US Army Corps of Engineers®

Pittsburgh District December 2007

# Final
# Detailed Project Report
## And
## Integrated Environmental Assessment

# APPENDIX 4

# COST ESTIMATES

## North Park Lake
### Allegheny County, PA
### Section 206 Aquatic Ecosystem Restoration Project

## Cost Appendix

This appendix includes the first level screening level cost estimates, a detailed second level screening level construction cost estimates, the total project cost estimate for the preferred plan, the fully funded cost estimate for the preferred plan, and additional cost backup.

## First Level Screening Level Cost Estimates

Initially, screening level cost estimates were prepared for three separate alternatives. These alternatives are as follows: Mechanical Sediment Removal – Drain the Lake, Mechanical Sediment Removal – No Lake Drainage, and Hydraulic Dredging.

The screening level estimates included the construction cost associated with removing sediment, trucking and placement of sediment, spreading and compaction of sediment, environmental features, sediment placement site preparation cost, access ramp cost, temporary channel excavation, traffic control issues, plantings, and a wetland protection rock berm. The majority of the cost items, not including the actual dredging and trucking costs were basically similar for the three alternatives.

The screening level cost estimates were developed using several methods. The dredging/trucking/spreading costs were prepared by developing rough crews and production rates. Most of the other costs were developed using historical unit price data. A 25% contingency was added to these screening level costs to account for the limited details available on the design, screening level quantities, and amount of unknowns typical for this level of design. These screening level estimates and their associated backup can be seen later in the appendix under the headings First Level Screening Level Cost Estimates and First Level Screening Level Backup.

### Mechanical Sediment Removal – Drain the Lake

This alternative consists of the local sponsor draining the lake prior to turning it over to a contractor. The contractor would then use standard mechanical excavation methods to remove the sediment. Production rates were developed for hydraulic excavators and truck transportation to the sediment placement areas. The cost was developed for excavating and disposing the sediment from different access points to each sediment placement area. To come up with an average cost for excavation and disposal of material, different areas and quantities of excavation were assigned to the different access ramps and placement areas.

### Mechanical Sediment Removal – No Lake Drainage

This alternative consists of utilizing mechanical equipment (hydraulic excavator) on work floats to dredge the lake sediment. Rough crews and production rates for the dredging

and trucking of sediment were developed for this alternative. An average trucking distance was used to determine the unit cost.

### Hydraulic Dredging

This alternative consists of utilizing hydraulic dredging equipment to remove sediment from the lake. The sediment would be pumped into geotubes at one of three laydown areas (Mars, County Site, and Bull Pen). The geotubes are used due to minimal space available for sediment basins. Geotubes act as large filters allowing the dredge water to pass through but keeping the sediment intact. A hanging bag test was performed to determine the adequate drying time for the sediment in the geotubes. This drying time along with a layout of the geotubes and a hydraulic dredging evaluation (performed by ERDC) was used to determine a production rate for the dredging operation. This production rate along with crew development was used to determine the unit cost of hydraulic dredging and sediment transportation and placement for this alternative.

**TABLE #1**
**SCREENING LEVEL CONSTRUCTION COST ESTIMATES**
October 2004 Cost Level

| **Alternative** | **Construction Cost*** | **$/CY** |
|---|---|---|
| Mechanical Sediment Removal – Drain the Lake | $8,642,000 | $21.34 |
| Mechanical Sediment Removal – No Lake Drainage | $12,792,000 | $31.59 |
| Hydraulic Dredging | $10,960,000 | $27.06 |

* Includes contingencies

### First Level Recommended Plan

The screening level cost estimate for the Mechanical Sediment Removal – Drain the Lake alternative, proved to be the most cost effective. However, due to funding restraints on the federal portion of Section 206 projects it is apparent that the entire amount of the dredging could not be performed. As a result, the recommended plan was broken into three segments as described below and as indicated on Plate 5-1, and a second level screening was performed on each (Alternatives 5, 6, and 7).

### Second Level Screening Level Cost estimates

For the second level screening process, North Park Lake was broken into three segments – the South Fork Alternative 5, the Dam Area Alternative 6, and the North Fork Alternative 7. A detailed cost estimate was then prepared for each of these alternatives using the assumptions detailed in the following paragraphs. Second level screening estimates include the same work and methods as used for the first level screening. All

three alternatives assume that the lake will be drained prior to initiation of work and that mechanical methods will be employed to remove the sediment.

**Alternative 5 – South Fork**

This alternative consists of the removal of approximately 73,000 CY of material from the South Fork section of North Park Lake. One access point will be used and the material will all be trucked to a single site for final disposal. Costs include the development and restoration of the Goldstar access site and the Bull Pen disposal site, removal and disposal of the sediment, and stream diversion and pumping during the removal work. Alternative 5 also includes the construction of the Wetlands Protection Barrier, as well as other environmental improvements including aquatic improvements, osprey nests, placement of coir logs, and shoreline plantings.

**Alternative 6 – Dam Area**

This alternative consists of the removal of approximately 140,000 CY of material from the area near the North Park Dam. Two access points will be used and the material will be trucked to the Bull Pen and the County sites for final disposal. Costs include the development and restoration of the Pierce Mill Road and the Point access sites and the Bull Pen and County disposal sites, removal and disposal of the sediment, and stream diversion and pumping during the removal work. Alternative 6 also includes environmental improvements including aquatic improvements, osprey nests, placement of coir logs, and shoreline plantings.

**Alternative 7 – North Fork**

This alternative consists of the removal of approximately 104,000 CY of material from the North Fork section of North Park Lake. Two access points will be used (Rose Barn and the Point) and the material will all be trucked to the Bull Pen site for final disposal. Costs include the development and restoration of the Rose Barn and the Point access sites and the Bull Pen disposal site, removal and disposal of the sediment, and stream diversion and pumping during the removal work. Alternative 7 also includes environmental improvements including aquatic improvements, osprey nests, placement of coir logs, and shoreline plantings.

**TABLE #2**
**SECOND LEVEL SCREENING COSTS**
October 2007 Cost Level

| Alternative | Quantity (BCY) | Construction Cost* | $/CY |
|---|---|---|---|
| 5 | 73,000 | $2,653,000 | $36.34 |
| 6 | 140,000 | $3,400,000 | $24.29 |
| 7 | 104,000 | $2,811,000 | $27.03 |

*Included contingencies

**Detailed Construction Cost Estimate Recommended Plan**

The construction cost estimate, prepared in MCACES, included detailed breakdowns of equipment, labor, material and supply costs. It also accounted for subcontractor and prime contractor markup's as well as overtime adjustments where necessary.

The estimate was based upon the assumption that the lake would be drained by the sponsor prior to being turned over to an earthwork construction contractor. The lake would be excavated using hydraulic excavators in conjunction with dozers. The trucking of the material was assumed to be subcontracted. It was assumed that the contractor would work double shifts, weather permitting, during the actual dredging portion of the work. This is due to the difficulty associated in excavating a dry lake bed in wet weather. The contractor will need to maximize the amount of production during the dry weather days.

**Total Project Cost Estimate**

The total project cost estimate consists of the construction cost as well as sunk cost, future design cost, real estate costs, and contingencies. The design cost, construction management, planning and project management costs were based upon a percentage of the construction cost prior to contingency. The real estate cost was based upon appraisals of land value by the Government with an additional in-house labor cost for processing the future land acquisitions. It was assumed that the local sponsor will be responsible for acquiring the land necessary for this project. The following table shows a breakdown of the total project cost estimate by the various codes of accounts (COA). A more detailed breakdown of the Construction (Dredging) COA is included later in this appendix.

**TABLE #3**
**TOTAL PROJECT COST BREAKDOWN**
October 2007 Cost Level

| COA | Description | Cost | Contingency | Total Cost |
|---|---|---|---|---|
| 01 | Land and Damages | $120,000 | $12,000 | $132,000 |
| 12 | Construction (Dredging) | $2,263,000 | $548,000 | $2,811,000 |
| 22 | ERR *Sunk Cost | $1,050,000 | $0 | $1,050,000 |
| 30 | Planning, Engineering and Design | $227,000 | $57,000 | $284,000 |
| 31 | Construction Management | $170,000 | $43,000 | $213,000 |
| | **Totals** | $3,830,000 | $660,000 | $4,490,000 |

Cost share breakdown is 65% federal, 35% non-federal.

**Fully Funded Cost Estimate**

The final cost estimating task was to take the total project cost and prepare a fully funded cost estimate. The fully funded estimate consists of the total project cost inflated per midpoint dates of various activities included in each individual COA. The inflation rate for COA 12 was taken from the Civil Works Construction Cost Index System (CWCCIS). The other COA's were inflated using a 3% per year inflation factor. The cost level of the individual cost items were considered to be October 2007. The COA's were then inflated to their midpoint based on the inflation rates and the time elapsed from October 2007.

**TABLE #4**
**FULLY FUNDED COST BREAKDOWN**
October 2007 Cost Level

| COA | Description | Cost | Contingency | Total Cost |
|---|---|---|---|---|
| 01 | Land and Damages | $122,000 | $12,000 | $134,000 |
| 12 | Construction (Dredging) | $2,603,000 | $627,000 | $3,230,000 |
| 22 | ERR *Sunk Cost | $1,050,000 | $0 | $1,050,000 |
| 30 | Plan, Engineer, and Design | $261,000 | $65,000 | $326,000 |
| 31 | Construction Management | $195,000 | $49,000 | $244,000 |
| | **Totals** | $4,231,000 | $753,000 | $4,984,000 |

The cost table presented below provides the total cost for the preferred plan (Alternative 7) as well as the fully funded cost updated to October 2007 price levels.

**TABLE #5**
**Total and Fully Funded Cost Breakdown**
**October 2007**

| Account No. and Description | Total Project Cost (Includes Contingencies) | Fully Funded Cost Level |
|---|---|---|
| 01- Lands and Damages | $132,000 | $134,000 |
| 12 – Construction (Dredging) | $2,811,000 | $3,230,000 |
| 22 – DPR Sunk Costs | $1,050,000 | $1,050,000 |
| 30 - Plan, Engineer, and Design | $284,000 | $326,000 |
| 31 - Construction Management | $213,000 | $244,000 |
| **Total** | **$4,490,000** | **$4,984,000** |

**Contingencies and Cost Risk**

Contingencies used are in the 20% to 25% range and are based on project uncertainties such as the actual condition of the sediment when excavated and anticipated continued ongoing deposition. Contingency does not take into account possible volatile price increases above normal inflation for commodities, particularly fuel costs, which could have a significant impact on overall project costs.