTION OF FLOW

APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL

25-FOOT CUTBACK LINE

50-FOOT CUTBACK LINE

100-FOOT CUTBACK LINE

NOTES:

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0 400' 800'

GRAPHIC SCALE

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

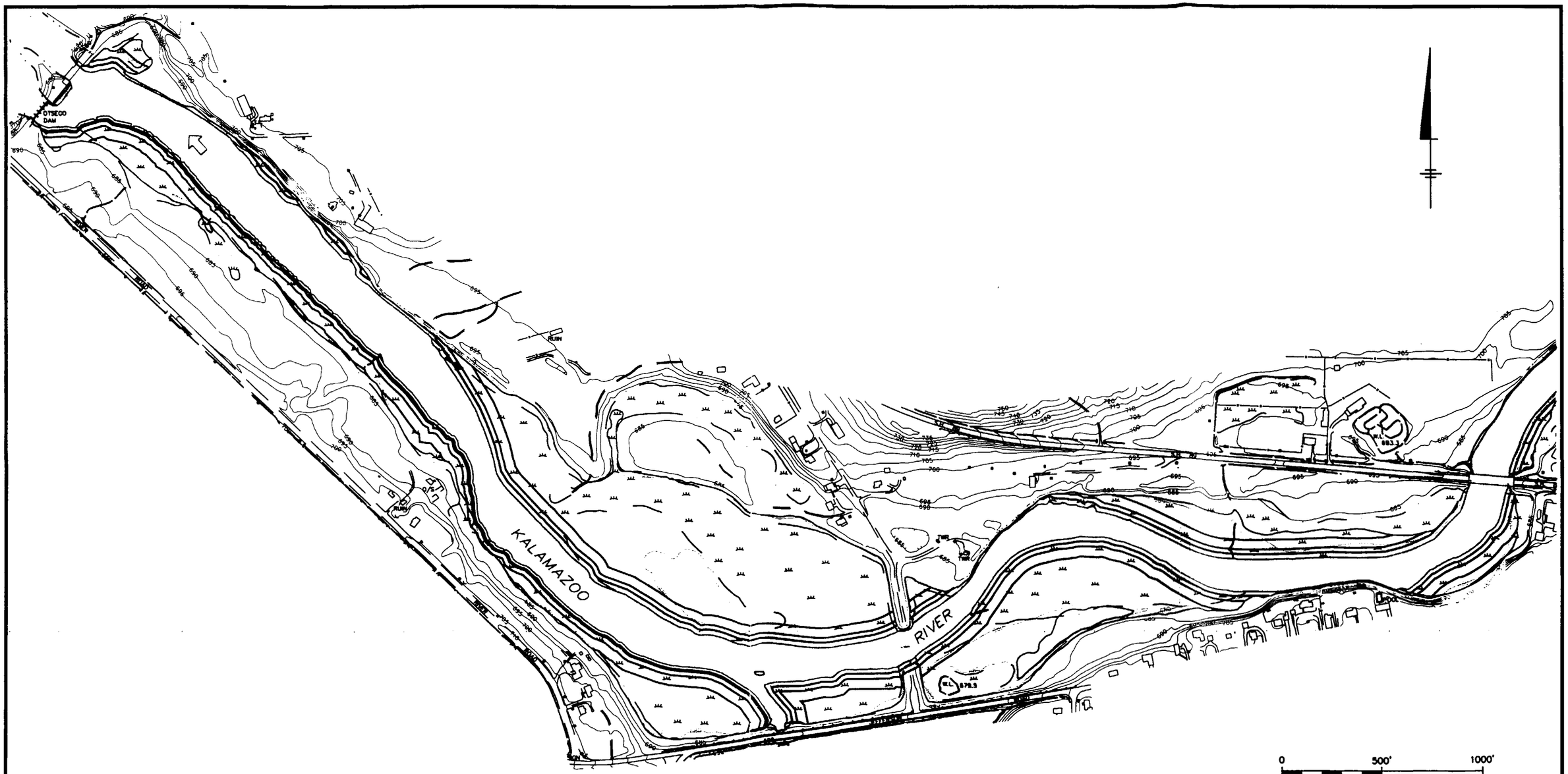
FORMER IMPOUNDMENT APPROACHES

FORMER PLAINWELL IMPOUNDMENT-CONCEPTUAL PLAN FOR SHORELINE CUTBACK

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 4

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-GMS PGL LJP
64524310/64524004.DWG



LEGEND

APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)

DIRECTION OF FLOW

APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL

25-FOOT CUTBACK LINE

50-FOOT CUTBACK LINE

100-FOOT CUTBACK LINE

NOTES:

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KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

FORMER IMPOUNDMENT APPROACHES

FORMER OTSEGO IMPOUNDMENT-CONCEPTUAL PLAN FOR SHORELINE CUTBACK

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 5

L: ON=*, OFF=REF*
P: STD-PCP/BL
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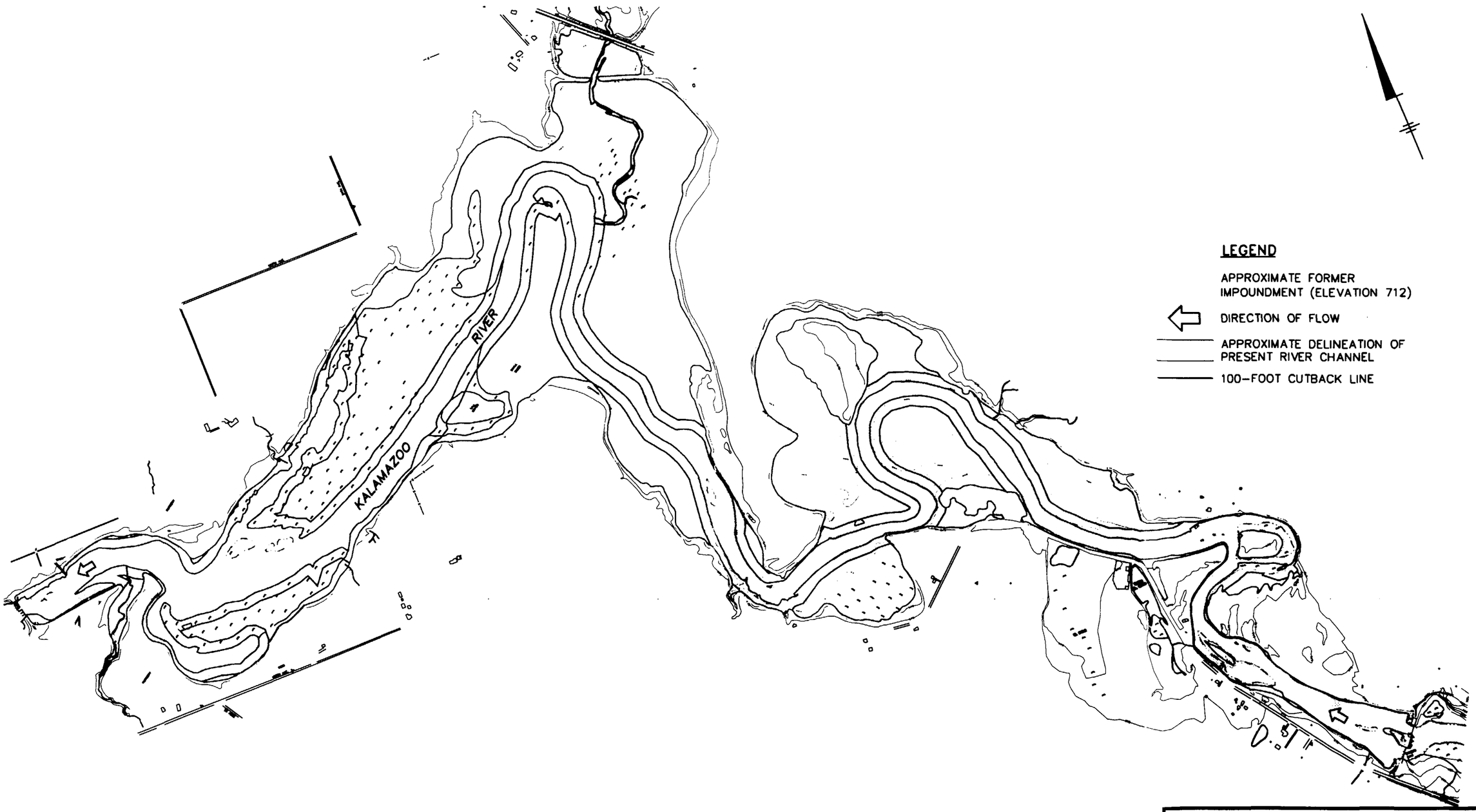
84524310/84524G05.DWG



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1000' 0 1000'
SCALE

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

FORMER IMPOUNDMENT APPROACHES

FORMER TROWBRIDGE IMPOUNDMENT-CONCEPTUAL PLAN FOR SHORELINE CUTBACK

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 6

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-GMS PGL LJP
64524310/64524G08.DWG

STATE OF MICHIGAN

JOHN ENGLER, Governor
DEPARTMENT OF ENVIRONMENTAL QUALITY
"Better Service for a Better Environment"
HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us
RUSSELL J. HARDING, Director

REPLY TO

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KNAPPS CENTRE
PO BOX 30426
LANSING MI 48909-7926

February 26, 2001

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Subject: *Former Impoundment Approaches* Document

During review of the Draft Remedial Investigation Feasibility Study, created by the Potential Responsible Parties (PRPs) for the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site, the Michigan Department of Environmental Quality (MDEQ) identified the need to evaluate additional alternatives for some portions of the river. In response, the PRPs created the attached document, *Former Impoundment Approaches*. This document provides cost estimates for several additional alternatives for exposed sediments in the impoundments behind three Michigan Department of Natural Resources (MDNR) owned dams.

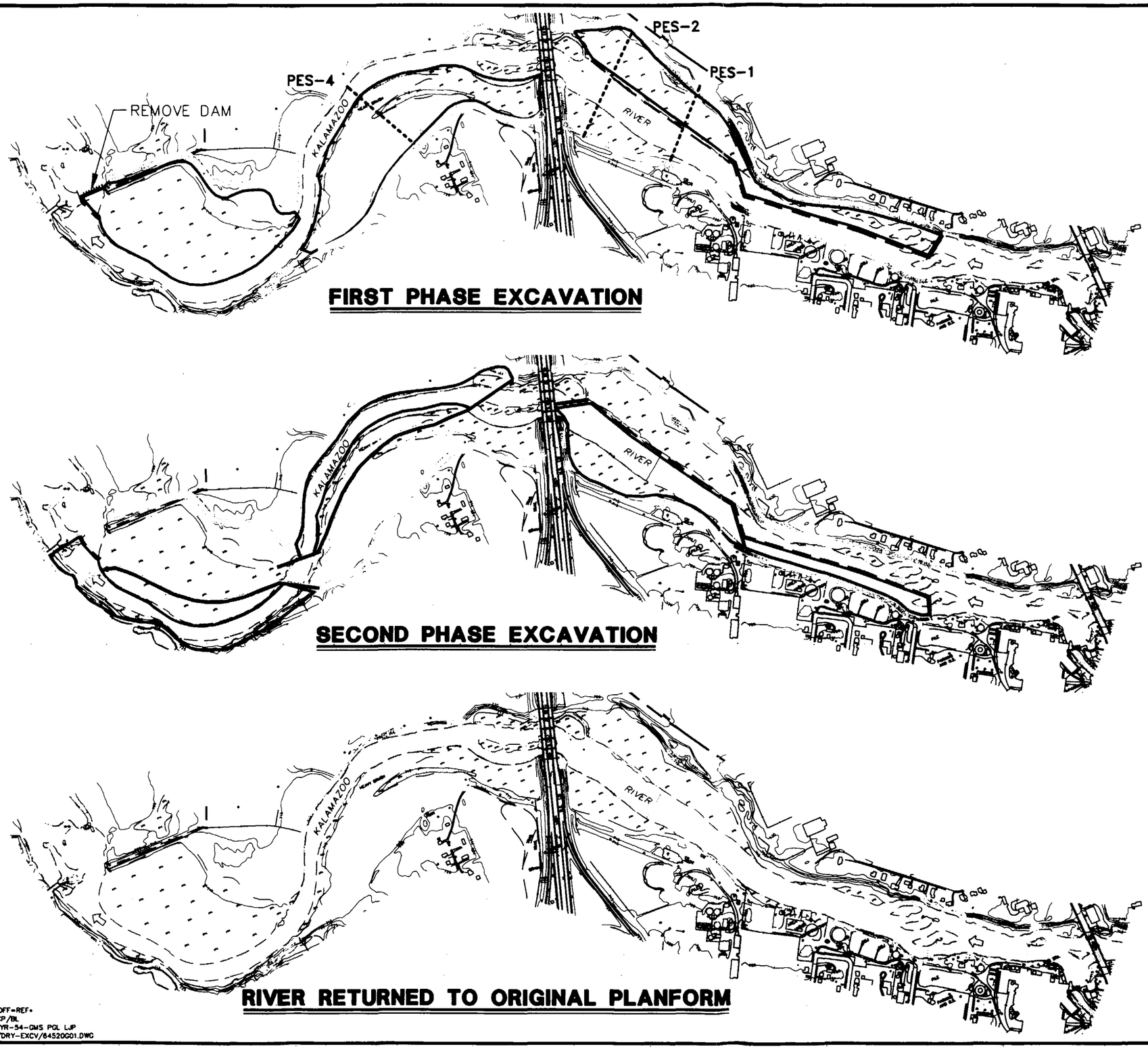
Also enclosed is a fax transmittal sheet. I would appreciate it if you would take the time to fax this response to me as soon as you have logged in the above document and placed it with the rest of the file.

If you have any questions, please contact me.

Sincerely

Brian von Gunten
Superfund Section
Environmental Response Division
517-373-6808
vonguntj@state.mi.us

Enclosure



LEGEND

- SHEETPILE DIVERSION
- ACCESS ROAD/WORK AREAS RESTORED
- FIRST PHASE EXCAVATION
- SECOND PHASE EXCAVATION
- CHANNEL
- DIVERSION BERM
- IMPOUNDMENT SOIL PCB SAMPLING TRANSECT LOCATION

0 800' 1600'

GRAPHIC SCALE

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

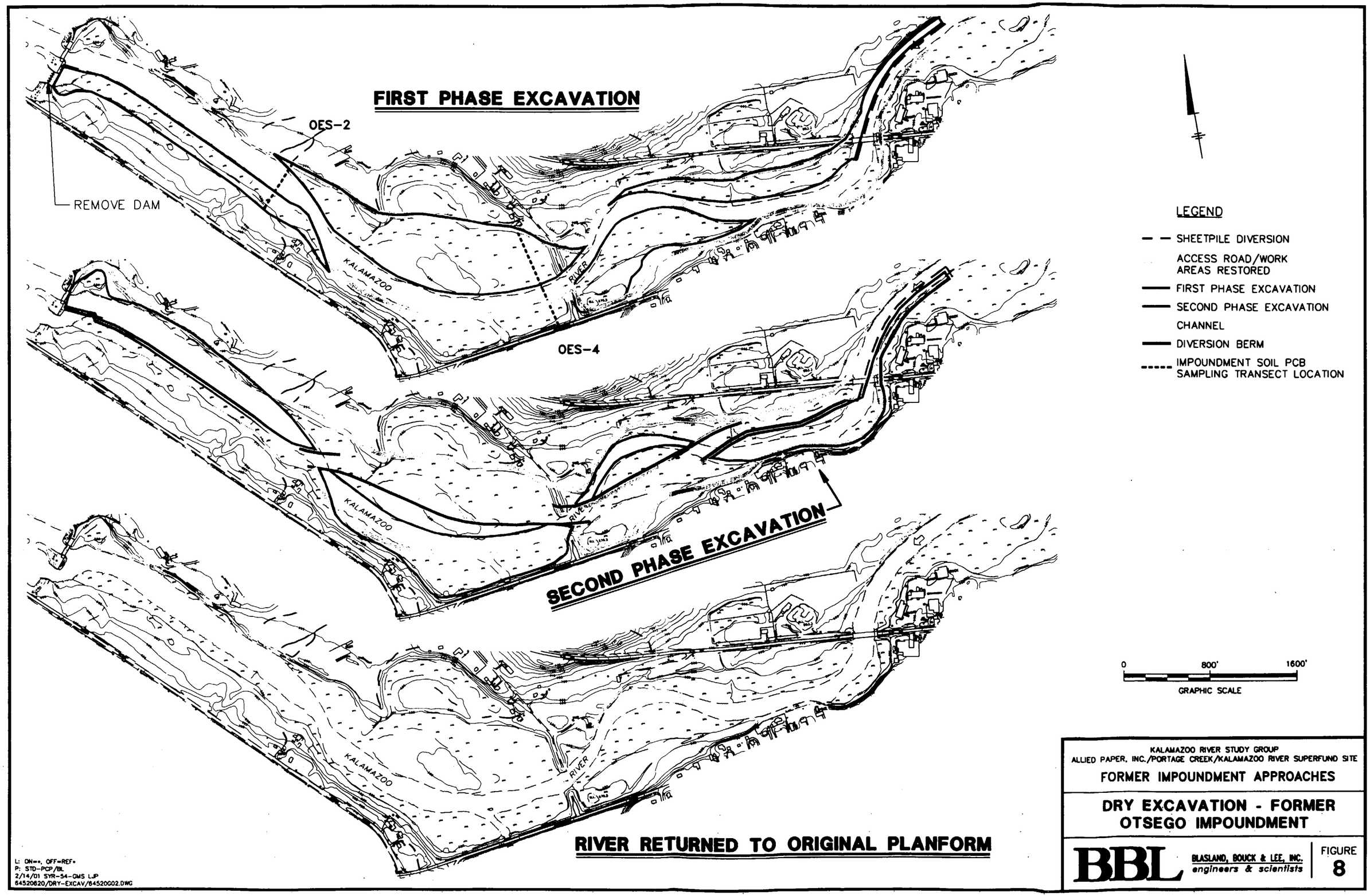
FORMER IMPOUNDMENT APPROACHES

DRY EXCAVATION - FORMER PLAINWELL IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 7

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-GMS PGL LJP
64520620/DRY-EXCV/64520G01.DWG



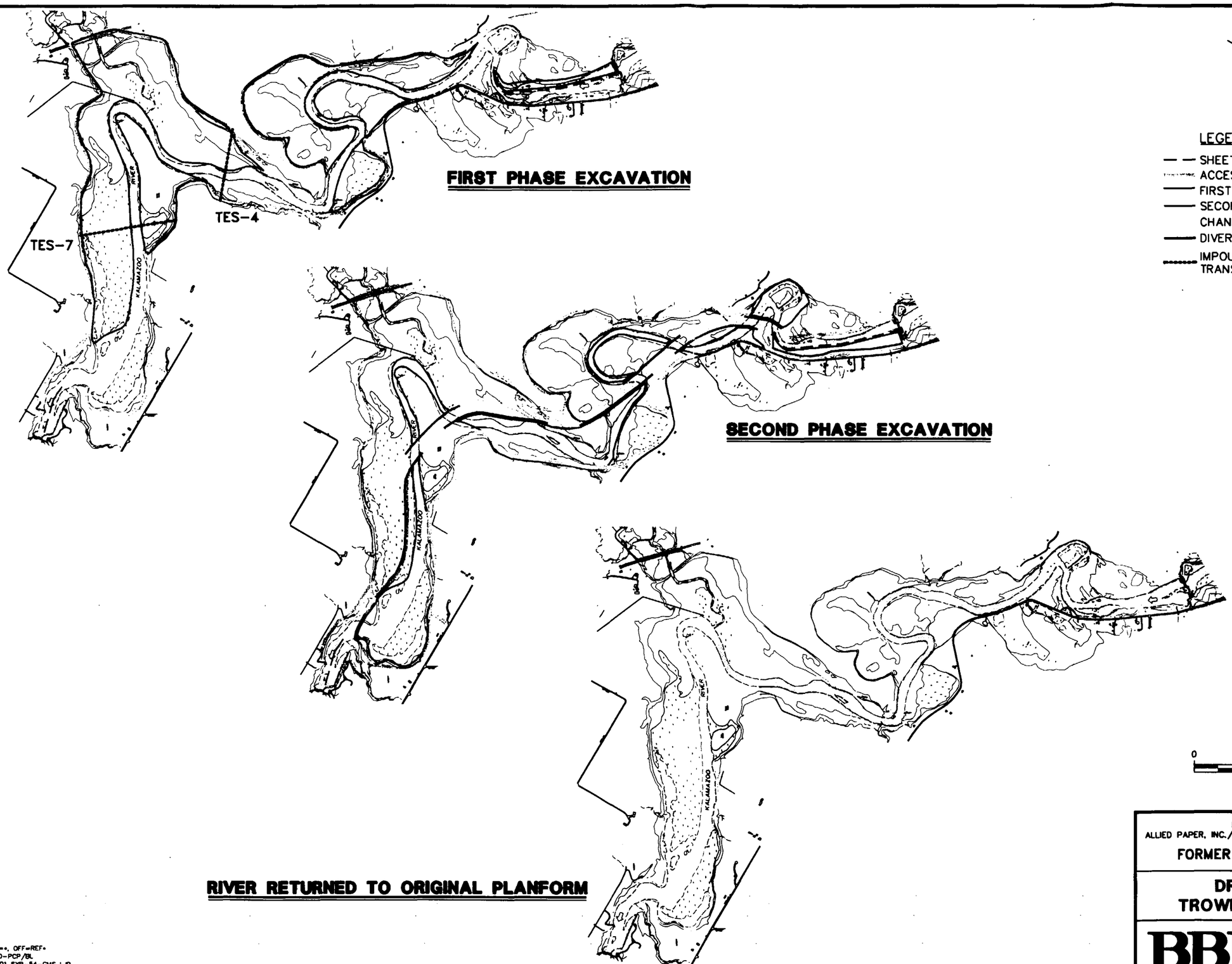
KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

FORMER IMPOUNDMENT APPROACHES

DRY EXCAVATION - FORMER OTSEGO IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 8



LEGEND

- SHEETPILE DIVERSION
- ACCESS ROAD/WORK AREAS RESTORED
- FIRST PHASE EXCAVATION
- SECOND PHASE EXCAVATION
- CHANNEL
- DIVERSION BERM
- IMPOUNDMENT SOIL PCB SAMPLING TRANSECT LOCATION

0 2000' 4000'

GRAPHIC SCALE

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

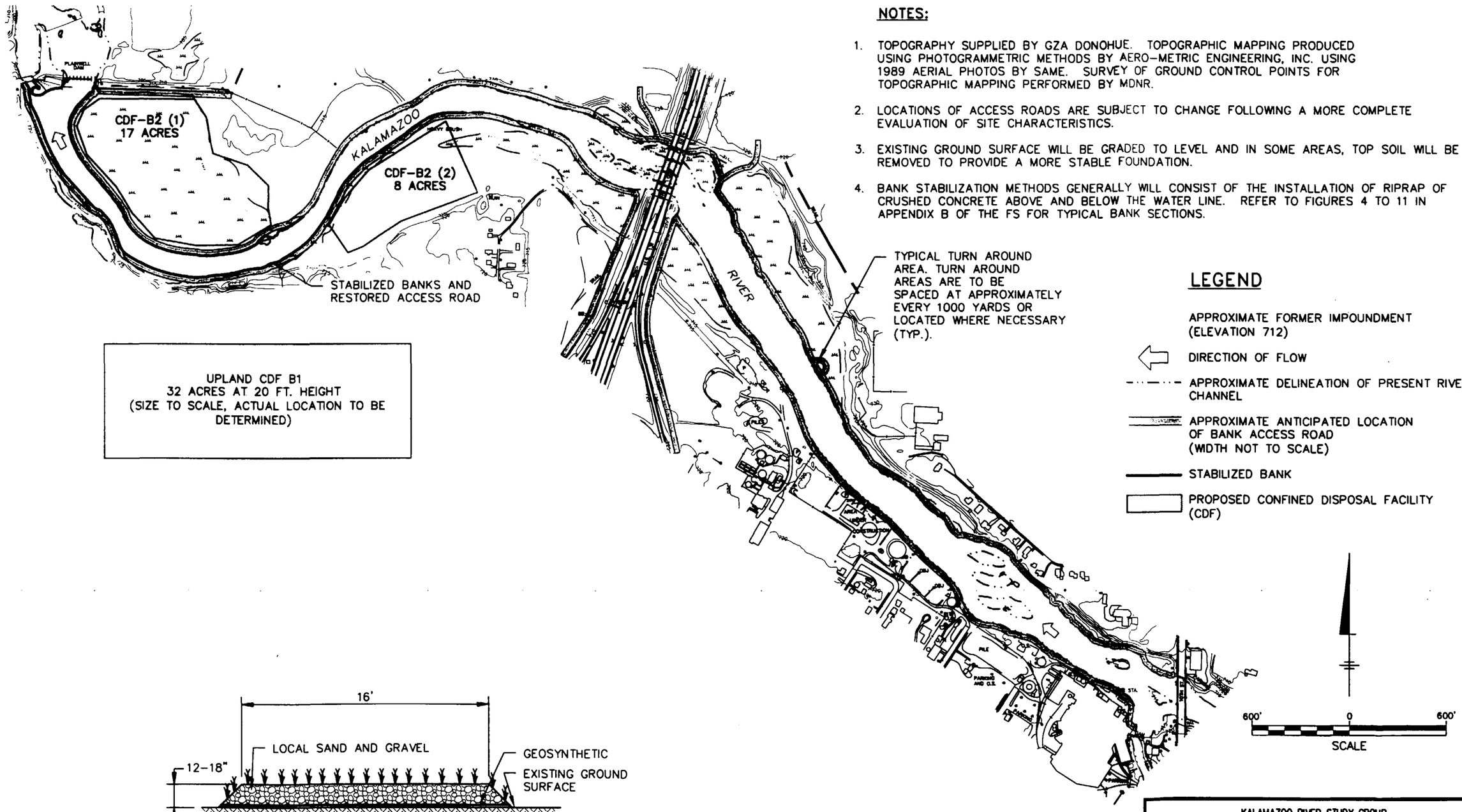
FORMER IMPOUNDMENT APPROACHES

DRY EXCAVATION - TROWBRIDGE IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 9

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-GMS LJP
64520620/DRY-EXCAV/64520C03.DWG

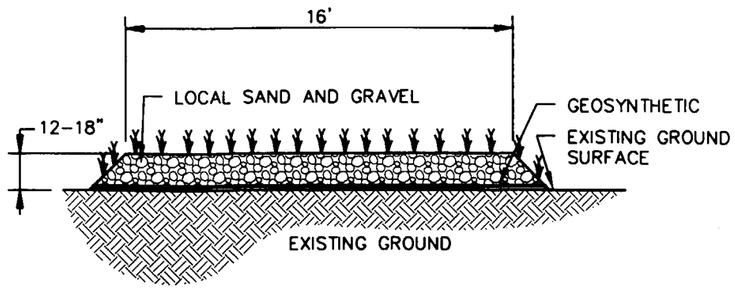


NOTES:

1. TOPOGRAPHY SUPPLIED BY GZA DONOHUE. TOPOGRAPHIC MAPPING PRODUCED USING PHOTOGRAMMETRIC METHODS BY AERO-METRIC ENGINEERING, INC. USING 1989 AERIAL PHOTOS BY SAME. SURVEY OF GROUND CONTROL POINTS FOR TOPOGRAPHIC MAPPING PERFORMED BY MDNR.
2. LOCATIONS OF ACCESS ROADS ARE SUBJECT TO CHANGE FOLLOWING A MORE COMPLETE EVALUATION OF SITE CHARACTERISTICS.
3. EXISTING GROUND SURFACE WILL BE GRADED TO LEVEL AND IN SOME AREAS, TOP SOIL WILL BE REMOVED TO PROVIDE A MORE STABLE FOUNDATION.
4. BANK STABILIZATION METHODS GENERALLY WILL CONSIST OF THE INSTALLATION OF RIPRAP OF CRUSHED CONCRETE ABOVE AND BELOW THE WATER LINE. REFER TO FIGURES 4 TO 11 IN APPENDIX B OF THE FS FOR TYPICAL BANK SECTIONS.

LEGEND

- APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)
- DIRECTION OF FLOW
- APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL
- APPROXIMATE ANTICIPATED LOCATION OF BANK ACCESS ROAD (WIDTH NOT TO SCALE)
- STABILIZED BANK
- PROPOSED CONFINED DISPOSAL FACILITY (CDF)



RESTORED ACCESS ROAD WITH HABITAT ENHANCEMENTS

NOT TO SCALE

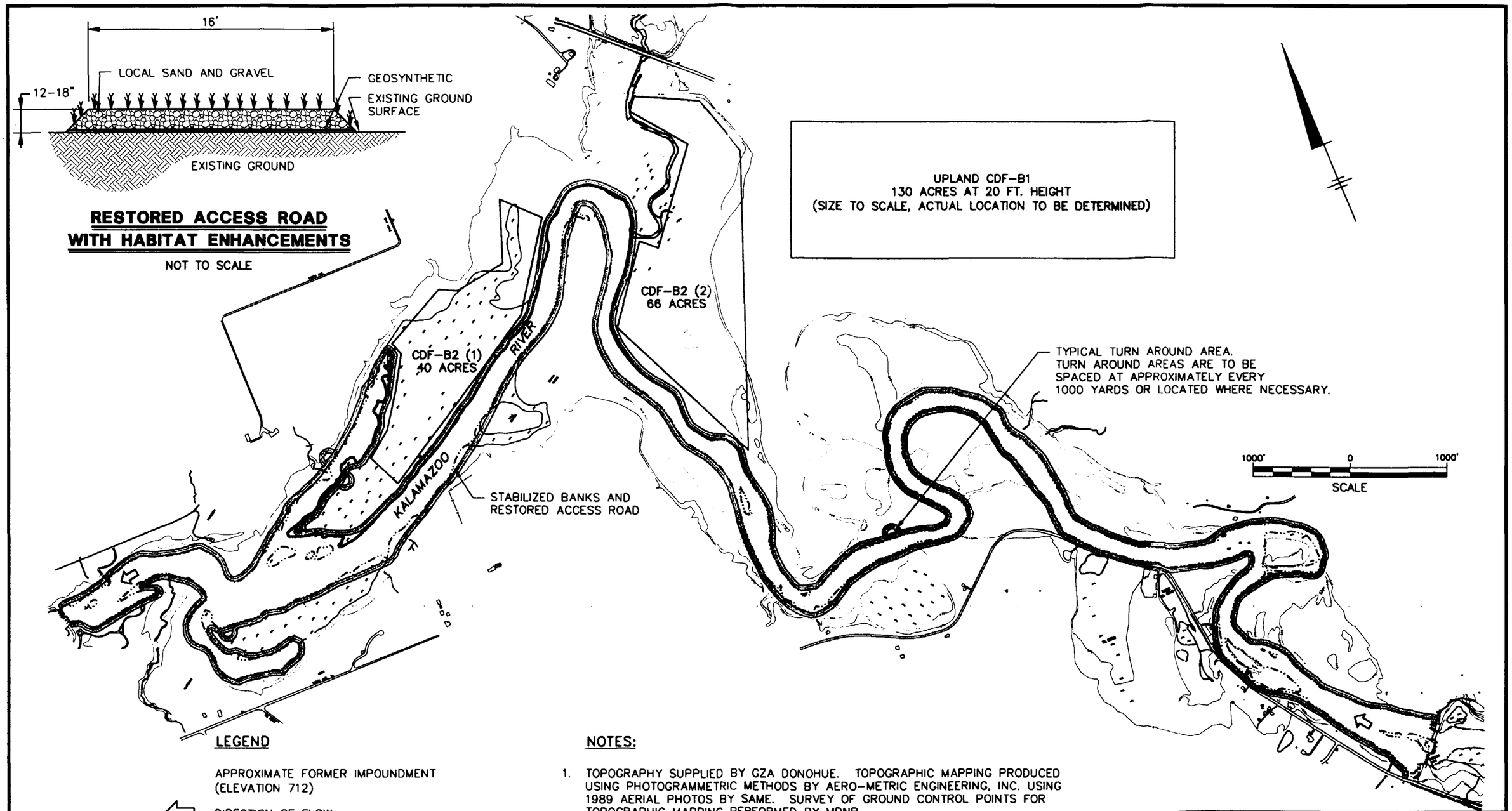
KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
FORMER IMPOUNDMENT APPROACHES

FORMER PLAINWELL IMPOUNDMENT CONCEPTUAL PLAN FOR CDF LOCATIONS (ALTERNATIVES B1, B2)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 10

X: NONE
L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-KMD PGL LJP
64532640/64532G01.DWG



LEGEND

- APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)
- DIRECTION OF FLOW
- APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL
- APPROXIMATE ANTICIPATED LOCATION OF BANK ACCESS ROAD (WIDTH NOT TO SCALE)
- STABILIZED BANK
- PROPOSED CONFINED DISPOSAL FACILITY (CDF)

NOTES:

1. TOPOGRAPHY SUPPLIED BY GZA DONOHUE. TOPOGRAPHIC MAPPING PRODUCED USING PHOTOGRAMMETRIC METHODS BY AERO-METRIC ENGINEERING, INC. USING 1989 AERIAL PHOTOS BY SAME. SURVEY OF GROUND CONTROL POINTS FOR TOPOGRAPHIC MAPPING PERFORMED BY MDNR.
2. LOCATIONS OF ACCESS ROADS ARE SUBJECT TO CHANGE FOLLOWING A MORE COMPLETE EVALUATION OF SITE CHARACTERISTICS.
3. EXISTING GROUND SURFACE WILL BE GRADED TO LEVEL AND IN SOME AREAS, TOP SOIL WILL BE REMOVED TO PROVIDE A MORE STABLE FOUNDATION.
4. BANK STABILIZATION METHODS GENERALLY WILL CONSIST OF THE INSTALLATION OF RIPRAP OF CRUSHED CONCRETE ABOVE AND BELOW THE WATER LINE. REFER TO FIGURES 4 TO 11 IN APPENDIX B OF THE FS FOR TYPICAL BANK SECTIONS.

X: NONE
L: ON=*, OFF=REF*,SP-TOC
P: STD-BL.PCP
2/14/01 SYR-54-KMD PGL LJP
64532640/64532003.DWG

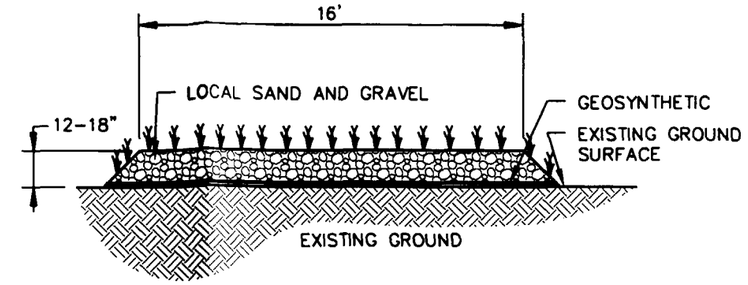
KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
FORMER IMPOUNDMENT APPROACHES

FORMER TROWBRIDGE IMPOUNDMENT CONCEPTUAL PLAN FOR CDF LOCATIONS (ALTERNATIVES B1, B2)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 11

UPLAND CDF-B1
62 ACRES AT 20 FT. HEIGHT
(SIZE TO SCALE ACTUAL LOCATION TO BE DETERMINED)



RESTORED ACCESS ROAD WITH HABITAT ENHANCEMENTS

NOT TO SCALE

STABILIZED BANKS AND RESTORED ACCESS ROAD

TYPICAL TURN AROUND AREA. TURN AROUND AREAS ARE TO BE SPACED AT APPROXIMATELY EVERY 1000 YARDS OR LOCATED WHERE NECESSARY (TYP.)

CDF-B2 (1)
34 ACRES

CDF-B2 (2)
10 ACRES

CDF-B2 (3)
3 ACRES

KALAMAZOO RIVER

600' 0 600'
SCALE

LEGEND

- APPROXIMATE FORMER IMPOUNDMENT (ELEVATION 712)
- DIRECTION OF FLOW
- APPROXIMATE DELINEATION OF PRESENT RIVER CHANNEL
- APPROXIMATE ANTICIPATED LOCATION OF BANK ACCESS ROAD (WIDTH NOT TO SCALE)
- STABILIZED BANK
- PROPOSED CONFINED DISPOSAL FACILITY (CDF)

NOTES:

1. TOPOGRAPHY SUPPLIED BY GZA DONOHUE. TOPOGRAPHIC MAPPING PRODUCED USING PHOTOGRAMMETRIC METHODS BY AERO-METRIC ENGINEERING, INC. USING 1989 AERIAL PHOTOS BY SAME. SURVEY OF GROUND CONTROL POINTS FOR TOPOGRAPHIC MAPPING PERFORMED BY MDNR.
2. LOCATIONS OF ACCESS ROADS ARE SUBJECT TO CHANGE FOLLOWING A MORE COMPLETE EVALUATION OF SITE CHARACTERISTICS.
3. EXISTING GROUND SURFACE WILL BE GRADED TO LEVEL AND IN SOME AREAS, TOP SOIL WILL BE REMOVED TO PROVIDE A MORE STABLE FOUNDATION.
4. BANK STABILIZATION METHODS GENERALLY WILL CONSIST OF THE INSTALLATION OF RIPRAP OF CRUSHED CONCRETE ABOVE AND BELOW THE WATER LINE. REFER TO FIGURES 4 TO 11 IN APPENDIX B OF THE FS FOR TYPICAL BANK SECTIONS.

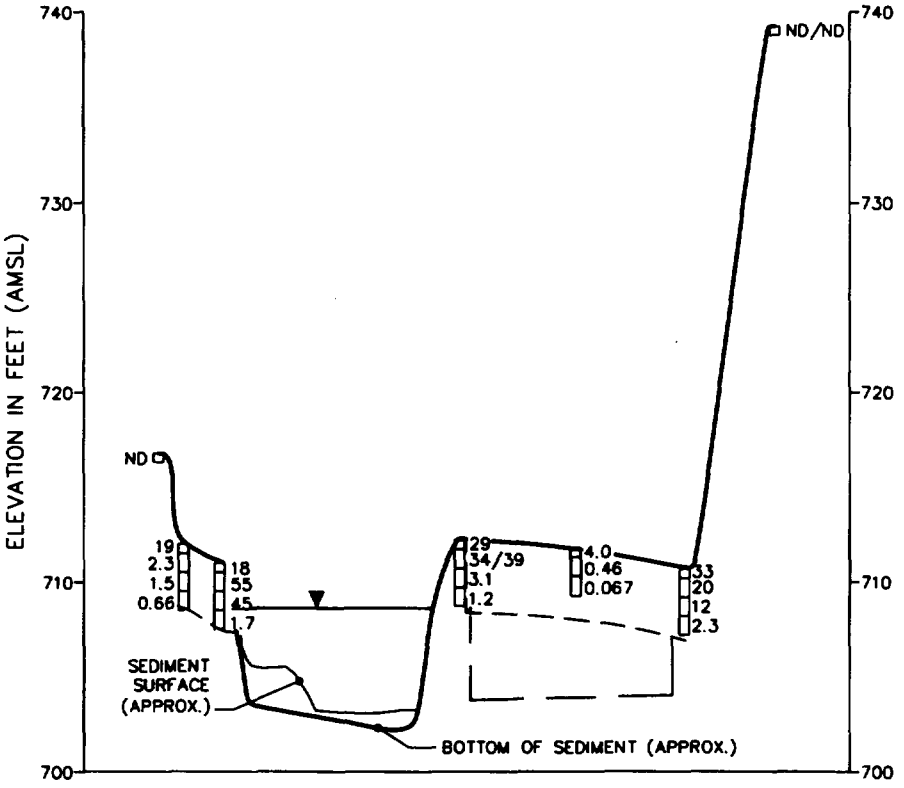
P: STD-PCP/BL
L: ON=*, OFF=REF*
2/14/01 SYR-54-KMD PGL LJP
64532840/84532G02.DWG

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
FORMER IMPOUNDMENT APPROACHES

FORMER OTSEGO IMPOUNDMENT CONCEPTUAL PLAN FOR CDF LOCATION (ALTERNATIVES B1, B2)

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 12



LEGEND:

- - - - - AVERAGE DEPTH OF IMPOUNDMENT SOIL REMOVAL (3.8')

— — — EXTENT OF CUT FOR NEW CHANNEL

19 / 2.3 / 1.5 / 0.66 BORING WITH SAMPLING INTERVAL AND CORRESPONDING PCB CONCENTRATION IN mg/Kg

NOTES:

1. PCB SAMPLE RESULTS CORRESPOND WITH RI/FS TECHNICAL MEMORANDUM 12 SAMPLING TRANSECT PES1. STREAM CHANNEL GEOMETRY CORRESPONDS WITH PROBING TRANSECT KPT 60.
2. ND = NOT DETECTED

0 200' 400'

HORIZONTAL SCALE = 1" = 200'
VERTICAL SCALE = 1"=10'

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

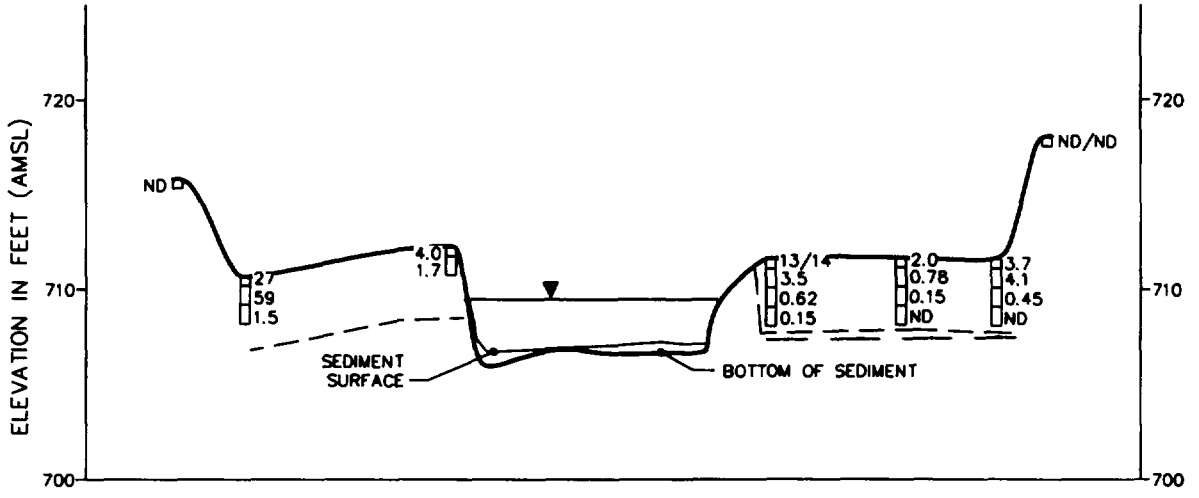
FORMER IMPOUNDMENT APPROACHES

IMPOUNDMENT SOIL REMOVAL/ DRY EXCAVATION - FORMER PLAINWELL IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 13

X: 64524X00
L: ON=*, OFF=*REF*
P: STD-AP.PCP
2/14/01 SYR-54-PGL LJP
64524310\64524V01.DWG



LEGEND:

- - - - - - AVERAGE DEPTH OF IMPOUNDMENT SOIL REMOVAL (3.8')

— — — — EXTENT OF CUT FOR NEW CHANNEL

3.7, 4.1, 0.45, ND — BORING WITH SAMPLING INTERVAL AND CORRESPONDING PCB CONCENTRATION IN mg/Kg

NOTES:

1. PCB SAMPLE RESULTS CORRESPOND WITH RI/FS TECHNICAL MEMORANDUM 12 SAMPLING TRANSECT PES2. STREAM CHANNEL GEOMETRY CORRESPONDS WITH PROBING TRANSECT KPT 61.
2. ND = NOT DETECTED

0 200' 400'

HORIZONTAL SCALE = 1" = 200'
VERTICAL SCALE = 1"=10'

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

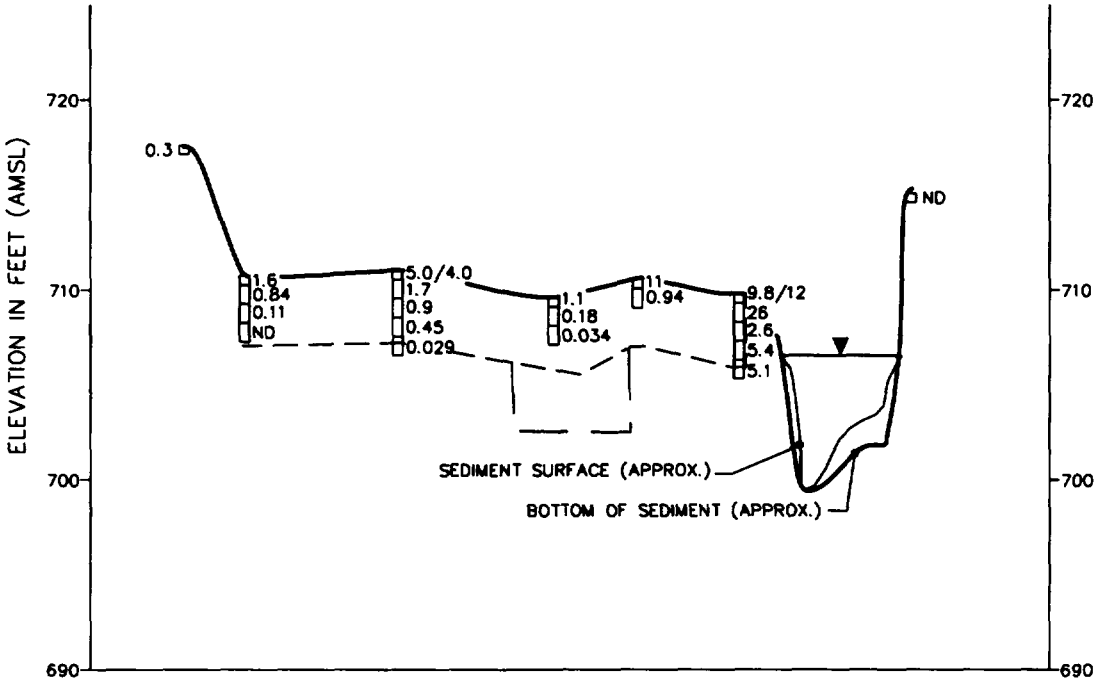
FORMER IMPOUNDMENT APPROACHES

IMPOUNDMENT SOIL REMOVAL/ DRY EXCAVATION - FORMER PLAINWELL IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 14

X: 84524X00.DWG
L: ON=*, OFF=*REF*
P: STD-AP.PCP
2/14/01 SYR-54-PGL LJP
84524310\84524V02.DWG



LEGEND:

- - - - - AVERAGE DEPTH OF IMPOUNDMENT SOIL REMOVAL (3.8')

— — — EXTENT OF CUT FOR NEW CHANNEL

1.6 / 0.84 / 0.11 / ND — BORING WITH SAMPLING INTERVAL AND CORRESPONDING PCB CONCENTRATION IN mg/Kg

NOTES:

1. PCB SAMPLE RESULTS CORRESPOND WITH RI/FS TECHNICAL MEMORANDUM 12 SAMPLING TRANSECT PES4. STREAM CHANNEL GEOMETRY CORRESPONDS WITH PROBING TRANSECT KPT 63.
2. ND = NOT DETECTED

0 200' 400'

HORIZONTAL SCALE = 1" = 200'
VERTICAL SCALE = 1"=10'

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

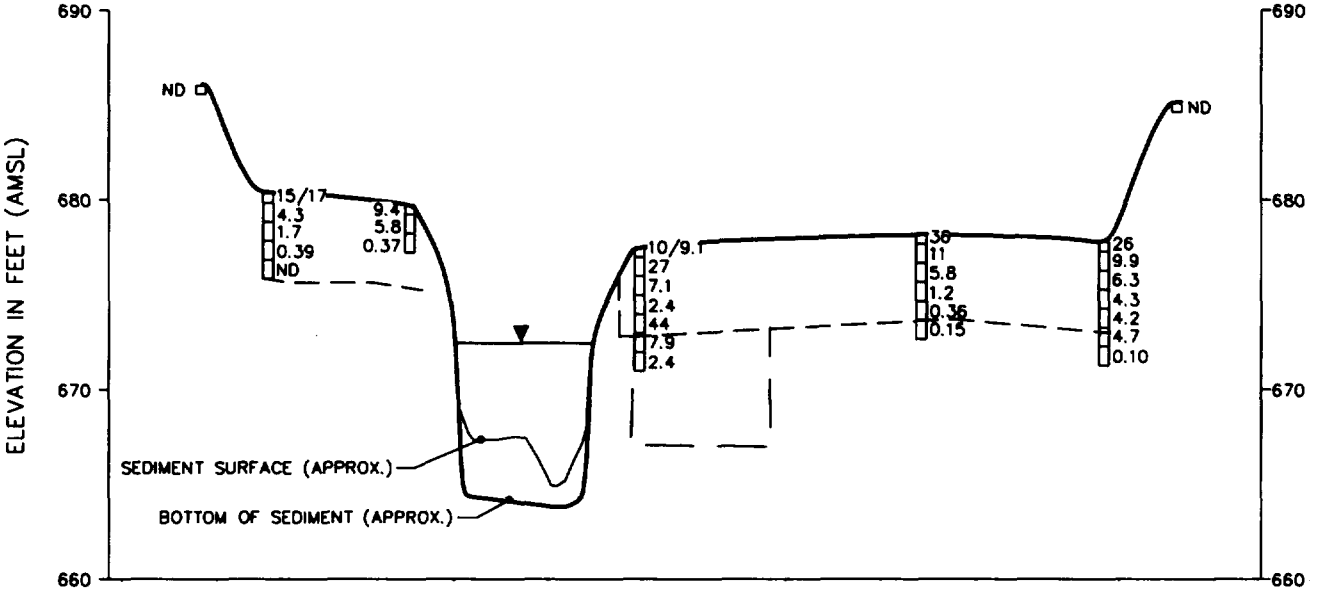
FORMER IMPOUNDMENT APPROACHES

IMPOUNDMENT SOIL REMOVAL/ DRY EXCAVATION - FORMER PLAINWELL IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 15

X: 64524X00.DWG
L: ON=*, OFF=*REF*
P: STD-AP.PCP
2/14/01 SYR-54-POL LJP
64524310\64524V03.DWG



LEGEND:

AVERAGE DEPTH OF IMPOUNDMENT SOIL REMOVAL (4.4')

EXTENT OF CUT FOR NEW CHANNEL

9.4 / 5.8 / 0.37 — BORING WITH SAMPLING INTERVAL AND CORRESPONDING PCB CONCENTRATION IN mg/Kg

0 200' 400'

HORIZONTAL SCALE = 1" = 200'
VERTICAL SCALE = 1"=10'

NOTES:

1. PCB SAMPLE RESULTS CORRESPOND WITH RI/FS TECHNICAL MEMORANDUM 12 SAMPLING TRANSECT OES2. STREAM CHANNEL GEOMETRY CORRESPONDS WITH PROBING TRANSECT KPT 89. KPT 89 SELECTED TO REPRESENT CROSS SECTION BECAUSE WIDTH MORE CLOSELY RESEMBLES OES2 THAN A PROBING TRANSECT LOCATED IN CLOSER PROXIMITY.
2. ND = NOT DETECTED

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

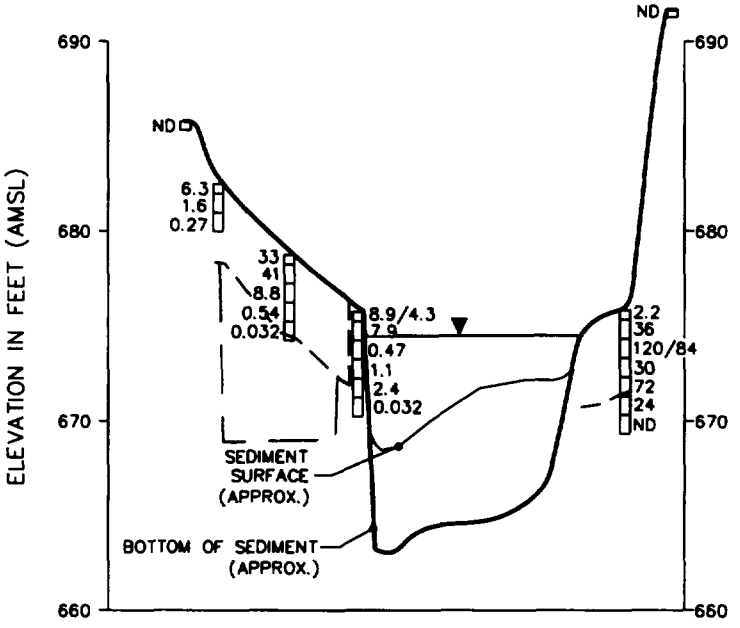
FORMER IMPOUNDMENT APPROACHES

IMPOUNDMENT SOIL REMOVAL/ DRY EXCAVATION - FORMER OTSEGO IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 16

X: 64524X00.DWG
L: ON=*, OFF=*REF*
P: STD-AP.PCP
2/14/01 SYR-54-PGL LJP
64524310\64524V04.DWG



LEGEND:

- - - - - AVERAGE DEPTH OF IMPOUNDMENT SOIL REMOVAL (4.4')

— — — EXTENT OF CUT FOR NEW CHANNEL (NARROWER CHANNEL THAN ORIGINAL DUE TO TOPOGRAPHIC CONSTRAINTS)

6.3 / 1.6 / 0.27 BORING WITH SAMPLING INTERVAL AND CORRESPONDING PCB CONCENTRATION IN mg/Kg

NOTES:

1. PCB SAMPLE RESULTS CORRESPOND WITH RI/FS TECHNICAL MEMORANDUM 12 SAMPLING TRANSECT OES4. STREAM CHANNEL GEOMETRY CORRESPONDS WITH PROBING TRANSECT KPT 92.
2. ND = NOT DETECTED

0 200' 400'

HORIZONTAL SCALE = 1" = 200'
VERTICAL SCALE = 1"=10'

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

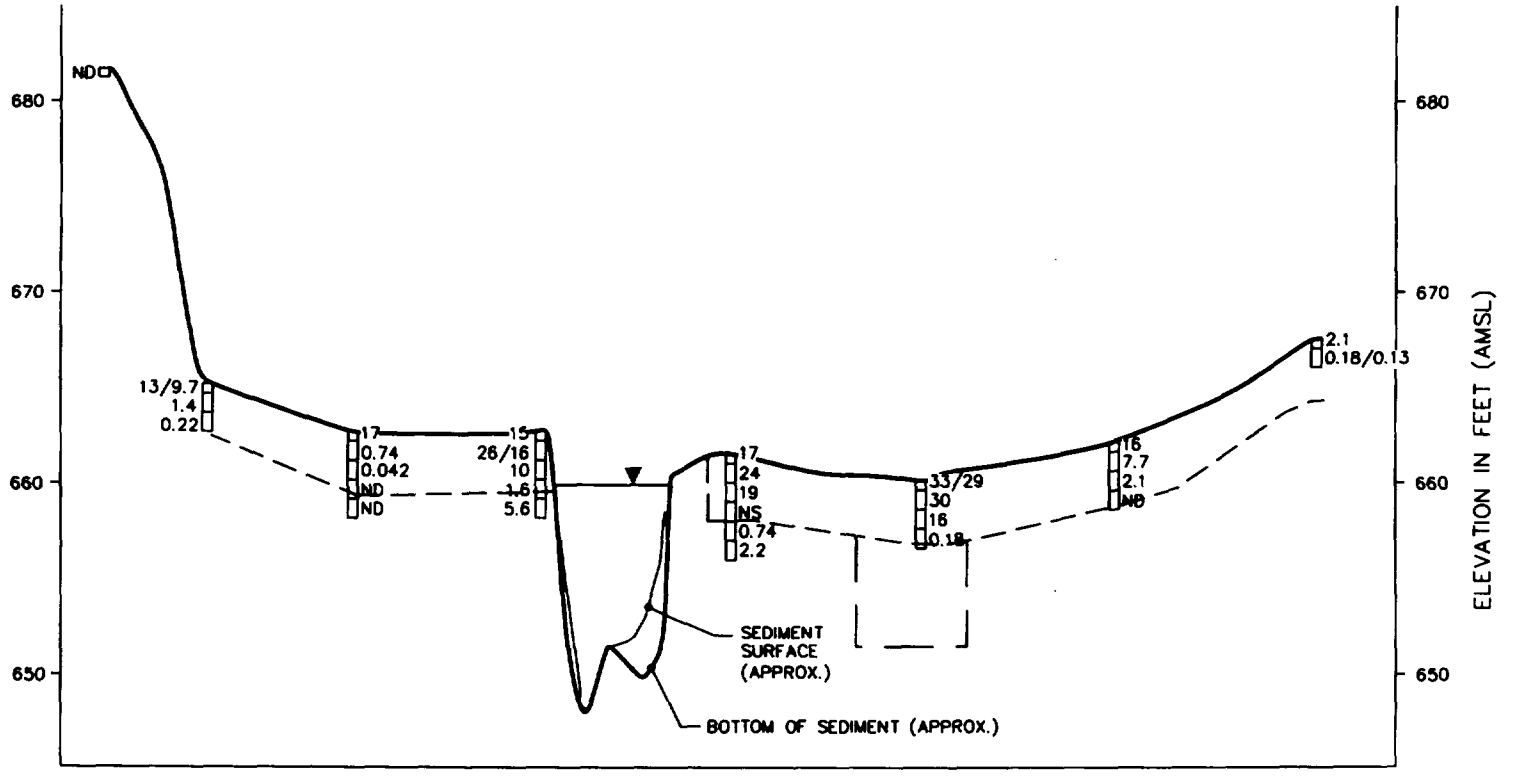
FORMER IMPOUNDMENT APPROACHES

IMPOUNDMENT SOIL REMOVAL/ DRY EXCAVATION- FORMER OTSEGO IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 17

X: 64524X00.DWG
L: ON=*, OFF=*REF*
P: STD-AP.PCP
2/14/01 SYR-54-PGL LJP
64524310\64524V05.DWG



LEGEND:

- - - - - AVERAGE DEPTH OF IMPOUNDMENT SOIL REMOVAL (3.1')

— — — EXTENT OF CUT FOR NEW CHANNEL

13/9.7 1.4 0.22 BORING WITH SAMPLING INTERVAL AND CORRESPONDING PCB CONCENTRATION IN mg/Kg

NOTES:

1. PCB SAMPLE RESULTS CORRESPOND WITH RI/FS TECHNICAL MEMORANDUM 12 SAMPLING TRANSECT TES4. STREAM CHANNEL GEOMETRY CORRESPONDS WITH PROBING TRANSECT KPT 101. KPT 101 SELECTED FOR REPRESENTATION BECAUSE RIVER GEOMETRY MORE CLOSELY RESEMBLES TES4 THAN A PROBING TRANSECT LOCATED IN CLOSER PROXIMITY.
2. ND = NOT DETECTED.
3. NS = NOT SAMPLED.

0 200' 400'

HORIZONTAL SCALE = 1" = 200'
VERTICAL SCALE = 1"=10'

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

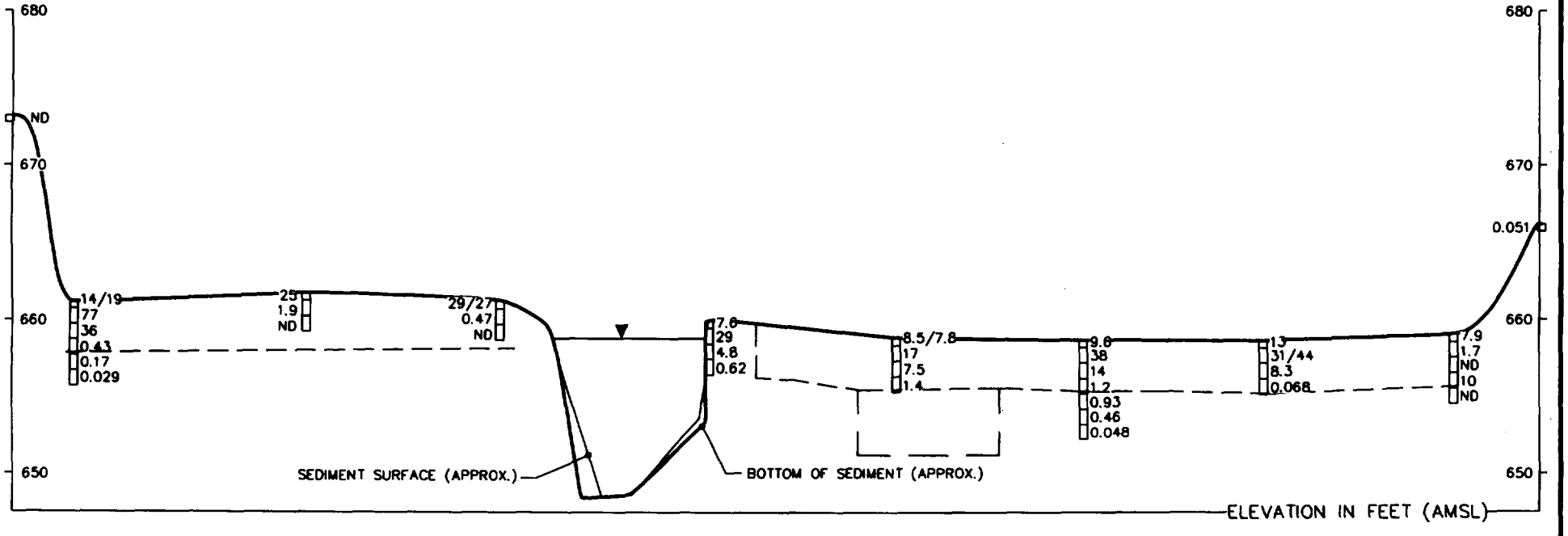
FORMER IMPOUNDMENT APPROACHES

IMPOUNDMENT SOIL REMOVAL/ DRY EXCAVATION - FORMER TROWBRIDGE IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 18

X: 64524X00.DWG
L: ON=*, OFF=*REF*
P: STD-AL.PCP
2/14/01 SYR-54-PGL LJP
64524310\64524V07.DWG



LEGEND:

- - - - - AVERAGE DEPTH OF IMPOUNDMENT SOIL REMOVAL (3.1')

— — — EXTENT OF CUT FOR NEW CHANNEL

25 / 1.9 / ND — BORING WITH SAMPLING INTERVAL AND CORRESPONDING PCB CONCENTRATION IN mg/Kg

NOTES:

1. PCB SAMPLE RESULTS CORRESPOND WITH RI/FS TECHNICAL MEMORANDUM 12 SAMPLING TRANSECT TES7. STREAM CHANNEL GEOMETRY CORRESPONDS WITH PROBING TRANSECT KPT 105.
2. ND = NOT DETECTED

0 200' 400'

HORIZONTAL SCALE = 1" = 200'
VERTICAL SCALE = 1"=10'

KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

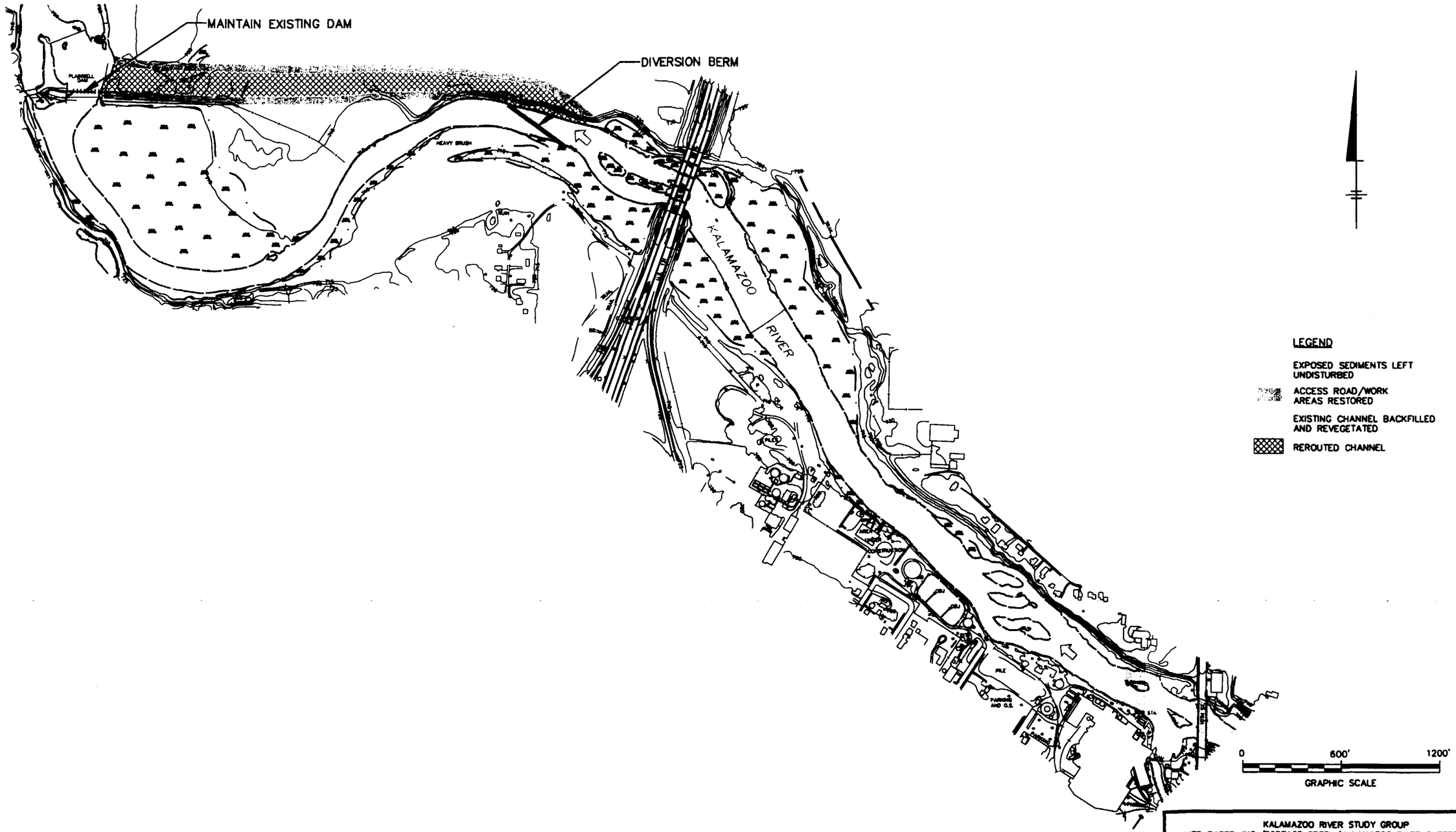
FORMER IMPOUNDMENT APPROACHES

IMPOUNDMENT SOIL REMOVAL/ DRY EXCAVATION - FORMER TROWBRIDGE IMPOUNDMENT

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 19

X: 64524X00.DWG
L: ON=*, OFF=*REF*
P: STD-AL.PCP
2/14/01 SYR-54-PGL LJP
64524310\64524V08.DWG



KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

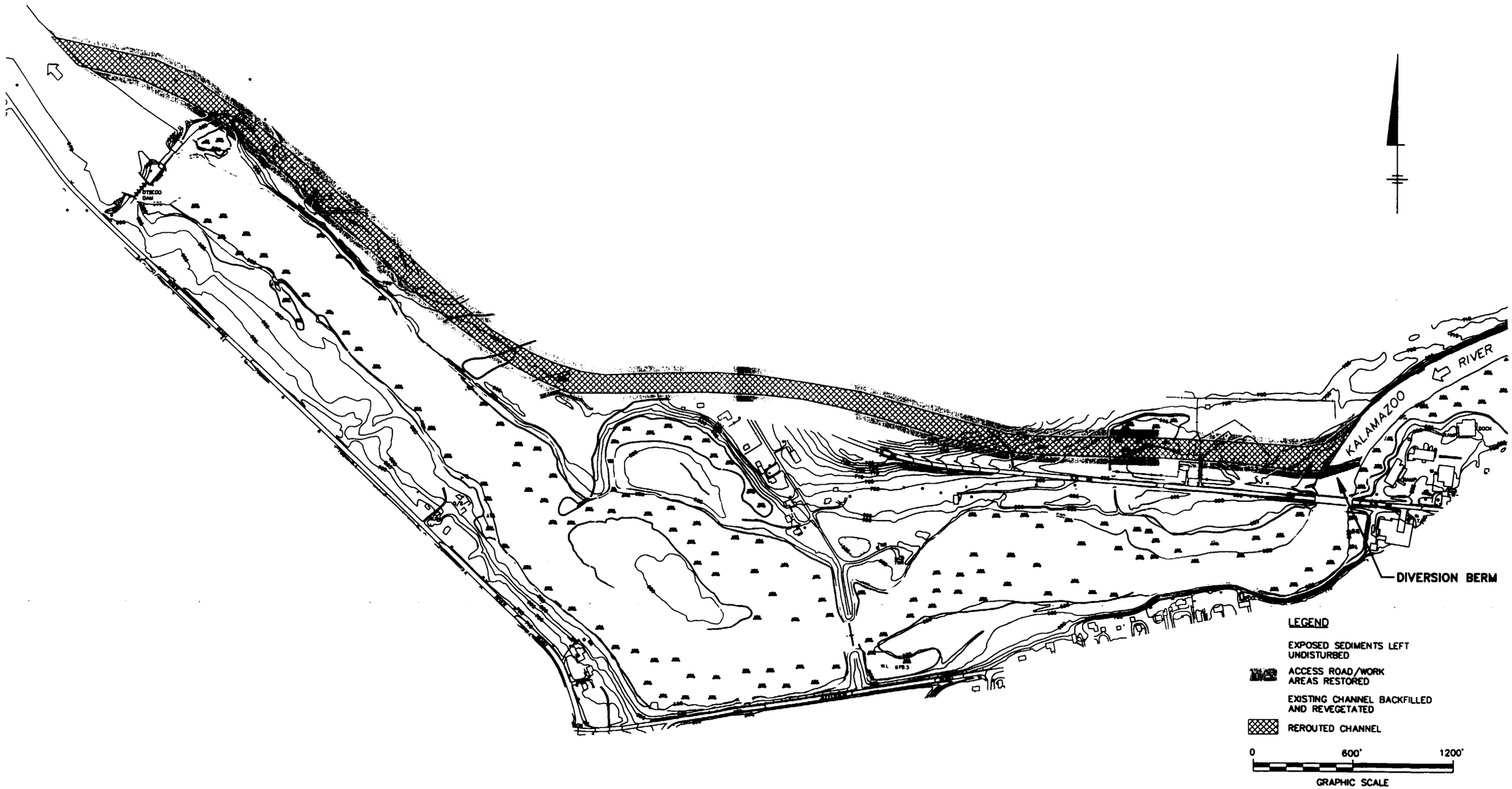
FORMER IMPOUNDMENT APPROACHES

FORMER PLAINWELL IMPOUNDMENT RECHANNELIZATION

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 20

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-GMS PGL LJP
84520820/RECHANEL/84520G01.DWG



KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

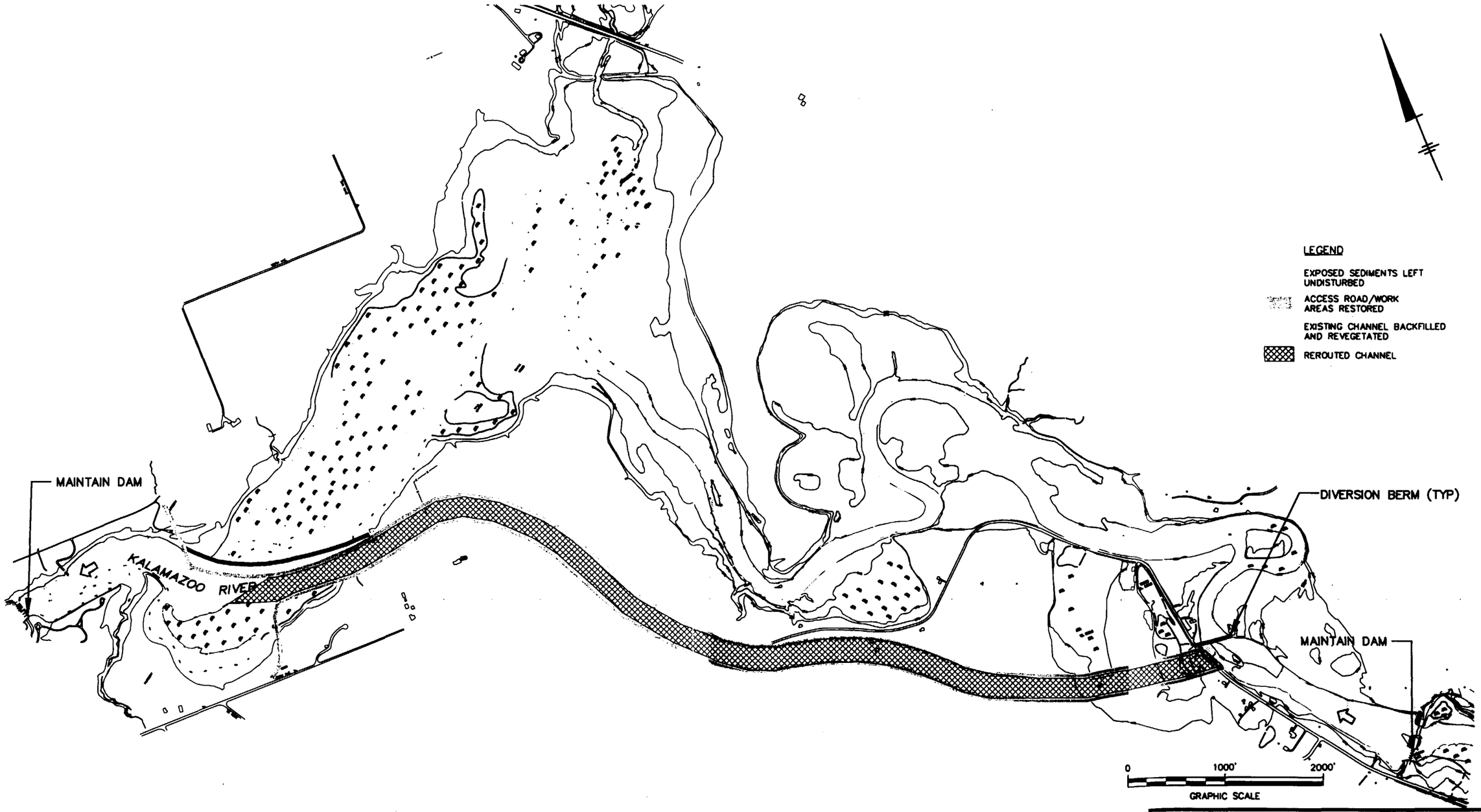
FORMER IMPOUNDMENT APPROACHES

FORMER OTSEGO IMPOUNDMENT RECHANNELIZATION

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 21

L: ON=*, OFF=REF*
P: STD-PCP/DL
2/14/01 SYR-54-GMS PGL LJP
64520620/RECHANEL/64520G02.DWG



KALAMAZOO RIVER STUDY GROUP
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

FORMER IMPOUNDMENT APPROACHES

FORMER TROWBRIDGE IMPOUNDMENT RECHANNELIZATION

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 22

L: ON=*, OFF=REF*
P: STD-PCP/BL
2/14/01 SYR-54-GMS PGL LJP
64520620/RECHANEL/64520G03.DWG

Appendix A

BLASLAND, BOUCK & LEE, INC. • *engineers & scientists*

consultants with focus

Detailed Cost Estimates

Table A-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$1,321,000	$1,321,000
	General Conditions	1	Lump Sum	$991,000	$991,000
	Project Insurance	1	Lump Sum	$660,000	$660,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	CDF A = 31.4 Acres	- -	- -	- -	- -
	CDF B = 61.9 Acres	- -	- -	- -	- -
	CDF C = 130.1 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	238	Acres	$8,000	$1,904,000
	CDF clearing & grubbing	238	Acres	$7,700	$1,833,000
	CDF bedding	360,402	cubic yards	$20	$7,208,000
	CDF exterior dikes	981,375	cubic yards	$15	$14,721,000
	CDF interior dikes	1,124,224	cubic yards	$15	$16,863,000
	CDF liner, bot & walls	9,730,843	square feet	$0.50	$4,865,000
	CDF piping	96,399	Linear feet	$12	$1,147,000
	CDF monitoring wells	24	wells	$1,000	$24,000
	WTF site preparation & paving	72,600	sq yards	$25	$1,815,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,431,000	$1,431,000
	SUBTOTAL				$69,007,000
	Engineering/Project Management (8%)				$5,521,000
	Construction Oversight (6%)				$4,140,000
	Contingency (20%)				$13,801,000
				TOTAL (YEARS 2005 - 2006):	$92,469,000
				PRESENT VALUE:	$65,929,000

Table A-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,762,000	$1,762,000
	General Conditions	1	Lump Sum	$1,322,000	$1,322,000
	Project Insurance	1	Lump Sum	$881,000	$881,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$4,164,000	$4,164,000
	Operate CDF - labor	2,277	days	$3,086	$7,028,000
	CDF & WTF maintenance	5	Years	$2,671,000	$13,355,000
	WTF chemicals	6,416	M Gal	$1,500	$9,624,000
	WTF filter media	6,416	M Gal	$200	$1,283,000
	WTF activated carbon	6,416	M Gal	$1,860	$11,934,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$92,072,000
	Engineering/Project Management (5%)				$4,604,000
	Construction Oversight (6%)				$5,524,000
	Contingency (20%)				$18,414,000
				TOTAL (YEARS 2006 - 2010):	$120,614,000
				PRESENT VALUE:	$70,520,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$3,028,000	$3,028,000
	General Conditions	1	Lump Sum	$2,271,000	$2,271,000
	Project Insurance	1	Lump Sum	$1,514,000	$1,514,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	360,000	cubic yards	$50	$18,000,000
	Removal of exposed sed. - Otsego (2009)	540,000	cubic yards	$50	$27,000,000
	Removal of exposed sed. - Trowbridge (2013)	1,900,000	cubic yards	$50	$95,000,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$158,232,000
	Engineering/Project Management (8%)				$12,659,000
	Construction Oversight (6%)				$9,494,000
	Contingency (20%)				$31,646,000
				TOTAL (YEARS 2006 - 2010):	$212,031,000
				PRESENT VALUE:	$88,438,000

Table A-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$594,000	$594,000
	General Conditions	1	Lump Sum	$446,000	$446,000
	Project Insurance	1	Lump Sum	$297,000	$297,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	Operate CDF - labor	389	days	$3,086	$1,201,000
	CDF & WTF maintenance	4	Years	$2,972,000	$11,888,000
	WTF chemicals	2,292	M Gal	$1,500	$3,439,000
	WTF filter media	2,292	M Gal	$200	$458,000
	WTF activated carbon	2,292	M Gal	$1,860	$4,264,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$31,060,000
	Engineering/Project Management (5%)				$1,553,000
	Construction Oversight (6%)				$1,864,000
	Contingency (20%)				$6,212,000
				TOTAL (YEARS 2007 - 2010):	$40,689,000
				PRESENT VALUE:	$22,959,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$1,840,000	$1,840,000
	General Conditions	1	Lump Sum	$1,380,000	$1,380,000
	Project Insurance	1	Lump Sum	$920,000	$920,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,846,000	$5,846,000
	CDF top liner	8,362,786	square feet	$0.50	$4,181,000
	CDF cover material	929,198	cubic yards	$25	$23,230,000
	CDF 2% graded cap	1,125,967	cubic yards	$25	$28,149,000
	SUBTOTAL				$96,138,000
	Engineering/Project Management (8%)				$7,691,000
	Construction Oversight (6%)				$5,768,000
	Contingency (20%)				$19,228,000
				TOTAL (YEARS 2012 - 2020):	$128,825,000
				PRESENT VALUE:	$44,306,000
	SUBTOTAL DREDGING CONSTRUCTION				$433,325,000
	SUBTOTAL DREDGING OPERATION				$161,303,000
	SUBTOTAL DREDGING				$594,628,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$198,673,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$93,479,000
	SUBTOTAL PRESENT WORTH DREDGING				$292,152,000

Table A-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$19,205	$845,000	$173,000
	SUBTOTAL ANNUAL				$1,814,000
	SUBTOTAL ANNUAL ALL YEARS				$43,918,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,955,000
				GRAND TOTAL COST:	**$638,546,000**
				GRAND TOTAL PRESENT WORTH COST:	**$305,107,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Exposed sediments are excavated by backhoe and trucked to CDF locations (avg. 6-mile haul).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production when dredging in the Kalamazoo River. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.

Table A-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging of former impoundments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on a bulking factor of 1.54 with 20-ft ultimate height. Three facilities are anticipated, with total containment volume of 4.9 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring

Table A-1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$243,000	$243,000
	General Conditions	1	Lump Sum	$182,000	$182,000
	Project Insurance	1	Lump Sum	$121,000	$121,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	CDF A = 31.4 Acres	- -	- -	- -	- -
	CDF B = 0 Acres	- -	- -	- -	- -
	CDF C = 0 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	36	Acres	$8,000	$288,000
	CDF clearing & grubbing	36	Acres	$7,700	$277,000
	CDF bedding	50,648	cubic yards	$20	$1,013,000
	CDF exterior dikes	212,030	cubic yards	$15	$3,180,000
	CDF interior dikes	131,189	cubic yards	$15	$1,968,000
	CDF liner, bot & walls	1,367,486	square feet	$0.50	$684,000
	CDF piping	13,503	Linear feet	$12	$161,000
	CDF monitoring wells	5	wells	$1,000	$5,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$12,683,000
	Engineering/Project Management (8%)				$1,015,000
	Construction Oversight (6%)				$761,000
	Contingency (20%)				$2,537,000
				TOTAL (YEARS 2005 - 2006):	$16,996,000
				PRESENT VALUE:	$12,118,000

Table A-1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$264,000	$264,000
	General Conditions	1	Lump Sum	$198,000	$198,000
	Project Insurance	1	Lump Sum	$132,000	$132,000
	Construction Trailers	24	Months	$400	$10,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$685,000	$685,000
	Operate CDF - labor	375	days	$3,086	$1,157,000
	CDF & WTF maintenance	2	Years	$494,000	$988,000
	WTF chemicals	1,071	M Gal	$1,500	$1,607,000
	WTF filter media	1,071	M Gal	$200	$214,000
	WTF activated carbon	1,071	M Gal	$1,860	$1,993,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$13,811,000
	Engineering/Project Management (5%)				$691,000
	Construction Oversight (6%)				$829,000
	Contingency (20%)				$2,762,000
				TOTAL (YEARS 2007 - 2008):	$18,093,000
				PRESENT VALUE:	$10,899,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$508,000	$508,000
	General Conditions	1	Lump Sum	$381,000	$381,000
	Project Insurance	1	Lump Sum	$254,000	$254,000
	Construction Trailers	24	Months	$400	$10,000
	Removal of exposed sed. - Plainwell (2009)	360,000	cubic yards	$50	$18,000,000
	Removal of exposed sed. - Otsego	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge	0	cubic yards	$50	$0
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$26,528,000
	Engineering/Project Management (8%)				$2,122,000
	Construction Oversight (6%)				$1,592,000
	Contingency (20%)				$5,306,000
				TOTAL (YEARS 2007 - 2008):	$35,548,000
				PRESENT VALUE:	$16,650,000

Table A-1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$94,000	$94,000
	General Conditions	1	Lump Sum	$71,000	$71,000
	Project Insurance	1	Lump Sum	$47,000	$47,000
	Construction Trailers	24	Months	$400	$10,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	Operate CDF - labor	75	days	$3,086	$231,000
	CDF & WTF maintenance	2	Years	$594,000	$1,188,000
	WTF chemicals	445	M Gal	$1,500	$667,000
	WTF filter media	445	M Gal	$200	$89,000
	WTF activated carbon	445	M Gal	$1,860	$827,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$4,920,000
	Engineering/Project Management (5%)				$246,000
	Construction Oversight (6%)				$295,000
	Contingency (20%)				$984,000
				TOTAL (YEARS 2007 - 2008):	$6,445,000
				PRESENT VALUE:	$3,882,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$232,000	$232,000
	General Conditions	1	Lump Sum	$174,000	$174,000
	Project Insurance	1	Lump Sum	$116,000	$116,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	1,066,845	square feet	$0.50	$533,000
	CDF cover material	118,538	cubic yards	$25	$2,963,000
	CDF 2% graded cap	78,543	cubic yards	$25	$1,964,000
	SUBTOTAL				$12,121,000
	Engineering/Project Management (8%)				$970,000
	Construction Oversight (6%)				$727,000
	Contingency (20%)				$2,424,000
				TOTAL (YEARS 2009 - 2009):	$16,242,000
				PRESENT VALUE:	$8,835,000
	SUBTOTAL DREDGING CONSTRUCTION				$68,786,000
	SUBTOTAL DREDGING OPERATION				$24,538,000
	SUBTOTAL DREDGING				$93,324,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$37,603,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$14,781,000
	SUBTOTAL PRESENT WORTH DREDGING				$52,384,000

Table A-1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$50,000	$100,000	$60,000
	Confirmation sampling and analyses	(2007 - 2008)	$832,000	$1,664,000	$1,002,000
	Bank observation	(2009 - 2039)	$36,129	$1,120,000	$264,000
	Bank maintenance	(2009 - 2039)	$479,548	$14,866,000	$3,498,000
	Monitoring - biota	(2007 - 2038)	$144,188	$4,614,000	$1,215,000
	Monitoring - water & sed	(2007 - 2038)	$134,125	$4,292,000	$1,130,000
	KALSIM model updates	(2007 - 2038)	$124,875	$3,996,000	$1,052,000
	CDF & groundwater monitoring	(2007 - 2039)	$4,000	$132,000	$34,000
	SUBTOTAL ANNUAL				$1,805,000
	SUBTOTAL ANNUAL ALL YEARS				$30,784,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,255,000
				GRAND TOTAL COST:	**$124,108,000**
				GRAND TOTAL PRESENT WORTH COST:	**$60,639,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment.
- Exposed sediments are excavated by backhoe and trucked to a CDF (app. 5-mile haul).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.

Table A-1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on achieving a bulking factor of 1.15 with 20-ft ultimate height. One facility is anticipated, with total containment volume of 0.6 million cy. Side slopes of 1:3 add additional area requirements, in addition to an adjacent facility for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- The CDF is assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDF assumes internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. A treatment facility is located adjacent to the CDF. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft will be constructed for the WTF.
- Closure of the completed CDF, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of the restored impoundment as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 33 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring

Table A-1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$374,000	$374,000
	General Conditions	1	Lump Sum	$280,000	$280,000
	Project Insurance	1	Lump Sum	$187,000	$187,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	CDF A = 0 Acres	- -	- -	- -	- -
	CDF B = 61.9 Acres	- -	- -	- -	- -
	CDF C = 0 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	67	Acres	$8,000	$536,000
	CDF clearing & grubbing	67	Acres	$7,700	$516,000
	CDF bedding	99,801	cubic yards	$20	$1,996,000
	CDF exterior dikes	308,830	cubic yards	$15	$4,632,000
	CDF interior dikes	306,465	cubic yards	$15	$4,597,000
	CDF liner, bot & walls	2,694,633	square feet	$0.50	$1,347,000
	CDF piping	26,537	Linear feet	$12	$316,000
	CDF monitoring wells	7	wells	$1,000	$7,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$19,526,000
	Engineering/Project Management (8%)				$1,562,000
	Construction Oversight (6%)				$1,172,000
	Contingency (20%)				$3,905,000
				TOTAL (YEARS 2005 - 2006):	$26,165,000
				PRESENT VALUE:	$18,655,000

Table A-1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$602,000	$602,000
	General Conditions	1	Lump Sum	$451,000	$451,000
	Project Insurance	1	Lump Sum	$301,000	$301,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$1,503,000	$1,503,000
	Operate CDF - labor	822	days	$3,086	$2,537,000
	CDF & WTF maintenance	4	Years	$788,000	$3,152,000
	WTF chemicals	2,309	M Gal	$1,500	$3,464,000
	WTF filter media	2,309	M Gal	$200	$462,000
	WTF activated carbon	2,309	M Gal	$1,860	$4,295,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$31,436,000
	Engineering/Project Management (5%)				$1,572,000
	Construction Oversight (6%)				$1,886,000
	Contingency (20%)				$6,287,000
				TOTAL (YEARS 2007 - 2010):	$41,181,000
				PRESENT VALUE:	$23,237,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$688,000	$688,000
	General Conditions	1	Lump Sum	$516,000	$516,000
	Project Insurance	1	Lump Sum	$344,000	$344,000
	Construction Trailers	24	Months	$400	$10,000
	Removal of exposed sed. - Plainwell (2018)	0	cubic yards	$50	$0
	Removal of exposed sed. - Otsego (2009)	540,000	cubic yards	$50	$27,000,000
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$35,933,000
	Engineering/Project Management (8%)				$2,875,000
	Construction Oversight (6%)				$2,156,000
	Contingency (20%)				$7,187,000
				TOTAL (YEARS 2007 - 2008):	$48,151,000
				PRESENT VALUE:	$20,501,000

Table A-1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$183,000	$183,000
	General Conditions	1	Lump Sum	$137,000	$137,000
	Project Insurance	1	Lump Sum	$92,000	$92,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	Operate CDF - labor	125	days	$3,086	$387,000
	CDF & WTF maintenance	4	Years	$888,000	$3,552,000
	WTF chemicals	738	M Gal	$1,500	$1,106,000
	WTF filter media	738	M Gal	$200	$148,000
	WTF activated carbon	738	M Gal	$1,860	$1,372,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$9,564,000
	Engineering/Project Management (5%)				$478,000
	Construction Oversight (6%)				$574,000
	Contingency (20%)				$1,913,000
				TOTAL (YEARS 2007 - 2010):	$12,529,000
				PRESENT VALUE:	$7,070,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$412,000	$412,000
	General Conditions	1	Lump Sum	$309,000	$309,000
	Project Insurance	1	Lump Sum	$206,000	$206,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$3,185,000	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	0	Lump Sum	$20,203,000	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	2,263,312	square feet	$0.50	$1,132,000
	CDF cover material	251,479	cubic yards	$25	$6,287,000
	CDF 2% graded cap	242,701	cubic yards	$25	$6,068,000
	SUBTOTAL				$21,534,000
	Engineering/Project Management (8%)				$1,723,000
	Construction Oversight (6%)				$1,292,000
	Contingency (20%)				$4,307,000
				TOTAL (YEARS 2011 - 2012):	$28,856,000
				PRESENT VALUE:	$13,261,000
	SUBTOTAL DREDGING CONSTRUCTION				$103,172,000
	SUBTOTAL DREDGING OPERATION				$53,710,000
	SUBTOTAL DREDGING				$156,882,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$52,417,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$30,307,000
	SUBTOTAL PRESENT WORTH DREDGING				$82,724,000

Table A-1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	CDF & groundwater monitoring	(2007 - 2042)	$5,611	$202,000	$49,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$33,320,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,752,000
				GRAND TOTAL COST:	**$190,202,000**
				GRAND TOTAL PRESENT WORTH COST:	**$91,476,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment.
- Exposed sediments at the Otsego Impoundment are excavated by backhoe and trucked to CDF location (app. 5-mile haul).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.

Table A-1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation. 9/98 escalated to 1/00
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on a bulking factor of 1.62 with 20-ft ultimate height. One facility is anticipated, with total containment volume of 1.4 million cy. Side slopes of 1:3 add additional area requirements, in addition to an adjacent facility for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- The CDF is assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDF assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. A treatment facility is located adjacent to CDF. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft will be constructed for the WTF.
- Closure of the completed CDF, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of the restored impoundment as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 36 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$705,000	$705,000
	General Conditions	1	Lump Sum	$528,000	$528,000
	Project Insurance	1	Lump Sum	$352,000	$352,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	CDF A = 0 Acres	- -	- -	- -	- -
	CDF B = 0 Acres	- -	- -	- -	- -
	CDF C = 130.1 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	135	Acres	$8,000	$1,080,000
	CDF clearing & grubbing	135	Acres	$7,700	$1,040,000
	CDF bedding	209,953	cubic yards	$20	$4,199,000
	CDF exterior dikes	460,516	cubic yards	$15	$6,908,000
	CDF interior dikes	686,569	cubic yards	$15	$10,299,000
	CDF liner, bot & walls	5,668,725	square feet	$0.50	$2,834,000
	CDF piping	56,359	Linear feet	$12	$671,000
	CDF monitoring wells	11	wells	$1,000	$11,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$36,818,000
	Engineering/Project Management (8%)				$2,945,000
	Construction Oversight (6%)				$2,209,000
	Contingency (20%)				$7,364,000
				TOTAL (YEARS 2005 - 2006):	$49,336,000
				PRESENT VALUE:	$35,176,000

Table A-1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$851,000	$851,000
	General Conditions	1	Lump Sum	$639,000	$639,000
	Project Insurance	1	Lump Sum	$426,000	$426,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$1,976,000	$1,976,000
	Operate CDF - labor	1,081	days	$3,086	$3,335,000
	CDF & WTF maintenance	5	Years	$1,389,000	$6,945,000
	WTF chemicals	3,035	M Gal	$1,500	$4,553,000
	WTF filter media	3,035	M Gal	$200	$607,000
	WTF activated carbon	3,035	M Gal	$1,860	$5,646,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$44,485,000
	Engineering/Project Management (5%)				$2,224,000
	Construction Oversight (6%)				$2,669,000
	Contingency (20%)				$8,897,000
				TOTAL (YEARS 2007 - 2011):	$58,275,000
				PRESENT VALUE:	$31,843,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$2,129,000	$2,129,000
	General Conditions	1	Lump Sum	$1,596,000	$1,596,000
	Project Insurance	1	Lump Sum	$1,064,000	$1,064,000
	Construction Trailers	84	Months	$400	$34,000
	Removal of exposed sed. - Plainwell	0	cubic yards	$50	$0
	Removal of exposed sed. - Otsego	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2012/13)	1,900,000	cubic yards	$50	$95,000,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$111,218,000
	Engineering/Project Management (8%)				$8,897,000
	Construction Oversight (6%)				$6,673,000
	Contingency (20%)				$22,244,000
				TOTAL (YEARS 2007 - 2013):	$149,032,000
				PRESENT VALUE:	$59,821,000

Table A-1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$344,000	$344,000
	General Conditions	1	Lump Sum	$258,000	$258,000
	Project Insurance	1	Lump Sum	$172,000	$172,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	Operate CDF - labor	189	days	$3,086	$583,000
	CDF & WTF maintenance	5	Years	$1,691,000	$8,455,000
	WTF chemicals	1,110	M Gal	$1,500	$1,665,000
	WTF filter media	1,110	M Gal	$200	$222,000
	WTF activated carbon	1,110	M Gal	$1,860	$2,065,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$17,979,000
	Engineering/Project Management (5%)				$899,000
	Construction Oversight (6%)				$1,079,000
	Contingency (20%)				$3,596,000
				TOTAL (YEARS 2007 - 2011):	$23,553,000
				PRESENT VALUE:	$12,870,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$1,228,000	$1,228,000
	General Conditions	1	Lump Sum	$921,000	$921,000
	Project Insurance	1	Lump Sum	$614,000	$614,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$3,185,000	$0
	Exposed soil cover & veget. - Otsego	0	Lump Sum	$4,161,000	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$3,557,000	$3,557,000
	CDF top liner	5,032,629	square feet	$0.50	$2,516,000
	CDF cover material	559,181	cubic yards	$25	$13,980,000
	CDF 2% graded cap	804,723	cubic yards	$25	$20,118,000
	SUBTOTAL				$64,147,000
	Engineering/Project Management (8%)				$5,132,000
	Construction Oversight (6%)				$3,849,000
	Contingency (20%)				$12,829,000
				TOTAL (YEARS 2014 - 2015):	$85,957,000
				PRESENT VALUE:	$32,245,000
	SUBTOTAL DREDGING CONSTRUCTION				$284,325,000
	SUBTOTAL DREDGING OPERATION				$81,828,000
	SUBTOTAL DREDGING				$366,153,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$127,242,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$44,713,000
	SUBTOTAL PRESENT WORTH DREDGING				$171,955,000

Table A-1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2013)	$832,000	$5,824,000	$2,988,000
	Bank observation	(2014 - 2044)	$36,129	$1,120,000	$188,000
	Bank maintenance	(2014 - 2044)	$479,548	$14,866,000	$2,494,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	CDF & groundwater monitoring	(2007 - 2045)	$8,795	$343,000	$78,000
	SUBTOTAL ANNUAL				$1,805,000
	SUBTOTAL ANNUAL ALL YEARS				$36,358,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$9,325,000
				GRAND TOTAL COST:	**$402,511,000**
				GRAND TOTAL PRESENT WORTH COST:	**$181,280,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment.
- Exposed sediments are excavated by backhoe and trucked to CDF (avg 5-mile haul).
- Dredging by hydraulic cutterhead dredge assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.

Table A-1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-1-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3,800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach.
- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on a bulking factor of 1.62 with 20-ft ultimate height. One facility is anticipated, with total containment volume of 2.9 cy. Side slopes of 1:3 add additional area requirements, in addition to an adjacent facility for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- The CDF is assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDF assumes internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. A treatment facility is located adjacent to the CDF. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft will be constructed for the WTF.
- Closure of completed the CDF, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of the restored impoundment as developed for Alternative 3 in the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 39 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$1,152,000	$1,152,000
	General Conditions	1	Lump Sum	$864,000	$864,000
	Project Insurance	1	Lump Sum	$576,000	$576,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	CDF A = 25.7 Acres	- -	- -	- -	- -
	CDF B = 49 Acres	- -	- -	- -	- -
	CDF C = 113.5 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	203	Acres	$0	$0
	CDF clearing & grubbing	203	Acres	$7,700	$1,563,000
	CDF bedding	303,487	cubic yards	$20	$6,070,000
	CDF exterior dikes	888,957	cubic yards	$15	$13,334,000
	CDF interior dikes	937,646	cubic yards	$15	$14,065,000
	CDF liner, bot & walls	8,194,148	square feet	$0.50	$4,097,000
	CDF piping	80,847	Linear feet	$12	$962,000
	CDF monitoring wells	21	wells	$1,000	$21,000
	WTF site preparation & paving	72,600	sq yards	$25	$1,815,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,431,000	$1,431,000
	SUBTOTAL				$60,174,000
	Engineering/Project Management (8%)				$4,814,000
	Construction Oversight (6%)				$3,610,000
	Contingency (20%)				$12,035,000
				TOTAL (YEARS 2005 - 2006):	$80,633,000
				PRESENT VALUE:	$57,490,000

Table A-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,930,000	$1,930,000
	General Conditions	1	Lump Sum	$1,448,000	$1,448,000
	Project Insurance	1	Lump Sum	$965,000	$965,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	9.2	Crew-Years	$700,726	$6,447,000
	Dredge, boat and pump fuel use	9.2	Crew-Years	$654,410	$6,021,000
	Dredge labor	9.2	Crew-Years	$1,303,584	$11,993,000
	Dredge pipelines	9.2	Crew-Years	$696,960	$6,412,000
	Silt Curtains, reefing and anchoring	9.2	Crew-Years	$123,000	$1,132,000
	Turbidity monitoring stations	1	Lump Sum	$2,277,000	$2,277,000
	Shoreline protection	1	Lump Sum	$4,710,000	$4,710,000
	Operate CDF - labor	2,576	days	$3,086	$7,951,000
	CDF & WTF maintenance	5	Years	$2,357,000	$11,785,000
	WTF chemicals	7,258	M Gal	$1,500	$10,887,000
	WTF filter media	7,258	M Gal	$200	$1,452,000
	WTF activated carbon	7,258	M Gal	$1,860	$13,500,000
	Operate WTF - labor	2,576	days	$4,629	$11,926,000
	SUBTOTAL				$100,860,000
	Engineering/Project Management (5%)				$5,043,000
	Construction Oversight (6%)				$6,052,000
	Contingency (20%)				$20,172,000
				TOTAL (YEARS 2006 - 2010):	$132,127,000
				PRESENT VALUE:	$77,252,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$2,161,000	$2,161,000
	General Conditions	1	Lump Sum	$1,621,000	$1,621,000
	Project Insurance	1	Lump Sum	$1,080,000	$1,080,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	205,200	cubic yards	$50	$10,260,000
	Removal of exposed sed. - Otsego (2009)	197,100	cubic yards	$50	$9,855,000
	Removal of exposed sed. - Trowbridge (2013)	1,330,000	cubic yards	$50	$66,500,000
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$2,564,931	$2,565,000
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$2,531,660	$2,531,660
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$10,278,946	$10,278,946
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$112,907,000
	Engineering/Project Management (8%)				$9,033,000
	Construction Oversight (6%)				$6,774,000
	Contingency (20%)				$22,581,000
				TOTAL (YEARS 2006 - 2010):	$151,295,000
				PRESENT VALUE:	$63,197,000

Table A-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$569,000	$569,000
	General Conditions	1	Lump Sum	$427,000	$427,000
	Project Insurance	1	Lump Sum	$285,000	$285,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	Operate CDF - labor	389	days	$3,086	$1,201,000
	CDF & WTF maintenance	4	Years	$2,658,000	$10,632,000
	WTF chemicals	2,292	M Gal	$1,500	$3,439,000
	WTF filter media	2,292	M Gal	$200	$458,000
	WTF activated carbon	2,292	M Gal	$1,860	$4,264,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$29,748,000
	Engineering/Project Management (5%)				$1,487,000
	Construction Oversight (6%)				$1,785,000
	Contingency (20%)				$5,950,000
				TOTAL (YEARS 2007 - 2010):	$38,970,000
				PRESENT VALUE:	$21,989,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$1,415,000	$1,415,000
	General Conditions	1	Lump Sum	$1,061,000	$1,061,000
	Project Insurance	1	Lump Sum	$708,000	$708,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,010,224	$2,010,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$2,626,229	$2,626,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$12,751,193	$12,751,000
	3 Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,846,000	$5,846,000
	CDF top liner	6,950,855	square feet	$0.50	$3,475,000
	CDF cover material	772,317	cubic yards	$25	$19,308,000
	CDF 2% graded cap	867,773	cubic yards	$25	$21,694,000
	SUBTOTAL				$73,937,000
	Engineering/Project Management (8%)				$5,915,000
	Construction Oversight (6%)				$4,436,000
	Contingency (20%)				$14,787,000
				TOTAL (YEARS 2012 - 2020):	$99,075,000
				PRESENT VALUE:	$34,075,000
	SUBTOTAL DREDGING CONSTRUCTION				$331,003,000
	SUBTOTAL DREDGING OPERATION				$171,097,000
	SUBTOTAL DREDGING				$502,100,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$154,762,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$99,241,000
	SUBTOTAL PRESENT WORTH DREDGING				$254,003,000

Table A-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$16,795	$739,000	$152,000
	SUBTOTAL ANNUAL				$1,812,000
	SUBTOTAL ANNUAL ALL YEARS				$43,812,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,934,000
				GRAND TOTAL COST:	**$545,912,000**
				GRAND TOTAL PRESENT WORTH COST:	**$266,937,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Exposed sediments are excavated by backhoe and trucked to CDF locations.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.

Table A-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging Former Impoundments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2,400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2,400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on a bulking factor of 1.56 with 20-ft ultimate height. Seven facilities are anticipated, with total containment volume of 3.8 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assumes internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDFs consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$210,000	$210,000
	General Conditions	1	Lump Sum	$157,000	$157,000
	Project Insurance	1	Lump Sum	$105,000	$105,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	14,870	linear foot	$21	$312,000
	Access road construction/restoration	34,981	square yard	$27	$944,000
	CDF A = 25.7 Acres	- -	- -	- -	- -
		- -	- -	- -	- -
		- -	- -	- -	- -
	CDF Land lease or purchase	31	Acres	$0	$0
	CDF clearing & grubbing	31	Acres	$7,700	$239,000
	CDF bedding	41,395	cubic yards	$20	$828,000
	CDF exterior dikes	189,043	cubic yards	$15	$2,836,000
	CDF interior dikes	116,823	cubic yards	$15	$1,752,000
	CDF liner, bot & walls	1,117,668	square feet	$0.50	$559,000
	CDF piping	10,987	Linear feet	$12	$131,000
	CDF monitoring wells	5	wells	$1,000	$5,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$10,950,000
	Engineering/Project Management (8%)				$876,000
	Construction Oversight (6%)				$657,000
	Contingency (20%)				$2,190,000
				TOTAL (YEARS 2005 - 2006):	$14,673,000
				PRESENT VALUE:	$10,462,000

Table A-2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$289,000	$289,000
	General Conditions	1	Lump Sum	$217,000	$217,000
	Project Insurance	1	Lump Sum	$145,000	$145,000
	Construction Trailers	18	Months	$400	$7,000
	Dredges, barges, pumps and boats	1.5	Crew-Years	$700,726	$1,051,000
	Dredge, boat and pump fuel use	1.5	Crew-Years	$654,410	$982,000
	Dredge labor	1.5	Crew-Years	$1,303,584	$1,955,000
	Dredge pipelines	1.5	Crew-Years	$696,960	$1,045,000
	Silt Curtains, reefing and anchoring	1.5	Crew-Years	$123,000	$185,000
	Turbidity monitoring stations	1	Lump Sum	$308,000	$308,000
	Shoreline protection	1	Lump Sum	$766,000	$766,000
	Operate CDF - labor	419	days	$3,086	$1,293,000
	CDF & WTF maintenance	1.5	Years	$449,000	$674,000
	WTF chemicals	1,197	M Gal	$1,500	$1,796,000
	WTF filter media	1,197	M Gal	$200	$239,000
	WTF activated carbon	1,197	M Gal	$1,860	$2,226,000
	Operate WTF - labor	419	days	$4,629	$1,939,000
	SUBTOTAL				$15,117,000
	Engineering/Project Management (5%)				$756,000
	Construction Oversight (6%)				$907,000
	Contingency (20%)				$3,023,000
				TOTAL (YEARS 2006 - 2010):	$19,803,000
				PRESENT VALUE:	$11,578,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$297,000	$297,000
	General Conditions	1	Lump Sum	$223,000	$223,000
	Project Insurance	1	Lump Sum	$149,000	$149,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	205,200	cubic yards	$50	$10,260,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$2,564,931	$2,565,000
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$15,528,000
	Engineering/Project Management (8%)				$1,242,000
	Construction Oversight (6%)				$932,000
	Contingency (20%)				$3,106,000
				TOTAL (YEARS 2006 - 2010):	$20,808,000
				PRESENT VALUE:	$10,123,000

Table A-2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$74,000	$74,000
	General Conditions	1	Lump Sum	$55,000	$55,000
	Project Insurance	1	Lump Sum	$37,000	$37,000
	Construction Trailers	4	Months	$400	$1,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	Operate CDF - labor	75	days	$3,086	$231,000
	CDF & WTF maintenance	0.3	Years	$549,000	$165,000
	WTF chemicals	445	M Gal	$1,500	$667,000
	WTF filter media	445	M Gal	$200	$89,000
	WTF activated carbon	445	M Gal	$1,860	$827,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$3,842,000
	Engineering/Project Management (5%)				$192,000
	Construction Oversight (6%)				$231,000
	Contingency (20%)				$768,000
				TOTAL (YEARS 2007 - 2010):	$5,033,000
				PRESENT VALUE:	$2,840,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$204,000	$204,000
	General Conditions	1	Lump Sum	$153,000	$153,000
	Project Insurance	1	Lump Sum	$102,000	$102,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,024,763	$3,025,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	848,060	square feet	$0.50	$424,000
	CDF cover material	94,229	cubic yards	$25	$2,356,000
	CDF 2% graded cap	55,667	cubic yards	$25	$1,392,000
	SUBTOTAL				$10,648,000
	Engineering/Project Management (8%)				$852,000
	Construction Oversight (6%)				$639,000
	Contingency (20%)				$2,130,000
				TOTAL (YEARS 2012 - 2020):	$14,269,000
				PRESENT VALUE:	$4,907,000
	SUBTOTAL DREDGING CONSTRUCTION				$49,750,000
	SUBTOTAL DREDGING OPERATION				$24,836,000
	SUBTOTAL DREDGING				$74,586,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$25,492,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$14,418,000
	SUBTOTAL PRESENT WORTH DREDGING				$39,910,000

Table A-2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$4,000	$176,000	$36,000
	SUBTOTAL ANNUAL				$1,799,000
	SUBTOTAL ANNUAL ALL YEARS				$43,249,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,818,000
				GRAND TOTAL COST:	**$117,835,000**
				GRAND TOTAL PRESENT WORTH COST:	**$52,728,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Exposed sediments are excavated by backhoe and trucked to CDF locations.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.

Table A-2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-PW - Hydraulic Dredging of Submerged Sediments at the Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on a bulking factor of 1.15 with 20-ft ultimate height. Two facilities are anticipated, with total containment volume of 0.5 million cy. Side slopes of 1:3 add additional area requirements, in addition to a nearby facility for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. It is assumed that one treatment facility will serve the CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft will be constructed for the WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$316,000	$316,000
	General Conditions	1	Lump Sum	$237,000	$237,000
	Project Insurance	1	Lump Sum	$158,000	$158,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	23,333	linear foot	$21	$490,000
	Access road construction/restoration	54,887	square yard	$27	$1,482,000
		- -	- -	- -	- -
	CDF B = 49 Acres	- -	- -	- -	- -
		- -	- -	- -	- -
	CDF Land lease or purchase	54	Acres	$0	$0
	CDF clearing & grubbing	54	Acres	$7,700	$416,000
	CDF bedding	79,029	cubic yards	$20	$1,581,000
	CDF exterior dikes	271,756	cubic yards	$15	$4,076,000
	CDF interior dikes	235,800	cubic yards	$15	$3,537,000
	CDF liner, bot & walls	2,133,791	square feet	$0.50	$1,067,000
	CDF piping	21,084	Linear feet	$12	$251,000
	CDF monitoring wells	7	wells	$1,000	$7,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedime	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$16,490,000
	Engineering/Project Management (8%)				$1,319,000
	Construction Oversight (6%)				$989,000
	Contingency (20%)				$3,298,000
				TOTAL (YEARS 2005 - 2006):	$22,096,000
				PRESENT VALUE:	$15,754,000

Table A-2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$614,000	$614,000
	General Conditions	1	Lump Sum	$461,000	$461,000
	Project Insurance	1	Lump Sum	$307,000	$307,000
	Construction Trailers	37	Months	$400	$15,000
	Dredges, barges, pumps and boats	3.1	Crew-Years	$700,726	$2,172,000
	Dredge, boat and pump fuel use	3.1	Crew-Years	$654,410	$2,029,000
	Dredge labor	3.1	Crew-Years	$1,303,584	$4,041,000
	Dredge pipelines	3.1	Crew-Years	$696,960	$2,161,000
	Silt Curtains, reefing and anchoring	3.1	Crew-Years	$123,000	$381,000
	Turbidity monitoring stations	1	Lump Sum	$760,000	$760,000
	Shoreline protection	1	Lump Sum	$1,597,000	$1,597,000
	Operate CDF - labor	874	days	$3,086	$2,696,000
	CDF & WTF maintenance	3.1	Years	$669,000	$2,074,000
	WTF chemicals	2,454	M Gal	$1,500	$3,681,000
	WTF filter media	2,454	M Gal	$200	$491,000
	WTF activated carbon	2,454	M Gal	$1,860	$4,565,000
	Operate WTF - labor	874	days	$4,629	$4,044,000
	SUBTOTAL				$32,089,000
	Engineering/Project Management (5%)				$1,604,000
	Construction Oversight (6%)				$1,925,000
	Contingency (20%)				$6,418,000
				TOTAL (YEARS 2006 - 2010):	$42,036,000
				PRESENT VALUE:	$24,577,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$288,000	$288,000
	General Conditions	1	Lump Sum	$216,000	$216,000
	Project Insurance	1	Lump Sum	$144,000	$144,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell	0	cubic yards	$50	$0
	Removal of exposed sed. - Otsego (2	197,100	cubic yards	$50	$9,855,000
	Removal of exposed sed. - Trowbrid	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement -	1	Lump Sum	$0	$0
	Bank stab. & habitat enhancement -	1	Lump Sum	$2,531,660	$2,531,660
	Bank stab. & habitat enhancemt - Tro	1	Lump Sum	$0	$0
	WTF coagulation/flocculation/sedime	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$15,069,000
	Engineering/Project Management (8%)				$1,206,000
	Construction Oversight (6%)				$904,000
	Contingency (20%)				$3,014,000
				TOTAL (YEARS 2006 - 2010):	$20,193,000
				PRESENT VALUE:	$8,809,000

Table A-2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-2-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$118,000	$118,000
	General Conditions	1	Lump Sum	$88,000	$88,000
	Project Insurance	1	Lump Sum	$59,000	$59,000
	Construction Trailers	5	Months	$400	$2,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	Operate CDF - labor	125	days	$3,086	$387,000
	CDF & WTF maintenance	0.40	Years	$770,000	$308,000
	WTF chemicals	738	M Gal	$1,500	$1,106,000
	WTF filter media	738	M Gal	$200	$148,000
	WTF activated carbon	738	M Gal	$1,860	$1,372,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$6,156,000
	Engineering/Project Management (5%)				$308,000
	Construction Oversight (6%)				$369,000
	Contingency (20%)				$1,231,000
				TOTAL (YEARS 2007 - 2010):	$8,064,000
				PRESENT VALUE:	$4,550,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$333,000	$333,000
	General Conditions	1	Lump Sum	$249,000	$249,000
	Project Insurance	1	Lump Sum	$166,000	$166,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainw	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$3,761,339	$3,761,000
	Exposed soil cover & veget. - Trowbri	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	1,752,521	square feet	$0.50	$876,000
	CDF cover material	194,725	cubic yards	$25	$4,868,000
	CDF 2% graded cap	165,367	cubic yards	$25	$4,134,000
	SUBTOTAL				$17,379,000
	Engineering/Project Management (8%)				$1,390,000
	Construction Oversight (6%)				$1,043,000
	Contingency (20%)				$3,476,000
				TOTAL (YEARS 2012 - 2020):	$23,288,000
				PRESENT VALUE:	$8,009,000
	SUBTOTAL DREDGING CONSTRUCTION				$65,577,000
	SUBTOTAL DREDGING OPERATION				$50,100,000
	SUBTOTAL DREDGING				$115,677,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$32,572,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$29,127,000
	SUBTOTAL PRESENT WORTH DREDGING				$61,699,000

Table A-2-OT

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Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
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	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$5,591	$246,000	$51,000
	SUBTOTAL ANNUAL				$1,801,000
	SUBTOTAL ANNUAL ALL YEARS				$43,319,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,833,000
				GRAND TOTAL COST:	**$158,996,000**
				GRAND TOTAL PRESENT WORTH COST:	**$74,532,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
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- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Exposed sediments are excavated by backhoe and trucked to CDF locations.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.

Table A-2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

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- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2,269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2,400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3,580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on a bulking factor of 1.62 in facilities with 20-ft ultimate height. Three facilities are anticipated, with total containment volume of 0.9 million cy. Side slopes of 1:3 add additional area requirements, in addition to a nearby facility for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDFs consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. It is assumed that one treatment facility will serve the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- One control building of 1500 square ft will be constructed for the WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative A-2TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$627,000	$627,000
	General Conditions	1	Lump Sum	$470,000	$470,000
	Project Insurance	1	Lump Sum	$313,000	$313,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	66,797	linear foot	$21	$1,403,000
	Access road construction/restoration	157,132	square yard	$27	$4,243,000
		- -	- -	- -	- -
		- -	- -	- -	- -
	CDF C = 113.5 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	118	Acres	$0	$0
	CDF clearing & grubbing	118	Acres	$7,700	$909,000
	CDF bedding	183,063	cubic yards	$20	$3,661,000
	CDF exterior dikes	428,159	cubic yards	$15	$6,422,000
	CDF interior dikes	585,024	cubic yards	$15	$8,775,000
	CDF liner, bot & walls	4,942,690	square feet	$0.50	$2,471,000
	CDF piping	48,776	Linear feet	$12	$580,000
	CDF monitoring wells	10	wells	$1,000	$10,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$32,756,000
	Engineering/Project Management (8%)				$2,620,000
	Construction Oversight (6%)				$1,965,000
	Contingency (20%)				$6,551,000
				TOTAL (YEARS 2005 - 2006):	$43,892,000
				PRESENT VALUE:	$31,294,000

Table A-2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative A-2TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$968,000	$968,000
	General Conditions	1	Lump Sum	$726,000	$726,000
	Project Insurance	1	Lump Sum	$484,000	$484,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	4.6	Crew-Years	$700,726	$3,223,000
	Dredge, boat and pump fuel use	4.6	Crew-Years	$654,410	$3,010,000
	Dredge labor	4.6	Crew-Years	$1,303,584	$5,996,000
	Dredge pipelines	4.6	Crew-Years	$696,960	$3,206,000
	Silt Curtains, reefing and anchoring	4.6	Crew-Years	$123,000	$566,000
	Turbidity monitoring stations	1	Lump Sum	$1,068,000	$1,068,000
	Shoreline protection	1	Lump Sum	$2,348,000	$2,348,000
	Operate CDF - labor	1,284	days	$3,086	$3,962,000
	CDF & WTF maintenance	5	Years	$1,239,000	$6,195,000
	WTF chemicals	3,607	M Gal	$1,500	$5,410,000
	WTF filter media	3,607	M Gal	$200	$721,000
	WTF activated carbon	3,607	M Gal	$1,860	$6,709,000
	Operate WTF - labor	1,284	days	$4,629	$5,944,000
	SUBTOTAL				$50,560,000
	Engineering/Project Management (5%)				$2,528,000
	Construction Oversight (6%)				$3,034,000
	Contingency (20%)				$10,112,000
				TOTAL (YEARS 2006 - 2010):	$66,234,000
				PRESENT VALUE:	$38,725,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$1,657,000	$1,657,000
	General Conditions	1	Lump Sum	$1,242,000	$1,242,000
	Project Insurance	1	Lump Sum	$828,000	$828,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed - Plainwell (2018)	0	cubic yards	$50	$0
	Removal of exposed sed - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed - Trowbridge (2013)	1,330,000	cubic yards	$50	$66,500,000
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$10,278,946	$10,278,946
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$86,560,000
	Engineering/Project Management (8%)				$6,925,000
	Construction Oversight (6%)				$5,194,000
	Contingency (20%)				$17,312,000
				TOTAL (YEARS 2006 - 2010):	$115,991,000
				PRESENT VALUE:	$47,097,000

Table A-2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative A-2TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$298,000	$298,000
	General Conditions	1	Lump Sum	$224,000	$224,000
	Project Insurance	1	Lump Sum	$149,000	$149,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	Operate CDF - labor	189	days	$3,086	$583,000
	CDF & WTF maintenance	4	Years	$1,541,000	$6,164,000
	WTF chemicals	1,110	M Gal	$1,500	$1,665,000
	WTF filter media	1,110	M Gal	$200	$222,000
	WTF activated carbon	1,110	M Gal	$1,860	$2,065,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$15,580,000
	Engineering/Project Management (5%)				$779,000
	Construction Oversight (6%)				$935,000
	Contingency (20%)				$3,116,000
				TOTAL (YEARS 2007 - 2010):	$20,410,000
				PRESENT VALUE:	$11,517,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$1,015,000	$1,015,000
	General Conditions	1	Lump Sum	$761,000	$761,000
	Project Insurance	1	Lump Sum	$507,000	$507,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$15,708,088	$15,708,000
	3 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$3,557,000	$3,557,000
	CDF top liner	4,350,275	square feet	$0.50	$2,175,000
	CDF cover material	483,364	cubic yards	$25	$12,084,000
	CDF 2% graded cap	646,740	cubic yards	$25	$16,169,000
	SUBTOTAL				$53,019,000
	Engineering/Project Management (8%)				$4,242,000
	Construction Oversight (6%)				$3,181,000
	Contingency (20%)				$10,604,000
				TOTAL (YEARS 2012 - 2020):	$71,046,000
				PRESENT VALUE:	$24,435,000
	SUBTOTAL DREDGING CONSTRUCTION				$230,929,000
	SUBTOTAL DREDGING OPERATION				$86,644,000
	SUBTOTAL DREDGING				$317,573,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$102,826,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$50,242,000
	SUBTOTAL PRESENT WORTH DREDGING				$153,068,000

Table A-2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative A-2TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$8,000	$352,000	$72,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$43,425,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,854,000
				GRAND TOTAL COST:	**$360,998,000**
				GRAND TOTAL PRESENT WORTH COST:	**$165,922,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.

Table A-2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative A-2TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls, and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on achieving long-term solids content of 47% w/w in facilities with 20-ft ultimate height. Three facilities are anticipated, with total containment volume of 2.4 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design. Confined Disposal of Dredged Material. U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$927,000	$927,000
	General Conditions	1	Lump Sum	$695,000	$695,000
	Project Insurance	1	Lump Sum	$463,000	$463,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$7,815,000	$7,815,000
	FP Filter press conditioning tanks	1	LS	$326,000	$326,000
	FP Filter presses	8	Yrs.	$2,015,000	$16,391,000
	FP Lime storage silos	1	LS	$255,000	$255,000
	FP Lime handling facilities	1	LS	$201,000	$201,000
	FP Polymer handling facilities	1	LS	$101,000	$101,000
	FP Polymer holding facilities	1	LS	$40,000	$40,000
	FP pumps, piping, M&E	1	LS	$3,769,000	$3,769,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	42,555	sq yards	$25	$1,064,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,281,000	$1,281,000
	SUBTOTAL				$48,413,000
	Engineering/Project Management (8%)				$3,873,000
	Construction Oversight (6%)				$2,905,000
	Contingency (20%)				$9,683,000
				TOTAL (YEARS 2005 - 2006):	$64,874,000
				PRESENT VALUE:	$46,254,000

Table A-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$8,501,000	$8,501,000
	General Conditions	1	Lump Sum	$6,376,000	$6,376,000
	Project Insurance	1	Lump Sum	$4,250,000	$4,250,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$4,164,000	$4,164,000
	FP lime use	311,941	dry Tons	$89	$27,763,000
	FP polymer use	1,701,944	Lbs	$0.33	$562,000
	Effluent neutralization at WTF	31,971,326	Lbs	$1.54	$49,236,000
	FP electrical use	75,346,378	kwh	$0.06	$4,521,000
	FP operating labor	2,550,665	Labor-hrs.	$25	$63,767,000
	FP QA/QC & management labor	63,769	Labor-hrs.	$40	$2,551,000
	FP & WTF maintenance	5	Years	$1,870,000	$9,350,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	81,989	Labor-hrs.	$25	$2,050,000
	SHF Other on-site Operations	36,440	Labor-hrs.	$25	$911,000
	SHF Weigh station	8	Yrs.	$18,000	$146,000
	SHF Electricity and utilities	2,277	Days	$10	$23,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	3,270,627	wet T	$60	$196,238,000
	SHF QA Monitoring and analyses	32	weeks	$2,800	$91,000
	WTF chemicals	6,439	M Gal	$1,500	$9,659,000
	WTF filter media	6,439	M Gal	$200	$1,288,000
	WTF activated carbon	6,439	M Gal	$1,860	$11,977,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$444,168,000
	Engineering/Project Management (5%)				$22,208,000
	Construction Oversight (6%)				$26,650,000
	Contingency (20%)				$88,834,000
				TOTAL (YEARS 2006 - 2010):	$581,860,000
				PRESENT VALUE:	$340,200,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$8,236,000	$8,236,000
	General Conditions	1	Lump Sum	$6,177,000	$6,177,000
	Project Insurance	1	Lump Sum	$4,118,000	$4,118,000
	Construction Trailers	60	Months	$400	$24,000
	Remove & solidify exposed sed. - Plainwell (2006)	360,000	cubic yards	$61	$21,888,000
	Remove & solidify exposed sed. - Otsego (2008)	540,000	cubic yards	$61	$32,832,000
	Remove & solidify exposed sed. - Trowbridge (2009	1,900,000	cubic yards	$61	$115,520,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	3,696,000	wet T	$60	$221,760,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$8,066,000	$8,066,000
	FP Filter press conditioning tanks	1	LS	$336,000	$336,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$430,352,000
	Engineering/Project Management (8%)				$34,428,000
	Construction Oversight (6%)				$25,821,000
	Contingency (20%)				$86,070,000
				TOTAL (YEARS 2006 - 2010):	$576,671,000
				PRESENT VALUE:	$248,088,000

Table A-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$1,781,000	$1,781,000
	General Conditions	1	Lump Sum	$1,336,000	$1,336,000
	Project Insurance	1	Lump Sum	$890,000	$890,000
	Construction Trailers	17	Months	$400	$7,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	FP lime use	53,297	dry Tons	$89	$4,743,000
	FP polymer use	290,787	Lbs	$0.33	$96,000
	Effluent neutralization at WTF	11,415,348	Lbs	$1.54	$17,580,000
	FP electrical use	12,873,369	kwh	$0.06	$772,000
	FP operating labor	435,796	Labor-hrs.	$25	$10,895,000
	FP QA/QC & management labor	10,895	Labor-hrs.	$40	$436,000
	SHF Front-end loaders and operators	14,008	Labor-hrs.	$25	$350,000
	SHF Other on-site Operations	6,226	Labor-hrs.	$25	$156,000
	SHF Weigh station	1.4	Yrs.	$18,000	$25,000
	SHF Electricity and utilities	389	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	558,806	wet T	$60	$33,528,000
	SHF QA Monitoring and analyses	65	weeks	$2,800	$182,000
	FP & WTF maintenance	1.4	Years	$2,592,000	$3,629,000
	WTF chemicals	2,299	M Gal	$1,500	$3,449,000
	WTF filter media	2,299	M Gal	$200	$460,000
	WTF activated carbon	2,299	M Gal	$1,860	$4,276,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$93,049,000
	Engineering/Project Management (5%)				$4,652,000
	Construction Oversight (6%)				$5,583,000
	Contingency (20%)				$18,610,000
				TOTAL (YEARS 2007 - 2010):	$121,894,000
				PRESENT VALUE:	$68,780,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$840,000	$840,000
	General Conditions	1	Lump Sum	$630,000	$630,000
	Project Insurance	1	Lump Sum	$420,000	$420,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	3 Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,486,000	$5,486,000
	FP decommissioning	1	Lump Sum	$5,779,600	$5,780,000
	SHF Decommissioning, decontamination and site re	1	LS	$165,000	$165,000
	SUBTOTAL				$43,913,000
	Engineering/Project Management (8%)				$3,513,000
	Construction Oversight (6%)				$2,635,000
	Contingency (20%)				$8,783,000
				TOTAL (YEARS 2012 - 2020):	$58,844,000
				PRESENT VALUE:	$20,238,000
	SUBTOTAL DREDGING CONSTRUCTION				$700,389,000
	SUBTOTAL DREDGING OPERATION				$703,754,000
	SUBTOTAL DREDGING				$1,404,143,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$314,580,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$408,980,000
	SUBTOTAL PRESENT WORTH DREDGING				$723,560,000

Table A-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	SUBTOTAL ANNUAL				$1,795,000
	SUBTOTAL ANNUAL ALL YEARS				$43,073,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,782,000
				GRAND TOTAL COST:	**$1,447,216,000**
				GRAND TOTAL PRESENT WORTH COST:	**$736,342,000**
					$326.45
					$166.10

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the draft FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the water line.
- Dry excavation of the exposed former sediments would be by conventional long-reach excavators, off-road dump trucks, and wide track dozers.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.

Table A-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3 - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.

- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 10,419,511 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 217,073 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 14,100 cf filter press cost of $ 14,154,000 is amortized over 10 years at 7% for annual cost of 2,015,000.
- FP Lime storage silos based on 95,877 cf lime storage capacity for 7 days inventory at installed cost of $ 255,000.
- FP Lime handling facilities based on 411 dry T/day handling facilities at installed cost of $ 201,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 2,242 lb/day polymer useage.
- FP Polymer holding facilities based on 2,242 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 2,762,354 cu yds of wet cake handled over a 2,277-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 311,941 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 1,701,944 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 39,971,326 lbs of neutralization chemical to treat 6,434 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 75,346,378 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 1,770,750 dry Tons of sediment cake production during a period of 2,277 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 2,277-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 2,277-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs /day during the 2,277-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft will be constructed for the WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$200,000	$200,000
	General Conditions	1	Lump Sum	$150,000	$150,000
	Project Insurance	1	Lump Sum	$100,000	$100,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	1	Yrs.	$934,000	$1,251,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$636,000	$636,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$10,445,000
	Engineering/Project Management (8%)				$836,000
	Construction Oversight (6%)				$627,000
	Contingency (20%)				$2,089,000
				TOTAL (YEARS 2005 - 2006):	$13,997,000
				PRESENT VALUE:	$9,980,000

Table A-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,407,000	$1,407,000
	General Conditions	1	Lump Sum	$1,056,000	$1,056,000
	Project Insurance	1	Lump Sum	$704,000	$704,000
	Construction Trailers	16	Months	$400	$6,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$685,000	$685,000
	FP lime use	51,346	dry Tons	$89	$4,570,000
	FP polymer use	280,143	Lbs	$0.33	$92,000
	Effluent neutralization at WTF	5,262,543	Lbs	$1.54	$8,104,000
	FP electrical use	12,402,162	kwh	$0.06	$744,000
	FP operating labor	419,844	Labor-hrs.	$25	$10,496,000
	FP QA/QC & management labor	10,497	Labor-hrs.	$40	$420,000
	FP & WTF maintenance	5	Years	$413,000	$2,065,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	13,496	Labor-hrs.	$25	$337,000
	SHF Other on-site Operations	5,998	Labor-hrs.	$25	$150,000
	SHF Weigh station	1	Yrs.	$18,000	$23,000
	SHF Electricity and utilities	375	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	538,352	wet T	$60	$32,301,000
	SHF QA Monitoring and analyses	5	weeks	$2,800	$15,000
	WTF chemicals	1,060	M Gal	$1,500	$1,590,000
	WTF filter media	1,060	M Gal	$200	$212,000
	WTF activated carbon	1,060	M Gal	$1,860	$1,971,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$73,540,000
	Engineering/Project Management (5%)				$3,677,000
	Construction Oversight (6%)				$4,412,000
	Contingency (20%)				$14,708,000
				TOTAL (YEARS 2006 - 2010):	$96,337,000
				PRESENT VALUE:	$56,326,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$1,124,000	$1,124,000
	General Conditions	1	Lump Sum	$843,000	$843,000
	Project Insurance	1	Lump Sum	$562,000	$562,000
	Construction Trailers	60	Months	$400	$24,000
	Remove & solidify exposed sed. - Plainwell (2006)	360,000	cubic yards	$61	$21,888,000
	Remove & solidify exposed sed. - Otsego (2008)	0	cubic yards	$61	$0
	Remove & solidify exposed sed. - Trowbridge (2009)	0	cubic yards	$61	$0
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	475,200	wet T	$60	$28,512,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$58,724,000
	Engineering/Project Management (8%)				$4,698,000
	Construction Oversight (6%)				$3,523,000
	Contingency (20%)				$11,745,000
				TOTAL (YEARS 2006 - 2010):	$78,690,000
				PRESENT VALUE:	$36,325,000

Table A-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$334,000	$334,000
	General Conditions	1	Lump Sum	$251,000	$251,000
	Project Insurance	1	Lump Sum	$167,000	$167,000
	Construction Trailers	4	Months	$400	$1,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	FP lime use	10,269	dry Tons	$89	$914,000
	FP polymer use	56,029	Lbs	$0.33	$18,000
	Effluent neutralization at WTF	2,199,513	Lbs	$1.54	$3,387,000
	FP electrical use	2,480,445	kwh	$0.06	$149,000
	FP operating labor	83,969	Labor-hrs	$25	$2,099,000
	FP QA/QC & management labor	2,099	Labor-hrs	$40	$84,000
	SHF Front-end loaders and operators	2,699	Labor-hrs	$25	$67,000
	SHF Other on-site Operations	1,200	Labor-hrs	$25	$30,000
	SHF Weigh station	0.3	Yrs.	$18,000	$5,000
	SHF Electricity and utilities	75	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	107,671	wet T	$60	$6,460,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$35,000
	FP & WTF maintenance	0.3	Years	$654,000	$196,000
	WTF chemicals	443	M Gal	$1,500	$664,000
	WTF filter media	443	M Gal	$200	$89,000
	WTF activated carbon	443	M Gal	$1,860	$824,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$17,471,000
	Engineering/Project Management (5%)				$874,000
	Construction Oversight (6%)				$1,048,000
	Contingency (20%)				$3,494,000
				TOTAL (YEARS 2007 - 2010):	$22,887,000
				PRESENT VALUE:	$12,914,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$144,000	$144,000
	General Conditions	1	Lump Sum	$108,000	$108,000
	Project Insurance	1	Lump Sum	$72,000	$72,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	1 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$974,600	$975,000
	SHF Decommissioning, decontamination and site restoratio	1	LS	$165,000	$165,000
	SUBTOTAL				$7,521,000
	Engineering/Project Management (8%)				$602,000
	Construction Oversight (6%)				$451,000
	Contingency (20%)				$1,504,000
				TOTAL (YEARS 2012 - 2020):	$10,078,000
				PRESENT VALUE:	$3,466,000
	SUBTOTAL DREDGING CONSTRUCTION				$102,765,000
	SUBTOTAL DREDGING OPERATION				$119,224,000
	SUBTOTAL DREDGING				$221,989,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$49,771,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$69,240,000
	SUBTOTAL PRESENT WORTH DREDGING				$119,011,000

Table A-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$8,190	$49,139	$28,000
	Confirmation sampling and analyses	(2006 - 2020)	$136,278	$2,044,164	$885,000
	Bank observation	(2010 - 2040)	$5,918	$183,451	$40,000
	Bank maintenance	(2010 - 2040)	$78,548	$2,435,000	$535,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	SUBTOTAL ANNUAL				$626,000
	SUBTOTAL ANNUAL ALL YEARS				$19,019,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$5,182,000
				GRAND TOTAL COST:	**$241,008,000**
				GRAND TOTAL PRESENT WORTH COST:	**$124,193,000**
					$381.93
					$196.81

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the draft FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the water line.
- Dry excavation of the exposed former sediments would be by conventional long-reach excavators, off-road dump trucks, and wide track dozers.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr

Table A-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Insitu solids = 77%; dredge solids = 5%, dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4,700 cf filter press cost of $6,560,000 is amortized over 10 years at 7% for annual cost of 934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 454,689 cu yds of wet cake handled over a 375-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 51,346 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 280,143 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 5,262,543 lbs of neutralization chemical to treat 1,060 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 12,402,162 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 291,469 dry Tons of sediment cake production during a period of 375 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 375-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 375-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 375-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft will be constructed for the WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$238,000	$238,000
	General Conditions	1	Lump Sum	$178,000	$178,000
	Project Insurance	1	Lump Sum	$119,000	$119,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	3	Yrs.	$934,000	$2,742,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$859,000	$859,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$12,421,000
	Engineering/Project Management (8%)				$994,000
	Construction Oversight (6%)				$745,000
	Contingency (20%)				$2,484,000
				TOTAL (YEARS 2005 - 2006):	$16,644,000
				PRESENT VALUE:	$11,867,000

Table A-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$3,050,000	$3,050,000
	General Conditions	1	Lump Sum	$2,288,000	$2,288,000
	Project Insurance	1	Lump Sum	$1,525,000	$1,525,000
	Construction Trailers	35	Months	$400	$14,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$1,503,000	$1,503,000
	FP lime use	112,594	dry Tons	$89	$10,021,000
	FP polymer use	614,309	Lbs	$0.33	$203,000
	Effluent neutralization at WTF	11,539,904	Lbs	$1.54	$17,771,000
	FP electrical use	27,195,931	kwh	$0.06	$1,632,000
	FP operating labor	920,651	Labor-hrs.	$25	$23,016,000
	FP QA/QC & management labor	23,017	Labor-hrs.	$40	$921,000
	FP & WTF maintenance	5	Years	$499,000	$2,495,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	29,594	Labor-hrs.	$25	$740,000
	SHF Other on-site Operations	13,153	Labor-hrs.	$25	$329,000
	SHF Weigh station	3	Yrs.	$18,000	$52,000
	SHF Electricity and utilities	822	Days	$10	$8,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,180,518	wet T	$60	$70,831,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$32,000
	WTF chemicals	2,324	M Gal	$1,500	$3,486,000
	WTF filter media	2,324	M Gal	$200	$465,000
	WTF activated carbon	2,324	M Gal	$1,860	$4,323,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$159,380,000
	Engineering/Project Management (5%)				$7,969,000
	Construction Oversight (6%)				$9,563,000
	Contingency (20%)				$31,876,000
				TOTAL (YEARS 2006 - 2010):	$208,788,000
				PRESENT VALUE:	$122,074,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$1,631,000	$1,631,000
	General Conditions	1	Lump Sum	$1,223,000	$1,223,000
	Project Insurance	1	Lump Sum	$816,000	$816,000
	Construction Trailers	60	Months	$400	$24,000
	Remove & solidify exposed sed. - Plainwell (2006)	0	cubic yards	$61	$0
	Remove & solidify exposed sed. - Otsego (2008)	540,000	cubic yards	$61	$32,832,000
	Remove & solidify exposed sed. - Trowbridge (2009	0	cubic yards	$61	$0
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	712,800	wet T	$60	$42,768,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$85,225,000
	Engineering/Project Management (8%)				$6,818,000
	Construction Oversight (6%)				$5,114,000
	Contingency (20%)				$17,045,000
				TOTAL (YEARS 2006 - 2010):	$114,202,000
				PRESENT VALUE:	$49,808,000

Table A-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$553,000	$553,000
	General Conditions	1	Lump Sum	$415,000	$415,000
	Project Insurance	1	Lump Sum	$277,000	$277,000
	Construction Trailers	5	Months	$400	$2,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	FP lime use	17,174	dry Tons	$89	$1,528,000
	FP polymer use	93,701	Lbs	$0.33	$31,000
	Effluent neutralization at WTF	3,678,405	Lbs	$1.54	$5,665,000
	FP electrical use	4,148,228	kwh	$0.06	$249,000
	FP operating labor	140,428	Labor-hrs.	$25	$3,511,000
	FP QA/QC & management labor	3,511	Labor-hrs.	$40	$140,000
	SHF Front-end loaders and operators	4,514	Labor-hrs.	$25	$113,000
	SHF Other on-site Operations	2,006	Labor-hrs.	$25	$50,000
	SHF Weigh station	0.4	Yrs.	$18,000	$7,000
	SHF Electricity and utilities	125	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	180,066	wet T	$60	$10,804,000
	SHF QA Monitoring and analyses	21	weeks	$2,800	$59,000
	FP & WTF maintenance	0.4	Years	$739,000	$296,000
	WTF chemicals	741	M Gal	$1,500	$1,111,000
	WTF filter media	741	M Gal	$200	$148,000
	WTF activated carbon	741	M Gal	$1,860	$1,378,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$28,906,000
	Engineering/Project Management (5%)				$1,445,000
	Construction Oversight (6%)				$1,734,000
	Contingency (20%)				$5,781,000
				TOTAL (YEARS 2007 - 2010):	$37,866,000
				PRESENT VALUE:	$21,366,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$170,000	$170,000
	General Conditions	1	Lump Sum	$128,000	$128,000
	Project Insurance	1	Lump Sum	$85,000	$85,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	1 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,317,400	$1,317,000
	SHF Decommissioning, decontamination and site re	1	LS	$165,000	$165,000
	SUBTOTAL				$8,898,000
	Engineering/Project Management (8%)				$712,000
	Construction Oversight (6%)				$534,000
	Contingency (20%)				$1,780,000
				TOTAL (YEARS 2012 - 2020):	$11,924,000
				PRESENT VALUE:	$4,101,000
	SUBTOTAL DREDGING CONSTRUCTION				$142,770,000
	SUBTOTAL DREDGING OPERATION				$246,654,000
	SUBTOTAL DREDGING				$389,424,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$65,776,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$143,440,000
	SUBTOTAL PRESENT WORTH DREDGING				$209,216,000

Table A-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$17,228	$103,371	$59,000
	Confirmation sampling and analyses	(2006 - 2020)	$286,681	$4,300,213	$1,862,000
	Bank observation	(2010 - 2040)	$12,449	$385,917	$85,000
	Bank maintenance	(2010 - 2040)	$165,226	$5,122,000	$1,126,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	SUBTOTAL ANNUAL				$879,000
	SUBTOTAL ANNUAL ALL YEARS				$24,219,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$6,826,000
				GRAND TOTAL COST:	**$413,643,000**
				GRAND TOTAL PRESENT WORTH COST:	**$216,042,000**
					$376.08
					$196.42

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the draft FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the water line.
- Dry excavation of the exposed former sediments would be by conventional long-reach excavators, off-road dump trucks, and wide track dozers.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach

Table A-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-OT - Hydraulic Dredging of Submerged Sediments at the Former Otsego Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration
- FP Filter presses based on 4,700 cf filter press cost of $6,560,000 is amortized over 10 years at 7% for annual cost of $934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $93,000 includes conveying, mixing and dust control
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 997,059 cu yds of wet cake handled over a 822-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 112,594 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 614,309 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 11,539.904 lbs of neutralization chemical to treat 2,324 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 27,159,931 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the
- FP operating labor is based on 1,120 labor-hrs./day to process 639,144 dry Tons of sediment cake production during a period of 822 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 822-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 822-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 822-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft to be constructed for the WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trwobridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trwobridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$327,000	$327,000
	General Conditions	1	Lump Sum	$245,000	$245,000
	Project Insurance	1	Lump Sum	$163,000	$163,000
	Construction Trailers	24	Months	$400	$10,000
	Cleanng	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	4	Yrs.	$934,000	$3,605,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$989,000	$989,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$17,067,000
	Engineenng/Project Management (8%)				$1,365,000
	Construction Oversight (6%)				$1,024,000
	Contingency (20%)				$3,413,000
				TOTAL (YEARS 2005 - 2006):	$22,869,000
				PRESENT VALUE:	$16,305,000

Table A-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trwobridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trwobridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$4,003,000	$4,003,000
	General Conditions	1	Lump Sum	$3,002,000	$3,002,000
	Project Insurance	1	Lump Sum	$2,002,000	$2,002,000
	Construction Trailers	47	Months	$400	$19,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$1,976,000	$1,976,000
	FP lime use	148,001	dry Tons	$89	$13,172,000
	FP polymer use	807,492	Lbs	$0.33	$266,000
	Effluent neutralization at WTF	15,168,879	Lbs	$1.54	$23,360,000
	FP electrical use	35,748,285	kwh	$0.06	$2,145,000
	FP operating labor	1,210,170	Labor-hrs.	$25	$30,254,000
	FP QA/QC & management labor	30,256	Labor-hrs.	$40	$1,210,000
	FP & WTF maintenance	5	Years	$548,000	$2,740,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	38,900	Labor-hrs.	$25	$972,000
	SHF Other on-site Operations	17,289	Labor-hrs.	$25	$432,000
	SHF Weigh station	4	Yrs.	$18,000	$70,000
	SHF Electricity and utilities	1,081	Days	$10	$11,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,551,757	wet T	$60	$93,105,000
	SHF QA Monitoring and analyses	16	weeks	$2,800	$44,000
	WTF chemicals	3,055	M Gal	$1,500	$4,583,000
	WTF filter media	3,055	M Gal	$200	$611,000
	WTF activated carbon	3,055	M Gal	$1,860	$5,682,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$209,167,000
	Engineering/Project Management (5%)				$10,458,000
	Construction Oversight (6%)				$12,550,000
	Contingency (20%)				$41,833,000
				TOTAL (YEARS 2006 - 2010):	$274,008,000
				PRESENT VALUE:	$160,206,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$5,482,000	$5,482,000
	General Conditions	1	Lump Sum	$4,112,000	$4,112,000
	Project Insurance	1	Lump Sum	$2,741,000	$2,741,000
	Construction Trailers	60	Months	$400	$24,000
	Remove & solidify exposed sed. - Plainwell (2006)	0	cubic yards	$61	$0
	Remove & solidify exposed sed. - Otsego (2008)	0	cubic yards	$61	$0
	Remove & solidify exposed sed. - Trowbridge (2009	1,900,000	cubic yards	$61	$115,520,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	2,508,000	wet T	$60	$150,480,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$286,455,000
	Engineering/Project Management (8%)				$22,916,000
	Construction Oversight (6%)				$17,187,000
	Contingency (20%)				$57,291,000
				TOTAL (YEARS 2006 - 2010):	$383,849,000
				PRESENT VALUE:	$161,990,000

Table A-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trwobridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trwobridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$842,000	$842,000
	General Conditions	1	Lump Sum	$631,000	$631,000
	Project Insurance	1	Lump Sum	$421,000	$421,000
	Construction Trailers	8	Months	$400	$3,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	FP lime use	25,854	dry Tons	$89	$2,301,000
	FP polymer use	141,057	Lbs	$0.33	$47,000
	Effluent neutralization at WTF	5,537,430	Lbs	$1.54	$8,528,000
	FP electrical use	6,244,696	kwh	$0.06	$375,000
	FP operating labor	211,399	Labor-hrs.	$25	$5,285,000
	FP QA/QC & management labor	5,285	Labor-hrs.	$40	$211,000
	SHF Front-end loaders and operators	6,795	Labor-hrs.	$25	$170,000
	SHF Other on-site Operations	3,020	Labor-hrs.	$25	$76,000
	SHF Weigh station	0.7	Yrs.	$18,000	$13,000
	SHF Electricity and utilities	189	Days	$10	$2,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	271,069	wet T	$60	$16,264,000
	SHF QA Monitoring and analyses	31	weeks	$2,800	$88,000
	FP & WTF maintenance	0.7	Years	$789,000	$552,000
	WTF chemicals	1,115	M Gal	$1,500	$1,673,000
	WTF filter media	1,115	M Gal	$200	$223,000
	WTF activated carbon	1,115	M Gal	$1,860	$2,074,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$43,970,000
	Engineering/Project Management (5%)				$2,199,000
	Construction Oversight (6%)				$2,638,000
	Contingency (20%)				$8,794,000
				TOTAL (YEARS 2007 - 2010):	$57,601,000
				PRESENT VALUE:	$32,502,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$495,000	$495,000
	General Conditions	1	Lump Sum	$371,000	$371,000
	Project Insurance	1	Lump Sum	$248,000	$248,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	1 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,516,000	$1,516,000
	SHF Decommissioning, decontamination and site re	1	LS	$165,000	$165,000
	SUBTOTAL				$25,870,000
	Engineering/Project Management (8%)				$2,070,000
	Construction Oversight (6%)				$1,552,000
	Contingency (20%)				$5,174,000
				TOTAL (YEARS 2012 - 2020):	$34,666,000
				PRESENT VALUE:	$11,923,000
	SUBTOTAL DREDGING CONSTRUCTION				$441,384,000
	SUBTOTAL DREDGING OPERATION				$331,609,000
	SUBTOTAL DREDGING				$772,993,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$190,218,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$192,708,000
	SUBTOTAL PRESENT WORTH DREDGING				$382,926,000

Table A-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trwobridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trwobridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$24,582	$147,491	$84,000
	Confirmation sampling and analyses	(2006 - 2020)	$409,041	$6,135,622	$2,656,000
	Bank observation	(2010 - 2040)	$17,762	$550,633	$121,000
	Bank maintenance	(2010 - 2040)	$235,774	$7,309,000	$1,607,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	SUBTOTAL ANNUAL				$1,085,000
	SUBTOTAL ANNUAL ALL YEARS				$28,450,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,162,000
				GRAND TOTAL COST:	**$801,443,000**
				GRAND TOTAL PRESENT WORTH COST:	**$391,088,000**
					$296.58
					$144.73

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the draft FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the water line.
- Dry excavation of the exposed former sediments would be by conventional long-reach excavators, off-road dump trucks, and wide track dozers.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.

Table A-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-3-TRO - Hydraulic Dredging of Submerged Sediments at the Former Trwobridge Impoundment, Dry Excavation of Exposed Sediment and Removal of Dam Sills at the Former Trwobridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- 6 miles avg. pipeline reach
- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 7'2,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4,700 cf filter press cost of $6,560,000 is amortized over 10 years at 7% for annual cost of $934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 1,310,606 cu yds of wet cake handled over a 1,081-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 148,001 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 807,492 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 15,168,879 lbs of neutralization chemical to treat 3,055 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 35,748,285 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 840,137 dry Tons of sediment cake production during a period of 1,081 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 1,081-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 1,081-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 1,081-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft to be constructed for the WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$928,000	$928,000
	General Conditions	1	Lump Sum	$696,000	$696,000
	Project Insurance	1	Lump Sum	$464,000	$464,000
	Construction Trailers	24	Months	$400	$10,000
	Cleanng	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	Site preparation	15	Acres	$6,000	$90,000
	FP Dredge slurry holding basins	1	LS	$7,815,000	$7,815,000
	FP Filter press conditioning tanks	1	LS	$326,000	$326,000
	FP Filter presses	8	Yrs.	$2,015,000	$16,391,000
	FP Lime storage silos	1	LS	$255,000	$255,000
	FP Lime handling facilities	1	LS	$201,000	$201,000
	FP Polymer handling facilities	1	LS	$101,000	$101,000
	FP Polymer holding facilities	1	LS	$40,000	$40,000
	FP pumps, piping, M&E	1	LS	$3,769,000	$3,769,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	42,555	sq yards	$25	$1,064,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,281,000	$1,281,000
	SUBTOTAL				$48,470,000
	Engineenng/Project Management (8%)				$3,878,000
	Construction Oversight (6%)				$2,908,000
	Contingency (20%)				$9,694,000
				TOTAL (YEARS 2005 - 2006):	$64,950,000
				PRESENT VALUE:	$46,308,000

Table A-4A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$9,185,000	$9,185,000
	General Conditions	1	Lump Sum	$6,889,000	$6,889,000
	Project Insurance	1	Lump Sum	$4,593,000	$4,593,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	910,000	Square Ft	$8	$7,280,000
	Bank excavation and solids stabilization	210,648	Cubic yards	$61	$12,850,000
	Bank replacement	63,194	Cubic yards	$25	$1,580,000
	FP lime use	311,941	dry Tons	$89	$27,763,000
	FP polymer use	1,701,944	Lbs	$0.33	$562,000
	Effluent neutralization at WTF	31,971,326	Lbs	$1.54	$49,236,000
	FP electrical use	75,346,378	kwh	$0.06	$4,521,000
	FP operating labor	2,550,665	Labor-hrs.	$25	$63,767,000
	FP QA/QC & management labor	63,769	Labor-hrs.	$40	$2,551,000
	FP & WTF maintenance	5	Years	$1,870,000	$9,350,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	81,989	Labor-hrs.	$25	$2,050,000
	SHF Other on-site Operations	36,440	Labor-hrs.	$25	$911,000
	SHF Weigh station	8	Yrs.	$18,000	$146,000
	SHF Electricity and utilities	2,277	Days	$10	$23,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	3,548,682	wet T	$60	$212,921,000
	SHF QA Monitoring and analyses	32	weeks	$2,800	$91,000
	WTF chemicals	6,439	M Gal	$1,500	$9,659,000
	WTF filter media	6,439	M Gal	$200	$1,288,000
	WTF activated carbon	6,439	M Gal	$1,860	$11,977,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$479,937,000
	Engineering/Project Management (5%)				$23,997,000
	Construction Oversight (6%)				$28,796,000
	Contingency (20%)				$95,987,000
				TOTAL (YEARS 2006 - 2010):	$628,717,000
				PRESENT VALUE:	$367,596,000

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$396,000	$396,000
	General Conditions	1	Lump Sum	$297,000	$297,000
	Project Insurance	1	Lump Sum	$198,000	$198,000
	Construction Trailers	60	Months	$400	$24,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$8,066,000	$8,066,000
	FP Filter press conditioning tanks	1	LS	$336,000	$336,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$20,712,000
	Engineering/Project Management (8%)				$1,657,000
	Construction Oversight (6%)				$1,243,000
	Contingency (20%)				$4,142,000
				TOTAL (YEARS 2006 - 2010):	$27,754,000
				PRESENT VALUE:	$13,305,000

Table A-4A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$1,781,000	$1,781,000
	General Conditions	1	Lump Sum	$1,336,000	$1,336,000
	Project Insurance	1	Lump Sum	$890,000	$890,000
	Construction Trailers	17	Months	$400	$7,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	FP lime use	53,297	dry Tons	$89	$4,743,000
	FP polymer use	290,787	Lbs	$0.33	$96,000
	Effluent neutralization at WTF	11,415,348	Lbs	$1.54	$17,580,000
	FP electrical use	12,873,369	kwh	$0.06	$772,000
	FP operating labor	435,796	Labor-hrs.	$25	$10,895,000
	FP QA/QC & management labor	10,895	Labor-hrs.	$40	$436,000
	SHF Front-end loaders and operators	14,008	Labor-hrs.	$25	$350,000
	SHF Other on-site Operations	6,226	Labor-hrs.	$25	$156,000
	SHF Weigh station	1.4	Yrs.	$18,000	$25,000
	SHF Electricity and utilities	389	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	558,806	wet T	$60	$33,528,000
	SHF QA Monitoring and analyses	65	weeks	$2,800	$182,000
	FP & WTF maintenance	1.4	Years	$2,592,000	$3,629,000
	WTF chemicals	2,299	M Gal	$1,500	$3,449,000
	WTF filter media	2,299	M Gal	$200	$460,000
	WTF activated carbon	2,299	M Gal	$1,860	$4,276,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$93,049,000
	Engineering/Project Management (5%)				$4,652,000
	Construction Oversight (6%)				$5,583,000
	Contingency (20%)				$18,610,000
				TOTAL (YEARS 2007 - 2010):	$121,894,000
				PRESENT VALUE:	$68,780,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$840,000	$840,000
	General Conditions	1	Lump Sum	$630,000	$630,000
	Project Insurance	1	Lump Sum	$420,000	$420,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	3 Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,486,000	$5,486,000
	FP decommissioning	1	Lump Sum	$5,779,600	$5,780,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$43,913,000
	Engineering/Project Management (8%)				$3,513,000
	Construction Oversight (6%)				$2,635,000
	Contingency (20%)				$8,783,000
				TOTAL (YEARS 2012 - 2020):	$58,844,000
				PRESENT VALUE:	$20,238,000
	SUBTOTAL DREDGING CONSTRUCTION				$151,548,000
	SUBTOTAL DREDGING OPERATION				$750,611,000
	SUBTOTAL DREDGING				$902,159,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$79,851,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$436,376,000
	SUBTOTAL PRESENT WORTH DREDGING				$516,227,000

Table A-4A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	SUBTOTAL ANNUAL				$1,795,000
	SUBTOTAL ANNUAL ALL YEARS				$43,073,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,782,000
				GRAND TOTAL COST:	**$945,232,000**
				GRAND TOTAL PRESENT WORTH COST:	**$529,009,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Bank replacement and habitant enhancement includes sheetpile installation in front of the banks, backfill placement in front of the sheeting plus limited enhancement.
- Habitat enhancement includes revegetation of the replaced river banks consisting of native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the water line, as described in Alternatives 3 and 4 of the FS (BBL, 2000).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. *It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98* escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.

Table A-4A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 10,419,511 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed
- FP Filter press conditioning tanks based on 217,073 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 14100 cf filter press cost of $ 14,154,000 is amortized over 10 years at 7% for annual cost of 2,015,000.
- FP Lime storage silos based on 95,877 cf lime storage capacity for 7 days inventory at installed cost of $ 255,000.
- FP Lime handling facilities based on 411 dry T/day handling facilities at installed cost of $ 201,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 2,242 lb/day polymer useage.
- FP Polymer holding facilities based on 2,242 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 2,762,354 cu yds of wet cake handled over a 2,277-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 311,941 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 1,701,944 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 31,971,326 lbs of neutralization chemical to treat 6,439 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 75,346,378 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 1,770,750 dry Tons of sediment cake production during a period of 2,277 days. Labor at $25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 2,277-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 2,277-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 2,277-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$200,000	$200,000
	General Conditions	1	Lump Sum	$150,000	$150,000
	Project Insurance	1	Lump Sum	$100,000	$100,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	1	Yrs.	$934,000	$1,251,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$636,000	$636,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$10,445,000
	Engineering/Project Management (8%)				$836,000
	Construction Oversight (6%)				$627,000
	Contingency (20%)				$2,089,000
				TOTAL (YEARS 2005 - 2006):	$13,997,000
				PRESENT VALUE:	$9,980,000

Table A-4A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,470,000	$1,470,000
	General Conditions	1	Lump Sum	$1,103,000	$1,103,000
	Project Insurance	1	Lump Sum	$735,000	$735,000
	Construction Trailers	16	Months	$400	$6,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	120,000	Square Ft	$8	$960,000
	Bank excavation and solids stabilization	27,778	Cubic yards	$61	$1,694,000
	Bank replacement	8,333	Cubic yards	$25	$208,000
	FP lime use	51,346	dry Tons	$89	$4,570,000
	FP polymer use	280,143	Lbs	$0.33	$92,000
	Effluent neutralization at WTF	5,262,543	Lbs	$1.54	$8,104,000
	FP electrical use	12,402,162	kwh	$0.06	$744,000
	FP operating labor	419,844	Labor-hrs.	$25	$10,496,000
	FP QA/QC & management labor	10,497	Labor-hrs.	$40	$420,000
	FP & WTF maintenance	2	Years	$413,000	$826,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	13,496	Labor-hrs.	$25	$337,000
	SHF Other on-site Operations	5,998	Labor-hrs.	$25	$150,000
	SHF Weigh station	1	Yrs.	$18,000	$23,000
	SHF Electricity and utilities	375	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	575,018	wet T	$60	$34,501,000
	SHF QA Monitoring and analyses	5	weeks	$2,800	$15,000
	WTF chemicals	1,060	M Gal	$1,500	$1,590,000
	WTF filter media	1,060	M Gal	$200	$212,000
	WTF activated carbon	1,060	M Gal	$1,860	$1,971,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$76,819,000
	Engineering/Project Management (5%)				$3,841,000
	Construction Oversight (6%)				$4,609,000
	Contingency (20%)				$15,364,000
				TOTAL (YEARS 2007 - 2008):	$100,633,000
				PRESENT VALUE:	$60,619,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$116,000	$116,000
	General Conditions	1	Lump Sum	$87,000	$87,000
	Project Insurance	1	Lump Sum	$58,000	$58,000
	Construction Trailers	24	Months	$400	$10,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,042,000
	Engineering/Project Management (8%)				$483,000
	Construction Oversight (6%)				$363,000
	Contingency (20%)				$1,208,000
				TOTAL (YEARS 2007 - 2008):	$8,096,000
				PRESENT VALUE:	$3,805,000

Table A-4A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$334,000	$334,000
	General Conditions	1	Lump Sum	$251,000	$251,000
	Project Insurance	1	Lump Sum	$167,000	$167,000
	Construction Trailers	4	Months	$400	$1,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	FP lime use	10,269	dry Tons	$89	$914,000
	FP polymer use	56,029	Lbs	$0.33	$18,000
	Effluent neutralization at WTF	2,199,513	Lbs	$1.54	$3,387,000
	FP electrical use	2,480,445	kwh	$0.06	$149,000
	FP operating labor	83,969	Labor-hrs.	$25	$2,099,000
	FP QA/QC & management labor	2,099	Labor-hrs.	$40	$84,000
	SHF Front-end loaders and operators	2,699	Labor-hrs	$25	$67,000
	SHF Other on-site Operations	1,200	Labor-hrs	$25	$30,000
	SHF Weigh station	0.3	Yrs.	$18,000	$5,000
	SHF Electricity and utilities	75	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	107,671	wet T	$60	$6,460,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$35,000
	FP & WTF maintenance	0.3	Years	$654,000	$196,000
	WTF chemicals	443	M Gal	$1,500	$664,000
	WTF filter media	443	M Gal	$200	$89,000
	WTF activated carbon	443	M Gal	$1,860	$824,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$17,471,000
	Engineering/Project Management (5%)				$874,000
	Construction Oversight (6%)				$1,048,000
	Contingency (20%)				$3,494,000
				TOTAL (YEARS 2007 - 2008):	$22,887,000
				PRESENT VALUE:	$13,787,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$127,000	$127,000
	General Conditions	1	Lump Sum	$95,000	$95,000
	Project Insurance	1	Lump Sum	$63,000	$63,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,373,871	$2,374,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	3 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$974,600	$975,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$6,633,000
	Engineering/Project Management (8%)				$531,000
	Construction Oversight (6%)				$398,000
	Contingency (20%)				$1,327,000
				TOTAL (YEARS 2009 - 2009):	$8,889,000
				PRESENT VALUE:	$4,835,000
	SUBTOTAL DREDGING CONSTRUCTION				$30,982,000
	SUBTOTAL DREDGING OPERATION				$123,520,000
	SUBTOTAL DREDGING				$154,502,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$18,620,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$74,406,000
	SUBTOTAL PRESENT WORTH DREDGING				$93,026,000

Table A-4A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$8,190	$16,380	$10,000
	Confirmation sampling and analyses	(2007 - 2008)	$136,278	$272,555	$164,000
	Bank observation	(2009 - 2039)	$5,918	$183,451	$43,000
	Bank maintenance	(2009 - 2039)	$78,548	$2,435,000	$573,000
	Monitoring - biota	(2007 - 2038)	$144,188	$4,614,000	$1,215,000
	Monitoring - water & sed	(2007 - 2038)	$134,125	$4,292,000	$1,130,000
	KALSIM model updates	(2007 - 2038)	$124,875	$3,996,000	$1,052,000
	SUBTOTAL ANNUAL				$632,000
	SUBTOTAL ANNUAL ALL YEARS				$15,809,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$4,187,000
				GRAND TOTAL COST:	**$170,311,000**
				GRAND TOTAL PRESENT WORTH COST:	**$97,213,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments for access to the work areas.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.

Table A-4A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of 934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 454,689 cu yds of wet cake handled over a 375-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 51,346 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 280,143 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 5,262,543 lbs of neutralization chemical to treat 1,060 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 12,402,162 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 291,469 dry Tons of sediment cake production during a period of 375 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 2,786-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 375-day processing period
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 375-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$238,000	$238,000
	General Conditions	1	Lump Sum	$178,000	$178,000
	Project Insurance	1	Lump Sum	$119,000	$119,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	3	Yrs.	$934,000	$2,742,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$859,000	$859,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$12,421,000
	Engineering/Project Management (8%)				$994,000
	Construction Oversight (6%)				$745,000
	Contingency (20%)				$2,484,000
				TOTAL (YEARS 2005 - 2006):	$16,644,000
				PRESENT VALUE:	$11,867,000

Table A-4A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$3,221,000	$3,221,000
	General Conditions	1	Lump Sum	$2,416,000	$2,416,000
	Project Insurance	1	Lump Sum	$1,611,000	$1,611,000
	Construction Trailers	35	Months	$400	$14,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	250,000	Square Ft	$8	$2,000,000
	Bank excavation and solids stabilization	57,870	Cubic yards	$61	$3,530,000
	Bank replacement	17,361	Cubic yards	$25	$434,000
	FP lime use	112,594	dry Tons	$89	$10,021,000
	FP polymer use	614,309	Lbs	$0.33	$203,000
	Effluent neutralization at WTF	11,539,904	Lbs	$1.54	$17,771,000
	FP electrical use	27,195,931	kwh	$0.06	$1,632,000
	FP operating labor	920,651	Labor-hrs.	$25	$23,016,000
	FP QA/QC & management labor	23,017	Labor-hrs.	$40	$921,000
	FP & WTF maintenance	4	Years	$499,000	$1,996,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	29,594	Labor-hrs.	$25	$740,000
	SHF Other on-site Operations	13,153	Labor-hrs.	$25	$329,000
	SHF Weigh station	3	Yrs.	$18,000	$52,000
	SHF Electricity and utilities	822	Days	$10	$8,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,256,907	wet T	$60	$75,414,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$32,000
	WTF chemicals	2,324	M Gal	$1,500	$3,486,000
	WTF filter media	2,324	M Gal	$200	$465,000
	WTF activated carbon	2,324	M Gal	$1,860	$4,323,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$168,310,000
	Engineering/Project Management (5%)				$8,416,000
	Construction Oversight (6%)				$10,099,000
	Contingency (20%)				$33,662,000
				TOTAL (YEARS 2007 - 2010):	$220,487,000
				PRESENT VALUE:	$124,412,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$119,000	$119,000
	General Conditions	1	Lump Sum	$89,000	$89,000
	Project Insurance	1	Lump Sum	$59,000	$59,000
	Construction Trailers	24	Months	$400	$10,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,208,000
	Engineering/Project Management (8%)				$497,000
	Construction Oversight (6%)				$372,000
	Contingency (20%)				$1,242,000
				TOTAL (YEARS 2007 - 2010):	$8,319,000
				PRESENT VALUE:	$3,820,000

Table A-4A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$553,000	$553,000
	General Conditions	1	Lump Sum	$415,000	$415,000
	Project Insurance	1	Lump Sum	$277,000	$277,000
	Construction Trailers	5	Months	$400	$2,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	FP lime use	17,174	dry Tons	$89	$1,528,000
	FP polymer use	93,701	Lbs	$0.33	$31,000
	Effluent neutralization at WTF	3,678,405	Lbs	$1.54	$5,665,000
	FP electrical use	4,148,228	kwh	$0.06	$249,000
	FP operating labor	140,428	Labor-hrs.	$25	$3,511,000
	FP QA/QC & management labor	3,511	Labor-hrs.	$40	$140,000
	SHF Front-end loaders and operators	4,514	Labor-hrs.	$25	$113,000
	SHF Other on-site Operations	2,006	Labor-hrs.	$25	$50,000
	SHF Weigh station	0.4	Yrs.	$18,000	$7,000
	SHF Electricity and utilities	125	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	180,066	wet T	$60	$10,804,000
	SHF QA Monitoring and analyses	21	weeks	$2,800	$59,000
	FP & WTF maintenance	0.4	Years	$739,000	$296,000
	WTF chemicals	741	M Gal	$1,500	$1,111,000
	WTF filter media	741	M Gal	$200	$148,000
	WTF activated carbon	741	M Gal	$1,860	$1,378,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$28,906,000
	Engineering/Project Management (5%)				$1,445,000
	Construction Oversight (6%)				$1,734,000
	Contingency (20%)				$5,781,000
				TOTAL (YEARS 2007 - 2010):	$37,866,000
				PRESENT VALUE:	$21,366,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$125,000	$125,000
	General Conditions	1	Lump Sum	$94,000	$94,000
	Project Insurance	1	Lump Sum	$63,000	$63,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$1,941,403	$1,941,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	3 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,317,400	$1,317,000
	SHF Decommissioning, decontamination and site r	1	LS	$165,000	$165,000
	SUBTOTAL				$6,544,000
	Engineering/Project Management (8%)				$524,000
	Construction Oversight (6%)				$393,000
	Contingency (20%)				$1,309,000
				TOTAL (YEARS 2011 - 2011):	$8,770,000
				PRESENT VALUE:	$4,167,000
	SUBTOTAL DREDGING CONSTRUCTION				$33,733,000
	SUBTOTAL DREDGING OPERATION				$258,353,000
	SUBTOTAL DREDGING				$292,086,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$19,854,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$145,778,000
	SUBTOTAL PRESENT WORTH DREDGING				$165,632,000

Table A-4A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	SUBTOTAL ANNUAL				$1,798,000
	SUBTOTAL ANNUAL ALL YEARS				$33,118,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,703,000
				GRAND TOTAL COST:	**$325,204,000**
				GRAND TOTAL PRESENT WORTH COST:	**$174,335,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments.
- Bank replacement and habitat enhancement includes sheetpile installation in front of the banks, backfill placement in front of the sheeting plus habitat enhancement.
- Habitat enhancement includes revegetation of the replaced river banks consisting of native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the water line, as described in Alternatives 3 and 4 of the FS (BBL, 2000).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production. A second overdredge of a 6-inch layer is assumed.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.

Table A-4A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $2 65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach
- First-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4,700 cf filter press cost of $6,560,000 is amortized over 10 years at 7% for annual cost of 2,015,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 997,059 cu yds of wet cake handled over a 822-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 112,594 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 614,309 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 11,539,904 lbs of neutralization chemical to treat 2,324 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 27,195,931 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 639,144 dry Tons of sediment cake production during a period of 822 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 822-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 822-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 2,786-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- A control building of 1500 square ft to be constructed for the WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$327,000	$327,000
	General Conditions	1	Lump Sum	$245,000	$245,000
	Project Insurance	1	Lump Sum	$163,000	$163,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	4	Yrs	$934,000	$3,605,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$989,000	$989,000
	SHF Solids handling site preparation	240	Labor-hrs	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$17,067,000
	Engineering/Project Management (8%)				$1,365,000
	Construction Oversight (6%)				$1,024,000
	Contingency (20%)				$3,413,000
				TOTAL (YEARS 2005 - 2006):	$22,869,000
				PRESENT VALUE:	$16,305,000

Table A-4A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$4,419,000	$4,419,000
	General Conditions	1	Lump Sum	$3,315,000	$3,315,000
	Project Insurance	1	Lump Sum	$2,210,000	$2,210,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	540,000	Square Ft	$8	$4,320,000
	Bank excavation and soilds stabilization	125,000	Cubic yards	$61	$7,625,000
	Bank replacement	37,500	Cubic yards	$25	$938,000
	FP lime use	148,001	dry Tons	$89	$13,172,000
	FP polymer use	807,492	Lbs	$0.33	$266,000
	Effluent neutralization at WTF	15,168,879	Lbs	$1.54	$23,360,000
	FP electrical use	35,748,285	kwh	$0.06	$2,145,000
	FP operating labor	1,210,170	Labor-hrs	$25	$30,254,000
	FP QA/QC & management labor	30,256	Labor-hrs	$40	$1,210,000
	FP & WTF maintenance	5	Years	$548,000	$2,740,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	38,900	Labor-hrs	$25	$972,000
	SHF Other on-site Operations	17,289	Labor-hrs	$25	$432,000
	SHF Weigh station	4	Yrs	$18,000	$70,000
	SHF Electricity and utilities	1,081	Days	$10	$11,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,716,757	wet T	$60	$103,005,000
	SHF QA Monitoring and analyses	16	weeks	$2,800	$44,000
	WTF chemicals	3,055	M Gal	$1,500	$4,583,000
	WTF filter media	3,055	M Gal	$200	$611,000
	WTF activated carbon	3,055	M Gal	$1,860	$5,682,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$230,916,000
	Engineering/Project Management (5%)				$11,546,000
	Construction Oversight (6%)				$13,855,000
	Contingency (20%)				$46,183,000
				TOTAL (YEARS 2007 - 2011):	$302,500,000
				PRESENT VALUE:	$165,294,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$162,000	$162,000
	General Conditions	1	Lump Sum	$122,000	$122,000
	Project Insurance	1	Lump Sum	$81,000	$81,000
	Construction Trailers	60	Months	$400	$24,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$8,485,000
	Engineering/Project Management (8%)				$679,000
	Construction Oversight (6%)				$509,000
	Contingency (20%)				$1,697,000
				TOTAL (YEARS 2007 - 2011):	$11,370,000
				PRESENT VALUE:	$5,025,000

Table A-4A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$842,000	$842,000
	General Conditions	1	Lump Sum	$631,000	$631,000
	Project Insurance	1	Lump Sum	$421,000	$421,000
	Construction Trailers	8	Months	$400	$3,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	FP lime use	25,854	dry Tons	$89	$2,301,000
	FP polymer use	141,057	Lbs	$0.33	$47,000
	Effluent neutralization at WTF	5,537,430	Lbs	$1.54	$8,528,000
	FP electrical use	6,244,696	kwh	$0.06	$375,000
	FP operating labor	211,399	Labor-hrs	$25	$5,285,000
	FP QA/QC & management labor	5,285	Labor-hrs	$40	$211,000
	SHF Front-end loaders and operators	6,795	Labor-hrs	$25	$170,000
	SHF Other on-site Operations	3,020	Labor-hrs	$25	$76,000
	SHF Weigh station	0.7	Yrs	$18,000	$13,000
	SHF Electricity and utilities	189	Days	$10	$2,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	271,069	wet T	$60	$16,264,000
	SHF QA Monitoring and analyses	31	weeks	$2,800	$88,000
	FP & WTF maintenance	0.7	Years	$789,000	$552,000
	WTF chemicals	1,115	M Gal	$1,500	$1,673,000
	WTF filter media	1,115	M Gal	$200	$223,000
	WTF activated carbon	1,115	M Gal	$1,860	$2,074,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$43,970,000
	Engineering/Project Management (5%)				$2,199,000
	Construction Oversight (6%)				$2,638,000
	Contingency (20%)				$8,794,000
				TOTAL (YEARS 2007 - 2011):	$57,601,000
				PRESENT VALUE:	$31,475,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$495,000	$495,000
	General Conditions	1	Lump Sum	$371,000	$371,000
	Project Insurance	1	Lump Sum	$247,000	$247,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,516,000	$1,516,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$25,840,000
	Engineering/Project Management (8%)				$2,067,000
	Construction Oversight (6%)				$1,550,000
	Contingency (20%)				$5,168,000
				TOTAL (YEARS 2012 - 2014):	$34,625,000
				PRESENT VALUE:	$14,390,000
	SUBTOTAL DREDGING CONSTRUCTION				$68,864,000
	SUBTOTAL DREDGING OPERATION				$360,101,000
	SUBTOTAL DREDGING				$428,965,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$35,720,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$196,769,000
	SUBTOTAL PRESENT WORTH DREDGING				$232,489,000

Table A-4A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	SUBTOTAL ANNUAL				$1,796,000
	SUBTOTAL ANNUAL ALL YEARS				$34,351,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,920,000
				GRAND TOTAL COST:	**$463,316,000**
				GRAND TOTAL PRESENT WORTH COST:	**$241,409,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment for access to the work areas.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.

Table A-4A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls, and Monitoring

- Insitu solids = 77%, dredge solids = 5%, dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $199 per hour for 10 active hours per day, while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day, while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day
- Second-pass dredging of Kalamazoo River segments at 60 cy/hr, 10 hrs/day, 6 days/wk, 4 wk/mo, 10 mo/yr, 2400 hrs/yr, or 144000 cy/yr
- Insitu solids = 77%, dredge solids = 2.5%, dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $314 per hour for 10 active hours per day, while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day, while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of $ 934,000
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control
- FP Polymer handling facilities based on 747 lb/day polymer useage
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq. ft
- FP pumps, piping, M&E is based on 15 percent of cost of installed components
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days
- SHF Solids storage and handling facilities based on 1,310,606 cu yds of wet cake handled over a 1,081-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft
- FP lime use based on 148,001 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w
- FP polymer use based on 807,492 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 15,168,879 lbs of neutralization chemical to treat 3,055 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb to treat 75.26 MG].
- FP electrical use based on 35,748,285 kwhMW reported use of 1130 amps. 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 840,137 dry Tons of sediment cake production during a period of 1,081 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 1,081-day processing period
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 1,081-day processing period
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 1,081-day processing period
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$928,000	$928,000
	General Conditions	1	Lump Sum	$696,000	$696,000
	Project Insurance	1	Lump Sum	$464,000	$464,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	Site preparation	15	Acres	$6,000	$90,000
	FP Dredge slurry holding basins	1	LS	$7,815,000	$7,815,000
	FP Filter press conditioning tanks	1	LS	$326,000	$326,000
	FP Filter presses	8	Yrs.	$2,015,000	$16,391,000
	FP Lime storage silos	1	LS	$255,000	$255,000
	FP Lime handling facilities	1	LS	$201,000	$201,000
	FP Polymer handling facilities	1	LS	$101,000	$101,000
	FP Polymer holding facilities	1	LS	$40,000	$40,000
	FP pumps, piping, M&E	1	LS	$3,769,000	$3,769,000
	SHF Solids handling site preparation	240	Labor-hrs	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	42,555	sq yards	$25	$1,064,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,281,000	$1,281,000
	SUBTOTAL				$48,470,000
	Engineering/Project Management (8%)				$3,878,000
	Construction Oversight (6%)				$2,908,000
	Contingency (20%)				$9,694,000
				TOTAL (YEARS 2005 - 2006):	$64,950,000
				PRESENT VALUE:	$46,308,000

Table A-4B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$9,776,000	$9,776,000
	General Conditions	1	Lump Sum	$7,332,000	$7,332,000
	Project Insurance	1	Lump Sum	$4,888,000	$4,888,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	910,000	Square Ft	$8	$7,280,000
	Bank excavation and solids stabilization	421,296	Cubic yards	$61	$25,699,000
	Bank replacement	63,194	Cubic yards	$25	$1,580,000
	FP lime use	311,941	dry Tons	$89	$27,763,000
	FP polymer use	1,701,944	Lbs	$0.33	$562,000
	Effluent neutralization at WTF	31,971,326	Lbs	$1.54	$49,236,000
	FP electrical use	75,346,378	kwh	$0.06	$4,521,000
	FP operating labor	2,550,665	Labor-hrs.	$25	$63,767,000
	FP QA/QC & management labor	63,769	Labor-hrs.	$40	$2,551,000
	FP & WTF maintenance	5	Years	$1,870,000	$9,350,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	81,989	Labor-hrs.	$25	$2,050,000
	SHF Other on-site Operations	36,440	Labor-hrs.	$25	$911,000
	SHF Weigh station	8	Yrs.	$18,000	$146,000
	SHF Electricity and utilities	2,277	Days	$10	$23,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	3,826,738	wet T	$60	$229,604,000
	SHF QA Monitoring and analyses	32	weeks	$2,800	$91,000
	WTF chemicals	6,439	M Gal	$1,500	$9,659,000
	WTF filter media	6,439	M Gal	$200	$1,288,000
	WTF activated carbon	6,439	M Gal	$1,860	$11,977,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$510,798,000
	Engineering/Project Management (5%)				$25,540,000
	Construction Oversight (6%)				$30,648,000
	Contingency (20%)				$102,160,000
				TOTAL (YEARS 2006 - 2010):	$669,146,000
				PRESENT VALUE:	$391,234,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$396,000	$396,000
	General Conditions	1	Lump Sum	$297,000	$297,000
	Project Insurance	1	Lump Sum	$198,000	$198,000
	Construction Trailers	60	Months	$400	$24,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$8,066,000	$8,066,000
	FP Filter press conditioning tanks	1	LS	$336,000	$336,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$20,712,000
	Engineering/Project Management (8%)				$1,657,000
	Construction Oversight (6%)				$1,243,000
	Contingency (20%)				$4,142,000
				TOTAL (YEARS 2006 - 2010):	$27,754,000
				PRESENT VALUE:	$13,305,000

Table A-4B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$1,781,000	$1,781,000
	General Conditions	1	Lump Sum	$1,336,000	$1,336,000
	Project Insurance	1	Lump Sum	$890,000	$890,000
	Construction Trailers	17	Months	$400	$7,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	FP lime use	53,297	dry Tons	$89	$4,743,000
	FP polymer use	290,787	Lbs	$0.33	$96,000
	Effluent neutralization at WTF	11,415,348	Lbs	$1.54	$17,580,000
	FP electrical use	12,873,369	kwh	$0.06	$772,000
	FP operating labor	435,796	Labor-hrs.	$25	$10,895,000
	FP QA/QC & management labor	10,895	Labor-hrs.	$40	$436,000
	SHF Front-end loaders and operators	14,008	Labor-hrs.	$25	$350,000
	SHF Other on-site Operations	6,226	Labor-hrs.	$25	$156,000
	SHF Weigh station	1.4	Yrs.	$18,000	$25,000
	SHF Electricity and utilities	389	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	558,806	wet T	$60	$33,528,000
	SHF QA Monitoring and analyses	65	weeks	$2,800	$182,000
	FP & WTF maintenance	1.4	Years	$2,592,000	$3,629,000
	WTF chemicals	2,299	M Gal	$1,500	$3,449,000
	WTF filter media	2,299	M Gal	$200	$460,000
	WTF activated carbon	2,299	M Gal	$1,860	$4,276,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$93,049,000
	Engineering/Project Management (5%)				$4,652,000
	Construction Oversight (6%)				$5,583,000
	Contingency (20%)				$18,610,000
				TOTAL (YEARS 2007 - 2010):	$121,894,000
				PRESENT VALUE:	$68,780,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$840,000	$840,000
	General Conditions	1	Lump Sum	$630,000	$630,000
	Project Insurance	1	Lump Sum	$420,000	$420,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,486,000	$5,486,000
	FP decommissioning	1	Lump Sum	$5,779,600	$5,780,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$43,913,000
	Engineering/Project Management (8%)				$3,513,000
	Construction Oversight (6%)				$2,635,000
	Contingency (20%)				$8,783,000
				TOTAL (YEARS 2012 - 2020):	$58,844,000
				PRESENT VALUE:	$20,238,000
	SUBTOTAL DREDGING CONSTRUCTION				$151,548,000
	SUBTOTAL DREDGING OPERATION				$791,040,000
	SUBTOTAL DREDGING				$942,588,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$79,851,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$460,014,000
	SUBTOTAL PRESENT WORTH DREDGING				$539,865,000

Table A-4B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	SUBTOTAL ANNUAL				$1,795,000
	SUBTOTAL ANNUAL ALL YEARS				$43,073,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,782,000
				GRAND TOTAL COST:	**$985,661,000**
				GRAND TOTAL PRESENT WORTH COST:	**$552,647,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments to access the current impoundments.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.

Table A-4B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day
- 6 miles avg. pipeline reach assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 10,419,511 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 217,073 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 14100 cf filter press cost of $ 14,154,000 is amortized over 10 years at 7% for annual cost of $ 2,015,000.
- FP Lime storage silos based on 95,877 cf lime storage capacity for 7 days inventory at installed cost of $ 255,000.
- FP Lime handling facilities based on 411 dry T/day handling facilities at installed cost of $ 201,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 2,242 lb/day polymer useage.
- FP Polymer holding facilities based on 2,242 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 2,762,354 cu yds of wet cake handled over a 2,277-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 311,941 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 1,701,944 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 31,971,326 lbs of neutralization chemical to treat 6,439 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 75,346,378 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps.
- FP operating labor is based on 1,120 labor-hrs./day to process 1,770,750 dry Tons of sediment cake production during a period of 2,277 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 2,277-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 2,277-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 2,277-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Hydr. Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$200,000	$200,000
	General Conditions	1	Lump Sum	$150,000	$150,000
	Project Insurance	1	Lump Sum	$100,000	$100,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	1	Yrs.	$934,000	$1,251,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$636,000	$636,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$10,445,000
	Engineering/Project Management (8%)				$836,000
	Construction Oversight (6%)				$627,000
	Contingency (20%)				$2,089,000
				TOTAL (YEARS 2005 - 2006):	$13,997,000
				PRESENT VALUE:	$9,980,000

Table A-4B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Hydr. Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,548,000	$1,548,000
	General Conditions	1	Lump Sum	$1,161,000	$1,161,000
	Project Insurance	1	Lump Sum	$774,000	$774,000
	Construction Trailers	16	Months	$400	$6,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	120,000	Square Ft	$8	$960,000
	Bank excavation and soilds stabilization	55,556	Cubic yards	$61	$3,389,000
	Bank replacement	8,333	Cubic yards	$25	$208,000
	FP lime use	51,346	dry Tons	$89	$4,570,000
	FP polymer use	280,143	Lbs	$0.33	$92,000
	Effluent neutralization at WTF	5,262,543	Lbs	$1.54	$8,104,000
	FP electrical use	12,402,162	kwh	$0.06	$744,000
	FP operating labor	419,844	Labor-hrs.	$25	$10,496,000
	FP QA/QC & management labor	10,497	Labor-hrs.	$40	$420,000
	FP & WTF maintenance	2	Years	$413,000	$826,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	13,496	Labor-hrs.	$25	$337,000
	SHF Other on-site Operations	5,998	Labor-hrs.	$25	$150,000
	SHF Weigh station	1	Yrs.	$18,000	$23,000
	SHF Electricity and utilities	375	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	611,685	wet T	$60	$36,701,000
	SHF QA Monitoring and analyses	5	weeks	$2,800	$15,000
	WTF chemicals	1,060	M Gal	$1,500	$1,590,000
	WTF filter media	1,060	M Gal	$200	$212,000
	WTF activated carbon	1,060	M Gal	$1,860	$1,971,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$80,889,000
	Engineering/Project Management (5%)				$4,044,000
	Construction Oversight (6%)				$4,853,000
	Contingency (20%)				$16,178,000
				TOTAL (YEARS 2007 - 2008):	$105,964,000
				PRESENT VALUE:	$63,831,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$116,000	$116,000
	General Conditions	1	Lump Sum	$87,000	$87,000
	Project Insurance	1	Lump Sum	$58,000	$58,000
	Construction Trailers	24	Months	$400	$10,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,042,000
	Engineering/Project Management (8%)				$483,000
	Construction Oversight (6%)				$363,000
	Contingency (20%)				$1,208,000
				TOTAL (YEARS 2007 - 2008):	$8,096,000
				PRESENT VALUE:	$3,805,000

Table A-4B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Hydr. Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$334,000	$334,000
	General Conditions	1	Lump Sum	$251,000	$251,000
	Project Insurance	1	Lump Sum	$167,000	$167,000
	Construction Trailers	4	Months	$400	$1,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	FP lime use	10,269	dry Tons	$89	$914,000
	FP polymer use	56,029	Lbs	$0.33	$18,000
	Effluent neutralization at WTF	2,199,513	Lbs	$1.54	$3,387,000
	FP electrical use	2,480,445	kwh	$0.06	$149,000
	FP operating labor	83,969	Labor-hrs.	$25	$2,099,000
	FP QA/QC & management labor	2,099	Labor-hrs.	$40	$84,000
	SHF Front-end loaders and operators	2,699	Labor-hrs.	$25	$67,000
	SHF Other on-site Operations	1,200	Labor-hrs.	$25	$30,000
	SHF Weigh station	0.3	Yrs.	$18,000	$5,000
	SHF Electricity and utilities	75	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	107,671	wet T	$60	$6,460,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$35,000
	FP & WTF maintenance	0.3	Years	$654,000	$196,000
	WTF chemicals	443	M Gal	$1,500	$664,000
	WTF filter media	443	M Gal	$200	$89,000
	WTF activated carbon	443	M Gal	$1,860	$824,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$17,471,000
	Engineering/Project Management (5%)				$874,000
	Construction Oversight (6%)				$1,048,000
	Contingency (20%)				$3,494,000
				TOTAL (YEARS 2007 - 2008):	$22,887,000
				PRESENT VALUE:	$13,787,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$127,000	$127,000
	General Conditions	1	Lump Sum	$95,000	$95,000
	Project Insurance	1	Lump Sum	$63,000	$63,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,373,871	$2,374,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	3 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$974,600	$975,000
	SHF Decommissioning, decontamination and site restora	1	LS	$165,000	$165,000
	SUBTOTAL				$6,633,000
	Engineering/Project Management (8%)				$531,000
	Construction Oversight (6%)				$398,000
	Contingency (20%)				$1,327,000
				TOTAL (YEARS 2009 - 2009):	$8,889,000
				PRESENT VALUE:	$4,835,000
	SUBTOTAL DREDGING CONSTRUCTION				$30,982,000
	SUBTOTAL DREDGING OPERATION				$128,851,000
	SUBTOTAL DREDGING				$159,833,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$18,620,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$77,618,000
	SUBTOTAL PRESENT WORTH DREDGING				$96,238,000

Table A-4B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Hydr. Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$8,190	$16,380	$10,000
	Confirmation sampling and analyses	(2007 - 2008)	$136,278	$272,555	$164,000
	Bank observation	(2009 - 2039)	$5,918	$183,451	$43,000
	Bank maintenance	(2009 - 2039)	$78,548	$2,435,000	$573,000
	Monitoring - biota	(2007 - 2038)	$144,188	$4,614,000	$1,215,000
	Monitoring - water & sed	(2007 - 2038)	$134,125	$4,292,000	$1,130,000
	KALSIM model updates	(2007 - 2038)	$124,875	$3,996,000	$1,052,000
	SUBTOTAL ANNUAL				$632,000
	SUBTOTAL ANNUAL ALL YEARS				$15,809,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$4,187,000
				GRAND TOTAL COST:	**$175,642,000**
				GRAND TOTAL PRESENT WORTH COST:	**$100,425,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates Dunng the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment to access the current impoundments.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.

Table A-4B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Hydr. Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr, 10 hrs/day; 6 days/wk; 4 wk/mo, 10 mo/yr; 2400 hrs/yr, or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2,269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo, 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of $ 934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 454,689 cu yds of wet cake handled over a 375-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 51,346 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 280,143 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 5,262,543 lbs of neutralization chemical to treat 1,060 MG of filtrate. [MW reported 373,680 lbs at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 12,402,162 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 291,469 dry Tons of sediment cake production during a period of 375 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 375-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 375-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 375-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$238,000	$238,000
	General Conditions	1	Lump Sum	$178,000	$178,000
	Project Insurance	1	Lump Sum	$119,000	$119,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	3	Yrs.	$934,000	$2,742,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$859,000	$859,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$12,421,000
	Engineering/Project Management (8%)				$994,000
	Construction Oversight (6%)				$745,000
	Contingency (20%)				$2,484,000
				TOTAL (YEARS 2005 - 2006):	$16,644,000
				PRESENT VALUE:	$11,867,000

Table A-4B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$3,384,000	$3,384,000
	General Conditions	1	Lump Sum	$2,538,000	$2,538,000
	Project Insurance	1	Lump Sum	$1,692,000	$1,692,000
	Construction Trailers	35	Months	$400	$14,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	250,000	Square Ft	$8	$2,000,000
	Bank excavation and solids stabilization	115,741	Cubic yards	$61	$7,060,000
	Bank replacement	17,361	Cubic yards	$25	$434,000
	FP lime use	112,594	dry Tons	$89	$10,021,000
	FP polymer use	614,309	Lbs	$0.33	$203,000
	Effluent neutralization at WTF	11,539,904	Lbs	$1.54	$17,771,000
	FP electrical use	27,195,931	kwh	$0.06	$1,632,000
	FP operating labor	920,651	Labor-hrs	$25	$23,016,000
	FP QA/QC & management labor	23,017	Labor-hrs	$40	$921,000
	FP & WTF maintenance	4	Years	$499,000	$1,996,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	29,594	Labor-hrs	$25	$740,000
	SHF Other on-site Operations	13,153	Labor-hrs	$25	$329,000
	SHF Weigh station	3	Yrs	$18,000	$52,000
	SHF Electricity and utilities	822	Days	$10	$8,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,333,296	wet T	$60	$79,998,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$32,000
	WTF chemicals	2,324	M Gal	$1,500	$3,486,000
	WTF filter media	2,324	M Gal	$200	$465,000
	WTF activated carbon	2,324	M Gal	$1,860	$4,323,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$176,790,000
	Engineering/Project Management (5%)				$8,840,000
	Construction Oversight (6%)				$10,607,000
	Contingency (20%)				$35,358,000
				TOTAL (YEARS 2007 - 2010):	$231,595,000
				PRESENT VALUE:	$130,680,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$119,000	$119,000
	General Conditions	1	Lump Sum	$89,000	$89,000
	Project Insurance	1	Lump Sum	$59,000	$59,000
	Construction Trailers	24	Months	$400	$10,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,208,000
	Engineering/Project Management (8%)				$497,000
	Construction Oversight (6%)				$372,000
	Contingency (20%)				$1,242,000
				TOTAL (YEARS 2007 - 2010):	$8,319,000
				PRESENT VALUE:	$3,820,000

Table A-4B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$553,000	$553,000
	General Conditions	1	Lump Sum	$415,000	$415,000
	Project Insurance	1	Lump Sum	$277,000	$277,000
	Construction Trailers	5	Months	$400	$2,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	FP lime use	17,174	dry Tons	$89	$1,528,000
	FP polymer use	93,701	Lbs	$0.33	$31,000
	Effluent neutralization at WTF	3,678,405	Lbs	$1.54	$5,665,000
	FP electrical use	4,148,228	kwh	$0.06	$249,000
	FP operating labor	140,428	Labor-hrs	$25	$3,511,000
	FP QA/QC & management labor	3,511	Labor-hrs	$40	$140,000
	SHF Front-end loaders and operators	4,514	Labor-hrs	$25	$113,000
	SHF Other on-site Operations	2,006	Labor-hrs	$25	$50,000
	SHF Weigh station	0.4	Yrs	$18,000	$7,000
	SHF Electricity and utilities	125	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	180,066	wet T	$60	$10,804,000
	SHF QA Monitoring and analyses	21	weeks	$2,800	$59,000
	FP & WTF maintenance	0.4	Years	$739,000	$296,000
	WTF chemicals	741	M Gal	$1,500	$1,111,000
	WTF filter media	741	M Gal	$200	$148,000
	WTF activated carbon	741	M Gal	$1,860	$1,378,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$28,906,000
	Engineering/Project Management (5%)				$1,445,000
	Construction Oversight (6%)				$1,734,000
	Contingency (20%)				$5,781,000
				TOTAL (YEARS 2007 - 2010):	$37,866,000
				PRESENT VALUE:	$21,366,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$128,000	$128,000
	General Conditions	1	Lump Sum	$96,000	$96,000
	Project Insurance	1	Lump Sum	$64,000	$64,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget - Otsego	1	Lump Sum	$2,077,518	$2,078,000
	Exposed soil cover & veget - Trowbridge	1	Lump Sum	$0	$0
	3 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,317,400	$1,317,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$6,687,000
	Engineering/Project Management (8%)				$535,000
	Construction Oversight (6%)				$401,000
	Contingency (20%)				$1,337,000
				TOTAL (YEARS 2011 - 2011):	$8,960,000
				PRESENT VALUE:	$4,257,000
	SUBTOTAL DREDGING CONSTRUCTION				$33,923,000
	SUBTOTAL DREDGING OPERATION				$269,461,000
	SUBTOTAL DREDGING				$303,384,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$19,944,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$152,046,000
	SUBTOTAL PRESENT WORTH DREDGING				$171,990,000

Table A-4B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	SUBTOTAL ANNUAL				$1,798,000
	SUBTOTAL ANNUAL ALL YEARS				$33,118,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,703,000
				GRAND TOTAL COST:	**$336,502,000**
				GRAND TOTAL PRESENT WORTH COST:	**$180,693,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted
- Costs do not include, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments to access the current impoundments.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.

Table A-4B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- 6 miles avg. pipeline reach assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at 60 cy/hr 10 hrs/day; 6 days/wk, 4 wk/mo; 10 mo/yr, 2400 hrs/yr; or 144 000 cy/yr
- Insitu solids = 77%, dredge solids = 5%, dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day
- Second-pass dredging of Kalamazoo River segments at 60 cy/hr; 10 hrs/day 6 days/wk; 4 wk/mo, 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $314 per hour for 10 active hours per day, while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $48 per hour for 10 active hours per day, while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day This allows treatment during periods when dredging is not being performed
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min for solids conditioning prior to press filtration
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of $ 934,000
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control
- FP Polymer handling facilities based on 747 lb/day polymer useage
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days
- SHF Solids storage and handling facilities based on 997,059 cu yds of wet cake handled over a 822-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft
- FP lime use based on 112,594 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 614,309 lbs used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 11,539,904 lbs of neutralization chemical to treat 2,324 MG of filtrate [MW reported 373,680 lbs at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 27,195,931 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr] Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day
- FP operating labor is based on 1,120 labor-hrs /day to process 639,144 dry Tons of sediment cake production during a period of 822 days. Labor at $ 25.08/hr The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs /day for oversight during the 822-day processing period
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 822-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 822-day processing period
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations
- Construction oversight includes project management and daily reports
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000)
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring

Table A-4B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$327,000	$327,000
	General Conditions	1	Lump Sum	$245,000	$245,000
	Project Insurance	1	Lump Sum	$163,000	$163,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	4	Yrs.	$934,000	$3,605,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$989,000	$989,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$17,067,000
	Engineering/Project Management (8%)				$1,365,000
	Construction Oversight (6%)				$1,024,000
	Contingency (20%)				$3,413,000
				TOTAL (YEARS 2005 - 2006):	$22,869,000
				PRESENT VALUE:	$16,305,000

Table A-4B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$4,770,000	$4,770,000
	General Conditions	1	Lump Sum	$3,577,000	$3,577,000
	Project Insurance	1	Lump Sum	$2,385,000	$2,385,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	540,000	Square Ft	$8	$4,320,000
	Bank excavation and solids stabilization	250,000	Cubic yards	$61	$15,250,000
	Bank replacement	37,500	Cubic yards	$25	$938,000
	FP lime use	148,001	dry Tons	$89	$13,172,000
	FP polymer use	807,492	Lbs	$0.33	$266,000
	Effluent neutralization at WTF	15,168,879	Lbs	$1.54	$23,360,000
	FP electrical use	35,748,285	kwh	$0.06	$2,145,000
	FP operating labor	1,210,170	Labor-hrs.	$25	$30,254,000
	FP QA/QC & management labor	30,256	Labor-hrs.	$40	$1,210,000
	FP & WTF maintenance	5	Years	$548,000	$2,740,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	38,900	Labor-hrs.	$25	$972,000
	SHF Other on-site Operations	17,289	Labor-hrs.	$25	$432,000
	SHF Weigh station	4	Yrs.	$18,000	$70,000
	SHF Electricity and utilities	1,081	Days	$10	$11,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,881,757	wet T	$60	$112,905,000
	SHF QA Monitoring and analyses	16	weeks	$2,800	$44,000
	WTF chemicals	3,055	M Gal	$1,500	$4,583,000
	WTF filter media	3,055	M Gal	$200	$611,000
	WTF activated carbon	3,055	M Gal	$1,860	$5,682,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$249,229,000
	Engineering/Project Management (5%)				$12,461,000
	Construction Oversight (6%)				$14,954,000
	Contingency (20%)				$49,846,000
				TOTAL (YEARS 2007 - 2011):	$326,490,000
				PRESENT VALUE:	$178,403,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$162,000	$162,000
	General Conditions	1	Lump Sum	$122,000	$122,000
	Project Insurance	1	Lump Sum	$81,000	$81,000
	Construction Trailers	60	Months	$400	$24,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$8,485,000
	Engineering/Project Management (8%)				$679,000
	Construction Oversight (6%)				$509,000
	Contingency (20%)				$1,697,000
				TOTAL (YEARS 2007 - 2011):	$11,370,000
				PRESENT VALUE:	$5,025,000

Table A-4B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$842,000	$842,000
	General Conditions	1	Lump Sum	$631,000	$631,000
	Project Insurance	1	Lump Sum	$421,000	$421,000
	Construction Trailers	8	Months	$400	$3,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	FP lime use	25,854	dry Tons	$89	$2,301,000
	FP polymer use	141,057	Lbs	$0.33	$47,000
	Effluent neutralization at WTF	5,537,430	Lbs	$1.54	$8,528,000
	FP electrical use	6,244,696	kwh	$0.06	$375,000
	FP operating labor	211,399	Labor-hrs.	$25	$5,285,000
	FP QA/QC & management labor	5,285	Labor-hrs.	$40	$211,000
	SHF Front-end loaders and operators	6,795	Labor-hrs.	$25	$170,000
	SHF Other on-site Operations	3,020	Labor-hrs.	$25	$76,000
	SHF Weigh station	0.7	Yrs.	$18,000	$13,000
	SHF Electricity and utilities	189	Days	$10	$2,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	271,069	wet T	$60	$16,264,000
	SHF QA Monitoring and analyses	31	weeks	$2,800	$88,000
	FP & WTF maintenance	0.7	Years	$789,000	$552,000
	WTF chemicals	1,115	M Gal	$1,500	$1,673,000
	WTF filter media	1,115	M Gal	$200	$223,000
	WTF activated carbon	1,115	M Gal	$1,860	$2,074,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$43,970,000
	Engineering/Project Management (5%)				$2,199,000
	Construction Oversight (6%)				$2,638,000
	Contingency (20%)				$8,794,000
				TOTAL (YEARS 2007 - 2011):	$57,601,000
				PRESENT VALUE:	$31,475,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$495,000	$495,000
	General Conditions	1	Lump Sum	$371,000	$371,000
	Project Insurance	1	Lump Sum	$247,000	$247,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,516,000	$1,516,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$25,840,000
	Engineering/Project Management (8%)				$2,067,000
	Construction Oversight (6%)				$1,550,000
	Contingency (20%)				$5,168,000
				TOTAL (YEARS 2012 - 2014):	$34,625,000
				PRESENT VALUE:	$14,390,000
	SUBTOTAL DREDGING CONSTRUCTION				$68,864,000
	SUBTOTAL DREDGING OPERATION				$384,091,000
	SUBTOTAL DREDGING				$452,955,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$35,720,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$209,878,000
	SUBTOTAL PRESENT WORTH DREDGING				$245,598,000

Table A-4B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	SUBTOTAL ANNUAL				$1,796,000
	SUBTOTAL ANNUAL ALL YEARS				$34,351,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,920,000
				GRAND TOTAL COST:	**$487,306,000**
				GRAND TOTAL PRESENT WORTH COST:	**$254,518,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments to access the work areas.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.

Table A-4B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediment along Shorelines (50 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of $ 934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 1,310,606 cu yds of wet cake handled over a 1,081-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 148,001 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 807,492 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 15,168,879 lbs of neutralization chemical to treat 3,055 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 35,748,285 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 840,137 dry Tons of sediment cake production during a period of 1,081 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 1,081-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 1,081-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 1,081-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft cut back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$928,000	$928,000
	General Conditions	1	Lump Sum	$696,000	$696,000
	Project Insurance	1	Lump Sum	$464,000	$464,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	Site preparation	15	Acres	$6,000	$90,000
	FP Dredge slurry holding basins	1	LS	$7,815,000	$7,815,000
	FP Filter press conditioning tanks	1	LS	$326,000	$326,000
	FP Filter presses	8	Yrs	$2,015,000	$16,391,000
	FP Lime storage silos	1	LS	$255,000	$255,000
	FP Lime handling facilities	1	LS	$201,000	$201,000
	FP Polymer handling facilities	1	LS	$101,000	$101,000
	FP Polymer holding facilities	1	LS	$40,000	$40,000
	FP pumps, piping, M&E	1	LS	$3,769,000	$3,769,000
	SHF Solids handling site preparation	240	Labor-hrs	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	42,555	sq yards	$25	$1,064,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,281,000	$1,281,000
	SUBTOTAL				$48,470,000
	Engineering/Project Management (8%)				$3,878,000
	Construction Oversight (6%)				$2,908,000
	Contingency (20%)				$9,694,000
				TOTAL (YEARS 2005 - 2006):	$64,950,000
				PRESENT VALUE:	$46,308,000

Table A-4C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft cut back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$10,957,000	$10,957,000
	General Conditions	1	Lump Sum	$8,218,000	$8,218,000
	Project Insurance	1	Lump Sum	$5,479,000	$5,479,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	910,000	Square Ft	$8	$7,280,000
	Bank excavation and solids stabilization	842,593	Cubic yards	$61	$51,398,000
	Bank replacement	63,194	Cubic yards	$25	$1,580,000
	FP lime use	311,941	dry Tons	$89	$27,763,000
	FP polymer use	1,701,944	Lbs	$0.33	$562,000
	Effluent neutralization at WTF	31,971,326	Lbs	$1.54	$49,236,000
	FP electrical use	75,346,378	kwh	$0.06	$4,521,000
	FP operating labor	2,550,665	Labor-hrs	$25	$63,767,000
	FP QA/QC & management labor	63,769	Labor-hrs	$40	$2,551,000
	FP & WTF maintenance	5	Years	$1,870,000	$9,350,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	81,989	Labor-hrs.	$25	$2,050,000
	SHF Other on-site Operations	36,440	Labor-hrs.	$25	$911,000
	SHF Weigh station	8	Yrs	$18,000	$146,000
	SHF Electricity and utilities	2,277	Days	$10	$23,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	4,382,849	wet T	$60	$262,971,000
	SHF QA Monitoring and analyses	32	weeks	$2,800	$91,000
	WTF chemicals	6,439	M Gal	$1,500	$9,659,000
	WTF filter media	6,439	M Gal	$200	$1,288,000
	WTF activated carbon	6,439	M Gal	$1,860	$11,977,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$572,522,000
	Engineering/Project Management (5%)				$28,626,000
	Construction Oversight (6%)				$34,351,000
	Contingency (20%)				$114,504,000
				TOTAL (YEARS 2006 - 2010):	$750,003,000
				PRESENT VALUE:	$438,509,000

Table A-4C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft cut back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$396,000	$396,000
	General Conditions	1	Lump Sum	$297,000	$297,000
	Project Insurance	1	Lump Sum	$198,000	$198,000
	Construction Trailers	60	Months	$400	$24,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$8,066,000	$8,066,000
	FP Filter press conditioning tanks	1	LS	$336,000	$336,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$20,712,000
	Engineering/Project Management (8%)				$1,657,000
	Construction Oversight (6%)				$1,243,000
	Contingency (20%)				$4,142,000
				TOTAL (YEARS 2006 - 2010):	$27,754,000
				PRESENT VALUE:	$13,305,000
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$1,781,000	$1,781,000
	General Conditions	1	Lump Sum	$1,336,000	$1,336,000
	Project Insurance	1	Lump Sum	$890,000	$890,000
	Construction Trailers	17	Months	$400	$7,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	FP lime use	53,297	dry Tons	$89	$4,743,000
	FP polymer use	290,787	Lbs	$0.33	$96,000
	Effluent neutralization at WTF	11,415,348	Lbs	$1.54	$17,580,000
	FP electrical use	12,873,369	kwh	$0.06	$772,000
	FP operating labor	435,796	Labor-hrs.	$25	$10,895,000
	FP QA/QC & management labor	10,895	Labor-hrs.	$40	$436,000
	SHF Front-end loaders and operators	14,008	Labor-hrs.	$25	$350,000
	SHF Other on-site Operations	6,226	Labor-hrs	$25	$156,000
	SHF Weigh station	1.4	Yrs	$18,000	$25,000
	SHF Electricity and utilities	389	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	558,806	wet T	$60	$33,528,000
	SHF QA Monitoring and analyses	65	weeks	$2,800	$182,000
	FP & WTF maintenance	1.4	Years	$2,592,000	$3,629,000
	WTF chemicals	2,299	M Gal	$1,500	$3,449,000
	WTF filter media	2,299	M Gal	$200	$460,000
	WTF activated carbon	2,299	M Gal	$1,860	$4,276,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$93,049,000
	Engineering/Project Management (5%)				$4,652,000
	Construction Oversight (6%)				$5,583,000
	Contingency (20%)				$18,610,000
				TOTAL (YEARS 2007 - 2010):	$121,894,000
				PRESENT VALUE:	$68,780,000

Table A-4C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft cut back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$840,000	$840,000
	General Conditions	1	Lump Sum	$630,000	$630,000
	Project Insurance	1	Lump Sum	$420,000	$420,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	3 Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,486,000	$5,486,000
	FP decommissioning	1	Lump Sum	$5,779,600	$5,780,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$43,913,000
	Engineering/Project Management (8%)				$3,513,000
	Construction Oversight (6%)				$2,635,000
	Contingency (20%)				$8,783,000
				TOTAL (YEARS 2012 - 2020):	$58,844,000
				PRESENT VALUE:	$20,238,000
	SUBTOTAL DREDGING CONSTRUCTION				$151,548,000
	SUBTOTAL DREDGING OPERATION				$871,897,000
	SUBTOTAL DREDGING				$1,023,445,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$79,851,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$507,289,000
	SUBTOTAL PRESENT WORTH DREDGING				$587,140,000
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	SUBTOTAL ANNUAL				$1,795,000
	SUBTOTAL ANNUAL ALL YEARS				$43,073,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,782,000
				GRAND TOTAL COST:	**$1,066,518,000**
				GRAND TOTAL PRESENT WORTH COST:	**$599,922,000**

Table A-4C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft cut back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993)
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075)
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments to access the current impoundments
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day
- 6 miles avg. pipeline reach is assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day
- FP Dredge slurry holding basins based on 10,419,511 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 217,073 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 14100 cf filter press cost of $ 14,154,000 is amortized over 10 years at 7% for annual cost of $2,015,000
- FP Lime storage silos based on 95,877 cf lime storage capacity for 7 days inventory at installed cost of $ 255,000.
- FP Lime handling facilities based on 411 dry T/day handling facilities at installed cost of $ 201,000 includes conveying, mixing and dust control

Table A-4C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft cut back) and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- FP Polymer handling facilities based on 2,242 lb/day polymer useage.
- FP Polymer holding facilities based on 2,242 cf storage space for 30-day inventory of polymer, or warehouse space of 560 sq ft at $ 70 /sq ft
- FP pumps, piping, M&E is based on 15 percent of cost of installed components
- SHF Solids handling site preparation is based on 20 labor-hrs /day for 12days.
- SHF Solids storage and handling facilities based on 2,762,000 cu yds of wet cake handled over a 2,277-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft
- FP lime use based on 311,941 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w
- FP polymer use based on 1,702,000 lbs used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids
- Effluent neutralization at WTF is based on 31,971,000 lbs of neutralization chemical to treat 6,400 MG of filtrate. [MW reported 373,680 lbs at $1.54/lb to treat 75.26 MG].
- FP electrical use based on 75,346,000 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day
- FP operating labor is based on 1,120 labor-hrs /day to process 1,771,000 dry Tons of sediment cake production during a period of 2,277 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day
- FP QA/QC & management labor is based on 28 labor-hrs /day for oversight during the 2,277-day processing period
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 2,277-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs /day during the 2,277-day processing period
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations
- Construction oversight includes project management and daily reports
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution
- Contingency is based upon 20% of the construction subtotal cost
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment at a 7% discount rate
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000)
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring

Table A-4C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$200,000	$200,000
	General Conditions	1	Lump Sum	$150,000	$150,000
	Project Insurance	1	Lump Sum	$100,000	$100,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	1	Yrs.	$934,000	$1,251,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$636,000	$636,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$10,445,000
	Engineering/Project Management (8%)				$836,000
	Construction Oversight (6%)				$627,000
	Contingency (20%)				$2,089,000
				TOTAL (YEARS 2005 - 2006):	$13,997,000
				PRESENT VALUE:	$9,980,000

Table A-4C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,679,000	$1,679,000
	General Conditions	1	Lump Sum	$1,260,000	$1,260,000
	Project Insurance	1	Lump Sum	$840,000	$840,000
	Construction Trailers	16	Months	$400	$6,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	120,000	Square Ft	$8	$960,000
	Bank excavation and solids stabilization	111,111	Cubic yards	$61	$5,555,556
	Bank replacement	8,333	Cubic yards	$25	$208,000
	FP lime use	51,346	dry Tons	$89	$4,570,000
	FP polymer use	280,143	Lbs	$0.33	$92,000
	Effluent neutralization at WTF	5,262,543	Lbs	$1.54	$8,104,000
	FP electrical use	12,402,162	kwh	$0.06	$744,000
	FP operating labor	419,844	Labor-hrs.	$25	$10,496,000
	FP QA/QC & management labor	10,497	Labor-hrs.	$40	$420,000
	FP & WTF maintenance	2	Years	$413,000	$826,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	13,496	Labor-hrs.	$25	$337,000
	SHF Other on-site Operations	5,998	Labor-hrs.	$25	$150,000
	SHF Weigh station	1	Yrs.	$18,000	$23,000
	SHF Electricity and utilities	375	Days	$10	$4,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	685,018	wet T	$60	$41,101,000
	SHF QA Monitoring and analyses	5	weeks	$2,800	$15,000
	WTF chemicals	1,060	M Gal	$1,500	$1,590,000
	WTF filter media	1,060	M Gal	$200	$212,000
	WTF activated carbon	1,060	M Gal	$1,860	$1,971,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$87,752,000
	Engineering/Project Management (5%)				$4,388,000
	Construction Oversight (6%)				$5,265,000
	Contingency (20%)				$17,550,000
				TOTAL (YEARS 2007 - 2008):	$114,955,000
				PRESENT VALUE:	$69,247,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$116,000	$116,000
	General Conditions	1	Lump Sum	$87,000	$87,000
	Project Insurance	1	Lump Sum	$58,000	$58,000
	Construction Trailers	24	Months	$400	$10,000
	Habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,042,000
	Engineering/Project Management (8%)				$483,000
	Construction Oversight (6%)				$363,000
	Contingency (20%)				$1,208,000
				TOTAL (YEARS 2007 - 2008):	$8,096,000
				PRESENT VALUE:	$3,805,000

Table A-4C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$334,000	$334,000
	General Conditions	1	Lump Sum	$251,000	$251,000
	Project Insurance	1	Lump Sum	$167,000	$167,000
	Construction Trailers	4	Months	$400	$1,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	FP lime use	10,269	dry Tons	$89	$914,000
	FP polymer use	56,029	Lbs	$0.33	$18,000
	Effluent neutralization at WTF	2,199,513	Lbs	$1.54	$3,387,000
	FP electrical use	2,480,445	kwh	$0.06	$149,000
	FP operating labor	83,969	Labor-hrs.	$25	$2,099,000
	FP QA/QC & management labor	2,099	Labor-hrs.	$40	$84,000
	SHF Front-end loaders and operators	2,699	Labor-hrs.	$25	$67,000
	SHF Other on-site Operations	1,200	Labor-hrs.	$25	$30,000
	SHF Weigh station	0.3	Yrs.	$18,000	$5,000
	SHF Electricity and utilities	75	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	107,671	wet T	$60	$6,460,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$35,000
	FP & WTF maintenance	0.3	Years	$654,000	$196,000
	WTF chemicals	443	M Gal	$1,500	$664,000
	WTF filter media	443	M Gal	$200	$89,000
	WTF activated carbon	443	M Gal	$1,860	$824,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$17,471,000
	Engineering/Project Management (5%)				$874,000
	Construction Oversight (6%)				$1,048,000
	Contingency (20%)				$3,494,000
				TOTAL (YEARS 2007 - 2008):	$22,887,000
				PRESENT VALUE:	$13,787,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$127,000	$127,000
	General Conditions	1	Lump Sum	$95,000	$95,000
	Project Insurance	1	Lump Sum	$63,000	$63,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,373,871	$2,374,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	3 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$974,600	$975,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$6,633,000
	Engineering/Project Management (8%)				$531,000
	Construction Oversight (6%)				$398,000
	Contingency (20%)				$1,327,000
				TOTAL (YEARS 2009 - 2009):	$8,889,000
				PRESENT VALUE:	$4,835,000
	SUBTOTAL DREDGING CONSTRUCTION				$30,982,000
	SUBTOTAL DREDGING OPERATION				$137,842,000
	SUBTOTAL DREDGING				$168,824,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$18,620,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$83,034,000
	SUBTOTAL PRESENT WORTH DREDGING				$101,654,000

Table A-4C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$8,190	$16,380	$10,000
	Confirmation sampling and analyses	(2007 - 2008)	$136,278	$272,555	$164,000
	Bank observation	(2009 - 2039)	$5,918	$183,451	$43,000
	Bank maintenance	(2009 - 2039)	$78,548	$2,435,000	$573,000
	Monitoring - biota	(2007 - 2038)	$144,188	$4,614,000	$1,215,000
	Monitoring - water & sed	(2007 - 2038)	$134,125	$4,292,000	$1,130,000
	KALSIM model updates	(2007 - 2038)	$124,875	$3,996,000	$1,052,000
	SUBTOTAL ANNUAL				$632,000
	SUBTOTAL ANNUAL ALL YEARS				$15,809,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$4,187,000
				GRAND TOTAL COST:	**$184,633,000**
				GRAND TOTAL PRESENT WORTH COST:	**$105,841,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment for construction access.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach is assumed for sediment slurry pumping.

Table A-4C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediment along Shorelines (25 Ft back) and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3,580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of 934,000
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 454,689 cu yds of wet cake handled over a 375-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 51,346 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w
- FP polymer use based on 280,143 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 5,262,543 lbs of neutralization chemical to treat 1,060 MG of filtrate. [MW reported 373,680 lbs at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 12,402,162 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 291,469 dry Tons of sediment cake production during a period of 375 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 375-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 375-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 375-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$238,000	$238,000
	General Conditions	1	Lump Sum	$178,000	$178,000
	Project Insurance	1	Lump Sum	$119,000	$119,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	3	Yrs.	$934,000	$2,742,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$859,000	$859,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$12,421,000
	Engineering/Project Management (8%)				$994,000
	Construction Oversight (6%)				$745,000
	Contingency (20%)				$2,484,000
				TOTAL (YEARS 2005 - 2006):	$16,644,000
				PRESENT VALUE:	$11,867,000

Table A-4C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$3,708,000	$3,708,000
	General Conditions	1	Lump Sum	$2,781,000	$2,781,000
	Project Insurance	1	Lump Sum	$1,854,000	$1,854,000
	Construction Trailers	35	Months	$400	$14,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	250,000	Square Ft	$8	$2,000,000
	Bank excavation and solids stabilization	231,481	Cubic yards	$61	$14,120,000
	Bank replacement	17,361	Cubic yards	$25	$434,000
	FP lime use	112,594	dry Tons	$89	$10,021,000
	FP polymer use	614,309	Lbs	$0.33	$203,000
	Effluent neutralization at WTF	11,539,904	Lbs	$1.54	$17,771,000
	FP electrical use	27,195,931	kwh	$0.06	$1,632,000
	FP operating labor	920,651	Labor-hrs.	$25	$23,016,000
	FP QA/QC & management labor	23,017	Labor-hrs.	$40	$921,000
	FP & WTF maintenance	4	Years	$499,000	$1,996,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	29,594	Labor-hrs.	$25	$740,000
	SHF Other on-site Operations	13,153	Labor-hrs.	$25	$329,000
	SHF Weigh station	3	Yrs.	$18,000	$52,000
	SHF Electricity and utilities	822	Days	$10	$8,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,486,073	wet T	$60	$89,164,000
	SHF QA Monitoring and analyses	12	weeks	$2,800	$32,000
	WTF chemicals	2,324	M Gal	$1,500	$3,486,000
	WTF filter media	2,324	M Gal	$200	$465,000
	WTF activated carbon	2,324	M Gal	$1,860	$4,323,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$193,745,000
	Engineering/Project Management (5%)				$9,687,000
	Construction Oversight (6%)				$11,625,000
	Contingency (20%)				$38,749,000
				TOTAL (YEARS 2007 - 2010):	$253,806,000
				PRESENT VALUE:	$143,213,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$119,000	$119,000
	General Conditions	1	Lump Sum	$89,000	$89,000
	Project Insurance	1	Lump Sum	$59,000	$59,000
	Construction Trailers	24	Months	$400	$10,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Habitat enhancemt - Trowbridge	1	Lump Sum	$0	$0
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,208,000
	Engineering/Project Management (8%)				$497,000
	Construction Oversight (6%)				$372,000
	Contingency (20%)				$1,242,000
				TOTAL (YEARS 2007 - 2010):	$8,319,000
				PRESENT VALUE:	$3,820,000

Table A-4C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$553,000	$553,000
	General Conditions	1	Lump Sum	$415,000	$415,000
	Project Insurance	1	Lump Sum	$277,000	$277,000
	Construction Trailers	5	Months	$400	$2,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	FP lime use	17,174	dry Tons	$89	$1,528,000
	FP polymer use	93,701	Lbs	$0.33	$31,000
	Effluent neutralization at WTF	3,678,405	Lbs	$1.54	$5,665,000
	FP electrical use	4,148,228	kwh	$0.06	$249,000
	FP operating labor	140,428	Labor-hrs.	$25	$3,511,000
	FP QA/QC & management labor	3,511	Labor-hrs.	$40	$140,000
	SHF Front-end loaders and operators	4,514	Labor-hrs.	$25	$113,000
	SHF Other on-site Operations	2,006	Labor-hrs.	$25	$50,000
	SHF Weigh station	0.4	Yrs.	$18,000	$7,000
	SHF Electricity and utilities	125	Days	$10	$1,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	180,066	wet T	$60	$10,804,000
	SHF QA Monitoring and analyses	21	weeks	$2,800	$59,000
	FP & WTF maintenance	0.4	Years	$739,000	$296,000
	WTF chemicals	741	M Gal	$1,500	$1,111,000
	WTF filter media	741	M Gal	$200	$148,000
	WTF activated carbon	741	M Gal	$1,860	$1,378,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$28,906,000
	Engineering/Project Management (5%)				$1,445,000
	Construction Oversight (6%)				$1,734,000
	Contingency (20%)				$5,781,000
				TOTAL (YEARS 2007 - 2010):	$37,866,000
				PRESENT VALUE:	$21,366,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$128,000	$128,000
	General Conditions	1	Lump Sum	$96,000	$96,000
	Project Insurance	1	Lump Sum	$64,000	$64,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$2,077,518	$2,078,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	3 Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,317,400	$1,317,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$6,687,000
	Engineering/Project Management (8%)				$535,000
	Construction Oversight (6%)				$401,000
	Contingency (20%)				$1,337,000
				TOTAL (YEARS 2011 - 2011):	$8,960,000
				PRESENT VALUE:	$4,257,000
	SUBTOTAL DREDGING CONSTRUCTION				$33,923,000
	SUBTOTAL DREDGING OPERATION				$291,672,000
	SUBTOTAL DREDGING				$325,595,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$19,944,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$164,579,000
	SUBTOTAL PRESENT WORTH DREDGING				$184,523,000

Table A-4C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	SUBTOTAL ANNUAL				$1,798,000
	SUBTOTAL ANNUAL ALL YEARS				$33,118,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,703,000
				GRAND TOTAL COST:	**$358,713,000**
				GRAND TOTAL PRESENT WORTH COST:	**$193,226,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment for construction access.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.

Table A-4C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-OT - Hydraulic Dredging of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach is assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration.
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of 934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 997,059 cu yds of wet cake handled over a 822-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- FP lime use based on 112,594 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.
- FP polymer use based on 614,309 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 11,539,904 lbs of neutralization chemical to treat 2,324 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 27,195,931 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 639,144 dry Tons of sediment cake production during a period of 822 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 822-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 822-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 822-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the Draft FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-4C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$327,000	$327,000
	General Conditions	1	Lump Sum	$245,000	$245,000
	Project Insurance	1	Lump Sum	$163,000	$163,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	Site preparation	6	Acres	$6,000	$36,000
	FP Dredge slurry holding basins	1	LS	$2,605,000	$2,605,000
	FP Filter press conditioning tanks	1	LS	$109,000	$109,000
	FP Filter presses	4	Yrs.	$934,000	$3,605,000
	FP Lime storage silos	1	LS	$118,000	$118,000
	FP Lime handling facilities	1	LS	$93,000	$93,000
	FP Polymer handling facilities	1	LS	$47,000	$47,000
	FP Polymer holding facilities	1	LS	$14,000	$14,000
	FP pumps, piping, M&E	1	LS	$989,000	$989,000
	SHF Solids handling site preparation	240	Labor-hrs.	$25	$6,000
	SHF Solids storage and handling facilities	16,374	Sq. Ft.	$50	$819,000
	WTF site preparation & paving	14,185	sq yards	$25	$355,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$427,000	$427,000
	SUBTOTAL				$17,067,000
	Engineering/Project Management (8%)				$1,365,000
	Construction Oversight (6%)				$1,024,000
	Contingency (20%)				$3,413,000
				TOTAL (YEARS 2005 - 2006):	$22,869,000
				PRESENT VALUE:	$16,305,000

Table A-4C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$5,471,000	$5,471,000
	General Conditions	1	Lump Sum	$4,103,000	$4,103,000
	Project Insurance	1	Lump Sum	$2,735,000	$2,735,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$0	$0
	Sheetpiling	540,000	Square Ft	$8	$4,320,000
	Bank excavation and solids stabilization	500,000	Cubic yards	$61	$30,500,000
	Bank replacement	37,500	Cubic yards	$25	$938,000
	FP lime use	148,001	dry Tons	$89	$13,172,000
	FP polymer use	807,492	Lbs	$0.33	$266,000
	Effluent neutralization at WTF	15,168,879	Lbs	$1.54	$23,360,000
	FP electrical use	35,748,285	kwh	$0.06	$2,145,000
	FP operating labor	1,210,170	Labor-hrs.	$25	$30,254,000
	FP QA/QC & management labor	30,256	Labor-hrs.	$40	$1,210,000
	FP & WTF maintenance	5	Years	$548,000	$2,740,000
	SHF Electrical and instrumentation	1	LS	$24,750	$25,000
	SHF Front-end loaders and operators	38,900	Labor-hrs.	$25	$972,000
	SHF Other on-site Operations	17,289	Labor-hrs.	$25	$432,000
	SHF Weigh station	4	Yrs.	$18,000	$70,000
	SHF Electricity and utilities	1,081	Days	$10	$11,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	2,211,757	wet T	$60	$132,705,000
	SHF QA Monitoring and analyses	16	weeks	$2,800	$44,000
	WTF chemicals	3,055	M Gal	$1,500	$4,583,000
	WTF filter media	3,055	M Gal	$200	$611,000
	WTF activated carbon	3,055	M Gal	$1,860	$5,682,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$285,856,000
	Engineering/Project Management (5%)				$14,293,000
	Construction Oversight (6%)				$17,151,000
	Contingency (20%)				$57,171,000
				TOTAL (YEARS 2007 - 2011):	$374,471,000
				PRESENT VALUE:	$204,621,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$162,000	$162,000
	General Conditions	1	Lump Sum	$122,000	$122,000
	Project Insurance	1	Lump Sum	$81,000	$81,000
	Construction Trailers	60	Months	$400	$24,000
	Habitat enhancement - Plainwell	1	Lump Sum	$0	$0
	Habitat enhancement - Otsego	1	Lump Sum	$0	$0
	Habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	FP Dredge slurry holding basins	1	LS	$2,689,000	$2,689,000
	FP Filter press conditioning tanks	1	LS	$112,000	$112,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$8,485,000
	Engineering/Project Management (8%)				$679,000
	Construction Oversight (6%)				$509,000
	Contingency (20%)				$1,697,000
				TOTAL (YEARS 2007 - 2011):	$11,370,000
				PRESENT VALUE:	$5,025,000

Table A-4C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$842,000	$842,000
	General Conditions	1	Lump Sum	$631,000	$631,000
	Project Insurance	1	Lump Sum	$421,000	$421,000
	Construction Trailers	8	Months	$400	$3,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	FP lime use	25,854	dry Tons	$89	$2,301,000
	FP polymer use	141,057	Lbs	$0.33	$47,000
	Effluent neutralization at WTF	5,537,430	Lbs	$1.54	$8,528,000
	FP electrical use	6,244,696	kwh	$0.06	$375,000
	FP operating labor	211,399	Labor-hrs.	$25	$5,285,000
	FP QA/QC & management labor	5,285	Labor-hrs.	$40	$211,000
	SHF Front-end loaders and operators	6,795	Labor-hrs.	$25	$170,000
	SHF Other on-site Operations	3,020	Labor-hrs.	$25	$76,000
	SHF Weigh station	0.7	Yrs.	$18,000	$13,000
	SHF Electricity and utilities	189	Days	$10	$2,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	271,069	wet T	$60	$16,264,000
	SHF QA Monitoring and analyses	31	weeks	$2,800	$88,000
	FP & WTF maintenance	0.7	Years	$789,000	$552,000
	WTF chemicals	1,115	M Gal	$1,500	$1,673,000
	WTF filter media	1,115	M Gal	$200	$223,000
	WTF activated carbon	1,115	M Gal	$1,860	$2,074,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$43,970,000
	Engineering/Project Management (5%)				$2,199,000
	Construction Oversight (6%)				$2,638,000
	Contingency (20%)				$8,794,000
				TOTAL (YEARS 2007 - 2011):	$57,601,000
				PRESENT VALUE:	$31,475,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$495,000	$495,000
	General Conditions	1	Lump Sum	$371,000	$371,000
	Project Insurance	1	Lump Sum	$247,000	$247,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,829,000	$1,829,000
	FP decommissioning	1	Lump Sum	$1,516,000	$1,516,000
	SHF Decommissioning, decontamination and site restoration	1	LS	$165,000	$165,000
	SUBTOTAL				$25,840,000
	Engineering/Project Management (8%)				$2,067,000
	Construction Oversight (6%)				$1,550,000
	Contingency (20%)				$5,168,000
				TOTAL (YEARS 2012 - 2014):	$34,625,000
				PRESENT VALUE:	$14,390,000
	SUBTOTAL DREDGING CONSTRUCTION				$68,864,000
	SUBTOTAL DREDGING OPERATION				$432,072,000
	SUBTOTAL DREDGING				$500,936,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$35,720,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$236,096,000
	SUBTOTAL PRESENT WORTH DREDGING				$271,816,000

Table A-4C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	SUBTOTAL ANNUAL				$1,796,000
	SUBTOTAL ANNUAL ALL YEARS				$34,351,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,920,000
				GRAND TOTAL COST:	**$535,287,000**
				GRAND TOTAL PRESENT WORTH COST:	**$280,736,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment for construction.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.

Table A-4C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-4C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundments, Dry Excavation of Exposed Sediment along Shorelines (100 Ft back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach is assumed for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- FP Dredge slurry holding basins based on 3,473,170 Gal holding capacity for a residence time of 1 day. This allows treatment during periods when dredging is not being performed.
- FP Filter press conditioning tanks based on 72,358 Gal holding capacity for a residence time of 30 min. for solids conditioning prior to press filtration
- FP Filter presses based on 4700 cf filter press cost of $ 6,560,000 is amortized over 10 years at 7% for annual cost of 934,000.
- FP Lime storage silos based on 31,959 cf lime storage capacity for 7 days inventory at installed cost of $ 118,000.
- FP Lime handling facilities based on 137 dry T/day handling facilities at installed cost of $ 93,000 includes conveying, mixing and dust control.
- FP Polymer handling facilities based on 747 lb/day polymer useage.
- FP Polymer holding facilities based on 747 cf storage space for 30-day inventory of polymer, or warehouse space of 187 sq ft at $ 70 /sq. ft.
- FP pumps, piping, M&E is based on 15 percent of cost of installed components.
- SHF Solids handling site preparation is based on 20 labor-hrs./day for 12days.
- SHF Solids storage and handling facilities based on 1,310,606 cu yds of wet cake handled over a 1,081-day period. Inventory space for 2 days storage is 16,374 sq ft priced at $ 50 /sq ft.
- *FP lime use based on 148,001 dry Tons during the processing period, using MW experience of 2931T lime/ 13707T dry solids or 21% w/w.*
- FP polymer use based on 807,492 lbs. used during the processing period, at an assumed dosage of 1 lb/dry Ton of solids.
- Effluent neutralization at WTF is based on 15,168,879 lbs of neutralization chemical to treat 3,055 MG of filtrate. [MW reported 373,680 lbs. at $1.54/lb. to treat 75.26 MG].
- FP electrical use based on 35,748,285 kwhMW reported use of 1130 amps, 480 v = full-load amp reqmt for the Demonstration facility pumps, mixers and dewatering systems [FSA 5/18/99 ltr]. Assuming operation at 1/2 full-load, with the water treatment system using 180 full-load amps, the dewatering system would apply (1130-180) full-load amps, processing 128.6 dry T/day.
- FP operating labor is based on 1,120 labor-hrs./day to process 840,137 dry Tons of sediment cake production during a period of 1,081 days. Labor at $ 25.08/hr. The demonstration program processed (11696/108 = 108.3) dry T of sediment/day and required six to seven personnel (see MWDSR, p. 4-13) to operate and maintain the dewatering system, running 24-hrs per day.
- FP QA/QC & management labor is based on 28 labor-hrs./day for oversight during the 1,081-day processing period.
- SHF Electrical and instrumentation is based on 3 percent of cost of installed components.
- SHF Front-end loaders and operators cost is based on 36 labor-hrs./day during the 1,081-day processing period.
- SHF Other on-site Operations cost is based on 16 labor-hrs./day during the 1,081-day processing period.
- SHF Weigh station cost is based on Means ER-33-01-0462.
- Water treatment consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).

Table A-5A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$871,000	$871,000
	General Conditions	1	Lump Sum	$653,000	$653,000
	Project Insurance	1	Lump Sum	$436,000	$436,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	CDF A = 16.4 Acres	- -	- -	- -	- -
	CDF B = 41.1 Acres	- -	- -	- -	- -
	CDF C = 55.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	128	Acres	$0	$0
	CDF clearing & grubbing	128	Acres	$7,700	$986,000
	CDF bedding	182,305	cubic yards	$20	$3,646,000
	CDF exterior dikes	683,157	cubic yards	$15	$10,247,000
	CDF interior dikes	543,783	cubic yards	$15	$8,157,000
	CDF liner, bot & walls	4,922,239	square feet	$0.50	$2,461,000
	CDF piping	47,939	Linear feet	$12	$570,000
	CDF monitoring wells	17	wells	$1,000	$17,000
	WTF site preparation & paving	72,600	sq yards	$25	$1,815,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,431,000	$1,431,000
	SUBTOTAL				$45,514,000
	Engineering/Project Management (8%)				$3,641,000
	Construction Oversight (6%)				$2,731,000
	Contingency (20%)				$9,103,000
				TOTAL (YEARS 2005 - 2006):	$60,989,000
				PRESENT VALUE:	$43,484,000

Table A-5A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$2,156,000	$2,156,000
	General Conditions	1	Lump Sum	$1,617,000	$1,617,000
	Project Insurance	1	Lump Sum	$1,078,000	$1,078,000
	Construction Trailers	60	Months	$400	$24,000
	Sheetpiling	910,000	Square Ft	$12	$10,920,000
	Bank excavation and hauling to CDF	210,648	Cubic yards	$50	$10,532,000
	Bank replacement	126,389	Cubic yards	$25	$3,160,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$4,164,000	$4,164,000
	Operate CDF - labor	2,277	days	$3,086	$7,028,000
	CDF & WTF maintenance	5	Years	$1,684,000	$8,420,000
	WTF chemicals	6,416	M Gal	$1,500	$9,624,000
	WTF filter media	6,416	M Gal	$200	$1,283,000
	WTF activated carbon	6,416	M Gal	$1,860	$11,934,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$112,635,000
	Engineering/Project Management (5%)				$5,632,000
	Construction Oversight (6%)				$6,758,000
	Contingency (20%)				$22,527,000
				TOTAL (YEARS 2006 - 2010):	$147,552,000
				PRESENT VALUE:	$86,270,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$439,000	$439,000
	General Conditions	1	Lump Sum	$329,000	$329,000
	Project Insurance	1	Lump Sum	$220,000	$220,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	27,778	cubic yards	$50	$1,389,000
	Removal of exposed sed. - Otsego (2009)	57,870	cubic yards	$50	$2,894,000
	Removal of exposed sed. - Trowbridge (2013)	125,000	cubic yards	$50	$6,250,000
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$22,940,000
	Engineering/Project Management (8%)				$1,835,000
	Construction Oversight (6%)				$1,376,000
	Contingency (20%)				$4,588,000
				TOTAL (YEARS 2006 - 2010):	$30,739,000
				PRESENT VALUE:	$13,584,000

Table A-5A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$516,000	$516,000
	General Conditions	1	Lump Sum	$387,000	$387,000
	Project Insurance	1	Lump Sum	$258,000	$258,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	Operate CDF - labor	389	days	$3,086	$1,201,000
	CDF & WTF maintenance	4	Years	$1,986,000	$7,944,000
	WTF chemicals	2,292	M Gal	$1,500	$3,439,000
	WTF filter media	2,292	M Gal	$200	$458,000
	WTF activated carbon	2,292	M Gal	$1,860	$4,264,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$26,940,000
	Engineering/Project Management (5%)				$1,347,000
	Construction Oversight (6%)				$1,616,000
	Contingency (20%)				$5,388,000
				TOTAL (YEARS 2007 - 2010):	$35,291,000
				PRESENT VALUE:	$19,913,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$1,042,000	$1,042,000
	General Conditions	1	Lump Sum	$782,000	$782,000
	Project Insurance	1	Lump Sum	$521,000	$521,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,299,678	$2,300,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$1,939,999	$1,940,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$17,199,559	$17,200,000
	Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,846,000	$5,846,000
	CDF top liner	3,956,777	square feet	$0.50	$1,978,000
	CDF cover material	439,642	cubic yards	$25	$10,991,000
	CDF 2% graded cap	352,348	cubic yards	$25	$8,809,000
	SUBTOTAL				$54,452,000
	Engineering/Project Management (8%)				$4,356,000
	Construction Oversight (6%)				$3,267,000
	Contingency (20%)				$10,890,000
				TOTAL (YEARS 2012 - 2020):	$72,965,000
				PRESENT VALUE:	$25,095,000
	SUBTOTAL DREDGING CONSTRUCTION				$164,693,000
	SUBTOTAL DREDGING OPERATION				$182,843,000
	SUBTOTAL DREDGING				$347,536,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$82,163,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$106,183,000
	SUBTOTAL PRESENT WORTH DREDGING				$188,346,000

Table A-5A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$13,591	$598,000	$123,000
	SUBTOTAL ANNUAL				$1,809,000
	SUBTOTAL ANNUAL ALL YEARS				$43,671,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,905,000
				GRAND TOTAL COST:	**$391,207,000**
				GRAND TOTAL PRESENT WORTH COST:	**$201,251,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments as needed to access the former impoundments.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.

Table A-5A

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.54 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 2.3 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-5A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$179,000	$179,000
	General Conditions	1	Lump Sum	$134,000	$134,000
	Project Insurance	1	Lump Sum	$89,000	$89,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	CDF A = 16.4 Acres	- -	- -	- -	- -
	CDF B = 0 Acres	- -	- -	- -	- -
	CDF C = 0 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	21	Acres	$0	$0
	CDF clearing & grubbing	21	Acres	$7,700	$162,000
	CDF bedding	26,379	cubic yards	$20	$528,000
	CDF exterior dikes	145,384	cubic yards	$15	$2,181,000
	CDF interior dikes	71,642	cubic yards	$15	$1,075,000
	CDF liner, bot & walls	712,244	square feet	$0.50	$356,000
	CDF piping	6,822	Linear feet	$12	$81,000
	CDF monitoring wells	4	wells	$1,000	$4,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$9,350,000
	Engineering/Project Management (8%)				$748,000
	Construction Oversight (6%)				$561,000
	Contingency (20%)				$1,870,000
				TOTAL (YEARS 2005 - 2006):	$12,529,000
				PRESENT VALUE:	$8,933,000

Table A-5A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$324,000	$324,000
	General Conditions	1	Lump Sum	$243,000	$243,000
	Project Insurance	1	Lump Sum	$162,000	$162,000
	Construction Trailers	24	Months	$400	$10,000
	Sheetpiling	120,000	Square Ft	$12	$1,440,000
	Bank excavation and hauling to CDF	27,778	Cubic yards	$50	$1,389,000
	Bank replacement	16,667	Cubic yards	$25	$417,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$685,000	$685,000
	Operate CDF - labor	375	days	$3,086	$1,157,000
	CDF & WTF maintenance	2	Years	$354,000	$708,000
	WTF chemicals	1,071	M Gal	$1,500	$1,607,000
	WTF filter media	1,071	M Gal	$200	$214,000
	WTF activated carbon	1,071	M Gal	$1,860	$1,993,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$16,912,000
	Engineering/Project Management (5%)				$846,000
	Construction Oversight (6%)				$1,015,000
	Contingency (20%)				$3,382,000
				TOTAL (YEARS 2007 - 2008):	$22,155,000
				PRESENT VALUE:	$13,346,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$87,000	$87,000
	General Conditions	1	Lump Sum	$66,000	$66,000
	Project Insurance	1	Lump Sum	$44,000	$44,000
	Construction Trailers	24	Months	$400	$10,000
	Removal of exposed sed. - Plainwell (2018)	27,778	cubic yards	$50	$1,389,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Bank stab. & habitat enhancemt - Otsego	0	Lump Sum	$1,120,000	$0
	Bank stab. & habitat enhancemt - Trowbridge	0	Lump Sum	$3,285,000	$0
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$4,566,000
	Engineering/Project Management (8%)				$365,000
	Construction Oversight (6%)				$274,000
	Contingency (20%)				$913,000
				TOTAL (YEARS 2007 - 2008):	$6,118,000
				PRESENT VALUE:	$2,916,000

Table A-5A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$89,000	$89,000
	General Conditions	1	Lump Sum	$66,000	$66,000
	Project Insurance	1	Lump Sum	$44,000	$44,000
	Construction Trailers	24	Months	$400	$10,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	Operate CDF - labor	75	days	$3,086	$231,000
	CDF & WTF maintenance	2	Years	$455,000	$910,000
	WTF chemicals	445	M Gal	$1,500	$667,000
	WTF filter media	445	M Gal	$200	$89,000
	WTF activated carbon	445	M Gal	$1,860	$827,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$4,629,000
	Engineering/Project Management (5%)				$231,000
	Construction Oversight (6%)				$278,000
	Contingency (20%)				$926,000
				TOTAL (YEARS 2007 - 2008):	$6,064,000
				PRESENT VALUE:	$3,653,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$151,000	$151,000
	General Conditions	1	Lump Sum	$113,000	$113,000
	Project Insurance	1	Lump Sum	$75,000	$75,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,299,678	$2,300,000
	Exposed soil cover & veget. - Otsego	0	Lump Sum	$1,939,999	$0
	Exposed soil cover & veget. - Trowbridge	0	Lump Sum	$17,199,559	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	501,577	square feet	$0.50	$251,000
	CDF cover material	55,731	cubic yards	$25	$1,393,000
	CDF 2% graded cap	25,320	cubic yards	$25	$633,000
	SUBTOTAL				$7,870,000
	Engineering/Project Management (8%)				$630,000
	Construction Oversight (6%)				$472,000
	Contingency (20%)				$1,574,000
				TOTAL (YEARS 2009 - 2009):	$10,546,000
				PRESENT VALUE:	$5,736,000
	SUBTOTAL DREDGING CONSTRUCTION				$29,193,000
	SUBTOTAL DREDGING OPERATION				$28,219,000
	SUBTOTAL DREDGING				$57,412,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$17,585,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$16,999,000
	SUBTOTAL PRESENT WORTH DREDGING				$34,584,000

Table A-5A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$50,000	$100,000	$60,000
	Confirmation sampling and analyses	(2007 - 2008)	$832,000	$1,664,000	$1,002,000
	Bank observation	(2009 - 2039)	$36,129	$1,120,000	$264,000
	Bank maintenance	(2009 - 2039)	$479,548	$14,866,000	$3,498,000
	Monitoring - biota	(2007 - 2038)	$144,188	$4,614,000	$1,215,000
	Monitoring - water & sed	(2007 - 2038)	$134,125	$4,292,000	$1,130,000
	KALSIM model updates	(2007 - 2038)	$124,875	$3,996,000	$1,052,000
	CDF & groundwater monitoring	(2007 - 2039)	$3,212	$106,000	$27,000
	SUBTOTAL ANNUAL				$1,804,000
	SUBTOTAL ANNUAL ALL YEARS				$30,758,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,248,000
				GRAND TOTAL COST:	**$88,170,000**
				GRAND TOTAL PRESENT WORTH COST:	**$42,832,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

Table A-5A-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.15 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 293,000 cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 33 years.

Table A-5A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$280,000	$280,000
	General Conditions	1	Lump Sum	$210,000	$210,000
	Project Insurance	1	Lump Sum	$140,000	$140,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	CDF = 41.1 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	46	Acres	$0	$0
	CDF clearing & grubbing	46	Acres	$7,700	$354,000
	CDF bedding	66,266	cubic yards	$20	$1,325,000
	CDF exterior dikes	246,507	cubic yards	$15	$3,698,000
	CDF interior dikes	183,239	cubic yards	$15	$2,749,000
	CDF liner, bot & walls	1,789,184	square feet	$0.50	$895,000
	CDF piping	17,762	Linear feet	$12	$211,000
	CDF monitoring wells	6	wells	$1,000	$6,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$14,606,000
	Engineering/Project Management (8%)				$1,168,000
	Construction Oversight (6%)				$876,000
	Contingency (20%)				$2,921,000
				TOTAL (YEARS 2005 - 2006):	$19,571,000
				PRESENT VALUE:	$13,954,000

Table A-5A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$721,000	$721,000
	General Conditions	1	Lump Sum	$541,000	$541,000
	Project Insurance	1	Lump Sum	$360,000	$360,000
	Construction Trailers	48	Months	$400	$19,000
	Sheetpiling	250,000	Square Ft	$12	$3,000,000
	Bank excavation and hauling to CDF	57,870	Cubic yards	$50	$2,894,000
	Bank replacement	34,722	Cubic yards	$25	$868,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$1,503,000	$1,503,000
	Operate CDF - labor	822	days	$3,086	$2,537,000
	CDF & WTF maintenance	4	Years	$587,000	$2,348,000
	WTF chemicals	2,309	M Gal	$1,500	$3,464,000
	WTF filter media	2,309	M Gal	$200	$462,000
	WTF activated carbon	2,309	M Gal	$1,860	$4,295,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$37,662,000
	Engineering/Project Management (5%)				$1,883,000
	Construction Oversight (6%)				$2,260,000
	Contingency (20%)				$7,532,000
				TOTAL (YEARS 2007 - 2010):	$49,337,000
				PRESENT VALUE:	$27,839,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$121,000	$121,000
	General Conditions	1	Lump Sum	$91,000	$91,000
	Project Insurance	1	Lump Sum	$60,000	$60,000
	Construction Trailers	48	Months	$400	$19,000
	Removal of exposed sed. - Plainwell (2018)	57,870	cubic yards	$50	$2,894,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	0	Lump Sum	$960,000	$0
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Bank stab. & habitat enhancemt - Trowbridge	0	Lump Sum	$3,285,000	$0
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,315,000
	Engineering/Project Management (8%)				$505,000
	Construction Oversight (6%)				$379,000
	Contingency (20%)				$1,263,000
				TOTAL (YEARS 2007 - 2010):	$8,462,000
				PRESENT VALUE:	$3,950,000

Table A-5A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$167,000	$167,000
	General Conditions	1	Lump Sum	$125,000	$125,000
	Project Insurance	1	Lump Sum	$84,000	$84,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	Operate CDF - labor	125	days	$3,086	$387,000
	CDF & WTF maintenance	4	Years	$688,000	$2,752,000
	WTF chemicals	738	M Gal	$1,500	$1,106,000
	WTF filter media	738	M Gal	$200	$148,000
	WTF activated carbon	738	M Gal	$1,860	$1,372,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$8,728,000
	Engineering/Project Management (5%)				$436,000
	Construction Oversight (6%)				$524,000
	Contingency (20%)				$1,746,000
				TOTAL (YEARS 2007 - 2010):	$11,434,000
				PRESENT VALUE:	$6,452,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$254,000	$254,000
	General Conditions	1	Lump Sum	$191,000	$191,000
	Project Insurance	1	Lump Sum	$127,000	$127,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$2,299,678	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$1,939,999	$1,940,000
	Exposed soil cover & veget. - Trowbridge	0	Lump Sum	$17,199,559	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	1,441,999	square feet	$0.50	$721,000
	CDF cover material	160,222	cubic yards	$25	$4,006,000
	CDF 2% graded cap	123,425	cubic yards	$25	$3,086,000
	SUBTOTAL				$13,279,000
	Engineering/Project Management (8%)				$1,062,000
	Construction Oversight (6%)				$797,000
	Contingency (20%)				$2,656,000
				TOTAL (YEARS 2011 - 2011):	$17,794,000
				PRESENT VALUE:	$8,454,000
	SUBTOTAL DREDGING CONSTRUCTION				$45,827,000
	SUBTOTAL DREDGING OPERATION				$60,771,000
	SUBTOTAL DREDGING				$106,598,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$26,358,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$34,291,000
	SUBTOTAL PRESENT WORTH DREDGING				$60,649,000

Table A-5A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	CDF & groundwater monitoring	(2007 - 2041)	$4,800	$168,000	$41,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$33,286,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,744,000
				GRAND TOTAL COST:	**$139,884,000**
				GRAND TOTAL PRESENT WORTH COST:	**$69,393,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

Table A-5A-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.62 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 0.85 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 35 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-5A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$413,000	$413,000
	General Conditions	1	Lump Sum	$310,000	$310,000
	Project Insurance	1	Lump Sum	$207,000	$207,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	CDF = 55.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	61	Acres	$0	$0
	CDF clearing & grubbing	61	Acres	$7,700	$470,000
	CDF bedding	89,660	cubic yards	$20	$1,793,000
	CDF exterior dikes	291,266	cubic yards	$15	$4,369,000
	CDF interior dikes	288,903	cubic yards	$15	$4,334,000
	CDF liner, bot & walls	2,420,811	square feet	$0.50	$1,210,000
	CDF piping	23,356	Linear feet	$12	$278,000
	CDF monitoring wells	7	wells	$1,000	$7,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$21,582,000
	Engineering/Project Management (8%)				$1,727,000
	Construction Oversight (6%)				$1,295,000
	Contingency (20%)				$4,316,000
				TOTAL (YEARS 2005 - 2006):	$28,920,000
				PRESENT VALUE:	$20,620,000

Table A-5A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,079,000	$1,079,000
	General Conditions	1	Lump Sum	$809,000	$809,000
	Project Insurance	1	Lump Sum	$539,000	$539,000
	Construction Trailers	60	Months	$400	$24,000
	Sheetpiling	540,000	Square Ft	$12	$6,480,000
	Bank excavation and hauling to CDF	125,000	Cubic yards	$50	$6,250,000
	Bank replacement	75,000	Cubic yards	$25	$1,875,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$1,976,000	$1,976,000
	Operate CDF - labor	1,081	days	$3,086	$3,335,000
	CDF & WTF maintenance	5	Years	$743,000	$3,715,000
	WTF chemicals	3,035	M Gal	$1,500	$4,553,000
	WTF filter media	3,035	M Gal	$200	$607,000
	WTF activated carbon	3,035	M Gal	$1,860	$5,646,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$56,371,000
	Engineering/Project Management (5%)				$2,819,000
	Construction Oversight (6%)				$3,382,000
	Contingency (20%)				$11,274,000
				TOTAL (YEARS 2007 - 2011):	$73,846,000
				PRESENT VALUE:	$40,351,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$231,000	$231,000
	General Conditions	1	Lump Sum	$174,000	$174,000
	Project Insurance	1	Lump Sum	$116,000	$116,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	125,000	cubic yards	$50	$6,250,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	0	Lump Sum	$960,000	$0
	Bank stab. & habitat enhancement - Otsego	0	Lump Sum	$1,120,000	$0
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$12,090,000
	Engineering/Project Management (8%)				$967,000
	Construction Oversight (6%)				$725,000
	Contingency (20%)				$2,418,000
				TOTAL (YEARS 2007 - 2011):	$16,200,000
				PRESENT VALUE:	$7,406,000

Table A-5A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$259,000	$259,000
	General Conditions	1	Lump Sum	$194,000	$194,000
	Project Insurance	1	Lump Sum	$130,000	$130,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	Operate CDF - labor	189	days	$3,086	$583,000
	CDF & WTF maintenance	5	Years	$843,000	$4,215,000
	WTF chemicals	1,110	M Gal	$1,500	$1,665,000
	WTF filter media	1,110	M Gal	$200	$222,000
	WTF activated carbon	1,110	M Gal	$1,860	$2,065,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$13,548,000
	Engineering/Project Management (5%)				$677,000
	Construction Oversight (6%)				$813,000
	Contingency (20%)				$2,710,000
				TOTAL (YEARS 2007 - 2011):	$17,748,000
				PRESENT VALUE:	$9,698,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$637,000	$637,000
	General Conditions	1	Lump Sum	$478,000	$478,000
	Project Insurance	1	Lump Sum	$319,000	$319,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$2,299,678	$0
	Exposed soil cover & veget. - Otsego	0	Lump Sum	$1,939,999	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$17,199,559	$17,200,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	2,013,202	square feet	$0.50	$1,007,000
	CDF cover material	223,689	cubic yards	$25	$5,592,000
	CDF 2% graded cap	203,604	cubic yards	$25	$5,090,000
	SUBTOTAL				$33,286,000
	Engineering/Project Management (8%)				$2,663,000
	Construction Oversight (6%)				$1,997,000
	Contingency (20%)				$6,657,000
				TOTAL (YEARS 2012 - 2014):	$44,603,000
				PRESENT VALUE:	$18,537,000
	SUBTOTAL DREDGING CONSTRUCTION				$89,723,000
	SUBTOTAL DREDGING OPERATION				$91,594,000
	SUBTOTAL DREDGING				$181,317,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$46,563,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$50,049,000
	SUBTOTAL PRESENT WORTH DREDGING				$96,612,000

Table A-5A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	CDF & groundwater monitoring	(2007 - 2044)	$5,605	$213,000	$49,000
	SUBTOTAL ANNUAL				$1,802,000
	SUBTOTAL ANNUAL ALL YEARS				$34,564,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,969,000
				GRAND TOTAL COST:	**$215,881,000**
				GRAND TOTAL PRESENT WORTH COST:	**$105,581,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

Table A-5A-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5A-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (25-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0 042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.62 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 1.2 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 38 years.

Table A-5B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$909,000	$909,000
	General Conditions	1	Lump Sum	$682,000	$682,000
	Project Insurance	1	Lump Sum	$455,000	$455,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	CDF A = 17.6 Acres	- -	- -	- -	- -
	CDF B = 43.6 Acres	- -	- -	- -	- -
	CDF C = 60.9 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	137	Acres	$0	$0
	CDF clearing & grubbing	137	Acres	$7,700	$1,055,000
	CDF bedding	197,104	cubic yards	$20	$3,942,000
	CDF exterior dikes	713,185	cubic yards	$15	$10,698,000
	CDF interior dikes	599,888	cubic yards	$15	$8,998,000
	CDF liner, bot & walls	5,321,802	square feet	$0.50	$2,661,000
	CDF piping	52,228	Linear feet	$12	$622,000
	CDF monitoring wells	17	wells	$1,000	$17,000
	WTF site preparation & paving	72,600	sq yards	$25	$1,815,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,431,000	$1,431,000
	SUBTOTAL				$47,509,000
	Engineering/Project Management (8%)				$3,801,000
	Construction Oversight (6%)				$2,851,000
	Contingency (20%)				$9,502,000
				TOTAL (YEARS 2005 - 2006):	$63,663,000
				PRESENT VALUE:	$45,391,000

Table A-5B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$2,376,000	$2,376,000
	General Conditions	1	Lump Sum	$1,782,000	$1,782,000
	Project Insurance	1	Lump Sum	$1,188,000	$1,188,000
	Construction Trailers	60	Months	$400	$24,000
	Sheetpiling	910,000	Square Ft	$12	$10,920,000
	Bank excavation and hauling to CDF	421,296	Cubic yards	$50	$21,065,000
	Bank replacement	126,389	Cubic yards	$25	$3,160,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$4,164,000	$4,164,000
	Operate CDF - labor	2,277	days	$3,086	$7,028,000
	CDF & WTF maintenance	5	Years	$1,776,000	$8,880,000
	WTF chemicals	6,416	M Gal	$1,500	$9,624,000
	WTF filter media	6,416	M Gal	$200	$1,283,000
	WTF activated carbon	6,416	M Gal	$1,860	$11,934,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$124,123,000
	Engineering/Project Management (5%)				$6,206,000
	Construction Oversight (6%)				$7,447,000
	Contingency (20%)				$24,825,000
				TOTAL (YEARS 2006 - 2010):	$162,601,000
				PRESENT VALUE:	$95,069,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$650,000	$650,000
	General Conditions	1	Lump Sum	$487,000	$487,000
	Project Insurance	1	Lump Sum	$325,000	$325,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	55,556	cubic yards	$50	$2,778,000
	Removal of exposed sed. - Otsego (2009)	115,741	cubic yards	$50	$5,787,000
	Removal of exposed sed. - Trowbridge (2013)	250,000	cubic yards	$50	$12,500,000
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$33,946,000
	Engineering/Project Management (8%)				$2,716,000
	Construction Oversight (6%)				$2,037,000
	Contingency (20%)				$6,789,000
				TOTAL (YEARS 2006 - 2010):	$45,488,000
				PRESENT VALUE:	$19,712,000

Table A-5B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$523,000	$523,000
	General Conditions	1	Lump Sum	$392,000	$392,000
	Project Insurance	1	Lump Sum	$261,000	$261,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	Operate CDF - labor	389	days	$3,086	$1,201,000
	CDF & WTF maintenance	4	Years	$2,078,000	$8,312,000
	WTF chemicals	2,292	M Gal	$1,500	$3,439,000
	WTF filter media	2,292	M Gal	$200	$458,000
	WTF activated carbon	2,292	M Gal	$1,860	$4,264,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$27,323,000
	Engineering/Project Management (5%)				$1,366,000
	Construction Oversight (6%)				$1,639,000
	Contingency (20%)				$5,465,000
				TOTAL (YEARS 2007 - 2010):	$35,793,000
				PRESENT VALUE:	$20,197,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$1,081,000	$1,081,000
	General Conditions	1	Lump Sum	$811,000	$811,000
	Project Insurance	1	Lump Sum	$540,000	$540,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,234,898	$2,235,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$1,804,901	$1,805,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$16,913,260	$16,913,000
	Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,846,000	$5,846,000
	CDF top liner	4,315,802	square feet	$0.50	$2,158,000
	CDF cover material	479,534	cubic yards	$25	$11,988,000
	CDF 2% graded cap	402,035	cubic yards	$25	$10,051,000
	SUBTOTAL				$56,471,000
	Engineering/Project Management (8%)				$4,518,000
	Construction Oversight (6%)				$3,388,000
	Contingency (20%)				$11,294,000
				TOTAL (YEARS 2012 - 2020):	$75,671,000
				PRESENT VALUE:	$26,025,000
	SUBTOTAL DREDGING CONSTRUCTION				$184,822,000
	SUBTOTAL DREDGING OPERATION				$198,394,000
	SUBTOTAL DREDGING				$383,216,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$91,128,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$115,266,000
	SUBTOTAL PRESENT WORTH DREDGING				$206,394,000

Table A-5B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$13,591	$598,000	$123,000
	SUBTOTAL ANNUAL				$1,809,000
	SUBTOTAL ANNUAL ALL YEARS				$43,671,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,905,000
				GRAND TOTAL COST:	**$426,887,000**
				GRAND TOTAL PRESENT WORTH COST:	**$219,299,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments as needed to access the former impoundments.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.

Table A-5B

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.54 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 2.5 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-5B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$184,000	$184,000
	General Conditions	1	Lump Sum	$138,000	$138,000
	Project Insurance	1	Lump Sum	$92,000	$92,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	CDF A = 17.6 Acres	- -	- -	- -	- -
	CDF B = 0 Acres	- -	- -	- -	- -
	CDF C = 0 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	23	Acres	$0	$0
	CDF clearing & grubbing	23	Acres	$7,700	$177,000
	CDF bedding	28,462	cubic yards	$20	$569,000
	CDF exterior dikes	152,072	cubic yards	$15	$2,281,000
	CDF interior dikes	74,986	cubic yards	$15	$1,125,000
	CDF liner, bot & walls	768,483	square feet	$0.50	$384,000
	CDF piping	7,592	Linear feet	$12	$90,000
	CDF monitoring wells	4	wells	$1,000	$4,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$9,605,000
	Engineering/Project Management (8%)				$768,000
	Construction Oversight (6%)				$576,000
	Contingency (20%)				$1,921,000
				TOTAL (YEARS 2005 - 2006):	$12,870,000
				PRESENT VALUE:	$9,176,000

Table A-5B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$352,000	$352,000
	General Conditions	1	Lump Sum	$264,000	$264,000
	Project Insurance	1	Lump Sum	$176,000	$176,000
	Construction Trailers	24	Months	$400	$10,000
	Sheetpiling	120,000	Square Ft	$12	$1,440,000
	Bank excavation and hauling to CDF	55,556	Cubic yards	$50	$2,778,000
	Bank replacement	16,667	Cubic yards	$25	$417,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$685,000	$685,000
	Operate CDF - labor	375	days	$3,086	$1,157,000
	CDF & WTF maintenance	2	Years	$366,000	$732,000
	WTF chemicals	1,071	M Gal	$1,500	$1,607,000
	WTF filter media	1,071	M Gal	$200	$214,000
	WTF activated carbon	1,071	M Gal	$1,860	$1,993,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$18,388,000
	Engineering/Project Management (5%)				$919,000
	Construction Oversight (6%)				$1,103,000
	Contingency (20%)				$3,678,000
				TOTAL (YEARS 2007 - 2008):	$24,088,000
				PRESENT VALUE:	$14,510,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$115,000	$115,000
	General Conditions	1	Lump Sum	$86,000	$86,000
	Project Insurance	1	Lump Sum	$58,000	$58,000
	Construction Trailers	24	Months	$400	$10,000
	Removal of exposed sed. - Plainwell (2018)	55,556	cubic yards	$50	$2,778,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Bank stab. & habitat enhancement - Otsego	0	Lump Sum	$1,120,000	$0
	Bank stab. & habitat enhancemt - Trowbridge	0	Lump Sum	$3,285,000	$0
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$6,017,000
	Engineering/Project Management (8%)				$481,000
	Construction Oversight (6%)				$361,000
	Contingency (20%)				$1,203,000
				TOTAL (YEARS 2007 - 2008):	$8,062,000
				PRESENT VALUE:	$3,849,000

Table A-5B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$89,000	$89,000
	General Conditions	1	Lump Sum	$67,000	$67,000
	Project Insurance	1	Lump Sum	$45,000	$45,000
	Construction Trailers	24	Months	$400	$10,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	Operate CDF - labor	75	days	$3,086	$231,000
	CDF & WTF maintenance	2	Years	$466,000	$932,000
	WTF chemicals	445	M Gal	$1,500	$667,000
	WTF filter media	445	M Gal	$200	$89,000
	WTF activated carbon	445	M Gal	$1,860	$827,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$4,653,000
	Engineering/Project Management (5%)				$233,000
	Construction Oversight (6%)				$279,000
	Contingency (20%)				$931,000
				TOTAL (YEARS 2007 - 2008):	$6,096,000
				PRESENT VALUE:	$3,672,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$154,000	$154,000
	General Conditions	1	Lump Sum	$116,000	$116,000
	Project Insurance	1	Lump Sum	$77,000	$77,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,234,898	$2,235,000
	Exposed soil cover & veget. - Otsego	0	Lump Sum	$1,804,901	$0
	Exposed soil cover & veget. - Trowbridge	0	Lump Sum	$16,913,260	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	548,786	square feet	$0.50	$274,000
	CDF cover material	60,976	cubic yards	$25	$1,524,000
	CDF 2% graded cap	28,977	cubic yards	$25	$724,000
	SUBTOTAL				$8,058,000
	Engineering/Project Management (8%)				$645,000
	Construction Oversight (6%)				$483,000
	Contingency (20%)				$1,612,000
				TOTAL (YEARS 2009 - 2009):	$10,798,000
				PRESENT VALUE:	$5,873,000
	SUBTOTAL DREDGING CONSTRUCTION				$31,730,000
	SUBTOTAL DREDGING OPERATION				$30,184,000
	SUBTOTAL DREDGING				$61,914,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$18,898,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$18,182,000
	SUBTOTAL PRESENT WORTH DREDGING				$37,080,000

Table A-5B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$50,000	$100,000	$60,000
	Confirmation sampling and analyses	(2007 - 2008)	$832,000	$1,664,000	$1,002,000
	Bank observation	(2009 - 2039)	$36,129	$1,120,000	$264,000
	Bank maintenance	(2009 - 2039)	$479,548	$14,866,000	$3,498,000
	Monitoring - biota	(2007 - 2038)	$144,188	$4,614,000	$1,215,000
	Monitoring - water & sed	(2007 - 2038)	$134,125	$4,292,000	$1,130,000
	KALSIM model updates	(2007 - 2038)	$124,875	$3,996,000	$1,052,000
	CDF & groundwater monitoring	(2007 - 2039)	$3,212	$106,000	$27,000
	SUBTOTAL ANNUAL				$1,804,000
	SUBTOTAL ANNUAL ALL YEARS				$30,758,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,248,000
				GRAND TOTAL COST:	**$92,672,000**
				GRAND TOTAL PRESENT WORTH COST:	**$45,328,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul)

Table A-5B-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2,400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.15 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 320,000 cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 33 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-5B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$297,000	$297,000
	General Conditions	1	Lump Sum	$223,000	$223,000
	Project Insurance	1	Lump Sum	$148,000	$148,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	CDF = 43.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	49	Acres	$0	$0
	CDF clearing & grubbing	49	Acres	$7,700	$377,000
	CDF bedding	70,380	cubic yards	$20	$1,408,000
	CDF exterior dikes	254,891	cubic yards	$15	$3,823,000
	CDF interior dikes	221,044	cubic yards	$15	$3,316,000
	CDF liner, bot & walls	1,900,258	square feet	$0.50	$950,000
	CDF piping	18,305	Linear feet	$12	$218,000
	CDF monitoring wells	6	wells	$1,000	$6,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$15,504,000
	Engineering/Project Management (8%)				$1,240,000
	Construction Oversight (6%)				$930,000
	Contingency (20%)				$3,101,000
				TOTAL (YEARS 2005 - 2006):	$20,775,000
				PRESENT VALUE:	$14,812,000

Table A-5B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$782,000	$782,000
	General Conditions	1	Lump Sum	$587,000	$587,000
	Project Insurance	1	Lump Sum	$391,000	$391,000
	Construction Trailers	48	Months	$400	$19,000
	Sheetpiling	250,000	Square Ft	$12	$3,000,000
	Bank excavation and hauling to CDF	115,741	Cubic yards	$50	$5,787,000
	Bank replacement	34,722	Cubic yards	$25	$868,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$1,503,000	$1,503,000
	Operate CDF - labor	822	days	$3,086	$2,537,000
	CDF & WTF maintenance	4	Years	$629,000	$2,516,000
	WTF chemicals	2,309	M Gal	$1,500	$3,464,000
	WTF filter media	2,309	M Gal	$200	$462,000
	WTF activated carbon	2,309	M Gal	$1,860	$4,295,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$40,861,000
	Engineering/Project Management (5%)				$2,043,000
	Construction Oversight (6%)				$2,452,000
	Contingency (20%)				$8,172,000
				TOTAL (YEARS 2007 - 2010):	$53,528,000
				PRESENT VALUE:	$30,204,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$179,000	$179,000
	General Conditions	1	Lump Sum	$134,000	$134,000
	Project Insurance	1	Lump Sum	$89,000	$89,000
	Construction Trailers	48	Months	$400	$19,000
	Removal of exposed sed. - Plainwell (2018)	115,741	cubic yards	$50	$5,787,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	0	Lump Sum	$960,000	$0
	Bank stab. & habitat enhancemt - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Bank stab. & habitat enhancemt - Trowbridge	0	Lump Sum	$3,285,000	$0
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$9,338,000
	Engineering/Project Management (8%)				$747,000
	Construction Oversight (6%)				$560,000
	Contingency (20%)				$1,868,000
				TOTAL (YEARS 2007 - 2010):	$12,513,000
				PRESENT VALUE:	$5,896,000

Table A-5B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$170,000	$170,000
	General Conditions	1	Lump Sum	$128,000	$128,000
	Project Insurance	1	Lump Sum	$85,000	$85,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	Operate CDF - labor	125	days	$3,086	$387,000
	CDF & WTF maintenance	4	Years	$730,000	$2,920,000
	WTF chemicals	738	M Gal	$1,500	$1,106,000
	WTF filter media	738	M Gal	$200	$148,000
	WTF activated carbon	738	M Gal	$1,860	$1,372,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$8,903,000
	Engineering/Project Management (5%)				$445,000
	Construction Oversight (6%)				$534,000
	Contingency (20%)				$1,781,000
				TOTAL (YEARS 2007 - 2010):	$11,663,000
				PRESENT VALUE:	$6,581,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$264,000	$264,000
	General Conditions	1	Lump Sum	$198,000	$198,000
	Project Insurance	1	Lump Sum	$132,000	$132,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$2,234,898	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$1,804,901	$1,805,000
	Exposed soil cover & veget. - Trowbridge	0	Lump Sum	$16,913,260	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	1,541,755	square feet	$0.50	$771,000
	CDF cover material	171,306	cubic yards	$25	$4,283,000
	CDF 2% graded cap	136,451	cubic yards	$25	$3,411,000
	SUBTOTAL				$13,818,000
	Engineering/Project Management (8%)				$1,105,000
	Construction Oversight (6%)				$829,000
	Contingency (20%)				$2,764,000
				TOTAL (YEARS 2011 - 2011):	$18,516,000
				PRESENT VALUE:	$8,797,000
	SUBTOTAL DREDGING CONSTRUCTION				$51,804,000
	SUBTOTAL DREDGING OPERATION				$65,191,000
	SUBTOTAL DREDGING				$116,995,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$29,505,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$36,785,000
	SUBTOTAL PRESENT WORTH DREDGING				$66,290,000

Table A-5B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	CDF & groundwater monitoring	(2007 - 2041)	$4,800	$168,000	$41,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$33,286,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,744,000
				GRAND TOTAL COST:	**$150,281,000**
				GRAND TOTAL PRESENT WORTH COST:	**$75,034,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

Table A-5B-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo, 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.62 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 0.9 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 35 years.

Table A-5B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$429,000	$429,000
	General Conditions	1	Lump Sum	$322,000	$322,000
	Project Insurance	1	Lump Sum	$215,000	$215,000
	Construction Trailers	24	Months	$400	$10,000
	Cleaning	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	CDF = 60.9 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	66	Acres	$0	$0
	CDF clearing & grubbing	66	Acres	$7,700	$508,000
	CDF bedding	98,262	cubic yards	$20	$1,965,000
	CDF exterior dikes	306,223	cubic yards	$15	$4,593,000
	CDF interior dikes	303,858	cubic yards	$15	$4,558,000
	CDF liner, bot & walls	2,653,061	square feet	$0.50	$1,327,000
	CDF piping	26,331	Linear feet	$12	$313,000
	CDF monitoring wells	7	wells	$1,000	$7,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$22,428,000
	Engineering/Project Management (8%)				$1,794,000
	Construction Oversight (6%)				$1,346,000
	Contingency (20%)				$4,486,000
				TOTAL (YEARS 2005 - 2006):	$30,054,000
				PRESENT VALUE:	$21,428,000

Table A-5B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,208,000	$1,208,000
	General Conditions	1	Lump Sum	$906,000	$906,000
	Project Insurance	1	Lump Sum	$604,000	$604,000
	Construction Trailers	60	Months	$400	$24,000
	Sheetpiling	540,000	Square Ft	$12	$6,480,000
	Bank excavation and hauling to CDF	250,000	Cubic yards	$50	$12,500,000
	Bank replacement	75,000	Cubic yards	$25	$1,875,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$1,976,000	$1,976,000
	Operate CDF - labor	1,081	days	$3,086	$3,335,000
	CDF & WTF maintenance	5	Years	$781,000	$3,905,000
	WTF chemicals	3,035	M Gal	$1,500	$4,553,000
	WTF filter media	3,035	M Gal	$200	$607,000
	WTF activated carbon	3,035	M Gal	$1,860	$5,646,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$63,102,000
	Engineering/Project Management (5%)				$3,155,000
	Construction Oversight (6%)				$3,786,000
	Contingency (20%)				$12,620,000
				TOTAL (YEARS 2007 - 2011):	$82,663,000
				PRESENT VALUE:	$45,169,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$356,000	$356,000
	General Conditions	1	Lump Sum	$267,000	$267,000
	Project Insurance	1	Lump Sum	$178,000	$178,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	250,000	cubic yards	$50	$12,500,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	0	Lump Sum	$960,000	$0
	Bank stab. & habitat enhancement - Otsego	0	Lump Sum	$1,120,000	$0
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$18,620,000
	Engineering/Project Management (8%)				$1,490,000
	Construction Oversight (6%)				$1,117,000
	Contingency (20%)				$3,724,000
				TOTAL (YEARS 2007 - 2011):	$24,951,000
				PRESENT VALUE:	$11,609,000

Table A-5B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$263,000	$263,000
	General Conditions	1	Lump Sum	$197,000	$197,000
	Project Insurance	1	Lump Sum	$132,000	$132,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	Operate CDF - labor	189	days	$3,086	$583,000
	CDF & WTF maintenance	5	Years	$882,000	$4,410,000
	WTF chemicals	1,110	M Gal	$1,500	$1,665,000
	WTF filter media	1,110	M Gal	$200	$222,000
	WTF activated carbon	1,110	M Gal	$1,860	$2,065,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$13,752,000
	Engineering/Project Management (5%)				$688,000
	Construction Oversight (6%)				$825,000
	Contingency (20%)				$2,750,000
				TOTAL (YEARS 2007 - 2011):	$18,015,000
				PRESENT VALUE:	$9,844,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$662,000	$662,000
	General Conditions	1	Lump Sum	$496,000	$496,000
	Project Insurance	1	Lump Sum	$331,000	$331,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$2,234,898	$0
	Exposed soil cover & veget. - Otsego	0	Lump Sum	$1,804,901	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$16,913,260	$16,913,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	2,225,261	square feet	$0.50	$1,113,000
	CDF cover material	247,251	cubic yards	$25	$6,181,000
	CDF 2% graded cap	236,606	cubic yards	$25	$5,915,000
	SUBTOTAL				$34,574,000
	Engineering/Project Management (8%)				$2,766,000
	Construction Oversight (6%)				$2,074,000
	Contingency (20%)				$6,915,000
				TOTAL (YEARS 2012 - 2014):	$46,329,000
				PRESENT VALUE:	$19,254,000
	SUBTOTAL DREDGING CONSTRUCTION				$101,334,000
	SUBTOTAL DREDGING OPERATION				$100,678,000
	SUBTOTAL DREDGING				$202,012,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$52,291,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$55,013,000
	SUBTOTAL PRESENT WORTH DREDGING				$107,304,000

Table A-5B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	CDF & groundwater monitoring	(2007 - 2044)	$5,605	$213,000	$49,000
	SUBTOTAL ANNUAL				$1,802,000
	SUBTOTAL ANNUAL ALL YEARS				$34,564,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,969,000
				GRAND TOTAL COST:	**$236,576,000**
				GRAND TOTAL PRESENT WORTH COST:	**$116,273,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

Table A-5B-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5B-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (50-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal. for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.62 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 1.3 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 38 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-5C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$977,000	$977,000
	General Conditions	1	Lump Sum	$733,000	$733,000
	Project Insurance	1	Lump Sum	$489,000	$489,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	CDF A = 20.2 Acres	- -	- -	- -	- -
	CDF B = 48.6 Acres	- -	- -	- -	- -
	CDF C = 71.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	155	Acres	$0	$0
	CDF clearing & grubbing	155	Acres	$7,700	$1,194,000
	CDF bedding	226,470	cubic yards	$20	$4,529,000
	CDF exterior dikes	769,523	cubic yards	$15	$11,543,000
	CDF interior dikes	689,349	cubic yards	$15	$10,340,000
	CDF liner, bot & walls	6,114,677	square feet	$0.50	$3,057,000
	CDF piping	60,249	Linear feet	$12	$717,000
	CDF monitoring wells	19	wells	$1,000	$19,000
	WTF site preparation & paving	72,600	sq yards	$25	$1,815,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,431,000	$1,431,000
	SUBTOTAL				$51,068,000
	Engineering/Project Management (8%)				$4,085,000
	Construction Oversight (6%)				$3,064,000
	Contingency (20%)				$10,214,000
				TOTAL (YEARS 2005 - 2006):	$68,431,000
				PRESENT VALUE:	$48,790,000

Table A-5C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$2,813,000	$2,813,000
	General Conditions	1	Lump Sum	$2,110,000	$2,110,000
	Project Insurance	1	Lump Sum	$1,407,000	$1,407,000
	Construction Trailers	60	Months	$400	$24,000
	Sheetpiling	910,000	Square Ft	$12	$10,920,000
	Bank excavation and hauling to CDF	842,593	Cubic yards	$50	$42,130,000
	Bank replacement	126,389	Cubic yards	$25	$3,160,000
	Dredges, barges, pumps and boats	8.1	Crew-Years	$700,726	$5,676,000
	Dredge, boat and pump fuel use	8.1	Crew-Years	$654,410	$5,301,000
	Dredge labor	8.1	Crew-Years	$1,303,584	$10,559,000
	Dredge pipelines	8.1	Crew-Years	$696,960	$5,645,000
	Silt Curtains, reefing and anchoring	8.1	Crew-Years	$123,000	$996,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Shoreline protection	1	Lump Sum	$4,164,000	$4,164,000
	Operate CDF - labor	2,277	days	$3,086	$7,028,000
	CDF & WTF maintenance	5	Years	$1,940,000	$9,700,000
	WTF chemicals	6,416	M Gal	$1,500	$9,624,000
	WTF filter media	6,416	M Gal	$200	$1,283,000
	WTF activated carbon	6,416	M Gal	$1,860	$11,934,000
	Operate WTF - labor	2,277	days	$4,629	$10,542,000
	SUBTOTAL				$146,992,000
	Engineering/Project Management (5%)				$7,350,000
	Construction Oversight (6%)				$8,820,000
	Contingency (20%)				$29,398,000
				TOTAL (YEARS 2006 - 2010):	$192,560,000
				PRESENT VALUE:	$112,585,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$1,071,000	$1,071,000
	General Conditions	1	Lump Sum	$803,000	$803,000
	Project Insurance	1	Lump Sum	$535,000	$535,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed - Plainwell (2018)	111,111	cubic yards	$50	$5,556,000
	Removal of exposed sed - Otsego (2009)	231,481	cubic yards	$50	$11,574,000
	Removal of exposed sed. - Trowbridge (2013)	500,000	cubic yards	$50	$25,000,000
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$656,000	$1,968,000
	WTF multimedia filters	3	Lump Sum	$474,000	$1,422,000
	WTF carbon adsorption	3	Lump Sum	$545,000	$1,635,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$1,005,000	$1,005,000
	SUBTOTAL				$55,958,000
	Engineering/Project Management (8%)				$4,477,000
	Construction Oversight (6%)				$3,357,000
	Contingency (20%)				$11,192,000
				TOTAL (YEARS 2006 - 2010):	$74,984,000
				PRESENT VALUE:	$31,968,000

Table A-5C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$536,000	$536,000
	General Conditions	1	Lump Sum	$402,000	$402,000
	Project Insurance	1	Lump Sum	$268,000	$268,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	1.4	Years	$805,351	$1,127,000
	Dredge, boat and pump fuel use	1.4	Years	$1,034,570	$1,448,000
	Dredge labor	1.4	Years	$1,303,584	$1,825,000
	Dredge pipelines	1.4	Years	$760,320	$1,064,000
	Silt Curtains, reefing and anchoring	1.4	Years	$123,000	$172,000
	Turbidity monitoring stations	1	Lump Sum	$306,000	$306,000
	Shoreline protection	1	Lump Sum	$711,000	$711,000
	Operate CDF - labor	389	days	$3,086	$1,201,000
	CDF & WTF maintenance	4	Years	$2,241,000	$8,964,000
	WTF chemicals	2,292	M Gal	$1,500	$3,439,000
	WTF filter media	2,292	M Gal	$200	$458,000
	WTF activated carbon	2,292	M Gal	$1,860	$4,264,000
	Operate WTF - labor	389	days	$4,629	$1,801,000
	SUBTOTAL				$28,005,000
	Engineering/Project Management (5%)				$1,400,000
	Construction Oversight (6%)				$1,680,000
	Contingency (20%)				$5,601,000
				TOTAL (YEARS 2007 - 2010):	$36,686,000
				PRESENT VALUE:	$20,700,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$1,161,000	$1,161,000
	General Conditions	1	Lump Sum	$871,000	$871,000
	Project Insurance	1	Lump Sum	$580,000	$580,000
	Construction Trailers	108	Months	$400	$43,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,094,542	$2,095,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$1,534,706	$1,535,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$16,335,260	$16,335,000
	Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$5,846,000	$5,846,000
	CDF top liner	5,032,621	square feet	$0.50	$2,516,000
	CDF cover material	559,180	cubic yards	$25	$13,980,000
	CDF 2% graded cap	507,814	cubic yards	$25	$12,695,000
	SUBTOTAL				$60,657,000
	Engineering/Project Management (8%)				$4,853,000
	Construction Oversight (6%)				$3,639,000
	Contingency (20%)				$12,131,000
				TOTAL (YEARS 2012 - 2020):	$81,280,000
				PRESENT VALUE:	$27,954,000
	SUBTOTAL DREDGING CONSTRUCTION				$224,695,000
	SUBTOTAL DREDGING OPERATION				$229,246,000
	SUBTOTAL DREDGING				$453,941,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$108,712,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$133,285,000
	SUBTOTAL PRESENT WORTH DREDGING				$241,997,000

Table A-5C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2006 - 2011)	$50,000	$300,000	$170,000
	Confirmation sampling and analyses	(2006 - 2020)	$832,000	$12,480,000	$5,403,000
	Bank observation	(2010 - 2040)	$36,129	$1,120,000	$246,000
	Bank maintenance	(2010 - 2040)	$479,548	$14,866,000	$3,269,000
	Monitoring - biota	(2006 - 2041)	$142,306	$5,123,000	$1,323,000
	Monitoring - water & sed	(2006 - 2041)	$132,111	$4,756,000	$1,228,000
	KALSIM model updates	(2006 - 2041)	$123,000	$4,428,000	$1,143,000
	CDF & groundwater monitoring	(2007 - 2050)	$15,205	$669,000	$137,000
	SUBTOTAL ANNUAL				$1,810,000
	SUBTOTAL ANNUAL ALL YEARS				$43,742,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$12,919,000
				GRAND TOTAL COST:	**$497,683,000**
				GRAND TOTAL PRESENT WORTH COST:	**$254,916,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes cleaning and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments as needed to access the former impoundments.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).
- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.

Table A-5C

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.54 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 3.0 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 44 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table A-5C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$193,000	$193,000
	General Conditions	1	Lump Sum	$145,000	$145,000
	Project Insurance	1	Lump Sum	$96,000	$96,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	CDF A = 20.2 Acres	- -	- -	- -	- -
	CDF B = 0 Acres	- -	- -	- -	- -
	CDF C = 0 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	25	Acres	$0	$0
	CDF clearing & grubbing	25	Acres	$7,700	$193,000
	CDF bedding	32,586	cubic yards	$20	$652,000
	CDF exterior dikes	164,629	cubic yards	$15	$2,469,000
	CDF interior dikes	81,265	cubic yards	$15	$1,219,000
	CDF liner, bot & walls	879,814	square feet	$0.50	$440,000
	CDF piping	8,665	Linear feet	$12	$103,000
	CDF monitoring wells	4	wells	$1,000	$4,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$10,075,000
	Engineering/Project Management (8%)				$806,000
	Construction Oversight (6%)				$605,000
	Contingency (20%)				$2,015,000
				TOTAL (YEARS 2005 - 2006):	$13,501,000
				PRESENT VALUE:	$9,626,000

Table A-5C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$408,000	$408,000
	General Conditions	1	Lump Sum	$306,000	$306,000
	Project Insurance	1	Lump Sum	$204,000	$204,000
	Construction Trailers	24	Months	$400	$10,000
	Sheetpiling	120,000	Square Ft	$12	$1,440,000
	Bank excavation and hauling to CDF	111,111	Cubic yards	$50	$5,556,000
	Bank replacement	16,667	Cubic yards	$25	$417,000
	Dredges, barges, pumps and boats	1.3	Crew-Years	$700,726	$911,000
	Dredge, boat and pump fuel use	1.3	Crew-Years	$654,410	$851,000
	Dredge labor	1.3	Crew-Years	$1,303,584	$1,695,000
	Dredge pipelines	1.3	Crew-Years	$696,960	$906,000
	Silt Curtains, reefing and anchoring	1.3	Crew-Years	$123,000	$160,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Shoreline protection	1	Lump Sum	$685,000	$685,000
	Operate CDF - labor	375	days	$3,086	$1,157,000
	CDF & WTF maintenance	2	Years	$387,000	$774,000
	WTF chemicals	1,071	M Gal	$1,500	$1,607,000
	WTF filter media	1,071	M Gal	$200	$214,000
	WTF activated carbon	1,071	M Gal	$1,860	$1,993,000
	Operate WTF - labor	375	days	$4,629	$1,735,000
	SUBTOTAL				$21,334,000
	Engineering/Project Management (5%)				$1,067,000
	Construction Oversight (6%)				$1,280,000
	Contingency (20%)				$4,267,000
				TOTAL (YEARS 2007 - 2008):	$27,948,000
				PRESENT VALUE:	$16,835,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$171,000	$171,000
	General Conditions	1	Lump Sum	$128,000	$128,000
	Project Insurance	1	Lump Sum	$85,000	$85,000
	Construction Trailers	24	Months	$400	$10,000
	Removal of exposed sed. - Plainwell (2018)	111,111	cubic yards	$50	$5,556,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	1	Lump Sum	$960,000	$960,000
	Bank stab. & habitat enhancement - Otsego	0	Lump Sum	$1,120,000	$0
	Bank stab. & habitat enhancemt - Trowbridge	0	Lump Sum	$3,285,000	$0
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$8,920,000
	Engineering/Project Management (8%)				$714,000
	Construction Oversight (6%)				$535,000
	Contingency (20%)				$1,784,000
				TOTAL (YEARS 2007 - 2008):	$11,953,000
				PRESENT VALUE:	$5,718,000

Table A-5C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-PW - Hydraulic Dredging of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$90,000	$90,000
	General Conditions	1	Lump Sum	$67,000	$67,000
	Project Insurance	1	Lump Sum	$45,000	$45,000
	Construction Trailers	24	Months	$400	$10,000
	Dredges, barges, pumps and boats	0.3	Years	$805,351	$242,000
	Dredge, boat and pump fuel use	0.3	Years	$1,034,570	$310,000
	Dredge labor	0.3	Years	$1,303,584	$391,000
	Dredge pipelines	0.3	Years	$760,320	$228,000
	Silt Curtains, reefing and anchoring	0.3	Years	$123,000	$37,000
	Turbidity monitoring stations	1	Lump Sum	$4,000	$4,000
	Shoreline protection	1	Lump Sum	$137,000	$137,000
	Operate CDF - labor	75	days	$3,086	$231,000
	CDF & WTF maintenance	2	Years	$488,000	$976,000
	WTF chemicals	445	M Gal	$1,500	$667,000
	WTF filter media	445	M Gal	$200	$89,000
	WTF activated carbon	445	M Gal	$1,860	$827,000
	Operate WTF - labor	75	days	$4,629	$347,000
	SUBTOTAL				$4,698,000
	Engineering/Project Management (5%)				$235,000
	Construction Oversight (6%)				$282,000
	Contingency (20%)				$940,000
				TOTAL (YEARS 2007 - 2008):	$6,155,000
				PRESENT VALUE:	$3,708,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$162,000	$162,000
	General Conditions	1	Lump Sum	$121,000	$121,000
	Project Insurance	1	Lump Sum	$81,000	$81,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,094,542	$2,095,000
	Exposed soil cover & veget. - Otsego	0	Lump Sum	$1,534,706	$0
	Exposed soil cover & veget. - Trowbridge	0	Lump Sum	$16,335,260	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	643,164	square feet	$0.50	$322,000
	CDF cover material	71,463	cubic yards	$25	$1,787,000
	CDF 2% graded cap	36,765	cubic yards	$25	$919,000
	SUBTOTAL				$8,441,000
	Engineering/Project Management (8%)				$675,000
	Construction Oversight (6%)				$506,000
	Contingency (20%)				$1,688,000
				TOTAL (YEARS 2009 - 2009):	$11,310,000
				PRESENT VALUE:	$6,152,000
	SUBTOTAL DREDGING CONSTRUCTION				$36,764,000
	SUBTOTAL DREDGING OPERATION				$34,103,000
	SUBTOTAL DREDGING				$70,867,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$21,496,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$20,543,000
	SUBTOTAL PRESENT WORTH DREDGING				$42,039,000

Table A-5C-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
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Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$50,000	$100,000	$60,000
	Confirmation sampling and analyses	(2007 - 2008)	$832,000	$1,664,000	$1,002,000
	Bank observation	(2009 - 2039)	$36,129	$1,120,000	$264,000
	Bank maintenance	(2009 - 2039)	$479,548	$14,866,000	$3,498,000
	Monitoring - biota	(2007 - 2038)	$144,188	$4,614,000	$1,215,000
	Monitoring - water & sed	(2007 - 2038)	$134,125	$4,292,000	$1,130,000
	KALSIM model updates	(2007 - 2038)	$124,875	$3,996,000	$1,052,000
	CDF & groundwater monitoring	(2007 - 2039)	$3,212	$106,000	$27,000
	SUBTOTAL ANNUAL				$1,804,000
	SUBTOTAL ANNUAL ALL YEARS				$30,758,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,248,000
				GRAND TOTAL COST:	**$101,625,000**
				GRAND TOTAL PRESENT WORTH COST:	**$50,287,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

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- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2400000 amortized at 7.0% for 15-year life results in annual owner cost of $263507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
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- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.15 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 376,000 cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 33 years.

Table A-5C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$312,000	$312,000
	General Conditions	1	Lump Sum	$234,000	$234,000
	Project Insurance	1	Lump Sum	$156,000	$156,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	CDF = 48.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	54	Acres	$0	$0
	CDF clearing & grubbing	54	Acres	$7,700	$416,000
	CDF bedding	78,441	cubic yards	$20	$1,569,000
	CDF exterior dikes	270,639	cubic yards	$15	$4,060,000
	CDF interior dikes	234,823	cubic yards	$15	$3,522,000
	CDF liner, bot & walls	2,117,913	square feet	$0.50	$1,059,000
	CDF piping	21,006	Linear feet	$12	$250,000
	CDF monitoring wells	7	wells	$1,000	$7,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$16,323,000
	Engineering/Project Management (8%)				$1,306,000
	Construction Oversight (6%)				$979,000
	Contingency (20%)				$3,265,000
				TOTAL (YEARS 2005 - 2006):	$21,873,000
				PRESENT VALUE:	$15,595,000

Table A-5C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$901,000	$901,000
	General Conditions	1	Lump Sum	$676,000	$676,000
	Project Insurance	1	Lump Sum	$450,000	$450,000
	Construction Trailers	48	Months	$400	$19,000
	Sheetpiling	250,000	Square Ft	$12	$3,000,000
	Bank excavation and hauling to CDF	231,481	Cubic yards	$50	$11,574,000
	Bank replacement	34,722	Cubic yards	$25	$868,000
	Dredges, barges, pumps and boats	2.9	Crew-Years	$700,726	$2,032,000
	Dredge, boat and pump fuel use	2.9	Crew-Years	$654,410	$1,898,000
	Dredge labor	2.9	Crew-Years	$1,303,584	$3,780,000
	Dredge pipelines	2.9	Crew-Years	$696,960	$2,021,000
	Silt Curtains, reefing and anchoring	2.9	Crew-Years	$123,000	$357,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Shoreline protection	1	Lump Sum	$1,503,000	$1,503,000
	Operate CDF - labor	822	days	$3,086	$2,537,000
	CDF & WTF maintenance	4	Years	$666,000	$2,664,000
	WTF chemicals	2,309	M Gal	$1,500	$3,464,000
	WTF filter media	2,309	M Gal	$200	$462,000
	WTF activated carbon	2,309	M Gal	$1,860	$4,295,000
	Operate WTF - labor	822	days	$4,629	$3,805,000
	SUBTOTAL				$47,063,000
	Engineering/Project Management (5%)				$2,353,000
	Construction Oversight (6%)				$2,824,000
	Contingency (20%)				$9,413,000
				TOTAL (YEARS 2007 - 2010):	$61,653,000
				PRESENT VALUE:	$34,788,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$294,000	$294,000
	General Conditions	1	Lump Sum	$221,000	$221,000
	Project Insurance	1	Lump Sum	$147,000	$147,000
	Construction Trailers	48	Months	$400	$19,000
	Removal of exposed sed. - Plainwell (2018)	231,481	cubic yards	$50	$11,574,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	0	Lump Sum	$960,000	$0
	Bank stab. & habitat enhancement - Otsego	1	Lump Sum	$1,120,000	$1,120,000
	Bank stab. & habitat enhancemt - Trowbridge	0	Lump Sum	$3,285,000	$0
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$15,385,000
	Engineering/Project Management (8%)				$1,231,000
	Construction Oversight (6%)				$923,000
	Contingency (20%)				$3,077,000
				TOTAL (YEARS 2007 - 2010):	$20,616,000
				PRESENT VALUE:	$9,788,000

Table A-5C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$173,000	$173,000
	General Conditions	1	Lump Sum	$130,000	$130,000
	Project Insurance	1	Lump Sum	$87,000	$87,000
	Construction Trailers	48	Months	$400	$19,000
	Dredges, barges, pumps and boats	0.4	Years	$805,351	$322,000
	Dredge, boat and pump fuel use	0.4	Years	$1,034,570	$414,000
	Dredge labor	0.4	Years	$1,303,584	$521,000
	Dredge pipelines	0.4	Years	$760,320	$304,000
	Silt Curtains, reefing and anchoring	0.4	Years	$123,000	$49,000
	Turbidity monitoring stations	1	Lump Sum	$149,000	$149,000
	Shoreline protection	1	Lump Sum	$229,000	$229,000
	Operate CDF - labor	125	days	$3,086	$387,000
	CDF & WTF maintenance	4	Years	$767,000	$3,068,000
	WTF chemicals	738	M Gal	$1,500	$1,106,000
	WTF filter media	738	M Gal	$200	$148,000
	WTF activated carbon	738	M Gal	$1,860	$1,372,000
	Operate WTF - labor	125	days	$4,629	$580,000
	SUBTOTAL				$9,058,000
	Engineering/Project Management (5%)				$453,000
	Construction Oversight (6%)				$543,000
	Contingency (20%)				$1,812,000
				TOTAL (YEARS 2007 - 2010):	$11,866,000
				PRESENT VALUE:	$6,696,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$285,000	$285,000
	General Conditions	1	Lump Sum	$214,000	$214,000
	Project Insurance	1	Lump Sum	$143,000	$143,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$2,094,542	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$1,534,706	$1,535,000
	Exposed soil cover & veget. - Trowbridge	0	Lump Sum	$16,335,260	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	1,738,150	square feet	$0.50	$869,000
	CDF cover material	193,128	cubic yards	$25	$4,828,000
	CDF 2% graded cap	163,337	cubic yards	$25	$4,083,000
	SUBTOTAL				$14,911,000
	Engineering/Project Management (8%)				$1,193,000
	Construction Oversight (6%)				$895,000
	Contingency (20%)				$2,982,000
				TOTAL (YEARS 2011 - 2011):	$19,981,000
				PRESENT VALUE:	$9,493,000
	SUBTOTAL DREDGING CONSTRUCTION				$62,470,000
	SUBTOTAL DREDGING OPERATION				$73,519,000
	SUBTOTAL DREDGING				$135,989,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$34,876,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$41,484,000
	SUBTOTAL PRESENT WORTH DREDGING				$76,360,000

Table A-5C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	CDF & groundwater monitoring	(2007 - 2041)	$5,600	$196,000	$48,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$33,314,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,751,000
				GRAND TOTAL COST:	**$169,303,000**
				GRAND TOTAL PRESENT WORTH COST:	**$85,111,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

Table A-5C-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-OT - Hydraulic Dredging of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr. 2400 hrs/yr; or 144,000 cy/yr
- Insitu solids = 77%; dredge solids = 5%; dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.62 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 1.0 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 35 years.

Table A-5C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Pass 1 Construction**				
	Mobilization - 1	1	Lump Sum	$473,000	$473,000
	General Conditions	1	Lump Sum	$355,000	$355,000
	Project Insurance	1	Lump Sum	$236,000	$236,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	CDF = 71.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	77	Acres	$0	$0
	CDF clearing & grubbing	77	Acres	$7,700	$593,000
	CDF bedding	115,443	cubic yards	$20	$2,309,000
	CDF exterior dikes	334,254	cubic yards	$15	$5,014,000
	CDF interior dikes	373,261	cubic yards	$15	$5,599,000
	CDF liner, bot & walls	3,116,950	square feet	$0.50	$1,558,000
	CDF piping	30,579	Linear feet	$12	$364,000
	CDF monitoring wells	8	wells	$1,000	$8,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$477,000	$477,000
	SUBTOTAL				$24,700,000
	Engineering/Project Management (8%)				$1,976,000
	Construction Oversight (6%)				$1,482,000
	Contingency (20%)				$4,940,000
				TOTAL (YEARS 2005 - 2006):	$33,098,000
				PRESENT VALUE:	$23,598,000

Table A-5C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Pass 1 Field Operations**				
	Dredging mobilization - 1	1	Lump Sum	$1,468,000	$1,468,000
	General Conditions	1	Lump Sum	$1,101,000	$1,101,000
	Project Insurance	1	Lump Sum	$734,000	$734,000
	Construction Trailers	60	Months	$400	$24,000
	Sheetpiling	540,000	Square Ft	$12	$6,480,000
	Bank excavation and hauling to CDF	500,000	Cubic yards	$50	$25,000,000
	Bank replacement	75,000	Cubic yards	$25	$1,875,000
	Dredges, barges, pumps and boats	3.9	Crew-Years	$700,726	$2,733,000
	Dredge, boat and pump fuel use	3.9	Crew-Years	$654,410	$2,552,000
	Dredge labor	3.9	Crew-Years	$1,303,584	$5,084,000
	Dredge pipelines	3.9	Crew-Years	$696,960	$2,718,000
	Silt Curtains, reefing and anchoring	3.9	Crew-Years	$123,000	$480,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Shoreline protection	1	Lump Sum	$1,976,000	$1,976,000
	Operate CDF - labor	1,081	days	$3,086	$3,335,000
	CDF & WTF maintenance	5	Years	$886,000	$4,430,000
	WTF chemicals	3,035	M Gal	$1,500	$4,553,000
	WTF filter media	3,035	M Gal	$200	$607,000
	WTF activated carbon	3,035	M Gal	$1,860	$5,646,000
	Operate WTF - labor	1,081	days	$4,629	$5,002,000
	SUBTOTAL				$76,712,000
	Engineering/Project Management (5%)				$3,836,000
	Construction Oversight (6%)				$4,603,000
	Contingency (20%)				$15,342,000
				TOTAL (YEARS 2007 - 2011):	$100,493,000
				PRESENT VALUE:	$54,912,000
C	**Pass 2 Construction**				
	CDF and WTF mobilization - 2	1	Lump Sum	$606,000	$606,000
	General Conditions	1	Lump Sum	$455,000	$455,000
	Project Insurance	1	Lump Sum	$303,000	$303,000
	Construction Trailers	60	Months	$400	$24,000
	Removal of exposed sed. - Plainwell (2018)	500,000	cubic yards	$50	$25,000,000
	Removal of exposed sed. - Otsego (2009)	0	cubic yards	$50	$0
	Removal of exposed sed. - Trowbridge (2013)	0	cubic yards	$50	$0
	Bank stab. & habitat enhancement - Plainwell	0	Lump Sum	$960,000	$0
	Bank stab. & habitat enhancement - Otsego	0	Lump Sum	$1,120,000	$0
	Bank stab. & habitat enhancemt - Trowbridge	1	Lump Sum	$3,285,000	$3,285,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$656,000	$656,000
	WTF multimedia filters	1	Lump Sum	$474,000	$474,000
	WTF carbon adsorption	1	Lump Sum	$545,000	$545,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$335,000	$335,000
	SUBTOTAL				$31,683,000
	Engineering/Project Management (8%)				$2,535,000
	Construction Oversight (6%)				$1,901,000
	Contingency (20%)				$6,337,000
				TOTAL (YEARS 2007 - 2011):	$42,456,000
				PRESENT VALUE:	$20,017,000

Table A-5C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
D	**Pass 2 Field Operations**				
	Dredging mobilization - 2	1	Lump Sum	$274,000	$274,000
	General Conditions	1	Lump Sum	$205,000	$205,000
	Project Insurance	1	Lump Sum	$137,000	$137,000
	Construction Trailers	60	Months	$400	$24,000
	Dredges, barges, pumps and boats	0.7	Years	$805,351	$564,000
	Dredge, boat and pump fuel use	0.7	Years	$1,034,570	$724,000
	Dredge labor	0.7	Years	$1,303,584	$913,000
	Dredge pipelines	0.7	Years	$760,320	$532,000
	Silt Curtains, reefing and anchoring	0.7	Years	$123,000	$86,000
	Turbidity monitoring stations	1	Lump Sum	$153,000	$153,000
	Shoreline protection	1	Lump Sum	$345,000	$345,000
	Operate CDF - labor	189	days	$3,086	$583,000
	CDF & WTF maintenance	5	Years	$986,000	$4,930,000
	WTF chemicals	1,110	M Gal	$1,500	$1,665,000
	WTF filter media	1,110	M Gal	$200	$222,000
	WTF activated carbon	1,110	M Gal	$1,860	$2,065,000
	Operate WTF - labor	189	days	$4,629	$874,000
	SUBTOTAL				$14,296,000
	Engineering/Project Management (5%)				$715,000
	Construction Oversight (6%)				$858,000
	Contingency (20%)				$2,859,000
				TOTAL (YEARS 2007 - 2011):	$18,728,000
				PRESENT VALUE:	$10,233,000
E	**Closure Construction**				
	Mobilization - 3	1	Lump Sum	$714,000	$714,000
	General Conditions	1	Lump Sum	$535,000	$535,000
	Project Insurance	1	Lump Sum	$357,000	$357,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget. - Plainwell	0	Lump Sum	$2,094,542	$0
	Exposed soil cover & veget. - Otsego	0	Lump Sum	$1,534,706	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$16,335,260	$16,335,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$1,949,000	$1,949,000
	CDF top liner	2,651,307	square feet	$0.50	$1,326,000
	CDF cover material	294,590	cubic yards	$25	$7,365,000
	CDF 2% graded cap	307,712	cubic yards	$25	$7,693,000
	SUBTOTAL				$37,288,000
	Engineering/Project Management (8%)				$2,983,000
	Construction Oversight (6%)				$2,237,000
	Contingency (20%)				$7,458,000
				TOTAL (YEARS 2012 - 2014):	$49,966,000
				PRESENT VALUE:	$20,766,000
	SUBTOTAL DREDGING CONSTRUCTION				$125,520,000
	SUBTOTAL DREDGING OPERATION				$119,221,000
	SUBTOTAL DREDGING				$244,741,000
	SUBTOTAL PRESENT WORTH DREDGING CONSTRUCTION				$64,381,000
	SUBTOTAL PRESENT WORTH DREDGING OPERATION				$65,145,000
	SUBTOTAL PRESENT WORTH DREDGING				$129,526,000

Table A-5C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	CDF & groundwater monitoring	(2007 - 2044)	$6,395	$243,000	$56,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$34,594,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,976,000
				GRAND TOTAL COST:	**$279,335,000**
				GRAND TOTAL PRESENT WORTH COST:	**$138,502,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment as needed.
- Bank replacement and habitat enhancement would include sheetpile installation in front of the excavated banks, backfill placement in front of the sheeting plus habitat enhancement as discussed below.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the Draft FS (BBL, 2000), includes revegetation of the replaced river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Exposed sediments at Plainwell, Otsego, and Trowbridge Impoundments are excavated by backhoe and trucked to CDF locations (avg. 5-mile haul).

Table A-5C-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach A-5C-TRO - Hydraulic Dredging of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Banks (100-Ft Cut Back) and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dredging by hydraulic cutterhead dredge, assuming 600 cu yd/day production rate. A second overdredge of a 6-inch layer is assumed for all areas.
- Cost of 13" Cutterhead Dredge at $2,400,000 amortized at 7.0% for 15-year life results in annual owner cost of $263,507.
- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each dredging segment. Fixed monitoring stations are constructed of 6-in steel piling for each dredging segment, and removed after dredging. It is assumed that turbidity sensors will be replaced every 90,000 cy of dredging.
- Temporary sheet piling will be placed along certain stretches to protect onshore facilities from dredging disturbance. It is assumed that this will be required along 10 percent of the shoreline.
- Cost of Boat at $350,000 amortized at 7.0% for 10-year life results in annual owner cost of $49,832.
- Boat consumes total energy of 35 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $2.65 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $0.265 per hr or $3.71 per day, for total fuel costs of $30 per day.
- 6 miles avg. pipeline reach for sediment slurry pumping.
- First-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 5%, dredge slurry pumping rate = 12.9 cfs during 10-hr/day.
- 13" Cutterhead Dredge consumes total energy of 2630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $199 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $19.9 per hr or $279 per day, for total fuel costs of $2269 per day.
- Three 13-inch booster pumps consume total energy of 311 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $24 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $2.4 per hr or $34 per day, for total fuel costs of $274 per day.
- Second-pass dredging of Kalamazoo River segments at: 60 cy/hr; 10 hrs/day; 6 days/wk; 4 wk/mo; 10 mo/yr; 2400 hrs/yr; or 144,000 cy/yr.
- Insitu solids = 77%; dredge solids = 2.5%; dredge slurry pumping rate = 26.2 cfs during 10-hr/day.
- Cost of 18" Cutterhead Dredge at $3,900,000 amortized at 7.0% for 20-year life results in annual owner cost of $368,132.
- 18" Cutterhead Dredge consumes total energy of 4148 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $314 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $31.4 per hr or $440 per day, for total fuel costs of $3580 per day.
- Three 18-inch booster pumps consume total energy of 630 HP at Engine Fuel Factor (EFF) of 0.042 and fuel price of $1.80/ gal, for fuel costs of $48 per hour for 10 active hours per day; while idling 14 hrs per day, fuel costs are $4.80 per hr or $67 per day, for total fuel costs of $547 per day.
- Confined disposal facility area requirement is based on the submerged plus bank cut volumes plus achieving a long-term bulking factor of 1.62 for submerged sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the bank cut sediments. Three facilities are anticipated, with total containment volume of 1.6 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow of dredge water from the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during dredging to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for dredging and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 5% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth dredging and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the draft FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 38 years.

Table B-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B-1 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization	1	Lump Sum	$1,214,000	$1,214,000
	General Conditions	1	Lump Sum	$910,000	$910,000
	Project Insurance	1	Lump Sum	$607,000	$607,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	CDF A = 29.4 Acres	- -	- -	- -	- -
	CDF B = 57.4 Acres	- -	- -	- -	- -
	CDF C = 123.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	226	Acres	$8,000	$1,808,000
	CDF clearing & grubbing	226	Acres	$7,700	$1,740,000
	CDF bedding	339,611	cubic yards	$20	$6,792,000
	CDF exterior dikes	949,141	cubic yards	$15	$14,237,000
	CDF interior dikes	1,088,668	cubic yards	$15	$16,330,000
	CDF liner, bot & walls	9,169,494	square feet	$0.50	$4,585,000
	CDF piping	90,671	Linear feet	$12	$1,079,000
	CDF monitoring wells	23	wells	$1,000	$23,000
	WTF site preparation & paving	72,600	sq yards	$25	$1,815,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$263,000	$789,000
	WTF multimedia filters	3	Lump Sum	$189,000	$567,000
	WTF carbon adsorption	3	Lump Sum	$287,000	$861,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$869,000	$869,000
	SUBTOTAL				$63,425,000
	Engineering/Project Management (8%)				$5,074,000
	Construction Oversight (6%)				$3,806,000
	Contingency (20%)				$12,685,000
				TOTAL (YEARS 2005 - 2006):	$84,990,000
				PRESENT VALUE:	$60,597,000

Table B-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B-1 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$4,968,000	$4,968,000
	General Conditions	1	Lump Sum	$3,726,000	$3,726,000
	Project Insurance	1	Lump Sum	$2,484,000	$2,484,000
	Construction Trailers	60	Months	$400	$24,000
	Former Plainwell Impoundment (2007 - 2008)				
	Excavate, haul and place exposed sed. in CDF	360,000	cubic yards	$50	$18,000,000
	Submerged sediments				
	Construct diversion berms	74,000	cubic yards	$5	$370,000
	Excavate diversion channel	146,667	cubic yards	$15	$2,200,000
	Install Sheet Pile	60,000	square foot	$12	$720,000
	Excavate and load submerged sediment	192,794	cubic yards	$40	$7,712,000
	Haul and place submerged sediment	192,794	cubic yards	$20	$3,856,000
	Former Otsego Impoundment (2009 - 2011)				
	Excavate, haul and place exposed sed. in CDF	540,000	cubic yards	$50	$27,000,000
	Submerged sediments				
	Construct diversion berms	132,000	cubic yards	$5	$660,000
	Excavate diversion channel	173,333	cubic yards	$15	$2,600,000
	Install Sheet Pile	36,000	square foot	$12	$432,000
	Excavate and load submerged sediment	422,766	cubic yards	$40	$16,911,000
	Haul and place submerged sediment	422,766	cubic yards	$20	$8,455,000
	Former Trowbridge Impoundment (2007-2011)				
	Excavate, haul and place exposed sed. in CDF	1,900,000	cubic yards	$50	$95,000,000
	Submerged sediments				
	Construct diversion berms	190,000	cubic yards	$5	$950,000
	Excavate diversion channel	288,889	cubic yards	$15	$4,333,000
	Install Sheet Pile	100,000	square foot	$12	$1,200,000
	Excavate and load submerged sediment	555,714	cubic yards	$40	$22,229,000
	Haul and place submerged sediment	555,714	cubic yards	$20	$11,114,000
	Habitat enhancement				
	Former Plainwell Impoundment	1	Lump Sum	$960,000	$960,000
	Former Otsego Impoundment	1	Lump Sum	$1,120,000	$1,120,000
	Former Trowbridge Impoundment	1	Lump Sum	$3,285,000	$3,285,000
	Silt Curtains, reefing and anchoring	14	Crew-Years	$123,000	$1,722,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Operate CDF - labor	304	days	$3,086	$937,000
	CDF & WTF maintenance	5	Years	$2,413,000	$12,065,000
	WTF chemicals	327	M Gal	$1,500	$490,000
	WTF filter media	327	M Gal	$200	$65,000
	WTF activated carbon	327	M Gal	$1,860	$608,000
	Operate WTF - labor	304	days	$4,629	$1,406,000
	SUBTOTAL				$259,578,000
	Engineering/Project Management (8%)				$20,766,000
	Construction Oversight (6%)				$15,575,000
	Contingency (20%)				$51,916,000
				TOTAL (YEARS 2007 - 2011):	$347,835,000
				PRESENT VALUE:	$190,066,000

Table B-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B-1 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$1,681,000	$1,681,000
	General Conditions	1	Lump Sum	$1,261,000	$1,261,000
	Project Insurance	1	Lump Sum	$840,000	$840,000
	Construction Trailers	60	Months	$400	$24,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$2,086,000	$2,086,000
	CDF top liner	7,844,953	square feet	$0.50	$3,922,000
	CDF cover material	871,661	cubic yards	$25	$21,792,000
	CDF 2% graded cap	1,027,001	cubic yards	$25	$25,675,000
	SUBTOTAL				$87,830,000
	Engineering/Project Management (8%)				$7,026,000
	Construction Oversight (6%)				$5,270,000
	Contingency (20%)				$17,566,000
				TOTAL (YEARS 2010 - 2014):	$117,692,000
				PRESENT VALUE:	$52,496,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$202,682,000
	SUBTOTAL DRY EXCAVATION OPERATION				$347,835,000
	SUBTOTAL DRY EXCAVATION				$550,517,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$113,093,000
	SUBTOTAL PRESENT WORTH OPERATION				$190,066,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$303,159,000

Table B-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B-1 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2044)	$141,500	$5,377,000	$1,244,000
	Monitoring - water & sed	(2007 - 2044)	$131,263	$4,988,000	$1,154,000
	KALSIM model updates	(2007 - 2044)	$122,211	$4,644,000	$1,074,000
	CDF & groundwater monitoring	(2007 - 2044)	$18,395	$699,000	$162,000
	SUBTOTAL ANNUAL				$1,811,000
	SUBTOTAL ANNUAL ALL YEARS				$36,104,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$9,114,000
				GRAND TOTAL COST:	**$586,621,000**
				GRAND TOTAL PRESENT WORTH COST:	**$312,273,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B-1

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B-1 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving a long-term bulking factor of 1.54 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. Three facilities are anticipated, with total containment volume of 4.6 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after three to five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 38 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization	1	Lump Sum	$214,000	$214,000
	General Conditions	1	Lump Sum	$160,000	$160,000
	Project Insurance	1	Lump Sum	$107,000	$107,000
	Construction Trailers	24	Months	$400	$10,000
	Cleaning	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	CDF A = 29.4 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	34	Acres	$8,000	$272,000
	CDF clearing & grubbing	34	Acres	$7,700	$262,000
	CDF bedding	47,490	cubic yards	$20	$950,000
	CDF exterior dikes	204,441	cubic yards	$15	$3,067,000
	CDF interior dikes	126,446	cubic yards	$15	$1,897,000
	CDF liner, bot & walls	1,282,232	square feet	$0.50	$641,000
	CDF piping	12,422	Linear feet	$12	$148,000
	CDF monitoring wells	5	wells	$1,000	$5,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$263,000	$263,000
	WTF multimedia filters	1	Lump Sum	$189,000	$189,000
	WTF carbon adsorption	1	Lump Sum	$287,000	$287,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$290,000	$290,000
	SUBTOTAL				$11,161,000
	Engineering/Project Management (8%)				$893,000
	Construction Oversight (6%)				$670,000
	Contingency (20%)				$2,232,000
				TOTAL (YEARS 2005 - 2006):	$14,956,000
				PRESENT VALUE:	$10,663,000

Table B1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$720,000	$720,000
	General Conditions	1	Lump Sum	$540,000	$540,000
	Project Insurance	1	Lump Sum	$360,000	$360,000
	Construction Trailers	24	Months	$400	$10,000
	Former Plainwell Impoundment (2007 - 2008)				
	Excavate, haul and place exposed sed. in CDF	360,000	cubic yards	$50	$18,000,000
	Submerged sediments				
	Construct diversion berms	74,000	cubic yards	$5	$370,000
	Excavate diversion channel	146,667	cubic yards	$15	$2,200,000
	Install Sheet Pile	60,000	square foot	$12	$720,000
	Excavate and load submerged sediment	192,794	cubic yards	$40	$7,712,000
	Haul and place submerged sediment	192,794	cubic yards	$20	$3,856,000
	Habitat enhancement				
	Former Plainwell Impoundment	1	Lump Sum	$960,000	$960,000
	Former Otsego Impoundment	1	Lump Sum	$0	$0
	Former Trowbridge Impoundment	1	Lump Sum	$0	$0
	Silt Curtains, reefing and anchoring	3	Crew-Years	$123,000	$369,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Operate CDF - labor	50	days	$3,086	$154,000
	CDF & WTF maintenance	2	Years	$422,000	$844,000
	WTF chemicals	69	M Gal	$1,500	$104,000
	WTF filter media	69	M Gal	$200	$14,000
	WTF activated carbon	69	M Gal	$1,860	$129,000
	Operate WTF - labor	50	days	$4,629	$231,000
	SUBTOTAL				$37,598,000
	Engineering/Project Management (8%)				$3,008,000
	Construction Oversight (6%)				$2,256,000
	Contingency (20%)				$7,520,000
				TOTAL (YEARS 2007 - 2008):	$50,382,000
				PRESENT VALUE:	$30,349,000

Table B1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$198,000	$198,000
	General Conditions	1	Lump Sum	$148,000	$148,000
	Project Insurance	1	Lump Sum	$99,000	$99,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$696,000	$696,000
	CDF top liner	991,837	square feet	$0.50	$496,000
	CDF cover material	110,204	cubic yards	$25	$2,755,000
	CDF 2% graded cap	70,407	cubic yards	$25	$1,760,000
	SUBTOTAL				$10,342,000
	Engineering/Project Management (8%)				$827,000
	Construction Oversight (6%)				$621,000
	Contingency (20%)				$2,068,000
				TOTAL (YEARS 2009 - 2009):	$13,858,000
				PRESENT VALUE:	$7,538,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$28,814,000
	SUBTOTAL DRY EXCAVATION OPERATION				$50,382,000
	SUBTOTAL DRY EXCAVATION				$79,196,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$18,201,000
	SUBTOTAL PRESENT WORTH OPERATION				$30,349,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$48,550,000

Table B1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$50,000	$100,000	$60,000
	Confirmation sampling and analyses	(2007 - 2008)	$832,000	$1,664,000	$1,002,000
	Bank observation	(2009 - 2039)	$36,129	$1,120,000	$264,000
	Bank maintenance	(2009 - 2039)	$479,548	$14,866,000	$3,498,000
	Monitoring - biota	(2007 - 2039)	$143,667	$4,741,000	$1,221,000
	Monitoring - water & sed	(2007 - 2039)	$133,576	$4,408,000	$1,135,000
	KALSIM model updates	(2007 - 2039)	$124,364	$4,104,000	$1,057,000
	CDF & groundwater monitoring	(2007 - 2039)	$4,000	$132,000	$34,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$31,135,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,271,000
				GRAND TOTAL COST:	**$110,331,000**
				GRAND TOTAL PRESENT WORTH COST:	**$56,821,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving a long-term bulking factor of 1.15 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. Three facilities are anticipated, with total containment volume of 0.6 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after three to five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS.
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 33 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization	1	Lump Sum	$337,000	$337,000
	General Conditions	1	Lump Sum	$253,000	$253,000
	Project Insurance	1	Lump Sum	$169,000	$169,000
	Construction Trailers	24	Months	$400	$10,000
	Cleaning	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	CDF B = 57.4 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	62	Acres	$8,000	$496,000
	CDF clearing & grubbing	62	Acres	$7,700	$477,000
	CDF bedding	92,637	cubic yards	$20	$1,853,000
	CDF exterior dikes	296,521	cubic yards	$15	$4,448,000
	CDF interior dikes	294,157	cubic yards	$15	$4,412,000
	CDF liner, bot & walls	2,501,205	square feet	$0.50	$1,251,000
	CDF piping	24,653	Linear feet	$12	$293,000
	CDF monitoring wells	7	wells	$1,000	$7,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$263,000	$263,000
	WTF multimedia filters	1	Lump Sum	$189,000	$189,000
	WTF carbon adsorption	1	Lump Sum	$287,000	$287,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$290,000	$290,000
	SUBTOTAL				$17,611,000
	Engineering/Project Management (8%)				$1,409,000
	Construction Oversight (6%)				$1,057,000
	Contingency (20%)				$3,522,000
				TOTAL (YEARS 2005 - 2006):	$23,599,000
				PRESENT VALUE:	$16,826,000

Table B1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$1,252,000	$1,252,000
	General Conditions	1	Lump Sum	$939,000	$939,000
	Project Insurance	1	Lump Sum	$626,000	$626,000
	Construction Trailers	48	Months	$400	$19,000
	Former Otsego Impoundment (2007 - 2010)				
	Excavate, haul and place exposed sed in CDF	540,000	cubic yards	$50	$27,000,000
	Submerged sediments				
	Construct diversion berms	132,000	cubic yards	$5	$660,000
	Excavate diversion channel	173,333	cubic yards	$15	$2,600,000
	Install Sheet Pile	36,000	square foot	$12	$432,000
	Excavate and load submerged sediment	422,766	cubic yards	$40	$16,911,000
	Haul and place submerged sediment	422,766	cubic yards	$20	$8,455,000
	Habitat enhancement				
	Former Plainwell Impoundment	1	Lump Sum	$0	$0
	Former Otsego Impoundment	1	Lump Sum	$1,120,000	$1,120,000
	Former Trowbridge Impoundment	1	Lump Sum	$0	$0
	Silt Curtains, reefing and anchoring	5	Crew-Years	$123,000	$615,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Operate CDF - labor	110	days	$3,086	$338,000
	CDF & WTF maintenance	4	Years	$700,000	$2,800,000
	WTF chemicals	111	M Gal	$1,500	$167,000
	WTF filter media	111	M Gal	$200	$22,000
	WTF activated carbon	111	M Gal	$1,860	$207,000
	Operate WTF - labor	110	days	$4,629	$507,000
	SUBTOTAL				$65,427,000
	Engineering/Project Management (8%)				$5,234,000
	Construction Oversight (6%)				$3,926,000
	Contingency (20%)				$13,085,000
				TOTAL (YEARS 2007 - 2010):	$87,672,000
				PRESENT VALUE:	$49,470,000

Table B1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$361,000	$361,000
	General Conditions	1	Lump Sum	$271,000	$271,000
	Project Insurance	1	Lump Sum	$181,000	$181,000
	Construction Trailers	12	Months	$400	$5,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$696,000	$696,000
	CDF top liner	2,086,501	square feet	$0.50	$1,043,000
	CDF cover material	231,833	cubic yards	$25	$5,796,000
	CDF 2% graded cap	214,824	cubic yards	$25	$5,371,000
	SUBTOTAL				$18,885,000
	Engineering/Project Management (8%)				$1,511,000
	Construction Oversight (6%)				$1,133,000
	Contingency (20%)				$3,777,000
				TOTAL (YEARS 2011 - 2011):	$25,306,000
				PRESENT VALUE:	$12,023,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$48,905,000
	SUBTOTAL DRY EXCAVATION OPERATION				$87,672,000
	SUBTOTAL DRY EXCAVATION				$136,577,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$28,849,000
	SUBTOTAL PRESENT WORTH OPERATION				$49,470,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$78,319,000

Table B1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2041)	$142,714	$4,995,000	$1,231,000
	Monitoring - water & sed	(2007 - 2041)	$132,571	$4,640,000	$1,144,000
	KALSIM model updates	(2007 - 2041)	$123,429	$4,320,000	$1,065,000
	CDF & groundwater monitoring	(2007 - 2041)	$5,600	$196,000	$48,000
	SUBTOTAL ANNUAL				$1,802,000
	SUBTOTAL ANNUAL ALL YEARS				$33,665,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,764,000
				GRAND TOTAL COST:	**$170,242,000**
				GRAND TOTAL PRESENT WORTH COST:	**$87,083,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving a long-term bulking factor of 1.62 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. Three facilities are anticipated, with total containment volume of 1.22 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after three to five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 35 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization	1	Lump Sum	$663,000	$663,000
	General Conditions	1	Lump Sum	$498,000	$498,000
	Project Insurance	1	Lump Sum	$332,000	$332,000
	Construction Trailers	24	Months	$400	$10,000
	Cleaning	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	CDF B = 123.6 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	129	Acres	$8,000	$1,032,000
	CDF cleaning & grubbing	129	Acres	$7,700	$993,000
	CDF bedding	199,484	cubic yards	$20	$3,990,000
	CDF exterior dikes	448,179	cubic yards	$15	$6,723,000
	CDF interior dikes	668,065	cubic yards	$15	$10,021,000
	CDF liner, bot & walls	5,386,057	square feet	$0.50	$2,693,000
	CDF piping	53,596	Linear feet	$12	$638,000
	CDF monitoring wells	11	wells	$1,000	$11,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$263,000	$263,000
	WTF multimedia filters	1	Lump Sum	$189,000	$189,000
	WTF carbon adsorption	1	Lump Sum	$287,000	$287,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$290,000	$290,000
	SUBTOTAL				$34,662,000
	Engineering/Project Management (8%)				$2,773,000
	Construction Oversight (6%)				$2,080,000
	Contingency (20%)				$6,932,000
				TOTAL (YEARS 2005 - 2006):	**$46,447,000**
				PRESENT VALUE:	$33,116,000

Table B1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$2,958,000	$2,958,000
	General Conditions	1	Lump Sum	$2,218,000	$2,218,000
	Project Insurance	1	Lump Sum	$1,479,000	$1,479,000
	Construction Trailers	60	Months	$400	$24,000
	Former Trowbridge Impoundment (2007 - 2011)				
	Excavate, haul and place exposed sed. in CDF	1,900,000	cubic yards	$50	$95,000,000
	Submerged sediments				
	Construct diversion berms	190,000	cubic yards	$5	$950,000
	Excavate diversion channel	288,889	cubic yards	$15	$4,333,000
	Install Sheet Pile	100,000	square foot	$12	$1,200,000
	Excavate and load submerged sediment	555,714	cubic yards	$40	$22,229,000
	Haul and place submerged sediment	555,714	cubic yards	$20	$11,114,000
	Habitat enhancement				
	Former Plainwell Impoundment	1	Lump Sum	$0	$0
	Former Otsego Impoundment	1	Lump Sum	$0	$0
	Former Trowbridge Impoundment	1	Lump Sum	$3,285,000	$3,285,000
	Silt Curtains, reefing and anchoring	6	Crew-Years	$123,000	$738,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Operate CDF - labor	144	days	$3,086	$445,000
	CDF & WTF maintenance	5	Years	$1,291,000	$6,455,000
	WTF chemicals	146	M Gal	$1,500	$220,000
	WTF filter media	146	M Gal	$200	$29,000
	WTF activated carbon	146	M Gal	$1,860	$272,000
	Operate WTF - labor	144	days	$4,629	$667,000
	SUBTOTAL				$154,530,000
	Engineering/Project Management (8%)				$12,362,000
	Construction Oversight (6%)				$9,272,000
	Contingency (20%)				$30,906,000
				TOTAL (YEARS 2007 - 2011):	$207,070,000
				PRESENT VALUE:	$113,149,000

Table B1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$1,122,000	$1,122,000
	General Conditions	1	Lump Sum	$841,000	$841,000
	Project Insurance	1	Lump Sum	$561,000	$561,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$696,000	$696,000
	CDF top liner	4,766,615	square feet	$0.50	$2,383,000
	CDF cover material	529,624	cubic yards	$25	$13,241,000
	CDF 2% graded cap	741,770	cubic yards	$25	$18,544,000
	SUBTOTAL				$58,605,000
	Engineering/Project Management (8%)				$4,688,000
	Construction Oversight (6%)				$3,516,000
	Contingency (20%)				$11,721,000
				TOTAL (YEARS 2012 - 2014):	$78,530,000
				PRESENT VALUE:	$32,637,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$124,977,000
	SUBTOTAL DRY EXCAVATION OPERATION				$207,070,000
	SUBTOTAL DRY EXCAVATION				$332,047,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$65,753,000
	SUBTOTAL PRESENT WORTH OPERATION				$113,149,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$178,902,000

Table B1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2044)	$141,500	$5,377,000	$1,244,000
	Monitoring - water & sed	(2007 - 2044)	$131,263	$4,988,000	$1,154,000
	KALSIM model updates	(2007 - 2044)	$122,211	$4,644,000	$1,074,000
	CDF & groundwater monitoring	(2007 - 2044)	$8,789	$334,000	$77,000
	SUBTOTAL ANNUAL				$1,801,000
	SUBTOTAL ANNUAL ALL YEARS				$35,739,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$9,029,000
				GRAND TOTAL COST:	**$367,786,000**
				GRAND TOTAL PRESENT WORTH COST:	**$187,931,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B1-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving a long-term bulking factor of 1.62 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. Three facilities are anticipated, with total containment volume of 2.8 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 38 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization - 1	1	Lump Sum	$1,023,000	$1,023,000
	General Conditions	1	Lump Sum	$767,000	$767,000
	Project Insurance	1	Lump Sum	$511,000	$511,000
	Construction Trailers	24	Months	$400	$10,000
	Cleaning	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	CDF A = 23.2 Acres	- -	- -	- -	- -
	CDF B = 44.2 Acres	- -	- -	- -	- -
	CDF C = 102.3 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	185	Acres	$0	$0
	CDF clearing & grubbing	185	Acres	$7,700	$1,425,000
	CDF bedding	273,680	cubic yards	$20	$5,474,000
	CDF exterior dikes	840,105	cubic yards	$15	$12,602,000
	CDF interior dikes	864,000	cubic yards	$15	$12,960,000
	CDF liner, bot & walls	7,389,348	square feet	$0.50	$3,695,000
	CDF piping	72,955	Linear feet	$12	$868,000
	CDF monitoring wells	20	wells	$1,000	$20,000
	WTF site preparation & paving	72,600	sq yards	$25	$1,815,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$263,000	$789,000
	WTF multimedia filters	3	Lump Sum	$189,000	$567,000
	WTF carbon adsorption	3	Lump Sum	$287,000	$861,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$869,000	$869,000
	SUBTOTAL				$53,445,000
	Engineering/Project Management (8%)				$4,276,000
	Construction Oversight (6%)				$3,207,000
	Contingency (20%)				$10,689,000
				TOTAL (YEARS 2005 - 2006):	$71,617,000
				PRESENT VALUE:	$51,062,000

Table B-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$3,938,000	$3,938,000
	General Conditions	1	Lump Sum	$2,954,000	$2,954,000
	Project Insurance	1	Lump Sum	$1,969,000	$1,969,000
	Construction Trailers	60	Months	$400	$24,000
	Former Plainwell Impoundment (2007 - 2008)				
	Removal of exposed sed.	221,400	cubic yards	$50	$11,070,000
	Construct diversion berms	74,000	cubic yards	$5	$370,000
	Excavate diversion channel	146,667	cubic yards	$15	$2,200,000
	Install Sheet Pile	60,000	square foot	$12	$720,000
	Excavate and load submerged sediment	192,794	cubic yards	$40	$7,712,000
	Haul submerged sediment	192,794	cubic yards	$10	$1,928,000
	Former Otsego Impoundment (2009 - 2011)				
	Removal of exposed sed.	232,200	cubic yards	$50	$11,610,000
	Construct diversion berms	132,000	cubic yards	$5	$660,000
	Excavate diversion channel	173,333	cubic yards	$15	$2,600,000
	Install Sheet Pile	36,000	square foot	$12	$432,000
	Excavate and load submerged sediment	422,766	cubic yards	$40	$16,911,000
	Haul submerged sediment	422,766	cubic yards	$10	$4,228,000
	Former Trowbridge Impoundment (2007-2011)				
	Removal of exposed sed.	1,387,000	cubic yards	$50	$69,350,000
	Construct diversion berms	190,000	cubic yards	$5	$950,000
	Excavate diversion channel	288,889	cubic yards	$15	$4,333,000
	Install Sheet Pile	100,000	square foot	$12	$1,200,000
	Excavate and load submerged sediment	555,714	cubic yards	$40	$22,229,000
	Haul submerged sediment	555,714	cubic yards	$10	$5,557,000
	Bank Stabilization & Habitat enhancement				
	Former Plainwell Impoundment	1	Lump Sum	$2,683,196	$2,683,000
	Former Otsego Impoundment	1	Lump Sum	$2,775,129	$2,775,000
	Former Trowbridge Impoundment	1	Lump Sum	$10,579,261	$10,579,000
	Silt Curtains, reefing and anchoring	9	Crew-Years	$123,000	$1,107,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	Operate CDF - labor	304	days	$3,086	$937,000
	CDF & WTF maintenance	5	Years	$2,042,000	$10,210,000
	WTF chemicals	327	M Gal	$1,500	$490,000
	WTF filter media	327	M Gal	$200	$65,000
	WTF activated carbon	327	M Gal	$1,860	$608,000
	Operate WTF - labor	304	days	$4,629	$1,406,000
	SUBTOTAL				$205,781,000
	Engineering/Project Management (8%)				$16,462,000
	Construction Oversight (6%)				$12,347,000
	Contingency (20%)				$41,156,000
				TOTAL (YEARS 2007 - 2011):	$275,746,000
				PRESENT VALUE:	$150,675,000

Table B-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$1,244,000	$1,244,000
	General Conditions	1	Lump Sum	$933,000	$933,000
	Project Insurance	1	Lump Sum	$622,000	$622,000
	Construction Trailers	60	Months	$400	$24,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$2,125,606	$2,126,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$2,776,969	$2,777,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$13,483,083	$13,483,000
	Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$2,086,000	$2,086,000
	CDF top liner	6,212,006	square feet	$0.50	$3,106,000
	CDF cover material	690,223	cubic yards	$25	$17,256,000
	CDF 2% graded cap	733,742	cubic yards	$25	$18,344,000
	SUBTOTAL				$65,001,000
	Engineering/Project Management (8%)				$5,200,000
	Construction Oversight (6%)				$3,900,000
	Contingency (20%)				$13,000,000
				TOTAL (YEARS 2010 - 2014):	$87,101,000
				PRESENT VALUE:	$38,851,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$158,718,000
	SUBTOTAL DRY EXCAVATION OPERATION				$275,746,000
	SUBTOTAL DRY EXCAVATION				$434,464,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$89,913,000
	SUBTOTAL PRESENT WORTH OPERATION				$150,675,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$240,588,000

Table B-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2044)	$141,500	$5,377,000	$1,244,000
	Monitoring - water & sed	(2007 - 2044)	$131,263	$4,988,000	$1,154,000
	KALSIM model updates	(2007 - 2044)	$122,211	$4,644,000	$1,074,000
	CDF & groundwater monitoring	(2007 - 2044)	$16,000	$608,000	$141,000
	SUBTOTAL ANNUAL				$1,809,000
	SUBTOTAL ANNUAL ALL YEARS				$36,013,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$9,093,000
				GRAND TOTAL COST:	**$470,477,000**
				GRAND TOTAL PRESENT WORTH COST:	**$249,681,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis. OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one ofthe other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B-2

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving a long-term bulking factor of 1.54 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. Three facilities are anticipated, with total containment volume of 3.6 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after three to five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 38 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization - 1	1	Lump Sum	$182,000	$182,000
	General Conditions	1	Lump Sum	$137,000	$137,000
	Project Insurance	1	Lump Sum	$91,000	$91,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	CDF A = 23.2 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	38	Acres	$0	$0
	CDF clearing & grubbing	38	Acres	$7,700	$293,000
	CDF bedding	37,431	cubic yards	$20	$749,000
	CDF exterior dikes	178,415	cubic yards	$15	$2,676,000
	CDF interior dikes	88,157	cubic yards	$15	$1,322,000
	CDF liner, bot & walls	1,010,644	square feet	$0.50	$505,000
	CDF piping	9,867	Linear feet	$12	$117,000
	CDF monitoring wells	4	wells	$1,000	$4,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$263,000	$263,000
	WTF multimedia filters	1	Lump Sum	$189,000	$189,000
	WTF carbon adsorption	1	Lump Sum	$287,000	$287,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$290,000	$290,000
	SUBTOTAL				$9,514,000
	Engineering/Project Management (8%)				$761,000
	Construction Oversight (6%)				$571,000
	Contingency (20%)				$1,903,000
				TOTAL (YEARS 2005 - 2006):	$12,749,000
				PRESENT VALUE:	$9,090,000

Table B2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$579,000	$579,000
	General Conditions	1	Lump Sum	$434,000	$434,000
	Project Insurance	1	Lump Sum	$290,000	$290,000
	Construction Trailers	24	Months	$400	$10,000
	Former Plainwell Impoundment (2007 - 2008)				
	Removal of exposed sed.	221,400	cubic yards	$50	$11,070,000
	Construct diversion berms	74,000	cubic yards	$5	$370,000
	Excavate diversion channel	146,667	cubic yards	$15	$2,200,000
	Install Sheet Pile	60,000	square foot	$12	$720,000
	Excavate and load submerged sediment	192,794	cubic yards	$40	$7,712,000
	Haul submerged sediment	192,794	cubic yards	$10	$1,928,000
	Bank Stabilization & Habitat enhancement	1	Lump Sum	$2,683,196	$2,683,000
	Silt Curtains, reefing and anchoring	5	Crew-Years	$123,000	$615,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	Operate CDF - labor	50	days	$3,086	$154,000
	CDF & WTF maintenance	2	Years	$356,000	$712,000
	WTF chemicals	69	M Gal	$1,500	$104,000
	WTF filter media	69	M Gal	$200	$14,000
	WTF activated carbon	69	M Gal	$1,860	$129,000
	Operate WTF - labor	50	days	$4,629	$231,000
	SUBTOTAL				$30,260,000
	Engineering/Project Management (8%)				$2,421,000
	Construction Oversight (6%)				$1,816,000
	Contingency (20%)				$6,052,000
				TOTAL (YEARS 2007 - 2008):	$40,549,000
				PRESENT VALUE:	$24,426,000

Table B2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$168,000	$168,000
	General Conditions	1	Lump Sum	$126,000	$126,000
	Project Insurance	1	Lump Sum	$84,000	$84,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,040,106	$3,040,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$696,000	$696,000
	CDF top liner	755,384	square feet	$0.50	$378,000
	CDF cover matenal	83,932	cubic yards	$25	$2,098,000
	CDF 2% graded cap	46,796	cubic yards	$25	$1,170,000
	SUBTOTAL				$8,770,000
	Engineering/Project Management (8%)				$702,000
	Construction Oversight (6%)				$526,000
	Contingency (20%)				$1,754,000
				TOTAL (YEARS 2009 - 2010):	$11,752,000
				PRESENT VALUE:	$6,183,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$24,501,000
	SUBTOTAL DRY EXCAVATION OPERATION				$40,549,000
	SUBTOTAL DRY EXCAVATION				$65,050,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$15,273,000
	SUBTOTAL PRESENT WORTH OPERATION				$24,426,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$39,699,000

Table B2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$50,000	$100,000	$60,000
	Confirmation sampling and analyses	(2007 - 2008)	$832,000	$1,664,000	$1,002,000
	Bank observation	(2009 - 2039)	$36,129	$1,120,000	$264,000
	Bank maintenance	(2009 - 2039)	$479,548	$14,866,000	$3,498,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	CDF & groundwater monitoring	(2007 - 2040)	$3,206	$109,000	$27,000
	SUBTOTAL ANNUAL				$1,801,000
	SUBTOTAL ANNUAL ALL YEARS				$31,463,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,278,000
				GRAND TOTAL COST:	**$96,513,000**
				GRAND TOTAL PRESENT WORTH COST:	**$47,977,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one ofthe other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B2-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving long-term bulking factor of 1.15 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. One facility is anticipated, with total containment volume of 442,000 cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after three to five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 34 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization - 1	1	Lump Sum	$278,000	$278,000
	General Conditions	1	Lump Sum	$208,000	$208,000
	Project Insurance	1	Lump Sum	$139,000	$139,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	CDF B = 44.2 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	59	Acres	$0	$0
	CDF clearing & grubbing	59	Acres	$7,700	$454,000
	CDF bedding	71,234	cubic yards	$20	$1,425,000
	CDF exterior dikes	256,601	cubic yards	$15	$3,849,000
	CDF interior dikes	222,540	cubic yards	$15	$3,338,000
	CDF liner, bot & walls	1,923,321	square feet	$0.50	$962,000
	CDF piping	19,217	Linear feet	$12	$229,000
	CDF monitoring wells	6	wells	$1,000	$6,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$263,000	$263,000
	WTF multimedia filters	1	Lump Sum	$189,000	$189,000
	WTF carbon adsorption	1	Lump Sum	$287,000	$287,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$290,000	$290,000
	SUBTOTAL				$14,503,000
	Engineering/Project Management (8%)				$1,160,000
	Construction Oversight (6%)				$870,000
	Contingency (20%)				$2,901,000
				TOTAL (YEARS 2005 - 2006):	$19,434,000
				PRESENT VALUE:	$13,856,000

Table B2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$888,000	$888,000
	General Conditions	1	Lump Sum	$666,000	$666,000
	Project Insurance	1	Lump Sum	$444,000	$444,000
	Construction Trailers	48	Months	$400	$19,000
	Former Otsego Impoundment (2007 - 2010)				
	Removal of exposed sed.	232,200	cubic yards	$50	$11,610,000
	Construct diversion berms	132,000	cubic yards	$5	$660,000
	Excavate diversion channel	173,333	cubic yards	$15	$2,600,000
	Install Sheet Pile	36,000	square foot	$12	$432,000
	Excavate and load submerged sediment	422,766	cubic yards	$40	$16,911,000
	Haul submerged sediment	422,766	cubic yards	$10	$4,228,000
	Bank Stabilization & Habitat enhancement				
	Former Otsego Impoundment	1	Lump Sum	$2,775,129	$2,775,000
	Silt Curtains, reefing and anchoring	7	Crew-Years	$123,000	$861,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	Operate CDF - labor	110	days	$3,086	$338,000
	CDF & WTF maintenance	4	Years	$577,000	$2,308,000
	WTF chemicals	111	M Gal	$1,500	$167,000
	WTF filter media	111	M Gal	$200	$22,000
	WTF activated carbon	111	M Gal	$1,860	$207,000
	Operate WTF - labor	110	days	$4,629	$507,000
	SUBTOTAL				$46,400,000
	Engineering/Project Management (8%)				$3,712,000
	Construction Oversight (6%)				$2,784,000
	Contingency (20%)				$9,280,000
				TOTAL (YEARS 2007 - 2010):	$62,176,000
				PRESENT VALUE:	$35,083,000

Table B2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$282,000	$282,000
	General Conditions	1	Lump Sum	$212,000	$212,000
	Project Insurance	1	Lump Sum	$141,000	$141,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$3,800,760	$3,801,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$696,000	$696,000
	CDF top liner	1,562,510	square feet	$0.50	$781,000
	CDF cover material	173,612	cubic yards	$25	$4,340,000
	CDF 2% graded cap	139,216	cubic yards	$25	$3,480,000
	SUBTOTAL				$14,743,000
	Engineering/Project Management (8%)				$1,179,000
	Construction Oversight (6%)				$885,000
	Contingency (20%)				$2,949,000
				TOTAL (YEARS 2011 - 2012):	$19,756,000
				PRESENT VALUE:	$9,079,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$39,190,000
	SUBTOTAL DRY EXCAVATION OPERATION				$62,176,000
	SUBTOTAL DRY EXCAVATION				$101,366,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$22,935,000
	SUBTOTAL PRESENT WORTH OPERATION				$35,083,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$58,018,000

Table B2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2042)	$142,306	$5,123,000	$1,236,000
	Monitoring - water & sed	(2007 - 2042)	$132,111	$4,756,000	$1,148,000
	KALSIM model updates	(2007 - 2042)	$123,000	$4,428,000	$1,068,000
	CDF & groundwater monitoring	(2007 - 2042)	$4,806	$173,000	$42,000
	SUBTOTAL ANNUAL				$1,800,000
	SUBTOTAL ANNUAL ALL YEARS				$33,994,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,770,000
				GRAND TOTAL COST:	**$135,360,000**
				GRAND TOTAL PRESENT WORTH COST:	**$66,788,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one ofthe other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B2-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving a long-term bulking factor of 1.62 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. Three facilities are anticipated, with total containment volume of 915,000 cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after three to five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 36 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring

Table B2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**CDF Construction**				
	Mobilization - 1	1	Lump Sum	$568,000	$568,000
	General Conditions	1	Lump Sum	$426,000	$426,000
	Project Insurance	1	Lump Sum	$284,000	$284,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	CDF C = 102.3 Acres	- -	- -	- -	- -
	CDF Land lease or purchase	117	Acres	$0	$0
	CDF clearing & grubbing	117	Acres	$7,700	$901,000
	CDF bedding	165,014	cubic yards	$20	$3,300,000
	CDF exterior dikes	405,090	cubic yards	$15	$6,076,000
	CDF interior dikes	553,303	cubic yards	$15	$8,300,000
	CDF liner, bot & walls	4,455,383	square feet	$0.50	$2,228,000
	CDF piping	43,872	Linear feet	$12	$522,000
	CDF monitoring wells	10	wells	$1,000	$10,000
	WTF site preparation & paving	24,200	sq yards	$25	$605,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$263,000	$263,000
	WTF multimedia filters	1	Lump Sum	$189,000	$189,000
	WTF carbon adsorption	1	Lump Sum	$287,000	$287,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$290,000	$290,000
	SUBTOTAL				$29,683,000
	Engineering/Project Management (8%)				$2,375,000
	Construction Oversight (6%)				$1,781,000
	Contingency (20%)				$5,937,000
				TOTAL (YEARS 2005 - 2006):	$39,776,000
				PRESENT VALUE:	$28,360,000

Table B2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dredging mobilization	1	Lump Sum	$2,464,000	$2,464,000
	General Conditions	1	Lump Sum	$1,848,000	$1,848,000
	Project Insurance	1	Lump Sum	$1,232,000	$1,232,000
	Construction Trailers	60	Months	$400	$24,000
	Former Trowbridge Impoundment (2007-2011)				
	Removal of exposed sed.	1,387,000	cubic yards	$50	$69,350,000
	Construct diversion berms	190,000	cubic yards	$5	$950,000
	Excavate diversion channel	288,889	cubic yards	$15	$4,333,000
	Install Sheet Pile	100,000	square foot	$12	$1,200,000
	Excavate and load submerged sediment	555,714	cubic yards	$40	$22,229,000
	Haul submerged sediment	555,714	cubic yards	$10	$5,557,000
	Bank Stabilization & Habitat enhancement				
	Former Trowbridge Impoundment	1	Lump Sum	$10,579,261	$10,579,000
	Silt Curtains, reefing and anchoring	7	Crew-Years	$123,000	$861,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	Operate CDF - labor	144	days	$3,086	$445,000
	CDF & WTF maintenance	5	Years	$1,109,000	$5,545,000
	WTF chemicals	146	M Gal	$1,500	$220,000
	WTF filter media	146	M Gal	$200	$29,000
	WTF activated carbon	146	M Gal	$1,860	$272,000
	Operate WTF - labor	144	days	$4,629	$667,000
	SUBTOTAL				$128,719,000
	Engineering/Project Management (8%)				$10,298,000
	Construction Oversight (6%)				$7,723,000
	Contingency (20%)				$25,744,000
				TOTAL (YEARS 2007 - 2011):	$172,484,000
				PRESENT VALUE:	$94,250,000

Table B2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$886,000	$886,000
	General Conditions	1	Lump Sum	$665,000	$665,000
	Project Insurance	1	Lump Sum	$443,000	$443,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$16,151,248	$16,151,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$696,000	$696,000
	CDF top liner	3,894,112	square feet	$0.50	$1,947,000
	CDF cover material	432,679	cubic yards	$25	$10,817,000
	CDF 2% graded cap	547,731	cubic yards	$25	$13,693,000
	SUBTOTAL				$46,308,000
	Engineering/Project Management (8%)				$3,705,000
	Construction Oversight (6%)				$2,778,000
	Contingency (20%)				$9,262,000
				TOTAL (YEARS 2011 - 2012):	$62,053,000
				PRESENT VALUE:	$28,517,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$101,829,000
	SUBTOTAL DRY EXCAVATION OPERATION				$172,484,000
	SUBTOTAL DRY EXCAVATION				$274,313,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$56,877,000
	SUBTOTAL PRESENT WORTH OPERATION				$94,250,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$151,127,000

Table B2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2042)	$142,306	$5,123,000	$1,236,000
	Monitoring - water & sed	(2007 - 2042)	$132,111	$4,756,000	$1,148,000
	KALSIM model updates	(2007 - 2042)	$123,000	$4,428,000	$1,068,000
	CDF & groundwater monitoring	(2007 - 2042)	$8,000	$288,000	$69,000
	SUBTOTAL ANNUAL				$1,803,000
	SUBTOTAL ANNUAL ALL YEARS				$34,991,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$9,001,000
				GRAND TOTAL COST:	**$309,304,000**
				GRAND TOTAL PRESENT WORTH COST:	**$160,128,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include real estate, legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundment and along the diversion berms to provide access for the dump trucks and equipment.
- Habitat enhancement costs as described for Alternatives 3 and 4 of the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one ofthe other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B2-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach B2-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Upland Confined Disposal atop portion of Exposed Sediment, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Also, dewatering during excavation activities (i.e., pump-out of excess water) due to recharge from adjacent areas has not been considered.
- Confined disposal facility area requirement is based on the exposed sediment volumes plus achieving a long-term bulking factor of 1.62 for in-river sediments in facilities with 20-ft ultimate height. No long-term volume changes are assumed for the exposed sediments. Three facilities are anticipated, with total containment volume of 2.3 million cy. Side slopes of 1:3 add additional area requirements, in addition to adjacent facilities for water treatment.
- CDF sizing is in accordance with Engineer Manual 1110-2-5027, Engineering and Design, Confined Disposal of Dredged Material, U.S. Army Corps of Engineers (30 Sep 1987).
- CDFs are assumed to contain a sand bedding of 1-ft, underdrains and polyethylene lining, prior to commencement of operation. Sizing of the CDFs assume 8 internal dikes will be constructed to facilitate operation and consolidation of sediment.
- Water treatment for overflow generated from the dewatering of excavated material in the CDF consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three CDFs. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Closure of completed CDFs, after three to five years of final consolidation, would consist of a polyethylene membrane, one foot of soil cover and a 2%-sloped soil cap for runoff control.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 of the FS (BBL, 2000).
- CDF monitoring consists of sampling and analyses of perimeter monitoring wells for 36 years.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Material Processing and Dewatering Facility**				
	Mobilization	1	Lump Sum	$311,000	$311,000
	General Conditions	1	Lump Sum	$233,000	$233,000
	Project Insurance	1	Lump Sum	$156,000	$156,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	105,000	linear foot	$21	$2,205,000
	Access road construction/restoration	247,000	square yard	$27	$6,669,000
	Site preparation (dewatering facility)	6	Acres	$7,700	$46,000
	SHF Primary dewatering basin (3 - 3-acre facilities)	3	Lump Sum	$400,000	$1,200,000
	SHF Site preparation	240	Labor-hrs.	$25	$6,000
	SHF Sediment stockpile area (0.5 acre)	65,340	square foot	$50	$3,267,000
	WTF site preparation & paving	21,780	sq yards	$25	$545,000
	WTF coagulation/flocculation/sedimentation	3	Lump Sum	$98,000	$294,000
	WTF multimedia filters	3	Lump Sum	$71,000	$213,000
	WTF carbon adsorption	3	Lump Sum	$144,000	$432,000
	WTF control buildings	4,500	square feet	$70	$315,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$360,000	$360,000
	SUBTOTAL				$16,262,000
	Engineering/Project Management (8%)				$1,301,000
	Construction Oversight (6%)				$976,000
	Contingency (20%)				$3,252,000
				TOTAL (YEARS 2005 - 2006):	$21,791,000
				PRESENT VALUE:	$15,537,000

Table B-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dry excavation mobilization	1	Lump Sum	$12,747,000	$12,747,000
	General Conditions	1	Lump Sum	$9,560,000	$9,560,000
	Project Insurance	1	Lump Sum	$6,374,000	$6,374,000
	Construction Trailers	60	Months	$400	$24,000
	Former Plainwell Impoundment (2007 - 2008)				
	Excavate, haul and place exposed sed. in Dewatering Facility and s	360,000	cubic yards	$61	$21,960,000
	Submerged sediments				
	Construct diversion berms	74,000	cubic yards	$5	$370,000
	Excavate diversion channel	146,667	cubic yards	$15	$2,200,000
	Install Sheet Pile	60,000	square foot	$12	$720,000
	Excavate and load submerged sediment	192,794	cubic yards	$40	$7,712,000
	Haul and place submerged sediment in Dewatering Facility and s	192,794	cubic yards	$31	$5,977,000
	Former Otsego Impoundment (2009 - 2011)				
	Excavate, haul and place exposed sed. in Dewatering Facility and s	540,000	cubic yards	$61	$32,940,000
	Submerged sediments				
	Construct diversion berms	132,000	cubic yards	$5	$660,000
	Excavate diversion channel	173,333	cubic yards	$15	$2,600,000
	Install Sheet Pile	36,000	square foot	$12	$432,000
	Excavate and load submerged sediment	422,766	cubic yards	$40	$16,911,000
	Haul and place submerged sediment in Dewatering Facility and s	422,766	cubic yards	$31	$13,106,000
	Former Trowbridge Impoundment (2007-2011)				
	Excavate, haul and place exposed sed. in Dewatering Facility and s	1,900,000	cubic yards	$61	$115,900,000
	Submerged sediments				
	Construct diversion berms	190,000	cubic yards	$5	$950,000
	Excavate diversion channel	288,889	cubic yards	$15	$4,333,000
	Install Sheet Pile	100,000	square foot	$12	$1,200,000
	Excavate and load submerged sediment	555,714	cubic yards	$40	$22,229,000
	Haul and place submerged sediment in Dewatering Facility and s	555,714	cubic yards	$31	$17,227,000
	Habitat enhancement				
	Former Plainwell Impoundment	1	Lump Sum	$960,000	$960,000
	Former Otsego Impoundment	1	Lump Sum	$1,120,000	$1,120,000
	Former Trowbridge Impoundment	1	Lump Sum	$3,285,000	$3,285,000
	Silt Curtains, reefing and anchoring	6	Crew-Years	$123,000	$738,000
	Turbidity monitoring stations	1	Lump Sum	$1,976,000	$1,976,000
	SHF Electrical and instrumentation	1	LS	$98,190	$98,000
	SHF Front-end loaders and operators	43,200	Labor-hrs.	$25	$1,080,000
	SHF Other on-site Operations	19,200	Labor-hrs.	$25	$480,000
	SHF Weigh station	5	Yrs.	$18,000	$90,000
	SHF Electricity and utilities	1,200	Days	$10	$12,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	5,859,051	wet T	$60	$351,543,000
	SHF QA Monitoring and analyses	200	weeks	$2,800	$560,000
	SHF & WTF maintenance	5	Years	$272,000	$1,360,000
	WTF chemicals	293	M Gal	$1,500	$439,000
	WTF filter media	293	M Gal	$200	$59,000
	WTF activated carbon	293	M Gal	$1,860	$545,000
	Operate WTF - labor	1,200	days	$4,629	$5,555,000
	SUBTOTAL				$666,032,000
	Engineering/Project Management (8%)				$53,283,000
	Construction Oversight (6%)				$39,962,000
	Contingency (20%)				$133,206,000
				TOTAL (YEARS 2007 - 2011):	$892,483,000
				PRESENT VALUE:	$487,677,000

Table B-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$665,000	$665,000
	General Conditions	1	Lump Sum	$498,000	$498,000
	Project Insurance	1	Lump Sum	$332,000	$332,000
	Construction Trailers	60	Months	$400	$24,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	3 Dam Removals	3	Lump Sum	$1,000,000	$3,000,000
	Decommission water treat facilities	1	Lump Sum	$864,000	$864,000
	Decommission sediment handling facilities	1	Lump Sum	$1,789,200	$1,789,000
	SUBTOTAL				$34,721,000
	Engineering/Project Management (8%)				$2,778,000
	Construction Oversight (6%)				$2,083,000
	Contingency (20%)				$6,944,000
				TOTAL (YEARS 2010 - 2014):	$46,526,000
				PRESENT VALUE:	$20,753,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$68,317,000
	SUBTOTAL DRY EXCAVATION OPERATION				$892,483,000
	SUBTOTAL DRY EXCAVATION				$960,800,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$36,290,000
	SUBTOTAL PRESENT WORTH OPERATION				$487,677,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$523,967,000

Table B-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2044)	$141,500	$5,377,000	$1,244,000
	Monitoring - water & sed	(2007 - 2044)	$131,263	$4,988,000	$1,154,000
	KALSIM model updates	(2007 - 2044)	$122,211	$4,644,000	$1,074,000
	SUBTOTAL ANNUAL				$1,793,000
	SUBTOTAL ANNUAL ALL YEARS				$35,405,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,952,000
				GRAND TOTAL COST:	**$996,205,000**
				GRAND TOTAL PRESENT WORTH COST:	**$532,919,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments and along the diversion berms to provide access for the dump trucks and equipment.
- Primary dewatering facilities include 3, 3-acre facilities with HDPE liner, crushed stone layer, geotextile and a floating decanter. Sediment stockpiling area includes 3, 0.5-acre paved areas.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B-3

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3 - Dry Excavation of Submerged Sediments at Former Impoundments, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Impoundments with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring It is assumed that 3800 linear feet will be replaced yearly Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Dewatering will be via passive gravity drainage methods Also, dewatering (i.e., pump-out of excess water) during excavation activities due to recharge from adjacent areas has not been considered.
- Stabilization of the dewatered sediments would be by addition of lime to the dewatered sediments.
- For off-site disposal, total tonnage is estimated assuming 1.2 short tons/cubic yard dewatered stabilized sediments in the case of dry-excavation of submerged sediments or 1.32 tons/cubic yard in-situ sediments in the case of dry-excavation of exposed former sediments.
- Water treatment for overflow generated from the dewatering of excavated material consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three dewatering facilities. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging
- Annual costs for maintenance of restored impoundments as developed for Alternative 3.
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Material Processing and Dewatering Facility**				
	Mobilization	1	Lump Sum	$95,000	$95,000
	General Conditions	1	Lump Sum	$71,000	$71,000
	Project Insurance	1	Lump Sum	$48,000	$48,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	20,000	linear foot	$21	$420,000
	Access road construction/restoration	47,000	square yard	$27	$1,269,000
	Site preparation (dewatering facility)	6	Acres	$7,700	$46,000
	SHF Primary dewatering basin (3 - 3-acre facilities)	3	Lump Sum	$400,000	$1,200,000
	SHF Site preparation	240	Labor-hrs	$25	$6,000
	SHF Sediment stockpile area (0 5 acre)	21,780	square foot	$50	$1,089,000
	WTF site preparation & paving	7,260	sq yards	$25	$182,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$98,000	$98,000
	WTF multimedia filters	1	Lump Sum	$71,000	$71,000
	WTF carbon adsorption	1	Lump Sum	$144,000	$144,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$120,000	$120,000
	SUBTOTAL				$4,974,000
	Engineering/Project Management (8%)				$398,000
	Construction Oversight (6%)				$298,000
	Contingency (20%)				$995,000
				TOTAL (YEARS 2005 - 2006):	$6,665,000
				PRESENT VALUE:	$4,752,000

Table B-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dry excavation mobilization	1	Lump Sum	$1,868,000	$1,868,000
	General Conditions	1	Lump Sum	$1,401,000	$1,401,000
	Project Insurance	1	Lump Sum	$934,000	$934,000
	Construction Trailers	24	Months	$400	$10,000
	Former Plainwell Impoundment (2007 - 2008)				
	Excavate, haul and place exposed sed. in Dewatering Facility and s	360,000	cubic yards	$61	$21,960,000
	Submerged sediments				
	Construct diversion berms	74,000	cubic yards	$5	$370,000
	Excavate diversion channel	146,667	cubic yards	$15	$2,200,000
	Install Sheet Pile	60,000	square foot	$12	$720,000
	Excavate and load submerged sediment	192,794	cubic yards	$40	$7,712,000
	Haul and place submerged sediment in Dewatering Facility and s	192,794	cubic yards	$31	$5,977,000
	Habitat enhancement				
	Former Plainwell Impoundment	1	Lump Sum	$960,000	$960,000
	Silt Curtains, reefing and anchoring	5	Crew-Years	$123,000	$615,000
	Turbidity monitoring stations	1	Lump Sum	$305,000	$305,000
	SHF Electrical and instrumentation	1	LS	$32,850	$33,000
	SHF Front-end loaders and operators	43,200	Labor-hrs.	$25	$1,080,000
	SHF Other on-site Operations	19,200	Labor-hrs.	$25	$480,000
	SHF Weigh station	2	Yrs.	$18,000	$36,000
	SHF Electricity and utilities	1,200	Days	$10	$12,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	740,376	wet T	$60	$44,423,000
	SHF QA Monitoring and analyses	200	weeks	$2,800	$560,000
	SHF & WTF maintenance	2	Years	$91,000	$182,000
	WTF chemicals	63	M Gal	$1,500	$95,000
	WTF filter media	63	M Gal	$200	$13,000
	WTF activated carbon	63	M Gal	$1,860	$118,000
	Operate WTF - labor	1,200	days	$4,629	$5,555,000
	SUBTOTAL				$97,619,000
	Engineering/Project Management (8%)				$7,810,000
	Construction Oversight (6%)				$5,857,000
	Contingency (20%)				$19,524,000
				TOTAL (YEARS 2007 - 2008):	$130,810,000
				PRESENT VALUE:	$78,797,000

Table B-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$108,000	$108,000
	General Conditions	1	Lump Sum	$81,000	$81,000
	Project Insurance	1	Lump Sum	$54,000	$54,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget - Plainwell	1	Lump Sum	$3,185,000	$3,185,000
	Exposed soil cover & veget - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$288,000	$288,000
	Decommission sediment handling facilities	1	Lump Sum	$918,000	$918,000
	SUBTOTAL				$5,644,000
	Engineering/Project Management (8%)				$452,000
	Construction Oversight (6%)				$339,000
	Contingency (20%)				$1,129,000
				TOTAL (YEARS 2009 - 2010):	$7,564,000
				PRESENT VALUE:	$3,980,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$14,229,000
	SUBTOTAL DRY EXCAVATION OPERATION				$130,810,000
	SUBTOTAL DRY EXCAVATION				$145,039,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$8,732,000
	SUBTOTAL PRESENT WORTH OPERATION				$78,797,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$87,529,000

Table B-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2008)	$50,000	$100,000	$60,000
	Confirmation sampling and analyses	(2007 - 2008)	$832,000	$1,664,000	$1,002,000
	Bank observation	(2011 - 2041)	$36,129	$1,120,000	$230,000
	Bank maintenance	(2011 - 2041)	$479,548	$14,866,000	$3,055,000
	Monitoring - biota	(2007 - 2040)	$143,176	$4,868,000	$1,226,000
	Monitoring - water & sed	(2007 - 2040)	$133,059	$4,524,000	$1,140,000
	KALSIM model updates	(2007 - 2040)	$123,882	$4,212,000	$1,061,000
	SUBTOTAL ANNUAL				$1,798,000
	SUBTOTAL ANNUAL ALL YEARS				$31,354,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$7,774,000
				GRAND TOTAL COST:	**$176,393,000**
				GRAND TOTAL PRESENT WORTH COST:	**$95,303,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments and along the diversion berms to provide access for the dump trucks and equipment.
- Primary dewatering facilities include 3, 3-acre facilities with HDPE liner, crushed stone layer, geotextile and a floating decanter. Sediment stockpiling area includes 3, 0.5-acre paved areas.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B-3-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-PW - Dry Excavation of Submerged Sediments at Former Plainwell Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Plainwell Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Dewatering will be via passive gravity drainage methods. Also, dewatering (i.e., pump-out of excess water) during excavation activities due to recharge from adjacent areas has not been considered.
- Stabilization of the dewatered sediments would be by addition of lime to the dewatered sediments.
- For off-site disposal, total tonnage is estimated assuming 1.2 short tons/cubic yard dewatered stabilized sediments in the case of dry-excavation of submerged sediments or 1.32 tons/cubic yard in-situ sediments in the case of dry-excavation of exposed former sediments.
- Water treatment for overflow generated from the dewatering of excavated material consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three dewatering facilities. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Material Processing and Dewatering Facility**				
	Mobilization	1	Lump Sum	$99,000	$99,000
	General Conditions	1	Lump Sum	$74,000	$74,000
	Project Insurance	1	Lump Sum	$49,000	$49,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	22,000	linear foot	$21	$462,000
	Access road construction/restoration	52,000	square yard	$27	$1,404,000
	Site preparation (dewatering facility)	6	Acres	$7,700	$46,000
	SHF Primary dewatering basin (3 - 3-acre facilities)	3	Lump Sum	$400,000	$1,200,000
	SHF Site preparation	240	Labor-hrs.	$25	$6,000
	SHF Sediment stockpile area (0.5 acre)	21,780	square foot	$50	$1,089,000
	WTF site preparation & paving	7,260	sq yards	$25	$182,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$98,000	$98,000
	WTF multimedia filters	1	Lump Sum	$71,000	$71,000
	WTF carbon adsorption	1	Lump Sum	$144,000	$144,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$120,000	$120,000
	SUBTOTAL				$5,159,000
	Engineering/Project Management (8%)				$413,000
	Construction Oversight (6%)				$310,000
	Contingency (20%)				$1,032,000
				TOTAL (YEARS 2005 - 2006):	$6,914,000
				PRESENT VALUE:	$4,930,000

Table B-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dry excavation mobilization	1	Lump Sum	$3,399,000	$3,399,000
	General Conditions	1	Lump Sum	$2,549,000	$2,549,000
	Project Insurance	1	Lump Sum	$1,699,000	$1,699,000
	Construction Trailers	48	Months	$400	$19,000
	Former Otsego Impoundment (2007 - 2010)				
	Excavate, haul and place exposed sed in Dewatering Facility andst	540,000	cubic yards	$61	$32,940,000
	Submerged sediments				
	Construct diversion berms	132,000	cubic yards	$5	$660,000
	Excavate diversion channel	173,333	cubic yards	$15	$2,600,000
	Install Sheet Pile	36,000	square foot	$12	$432,000
	Excavate and load submerged sediment	422,766	cubic yards	$40	$16,911,000
	Haul and place submerged sediment in Dewatering Facility and s	422,766	cubic yards	$31	$13,106,000
	Habitat enhancement				
	Former Otsego Impoundment	1	Lump Sum	$1,120,000	$1,120,000
	Silt Curtains, reefing and anchoring	7	Crew-Years	$123,000	$861,000
	Turbidity monitoring stations	1	Lump Sum	$757,000	$757,000
	SHF Electrical and instrumentation	1	LS	$32,850	$33,000
	SHF Front-end loaders and operators	43,200	Labor-hrs.	$25	$1,080,000
	SHF Other on-site Operations	19,200	Labor-hrs.	$25	$480,000
	SHF Weigh station	4	Yrs	$18,000	$72,000
	SHF Electricity and utilities	1,200	Days	$10	$12,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	1,532,804	wet T	$60	$91,968,000
	SHF QA Monitoring and analyses	200	weeks	$2,800	$560,000
	SHF & WTF maintenance	4	Years	$91,000	$364,000
	WTF chemicals	111	M Gal	$1,500	$167,000
	WTF filter media	111	M Gal	$200	$22,000
	WTF activated carbon	111	M Gal	$1,860	$207,000
	Operate WTF - labor	1,200	days	$4,629	$5,555,000
	SUBTOTAL				$177,573,000
	Engineering/Project Management (8%)				$14,206,000
	Construction Oversight (6%)				$10,654,000
	Contingency (20%)				$35,515,000
				TOTAL (YEARS 2007 - 2010):	$237,948,000
				PRESENT VALUE:	$134,265,000

Table B-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$128,000	$128,000
	General Conditions	1	Lump Sum	$96,000	$96,000
	Project Insurance	1	Lump Sum	$64,000	$64,000
	Construction Trailers	24	Months	$400	$10,000
	Exposed soil cover & veget. - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget. - Otsego	1	Lump Sum	$4,161,000	$4,161,000
	Exposed soil cover & veget. - Trowbridge	1	Lump Sum	$0	$0
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$288,000	$288,000
	Decommission sediment handling facilities	1	Lump Sum	$918,000	$918,000
	SUBTOTAL				$6,665,000
	Engineering/Project Management (8%)				$533,000
	Construction Oversight (6%)				$400,000
	Contingency (20%)				$1,333,000
				TOTAL (YEARS 2011 - 2012):	$8,931,000
				PRESENT VALUE:	$4,104,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$15,845,000
	SUBTOTAL DRY EXCAVATION OPERATION				$237,948,000
	SUBTOTAL DRY EXCAVATION				$253,793,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$9,034,000
	SUBTOTAL PRESENT WORTH OPERATION				$134,265,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$143,299,000

Table B-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2010)	$50,000	$200,000	$113,000
	Confirmation sampling and analyses	(2007 - 2010)	$832,000	$3,328,000	$1,878,000
	Bank observation	(2013 - 2043)	$36,129	$1,120,000	$201,000
	Bank maintenance	(2013 - 2043)	$479,548	$14,866,000	$2,668,000
	Monitoring - biota	(2007 - 2042)	$142,306	$5,123,000	$1,236,000
	Monitoring - water & sed	(2007 - 2042)	$132,111	$4,756,000	$1,148,000
	KALSIM model updates	(2007 - 2042)	$123,000	$4,428,000	$1,068,000
	SUBTOTAL ANNUAL				$1,795,000
	SUBTOTAL ANNUAL ALL YEARS				$33,821,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,312,000
				GRAND TOTAL COST:	**$287,614,000**
				GRAND TOTAL PRESENT WORTH COST:	**$151,611,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes clearing and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments and along the diversion berms to provide access for the dump trucks and equipment.
- Primary dewatering facilities include 3, 3-acre facilities with HDPE liner, crushed stone layer, geotextile and a floating decanter. Sediment stockpiling area includes 3, 0.5-acre paved areas.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B-3-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-OT - Dry Excavation of Submerged Sediments at Former Otsego Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Otsego Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Dewatering will be via passive gravity drainage methods. Also, dewatering (i.e., pump-out of excess water) during excavation activities due to recharge from adjacent areas has not been considered.
- Stabilization of the dewatered sediments would be by addition of lime to the dewatered sediments.
- For off-site disposal, total tonnage is estimated assuming 1.2 short tons/cubic yard dewatered stabilized sediments in the case of dry-excavation of submerged sediments or 1.32 tons/cubic yard in-situ sediments in the case of dry-excavation of exposed former sediments.
- Water treatment for overflow generated from the dewatering of excavated material consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three dewatering facilities. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table B-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
A	**Material Processing and Dewatering Facility**				
	Mobilization	1	Lump Sum	$168,000	$168,000
	General Conditions	1	Lump Sum	$126,000	$126,000
	Project Insurance	1	Lump Sum	$84,000	$84,000
	Construction Trailers	24	Months	$400	$10,000
	Clearing	63,000	linear foot	$21	$1,323,000
	Access road construction/restoration	148,000	square yard	$27	$3,996,000
	Site preparation (dewatering facility)	6	Acres	$7,700	$46,000
	SHF Primary dewatering basin (3 - 3-acre facilities)	3	Lump Sum	$400,000	$1,200,000
	SHF Site preparation	240	Labor-hrs.	$25	$6,000
	SHF Sediment stockpile area (0.5 acre)	21,780	square foot	$50	$1,089,000
	WTF site preparation & paving	7,260	sq yards	$25	$182,000
	WTF coagulation/flocculation/sedimentation	1	Lump Sum	$98,000	$98,000
	WTF multimedia filters	1	Lump Sum	$71,000	$71,000
	WTF carbon adsorption	1	Lump Sum	$144,000	$144,000
	WTF control buildings	1,500	square feet	$70	$105,000
	WTF misc pumps, piping & electrical	1	Lump Sum	$120,000	$120,000
	SUBTOTAL				$8,768,000
	Engineering/Project Management (8%)				$701,000
	Construction Oversight (6%)				$526,000
	Contingency (20%)				$1,754,000
				TOTAL (YEARS 2005 - 2006):	$11,749,000
				PRESENT VALUE:	$8,377,000

Table B-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
B	**Field Operations**				
	Dry excavation mobilization	1	Lump Sum	$7,814,000	$7,814,000
	General Conditions	1	Lump Sum	$5,860,000	$5,860,000
	Project Insurance	1	Lump Sum	$3,907,000	$3,907,000
	Construction Trailers	60	Months	$400	$24,000
	Former Trowbridge Impoundment (2007-2011)				
	Excavate, haul and place exposed sed. in Dewatering Facility and s	1,900,000	cubic yards	$61	$115,900,000
	Submerged sediments				
	Construct diversion berms	190,000	cubic yards	$5	$950,000
	Excavate diversion channel	288,889	cubic yards	$15	$4,333,000
	Install Sheet Pile	100,000	square foot	$12	$1,200,000
	Excavate and load submerged sediment	555,714	cubic yards	$40	$22,229,000
	Haul and place submerged sediment in Dewatering Facility and s	555,714	cubic yards	$31	$17,227,000
	Habitat enhancement				
	Former Trowbridge Impoundment	1	Lump Sum	$3,285,000	$3,285,000
	Silt Curtains, reefing and anchoring	6	Crew-Years	$123,000	$738,000
	Turbidity monitoring stations	1	Lump Sum	$914,000	$914,000
	SHF Electrical and instrumentation	1	LS	$32,850	$33,000
	SHF Front-end loaders and operators	43,200	Labor-hrs.	$25	$1,080,000
	SHF Other on-site Operations	19,200	Labor-hrs.	$25	$480,000
	SHF Weigh station	5	Yrs.	$18,000	$90,000
	SHF Electricity and utilities	1,200	Days	$10	$12,000
	SHF Transport and Dispose TSCA wastes	0	wet T	$110	$0
	SHF Transport and Dispose Non-TSCA wastes	3,585,872	wet T	$60	$215,152,000
	SHF QA Monitoring and analyses	200	weeks	$2,800	$560,000
	SHF & WTF maintenance	5	Years	$91,000	$455,000
	WTF chemicals	130	M Gal	$1,500	$195,000
	WTF filter media	130	M Gal	$200	$26,000
	WTF activated carbon	130	M Gal	$1,860	$242,000
	Operate WTF - labor	1,200	days	$4,629	$5,555,000
	SUBTOTAL				$408,261,000
	Engineering/Project Management (8%)				$32,661,000
	Construction Oversight (6%)				$24,496,000
	Contingency (20%)				$81,652,000
				TOTAL (YEARS 2007 - 2011):	$547,070,000
				PRESENT VALUE:	$298,934,000

Table B-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
C	**Closure Construction**				
	Mobilization	1	Lump Sum	$448,000	$448,000
	General Conditions	1	Lump Sum	$336,000	$336,000
	Project Insurance	1	Lump Sum	$224,000	$224,000
	Construction Trailers	36	Months	$400	$14,000
	Exposed soil cover & veget - Plainwell	1	Lump Sum	$0	$0
	Exposed soil cover & veget - Otsego	1	Lump Sum	$0	$0
	Exposed soil cover & veget - Trowbridge	1	Lump Sum	$20,203,000	$20,203,000
	Dam Removals	1	Lump Sum	$1,000,000	$1,000,000
	Decommission water treat facilities	1	Lump Sum	$288,000	$288,000
	Decommission sediment handling facilities	1	Lump Sum	$918,000	$918,000
	SUBTOTAL				$23,431,000
	Engineering/Project Management (8%)				$1,874,000
	Construction Oversight (6%)				$1,406,000
	Contingency (20%)				$4,686,000
				TOTAL (YEARS 2012 - 2014):	$31,397,000
				PRESENT VALUE:	$13,049,000
	SUBTOTAL DRY EXCAVATION CONSTRUCTION				$43,146,000
	SUBTOTAL DRY EXCAVATION OPERATION				$547,070,000
	SUBTOTAL DRY EXCAVATION				$590,216,000
	SUBTOTAL PRESENT WORTH CONSTRUCTION				$21,426,000
	SUBTOTAL PRESENT WORTH OPERATION				$298,934,000
	SUBTOTAL PRESENT WORTH DRY EXCAVATION				$320,360,000

Table B-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

Item No.	Remedial Component	Quantity	Units	Unit Cost	Item Cost
F	**Annual Costs**	Years	Annual	Total	Present Worth
	Bathymetric surveys	(2007 - 2011)	$50,000	$250,000	$137,000
	Confirmation sampling and analyses	(2007 - 2011)	$832,000	$4,160,000	$2,273,000
	Bank observation	(2012 - 2042)	$36,129	$1,120,000	$215,000
	Bank maintenance	(2012 - 2042)	$479,548	$14,866,000	$2,855,000
	Monitoring - biota	(2007 - 2044)	$141,500	$5,377,000	$1,244,000
	Monitoring - water & sed	(2007 - 2044)	$131,263	$4,988,000	$1,154,000
	KALSIM model updates	(2007 - 2044)	$122,211	$4,644,000	$1,074,000
	SUBTOTAL ANNUAL				$1,793,000
	SUBTOTAL ANNUAL ALL YEARS				$35,405,000
	SUBTOTAL ANNUAL PRESENT WORTH ALL YEARS				$8,952,000
				GRAND TOTAL COST:	**$625,621,000**
				GRAND TOTAL PRESENT WORTH COST:	**$329,312,000**

NOTES/ASSUMPTIONS

General:

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Unit costs are in 2000 dollars and are estimated from standard estimating guides (e.g. Means Site Work and Landscape Cost Data, vendors, professional judgement and experience from other similar projects).
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Present worth is estimated based on a 7 percent (%) beginning-of-year discount rate (adjusted for inflation) in accordance with USEPA policy directive entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis, OSWER Directive No. 9355.3-20 (USEPA 1993). It is assumed that Year 0 is 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 20% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.

Specific:

- Mobilization/demobilization is a lump sum based on project size.
- General conditions refer to contractor overhead, and miscellaneous costs such as health and safety and construction trailer facility. Cost is a lump sum based on project size.
- Labor prices in accordance with Prevailing Rate Schedule, Kalamazoo Co., 1/1/2000 at 40hrs/wk/shift straight time and 14hrs overtime/wk/shift.
- Access area development includes cleaning and preparation of equipment and material staging/handling areas. Restoration includes the removal and disposal of gravel, fill replacement, where necessary, followed by topsoil and vegetation.
- Access road construction assumes construction and restoration of a 16-foot wide roadway along both sides of the former impoundments and along the diversion berms to provide access for the dump trucks and equipment.
- Primary dewatering facilities include 3, 3-acre facilities with HDPE liner, crushed stone layer, geotextile and a floating decanter. Sediment stockpiling area includes 3, 0.5-acre paved areas.
- Habitat enhancement costs as described for Alternatives 3 and 4 in the FS (BBL, 2000), includes revegetation of the river banks with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline.
- Excavation is by dry excavation methods utilizing conventional long-reach excavators, off-road dump trucks, and wide track dozers. A production rate of 1,500 cu yd/day (in-situ) per excavation operation is assumed. It is assumed that excavation will concurrently occur at the former Trowbridge Impoundment and one of the other two former impoundments.
- Excavation will generally proceed from the perimeter of the exposed floodplains and progressing in the direction of the Kalamazoo River. Diversion channels will then be constructed in areas that have been excavated utilizing diversion berms and sheet piling as needed. Diversion berms will be constructed of locally available clean sand fills. Sheet piling will be placed along certain stretches to divert the river and protect onshore facilities from excavation disturbance.
- Once the Kalamazoo River is routed to a section of the temporary diversion channel, the remnants of the former dams will be removed and the floodplain drained. The sediments within the river and the banks will then be excavated.

Table B-3-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Alternative B-3-TRO - Dry Excavation of Submerged Sediments at Former Trowbridge Impoundment, Dry Excavation of Exposed Sediments and Removal of Dam Sills at the Former Trowbridge Impoundment with Dewatering, Offsite Landfill Disposal, Institutional Controls and Monitoring

- Dual layer vinyl coated polyester silt curtain includes reefing and anchoring. It is assumed that 3800 linear feet will be replaced yearly. Silt curtain based on Elastec quotation, 9/98 escalated to 1/00.
- Five real-time turbidity monitoring stations are used for each excavation segment. Fixed monitoring stations are constructed of 6-in steel piling for each excavation segment, and removed after excavation. It is assumed that turbidity sensors will be replaced every 90,000 cy of in-river dry excavation.
- For the purpose of this estimates it is assumed that insitu river sediment solids = 77% and excavated river solids = 38.5%. However, potential dilution of the exposed former sediments during excavation has not been considered. Dewatering will be via passive gravity drainage methods. Also, dewatering (i.e., pump-out of excess water) during excavation activities due to recharge from adjacent areas has not been considered.
- Stabilization of the dewatered sediments would be by addition of lime to the dewatered sediments.
- For off-site disposal, total tonnage is estimated assuming 1.2 short tons/cubic yard dewatered stabilized sediments in the case of dry-excavation of submerged sediments or 1.32 tons/cubic yard in-situ sediments in the case of dry-excavation of exposed former sediments.
- Water treatment for overflow generated from the dewatering of excavated material consists of flocculation, sedimentation, dual-media filtration and activated carbon adsorption. Discharge is to the Kalamazoo River. Treatment facilities are located adjacent to each of the three dewatering facilities. Unit costs are based on experience at the Fox River SMU 56/57, with elimination of neutralization chemical costs. Flocculation and sedimentation assume 60 min. detention, filtration facilities are assumed to be loaded at 2.0 gpd/sf, and carbon contactors assume empty bed contact time of 20 min.
- Control building of 1500 square ft to be constructed for each WTF.
- Bathymetric surveys are performed annually during excavation to confirm effectiveness.
- Confirmation Sampling includes analyses and QA/QC for in-situ sediments, waters and residuals for the excavation and water treatment operations.
- Construction oversight includes project management and daily reports.
- Engineering fees are based on 8% of the construction subtotal cost or 8% of operational costs during field execution.
- Contingency is based upon 20% of the construction subtotal cost.
- Present worth excavation and disposal cost assumes costs are spread evenly over the duration of each program segment, at a 7% discount rate.
- Present worth cost includes institutional controls and monitoring. Samples for Advisory Monitoring of Biota are taken at year 1, then every 5 years until 30 years after completion of dredging. Samples for Trend Monitoring of Biota are taken at year 1, then every 3 years until 30 years after completion of dredging. Water and sediment samples are taken at year 1, then every 5 years until 30 years after completion of dredging. KALSIM model updates are performed at year 1, then every 5 years until 30 years after completion of dredging.
- Annual costs for maintenance of restored impoundments as developed for Alternative 3 in the FS (BBL, 2000).
- Total present worth cost is the sum of costs for dredging, disposal, water treatment, institutional controls, and monitoring.

Table C1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-PW - Rechannelization of Former Plainwell Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

SUMMARY OF CAPITAL COSTS

Item No.	Description	Quantity	Unit	Unit Cost (rounded)	Item Cost (rounded)
1	Mobilization/demobilization	1	lump sum	$293,000	$293,000
2	General conditions	1	lump sum	$146,000	$146,000
3	Land purchase	60	acre	$10,000	$600,000
4	Clearing	30	acre	$6,000	$180,000
5	Access road construction	9,000	square yard	$27	$243,000
6	New channel excavation	360,000	cubic yard	$10	$3,600,000
7	Backfilling existing channel	180,000	cubic yard	$4	$720,000
8	Handling/stockpiling of excess excavation soil	180,000	cubic yard	$4	$720,000
9	Construct diversion dykes	2	each	$500,000	$1,000,000
10	Erosion control (silt fence, haybales, etc.)	3,000	linear foot	$5	$15,000
11	Bioengineer new channel banks	17,000	square yard	$40	$680,000
12	Revegetate/restore cleared areas	47,311	square yard	$15	$709,667
13	Revegetate backfilled channel	126,000	square yard	$15	$1,890,000
				Subtotal:	$10,796,667
				Engineering fees and project management (11%):	$1,188,000
				Construction management (6%):	$648,000
				Contingency (30%):	$3,239,000
				Total (2005-2007):	$15,872,000
				Present worth:	$10,592,000

SUMMARY OF O&M COSTS

Item No.	Description	Quantity	Unit	Unit Cost	Item Cost (rounded)
A	**Perform post-remedy visual observation of the re-routed channel banks**				
	1 Administrative and coordination	1	lump sum	$3,200	$3,200
	2 Mobilization/Demobilization	1	lump sum	$6,500	$6,500
	3 Visual observations of new channel banks (above water)	10	day	$2,200	$22,000
	4 Visual observations of new channel banks (below water)	20	day	$3,800	$76,000
	5 Reporting	1	lump sum	$10,000	$10,000
	SUBTOTAL				$118,000
	Engineering fees (15%)				$18,000
	Contingency (20%)				$24,000
				TOTAL (1 EVENT):	$160,000
				TOTAL (7 EVENTS, YEARS 2008 THROUGH 2038):	$1,120,000
				PRESENT VALUE:	$294,000

(See notes on page 3)

Table C1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-PW - Rechannelization of Former Plainwell Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

SUMMARY OF O&M COSTS (CONTINUED)

Item No.	Description	Quantity	Unit	Unit Cost	Item Cost (rounded)
B	**Care and maintenance of re-routed channel banks**				
	Repairing local erosions, wash outs, vegetation touch ups, etc.	1	lump sum	$539,833	$539,833
	SUBTOTAL				$539,833
	Engineering fees (15%)				$81,000
	Contingency (20%)				$108,000
				TOTAL (1 EVENT):	$728,833
				TOTAL (7 EVENTS, YEARS 2008 THROUGH 2038):	$5,102,000
				PRESENT VALUE:	$1,340,000
C	**Institutional controls and monitoring**				
	1 Water column sampling	8	one event/5-years	$331,000	2,648,000
	2 Sediment sampling	8	one event/5-years	$249,000	1,992,000
	3 Biota sampling and monitoring - ad	8	one event/5-years	$398,000	3,184,000
	4 Biota sampling and monitoring - tre	12	one event/3-years	$143,000	1,716,000
	5 KALSIM model updates	8	one event/5-years	$540,000	$4,320,000
				TOTAL (YEARS 5 THROUGH 38):	$13,860,000
				PRESENT VALUE:	$3,286,000
				TOTAL O&M COSTS:	$20,082,000
				PRESENT VALUE:	$4,920,000
				GRAND TOTAL COST:	$35,954,000
				GRAND TOTAL PRESENT WORTH COST:	$15,512,000

(See notes on page 3)

Table C1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-PW - Rechannelization of Former Plainwell Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

NOTES/ASSUMPTIONS

General

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Costs do not include riprap protection of banks, grade control, bed material placement, stabilization of upstream and downstream areas and disposal of contaminated soils if encountered. Also, the costs for removal of the PCB-impacted sediments in the remaining river segment are not included.
- Unit costs are in 2000 dollars.
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 30% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.
- It is assumed that the construction activities for rechannelization would commence in 2005. The construction would occur between years 2005 and 2007. Care and maintenance for rechannelization would commence in Year 2008 and continue to 2038, that is 30-years following overall completion of this project.

Specific Comments

- Mobilization/demobilization (labor, material, equipment, etc.) is based on 3 percent of the sum of items 4 through 13 of Capital Costs.
- General conditions refer to contractor overhead, project administration, and miscellaneous costs including health and safety and temporary construction trailer facility expenses. This is based on 1.5 percent of the sum of items 4 through 13 of Capital Costs.
- An allowance of $10,000 is assumed for land purchase for the new channel based on a review of some listed properties in the general area. The actual price of land is subjected to the variability of the realestate market at the time of project execution.
- Clearing refers to clearing of vegetation and debris prior to excavating new channel.
- Access road costs assume the construction of a 16-foot wide roadway along both sides of the new channel with additional ingress and egress and turning areas as needed. The cost includes the restoration cost at the conclusion of the work.
- A new channel will be excavated straightening the river from downstream of Hwy 131 to approximately 1200 feet downstream of the Plainwell Dam. The new channel will be 200 feet wide at the base with a 2 horizontal: 1 vertical (2H:1V) side slopes. Average excavation depth is approximately 16 feet. No consideration has been given for possible flood control measures or other design issues that may arise.
- The old channel will be backfilled using the excavated soil from the new channel.

Table C1-PW

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-PW - Rechannelization of Former Plainwell Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

- A nominal $4/cubic yard is assumed for handling/stockpiling of the excess excavation volume generated from the new channel. It is assumed that this material will be used in other remedial action components as "clean fill" and that the cost of hauling and placement would be included under respective activities.
- Two (2) diversion dykes are anticipated at a minimum to divert the flow to the new channel and to control limited water flow into the backfilled old channel to maintain wetland type conditions. A nominal cost of $500,000 is assumed for each diversion dyke.
- Erosion control measures would include silt fence and hay bales around the work areas and marine silt curtain for in-river construction activities.
- Banks of the new channel will generally be covered with soil and revegetated with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline. Higher costs are assumed to allow bioengineering the banks as needed.
- The cleared areas will be restored and revegetated with native harbaceous species and woody shrubs.
- The existing channel will be backfilled and revegetated to create new wetlands or a green corridor as applicable.
- Visual observations are assumed to be performed 1 year after remedy implementation and then at 5-year intervals thereafter, where the observation event will correspond with the occurrence of the NCP-required 5-year review.
- Post-remedy care and maintenance are assumed to be performed 1 year after remedy and then at 5-year intervals thereafter for a period of 30 years post-remedy. It is assumed that the rechannelization activities will be completed in Year 2005. So, post-remedy care and maintenance will begin from Year 2006. Maintenance costs were determined assuming that 5 percent of the rechannelized river will require repair work during each maintenance event.
- Institutional controls and monitoring program will begin in Year 2005 at the start of remedy implementation activities and continue for 30-years post-implementation to Year 2038. This will involve water column, sediment and biota-advisory monitoring every five years and biota-trend monitoring every 3 years. In addition, KALSIM model will be updated every five years.

Table C1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-OT - Rechannelization of Former Otsego Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

Item No.	Description	Quantity	Unit	Unit Cost (rounded)	Item Cost (rounded)
1	Mobilization/demobilization	1	lump sum	$1,603,000	$1,603,000
2	General conditions	1	lump sum	$802,000	$802,000
3	Land purchase	160	acre	$10,000	$1,600,000
4	Clearing	80	acre	$6,000	$480,000
5	Access road construction	31,000	square yard	$27	$837,000
6	New channel excavation	3,979,000	cubic yard	$6	$23,874,000
7	Backfilling existing channel	325,000	cubic yard	$6	$1,950,000
8	Handling/stockpiling of excess excavation soil for reuse or sale	3,654,000	cubic yard	$4	$14,616,000
9	Construct diversion dykes	2	each	$500,000	$1,000,000
10	Construct highway bridge for Route 89	1	each	$2,500,000	$2,500,000
11	Erosion control (silt fence, haybales, etc.)	29,000	linear foot	$5	$145,000
12	Bioengineer new channel banks	54,000	square yard	$40	$2,160,000
13	Revegetate/restore cleared areas	83,067	square yard	$15	$1,246,000
14	Revegetate backfilled channel	309,000	square yard	$15	$4,635,000
				Subtotal:	$57,448,000
				Engineering fees and project management (11%):	$6,319,000
				Construction management (6%):	$3,447,000
				Contingency (30%):	$17,234,400
				Total (Years 2005-2010):	$84,448,000
				Present worth:	$51,181,000

SUMMARY OF O&M COSTS

Item No.	Description	Quantity	Unit	Unit Cost	Item Cost (rounded)
A	**Perform post-remedy visual observation of the re-routed channel banks**				
	1 Administrative and coordination	1	lump sum	$3,200	$3,200
	2 Mobilization/Demobilization	1	lump sum	$6,500	$6,500
	3 Visual observations of stabilized banks (above water)	10	day	$2,200	$22,000
	4 Visual observations of stabilized banks (below water)	20	day	$3,800	$76,000
	5 Reporting	1	lump sum	$10,000	$10,000
	SUBTOTAL				$118,000
	Engineering fees (15%)				$18,000
	Contingency (20%)				$24,000
				TOTAL (1 EVENT):	$160,000
				TOTAL (7 EVENTS, YEARS 2011 THROUGH 2041):	$1,120,000
				PRESENT VALUE:	$240,000

(See notes on page 3)

Table C1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-OT - Rechannelization of Former Otsego Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

SUMMARY OF O&M COSTS (CONTINUED)

Item No.	Description	Quantity	Unit	Unit Cost	Item Cost (rounded)
B	**Care and maintenance of re-routed channel banks** Repairing local erosions, wash outs, vegetation touch ups, etc.	1	lump sum	$2,872,400	$2,872,400
	SUBTOTAL				$2,872,400
	Engineering fees (15%)				$431,000
	Contingency (20%)				$574,000
				TOTAL (1 EVENT):	$3,877,400
				TOTAL (7 EVENTS, YEARS 2011 THROUGH 2041):	$27,142,000
				PRESENT VALUE:	$5,817,000
C	**Institutional controls and monitoring**				
	1 Water column sampling	8	one event/5-years	$331,000	2,648,000
	2 Sediment sampling	8	one event/5-years	$249,000	1,992,000
	3 Biota sampling and monitoring - advisory	8	one event/5-years	$398,000	3,184,000
	4 Biota sampling and monitoring - trend	13	one event/3-years	$143,000	1,859,000
	5 KALSIM model updates	8	one event/5-years	$540,000	$4,320,000
				TOTAL (YEARS 2005 THROUGH 2041):	$14,003,000
				PRESENT VALUE:	$3,293,000
				TOTAL O&M COSTS:	$42,265,000
				PRESENT VALUE:	$9,350,000
				GRAND TOTAL COST:	$126,713,000
				GRAND TOTAL PRESENT WORTH COST:	$60,531,000

(See notes on page 3)

Table C1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-OT - Rechannelization of Former Otsego Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

NOTES/ASSUMPTIONS

General

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Costs do not include engineered bank stabilization, grade control, bed material placement, stabilization of upstream and downstream areas and disposal of contaminated soils if encountered. Inaddition, the costs for removal/or remediation of the PCB-impacted sediments in the remaining river segment and the former impoundment limit are not included.
- Unit costs are in 2000 dollars.
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 30% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.
- It is assumed that the construction activities for rechannelization would commence in 2005. The construction would occur between years 2005 and 2010. Care and maintenance for rechannelization would commence in Year 2010 and continue to 2041, that is 30-years following overall completion of this project.

Component-Specific

- Mobilization/demobilization (labor, material, equipment, etc.) is based on 3 percent of the sum of items 4 through 14 of Capital Costs.
- General conditions refer to contractor overhead, project administration, and miscellaneous costs including health and safety and temporary construction trailer facility expenses. This is based on 1.5 percent of B37the sum of items 4 through 14 of Capital Costs.
- An allowance of $10,000 is assumed for land purchase for the new channel based on a review of realestate costs in the general area during October 2000.
- Clearing refers to clearing of vegetation and debris prior to excavating new channel.
- Access road costs assume the construction of a 16-foot wide roadway along both sides of the new channel with additional ingress and egress and turning areas (assumed to be 10 percent) as needed. The cost includes the restoration cost at the conclusion of the work.
- A new channel will be excavated in the adjoining land straightening the existing river. The new channel will be 200 feet wide at the base with 2 horizontal: 1 vertical (2H:1V) side slopes. For the purpose of this estimate excavation depths are determined from USGS topographic maps. It is assumed that there will be no bedrock excavation.
- The old channel will be backfilled using the excavated soil from the new channel.
- A nominal $4/cubic yard is assumed for handling/stockpiling of the excess excavation volume generated from the new channel. It is assumed that this material will be used in other remedial action components as "clean fill" and that the cost of hauling and placement would be included under respective activities.
- Note that excess excavation soil can be used to place a soil cover on the former exposed sediments. However, a cost for this has not been included in this estimate.
- Two (2) diversion dykes are anticipated at a minimum to divert the flow to the new channel and to control limited water flow into the backfilled old channel to maintain wetland type conditions. A nominal cost of $500,000 is assumed for each diversion dyke.
- An allowance of $2,500,000 is assumed for constructing a bridge for Route 89 over the new channel. The following assumptions are made: the bridge will be on piles, there are no utilities in the way, bridge is approx. 20 feet above the water surface, no maintenance and protection of traffic is necessary, bridge is straight. Also, this estimate does not include any roadwork off the bridge itself.
- Erosion control measures would include silt fence and haybales around the work areas and marine silt curtain for in-river construction activities.

Table C1-OT

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-OT - Rechannelization of Former Otsego Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

- Banks of the new channel will generally be covered with soil and revegetated with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline. Higher costs are assumed to allow bioengineering the banks as needed.
- The cleared areas will be restored and revegetated with native harbaceous species and woody shrubs.
- The existing channel will be backfilled and revegetated to create new wetlands or a green corridor as applicable.
- Visual observations are assumed to be performed 1 year after remedy implementation and then at 5-year intervals thereafter, where the observation event will correspond with the occurrence of the NCP-required 5-year review.
- Post-remedy care and maintenance are assumed to be performed 1 year after remedy and then at 5-year intervals thereafter for a period of 30 years post-remedy. It is assumed that the rechannelization activities will be completed in Year 2010. So, post-remedy care and maintenance will begin from Year 2011. Maintenance costs were determined assuming that 5 percent of the rechannelized river will require repair work during each maintenance event.
- Institutional controls and monitoring program will begin in Year 2005 at the start of remedy implementation activities and continue for 30-years post-implementation to Year 2041. This will involve water column, sediment and biota-advisory monitoring every five years and biota-trend monitoring every 3 years. In addition, KALSIM model will be updated every five years.

Table C1-TRO

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Preliminary Cost Estimate

Approach C1-TRO - Rechannelization of Former Trowbridge Impoundment, Backfilling and Revegetation of the Existing Channel, Institutional Controls and Monitoring

Item No.	Description	Quantity	Unit	Unit Cost (rounded)	Item Cost (rounded)
1	Mobilization/demobilization	1	lump sum	$2,352,000	$2,352,000
2	General conditions	1	lump sum	$1,176,000	$1,176,000
3	Land purchase	220	acre	$10,000	$2,200,000
4	Relocation of home and property owners				
5	Clearing	110	acre	$6,000	$660,000
6	Access road construction	45,000	square yard	$27	$1,215,000
7	New channel excavation	4,081,870	cubic yard	$10	$40,818,697
8	Backfilling existing channel	761,000	cubic yard	$6	$4,566,000
9	Handling/stockpiling of excess excavation	3,320,870	cubic yard	$4	$13,283,479
	soil for reuse or sale				
10	Construct diversion dykes	5	each	$500,000	$2,500,000
11	Construct road bridges	2	each	$2,500,000	$5,000,000
12	Erosion control (silt fence, haybales, etc.)	83,000	linear foot	$5	$415,000
13	Bioengineer new channel banks	77,000	square yard	$40	$3,080,000
14	Revegetate/restore cleared areas	97,622	square yard	$15	$1,464,333
15	Revegetate backfilled channel	359,000	square yard	$15	$5,385,000
				Subtotal:	$84,115,509
				Engineering fees and project management (11%):	$9,253,000
				Construction management (6%):	$5,047,000
				Contingency (30%):	$25,234,653
				Total (Years 2005-2014):	$123,650,000
				Present worth:	$66,255,000

SUMMARY OF O&M COSTS

Item No.	Description	Quantity	Unit	Unit Cost	Item Cost (rounded)
A	**Perform post-remedy visual observation of the re-routed channel banks**				
	1 Administrative and coordination	1	lump sum	$3,200	$3,200
	2 Mobilization/Demobilization	1	lump sum	$6,500	$6,500
	3 Visual observations of stabilized banks (above water)	10	day	$2,200	$22,000
	4 Visual observations of stabilized banks (below water)	20	day	$3,800	$76,000
	5 Reporting	1	lump sum	$10,000	$10,000
	SUBTOTAL				$118,000
	Engineering fees (15%)				$18,000
	Contingency (20%)				$24,000
				TOTAL (1 EVENT):	$160,000
				TOTAL (7 EVENTS, YEARS 2015-2045):	$1,120,000
				PRESENT VALUE:	$183,000

See notes on page 3.

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Item No.	Description	Quantity	Unit	Unit Cost	Item Cost (rounded)
B	**Care and maintenance of re-routed channel banks**				
	Repairing local erosions, wash outs, vegetation touch ups, etc.	1	lump sum	$4,205,775	$4,205,775
	SUBTOTAL				$4,205,775
	Engineering fees (15%)				$631,000
	Contingency (20%)				$841,000
				TOTAL (1 EVENT):	$5,677,775
				TOTAL (7 EVENTS, YEARS 2015-2045):	$39,744,000
				PRESENT VALUE:	$6,498,000
C	**Institutional controls and monitoring**				
	1 Water column sampling	9	one event/5-years	$331,000	2,979,000
	2 Sediment sampling	9	one event/5-years	$249,000	2,241,000
	3 Biota sampling and monitoring - ad	9	one event/5-years	$398,000	3,582,000
	4 Biota sampling and monitoring - tre	14	one event/3-years	$143,000	2,002,000
	5 KALSIM model updates	9	one event/5-years	$540,000	$4,860,000
				TOTAL (YEARS 5 THROUGH 45):	$15,664,000
				PRESENT VALUE:	$3,358,000
				TOTAL O&M COSTS:	$56,528,000
				PRESENT VALUE:	$10,039,000
				GRAND TOTAL COST:	$180,178,000
				GRAND TOTAL PRESENT WORTH COST:	$76,294,000

See notes on page 3.

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NOTES/ASSUMPTIONS

General

- All costs include material and labor, unless otherwise noted.
- Costs do not include legal fees, permitting, obtaining access, negotiations, or agency oversight.
- Costs do not include bank stabilization, grade control, bed material placement, stabilization of upstream and downstream areas and disposal of contaminated soils if encountered. Inaddition, the costs for removal of the PCB-impacted sediments in the remaining river segment and the former impoundment limit are not included.
- Unit costs are in 2000 dollars.
- Costs based on current site information and project understanding. This may change following collection of additional data and/or receipt of Agency input and actual project design.
- Cost estimates are generally developed based on the USEPA guidance document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 540-R-00-002 (OSWER 9355.0-75) dated July 2000.
- Engineering fees, project management and construction management are generally based on percentages shown on Exhibit 5-8 of the EPA guidance document for feasibility study (OSWER 9355.0-075).
- A 30% contingency allowance is included to provide for unforeseen circumstances or variability in estimated areas, volumes, labor and material costs.
- It is assumed that the construction activities for rechannelization would commence in 2005. The construction would occur between years 2005 and 2014. Care and maintenance for rechannelization would commence in Year 2015 and continue to 2045, that is 30-years following overall completion of this project.

Component-Specific

- Mobilization/demobilization (labor, material, equipment, etc.) is based on 3 percent of the sum of items 4 through 15 of the Capital Costs.
- General conditions refer to contractor overhead, project administration, and miscellaneous costs including health and safety and temporary construction trailer facility expenses. This is based on 1.5 percent of the sum of items 4 through 15 of Capital Costs.
- An allowance of $10,000 per acre is assumed for land purchase or leasing for the new channel.
- The costs for relocation of existing home and property owners has not been considered.
- Clearing refers to clearing of vegetation and debris prior to excavating new channel.
- Access road costs assume the construction of a 16-foot wide roadway along both sides of the new channel with additional ingress and egress and turning areas (assumed to be 10 percent) as needed. The cost includes the restoration cost at the conclusion of the work.
- A new channel will be excavated in the adjoining land straightening the existing river. The new channel will be 200 feet wide at the base with 2 horizontal: 1 vertical (2H:1V) side slopes. For the purpose of this estimate excavation depths are determined from USGS topographic maps. The high excavation volume is due to steep topography of the adjacent banks. Excavation is assumed in the overburden soil only.
- The old channel will be backfilled using the excavated soil from the new channel.
- A nominal $4/cubic yard is assumed for handling/stockpiling of the excess excavation volume generated from the new channel. It is assumed that this material will be used in other remedial action components as "clean fill" and that the cost of hauling and placement would be included under respective activities.
- Note that excess excavation soil can be used to place a soil cover on the former exposed sediments. However, a cost for this has not been included in this estimate.
- Two (2) diversion dykes are anticipated at a minimum to divert the flow to the new channel and to control limited water flow into the backfilled old channel to maintain wetland type conditions. A nominal cost of $500,000 is assumed for each diversion dyke.

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- An allowance of $2,500,000 per bridge structure is assumed for constructing two bridges for roads over the new channel. The following assumptions are made: the bridge will be on piles, there are no utilities in the way, bridge is approx. 20 feet above the water surface, no maintenance and protection of traffic is necessary, bridge is straight. Also, this estimate does not include any roadwork off the bridge itself.
- Erosion control measures would include silt fence and haybales around the work areas and marine silt curtain for in-river construction activities.
- Banks of the new channel will generally be covered with soil and revegetated with native emergent herbaceous species at the water line and herbaceous plants and woody shrubs above the waterline. Higher costs are assumed to allow bioengineering the banks as needed.
- The cleared areas will be restored and revegetated with native harbaceous species and woody shrubs.
- The existing channel will be backfilled and revegetated to create new wetlands or a green corridor as applicable.
- Visual observations are assumed to be performed 1 year after remedy implementation and then at 5-year intervals thereafter, where the observation event will correspond with the occurrence of the NCP-required 5-year review.
- Post-remedy care and maintenance are assumed to be performed 1 year after remedy and then at 5-year intervals thereafter for a period of 30 years post-remedy. It is assumed that the rechannelization activities will be completed in Year 2014. So, post-remedy care and maintenance will begin from Year 2015. Maintenance costs were determined assuming that 5 percent of the rechannelized river will require repair work during each maintenance event.
- Institutional controls and monitoring program will begin in Year 2005 at the start of remedy implementation activities and continue for 30-years post-implementation to Year 2045. This will involve water column, sediment and biota-advisory monitoring every five years and biota-trend monitoring every 3 years. In addition, KALSIM model will be updated every five years.