EXECUTIVE SUMMARY

INTRODUCTION

The Lower Passaic River Restoration Project ("the Study") is a comprehensive study of the 17-mile tidal portion of the Passaic River and its watershed. This integrated Study is being implemented by the U.S. Environmental Protection Agency (USEPA) under the Superfund Program (the Lower Passaic River is a part of the Diamond Alkali Superfund Site); by the U.S. Army Corps of Engineers (USACE) and New Jersey Department of Transportation (NJDOT) under the Water Resources Development Act; and by the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA), and New Jersey Department of Environmental Protection (NJDEP) as Natural Resource Trustees. The scope of the Study is to gather data needed to make decisions on remediating contamination in the river to reduce human health and ecological risks, improve the water quality of the river, improve and create aquatic habitat, improve human use, and reduce contaminant loading in the Lower Passaic River and the New York-New Jersey Harbor Estuary.

During the course of the Study, sediments in the lower eight miles of the river were identified as a major source of contamination to the 17-mile Study Area and to Newark Bay. Therefore, this Focused Feasibility Study (FFS) was undertaken to evaluate a range of remedial alternatives that might be implemented as an early action to control that major source. The Source Control Early Action, if undertaken, would address contaminated sediments in the lower eight miles of the Passaic River, in order to more rapidly reduce risks to human health and the environment. The Source Control Early Action, which would be a final action for the sediments in the lower eight miles, is intended to take place in the near term, while the comprehensive 17-mile Study is on-going.

DESCRIPTION OF THE RIVER

The Lower Passaic River watershed was one of the major centers of the American industrial revolution, with early manufacturing, particularly cotton mills, developing in the area around Great Falls in Paterson, New Jersey. In subsequent years, many industrial operations developed along the banks of the Passaic River, including manufactured gas plants, paper manufacturing and recycling facilities, chemical manufacturing facilities, and others that used the river for wastewater disposal. Direct and indirect discharges from these facilities have impacted the river. Furthermore, the Lower Passaic River has received direct and indirect municipal discharges from the middle of the nineteenth century to the present time. Together, these waste streams (industrial and municipal) discharged many contaminants, including dioxins, petroleum hydrocarbons, polychlorinated biphenyls (PCB), pesticides, and metals to the Lower Passaic River.

Today, extremely contaminated surface sediments present high levels of risk to human heath and the ecosystem. A risk assessment conducted for the FFS concluded that among adults consuming 40 meals per year of fish from the Lower Passaic River over 30 years, their risk of developing cancer would be one in one hundred. This risk is greater than USEPA's risk range established in the Superfund Program of one in ten thousand to one in a million. Approximately 65 percent of the human health cancer risk is associated with the presence of dioxin. Most of the remaining cancer risk (approximately 33 percent) is from PCB, while all other contaminants combined contribute approximately two percent. Accordingly, fish consumption advisories have been in place for many years due to contamination from dioxins and PCB. Similar risks are present for wildlife, although metals and pesticides cause most of the risk to fish, while dioxin and PCB cause most of the risks for animals and birds that eat fish.

An important component of the region's historical development and urbanization was the deepening of the river to permit commercial navigation into the city of Newark and farther upriver. Several large dredging projects at the beginning of the twentieth century established and maintained a navigation channel through more than 15 miles of the river.

Since the 1940s, there has been little maintenance dredging and none since the early 1980s. Consequently, the river has accumulated substantial sediment deposits particularly in the lower eight miles, measuring up to 25 feet thick. Less sedimentation has occurred upstream because of the faster flowing narrower channel. Tidal mixing has distributed contamination throughout the lower eight miles, as well as upriver and into Newark Bay and the New York – New Jersey Harbor Estuary.

Sediment contamination is even greater in deeper sediments than at the surface. Sediment erosion due to the back-and-forth motion of the tides and storm events is most likely responsible for continuing releases of contaminants from the river bed. As a fraction of all of the solids sources to the Lower Passaic, resuspension of deeper sediments comprises about 10 percent of the total annual deposition. However, resuspension accounts for over 95 percent of the dioxin accumulating in the river bottom, and at least 40 percent of PCBs, pesticides and mercury accumulating in the river.

The Lower Passaic River is also a major source of contaminants to Newark Bay. Sediment transport from the Lower Passaic River to Newark Bay delivers the contaminants found in Newark Bay's surficial sediments, particularly dioxin. It is estimated that the Lower Passaic River contributes approximately 10 percent of the average annual amount of sediment accumulating in Newark Bay, and more than 80 percent of the dioxin accumulating in the Bay. A recent study of dioxin contamination in New York Harbor (Chaky, 2003) suggests that the Lower Passaic River dioxin signature can be traced through the entire Harbor. The Lower Passaic River also contributes approximately 20 percent of the mercury to Newark Bay.

Sediment contamination is not the only problem in the Lower Passaic River. The communities that line the banks of the Lower Passaic River are prone to flooding. Development of the banks and the watershed has eliminated vital wetlands and floodplains, so that flood events pose economic and public safety risks. Finally, the State of New Jersey has reaffirmed its need for the river's navigation infrastructure, as its communities develop plans for use of a restored river in the future. The State's needs are documented in this report and help define the reasonably anticipated future use for the Lower Passaic River.

REMEDIAL ACTION OBJECTIVES AND TARGET AREAS

Remedial Action Objectives (RAOs) were established to describe what the cleanup is expected to accomplish, and preliminary remediation goals (PRGs) were developed as targets for the cleanup to meet in order to protect human health and the environment.

The RAOs are as follows:

- Reduce cancer risks and non-cancer health hazards for people eating fish and shellfish from the Lower Passaic River by reducing the concentration of contaminants of potential concern (COPCs) in fish and shellfish.
- Reduce the risks to ecological receptors by reducing the concentration of contaminants of potential ecological concern (COPECs) in fish and shellfish.
- Reduce the mass of COPCs and COPECs in sediments that are or may become bioavailable.
- Remediate the most significant mass of contaminated sediments that may be mobile (*e.g.*, erosional or unstable sediments) to prevent it from acting as a source of contaminants to the Lower Passaic River or to Newark Bay and the New York-New Jersey Harbor Estuary.

Background contaminant contributions to sites should be considered to adequately understand contaminant sources and establish realistic risk reduction goals. Investigation of sediment contaminant concentrations in the Upper Passaic River above the Dundee Dam has revealed the presence of historic and ongoing upstream sources of inorganics, pesticides, and PCB that are significant in comparison to contaminant concentrations in the Lower Passaic River. USEPA guidance defines "*background*" as constituents and locations that are not influenced by releases from the site and includes both anthropogenic and naturally derived constituents. The dam physically isolates the proximal Dundee Lake and other Upper Passaic River sediments from Lower Passaic

River influences while the Lower Passaic River receives contaminant loads from above the dam. The proximity of these sediments to the proposed remediation area and demonstrated geochemical connection to a portion of the Lower Passaic River sediment contamination strongly argues in favor of their consideration as representative of "background" for the Lower Passaic River.

A number of human health and ecological risk-based concentrations were considered in the development of PRGs. The developed risk-based threshold concentrations were calculated from cancer risks and toxicity for human receptors who potentially consume between one and 40 meals of fish or shellfish a year from the river and from toxicity to benthic organism and wildlife. The background concentrations derived from recent sediment data from above Dundee Dam were found to be above the risk-based thresholds. Since the Superfund program, generally, does not clean up to concentrations below natural or anthropogenic background levels (USEPA, 2002b), background concentrations were selected as PRGs. Table A lists the background concentrations of COPECs and COPCs, selected as the PRGs.

Table A: Selected PRGs

Contaminant	Background Concentration (ng/g)
Copper	80,000
Lead	140,000
Mercury[a]	720
Low Molecular Weight PAHs	8,900
High Molecular Weight PAHs	65,000
Total PCB	660
Total DDx	91
Dieldrin	4.3
Chlordane	92
2,3,7,8-TCDD	0.002

(a) All occurrences of mercury are assumed to be methylated for purposes of this evaluation.

The COPC and COPEC concentrations known to exist in the surface sediments of the lower 8 miles are much greater than these PRGs. For this reason a remedial strategy that can reduce the concentrations to at least the level of background is necessary to begin to achieve the RAOs.

The background levels for many of the contaminants pose unacceptable risks, in part resulting from continuing contributions from upstream sources. Thus, while the Source Control Early Action addresses the contaminated sediments of the lower eight miles of the Passaic River, a separate source control action will need to be implemented above Dundee Dam to identify and reduce or eliminate those background sources. Such a separate action might include identifying facilities above the dam with on-going contributions to the Upper Passaic River, or conducting a track-down program where samplers are placed further and further upstream until contaminants are tracked back to specific industrial or municipal sources. Such sources would then be controlled through federal or State of New Jersey regulatory programs.

To identify distinct areas that, if remediated, may result in the achievement of RAOs, a series of geospatial and geochemical analyses were conducted. During these analyses, three target areas were identified for consideration: the Primary Erosional Zone (68 acres), the Primary Inventory Zone (63 acres), and the Area of Focus (650 acres, lower eight miles). The Primary Erosional Zone is an area of the Lower Passaic River in which there exists a greater amount of surface area that may erode as compared to other areas of the river. The Primary Inventory Zone is an area of the Lower Passaic River in which there exists a relatively greater contaminant inventory (mass) as compared to other areas of the river. The Area of Focus encompasses the entire (bank-to-bank) river area from RM0 to RM8.3, which contains elevated COPC and COPEC concentrations in surface sediment and contaminant inventory that is at risk of being eroded and transported over time due to high flow events as well as typical flow and tidal conditions.

Future concentrations of COPECs and COPCs in the Lower Passaic River surface sediments were estimated using an empirical method. The sediment concentration forecasting supported risk evaluations, which considered the following scenarios: No Action (including natural recovery), remediating the Primary Erosion Zone, remediating the Primary Inventory Zone, and remediating the Area of Focus.

These evaluations of risk, development of PRGs, and estimation of future concentrations were used to evaluate the benefit of remediating each of the three target areas. Based on the estimated risk reduction, No Action or the remediation of only the Primary Erosional Zone and/or the Primary Inventory Zone will not achieve residual risks within the USEPA risk range of one in ten thousand to one in a million within reasonable time frames. In addition, sediment concentrations exceeding PRGs have been identified throughout the Area of Focus and remediating only the Primary Erosion Zone and/or the Primary Inventory Zone does not address these continuing contaminant sources. However, remediating the Area of Focus reduces the COPC and COPEC concentrations in the surface sediments over the long term to the background concentrations that are introduced to the Lower Passaic River from the Upper Passaic River. Active remediation of the Area of Focus is also predicted to reduce the human health risk by 95 to 98 percent (fish versus crab consumption) and the ecological hazard by 78 to 98 percent (species dependent), which meets the RAOs. It is important to note that regardless of the PRG or risk levels that need to be achieved, remediating the Area of Focus achieves clean-up of 2,3,7,8-TCDD, which is responsible for about 65 percent of the human health cancer risk, 40 years faster than it would be achieved by No Action. The reduction of other COPCs and COPECs is also accelerated by the remediation of the Area of Focus. For these reasons, all active alternatives were developed to remediate the Area of Focus, which encompasses the fine-grained sediments of the lower eight miles in their entirety.

DEVELOPMENT OF ALTERNATIVES

Available technologies were analyzed in order to develop alternatives for remediating the sediments of the lower eight miles. Consistent with the intent of an early action, preference was given to technologies that have been proven in other full-scale remedies and could be designed and implemented in the near term, without additional lengthy research. For the in-river aspects of the remediation, remedial technology classes selected for analysis were dredging (mechanical) and engineered capping (sand and armor). For management of dredged materials, nearshore confined disposal facilities (CDF) were selected for analysis, either as the only management solution or in combination with a local thermal treatment facility.

In addition to the No Action alternative that the Superfund program requires to be evaluated, six active alternatives were developed and evaluated:

- Alternative 1: Removal of Fine Grained Sediment from Area of Focus.
- Alternative 2: Engineered Capping of Area of Focus.
- Alternative 3: Engineered Capping of Area of Focus Following Reconstruction of Federally Authorized Navigation Channel.
- Alternative 4: Engineered Capping of Area of Focus Following Construction of Navigation Channel to Accommodate Current Usage.
- Alternative 5: Engineered Capping of Area of Focus Following Construction of Navigation Channel to Accommodate Future Usage.
- Alternative 6: Engineered Capping of Area of Focus Following Construction of Navigation Channel to Accommodate Future Usage and Removal of Fine Grained Sediment from Primary Inventory Zone and Primary Erosional Zone.

Following the completion of active remediation in the river, each of these alternatives relies on monitored natural recovery, with institutional controls, to achieve protectiveness.. In addition, separate source control actions above Dundee Dam, when implemented, will shorten the time frame within which the active alternatives achieve protectiveness.

DETAILED ANALYSIS OF ALTERNATIVES

The Superfund program has established nine criteria for evaluating remedial alternatives. The first two criteria are threshold criteria that must be met by each alternative: overall protection of human health and the environment, and compliance with applicable or relevant and appropriate requirements (ARARs). The next five criteria are primary balancing criteria upon which the analysis is based: long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost. The No Action alternative and six active alternatives were evaluated using these seven criteria, with the last two, the modifying criteria of state acceptance and community acceptance, left to be evaluated following the Proposed Plan.

A summary of the comparison of the No Action alternative and the six active remediation alternatives to the Superfund criteria is included in Table B. A summary of important quantitative estimates for No Action alternative and the six active alternatives is included in Table C. A graphical presentation of the costs for the six active alternatives is shown on Figure A.

All active remediation alternatives rely on natural recovery processes in the river, as well as continued introduction of relatively cleaner sediments from above the Dundee Dam, for continued improvement following active remediation of sediments in the lower eight miles to control that source of contaminants. In contrast to the other alternatives, the No Action alternative does not require any active measures to address the contaminated sediment; thus is it technically feasible and would result in comparatively little cost. However, the No Action alternative would take much longer to achieve remedial action objectives compared to the active alternatives, and would be ineffective at reducing toxicity, mobility and volume of contaminated sediments. While active alternatives would result in rapidly cutting off the source of much contamination to Newark Bay and its gradual improvement, No Action would allow the continued long-term mobilization of contaminated sediments to Newark Bay and other areas in the New York – New Jersey Harbor Estuary. The No Action alternative would not support the reasonably anticipated future uses of the river for navigation. Finally, the No Action alternative would not meet RAOs within a reasonable time frame and would thus not be protective of human health and the environment.

In addition to cost, the major differences among the six active alternatives are related to the volume of material to be dredged, the final elevation of the remediated surface in various stretches of the lower eight miles (related to compatibility with future use objectives), and the extent of engineered capping employed versus backfilling. As shown on Table B, all active alternatives are considered equivalent for the criteria of Overall Protection of Human Health and the Environment and Compliance with ARARs. The active alternatives can be distinguished from each other for the other five criteria as follows:

- Long Term Effectiveness and Permanence: Alternatives 1 and 3 rely most heavily on backfill (which would not be maintained) following dredging to historically dredged surfaces, and Alternatives 2 and 4 rely most on engineered capping, which would be maintained in perpetuity. Dredging followed by backfilling and capping are judged to have similar adequacy in addressing the contamination in the fine-grained sediments, and the reliability of both depends on proper design and implementation. However, the long-term reliability of capping depends heavily on the consistency and sufficiency of future cap maintenance activities, while the long-term reliability of backfill placed would not be monitored.
- Reduction of Toxicity, Mobility, and Volume: the active alternatives have varying dredging removal volumes that range from 1.2 million cubic yards to 11 million cubic yards.
- Short Term Effectiveness: larger removal volumes would have a greater potential for short term impacts from dredging resuspension and associated construction activities (see estimated construction durations on Table C).
- Implementability: the active alternatives are distinguished primarily on the basis of flooding (considerable flooding increases would occur for Alternatives 2 and 4); also, certain alternatives would require administrative changes to the navigation channel authorization (Alternatives 2, 4, 5, and 6).
- Cost: the active alternatives range in cost from $0.9 billion to $2.3 billion.

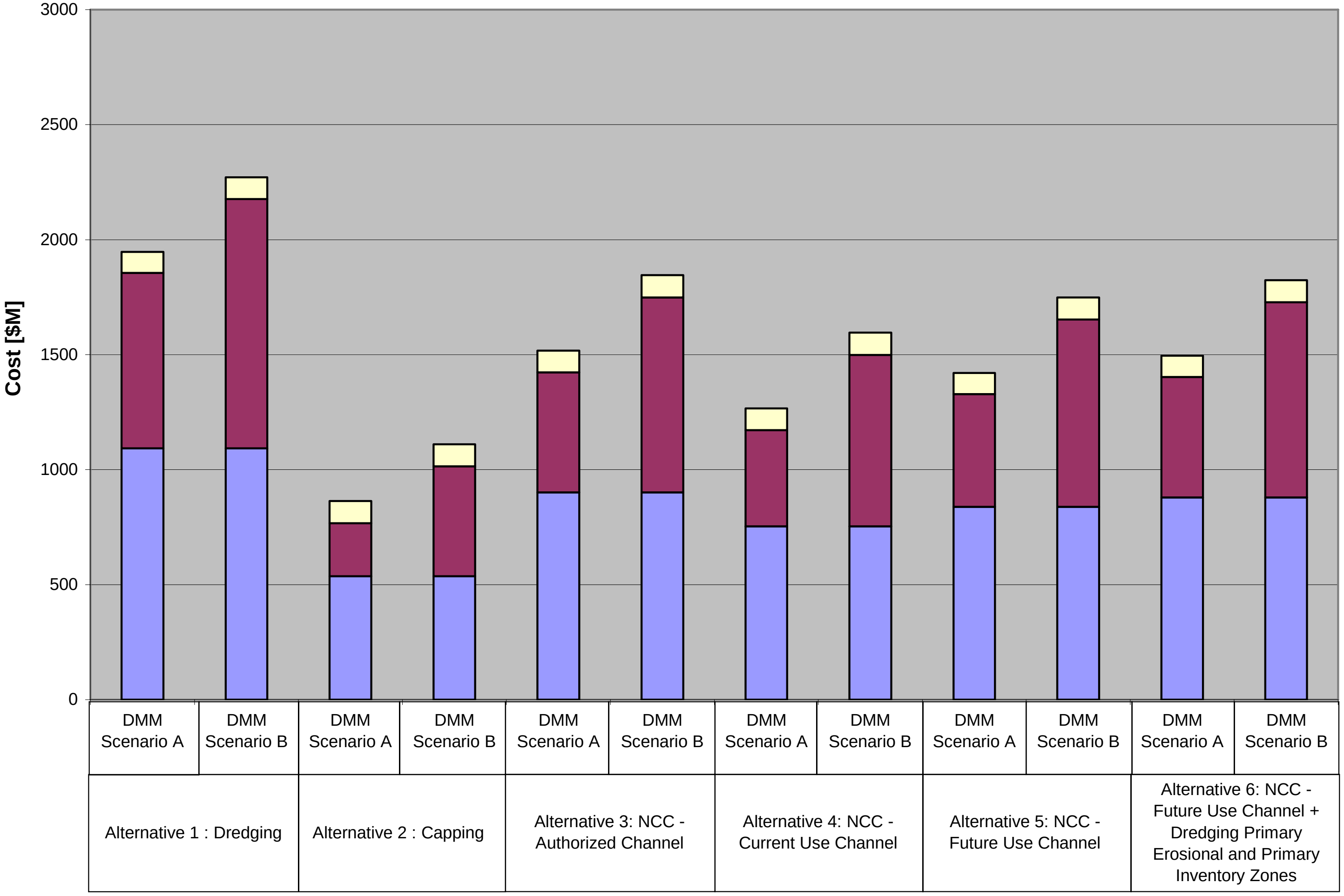
Alternative	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short Term Effectiveness	Implementability	Cost	
							DMM Scenario A[4]	DMM Scenario B[5]
No Action	**Not protective.** Natural recovery processes would achieve some reduction in risk from current levels, but human health and ecological risks continue to be above acceptable levels. In addition, the contaminated sediment load from the Lower Passaic River to Newark Bay and the New York-New Jersey Harbor Estuary would continue.	None of the identified action-specific or location-specific ARARs are applicable to the No Action alternative.	Cancer risks reduced to 4×10^{-3} for ingestion of fish and 3×10^{-3} for ingestion of crab. For fish ingestion, HI for adult reduced to 6.8 and child to 31. For crab ingestion, HI for adult reduced to 5.2 and child to 27. Mink HI reduced to 52. Heron HI reduced to 5.	None	Some decreases in existing risks are achieved from natural recovery processes, but acceptable levels of risk are not achieved within a reasonable time frame (30 years).	Implementable. Requires no action. Gradual increase in flooding impact. Change in authorized depth required.	Not applicable	Not applicable
Alternative 1: Removal of Fine Grained Sediment from Area of Focus	**Protective.** Human health risks are reduced to the risk range. Substantial ecological improvements occur in a substantially shorter period of time. Institutional controls will be necessary to protect human health after remedy is implemented, during period of monitored natural recovery. Control of sources above Dundee Dam will accelerate time to reach risk range.	Alternative 1 through 6 will be designed and carried out in accordance with applicable ARARs and accepted best management practices.	Cancer risks reduced to 5×10^{-4} for ingestion of fish and 4×10^{-4} for ingestion of crab. For fish ingestion, HI for adult reduced to 4.7 and child to 22. For crab ingestion, HI for adult reduced to 3.5 and child to 19. Mink HI reduced to 6. Heron HI reduced to 2. Alternative 1 relies exclusively on placement of a backfill layer to provide a measure of control in the event that residual contamination poses health risks. This alternative does not include an engineered cap, because the intent is for the contaminated fine-grained sediment to be removed with the assumption that the underlying less-contaminated sand material will not erode to any significant extent. The backfill layer is not intended to be maintained, in contrast to the engineered cap in Alternative 2 whose thickness must be maintained in the long term in order to ensure protectiveness of contaminant inventory left underneath. Alternatives 3, 4, 5, and 6 rely on varying combinations of backfill and engineered cap, depending on the amount of contaminated inventory left after dredging. Of these four alternatives, Alternative 3 proposes removing the most fine-grained sediment down to the underlying sandy layer, while Alternative 4 proposes leaving behind the most contaminant inventory, so that Alternative 3 relies most heavily on backfill and Alternative 4 relies most on engineered capping. The reliability of both dredging and engineered caps depends upon proper design and implementation, while the reliability of capping also depends on the consistency and sufficiency of future maintenance.	Removal of 11 million cy of contaminated sediment would permanently reduce volume of contaminants in Area of Focus. Thermal treatment of 1.7 million cy would irreversibly destroy contaminants.	Greatest amount of removal results in greatest potential for disturbance and environmental impact.	Implementable. Slight decrease in flooding. No change in authorized depth required.	$2.0 Billion	$2.3 Billion
Alternative 2: Engineered Capping of Area of Focus				Removal of 1.2 million cy of contaminated sediment would permanently reduce volume of contaminants in Area of Focus. Thermal treatment of 1.2 million cy would irreversibly destroy contaminants.	Lowest amount of removal results in lowest potential for disturbance and environmental impact.	Considerable increase in flooding. Change in authorized depth required.	$0.9 Billion	$1.1 Billion
Alternative 3: Engineered Capping of Area of Focus Following Reconstruction of Federally Authorized Navigation Channel				Removal of 7.1 million cy of contaminated sediment would permanently reduce volume of contaminants in Area of Focus. Thermal treatment of 1.7 million cy would irreversibly destroy contaminants.	Relatively moderate amount of removal results in moderate potential for disturbance and environmental impact.	Implementable. Slight decrease in flooding. No change in authorized depth required.	$1.5 Billion	$1.9 Billion
Alternative 4: Engineered Capping of Area of Focus Following Construction of Navigation Channel to Accommodate Current Usage				Removal of 3.2 million cy of contaminated sediment would permanently reduce volume of contaminants in Area of Focus. Thermal treatment of 1.7 million cy would irreversibly destroy contaminants.	Relatively lower amount of removal results in relatively lower potential for disturbance and environmental impact.	Considerable increase in flooding. Change in authorized depth required.	$1.3 Billion	$1.6 Billion
Alternative 5: Engineered Capping of Area of Focus Following Construction of Navigation Channel for Future Use				Removal of 6.3 million cy of contaminated sediment would permanently reduce volume of contaminants in Area of Focus. Thermal treatment of 1.7 million cy would irreversibly destroy contaminants.	Relatively moderate amount of removal results in moderate potential for disturbance and environmental impact.	Implementable. Slight decrease in flooding. Change in authorized depth required.	$1.4 Billion	$1.8 Billion
Alternative 6: Engineered Capping of Area of Focus Following Construction of Navigation Channel for Future Use and Removal of Fine Grained Sediment from Primary Inventory Zone and Primary Erosional Zone				Removal of 7.2 million cy of contaminated sediment would permanently reduce volume of contaminants in Area of Focus. Thermal treatment of 1.7 million cy would irreversibly destroy contaminants.	Relatively moderate amount of removal results in moderate potential for disturbance and environmental impact.	Implementable. Slight decrease in flooding. Change in authorized depth required.	$1.5 Billion	$1.8 Billion

Table C: Summary of Quantitative Estimates for Six Remedial Alternatives

Alternatives	Navigation Usage • Navigation channel depths[1]	Flooding[2] (additional flooding)	Dredging Volume (millions of cubic yards)	Construction Duration (years)	Human Health Risk Assessment[3]	Ecological Risk Assessment[3]	Total Present Worth Cost	
					Fish Consumption [4]	Heron [5]	DMM Scenario A[6]	DMM Scenario B[7]
No Action	Similar to Current Use Alternative 4; limits feasibility of future channel maintenance.	Gradual increase with time (not estimated)	0	Not applicable	4 E-03	5	Not applicable	Not applicable
Alternative 1: Removal of Fine-Grained Sediment from Area of Focus	Authorized channel dimensions accommodated (see Alternative 3 below).	Decrease (not estimated)	11.0	12	5 E-04 (95% reduction compared to current)	2	$2.0 Billion	$2.3 Billion
Alternative 2: Engineered Capping of Area of Focus	Navigation significantly reduced.	***Considerable Increase (93 acres)***	1.1	6			$0.9 Billion	$1.1 Billion
Alternative 3: Engineered Capping of Area of Focus Following Reconstruction of Federally Authorized Navigation Channel	Authorized channel dimensions accommodated. • 30' from RM0 to RM2.5 • 20' from RM2.5 to RM4.6 • 16' from RM4.6 to RM8.1 • 10' above RM8.1	Decrease (not estimated)	7.0	8			$1.5 Billion	$1.9 Billion
Alternative 4: Engineered Capping of Area of Focus Following Construction of Navigation Channel to Accommodate Current Usage	Current navigation usage accommodated. • 30' from RM0 to RM1.2 • 16' from RM1.2 to RM2.5 • Navigation above RM2.5 significantly reduced	***Considerable Increase (24 acres)***	4.4	6			$1.3 Billion	$1.6 Billion
Alternative 5: Engineered Capping of Area of Focus Following Construction of Navigation Channel for Future Use	Anticipated future navigation usage accommodated. • 30' from RM0 to RM1.2 • 16' from RM1.2 to RM3.6 • 10' above RM3.6	Decrease (-17 acres)	6.1	7			$1.4 Billion	$1.8 Billion
Alternative 6: Engineered Capping of Area of Focus Following Construction of Navigation Channel for Future Use and Removal of Fine Grained Sediment from Primary Inventory Zone and Primary Erosional Zone		Decrease (not estimated)	7.0	8			$1.5 Billion	$1.8 Billion

Notes:

(1) Navigation channel depths are provided in feet below mean low water.
(2) Flood estimates are provided for the 100-year return interval river flow event.
(3) Risk reductions presented are for 30 year timeframe. Alternatives 1 through 6 rely on monitored natural recovery with institutional controls in place to achieve 1E-04 and HI=1 in subsequent years. In addition, separate source control actions above Dundee Dam, when implemented, will accelerate the time frame to reach 1E04 and HI=1.
(4) A human health risk assessment was also conducted for the scenario of crab consumption. More information is presented in Appendix C: Risk Assessment.
(5) An ecological risk assessment was also conducted for other species. More information is presented in Appendix C: Risk Assessment.
(6) Dredged Material Management Scenario A: Nearshore Confined Disposal
(7) Dredged Material Management B: Nearshore Confined Disposal, Storage, Thermal Treatment, and Beneficial Use



Legend

- Operation and Maintenance Costs
- Dredged Material Management Costs
- Capital Costs

Notes

DMM Scenario A: Nearshore Confined Disposal

DMM Scenario B: Nearshore Confined Disposal, Storage, Thermal Treatment, and Beneficial Use

Acronyms

DMM = Dredged Material Management

NCC = Navigationally Constrained Capping

Draft Contractor Document: Subject to Continuing Agency Review

Remedial Alternatives Cost Comparison

Lower Passaic River Restoration Project

Figure A

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