Productivity

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Presentation Outline

- Definition of the Productivity Standard
- How it was developed
- Why it is feasible
- Key issues raised during the public review process:
  - Interaction with Resuspension & Residuals Standards
Objective

- Monitor and maintain the progress of the dredging to meet the 6-year duration stated in the ROD
Framework of the Productivity Standard

- Phase 1 and Phase 2 standards
- Targets & Requirements
- Action Levels and Required Responses
- Other constraints
Productivity Performance Standard

Components

- Complete dredging in 6 years:
  - Phase 1: One year at reduced scale
  - Phase 2: Five years at full scale
- Backfill and stabilize shoreline by end of each year
- Process and transport sediment to offsite disposal by end of each year
Phase 1 Performance Standard

- ~240,000 cubic yards (or about one-half the minimum annual for Phase 2, whichever is less)
- 30 days operating at full scale rate
- Seasonal “Closeout”
Phase 2 Performance Standard

- Cumulative Targets…4 ½ seasons (530,000 CY/yr)
- Cumulative Requirements…5 seasons (480,000 CY/yr)
- Seasonal “Closeout”
### Performance Standard Volumes

<table>
<thead>
<tr>
<th>Project Phase and Year</th>
<th>Required Cumulative Volume (cubic yards)</th>
<th>Target Cumulative Volume (cubic yards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 (Year 1)</td>
<td>approx. 240,000</td>
<td>265,000</td>
</tr>
<tr>
<td>Phase 2 (Year 2)</td>
<td>720,000</td>
<td>795,000</td>
</tr>
<tr>
<td>Phase 2 (Year 3)</td>
<td>1,200,000</td>
<td>1,325,000</td>
</tr>
<tr>
<td>Phase 2 (Year 4)</td>
<td>1,680,000</td>
<td>1,855,000</td>
</tr>
<tr>
<td>Phase 2 (Year 5)</td>
<td>2,160,000</td>
<td>2,385,000</td>
</tr>
<tr>
<td>Phase 2 (Year 6)</td>
<td>2,650,000</td>
<td>2,650,000</td>
</tr>
</tbody>
</table>
## Action Levels and Required Responses

<table>
<thead>
<tr>
<th>Action Level</th>
<th>Situation</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concern Level</strong></td>
<td>Monthly production rate falls 10% or more below scheduled rate.</td>
<td>Notify USEPA and take immediate steps to erase shortfall in production over next two months.</td>
</tr>
<tr>
<td><strong>Control Level</strong></td>
<td>Production falls below scheduled production by 10% or more for two or more consecutive months.</td>
<td>Submit an action plan to EPA explaining the reasons for the lower production and describing the engineering and management actions taken or underway to increases production and erase shortfall by end of the dredging season.</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td>Annual cumulative volume fails to meet production requirements.</td>
<td>USEPA action to be determined based on Agency review of specific circumstances.</td>
</tr>
</tbody>
</table>
Standard Development: Key Calculations & Basis

- 2.65 Million CY, 6 Dredging Seasons (per ROD)
- Phase 1 Production Volume = \( \frac{1}{2} \times 2,650,000 / (5 + 0.5) = 240,000 \) CY
- Phase 2 Production Volume = 2,650,000 – 240,000 = 2,410,000 CY
- Phase 2 Annual Production Volume = 2,410,000 / 5 = 480,000
Productivity Schedule

- Depicts an example feasible scenario for meeting Phase 1 and Phase 2 cumulative targets
- Conceptual CPM schedule (Primavera®)
- Conservative
- Conventional Equipment
Key Constraints for Schedule Development

- Complete an area before removing containment (if utilized)
- Work generally upstream to downstream within a given pool
- Limit obstructions to flow or navigation
- Seasonal closeout
- 6 days / week
Key Assumptions Supported with Conceptual Analysis

- Processing / Transportation can “keep up” with dredging
- Mechanical Dredging Scenario is conservative for River Section 1
- Redredging is 50% of the duration to initially dredge a certification unit
Production Factors

- **Silt Barrier Installation and Removal**
  - Installing sheet piling – 90 LF/day/crew
  - Installing HDPE barrier – 200 LF/day/crew

- **Mechanical Dredging (Horizontal Profiler)**
  - 82 CY/hour (large “production” dredge)
  - 27 CY/hour (small “alternative” dredge)

- **Backfill**
  - 1 acre/day for “non-critical” areas
  - $\frac{1}{2}$ acre/day for “critical” areas
- Right: Dredge Operator’s View / Screen Display
- Below: Horizontal cut

Source: Bean Environmental
Productivity Schedule
Conclusions

- Schedule is conservative
  - Mechanical dredging (slower)
  - Containment
  - Other constraints that affect sequence

- Depicts
  - ~270,000 CY dredged in Phase 1
  - Exceeds productivity targets for all five years of Phase 2
Why It’s Feasible: Conservative Aspects of Productivity Schedule

- Use of containment
- Limited number of dredges working (four 4-cy, four 2-cy)
- Conservative production factors
  - 13 hours full production / day
  - For example: used 82 CY / hr when dredge typically performs 95 – 120 CY / hr
Mechanical Dredging Production Rates

- Typical Cycle Time (Production Dredging) = 50-60 cycles/hr
- Assume 4 cy Bucket – 90% Full
  \[0.90 \times 4.0 \text{ cy} = 3.6 \text{ cy/cycle}\]
- 50 cycles/hr = 50 \times 3.6 \text{ cy/hr} = 180 \text{ cy/hr}
- 60 cycles/hr = 60 \times 3.6 \text{ cy/hr} = 216 \text{ cy/hr}
- Example Schedule Assumes: 82 cy/hr when dredging
Mechanical Dredging Productivity (Continued)

- Available Days = 210 Per Season (30 wks)
- Available Dredging Hours Per Season: @ 24 hr/day; 6 day week = 4200 hr
- Required Dredging = 480,000 cy/season
- Minimum Production Rate Req’d: 480,000 cy/4200 hr = 114 cy/hr
- At 82 cy/hr Rate, Need two 4-cy dredges
- Proposed four 4-cy and four 2-cy dredges
Target Production Rate = 530,000 cy/season

530,000 cy/4200 hr = 126 cy/hr

At 82 cy/hr Rate, Need 2, 4 cy Dredges

Proposed 4, 4 cy and 4, 2 cy Dredges
Mechanical Dredging Case Study

New Bedford Harbor PDFT
Summary of Dredge Performance Tests Results

- Sediment removal accuracy: Within 4 inches
- Transportation and disposal efficiency: 70% Solids by volume
- PCB removal efficiency: 97% removal
- Water quality impact: Acceptable impact
- Air quality impact: Acceptable impact
- Production: 95 – 120 cys / hour
Hydraulic Dredging Production Rates

- Dredge Evaluated – 12 inch cutterhead dredge, 600 HP Dredge Pump
- Optimum Production Rate – 470 cy/hr Avg. (Area coverage mode)
- Typical Efficiency – 62% Optimum Production Rate
Hydraulic Dredging Production Rates (Continued)

- Maximum Production at Optimum Rate:
  \[ @ \ 24 \text{ hr/day}; \ 6 \text{ day/wk} = 4200 \text{ hr} \times 470 \text{ cy/hr} = 1,974,000 \text{ cy/season} \]

- Req’d Efficiency at Productivity Standard
  \[ \frac{480,000 \text{ cy}}{1,974,000 \text{ cy}} = 24.3\% \]
Case Study: Grand Calumet River

- 12-inch hydraulic dredge
- 8-inch hydraulic dredge
- Production: 2/16/03 - 9/10/03 = 543,000 cy
- 175 days, 24 hr/day, 6 day/week
- Equal to Hudson River target dredging rate
Conceptual Dewatering System
Hydrocyclone-Screening Tower

Confined Disposal Facilities
Sand Separation at Slufter

Separation of 220,000 tons dry solids sand from dredged material

Hydrocyclones and separation (settling) basins
On-Shore Processing Conceptual Water Treatment

- Ballasted Flocculation and Settling System
- Mixed Media Pressure Filters
- GAC Pressure Filters
- All Available as Prefabricated Systems
Assumptions used to develop Productivity Standard are conservative.

Proper design, scheduling, and construction management will make Productivity Standard achievable.
Public Comment

- Comment: Dredging faster will increase resuspension
- Response: Expeditious completion with the right equipment under normal operation reduces resuspension losses
Interaction with Other Standards

- Comment: Processing can’t keep up with dredging
- Response: A properly designed facility will easily handle daily & peak volumes
Interaction with Other Standards

- Comment: Redredging will go on forever
- Response: The residuals standard, while protective, is flexible to handle most contingencies:
  - Limits # of redredging passes to 2
  - Allows capping
The End
END
Redredging Assumptions & Basis

- Assumption for Productivity Schedule:
  Redredging takes 50% of the number of days to perform design cut

- Basis: Our estimate….45%
  - Uses existing equipment
  - ½ of sites are clean after each attempt
  - Limited to 2 redredging attempts (per Residuals Standard)