Revision and Updates to the Environmental Dredging Pilot Study

Lower Passaic River Restoration Project

Project Delivery Team Meeting
March 4, 2009
Outline

- Design and Objectives of Pilot Study
- Revisions and Updates
  - Volume of Sediments Dredged
  - Productivity Analysis
  - Resuspension
- Conclusion and Next Steps
Design & Objectives

Pilot Study designed to examine production environmental dredging

One mechanical dredging system equipped with an 8-CY clamshell bucket

Three target depths over approximately 1 acre of area in 5 work days

Evaluate productivity, vertical accuracy, and Best Management Practices

Evaluate dredge-related resuspension through a monitoring program

Evaluate decontamination technologies
## Design & Objective

<table>
<thead>
<tr>
<th>Date</th>
<th>Dredging Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 5</td>
<td>13-foot MLW cut</td>
</tr>
<tr>
<td>December 6</td>
<td>11-foot MLW cut</td>
</tr>
<tr>
<td>December 7</td>
<td>15-foot MLW cut</td>
</tr>
<tr>
<td>December 8</td>
<td>15-foot MLW cut</td>
</tr>
<tr>
<td>December 9</td>
<td>No dredging due to storm</td>
</tr>
<tr>
<td>December 10</td>
<td>15-foot MLW cut</td>
</tr>
</tbody>
</table>
Pilot Study was NOT intended to report on....

- Other dredging performance features and technologies
- Other remedial alternatives such as capping
- Clean-up passes or residuals
- Material handling and decontamination technology (separate reports)
- Cost implications for a full-scale dredging operation
- Quality of life issues

Feasibility study will extrapolate Pilot Study data to estimate a full-scale operation
Revision on Volume of Sediments Dredged
Revision on Volume of Sediments Dredged

Method 1
Compare the river bottom elevations before and after the dredging operation by using the pre-dredge and post-dredge surveys

Method 2
Sum the daily dredge volumes by evaluating daily bathymetric surveys to the pre-dredge survey
Method 1

Pre-dredge Versus Post-dredge Survey
3,800 ±100 Cubic Yards

Legend
- Proposed Dredge Area
- Change in depth from November 28, 2005
- Pilot Study Survey Area to December 11, 2005

< 1 foot
> 1 foot
Method 2

Daily Survey Comparison
4,000 ±210 Cubic Yards

Legend
- Proposed Dredge Area
- Pilot Study Survey Area

Change in depth from November 28, 2005
to December 11, 2005

- <= 1 foot
- > 1 foot

Dredge Bucket Coordinates
- December 5, 2005
- December 6, 2005
- December 7, 2005
- December 8, 2006
- December 10, 2005
Revision on Volume of Sediments Dredged

<table>
<thead>
<tr>
<th>Date</th>
<th>Malcolm Pirnie (Cubic Yards)</th>
<th>Jay Cashman (Cubic Yards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 5</td>
<td>890 ±20</td>
<td>940</td>
</tr>
<tr>
<td>December 6</td>
<td>1,200 ±30</td>
<td>1,400</td>
</tr>
<tr>
<td>December 7</td>
<td>770 ±20</td>
<td>830</td>
</tr>
<tr>
<td>December 8</td>
<td>490 ±10</td>
<td>490</td>
</tr>
<tr>
<td>December 10</td>
<td>630 ±20</td>
<td>520</td>
</tr>
<tr>
<td><strong>Total Volume</strong></td>
<td><strong>4,000 ±210</strong></td>
<td><strong>4,200</strong></td>
</tr>
</tbody>
</table>

* Values rounded to two significant figures
Revision of Productivity Analysis
Revision of Productivity Analysis

- Daily surveys were used to estimate productivity.
- Revised work time breakdown based on ClamVision data for actual dredge time.
- Linked cycle time (ClamVision data) to the work time analysis to separate equipment movement from dredge time.
Revision of Productivity Analysis

Evaluation decreased dredge time and increased equipment movement, which will cause an increase in productivity.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Draft Dredge Pilot Value</th>
<th>Revised Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Dredging Time</td>
<td>6.2 hours</td>
<td>5.0 hours</td>
</tr>
<tr>
<td>Average Working Day</td>
<td>11 hours</td>
<td>10.5 hours</td>
</tr>
<tr>
<td>Work Day minus Client Standby</td>
<td>9.6 hours</td>
<td>9.2 hours</td>
</tr>
</tbody>
</table>
Revision on Productivity Analysis

- **Operating Time**: 5 hours
- **Average Project Day**: 10.5 hours
- **Setup**: 1.5 hours
- **Client-Directed Standby**: 1.3 hours
- **Down Time**: 0.1 hours
- **Lost Time**: 0.9 hours
- **Equipment Movement**: 1.7 hours
# Revision of Productivity Analysis

<table>
<thead>
<tr>
<th>Date</th>
<th>Draft Dredge Pilot Value</th>
<th>Revised Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 5, 2005</td>
<td>70 CY/hr</td>
<td>73 CY/hr</td>
</tr>
<tr>
<td>December 6, 2005</td>
<td>98 CY/hr</td>
<td>110 CY/hr</td>
</tr>
<tr>
<td>December 7, 2005</td>
<td>89 CY/hr</td>
<td>100 CY/hr</td>
</tr>
<tr>
<td>December 8, 2005</td>
<td>99 CY/hr</td>
<td>99 CY/hr</td>
</tr>
<tr>
<td>December 10, 2005</td>
<td>91 CY/hr</td>
<td>110 CY/hr</td>
</tr>
</tbody>
</table>

*Revised values based on USACE ERDC/EL TR-08-29 “Technical Guidelines for Environmental Dredging of Contaminated Sediments”*
### Revision of Productivity Analysis

<table>
<thead>
<tr>
<th>Date</th>
<th>Average Operating Production Rate</th>
<th>Uptime</th>
<th>Mathematical 24-hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 5-6</td>
<td>90 CY/hr</td>
<td>45 percent</td>
<td>2,200 CY</td>
</tr>
<tr>
<td>December 7-8 and 10</td>
<td>100 CY/hr</td>
<td>79 percent</td>
<td>2,500 CY</td>
</tr>
</tbody>
</table>
Revision of Resuspension Analysis
Revision of Resuspension

Solids and chemical monitoring conducted at transects between Moorings 1-2 and Moorings 5-6. Boat-Based ADCP Monitoring Throughout Pilot Study Area
Dredging Resuspension Assessment is difficult due to Resuspension from Tidal Currents

Upriver Tracks on December 5, 2005 during Ebb Tide
ADCP Profiles on December 7, 2005 during Ebb Tide

Very Near-Field (<50 meters) Boat-Based Monitoring Can Detect Resuspension
ADCP Profiles on December 10, 2005 during Flood Tide

Boat-Based Monitoring Demonstrates the Rapid Dispersion of Resuspension Plume
## Revision of Resuspension Analysis

<table>
<thead>
<tr>
<th>Date</th>
<th>Production Rate (kg/s)</th>
<th>Average Release Rate (kg/s)</th>
<th>Very Near-Field Percent Resuspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 5, 2005</td>
<td>19</td>
<td>1.1</td>
<td>5.5%</td>
</tr>
<tr>
<td>December 6, 2005</td>
<td>29</td>
<td>1.7</td>
<td>5.9%</td>
</tr>
<tr>
<td>December 7, 2005</td>
<td>16</td>
<td>0.35</td>
<td>2.3%</td>
</tr>
<tr>
<td>December 8, 2005</td>
<td>14</td>
<td>0.19</td>
<td>1.3%</td>
</tr>
<tr>
<td>December 10, 2005</td>
<td>14</td>
<td>0.83</td>
<td>5.8%</td>
</tr>
</tbody>
</table>
Revision of Resuspension Analysis

Best Management Practices were evaluated to optimize dredging operations while minimizing resuspension.

- Optimize the cycle time between grabs by adjusting the depth of cut, the lift speed, and hang time.
- Optimize the use of winching and cabling in place of tugboats for repositioning the rinse tank.
# Revision on Productivity Analysis

<table>
<thead>
<tr>
<th>Date</th>
<th>Uptime</th>
<th>Mathematical 24-hour</th>
<th>Resuspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 5-6 Shakedown</td>
<td>45 percent</td>
<td>2,200 CY</td>
<td>5-6%</td>
</tr>
<tr>
<td>December 7-8 BMP Optimized</td>
<td>79 percent</td>
<td>2,500 CY</td>
<td>1-2%</td>
</tr>
</tbody>
</table>
Revision of Resuspension

- Release during dredging generally masked by background TSS due to movement of salt wedge and tidal resuspension.
- Dredge signal was detectable ONLY in very near-field (< 50 m) of dredging operation, despite wide variation in the background sediment load.
- Dredge signal not readily discernable at far-field of Pilot Study Area (300 meters away).
- No chemical signal due to dredging.
- Very near-field dredging release is less than 2% of solids removal under environmental dredging conditions with Best Management Practices.
Conclusions and Next Steps

- Pilot Study Report will be revised:
  - 4,000 CY of sediment removed
  - 9.2 hours for the work day (minus client standby time)
  - 79% Uptime with Best Management Practice
  - 1-2% Resuspension using Best Management Practice

- Additional supporting data will be added into the report and provided as appendices.

Final Report anticipated 
**June 2009**