Basis of Cost Estimates

Lower Eight Miles of the Lower Passaic River

LOWER EIGHT MILES OF THE LOWER PASSAIC RIVER
COST ESTIMATES

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LOWER EIGHT MILES OF THE LOWER PASSAIC RIVER

COST ESTIMATES

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1 INTRODUCTION

This document presents the cost estimates for the remedial alternatives evaluated in the Focused Feasibility Study (FFS) and Record of Decision (ROD) for the lower eight miles of the Lower Passaic River, as follows:

- Alternative 1: No Action
- Alternative 2: Deep Dredging with Backfill
- Alternative 3: Capping with Dredging for Flooding and Navigation
- Alternative 4: Focused Capping with Dredging for Flooding

Each of the three active remedial alternatives (*i.e.*, alternatives other than No Action) has three dredged material management (DMM) scenarios:

- DMM Scenario A: Confined Aquatic Disposal (CAD)
- DMM Scenario B: Off-site Disposal
- DMM Scenario C: Local Decontamination and Beneficial Use

Cost estimates were developed in accordance with U.S. Environmental Protection Agency (USEPA) guidance for developing cost estimates for feasibility studies (USEPA, 2000). This document has been revised from the original prepared as part of the Focused Feasibility Study, to address changes incorporated into the cost estimate based on the Responsiveness Summary (RS) prepared for the ROD dated March 2016.

The estimated cost for each active remedial alternative includes preconstruction costs, dredging and capping costs, DMM capital and operation and maintenance (O&M) costs, and operation and long-term O&M costs. Note that Alternative 1 does not involve any active remediation and has no monetary cost. Preliminary cost estimates are based on January 2014 costs. The Engineering News Record (ENR) Construction Cost Index from January 2014 was 9664.45 (ENR, 2014). For comparison purposes, costs for each

remedial alternative were converted to Present Value[1] based on the project schedule shown in Figure 1-1. A seven percent discount rate was selected based on USEPA guidance (USEPA, 1993). The basis of cost for each of the cost items is summarized in the following sections of this document.

Unit prices were taken from a variety of published and unpublished sources including RS Means, internal cost databases, and communications with contractors, suppliers, vendors and other professional engaged in similar activities. Where appropriate, costs were based on delivery of goods and services in Newark, New Jersey. Costs do not include USEPA oversight.

Costs for acquisition of property for the upland processing facility are included in the cost estimate. Costs associated with acquiring a leasehold or other interest in Newark Bay for construction of the CAD are not included. Due to the opposition voiced by the state of New Jersey to construction of a CAD in the bay, it was not possible to develop an estimate of such costs.

Remediation costs for the upland processing site are not included in the cost estimate. Because it is likely that upland support or sediment processing facility sites would be in close proximity to the river, and potentially located on a former industrial site, it is not unreasonable to assume that some remedial activities would be required at the site. However, due to the unknown scope of this work, it is not possible to estimate the cost. Similarly, costs for structural improvements to the soil at the site were not included in the cost estimate. In addition, a variety of soil conditions exist in upland sites along the Lower Passaic River which would affect site development; it is not possible at this stage of the project to determine which conditions are likely to apply to the selected site. These conditions would impact each of the remedial alternatives evaluated since each DMM scenario includes an upland support or sediment processing facility. There would be a greater impact on DMM scenarios with larger upland sites and a smaller impact on DMM

[1] Note that Net Present Value and Net Present Worth are other commonly used terms.

scenarios with smaller upland sites. These factors would be evaluated during the site selection process. Assuming an appropriate site selection process, these conditions would not impact the relative costs of the various remedial alternatives.

Cost estimates in this document were provided so that comparisons among remedial alternatives could be made in the FFS and ROD. After remedy selection, detailed scopes of work will be developed and project-specific costs developed.

Uncertainty of Cost Estimates

Estimated costs are expected to be within -30 to +50 percent of the actual costs. However, a number of variables introduce a degree of uncertainty into the estimated costs for the active remedial alternatives and DMM scenarios:

- *Uncertainty related to volume estimates (FFS Appendix G; RS Section II.H.3.3).* This arises due to the inherent need to project conditions over the lower eight miles of the Lower Passaic River based on a limited number of sampling points. Unidentified conditions could impact the volume of material to be handled; actual volumes could either increase or decrease.
- *Uncertainty regarding project duration and schedule.* A number of things could impact the project duration including general weather conditions, natural and man-made disasters, labor disputes, fish windows or other conditions identified during the predesign investigation.
- *Uncertainty in the dredging productivity estimates based on site conditions (RS Section III.C.3).* Dredging productivity estimates were developed based on site-specific conditions, information from vendors, pilot study results, and experience at other major sediment projects in the area. If unforeseen conditions are encountered during dredging, productivity could change.
- *Uncertainty in market conditions that would affect vendor pricing.* In preparing the cost estimate, information was obtained from vendors on various components in the conceptual design. These prices are subject to change based on market conditions (*e.g.,* the number and size of other dredging projects in the northeastern United States) at the time the project contracts are let.

- *Uncertainty in inflation and interest rates (actual discount rate).* Project costs will ultimately be impacted by inflation rates and change in interest rates during project implementation. Alternative 2, because it has the longest project duration, is likely to be the most affected by changes in inflation and interest rates. Alternative 3, because it requires long-term care of the engineered cap in perpetuity, is also likely to be impacted by changes in interest rates and inflation although the impact may not be as significant as for Alternative 2.

The impact of these and other major factors are evaluated in the sensitivity analysis presented in Chapter 5 of the FFS.

2 CAPITAL COSTS

General Assumptions

Construction performed under multiple prime contracts held by client, not by single prime/general contractor

Ten percent construction management fee applied to construction phase capital costs (not including Pre-Construction Activities costs)

Twenty five percent contingency on all costs except construction management

2.1 A. Pre-Construction Activities

Design:

Covers design analysis, plans, specifications, and engineer's cost estimate

Six percent of construction phase capital costs (not including Pre-Construction Activities costs)

Regulatory Requirements, Legal, and Community Outreach:

Permitting or if on-site, establishing compliance with substantive requirements

Two percent construction phase capital costs (not including Pre-Construction Activities costs)

Contractor Work Plans and Submittals:

Lump sum charge of $355,000 for contractor submittals and project specific Health and Safety Plan

Pre-Construction Support Facility:

Facility/property used for contractor job trailers, core/sample processing facility, equipment storage employee parking, etc.

Lease existing warehouse space with or near to water access.

Size - five acres

Monthly lease rate - $10,000 [Internal database]

Lease period - 12 months

Pre-Construction Oversight:

Monthly charge of $48,000 for two staff to oversee coring/processing operations

Monthly charge includes labor, equipment and supplies, transportation, per diem, quality assurance (QA) sampling and analysis performed in addition to the sample specified, etc.

Field investigation takes 12 months to complete

General Survey and Coring Vessels Mobilization:

One time cost for mobilization [Contractor communications]

- One geophysical vessel - $6,000
- Video survey vessel - $4,000
- Vibracoring vessel:
  - Alternative 2 - $6,900 per vessel (18-foot to 28-foot cores); three vessels
  - Alternative 3 (RM0 to RM1.7 Channel) - $3,500 (12-foot to 18-foot cores)
  - Alternative 3 (RM1.7 to RM8.3 and RM0-RM1.7 Shoals) - $2,800 (less than 12-foot cores)
  - Alternative 4 - $2,800 (less than 12-foot cores)
- Barge-auger - $12,600

Pre-Design Investigation – Chemical, Waste Characterization, and Geological Sample Collection:

Daily rate for vibracoring vessel and equipment [Contractor communications]:

- Alternative 2 - $7,300 (18-foot to 28-foot cores)
- Alternative 3 (RM0 to RM1.7 Channel) - $6,900 (12-foot to 18-foot cores)
- Alternative 3 (RM1.7 to RM8.3 and RM0-RM1.7 Shoals) - $3,700 (less than 12-foot cores)
- Alternative 4 - $3,700 (less than 12-foot cores)

Daily rate for vibracoring vessel crew (labor) - $1,600 [Contractor communications]

Daily equipment rate (not including labor) scaled by factor of 1.5 to calculate 12 hour daily rate and 9 to calculate monthly rate [Contractor communications]

Vibracoring equipment would be selected for a coring range approximately two feet longer than targeted core length

Sampling rate:

- Alternative 2 - five 16-foot cores collected per vessel per 12 hour day
- Alternative 3 (RM0 to RM1.7 Channel) - eight 10-foot cores collected per 12 hour day

  Alternative 3 (RM1.7 to RM8.3 and RM0-RM1.7 Shoals) - twenty 4-foot cores collected per 12 hour day
- Alternative 4 - twenty 4-foot cores collected per 12 hour day

Cores collected in a triangular pattern – 80-foot spacing for chemical cores and 160-foot spacing for waste characterization and geological samples

Samples for Alternatives 2 and 3 would be collected over the lower eight miles of the Lower Passaic River; samples for Alternative 4 would be collected over a number of separate areas as shown in Figure 18 of the ROD

Ten percent additional cores collected as samples of opportunity

Ten percent additional cores collected for chemical analysis and waste characterization for confirmation or delineation of dredged material management waste streams

Sample processing rate of $130 per man hour

Five man hours processing time for 16-foot cores (includes transport, sectioning, and packaging for shipment of core)

Four man hours processing time for 10-foot cores (includes transport, sectioning, and packaging for shipment of core)

One man hour processing time for two 4-foot cores (includes transport, sectioning, and packaging for shipment of core)

Additional 25 percent of processing time to account for time to process additional samples at the 160-foot grid level

Core processing performed at support facility

Process and decontamination water containerized for later processing at wastewater treatment plant

Investigation derived waste (IDW) transportation and disposal cost of $630 per cubic yard [Internal database]

IDW volume calculated assuming 4-inch core diameter and half of the core volume is disposed

Pre-Design Investigation - Geotechnical Sample Collection:

Daily rate for barge-auger - $8,200 [Contractor communications]

Four cores collected at each transect for Alternatives 2 and 3 and two cores for Alternative 4; transects spaced at 0.5 miles intervals

Ten percent additional cores collected as samples of opportunity

One core collected per day; three samples taken per core

Undisturbed sample collection and processing cost - $500 per sample [Internal database]

Core processing performed at support facility

Process and decontamination water containerized for later processing at wastewater treatment plant

IDW transportation and disposal cost of $630 per cubic yard [Internal database]

IDW volume calculated assuming 6-inch boring diameter, 20-foot boring depth and half of the boring volume is disposed

Pre-Design Investigation - Chemical Analysis:

Samples collected at 2-foot intervals of core

Additional sample collected in 4-foot cores for Alternatives 3 and 4

Samples analyzed for dioxins, metals (including mercury), and Polyaromatic hydrocarbons (PAHs)

Ten percent of samples analyzed for "full suite" of chemicals (Target Analyte List/Target Compound List [TAL/TCL] plus cyanide)

Analytical and validation cost per sample [Internal database]:

- Metals - $275
- PAHs - $250
- Dioxins - $940

- TAL/TCL plus cyanide - $625

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Pre-Design Investigation – Waste Characterization Analysis:

Samples collected at 2-foot intervals of core

Additional sample collected in 4-foot cores for Alternatives 3 and 4

Samples analyzed for Polychlorinated biphenyls (PCBs) Aroclors, Toxicity Characteristic Leaching Procedure (TCLP) for waste characterization, and Resource Conservation Recovery Act (RCRA) criteria (corrosivity, ignitability, and reactivity).

Analytical and validation cost per sample [Internal database]:

- PCBs - $188
- TCLP - $1063
- RCRA disposal criteria (ignitability, corrosivity, reactivity) - included in TCLP price

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Pre-Design Investigation - Geological Analysis:

Samples collected at 2-foot intervals of core

Additional sample collected in 4-foot cores for Alternatives 3 and 4

Samples analyzed for grain size (sieve and hydrometer), moisture content, and total organic carbon (TOC)

Analytical and validation cost per sample [Internal database]:

- Grain size (sieve and hydrometer) - $150
- Moisture content - $32
- TOC - $63

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Pre-Design Investigation - Geotechnical Analysis:

Three samples collected per boring

Samples analyzed for Atterberg limits, percent solids, specific gravity, grain size (sieve and hydrometer), consolidation tests and strength tests

Analytical and validation cost per sample [Internal database]:

- Atterberg limits - $85
- Percent solids- $50
- Specific gravity- $75
- Grain size (sieve and hydrometer) - $150
- Consolidation- $600
- Strength - $250

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Biological Monitoring Baseline Studies:

Terrestrial vegetation surveys

Avian community surveys

Fish community surveys

Benthic invertebrate surveys

Biological tissue-residual testing

Toxicity testing

Lump sum cost of $2,800,000

Pore Water Evaluation:

Pore water evaluation conducted for Alternatives 3 and 4 (which incorporate an engineered cap); not required for Alternative 2 because this alternative targets the entire contaminant inventory for removal and does not include an engineered cap

Samples collected concurrent with chemical/geological investigation samples

Elutriate tests and particulate organic carbon (POC) and dissolved organic carbon (DOC) performed on 10 percent of cores

Analytical and validation cost per sample [Internal database]:

- Elutriate - $600
- POC - $188
- DOC - $219

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Sub-bottom Geophysics and Bathymetric Survey:

Daily rate for geophysical vessel - $1,600 (labor) and $6,600 (vessel and equipment) [Contractor communications]

Survey rate - one river mile per day

Video Survey for Debris Identification:

Daily rate for video survey vessel - $1,600 (labor) and $6,600 (vessel and equipment) [Contractor communications]

Survey rate - one river mile per day

Habitat Survey (in river):

Lump sum cost of $100,000

Mapping and presentation of existing data

No additional field work

Cultural Survey (in river):

Phase I study - Lump sum cost of $40,000

Phase II study - Lump sum cost of $500,000

Fish Spawning Study:

Lump sum cost of $50,000

Compilation and assessment of existing information that has been collected previously for the Lower Passaic River; no additional field investigation

To be used to determine fish windows and other restrictions on in-water operations

Borrow Site Pre-Screening:

Three borings per five acres collected using standard drill rig (air rotary, sonic, *etc.*)

Borings extend to a depth of 25 feet below ground surface

Three samples per borehole

Samples analyzed for grain size (sieve and hydrometer) and metals

Cost per sample (including collection and shipping) - $3,000 [Internal database]

Ten borrow sources evaluated – average of 50 acres per site

Borrow Material Characterization:

One sample per 5,000 cubic yard of fine grained soils (mudflat reconstruction material)

One sample per 10,000 cubic yard of granular soil (engineered cap and backfill materials)

Samples collected using standard drill rig (air rotary, sonic, *etc.*)

Samples analyzed for grain size (sieve and hydrometer), TOC, and metals

Ten percent of samples analyzed for dioxin, PCBs, and pesticides

Analytical and validation cost per sample [Internal database]:

- Grain size - $150
- TOC - $63
- Metals - $275
- Dioxin - $940
- PCBs - $188
- Pesticides - $1063

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Cap Erosion Modeling for Armor Placement Design:

Alternatives 3 and 4 only

Lump sum cost of $18,000

Computer modeling of final cap design [Internal database]

2.2 B. Mobilization and Demobilization

Dredge Equipment Mobilization/Demobilization:

One time mobilization charge of $237,000 per dredge [Contractor communications]:

- Three dredges for Alternative 2
- Three dredges for Alternative 3
- Three dredges for Alternative 4

Equipment onsite for either duration of dredging or capping activities (not including the armor placement duration), whichever is greater

Backfilling/Capping Equipment Mobilization/Demobilization:

One time mobilization charge of $237,000 per clamshell [Contractor communications] :

- Three clamshells for Alternative 2
- Three clamshells for Alternative 3
- Three clamshells for Alternative 4

Capping equipment used for backfilling activities

Equipment onsite for either duration of dredging or capping activities (not including the armor placement duration), whichever is greater

Monitoring Equipment Mobilization/Demobilization:

One time mobilization charge of $13,800 for monitoring equipment for each Alternative [Contractor communications]:

- Two Water quality vessels - $2,500 each
- Geophysical vessel - $6,000
- Small vibracoring vessel - $2,800

Equipment onsite for duration of project

Debris Removal Equipment Mobilization/Demobilization:

One-time mobilization charge of $60,000 (each Alternative)

Equipment onsite for either duration of dredging or capping activities (not including the armor placement duration), whichever is greater

Shoreline Protection Equipment Mobilization/Demobilization:

One time mobilization charge of $237,000 for each Alternative [Internal database]

Shoreline protection equipment used to protect utilities, if necessary

Equipment onsite for either duration of dredging or capping activities (not including the armor placement duration), whichever is greater

New Season Restart:

Annual charge (starting in second year) of 25 percent of equipment mobilization/demobilization costs to cover shutdown and restart of operations each dredging season plus an additional $50,000 for the bypass pumping system

Dredging operation duration:

- Alternative 2 - 14 years total, 13 new season restart charges
- Alternative 3 - 6 years total, 5 new season restart charges (in the 5th season restart, there is approximately half the equipment)
- Alternative 4 - 2 years total, 1 new season restart charges

2.3 C. Testing and Monitoring During Dredging and Backfilling/Capping

Monitoring and testing activities performed throughout duration of construction and dredging activities. Assume dredging/capping operations occur a maximum of 35 weeks per year if no additional downtime is assumed, 6 days per week. For cost estimating purposes this is equivalent to approximately 210 days per year or 26 days per month.

Bathymetric Survey:

Daily rate for geophysical vessel - $1,600 (labor) and $2,800 (vessel and equipment) for bathymetric survey only [Contractor communications]

Daily equipment rate (not including labor) scaled by factor of 1.5 to calculate 12 hour daily rate and 9 to calculate monthly rate [Contractor communications]

Equipment rate scaled by a factor of 8 to calculate yearly rate.

Bathymetric surveys at each dredging unit would include pre-dredging, post-dredging, and post-capping surveys to confirm target elevations and assess dredging/capping performance.

Water Quality Monitoring:

Daily rate for two water quality vessels - $2,400 (labor) and $2,000 (vessel and equipment) [Contactor communications]

Daily equipment rate (not including labor) scaled by factor of 1.5 to calculate 12 hour daily rate and 9 to calculate monthly rate [Contactor communications]

Equipment rate scaled by a factor of 8 to calculate yearly rate.

Two vessels collect water quality samples continuously during dredging operations; one vessel located upstream and one located downstream of dredge operations

Ten water column samples collected per day, or 260 samples per month

Water column samples analyzed for Total Suspended Solids (TSS)

Two composite water samples per day analyzed for Total Petroleum Hydrocarbons (TPH) and lead (surrogate chemical parameters)

Ten percent of daily composite water samples analyzed for "full suite" of analytes (dioxin, pesticides, and TAL/TCL plus cyanide)

Analytical and validation cost per sample [Internal database]:

- TSS - $50
- TPH - $207
- Lead - $25
- Dioxin - $940
- Pesticides - $1,063
- TAL/TCL - $625

Sample processing rate of $130 per man hour

Process/ship three samples per man hour

Shipping cost $100 per cooler; four samples per cooler [Internal database]

Sediment Monitoring:

Conducted for all alternatives

Grab samples collected from dredge

Eight sediment samples collected per acre

Average acres completed per month:

- Alternative 2 - 5.8 acres
- Alternative 3 – 13.5 acres
- Alternative 4 – 13.6 acres

Samples analyzed for TPH and lead (surrogate chemical parameters).

Ten percent of the samples analyzed for the "full suite" of chemicals (dioxin, pesticides, and TAL/TCL plus cyanide).

Analytical and validation cost per sample [Internal database]:

- TPH - $207
- Lead - $25
- Dioxin - $940
- Pesticides - $1,063
- TAL/TCL - $625

Sample processing rate of $130 per man hour

Process/ship three samples per man hour

Shipping cost $100 per cooler, four samples per cooler [Internal database]

Biological Monitoring:

Biological monitoring conducted monthly throughout dredging operations

Monthly surveys may include all or some of the following elements:

- Terrestrial vegetation surveys
- Avian community surveys
- Fish community surveys
- Benthic invertebrates survey
- Biological tissue-residual testing
- Toxicity testing

Average monthly cost of approximately $112,500 or approximately $900,000 per year [Internal calculation/database]

Air Monitoring:

Air monitoring at dredge site(s) for VOCs and odors - $5,000 per month per dredge

Air monitoring equipment scaled by a factor of 8 to calculate yearly rate.

Includes labor, sample analysis, equipment maintenance

Monitoring Reports (including Laboratory Reporting):

Annual cost of $355,000 monitoring reports during dredging [Internal database]

2.4 **D. Dredging**

Mechanical Dredging:

Dredging limits for Alternatives 2 and 3 are assumed to be the 2008 New Jersey Department of Environmental Protection shoreline (*i.e.*, within the lower eight miles of the Lower Passaic River) as shown in the FFS concept designs (see Figures 4-6 of the FFS and III.C.4-1 of the RS)

Dredging limits for Alternative 4 are assumed to be select areas within the lower eight miles of the Lower Passaic River as determined by modeling results (see Figure 18 of the ROD)

Existing structures would not be removed - dredging would be conducted as close as possible without damaging structures

Mechanical dredging operations - $25 per cubic yard [Contractor communications]

Dredge production rate - 2,000 cubic yards per day per dredge

Dredging season - 35 weeks per year

Dredging operations conducted 24 hour days, 6 work days per week during season (210 days per year)

Once design depths achieved, additional dredging for residuals cleanup performed, on average, in one pass (applies to locations where all inventory is targeted, not in areas where capping is planned)

Large Debris Removal, Off-loading, Transport, and Disposal:

DMM Scenario A (CAD Disposal) - large debris removed and off-loaded for disposal in the CAD; $30 per ton

DMM Scenarios B and C (incorporating an upland processing site) - large debris removed, off-loaded, decontaminated (*e.g.*, via high pressure washing), and transported off-site for disposal - $200 per ton [Contractor communications].

Volume of material removed during dredging operations:

- Alternative 2 - 8,000 tons total
- Alternative 3 - 6,000 tons total
- Alternative 4 - 2,000 tons total

- Quantity estimated based on review of site-specific geophysical surveys

Sediment Screening for Bypass Pumping

Screens to remove medium sized solids that would impact pumping and debris management

Other dredge site related operations for dredging between RM5.7-RM6.1, RM6.1-RM8.1 and above RM8.1

Cost of $9 per cubic yard

Bypass Pumping Stations at RM5.7 and RM6.1

Bypass pumping to avoid regular opening of low bridges at Clay Street and Bridge Street.

Pumping Stations located at approximately RM5.7 and RM6.1

Additional transportation costs related to pumping operations

Cost of $12 per cubic yard

Offloading and Transport

Offloading station and barge from below RM5.7 to processing facility

Cost of $15 per cubic yard

Utility Protection:

To prevent undercutting utility lines - Alternative 2 only

Sheetpiling driven to 35-foot depth on average, on each side of utility line

Cost of $100 per square foot of sheeting for installation and removal following dredging operations [Internal database]

One utility crossing requiring protection per river mile; approximate river width - 500 feet at each crossing

Bridge/Abutment/Bulkhead Protection:

To prevent undercutting of structures - Alternative 2 only

Cost of protection -$4,100 per linear foot [Internal database]

Approximately 20 percent of existing linear pier/bulkheads to be reinforced

Barge Transport of Dredged Material:

Barge transport cost - $10 per cubic yard [Contractor communications]

Dredged material transported in 1,500 - 4,000 cubic yard hopper scows and delivered to upland processing site or CAD

Estimate of volume of material to be transported based on process flow calculations

Shallow Water Sediments - Double Handling:

Applies to dredging in shallow water areas such as Kearny Mudflats and areas upstream of RM8.1

Applicable to Alternatives 3 and 4 where these materials represent a greater portion of total volume of material

Small equipment required for shallow water access with transfer to large barges for transport to upland sediment processing facility or CAD

Additional costs for transfer and barge transport - $5 per cubic yard

Hydraulic Offloading of Dredged Material:

Hydraulic offloading cost - $10 per cubic yard for DMM Scenarios B and C only [Internal calculation/database, Contractor communications]

Estimate of volume of material to be offloaded based on process flow calculations

Controls for Quality of Life Impacts:

Includes odor controls, light shielding, sound abatement, vector management and related costs

Approximately one percent of cost for dredging and backfill/capping activities

2.5 E. Backfill and/or Engineered Cap

Backfill/Engineered Cap Material Purchase and Delivery:

Backfill/engineered cap material purchased and delivered in hopper scow directly to dredge site

Cost of material - $30 per cubic yard [Contractor communications]

Backfill/engineered cap material volume:

- Backfill sand thickness - two feet, used when dredging depth exceeds depth of fine-grained sediments (Alternative 2 and portions of Alternative 3)
- Engineered cap design thickness - two feet used when dredging depth does not remove entire depth of fine-grained sediments (portions of Alternative 3 and Alternative 4)

  Overplacement allowance of up to 0.5 feet.

Backfill/Engineered Cap Material Placement:

Cost to place backfill material (Alternative 2 and portions of Alternative 3) - $20 per cubic yard [Contractor communications]

Cost to place engineered cap material (portions of Alternative 3 and Alternative 4) - $30 per cubic yard [Contractor communications]

Material placement rate - 2,000 cubic yard per day [Contractor communications]

Armor Material Purchase and Delivery:

Alternatives 3 and 4 only

Armor layer purchased and delivery to site in hopper scow - $30 per cubic yard [Contractor communications]

Armor material volume:

- Armor placed over engineered sand cap in high erosional areas (refer to Appendix F) - 0.5 feet thick
- Coverage: Alternative 3 - 119 acres; Alternative 4 - 56 acres
- Overplacement allowance of up to 0.5 feet

Armor Material Placement:

Alternatives 3 and 4 only

Cost to place armor material - $30 per cubic yard [Contractor communications]

Material placement rate - 2,000 cubic yard per day [Contractor communications]

Confirmation Coring:

Three-foot long cores collected to verify proper placement of cap layer (assessment of mixing during cap placement)

Seven cores collected along each transect for Alternatives 2 and 3; transects placed at 0.125 miles intervals

Three cores collected along each transect for Alternative 4; transects placed at 0.125 miles intervals

26 cores collected per day

Daily rate for small vibracoring vessel - $1,600 (labor) and $3,700 (vessel and equipment) [Contractor communications]

Daily equipment rate (not including labor) scaled by factor of 1.5 to calculate 12 hour daily rate and 9 to calculate monthly rate [Contactor communications]

One man hour processing time per two cores (includes transport, sectioning , and packaging for shipment of core)

Sediment Recontamination Monitoring:

Samples taken from confirmation coring, three samples per core

Samples analyzed for TPH and lead (surrogate chemical parameters).

Ten percent of the samples analyzed for the "full suite" of chemicals (dioxin, pesticides, and TAL/TCL plus cyanide).

Analytical and validation cost per sample [Internal database]:

- TPH - $207
- Lead - $25
- Dioxin - $940
- Pesticides - $1,063
- TAL/TCL - $625

Shipping cost $100 per cooler, four samples per cooler [Internal database]

Mudflat Backfill/Engineered Cap:

Backfill or cap mudflats (*i.e.*, areas which are intermittently exposed and submerged based on tidal action) disturbed through dredging operations and regrade to original bathymetry

Top one foot of mudflat will be reconstructed with suitable habitat material (see Mudflat Reconstruction below)

Alternative 2:

- Dredged to the depth of contamination (refer to Appendix G)
- Disturbed area approximately 101 acres
- Backfill to one foot below original grade
- Cost to purchase, deliver, and place backfill material - $50 per cubic yard [Internal database]

Alternatives 3 and 4:

- Dredged to accommodate engineered cap elements
- Disturbed area approximately 101 acres for Alternative 3 and 51 acres for Alternative 4
- Cap with one foot of capping material for chemical isolation layer (Appendix F)
- Cost to purchase, deliver, and place backfill material - $80 per cubic yard [Internal database]

Overplacement allowance of up to 0.25 feet

Mudflat Reconstruction:

One foot thick layer of suitable material placed in disturbed mudflats areas (see Mudflat Backfill/Engineered Cap above)

Overplacement allowance of up to 0.25 feet

Cost to purchase and deliver mudflat reconstruction material - $100 per cubic yard [Internal database]

Cost to place mudflat reconstruction material - $50 per cubic yard [Internal database].

Natural Shoreline Reconstruction:

Required only with Alternative 2

Twenty foot wide area of shoreline to be restored with backfill. Side slopes to be constructed with a 3 horizontal to 1 vertical (3H:1V) slope

Approximately 5,560 feet of natural shorelines to be reconstructed

Estimate cost of backfill (purchase, delivery and placement) - $50 per cubic yard

Natural Shoreline Biostabilization:

Required only with Alternative 2

Twenty foot wide area of shoreline to be stabilized

Cost for two coir rolls, wedges, twine, and biodegradable erosion control matting - $30 per linear foot

Twenty wetland plants planted per linear foot at $3 per plant, or $60 per linear foot

Two hours of labor for two laborers to install one lineal foot of erosion control matting, coir roll, and plants at a cost of $65 per hour

Riprapped Shoreline Repairs and Replacement:

Allowance to repair or replace riprap slope protection

- Alternative 2 - approximately 10,000 square yards
- Alternative 3 – approximately 5,000 square yards
- Alternative 4 – approximately 2,500 square yards

Cost for riprap installation - $75 per square yard

3 DREDGED MATERIAL MANAGEMENT CAPITAL COSTS

3.1 CAD (DMM Scenario A)

General Assumptions

Construction performed under multiple prime contracts held by client, not by a single prime/general contractor

Ten percent construction management fee applied to DMM construction phase capital costs (not including Pre-Construction Activities costs)

Twenty five percent contingency on all costs except construction management

3.1.1 F1. Pre-Construction Activities for DMM

Design:

Six percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities costs)

Covers design analysis, plans, specifications, and engineer's cost estimate

Regulatory Requirements, Legal, and Community Outreach:

Permitting or if on-site, establishing compliance with substantive requirements

Two percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities)

Land Acquisition:

Site selection study for upland support facility

Site to include water access

Land purchased for upland support facility under Alternatives 2, 3, and 4

Facility size - five acres

Estimated cost for property acquisition - $510,000 per acre

Contractor Work Plans and Submittals:

Lump sum charge of $119,000 for contractor submittals and project specific Health and Safety Plan

Pre-Construction Oversight:

Monthly charge of $48,000 for two staff to oversee coring/processing operations at disposal site

Monthly charge includes labor, equipment and supplies, transportation, per diem

Field investigation takes two months to complete for each of the alternatives

Upland Support Facility Site Investigation – Geotechnical:

Samples collected using standard drill rig (air rotary, sonic, or other)

Cost for sampling and processing - $1,800 per core

Borings extend to depth of 25 feet below ground surface

Two borings per acre for all sites with upland component; three samples per core

Samples are analyzed for Atterberg limits, percent solids, specific gravity, grain size (sieve and hydrometer)

Consolidation tests and strength tests performed on 10 percent of the samples

Analytical and validation cost per sample [Internal database]:

- Atterberg limits - $85
- Percent solids - $50
- Specific gravity - $75
- Grain size (sieve and hydrometer) - $150
- Consolidation - $600
- Strength - $250

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Upland Support Facility Site Investigation – Chemical:

Conduct Phase I/II Due Diligence investigation of upland site

Estimated cost per acre for Phase I/II Due Diligence investigation is $1,000

Samples taken from Geotechnical Investigation borings, one boring per acre; three samples per boring

Samples analyzed for metals

Ten percent of samples analyzed for dioxin, PCBs, and pesticides

Analytical and validation cost per sample [Internal database]:

- Metals - $275
- Dioxin - $940
- PCBs - $188
- Pesticides - $1,063

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Topographic Survey – Upland Support Facility Site:

Topographic survey prepared for uplands support facility site plus additional 10 percent of acreage to include surrounding areas for design purposes

Topographic map tied to State Plane coordinates with two foot contour interval tied to North American Vertical Datum (NAVD)

One day of ground survey to establish ground control for aerial survey

Daily rate for survey crew - $4,000 [Internal database]

Topographic map prepared by aerial survey of site - $500 per acre for flight

Drawing cost for contour map - $100 per acre

Pre-Design Investigation of CAD Site – Chemical Sample Collection:

Daily rate for vibracoring vessel - $1,600 (labor) and $7,300 (vessel and equipment) [Contractor communications] Daily rate scaled by factor of 1.5 to calculate 12 hour daily rate [Contractor communications]

Five 16-foot cores collected per 12 hour day in contaminated sediment layer

One core collected per 5,000 cubic yard in contaminated sediment layer

Five man hours processing time per 16-foot core (includes transport, sectioning, and packaging for shipment of core)

Assumes excess sediment (*i.e.*, IDW) is transported/disposed at cost of $630 per cubic yard [Internal database]

Pre-Design Investigation of CAD Site – Geotechnical Sample Collection:

Daily rate for barge-auger - $8,200 [Contractor communications]

One core collected per five acres of disposal area, minimum five cores; three samples per core:

- Alternative 2 - 33 cores
- Alternative 3 - 15 cores
- Alternative 4 - 5 cores

Undisturbed sample collection and processing cost - $500 per sample [Internal database]

Pre-Design Investigation of CAD Site – Chemical Analysis:

One sample per 5,000 cubic yard of dredged materials

Samples analyzed for PAHs, dioxin, and TAL/TCL plus cyanide.

Analytical and validation cost per sample [Internal database]:

- PAHs - $250
- Dioxin - $940
- TAL/TCL plus cyanide - $625

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Pre-Design Investigation of CAD Site – Geotechnical Analysis:

Samples analyzed for Atterberg limits, percent solids, specific gravity, grain size (sieve and hydrometer), consolidation tests and strength tests

Analytical and validation cost per sample [Internal database]:

- Atterberg limits - $85
- Percent solids - $50
- Specific gravity - $75
- Grain size (sieve and hydrometer) - $150
- Consolidation - $600
- Strength - $250

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Pre-Design Investigation of CAD Site – Historic Area Remediation Site (HARS)

Disposal Determination:

Toxicology assessment of material quality

Lump sum cost of $200,000 for sample collection and analysis

Habitat Survey (upland support facility site):

Lump sum cost of $5,000

Cultural Survey (upland support facility site):

Lump sum cost of $5,000

Elutriate Evaluation:

Samples collected concurrent with chemical core sampling

One core collected per 5,000 cubic yard of dredged materials

Elutriate tests and POC, DOC analyses performed on 10 percent of cores for Alternatives 2 and 3; and 5 percent for Alternative 4

Analytical and validation cost per sample [Internal database]:

- Elutriate tests - $600
- POC - $188
- DOC - $219

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Sub-bottom Geophysics and Bathymetric Survey:

Daily rate for geophysical vessel - $1,600 (labor) and $6,600 (vessel and equipment) [Contractor communications]

Survey rate - one day for CAD (each alternative)

Miscellaneous Tests for DMM Design:

Samples taken cores and borings collected for chemical and geotechnical analyses

Dredged material slurry simulations - 20 tests at (@) $1,900

Dredge elutriate tests - 20 tests @ $600 each

Settling tests - 20 tests @ $1,300

3.1.2 G1. CAD Excavation

Dredge Mobilization/ Demobilization:

One time mobilization charge for each cell constructed of $237,000 per dredge for both navigation and environmental dredges. Separate mobilizations for each disposal cell

Dredge usage:

- Alternative 2 - two navigation dredges; two environmental dredges, three cells
- Alternative 3 - two navigation dredges; two environmental dredges, two cells
- Alternative 4 - two navigation dredges; two environmental dredges, one cell

Monitoring Equipment and Debris Removal Mobilization/Demobilization:

Monitoring Equipment Mobilization/Demobilization:

- One time mobilization charge for monitoring equipment for each Alternative for each cell [Contractor communications]:
  - Two Water quality vessels - $2,500 each
  - Geophysical vessel - $6,000
  - Small vibracoring vessel - $2,800

Debris Removal Equipment Mobilization/Demobilization

- One-time mobilization charge of $59,000 (Alternatives 2, 3, and 4)

Equipment usage:

- Alternative 2 - three cells
- Alternative 3 - two cells
- Alternative 4 - one cell

Large Debris Removal:

Debris removed, off-loaded, decontaminated (*e.g.*, via high pressure washing), and transported off-site for disposal at cost of $300 per ton [Contractor communications]

Volume removed during dredging operations based on previous survey results:

- Alternative 2 - 1,000 tons total
- Alternative 3 - 500 tons total
- Alternative 4 - 200 tons total

Contaminated Sediment Dredging (First Cell):

Includes material removed from both CAD site and entrance channel

Cost for dredging, amending, and upland disposal of dredged sediment - $200 per cubic yard:

- Alternative 2 - 388,000 cubic yards
- Alternative 3 - 278,000 cubic yards
- Alternative 4 - 148,000 cubic yards

Contaminated Sediment Testing and Disposal (First Cell):

Includes material removed from both CAD site and entrance channel

Analysis cost [Internal database]:

- TCLP - $1,063
- Paint filter - $25

One sample per 5,000 cubic yards dredged materials

Contaminated Sediment Dredging and Disposal (Subsequent Cells):

Includes material removed from both CAD site and entrance channel

No additional testing required (disposed in existing CAD cell)

Cost for dredging and CAD placement of dredged sediment - $35 per cubic yard

- Alternative 2 - 786,000 cubic yards
- Alternative 3 - 278,000 cubic yards
- Alternative 4 - not applicable

Clay Dredging/Transport/Disposal at HARS:

Cost to dredge, transport, and dispose of dredged material at HARS - $25 per cubic yard [Internal database]

- Alternative 2 - 11,153,000 cubic yards
- Alternative 3 - 5,062,000 cubic yards
- Alternative 4 - 1,121,000 cubic yards

Average dredge production rate - 5,000 cubic yards per day per dredge (average rate decreases with depth)

Site conditions allow excavation to required depth without removal of bedrock

Containment System Installation:

Construct containment wall around CAD area consisting of a combination of kingpiles (62 feet in length) and sheet piles (25 feet in length)

Total length of berm

- Alternative 2 - 365,000 square feet
- Alternative 3 - 220,000 square feet
- Alternative 4 - 107,500 square feet

Scour protection (sand and riprap)

Cost - $250 per square foot (materials and installation)

Silt Curtain at CAD Entrance Channel:

Silt curtain to close entrance area during dumping operations

Entrance Channel opening - 150 feet

Height of water - 15 feet with 5 foot allowance for tidal variations

Provisions for opening and closing silt curtain during placement operations.

Material purchase and installation cost - $100 per square feet

Air Monitoring During Construction:

Monitoring for VOCs and odors - $5,000 per month

Includes labor, sample analysis, equipment maintenance

Air monitoring occurs for 12 months of initial CAD cell construction and an additional 4 months for each subsequent cell construction

Testing and Monitoring:

Daily rate for geophysical vessel - $1,600 (labor) and $6,600 (vessel and equipment)

Daily equipment rate (not including labor) scaled by factor of 1.5 to calculate 12 hour daily rate and 9 to calculate monthly rate [Contactor communications]

Two rounds of bathymetric surveys performed after dredging to specified elevation

Daily rate for two water quality vessels - $2,400 (labor) and $2,000 (vessel and equipment)

Daily equipment rate (not including labor) scaled by factor of 1.5 to calculate 12 hour daily rate and 9 to calculate monthly rate [Contactor communications]

Two sampling vessels (one located upstream and one downstream of the dredge) collecting water quality samples continuously during dredging operations.

Ten water column samples collected per day, or 260 samples per month of operation (210 days per year of maximum dredging operations (assuming no downtime) averaged over 8 months of operation, or approximately 26 days per month of operation)

Testing/monitoring occurs for 12 months of initial CAD cell construction and an additional 4 months for each subsequent cell construction

Water column samples analyzed for TSS

Two composite water samples per day analyzed for TPH and lead (surrogate chemical parameters)

Ten percent of daily composite water samples analyzed for "full suite" of analytes (dioxin, pesticides, and TAL/TCL plus cyanide)

Analytical and validation cost per sample [Internal database]:

- TSS - $50
- TPH - $207
- Lead - $25
- Dioxin - $940
- Pesticides - $1,063
- TAL/TCL - $625

Process/ship three samples per man hour

Shipping cost $100 per cooler, four samples per cooler [Internal database]

Lump sum data reporting cost of $63,000 [Internal database]

3.1.3 H1. Upland Support Facility

Mobilization/Demobilization:

Ten percent of construction costs for uplands facility [Internal database]

Layout and Documentation Survey:

Daily rate for survey crew - $4,000 [Internal database]

Surveying performed periodically during construction - 10 days total

Fencing:

Material purchase and installation - $60 per linear foot [Internal database]:

- Alternative 2 - 1,900 linear feet
- Alternative 3 - 1,900 linear feet
- Alternative 4 - 1,900 linear feet

Increase fencing quantity by two percent to account for cost of gates

Exterior Lighting:

Material purchase and installation - $50,000 per acre [Internal database]:

- Alternative 2 - five acres
- Alternative 3 - five acres
- Alternative 4 - five acres

Security:

Lump sum cost of $20,000 for each alternative [Internal database]

Buildings:

Administrative

- Size - 10,000 square feet
- Cost - $100 per square foot not including amenities [Internal database]

- Amenities (laboratory, shower, locker room) - Lump sum - $25,000 {Internal database]
- Mechanical, electrical -10% of building costs [Internal database]

Guard shack - 150 square feet @ $100 per square foot [Internal database]

Truck wash facility - Lump sum - $20,000 [Internal database]

Utilities:

Sewer connection - Lump sum - $50,000

Water connection - Lump sum - $25,000

Electrical connection - Lump sum - $50,000 [Internal database]

Earthwork:

Site suitable for construction of wastewater treatment facility and other support facilities without major earthwork

Grading cost - $12 per cubic yard [Internal database]

Average one foot cut across relatively flat site

No demolition or site remediation costs included

Stormwater Management:

Contact water drains to decontamination pad or truck wash

Stormwater system design intensity - 24-hour, 10-year storm event:

- Grading costs - $15 per cubic yard [Internal database]
- Retention basin for non-contact water - 2,500 cubic yards
- Perimeter drainage ditches for non-contact water - 1,400 cubic yards

Lump sum for miscellaneous piping and catch basins - $10,000

Paving:

Filter fabric installed above native soils

Installed cost of filter fabric - $2 per square yard [Internal database]

Six inches subgrade material placed over filter fabric

Installed cost of subgrade material - $40 per cubic yard [Internal database]

Plant mix asphalt paving - 3 inches bearing course and 1.5 inches wearing course

Installed cost of plant mix asphalt paving - $20 per square yard [Internal database]

Paved area - 17,300 square yards

Pier/Dock Structure:

Docking facilities provided for docking of monitoring and sampling equipment

Size - 15,000 square feet

Material cost and installation - $160 per square foot [Internal database]

Wastewater Treatment System for Contact Water:

Contact water from decontamination of sampling equipment/utensils

Rental rate - $10,000 per month

Rental period of 12 months for initial CAD cell construction plus an additional 4 months for each additional cell

Rental Period:

- Alternative 2 - 132 months
- Alternative 3 - 64 months
- Alternative 4 - 32 months

3.1.4 I1. CAD Closure

Cap Material Purchase and Delivery:

Engineered cap material purchased and delivered in hopper scow directly to dredge site

Cap material:

- Alternative 2 - 930,000 cubic yards
- Alternative 3 - 420,000 cubic yards
- Alternative 4 - 90,000 cubic yards

Cost of material - $30 per cubic yard [Contractor communications]

Engineered Cap Material Placement:

Material placement rate - 2,000 cubic yard per day [Contractor communications]

Engineered cap design thickness - 3 feet

Overplacement allowance of up to 0.5 feet.

Installation cost - $30 per cubic yard [Internal database]

Confirmation Coring:

Three-foot long cores collected to verify proper placement of cap layer (assessment of mixing during cap placement)

Twenty cores collected per day; five cores per acre

Daily rate for small vibracoring vessel - $1,600 (labor) and $3,700 (vessel and equipment) [Contractor communications]

Daily equipment rate (not including labor) scaled by factor of 1.5 to calculate 12 hour daily rate and 9 to calculate monthly rate [Contactor communications]

One man hour processing time per two cores (includes transport, sectioning, and packaging for shipment of core)

Collect three samples from each core and analyze samples for TPH and lead (surrogate chemical parameters)

Ten percent of the samples analyzed for the "full suite" of chemicals (dioxin, pesticides, and TAL/TCL plus cyanide)

Analytical and validation cost per sample [Internal database]:

- TPH - $207
- Lead - $25
- Dioxin - $940
- Pesticides - $1,063
- TAL/TCL - $625

Shipping cost $100 per cooler, four samples per cooler [Internal database]

Remove Containment System:

Sheeting removed at an estimated cost of $36 per square foot

Bathymetric Survey:

Daily rate for survey crew - $8,200 [Internal database]

Survey crew on-site periodically totaling two days per cell

Additional Habitat Mitigation:

Disturbed acres

- Alternative 2 - 171 acres
- Alternative 3 - 80 acres
- Alternative 4 - 19 acres

Cost for off-site mitigation – see Table 2-3 in Appendix F of the FFS

- Alternative 2 - $102,751,000
- Alternative 3 - $63,770,000
- Alternative 4 - $12,950,000

3.1.5 J1. Site Decommissioning/Restoration

Site restoration/demolition/decommissioning of upland support facility - $30,000 per acre

3.2 Off-Site Disposal (DMM Scenario B)

General Assumptions

Construction performed under multiple prime contracts held by client, not by a single prime/general contractor

Ten percent construction management fee applied to DMM construction phase capital costs (not including Pre-Construction Activities costs)

Twenty-five percent contingency on all costs except construction management because of technical complexity of the operations

3.2.1 F2. Pre-Construction Activities for DMM

Design:

Six percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities costs)

Covers design analysis, plans, specifications, and engineer's cost estimate

Regulatory Requirements, Legal, and Community Outreach:

Permitting or if on-site, establishing compliance with substantive requirements

Two percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities)

Land Acquisition:

Site selection study for upland sediment processing facility

Site to include water access and rail spur/siding or ability to construct rail spur or siding

Land purchased for upland sediment processing facility under Alternatives 2, 3, and 4

Estimated cost for property acquisition @ $510,000 per acre:

- Alternative 2 - 38 acres
- Alternative 3 - 32 acres
- Alternative 4 - 29 acres

Contractor Work Plans and Submittals:

Lump sum charge of $119,000 for contractor submittals and project specific Health and Safety Plan

Pre-Construction Oversight:

Monthly charge of $48,000 for two staff to oversee site investigation of processing site

Monthly charge includes labor, equipment and supplies, transportation, per diem

Field investigation takes three months to complete for each of the alternatives

Upland Sediment Processing Facility Site Investigation - Geotechnical:

Samples collected using standard drill rig (air rotary, sonic, or other)

Cost for core sampling and processing - $1,800 per core [Internal database]

Cores extend to depth of 25 feet below ground surface

Two cores per acre collected for all sites with upland component; three samples taken per core

Samples analyzed for Atterberg limits, percent solids, specific gravity, grain size (sieve and hydrometer)

Consolidation tests and strength tests performed on 10 percent of the samples

Analytical and validation cost per sample [Internal database]:

- Atterberg limits - $85
- Percent solids - $50
- Specific gravity - $75
- Grain size (sieve and hydrometer) - $150
- Consolidation - $600
- Strength - $250

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Upland Sediment Processing Facility Site Investigation – Chemical:

Conduct Phase I/II Due Diligence investigation of upland sediment processing facility site

Estimated cost per acre for Phase I/II Due Diligence investigation is $1,000

Samples taken from Geotechnical Investigation borings, one boring per acre; three samples per boring

Samples analyzed for metals

Ten percent of samples analyzed for dioxin, PCBs, and pesticides

Analytical and validation cost per sample [Internal database]:

- Metals - $275
- Dioxin - $940
- PCBs -$188
- Pesticides - $1,063

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Topographic Survey – Upland Sediment Processing Facility Site:

Topographic survey prepared for upland sediment processing facility site plus additional 10 percent of acreage to include surrounding areas for design purposes

Topographic map tied to State Plane coordinates with two foot contour interval tied to NAVD

Two days of ground survey to establish ground control for aerial survey

Daily rate for survey crew - $4,000 [Internal database]

Topographic map prepared by aerial survey of site:

- Cost for aerial survey flight - $500 per acre
- Cost for drawing contour map - $100 per acre

Habitat Survey (upland sediment processing facility site):

Lump sum cost of $42,000

Cultural Survey (upland sediment processing facility site):

Lump sum cost of $42,000

Miscellaneous Tests for DMM Design:

Samples taken from cores and borings collected for chemical and geotechnical analyses

Dredged material slurry simulations - 20 tests @ $1,900

Dredge elutriate tests - 20 tests @ $600 each

Paint filter tests - 20 tests @ $25 each

Jar testing/settling tests - 20 tests @ $1,300

Optimum polymer doses - 3 tests@ $1,900

Mechanical dewatering tests - 1 test @ $1,300

Multimedia filter tests - 20 tests @ $600 each

TCLP Testing - 10 @ $1,063 each

3.2.2 G2. Upland Sediment Processing Facility

Mobilization and Demobilization:

Ten percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities costs) [Internal database]

Mechanical and Electrical:

Ten percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities costs) [Internal database]

Layout and Documentation Survey:

Daily rate for survey crew - $4,000 [Internal database]

Surveying performed periodically during construction - 2 days per week over 12 month construction period

Fencing:

Material purchase and installation - $60 per linear foot [Internal database]:

- Alternative 2 - 10,100 linear feet (5,100 feet for site boundary; 5,000 feet for exclusion zone)
- Alternative 3 - 9,200 linear feet (4,700 feet for site boundary; 4,500 feet for exclusion zone)
- Alternative 4 - 8,800 linear feet (4,500 feet for site boundary; 4,300 feet for exclusion zone)

Increase fencing quantity by two percent to account for cost of gates

Exterior Lighting:

Material purchase and installation - $50,000 per acre [Internal database]:

- Alternative 2 - 38 acres
- Alternative 3 - 32 acres
- Alternative 4 - 29 acres

Security:

Lump sum cost of $100,000 [Internal database]

Buildings:

Processing Building

- Size:
  - Alternative 2 approximately 246,200 square feet
  - Alternative 3 approximately 236,200 square feet
  - Alternative 4 approximately 231,600 square feet
- Cost - $100 per square foot not including amenities [Internal database]
- Amenities - Lump sum for laboratory, shower, and locker facility - $100,000

Additional cost for Administrative/Laboratory Area of Processing Building - 30,000 square feet @ $50 per square foot

Wastewater treatment system included in Processing Building (equipment costs elsewhere)

Guard shack - 150 square feet @ $100 per square foot [Internal database]

Truck wash - Lump sum $100,000 [Internal database]

Laboratory Equipment - Lump sum $100,000 [Internal database]

Assumes site soils are stable and capable of supporting building and equipment loads without piling or major soil modifications

Utilities:

Sewer connection - $500,000

Water connection - $250,000

Electrical connection - $500,000 [Internal database]

Costs assumes an undeveloped site and all new utility connections

Earthwork:

Grading and clearing of site prior to construction - assume minimal effort required (up to three foot cut/fill across site)

Cost - $12 per cubic yard based on on-site disposal of soil

Continuous footings required around building perimeter along with pads for major equipment

No other costs for soil improvements required

Stormwater Management:

Perimeter drainage ditch diverts non-contact water to a sedimentation basin for treatment prior to discharge to the river

Roof leaders are connected to perimeter drainage system

Water in the exclusion zone is captured and treated/reused before being discharged to river in accordance with regulatory requirements

Lump sum cost of $168,000 for Alternative 2 and $154,000 for Alternative 3 and $153,000 for Alternative 4

Paving:

Filter fabric installed over native soil

Installed cost of filter fabric - $2 per square yard [Internal database]

Six inches subgrade material placed over the filter fabric

Installed cost of subgrade material - $40 per cubic yard [Internal database]

Plant mix asphalt paving - 3 inches bearing course and 1.5 inches wearing course

Installed cost of plant mix asphalt paving - $20 per square yard [Internal database]

Paved area:

- Alternative 2 - approximately 128,000 square yards
- Alternative 3 - approximately 105,000 square yards
- Alternative 4 - approximately 97,000 square yards

Pier/Dock Structure:

Frontage wharf along shore of upland sediment processing facility - 50,000 square feet

Wharf intended for temporary use during hydraulic offloading.

The length of the wharf is intended to provide space for two barges at a time.

Material cost and installation - $160 per square foot [Internal database]

Pre-fabricated Building (Sprung Structure) for Dewatered Sediment Storage:

Enclosed on-site storage of dewatered solids

Approximately six months of storage provided for material to be shipped off-site for thermal treatment to allow flexibility in production schedules; approximately three months of storage provided for materials to be shipped off-site for disposal in landfill

Negative pressure maintained in structure to control emission; vapors routed through granular activated carbon before discharge

Approximate storage requirements:

- Alternative 2 - 200,000 square feet
- Alternative 3 - 138,000 square feet
- Alternative 4 - 109,000 square feet

Installed cost for insulated structure - $40 per square foot [Contactor communications]

Storage Area – Concrete Slab and Push Walls:

Structure installed on concrete slab with eight foot push walls

Installed costs for concrete slabs - $600 per cubic yard [Internal database]

Storage Area – Subgrade Material:

Installed cost for subgrade material under slab - $40 per cubic yard [Internal database]

Storage Area – Filter Fabric:

Installed cost for filter fabric under slab - $2 per square yard [Internal database]

Storage Area –Vapor Emissions Control:

Maintain negative pressure within storage structure to control emissions (dust and odors)

One unit for approximately 10,000 cubic yards of storage capacity

Vapors routed through a granular activated carbon (GAC) filter units prior to discharge to atmosphere:

- Alternative 2 - 17 units
- Alternative 3 - 12 units
- Alternative 4 - 10 units

Installed cost per unit - $5,000 [Internal database]

Piping:

Includes exterior piping and appurtenances (e.g., storm drains, catch basins, culverts, etc.) and interior piping in processing building

Exterior piping (stormwater and ancillary piping) - 35,500 linear feet for Alternative 2 and 29,000 linear feet for Alternative 3 and 26,500 for Alternative 4

Interior piping (dewatering system) - 4,800 linear feet for Alternative 2 and 4,600 linear feet for Alternative 3 and 4,500 for Alternative 4

Installed/delivered cost - $25 per linear foot for exterior piping and $15 per linear foot for interior piping [Internal database]

Add 25 percent for joints, tees, wyes, other connections and fittings

Upfront Storage and Recycle Water Tanks:

Upfront Storage Tank - provide temporary storage of sediment in case of plant upsets or shutdown

Recycle Water Tank - provide temporary storage of water used for the hydraulic offloading of barges

Storage capacity provided for each tank - 12 hours [Internal database]

Lump sum cost of $2,052,000 for Alternative 2 and $707,000 for Alternatives 3 and 4

Loadout Facility:

Lump sum - $500,000 [Internal database]

Rail Line Spur/Railcar Storage:

Provide siding/spur capacity adequate for staging rail cars

Five miles of railroad spur/siding constructed at site

Installed cost - $1,000,000 per mile [Internal database]

Temporary Bunkers for Loadout Facility:

Two bunkers at $10,000 each [Internal database]

Hazardous Material Storage Area:

Temporary storage of material prior to shipment off site

Includes decontamination pad for medium and large debris processing

Lump sum[Internal database]:

- Alternative 2 - $124,000
- Alternative 3 - $93,000
- Alternative 4 - $36,000

Air Monitoring During Construction:

Fugitive dust monitoring - $5,000 per month

Other constituents based on site soil characterization data

Includes labor, sample analysis, equipment maintenance

3.2.3 H2. Equipment Costs

Operating Equipment:

Equipment purchased for site operators:

- 3 Front end loaders ($124,000 each)
- 1 Skidsteer ($25,000 each)
- 1 Excavator ($200,000 each)
- 4 Dump trucks ($80,000 each)
- 1 Water truck ($50,000 each)
- 1 Street Sweeper ($100,000 each)

Wastewater Treatment Plant:

Wastewater treatment plant (WWTP) includes the following components: equalization tank, sedimentation tank with combined oil-water separator, multimedia filter, carbon filter, and bag filter

Where feasible water would be treated and reused in the process minimizing the overall water consumption

Cost includes fixed and variable components:

- Fixed costs (structure, design, contractor overhead, etc.)
- Variable costs (based on flow in million gallons per day [MGD])

Treatment plant sizes:

- Alternative 2 - 1.1 MGD
- Alternative 3 - 1.0 MGD
- Alternative 4 - 0.9 MGD

3.2.4 I2. Processing and Disposal

Mechanical Dewatering Using Filter Presses:

Treatment includes screening, coarse and fine sand separation, pre-thickening, chemical addition, and mechanical dewatering,

Cost includes equipment capital costs and operating costs (including labor)

Unit costs - $50 per cubic yard [Contractor communications]

Dewatered Material Testing for Disposal:

One sample per 5,000 cubic yards of dewatered material

Analytical cost [Internal database]:

- TCLP - $1,063
- Paint filter - $25

Transport Off-site to Thermal Treatment:

Rail transportation through long-term leasing of rail cars

Based on evenly distributed usage of all treatment facilities (see Appendix G), average transportation cost is approximately $240 per ton

Thermal Treatment and Disposal (Off-site Facility):

Four thermal treatment facilities identified in United States that could potentially treat contaminated sediment; facilities include:

- Veolia Environmental Services' Gulf Coast Incineration Facility, Port Arthur, Texas
- Clean Harbors' Aragonite Incineration Facility, Salt Lake City, Utah
- Clean Harbors' Deer Park Incineration Facility, La Porte, Texas
- Clean Harbors' Kimball Incineration Facility, Kimball, Nebraska

Information on sites provided for estimation purposes only and would have to be verified during site design; details on sites presented in Appendix G

Disposal cost at United States facilities for RCRA waste - approximately $400 per ton (varies based on material characteristics)

On-site storage at the upland sediment processing facility (described elsewhere)

Dewatered mass of material to be thermally treated

- Alternative 2 - 520,000 tons
- Alternative 3 - 100,000 tons
- Alternative 4 - 10,000 tons

Transport to Subtitle C Landfill (Off-site Facility):

Rail transportation through long-term leasing of rail cars

Based on use of multiple facilities, average transportation cost is approximately $130 per ton

Off-Site Disposal in Subtitle C Landfill:

Fifteen Subtitle C landfills identified in United States that could potentially accept contaminated sediment. Three facilities: Lake Charles, Lone Mountain and Grandview, have a combined total of approximately 12.7 million cubic yards in available capacity.

Information on sites provided for estimation purposes only and would have to be verified during site design; details on sites presented in Appendix G.

Landfill Tipping Fee - $100 per ton - will vary based on waste characteristics [Contractor communications]

Dewatered mass of material to be disposed at a Subtitle C Landfill:

- Alternative 2 - 6,880,000 tons
- Alternative 3 - 2,070,000 tons
- Alternative 4 - 610,000 tons

Decontamination and Disposal of Medium-Sized Debris:

Debris removed during screening, decontaminated (via high pressure washing), and transported off-site for disposal at cost of $200 per ton [Contractor communications]

In-situ mass of debris removed during dredging operations:

- Alternative 2 - 635,000 tons
- Alternative 3 - 231,000 tons
- Alternative 4 - 67,000 tons

Debris Transport and Disposal (Small Organic Fraction) in Subtitle C Landfill:

Generally small sized organic debris and gravel removed by fine screening or microfiltration during processing

Debris containerized and shipped to a Subtitle C landfill for disposal at a cost of $230 per ton.

In-situ mass of debris:

- Alternative 2 - 55,000 tons total
- Alternative 3 - 20,000 tons total
- Alternative 4 - 6,000 tons total

Reclaimed Sand Processing, Transport, and Beneficial Use:

Reclaimed sand recovered during sediment processing to be used beneficially

Cost for transportation and beneficial use - $50 per ton.

Dewatered mass of reclaimed sand:

- Alternative 2 - 1,600,000 tons total
- Alternative 3 - 500,000 tons total
- Alternative 4 - 100,000 tons total

3.2.5 J2. Site Decommissioning/Restoration

Site restoration/demolition/decommission - $30,000 per acre

3.3 Local Decontamination and Beneficial Use (DMM Scenario C)

General Assumptions:

Construction performed under multiple prime contracts held by client, not by single prime/general contractor

Ten percent construction management fee applied to DMM construction phase capital costs (not including Pre-Construction Activities costs)

Twenty-five percent contingency on all costs except construction management because of technical complexity of the operations

3.3.1 F3. Pre-Construction Activities for DMM

Design:

Six percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities costs)

Covers design analysis, plans, specifications, and engineer's cost estimate

Regulatory Requirements, Legal, and Outreach:

Permitting or if on-site, establishing compliance with substantive requirements

Two percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities)

Land Acquisition:

Site selection study for upland sediment processing facility

Site to include water access

Land purchased for upland sediment processing facility under Alternatives 2, 3, and 4

Estimated cost for property acquisition @ $510,000 per acre:

- Alternative 2 - 38 acres
- Alternative 3 - 34 acres
- Alternative 4 - 32 acres

Contractor Work Plans and Submittals:

Lump sum charge of $119,000 per alternative for contractor submittals and project specific Health and Safety Plan

Pre-Construction Oversight:

Monthly charge of $48,000 for two staff to oversee coring/processing operations at disposal site

Monthly charge includes labor, equipment and supplies, transportation, per diem

Field investigation takes three months to complete for each of the alternatives

Upland Sediment Processing Facility Site Investigation - Geotechnical:

Samples collected using standard drill rig (air rotary, sonic, or other)

Cost for core sampling and processing - $1,800 per core [Internal database]

Cores extend to depth of 25 feet below ground surface

Two cores per acre collected for all sites with upland component; three samples taken per core

Samples analyzed for Atterberg limits, percent solids, specific gravity, grain size (sieve and hydrometer)

Consolidation tests and strength tests performed on 10 percent of the samples

Analytical and validation cost per sample [Internal database]:

- Atterberg limits - $85
- Percent solids - $50
- Specific gravity - $75
- Grain size (sieve and hydrometer) - $150
- Consolidation - $600

- Strength - $250

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Upland Sediment Processing Facility Site Investigation – Chemical:

Conduct Phase I/II Due Diligence investigation of upland sediment processing facility site

Estimated cost per acre for Phase I/II Due Diligence investigation is $1,000

Samples taken from Geotechnical Investigation borings, one boring per acre; three samples per boring

Samples analyzed for metals

Ten percent of samples analyzed for dioxin, PCBs, and pesticides

Analytical and validation cost per sample [Internal database]:

- Metals - $275
- Dioxin – $940
- PCBs -$188
- Pesticides - $1,063

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Topographic Survey – Uplands Sediment Processing Facility Site:

Topographic survey prepared for uplands site plus an additional 10 percent of acreage to include surrounding areas for design purposes

Topographic map tied to State Plane coordinates with two foot contour interval tied to NAVD.

Two days of ground survey to establish ground control for aerial survey

Daily rate for survey crew - $4,000 [Internal database]

Topographic map prepared by aerial survey of site:

- Cost for aerial survey flight - $500 per acre
- Cost for drafting contour map - $100 per acre

Habitat Survey (upland site):

Lump sum cost of $42,000

Cultural Survey (upland site):

Lump sum cost of $42,000

Miscellaneous Tests for DMM Design:

Samples taken from cores and boring materials collected for chemical and geotechnical analyses

Dredged material slurry simulations - 20 tests @ $1,900

Dredge elutriate tests - 20 tests @ $600 each

Paint filter tests - 20 tests @ $25 each

Jar testing/settling tests - 20 tests @ $1,200

Optimum polymer doses - 3 tests@ $1,900

Mechanical dewatering tests - 1 test @ $1,200

Multimedia filter tests - 20 tests @ $600 each

TCLP Testing - 10 @ $1,063 each

3.3.2 G3. Upland Sediment Processing Facility

Mobilization and Demobilization:

Ten percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities costs) [Internal database]

Mechanical and Electrical:

Ten percent of DMM construction phase capital costs (not including DMM Pre-Construction Activities and Mobilization costs) [Internal database]

Layout and Documentation Survey:

Daily rate for survey crew - $4,000 [Internal database]

Surveying performed periodically during construction – 2 days per week over 12 month construction period

Fencing:

Material purchase and installation - $60 per linear foot [Internal database]:

- Alternative 2 - 10,100 linear feet (5,100 feet for site boundary; 5,000 feet for exclusion zone)
- Alternative 3 - 9,600 linear feet (4,900 feet for site boundary; 4,700 feet for exclusion zone)
- Alternative 4 - 9,200 linear feet (4,700 feet for site boundary; 4,500 feet for exclusion zone)

Increase fencing quantity by two percent to account for cost of gates

Exterior Lighting:

Material purchase and installation - $50,000 per acre [Internal database]:

- Alternative 2 - 38 acres
- Alternative 3 - 34 acres
- Alternative 4 - 32 acres

Security:

Lump sum cost of $100,000 [Internal database]

Buildings:

Processing Building

- Size:
  - Alternative 2 - approximately 369,300 square feet
  - Alternative 3 approximately 354,400 square feet
  - Alternative 4 – approximately 347,400 square feet
- Cost - $100 per square foot not including amenities [Internal database]
- Amenities - Lump sum for laboratory, shower, and locker facility - $100,000

Additional cost for Administrative/Laboratory Area of Processing Building - 30,000 square feet @ $50 per square foot

Wastewater treatment system included in Processing Building (equipment costs elsewhere

Guard shack - 150 square feet @ $100 per square foot [Internal database]

Truck wash - Lump sum $100,000 [Internal database]

Laboratory Equipment - Lump sum $100,000 [Internal database]

Assumes site soils are stable and capable of supporting building and equipment loads without piling or major soil modifications

Utilities:

Sewer connection - $500,000

Water connection - $250,000

Electrical connection - $500,000 [Internal database]

Costs assumes an undeveloped site and all new utility connections

Earthwork:

Grading and clearing of site prior to construction - assume minimal effort required (up to three foot cut/fill across site)

Cost - $12 per cubic yard based on on-site disposal of soil

Continuous footings required around building perimeter along with pads for major equipment

No other costs for soil improvements required

Stormwater Management:

Perimeter drainage ditch diverts non-contact water to a sedimentation basin for treatment prior to discharge to the river

Roof leaders are connected to perimeter drainage system

Water in the exclusion zone is captured and treated/reused before being discharged to river in accordance with regulatory requirements

Lump sum cost of $218,000 for Alternative 2 and $167,000 for Alternative 3 and $165,000 for Alternative 4

Paving:

Filter fabric installed over native soil

Installed cost of filter fabric - $2 per square yard [Internal database]

Six inches subgrade material placed over the filter fabric

Installed cost of subgrade material - $40 per cubic yard [Internal database]

Plant mix asphalt paving - 3 inches bearing course and 1.5 inches wearing course

Installed cost of plant mix asphalt paving - $20 per square yard [Internal database]

Paved area:

- Alternative 2 - approximately 78,000 square yards
- Alternative 3 - approximately 71,000 square yards
- Alternative 4 - approximately 67,000 square yards

Pier/Dock Structure:

Frontage wharf along shore of upland sediment processing facility – 50,000 square feet

Wharf intended for temporary use during hydraulic offloading

The length of the wharf is intended to provide space for two barges at a time

Material cost and installation - $160 per square foot [Internal database]

Pre-fabricated Building (Sprung Structure) for Dewatered Sediment Storage:

Enclosed on-site storage of dewatered solids

Approximately six months of storage provided for dewatered hazardous material to allow flexibility in production schedules; approximately six months of storage for treated materials (thermal treatment and sediment washing)

Negative pressure maintained in structure to control emission; vapors routed through granular activated carbon before discharge

Approximate storage requirements:

- Alternative 2 - 269,000 square feet
- Alternative 3 - 185,000 square feet
- Alternative 4 - 146,000 square feet

Installed cost for insulated structure - $40 square foot [Contactor communications]

Storage Area – Concrete Slab and Push Walls:

Structure installed on concrete slab with eight foot push walls

Installed costs for concrete slabs - $600 per cubic yard [Internal database]

Storage Area – Subgrade Material:

Installed cost for subgrade material under slab - $40 per cubic yard [Internal database]

Storage Area – Filter Fabric:

Installed cost for filter fabric under slab - $2 per square yard [Internal database]

Storage Area –Vapor Emissions Control:

Maintain negative pressure within storage structure to control emissions (dust and odors)

One unit for approximately 10,000 cubic yards of storage capacity

Vapors routed through GAC filter units prior to discharge to the atmosphere:

- Alternative 2 - 23 units
- Alternative 3 - 16 units
- Alternative 4 - 13 units

Installed cost per unit - $5,000 [Internal database]

Piping:

Includes exterior piping and appurtenances (e.g., storm drains, catch basins, culverts, etc.) and interior piping in processing building

Exterior piping (stormwater and ancillary piping) - 35,500 linear feet for Alternative 2 and 31,500 linear feet for Alternative 3 and 29,500 linear feet for Alternative 4

Interior piping (treatment system) - 7,100 linear feet for Alternative 2 and 6,800 linear feet for Alternative 3 and 6,700 linear feet for Alternative 4

Installed/delivered cost - $25 per linear foot for exterior piping and $15 per linear foot for interior piping [Internal database]

Add 25 percent for joints, tees, wyes, other connections and fittings

Upfront Storage and Recycle Water Tanks

Upfront Storage Tank: provide temporary storage of sediment in case of plant upsets or shutdown

Recycle Water Tank: provide temporary storage of water used for the hydraulic offloading of barges

Storage capacity provided for each tank- 12 hours [Internal database]

Lump sum cost of $2,085,500 for Alternative 2 and $740,500 for Alternatives 3 and 4

Loadout Facility:

Lump sum - $500,000 [Internal database]

Transfer Vehicle Storage:

Approximately 2.8 to 3.4 acres of storage area for transfer vehicles; provide storage for 5 to 10 days of vehicle storage

Storage area can be on a separate parcel away from the rest of the upland sediment processing facility as long as it is located in the general area

Paved surface for parking area

Installed cost per square yard - $30 [Internal database]

Temporary Bunkers for Loadout Facility:

Two bunkers at $10,000 each [Internal database]

Hazardous Material Processing and Storage Area:

Includes decontamination pad for medium and large debris processing

Lump sum[Internal database]:

- Alternative 2 - $124,000
- Alternative 3 - $93,000
- Alternative 4 - $36,000

Air Monitoring During Construction

Fugitive dust, odors, VOCs monitoring - $5,000 per month

Includes labor, sample analysis, equipment maintenance

3.3.3 H3. Equipment Costs

Operating Equipment:

Equipment purchased for site operators:

- 3 Front end loaders ($124,000 each)
- 1 Skidsteer ($25,000 each)
- 1 Excavator ($200,000 each)
- 4 Dump trucks ($80,000 each)
- 1 Water truck ($50,000 each)
- 1 Street Sweeper ($100,000 each)

Wastewater Treatment Plant:

Wastewater treatment plant (WWTP) includes the following components: equalization tank, sedimentation tank with combined oil-water separator, multimedia filter, carbon filter, and bag filter.

Where feasible water would be treated and reused in the process minimizing the overall water consumption

Cost broken down into fixed and variable components

- Fixed costs (structure, design, contractor overhead, etc.)
- Variable costs (based on flow in MGD)

Treatment plant sizes:

- Alternative 2 - 1.5 MGD
- Alternative 3 - 1.4 MGD
- Alternative 4 - 1.3 MGD

3.3.4 I3. Local Decontamination

Mechanical Dewatering Using Filter Presses:

Treatment includes screening, coarse and fine sand separation, pre-thickening, chemical addition, and mechanical dewatering,

Cost includes equipment capital costs as well as operating costs

Unit costs: $50 per cubic yard [Contractor communications]

Dewatered Material Testing for Disposal:

One sample per 5,000 cubic yards of material

Analytical cost [Internal database]:

- TCLP - $1,063
- Paint filter - $25

Thermal Treatment (On-site/Local Facility):

Thermal treatment systems potentially suitable for lower eight miles of the Lower Passaic River sediments include the following:

- Cement-Lock® Technology
- JCI/Upcycle Associates, LLC's Rotary Kiln
- Minergy's Glass Furnace Technology
- WPC's Vitrification Technology

Information on technologies provided for estimation purposes only and performance would have to be verified during site design; details on sites presented in Appendix G

Thermal Treatment unit (e.g., GTI/Volcano) constructed at the processing site or in the general area for treatment of heavily contaminated sediment

Byproduct of the treatment process (*e.g.*, CementLock®) would meet beneficial use requirements in the state of New Jersey

Income derived from the sale of the byproduct would offset marketing and transportation costs for the material

Treatment cost of $370 per dewatered ton for Alternatives 2 and 3 [Contractor communications]

Treatment cost of $640 per dewatered ton for Alternative 4. Cost adjusted to reflect that a dedicated thermal treatment facility may not be commercially viable [Contractor communications].

Dewatered mass of material to be thermally treated

- Alternative 2 - 520,000 tons
- Alternative 3 - 100,000 tons
- Alternative 4 - 10,000 tons

Storage requirements addressed elsewhere

Sediment Washing:

Sediment washing systems potentially suitable for lower eight miles of the Lower Passaic River sediments include the following:

- Pear Technologies
- Biogenesis®

Information on technologies provided for estimation purposes only and performance would have to be verified during site design; details on sites presented in Appendix G

Sediment washing system (*e.g.,* Biogenesis®) constructed at the processing site for treatment of medium contaminated sediment; washed sediment stabilized using Portland cement, Cement Kiln Dust (CKD) or other similar material to meet beneficial use requirements in the state of New Jersey

Treated sediment would be hauled to a landfill for beneficial use as cover material

Treatment is $150 per cubic yard.

In-situ volumes of material

- Alternative 2 - 6,400,000 cubic yards
- Alternative 3 - 2,380,000 cubic yards
- Alternative 4 - 720,000 cubic yards

Sediment Amendment:

Sediment that is lightly contaminated would be stabilized using Portland cement, CKD or other similar material to meet beneficial use requirements in the state of New Jersey

Sediment amendment cost totals $80 per dewatered cubic yard

Dewatered mass of material being amended

- Alternative 2 - 114,000 cubic yards
- Alternative 3 - 17,000 cubic yards
- Alternative 4 - 10,000 cubic yards

Processed Sediment Transportation and Beneficial Use:Sediment treated with sediment washing or sediment amendment would be hauled to a landfill for beneficial use as cover material

Sediment transportation and beneficial use cost totals $50 per ton

Decontamination and Disposal of Medium-Sized Debris:

Debris removed during screening, decontaminated (via high pressure washing), and transported off-site for disposal at cost of $200 per ton [Contractor communications]

In-situ volume of debris removed during dredging operations:

- Alternative 2 - 635,000 tons total
- Alternative 3 - 231,000 tons total
- Alternative 4 - 67,000 tons total

Debris Transport and Disposal (Small Organic Fraction) in Subtitle C Landfill:

Generally small sized organic debris and gravel removed by fine screening or microfiltration during processing

Debris containerized and shipped to a Subtitle C landfill for disposal at a cost of $230 per ton

In-situ mass of debris:

- Alternative 2 - 55,000 tons total
- Alternative 3 - 20,000 tons total
- Alternative 4 - 6,000 tons total

Reclaimed Sand Processing, Transport, and Beneficial Use:

Reclaimed sand recovered during sediment processing to be used beneficially

Cost for transportation, and beneficial use - $50 per ton.

Dewatered mass of reclaimed sand:

- Alternative 2 - 1,600,000 tons total
- Alternative 3 - 500,000 tons total
- Alternative 4 - 100,000 tons total

3.3.5 J3. Site Decommissioning/Restoration

Site restoration/demolition/decommissioning - $30,000 per acre

4 DREDGED MATERIAL MANAGEMENT O&M COSTS

4.1 K. DMM Site O&M

4.1.1 CAD (DMM Scenario A)

General Assumptions:

Construction performed under multiple prime contracts held by client, not by single prime/general contractor

Ten percent construction management fee applied to DMM construction phase capital costs (not including Pre-Construction Activities costs)

Twenty five percent contingency on all costs except construction management

Duration of Dredging and Capping Operations:

- Alternative 2 - 14 years
- Alternative 3 - 6 years
- Alternative 4 - 2 years

Operational Testing:

One to two water column samples collected per day, or 30 samples per month (210 days per year of dredging operations averaged over 8 months, or approximately 26 days per month of operations)

Water column samples analyzed for TSS

Two composite water samples per month analyzed for TAL/TCL plus cyanide and dioxin per month

Analytical and validation cost per sample [Internal database]:

- TSS - $50
- Dioxin - $940
- TAL/TCL - $625

Process/ship three samples per man hour

Shipping cost $100 per cooler, four samples per cooler [Internal database]

Upland Support Facility O&M:

Staffed operations in upland support facility:

- 24 hour per day operations during dredging and capping
- Staffing does not include dredging contractor workforce

Site operations support staff:

- Site Manager - one person @ $131,000 per year
- Shift Supervisors - three people @ 102,000 per year (each)
- Site Health and Safety Officer - one person @ 102,000 per year
- Mechanics - three people @ $80,000 per year (each)
- Laborers - two people @ $44,000 per year (each)
- Laboratory Technician - one person @ $58,000 per year
- Administrative Support - one person @ $36,000 per year
- Site Security - four people @ $29,000 per year (each)

Annual wages/salaries including 40 percent benefits

Utilities/Fuel - $20,000 per year

Insurance - $100,000 per year

Miscellaneous Equipment - $25,000 per year

Operations Management/Coordination:

Site operational staffing:

- Program Manager - one person @ $204,000 per year
- Operations Leaders - three people @ $131,000 per year (each)
- Senior QA - one person @ $204,000 per year (half time)
- Program Management Support - three people @ $80,000 per year

Annual wages/salaries including 40 percent benefits

Air Monitoring:

Fugitive dust, odors, VOCs monitoring - $5,000 per month

Includes labor, sample analysis, equipment maintenance

4.1.2 Off-Site Disposal (DMM Scenario B)

General Assumptions:

Construction performed under multiple prime contracts held by client, not by single prime/general contractor

Ten percent construction management fee applied to Long Term O&M costs

Twenty five percent contingency on all costs except construction management

Duration of Dredging and Capping Operations:

- Alternative 2 - 14 years
- Alternative 3 - 6 years
- Alternative 4 - 2 years

Wastewater Treatment Plant O&M:

Annual operation and maintenance cost – ten percent of the capital wastewater treatment plant costs

Covers chemical and supplies, regeneration of activated carbon, waste disposal, electrical

Treated wastewater discharged to Newark Bay in accordance with regulatory requirements

Sediment Processing Site O&M:

Includes labor, fuel, utilities, site maintenance and site security for upland processing site

Staffed operations during dredging and processing:

- 24 hour per day operations during dredging and processing
- Staffing does not include dredging contractor workforce or dewatering contractor workforce at upland sediment processing facility

Site operational staffing:

- Site Manager - one person @ $131,000 per year
- Shift Supervisors - three people @ $102,000 per year (each)
- Site Health and Safety Officer - one person @ $102,000 per year

- Equipment/WWTP Operators - four people @ $80,000 per year (each)
- Mechanics - four people @ $80,000 per year (each)
- Laborers - four people @ $44,000 per year (each)
- Laboratory Technician - two people @ $58,000 per year (each)
- Administrative Support - two people @ $36,000 per year (each)
- Site Security - four people @ $29,000 per year (each)

Annual wages/salaries including 40 percent benefits

Insurance - $100,000 per year

Utilities/Fuel - $20,000 per year

GAC storage/recycle cost

- Alternative 2 - $40,000 per year
- Alternative 3 - $30,000 per year
- Alternative 4 - $10,000 per year

Annual equipment operations and maintenance - 10% of total equipment costs

Miscellaneous equipment - $25,000 per year

Operations Management/Coordination:

Site operational staffing:

- Program Manager - one person @ $204,000 per year
- Operations Leaders - three people @ $131,000 per year (each)
- Senior QA - one person @ $204,000 per year (half time)
- Program Management Support - three people @ $80,000 per year

Annual wages/salaries including 40 percent benefits

Wastewater Testing:

Monthly sampling and analysis

- TSS - 30 samples
- TAL/TCL plus cyanide - 2 samples
- Dioxins - 2 samples

Analytical and validation cost per sample:

- TSS - $50
- Dioxin - $940
- TAL/TCL plus cyanide - $625 [Internal database]

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Air Monitoring:

Fugitive dust, VOCs and odors - $5,000 per month [Internal database]

Includes labor, sample analysis, equipment maintenance

4.1.3 Local Decontamination and Beneficial Use (DMM Scenario C)

General Assumptions:

Construction performed under multiple prime contracts held by client, not by single prime/general contractor

Ten percent construction management fee applied to Long Term O&M costs

Twenty five percent contingency on all costs except construction management

Duration of Dredging and Capping Operations:

- Alternative 2 - 14 years
- Alternative 3 - 6 years
- Alternative 4 - 2 years

Wastewater Treatment Plant O&M:

Annual operation and maintenance cost - 10% of the capital wastewater treatment plant costs

Includes chemical and supplies, regeneration of activated carbon, waste disposal, electrical

Treated wastewater discharged to Newark Bay in accordance with regulatory requirements

Sediment Processing Site O&M:

Includes labor, fuel, utilities, site maintenance and site security for upland processing site

Staffed operations during dredging and processing:

- 24 hour per day operations during dredging and processing
- Staffing does not include dredging contractor workforce or dewatering contractor workforce at upland sediment processing facility

Site operational staffing:

- Site Manager - one person @ $131,000 per year
- Shift Supervisors - three people @ $102,000 per year (each)
- Site Health and Safety Officer - one person @ $102,000 per year
- Equipment/WWTP Operators - six people @ $80,000 per year (each)
- Mechanics - five people @ $80,000 per year (each)
- Laborers - five people @ $44,000 per year (each)
- Laboratory Technician - two people @ $58,000 per year (each)
- Administrative Support - two people @ $36,000 per year (each)
- Site Security - four people @ $29,000 per year (each)

Annual wages/salaries including 40 percent benefits

Insurance - $100,000 per year

Utilities/Fuel - $20,000 per year

GAC storage/recycle cost:

- Alternative 2 - $40,000 per year
- Alternative 3 - $30,000 per year
- Alternative 4 - $10,000 per year

Annual equipment operations and maintenance - 10% of total equipment costs

Miscellaneous equipment - $25,000 per year

Operations Management/Coordination:

Site operational staffing:

- Program Manager - one person @ $204,000 per year
- Operations Leaders - three people @ $131,000 per year (each)
- Senior QA - one person @ $204,000 per year (half time)
- Program Management Support - three people @ $80,000 per year

Annual wages/salaries including 40 percent benefits

Wastewater Testing:

Monthly sampling and analysis:

- TSS - 30 samples
- TAL/TCL plus cyanide - 2 samples
- Dioxins - 2 samples

Analytical and validation cost per sample:

- TSS - $50
- Dioxin - $940
- TAL/TCL plus cyanide - $625 [Internal database]

Shipping cost of $100 per cooler; four samples per cooler [Internal database]

Air Monitoring:

Fugitive dust, VOCs and odors - $5,000 per month [Internal database]

Includes labor, sample analysis, equipment maintenance

5 LONG TERM O&M COSTS

General Assumptions:

Ten percent construction management fee applied to Long Term O&M costs

Twenty five percent contingency on all costs except construction management

Alternative 2 has fewer annual O&M requirements because of the reduced volume of remaining contaminant inventory and the lack of engineered cap in the river

5.1 Annual O&M

5.1.1 L. Annual Monitoring Activities

Community Outreach:

Includes public meetings, fact sheet development, maintenance of administrative record, and other efforts to communicate with the public on the status of work and conditions in the lower eight miles of the Lower Passaic River

Alternative 2 (DMM Scenario A only) and Alternatives 3 and 4 (all DMM Scenarios)

Lump sum of $95,000 per year [Internal database]

Mobilization and Demobilization of Monitoring Equipment:

Annual mobilization charge for monitoring equipment [Contractor communications]:

- Two water quality vessels - $2,500 each
- Geophysical vessel - $6,000
- Small vibracoring vessel - $2,800
- Sediment profile imaging (SPI) vessel - $13,100

Bathymetric Survey:

Daily rate for geophysical vessel of $1,600 (labor) and $6,600 (vessel and equipment) [Contractor communications]

Survey rate - one river mile surveyed per day plus one additional day to survey CAD cell (DMM Scenario A only)

Water Column Sampling and Analysis:

All Alternatives - Two samples taken for two tidal cycles per river mile

DMM Scenario A - Four additional samples for two tidal cycles per CAD cell

Ten percent additional samples collected as samples of opportunity

Daily rate for two water quality vessels of $2,400 (labor) and $2,000 (vessel and equipment) [Contractor communications]

Ten water quality samples collected per day

Samples are analyzed for TPH and lead (surrogate chemical parameters).

Ten percent of the samples are analyzed for the "full suite" of chemicals (dioxin, pesticides, and TAL/TCL plus cyanide).

Analytical and validation cost per sample [Internal database]:

- TPH - $207
- Lead - $25
- Dioxin - $940
- Pesticides - $1,063
- TAL/TCL - $625

Process/ship three samples per man hour

Shipping cost $100 per cooler; four samples per cooler [Internal database]

Sediment Sampling and Analysis:

Sediment sampling for evaluation of remedy and/or cap performance:

- Alternative 2 - Five samples collected at each transect; transects spaced at 0.125 mile intervals; surface sediment sampling only
- Alternatives 3 and 4 - Five cores collected at each transect; transects spaced at 0.1 mile intervals; 6-foot cores on average; four samples per core
- DMM Scenario A - Five cores per CAD cell; 6-foot cores on average; 4 samples per core

Daily rate for small vibracoring vessel of $1,600 (labor) and $3,700 (vessel and equipment) [Contractor communications]

Twenty sediment samples collected per day

Samples analyzed for TPH and lead (surrogate chemical parameters)

Ten percent of samples analyzed for "full suite" of chemicals (dioxin, pesticides, and TAL/TCL plus cyanide)

Analytical and validation cost per sample [Internal database]:

- TPH - $207
- Lead - $25
- Dioxin - $940
- Pesticides - $1,063
- TAL/TCL - $625

Process/ship three samples per man hour

Shipping cost $100 per cooler; four samples per cooler [Internal database]

Biological Monitoring:

Biological monitoring conducted monthly throughout long term O&M period; surveys may include all or some of the following elements:

- Avian community surveys
- Fish community surveys
- Benthic invertebrates surveys
- Biological tissue-residual testing
- Toxicity testing

All Alternatives - Average monthly cost of $112,500, or approximately $1,400,000 per year [Internal calculation/database] for surveying the lower 8.3 river miles

DMM Scenario A - Additional average monthly cost for monitoring cost at the CAD cell:

- Alternative 2 - equal to 20 percent of average monthly cost for surveying in the lower 8.3 miles
- Alternative 3 - equal to 10 percent of average monthly cost for surveying in the lower 8.3 miles
- Alternative 4 - equal to 3 percent of average monthly cost for surveying in the lower 8.3 miles

Habitat Recolonization using SPI:

All Alternatives - Approximately 10 SPI locations per river mile, 20 percent of the river each year

DMM Scenario A - Four additional locations per CAD cell

Imaging, processing and reporting - $2,300 per SPI location

Annual Monitoring Reports:

Laboratory reporting cost - $35,000

Report preparation - 400 hours at $175 per hour to complete draft and final monitoring reports

5.1.2 M. Annual Maintenance Activities

Mobilization and Demobilization of Cap Maintenance Equipment:

Alternative 2 (DMM Scenario A only) and Alternative 3 and 4 (all DMM Scenarios)

Cost based on use of more conventional and readily available equipment compared to precision equipment used to construct cap initially

Ice Scour Evaluation for Cap along Shoreline:

Alternatives 3 and 4 only

Visual cap inspection during low tide in the spring to evaluate winter season ice impacts - three person crew; five 8-hour days - $15,000

Reporting costs - $6,000

Annual Cap Maintenance:

Annual cap maintenance performed on an as-needed based on conditions observed during routine maintenance; estimate provided for budgetary purposes

- Alternative 2, DMM Scenario A - 0.2 percent of cap material at CAD cell replaced annually
- Alternatives 3 and 4, all DMM Scenarios - 0.2 percent of cap material at CAD cell and in river replaced annually

Cap material cost (installed) - $50 per cubic yard

No maintenance required in backfill and armor areas

5.2 Periodic O&M

General Assumptions:

Periodic or supplemental O&M activities to occur approximately every five years

5.2.1 N. Periodic Monitoring Activities

Community Outreach:

Includes public meetings, fact sheet development, maintenance of administrative record, and other efforts to communicate with the public on the status of work and conditions in the lower eight miles of the Lower Passaic River

Alternative 2 (DMM Scenarios B and C only)

Lump sum of $95,000 per year [Internal database]

Supplemental Biological Monitoring:

Supplemental biological monitoring conducted periodically; surveys may include all or some of the following elements:

- Avian community surveys
- Fish community
- Benthic invertebrates
- Biological tissue-residual testing
- Toxicity testing

Approximate cost for complete assessment $2,800,000 [Internal calculation/database] less work performed on an annual basis for an additional periodic cost of approximately $1,400,000

Supplemental Habitat Recolonization using SPI:

All Alternatives - approximately 10 SPI locations per river mile, additional 80 percent of the river

DMM Scenario A - additional six locations per CAD cell

Imaging, processing and reporting - $2,300 per SPI location

Performance Review Report:

Additional laboratory report cost - $15,000

Report preparation - 2,000 hours at $175 per hour to complete draft and final monitoring reports

5.2.2 O. Periodic Maintenance Activities

Periodic Cap Maintenance:

Periodic expanded maintenance of engineered cap:

- Alternative 2, DMM Scenario A - five percent of cap material at CAD cell replaced periodically
- Alternatives 3 and 4, all DMM Scenarios - five percent of cap material (at CAD cell and in river [DMM Scenario A]) replaced periodically

Installed cap material costs - $50 per cubic yard

No maintenance required in backfill and armor areas

Natural Shoreline Maintenance:

Replace dying and diseased plantings

Replant ten percent of natural shoreline - approximately 2,300 linear feet

Replanting cost - $200 per linear foot

6 ACRONYMS

@ at

CAD Confined Aquatic Disposal

CKD cement kiln dust

DMM Dredge Materials Management

DOC dissolved organic carbon

ENR Engineering News Record

FFS Focused Feasibility Study

GAC Granulated Activated Carbon

H:V horizontal to vertical

HARS Historic Area Remediation Site

IDW investigation derived waste

MGD million gallons per day

NAVD North American Vertical Datum

O&M Operations and Maintenance

PAH polycyclic aromatic hydrocarbon

PCB polychlorinated biphenyl

POC particulate organic carbon

QA quality assurance

RCRA Resource Conservation and Recovery Act

RM river mile

S/S solidification/stabilization

SVOC semi-volatile organic compounds

TAL/TCL Target Analyte List/Target Compound List

TCLP Toxicity Characteristic Leaching Procedure

TOC total organic carbon

TPH total petroleum hydrocarbons

TSS total suspended solids

USEPA United States Environmental Protection Agenc y

VOC volatile organic compounds

Unit Acronyms Presented in Tables

CY cubic yards

EA each

LF linear feet

LS lump sum

SF square feet

SY square yard

7 REFERENCES

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